

3 - CHARACTERISTICS OF RADIATORS

3.2- Radiators for Power Transformers (W = 520)

3.2.6- Cooling surface, Dissipation factors, Weight and Volum per Element :

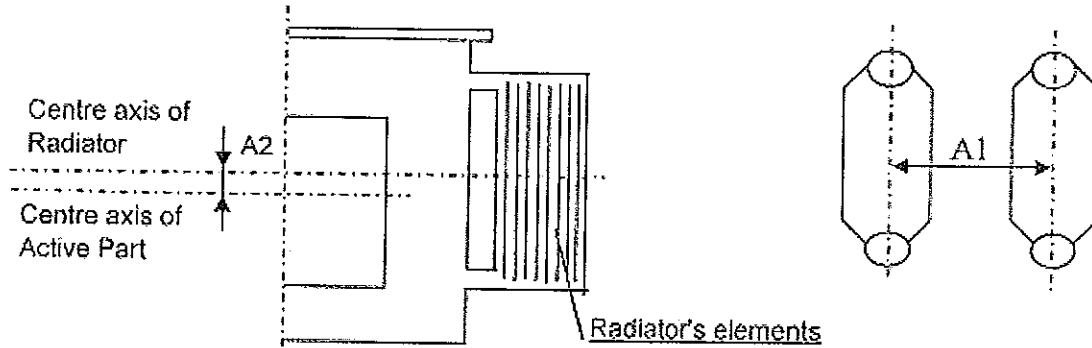
L (mm)	Qe Surface per Elem. (m ²)	W55 / m2 (W)	W55 / ele. (W)	Ge Weight per Elem. (kg)	Ve Volume per Elem. (dm ³)
800	0,953	432	412	9,70	2,80
900	1,073	430	462	10,83	3,08
1000	1,192	428	510	11,94	3,36
1100	1,311	427	560	13,05	3,63
1200	1,430	421	602	14,16	3,92
1300	1,550	418	648	15,28	4,19
1400	1,669	416	694	15,62	4,46
1500	1,778	413	739	17,42	4,73
1600	1,907	408	778	18,62	5,02
1700	2,027	404	819	18,97	5,30
1800	2,146	400	858	20,87	5,57
1900	2,265	398	901	21,98	5,85
2000	2,384	395	942	23,09	6,11
2100	2,503	392	981	24,20	6,31
2200	2,622	389	1020	25,32	6,67
2300	2,742	386	1058	26,44	6,95
2400	2,861	379	1084	26,770	7,23
2500	2,980	375	1116	28,67	7,50
2600	3,099	372	1153	29,78	7,76
2700	3,218	370	1191	30,90	8,04
2800	3,334	369	1230	31,98	8,32
2900	3,457	365	1262	33,13	8,59
3000	3,576	360	1287	33,47	8,87
3100	3,695	358	1323	35,36	9,15
3200	3,814	356	1358	36,47	9,42
3300	3,934	353	1389	36,82	9,68
3400	4,053	349	1415	38,71	9,97
3500	4,172	348	1452	39,82	10,26

000189

3 - CHARACTERISTICS OF RADIATORS

3.2- Radiators for Power Transformers (W = 520)

3.2.7- Correction Factors:



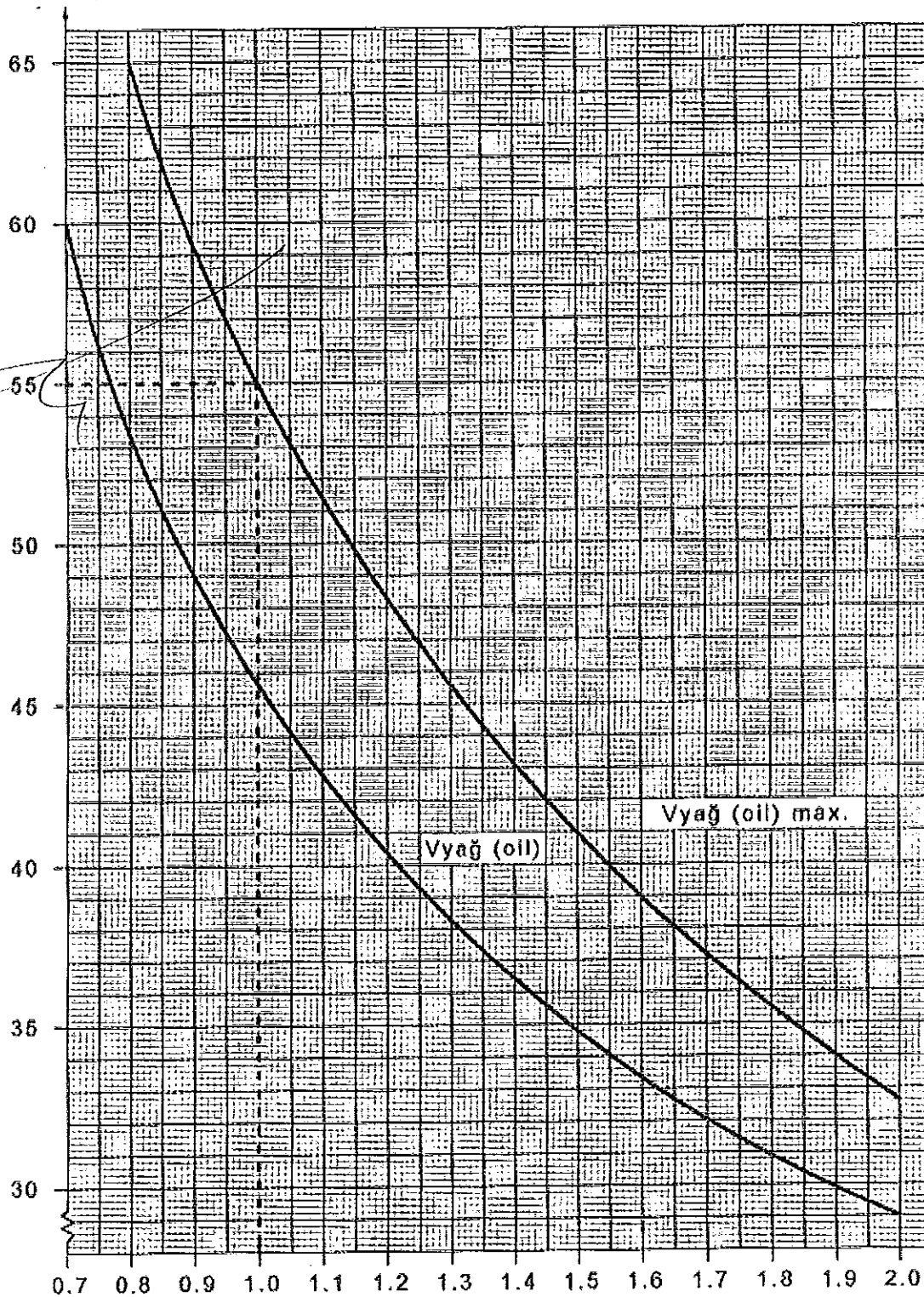
Opening Factor between Groups	
A1 (mm)	f1
580	0,892
590	0,905
600	0,916
610	0,924
620	0,931
630	0,940
640	0,946
650	0,953
660	0,958
670	0,963
680	0,967
690	0,972
700	0,977
710	0,982
720	0,986
730	0,991
740	0,996
750	1,000
>750	1,000

Number of Elements Factor	
Nc	f2
2	1,141
3	1,125
4	1,100
5	1,080
6	1,069
7	1,055
8	1,047
9	1,034
10	1,010
11	1,000
12	0,975
13	0,957
14	0,941
15	0,927
16	0,910
17	0,890
18	0,873
19	0,851
20	0,832
21	0,819
22	0,795
23	0,780
24	0,761

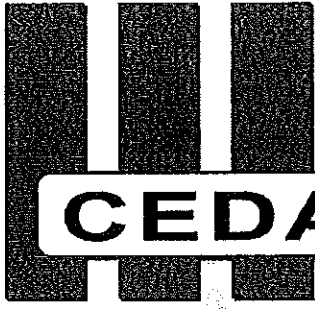
Factor of Height Difference	
A2 (mm)	f3
0	0,800
25	0,820
50	0,830
75	0,840
100	0,850
125	0,860
150	0,870
175	0,880
200	0,890
225	0,900
250	0,910
275	0,915
300	0,925
325	0,930
350	0,935
375	0,940
400	0,950
425	0,955
450	0,960
475	0,970
500	0,975
525	0,980
550	0,985
575	0,990
600	1,000
625	1,005
650	1,010
675	1,020
700	1,025
725	1,030
750	1,035
775	1,040
800	1,050
825	1,055
850	1,060
875	1,070
900	1,075
925	1,080
950	1,085
975	1,090

ISI DÜZELTME FAKTÖRÜ
HEAT CORRECTION FACTOR

Vyağ (oil) (°C)

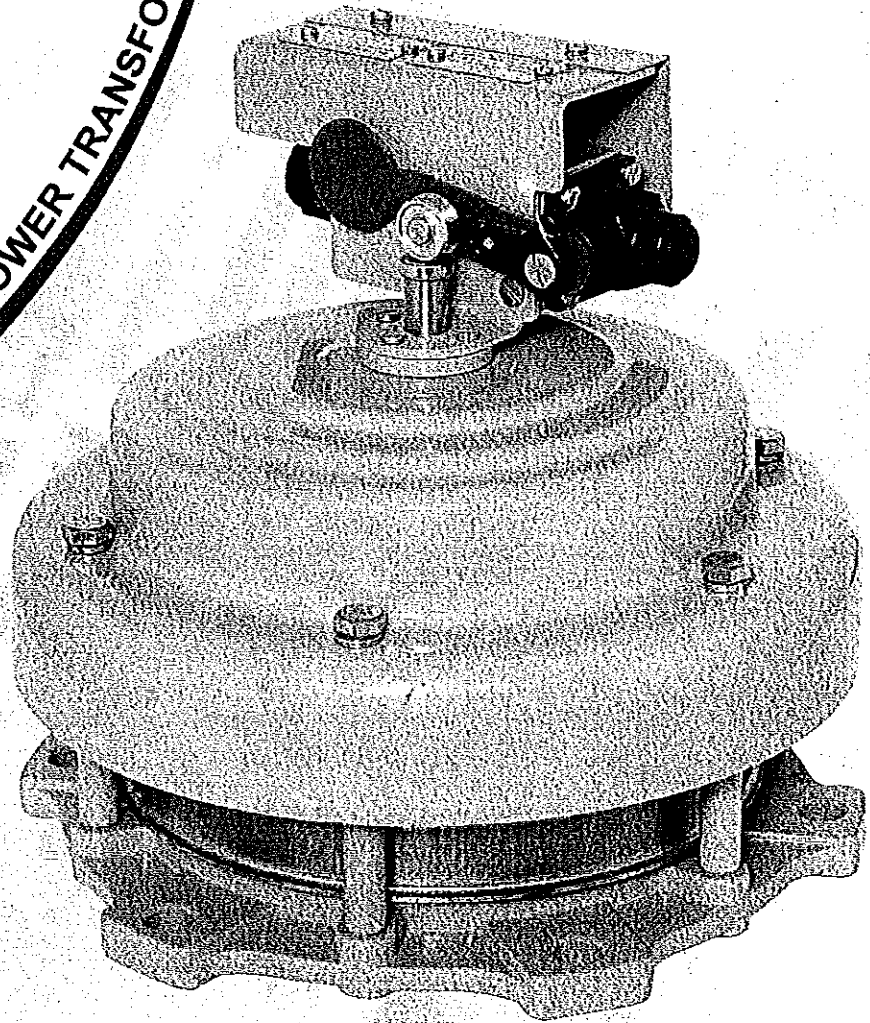


000191



CEDASPE

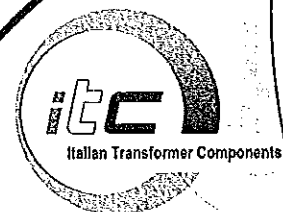
ACCESSORIES FOR POWER TRANSFORMERS



PRESSURE RELIEF VALVE RT6

(Model year 2013)

Made in Italy



Water Transformer Components

000192



I. 20088 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.28.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 600.000 I.V. - TVA-P.I. IT 01066780165 - C.F. 01066780165
R.E.A. MI 729991 - IMPORT-EXPORT MI 142410 - REG. IMPR. 132146/334446 TRB. MI

1.0 Features

When it is required to limit the pressure rise inside a tank, in order to prevent an excessive mechanical stress of the walls, it is necessary to use a safety valve set at a precise overpressure value.

The tank of oil-immersed transformers is usually fit with this kind of protecting device; as matter of fact, in case of short-circuit due to an insulation failure, the dielectric arc between alive parts vaporises the surrounding insulating fluid which generates a quick rise of the pressure inside the tank, with the risk of permanent deformations, or, even, of the failure of the tank walls with the consequent flow-out of hot oil. Due to the high rapidity of this event, it is necessary to mount on the transformer an adequate protecting device which relieves quite suddenly the excess of pressure generated inside the tank by the above mentioned failure.

Our Pressure Relief device RT6 can assure such kind of protection

2.0 Construction features

Reference drawings

Assembly, overall dimensions, available wiring diagram, and cross section: see drawing 1375

Materials and components

Flange is made in aluminum alloy pressure die casted; shutter in stainless steel; cover in mild steel; springs (compression type) are made of special hardened spring steel; gaskets (in standard execution) in NBR; fittings in stainless steel or brass or mild steel

Surface protection

Flange, cover and contact's casing are painted internally and externally with one primer coat of epoxy paint and externally with a finishing powder coating colour RAL7030. The primer coat on the internal surfaces in contact is compatible with transformer mineral oil up to temperatures of 120°C. Total thickness of the two coats is 120 microns; special painting cycle can be provided for transformer located in very polluted areas; springs and fittings made in mild steel are epoxy coated protected and other parts made in brass are nickel plated

Construction

The pressure relief valve type RT6 is an out of tank spring loaded safety valve, consisting of a 6 holes mounting flange with the central opening closed by a spring loaded shutter; the springs are compressed between shutter and the protective cover (that has also the function of compressive ring), which is assembled to the flange by columns.

No one part of the pressure relief valve protrudes inside the transformer tank.

A specially designed set of gasket assures the oil-tightness between flange and shutter when the valve is in closed position.

Operation indication

A red armed semaphore, horizontally locked in rest position, rotates up, showing approx 50 mm over the top of the valve cover, in case of valve operation due to an overpressure.

The operation of the pressure relief valve is also indicated by one or two electric contacts (see the characteristics at paragraph 5).

Oil-tightness and resistance to pressure

The pressure relief valve RT6 are oil tight with oil at 100°C up to the tightness test pressure P_t (ref table at end of paragraph 6), which depends on the setting pressure

Mechanically, the pressure relief valve are resistant to vacuum (10 torr) and to internal pressure up to 4 bars.

Resistance to dynamical stress

The pressure relief valve RT6 can operate without undue operation in the following conditions:

Sinus vibrations with frequency ≤ 120 Hz and amplitude $\leq 250 \mu$;

Dynamic conditions causing following accelerations:

- Max 3g in all directions, sinus vibration, amplitude ≤ 20 mm;
- Shock condition with max 10 g in all directions.

000193



I - 28088 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
 TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.20.44.22
 E-Mail: cedaspe@cedaspe.com - Internet Site: http://www.cedaspe.com
 CAP. SOC. € 600.000 I.V. - TVA, P.I. IT 01065780156 - C.F. 01065780156
 R.E.A. MI 729991 - IMPORT - EXPORT IM 142410 - REG. IMPR. 132145/33446 TRIB. MI

3.0 Operation and installation

Operation

Should an overpressure inside the transformer tank rise up, higher than the operation pressure set, the shutter of the relief valve lifts slowly from the rest position disjoining the main tightening gasket; the excess of gas can't be released yet from valve due to the second tightening gasket which is still in contact with the shutter; in this position, the gas (or the oil) is operating over a much bigger area than the surface defined by the main gasket; the result is that in few milliseconds there is a very high increase of the load on the shutter which wins the springs counterload and the shutter lifts suddenly; the excess of pressure is released very quickly through the very big section opened by the shutter which, after it, recloses as much suddenly as its opening.

Importance of the electric contact

Real life tests have shown, that failures of the transformer followed by sudden pressure increases, such as for instance short circuits, induce the operation of the pressure relief valve in time spans which are considerably shorter than that of other safety devices, such as the Buchholz Relay.

Installation

There is not any precise formula to be used to determine the nr of valve to be installed on one transformer. The normal practice suggests to use one pressure relief device for each 35.000 litres of transformer oil capacity or fraction.

The pressure relief valve should be installed, either in horizontal or vertical position, on the transformer tank or cover, as near as possible to the failure sources or in a central position to such sources making sure of a good visibility of the red semaphore.

4.0 Setting

The setting of the pressure relief valve RT6 is effected by choosing a proper spring for every operating pressure value; therefore the setting of the pressure relief valve can be changed only at the factory, thus eliminating possible misuses.

The performance of the pressure relief valves depends from the test fluid and the layout of the transformer tank. The pressure values listed below are obtained by operating the valves with compressed air on a test bed having a compressed air volume of 150 dm³.

To avoid oil leakage or undue operation of the valve, the operating pressure must be chosen so that in normal operation the corresponding maximum operating pressure is never reached.

In following table are indicated the tolerance of the standard pressure setting, the service pressure, the closing pressure and the tightness pressure for the different nominal pressure settings.

Pn		Pmin		Pmax		Pc	Pt
[bar]	[kPa]	- %	[bar]	+ %	[bar]		
0,35	35	20	0,28	20	0,42	0,12	0,26
0,42	42	17	0,35	17	0,49	0,14	0,31
0,49	49	14	0,42	14	0,56	0,18	0,36
0,56	56	12	0,49	12	0,63	0,22	0,42
0,7	70	10	0,63	10	0,77	0,28	0,52
0,84	84	8	0,77	8	0,91	0,35	0,63

Pn (nominal pressure) is the setting pressure of the pressure relief valve, on which the tolerance must be applied in order to determinate the minimum and maximum operating pressure.

Pmin, Pmax (minimum and maximum operating pressure) are the limits of the pressure range inside which the pressure relief valve must operate.

Pc (closing pressure) is the minimum pressure at which the valve closes after operation

Pt (tightness test pressure) is the pressure at which the valve is tested during the leakage tests.

000191



I - 26098 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.29.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 600.000 I.V. - TVA-P.I. IT 01066780165 - C.F. 01066780165
R.E.A. MI729391 - IMPORT - EXPORT IM 142410 - REG. IMPR. 132146334446 TRIB. MI

5.0 Electric contacts

The contacts used are microswitch type and are mechanically operated by the shutter; after operation the contacts remain in trip position and it is necessary to reset them manually by rotating the red semaphore (located on the cover of the PRD) in the rest position; the contacts are housed inside the terminal box made of aluminium with a cable gland or conduit entry M25

Characteristic of N/O and N/C contacts (used in wiring diagram C1 and C2)

Type	Limit switch
Lever	Stainless steel
Contact material	Silver
Mechanical life of contact	2x10 ⁷ cycles
Temperature range	-40°C - +125°C
Standard interruption power	AC 125/250V-5A - DC 125V-2A
Insulation to earth at 20°C	2.500V
Insulation of open contact at 20°C	1.500V
Protection degree of terminal box	IP 67

Characteristic of changeover contacts (used in wiring CX)

Type	Microswitch
Lever	Stainless steel
Contact material	Nickel coated silver
Mechanical life of contact	1x10 ⁷ cycles
Temperature range	-40°C - +125°C
Standard interruption power	AC 125/250V-15A - DC 125V-1A
Insulation to earth at 20°C	2.500V
Insulation of open contact at 20°C	1.500V
Protection degree of terminal box	IP 65

6.0 Compatibility of installation

The installation compatibility of the pressure relief valve RT6 depends mainly on the material used for the gaskets; our standard material is high quality NBR (which is compatible with the most common ambient conditions) therefore admitted operating conditions are:

Environmental conditions.

Ambient temperature: -20°C to +50°C

Relative humidity: 95% at 20°C - 80% at 40°C - 50% at 50°C

Insulating liquid (transformer mineral or silicon oil).

Temperature: -20°C to +110°C

For other environmental and/or operating conditions to be examined individually.

7.0 Ordering Instructions

When ordering must be defined following data:

- Model of pressure relief device : RT6
- Wiring diagram (ref to drawing 1375) : CX; C1; C2
- Nominal operating pressure in kPa (or bar or psi)
- Special requirements

Example

Nr 1 Pressure relief device type RT6 C1 0.5 bar

Means that is required nr 1 PRD type RT6 having 2 contacts 1 N/O and 1 N/C (wiring diagram C1), set at nominal pressure 0.5 bar, standard execution

000195

A4 (210x297)

LIT. [(0.0) (195.286)]

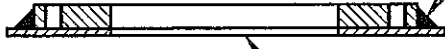
FILE = 1375 .DWG

REV. 05 DTG 22/11/10

La CEDASPE S.p.A. si riserva o termini di legge la proprietà del presente disegno con divieto di riprodurlo e comunicarlo a terzi senza sua autorizzazione.

Note :
Tapping has to be
done before welding

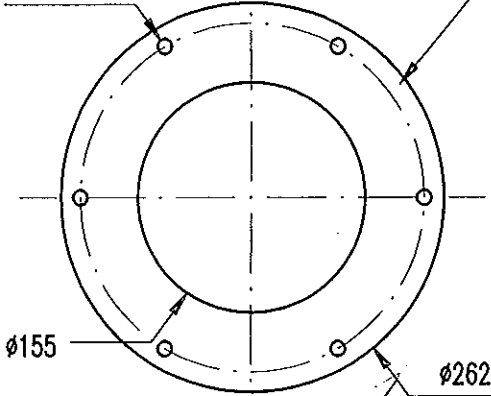
LEAK PROOF
WELDING



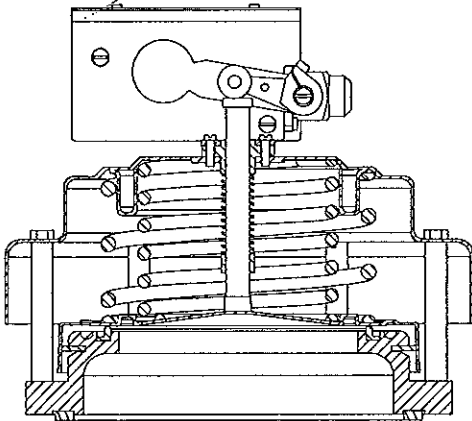
TANK COVER

6 HOLES M12
ON PCD Ø235

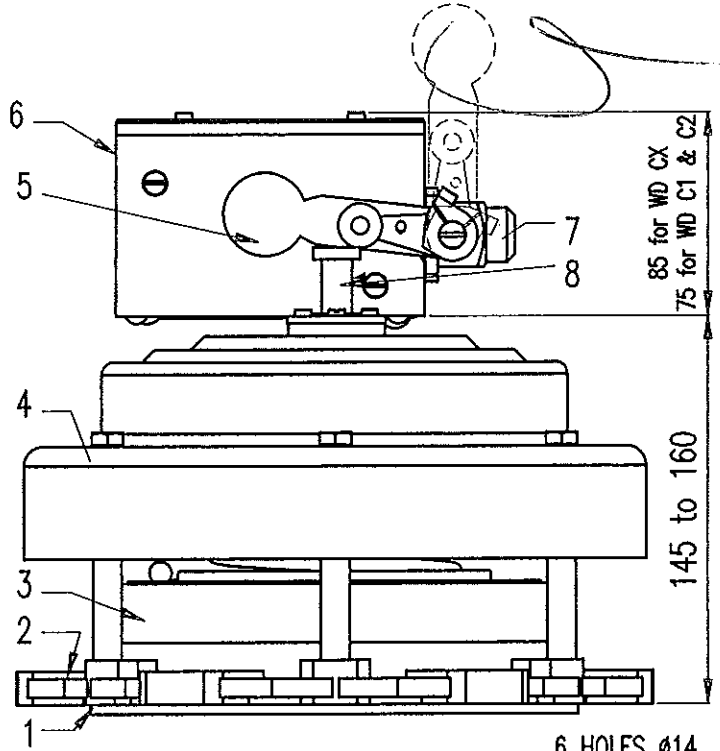
15 mm THK



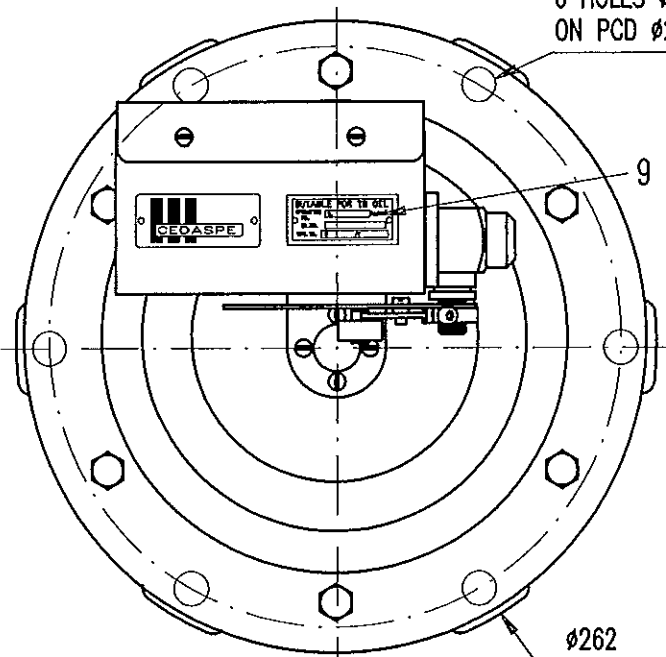
Connecting flange



Cross section



6 HOLES Ø14
ON PCD Ø235



Ø262

	Type CX	Type C1	Type C2
WIRING DIAGRAM			
CONTACT RATING	AC : 15A 125/250V DC : 1A 125V	AC : 5A 220/240V DC : 2A 220V	

Pos	Description	Material
1	Flange gasket	NBR
2	Body valve	Aluminium
3	Shutter	S/Steel
4	Cover	Steel
5	Red Semaphore	Aluminium
6	Terminal box	Aluminium w/steel cover protection
7	Switch	
8	Actuating rod	S/Steel
9	Data plates	Brass

CEDASPE

Titolo

**PRESSURE RELIEF
VALVE RT6**

Data 28/03/08

Scala 1:3

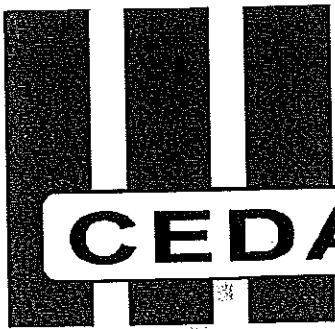
Dis.

Visto

Dis. Nr

000199
1375

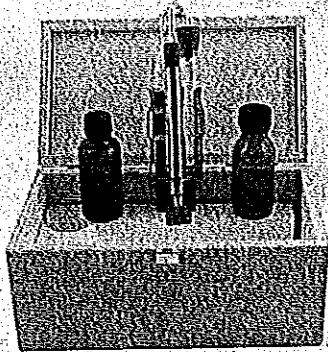
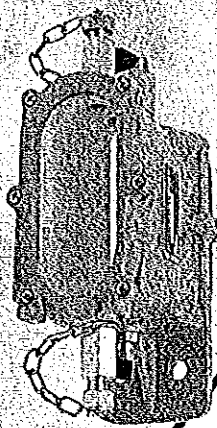
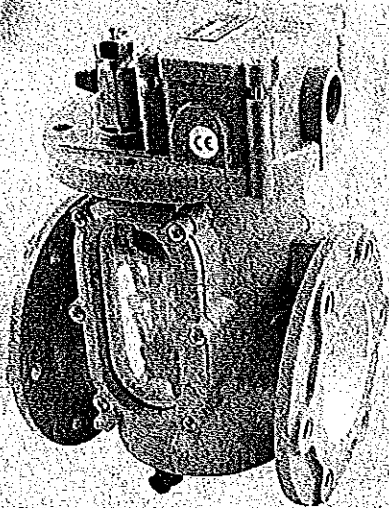
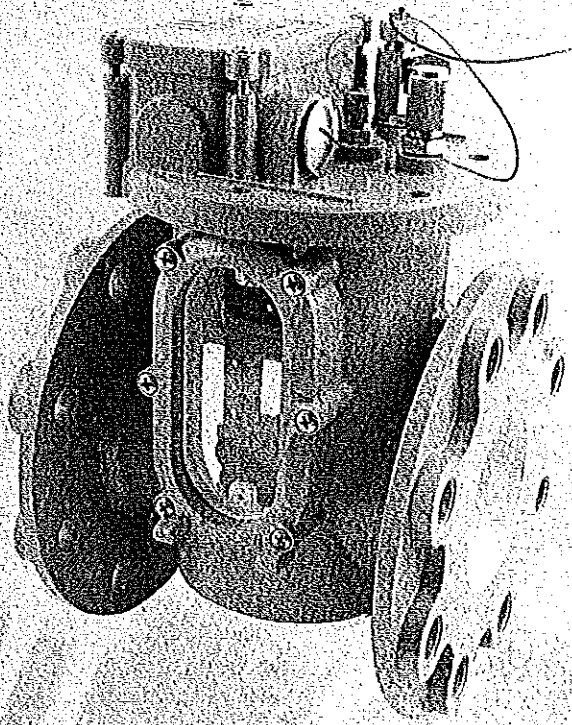
1 2 3 4 5



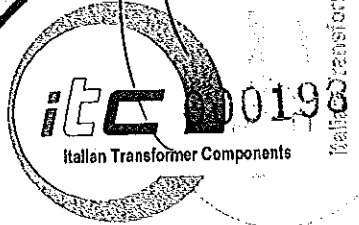
CEDASPE

CEDASPE
S.p.A.
Via ...
...

BUCHHOLZ RELAYS



000197



Made in Italy

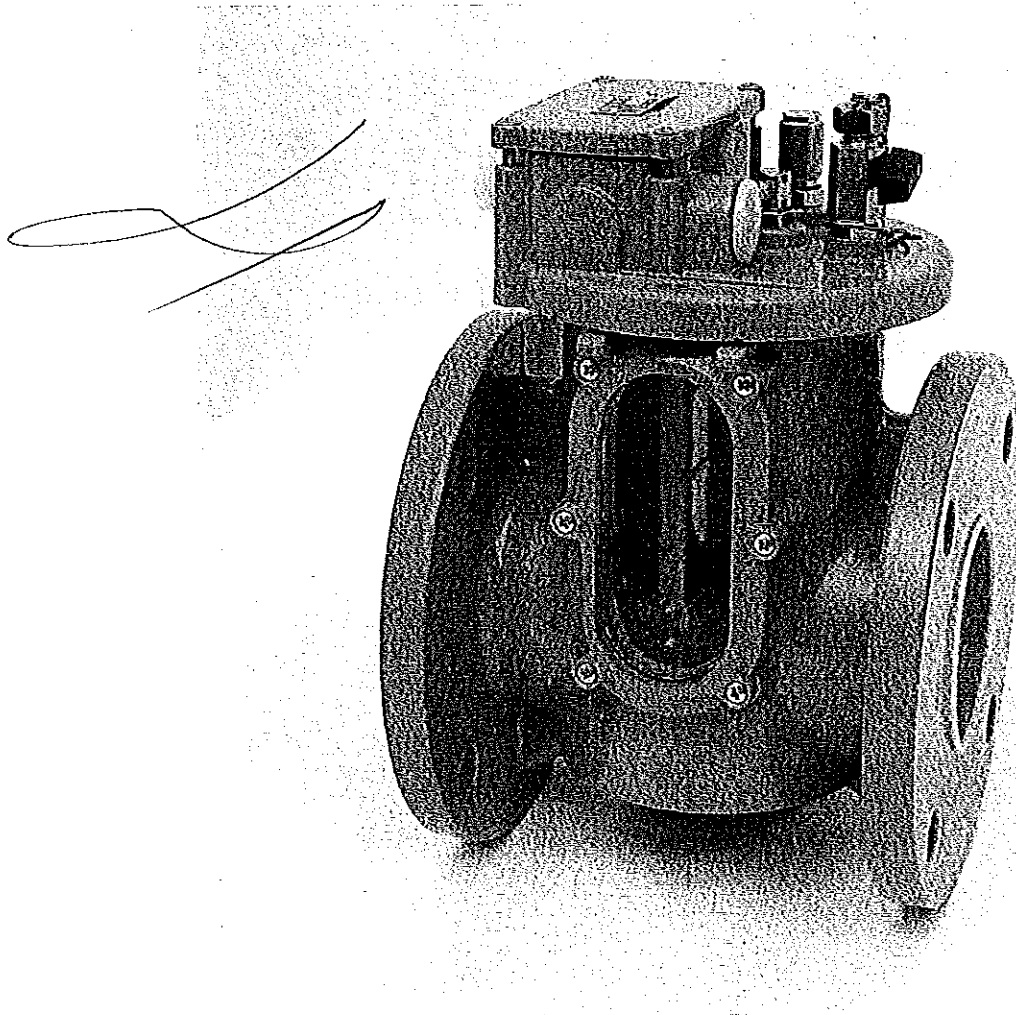


Italian Transformer Components



I - 24098 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 500.000 I.V. - TVA-P.I. IT 01066780165 - C.F. 01066780165
R.E.A. MI 729991 - IMPORT - EXPORT MI 142410 - REG. IM/PR. 132146/334446 TRUB. MI

GAS ACTUATED RELAYS FOR OIL FILLED TRANSFORMERS EN 50216-2





1 - 28098 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 99.20.44.22
E-Mail: cedaspe@cedaspe.com - Internet Site: http://www.cedaspe.com
CAP. SOC. € 500.000 I.V. - TVA-PI, IT 01066780165 - C.F. 01066780165
R.E.A. MI 729991 - IMPORT - EXPORT MI 142410 - REG. IMPR. 132146/34446 TR9. MI

1. General Features

1.1 Characteristics

The gas-actuated protective relay is designed to detect faults as well as to minimise the propagation of any damage, which might occur within oil-filled transformers.

The relay is therefore particularly effective in case of:

- short-circuited core laminations
- broken-down core bolt insulation
- overheating of some part of the windings
- bad contacts
- short circuits between phases, turns
- earth faults
- puncture of bushing insulators inside tank

Furthermore the relay can prevent the development of conditions leading to a fault in the transformer, such as the falling of the oil level due to leaks, or the penetration of air as a result of defects in the oil circulating system.

The adoption of other forms of protection does not therefore exclude the use of the gas-actuated Buchholz relay, as this device is the only means of detecting incipient faults, which if unnoticed, can cause heavy failures.

1.2 Operating principle

The operation of the Buchholz relay is based upon the fact that every kind of fault in an oil-filled transformer causes decomposition of the insulating material, be it liquid or solid, due to overheating in the fault zone or to the action of an intense electric field, and generation of bubble of gas.

These reach the relay (normally filled with oil) through the pipe connecting the transformer to the conservator where the buchholz relay is mounted

2. Special features

2.1 Design of active part

The active part of relay is designed in order to permit the free passage of the oil flow through the body, not any obstacle (except the flap that detects the oil flow rate) such as the floats or any other apparatus is present between the entry and the exit of the oil inside the relay.

The lower and the upper floats are isolated from flux of oil thus unattended operation due to turbulence of oil are avoided.

On demand, a special device permit, in case of oil surge, to hold the trip contact in his operated position making possible the relay be resettable only manually.

2.2 Design of contacts

The relays are provided with magnetic switches instead of the traditional mercury switches in which the high mobility of the mercury makes it necessary to fit expensive adjustments to avoid unattended closing of the contacts and the consequent mal-functioning of the relay, whenever this is subject to severe vibrations.

Moreover, each contact is operated by 2 magnets displaced in a such way that make a constant magnetic field around the contact itself, in this way contact is not influenced by external magnetic fields that are present on a transformer



I - 20099 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0299.20.44.11 - TELEFAX +39 02 99.20.44.22
E-Mail: cedaspe@cedaspe.com - IntraNet Site: http://www.cedaspe.com
CAP. SOC. € 600.000 I.V. - TVA, P.I. IT 01066780155 - C.F. 01065780155
R.E.A. N. 729391 - IMPORT - EXPORT IM 142410 - REG. IMPR. 132146/0344A6 TRUB. IM

3. Operating features

3.1 Slight faults

When a slight or incipient fault occurs in the transformers, the small bubbles of gas, which pass upwards towards the conservator, are trapped in the relay housing, thus causing a decrease of the oil level inside the relay.

As a result, the upper float closes its magnetic switch, thus completing the alarm circuit and operating an external alarm device.

3.2 Serious faults

3.2.1 Gas generation

When a serious fault occurs in the transformer, the gas generation is violent and causes the oil to rush through the connecting pipe to the conservator.

In the relay, this oil surge impinges on the flap fitted on the lower part (located in front of the hole for the oil passage) and causes the closing of its magnetic switch, completing the tripping circuit to the circuit-breaker and disconnecting the transformer.

The value of the oil speed required to operate the tripping device can be varied by changing a counterweight fitted on the device itself or changing its size.

3.2.2 Oil leak

An oil leak in the transformer causes the fall down of the oil level inside the relay, thus operating first the alarm (upper) float and then the tripping (lower) float, which will close their own circuits

3.2.3 Air inlet

The ingress of air into the transformer, arising from defects in the oil circulating system or from other causes, operates the alarm float first and after the trip contact.

4. Construction feature, Finish and Accessories

4.1 Construction features

The body and the cap of the buchholz relay are made of aluminium alloy casting, oil tight weatherproof; the compact design, that means low weight, small sizes, efficiency, is the result of a very long experience in manufacturing relays. Two flanges on the body permit an easy connection of the relay to the tubes; two large inspection windows made in trogamid (on request made in tempered glass), with graduated scale, are fitted on both sides of the relay housing (on request windows can be provided with sun shield protection).

A flat surface on the cap of the relay make it possible, using a spirit level, to mount the relay with the proper inclination

4.2 Accessories

On the cap of the relay are provided petcock for the release of the gas, a push-button for testing the electrical circuits, a small valve for pneumatic test (standard on Buchholz size 2" & 3" on request on Buchholz size 1") and a cable box (which is cast integrally to the cap) with 2 cable gland entry size M25x1.5.

On the bottom of the relay is provided a plug for draining of oil.

4.3 Finish

In standard execution, all cast parts are protected by one coat of epoxy primer and one coat of polyurethane paint (total thickness 80 µm), final colour RAL 7030 and screws and washer are in stainless steel; the protection degree of the device is IP 55. Therefore the device is suitable for outdoor installation in tropical climate and with industrial pollution.



I-28988 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
 TELEFONO +39 0298.29.44.11 - TELEFAX +39 02 98.29.44.22
 E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
 CAP. SOC. € 600.000 I.V. - TVA-P.I. IT 01056780155 - C.F. 01056780155
 R.E.A. M.723991 - IMPORT - EXPORT M 142410 - REG. IMPR. 132146/33446 TRB. MI



5. Contacts

5.1 General

The magnetic switches consist of two thin reed contact blades hermetically sealed inside a glass capsule in an atmosphere of dry inert gas.

The reeds are made of a ferromagnetic material and are cantilevered into the end of the capsule.

The tips of the reeds overlap and are separated by an air gap. The tips, forming the contact surfaces, are coated with a contact material.

The switches are operated by a permanent magnet.

The operating principle of the magnetic switches is very simple: when a magnet approaches the switch, the reeds close the circuit; when the magnets moves away from the switch, the contact gets open.

5.2 Rated current

The rated current for normally open contacts is 2 A r.m.s. and 1 A for changeover contacts;

The short time current is 10A r.m.s. for 30 ms

5.3 Breaking and making capacity

Normally Open Contacts			
Voltage	Max Current	Breaking capacity	
24V d.c. to 240V d.c.	2A	250W	L/R<40ms
230V a.c.	2A	400VA	cosφ>0,5

Change over Contacts			
Voltage	Max Current	Breaking capacity	
24V d.c. to 240V d.c.	1A	130W	L/R<40ms
230V a.c.	1A	250VA	cosφ>0,5

6. Wiring diagrams

6.1 Standard wiring diagrams

Standard wiring diagram available are:

Type "A" - 2 N/O contacts (1 for alarm; 1 for trip signalling)

Type "L" - 2 change-over contacts (1 for alarm; 1 for trip signalling)

Type "G" - 3 N/O contacts (1 for alarm; 2 for trip signalling)

6.2 Special wiring diagrams

Special wiring diagram are available on demand on relays NB 50 & 80 mm are

Type S2 - 1 changeover contacts for alarm and 1 changeover contact plus 1 N/O contact for trip

Type S3 - 1 changeover contacts plus 1 N/O contact for alarm and 1 changeover contact for trip

Type S4 - 4 contacts N/O; 2 for alarm and 2 for trip

Type R - 2 changeover contacts with a device which hold the trip contact in its position in case of oil surge operation; manual reset of the contact by pushing the test button on top of relay (same as TU system).

Handwritten mark and stamp: 000201



I - 20098 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
 TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.20.44.22
 E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
 CAP. SOC. € 500.000 I.V. - TVA-P.I. IT 01066780165 - C.F. 01065780165
 R.E.A. M 729991 - IMPORT - EXPORT M 142410 - REG. IMPR. 13214633446 TRIB. MI

7. Service conditions

7.1 Environmental conditions

Relays comply with following environmental conditions as classified in EN60721-3-4

K	Climatic conditions	4K2
Z	Special climatic conditions	4Z2+4Z4+4Z7
B	Biological conditions	4B1
C	Chemically active substances	4C2
S	Mechanically active substances	4S3

7.2 Special mechanical conditions

Our buchholz relay can withstand to mechanical stresses without unattended operation to the following stresses acc to EN 60721-3-4

- stationary sinusoidal vibration class 4M4
- non stationary vibration : a vertical shock of 100m/s², with type 1 spectrum

7.3 Protection degree

Protection degree of the terminal box is IP65 acc to EN60529

7.4 Corrosion

The relay is designed to withstand to corrosion test acc to ASTM B 117 in salty fog chamber for 200h

7.5 Pressure and vacuum resistance

The relay is designed to work continuously with an internal pressure of 50kPa but is capable to withstand an overpressure of 250 kPa for 2 min and to vacuum pressure of 2.5 kPa for 24h

7.6 Insulating liquid

The relay is designed for operate with transformer oil with viscosity range from 1 mm²/s to 1100 mm²/s

7.7 Working temperature

The relay is suitable for operation in transformer oil over temperature range from minimum minus 25°C to plus 115 °C

The relay is suitable for operation in ambient air temperature range from minimum minus 45°C to plus 70 °C

Special execution are available on demand

7.8 Mounting position

The relay is designed to operate properly on a pipe having an inclination from horizontal between 2 and 5 degrees

8. Operational performance

8.1 Operating characteristics

Typical values of the oil speed required to operate the tripping element under surge conditions and the volume of accumulated gas required to operate the alarm float and trip contact , are:

Oil pipe connection internal diameter	Alarm for gas accumulation	Trip for steady oil flow	Trip for gas accumulation	
25 mm	150±50 cm ³	100±15 cm/s	after alarm contact is operated and before the oil reaches lowest point of pipe	
50 mm				
80 mm				100±15 cm/s (standard)
				150±25 cm/s (upon request)
	200±100 cm ³	200±35 cm/s (upon request)		



I - 28088 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.29.44.22
E-Mail: cedaspe@cedaspe.com - Internet Site: <http://www.cedaspe.com>
CAP. SOC. € 600.000 I.V. - TIVA-P.I. IT 01066780165 - C.F. 01066780165
R.E.A. MI 729931 - IMPORT-EXPORT M 142410 - REG. IMPR. 132146/334446 TRIB. MI



9. Installation

9.1 Mounting

The gas actuated relay is mounted on the connecting pipe between the transformer and the conservator.

The pipe has to allow the easy flow to the relay of the gas arising from faults inside the transformer, starting from the highest point on the transformer cover and must not protrude inside into the transformer.

The pipe should not contain any right-angle elbows. Its diameter should correspond to the diameter of the hole for the passage of oil of the relay.

The pipe must be arranged to slope upwards towards the conservator at an angle of about 2 to 4 degrees to the horizontal (max 5 degrees).

The part of the pipe preceding the relay should be straight for a length equal to at least five pipe diameters; the part of the pipe leading to the conservator immediately adjacent to the relay should be straight for a length equal to at least three pipe diameters.

A flat surface on the cap of the relay make it possible, using a spirit level, to mount the relay with the proper inclination

The petcock at the top of the relay must be at a level below the bottom of the conservator.

When mounting, the arrow engraved on the body of the relay must point in the same direction as the oil flow to the conservator.

If the transformer is provided with an explosion vent or similar attachment, this must be sealed in such a way that any gas liberated by the transformer does not accumulate in the vent, otherwise the operation of the alarm float will be delayed.

9.2 Setting to work

Once the relay has been mounted, unscrew the knurled cap which covers the push-button for checking the circuits and remove from inside it the small spacer which immobilises the alarm and tripping floats in their lower position, thereby preventing their movement during despatch.

Open up the gas release cock, located on the relay cover, to allow the relay to fill up with oil.

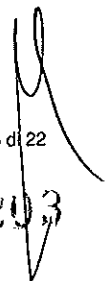
The filling up and the position of the floats can be seen through the inspection windows.

When the relay is filled with oil, close the gas release cock.

The electrical circuits must be connected as shown in the diagram accompanying the relay.

9.3 Maintenance

The buchholz relay does not need periodic maintenance; however it is advisable to check regularly the electric contact and the freely movement of float.





I - 20099 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.29.44.11 - TELEFAX +39 02 98.29.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 500.000 I.V. - TVA-P.I. IT 01066780155 - C.F. 01066780155
R.E.A. MI 729931 - IMPORT - EXPORT MI 142410 - REG. IMPR. 132146/334416 TRIB. MI

10. Check after actuation of relay

10.1 Alarm signal

When the alarm signal is given, the colour of the gas should be observed through the inspection-windows.

The gas may be released or samples can be taken for analysis. (If the relay is supplied with our "Buchholz gas sampling apparatus RG3, this operation can be carried out at eye-level).

It should be noted that:

- whitish gas : it is caused by electric arcing in contact with paper, cotton and silk
- yellowish gas : it is caused by wood and cardboard
- greyish gas : it is caused by from a breakdown of the magnetic circuit
- black gas : it is caused by from free arcing in the oil

Note that there may be air in the transformer during commissioning or after an operation of oil refilling

In similar cases the alarm is only temporary and should end in a short period of time.

10.2 Trip signal

If the relay disconnects the transformer, similar checks on the gas should be made to determine the colour and the quantity of gas collected.

It is always good practice to make a gas analysis.

In any case, the transformer should not be immediately re-energized, as this would increase the seriousness of the fault.

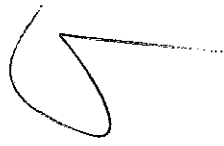
Note that tripping contact can be actuated also by oil leak; in that case refill oil into conservator after discovered the cause of the oil fall before re-energizing the transformer.

11. Test of gas on site

It can be executed only if a gas analyser is available



I - 20093 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
 TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.20.44.22
 E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
 CAP. SOC. € 500.000 I.V. - TVA-P.I. IT 01065780155 - C.F. 01065780155
 R.E.A. M 729991 - IMPORT - EXPORT M 142410 - REG. IMPR. 13214634446 TRIB. MI



12. Order instructions

When ordering a relay it is necessary to indicate (see table)

- Type
- Size
- Wiring diagram
- Oil flow rate
- Operating conditions.
- Special requirements

E	B	0	8	0	G	2	7	N	
TYPE	SIZE	WIRING DIAGRAM	OIL FLOW RATE	OPERATING CONDITIONS	CTRL CHAR	LEGENDA			
						N	STANDARD		
								X	SPECIAL
						5	LOW TEMPERATURE		
						7	TROPICAL CONDITIONS		
						6	CORROSIVE AMBIENT		
						0	NORMAL AMBIENT		
						2	100 cm/sec		
						3	150 cm/sec		
						4	200 cm/sec		
				A	2 N/O CONTACTS				
				L	2 SPDT CONTACTS				
				G	3 N/O CONTACTS				
				2	SPECIAL W.D. S2				
				3	SPECIAL W.D. S3				
				4	SPECIAL W.D. S4				
				R	2 SPDT contacts with manual resetting				
	024 025 050 079 080								SEE DRAWINGS
EB									RELAY DIN STYLE
EE									RELAY BRITISH STYLE
ET									RELAY WITH FLANGE PN6
EU									RELAY ITALIAN STYLE

Example :

To order nr 3 buchholz relay type EB080 wiring diagram G; standard flow rate (100cm/sec); tropical conditions please indicate the following :

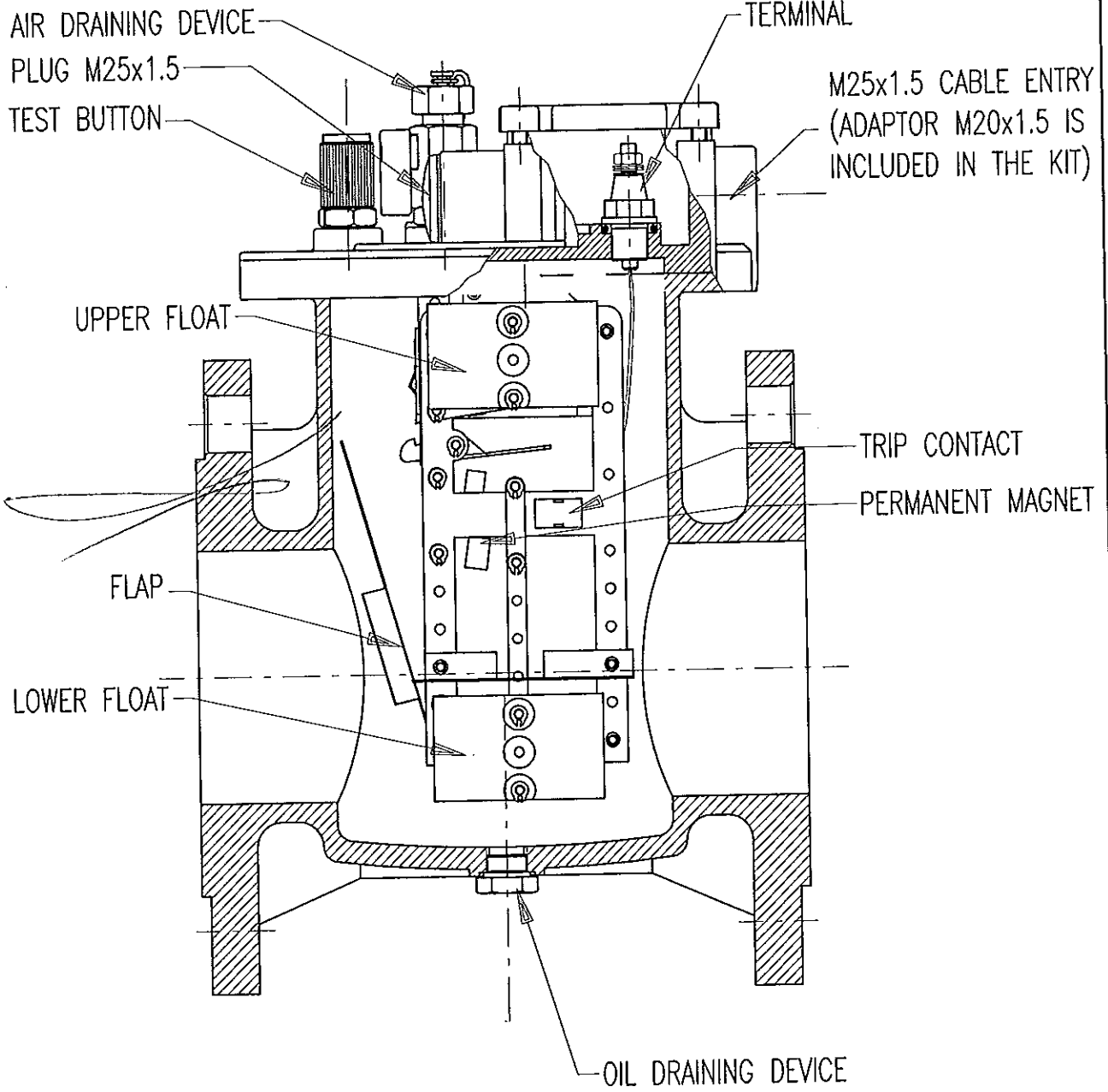
Nr 1 Buchholz relay type EB080G27N



I-28998 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 600.000 I.V. - TVA-PI. IT 01065780155 - C.F. 01065780155
R.E.A. MI 729991 - IMPORT-EXPORT MI 142410 - REG. IMPR. 132146034446 TRIB. MI

13. Part denomination of relay

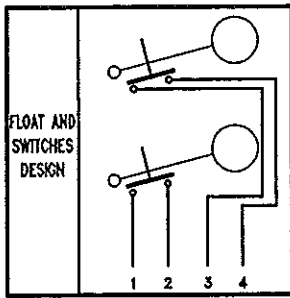
Pos.	Part denomination	Material
1	Inspection window	Trogamid
2	Gas release cock	Brass
3	Push button for checking electric circuits	Brass
4	Terminal box	Aluminium alloy
5	Cable gland entry M25x1.5	
6	Oil flow direction (from tank to conservator)	
7	Oil drain plug	Brass
8	Pneumatic test device	Brass
9	Trip terminals	Brass
10	Alarm terminals	Brass
12	Plug M25x1.5	brass
13	Window sunshield cover	Aluminium
15	Earth screw	Brass
16	Cock for air injection test	Brass



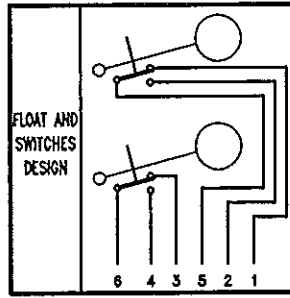
Cross section

000207

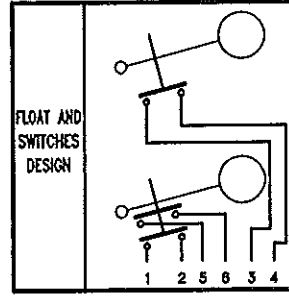
STANDARD WIRING DIAGRAM



SIGNALLING	ALARM		TRIP	
NUMBER OF INSULATOR	3	4	1	2
WIRING DIAGRAM	N/O CONTACT		N/O CONTACT	
A				

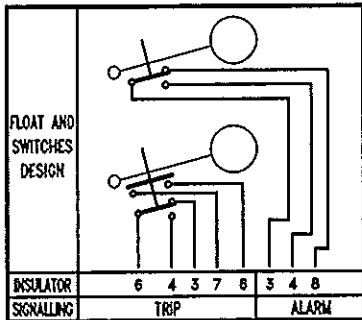


SIGNALLING	ALARM		TRIP			
NUMBER OF INSULATOR	6	3	4	5	1	2
WIRING DIAGRAM	CHANGEOVER CONTACT		CHANGEOVER CONTACT			
L						

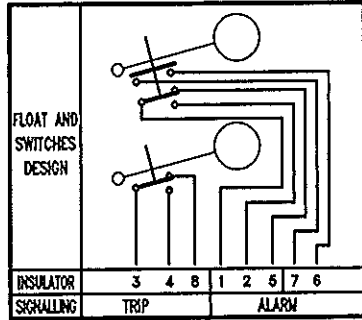


SIGNALLING	ALARM		TRIP			
NUMBER OF INSULATOR	3	4	1	2	5	6
WIRING DIAGRAM	N/O CONTACT		N/O CONTACT		N/O CONTACT	
G						

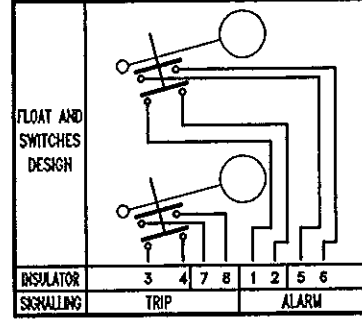
SPECIAL WIRING DIAGRAM



SIGNALLING	TRIP				ALARM			
NUMBER OF INSULATOR	5	1	2	7	6	8	3	4
WIRING DIAGRAM	CHANGEOVER CONTACT		N/O CONTACT		CHANGEOVER CONTACT			
S2								



SIGNALLING	TRIP		ALARM					
NUMBER OF INSULATOR	8	3	4	5	1	2	7	6
WIRING DIAGRAM	CHANGEOVER CONTACT		CHANGEOVER CONTACT		N/O CONTACT			
S3								



SIGNALLING	TRIP				ALARM			
NUMBER OF INSULATOR	3	4	7	8	1	2	5	6
WIRING DIAGRAM	N/O CONTACT		N/O CONTACT		N/O CONTACT		N/O CONTACT	
S4								

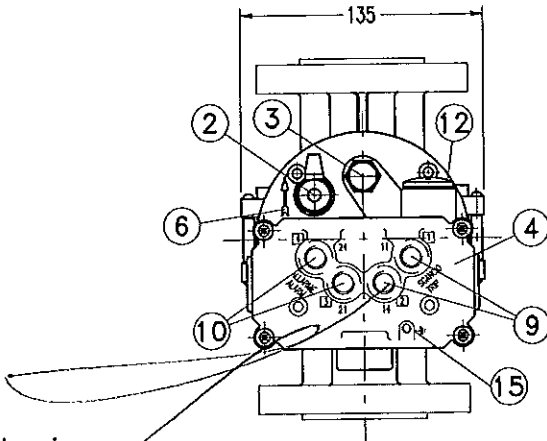
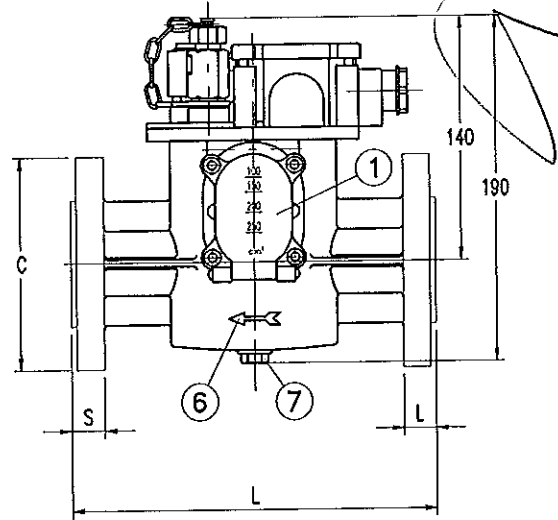
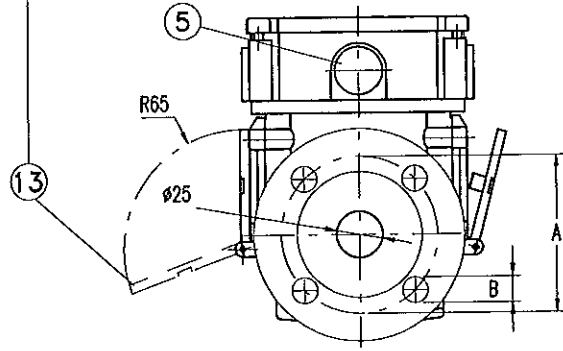
Wiring diagram

000208

Float and switch design

Protezione finestra a richiesta
Sunshield cover upon request

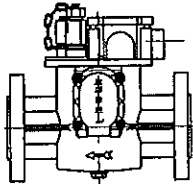
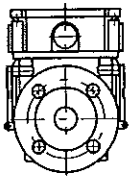
FILE = PAGE 12.dwg
REV. 01 DTD 06/11/06
LMT (60.0) (196.286)
A4 (210x297)



dim in mm.

The figure shows the relay EB025 Scale 1:4

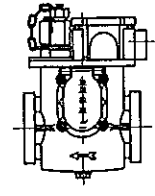
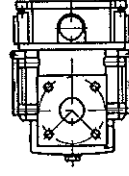
TYPE EB025



A	85
B	14
C	115
L	200
S	18

WEIGHT Kg 1.70

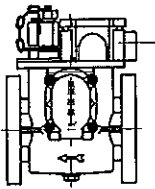
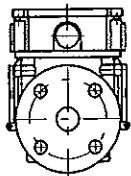
TYPE EE025



A	72
B	M10
C	76
L	127
S	12

WEIGHT Kg 1.40

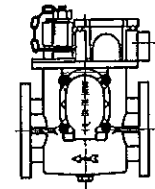
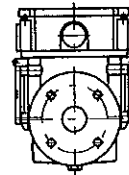
TYPE EU025



A	85
B	14
C	115
L	140
S	15

WEIGHT Kg 1.60

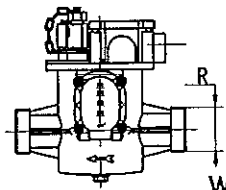
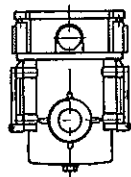
TYPE ET024



A	75
B	11.5
C	100
L	140
S	11

WEIGHT Kg 1.50

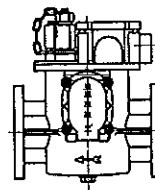
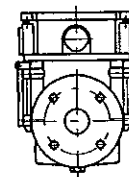
TYPE EB024



A	==
B	==
R	1 1/2" G
L	185
S	16

WEIGHT Kg 1.40

TYPE ET025



A	75
B	11.5
C	100
L	160
S	11

WEIGHT Kg 1.50

CEDASPE

Gas actuated relay NB 25 EN50216-2

LG00209

La CEDASPE S.p.A. si riserva e termina di legge la proprietà del presente disegno con divieto di riproduzione o di pubblicazione o di terzi senza sua autorizzazione.

Protezione finestra a richiesta
Sunshield cover upon request

A4 (21/02/07)

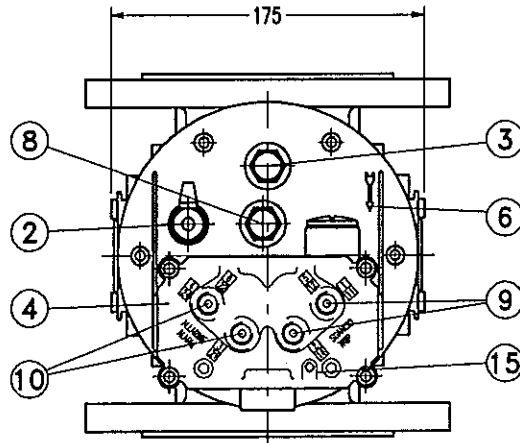
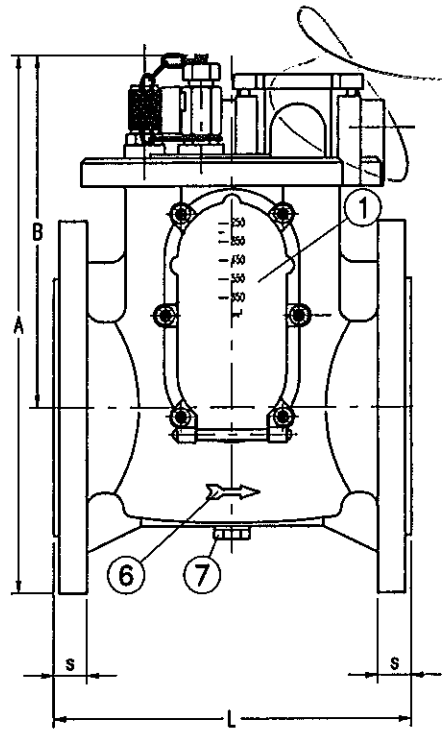
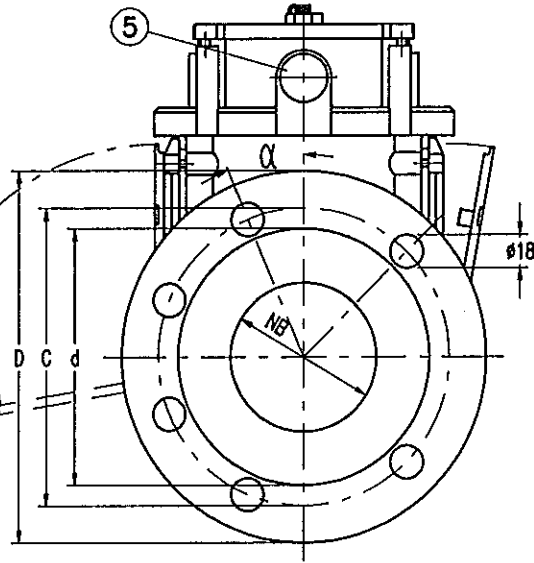
LWT (0,0) (19/02/05)

FILE = PAGE 13.dwg

REV. 01 DTD 06/09/07

La CEDASPE S.p.A. si riserva o termini di legge la proprietà del presente disegno con diritto di riproduzione o comunicarlo a terzi senza sua autorizzazione.

13



Z = Nr of holes

Tipo Type	NB	A	D	C	B	s	L	α	d	Z	Peso (kg) Weight (kg)
EB050	50	230	165	125	160	18	195	45°	102	4	≈ 4.60
EB079	80	285	200	160	190	18	195	45°	138	4	≈ 5.50
EB080	80	285	200	160	190	18	195	22.5°	138	8	≈ 5.50
ET050	50	185	140	110	160	13	183	45°	/	4	≈ 4.50

dim in mm.

The figure shows the relay EB080 Scale 1:4

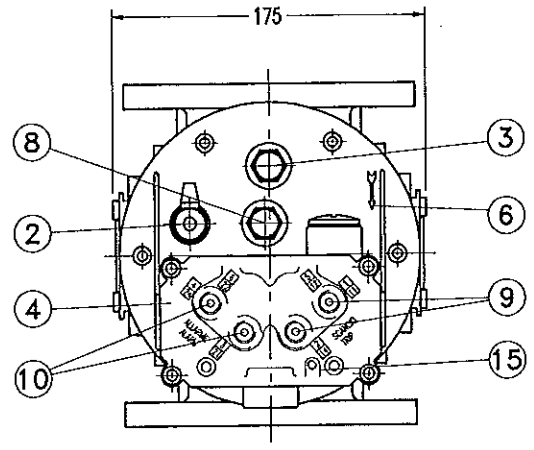
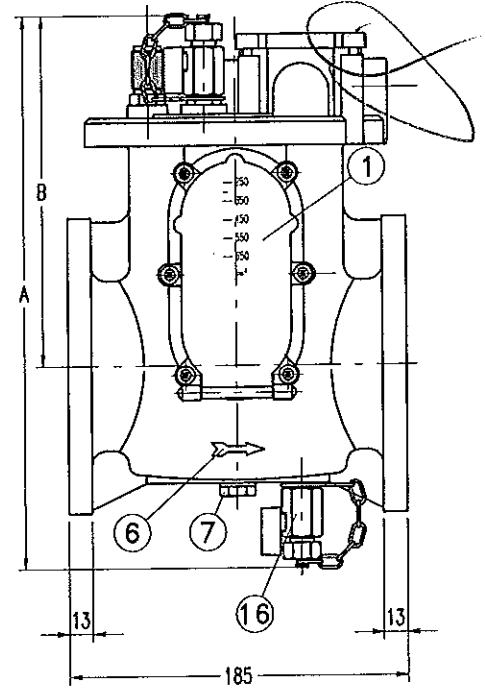
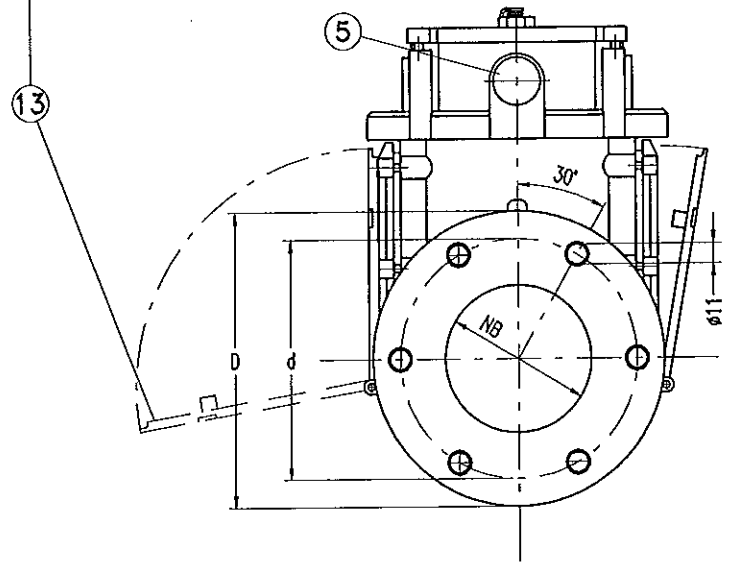
000210

CEDASPE

Gas actuated relay type EB EN50216-2

Protezione finestra a richiesta
Sunshield cover upon request

FILE = PAGE 14.dwg
LWT (Co.) (196,286)
REV. 01 DID 06/11/06



Tipo Type	NB	A	B	D	d	Peso (kg) Weight (kg)
EE050	50	270	160	140	110	≈ 4.60
EE080	80	300	190	160	130	≈ 5.50

dim in mm.

The figure shows the relay EE080 Scale 1:4

000211

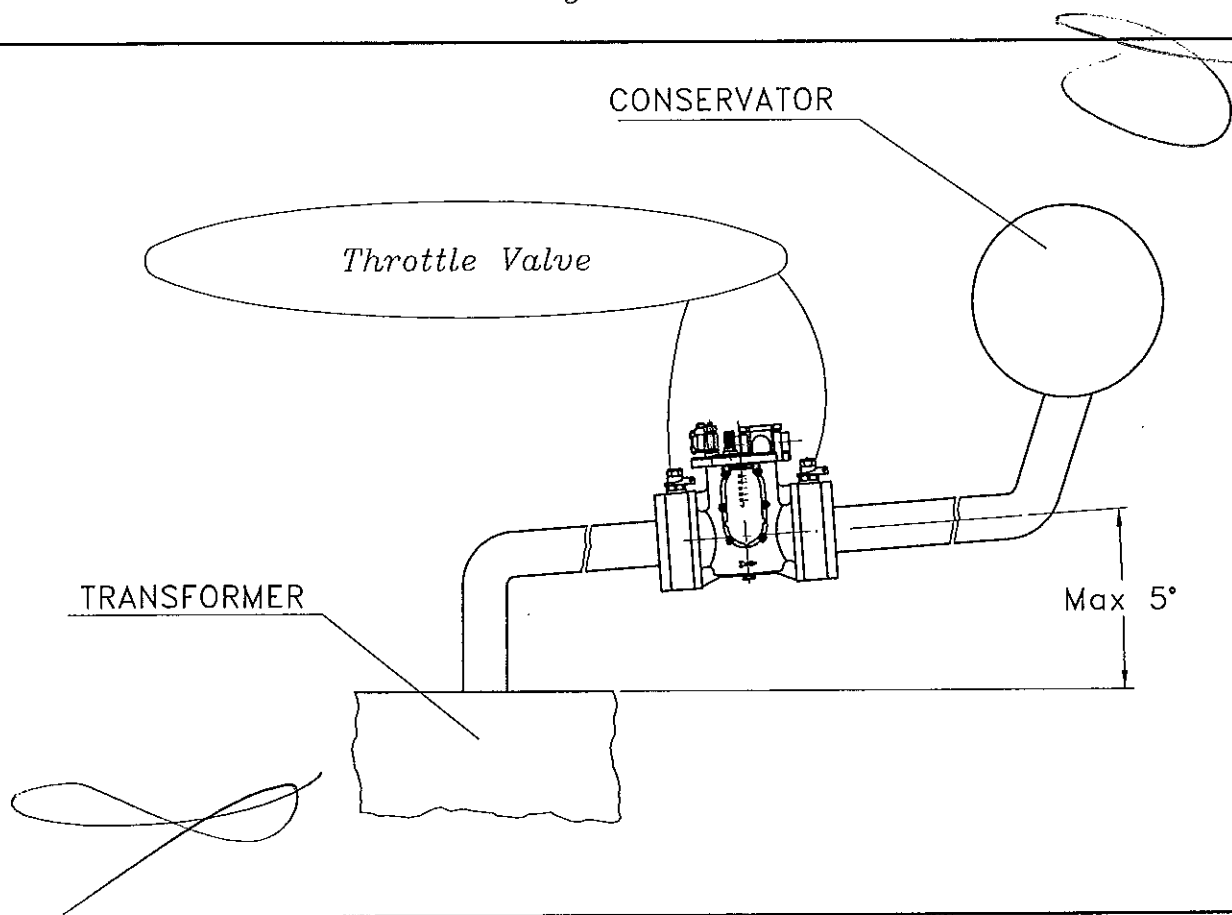
Gas actuated relay type EE EN50216-2



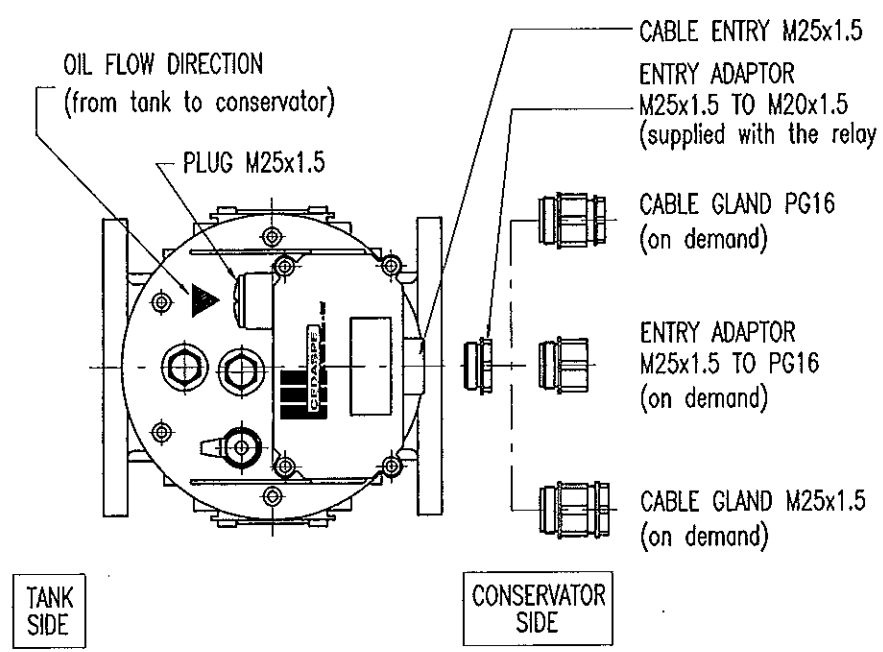
La CEDASPE S.p.A. si riserva o termini di legge la proprietà del presente disegno con divieto di riproduzione o comunicazione a terzi senza sua autorizzazione.

FILE = PAGE 15.DWG
REV. 00 DTD 05/10/06
LMT [(0,0) (196,286)]
A4 (210x297)

Mounting Sketch



Cable entry arrangement



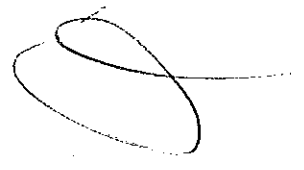
IMPORTANT NOTICE:

THIS SOLUTION OF CABLE ENTRY IS AVAILABLE ONLY FOR RELAY HAVING SIZE 050; 079; 080.
RELAY HAVING SIZE 024 & 025 ONLY PG16 CABLE ENTRY IS AVAILAIBLE

La CEDASPE S.p.A. si riserva o termini di legge la proprietà del presente disegno con divieto di riproduzione o comunicazione a terzi senza sua autorizzazione.

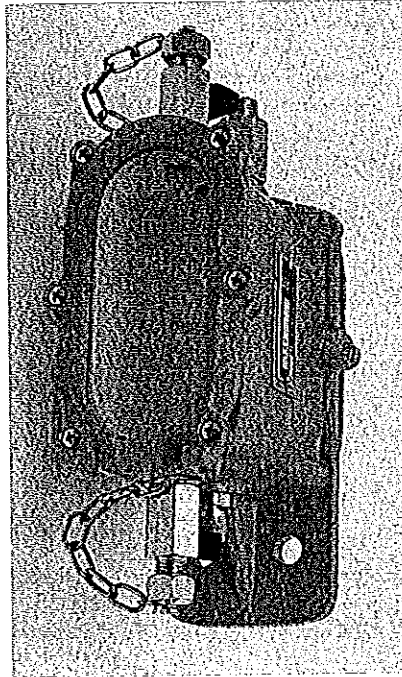


I-28888 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 02 88.28.44.11 - TELEFAX +39 02 88.28.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 600.000 I.V. - TVA-P.I. IT 01065780165 - C.F. 01065780165
R.E.A. MI 729391 - IMPORT-EXPORT MI 142410 - REG. IMPR. 13216/33446 TRB. MI



14. Accessories

14.1 Gas sampling device RG3.2



14.1.1 General features

The body is made of aluminium alloy casting; in order to check gas and oil two large inspection windows made in trogamid (on request made in tempered glass and with sunshield), are fitted on either side of the casting.

Two petcock complete with hermeto joints are present for connection to relay and one pneumatic valve for test and another petcock draining oil complete the apparatus

14.1.2 Installation

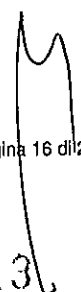
The Buchholz gas sampling device "RG3" must be fitted on the transformer tank, from the ground level, within handy height.

A copper tube (size 8 mm OD/ 6 mm ID) must be used to connect the "RG3.2" device, from the cock "12", to the top of the Buchholz relay, cock "R"; for connecting the tube to the cocks, special unions "14" shall be used. If using RG3.3 a second copper tube has to be used for connecting cock "T" to cock "15".

When the RG3 apparatus has been mounted cocks "R" and "T" have to remain open position

For filling the device with oil, open the cocks "R"; "T"; "15" and "12", open the cock "2" and wait until oil has entirely filled the «RG3» device, then close cock "2" and "15"; oil level inside «RG3» may be controlled through the inspection windows located on the two sides.

In the normal operating conditions, the gas sampling device, the Buchholz relay and the connecting tube between them should be oil filled.





I - 20099 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - Internet Site: http://www.cedaspe.com
CAP. SOC. € 600.000 I.V. - TVA, P.I. IT 01065780155 - C.F. 01065780155
R.E.A. MI 729591 - IMPORT-EXPORT MI 142410 - REG. IMPR. 13214634446 TRIB. MI



14.1.3 Operating instruction

14.1.3.1 Gas sampling from the Buchholz relay

Open oil drain cock "11" and watch through the «RG3» windows until gas is seen to have flown into the «RG3» device; then close "11".

Now, the gas, formerly accumulated inside the Buchholz relay due to some electrical failure inside the transformer, may be sampled for examination or released, by opening the cock "2".

The gas should be totally released (i.e. until the «RG3» is completely filled again with oil) to reset the Buchholz relay in normal operating conditions; in the case it is necessary to maintain the gas inside the «RG3», the shut-off cock "12" and "2" must be closed; cock "2" may be reopened for sampling the gas for examination, or for gas release.

14.1.3.2 Checking of alarm circuits

Cock "12" in open position.

Inject air inside «RG3.2» through the bottom valve "8" (after removing the knurled protecting cap), using a bottle of compressed air or a normal bicycle tyre pump, until the alarm signal (or signals) have been set in operation.

To reset the Buchholz relay in normal operating conditions, follow above instructions for gas sampling and release.

14.1.3.3 Checking trip circuits

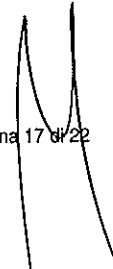
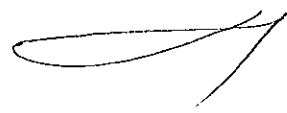
Cock "12" in open position. Inject air inside «RG3.2» through the bottom valve "8" (after removing the knurled protecting cap), using a bottle of compressed air or a normal bicycle tyre pump, until the trip signal (or signals) have been set in operation.

To reset the Buchholz relay in normal operating conditions, follow above instructions for gas sampling and release.

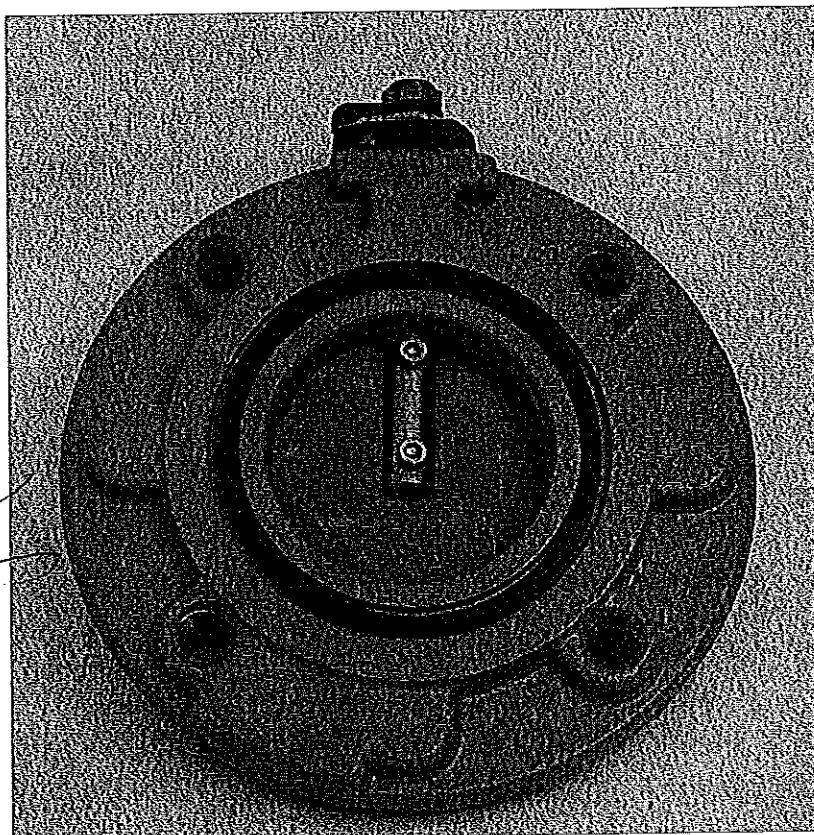
If test is executed on Buchholz relay EE type (NB 50 or 80 mm) an RG3.3 is used and trip contact has to be checked as follows:

Cock "12" in closed position; cock "15" in open position. Inject air inside «RG3.3» through the bottom valve "8" (after removing the knurled protecting cap), using a bottle of compressed air or a normal bicycle tyre pump, until the trip signal (or signals) have been set in operation.

To reset the Buchholz relay in normal operating conditions, follow above instructions for gas sampling and release.



14.2 Throttle valves for buchholz relays



This kind of valves, metal to metal sealing, are used on power transformers with the scope to allow the disconnection of the Buchholz relay from the conservator or from the cover; they are preferred to the conventional gate valves for their compact overall dimensions in the direction of the oil flow.

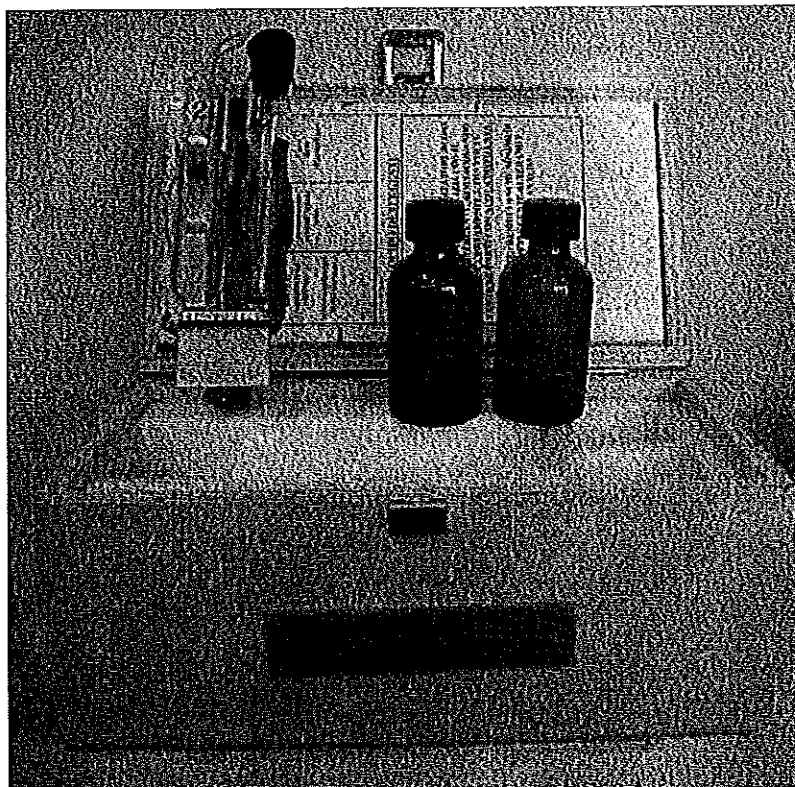
The throttle design and an accurate machining of all the components minimise the oil leakage from the throttle in close position, during the operations of disconnection of the relay with the transformer oil filled, it is necessary to put small containers on the ground to collect the small quantity of oil which flow out from the throttle; once the disconnection is terminated, blind flanges must be put on the throttle valves.

All these valves have bodies made in steel ASTM A105 zincplated, painted and carefully tooled; the design and the execution of the throttle ensures a good oil proof; once the throttle is closed, the oil losses are very small (< 5 cc/60" every 25mm of the nominal diameter of the throttle); the drive shaft can be locked by means of a small padlock in both the close/open positions, which are also indicated by a label; the sealing gaskets on the drive shaft can be easily changed, if necessary, as shown on the sketch in the drawings.

All those valves are supplied with flange NBR sealing gaskets.



14.3 Gas analyser for buchholz relays



If a gas analyser kit is available it is possible to have an idea of the cause that generated the gas by checking the precipitate inside the test tube of the gas analyser.


If gas is due only to oil decomposition, in the test tube 1 a white precipitate is formed which, exposed to the light, slowly turns brown.

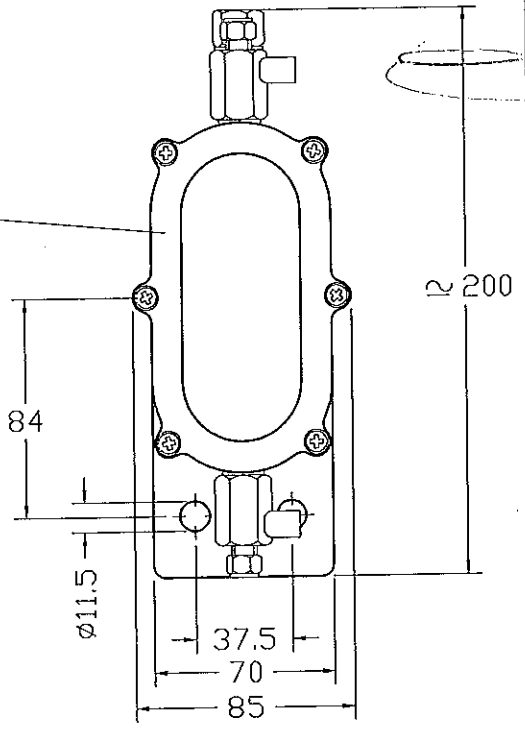
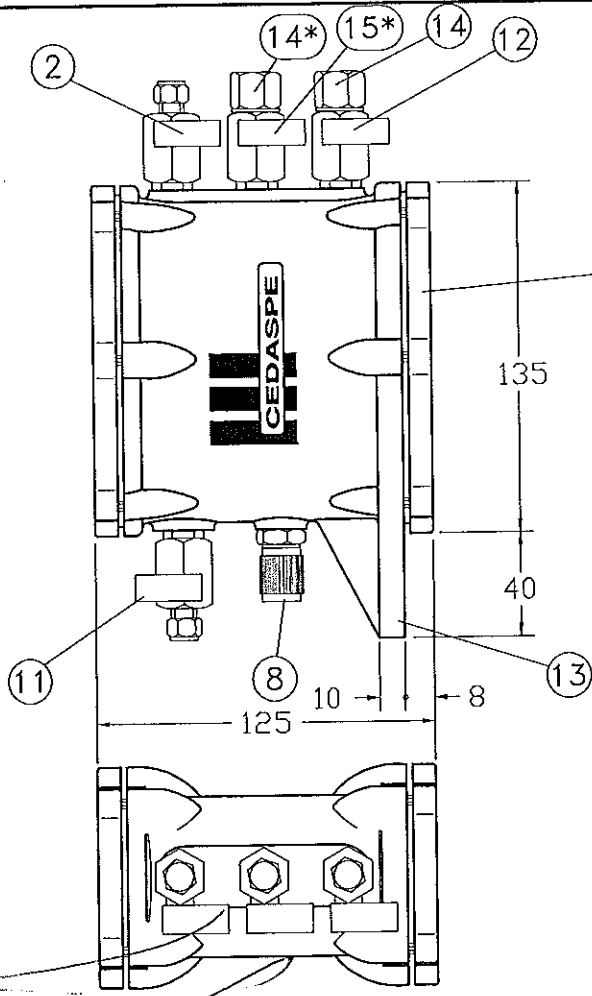
Should, however, in the test tube "2" a black precipitate be formed, this means that the gases contain decomposition products of solid insulation, such as cotton, paper, wood and the like.

In such a case, a coil deficiency has taken place.

In the case the Buchholz relay operation is caused by air (first installation into work, total oil refilling, defect in the cooling system) there isn't any formation of precipitate inside the tubes.

After the sample of the gases has been drawn, the cock should be closed again, and the analyser housed in its container.

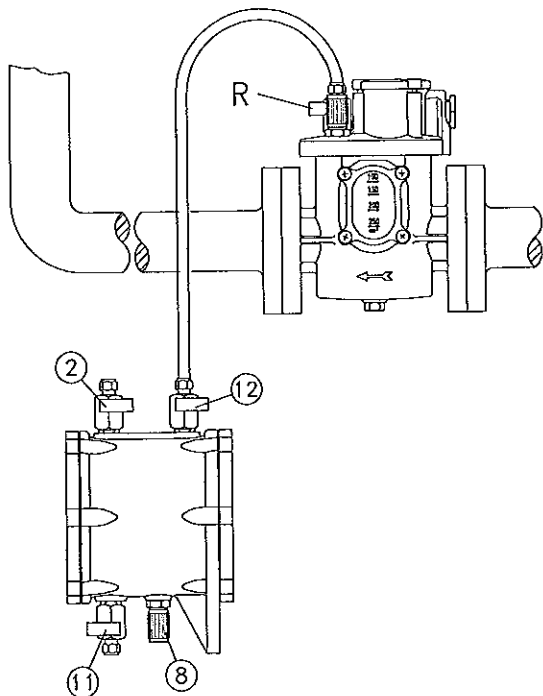

000216



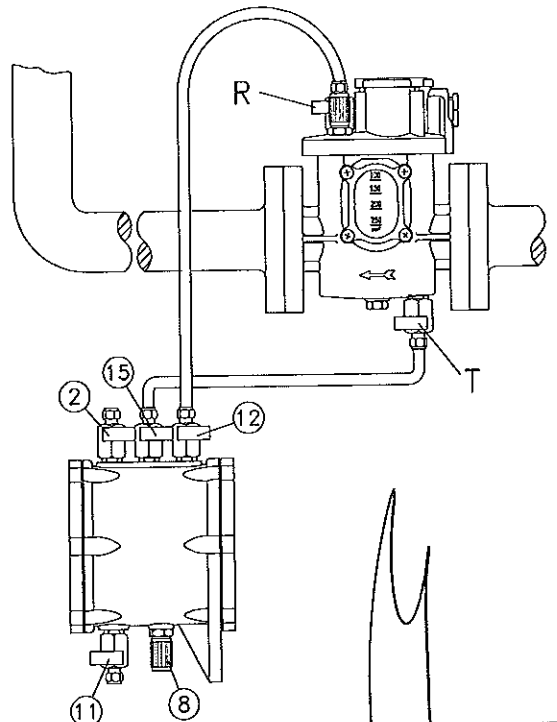
Pos	Description
1	Inspection windows
2	Gas release cock
8	Pneumatic test device
11	Oil drain cock
12	Stop cock
13	Fixing plate
14	Ermeto joint
15*	Stop cock (present only on RG3.3)
14*	Ermeto joint (present only on RG3.3)

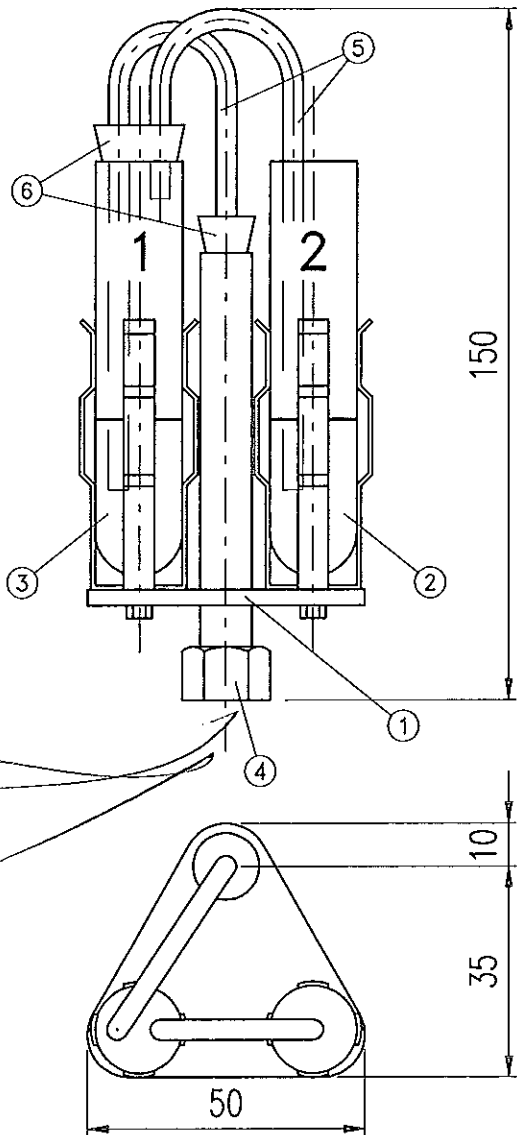
dim in mm.

Mounting instructions for RG3.2



Mounting instructions for RG3.3





6	Rubber plugs
5	Glass tubes
4	Revolving nut 1/4" BSP
3	Test probe 1
2	Test probe 2
1	Support
Pos.	Description

Mounting sketch

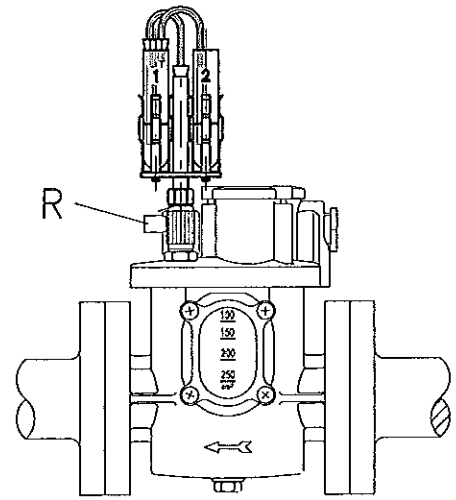


Fig. A: directly on relay

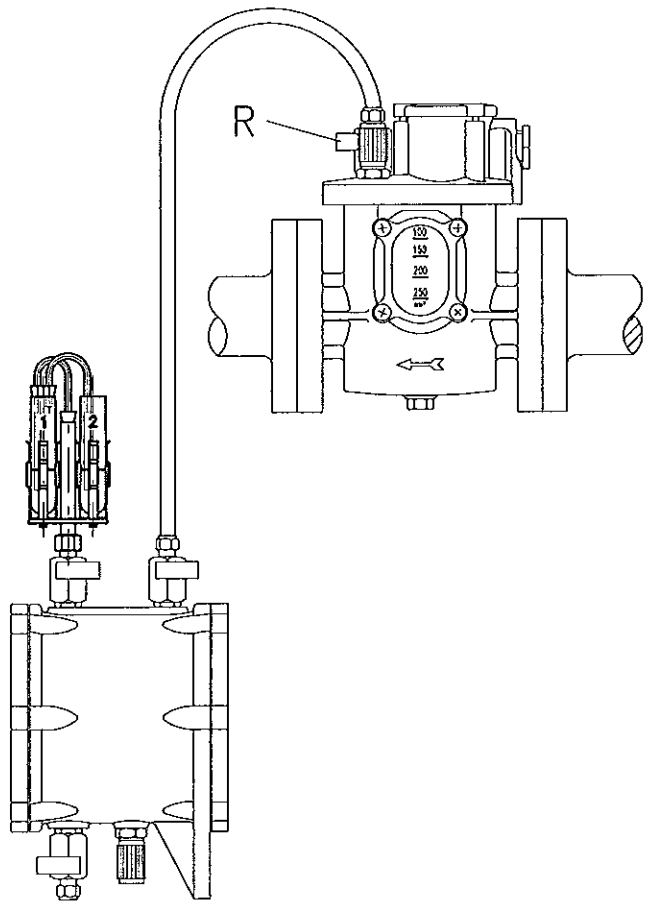
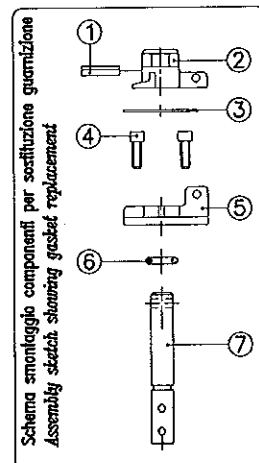
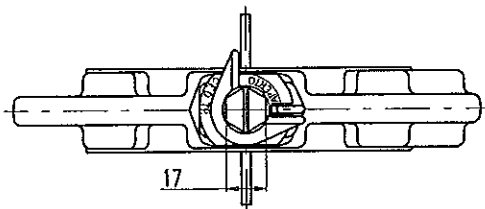
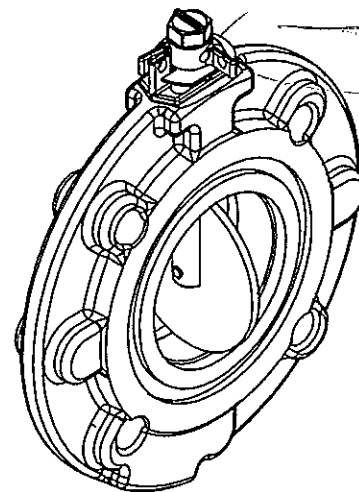
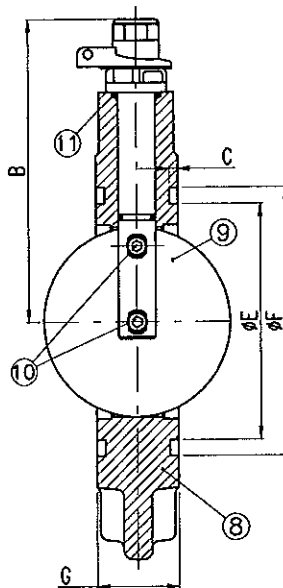
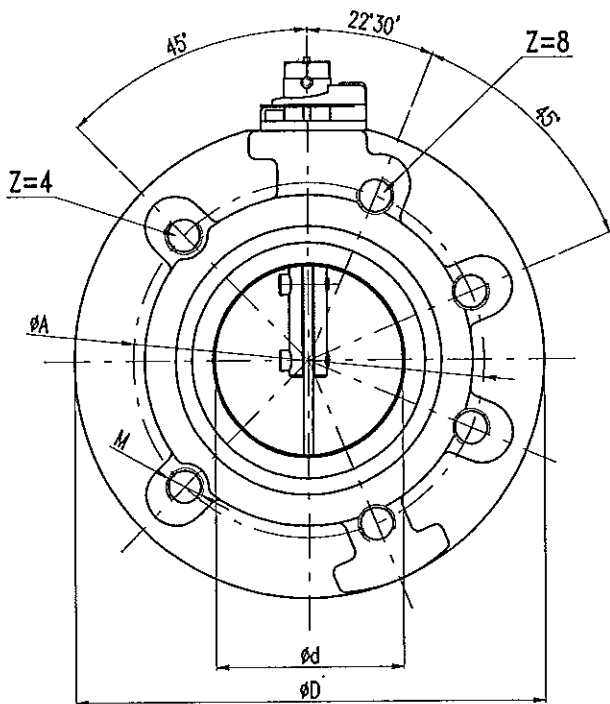


Fig. B: With RG3 apparatus



Schema smontaggio componenti per sostituzione guarnizione
 Assembly sketch showing gasket replacement

Pos	Description	Material
1	Grooved pin	Stainless Steel
2	Drive	Brass
3	Label open/closed	Aluminium
4	Screw M5	Stainless Steel
5	Gland	Brass
6	O-ring	Viton
7	Spindle	Stainless Steel
8	Body	Fe520 Zinc-Plated
9	Throttle	C40
10	Screw M5	Stainless Steel
11	O-ring	NBR

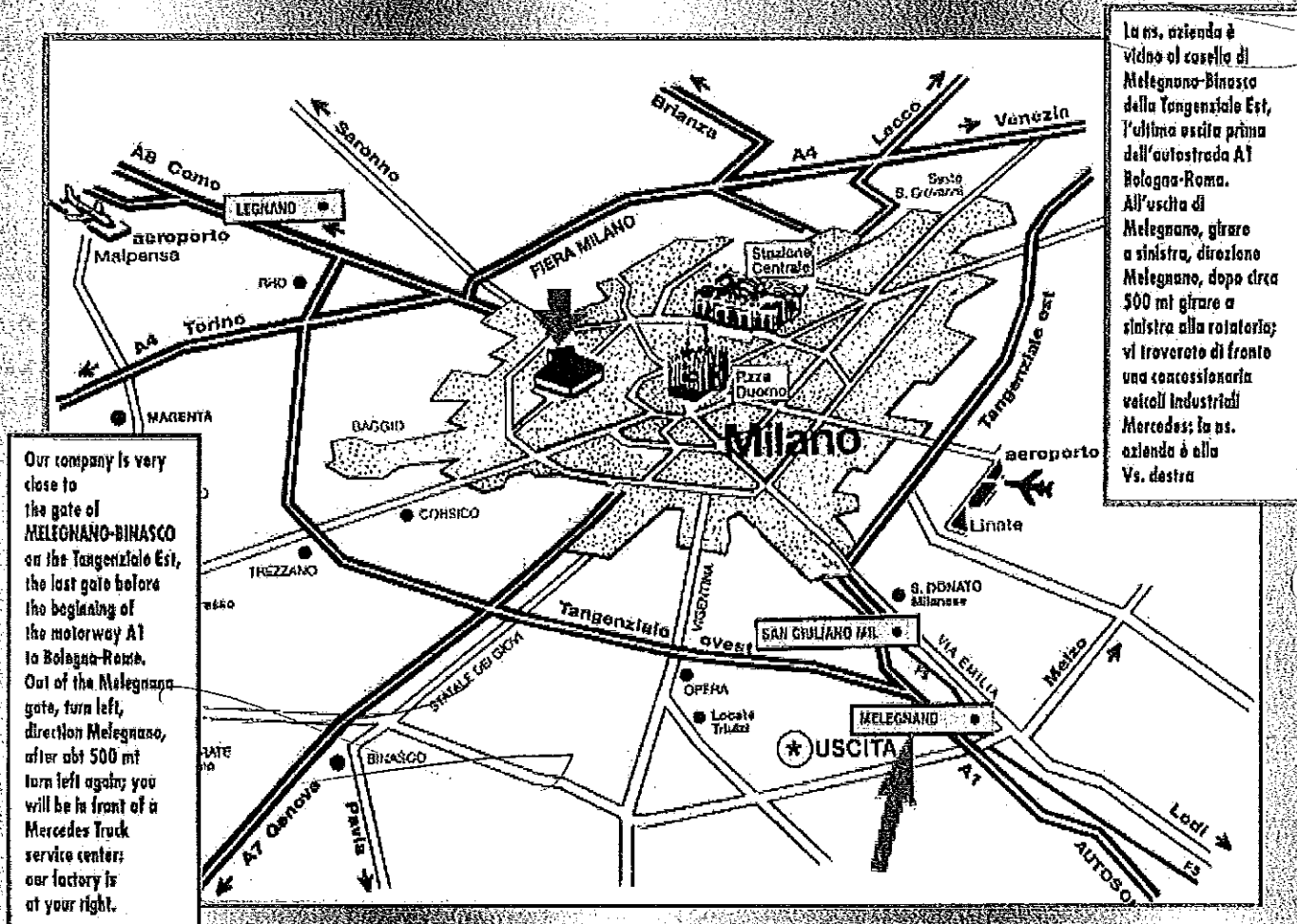
Z = Nr of holes

Tipo Type	ØA	B	C	Ød	ØD	ØE	ØF	G	M	Z	O-Ring	Vite UNI 5739 Screw DIN 933	Tirante Rod
DN25 PN6	75	85	3.6	28	115	37	51	25	M10	4	6150	M10X20	M10x90
DN25 PN10	85	85	3.6	28	115	37	51	25	M12	4	6150	M12X25	M12x90
DN50 PN6	110	110	3.6	52	165	68.5	82.5	35	M12	4	6275	M12X30	M12x100
DN50 PN10	125	110	3.6	52	165	68.5	82.5	35	M16	4	6275	M16X35	M16x110
DN80 PN6	150	130	3.6	80	200	99.5	113.5	35	M16	4	6400	M16X35	M16x110
DN80D PN10	160	130	3.6	80	200	99.5	113.5	35	M16	8	6400	M16X30	M16x120
DN80U PN10	160	130	3.6	80	200	99.5	113.5	35	M16	4	6400	M16X30	M16x120

CEDASPE

THROTTLE VALVE
 TYPE DN25 / DN50 / DN80

000219



PROGRAMMA DI PRODUZIONE

Isolatori passanti BT/MT
 Relè ad accumulazione gas
 Indicatori livello olio
 Essiccatori d'aria
 Valvole a farfalla per radiatori e relè
 Valvole di sovrappressione
 Termometri con e senza contatti elettrici
 Commutatori di presa a vuoto
 Muffole per entrata in cavo (BS2562)

PROGRAMA DE PRODUCCION

Pasalapas BT/MT
 Relés Buchholz
 Indicadores de nivel de aceite
 Deshumectadores de aire
 Valvulas mariposa para radiadores
 Valvulas de subrepression
 Termómetros con y sin contactos electricos
 Conmutadores
 Cajas de bornas AT (BS2562)

MANUFACTURING PROGRAM

LV and HV Transformer Bushings
 Gas actuated Relays
 Oil Level Gauges
 Dehydrating Breathers
 Radiator throttle Valves
 Pressure Relief Devices
 Thermometers with/without electric contacts
 Off-load Tap Changers
 Cable boxes (BS2562)

PROGRAMME DE PRODUCTION

Traversée isolée BT/MT
 Buchholz Relais
 Indicateur de niveau d'huile
 Assécheur d'air
 Vannes a papillon pour radiateurs
 Soupape de sureté
 Thermomètres avec/sans contacts
 Commutateurs des prises
 Boîte a cable MT (BS2562)

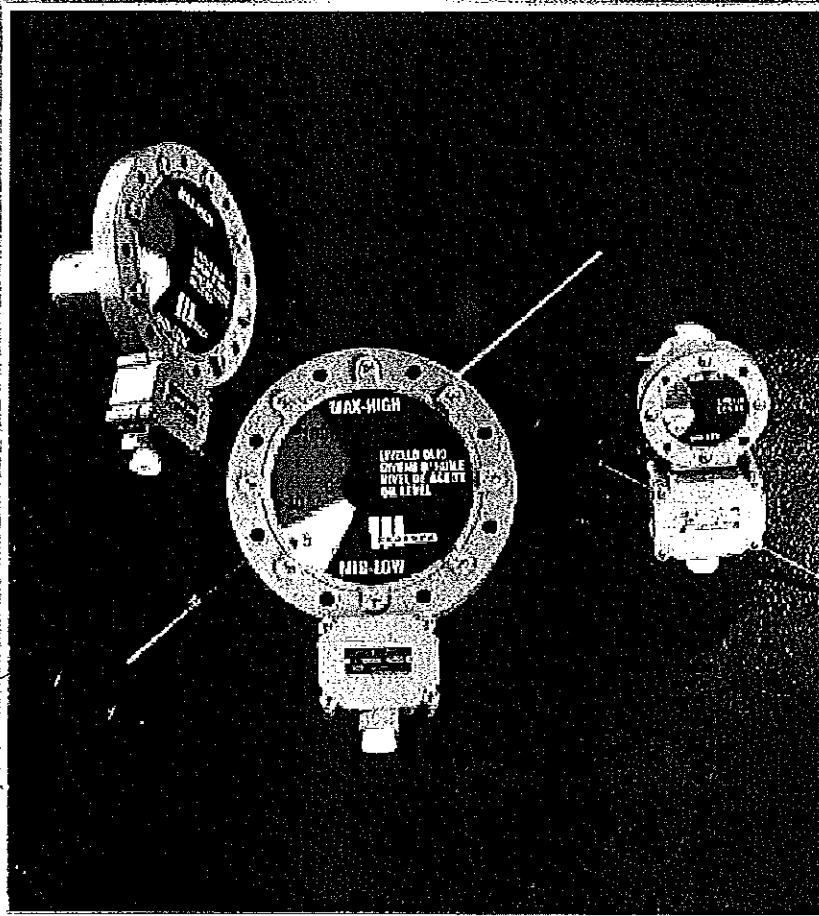
030220

CEDASPE S.p.A.

Via Colombara, 1 - Fraz. Pedrignano - 20098 S. Giuliano Milanese (MI) - Tel. +39/0298204411 - Fax +39/0298204422
 E-MAIL: cedaspa@cedaspa.com - InterNet Site: http://www.cedaspa.com

Handwritten mark resembling a stylized 'K' or 'S'.

ACCESSORI PER TRASFORMATORI ELETTRICI
ACCESSORIES FOR ELECTRIC TRANSFORMERS



INDICATORI LIVELLO OLIO
OIL LEVEL GAUGES

000221

Handwritten signature or mark.

MAGNETIC OIL LEVEL GAUGES

With electric contacts (serie 2000)

1.0 FEATURES

The gauges type IMLO, for oil immersed power transformers, give an analogic indication of the oil level inside the conservator on which are usually mounted; when required, they give an electric alarm signal if the oil reaches the minimum and/or the maximum admitted level.

The body of the gauge, one piece only, is made of a solid casting of aluminium alloy; inside there is an indicating disc; in the front there is a dial made in transparent plexiglas with the marking of the maximum and minimum level and of the intermediate levels that the oil reaches at the temperature of -20°C, +20°C and +85°C (dial with different marking can be supplied upon request)

The indicating disc is half white and half red coloured: at the minimum level you can see only the red part, at the maximum only the white part; at the intermediate levels, the red part of the disc which is visible is directly proportional to the oil level inside the conservator.

The body has two hollow spaces containing the monitoring and the indication mechanism; a wall between the two hollow spaces guarantees a full separation between the oil inside the conservator and the ambient air.

The magnetic oil level gauges consist of two mechanisms ("Monitoring" the first, "Indication" the second) connected between them by means of a magnetic joint.

1.1 Monitoring system

One float fitted at one end of the arm follows the movement of the surface of the oil; the other end of the arm transmits the movement of the float to a magnet.

The float may move onto a plan parallel to the dial (style R, page 5.27), or orthogonal (style Y, page 5.28): in the first way the float arm is rigidly connected to the magnet; in the second, two bevel gears are in between the float-arm and the magnet.

1.2 Indication system

It consists of one magnet and one indicating disc, one or more cams and as many contacts (depending on the wiring diagram) rigidly connected.

The magnet of the monitoring system leads the magnet of the indication system during its movement, because of the magnetic flux.

The indication system contains inside the min and/or max level switches and wiring.

2.0 MANUFACTURING PROGRAM

2.1 Type IMLO 100-140-220-345, page 5.27-28

It is a complete family of oil level gauges, with four different body sizes, which make them suitable to be used either on small either on large power transformers; the choice of the size is function of the size of the conservator.

They are normally fitted with changeover microswitches for minimum or for minimum and maximum level, so they can be used also on transformers subject to strong vibrations or in case of aseismic requirements.

2.2 Type IMLO-Y-220-ATMOSEAL page 5.29.A-B

This oil level gauge is suitable for use on conservators with hermetically sealed rubber bag and it is normally fitted with one contact to operate at min oil level, but this doesn't exclude the possibility to use any other wiring diagrams.

The page 5.29.A shows the two most common ways of mounting on the conservator end, vertical or with a slight inclination (fig B), or inclined at 45° under the conservator (fig A): a copy of this page filled with all the data can be used as an order form sheet.

The possibility to choose among three executions (see page 5.29.B) that are different owing to the bevel gear ratio (IMLO-Y-222 ratio 1:2; IMLO-Y-223 ratio 1:3; IMLO-Y-224 ratio 1:4) offer a wide flexibility of use; the mounting of the bevel gear inside the body and an adjustable-length strong arm with two big rolling floats offer an high reliability.

The dial of these gauges is customised with special marking for each job.

3.0 ELECTRIC SWITCHES CHARACTERISTICS

3.1 Rated current of the microswitches

a.c.: 3 A (50 Hz) $\cos\phi > 0,4$ at 250 V

d.c.: 1 A at 30V / 0,27 A at 110 V / 0,13 A at 220 V (L/R=5 ms)

Breakdown voltage between contacts: 750 V

Operating life: 30.000.000 cycles at 1 Hz

3.2 Precision of the indication: +1°-5° disc rotation.

4.0 CONTACT DESIGN & SYMBOLS

4.1 Only changeover contacts are available.

(the switch changes-over the circuit at the set point)

CEDASPE Spa - Via Colombara 1 (Fraz. Pedriano) - I-20098 SAN GIULIANO MIL (ITALY)

Tel. +39.02.98204411 Fax +39.02.98204422

E-mail: cedaspe@cedaspe.com

Mar 2004 Cat 0403 - UNCONTROLLED COPY

Ragina 1 di 2

000222

4.2 Symbols of contacts

- F: min changeover contacts
- G: max changeover contact

4.3 Wiring diagrams

-Styles available for all sizes

FM : 1 electric contact at Min level

FGM : 1 electric contact at Min level and 1 electric contact at Max level

-Styles available for the sizes 140,220,345

FFM – S : 2 electric contact at Min level operating simultaneously

FFM – A : 2 electric contacts operating sequentially at Min level (alarm and trip wiring diagram)

-Styles available for the sizes 220 & 345

FFGGM : 2 electric contact at Min level and 2 electric contacts operating at Max level

See page 5.29D for the sketches of the wiring diagram and the identification of the terminals

5.0 CABLE BOX

Our gauges are fitted with a weatherproof cable box, with a PG16 cable gland and a ground screw.

6.0 OPERATING TEMPERATURE

Our oil level gauges are manufactured in order to withstand oil temperature between -25°C and +100°C and ambient temperature between -25°C and +85°C.

7.0 SWITCHES SET-POINT

The set point of the switches is calibrated 2° to 5° in advance to the min or max level.

Overlap at min or max level: 5° (angular)

Switching differential: 5°

8.0 GROUND-INSULATION TEST

Each gauge is tested at 2000 V a.c. (50 Hz) for 60", between the gauge housing and the electric circuits, and between the two independent circuits.

9.0 PROTECTION DEGREE: IP 55

10.0 EXTERNAL SURFACES FINISH: epoxy paint RAL 7030, Stainless steel screws.

11.0 SPECIAL REQUIREMENTS

- Special dial marking
- Cable gland adaptor PG16 to 3/4" or M20x1;5 or 1"W
- Special executions for desert or for highly polluted atmosphere

12.0 MOUNTING INSTRUCTIONS

Normally the " Y " execution is suggested when it is necessary to mount an oil level gauge on the cylindrical surface of the conservator; the " R " execution, the most commonly used, is suitable for mounting on the front or back ends of the conservator. Welding studs or blind tapped holes are both acceptable ways to fix the gauge on the wall, using respectively nuts or screws(see page 5.29.D for mounting sketch); a flat cork impregnated gasket, supplied together with the gauge, must be put between gauge and wall before tightening; on demand sizes 140 and 220 may be supplied with an O'ring tightening flange gasket.

At page 5.27 & 5.28 you find the formula for the calculation of the arm float length "R" and of the distance "S" between centre of the dial and of the conservator.

13.0 ORDER INSTRUCTIONS

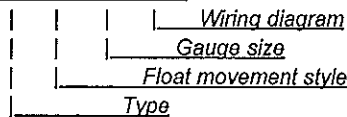
The following details must be given when issuing an order, or asking a quotation:

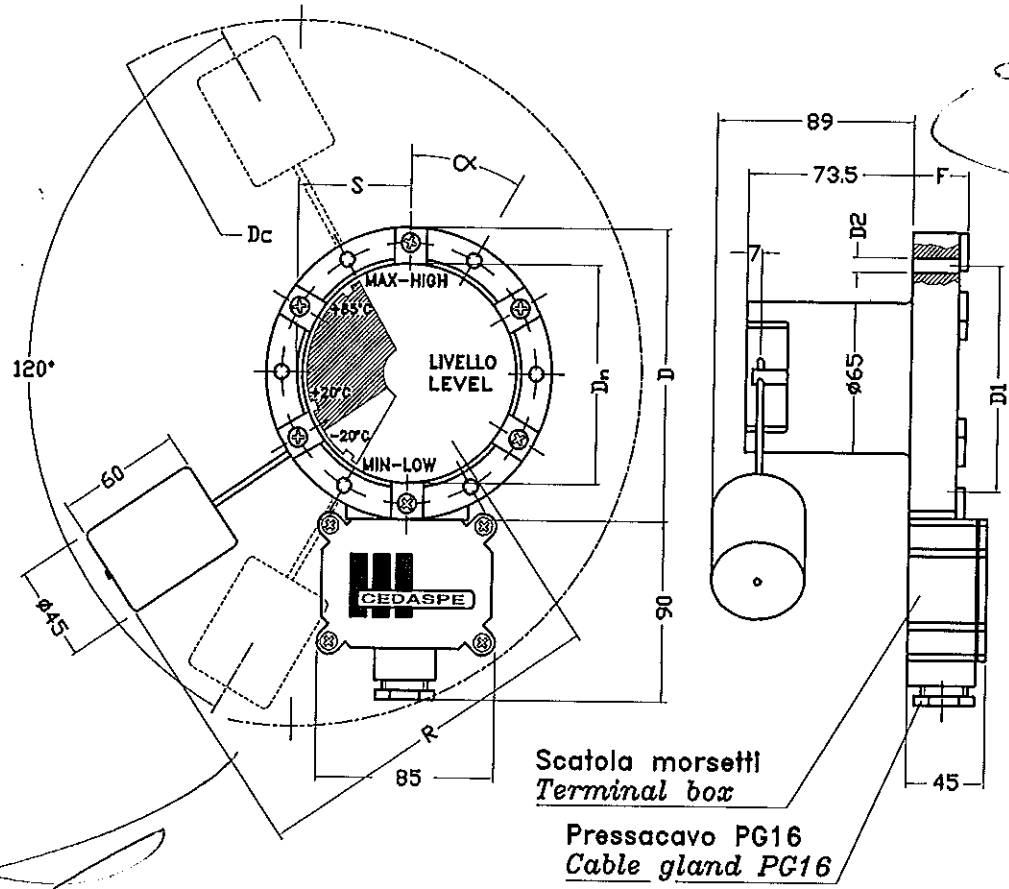
- Type
- Float movement design
- Size
- Wiring diagram

EXAMPLE

IMLO R 220 FGM

IMLO Y 140 FM





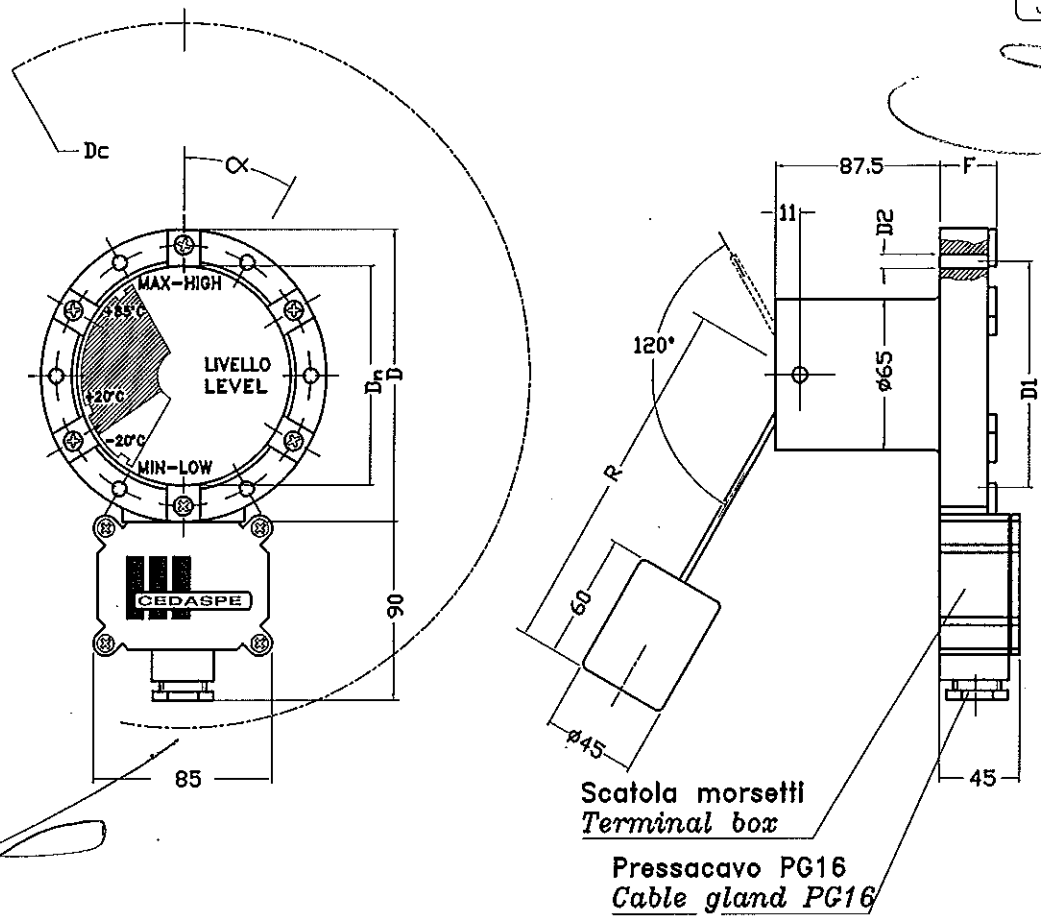
- Z: N° Fori D2 su flange
- Z: N° Holes D2 on flange
- Dc: Diametro conservatore
- Dc: Conservator diameter
- R: Braccio galleggiante
- R: Arm lenght $= 1,15 \left(\frac{Dc}{2} - 45 \right)$
- K: Foro per montaggio su conservatore
- K: Mounting hole on the conservator $= 70 \pm 1 \text{ mm}$
- S: Scostamento da centro conservatore
- S: Distance between conservator/gauge centers $= 0,577 \left(\frac{Dc}{2} - 45 \right)$

Tipo/Type	D _n	D	D1	D2	α	Z	F	D _{cMAX}
IMLO R 100	65	100	85	7	45	4	22	400
IMLO R 140	100	140	125	7	30	6	22	400
IMLO R 220	150	220	190	12	22.5	8	26	1000
IMLO R 345	265	345	305	14	22.5	8	26	3000

dim in mm.



Indicatori magnetici di livello olio radiali (forma R)
Radial magnetic oil level gauges (form R)



Z: N° Fori D2 su flangia
 Z: N° Holes D2 on flange
 Dc: Diametro conservatore
 Dc: Conservator diameter
 R: Braccio galleggiante = $1,15 \left(\frac{Dc}{2} - 45 \right)$
 R: Arm lenght
 K: Foro per montaggio su conservatore = $70 \pm 1 \text{ mm}$
 K: Mounting hole on the conservator

Tipo/Type	D _n	D	D1	D2	α	Z	F	D _{cMAX}
IMLO Y 100	65	100	85	7	45	4	22	400
IMLO Y 140	100	140	125	7	30	6	22	400
IMLO Y 220	150	220	190	12	22.5	8	26	1000
IMLO Y 345	265	345	305	14	22.5	8	26	3000

dim. in mm.



Indicatori magnetici di livello olio assiali (forma Y)
 Axial magnetic oil level gauges (form Y)

Fig. A

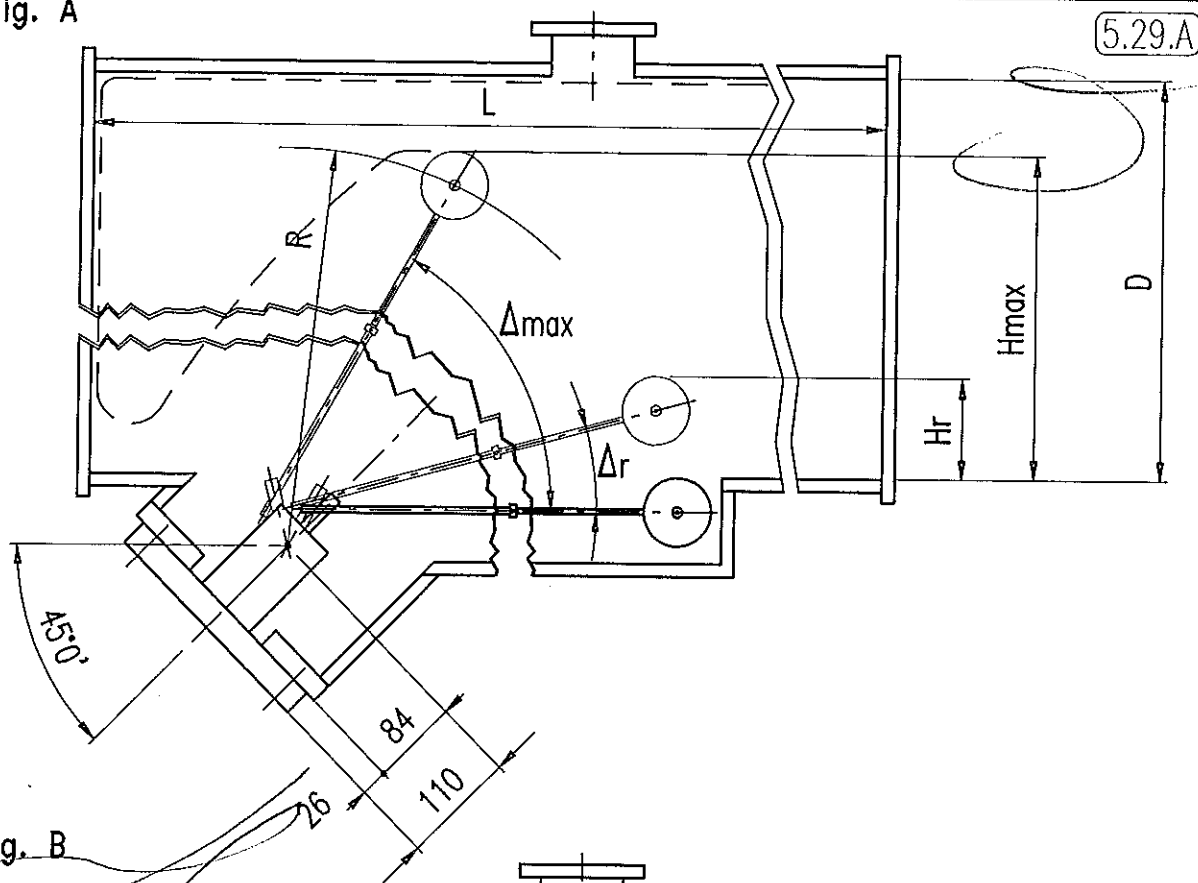
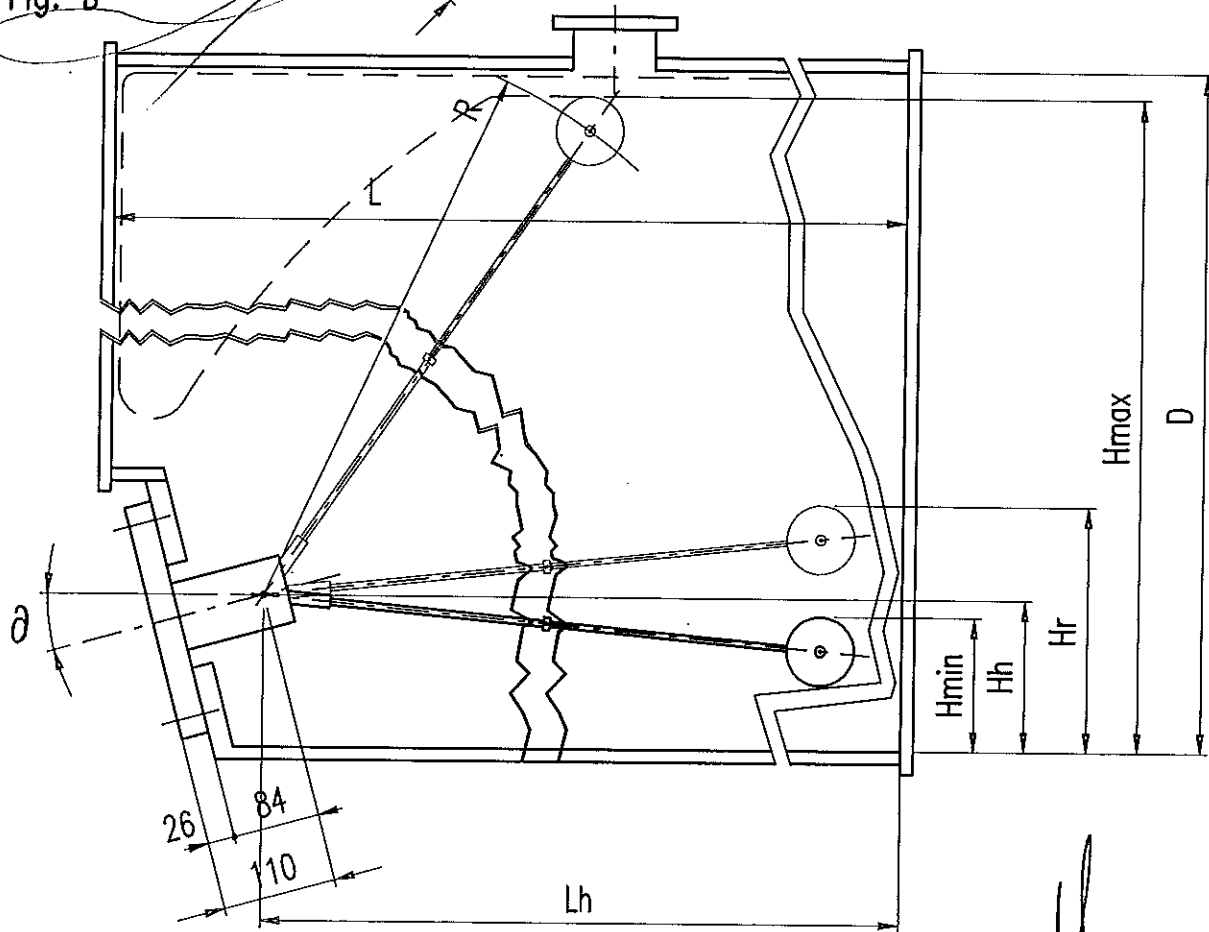


Fig. B



CEDASPE

Indicatori magnetici di livello IMLO Y 220 - ATMSEAL
 - schema di montaggio -
 Magnetic oil level gauges IMLO Y 220 - ATMSEAL
 - mounting sketch -

000426

FIG. A

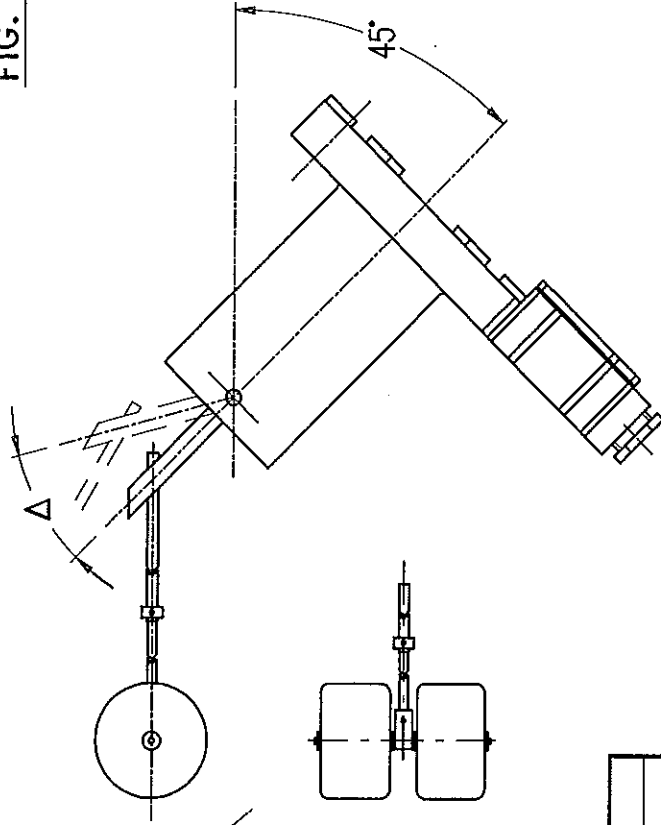
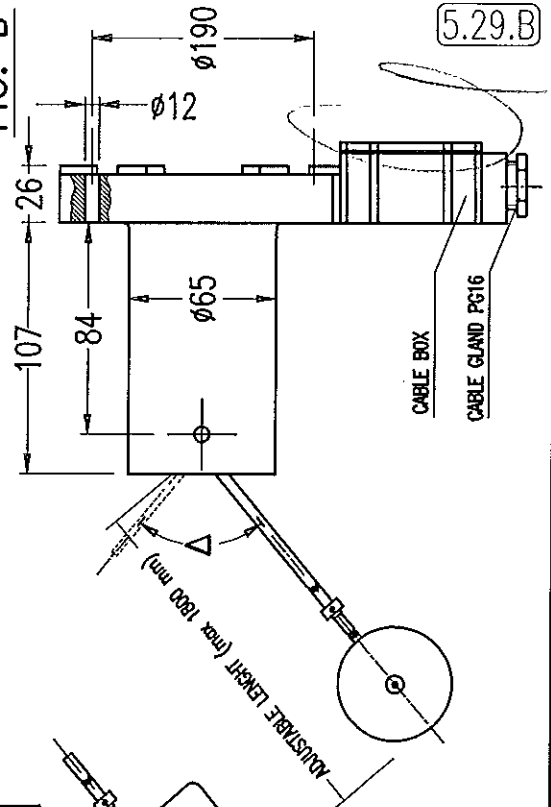
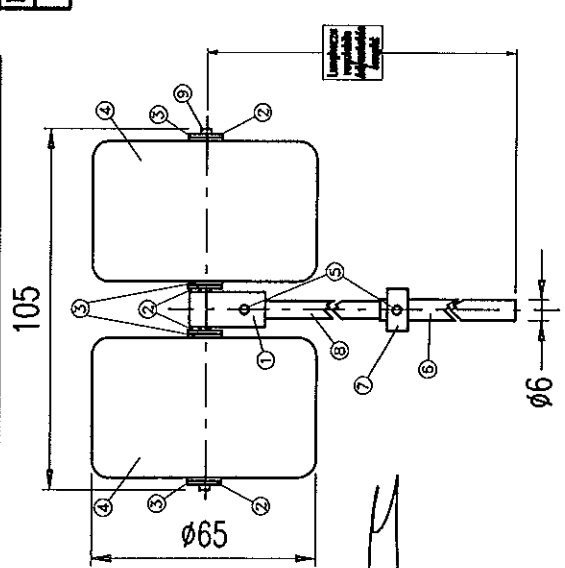
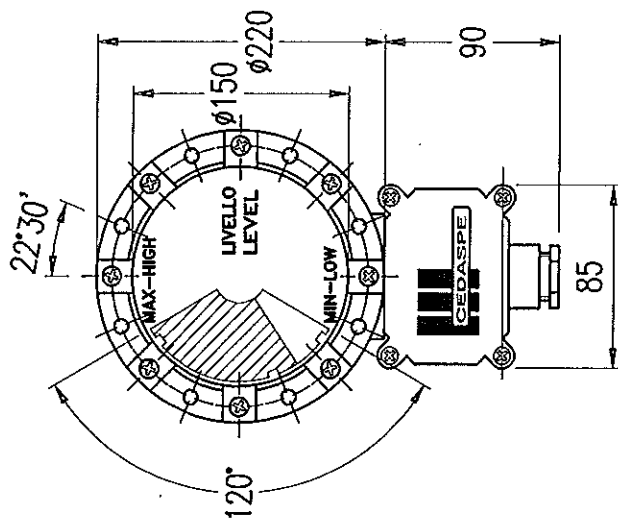


FIG. B



IMLO-Y-224	30°	1:4
IMLO-Y-223	40°	1:3
IMLO-Y-222	60°	1:2
TYPE	Δ max	Bevel gear ratio



dim in mm.

CEDASPE

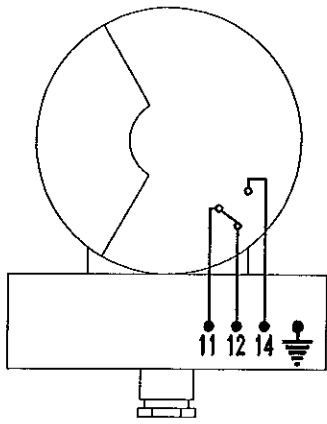
Indicatori magnetici di livello IMLO Y 220 - ATMOSEAL
Magnetic oil level gauges IMLO Y 220 - ATMOSEAL

000227

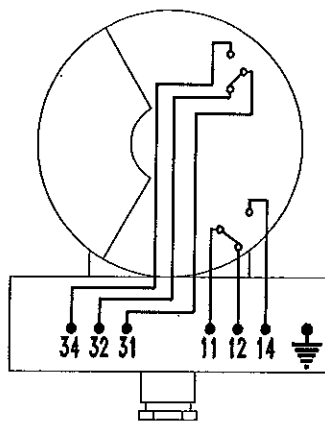
FILE = PAC5.29.D .DWG
 REV. 03 OTD 28/03/04
 La CEDASPE S.p.A. si riserva a termini di legge la proprietà del presente disegno con divieto di riprodurlo o comunicarlo a terzi senza sua autorizzazione.

Wiring diagram & terminal box connection

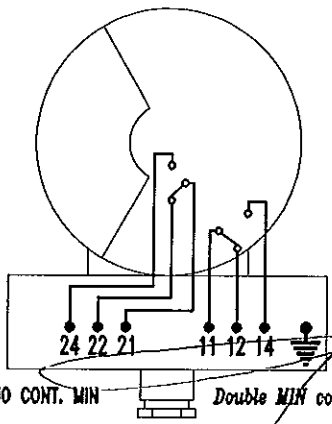
5.29.D



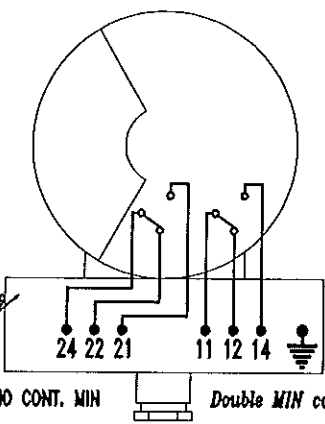
FM (Min cont.)



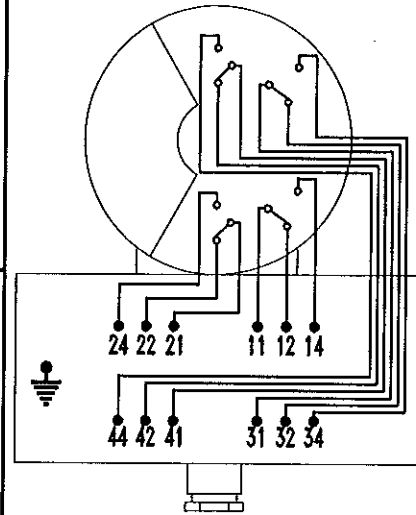
FGM (Min & Max cont.)



FFM-A (Min Al + Trip cont.)
(Cont. Al + Sgancio)

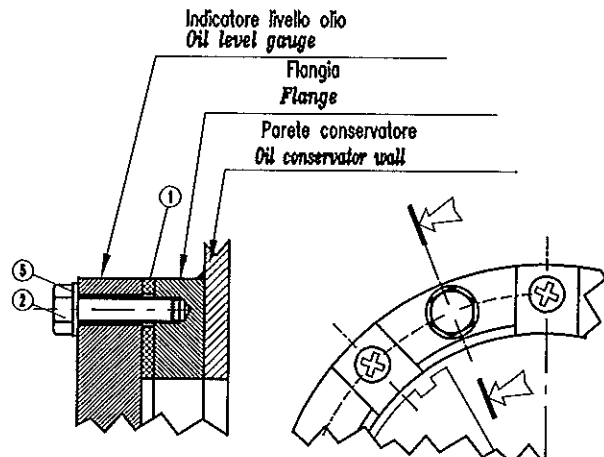
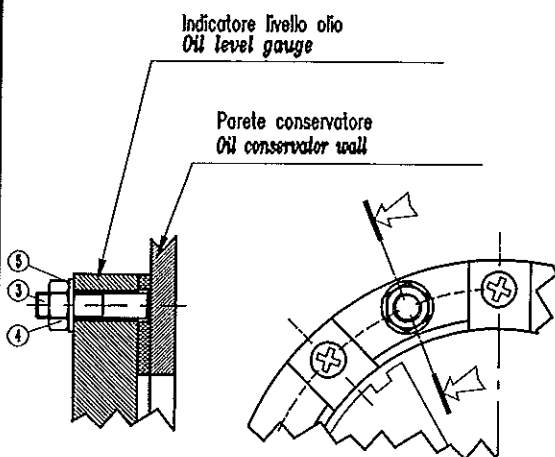


FFM-S (Simultaneous)
(Simultanei)



FFGG-M
DOPPIO CONT. MIN + DOPPIO CONT. MAX
Double MIN cont. + Double MAX cont.

Mounting sketch



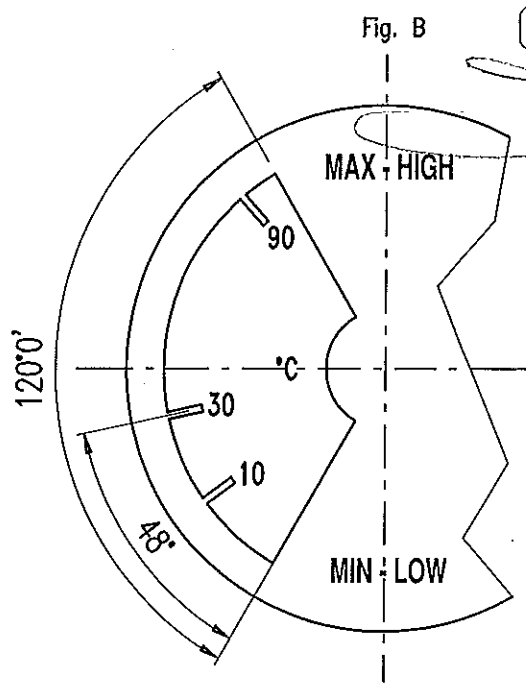
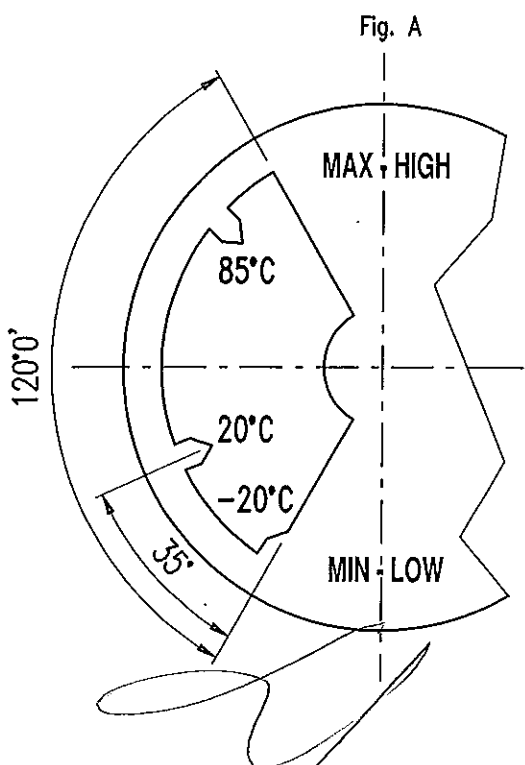
	5 ROSETTA PIANA M6	ROSETTA PIANA M10	ROSETTA PIANA M12
	4 DADO M6	DADO M10	DADO M12
	3 PRIGIONIERO M6X35	PRIGIONIERO M10X40	PRIGIONIERO M12X40
	2 VITE T.E. M6X30	VITE T.E. M10X35	VITE T.E. M12X35
	1 GUARNIZIONE FLANGIA		
Pca.	R/Y100	R/Y140	R/Y220
	INDICATORE DI LIVELLO		

	5 WASHER M6	WASHER M10	WASHER M12
	4 NUT M6	NUT M10	NUT M12
	3 STUD M6X35	STUD M10X40	STUD M12X40
	2 SCREW M6X30	SCREW M10X35	SCREW M12X35
	1 FLANGE GASKET		
Pca.	R/Y100	R/Y140	R/Y220
	MAGNETIC OIL LEVEL INDICATOR		

CEDASPE

Indicatori magnetici di livello IMLO
 Magnetic oil level gauges IMLO

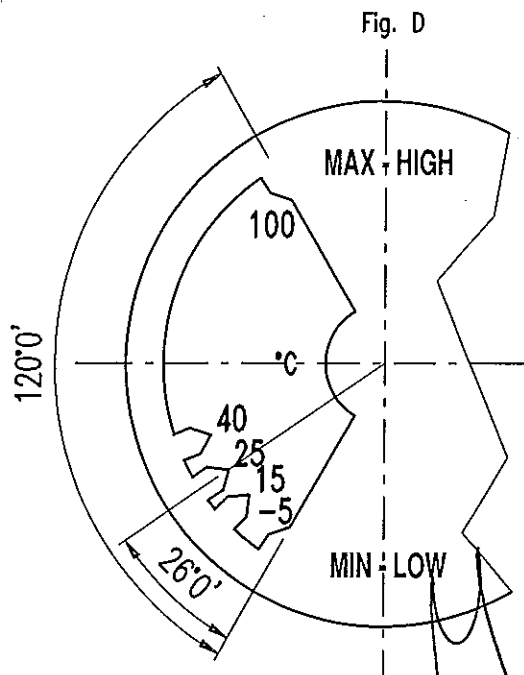
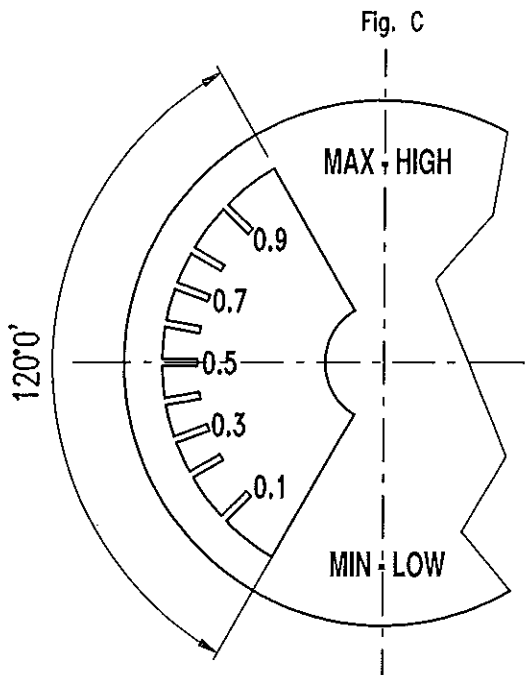
000228



5.29.E

IMLO R/Y 345	STANDARD	SU RICHIESTA / UPON REQUEST		
IMLO R/Y 220	STANDARD	SU RICHIESTA / UPON REQUEST	SU RICHIESTA / UPON REQUEST	SU RICHIESTA / UPON REQUEST
IMLO R/Y 140	STANDARD	SU RICHIESTA / UPON REQUEST	SU RICHIESTA / UPON REQUEST	
IMLO R/Y 100	STANDARD			
Tipo / Type	Fig. A	Fig. B	Fig. C	Fig. D

Altri quadranti disponibili su richiesta / Other dials available upon request



dim in mm.

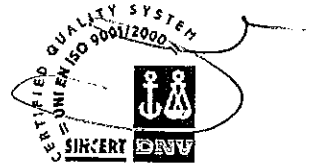


Indicatori magnetici di livello - Quadranti
 Magnetic oil level gauges - Dials

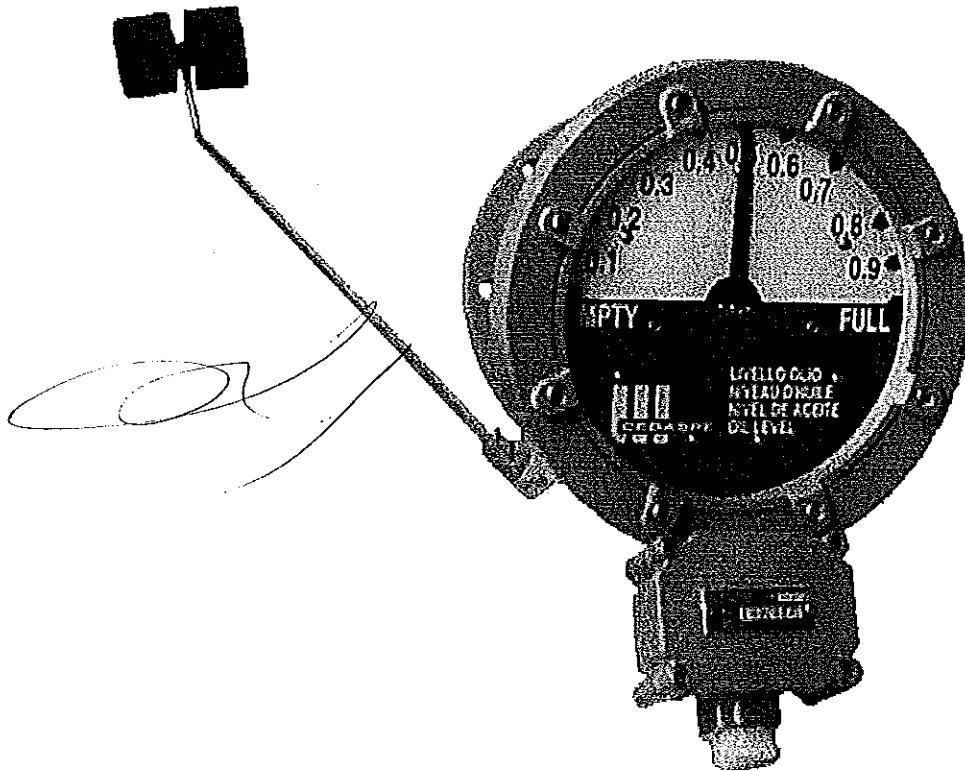
000229



I - 20098 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 02 98.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: <http://www.cedaspe.com>
CAP. SOC. € 620.000 I.V. - IVA-PI. IT 01065780155 - C.F. 01065780155
R.E.A. MI 728991 - IMPORT - EXPORT IM 142410 - REG. IMPIR. 1921483944/46 TRB. MI



MAGNETIC OIL LEVEL INDICATOR FOR POWER TRANSFORMER IFG SERIES (Inclined Flange Gauge)





I - 20093 S. GIULIANO MIL. (ITALY) - VIA COLOMBAIA, 1 - FRAZ. PEDRIANO
TELEFONO +39 02 98.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 520.000 I.V. - TVA-RI. IT 01065780165 - C.F. 01065780165
R.E.A. MI 729991 - IMPORT - EXPORT MI 142410 - REG. IMPR. 132146/334/46 TRIB. MI



1.0 Features

The magnetic oil level indicators type IFG has been specially studied for use on power transformer to give an analogical indication of the oil level inside the conservator by a graduated dial with arrow plus one or more electric signal (max 4 signals) when the oil inside the conservator reaches the max or min level.

2.0 Construction features

o Materials and components

The body of the gauge is made in one piece of solid compact aluminium alloy casting oiltightened proof. The dial face is inclined of 20° from the connecting flange towards the ground, offering a better view at human height of the oil level indication system.

The indicating system is located inside the body and is composed by a yellow arrow, a graduated scale with ten division, one or more contacts activated by cams and a permanent magnet.

The monitoring system is partially located inside the fixing flange and is composed by a permanent magnet, a bevel gear rigidly connected to a float arm which follows the movement of the surface of the oil.

The two systems are connected by a magnetic joint obtained using the magnetic flux of the permanent magnets

The electric signal coming from contacts are carried out through a waterproof terminal box (IP55) fitted with a PG16 cable gland and a ground screw

o Oil-tightness and resistance to pressure

The magnetic oil level indicators IFG are suitable to work with oil up to a max temperature of 115°C; lowest ambient temperature -25°C and are mechanically resistant to vacuum (10 torr)

o Resistance to dynamical stress

The magnetic oil level indicators IFG can operate without undue operation in following conditions:

Sinus vibrations with frequency ≤ 120 Hz and amplitude ≤ 250 μm ;

Dynamical conditions causing following accelerations:

- Max 3g in all directions, sinus vibration, amplitude ≤ 20 mm;
- Shock condition with max 10 g in all directions.

o Surface protection

Body, frame, terminal box and his cover are painted internally and externally with one primer coat of epoxy paint and externally with a finishing coat of polyurethane paint colour RAL 7030. The primer coat on the internal surfaces is compatible with transformer mineral oil up to temperatures of 120°C. Total thickness of two coats is 80 microns; special painting cycle can be provided for transformers located in very polluted areas

3.0 Manufacturing program

Magnetic oil level indicator series IFG is manufactured in 3 different execution

- Type IFG FK2 axial type suitable for use in conservator with rubber bag
- Type IFG AQ2 axial type suitable for use in traditional conservator
- Type IFG BQ2 radial type suitable for use in traditional conservator

All execution are equipped with 1 or more electric contacts, microswitch type that are activated when the oil (and consequently the arrow of the instrument) reaches presetted positions (see available wiring diagram).

Two different connecting flange are available, one (standard type) O.D. 180 mm with 8 holes for connecting to the tank, another (special execution only for types AQ2 and FK2) with O.D. 160 mm and 6 holes.

Indicating arrow moves over a 180° angle, float arm moves over an angle of 60°/90°/140° respectively for type FK2, AQ2, BQ2 (standard execution); for type FK2 is also available a special execution with float arm rotation angle of 45°.

White indicating dial having 10 divisions with black figures and with adjustable red mark indicating filling position.



I - 20098 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 02 98.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 620.000 I.V. - TVA-PI, IT 01065780165 - C.F. 01065780165
R.E.A. MI 729991 - IMPORT - EXPORT IM 142410 - REG. IMPR. 192146/334/46 TRB, MI



4.0 Operation, installation and maintenance

o Operation

Should an increase of oil inside the conservator (due to heating) or a decrease of oil (due to an oil loss) the float arm detects this variation and gives an optical signal (analogic type) through the arrow and when the oil reaches the presetted value for alarm and/or trip a microswitch is activated and an electric signal is provided inside the terminal box.

o Installation

Use one magnetic oil level indicator for the conservator of the main tank and one for OLTC conservator (if present); the oil level indicator can be fixed to the conservator using 8 (or 6) nuts M10 complete with washer and spring washer that have to be mounted on studs M10x30mm

o Positioning of red arrow of filling position

All our IFG are equipped with an adjustable red mark to show the correct filling level of the oil inside the conservator.

Our IFG is delivered with this red mark positioned at 30% volume of the conservator.

If it is necessary to change the position of the red mark please follow below instruction (refer to sketch at the end of brochure).

unloose screws A,B,C

- position the red mark in the desired position
- close screw A,B,C

o Adjusting float arm length

All our IFG are supplied with adjustable float arm length; this in order to have an optimal calibration of the instrument. Adjustment is very easy: you need only to unloose screw A (please refer to drawing at the end of brochure), adjust float arm to desired length and close screw A again.

o Maintenance

Magnetic oil level gauges IFG don't need specific maintenance; we suggest to check regularly contacts during the normal maintenance of the transformer

5.0 Electric contacts

The contacts are microswitches changeover type and are mechanically operated by a cam.

Following main characteristic of microswitches

Lever	Stainless steel
Body and pushbutton	Thermosetting composition
Contact material	Silver
Mechanical endurance of contact	1x10 ⁷ cycles
Temperature range	-40°C - +125°C
Standard interruption power AC	AC 250V-5A
Standard interruption power DC	see diagram at end of brochure
Insulation to earth at 20°C	2.000V
Protection degree of terminal box	IP 55

6.0 Wiring diagrams

Available wiring diagram are:

- wiring diagram type C1 : gives a signal when oil reaches low level inside conservator
- wiring diagram type C2 : gives a signal when oil reaches low and max level inside conservator
- wiring diagram type D1 : gives an alarm signal when oil reaches low level and trip signal for very low level inside conservator
- wiring diagram type D2 : gives a double signal when oil reaches low level inside conservator

All contacts are operated 3/5 degrees before the arrow reach the minimum or the maximum level of oil

See sketch



I - 20098 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 02 98.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - Inter/Net Site: http://www.cedaspe.com
CAP. SOC. € 520.000 I.V. - TVA-PI, IT 01065780165 - C.F. 01065780165
R.E.A. MI 729991 - IMPORT - EXPORT IN 142410 - REG. IMPR. 132146/3344/46 TRIB. MI



7.0 Compatibility of installation

The installation compatibility of the magnetic oil level indicator depend mainly on the material used for the flange gasket; therefore the executions differ because of the material used for this gasket.

o Standard execution N – nitrile rubber gasket

Admitted operating conditions are:

Environmental conditions:

Ambient temperature -25°C to +50°C

Relative humidity 95% to 20°C - 80% to 40°C - 50% to 50°C

Insulating liquid: transformer mineral or silicon oil

Temperature - 25°C to + 115°C

o Execution C – cork gasket

Admitted operating conditions are:

Environmental conditions:

Ambient temperature -20°C to +50°C

Relative humidity 95% to 20°C - 80% to 40°C - 50% to 50°C

Insulating liquid: transformer mineral or silicon oil

Temperature - 20°C to + 110°C

o Execution V – fluor rubber gasket (Viton V)

Admitted operating conditions are:

Environmental conditions:

Ambient temperature -15°C to +50°C

Relative humidity 95% to 20°C - 80% to 40°C - 50% to 50°C

Insulating liquid: transformer mineral or silicon oil

Temperature - 15°C to + 150°C

o Special executions

For other environmental and/or operating conditions to be examined individually.

8.0 Ordering Instructions

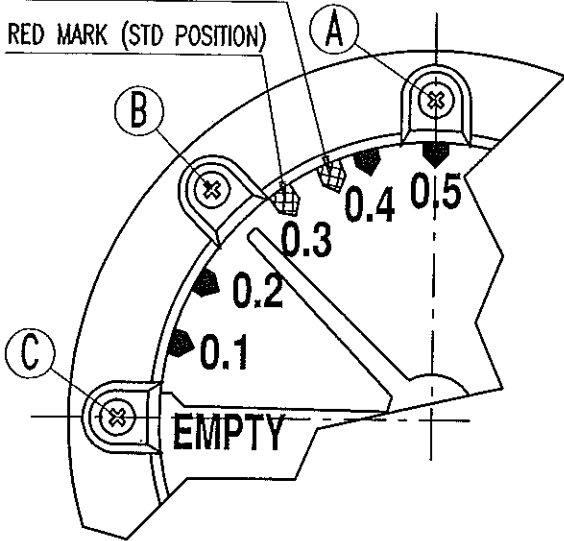
When ordering must be defined following data:

- Type of magnetic oil level indicator : IFG FK2 or AQ2 or BQ2
- Fixing flange 8H (or 6H)
- Type of gasket required : N; V; C or special
- Wiring diagram: C1; C2; D1; D2
- For type FK2 also float arm rotation or a mounting sketch showing min, max and filling levels of oil, float arm length (see form at the end of brochure)

FILE = PAGES.DWG
 LMT [(0.0) (196.286)]
 A4 (210x297)
 REV. 00 DTD 11/03/04
 La CEDASPE S.p.A. si riserva a termini di legge, le proprietà del presente disegno con divieto di riproduzione o comunicazione a terzi, senza sua autorizzazione.

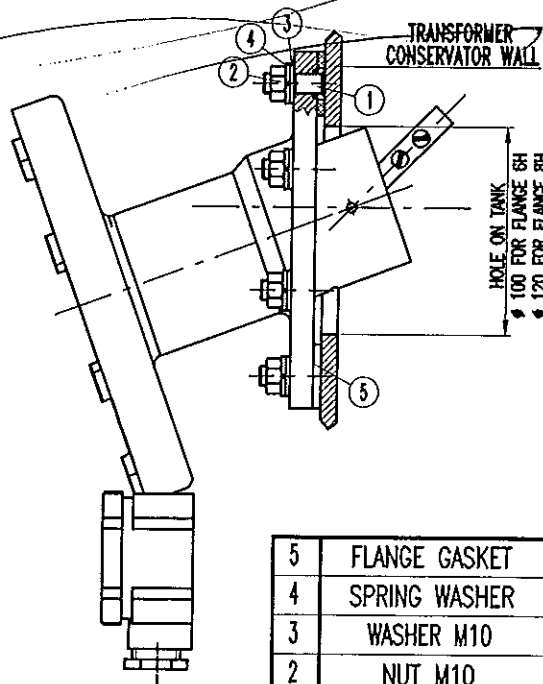
ADJUSTED POSITION OF RED MARK

RED MARK (STD POSITION)



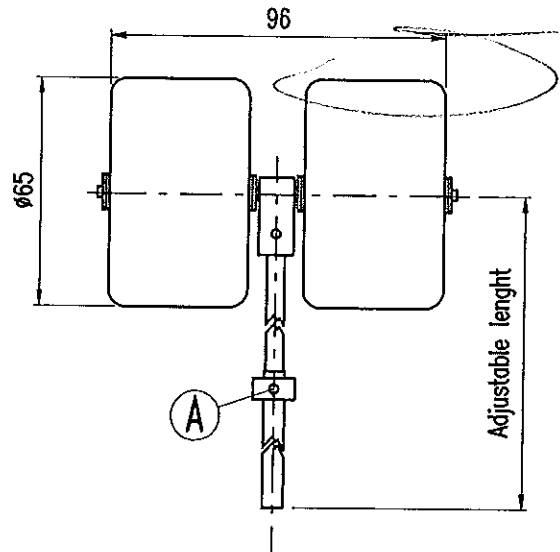
- 1) UNLOOSE SCREWS A, B, C
- 2) MOVE RED ARROW TO REQUIRED POSITION
- 3) CLOSE SCREWS A, B, C

ADJUSTMENT OF RED ARROW

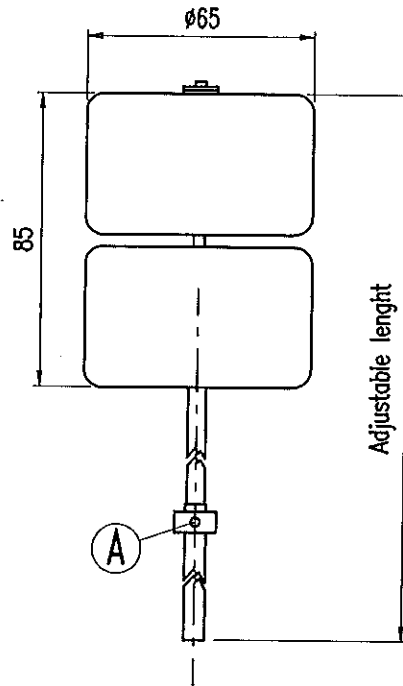


POS.	DESCRIPTION
5	FLANGE GASKET
4	SPRING WASHER
3	WASHER M10
2	NUT M10
1	STUD M10X30

MOUNTING SKETCH



FK2



AQ2 & BQ2

- 1) UNLOOSE SCREW A
- 2) ADJUST ARM TO REQUIRED LENGTH
- 3) CLOSE SCREW A

FLOAT ARM

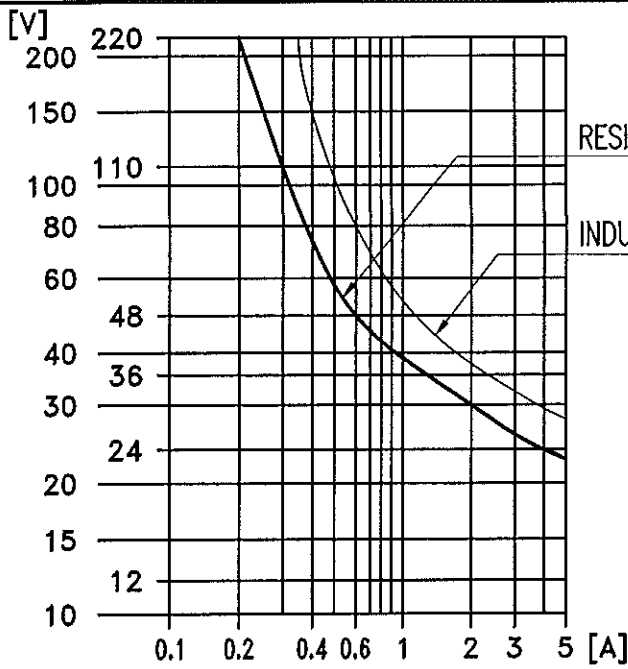
Titolo

MAGNETIC OIL LEVEL INDICATOR IFG

CEDASPE

000234

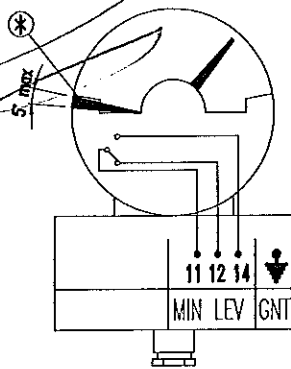
FILE = PAGES6 .DWG
 DAT (0.0) (196.286)
 AA (210287)
 REV.00 (01) 11/03/04
 La CEDASPE S.p.A. si riserva a termini di legge la proprietà del presente disegno con divieto di riproduzione o comunicazione a terzi senza sua autorizzazione.



CONTACT BREAKING CAPACITY DC

WIRING DIAGRAM

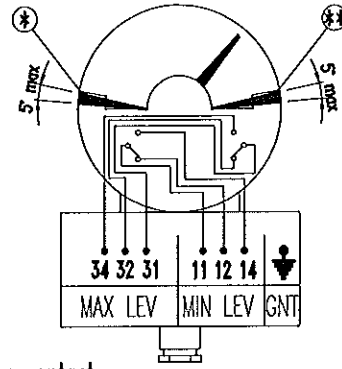
WIRING DIAGRAM C1



Only min contact

*) Min contact operates in this area

WIRING DIAGRAM C2

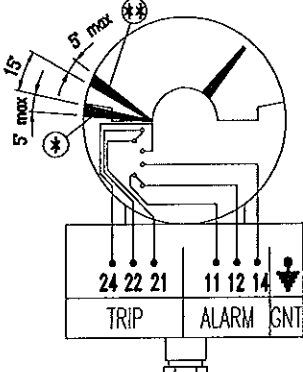


Min & max contact

*) Min contact operates in this area

***) Max contact operates in this area

WIRING DIAGRAM D1

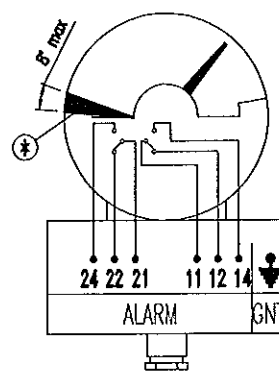


Alarm contact low level - Trip contact very low level

*) Trip contact operates in this area

***) Alarm contact operates in this area

WIRING DIAGRAM D2



Double contact at min level

*) Both contacts operate in this area

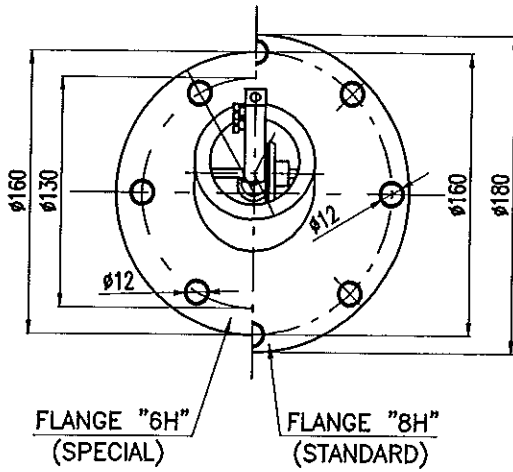
CEDASPE

Titolo

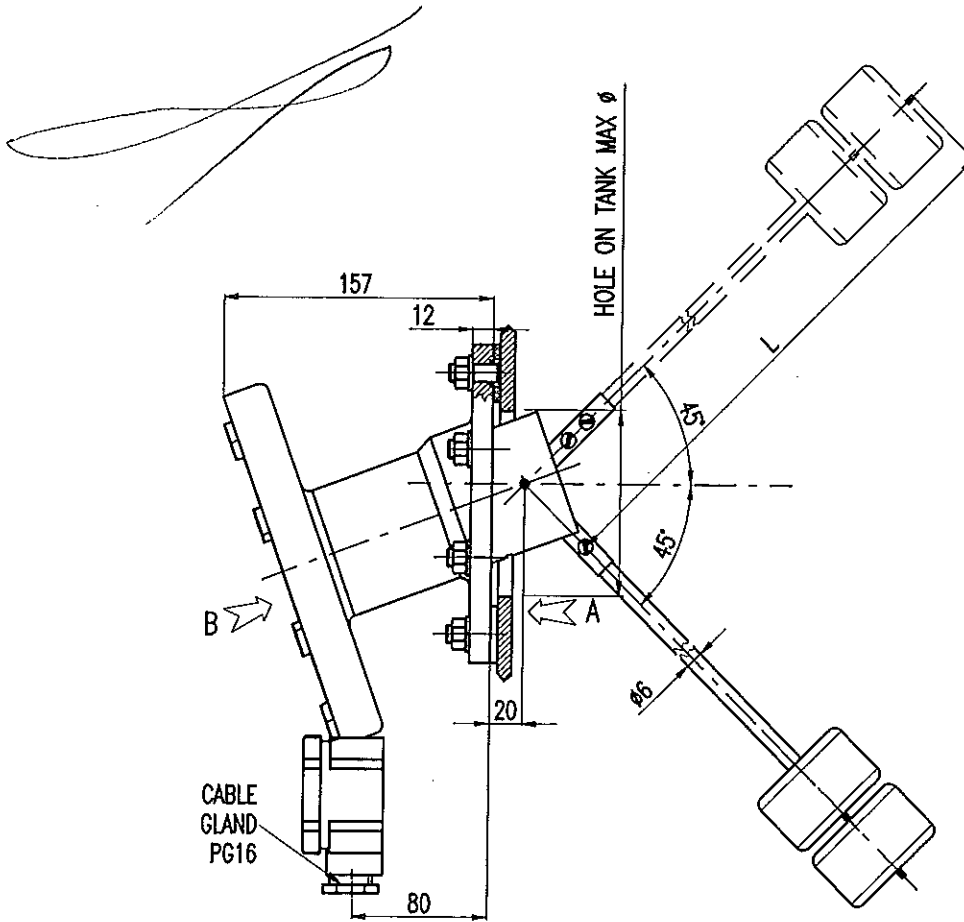
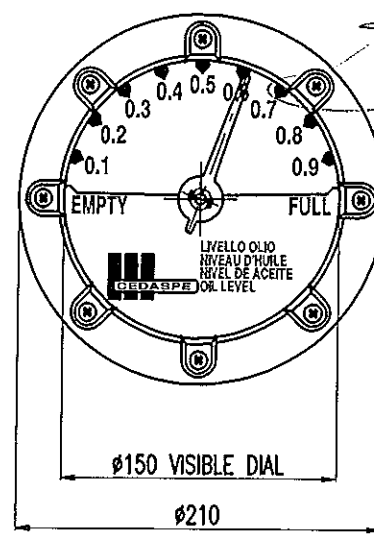
MAGNETIC OIL LEVEL INDICATOR "IFG"

000235

VIEW OF CONNECTING FLANGE



VIEW OF FRONT FACE



2	100	FLANGE "6H" SPECIAL
1	120	FLANGE "8H" STD
POS.	Ø	NOTE

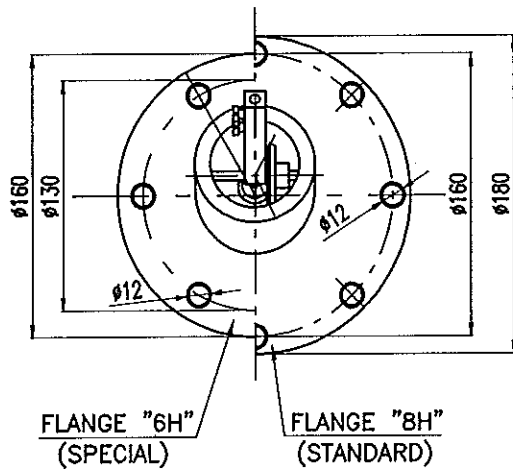
FILE = PAGE7 .DWG UNIT [(0.0) (196286)] A4 (210x297)
 REV. 00 DTD 11/03/04 La CEDASPE S.p.A. si riserva a termini di legge la proprietà del presente disegno con divieto di riproduzione o comunicazione a terzi senza sua autorizzazione.



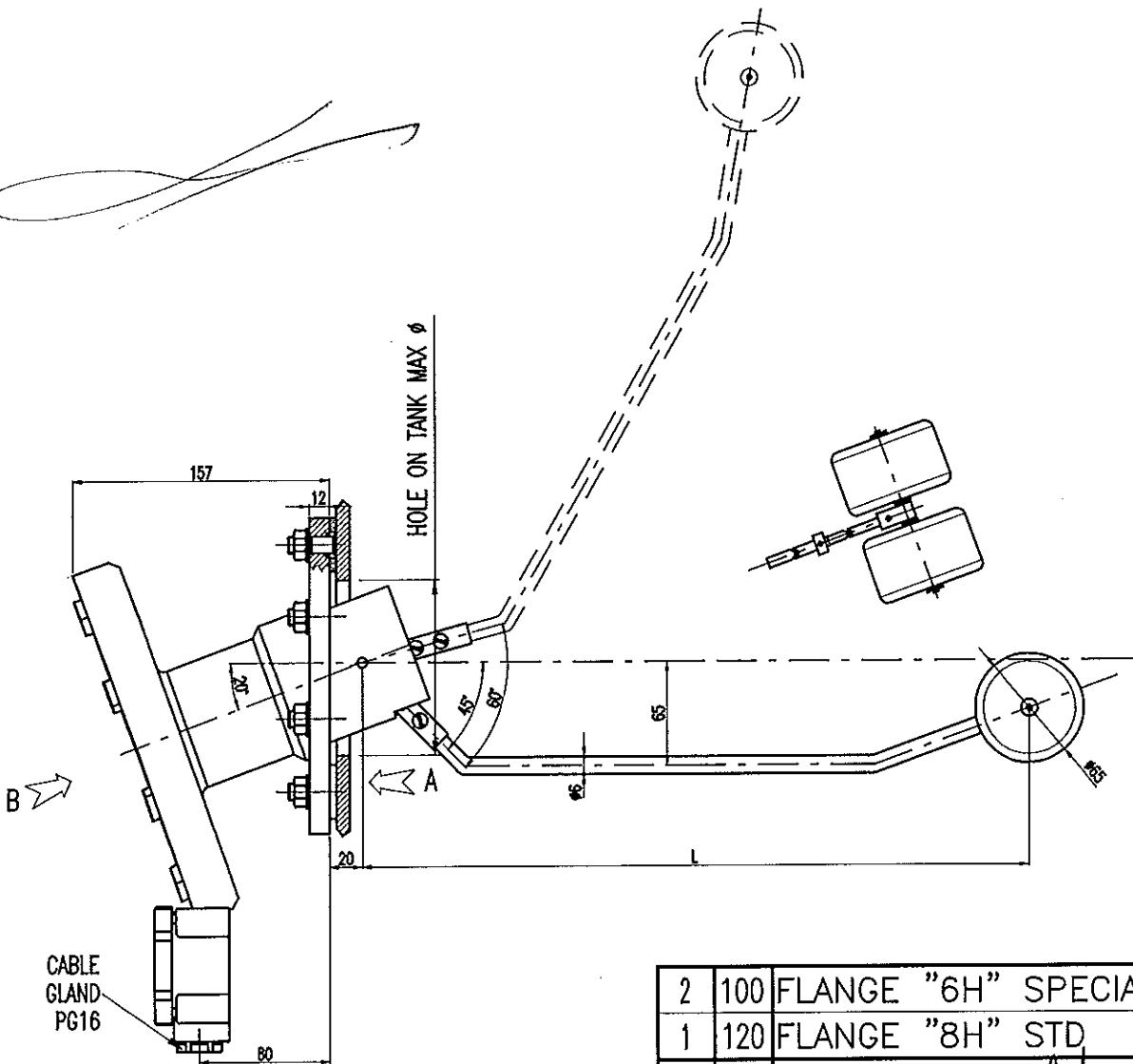
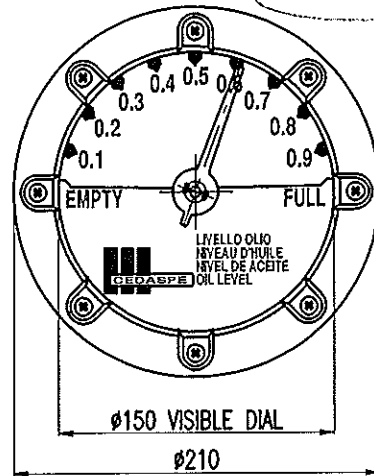
Titolo
**MAGNETIC OIL LEVEL INDICATOR IFG
 MODEL AQ2 FOR TRADITIONAL CONSERVATORS**

000236

VIEW OF CONNECTING FLANGE



VIEW OF FRONT FACE



2	100	FLANGE "6H" SPECIAL
1	120	FLANGE "8H" STD
POS.	Ø	NOTE

Titolo

MAGNETIC OIL LEVEL INDICATOR IFG
MODEL FK2 FOR HERMETIC RUBBER BAG CONSERVATOR

CEDASPE

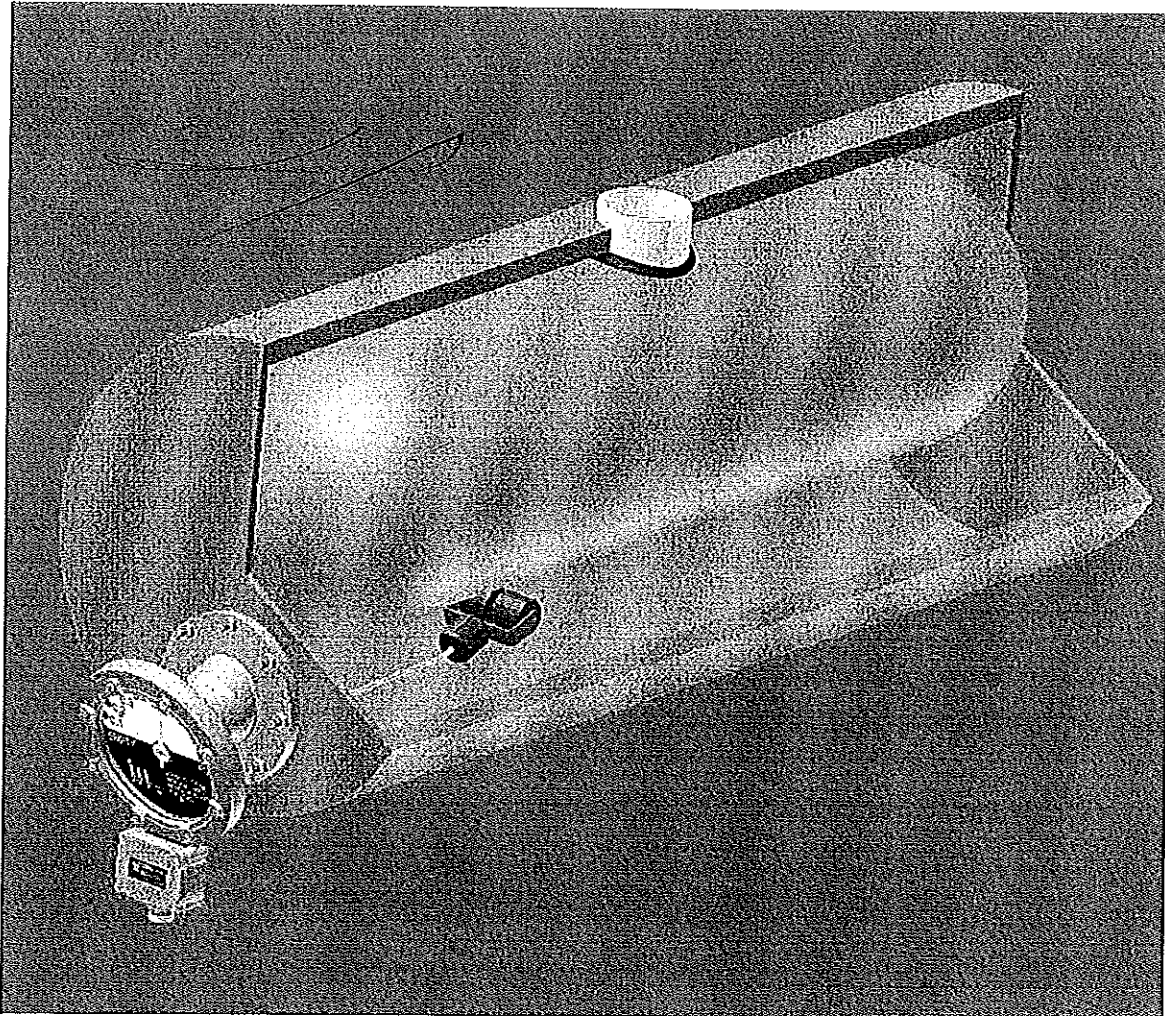
000237

FILE = PAGES .DWG LMF [(0,0) (196,286)] A4 (210x297)
 REV. 00 DTD 11/03/04
 La CEDASPE S.p.A. si riserva o termini di legge la proprietà del presente disegno con divieto di riprodurre o comunicare a terzi senza sua autorizzazione.

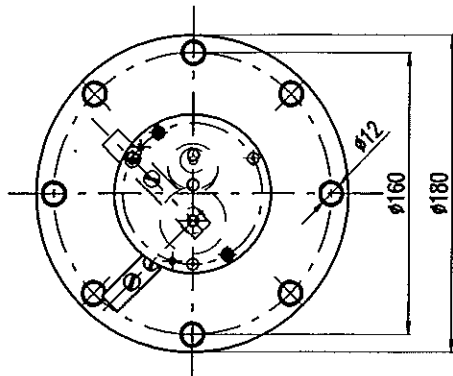


CEDASPE s.p.a.

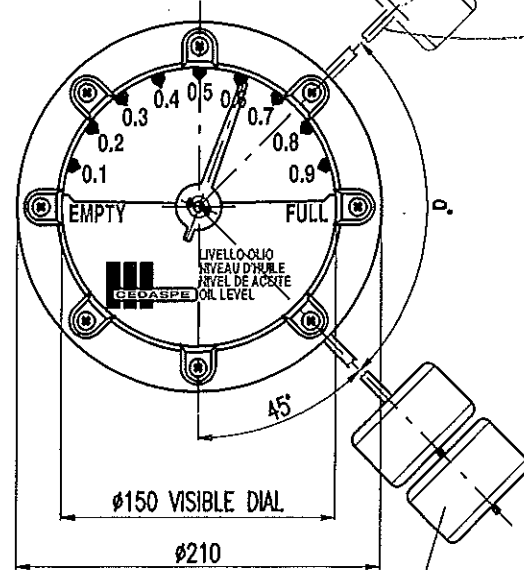
I - 20098 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 02 98.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - Inter/Net Site: http://www.cedaspe.com
CAP. SOC. € 520.000 I.V. - TVA-PI. IT 01065780165 - C.F. 01065780165
R.E.A. MI 729991 - IMPORT - EXPORT MI 142410 - REG. IMPR. 132146/3344/46 TRIB. MI



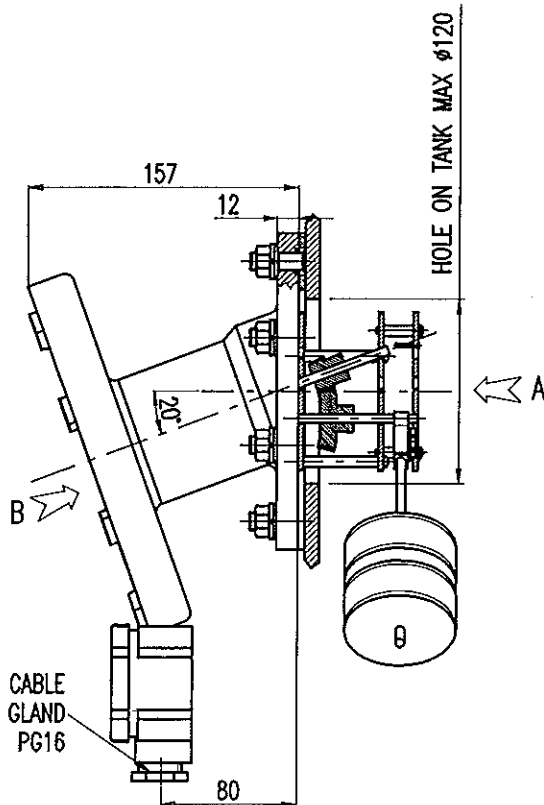
VIEW OF CONNECTING FLANGE



VIEW OF FRONT FACE



ATTENTION:
FLOAT ARM IS ON
RIGHT HAND SIDE



2	90°	SPECIAL
1	140°	STANDARD
POS.	α°	EXECUTION

FILE = PAGE10.DWG

REV. 00 DTD 11/03/04

La CEDASPE S.p.A. si riserva e termina di legge la proprietà del presente disegno con divieto di riprodurlo o comunicarlo a terzi senza sua autorizzazione.

CEDASPE

Titolo

MAGNETIC OIL LEVEL INDICATOR IFG
MODEL BQ2 RADIAL TYPE

000239

ORDER FORM

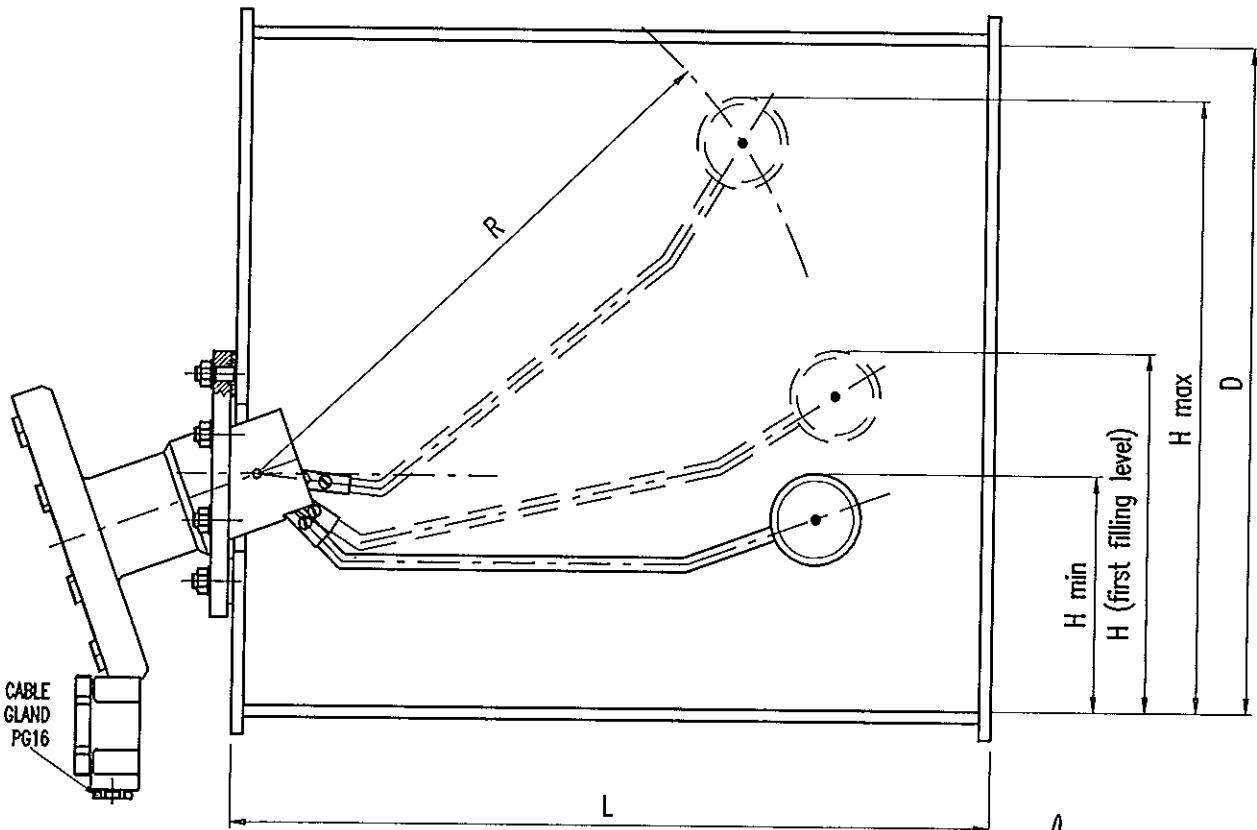
- TYPE FK2 AQ2 BQ2
- GASKET TYPE N C V SPECIAL
- WIRING DIAGRAM C1 C2 D1 D2
- FLANGE TYPE 6H 8H

NOTE

.....

SPECIAL REQUIREMENT

ONLY FOR IFG "FK2"



AA (210x297) LMF [(0,0) (196,268)] FILE = PAGE11.DWG REV. 00 DTD 11/03/04
 La CEDASPE S.p.A. si riserva a termini di legge la proprietà del presente disegno con divieto di riproduzione o comunicazione a terzi senza sua autorizzazione.

CEDASPE

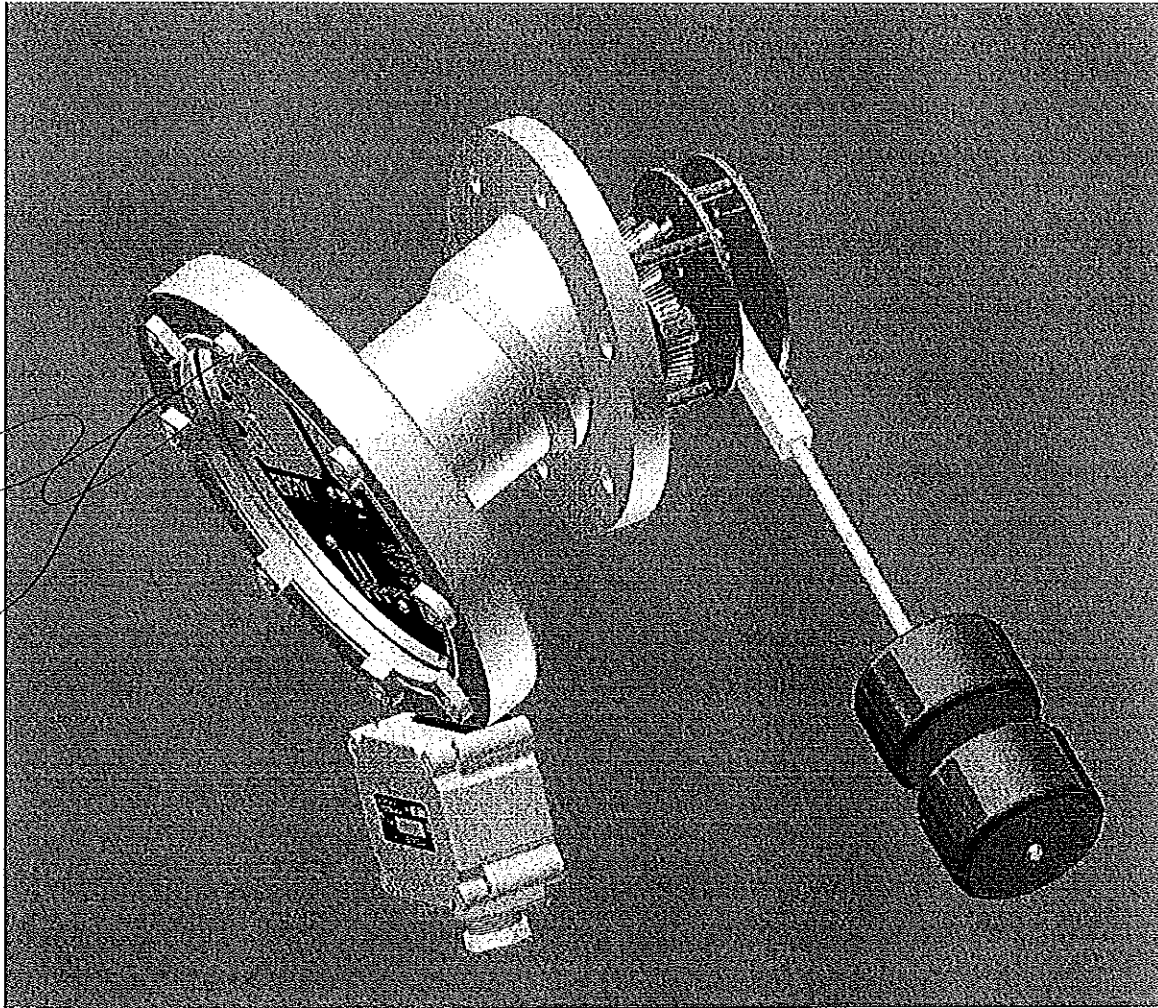
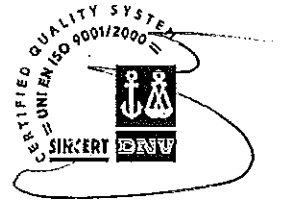
Titolo

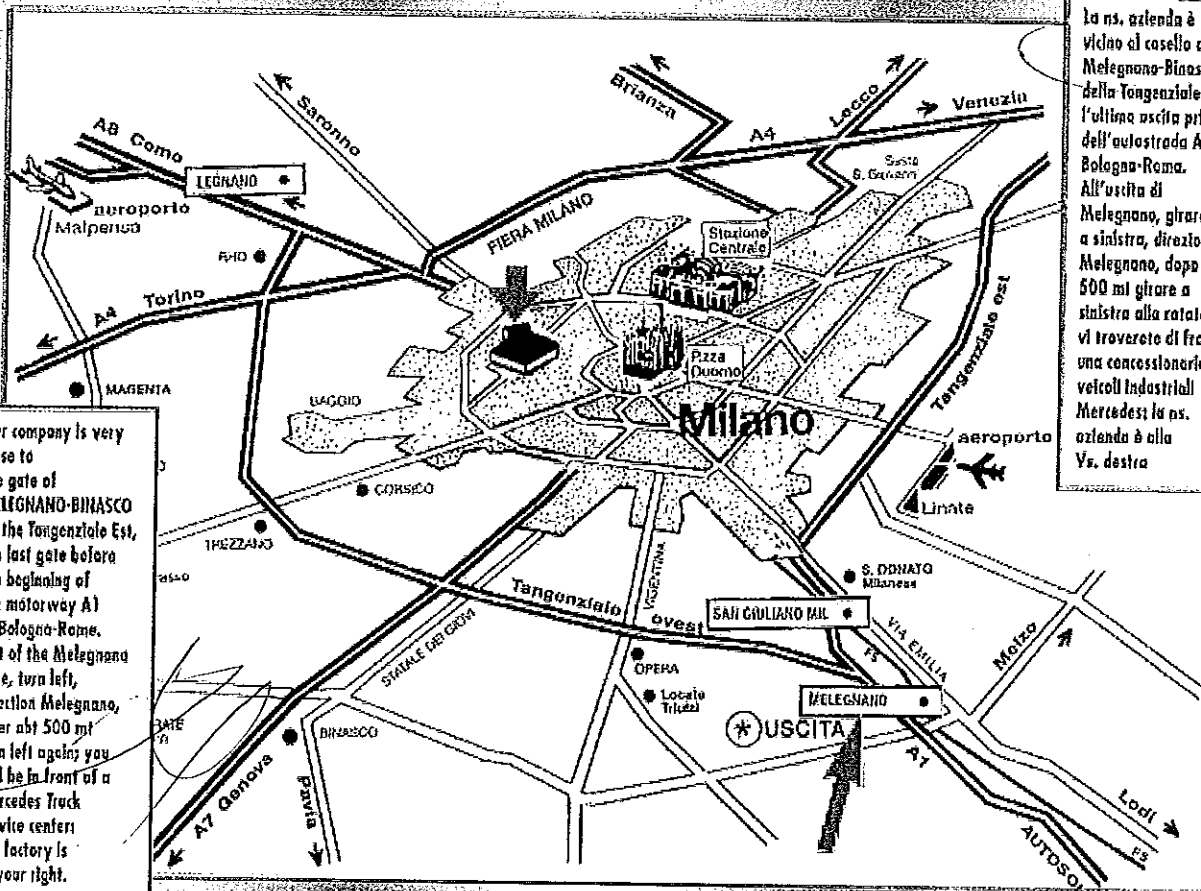
MAGNETIC OIL LEVEL INDICATOR "IFG"

000260



I - 20098 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 02 98.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 620.000 I.V. - TVA-PI. IT 01065780165 - C.F. 01065780165
R.E.A. MI 729991 - IMPORT - EXPORT MI 142410 - REG. IMPR. 132146/3344/46 TRNB. MI





La ns. azienda è vicino al casello di Melegnano-Binasco della Tangenziale Est, l'ultima uscita prima dell'autostrada A1 Bologna-Roma. All'uscita di Melegnano, girare a sinistra, direzione Melegnano, dopo circa 500 mt girare a sinistra alla rotonda; vi troverete di fronte una concessionaria veicoli industriali Mercedes; la ns. azienda è alla Vs. destra

Our company is very close to the gate of MELEGNANO-BINASCO on the Tangenziale Est, the last gate before the beginning of the motorway A1 to Bologna-Rome. Out of the Melegnano gate, turn left, direction Melegnano, after abt 500 mt turn left again; you will be in front of a Mercedes Truck service center; our factory is at your right.

PROGRAMMA DI PRODUZIONE

- Isolatori passanti BT/MT
- Relè ad accumulo di gas
- Indicatori livello olio
- Essiccatori d'aria
- Valvole a farfalla per radiatori e relè
- Valvole di sovrappressione
- Termometri con e senza contatti elettrici
- Commutatori di prese a vuoto
- Muffole per entrata in cavo (BS2562)

PROGRAMA DE PRODUCCION

- Passatapas BT/AT
- Relés Buchholz
- Indicadores de nivel de aceite
- Deshumectadores de aire
- Valvulas mariposa para radiadores
- Valvulas de sobrepresion
- Termometros con y sin contactos electricos
- Commutadores
- Cajas de bornas AT (BS2562)

MANUFACTURING PROGRAM

- LV and HV Transformer Bushings
- Gas actuated Relays
- Oil Level Gauges
- Dehydrating Breathers
- Radiator throttle valves
- Pressure Relief Devices
- Thermometers with/without electric contacts
- Off-load Tap Changers
- Cable boxes (BS2562)

PROGRAMME DE PRODUCTION

- Traversée isolée BT/HT
- Buchholz Relais
- Indicateur de niveau d'huile
- Assécheur d'air
- Vannes a papillon pour radiateurs
- Souape de surere
- Thermomètres avec/sans contacts
- Commutateurs des prises
- Boîte a cable MT (BS2562)

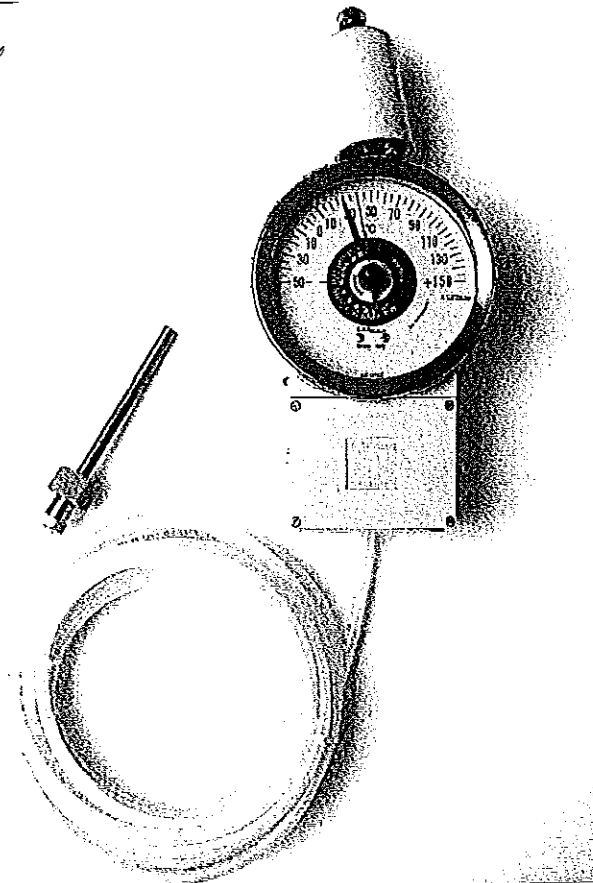
CEDASPE S.p.A.

Via Colombara, 1 Fraz. Pedriano - 20098 S. Giuliano Milanese (MI) - Tel. +39/0298204411 - Fax +39/0298204422

E-MAIL: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com

**Oil Temperature Indicator
for Power Transformer type :**

MSRT 150



Introduction	Pag.	02
Description and general specifications	Pag.	02
Options	Pag.	04
Operating instructions and maintenance	Pag.	07
Finished product quality control tests	Pag.	09
Testing sheet for thermometer	Pag.	09



Quality made to measure

Introduction.

These instruments are designed to measure the temperature of the insulating oil inside of power transformer tanks and they can be fitted with up to five change-over microswitches suitable to control cooling equipments and protection circuits (alarm and trip) of the transformer.

This sector of our production is the result of considerable research and experiment commitment which has led to internationally patented new concept instruments design and construction.

The component designs of our instruments are protected by :

ITALIAN PATENT No. 208603
ITALIAN PATENT No. 89113
E.E.C. PATENT No. 0245212
U.S. PATENT No. 4,727,227

Effectiveness of these instruments must be stressed, both as regards measuring/commutation precision and extreme simplicity of operation.

Special attention has been paid to design of each single part resulting in extreme high reliability of our instruments and ensuring long-lasting accurate operating. We have designed the setting system, the mounting devices and the dimensions of the cable boxes to consent the operator to easily install the indicator and to save time in setting and making cable layout.

Besides the exact constructional and severe quality control we adopt, the high performances of our instruments are further assured by the employ of the best products supplied by European technology's more advanced company names. In particular :

- the **INDICATING SHAFT** is mounted on 2 micro ball bearings to reduce the frictions and to grant right working under vibrations;
- the **AWG 22 CABLES** we adopt are silver plated and protected with Teflon according to MIL - W - 16878-4 Standard;
- the **TERMINAL BLOCKS (WEIDMULLER - Germany)** grant very high performances and are certified in accordance with European standards;
- the **POWDER PAINT** grants protection against corrosion and increases the insulation of the device;
- the **SENSING SPRING TUBE** is manufactured with a special bronze alloy that avoid any plastic deformation and histeresis of the spring.

Description and general specifications.

Temperature sensing system : expansion type compensated for ambient temperature changes by means of a built-in compensating device.

To avoid too many checks after setting into work and periodical re-calibrations we adopt particular cares in testing the components. In particular the sensing system is subject to 3 different tests:

1. **vacuum test**: the sensing system is connected to a vacuum plant. The plant pressure is decreased to 2×10^{-3} mbar (hpa) to verify the quality of the welding and the porosity of the material;
2. **pressure test**: the sensing system is put under pressure up to 280 bar to verify the welding and that the spring is not subject to any plastic deformation.
3. **overheating test**: once the sensing system is completed, its bulb is located in a heating plant controlled by a microprocessor based temperature monitoring system. The temperature is increased up to a value that is 20% higher than the maximum range value of the sensing systems (i.e. for an indicator whose range is 0/150°C the overheating test temperature is 180°C). The temperature remains at that value for 8



Quality made to measure



hours in this way simulating 1 year life under normal working conditions (i.e. for an indicator whose range is 0/150°C ---> 110°C). In this way we train the spring and verify that the precision remains the same.

Capillary tube protection : rilsan tubing / stainless steel armouring / steel + PVC armouring.

Bulb : bronze.

Casing : aluminium alloy powder painted (RAL 7035) suitable to withstand to any climate and to heavy polluted atmosphere in as well tropical or arctic climates (-40 / +70°C). All components are made of corrosion resistant or surface treated materials. The case is provided with a breather device to avoid dew on the lens. To make cable layout quick and easy, the case is equipped with a large junction box that is completely separate from instrument's sensing system. Cable glands PG 16, 1/2" BSP, 3/4" BSP or M20x1,5.

Mechanical protection degree : IP 65.

Lens : glass or polycarbonate.

Locking ring : Nickel plated brass; transparent coated.

Standard measuring ranges :
-20 / +130°C; 0 / +150°C; -20 / +140°C; 0 / +160°C; 0 / +200°C.

Measuring tolerance : 1,5% of full scale value.

Commutation tolerance : 2% of full scale value.

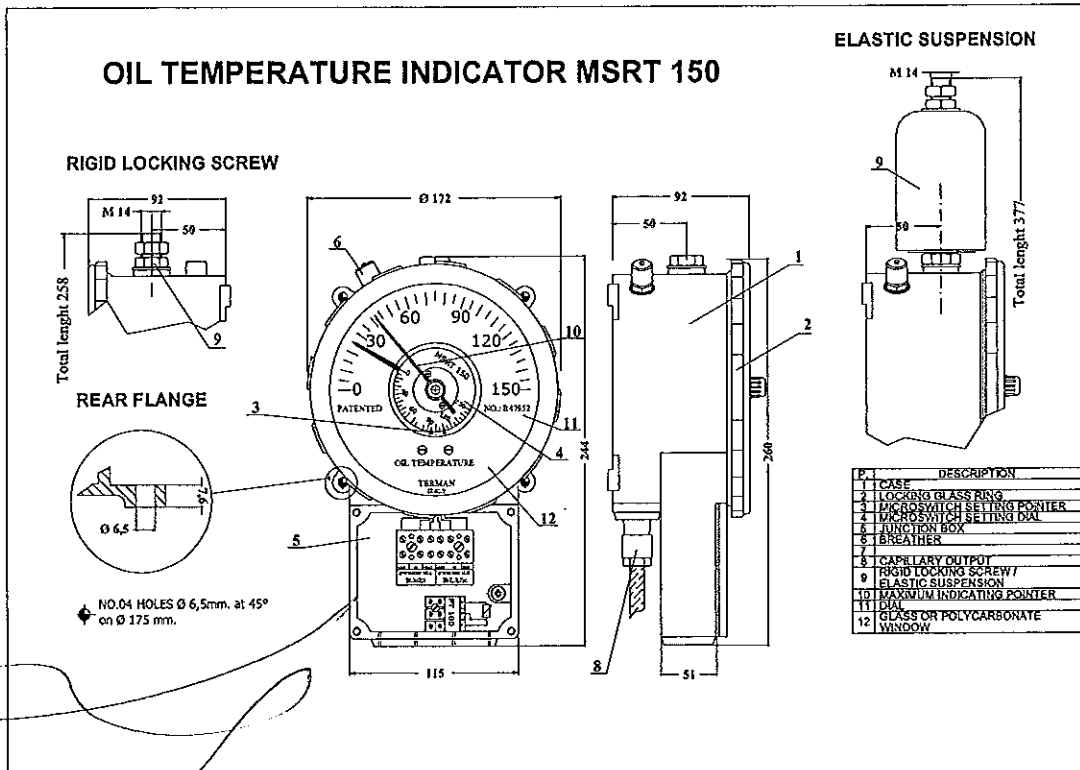
Commutation differential : 4% of full scale value.
On customer's request the differential can be increased.

Insulation : 2000V 50Hz between terminals and earth for a 60 seconds time.

MICROSWITCHES MAKING AND BREAKING CAPACITY :

VOLTAGE	STANDARD MICROSWITCHES		HIGH-PERFORMANCE MICROSWITCHES	
	RESISTIVE LOAD	INDUCTIVE LOAD	RESISTIVE LOAD	INDUCTIVE LOAD
125 VAC	5 A	5 A	10 A	10 A
250 VAC	5 A	5 A	10 A	10 A
30 VDC	5 A	3 A	10 A	10 A
50 VDC	1 A	1 A	3 A	2,5 A
75 VDC	0,75 A	0,25 A	1 A	0,5 A
125 VDC	0,5 A	0,1 A	0,5 A	0,1 A
250 VDC	0,25 A	0,1 A	0,25 A	0,1 A





DRWG. N. 1242

Options.

Elastic suspension (Drwg. No.1231) : it's a vibration damping system able to minimize the effects of a machine vibrations on the instrument.

Earthquake proof version : done by equipping the instrument with the elastic suspension and suitable internal components.

PT 100 sensor : the oil temperature indicator can be equipped with one or two a PT 100 sensors that convert the temperature values in resistance values and transmit them to a receiver or to a monitoring system.

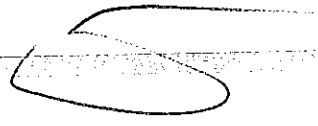
Receiver (Drwg. No.1479) : we can supply a digital receiver (220VAC 50/60Hz) to display the temperature signal received from the sensor.

Transducer 4...20mA (Drwg. No.1707) : we can supply a transducer 4...20mA that converts the resistance values in current values. This device must be mounted on a DIN rail inside of the terminal box.

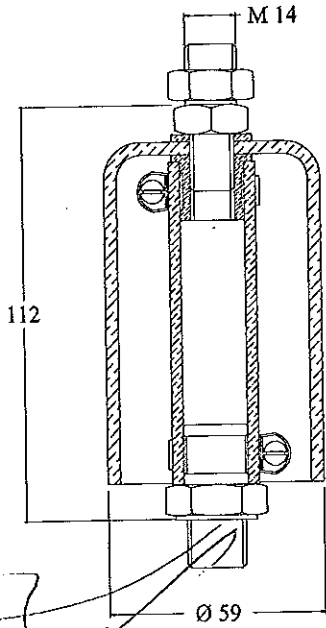
000245



Quality made to measure

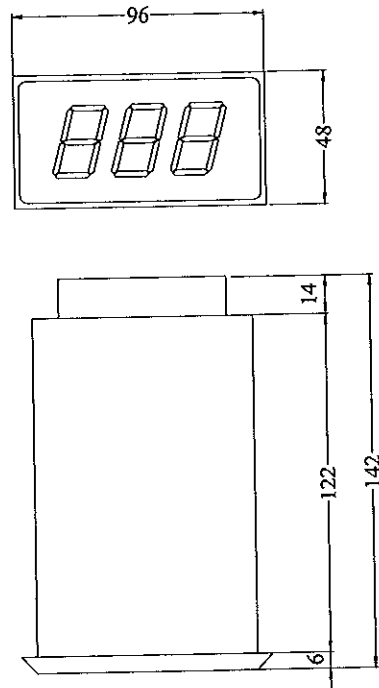


ELASTIC SUSPENSION



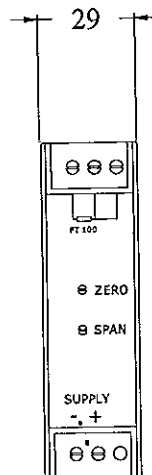
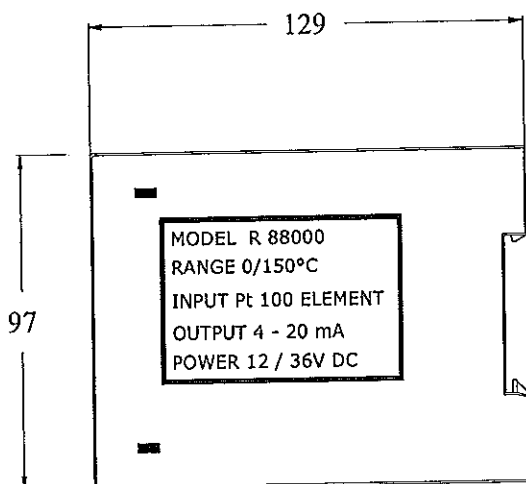
DRWG. N. 1231

PT 100 RECEIVER



DRWG. N. 1479

4...20mA TRANSDUCER for PT 100 PROBE



DRWG. N. 1707



000246



Quality made to measure



STANDARD BULBS

O.T.I. BULBS

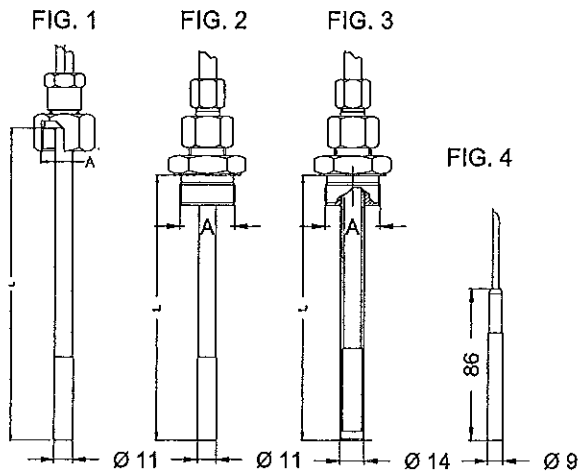


	Fig. 1			Fig. 2/3		
A	3/4 BSP	M27x2	other	3/4 BSP	1" BSP	M27x2 M22x1,5 other
L	Min 80 mm.	Std. 150 mm.		Min 80 mm.		Std. 150 mm.



O.T.I.

equipped with PT 100 sensor bulbs

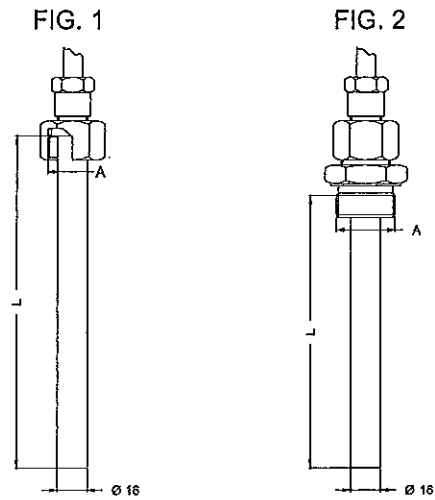


	Fig. 1			Fig. 2		
A	3/4 BSP	M27x2	other	3/4 BSP	1" BSP	M27x2 M22x1,5 other
L	Min 150 mm.	Std. 150 mm.		Min 120 mm.		Std. 150 mm.





Quality made to measure



Mounting : mount the instrument on its machine or plant.

Being the instrument provided with capillary tube it is possible to supply the same with one of the following connections :

- rigid locking screw M14 (Drwg. No.1242) located on the top of the thermometer;
- elastic suspension (Drwg. 1231) that is mounted on the top of the thermometer with a screw M14 that consents to install the instrument to the plant;
- rear flange (Drwg. No.1242/F) for wall mounting on the transformers tank.

Removing of the terminal box cover : by unscrewing the 4 stainless steel screws.

Cable layout : the numerations 1-2-3-4-5 indicate the microswitches progression (red, blue, green, yellow, white pointer). Close to the terminals you can find the following abbreviations :

- C = common
- NO = normally open
- NC = normally closed

that allow the operator to choose the desired cable layout.

Connect the microswitches terminals and the earth terminal.

If the thermometer is equipped with the PT 100 probe you find also the PT 100 terminals with a clear label that indicates how you can connect the probe to the display or to a transducer.

After having done all the connecting operations re-position the terminal box cover taking care to put the flat gasket in the right position and screwing the 4 stainless steel screws.

Setting : to set microswitches pls., follow exactly the instructions :

- remove the locking ring;
- remove the glass or polycarbonate lens (take care of the O-ring);
- stop the microswitches setting dial (small black dial) with two fingers and slide the frictioned microswitches setting pointers until they are located at the desired temperature. Note that to reduce errors you have to slide the pointers towards higher temperature value.
- Replace the glass or polycarbonate lens taking care that the max. temperature indicating pointer is located on the right side of the temperature indicating pointer and that the lens itself correctly positioned over the sealing O-ring;
- Lock the lens screwing the locking ring.

Maintenance

No particular maintenance is required. Only periodical inspections (typical interval 6 months) to verify precision, functions and electrical connections.

When the instrument is equipped with polycarbonate lens, cleaning must be done with care in order to avoid scraps on the surface. Use water and soap only.

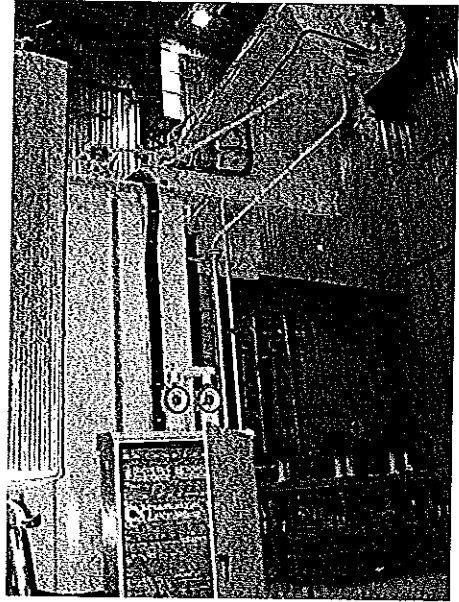
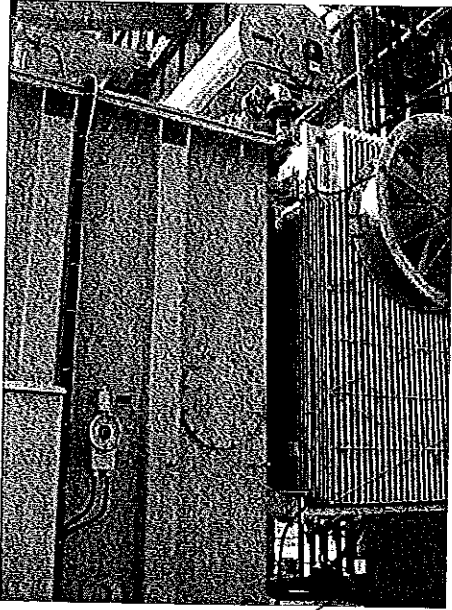


000243

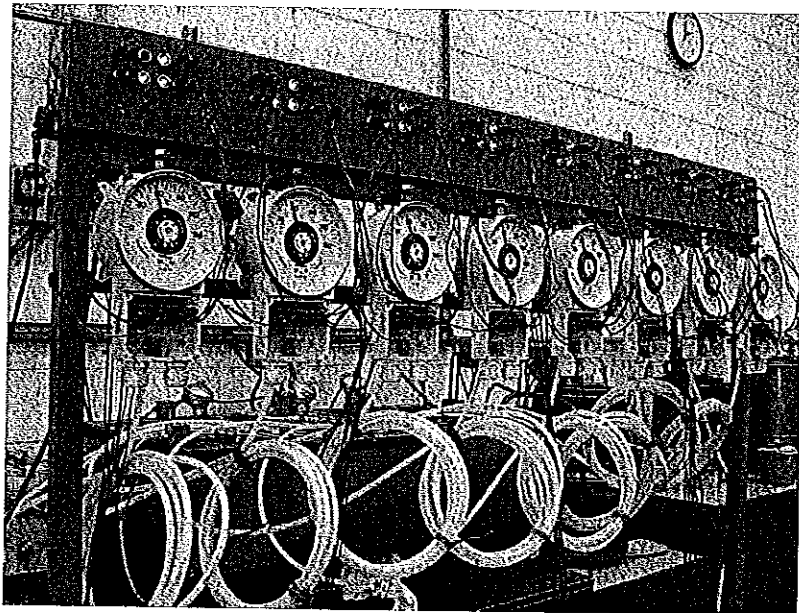
CELMAN

Quality made to measure

[Handwritten signature]



[Handwritten signature]

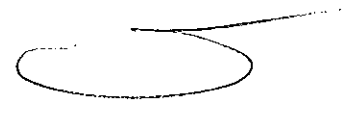


[Handwritten signature]

000249



Quality made to measure



Finished product quality control tests.

Instrument calibration : carried out through thermostatic baths controlled by a computer system. The procedure varies according to instruments scale.

Example of procedure for a thermometer scale -20 / +130°C: the calibration is made using 5 different baths set at the following temperatures :

- bath 1 = -20°C
- bath 2 = 20°C
- bath 3 = 50°C
- bath 4 = 100°C
- bath 5 = 125°C

Calibration procedure :

Step 1: a check is carried out to see whether the temperature taken by the instrument under test differs from that taken through the sample sensor by more than the 70% of the maximum allowed instrument reading tolerance value.

This test is performed by sequentially plunging the Oil Temperature bulb into successive temperature increasing thermostatic baths: -20°C / +20°C / +50°C / +100°C / +125°C.

Step 2: the instrument is heated until the instrument pointer exceeds by 20% the angular full scale value.

Step 3: step 1 is repeated, but inversely.

Microswitches actuation test : performed through a computer controlled testing unit.

The bulb is immersed in a thermostatic bath. The computer changes the temperature inside of the bath and by means of suitable sensors verifies the commutation tolerance, the commutation differential, the electrical circuits of each microswitch.

At the end of the test a report is directly printed by the computer.

Check of instrument mechanical protection degree : IP 65.

This test is carried out by means a lance-sprinkled water jet on all sides of device.

Insulation test : carried out by means of a microprocessor controlled testing unit.

Note : all the collected data are immediately transferred, by means of the computer net, to the quality control and to the design departments to be supervised and evaluated.

In our files, we keep all the above mentioned informations and we can supply to the customer detailed reports regarding the performances of each instrument delivered.

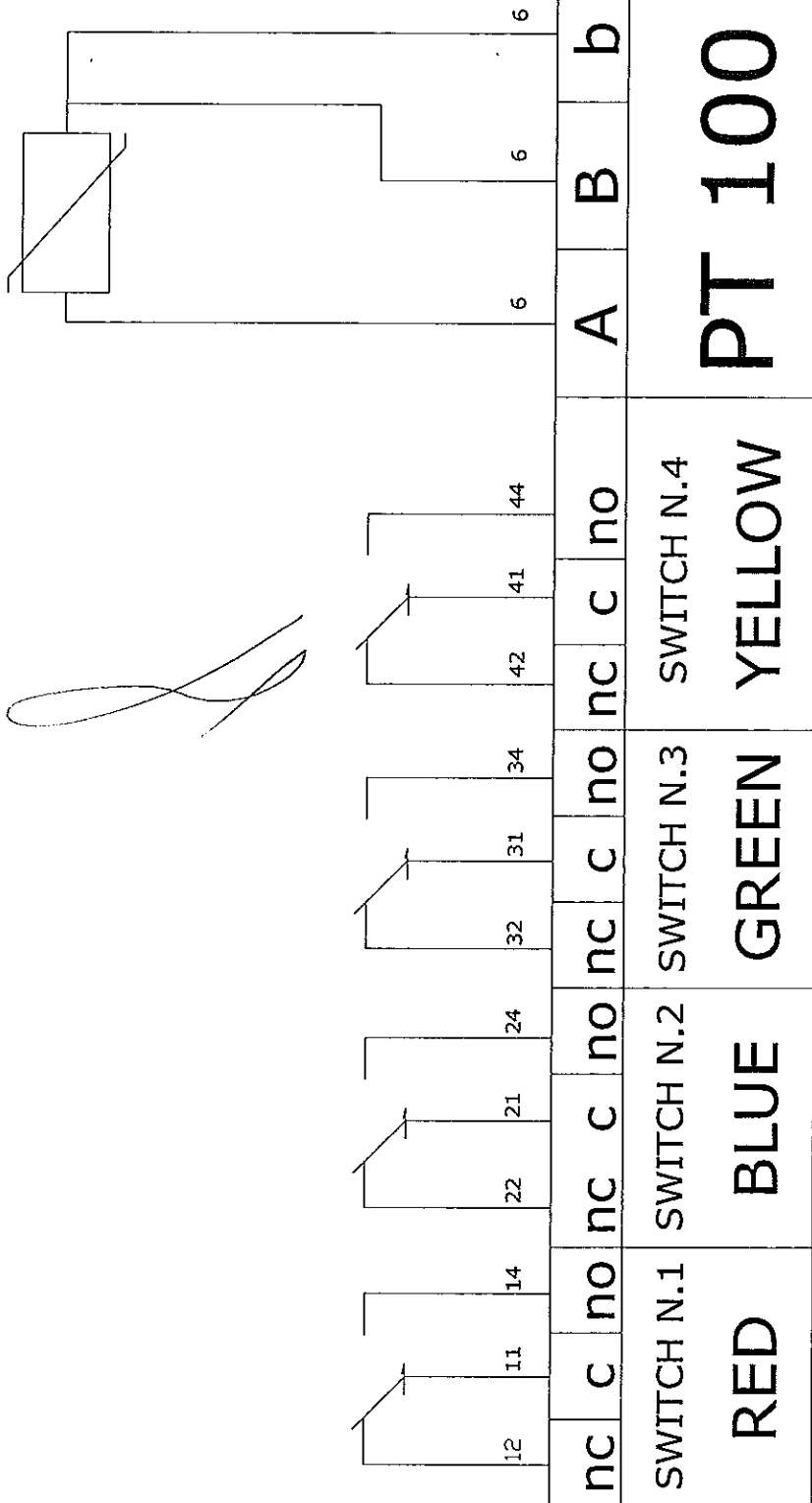


Terman '90 Strumentazione Industriale S.r.l., Via Ghisalba, 13-20/21, 20021 Bollate (MI) – Italy. Tel: +39 02 38 30 37 12,
Fax: +39 02 38 30 37 19, E-Mail info@terman.com, www.terman.com
C.F./P. IVA IT 09970270154 – C.C.I.A.A. 1332904 – Trib. Milano Reg. Soc. 302729 – Cap. Soc. € 10.400

1 EDITION AUGUST 2006



000250



[Handwritten signature]

nc	c	no	nc	c	no	nc	c	no	A	B	b
12	11	14	22	21	24	32	31	34	42	41	44
SWITCH N.1			SWITCH N.2			SWITCH N.3			SWITCH N.4		
RED			BLUE			GREEN			YELLOW		
PT 100											

[Handwritten signature]

O.T.I. wiring diagram

TER.MAN.'90 Srl - Strum. Ind.le
Bollate - MILAN - ITALY

DRWG. N. 1487
FILE : CAD 1487

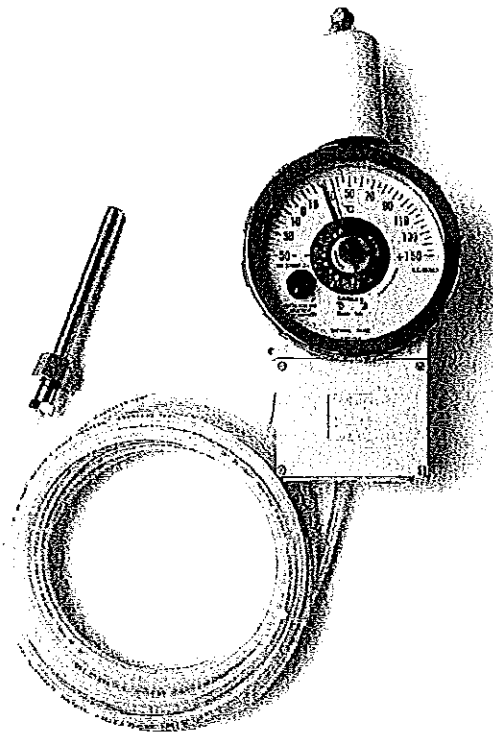
000251

Terminan

Quality made to measure

Winding Temperature Indicator for Power Transformers type :

MSRT 150-W



Introduction	page	02
Description and general specifications	page	02
Options	page	04
Operating instructions and maintenance	page	06
Finished product quality control tests	page	08

000252


terman

Quality made to measure

Introduction.

The winding is the transformer component with the highest temperature and, above all, the one subject to the fastest temperature changes as the load increases. Thus, to have total control of the temperature parameter inside of the transformer, the temperature of the winding must also be measured. An indirect system is used to measure this latter since it is dangerous to place a sensor close to the winding due to the high voltage.

The indirect measuring is done by means of a Thermal Image.

This Winding Temperature Indicator is designed to measure the temperature of the winding by means of a special bulb surrounded by a heating resistance through which passes a current proportional to the current passing through the transformer winding subject to a given load and immersed in insulating oil at temperature T_{oil} . It's possible to adjust the heating system by means of a potentiometer whose knob is located on the winding temperature indicator's dial. In this way the value of the winding temperature indicated by the instrument will be equal to the ones planned by the trafo manufacturer for a given transformer load.

The winding temperature indicators can be fitted with up to five change-over microswitches suitable to control cooling equipments and protection circuits (alarm and trip) of the transformer.

This sector of our production is the result of considerable research and experiment commitment which has led to internationally patented new concept instruments design and construction.

The component designs of our instruments are protected by :


ITALIAN PATENT No. 208603

ITALIAN PATENT No. 89113

E.E.C. PATENT No. 0245212

U.S. PATENT No. 4,727,227

Effectiveness of these instruments must be stressed, both as regards measuring/commutation precision and extreme simplicity of operation. Special attention has been paid to design of each single part resulting in extreme high reliability of our instruments and ensuring long-lasting accurate operating. We have designed the setting system, the mounting devices and the dimensions of the cable boxes to consent the operator to easily install the indicator and to save time in setting and making cable layout.

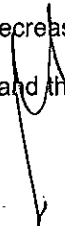
Besides the exact constructional and severe quality control we adopt, the high performances of our instruments are further assured by the employ of the best products supplied by European technology's more advanced company names. In particular:

- the **INDICATING SHAFT** is mounted on 2 micro ball bearings to reduce the frictions and to grant right working under vibrations;
- the **AWG 22 CABLES** we adopt are silver plated and protected with Teflon according to MIL - W - 16878-4 Standard;
- the **TERMINAL BLOCKS (WEIDMULLER - Germany)** grant very high performances and are certified in accordance with European standards;
- the **POWDER PAINT** grants total protection against corrosion and increases the insulation of the device;
- the **SENSING SPRING TUBE** is manufactured with a special bronze alloy that avoid any plastic deformation and histeresis of the spring.

Description and general specifications.

Temperature sensing system : expansion type compensated for ambient temperature changes by means of a built-in compensating device.

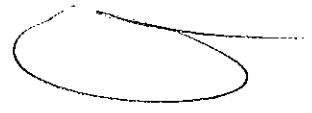
To avoid to many checks after setting into work and periodical re-calibrations we adopt particular cares in testing the components. In particular the sensing system is subject to 3 different tests :

1. vacuum test : the sensing system is connected to a vacuum plant. The plant pressure is decreased to 2×10^{-3} mbar (hpa) to verify the quality of the welding and the porosity of the material;
 2. pressure test : the sensing system is put under pressure up to 280 bar to verify the welding and that the spring is not subject to any plastic deformation;
- 

000253



Quality made to measure



3. **overheating test** : once the sensing system is completed, its bulb is located in a heating plant controlled by a microprocessor based temperature monitoring system. The temperature is increased up to a value that is 20% higher than the maximum range value of the sensing systems (i.e. for an indicator whose range is 0 / 150°C the overheating test temperature is 180°C). The temperature remains at that value for 8 hours in this way simulating 1 year life under normal working conditions (i.e. for an indicator whose range is 0 / 150°C ---> 110°C). In this way we train the spring and verify that the precision remains the same.

Capillary tube protection : rilsan tubing / stainless steel armouring / steel + PVC armouring.

Bulb : bronze .

Casing : aluminium alloy powder painted (RAL 7035) suitable to withstand to any climate and to heavy polluted atmosphere in as well tropical or artic climates (-40 / +70°C). All components are made of corrosion resistant or surface treated materials.

The case is provided with a breather device to avoid dew on the lens.

To make cable layout quick and easy, the case is equipped with a large junction box that is completely separate from instrument's sensing system. Cable glands PG 16 - M20 - 3/4"BSP.

Mechanical protection degree : IP 65.

Working temperature : -40 / +70°C.

Lens : glass or polycarbonate.

Locking ring : Nickel plated brass, Transparent coated.

Standard measuring ranges : 0 / +150°C; 0 / +160°C.

Measuring tolerance : 1,5% of full scale value.

Commutation tolerance : 2% of full scale value.

Commutation differential : 4% of full scale value.

On customer's request the differential can be increased.

Insulation : 2000V 50Hz between terminals and earth for a 60 seconds time.

MICROSWITCHES MAKING AND BREAKING CAPACITY :

VOLTAGE	STANDARD MICROSWITCHES		HIGH-PERFORMANCE MICROSWITCHES	
	RESISTIVE LOAD	INDUCTIVE LOAD	RESISTIVE LOAD	INDUCTIVE LOAD
125 VAC	5 A	5 A	10 A	10 A
250 VAC	5 A	5 A	10 A	10 A
30 VDC	5 A	3 A	10 A	10 A
50 VDC	1 A	1 A	3 A	2,5 A
75 VDC	0,75 A	0,25 A	1 A	0,5 A
125 VDC	0,5 A	0,1 A	0,5 A	0,1 A
250 VDC	0,25 A	0,1 A	0,25 A	0,1 A

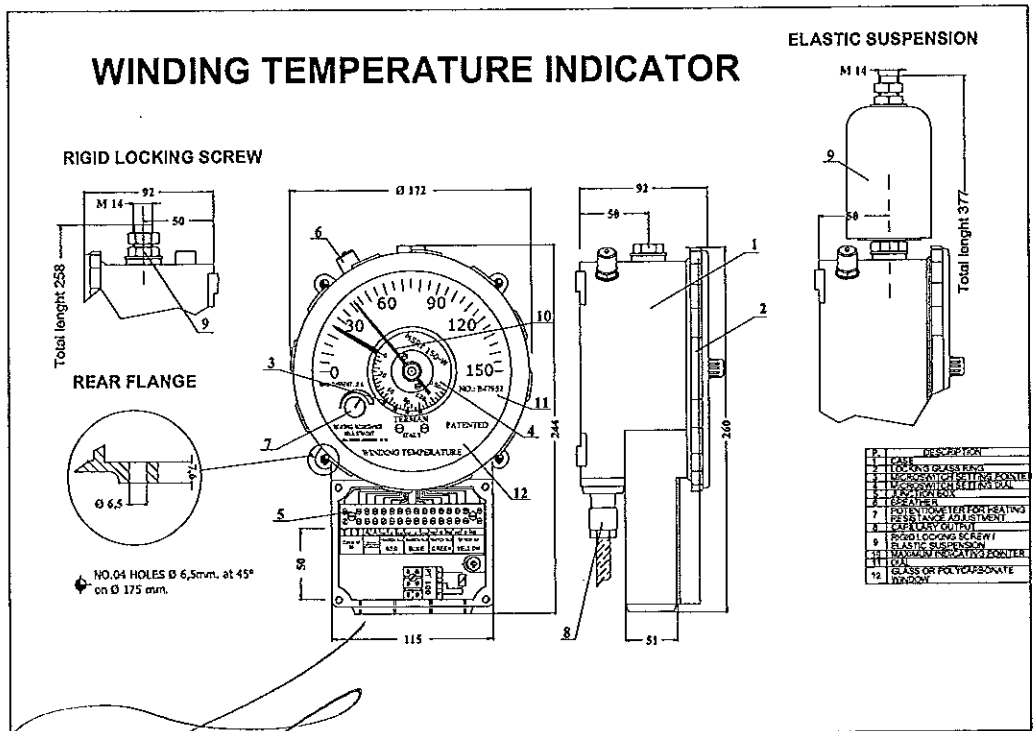


000254



Quality made to measure

TELMAN S.p.A. - Via S. Felice 10 - 37060 Sommacampagna (Verona) - Italy - Tel. 0445/4601 - Telex 320321 - Fax 0445/4602



DRWG. N. 1242/B

Options.

Elastic suspension (Drwg. No.1231) : it's a vibration damping system able to minimize the effects of a machine vibrations on the instrument.

Earthquake proof version : done by equipping the instrument with the elastic suspension and suitable internal components.

PT 100 sensor : the oil temperature indicator can be equipped with one or two PT 100 sensors that convert the temperature values in resistance values and transmit them to a receiver or to a monitoring system. Up to 2 PT 100 sensors can be mounted on the WTI.

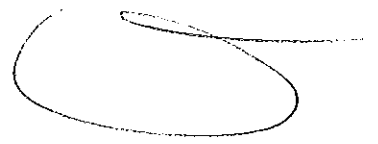
Receiver (Drwg. No.1479) : we can supply a digital receiver to display the temperature signal received from the sensor.

Transducer 4...20mA (Drwg. No.1707) : we can supply a wide range of transducers 4...20mA that convert the resistance values (input Pt100) into current values (output 0..20mA or 4..20mA) or into voltage values (0..5V or 0..10 V). These devices can be mounted on a DIN rail inside of the transformer marshalling box.

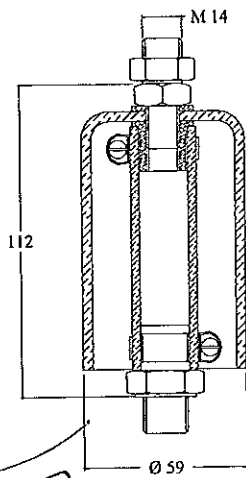
000255



Quality made to measure

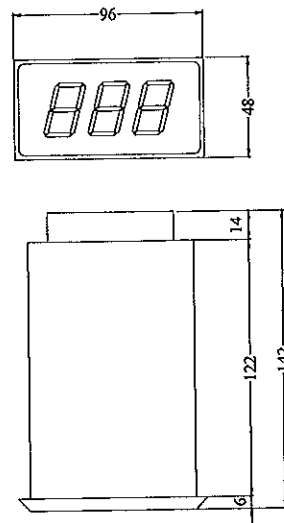


ELASTIC SUSPENSION



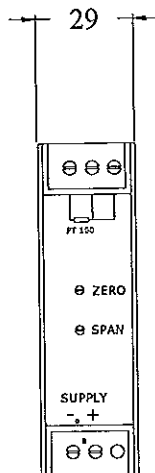
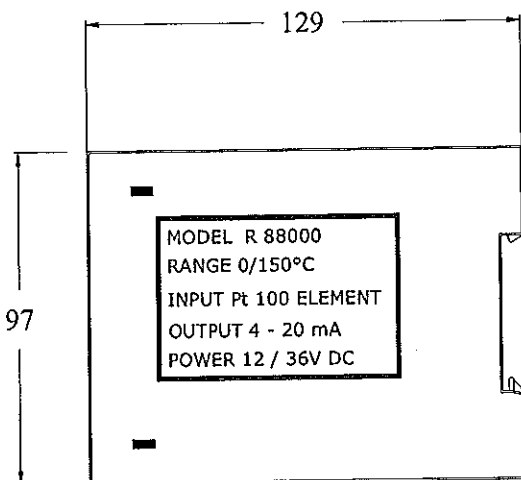
DRWG. N. 1231

PT 100 RECEIVER



DRWG. N. 1479

4...20mA TRANSDUCER PT 100 INPUT



DRWG. N. 1707



000256

STANDARD BULBS

W.T.I. BULBS

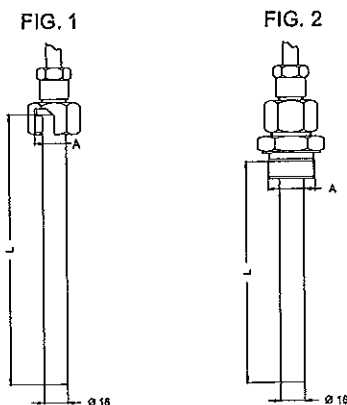


	Fig. 1			Fig. 2		
A	3/4 BSP	M27x2	other	3/4 BSP	1" BSP	M27x2 M22x1,5 other
L	Min 150 mm.	Std. 150 mm.		Min 120 mm.		Std. 160 mm.

Operating instructions and maintenance.

Mounting: mount the instrument on its machine or plant :

- rigid locking screw M14 (Drwg. No.1242/B) located on the top of the thermometer;
- elastic suspension (Drwg. 1231) that is mounted on the top of the thermometer with a screw M14 that consents to install the instrument to the plant,
- rear flange (Drwg. No.1242/B-F) for wall mounting to the oil tank.

Removing of the terminal box cover : by unscrewing the 4 stainless steel screws.

Cable layout : the numerations 1-2-3-4-5 indicate the microswitches progression (red, blue, green, yellow, white pointer). Close to the terminals you will find the following abbreviations :

- C = common
- NO = normally open
- NC = normally closed

that allow the operator to choose the desired cable layout. Connect the microswitches terminals and the earth terminal. If the thermal image is equipped with the PT 100 probe you find also the PT 100 terminals with a clear label that indicates how you can connect the probe to the display or to a transducer. After having done all the connecting operations re-position the terminal box cover taking care to put the flat gasket in the right position and screwing the 4 stainless steel screw.

Regulation of the value of ΔT : within the instrument's terminal board there are, as well as earth and microswitches connection terminals, the terminals T-T and the terminals A-A. Procedure for regulating the instruments :

1. insert the ammeter probes in terminals **A-A**;
2. remove jumper **A-A**;
3. connect terminals **T-T** to the current transformer. **AFTER** having checked that the value of the power supply current printed on the dial (above the knob for regulating overheating) is, in fact, the same, as that of **CT (current transformer)**;
4. regulate the current on the basis of curve I - ΔT attached;



Quality made to measure



5. replace jumper A-A;
6. remove the ammeter probes;

7. wait a few minutes to allow T_w to stabilize;
8. check the exactitude of T_w ;

N.B.: the bulb of the thermometer for the thermal image must be filled with oil to accelerate the heat interchange occurrences. The bulb must be inserted in a well filled with transformer oil : the oil will rise through a suitable hole located in the bottom of the bulb itself until it covers the resistance.

Setting : to set microswitches pls., follow exactly the instructions :

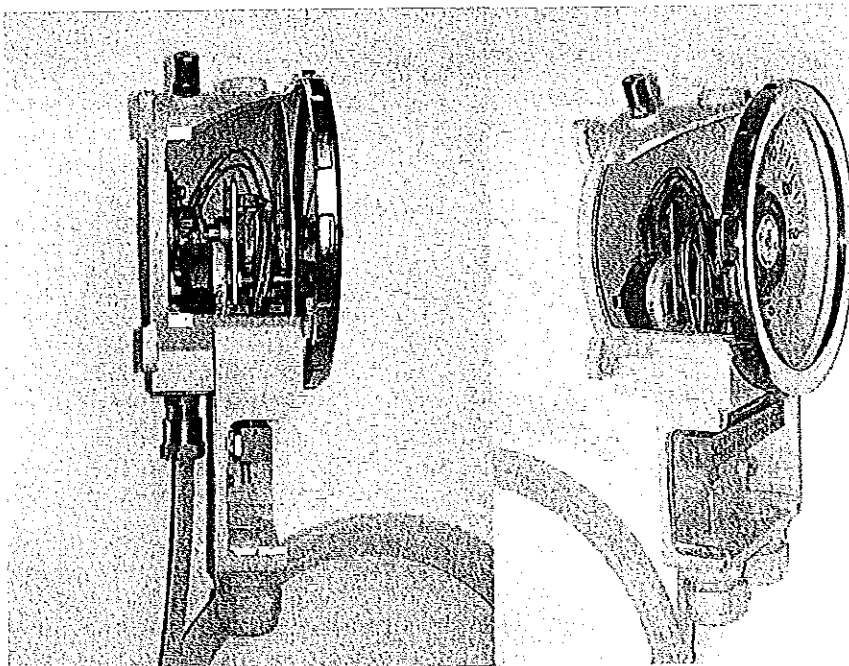
- remove the locking ring;
 - remove the glass or polycarbonate lens (take care to the O-ring);
 - stop the microswitches setting dial (small black dial) with two fingers and slide the frictioned microswitches setting pointers until they are located at the desired temperature. _____
-
- Replace the lens taking care that the max. temperature indicating pointer is located on the right side of the temperature indicating pointer and that the lens itself is correctly positioned over the sealing O-ring;
 - Lock the lens screwing the locking ring.

Maintenance

No particular maintenance is required. Only periodical inspections (typical interval 6 months) to verify precision, functions and electrical connections.

In case of working test effected with thermostatic bath, please note that WTI bulb **MUST NOT** be immersed in water. The WTI bulb is surrounded by the heating resistance and water may cause serious damages to the heating system. The calibration test must be done with oil or hot air only.

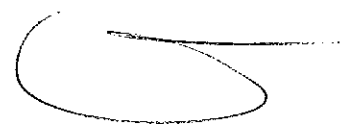
When the instrument is equipped with polycarbonate lens, cleaning must be done with care in order to avoid scraps on the surface. Use water and soap only.



000258



Quality made to measure



Finished product quality control tests.

Instrument calibration : carried out through thermostatic baths controlled by a computer system. The procedure varies according to instruments scale.

Example of procedure for a thermal image scale 0/150°C: the calibration is made using 5 different baths set at the following temperatures :

- bath 1 = 0°C
- bath 2 = 20°C
- bath 3 = 50°C
- bath 4 = 100°C
- bath 5 = 125°C

Calibration procedure :

Step 1: a check is carried out to see whether the temperature taken by the instrument under test differs from that taken through the sample sensor by more than the 70% of the maximum allowed instrument reading tolerance value.

This test is performed by sequentially plunging the Winding Temperature bulb into successive temperature increasing thermostatic baths: 0°C / +20°C / +50°C / +100°C / +125°C.

Step 2: the instrument is heated until the instrument pointer exceeds by 20% the angular full scale value.

Step 3: step 1 is repeated, but inversely.

Microswitches actuation test : performed through a computer controlled testing unit.

The bulb is immersed in a thermostatic bath. The computer changes the temperature inside the bath and by means of suitable sensors verifies the commutation tolerance, the commutation differential, the electrical circuits of each microswitch.

At the end of the test a test report is directly printed by the computer.

Check of instrument protection degree : IP 65.

This test is carried out by means a lance-sprinkled water jet on all sides of device

Insulation test : carried out by means of a microprocessor controlled testing unit.

Heating system functionality test : to verify trimming functionality of potentiometer and total resistance values of the circuit.

Note : all the collected data are immediately transferred, by means of the computer net, to the quality control and to the design departments to be supervised and evaluated.

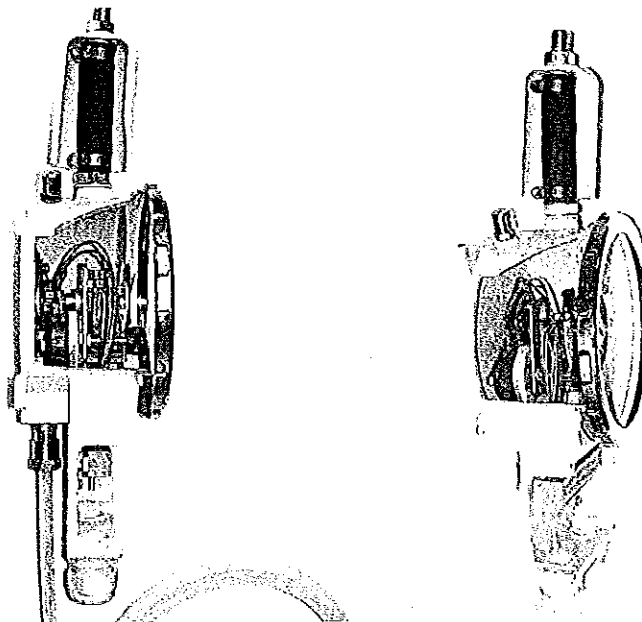
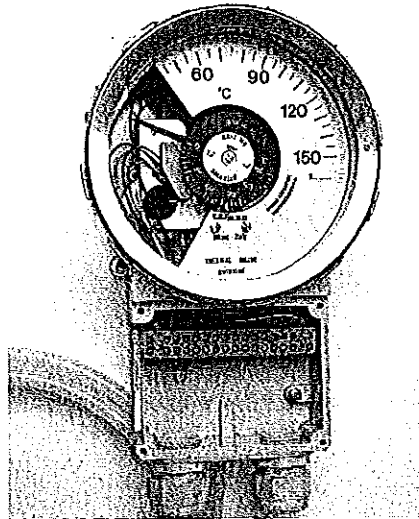
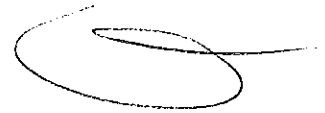
In our files, we keep all the above mentioned informations and we can supply to the customer detailed reports regarding the performances of each instrument delivered.

000259



terman

Quality made to measure



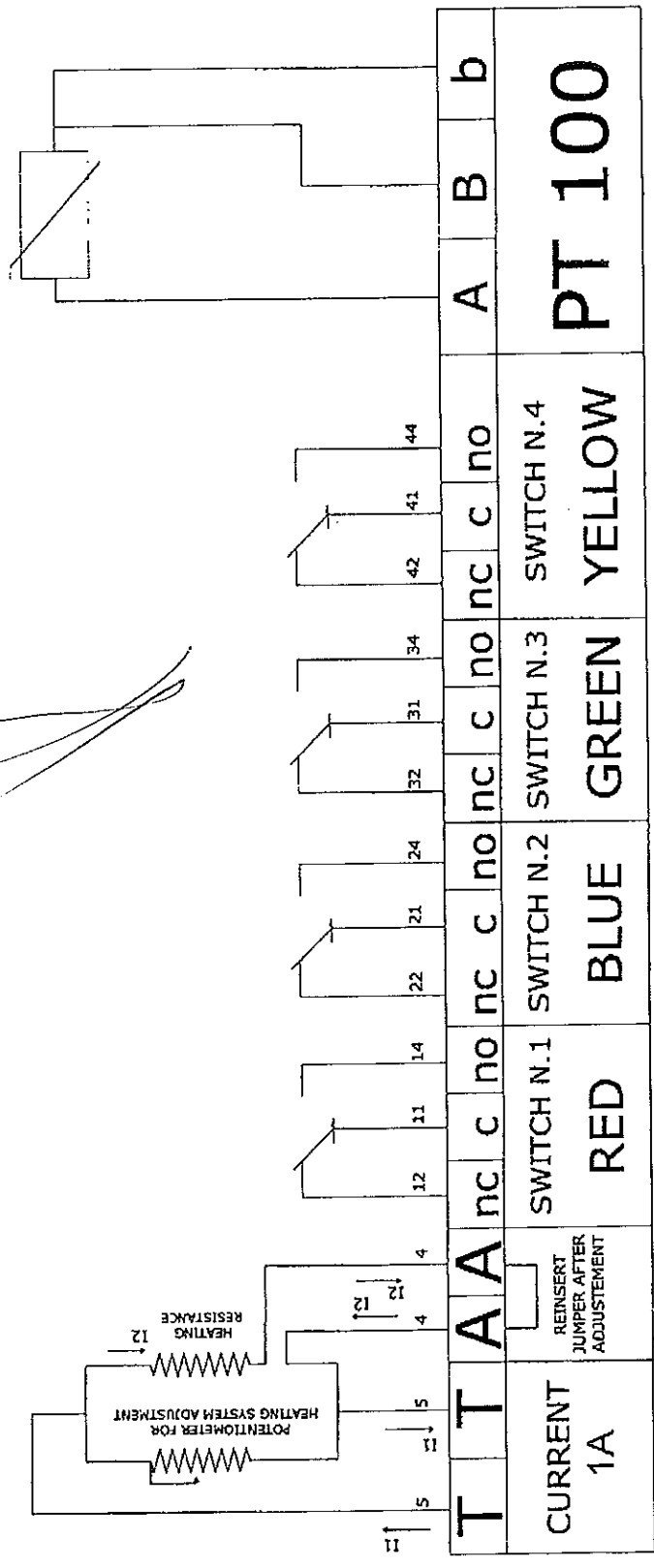
1 EDITION AUGUST 2006

terman

Terman '90 Strumentazione Industriale S.r.l., Via Ghisalba, 13-20/21, 20021 Bollate (MI) - Italy. Tel: +39 02 38 30 37 12,
Fax: +39 02 38 30 37 19, E-Mail info@terman.com, www.terman.com
C.F./P. IVA IT 09970270154 - C.C.I.A.A. 1332904 - Trib. Milano Reg. Soc. 302729 - Cap. Soc. € 10.400

000260

192009



W.T.I. wiring diagram

TER.MAN.'90 Srl - Strum. Ind.le
Bollate - MILAN - ITALY

DRWG.

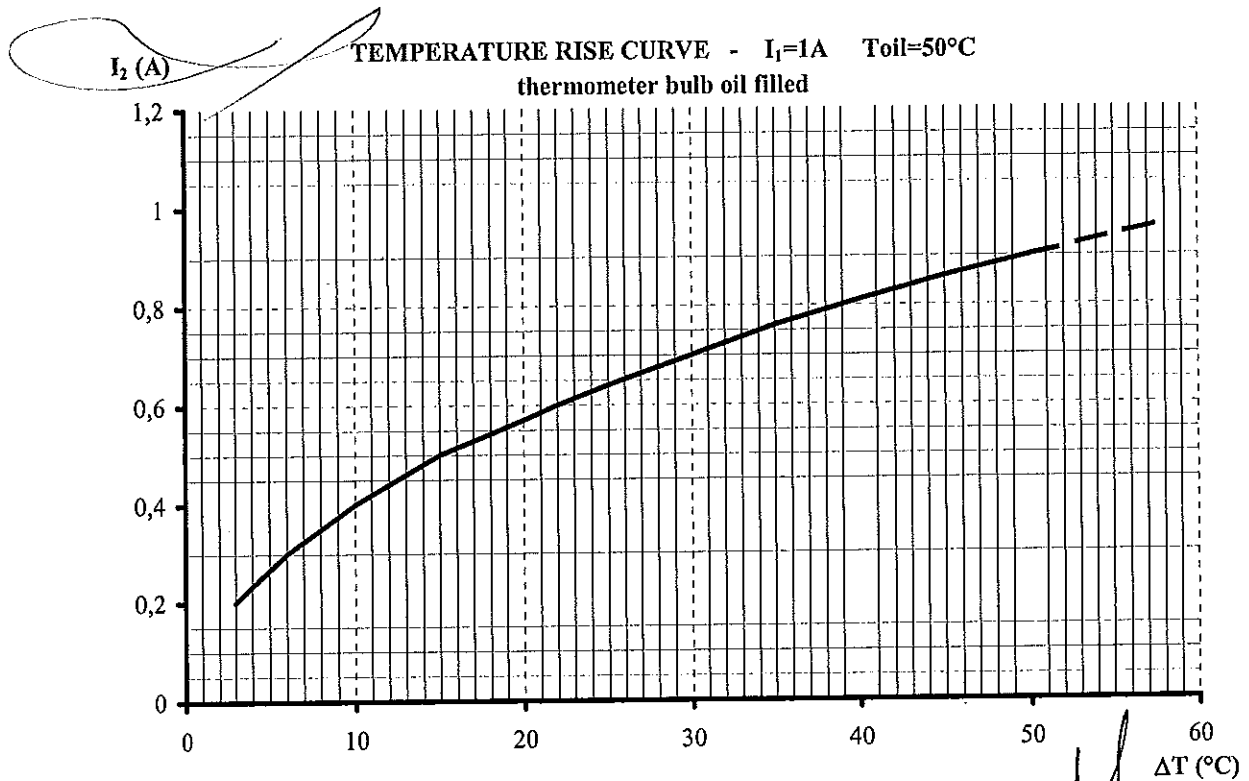
THERMAL IMAGE

MICROSWITCHES-EQUIPPED WINDING TEMPERATURE INDICATOR

"MSRT 150-W"

CURVE I - ΔT FOR TEMPERATURE RISING ADJUSTMENT

CURRENT I_2 (A)	RISE ΔT (°C)	POWER ABSORBED (VA) if $I_1=1A$
0,2	3	2,7
0,3	6	4
0,4	10	5,3
0,5	15	6,6
0,57	20	7,5
0,6	22	7,9
0,64	25	8,5
0,7	30	9,2
0,76	35	10
0,8	39	10,6
0,81	40	10,7
0,86	45	11,4
0,9	50	11,9



NOTE: I - ΔT CURVE IS VALID ONLY IF THE BULB IS IMMERSED IN OIL
 CURRENT $I_1=1A$ $T_{oil}=50^\circ C$
 REINSERT JUMPER AFTER TEMPERATURE RISE ADJUSTMENT

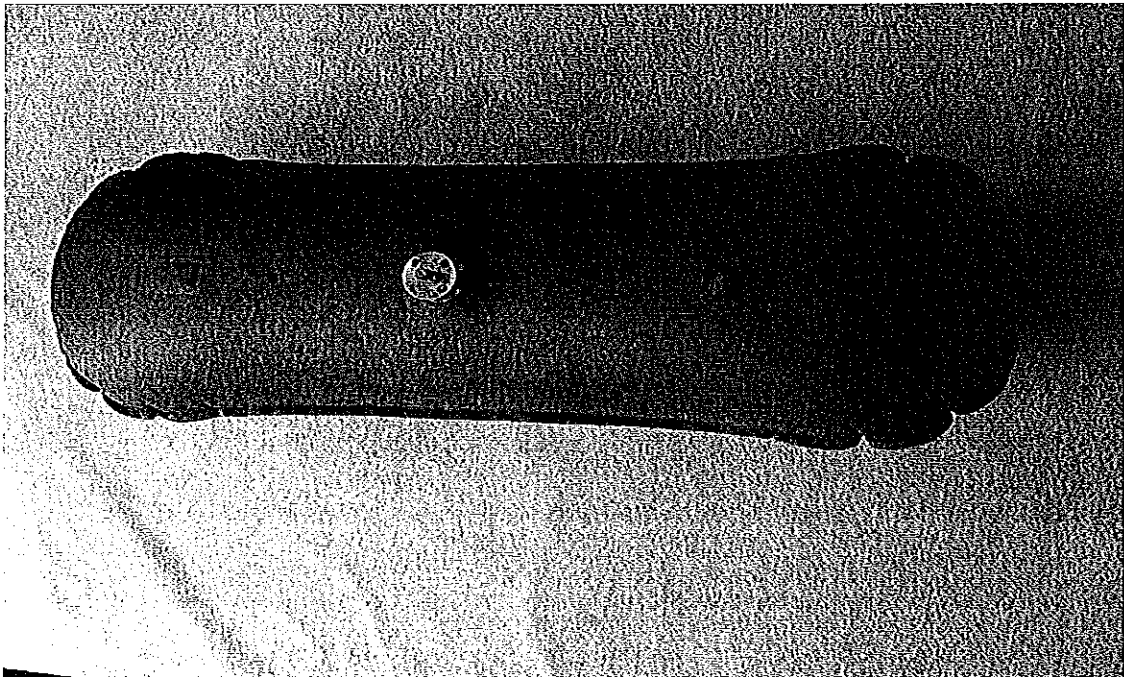
60021A

Musthane

Technical intelligence for flexible forces



**RUBBER AIR CELLS
for oil preservation system of
Power Transformer**

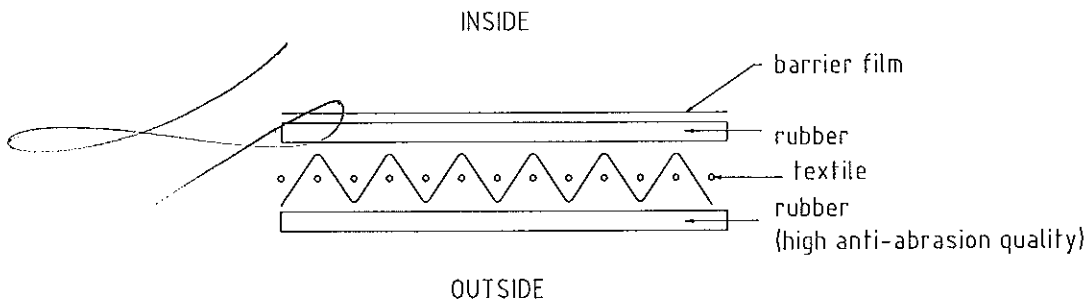


**TECHNICAL INFORMATION
for standard oil conservator
(cylinder shape)**

Material :

Nitrile rubber (NBR) on oil and air side, with textile reinforcement on Polyamid high tenacity (annexe 1 – DOC/COM/010)

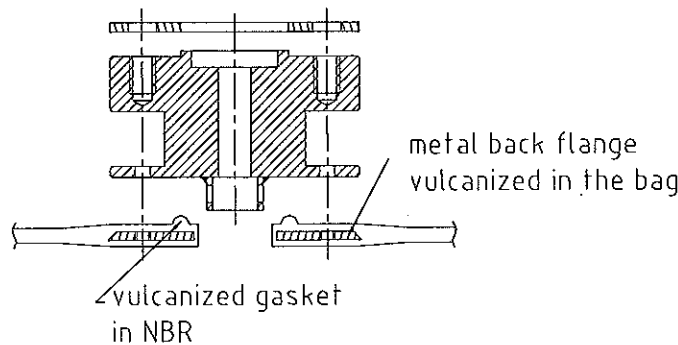
The internal faces of the rubber air cell are coated with a barrier film. This film is vulcanized with the internal rubber in one operation. This barrier improves the life time of the product (Better ozone resistance) *



Flange :

The gasket between the rubber air cell and the flange is directly vulcanized in one operation. This procures a better quality in leakness avoidance. That also means that this gasket is made with the same material than the rubber air cell , can not pollute the oil, can not be forgotten and is guarrantied during all the life time of the product.

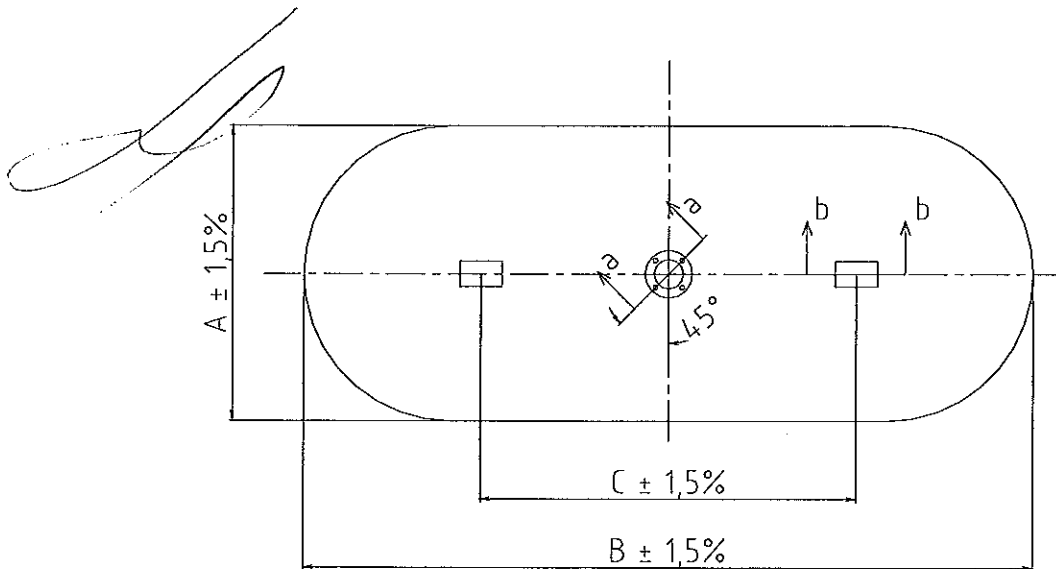
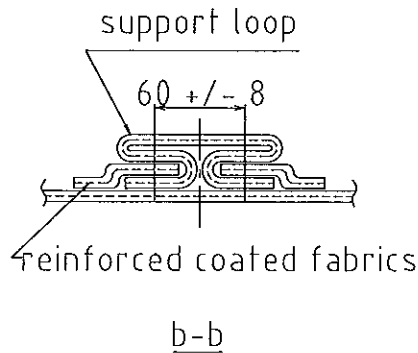
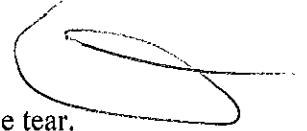
Example of flange :



**This barrier film could be optionnal depending on the customer specifications*

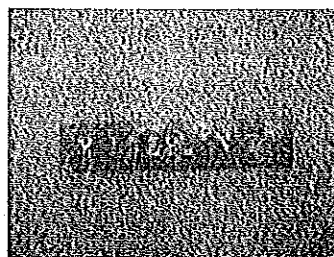
Fixation loops :

The loops are manufactured with a reinforced coated fabric which avoid a possible tear.



Identification :

Each rubber air cell is manufactured with our company name and our serial number, with no additional label. It is printed directly in the rubber in order to avoid all risk of oil pollution. We do not recommended the using of sticker or heat welding label which could not be in accordance with ASTM D974, D877, D924 and D1500.



Handwritten signature and a stamped number "000205".

Test :

All rubber air cells are tested before shipment :

- a leakage test with a least 0.2 bar during 1 hour
- a visual test with soap of the assembly

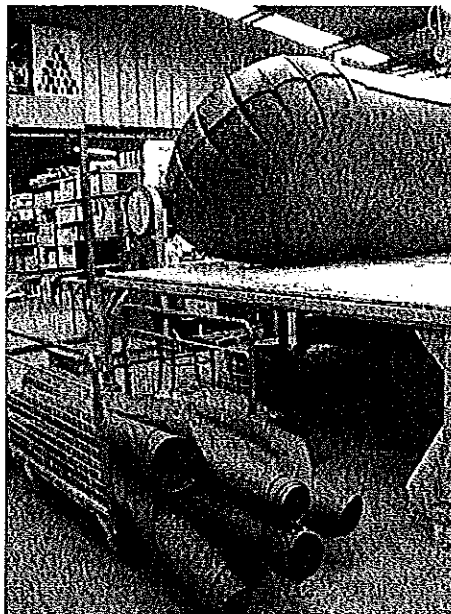


Test report :

All air cells are delivered with a routing test report that means that 100 % of our air rubber cells are tested before shipment. (annexe 2 -- DOC/ATE/029)

Cleaning :

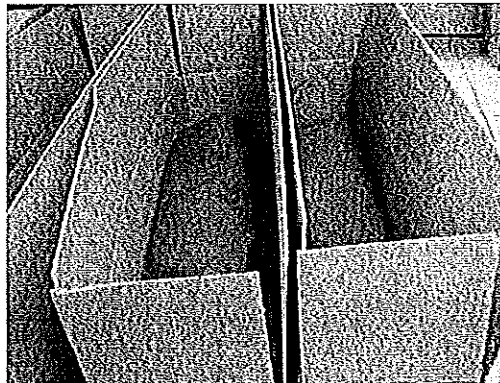
Each rubber air cell is cleaned before shipment in order to be used directly in the oil conservator. After the tests, the rubber air cell is transported in specific wagons.



000266

Packing :

Rubber air cells are delivered in a reinforced cardboard box
Sizes : 1500 X 300 X 400 mm (annexe 3 / drawing MF0522-00)
The instructions for the installation and a test report are sent with the rubber air cell
(annexe 4)



000267

MUSTHANE	Visa		DOC/COM/010	
		Mis à jour le :		22/02/01
FICHE TECHNIQUE TISSU ENDUIT POUR EQUILIBREURS TECHNICAL DATA SHEET CONCERNING FABRICS COATED FOR BLADDERS				
Support textile : <i>Basic fabric :</i>	Polyamide haute tenacité Polyamid high tenacity			
Gommage extérieur <i>External coating</i>	DP18 (Nitrile rubber)			
Gommage intérieur : <i>Internal coating :</i>	DP18 (Nitrile rubber)			
Epaisseur <i>Thickness</i>	NFG	mm		0,9 +/- 0,1
Masse surfacique <i>Surfacic mass</i>	NFG 37102 FSTM 191/5041	g/m ²		950 +/- 130
TESTS TESTS	NORME STANDARD	UNITE UNIT		RESULTAT RESULT
Résistance à la rupture <i>Tensile strength</i>	NFG 37103 ASTM D 751/B FSTM 191/5102	daN/5cm	CH WP TR WF	>=300 >=300
Allongement à la rupture <i>Elongation at break</i>	NFG 37103 ASTM D 751/B FSTM 191/5102	%	CH WP TR WF	>=20 >=20
Résistance à la déchirure <i>Tear resistance</i>				
Pendulaire <i>Pendulum test</i>	NFG 37129/2 ASTM D 751/A	daN	CH WP TR WF	>=12 >=12
Pantalon <i>Tongue test</i>	NFG 37128/A ASTM D 751/B FSTM 191/5134	daN	CH WP TR WF	>=16 >=18
Adhérence par collage/pelage <i>Adhesion (peeling test)</i>	NFT 46008 FSTM 601/8011	daN/cm		>=3,5
Résistance au froid <i>Cold resistance</i>	NFG 37111 MIL, T, 52983/A	°C		<= -20 pass
Température extrême	static			-40, +140
Température idéale d'utilisation <i>Recommanded using temper</i>	dynamic	°C		-20, +120
Résistance à la perforation <i>Perforation resistance</i>		daN		18
Index de neutralisation <i>Neutralization index</i>	laboratoire. SGS ASTMD974 0.03 max	mg KOH/g		0,02
Résistance diélectrique <i>Dielectrical resistance</i>	laboratoire. SGS ASTMD877 28 min	KV		36,3
Tangente delta <i>Power factor at 100°C</i>	laboratoire. SGS ASTMD924 1.1 max	PCT		0,54
Coloration <i>ASTM color</i>	laboratoire. SGS ASTMD1500 < 0,5			< 0,5
Perméabilité à l'oxygène <i>Oxygen permeability</i>	NFT 46-037	m ² Pa-1s-1		3,0 10 ⁻¹⁸
Perméabilité à la vapeur d'eau <i>Water vapo permeability</i>	NF ISO 2528	g/m ² .24h		11
Résistance à l'ozone <i>Ozone resistance</i>	ISO 1431	96H 50ppcm		Pas de craquelure no cracks

000268

MUSTHANE FRANCE	Fiche de contrôle équilibre souple/Routing test report for bladder Ficha de control deposito de caucho/Controle gegevens	DOC/ATE/029 index: B
--------------------	---	-------------------------

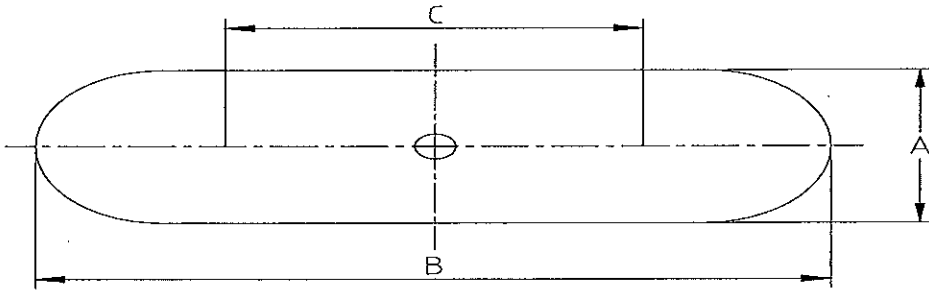
OF/WO N° :	Qté/Qty:	Date de livraison: Delivery time :
		N° de série: Serial N° :
		N° de commande: Order N° :

Client: Customer:		Plan N° Drawing N°
----------------------	--	-----------------------

Tissu/Coated fabric Tejido/Material karakteristieken	trile/Nitri	Nitrile /PVC
---	-------------	--------------

Dimensions/Dimensions (mm)
Dimensionales/Afmetingen (mm)

Longueur/Length B <input type="text"/>	Largeur/Width A <input type="text"/>	Entraxe/Entraxe C <input type="text"/>
Longitud/Lengte B <input type="text"/>	Anchura/Breedte A <input type="text"/>	Entraxa/Ophangpunt C <input type="text"/>



Accessoire/Fitting Accessorios/Toebehoren	Prévu/Forecasted/Previstos/Vodrzien	Réel/Real/Reales/Werkeluk
--	-------------------------------------	---------------------------

Position patte/Loop position (cf plan/drawing) Posicionamento pasadores/Positie ophangpunten	Position	Visa
---	----------	------

Position bride/Flange position Posicionamiento brida/Positie ophangflens	Position	Visa
---	----------	------

Contrôle dimensionnel après vulcanisation/Dimensional control after vulcanization Control dimensional despues de vulcanisation/Afmetines control na vulcanizatie	B	<input type="text"/>
Tolérance : +/- 1,5%	A	<input type="text"/>
	C	<input type="text"/>

Etanchéité à l'air/Airproof resistance (0.2 bar=>1H) Impermeabilidad /Dichtheids proef na vulcanizatie	VISA	<input type="text"/>
---	------	----------------------

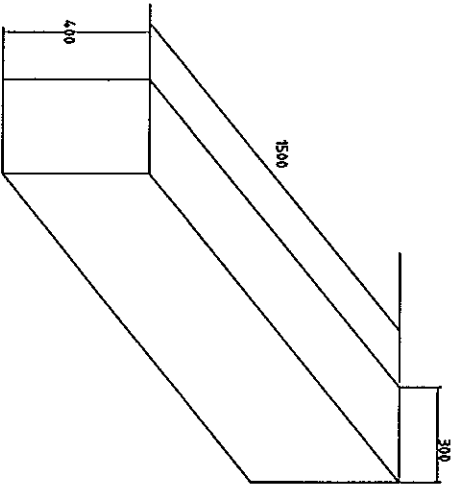
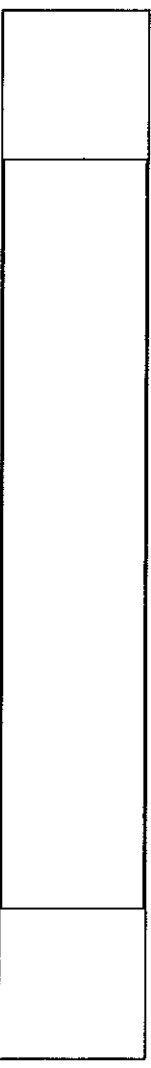
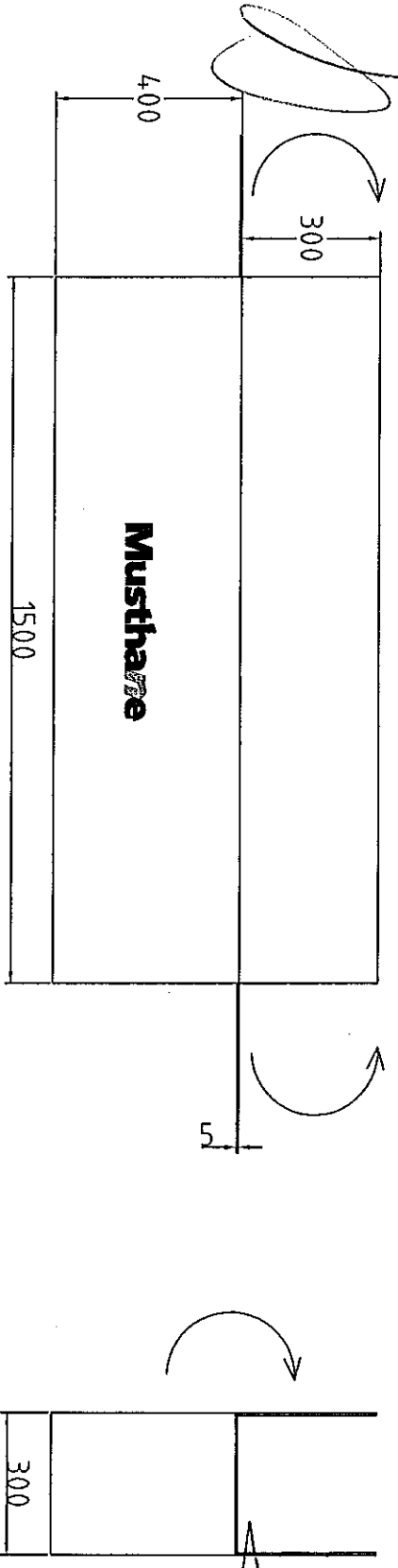
Contrôle à la mousse des assemblages/Visual control with soap Control visual de los conjuntos con espuma/Visuele controle met zeepsop aan de verbindingen	VISA	<input type="text"/>
--	------	----------------------

Contrôle d'aspect / Look control		
0 few curlings without any consequence	0 look flaw without any consequence	
0 curlings without any consequence	0 with repairing without any consequence	

Remarque/Notice : Observaciones/Opmerkingen :	<input type="text"/>		
--	----------------------	--	--

Nom/Name RAQ : H BLOND Apellido/Naam RAQ	Controleur/Controleur Controlador/controlleur	Décision/Opinion RAQ Decision/Beslissing RAQ	Visa/Visa Visa/Goedgekeur
Date/date Fecha/datum	Date/date Fecha/datum		

000269



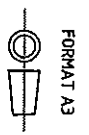
[Handwritten signature]

REV	DATE	REVISION	REVISION BY	OBSERVATION	ORDER BY
A	18/06/02	ND		EMISSION INITIALE	FJ
TOLERANCES GENERALES SUR PARTIES METALLIQUES ISO 2768-MK (SAUF INDICATIONS PARTICULIERES)					
ETAT DE SURFACER 32					
(SAUF INDICATIONS)					
RAYONS DE 0,5 PARTOUT SAUF IND			FILÉTAGES ISO 6H/6g/GAZ A/H		
FINITION: CHAMPREINS 0,5 A 45°			DIMENSIONS: H13, M13		
ECHELLE: 1/10			MATERIE: CARTON 5mm		
N° : MF0522-00			PROTECTION: XXXX		
			TRAITEMENT: XXXX		

CARBOARD.BOX
1500X300X400MM

Musthane

53, rue de la République, 59780 WILLEMS, FRANCE
TEL: +33 03 28 37 00 40
FAX: +33 03 28 37 00 49
www.musthane.com/mail: musthane@musthane.com

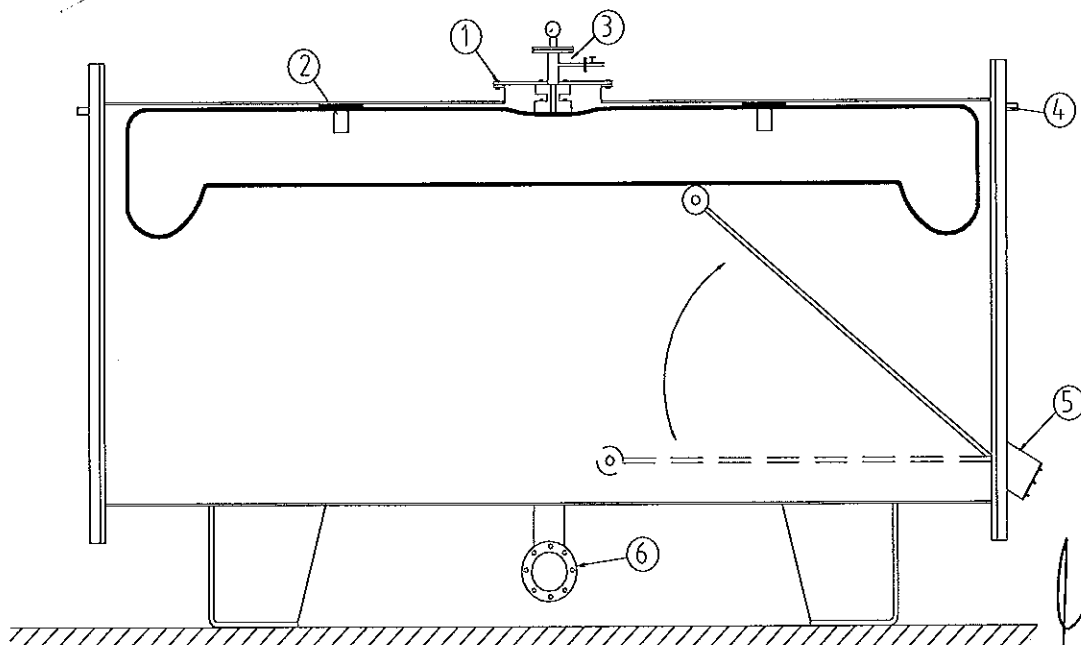


Musthane

Technical intelligence for flexible forces

INSTALLATION OF THE MUSTBALANCE MBT

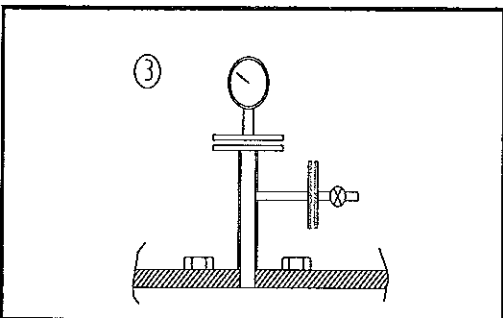
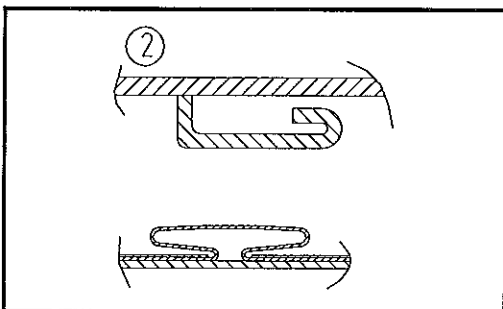
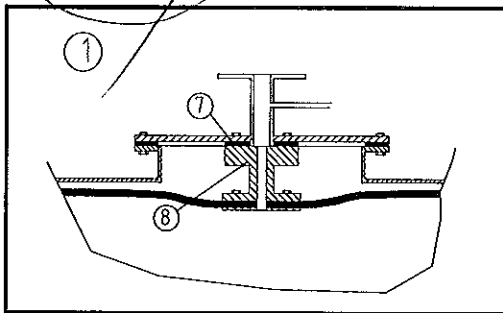
- Push the MBT into the conservator through the open end or inspection hatch in the end of the conservator.
- Suspend the MBT from hooks (2) in the ceiling of the conservator using the loops
- Fit the MBT flange (8) on the conservator flange using a ring* (7) to ensure airtightness of the system
- Close the open end of the conservator
- Fill the MBT to a pressure of 10kPa (0,1 bar). Close the filling valve (3) while leaving the system pressurised. A relief hole (4) must be on the oil filled side of the conservator so that the MBT can freely expand.
- The MBT will gradually stabilise. After 6 hours, adjust the air pressure again to 10kPa (0,1 bar). A 24 hours leak test is then to be made on the MBT. After 24 hours check the pressure reading again. If the pressure has not dropped significantly, the test is correct. The temperature should be as stable as possible during the leakage testing period.



000271

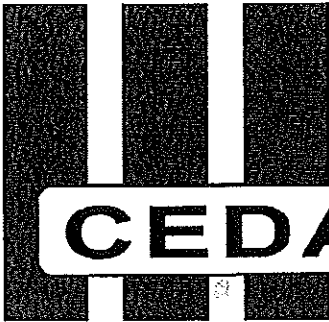
FILLING THE CONSERVATOR

- Check that the air pressure in the MBT is 10kPa (0,1 bar). If not, increase the pressure to the correct level and close the air-filling valve.
- Open the air vent valves (4) in both ends of the conservator.
- Open the valve (6) between the conservator and transformer tank and pump in more oil so that the oil rises to the conservator. The pumping speed should be suitably slow so that the pressure within the MBT does not exceed 13 kPa (0,13 bar). Stop pumping, when oil begins to come out of the vent valves and close the vent screws.
- Adjust the pressure in the MBT to normal by opening the plug in the flange or air filling valve from which the pressure hose is removed.
- Reopen the valve (6) between the conservator and the transformer tank and continue filling with oil until the oil level indicator gives the correct reading according to the temperature of transformer.



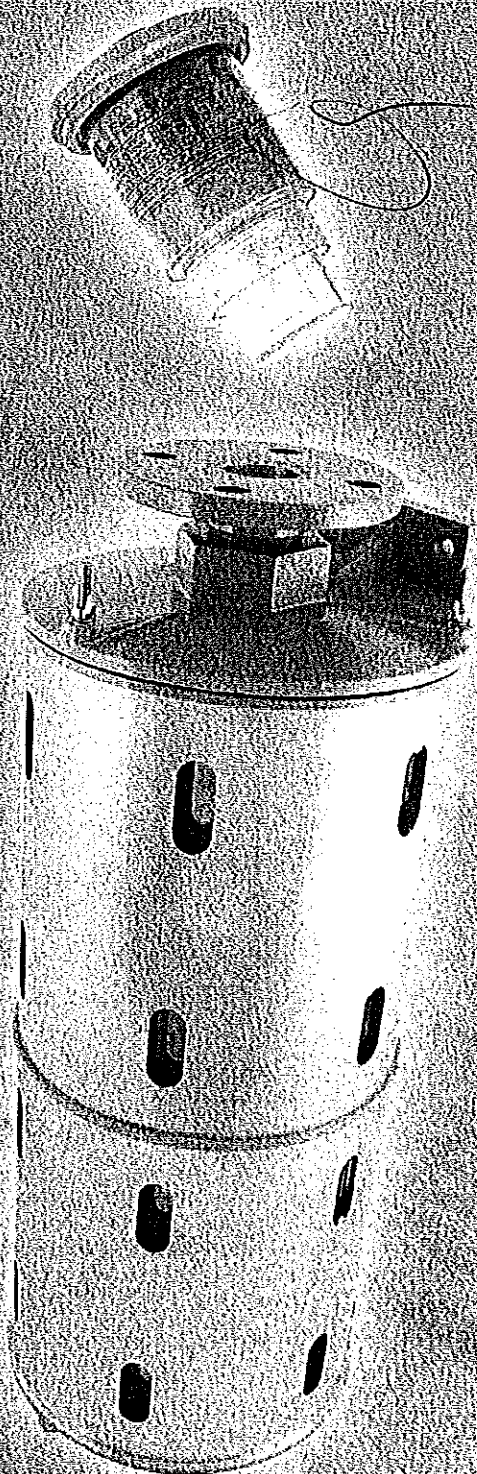
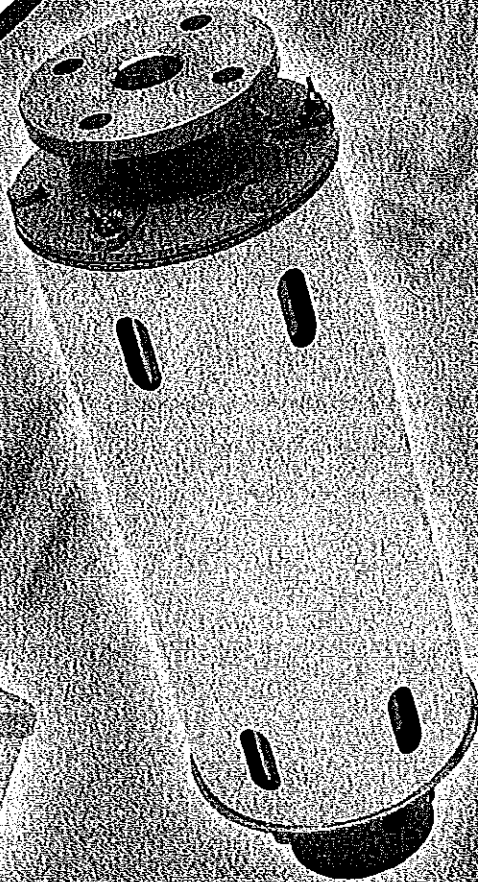
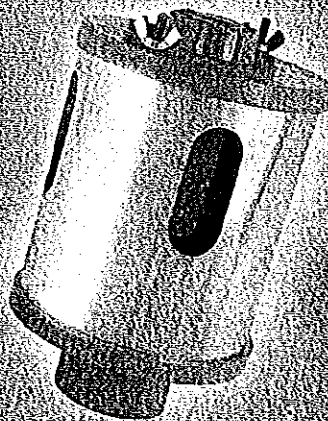
* MUSTHANE can also supply compression rings for contact with transformer oil. Their advantages: excellent mechanical properties, resistance to temperature and aging.

000272

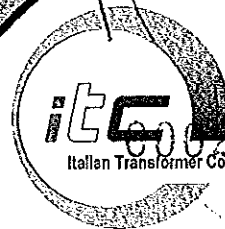


CEDASPE

DEHYDRATING BREATHERS



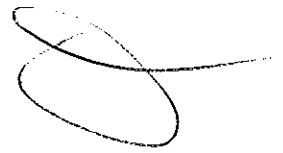
Made in Italy



Italian Transformer Components



I - 26888 S. GIULIANO NIL. (ITALY) - VIA COLONBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - Internet Site: http://www.cedaspe.com
CAP. SOC. € 600.000 I.V. - TVA-P.I. IT 01066780165 - C.F. 01066780165
R.E.A. MI 729391 - IMPORT - EXPORT M 142410 - REG. IMPR. 132146/034446 TRIB. MI



AIR DEHYDRATING BREATHERS
threaded and/or flanged connection, single unit and modular assy
type VE 05 - 10 - 15 - 30 - 50 - 80 - 100 - 150
for power transformers

1. GENERAL INFORMATION

Air dehydrating breathers are transparent hollow cylinder tubes which contain chemically pure silicium salt (silicagel) with coloured indicator. The air breathed inside the transformer due to the thermal contraction of the oil mass, passes through the silicagel.

The silicagel absorbs the humidity, indicating the saturation degree by changing colour as follows:

YELLOW/ORANGE silicagel completely dry
AMBER silicagel partly humid
CYAN silicagel saturated with humidity

The salt contained in the breather, when saturated, may be easily removed and regenerated by heating it, inside a ventilated oven, at 120° - 150°C, until the colour becomes orange again.

The specific property of the silicagel is its high absorption power of humidity. This is total until the salt has absorbed water for about 15% of its weight, and saturation is reached when the salt has absorbed water for 30 to 40 % of its weight.

2. TECHNICAL FEATURES

The upper and lower parts are made in a non-porous corrosion-proof aluminium alloy casting. The hollow cylinder is made of plexiglas and it is protected by a stainless steel cylinder, with windows which allow the visual control of the silicagel colour.

In the bottom side of the breather, an hydraulic valve prevents continuous air contact with the silicagel and allows the air to pass in both direction (Inlet or outlet) only when there is pressure deficiency or excess inside the transformer.

Pressure values for air passage into the dehumidifier are:

0.003 kg/cm² inlet , or 0.005 kg/cm² outlet

The hollow container and the hydraulic valve are separated by a drilled plate with a labyrinth system, which have the double purpose of diffusing inlet air uniformly, and of avoiding that any salt dust may damage the closing system.

3. DRAWINGS AND TECHNICAL DATA

A table on the drawings in the following pages shows, the general overall dimensions, the silicagel contained inside the cylinder, the max oil quantity, contained inside the transformer on which the breather must be installed, calculated for normal conditions, as below indicated, using the formula at paragraph 5:

Average air temperature	20°C
Average air humidity	60%
Average thermal cycle "Δ t "	20°C
Average duration of thermal cycle T	8 hours
Maintenance interval M	90 days

Different environment conditions of the site where the transformer is installed may influence the maintenance interval, when the choice of the size of the breather has been made.

4. PROTECTION OF OUTER SURFACES

Outer surfaces in aluminium alloy are covered with a double coat of high protective paint against all weather conditions, and temperature between - 40°C and + 100°C. All the screws are made in mild steel zinkplated; upon request in stainless steel.

5. CHOICE OF THE BREATHER SIZE (or of the maintenance interval)

The choice of the breather size (or maintenance interval) is directly related to the quantity of the breather silicagel contain. The mass of silicagel necessary for the proper functioning is given approximately by a function of 6 variable quantities, listed here following:

- Mass of oil "V" inside the transformer , denominated in dm³ or in litres.
- Average temperature of the air in the environment where the transformer is installed, denominated in °C
- Average Humidity of the air in the environment where the transformer is installed, denominated in %.
- Average thermal cycle "Δt" of the transformer, denominated in °C, to be calculated as difference between the minimum and the maximum temperatures reached by the oil inside the transformer within a time period.
- Average duration of thermal cycle "T" denominated in hours, to be calculated as the time interval between two thermal cycles.
- Maintenance interval "M" denominated in days.



I - 20088 S. GIULIANO MIL. (ITALY) - VIA COLOMBARA, 1 - FRAZ. PEDRIANO
TELEFONO +39 0298.20.44.11 - TELEFAX +39 02 98.20.44.22
E-Mail: cedaspe@cedaspe.com - InterNet Site: http://www.cedaspe.com
CAP. SOC. € 500.000 I.V. - TVA-P.I. IT 01066780166 - C.F. 01066780166
R.E.A. 24 729591 - IMPORT - EXPORT M 142410 - REG. IMPR. 132146334486 TRIB. MI

From the saturated steam table for water (see next pages), depending from the average temperature and humidity of the air, it is possible to calculate the quantity of water "A" (denominated in grams) for each m3 of air which enter inside the transformer.

Now, using the following formula, we are ready to calculate the quantity of silicagel (denominated in Kg) necessary for the proper functioning of the transformer:

$$\text{Mass of silicagel} = (127,056 \times 10^{-9} \times V \times \Delta t \times A \times M) : T \quad [\text{kg}]$$

It is important to note that the result of above formula is only a first approximation value, due to the simplification related to the average values considered as constant values for the duration of the thermal cycles between two following maintenance intervals

It is also evident that shortening the maintenance interval, the average conditions used in the formula simulate more exactly the true conditions of the transformer during its working life (i.e. the average temperature of the air for 30 days in January has a statistic scattering degree lower than the average temperature for 90 days in Dec/Jan/Feb); same comments must be done for humidity, thermal cycle duration and temperature

Only two data may be easily fixed without doubt: mass of oil inside the transformer and maintenance interval.

For a better understanding, we show here following three examples of the choice of quantity of silicagel necessary for the same transformer installed in three different places, but with the same thermal cycle and maintenance interval; the following conditions shall be the same in all the three cases:

- Average thermal cycle "Δ t" 20°C
- Average duration of thermal cycle T 8 hours
- Maintenance interval M 90 days
- Mass of oil V 10000 dm³

The mass of silicagel necessary for a good functioning of the transformer will be:

1° CASE: Transformer installed in normal European condition:

- Average air temperature 20°C
- Average humidity 60%
- Silicagel mass 2,95 kg
- Suggested size of the breather: size VE30

2° CASE: Transformer installed in tropical climate:

- Average air temperature 30°C
- Average humidity 90%
- Silicagel mass 7,77 kg
- Suggested size of the breather: size VE80

3° CASE: Transformer installed in desert condition:

- Average air temperature 35°C
- Average humidity 40%
- Silicagel mass 4,50 kg
- Suggested size of the breather: size VE50

7. MANUFACTURING PROGRAM

We propose a full range of dehydrating breathers for power transformers, starting from 1 kg silicagel contain up to 15 kg; additionally, using 4 different sizes of modular unit, it is possible to assembly breathers in racks with high silicagel contain.

All our models are identified with two letters 'VE' followed by two figures which represent the quantity (denominated in hg) of silicagel contain, with this scale in kg 1;1,5;3;5;8;10;15.

All these breathers can be connected to the tube coming from the conservator by means of a threaded connection or by means of a flange.

Starting from size VE50 all the breathers are fitted with a side support which enable to make a bolted connection to a transformer wall or to a rack.

When there is a need of silicagel contain higher than kg 15, we propose a modular assy using multiple units of 5,8,10,15 kg silicagel contain each, as shown at page 5.50; the modular unit follow the same identification littering of the normal breathers adding the letter 'M' at the end

The dehydrating breathers, complete with salts are despatched in sealed packages in order to avoid alteration of the dry state of silicagel. Upon request, we supply also empty breathers with silicagel filling packed separately in ermetic bags, or even without filling, if the customer wants to manage silicagel separately from the breathers.

When they are mounted on the transformer, it is necessary to remove the protective plugs and pour mineral oil up to the mark on the jar.

8. ORDER INSTRUCTIONS

As said, the identification of a model start with two letters VE followed by two figures which represent the weight of silicagel inside the breather and the letter M for the modular unit.

Few example, to make it completely clear:

- VE 50 Breather with 5 kg silicagel contain
 - VE150 Breather with 15 kg silicagel contain
 - VE100M Modular unit with 10 kg silicagel contain
- Special instruction must be indicated separately.



I - 28098 S. GIULIANO MIL. (ITALY) - VIA COLONBARA, 1 - FRAZ. PEDRIANO
 TELEFONO +39 0238.28.44.11 - TELEFAX +39 02 38.28.44.22
 E-Mail: cedaspe@cedaspe.com - Internet Site: http://www.cedaspe.com
 CAP. SOC. € 500.000 I.V. - IVA-P.I. IT 01066780155 - C.F. 01055780155
 R.E.A. MI 729931 - IMPORT - EXPORT MI 142410 - REG. IMPR. 132146/034446 TRIB. MI



9. SATURATED STEAM TABLE FOR WATER

Showing the mass of water, in gram (10^{-3} kg), contained in one cubic meter of air (related to the air temperature and the air humidity).

°C	AIR TEMPERATURE				AIR HUMIDITY [%]					
	10%	20%	30%	40%	50%	60%	70%	80%	90%	100%
0	0.49	0.98	1.47	1.96	2.45	2.94	3.43	3.92	4.40	4.90
5	0.68	1.36	2.04	2.72	3.40	4.08	4.76	5.44	6.10	6.80
10	0.94	1.87	2.82	3.76	4.70	5.64	6.58	7.52	8.50	9.40
15	1.28	2.56	3.84	5.12	6.40	7.68	8.96	10.20	11.50	12.80
20	1.72	3.44	5.16	6.88	8.60	10.30	12.00	13.80	15.50	17.20
25	2.29	4.58	6.87	9.16	11.45	13.70	16.00	18.30	20.60	22.90
30	3.02	6.04	9.05	12.10	15.10	18.10	21.10	24.10	27.20	30.20
35	3.94	7.88	11.80	15.80	19.70	23.60	27.60	31.50	35.40	39.40
40	5.08	10.20	15.30	20.40	25.40	30.50	35.60	40.70	45.80	50.90
50	8.27	16.50	24.80	33.10	41.40	49.60	57.80	66.20	74.40	82.70
60	13.00	26.00	39.00	52.00	65.00	78.00	91.00	104.00	117.00	130.00

10. AIR DEHYDRATING BREATHER TYPE TV75 & VE05 (page 5.40)

They are small sized dehydrating breathers, particularly fit for assembling on small distribution transformers

The type VE05 follows the same manufacturing principles of the bigger sizes like the type VE10.

The type TV75 (or TV74) is the cheapest model of our breathers: its top flange is made in corrosion proof aluminium alloy.

The silicagel housing is made of cellulose triacetate (cellidor by Bayer), suitable for mineral oil; only upon request, this breather can be fitted with a stainless steel cylindrical protection.

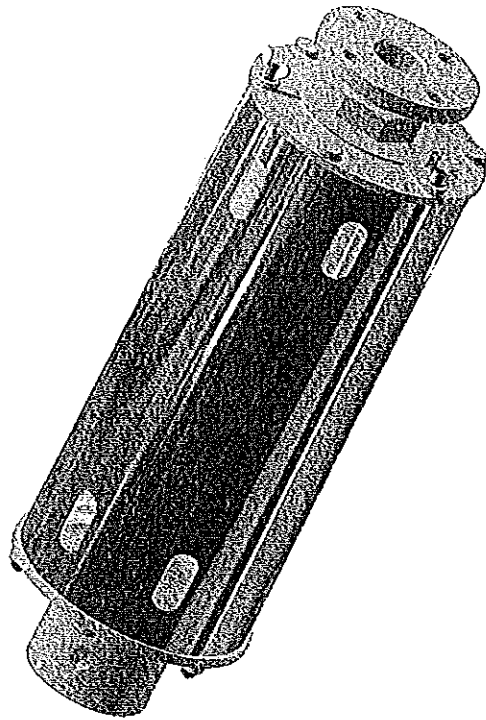
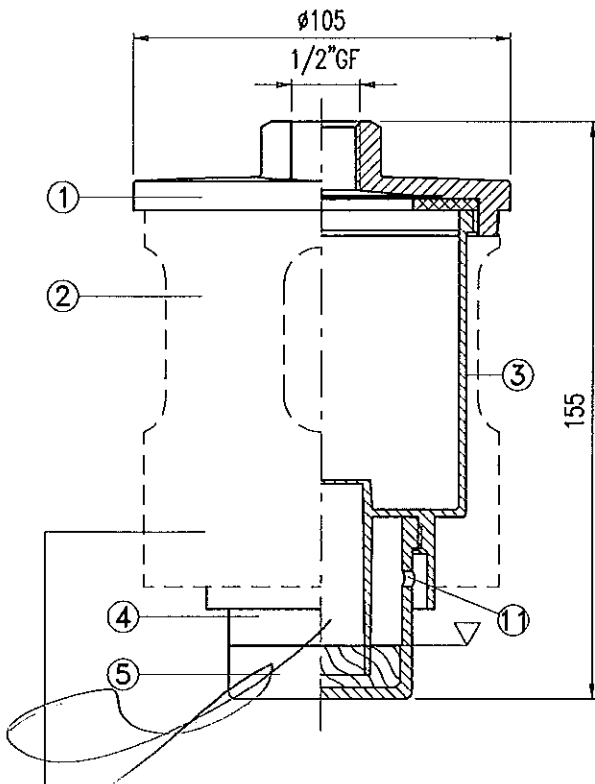


Fig. A1
 - Tipo TV
 - Type TV



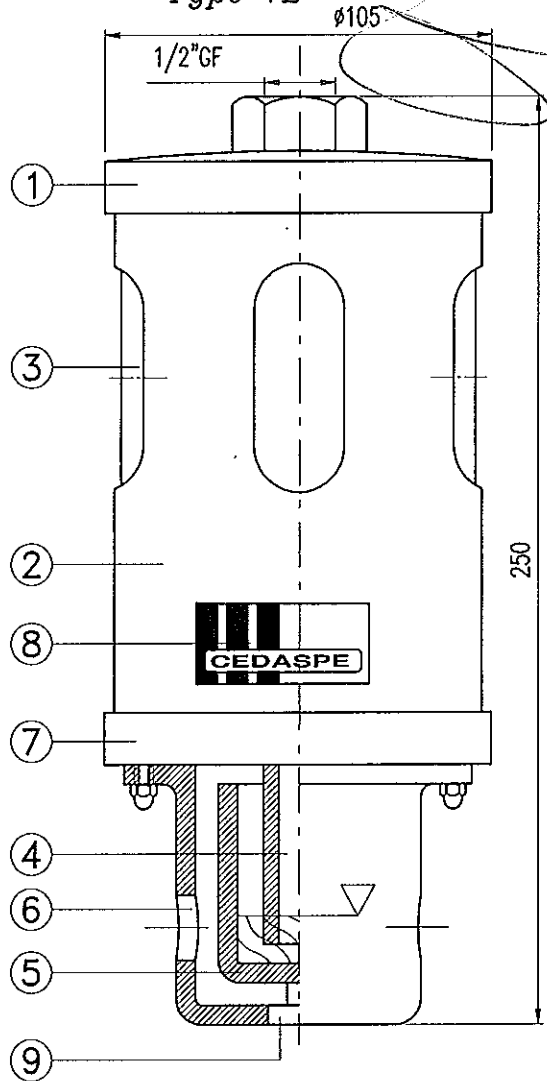
PROTEZIONE SOLO SU TV76NE
 S/S HOUSING AVALALBE ONLY ON TV76NE

▽ Livello olio
 Oil level

Pos	Descrizione
1	Coperchio
2	Protezione acciaio Inox
3	Contenitore trasparente di sali
4	Pescante
5	Coppa olio (trasparente)
6	Spla olio e presa d'aria
7	Coperchio Inferiore
8	Targhetta d'identificazione
9	Scarico condensa
11	Presa d'aria

Fig. B1
 - Tipo VE
 - Type VE

5.40



Pos	Description
1	Top cap
2	Stainless steel housing
3	Gel container (transparent)
4	Fishig out cylider
5	Oil cup (transparent)
6	Oil window and air intake
7	Bottom cap
8	Data plate
9	Drain hole
11	Air intake

Dim. in mm; Scala 1:2

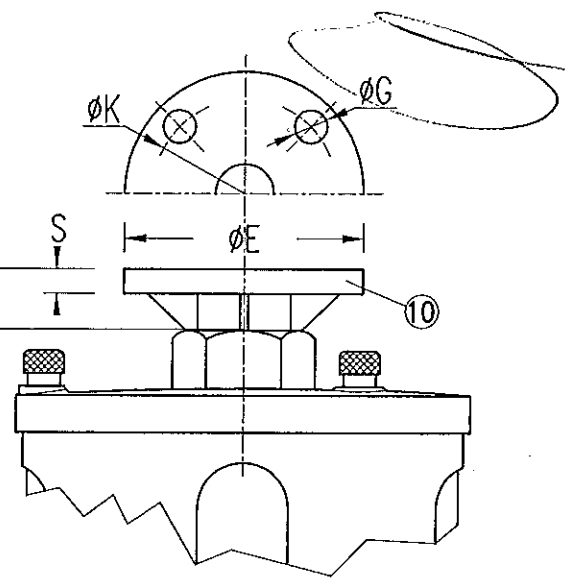
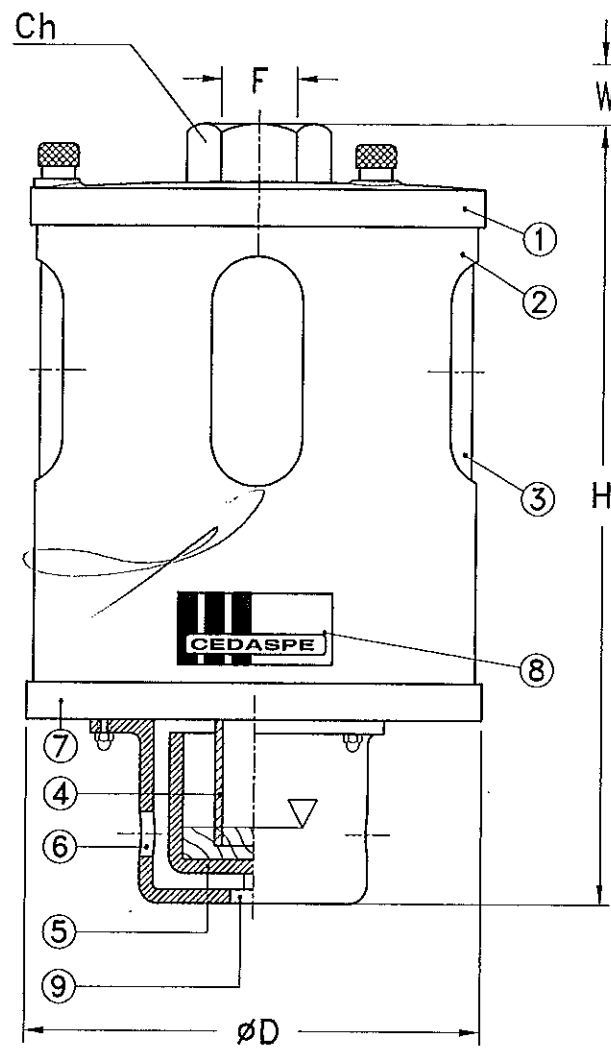
Tipo Type	Olio nel trasf. Transf. oil kg	Silicagel		NOTE:
		Q. ty Kg	Vol. dm ³	
TV75NE	700	0.25	0.35	senza protezione Pos. 2 Fig. A1 - w/out stainless steel housing
TV76NE				con protezione Pos. 2 Fig. A1 - with stainless steel housing
VE05	1500	0.50	0.65	con protezione Pos. 2 Fig. B1 - with stainless steel housing

CEDASPE

Essicatori d'aria per trasformatori di distribuzione
 Dehydrating breathers for distribution transformers

Fig. B1
 - Raccordo flangiato
 - Flanged connection

Fig. A1
 - Raccordo filettato
 - Tapped connection



Pos	Descrizione/Description
1	Coperchio Top cap
2	Protezione acciaio inox Stainless steel housing
3	Contentitore trasparente di sili Gel container (transparent)
4	Pescante Fishing out cylinder
5	Coppa olio (trasparente) Oil cup (transparent)
6	Spia olio e presa d'aria Oil window and air intake
7	Coperchio inferiore Bottom cap
8	Targhetta d'identificazione Data plate
9	Scarico condensa Drain hole
10	Flangia Flange

▽ Livello olio
Oil level

Tipo Type	Olio nel trasf. Transf. oil kg	H mm	D mm	F	Silicagel		Ch mm	W mm	S mm	E mm	G mm	K mm
					Q.ty Kg	Vol. dm ³						
VE10	3500	245	140	1" G	1,00	1,35	46	25	10	100	11.5	75
VE15	5000	300			1,50	2,00						
VE30	10000	370	190	1 1/2" G	3,00	4,00	65	30	12	150	18.0	110
VE4-EL	22000	530			5,00	7,00						



Essicatori d'aria per trasformatori di potenza
 Dehydrating breathers for power transformers

000278

FILE = PAG5-46 .DWG LWT [(o.p) (195.285)] A4 (210x297)
 REV. 03 DTD 13/02/2001
 Lo CEDASPE S.p.A. si riserva o termini di legge la proprietà del presente disegno con divieto di riprodurre o comunicare o terzi senza sua autorizzazione.

FILE = PAC5-47.DWG LWT [(0,0) (196,286)] M4 (210x297)
 REV 05 DTD 10/06/08
 La CEDASPE S.p.A. si riserva a termini di legge la proprietà del presente disegno con divieto di riproduzione o comunicazione a terzi senza sua autorizzazione.

5.47

Fig. A1
 - Raccordo filettato
 - Tapped connection

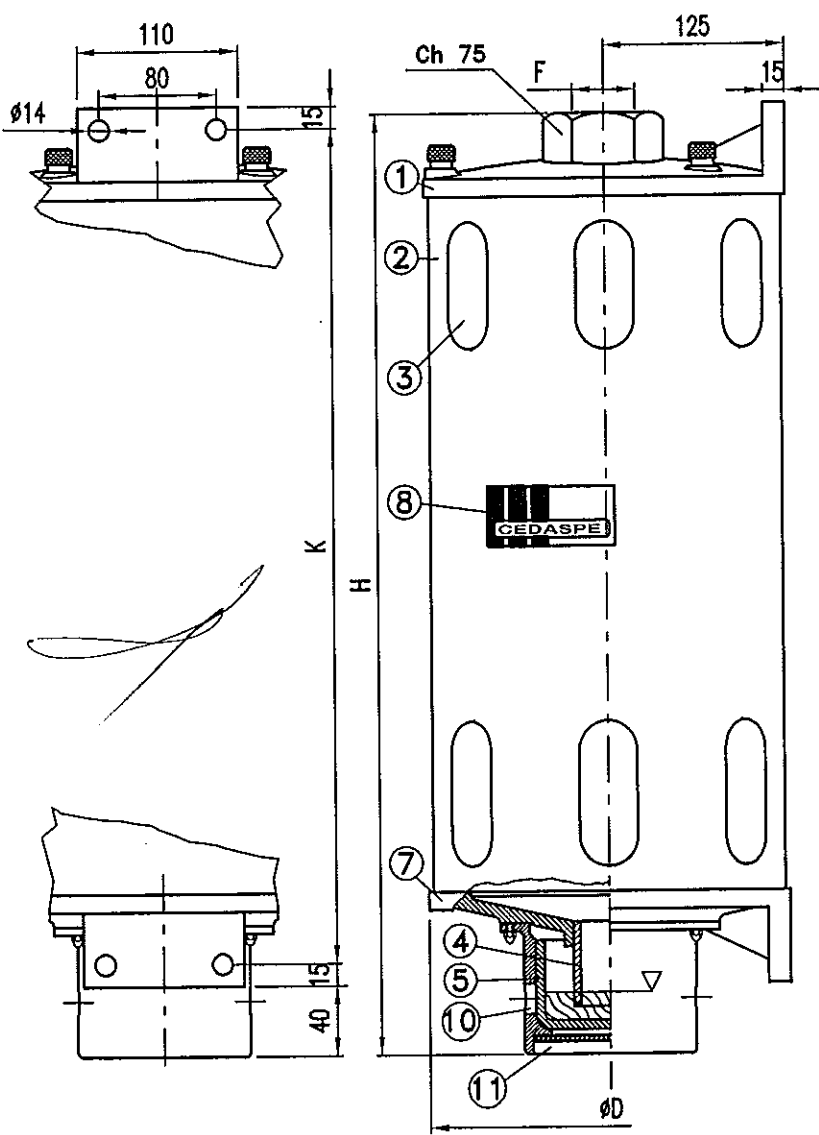
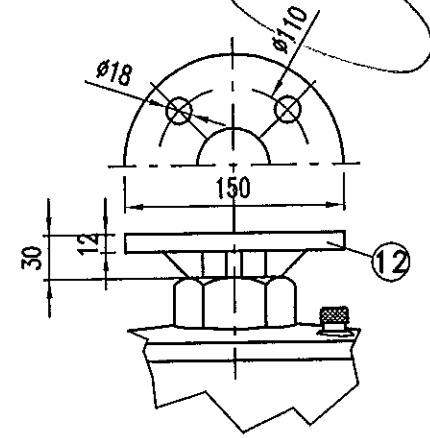


Fig. B1
 - Raccordo flangiato
 - Flanged connection



Pos	Descrizione/Description
1	Coperchio Top cap
2	Protezione acciaio inox Stainless steel housing
3	Contenitore trasparente di sabbia Gel container (transparent)
4	Pescante Fishing out cylinder
5	Coppa olio (trasparente) Oil cup (transparent)
7	Coperchio inferiore Bottom cap
8	Targhetta d'identificazione Data plate
9	Scarico condensa Drain hole
10	Spia olio Oil window
11	Preso d'aria Air intake
12	Flangia Flange

▽ Livello olio
Oil level

Tipo Type	Olio nel trasformatore Transformer oil	H	D	K	F	Silicagel	
						Q. ty kg	Vol. dm ³
VE50	17500 Kg	390 mm	245 mm	320 mm	1 1/2" G (*)	5,00	6,70
VE80	28000 Kg	485 mm		410 mm		8,00	10,70

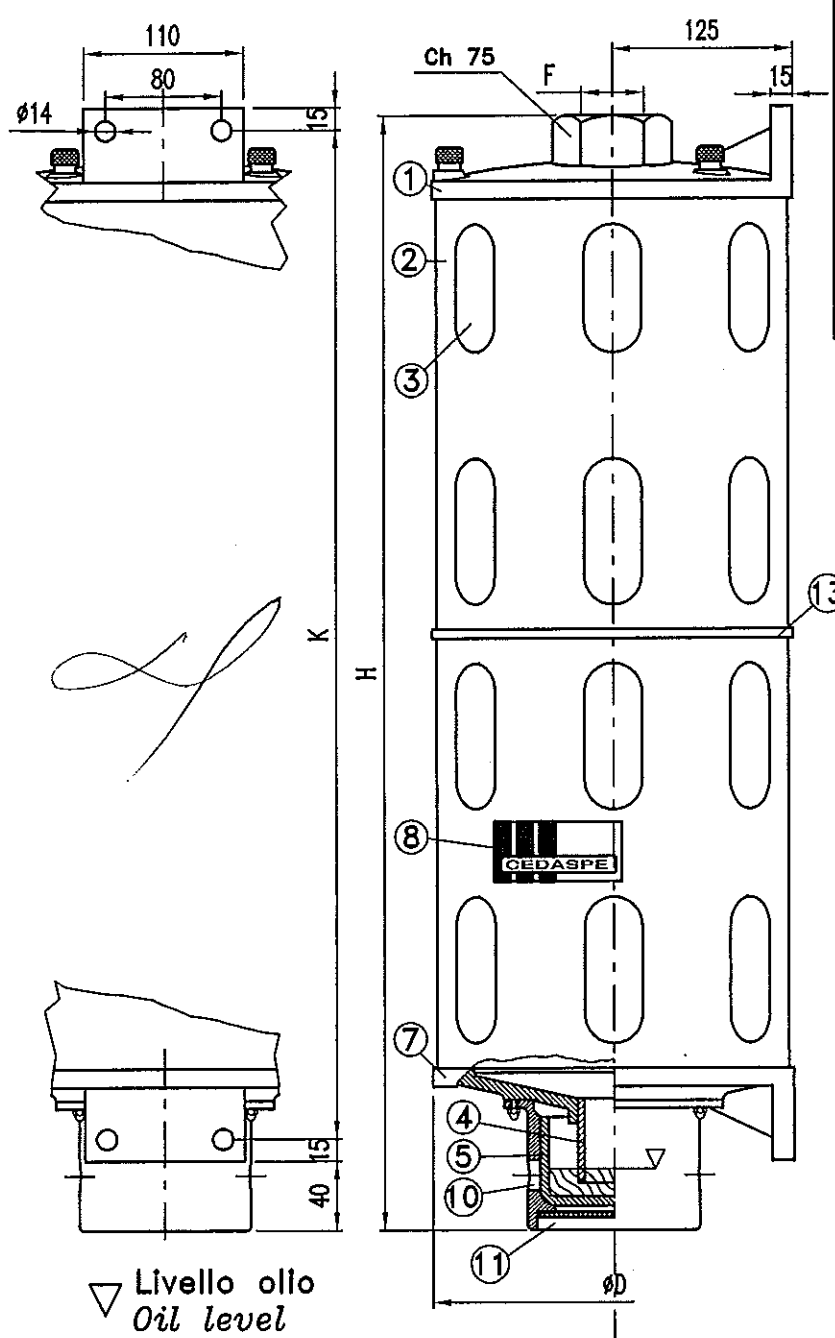
Dim. in mm; Scala 1:5

(*) 2" G Solo su richiesta/Upon request

CEDASPE

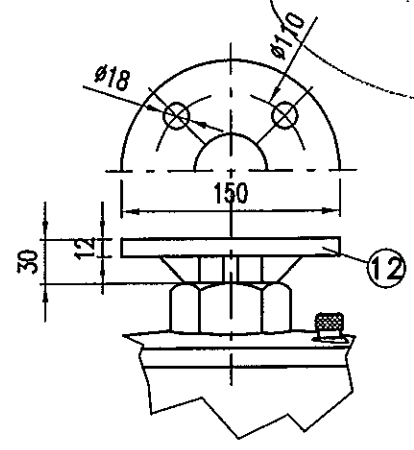
Essicatori d'aria per trasformatori di potenza
 Dehydrating breathers for power transformers

Fig. A1
 - Raccordo filettato
 - Tapped connection



▽ Livello olio
 Oil level

Fig. B1
 - Raccordo flangiato
 - Flanged connection



Pos	Descrizione/Description
1	Coperchio Top cap
2	Protezione acciaio Inox Stainless steel housing
3	Contenitore trasparente di sili Gel container (transparent)
4	Pescante Fishing out cylinder
5	Coppa olio (trasparente) Oil cup (transparent)
7	Coperchio inferiore Bottom cap
8	Targhetta d'identificazione Data plate
9	Scarico condensa Drain hole
10	Splia olio Oil window
11	Presca d'aria Air intake
12	Flangia Flange
13	Flangia intermedia Frame

Tipo Type	Olio nel trasformatore Transformer oil	H	D	K	F	Silicagel	
						Q.ty kg	Vol. dm ³
VE100	35000 Kg	650	245 mm	578 mm	1 1/2" G (*)	10,00	13,50
VE150	56000 Kg	830 mm		758 mm		15,00	21,00

Dim. in mm; Scala 1:5

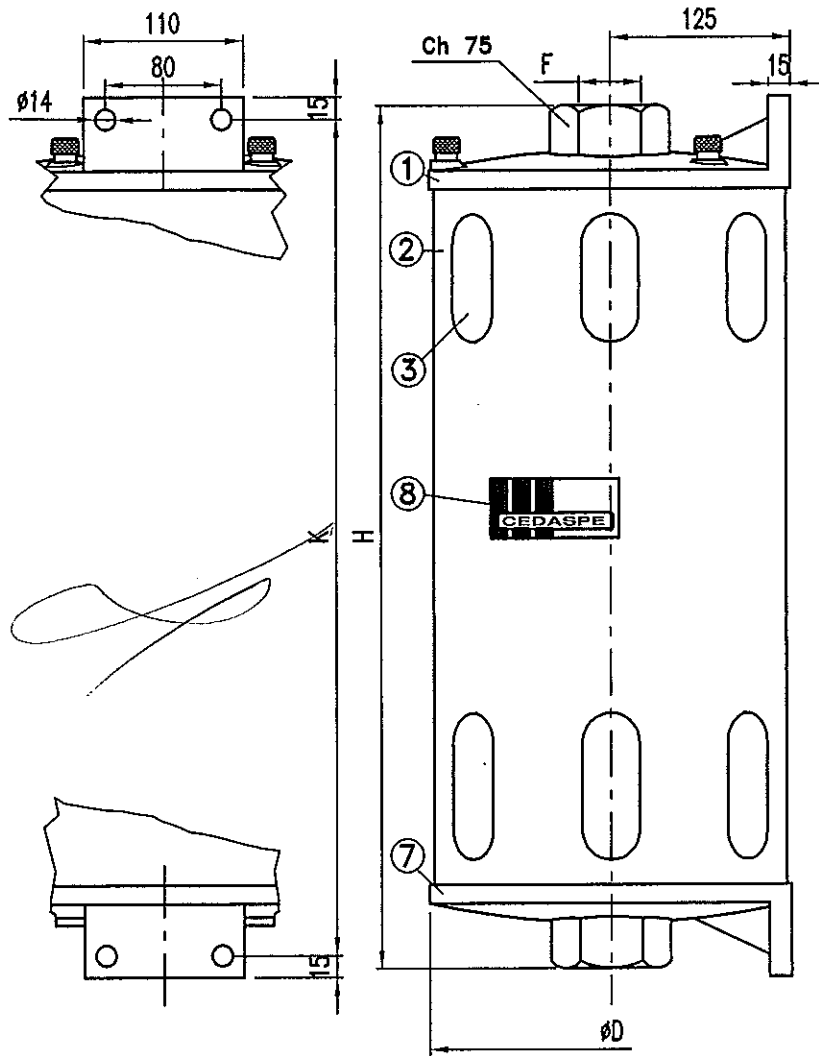
(*) 2" G Solo su richiesta/Upon request



Essiccati d'aria per trasformati di potenza
 Dehydrating breathers for power transformers

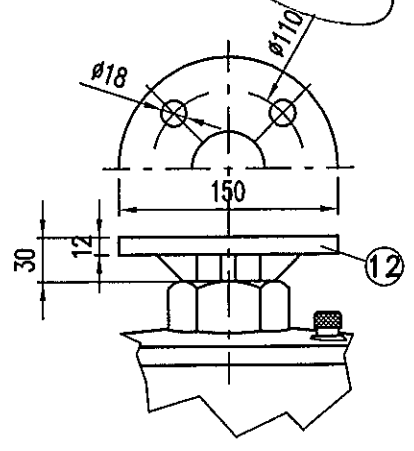
000200

Fig. A1
 - Raccordo filettato
 - Tapped connection



5.49

Fig. B1
 - Raccordo flangiato
 - Flanged connection



Pos	Descrizione / Description
1	Coperchio / Top cap
2	Protezione acciaio Inox / Stainless steel housing
3	Contenitore trasparente di sali / Gel container (transparent)
7	Coperchio inferiore / Bottom cap
8	Targhetta d'identificazione / Data plate
12	Flangia / Flange

Tipo / Type	H	D	K	F	Silicagel	
					Q. ty / Kg	Vol. / dm ³
VE50M	345 mm	245 mm	320 mm	1 1/2'G (*)	5,00	6,70
VE80M	435 mm		410 mm		8,00	10,70
VE100M	605 mm		578 mm		10,00	13,50
VE150M	785 mm		758 mm		15,00	21,00

(*) 2" G Solo su richiesta / Upon request

Dim. in mm; Scala 1:5



Modulo per montaggio multiplo essiccatori
 Module for multiple assembly of dehydrating breathers

Fig. A1
 - Montaggio orizzontale
 - Horizontal assembly

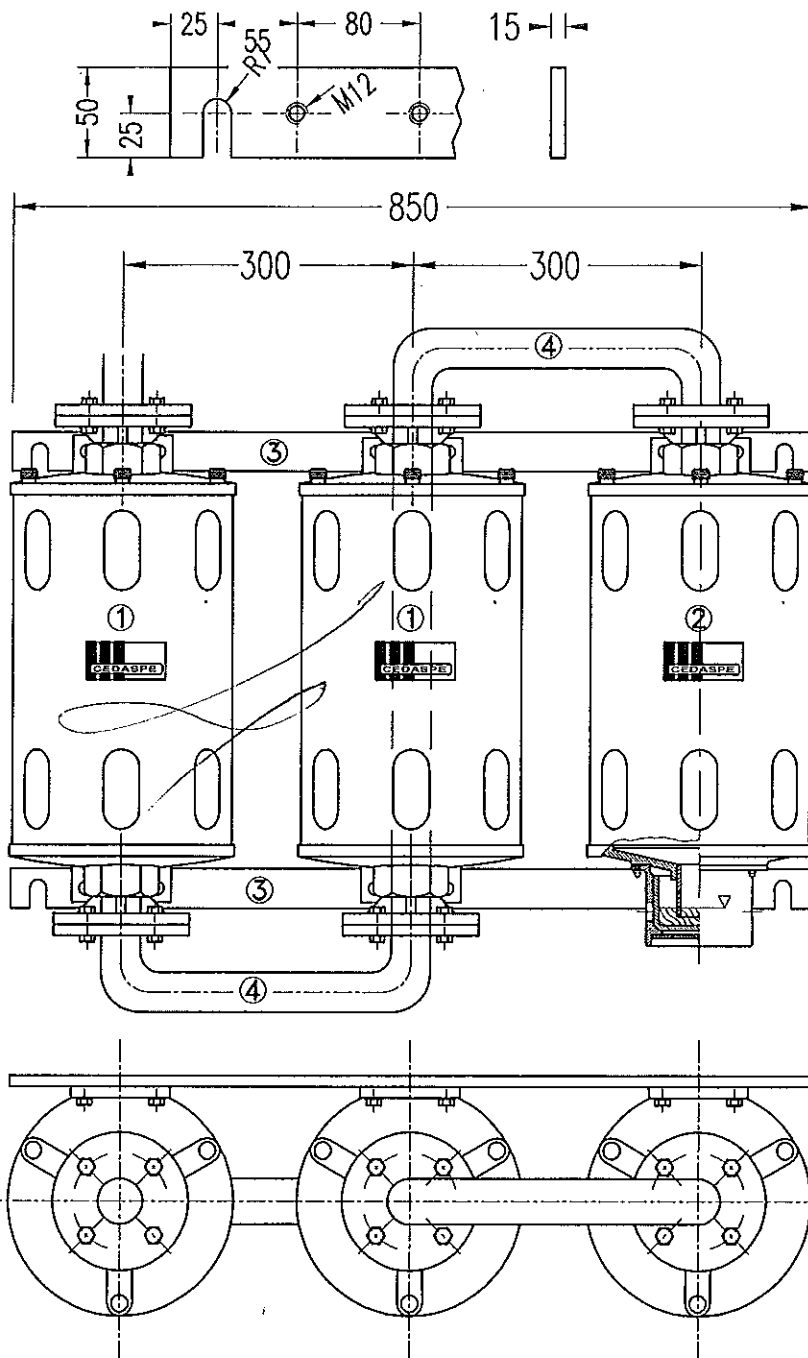
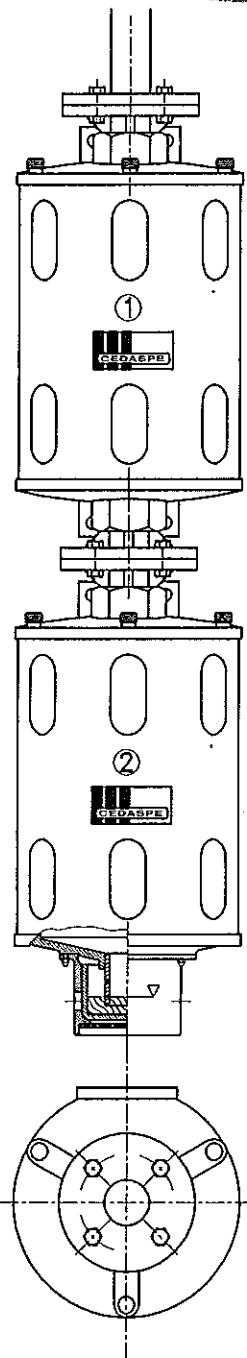


Fig. B1
 - Montaggio verticale
 - Vertical assembly



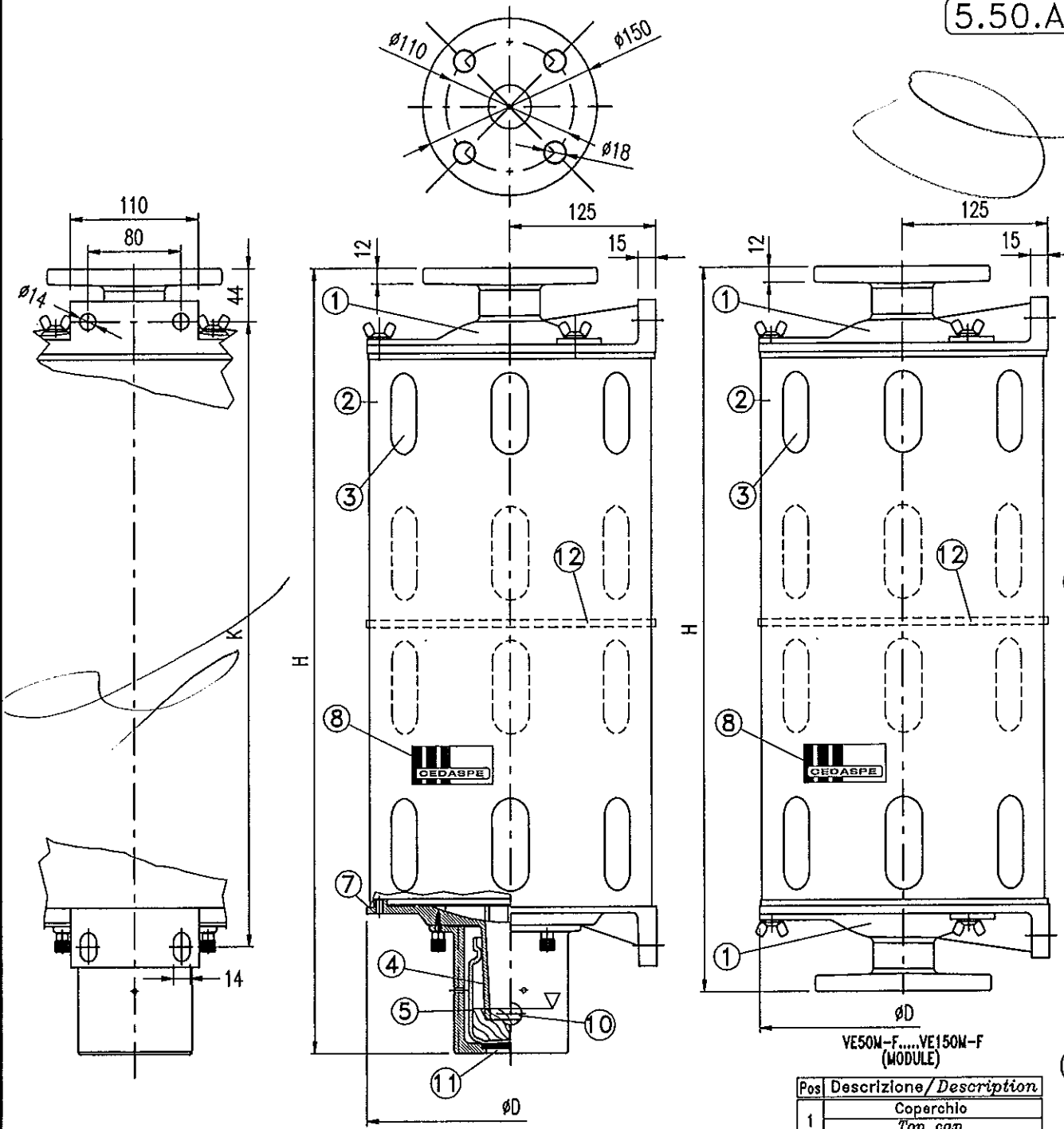
1	Breather module	VE50M	pag 5.49
		VE80M	pag 5.49
		VE100M	pag 5.49
		VE150M	pag 5.49
2	Breather	VE50	pag 5.47
		VE80	pag 5.47
		VE100	pag 5.48
		VE150	pag 5.48
3	Holder	Not supplied	
4	Connecting pipe	Not supplied	

1	Modulo essiccatore	VE50M	pag 5.49
		VE80M	pag 5.49
		VE100M	pag 5.49
		VE150M	pag 5.49
2	Essiccatore	VE50	pag 5.47
		VE80	pag 5.47
		VE100	pag 5.48
		VE150	pag 5.48
3	Supporto	Non fornito	
4	Tubo collegamento	Non fornito	

Dim. in mm; Scala 1:8

000282

5.50.A



▽ Livello olio
Oil level

Tipo Type	Olio nel trasformatore Transformer oil	H	D	K	Silicagel	
					Q. ty kg	Vol. dm ³
VE50-F	17500 Kg	453 mm	247 mm	317 mm	5,00	6,70
VE50M-F		410 mm				
VE80-F	28000 Kg	548 mm		427 mm	8,00	10,70
VE80M-F		505 mm				
VE100-F	35000 Kg	716 mm		567 mm	10,00	13,50
VE100M-F		673 mm				
VE150-F	56000 Kg	896 mm	747 mm	15,00	21,00	
VE150M-F		853 mm				

Pos	Descrizione / Description
1	Coperchio Top cap
2	Protezione acciaio inox Stainless steel housing
3	Contenitore trasparente di sali Gel container (transparent)
4	Pescante Fishing out cylinder
5	Coppa olio (trasparente) Oil cup (transparent)
7	Coperchio inferiore Bottom cap
8	Targhetta d'identificazione Data plate
9	Scarico condensa Drain hole
10	Finestra olio Oil window
11	Presca d'aria Air intake
12	Flangia intermedia Frame (VE100/150)

Dim. in mm; Scala 1:5



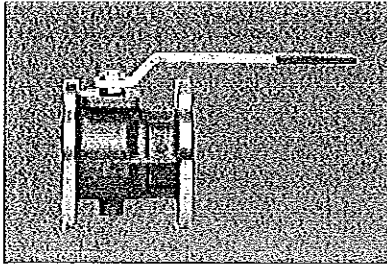
Essiccatori d'aria per trasformatori di potenza
Dehydrating breathers for power transformers
New model VE50.....150-F 000283

VALPRES

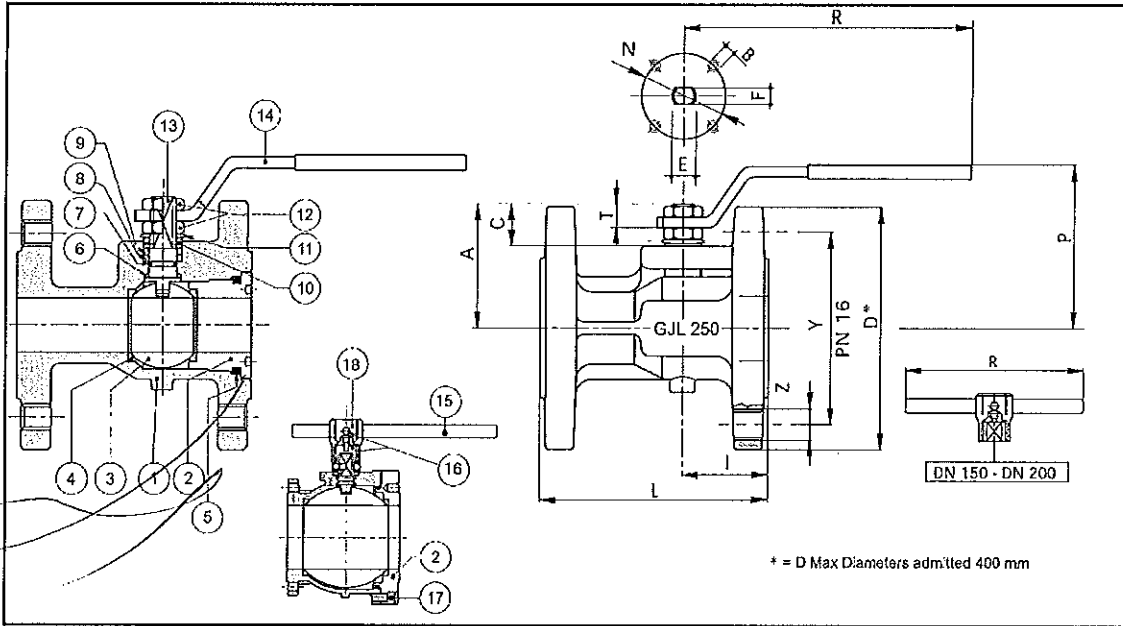
SERIE 730000 Art. 730000

UNI
T.A. LUFT

Valvola Notificata
CONFESE



Full bore flanged ball valve, PN 16 in cast iron, from DN 25 to DN 200. Face to face dimension from DN 25 to DN 150 according to DIN 3202 F4 and DN 200 according to DIN 3202 F5.



POS.	PART NAME	MATERIALS	N°P.
1	BODY	EN-GJL 250	1
2	END CONNECTION	ASTM A105	1
3	BALL	CW517H UNI EN 12165	1
4	BALL SEAT	P.T.F.E.	2
5	RING	BUNA	1
6	THRUST WASHER	P.T.F.E.	1
7	O-RING	BUNA	1
8	STEM SEAT	P.T.F.E.	1
9	PACKING GLAND	CARBON STEEL	1
10	END STOP	NOT A 9110 (EN 10220) CARBON STEEL (EN 15013)	2 - 1
11	SPRING WASHER	CARBON STEEL	2
12	NUT	CARBON STEEL	2
13	STEM	A182-F304	1
14	HANDLE	CARBON STEEL	1
15	HANDLE DN 150-200	CARBON STEEL	1
16	SCREW	CARBON STEEL	1
17	SCREW	CARBON STEEL	8
18	BODY HANDLE DN 150	EN-GJL 250	1

SPECIFICATIONS

SERIE	73
THREAD ENDS	PN 6 - 10 - 16
NOMINAL DIAMETRE	From DN 25 to DN 200
MANEUVER	90° rotation of the lever
PAINTING	Epoxy painting Rel 3002
TESTING	100% tested
OPERATOR	UNI 7070 handle with blue P.V.C. cover

APPLICATION

Assembly in flanged pipe system
 Other specifications in the Technical Specifications catalogue
 Nominal pressure (PN) in bar
 For temperature > 80°C see diagram in the Technical Specifications catalogue
 KV: flow coefficient in m³/h at differential pressure of 100 kPa
 Vacuum: Maximum 10³ torr.
 Temperature range: -20°C +120°C OR Buna + 160°C Viton®
 Direction of flow: both directions
 We recommend the valve use in fully open or closed, not in mid position, and to manoeuvre the valve at least twice a year.

DN	D	Y	Z	I	L	R	P	A	C	T	E	F	N	B	KV	PN	Kg
1"	25	115	85	4xM12	42	125	174,5	79	59	19,5	11,6	12	8	-	43	16	3,1
1 1/4"	32	140	100	4xM16	47	130	174,5	85,5	64,5	18,5	10,5	12	8	-	69	16	4,8
1 1/2"	40	160	110	4xM16	49	140	250,5	103	78	24	12,5	16	10	-	230	16	6,1
2"	50	185	125	4xM16	52	150	250,5	110	85	24	12,5	16	10	-	265	16	7,8
2 1/2"	65	185	145	4xM16	65	170	321,5	125,5	103	28	18	20	14	-	540	16	11,4
3"	80	200	160	8xM16	65	180	321,5	137,5	114	28	18	20	14	70	M 8	873	14,1
4"	100	220	160	8xM16	89	180	381,5	168	137	32,5	20,5	24	18	102	M10	1390	20
5"	125	250	210	8xM16	100	200	381,5	179,5	159,5	32,5	21,5	24	18	102	M10	1707	30,4
6"	150	265	240	8xM20	105	210	700	237	201,5	51,5	30	42	30	125	M12	2024	44,6
8"	200	340	285	12x22	203	400	700	279	244	62	30	42	30	125	M12	2720	103

OPTIONS AVAILABLE

730001 PN 10 flange from DN 60 to DN 200
 730002 PN 6 flange from DN 40 to DN 80

730003 Ball and stem AISI 304-CF8 from DN 40 to DN 200
 730004 P.T.F.E., Viton® stem seal

730005 Without holes
 730008 Drilled ISO 5211

730014 Stem extension lever X37 blue
 730015 For oxygen

Nytro Lyra X



SAFETY DATA SHEET

Date of printing	2016-02-19
Date of issue/ Date of revision	2016-02-19
Date of previous issue	2015-09-17
Version	2

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name	Nytro Lyra X
Product description	Insulating oil
Product type	Liquid.
MARPOL Annex 1	Oils

1.2 Identified uses

Identified uses
Use in formulations in lubricants- Industrial
Use as lubricant in open and closed systems - Professional
Distribution of substance - Industrial
Formulation and (re)packing of substances and mixtures - Industrial
Manufacture of substance - Industrial
Functional Fluids - Industrial
Functional Fluids - Professional

Uses advised against	Reason
This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the supplier.	-

1.3 Details of the supplier of the safety data sheet

Supplier/Manufacturer	Head office: Nynas AB P.O. Box 10700 SE-121 29 Stockholm SWEDEN +46 8 602 12 00 (Office hours 8 am - 4.30 pm (CET)) www.nynas.com
e-mail address of person responsible for this SDS	ProductHSE@nynas.com

1.4 Emergency telephone number

Telephone number	+44 (0) 1235 239 670
Hours of operation	24 hour service
<u>National advisory body/Poison Centre</u>	
Telephone number	020 - 99 60 00 (Kemiakuten, 24h service)

000285

Nytro Lyra X

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Product definition Mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Asp. Tox. 1, H304

Aquatic Chronic 3, H412

The product is classified as hazardous according to Regulation (EC) 1272/2008 as amended.

See Section 16 for the full text of the H statements declared above.

See Section 11 for more detailed information on health effects and symptoms.

2.2 Label elements

Hazard pictograms



Signal word

Danger

Hazard statements

H304 - May be fatal if swallowed and enters airways.
H412 - Harmful to aquatic life with long lasting effects.

Precautionary statements

Prevention

P273 - Avoid release to the environment.

Response

P301 - IF SWALLOWED:
P310 - Immediately call a POISON CENTER or physician.
P331 - Do NOT induce vomiting.

Storage

Not applicable.

Disposal

P501 - Dispose of contents and container in accordance with all local, regional, national and international regulations.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

Not applicable.

2.3 Other hazards

Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII Not applicable.

Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII Not applicable.

SECTION 3: Composition/information on ingredients

3.2 Mixtures

Mixture

Product/ingredient name	Identifiers	%	Classification Regulation (EC) No. 1272/2008 [CLP]	Type
Distillate (petroleum), hydrotreated light naphthenic	REACH #: 01-2119480375-34 EC: 265-156-6 CAS: 64742-53-6 Index: 649-466-00-2	50 - 100	Asp. Tox. 1, H304	[1]
Distillate (petroleum), hydrotreated light	REACH #: 01-2119487077-29	0 - 50	Asp. Tox. 1, H304	[1]

000286

Nytro Lyra X

SECTION 3: Composition/information on ingredients

paraffinic	EC: 265-158-7 CAS: 64742-55-8 REACH #: 01-2119474889-13	0 - 50	Asp. Tox. 1, H304	[1]
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	EC: 276-738-4 CAS: 72623-87-1 Index: 649-483-00-5 REACH #: 01-2119484627-25	0 - 50	Asp. Tox. 1, H304	[1]
Distillate (petroleum), hydrotreated heavy paraffinic	EC: 265-157-1 CAS: 64742-54-7 Index: 649-467-00-8 REACH #: 01-2119474878-16	0 - 30	Asp. Tox. 1, H304	[1]
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	EC: 276-737-9 CAS: 72623-86-0 Index: 649-482-00-X REACH #: 01-2119555270-46	<0.4	Aquatic Acute 1, H400 (M=1) Aquatic Chronic 1, H410 (M=1)	[1]
2,6-di-tert-butyl-p-cresol	EC: 204-881-4 CAS: 128-37-0		See Section 16 for the full text of the H statements declared above.	

Annex I Nota L applies to the base oil(s) in this product. Nota L - The classification as a carcinogen need not apply if it can be shown that the substance contains less than 3 % DMSO extract as measured by IP 346.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment, are PBTs or vPvBs or have been assigned a workplace exposure limit and hence require reporting in this section.

Type

- [1] Substance classified with a health or environmental hazard
- [2] Substance with a workplace exposure limit
- [3] Substance meets the criteria for PBT according to Regulation (EC) No. 1907/2006, Annex XIII
- [4] Substance meets the criteria for vPvB according to Regulation (EC) No. 1907/2006, Annex XIII
- [5] Substance of equivalent concern

SECTION 4: First aid measures

4.1 Description of first aid measures

Eye contact	Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If irritation, blurred vision or swelling occurs and persists, obtain medical advice from a specialist.
Inhalation	If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing. If casualty is unconscious and: If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Get medical attention if adverse health effects persist or are severe. Maintain an open airway.
Skin contact	Wash with soap and water. Remove contaminated clothing and shoes. Handle with care and dispose of in a safe manner. Seek medical attention if skin irritation, swelling or redness develops and persists. Accidental high pressure injection through the skin requires immediate medical attention. Do not wait for symptoms to develop.
Ingestion	Always assume that aspiration has occurred. Do not induce vomiting. Can enter lungs and cause damage. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Seek professional medical attention or send the casualty to a hospital. Do not wait for symptoms to develop. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway.

000287

Nytro Lyra X

SECTION 4: First aid measures

Protection of first-aiders
Loosen tight clothing such as a collar, tie, belt or waistband.
No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.
Before attempting to rescue casualties, isolate area from all potential sources of ignition including disconnecting electrical supply. Ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry into confined spaces.

4.2 Most important symptoms and effects, both acute and delayed

Potential acute health effects

Eye contact Eye contact may cause redness and transient pain.
Inhalation Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.
Skin contact No known significant effects or critical hazards.
Ingestion May be fatal if swallowed and enters airways.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to physician Due to low viscosity there is a risk of aspiration if the product enters the lungs. Treat symptomatically.
Specific treatments Always assume that aspiration has occurred.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media Use dry chemical, CO₂, water spray (fog) or foam.
Unsuitable extinguishing media Do not use direct water jets on the burning product; they could cause splattering and spread the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

5.2 Special hazards arising from the substance or mixture

Hazards from the substance or mixture In a fire or if heated, a pressure increase will occur and the container may burst. This substance will float and can be reignited on surface water. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.
Hazardous thermal decomposition products Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide, H₂S, SO_x (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

5.3 Advice for firefighters

Special precautions for fire-fighters Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.
Special protective equipment for fire-fighters Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. Clothing for fire-fighters (including helmets, protective boots and gloves) conforming to European standard EN 469 will provide a basic level of protection for chemical incidents.

000288

Nytro Lyra X

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Avoid breathing vapour or mist. Keep non-involved personnel away from the area of spillage. Alert emergency personnel. Except in case of small spillages, the feasibility of any actions should always be assessed and advised, if possible, by a trained, competent person in charge of managing the emergency. Stop leak if safe to do so. Avoid direct contact with the product. Stay upwind/keep distance from source. In case of large spillages, alert occupants in downwind areas.

Eliminate all ignition sources if safe to do so. Spillages of limited amounts of product, especially in the open air when vapours will be usually quickly dispersed, are dynamic situations, which will presumably limit the exposure to dangerous concentrations.

Note : recommended measures are based on the most likely spillage scenarios for this material; however, local conditions (wind, air temperature, wave/current direction and speed) may significantly influence the choice of appropriate actions. For this reason, local experts should be consulted when necessary. Local regulations may also prescribe or limit actions to be taken.

For emergency responders

Small spillages: normal antistatic working clothes are usually adequate.

Large spillages: full body suit of chemically resistant and thermal resistant material should be used. Work gloves providing adequate chemical resistance, specifically to aromatic hydrocarbons. Note : gloves made of PVA are not water-resistant, and are not suitable for emergency use. Safety helmet, antistatic non-skid safety shoes or boots. Goggles and /or face shield, if splashes or contact with eyes is possible or anticipated.

Respiratory protection : A half or full-face respirator with filter(s) for organic vapours (and when applicable for H₂S) a Self Contained Breathing Apparatus (SCBA) can be used according to the extent of spill and predictable amount of exposure. If the situation cannot be completely assessed, or if an oxygen deficiency is possible, only SCBA's should be used.

6.2 Environmental precautions

Water polluting material. May be harmful to the environment if released in large quantities. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Prevent product from entering sewers, rivers or other bodies of water. If necessary dike the product with dry earth, sand or similar non-combustible materials. In case of soil contamination, remove contaminated soil and treat in accordance with local regulations.

In case of small spillages in closed waters (i.e. ports), contain product with floating barriers or other equipment. Collect spilled product by absorbing with specific floating absorbents.

If possible, large spillages in open waters should be contained with floating barriers or other mechanical means. If this is not possible, control the spreading of the spillage, and collect the product by skimming or other suitable mechanical means. The use of dispersants should be advised by an expert, and, if required, approved by local authorities.

6.3 Methods and material for containment and cleaning up

Small spill

Stop leak if without risk. Absorb spilled product with suitable non-combustible materials.

Large spill

Large spillages may be cautiously covered with foam, if available, to limit vapour cloud formation. Do not use water jet. When inside buildings or confined spaces, ensure adequate ventilation. Transfer collected product and other contaminated materials to suitable containers for recovery or safe disposal.

6.4 Reference to other sections

See Section 1 for emergency contact information.
See Section 8 for information on appropriate personal protective equipment.
See Section 13 for additional waste treatment information.

000200

SECTION 7: Handling and storage

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

General information Obtain special instructions before use. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Use and store only outdoors or in a well-ventilated area. Hazard of slipping on spilt product. Avoid release to the environment.

7.1 Precautions for safe handling

Protective measures

Do not ingest. Do not breathe dust/fume/gas/mist/vapours/spray. Avoid contact with eyes, skin and clothing.

Prevent the risk of slipping. Take precautionary measures against static discharge. Avoid splash filling of bulk volumes when handling hot liquid product.

Avoid release to the environment.

Nota : See Section 8 for information on appropriate personal protective equipment. See section 13 for waste disposal information.

Advice on general occupational hygiene

Ensure that proper housekeeping measures are in place. Contaminated materials should not be allowed to accumulate in the workplaces and should never be kept inside the pockets. Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Wash hands thoroughly after handling. Change contaminated clothes at the end of working shift. See also Section 8 for additional information on hygiene measures.

7.2 Conditions for safe storage, including any incompatibilities

Storage area layout, tank design, equipment and operating procedures must comply with the relevant regional, national or local legislation. Storage installations should be designed with adequate bunds in case of leaks or spills. Cleaning, inspection and maintenance of internal structure of storage tanks must be done only by properly equipped and qualified personnel as defined by national, local or company regulations.

Store separately from oxidising agents.

Recommended materials for containers, or container linings use mild steel, stainless steel. Not suitable : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Compatibility should be checked with the manufacturer.

Keep only in the original container or in a suitable container for this kind of product. Keep container tightly closed and sealed until ready for use. Do not store in unlabelled containers. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Empty containers may contain harmful, flammable/combustible or explosive residue or vapours. Do not cut, grind, drill, weld, reuse or dispose of containers unless adequate precautions are taken against these hazards. Store locked up. Protect from sunlight.

7.3 Specific end use(s)

Recommendations

Not available.

Industrial sector specific solutions

Not available.

SECTION 8: Exposure controls/personal protection

The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

8.1 Control parameters

Occupational exposure limits

000290

Nytro Lyra X

SECTION 8: Exposure controls/personal protection

Product/ingredient name	Exposure limit values
Oil mist	[Air contaminant] AFS 2011:18 (Sweden, 12/2011). TWA: 1 mg/m ³ 8 hours. Form: mist and fume STEL: 3 mg/m ³ 15 minutes. Form: mist and fume

Recommended monitoring procedures

If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to monitoring standards, such as the following: European Standard EN 689 (Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy) European Standard EN 14042 (Workplace atmospheres - Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents) European Standard EN 482 (Workplace atmospheres - General requirements for the performance of procedures for the measurement of chemical agents) Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

DNELs/DMELs

Product/ingredient name	Type	Exposure	Value	Population	Effects
Distillate (petroleum), hydrotreated light naphthenic	DNEL	Long term Inhalation	5,4 mg/m ³	Workers	Local
Distillate (petroleum), hydrotreated light paraffinic	DNEL	Long term Inhalation	5,4 mg/m ³	Workers	Local
Distillates (petroleum), hydrotreated heavy paraffinic	DNEL	Long term Inhalation	5,4	Workers	Local

PNECs

Product/ingredient name	Compartment Detail	Value	Method Detail
2,6-Di-tert-butyl-p-cresol	Soil	1.04 mg/kg wwt	Equilibrium Partitioning Assessment Factors
	Sewage Treatment Plant	100 mg/l	
	Sediment	1.29 mg/kg wwt	Equilibrium Partitioning Assessment Factors
	Secondary Poisoning	16.7 mg/kg	
	Marine water	0.4 µg/l	
Fresh water	4 µg/l	Assessment Factors	

PNEC Summary

The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

8.2 Exposure controls

Appropriate engineering controls

Mechanical ventilation and local exhaust will reduce exposure via the air. Use oil resistant material in construction of handling equipment. Store under recommended conditions and if heated, temperature control equipment should be used to avoid overheating.

Individual protection measures

Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Wash contaminated clothing before reuse.

Eye/face protection

Recommended: safety glasses with side-shields

Skin protection

Hand protection

4 - 8 hours (breakthrough time): nitrile rubber

Body protection

Wear protective clothing if there is a risk of skin contact. Change contaminated clothes at the end of working shift.

Other skin protection

Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Nytro Lyra X

SECTION 8: Exposure controls/personal protection

Respiratory protection	Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Use a properly fitted, particulate filter respirator complying with an approved standard if a risk assessment indicates this is necessary.
Environmental exposure controls	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	Liquid.
Colour	Light yellow
Odour	Odourless/Light petroleum.
Odour threshold	Not available.
pH	Not applicable.
Melting point/freezing point	-48°C
Initial boiling point and boiling range	>250°C
Flash point	Closed cup: >140°C [Pensky-Martens.]
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.
Upper/lower flammability or explosive limits	Not available.
Vapour pressure	160 Pa @ 100 °C
Density	0.87 g/cm ³ [15°C]
Solubility(ies)	Insoluble in water.
Partition coefficient: n-octanol/water	Not available.
Auto-ignition temperature	>270°C
Decomposition temperature	>280°C
Viscosity	Kinematic (40°C): 0.093 cm ² /s (9.3 cSt)
Explosive properties	Not available.
Oxidising properties	Not available.
DMSO extractable compounds for base oil substance(s) according to IP346	< 3%

SECTION 10: Stability and reactivity

10.1 Reactivity	No specific test data related to reactivity available for this product or its ingredients.
10.2 Chemical stability	Stable under normal conditions.
10.3 Possibility of hazardous reactions	Under normal conditions of storage and use, hazardous reactions will not occur.
10.4 Conditions to avoid	Oxidising agent.
10.5 Incompatible materials	Keep away from extreme heat and oxidizing agents.
10.6 Hazardous decomposition products	Incomplete combustion is likely to give rise to a complex mixture of airborne solid and liquid particulates, gases, including carbon monoxide, H ₂ S, SO _x (sulfur oxides) or sulfuric acid and unidentified organic and inorganic compounds.

000291

Nytro Lyra X

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure	Remarks
Distillate (petroleum), hydrotreated light naphthenic	LC50 Inhalation Dusts and mists	Rat - Male, Female	>5.53 mg/l	4 hours	EMBSI 1988a (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1986a (similar material)
Distillate (petroleum), hydrotreated light paraffinic	LC50 Inhalation Dusts and mists	Rat - Male, Female	>5.53 mg/l	4 hours	EMBSI 1988a (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1986a (similar material)
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	LC50 Inhalation Dusts and mists	Rat - Male, Female	>5.53 mg/l	4 hours	EMBSI 1988a (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1986a (similar material)
Distillate (petroleum), hydrotreated heavy paraffinic	LC50 Inhalation Dusts and mists	Rat	>5.53 mg/l	4 hours	EMBSI 1988a (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1986a (similar material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	LC50 Inhalation Dusts and mists	Rat - Male, Female	>5.53 mg/l	4 hours	EMBSI 1988a (similar material)
	LD50 Dermal	Rabbit	>5000 mg/kg	-	API 1982 (similar material)
	LD50 Oral	Rat	>5000 mg/kg	-	API 1986a (similar material)
2,6-di-tert-butyl-p-cresol	LD50 Dermal	Rat	>5000 mg/kg	-	Supplier's information
	LD50 Oral	Rat	>5000 mg/kg	-	Supplier's information

Conclusion/Summary No known significant effects or critical hazards.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Observation	Remarks
Distillate (petroleum), hydrotreated light naphthenic	Skin - Non-irritant to skin.	Rabbit	0 to 0.8	24 to 72 hours	UBTL 1984e (similar material)
	Eyes - Non-irritating to the eyes.	Rabbit	0.17 to 0.33	24 to 72 hours	UBTL 1984i (similar material)
Distillate (petroleum), hydrotreated light paraffinic	Skin - Non-irritant to skin.	Rabbit	0 to 0.8	24 to 72 hours	UBTL 1984e (similar material)
	Eyes - Non-irritating to the eyes.	Rabbit	0.17 to 0.33	24 to 72 hours	UBTL 1984i (similar material)
Lubricating oils	Skin - Non-irritant to skin.	Rabbit	0 to 0.8	24 to 72 hours	UBTL 1984e (similar material)

Nytra Lyra X

SECTION 11: Toxicological information

(petroleum), C20-50, hydrotreated neutral oil-based	Eyes - Non-irritating to the eyes.	Rabbit	0.17 to 0.33	24 to 72 hours	(similar material) UBTL 1984i (similar material)
Distillate (petroleum), hydrotreated heavy paraffinic	Skin - Non-irritant to skin.	Rabbit	0 to 0.8	24 to 72 hours	UBTL 1984e (similar material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Eyes - Non-irritating to the eyes.	Rabbit	0.17 to 0.33	24 to 72 hours	UBTL 1984i (similar material)
	Eyes - Non-irritating to the eyes.	Rabbit	0.17 to 0.33	24 to 72 hours	UBTL 1984i (similar material)
2,6-di-tert-butyl-p-cresol	Eyes - Redness of the conjunctivae	Rabbit	0.5	-	Supplier's information
	Eyes - Iris lesion	Rabbit	0	-	Supplier's information
	Eyes - Oedema of the conjunctivae	Rabbit	0.1	-	-

Skin No known significant effects or critical hazards.
 Eyes No known significant effects or critical hazards.
 Respiratory No known significant effects or critical hazards.

Sensitisation

Product/ingredient name	Route of exposure	Species	Result	Remarks
Distillate (petroleum), hydrotreated light naphthenic	skin	Guinea pig	Not sensitizing	UBTL 1984j,k,l (similar material)
Distillate (petroleum), hydrotreated light paraffinic	skin	Guinea pig	Not sensitizing	UBTL 1984j,k,l (similar material)
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	skin	Guinea pig	Not sensitizing	UBTL 1984j,k,l (similar material)
Distillate (petroleum), hydrotreated heavy paraffinic	skin	Guinea pig	Not sensitizing	UBTL 1984j,k,l (similar material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	skin	Guinea pig	Not sensitizing	UBTL 1984j,k,l (similar material)

Skin No known significant effects or critical hazards.
 Respiratory No known significant effects or critical hazards.

Mutagenicity

Product/ingredient name	Test	Experiment	Result	Remarks
Distillate (petroleum), hydrotreated light naphthenic	OECD 473 473 In vitro Mammalian Chromosomal Aberration Test	Experiment: In vitro Subject: Mammalian-Animal Metabolic activation: with and without	Negative	-
Distillate (petroleum), hydrotreated light	OECD 473 473 In vitro	Experiment: In vitro	Negative	- 000293

Nytro Lyra X

SECTION 11: Toxicological information

paraffinic	Mammalian Chromosomal Aberration Test	Subject: Mammalian-Animal Experiment: In vitro	Negative	-
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	OECD 473 473 In vitro Mammalian Chromosomal Aberration Test	Subject: Mammalian-Animal Metabolic activation: with and without Experiment: In vitro	Negative	-
Distillate (petroleum), hydrotreated heavy paraffinic	OECD 473 473 In vitro Mammalian Chromosomal Aberration Test	Subject: Mammalian-Animal Metabolic activation: With and without Experiment: In vitro	Negative	-
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	OECD 473 473 In vitro Mammalian Chromosomal Aberration Test	Subject: Mammalian-Animal Metabolic activation: with and without Experiment: In vitro	Negative	-
2,6-di-tert-butyl-p-cresol	476 In vitro Mammalian Cell Gene Mutation Test	Subject: Mammalian-Animal Metabolic activation: with and without Experiment: In vitro	Negative	-
	473 In vitro Mammalian Chromosomal Aberration Test	Subject: Mammalian-Animal Cell: Somatic Experiment: In vitro	Negative	-
		Subject: Mammalian-Animal Cell: Germ		

Conclusion/Summary No known significant effects or critical hazards.

Carcinogenicity

Product/ingredient name	Result	Species	Dose	Exposure	Remarks
Distillate (petroleum), hydrotreated light naphthenic	Negative - Dermal	Mouse - Female	0.22 to 0.25 ml	78 weeks; Various	Doak, 1983, McKee, 1989 (similar material)
Distillate (petroleum), hydrotreated light paraffinic	Negative - Dermal	Mouse - Female	0.22 to 0.25 ml	78 weeks; Various	Doak, 1983, McKee, 1989 (similar material)
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	Negative - Dermal	Mouse - Female	0.22 to 0.25 ml	78 weeks; Various	Doak, 1983, McKee, 1989 (similar material)
Distillate (petroleum), hydrotreated heavy	Negative - Dermal	Mouse - Female	0.22 to 0.25 ml	78 weeks; Various	Doak, 1983, McKee, 1989 (similar material)

Nytro Lyra X

SECTION 11: Toxicological information

paraffinic Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Negative - Dermal	Mouse - Female	0.22 to 0.25 ml	78 weeks; Various	Doak, 1983, McKee, 1989 (similar material)
---	-------------------	----------------	-----------------	-------------------	--

Conclusion/Summary The base oil(s) in this product is based on an severely hydrotreated distillate. The product should not be regarded as a carcinogen.

Reproductive toxicity

Teratogenicity

Product/ingredient name	Result	Species	Dose	Exposure	Remarks
Distillate (petroleum), hydrotreated light naphthenic	Negative - Dermal	Rat	0 to 2000 mg/kg mg/kg/day	-	(similar material)
Distillate (petroleum), hydrotreated light paraffinic	Negative - Dermal	Rat	0 to 2000 mg/kg mg/kg/day	-	-
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	Negative - Dermal	Rat	0 to 2000 mg/kg mg/kg/day	-	-
Distillate (petroleum), hydrotreated heavy paraffinic	Negative - Dermal	Rat	0 to 2000 mg/kg mg/kg bw/day	-	1987 (similar material)
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Negative - Dermal	Rat	0 to 2000 mg/kg mg/kg/day	-	-

Conclusion/Summary No known significant effects or critical hazards.

Aspiration hazard

Product/ingredient name	Result
Distillate (petroleum), hydrotreated light naphthenic	ASPIRATION HAZARD - Category 1
Distillate (petroleum), hydrotreated light paraffinic	ASPIRATION HAZARD - Category 1
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	ASPIRATION HAZARD - Category 1
Distillate (petroleum), hydrotreated heavy paraffinic	ASPIRATION HAZARD - Category 1
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	ASPIRATION HAZARD - Category 1

Information on likely routes of exposure Not available.

Potential acute health effects

Eye contact Eye contact may cause redness and transient pain.
 Inhalation Inhalation of oil mist or vapours at elevated temperatures may cause respiratory irritation.
 Skin contact No known significant effects or critical hazards.
 Ingestion May be fatal if swallowed and enters airways.

Potential chronic health effects

Product/ingredient name	Result	Species	Dose	Exposure
2,6-Di-tert-butyl-p-cresol	Chronic NOAEL Oral	Rat	25 mg/kg	28 days; 7 days per week

General No known significant effects or critical hazards.
 Carcinogenicity The base oil(s) in this product is based on an severely hydrotreated distillate. The product should not be regarded as a carcinogen.
 Mutagenicity No known significant effects or critical hazards.
 Teratogenicity No known significant effects or critical hazards.

Nytro Lyra X

SECTION 11: Toxicological information

Product/ingredient name No known significant effects or critical hazards.
 Fertility effects No known significant effects or critical hazards.

Other information Not available.

Specific hazard

SECTION 12: Ecological information

12.1 Toxicity

Product/ingredient name	Result	Species	Exposure
Distillate (petroleum), hydrotreated light naphthenic	Acute LL50 >10000 mg/l	Aquatic invertebrates.	96 hours
	Acute LL50 >100 mg/l	Fish	96 hours
	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l	Aquatic invertebrates.	21 days
Distillate (petroleum), hydrotreated light paraffinic	Acute IC50 >100 mg/l	Algae	48 hours
	Acute LC50 >100 mg/l	Fish	96 hours
	Acute LL50 >10000 mg/l	Aquatic invertebrates.	96 hours
	Acute LL50 >100 mg/l	Fish	96 hours
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l	Aquatic invertebrates.	21 days
	Acute LL50 >10000 mg/l	Aquatic invertebrates.	96 hours
	Acute LL50 >100 mg/l	Fish	96 hours
Distillate (petroleum), hydrotreated heavy paraffinic	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l	Aquatic invertebrates.	21 days
	Acute EL50 >10000 mg/l	Aquatic invertebrates.	96 hours
	Acute LL50 >100 mg/l	Fish	96 hours
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l	Aquatic invertebrates.	21 days
	Acute LL50 >10000 mg/l	Aquatic invertebrates.	96 hours
	Acute LL50 >100 mg/l	Fish	96 hours
2,6-di-tert-butyl-p-cresol	Acute NOEL >100 mg/l	Algae	72 hours
	Chronic NOEL 10 mg/l	Aquatic invertebrates.	21 days
	Acute EC50 0.61 mg/l	Daphnia - Magna	48 hours
	Acute IC50 >0.4 mg/l	Algae - Desmodesmus Subspicatus	72 hours
	Chronic NOEC 0.316 mg/l	Daphnia - Magna	21 days

Conclusion/Summary Harmful to aquatic life with long lasting effects.

12.2 Persistence and degradability

Product/ingredient name	Test	Result	Dose	Inoculum
2,6-di-tert-butyl-p-cresol	OECD 301C 301C Ready Biodegradability - Modified MITI Test (I)	4.5 % - 28 days	-	-

000296

Nytro Lyra X

SECTION 12: Ecological information

Product/ingredient name	Aquatic half-life	Photolysis	Biodegradability
Distillate (petroleum), hydrotreated light naphthenic	-	-	Inherent
Distillate (petroleum), hydrotreated light paraffinic	-	-	Inherent
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	-	-	Inherent
Distillate (petroleum), hydrotreated heavy paraffinic	-	-	Inherent
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	-	-	Inherent
2,6-di-tert-butyl-p-cresol	-	-	Not readily

Conclusion/Summary Inherently biodegradable.

12.3 Bioaccumulative potential

Product/ingredient name	LogP _{ow}	BCF	Potential
Distillate (petroleum), hydrotreated light naphthenic	2 to 6	<500	low
Distillate (petroleum), hydrotreated light paraffinic	2 to 6	<500	low
Lubricating oils (petroleum), C20-50, hydrotreated neutral oil-based	2 to 6	<500	low
Distillate (petroleum), hydrotreated heavy paraffinic	2 to 6	<500	low
Lubricating oils (petroleum), C15-30, hydrotreated neutral oil-based	2 to 6	<500	low
2,6-di-tert-butyl-p-cresol	5,1	>500	high

Conclusion/Summary The product has a potential to bioaccumulate.

12.4 Mobility in soil

Mobility High mobility in soil predicted, based on log Kow > 3.0.

12.5 Results of PBT and vPvB assessment

Not applicable.
Not applicable.

12.6 Other adverse effects

Insoluble in water. Spills may form a film on water surfaces causing physical damage to organisms. Oxygen transfer could also be impaired.

SECTION 13: Disposal considerations

The information in this section contains generic advice and guidance. The list of Identified Uses in Section 1 should be consulted for any available use-specific information provided in the Exposure Scenario(s).

13.1 Waste treatment methods

Product

Methods of disposal

Where possible (e.g. in the absence of relevant contamination), recycling of used substance is feasible and recommended. This substance can be burned or incinerated, subject to national/local authorizations, relevant contamination limits, safety regulations and air quality legislation. Contaminated or waste substance (not directly recyclable): Disposal can be carried out directly, or by delivery to qualified waste handlers. National legislation may identify a specific organization, and/or prescribe composition limits and methods for recovery or disposal.

Hazardous waste

Yes.

000297

Nytro Lyra X

SECTION 13: Disposal considerations

European waste catalogue (EWC)

Waste code	Waste designation
13 03 07*	mineral-based non-chlorinated insulating and heat transmission oils

Packaging

Methods of disposal

The generation of waste should be avoided or minimised wherever possible. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible.

SECTION 14: Transport information

International transport regulations

	ADR/RID	ADN	IMO/IMDG Classification	ICAO/IATA Classification
14.1 UN number	Not regulated.	Not regulated.	Not regulated.	Not regulated.
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard class(es)	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	No.	No.	No.	No.
Additional information	-	-	-	-

14.6 Special precautions for user

Transport within user's premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

14.7 Transport in bulk according to Annex I of MARPOL 73/78 and the IBC Code

Oils

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

EU Regulation (EC) No. 1907/2006 (REACH)

Annex XIV - List of substances subject to authorisation

Annex XIV

None of the components are listed.

Substances of very high concern

None of the components are listed.

Annex XVII - Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles

Not applicable.

M
000293

Nytro Lyra X

SECTION 15: Regulatory information

Other EU regulations

Seveso Directive

This product is not controlled under the Seveso Directive.

International lists

National inventory

Australia	All components are listed or exempted.
Canada	All components are listed or exempted.
China	All components are listed or exempted.
Japan	Japan inventory (ENCS): All components are listed or exempted. Japan inventory (ISHL): Not determined.
Malaysia	Not determined.
New Zealand	All components are listed or exempted.
Philippines	All components are listed or exempted.
Republic of Korea	All components are listed or exempted.
Taiwan	All components are listed or exempted.
United States	All components are listed or exempted.

15.2 Chemical safety assessment

Chemical Safety Assessments for all substances in this product are either Complete or Not applicable.

SECTION 16: Other information

Revision comments Not available.

Indicates information that has changed from previously issued version.

- ADN = European Provisions concerning the International Carriage of Dangerous Goods by Inland Waterway
- ADR = The European Agreement concerning the International Carriage of Dangerous Goods by Road
- ATE = Acute Toxicity Estimate
- CLP = Classification, Labelling and Packaging Regulation [Regulation (EC) No. 1272/2008]
- CMR = Carcinogen, Mutagen or Reproductive toxicant
- CSA = Chemical Safety Assessment
- CO₂ = carbon dioxide
- DNEL = Derived No Effect Level
- EC50 = Half maximal effective concentration
- EUH statement = CLP-specific Hazard statement
- IATA = International Air Transport Association
- IC50 = Half maximal inhibitory concentration
- IMDG = International Maritime Dangerous Goods
- LC50 = Median lethal concentration
- LD50 = Median lethal dose
- PNEC = Predicted No Effect Concentration
- PBT = Persistent, Bioaccumulative and Toxic
- RID = The Regulations concerning the International Carriage of Dangerous Goods by Rail
- REACH = Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation [Regulation (EC) No. 1907/2006]
- SCBA = Self-Contained Breathing Apparatus
- SVHC = Substances of Very High Concern

Procedure used to derive the classification according to Regulation (EC) No. 1272/2008 [CLP/GHS]

Classification	Justification
Asp. Tox. 1, H304 Aquatic Chronic 3, H412	Calculation method Calculation method 000299

Sweden

Nytro Lyra X

SECTION 16: Other information

Full text of abbreviated H statements	H304	May be fatal if swallowed and enters airways.
	H400	Very toxic to aquatic life.
	H410	Very toxic to aquatic life with long lasting effects.
	H412	Harmful to aquatic life with long lasting effects.
Full text of classifications [CLP/GHS]	Aquatic Acute 1, H400	ACUTE AQUATIC HAZARD - Category 1
	Aquatic Chronic 1, H410	LONG-TERM AQUATIC HAZARD - Category 1
	Aquatic Chronic 3, H412	LONG-TERM AQUATIC HAZARD - Category 3
	Asp. Tox. 1, H304	ASPIRATION HAZARD - Category 1
Date of printing	2016-02-19	
Date of issue/ Date of revision	2016-02-19	
Date of previous issue	2015-09-17	
Version	2	

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

000500

Industrial

Identification of the substance or mixture

Product definition Mixture
 Product name Nytro Lyra X

Section 1 - Title

Short title of the exposure scenario Use in formulations in lubricants- Industrial (2,6-di-tert-butyl-p-cresol)
 List of use descriptors **Identified use name:** Use in formulations in lubricants- Industrial
Process Category: PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, PROC08b, PROC09
Substance supplied to that use in form of: As such
Sector of end use: SU03, SU10
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC02
Market sector by type of chemical product: PC17, PC24, PC25

Environmental contributing scenarios

Health Contributing scenarios

Number of the ES	Not applicable.
Industry Association	Not applicable.
Generic exposure scenario	Not applicable.
Processes and activities covered by the exposure scenario	Covers the use of formulated lubricants within closed or contained systems including incidental exposures during material transfers, operation of machinery/engines and similar articles, equipment maintenance and disposal of wastes.
Additional information	Industrial

Section 2 - Exposure controls

Product characteristics solid
 Melting/Freezing Point (°C): 69.8
 Concentration of substance in mixture or article ≤100%
 Amounts used Annual site tonnage 22 t/a
 Frequency and duration of use Continuous release(d/a): 300
 Environment factors not influenced by risk management Local freshwater dilution factor 10
 Receiving surface water flow is 18000 m³/d.
 Local marine water dilution factor 100
 Other given operational conditions affecting environmental exposure Not applicable.
 Technical conditions and measures at process level (source) to prevent release % Release fraction to wastewater from process (initial release prior to RMM) 0.2
 % Release fraction to air from process (initial release prior to RMM) 0,05
 % Release fraction to soil from process (initial release prior to RMM) 0
 Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil On-site wastewater treatment required.
 Ensure all waste water is collected and treated via a waste water treatment plant.
 Floors should be impervious, resistant to liquids and easy to clean.
 Organisational measures to prevent/limit release from site Ensure operatives are trained to minimise exposures.

000301

Section 2 - Exposure controls

Conditions and measures related to municipal sewage treatment plant	Size of industrial sewage treatment plant (m ³ /d): 2000,
Conditions and measures related to external treatment of waste for disposal	No special measures are required. General information, See section 13 for waste disposal information.
Conditions and measures related to external recovery of waste	See section 13 for waste disposal information.

Contributing scenario controlling worker exposure for 0:

Product characteristics	Melting/Freezing Point (°C): 69.8
Concentration of substance in mixture or article	Covers percentage substance in the product up to 1%.
Physical state	Liquid
Frequency and duration of use	Exposure duration per day: 4 h (half shift). Exposure duration per year: 230 d
Human factors not influenced by risk management	Respiratory (m ³ /d): 10 Body weight: 70 kg
Other given operational conditions affecting workers exposure	The product should be handled at room temperature. Indoor
Technical conditions and measures at process level (source) to prevent release	No special measures required.
Technical conditions and measures to control dispersion from source towards the worker	Handle only in a place with local exhaust ventilation (or other adequate ventilation). Efficiency of at least 90 %
Organisational measures to prevent/limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures.
Conditions and measures related to personal protection and hygiene	
Personal protection	Wear protective clothing. See Section 8 of the safety data sheet (personal protective equipment). PROC 05; PROC08a: Wear protective gloves. Efficiency of at least 90 %

Section 3 - Exposure estimation and reference to its source

Website: Not available.

Exposure estimation and reference to its source - Environment: 2:

Exposure assessment (environment):	Used EUSES model.(v2.1).
Exposure estimation	Risk characterisation ratio (PEC/PNEC): <1

Exposure estimation and reference to its source - Workers: 1:

Exposure assessment (human):	Used ECETOC TRA model (May 2010 release).2.0
Exposure estimation	Risk characterisation ratio DNELs <1

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Nytro Lyra X

Use in formulations in lubricants- Industrial (2,6-di-tert-butyl-p-cresol)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment
Health

Not available.
Not available.



Environment
Health

Not applicable.
Wear protective gloves/protective clothing/eye protection/face protection.
Wear respiratory protection.
See Section 8 for information on appropriate personal protective equipment.



000303

Professional

Identification of the substance or mixture

Product definition Mixture
 Product name Nytro Lyra X

Section 1 - Title

Short title of the exposure scenario OLD - Use as lubricant in open and closed systems- Professional (2,6-di-tert-butyl-p-cresol)
 List of use descriptors **Identified use name:** Use as lubricant in open and closed systems - Professional
Process Category: PROC01, PROC02, PROC03, PROC04, PROC05, PROC07, PROC08a, PROC08b, PROC09, PROC10, PROC11, PROC13
Substance supplied to that use in form of: As such
Sector of end use: SU22
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC08a, ERC08d, ERC09a, ERC09b
Market sector by type of chemical product: PC17, PC24

Environmental contributing scenarios
 Health Contributing scenarios

Number of the ES	Not applicable.
Industry Association	Not applicable.
Generic exposure scenario	Not applicable.
Processes and activities covered by the exposure scenario	Covers the use of formulated lubricants in closed and open systems including transfer operations, operation of engines and similar articles, reworking on reject articles, equipment maintenance and disposal of waste oil.
Additional information	Professional

Section 2 - Exposure controls

Product characteristics solid
 Melting/freezing point 69.8

Concentration of substance in mixture or article $\leq 2\%$

Amounts used Annual site tonnage
 ≤ 0.16 t/a (Closed system)
 ≤ 0.03 t/a open systems

Frequency and duration of use Continuous release(d/a): 300

Environment factors not influenced by risk management Local freshwater dilution factor 10
 Receiving surface water flow is 18000 m³/d.
 Local marine water dilution factor 100

Other given operational conditions affecting environmental exposure Not applicable.

Technical conditions and measures at process level (source) to prevent release % Release fraction to wastewater from process (initial release prior to RMM) 0.2
 % Release fraction to air from process (initial release prior to RMM) 0.01
 % Release fraction to soil from process (initial release prior to RMM) 1

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil On-site wastewater treatment required.
 Ensure all waste water is collected and treated via a waste water treatment plant.
 Floors should be impervious, resistant to liquids and easy to clean.

Organisational measures to prevent/limit release from site Ensure operatives are trained to minimise exposures.

000304

Section 2 - Exposure controls

Conditions and measures related to municipal sewage treatment plant	Size of industrial sewage treatment plant (m ³ /d): 2000 , Removal Efficiency (total) 94%
Conditions and measures related to external treatment of waste for disposal	No special measures are required. See section 13 for waste disposal information.
Conditions and measures related to external recovery of waste	See section 13 for waste disposal information.

Contributing scenario controlling worker exposure for 0:

Product characteristics	Melting/Freezing Point (°C): 69.8
Concentration of substance in mixture or article	≤2%
Physical state	solid
Dust	Solid, medium dustiness
Frequency and duration of use	Exposure duration per year: 230 days Exposure duration per day: 8 h (full shift).
Human factors not influenced by risk management	Respiratory m ³ /d: 10
Other given operational conditions affecting workers exposure	The product should be handled at room temperature. Lubricants (Closed system)
Technical conditions and measures at process level (source) to prevent release	No special measures required.
Technical conditions and measures to control dispersion from source towards the worker	Handle only in a place with local exhaust ventilation (or other adequate ventilation).
Organisational measures to prevent/limit releases, dispersion and exposure	Ensure operatives are trained to minimise exposures.
Conditions and measures related to personal protection and hygiene	
Personal protection	Wear protective clothing. See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Website: Not available.

Exposure estimation and reference to its source - Environment: 2:

Exposure assessment (environment):	Used EUSES model. (v2.1)
Exposure estimation	Risk characterisation ratio (PEC/PNEC): <1

Exposure estimation and reference to its source - Workers: 1:

Exposure assessment (human):	Used ECETOC TRA model (May 2010 release).
Exposure estimation	Risk characterisation ratio DNELs <1

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

600305

Nytro Lyra X

OLD - Use as lubricant in open and closed systems-
Professional (2,6-di-tert-butyl-p-cresol)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

Not available.

Health

Not available.

Environment


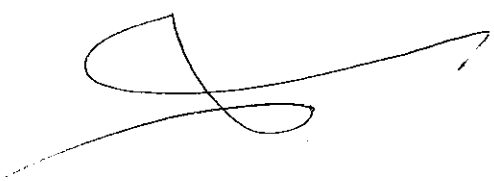
Not available.

Health

Wear protective gloves/protective clothing/eye protection/face protection.

Wear respiratory protection.

See Section 8 for information on appropriate personal protective equipment.


000306

Industrial

Identification of the substance or mixture

Product definition Mixture
 Product name Nytro Lyra X

Section 1 - Title

Short title of the exposure scenario Distribution of substance- Industrial (Other Lubricant Base Oils, IP346<3%, H304)
 List of use descriptors **Identified use name:** Distribution of substance - Industrial
Process Category: PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC09, PROC15
Substance supplied to that use in form of: Substance
Sector of end use: SU03
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC04, ERC05, ERC06a, ERC06b, ERC06c, ERC06d, ERC07, ESVOC SpERC 1.1b.v1
Market sector by type of chemical product: Not applicable.
Article category related to subsequent service life: Not applicable.

Environmental contributing scenarios Distribution of substance
 Health Contributing scenarios Distribution of substance

Number of the ES	9.3.1b
Industry Association	Concawe 2012
Generic exposure scenario	01a
Processes and activities covered by the exposure scenario	Bulk loading (including marine vessel/barge, rail/road car and IBC loading) of substance within closed or contained systems, including incidental exposures during its sampling, storage, unloading, maintenance and associated laboratory activities.
Additional information	Industrial

Section 2 - Exposure controls

Product characteristics Substance is complex UVCB.. Predominantly hydrophobic
 Amounts used Fraction of EU tonnage used in region 0.1
 Regional use tonnage 8.5E+5
 Fraction of Regional tonnage used locally 1
 Maximum daily site tonnage 1.7E+4

Frequency and duration of use Continuous release
 Emission days 100

Environment factors not influenced by risk management Local freshwater dilution factor 10
 Local marine water dilution factor 100

Other given operational conditions affecting environmental exposure Release fraction to air from process (initial release prior to RMM) 1.0E-4
 Release fraction to wastewater from process (initial release prior to RMM) 1.0E-7
 Release fraction to soil from process (initial release prior to RMM) 0.00001

Technical conditions and measures at process level (source) to prevent release Common practices vary across sites thus conservative process release estimates used.

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil Risk from environmental exposure is driven by freshwater sediment.
 If discharging to municipal sewage treatment plant, no on-site wastewater treatment required.

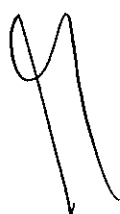
Risk management measures - Air Treat air emission to provide a typical removal efficiency of 90

000307

Section 2 - Exposure controls

Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 64.4 If discharging to municipal sewage treatment plant, provide the required on-site wastewater removal efficiency of 0
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment 94.7 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs 94.7 Maximum allowable site tonnage (M_{safe}) based on release following total wastewater treatment removal $1.1E+5$ Assumed on-site sewage treatment plant flow 2000
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.
Conditions and measures related to external recovery of waste	External recovery and recycling of waste should comply with applicable local and/or national regulations.

Contributing scenario controlling worker exposure for 0: Distribution of substance	
Product characteristics	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in mixture or article	Covers percentage substance in the product up to 100% (unless stated differently).
Physical state	Liquid
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other given operational conditions affecting workers exposure	Operation is carried out at elevated temperature (> 20°C above ambient temperature) Assumes a good basic standard of occupational hygiene is implemented Aspiration hazard if swallowed. Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract. Aspiration of hydrocarbon substances can result in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death. This property relates to the potential for low viscosity material to spread quickly into the deep lung and cause severe pulmonary tissue damage. Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. Do not induce vomiting as there is high risk of aspiration. IF SWALLOWED: Immediately call a POISON CENTER or physician.
Contributing scenarios - Operational conditions and risk management measures	
	General exposures (closed systems) No other specific measures identified.
	General exposures (open systems) No other specific measures identified.
	Process sampling No other specific measures identified.
	Laboratory activities No other specific measures identified.
	Bulk transfers closed systems No other specific measures identified.
	Bulk transfers open systems No other specific measures identified.


000303

Section 2 - Exposure controls

Drum and small package filling
No other specific measures identified.

Equipment cleaning and maintenance
Drain down and flush system prior to equipment break-in or maintenance.

Storage
Store substance within a closed system.

Conditions and measures related to personal protection and hygiene

Personal protection See Section 8 of the safety data sheet (general health and safety measures).
See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Website: Not applicable.

Exposure estimation and reference to its source - Environment: 2: Distribution of substance

Exposure assessment (environment): Not available.

Exposure estimation The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Exposure estimation and reference to its source - Workers: 1: Distribution of substance

Exposure assessment (human): Not available.

Exposure estimation The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment
Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SPERC factsheet. Scaled local assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file - "Site-Specific Production" worksheet.

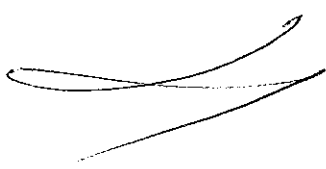
Health
The CLP hazard statement H304: May be fatal if swallowed and enters airways (the DPD risk phrase R65: Harmful: may cause lung damage if swallowed) relates to potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is vomited following ingestion.
A DNEL (derived no effect levels) cannot be derived.
This general qualitative CSA (chemical safety assessment) approach aims to reduce/avoid contact or incidents with the substance.
However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.
Exposures should be controlled to at least the levels that represent an acceptable level of risk such that the implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the substance hazard is negligible, and the risk is considered to be controlled to a level of no concern.
There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.
For any substance, classifies as H304 (R65), these measures should be

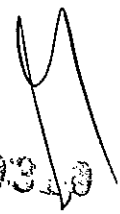
Nytro Lyra X

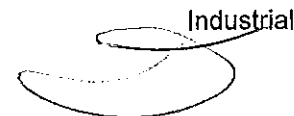
Distribution of substance- Industrial (Other Lubricant Base
Oils, IP346<3%, H304)

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set
by the ES

communicated via the safety data sheet by use of the following phrase: Do not ingest.
If swallowed then seek immediate medical assistance.



600340




Identification of the substance or mixture

Product definition Mixture
 Product name Nytro Lyra X

Section 1 - Title

Short title of the exposure scenario Formulation & (re)packing of substances and mixtures- Industrial (Other Lubricant Base Oils, IP346<3%)
 List of use descriptors **Identified use name:** Formulation and (re)packing of substances and mixtures - Industrial
Process Category: PROC01, PROC02, PROC03, PROC04, PROC05, PROC08a, PROC08b, PROC09, PROC14, PROC15
Substance supplied to that use in form of: Substance
Sector of end use: SU10
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC02, ESVOC SpERC 2.2.v1
Market sector by type of chemical product: Not applicable.
Article category related to subsequent service life: Not applicable.

Environmental contributing scenarios Formulation and (re)packing of substances and mixtures
 Health Contributing scenarios Formulation and (re)packing of substances and mixtures

Number of the ES	9.4.1b
Industry Association	Concawe 2012
Generic exposure scenario	02
Processes and activities covered by the exposure scenario	Formulation, packing and re-packing of the substance and its mixtures in batch or continuous operations, including storage, materials transfers, mixing, tableting, compression, pelletisation, extrusion, large and small scale packing, sampling, maintenance and associated laboratory activities.
Additional information	Industrial

Section 2 - Exposure controls

Product characteristics Substance is complex UVCB.. Predominantly hydrophobic
 Amounts used Fraction of EU tonnage used in region 0.1
 Regional use tonnage 8.5E+5
 Fraction of Regional tonnage used locally 1
 Annual site tonnage 3.0E+4
 Maximum daily site tonnage 1.0E+5

Frequency and duration of use Continuous release
 Emission days 300

Environment factors not influenced by risk management Local freshwater dilution factor 10
 Local marine water dilution factor 100

Other given operational conditions affecting environmental exposure Release fraction to air from process (initial release prior to RMM) 2.5E-3
 Release fraction to wastewater from process (initial release prior to RMM) 5.0E-6
 Release fraction to soil from process (initial release prior to RMM) 0.0001

Technical conditions and measures at process level (source) to prevent release Common practices vary across sites thus conservative process release estimates used.

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil Risk from environmental exposure is driven by freshwater sediment.
 Prevent discharge of undissolved substance to or recover from onsite wastewater. If discharging to municipal sewage treatment plant, no on-site wastewater treatment required.

Section 2 - Exposure controls

Risk management measures - Air	Treat air emission to provide a typical removal efficiency of 0
Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 99.5 If discharging to municipal sewage treatment plant, provide the required on-site wastewater removal efficiency of 0
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.
Conditions and measures related to municipal sewage treatment plant	Not applicable as there is no release to wastewater. Estimated substance removal from wastewater via on-site sewage treatment 94.7 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs 94.7 Maximum allowable site tonnage (M _{safe}) based on release following total wastewater treatment removal 5.7E+5 Assumed on-site sewage treatment plant flow 2000
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.
Conditions and measures related to external recovery of waste	External recovery and recycling of waste should comply with applicable local and/or national regulations.

Contributing scenario controlling worker exposure for 0: Formulation and (re)packing of substances and mixtures	
Product characteristics	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in mixture or article	Covers percentage substance in the product up to 100% (unless stated differently).
Physical state	Liquid
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other given operational conditions affecting workers exposure	Operation is carried out at elevated temperature (> 20°C above ambient temperature) Assumes a good basic standard of occupational hygiene is implemented Aspiration hazard if swallowed. Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract. Aspiration of hydrocarbon substances can result in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death. This property relates to the potential for low viscosity material to spread quickly in the deep lung and cause severe pulmonary tissue damage. Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. Do not induce vomiting as there is high risk of aspiration. IF SWALLOWED: Immediately call a POISON CENTER or physician.
	Contributing scenarios - Operational conditions and risk management measures
	General exposures (closed systems) No other specific measures identified.
	General exposures (open systems) No other specific measures identified.
	Batch processes at elevated temperatures No other specific measures identified.
	Use in contained batch processes No other specific measures identified.
	Process sampling No other specific measures identified.

M
000312

Section 2 - Exposure controls

Laboratory activities	No other specific measures identified. Bulk transfers Dedicated facility
	No other specific measures identified.
Mixing operations (open systems)	No other specific measures identified.
Transfer from/pouring from containers	Manual Non-dedicated facility No other specific measures identified.
Drum/batch transfers	Dedicated facility No other specific measures identified.
Production of preparation or articles by tableting, compression, extrusion or pelletisation	No other specific measures identified.
Drum and small package filling	No other specific measures identified.
Equipment cleaning and maintenance	Drain down and flush system prior to equipment break-in or maintenance.
Storage	Store substance within a closed system.
Conditions and measures related to personal protection and hygiene	
Personal protection	See Section 8 of the safety data sheet (general health and safety measures). See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Website:	Not applicable.
Exposure estimation and reference to its source - Environment: 2: Formulation and (re)packing of substances and mixtures	
Exposure assessment (environment):	Not available.
Exposure estimation	The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.
Exposure estimation and reference to its source - Workers: 1: Formulation and (re)packing of substances and mixtures	
Exposure assessment (human):	Not available.
Exposure estimation	The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment	Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SPERC factsheet. Scaled local assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file - "Site-Specific Production" worksheet.
-------------	--

000313

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES**Health**

The CLP hazard statement H304: May be fatal if swallowed and enters airways (the DPD risk phrase R65: Harmful: may cause lung damage if swallowed) relates to potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is vomited following ingestion.

A DNEL (derived no effect levels) cannot be derived.

This general qualitative CSA (chemical safety assessment) approach aims to reduce/avoid contact or incidents with the substance.

However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.

Exposures should be controlled to at least the levels that represent an acceptable level of risk such that the implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the substance hazard is negligible, and the risk is considered to be controlled to a level of no concern.

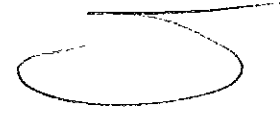
There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

For any substance, classifies as H304 (R65), these measures should be communicated via the safety data sheet by use of the following phrase: Do not ingest. If swallowed then seek immediate medical assistance.

000314

Identification of the substance or mixture

Product definition Mixture
 Product name Nytro Lyra X



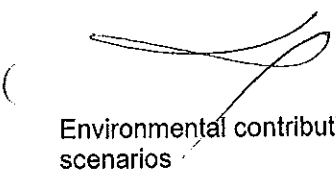
Section 1 - Title

Short title of the exposure scenario Manufacturer of substance- Industrial (Other Lubricant Base Oils, IP346<3%, H304)

List of use descriptors
Identified use name: Manufacture of substance - Industrial
Process Category: PROC01, PROC02, PROC03, PROC04, PROC08a, PROC08b, PROC15
Substance supplied to that use in form of: Substance
Sector of end use: SU03, SU08, SU09
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC04, ESVOC SpERC 1.1.v1
Market sector by type of chemical product: Not applicable.
Article category related to subsequent service life: Not applicable.

Environmental contributing scenarios **Manufacture of substance**

Health Contributing scenarios **Manufacture of substance**



Number of the ES	9.1.1b
Industry Association	Concawe 2012
Generic exposure scenario	01
Processes and activities covered by the exposure scenario	Manufacture of the substance or use as a process chemical or extraction agent within closed or contained systems. Includes incidental exposures during recycling/recovery, material transfers, storage, sampling, associated laboratory activities, maintenance and loading (including marine vessel/barge, road/rail car and bulk container).
Additional information	Industrial

Section 2 - Exposure controls

Product characteristics Substance is complex UVCB.. Predominantly hydrophobic

Amounts used
 Fraction of EU tonnage used in region 0.1
 Regional use tonnage 8.5E+5
 Fraction of Regional tonnage used locally 1
 Annual site tonnage 6.0E+5
 Maximum daily site tonnage 2.0E+6

Frequency and duration of use
 Continuous release
 Emission days 300

Environment factors not influenced by risk management
 Local freshwater dilution factor 10
 Local marine water dilution factor 100

Other given operational conditions affecting environmental exposure
 Release fraction to air from process (initial release prior to RMM) 1.0e-4
 Release fraction to wastewater from process (initial release prior to RMM) 1.0e-5
 Release fraction to soil from process (initial release prior to RMM) 0.0001

Technical conditions and measures at process level (source) to prevent release
 Common practices vary across sites thus conservative process release estimates used.

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil
 Risk from environmental exposure is driven by freshwater sediment.
 Prevent discharge of undissolved substance to or recover from onsite wastewater.
 If discharging to municipal sewage treatment plant, no on-site wastewater treatment required.

000315

Section 2 - Exposure controls

Risk management measures - Air	Treat air emission to provide a typical removal efficiency of 90
Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 84.8 If discharging to municipal sewage treatment plant, provide the required on-site wastewater removal efficiency of 0
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment 94.7 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs 94.7 Maximum allowable site tonnage (M _{safe}) based on release following total wastewater treatment removal 5.7E+6 Assumed on-site sewage treatment plant flow 10000
Conditions and measures related to external treatment of waste for disposal	During manufacturing, no waste of the substance is generated.
Conditions and measures related to external recovery of waste	During manufacturing, no waste of the substance is generated.

Contributing scenario controlling worker exposure for 0: Manufacture of substance	
Product characteristics	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in mixture or article	Covers percentage substance in the product up to 100% (unless stated differently).
Physical state	Liquid With potential for aerosol generation
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other given operational conditions affecting workers exposure	Operation is carried out at elevated temperature (> 20°C above ambient temperature) Assumes a good basic standard of occupational hygiene is implemented Aspiration hazard if swallowed. Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract. Aspiration of hydrocarbon substances can result in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death. This property relates to the potential for low viscosity material to spread quickly into the deep lung and cause severe pulmonary tissue damage. Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. Do not induce vomiting as there is high risk of aspiration. IF SWALLOWED: Immediately call a POISON CENTER or physician.
	Contributing scenarios - Operational conditions and risk management measures
	General exposures (closed systems) No other specific measures identified.
	General exposures (open systems) No other specific measures identified.
	Process sampling No other specific measures identified.
	Laboratory activities No other specific measures identified.
	Bulk transfers (Closed system) No other specific measures identified.
	Bulk transfers open systems

M
000318

Section 2 - Exposure controls

No other specific measures identified.

Equipment cleaning and maintenance
Drain down and flush system prior to equipment break-in or maintenance.

Bulk product storage
Store substance within a closed system.

Conditions and measures related to personal protection and hygiene

Personal protection

See Section 8 of the safety data sheet (general health and safety measures).
See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Website: Not applicable.

Exposure estimation and reference to its source - Environment: 2: Manufacture of substance

Exposure assessment (environment): Not available.

Exposure estimation The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Exposure estimation and reference to its source - Workers: 1: Manufacture of substance

Exposure assessment (human): Not available.

Exposure estimation The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SPERC factsheet. (<http://cefic.org/en/reach-for-industries-libraries.html>) Scaled local assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file - "Site-Specific Production" worksheet.

Health

The CLP hazard statement H304: May be fatal if swallowed and enters airways (the DPD risk phrase R65: Harmful: may cause lung damage if swallowed) relates to potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is vomited following ingestion.
A DNEL (derived no effect levels) cannot be derived.
This general qualitative CSA (chemical safety assessment) approach aims to reduce/avoid contact or incidents with the substance.
However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.
Exposures should be controlled to at least the levels that represent an acceptable level of risk such that the implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the substance hazard is negligible, and the risk is considered to be controlled to a level of no concern.
There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.
For any substance, classified as H304 (R65), these measures should be communicated via the safety data sheet by use of the following phrase: Do not ingest.

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

If swallowed then seek immediate medical assistance.

Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented.

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterisation.



000313

Identification of the substance or mixture

Product definition Mixture
 Product name Nytro Lyra X

Section 1 - Title

Short title of the exposure scenario Uses in Functional fluids - Industrial (Other Lubricant Base Oils, IP346<3%, H304)

List of use descriptors **Identified use name:** Functional Fluids - Industrial
Process Category: PROC01, PROC03, PROC08a, PROC08b, PROC02, PROC04, PROC09
Substance supplied to that use in form of: Substance
Sector of end use: SU03
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC07,
Market sector by type of chemical product: Not applicable.
Article category related to subsequent service life: Not applicable.

Environmental contributing scenarios **Functional Fluids**

Health-Contributing scenarios **Functional Fluids**

Number of the ES	9.37.1b
Industry Association	Concawe 2012
Generic exposure scenario	13a
Processes and activities covered by the exposure scenario	Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in industrial equipment including maintenance and related material transfers.
Additional information	Industrial

Section 2 - Exposure controls

Product characteristics Substance is complex UVCB. Predominantly hydrophobic

Amounts used Fraction of EU tonnage used in region 0.1
 Regional use tonnage 1.2E+3
 Fraction of Regional tonnage used locally 1
 Annual site tonnage 1.0E+1
 Maximum daily site tonnage 5.0E+2

Frequency and duration of use Continuous release
 Emission days 20

Environment factors not influenced by risk management Local freshwater dilution factor 10
 Local marine water dilution factor 100

Other given operational conditions affecting environmental exposure Release fraction to air from process (initial release prior to RMM) 5.0E-4
 Release fraction to wastewater from process (initial release prior to RMM) 1.0E-6
 Release fraction to soil from process (initial release prior to RMM) 0.001

Technical conditions and measures at process level (source) to prevent release Common practices vary across sites thus conservative process release estimates used.

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil Risk from environmental exposure is driven by freshwater sediment.
 Prevent discharge of undissolved substance to or recover from onsite wastewater.
 If discharging to municipal sewage treatment plant, no on-site wastewater treatment required.

Risk management measures - Air Treat air emission to provide a typical removal efficiency of 0

000319

Section 2 - Exposure controls

Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 64.4 If discharging to municipal sewage treatment plant, provide the required on-site wastewater removal efficiency of 0
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment 94.7 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs 94.7 Maximum allowable site tonnage (M _{safe}) based on release following total wastewater treatment removal 3.3E+3 Assumed on-site sewage treatment plant flow 2000
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.
Conditions and measures related to external recovery of waste	External recovery and recycling of waste should comply with applicable local and/or national regulations.

Contributing scenario controlling worker exposure for 0: Functional Fluids	
Product characteristics	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in mixture or article	Covers percentage substance in the product up to 100% (unless stated differently).
Physical state	Liquid With potential for aerosol generation
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other given operational conditions affecting workers exposure	Operation is carried out at elevated temperature (> 20°C above ambient temperature) Assumes a good basic standard of occupational hygiene is implemented Aspiration hazard if swallowed. Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract. Aspiration of hydrocarbon substances can result in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death. This property relates to the potential for low viscosity material to spread quickly into the deep lung and cause severe pulmonary tissue damage. Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. Do not induce vomiting as there is high risk of aspiration. IF SWALLOWED: Immediately call a POISON CENTER or physician.
Contributing scenarios - Operational conditions and risk management measures	
Bulk transfers - Closed system No other specific measures identified.	
Drum/batch transfers - Dedicated facility No other specific measures identified.	
Filling of articles/equipment - closed systems No other specific measures identified.	
Filling/preparation of equipment from drums or containers - Non-dedicated facility No other specific measures identified.	
General exposures (closed systems) No other specific measures identified.	
General exposures (open systems) - Elevated temperature Restrict area of openings to equipment. Provide extract ventilation to emission points when contact with warm (>50°C) lubricant is likely.	

0000-20

Section 2 - Exposure controls

Remanufacture of reject articles
No other specific measures identified.

Equipment cleaning and maintenance
Drain down system prior to equipment break-in or maintenance.

Storage
Store substance within a closed system.

Conditions and measures related to personal protection and hygiene

Personal protection See Section 8 of the safety data sheet (general health and safety measures).
See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Website: Not applicable.

Exposure estimation and reference to its source - Environment: 2: Functional Fluids

Exposure assessment (environment): Not available.

Exposure estimation The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Exposure estimation and reference to its source - Workers: 1: Functional Fluids

Exposure assessment (human): Not available.

Exposure estimation The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SPERC factsheet. (<http://cefic.org/en/reach-for-industries-libraries.html>) Scaled local assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file - "Site-Specific Production" worksheet.

Health

The CLP hazard statement H304: May be fatal if swallowed and enters airways (the DPD risk phrase R65: Harmful: may cause lung damage if swallowed) relates to potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is vomited following ingestion.
A DNEL (derived no effect levels) cannot be derived.
This general qualitative CSA (chemical safety assessment) approach aims to reduce/avoid contact or incidents with the substance.
However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.
Exposures should be controlled to at least the levels that represent an acceptable level of risk such that the implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the substance hazard is negligible, and the risk is considered to be controlled to a level of no concern.
There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

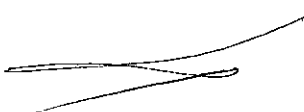
Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For any substance, classified as H304 (R65), these measures should be communicated via the safety data sheet by use of the following phrase: Do not ingest. If swallowed then seek immediate medical assistance.

Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented.

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterisation.



000322

Professional

Identification of the substance or mixture

Product definition Mixture
Product name Nytro Lyra X

Section 1 - Title

Short title of the exposure scenario Uses in Functional fluids - Professional (Other Lubricant Base Oils, IP346<3%, H304)

List of use descriptors
Identified use name: Functional Fluids - Professional
Process Category: PROC01, PROC02, PROC03, PROC08a, PROC09, PROC20
Substance supplied to that use in form of: Substance
Sector of end use: SU22
Subsequent service life relevant for that use: No.
Environmental Release Category: ERC09a, ERC09b, ESVOC SpERC 9.13b.v1
Market sector by type of chemical product: Not applicable.
Article category related to subsequent service life: Not applicable.

Environmental contributing scenarios **Functional Fluids**

Health Contributing scenarios **Functional Fluids**

Number of the ES	9.38.1b
Industry Association	Concawe 2012
Generic exposure scenario	13b
Processes and activities covered by the exposure scenario	Use as functional fluids e.g. cable oils, transfer oils, coolants, insulators, refrigerants, hydraulic fluids in professional equipment including maintenance and related material transfers.
Additional information	Professional

Section 2 - Exposure controls

Product characteristics Substance is complex UVCB. Predominantly hydrophobic

Amounts used
 Fraction of EU tonnage used in region 0.1
 Regional use tonnage 1.2E+3
 Fraction of Regional tonnage used locally 1
 Annual site tonnage 6.0E-1
 Maximum daily site tonnage 1.6E+0

Frequency and duration of use
 Continuous release
 Emission days 365

Environment factors not influenced by risk management
 Local freshwater dilution factor 10
 Local marine water dilution factor 100

Other given operational conditions affecting environmental exposure
 Release fraction to air from process (initial release prior to RMM) 0.05
 Release fraction to wastewater from process (initial release prior to RMM) 0.025
 Release fraction to soil from process (initial release prior to RMM) 0.025

Technical conditions and measures at process level (source) to prevent release
 Common practices vary across sites thus conservative process release estimates used.

Technical on-site conditions and measures to reduce or limit discharges, air emissions and releases to soil
 Risk from environmental exposure is driven by freshwater sediment.
 If discharging to municipal sewage treatment plant, no on-site wastewater treatment required.

Risk management measures - Air
 Treat air emission to provide a typical removal efficiency of N/A

000323

Section 2 - Exposure controls

Risk management measures - Water	Treat on-site wastewater (prior to receiving water discharge) to provide the required removal efficiency of 64.9 If discharging to municipal sewage treatment plant, provide the required on-site wastewater removal efficiency of 0
Organisational measures to prevent/limit release from site	Do not apply industrial sludge to natural soils. Sewage sludge should be incinerated, contained or reclaimed.
Conditions and measures related to municipal sewage treatment plant	Estimated substance removal from wastewater via on-site sewage treatment 94.7 Total efficiency of removal from wastewater after on-site and off-site (municipal treatment plant) RMMs 94.7 Maximum allowable site tonnage (M _{safe}) based on release following total wastewater treatment removal 1.1E+1 Assumed on-site sewage treatment plant flow 2000
Conditions and measures related to external treatment of waste for disposal	External treatment and disposal of waste should comply with applicable local and/or national regulations.
Conditions and measures related to external recovery of waste	External recovery and recycling of waste should comply with applicable local and/or national regulations.

Contributing scenario controlling worker exposure for 0: Functional Fluids	
Product characteristics	Liquid, vapour pressure < 0.5 kPa at STP
Concentration of substance in mixture or article	Covers percentage substance in the product up to 100% (unless stated differently).
Physical state	Liquid With potential for aerosol generation
Frequency and duration of use	Covers daily exposures up to 8 hours (unless stated differently)
Other given operational conditions affecting workers exposure	Operation is carried out at elevated temperature (> 20°C above ambient temperature) Assumes a good basic standard of occupational hygiene is implemented Aspiration hazard if swallowed. Aspiration means the entry of a liquid substance directly into the trachea and lower respiratory tract. Aspiration of hydrocarbon substances can result in severe acute effects such as chemical pneumonitis, varying degree of pulmonary injury or death. This property relates to the potential for low viscosity material to spread quickly into the deep lung and cause severe pulmonary tissue damage. Classification of a hydrocarbon substance for aspiration hazard is made on the basis of reliable human evidence or on the basis of physical properties. Do not induce vomiting as there is high risk of aspiration. IF SWALLOWED: Immediately call a POISON CENTER or physician.
Contributing scenarios - Operational conditions and risk management measures	
Bulk transfers - Closed system No other specific measures identified.	
Drum/batch transfers - Dedicated facility No other specific measures identified.	
Filling of articles/equipment - closed systems No other specific measures identified.	
Filling/preparation of equipment from drums or containers - Non-dedicated facility No other specific measures identified.	
General exposures (closed systems) No other specific measures identified.	
General exposures (open systems) - Elevated temperature Restrict area of openings to equipment. Provide extract ventilation to emission points when contact with warm (>50°C) lubricant is likely.	

Section 2 - Exposure controls

Remanufacture of reject articles
No other specific measures identified.

Equipment cleaning and maintenance
Drain down system prior to equipment break-in or maintenance.

Storage
Store substance within a closed system.

Conditions and measures related to personal protection and hygiene

Personal protection See Section 8 of the safety data sheet (general health and safety measures).
See Section 8 of the safety data sheet (personal protective equipment).

Section 3 - Exposure estimation and reference to its source

Website: Not applicable.

Exposure estimation and reference to its source - Environment: 2: Functional Fluids

Exposure assessment (environment): Not available.

Exposure estimation The Hydrocarbon Block Method has been used to calculate environmental exposure with the Petrorisk model.

Exposure estimation and reference to its source - Workers: 1: Functional Fluids

Exposure assessment (human): Not available.

Exposure estimation The ECETOC TRA tool has been used to estimate workplace exposures unless otherwise indicated.

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

Environment

Guidance is based on assumed operating conditions which may not be applicable to all sites; thus, scaling may be necessary to define appropriate site-specific risk management measures. Required removal efficiency for wastewater can be achieved using onsite/offsite technologies, either alone or in combination. Required removal efficiency for air can be achieved using on-site technologies, either alone or in combination. Further details on scaling and control technologies are provided in SPERC factsheet. (<http://cefic.org/en/reach-for-industries-libraries.html>) Scaled local assessments for EU refineries have been performed using site-specific data and are attached in PETRORISK file - "Site-Specific Production" worksheet.

Health

The CLP hazard statement H304: May be fatal if swallowed and enters airways (the DPD risk phrase R65: Harmful: may cause lung damage if swallowed) relates to potential for aspiration, a non-quantifiable hazard determined by physico-chemical properties (i.e. kinematic viscosity) that can occur during ingestion and also if it is vomited following ingestion.
A DNEL (derived no effect levels) cannot be derived.
This general qualitative CSA (chemical safety assessment) approach aims to reduce/avoid contact or incidents with the substance.
However, implementation of risk management measures (RMMs) and operational conditions (OCs) need to be proportional to the degree of concern for the health hazard presented by the substance.
Exposures should be controlled to at least the levels that represent an acceptable level of risk such that the implementation of the chosen RMMs will ensure that the likelihood of an event occurring due to the substance hazard is negligible, and the risk is considered to be controlled to a level of no concern.
There are no routine anticipated exposures by ingestion related to any supported uses of the substance. The risk arising from aspiration hazard is solely related to the physico-chemical properties of the substance. The risk can therefore be controlled by implementing risk management measures tailored to this specific risk.

Section 4 - Guidance to DU to evaluate whether he works inside the boundaries set by the ES

For any substance, classified as H304 (R65), these measures should be communicated via the safety data sheet by use of the following phrase: Do not ingest. If swallowed then seek immediate medical assistance.

Predicted exposures are not expected to exceed the DN(M)EL when the risk management measures/operational conditions outlined in section 2 are implemented.

Where other risk management measures/operational conditions are adopted, then users should ensure that risks are managed to at least equivalent levels.

Available hazard data do not enable the derivation of a DNEL for dermal irritant effects. Available hazard data do not support the need for a DNEL to be established for other health effects. Risk management measures are based on qualitative risk characterisation.



Nytro Lyra X



SAFETY DATA SHEET

Date of printing	2016-02-19
Date of issue/ Date of revision	2016-02-19
Date of previous issue	2015-09-17
Version	2

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier

Product name	Nytro Lyra X
Product description	Insulating oil
Product type	Liquid.
MARPOL Annex 1	Oils

1.2 Identified uses

Identified uses

Use in formulations in lubricants- Industrial
 Use as lubricant in open and closed systems - Professional
 Distribution of substance - Industrial
 Formulation and (re)packing of substances and mixtures - Industrial
 Manufacture of substance - Industrial
~~Functional Fluids - Industrial~~
~~Functional Fluids - Professional~~

Uses advised against

This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the supplier.

Reason

-

1.3 Details of the supplier of the safety data sheet

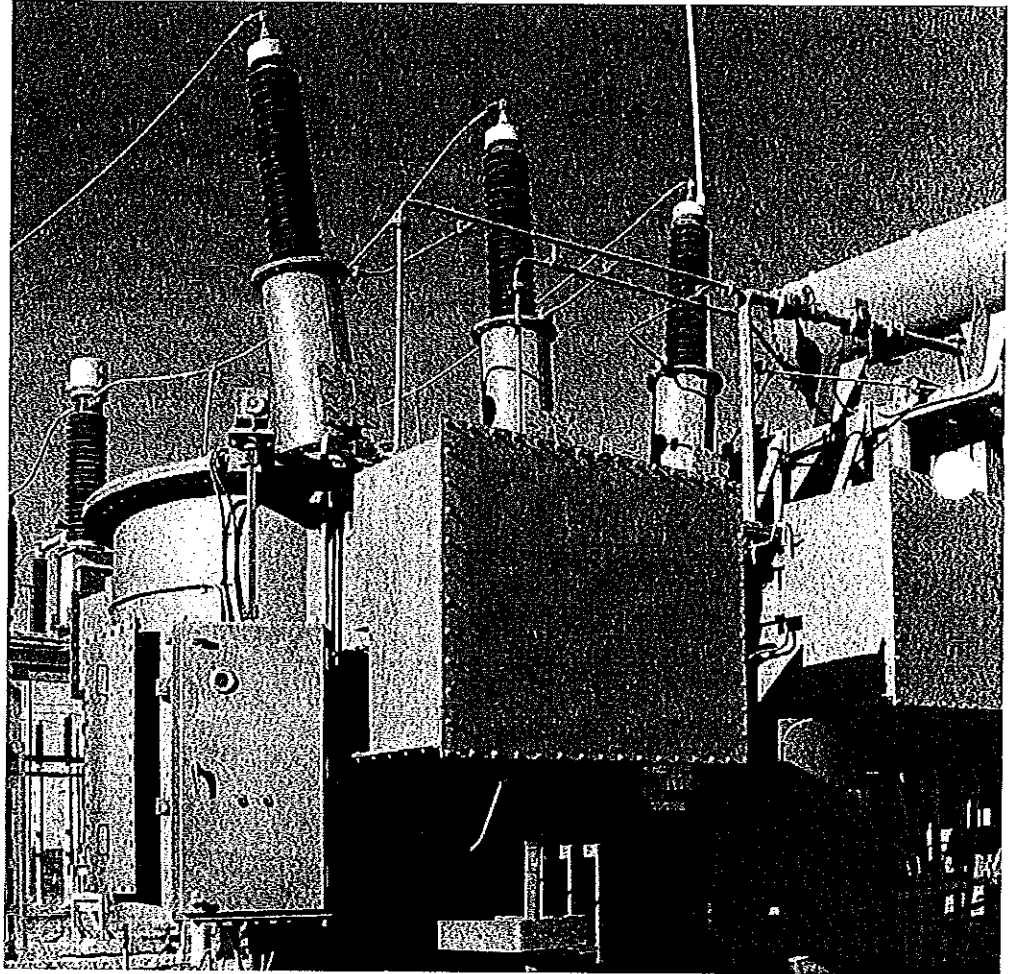
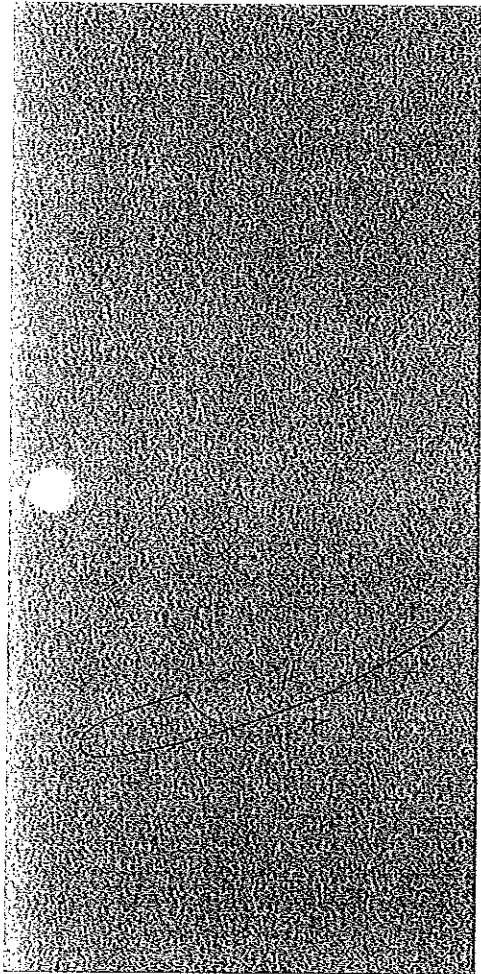
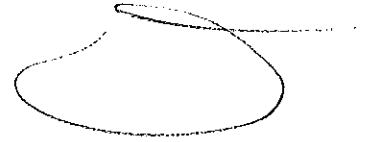
Supplier/Manufacturer	Head office: Nynas AB P.O. Box 10700 SE-121 29 Stockholm SWEDEN +46 8 602 12 00 (Office hours 8 am - 4.30 pm (CET)) www.nynas.com
-----------------------	---

e-mail address of person responsible for this SDS	ProductHSE@nynas.com
---	----------------------

1.4 Emergency telephone number

Telephone number	+44 (0) 1235 239 670
Hours of operation	24 hour service
<u>National advisory body/Poison Centre</u>	
Telephone number	020 - 99 60 00 (Kemiakuten, 24h service)

000327



LumaSMART

Fluoroptic-Based Winding Hot Spot Temperature Sensor for Generation, Transmission and Distribution Transformers

LumaSMART is the fifth generation Fluoroptic®-based thermometry system from LumaSense. By providing direct and real-time winding hotspot measurements, utilities can:

- Implement Dynamic Loading
- Extend the Life of Transformers
- Reduce Costly Failures
- Maximize Safe Performance



Exceptional Reliability and Accuracy in Winding Hot Spots Temperature Monitoring

LumaSense Technologies' LumaSMART winding hot spot temperature system is the most advanced and reliable real-time monitoring solution available today. LumaSense is the leader in Fluoroptic® (FOT) Technology, with decades of proven expertise. The LumaSMART FOT hot spot monitoring systems provide accurate, real-time temperature readings for protection and control of your critical power transformer assets.

LumaSense's PFA teflon-jacketed Fluoroptic probes are considered the standard in the industry. Featuring five-layer protection in their fiber optic encapsulation for 99% installation success, they are specially designed to withstand harsh environments without deteriorating physically or affecting the accuracy of the temperature measurement.

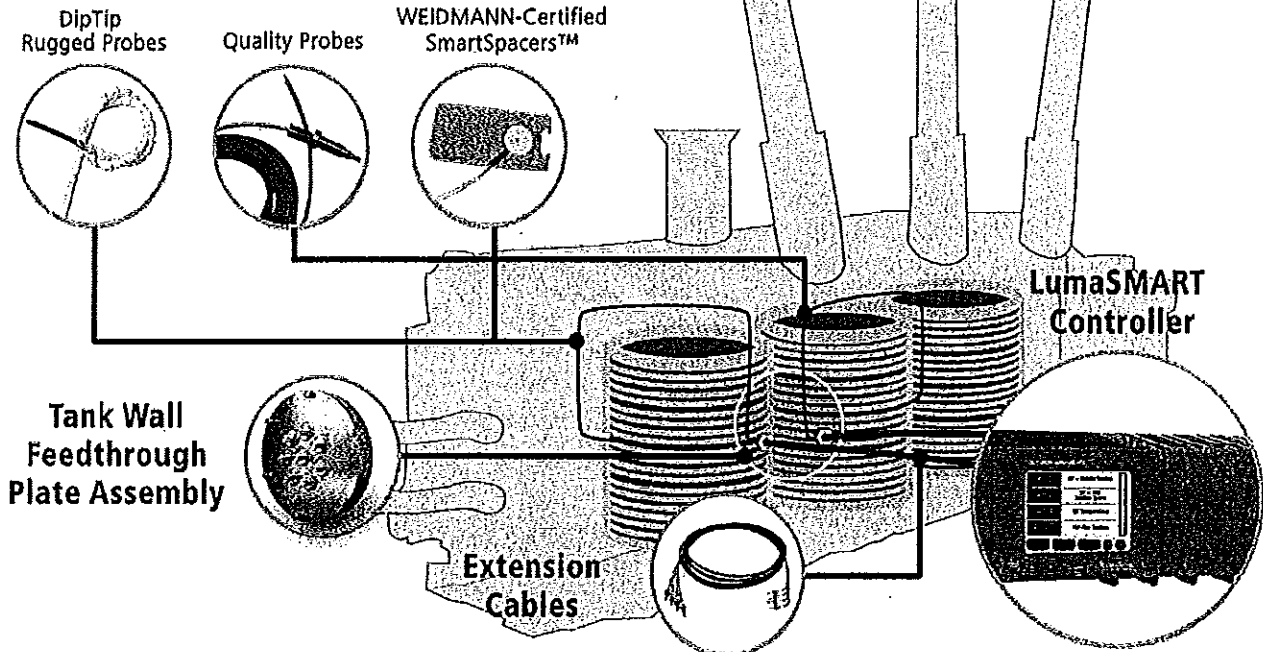
LumaSense Technologies' LUXTRON brand is the world leader in fiber optic temperature measurement in transformers. With more than 30 years of fiber optic experi-

ence, LumaSense continues to lead the way in innovation of new, robust technology.

Measuring Hot Spot Winding Temperature
Transformers often take the brunt of an overload condition. Monitoring the transformer winding hot spot is critical to safeguard your transformer from damage and extend its usage. Transformer life is directly related to the life of the internal paper insulation. The insulating paper's life is directly affected by its exposure to high temperature. The highest temperature on the windings is the Winding Hot Spot, where the insulating paper will deteriorate first. Conventional methods simulate or calculate this temperature, but do not accurately measure it. The only true way of knowing the actual temperature is through real-time fiber optic measurement. Our reliable, accurate monitors quickly detect and respond to hot spot conditions, triggering alarms and relays to protect your most valuable assets.

Smart Grid Power Transformer Hot Spots Temperature Monitoring

Multi-Layer Teflon-Jacketed, Kevlar-Wrapped Fiber Optic Probes

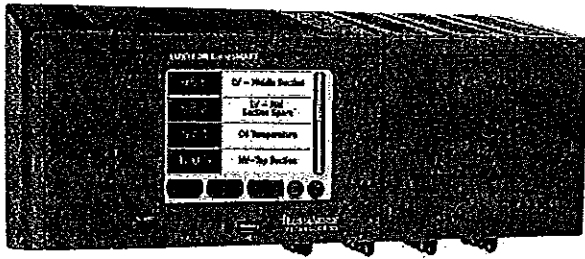


The Multi-Channel Controller System Should Include:

- LumaSMART Multi-Channel Smart Controller
- Fluoroptic Probes
 - Quality Probes
 - DipTip Rugged Probes
- Extension Cables
 - Single Fiber Extension
 - Four-Fiber Extension
- Tank Wall Feedthrough Plate Assembly
 - Stainless Steel Bolted Plate
 - Individual Tank Wall Feedthroughs
- Optional Accessories
 - NEMA 4 Enclosure
 - WEIDMANN-Certified SmartSpacers™
 - NEMA 12 Tank Wall Cover Box
 - Internal and External Plug Assemblies
 - LUXTRON 812 Handheld Unit

000329

The LumaSMART Controller

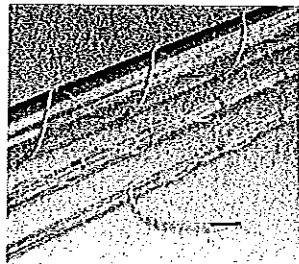


LumaSense Technologies' LumaSMART controller is the newest innovation from the leader in FOT technology. Building on the proven performance of the ThermAsset2, this monitor provides all of the capabilities of its predecessor while adding smart grid capabilities, an innovative touch screen and extended channel and relay capabilities.

- Easily adaptable to user-specific needs with 4 to 16 channels and 0, 8 or 16 Form-C programmable relays
- $\pm 2^{\circ}\text{C}$ accuracy over the entire temperature range for the life of transformer with no calibration
- No drift, no calibration required
- Analog outputs and Modbus, DNP3, ASCII and IEC61850 communication capability standard
- RS-232C and RS-485, Ethernet and USB serial outputs
- Light source lasts the life of the transformer
- Interactive touch screen display for alarms, notifications and set-up
- Equipped with 2GB standard data storage for transformer lifetime memory storage
- On-board diagnostics troubleshooting guidance

Fiber Optic Probes

The measurement performance of LUXTRON probes exceeds common temperature sensors in environments with high voltage, radio frequency interference (RFI), electromagnetic interference (EMI) or corrosive and above boiling point liquids. Our robust probes are designed for ease of installation and have a greater than 99% installation success rate.

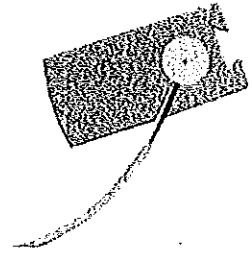


- Industry standard LUXTRON Quality Probes™ and DipTip Rugged Probes™
- Viton O-ring connector for protection against leaks
- PFA Teflon®-jacketed design with Kevlar® construction
- Immune to RF and EMI and Electrically Non-Conductive
- Most robust, well-built fiber optic probes on the market
- Insulated with five layers for superior protection
- DipTip Rugged Probes don't require double installations

- Dielectrically tested to ensure safe, accurate performance
- Chemically inert and compatible with many aggressive chemicals
- Intrinsically safe, stable and drift-free
- Available in various lengths (1m to 16m standard)

WEIDMANN-Certified SmartSpacers™

Our sensor tips can be supplied with WEIDMANN-certified SmartSpacers. All WEIDMANN-certified components including adhesives and assemblies meet strict manufacturing process controls and are shipped with a certificate of compliance outlining that the component has met the five-part WEIDMANN certification process. Available with LumaSense DipTip Rugged Probes™.



Extensions

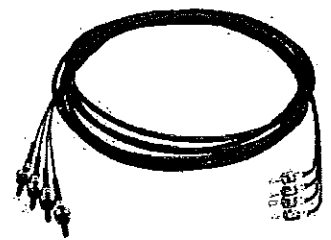
LumaSense offers multiple fiber optic extensions options to connect the probes from the tank wall plate to the instrument.

Single Fiber Extension

- Hard Clad Silica fiber jacketed in PVC and Kevlar®
- Available in lengths of 5, 10, 15 or 20 meters or custom lengths by request up to 50 meters
- SMA connector includes Viton O-ring for protection against leaks

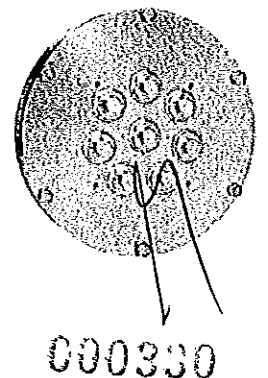
Four-Fiber Extension

- Four fiber cable subunits and a central Kevlar® strength member in one PVC outer jacket
- Each subunit features Hytrel® and Kevlar® over Hard Clad Silica fiber
- Available in lengths of 5, 10, 15 or 20 meters or custom lengths by request up to 50 meters
- Viton O-ring connectors for protection against leaks
- Available in low temperature construction also



Tank Wall Plate Assembly

LumaSense provides welded tank wall feedthrough plate assemblies. Each tank wall plate features our proprietary welded feedthroughs on a stainless steel plate, with a carbon steel backing ring and Viton O-ring for maximum protection against leaks.



Technical Data

Performance

Number of Channels	4 to 16 (in increments of 2)
Temperature Range	-30 to 230°C
Accuracy	±2°C over entire temperature range for life of transformer without calibration
Display Response Time	1 sec
Measurement Resolution	0.1°C
Precision	±0.5°C
Light Source Life Span	Life of the transformer
EMI/RFI Susceptibility	Complete immunity

Interface

Display	5.7-inch interactive touch screen
Probe Signal Strength Readout	Accessible for all channels
Diagnostics	On-board self diagnostics and troubleshooting guide

Environmental Specifications

Operating Temperature	-30 to 70°C
Storage Temperature	-35 to 75°C

Communication

Analog Output	Choice of 4-20mA or 0-1mA
Serial Output	RS-232C and RS-485, Ethernet, USB
Relays	0, 8 or 16 Form-C programmable relays
System Status Relay	1 Form-C relay
Communications	Modbus ASCII, Modbus RTU, DNP3.0, ASCII and IEC61850 Standard
Probes	Accepts LUXTRON Rugged and Quality Probes
Data Storage	2 GB of data at 1 minute intervals on all channels, as well as error codes and relay statuses. Retains approximately 40 years of data.

Electrical

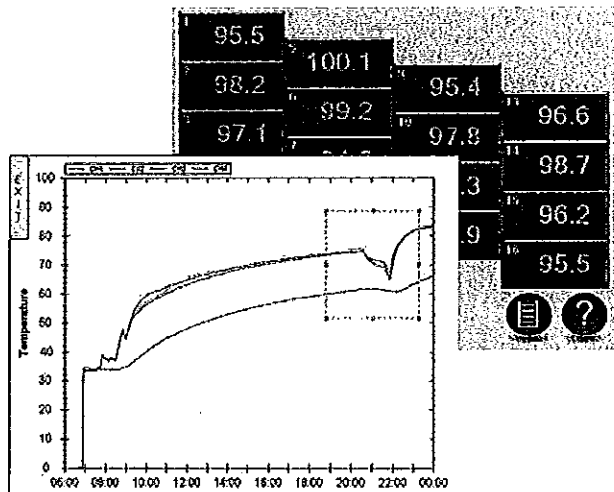
Input Power	90 to 264 VAC or 127 to 370 VDC, 47 to 63 Hz
Surge Protection	4000V (IEEE C37.90.1-2002)
Consumption	108 W (maximum)

Physical

Mounting	Rack, panel or wall mount available
----------	-------------------------------------

Innovative On-Board Software

The LumaSMART's innovative on-board software gives a color-coded visual display of all connected probes. Using the touch screen exclusively offered by LumaSense, you can customize channel labels, configure alarms and relays and download data logs. In addition, the diagnostic feature allows you to easily test your configured relay settings by simulating alarm conditions. Our software also allows for trending and data analysis of temperatures measured.



LumaSense Technologies

Americas and Australia
Sales & Service
Santa Clara, CA
Ph: +1 800 631 0176
Fax: +1 408 727 1677

Europe, Middle East, Africa
Sales & Service
Frankfurt, Germany
Ph: +49 69 97373 0
Fax: +49 69 97373 167

India
Sales & Support Center
Mumbai, India
Ph: +91 22 67419203
Fax: +91 22 67419201

Awakening Your 6th Sense

China
Sales & Support Center
Shanghai, China
Ph: +86 133 1182 7766
Fax: +86 21 5877 2383

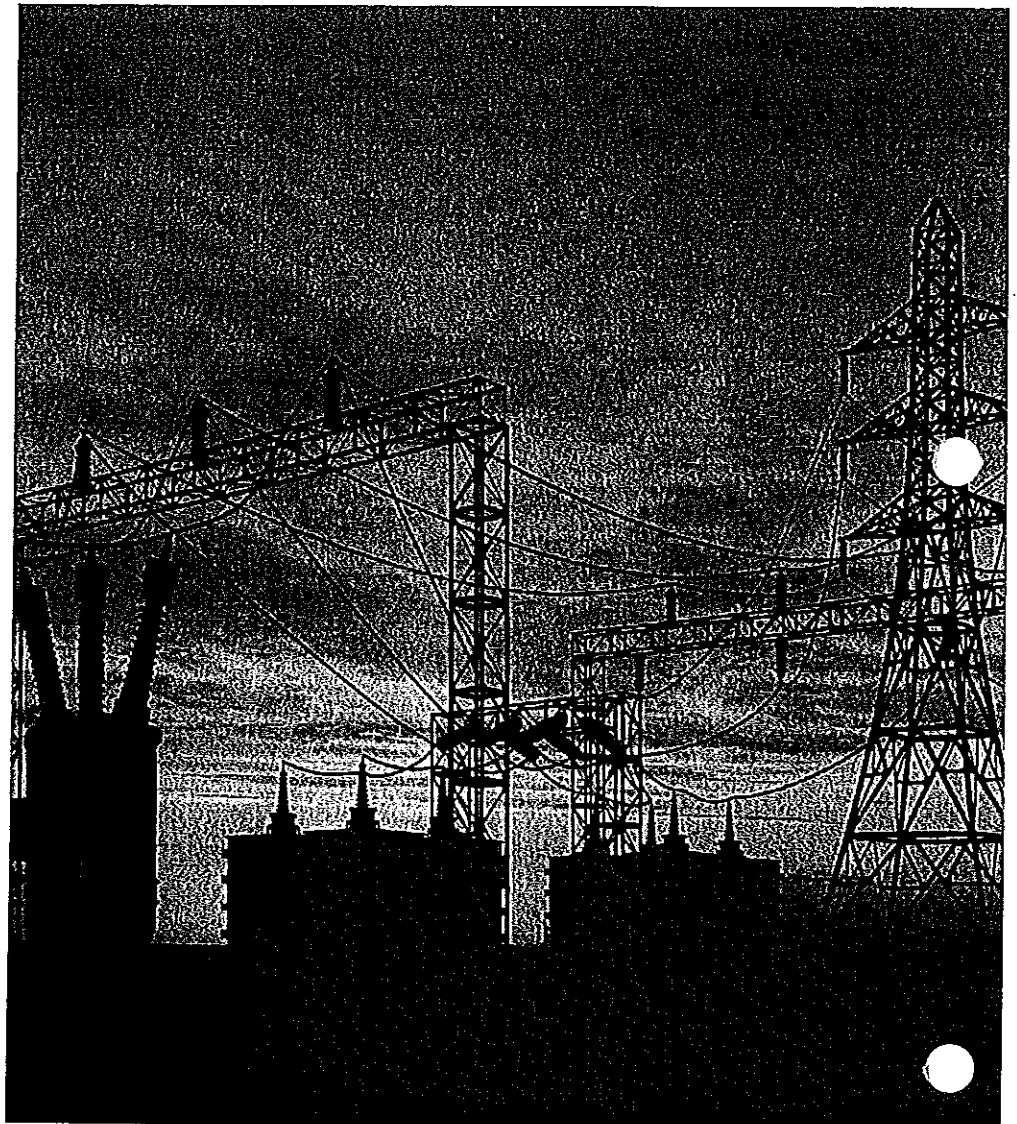
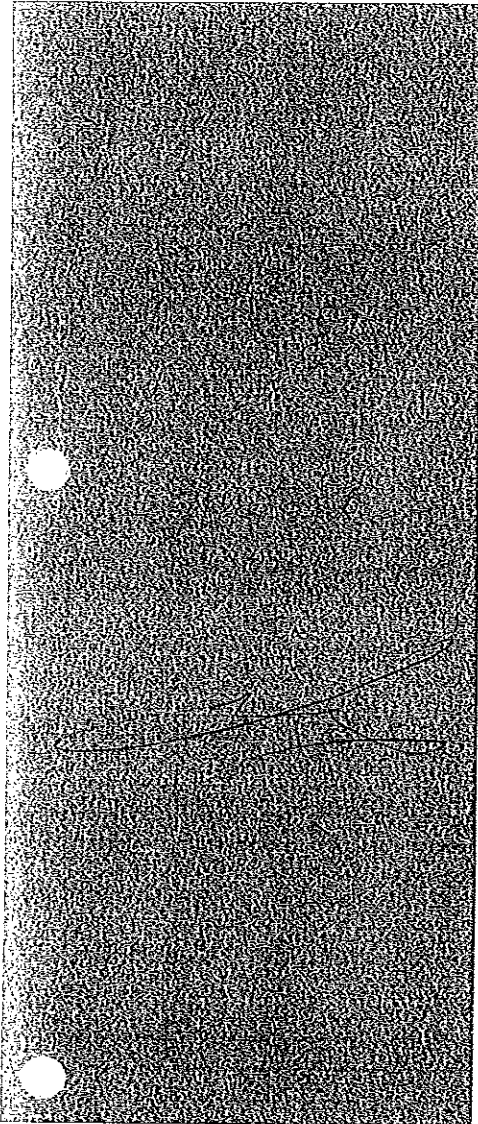
info@lumasenseinc.com

LumaSense Technologies, Inc., reserves the right to change the information in this publication at any time.

www.lumasenseinc.com
©2013 LumaSense Technologies. All rights reserved.
LumaSMART Brochure Rev. 09/03/13

000331

5



SmartDGA® Monitoring Solutions

Cost-effective and accurate gas detection solutions based on Non-Dispersive Infrared (NDIR) sensor technology to measure fault gases in transformers or load tap changers (LTCs)

- Identify potential faults prior to failures and reduce unplanned outages and associated cost
- Reduce the number and frequency of LTC maintenance cycles, thereby increasing uptime and maximum efficiency of the LTC
- Proactively investigate premature aging or the cause of faults of a transformer

000332

Protect critical assets through comprehensive analysis of transformer fault conditions with online SmartDGA® monitors

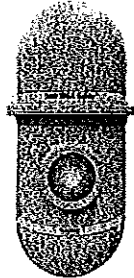
SmartDGA® Instruments

The SmartDGA® family of instruments is the industry's most cost effective Dissolved Gas Analysis (DGA) solution, designed to be the most flexible and to provide the best user experience available.

Each model has been designed using state-of-the-art Non-Dispersive Infrared (NDIR) technology. The continuous online DGA values reported by the SmartDGA® instrument quickly identify potential fault conditions through monitoring of key gas levels, rates, and ratios.

Each SmartDGA® package includes the instrument, mounting hardware, connection cable, the SmartDGA EZHub™ unit, and SmartDGA Viewer Software.

- **SmartDGA Gauge™** is the industry's first dedicated online Load Tap Changer (LTC) condition monitor. The Gauge measures and records Methane, Acetylene, and Ethylene plus moisture to assess LTC health.
- **SmartDGA Guard™** provides a cost effective early warning monitoring system of potential transformer failures. The Guard measures and records Hydrogen, Acetylene, Carbon Dioxide, and Carbon Monoxide plus moisture to provide an early diagnostics tool.
- **SmartDGA Guide™** provides comprehensive online DGA results that enable diagnostic techniques. The Guide measures and reports nine (9) DGA gases plus moisture in an instrument that vastly reduces total cost of ownership of an online monitoring system.

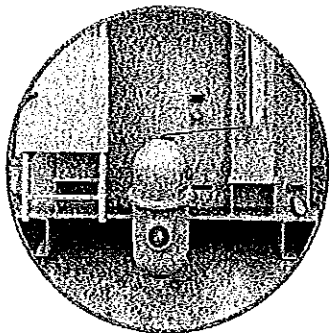


Key Functional Features

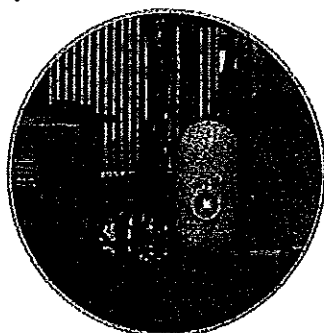
- Versatile mounting configurations – including single and dual valve mount. Inline mounting is available for LTC filter system or non-valve mounting for a transformer.
- Extremely cost effective – total cost of ownership is a fraction of the cost of other instruments and installation can be accomplished in just hours.
- No consumables, carrier gases, or scheduled calibration required.
- Sunlight visible indicators for Caution, Warning, and Alarm conditions. Status Relay notification and corrective action triggering to ensure optimal system operations.
- Communications supported via all major protocols common in the electric power industry such as Modbus RTU, DNP 3.0, and IEC 61850 with the optional iCore.

40+ Years of Experience with NDIR

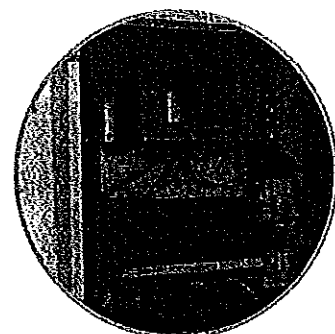
With over 40 years of experience, LumaSense is the industry leader in the use of Non-Dispersive Infrared (NDIR) technologies and has deployed thousands of systems in the field. Our ANDROS® brand pioneered NDIR gas analysis for automotive emissions and patient monitoring. This NDIR technology is the heart of our suite of SmartDGA® products.



Industry leading installation options including on-transformer installation of a full nine gas monitor using a single valve.



Mount the instrument anywhere using the compact off-transformer mounting kit when space at the transformer is limited or policy prohibits direct mounting to the transformer.

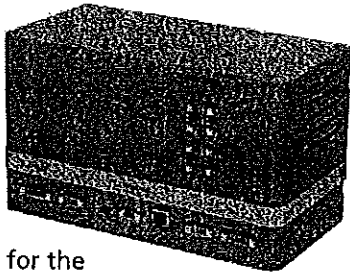


Separate supporting electronics can be mounted up to 30 meters away in a separate enclosure. This allows for a compact sensor that can be conveniently mounted anywhere.

000333

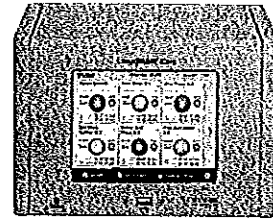
SmartDGA EZHub™

The SmartDGA EZHub™ unit is the central intelligence for the SmartDGA® system. A fully configured unit is capable of handling the power and communication needs for the SmartDGA® system. The EZHub can support a Gauge instrument for the LTC and a Guard or Guide instrument for the transformer. All interface functions and interconnects are provided in the EZHub device as well as internal memory, and four (4) relays with bright LED indicators to indicate Caution, Warning, and Alarm gas level, rate, and ratio conditions. The fourth relay provides status information on the SmartDGA system itself.



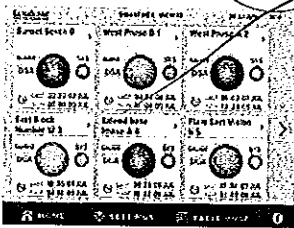
LumaSMART iCore™ (Optional)

The LumaSmart iCore™ controller provides a local interactive touch screen display of DGA data collected from the SmartDGA EZHub™ using the DGA Viewer™ software. The DGA Viewer™ software allows for on-site viewing of DGA data collected from the SmartDGA® instruments. The software provides a local means to set and create operational levels for caution, warning and alarm conditions. Additionally, the LumaSmart iCore™ device provides communications to external systems using RS485 or Ethernet. Each LumaSmart iCore™ device enables connectivity to multiple EZHub™ units (up to a maximum of 4 using either the Ethernet or RS485 connection).

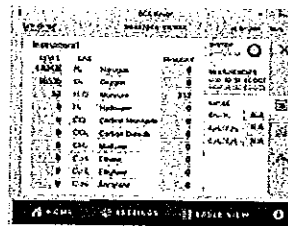


DGA Viewer™ software

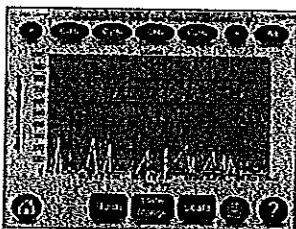
The DGA Viewer™ software allows users to configure systems using various set-up tools and view data being captured by the SmartDGA® instrument.



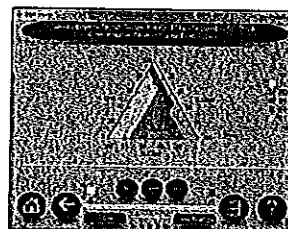
DGA Dashboard
The DGA Viewer™ software displays all connected instruments with status as well as the last and next sampling times.



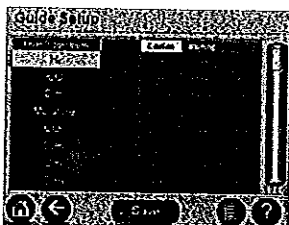
Details Screen
Review Gas levels and PPM/day as well as Ratios in a single screen. The last and next measurement date and times are also visible.



Trends
The Trends screen displays all detected gases via a trend graph over a user-selectable period of time. Each gas can be individually displayed or all 9 gases can be displayed at once.



Duval Triangle
Visual diagnostic tool divided into fault zones based on the types of electrical and thermal faults as defined in Duval triangle type 1 and 2 for transformers and LTCs respectively.



Device Configuration
Customized gas detection levels of Caution, Warning, and Alarm values. Included are user-configurable settings for each gas Rate of Change detection levels. Ratio setpoint activation is also available.

000334

SmartDGA™ System Technical Data

Instrument Specifications

NDIR Gas Phase Sensor Accuracy	± 5% or ± LDL, whichever is greater
Reporting Rate	Every 24 hours - default, user selectable from approximately 3 hours to 7 days.
Measurement Range	Minimum value is the lower detectable limit, maximum value is the upper limit of accurate response
Moisture Accuracy	± 3 ppm or ± 2% RS
Oil Pressure	up to 45 psig (3 bar)
Enclosure Rating	IP 55
Sunlight visible Indicators for condition codes	<ul style="list-style-type: none"> • Green - Normal • Yellow - Caution • Blue - Warning • Red - Alarm • Red/Blue - System Status Error • Green/Yellow - Loss of Communication
Note: Indicators normally flash on for 5 seconds, off for 15 seconds	

Environmental

	SmartDGA® Instrument	SmartDGA EZHub™	LumaSMART iCore™
Operating Temperature*	-50 to 55 °C	-50 to 55 °C	-40 to 70 °C
Storage Temperature	-50 to 70 °C	-50 to 70 °C	-40 to 75 °C
Storage Humidity (non-condensing)	1-99% RH	1-99% RH	1-99% RH
Dimensions (L x H x D)	20.9" x 8.6" dia.	10.3" x 5.7" x 6"	8.7" x 7.4" x 6.6"
Weight	~18.74 lbs	6.61 lbs	11.02 lbs

Standards Compliance

The SmartDGA system underwent thorough testing and complies with the following standards.

Emissions / Immunity	EN 61000-6-5 (2001) EN 61000-6-4 (2007) +A1 EN 61000-3-2 (2006) +A1 EN 61000-3-3 (2008)
Environmental / Vibration	ETSI EN 300 019-2-4
Surge Protection	4000V (IEEE C37.90.1-2002)

Standard Accessories (included in system price)

- Mounting Hardware - includes single valve, dual valve or off transformer installation kit
- Connection Cable - 10 m standard (additional lengths and cold weather options available)
- DGA Viewer™ software

SmartDGA® Instrument Gas Measurements (Min-Max)

Gas	Gauge	Guard	Guide
Acetylene (C ₂ H ₂)	0.5-50,000 ppm	0.5-10,000 ppm	0.5-10,000 ppm
Ethylene (C ₂ H ₄)	2-50,000 ppm		2-50,000 ppm
Carbon Monoxide (CO)		10-10,000 ppm	10-10,000 ppm
Moisture (RS)	1-99%	1-99%	1-99%
Hydrogen (H ₂)		5-10,000 ppm	5-10,000 ppm
Carbon Dioxide (CO ₂)		10-20,000 ppm	10-20,000 ppm
Methane (CH ₄)	2-50,000 ppm		2-50,000 ppm
Ethane (C ₂ H ₆)			2-20,000 ppm
Oxygen (O ₂)			500-50,000 ppm
Nitrogen (N ₂)			5,000-100,000 ppm

EZHub™ & LumaSMART iCore™ Specifications

Power Supplied to EZHub & iCore	90 ~ 264 VAC, 127 ~ 370 VDC, 47 ~ 63 Hz, 6.5 A max
Power Supplied to Instrument	48 VDC ~ 4.16 A max
Memory	Up to 40+ years worth of data storage available with optional iCore
Data Export (Available with EZHub and iCore/PC)	Export of results to date in a single file onto a USB memory stick. When using iCore/PC, user can select date range; when using EZHub port, all data is exported
Available Communications (Available with EZHub)	Proprietary communications via RS485 and Ethernet connections to DGA Viewer software
Optional Communications (ModBus available with PC, others available with iCore)	IEC61850 Edition 2, DNP3 IEEE Std 1815-2012, ModBus RTU V1.02, ModBus TCP/IP 1.0b protocols for up to 3 EZHubs
EZHub Alarm Contacts	(3) programmable relay outputs (Type C, NO/NC) for caution, warning, & alarm (1) alarm relay output for system status (Type C, NO/NC)
Relay Contact Ratings	Single phase alarm relays (8 A, 250 VAC; 5 A, 30 VDC)

Optional Accessories

- LumaSMART iCore™ controller
- NEMA4x Enclosure (for SmartDGA EZHub™ and/or iCore)

*For operating temperatures less than -20 °C, the cold weather cable is required. Additional heating of oil transfer lines may be required for operation in cold locations. The unit will generate a system fault if the mineral oil temperature is outside of standard fluid limits of -20 and 120 °C. For operating in environments where the temperature routinely exceeds 40 °C, the high temperature accessory is recommended to prevent premature aging and reduction of component lifetime. Temperatures are based upon air temperatures for unit installation in shaded location.

LumaSense Technologies

Americas and Australia
Sales & Service
Santa Clara, CA
Ph: +1 800 631 0176
Fax: +1 408 727 1677

Europe, Middle East, Africa
Sales & Service
Frankfurt, Germany
Ph: +49 69 97373 0
Fax: +49 69 97373 167

India
Sales & Support Center
Mumbai, India
Ph: +91 22 67419203
Fax: +91 22 67419201

China
Sales & Support Center
Shanghai, China
Ph: +86 133 1182 7766
Fax: +86 21 5877 2383

info@lumasenseinc.com

LumaSense Technologies, Inc., reserves the right to change the information in this publication at any time.

Awakening Your 6th Sense

www.lumasenseinc.com

©2017 LumaSense Technologies. All rights reserved.
SmartDGA Brochure-EN - Rev. 03/31/2017

000355

(

(



RESEARCH, DEVELOPMENT AND
TESTING NATIONAL INSTITUTE
FOR ELECTRICAL ENGINEERING



LIT

ICMET CRAIOVA
ROMANIA
HIGH VOLTAGE LABORATORY - LIT

200515 Craiova, Calea Bucuresti 144
Phone: 0351 - 404888, 404889, 0351 - 402425, Fax: 0251 - 415482; 0351 - 404890

TEST REPORT
No.41265 / 18.09.2007

1. Product: Power transformer type : TMPY - ONAN / ONAF 50 / 66 MVA;

161 ± 8 x 1.25% / 34.5 kV; Connee. Y_{ND} - 11

- Serial no. I12931 -

2. Tests: Dielectric test after short - circuit tests

- I - Lightning impulse test full wave
- II - Separate-source voltage withstand test
- III - Induced AC voltage test
- IV - Measurement of partial discharges

3. Test order: 20622 / 14.09.2007 (Contract no.3260 / 16.01.2007)

4. Producer: Hyundai Heavy Industries Co. BULGARIA

5. Customer: Hyundai Heavy Industries Co. BULGARIA

6. Customer's address: 41, ROJEN Blvd., 1271 SOFIA BULGARIA

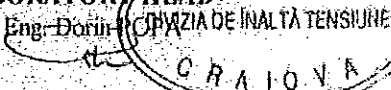
7. Test responsible: Eng. I. Badea (I)

Eng. M. Florea (II, III)

Eng. T. Nicoară (IV)

Test Supervisor
Eng. A. Ungureanu

APPROVED
LABORATORY HEAD
Eng. Dorin



TEST WITNESSED BY,
Eng. Stoil Stoilov - Manager QA
Eng. Matey Mateev (HHI-B)

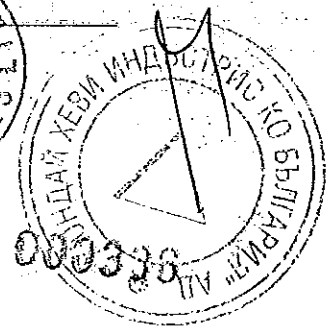
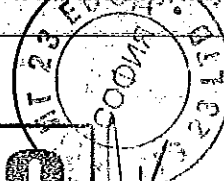
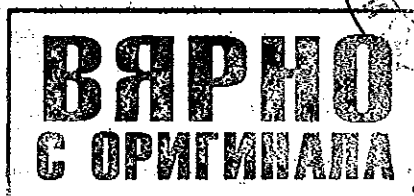
8. The test report contains 16 pages.

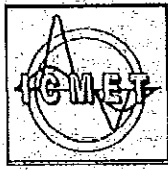
9. The test report was edited in 4 ex.; 1 ex. to LIT and 3 ex. to customer.

CAUTION:

- a. The test result makes reference only to tested product.
- b. Integral reproduction of the test report is forbidden.
- c. Any part of this test report may be reproduced only with the accord of LIT and RENAR.
- d. Reports without original signatures are not valid.
- e. Laboratory accreditation or any of its test reports elaborated in accreditation conditions not constitute or imply themselves, an approval of product by RENAR, which has accredited the test laboratory, or by any other organization.

© ICMET Craiova 2007





LIT

TEST REPORT No. 41265
TRANSFORMER No. 11293 I

page 2

I - LIGHTNING IMPULSE TEST

1. Reception product date: 17.09.2007
2. Atmospheric conditions: $p = 1006 \text{ mbar}$; $t = 18,7 \text{ }^\circ\text{C} \pm 0,2 \text{ }^\circ\text{C}$; $h = 49,8 \%$
3. Test standard: IEC 60076-3 / 2000, clause 13
4. Rated lightning impulse withstand voltages:

Test date: 17.09.2007

Tested terminal	Full wave (KV)	Wave- shape (μs)
a, b, c	170	1,2 / 50
N	325	0,84+13 / 50
A, B, C	650	1,2 / 50

5. Equipment and apparatus used:

Parameters of impulse generator and voltage divider used: Impulse generator 4.2 MV

Tested terminal	Parameters of impulse generator				Divider ratio K_{div}
	Stages number	C_s [μF]	R_s [Ω]	R_p [Ω]	
a, b, c	1x8	4,608	41	32,9	348
N	3x	0,192	141	345	1042
A, B, C	5x1	0,115	117,5	805	1741,8

Addenda: C_s - equivalent capacity of impulse generator; R_s - equivalent serial resistance of impulse generator; R_p - equivalent parallel resistance of impulse generator

Measuring system : - Capacitive divider of impulse generator 4.2 MV and digital measuring system type TR-AS 100-10/4, serial no. 241, channels 3 and 4.

6. Terminal connections of the tested object:

Tested terminal	Earthed terminals		Free terminals	
	Direct	Trough resistors [Ω]		
N	a, b, c	A, B, C (0,5)	-	Fig.1
A	B, C, a, b, c	N (0,5)	-	Fig.2
a	N, A, B, C	a, b (0,015)	-	Fig.3

Notes:

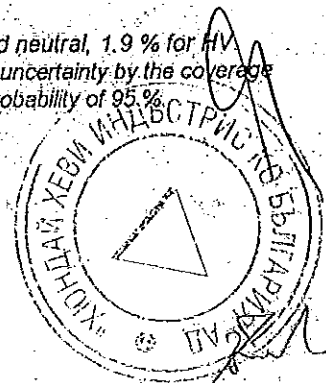
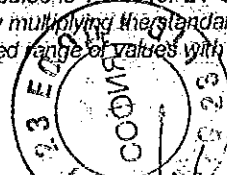
1. During the test, core, frame and tank and terminals of current transformers were connected to earth.
2. During the tests the tap changer was on following position. N - A, a, b, c - 1; B - 9; C - 17
3. Wave-forms of voltage impulse during the tests were inside of the limits prescribed by the test norms.

The picture of test set-up are presented on the page 16.

Measuring uncertainty for the peak value of lightning impulse is 1,7 % for LV and neutral, 1,9 % for HV. The uncertainty stated is expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. The value of measurand lies within the assigned range of values with probability of 95 %.

7. Conclusion: The product passed the test.

**ВЯРНО
С ОРИГИНАЛА**



000337



Fig.1 - HV winding neutral terminal testing circuit diagram for LI

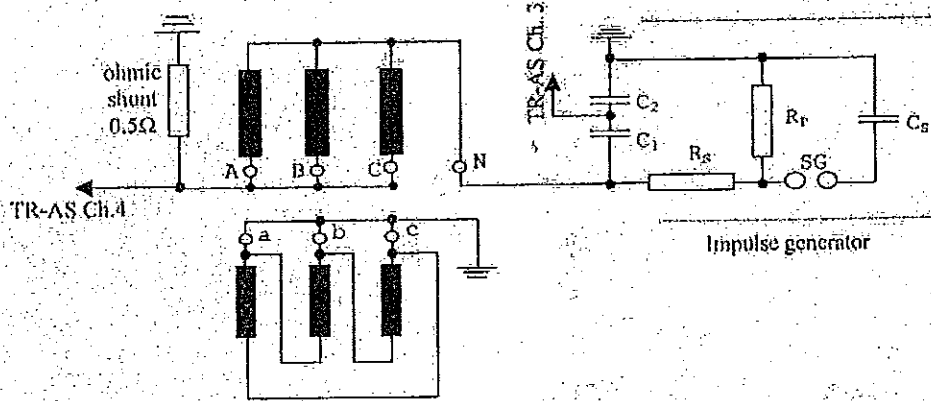


Fig. 2 - HV winding line terminals testing circuit diagram for LI

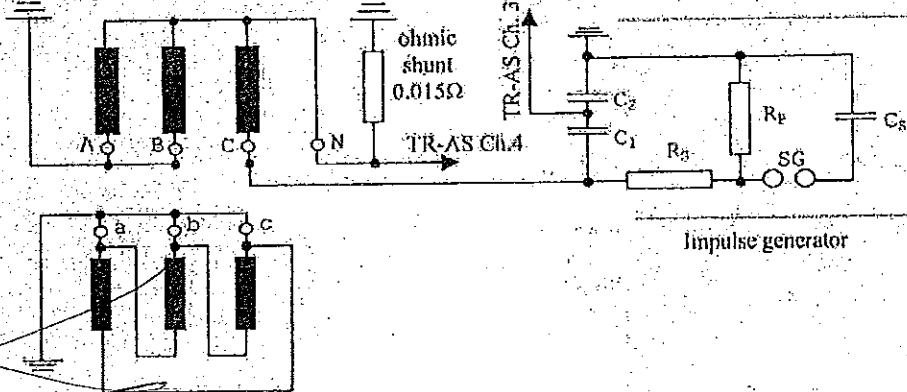
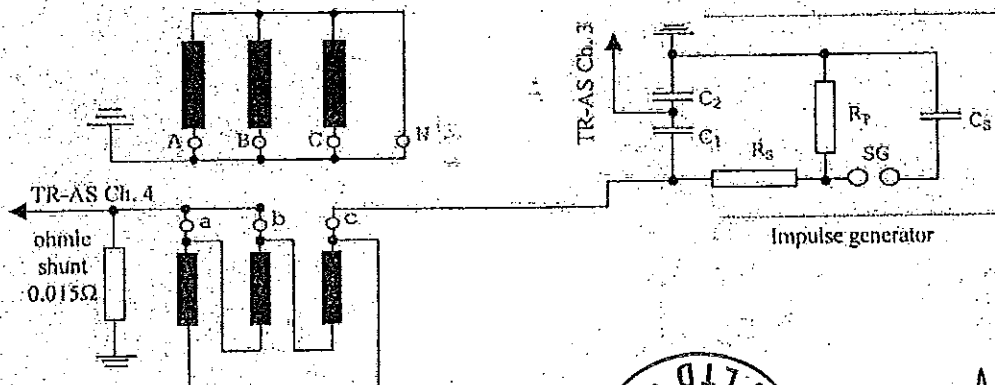


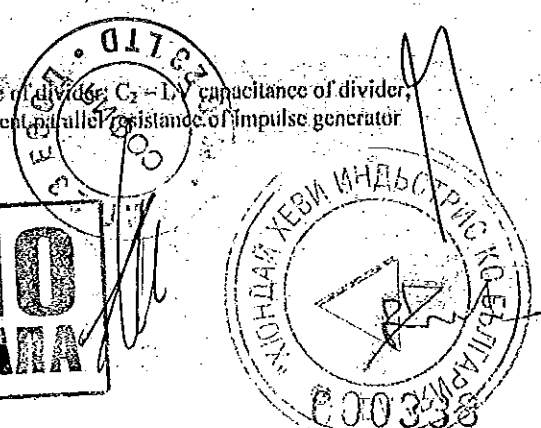
Fig.3 - LV winding line terminals testing circuit diagram for LI



Legend:

C_s - equivalent capacity of impulse generator; C_1 - HV capacitance of divider; C_2 - LV capacitance of divider;
 R_s - equivalent serial resistance of impulse generator; R_p - equivalent parallel resistance of impulse generator
 K_{div} - divider ratio; SG - sphere-gap

**ВЕРНО
С ОРИГИНАЛОМ**



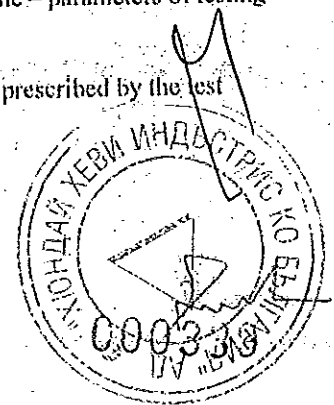
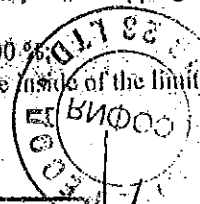


LIT

Recorded oscillograms					
No.	Up [kV]	T1 [μ s]	T2 [μ s]	Tc [μ s]	Step / Phase / Winding
177127	- 85.7	1.16	55.8		RFW/a/LV
177128	- 166	1.13	55.7		FW1/a/LV
177129	- 169	1.13	55.9		FW2/a/LV
177130	- 170	1.13	55.7		FW3/a/LV
177131	- 85.8	1.15	55.8		RFW/b/LV
177132	- 169	1.13	56.0		FW1/b/LV
177133	- 170	1.13	56.0		FW2/b/LV
177134	- 170	1.13	55.9		FW3/b/LV
177135	- 85.1	1.14	55.9		RFW/c/LV
177136	- 170	1.12	56.1		FW1/c/LV
177137	- 169	1.12	55.9		FW2/c/LV
177138	- 170	1.13	56.1		FW3/c/LV
177140	- 164	7.03	47.0		RFW/N/HV
177141	- 319	7.04	47.1		FW1/N/HV
177142	- 325	6.89	47.0		FW2/N/HV
177143	- 324	7.01	47.0		FW3/N/HV
177145	- 327	1.42	52.8		RFW/A/HV
177146	- 645	1.40	53.0		FW1/A/HV
177147	- 651	1.39	52.9		FW2/A/HV
177148	- 648	1.41	53.0		FW3/A/HV
177149	- 325	1.43	51.3		RFW/B/HV
177150	- 647	1.43	51.6		FW1/B/HV
177151	- 650	1.43	51.7		FW2/B/HV
177152	- 651	1.42	51.5		FW3/B/HV
177153	- 329	1.46	48.8		RFW/C/HV
177154	- 647	1.45	49.0		FW1/C/HV
177155	- 653	1.44	48.9		FW2/C/HV
177156	- 651	1.45	48.9		FW3/C/HV

- Notes: 1. Up-peak value a testing voltage; T1 -- front; T2 -- tail; Tc-- chopping time -- parameters of testing impulse wave
 2. RFW-reduced full wave 50-75 %; FW-full wave 100 %
 3. Wave forms of voltage impulse during the tests were inside of the limits prescribed by the test norms.

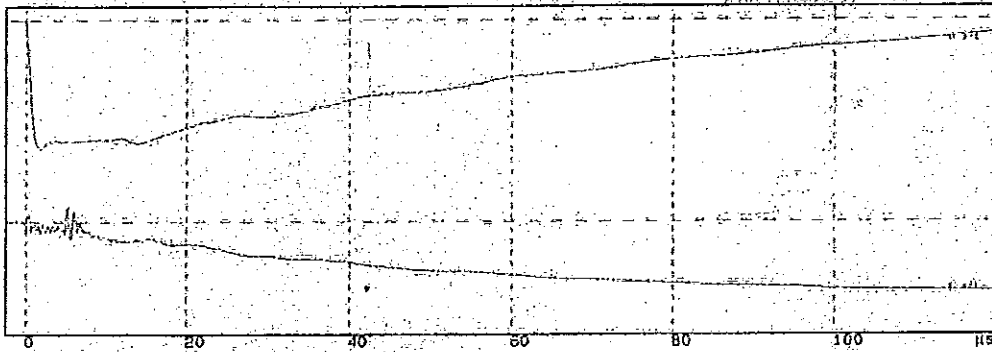
**ВЯРНО
С ОРИГИНАЛА**



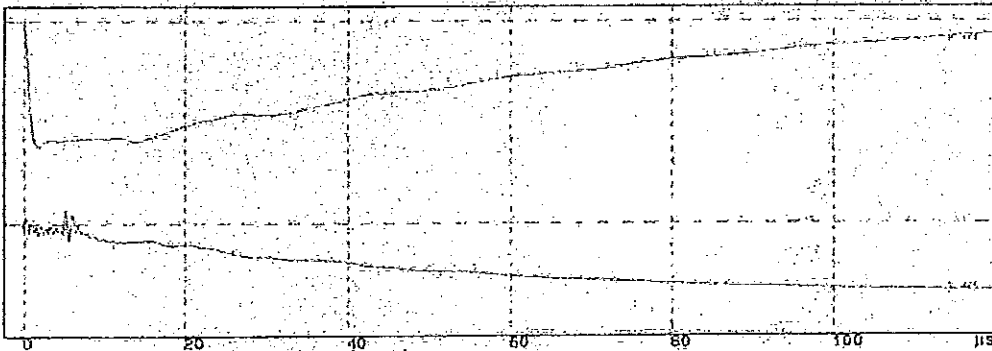


LIT

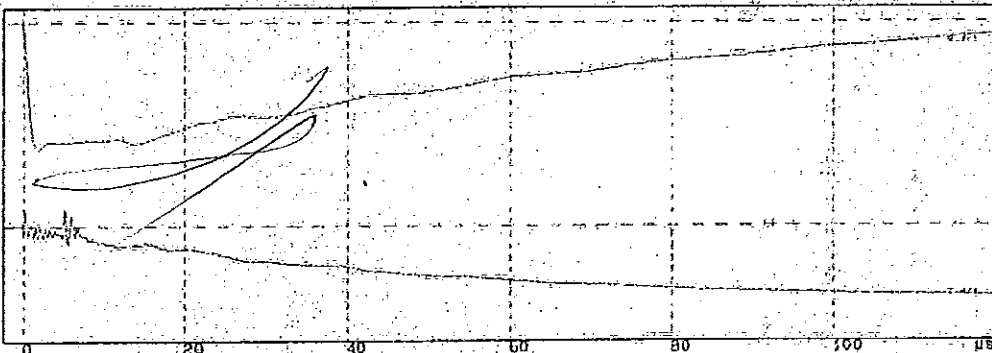
TEST REPORT No. 41265
TRANSFORMER No. 112931



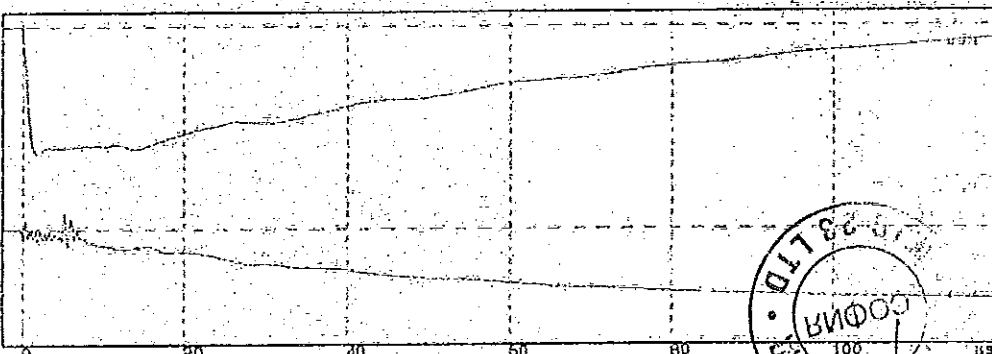
No. 177127
 17.09.2007 14:29:41
 FMW/8/LY
 K3: U LI
 Up = -05.57 kV
 T1 = 1.10 μs
 T2 = 55.8 μs
 K4: I
 I = -0.014 kA



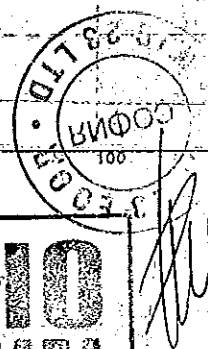
No. 177128
 17.09.2007 14:38:44
 FM1/3/LY
 K3: U LI
 Up = -166 kV
 T1 = 1.13 μs
 T2 = 55.7 μs
 K4: I
 I = -1.77 kA



No. 177129
 17.09.2007 14:40:44
 FM2/4/LY
 K3: U LI
 Up = -169 kV
 T1 = 1.13 μs
 T2 = 55.9 μs
 K4: I
 I = -1.20 kA



No. 177130
 17.09.2007 14:41:55
 FM3/5/LY
 K3: U LI
 Up = -170 kV
 T1 = 1.13 μs
 T2 = 55.7 μs
 K4: I
 I = -1.61 kA

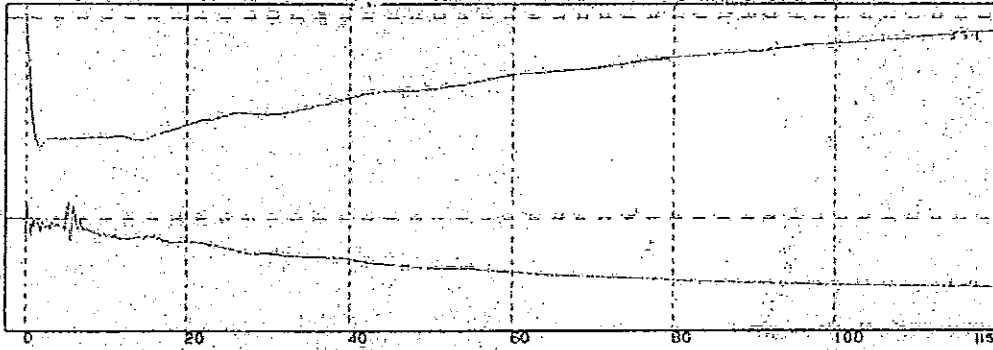


**ВЯРНО
С ОРГИНАЛА**

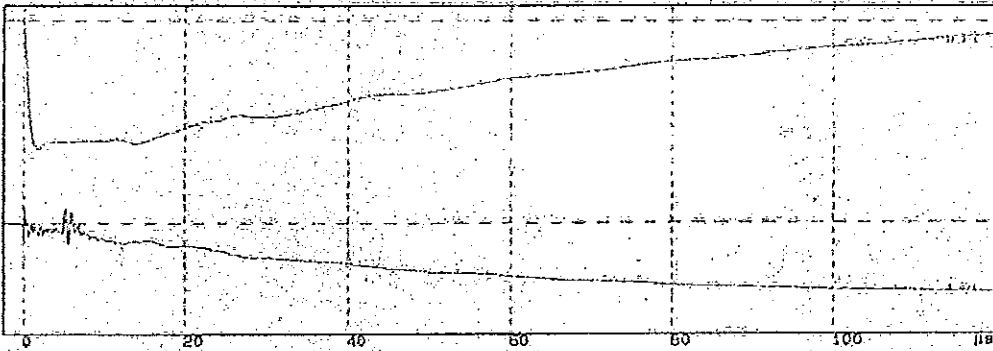
000340



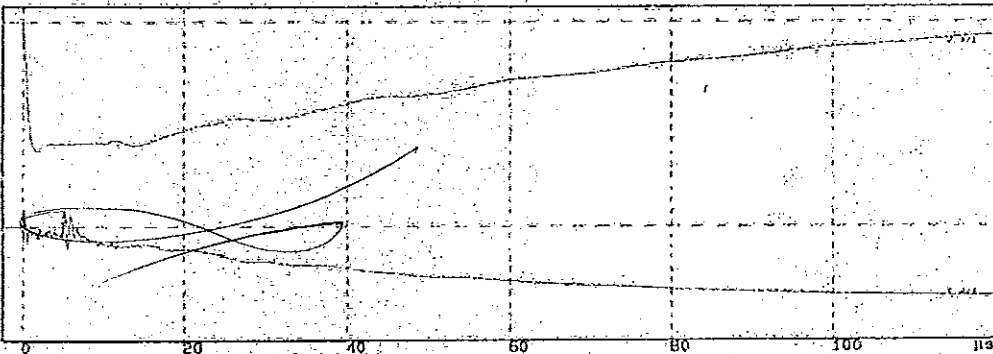
TEST REPORT No. 41265
TRANSFORMER No. 112931



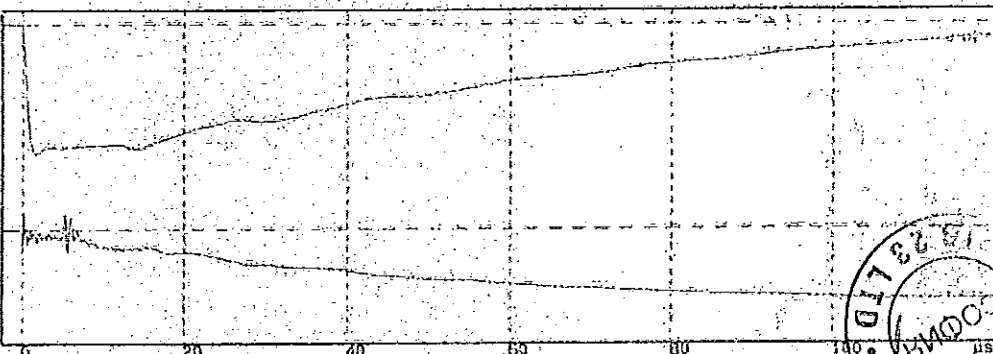
No. 177131
17.09.2007 14:50:43
FW4/6/LV
K3: U LI
Up= -05.8 kV
T1= 1.15 us
T2= 55.8 us
K4: I
I= -0.817 kA



No. 177132
17.09.2007 14:52:22
FW1/6/LV
K3: U LI
Up= -169 kV
T1= 1.13 us
T2= 55.0 us
K4: I
I= -1.83 kA

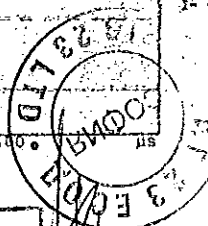


No. 177133
17.09.2007 14:53:08
FW2/6/LV
K3: U LI
Up= -170 kV
T1= 1.13 us
T2= 55.0 us
K4: I
I= -1.03 kA



No. 177134
17.09.2007 14:53:52
FW3/6/LV
K3: U LI
Up= -170 kV
T1= 1.13 us
T2= 55.8 us
K4: I
I= -1.83 kA

**ВЯРНО
С ОПРИМКА**

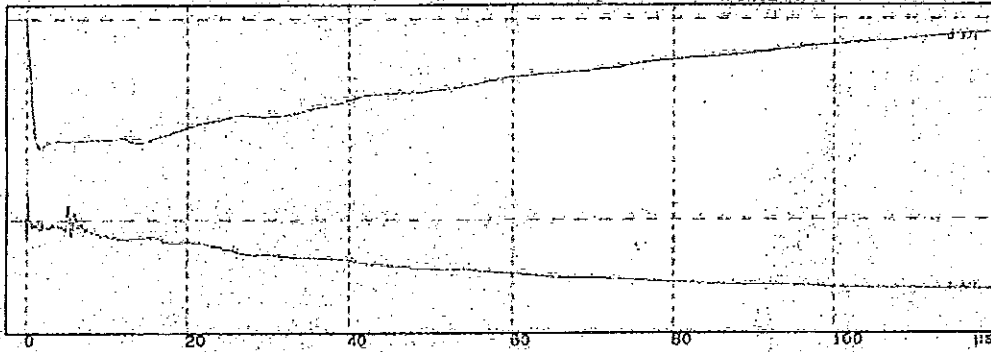




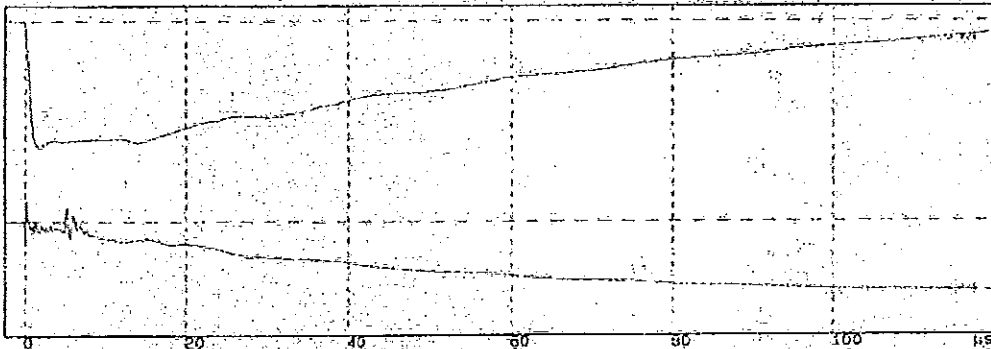
TEST REPORT No. 41265
TRANSFORMER No. 112931



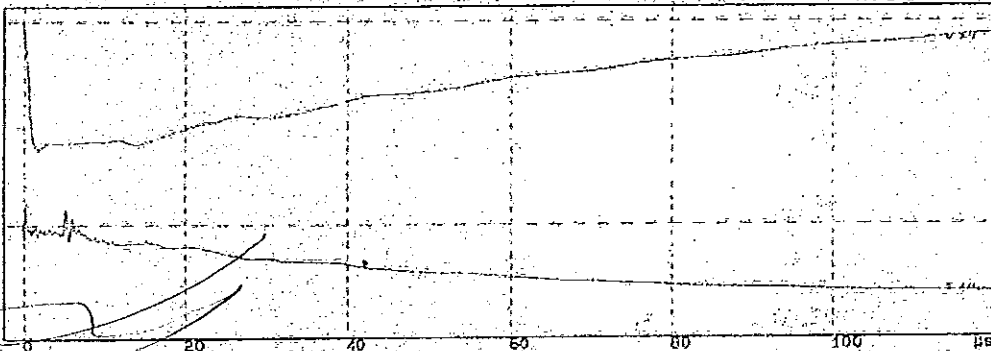
LIT



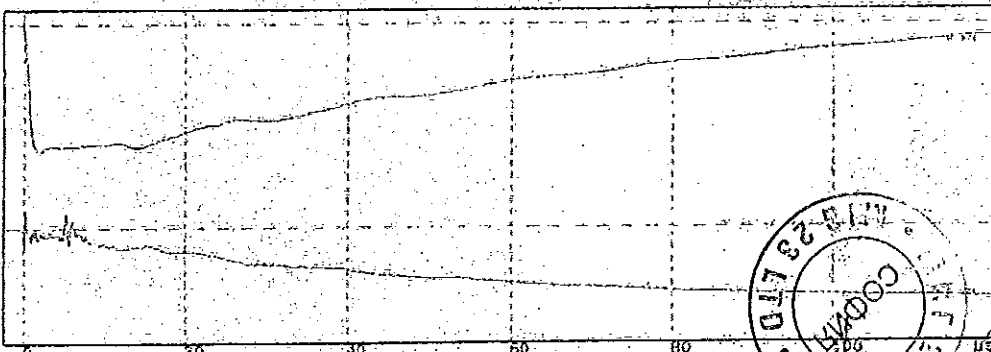
No. 177135
17.09.2007 15:03:22
F41/c/LV
K3: U LI
U_p = -65.1 kV
T₁ = 1.14 µs
T₂ = 55.9 µs
K4: I
I = -0.012 kA



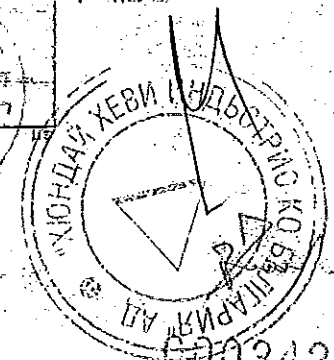
No. 177136
17.09.2007 15:05:08
F41/c/LV
K3: U LI
U_p = -170 kV
T₁ = 1.13 µs
T₂ = 56.1 µs
K4: I
I = -1.00 kA



No. 177137
17.09.2007 15:05:50
F42/c/LV
K3: U LI
U_p = -109 kV
T₁ = 1.12 µs
T₂ = 55.8 µs
K4: I
I = -1.30 kA



No. 177138
17.09.2007 15:06:35
F43/c/LV
K3: U LI
U_p = -170 kV
T₁ = 1.13 µs
T₂ = 56.1 µs
K4: I
I = -1.00 kA

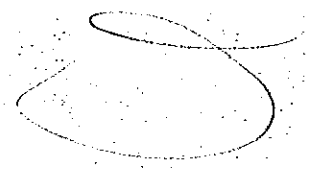


**ВЯРНО
С ОРГИНАЛА**

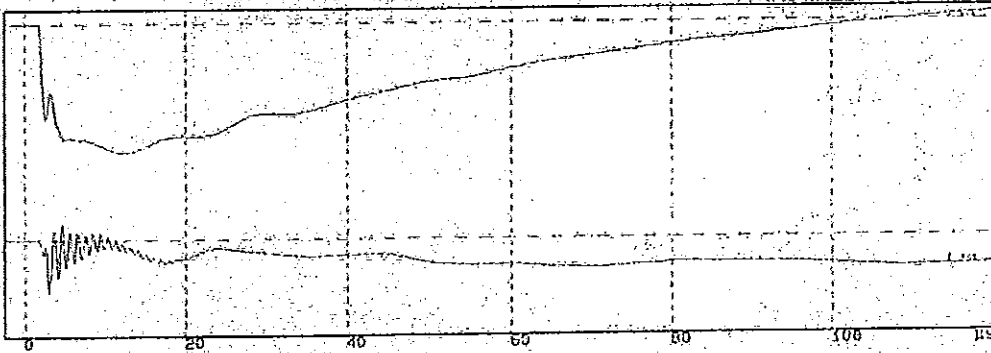
000342



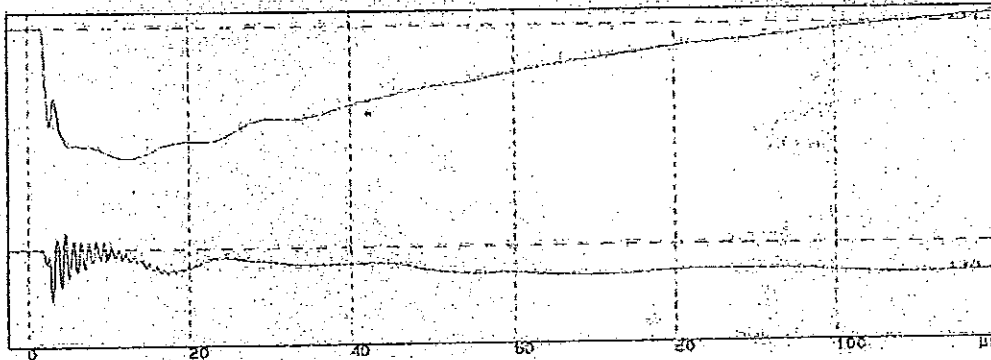
TEST REPORT No. 41265
TRANSFORMER No. 112931



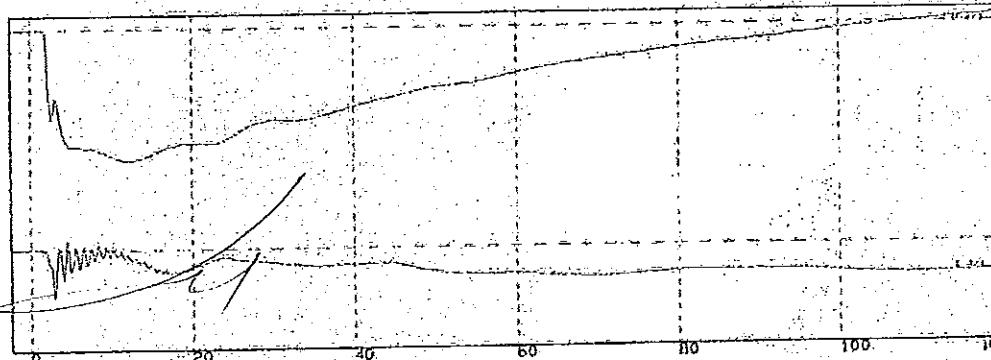
LIT



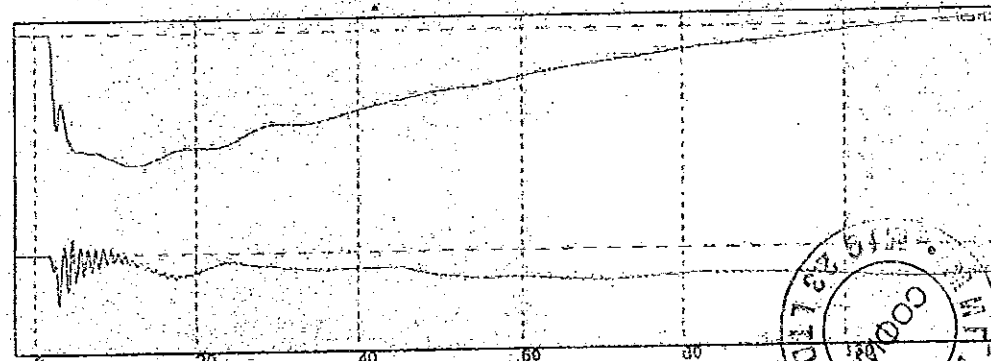
No. 177140
17.09.2007 15:40:57
FR1/N/VV
K3: U LI
Up = -164 kV
T1 = 7.03 μ s
T2 = 47.0 μ s
K4: I
I = -264 A



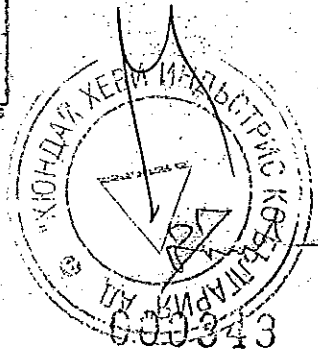
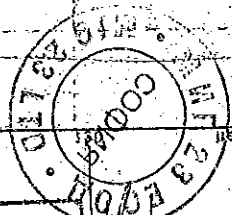
No. 177141
17.09.2007 15:44:08
FR1/N/VV
K3: U LI
Up = -319 kV
T1 = 7.04 μ s
T2 = 47.1 μ s
K4: I
I = -523 A



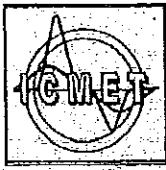
No. 177142
17.09.2007 16:45:25
FR2/N/VV
K3: U LI
Up = -329 kV
T1 = 6.99 μ s
T2 = 47.6 μ s
K4: I
I = -367 A



No. 177143
17.09.2007 16:45:51
FR3/N/VV
K3: U LI
Up = -324 kV
T1 = 7.01 μ s
T2 = 47.0 μ s
K4: I
I = -522 A

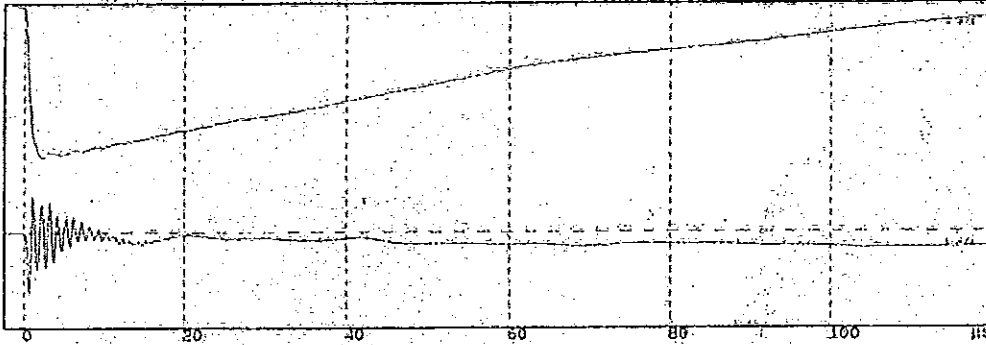


**ВЯРНО
С ОПРИТНАТА**

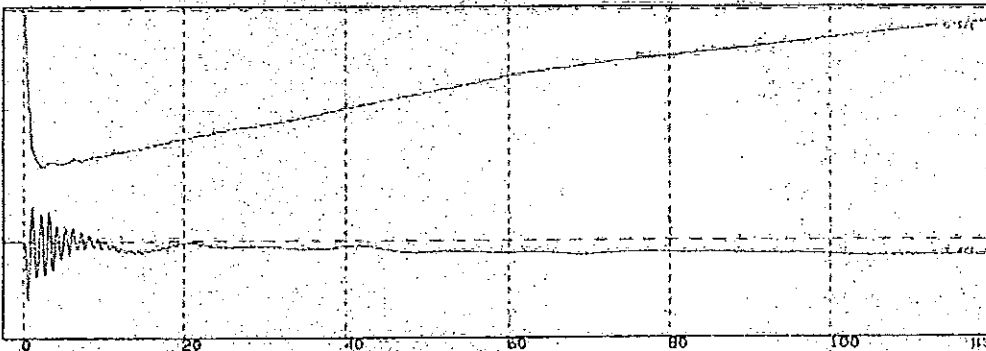


LIT

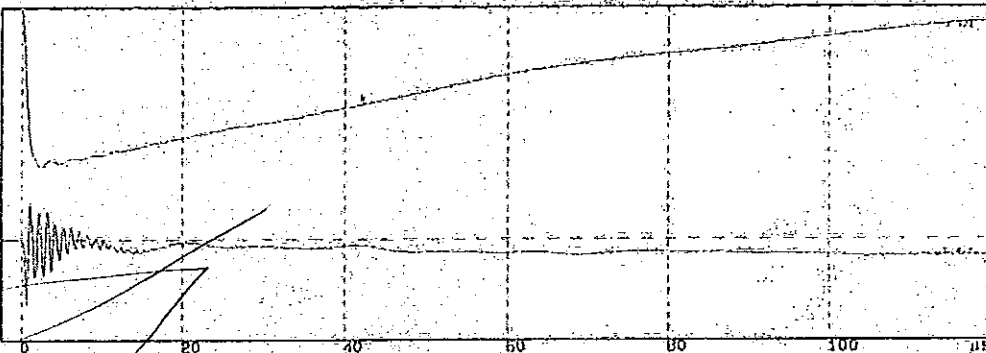
TEST REPORT No. 41265
TRANSFORMER No. 112931



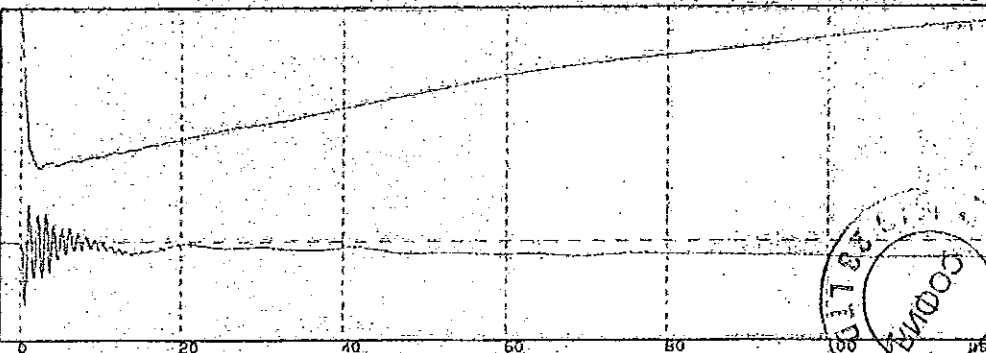
No. 177145
17.09.2007 16:15:25
FW1/A/HV
K3: U LI
U₀ = -327 kV
T1 = 1.42 μs
T2 = 52.8 ns
K4: I
I = -467 A



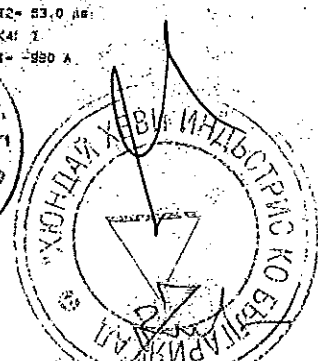
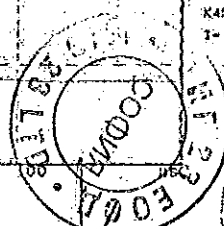
No. 177146
17.09.2007 16:18:07
FW1/A/HV
K3: U LI
U₀ = -545 kV
T1 = 1.40 μs
T2 = 53.6 μs
K4: I
I = -849 A



No. 177147
17.09.2007 16:20:08
FW2/A/HV
K3: U LI
U₀ = -591 kV
T1 = 1.39 μs
T2 = 52.9 ns
K4: I
I = -673 A

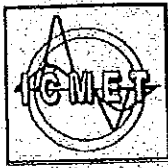


No. 177148
17.09.2007 16:20:36
FW3/A/HV
K3: U LI
U₀ = -636 kV
T1 = 1.41 μs
T2 = 53.0 μs
K4: I
I = -890 A



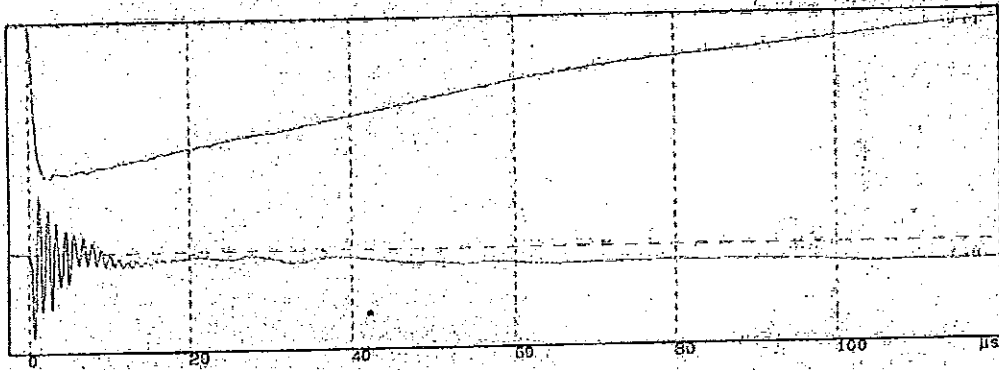
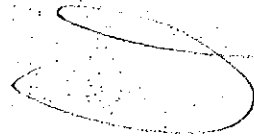
**ВЯРНО
С ОРИГИНАЛА**

000344

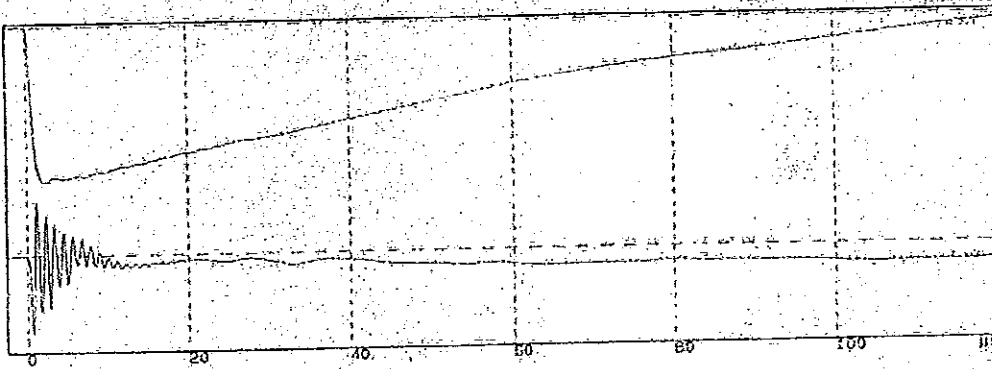


LIT

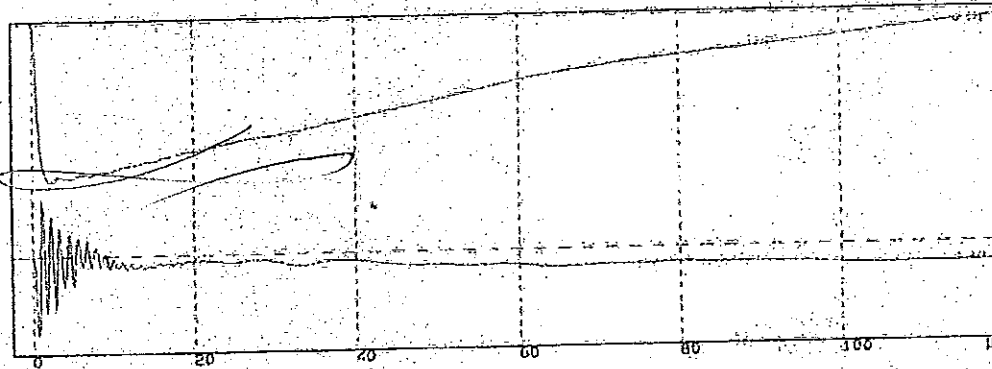
TEST REPORT No. 41265
TRANSFORMER No. 112931



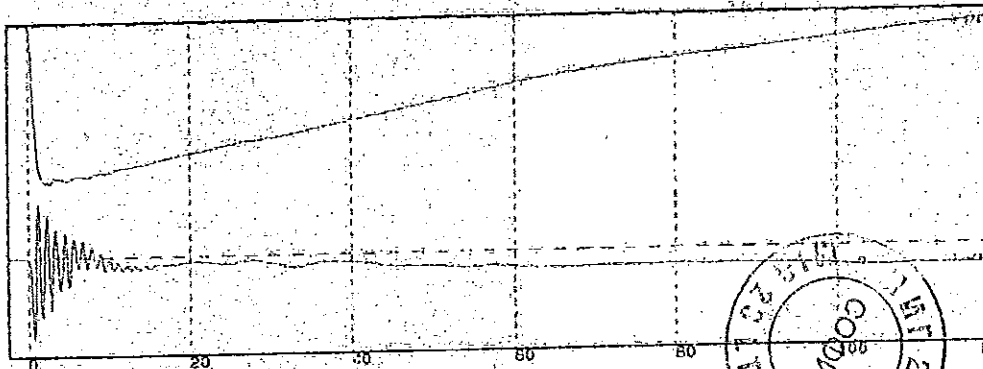
No. 177148
 17.09.2007 16:28:50
 FM1/D/IV
 K3: U LI
 Up = -325 kV
 T1 = 1.43 μs
 T2 = 51.3 μs
 K4: I
 I = -643 A



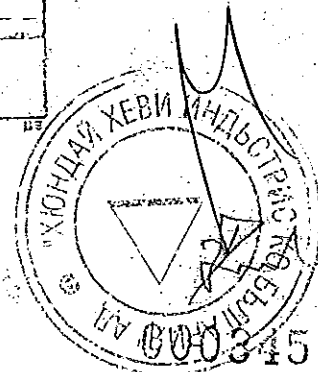
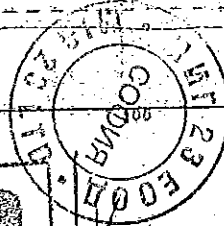
No. 177150
 17.09.2007 16:30:13
 FM1/B/IV
 K3: U LI
 Up = -647 kV
 T1 = 1.43 μs
 T2 = 51.6 μs
 K4: I
 I = -1092 A



No. 177151
 17.09.2007 16:30:59
 FM2/B/IV
 K3: U LI
 Up = -636 kV
 T1 = 1.43 μs
 T2 = 51.7 μs
 K4: I
 I = -1265 A



No. 177152
 17.09.2007 16:31:16
 FM3/B/IV
 K3: U LI
 Up = -851 kV
 T1 = 1.42 μs
 T2 = 51.9 μs
 K4: I
 I = -1255 A

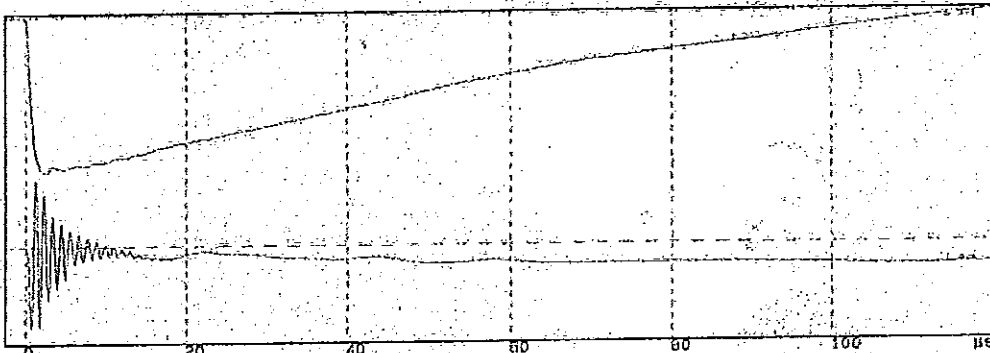


**ВЕРНО
С ОРИГИНАЛА**

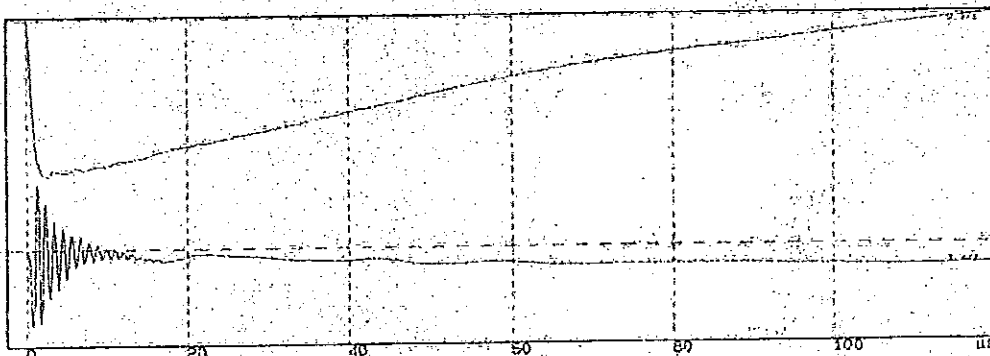


LIT

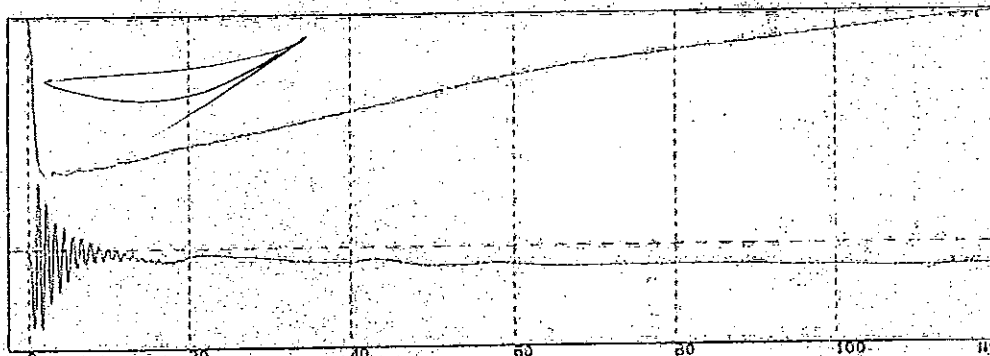
TEST REPORT No. 41265
TRANSFORMER No. 112931



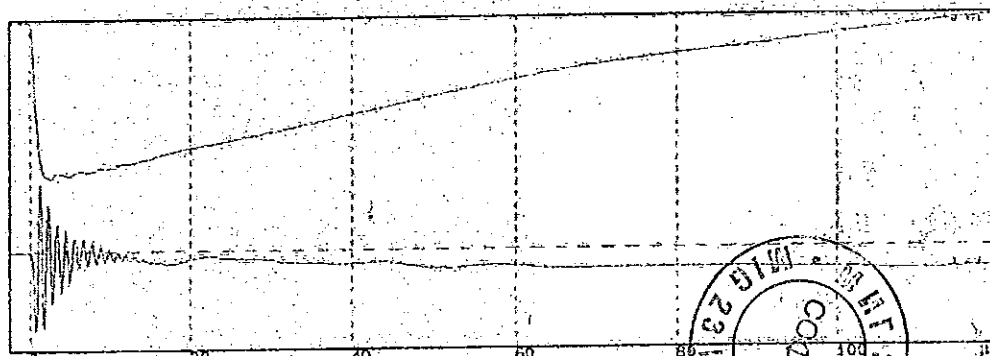
No. 177153
 17.09.2007 (t: 37.20)
 F#1/C/HV
 K3: U LI
 U_p = -329 kV
 T1 = 1.46 µs
 T2 = 48.8 µs
 K4: I
 I = -632 A



No. 177154
 17.09.2007 (t: 40.24)
 F#1/C/HV
 K3: U LI
 U_p = -447 kV
 T1 = 1.45 µs
 T2 = 48.0 µs
 K4: I
 I = -1211 A



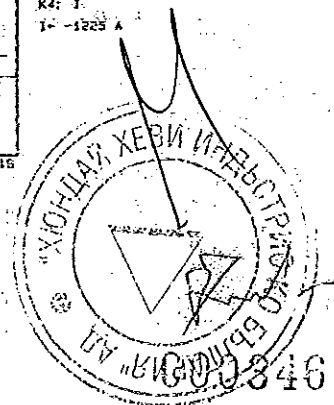
No. 177155
 17.09.2007 (t: 40.56)
 F#2/C/HV
 K3: U LI
 U_p = -653 kV
 T1 = 1.44 µs
 T2 = 48.9 µs
 K4: I
 I = -1222 A

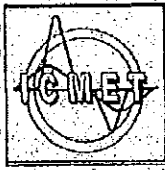


No. 177156
 17.09.2007 (t: 41.20)
 F#3/C/HV
 K3: U LI
 U_p = -651 kV
 T1 = 1.45 µs
 T2 = 48.9 µs
 K4: I
 I = -1223 A



**ВЯРНО
С ОРГИНАЛА**

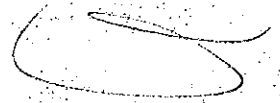




LIT

TEST REPORT No. 41265
TRANSFORMER No. 112931

page 12



II. SEPARATE-SOURCE VOLTAGE WITHSTAND TEST

Reception product date: 17.09.2007

Test date: 17.09.2007

Atmospheric conditions: p = 1005 mbar; t = 18,7 °C ± 0,1 °C; h = 49,4 %

Test standard: IEC 60076-3 / 2000, subclause 11.

Tested Winding	Earthed Winding	Test voltage [kV]	Frequency [Hz]	Test Time [s]
HV	LV	140	50	60
LV	HV	70	50	60

Equipment used: High voltage source 200 kVA / 200 kV, no. 5 - 1199.

Group Motor Generator 5 MVA, 6(12) kV, no. 5 - 1194.

Cascade Transformers 1.2 MV, no. 5-1196.

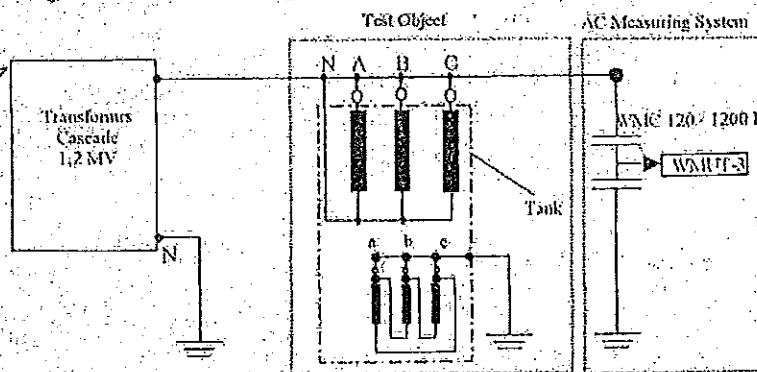
Measuring systems used: - For LV winding: AC measuring system 350 kV consists of: high voltage compressed gas capacitor type MCF 75/350P, no. 853889 and low voltage arm type H90, no. 898939 + digital peak voltmeter type MU9, no. 892209.

- For HV winding: AC measuring system 1200 kV consists of: high voltage capacitor type WMC 120 / 1200, no. 897186 and low voltage arm embedded in the peak voltmeter type WMUT-3, no. 798717 for HV.

Measuring uncertainty is: ± 1.2 %

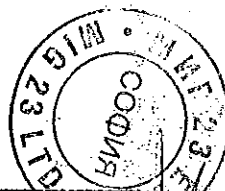
The reported uncertainty is an expanded uncertainty, based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %.

Test circuit diagram for HV winding:

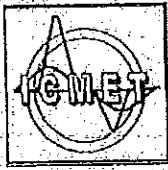


Conclusion: The product passed the test.

**ВЯРНО
С ОРИГИНАЛА**



000347



LIT

TEST REPORT No. 41265
TRANSFORMER No. 112931

page 13

III. INDUCED AC VOLTAGE TEST

Reception product date: 17.09.2007

Test date: 17.09.2007

Atmospheric conditions: p = 1005 mbar; t = 18.6 °C ± 0.2 °C; h = 49.4 %

Test standard: IEC 60076-3 / 2000, subclause 12.2.1.

Test parameters:

Test voltage [kV _{max}]	Frequency [Hz]	Test time [s]
275	150	40

Terminal connections of the tested object:

Tested phases	Supply phases	Earthed terminals	Free terminals	Tap position
A	a-c	B, C, c	N	10
B	b-a	A, C, a	N	
C	c-b	A, B, b	N	

Notes: During the test, core, frame, tank and terminals of current transformers were connected to earth.

Equipment used: Group Motor Generator 5 MVA, no.5-1194; 6(12) kV; f = 150 Hz;
Induced voltage station 110/35/20 kV no.3 - 4I

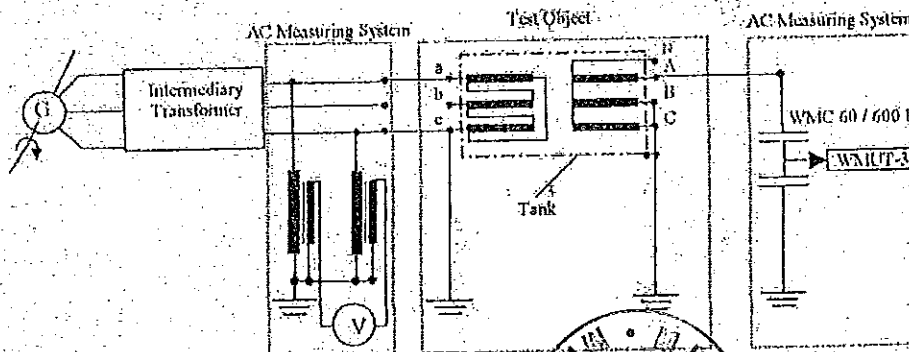
Measuring systems used: - For LV winding: Voltage Transformers 110 kV / 0.1 kV, no.733954, 733955, 486474; Voltmeter EAW, no. 400944.

- For HV winding: AC measuring system 600 kV consists of: high voltage compressed gas capacitor type WMC 60/600P, no.899400 and low voltage arm embedded in the peak voltmeter type WMUT-3, no.798718.

Measuring uncertainty is ± 1.4 % for LV and 1% for HV.

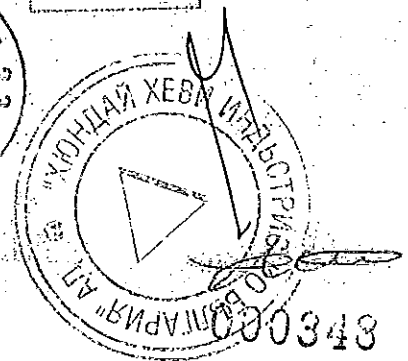
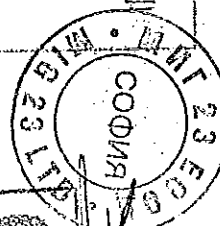
The reported uncertainty is an expanded uncertainty, based on a standard uncertainty multiplied by a coverage factor k = 2, providing a level of confidence of approximately 95 %.

Test circuit diagram for phase A:



Conclusion: The product passed the test.

**ВЯРНО
С ОРИГИНАЛА**





LIT

TEST REPORT No. 41265
TRANSFORMER No. 112931



IV. MEASUREMENT OF PARTIAL DISCHARGES

1. Reception product date: 17.09.2007
2. Measurement date: 17.09.2007
3. Atmospheric conditions: $p = 1006 \text{ mbar}$; $t = 19 \text{ }^\circ\text{C} \pm 0.1 \text{ }^\circ\text{C}$; $h = 50 \%$
4. Test standard: IEC 60076 - 3 / 2000; Agreement no.2 / 17.09.2007
5. Equipment and apparatus used:

- Group Motor Generator 5 MVA; 6(12) kV; $f = 100 \text{ Hz}$.
- Measuring system used for AC voltage: Voltage Transformers 110 kV / 0.1 kV, no. 733954, 733955, 486474; Voltmeter EAW, no. 400944.

Measuring uncertainty is $\pm 1.4 \%$.

The reported uncertainty is an expanded uncertainty, based on a standard uncertainty multiplied by a coverage factor $k = 2$, providing a level of confidence of approximately 95 %.

- Coupling capacitor: HV terminal of bushings
- Shields: for tested HV terminals with 400 [mm] diameter
- Charge for calibration: 250 pC
Calibrator type PET 2-1, no. 893534, Calibration Certificate DKD no. 0094/28.03.2007
- PD measuring system; measuring impedances type LDM - 5/U (no. 735 35 131; 736 35 131; 737 35 131) + switching box type LDM - 5 / M6 (no. 734 35 131) + measuring instrument type LDS - 6 (no. 21 543 181), Calibration Certificate DKD no. 0087/03.07.2006.

6. Test results:

Test voltage (kV)	PD level (pC)			
	No. reading	A	B	C
1.2x170=204	1	31	44	68
	2	20	29	65
	3	15	26	63
	4	14	23	60
1.5x170=255	1	140	206	102
	2	136	186	98
	3	134	140	96
	4	130	132	96
	5	130	130	94
	6	128	122	94
	7	128	120	92
1.2x170=204	1	36	48	68
	2	35	48	67
	3	35	45	65
	4	34	42	60

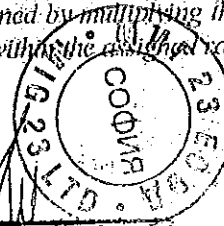
Notes: During the test the tap changer was on 9 position.

The diagram of the PD measuring circuit is presented on page 15.

Measuring uncertainty for the PD level is: $0.5 \text{ pC} + 0.04q \text{ (pC)}$

The uncertainty stated is expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor $k = 2$. The value of measurand lies within the assigned range of values with probability of 95 %.

7. Conclusion: The product passed the test.

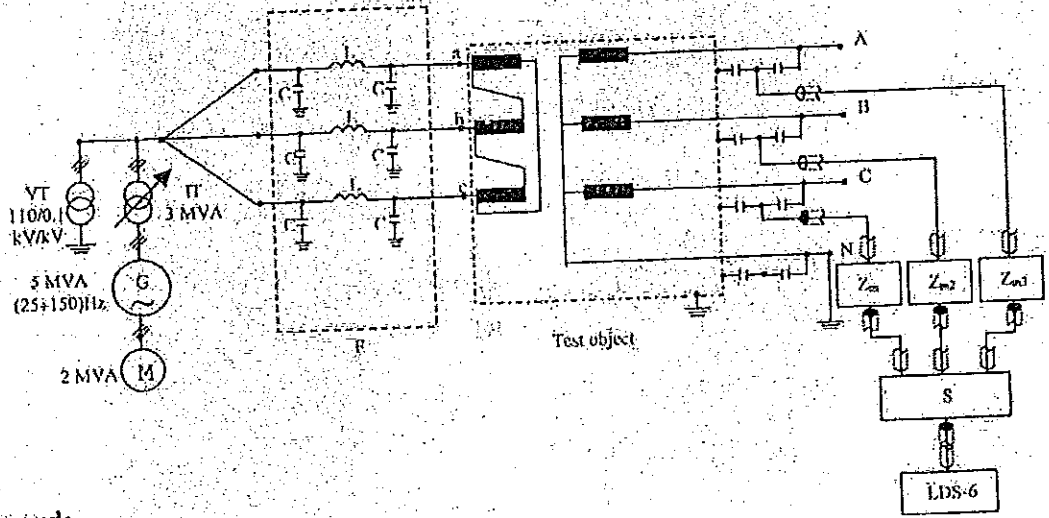




LIT

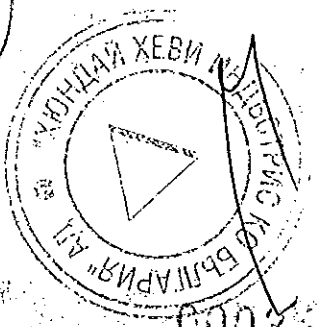
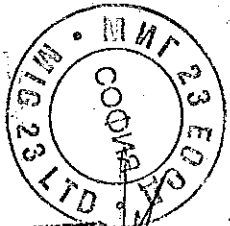
TEST REPORT No. 41265
TRANSFORMER No. 112931

Diagram of PD measurement circuit



- Legend:**
 VT – voltage transformer 110/0.1: kV / kV;
 G – generator 5 MVA (25 + 150) Hz;
 M – motor 2 MVA;
 IT – intermediary transformer 3 MVA;
 F – low-pass filter;
 Z_{m1}, Z_{m2}, Z_{m3} – measuring impedances;
 S – Switching box;
 LDS-6 – PD measuring instrument.

**ВЯРНО
С ОРИГИНАЛА**



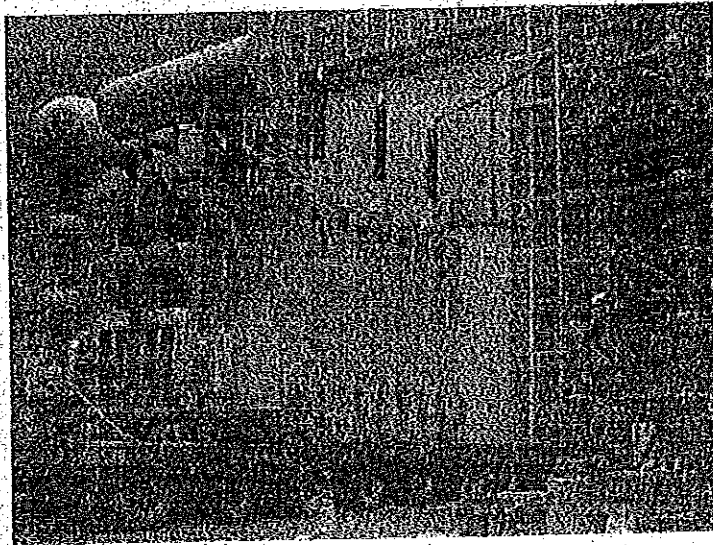
000330



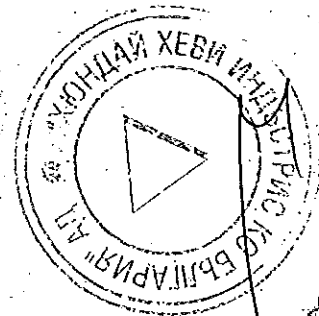
LIT

TEST REPORT No. 41265
TRANSFORMER No. 112931

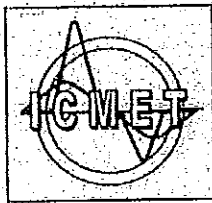
page 16



**ВЯРНО
С ОРИГИНАЛА**



000351



RESEARCH, DEVELOPMENT AND TESTING
NATIONAL INSTITUTE
FOR ELECTRICAL ENGINEERING
I C M E T CRAIOVA



CALEA BUCUREȘTI 144, 1100 CRAIOVA, ROMÂNIA
Certificat de înmatriculare: J 16/312/1999; Cod fiscal R387 15.99; Telefon. 437795; 0351 402421
www.icmet.ro, e-mail: lme@icmet.ro

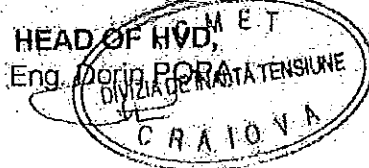
DEPARTMENT LABORATORY
HIGH VOLTAGE DIVISION
ELECTROTECHNICAL MATERIALS LABORATORY

TEST REPORT
No. 91 / 19.09.2007

1. Product: Oil of transformer type TMPY- ONAN / ONAF 50 / 66 MVA; 161/34,5 KV -
Serial no. 112931
2. Tests: Dissolved Gas Concentration (ppm)
3. Test order: 3260 / 16.01.2007.
4. Producer: Hyundai Heavy Industries Co. BULGARIA
5. Customer: Hyundai Heavy Industries Co. BULGARIA
6. Customer's adress: 41, ROJEN Blvd., 1271 SOFIA BULGARIA
7. Test responsables: Chem. Floarea Vasilescu

Head of EML,
Chem. Emanuela Radulescu

Q.A. Responsible:
Chem. Floarea Vasilescu

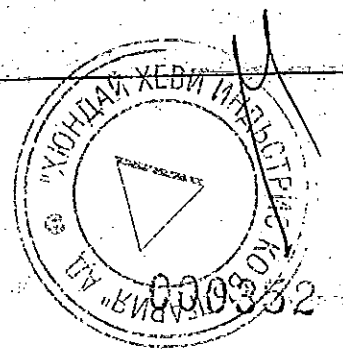
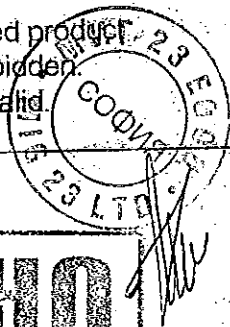


8. The test report contains 2 pages.
9. The test report was edited in 4 ex.; 1 ex. to HVD and 3 ex. to customer.

CAUTION:

- a. The test result makes reference only to tested product.
- b. Integral reproduction of the test report is forbidden.
- c. Reports without original signatures are not valid.

© ICMET Craiova 2007



10. Material/Product identification: Oil of transformer type: TMPY-ONAN / ONAF
50 / 66 MVA; 161/34,5 KV - Serial no. 112931

11. Test results: Sample taken from the lower level

a) Before measurement of the dielectric tests

Dissolved Gas Concentration (ppm)

Hydrogen (H ₂)	n/d
Methane (CH ₄)	36
Carbon Monoxide (CO)	36
Carbon Dioxide (CO ₂)	236
Ethylene (C ₂ H ₄)	n/d
Ethane (C ₂ H ₆)	n/d
Acetylene (C ₂ H ₂)	n/d

Equivalent TCG (%) 0,04 %

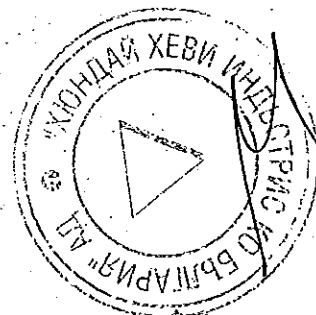
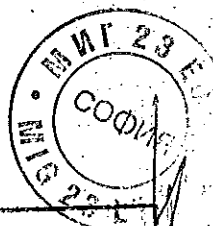
b) After measurement

Dissolved Gas Concentration (ppm)

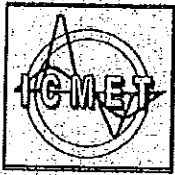
Hydrogen (H ₂)	n/d
Methane (CH ₄)	25
Carbon Monoxide (CO)	38
Carbon Dioxide (CO ₂)	249
Ethylene (C ₂ H ₄)	n/d
Ethane (C ₂ H ₆)	n/d
Acetylene (C ₂ H ₂)	n/d

Equivalent TCG (%) 0,04 %

12. CONCLUSION: Passed the test



000353



LIT

RESEARCH, DEVELOPMENT AND TESTING NATIONAL
INSTITUTE FOR ELECTRICAL ENGINEERING
ICMET CRAIOVA
ROMANIA

HIGH VOLTAGE LABORATORY - LIT

200515 Craiova, Calea București 144,
Phone: 0351 - 404888, 404889, 0351 - 402425, Fax: 0251 - 415482; 0351 - 404890

TEST REPORT

No. 41266 / 18.09.2007

- 1. Product: Power transformer type: **TMPY - ONAN / ONAF 50 / 66 MVA;**
161 ± 8 x 1.25% / 34.5 kV; Y_{Nd} - 11
- Serial no. 112931 -

- 2. Test: Measurement of the frequency response
- 3. Test order: 3260 / 16.01.2007
- 4. Producer: Hyundai Heavy Industries Co. BULGARIA
- 5. Customer: Hyundai Heavy Industries Co. BULGARIA
- 6. Customer's address: 41, ROJEN Blvd., 1271 SOFIA BULGARIA
- 7. Test responsible: Eng. Dan ȘTEFAN *[Signature]*

Test Supervisor:
Eng. Ionel DUMBRAVA *[Signature]*

[Stamp: ICMET CRAIOVA - LIT]
Q.A. Responsible:
Eng. Gheorghe MACOVEI

[Stamp: ICMET CRAIOVA]
APPROVED
LABORATORY HEAD
Eng. Dorin POPA *[Signature]*

TEST WITNESSED BY,
Eng. Stoil Stoilov - QA Director (HHI - Bg)
Eng. Matey Mateev (HHI - Bg)

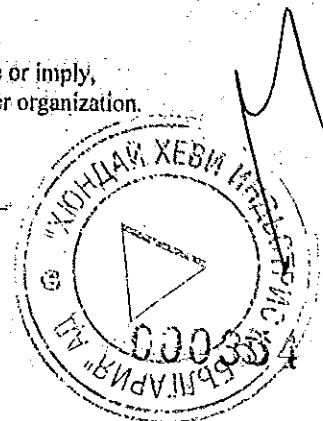
- 8. The test report contains 4 pages.
- 9. The test report was edited in 4 ex.; 1 ex. to LIT and 3 ex. to customer.

CAUTION;

- a. The test result makes reference only to tested product.
- b. Integral reproduction of the test report is forbidden.
- c. Any part of this test report may be reproduced only with the accord of LIT.
- d. Reports without original signatures are not valid.
- e. Laboratory accreditation or any of its test reports elaborated in accreditation conditions not constitute or imply, themselves, an approval of product by RENAR, which has accredited the test laboratory or by any other organization.

© ICMET Craiova 2007

**ВЯРНО
С ОРИГИНАЛА**





TEST REPORT No. 41266
Transformer serial no. 112931

page 2

Measurement of the frequency response

Reception product date: 14 September 2007

Test date: 14 September 2007: before SCT test;
16 September 2007: after SCT test.

Atmospheric conditions: $p = 1007 \text{ mbar}$; $t = 19 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$; $h = 49.3 \%$

Measuring system:

Frequency response was measured with the equipment MRF-100i, containing a low voltage impulse generator and a laptop connected to a digital acquisition unit with two synchronous channels.

The generator was used to produce chopped voltage impulses, with the peak value $< 400 \text{ V}$. The digital acquisition unit was used to record the applied signal and the response signal with a sampling rate of 25 MS/s and an amplitude resolution of 14 bits. The two signals were automatically transferred to the laptop to determine the transfer function applying the FFT algorithm.

Three coaxial cables ($l = 15 \text{ m}$) were used make the measurements: one to inject the low voltage impulse, one to measure the applied voltage and other one to measure the current.

For each phase of HV and LV windings, there were measured the applied impulse voltage and the current through winding.

The impulse voltage was measured with a voltage divider ($181.5 : 1$) and the current was measured with a shunt (1 Ohm), both placed near the transformer terminals.

Measuring conditions:

The measurements were performed with the tap changer in the nominal position (9).

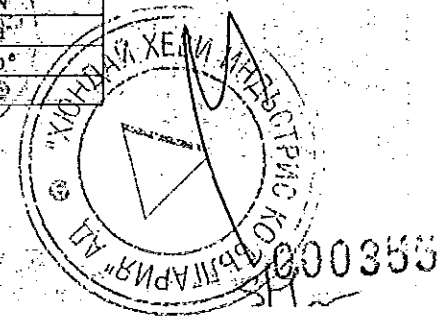
During the measurements, the terminals not used to connect the equipment MRF-100i to transformer remain free.

Performed measurements:

Two measurement sets were performed, before and after short-circuit test, according the following set-up.

Winding	Tested phase	Terminal where the impulse voltage was applied and measured	Terminal where the current was measured
HV	A	A	A
	B	B	B
	C	C	C
LV	a	a	a
	b	b	b
	c	c	c

Conclusion: The product passed the test.

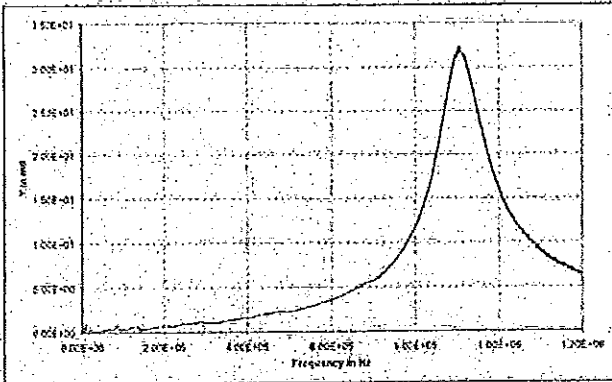




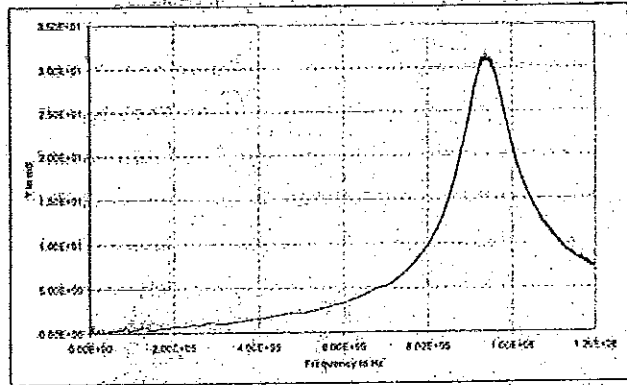
TEST REPORT No. 41266
Transformer serial no. 112931

page 3

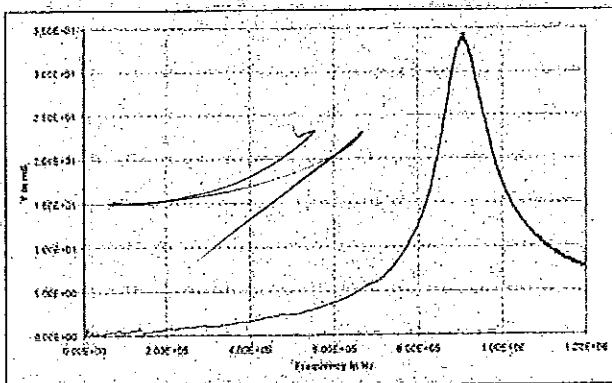
HV winding, phase A
before SCT test



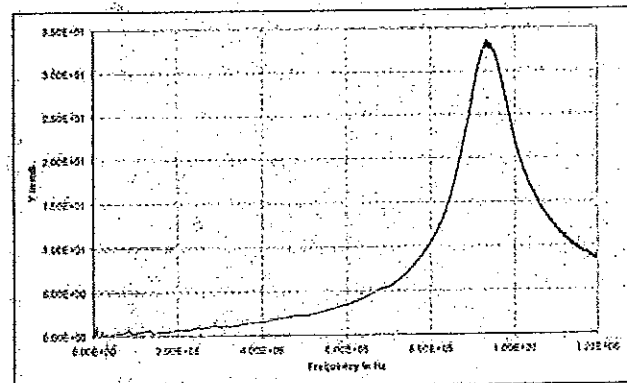
after SCT test



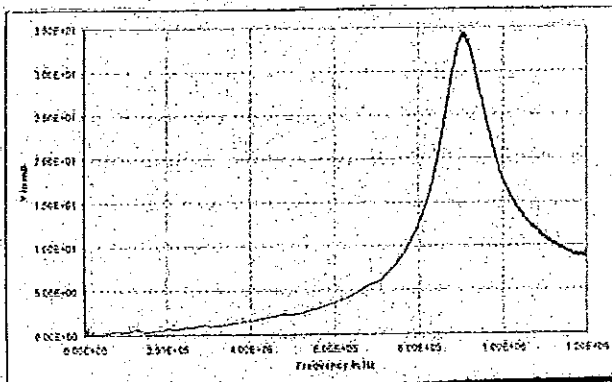
HV winding, phase B
before SCT test



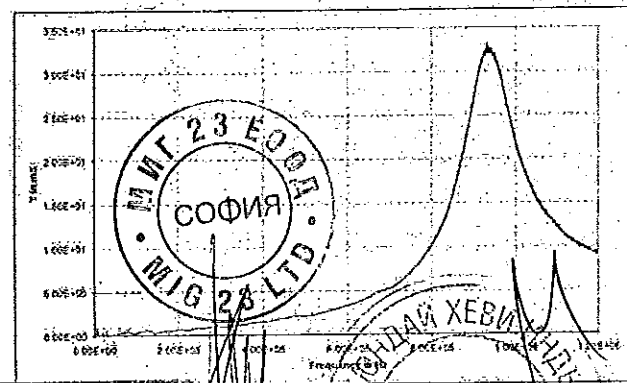
after SCT test



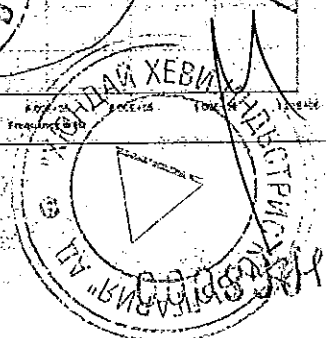
HV winding, phase C
before SCT test



after SCT test



**ВЯРНО
С ОРИГИНАЛА**





ROMANIAN ACCREDITATION ASSOCIATION - RENAR

Bucharest, Calea Vitan no. 242, sector 3, zip code 031301

CIF RO 4311980



RENAR is EA-MLA signatory for Testing.

ACCREDITATION CERTIFICATE No. LI 1036

Romanian Accreditation Association – RENAR, being recognized as National Accreditation Body by OG 23/2009, herewith attests that the organization:

NATIONAL INSTITUTE FOR RESEARCH-DEVELOPMENT AND TESTING IN ELECTRICAL ENGINEERING

Craiova, Decebal Avenue no. 118 A, Dolj county

through

Low and High Voltage Testing Laboratory

fulfills the requirements of **SR EN ISO/CEI 17025:2005** and is competent to carry on **TESTING** activities, as it is detailed in the Annex of the present accreditation certificate.

This accreditation is maintained provided that the accreditation criteria established by the Romanian Accreditation Association – RENAR are met continuously.

The present certificate includes Annex no. 1 (43 pages), which is an integrated part of this certificate.

In order to check the validity of the accreditation certificate, including the Annex, the website of RENAR shall be consulted: www.renar.ro.

Date of initial accreditation: 10.10.2014

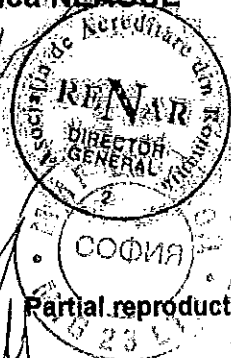
The accreditation is valid until: 09.10.2018

GENERAL DIRECTOR

Cătălina Viorica NEAGUE

PRESIDENT OF THE ACCREDITATION COUNCIL

PhD. Eng. Dumitru DINU



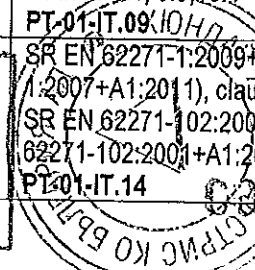
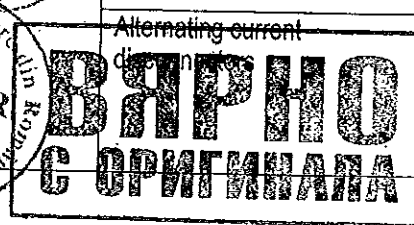
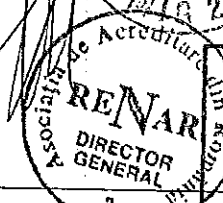
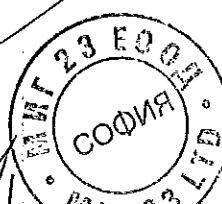
Low and High Voltage Testing Laboratory for electrical equipment (LHVTL)

Craiova, Decebal Avene no. 118A, Dolj county

Belonging to NATIONAL INSTITUTE FOR RESEARCH-DEVELOPMENT AND TESTING
IN ELECTRICAL ENGINEERING – ICMET CRAIOVA

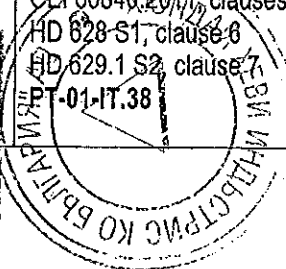
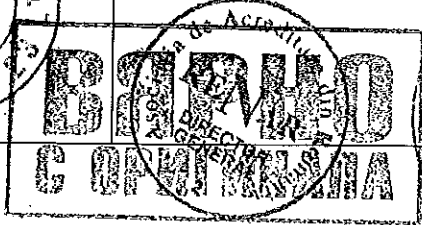
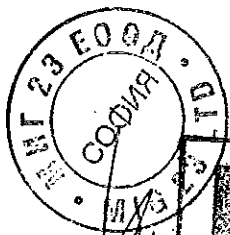
A. Tests performed in permanent sites

No.	Type / Name of the test	Material / product	Reference document
	I. TESTS FOR HIGH VOLTAGE EQUIPMENTS		SR EN 60060-1:2011 (CEI 60060-1:2010) SR EN 60060-2:2011 (CEI 60060-2:2010) SR EN 60071-1:2006+A1:2010 (CEI 60071-1:2006+A1:2010) SR EN 60071-2:1999 (CEI 60071-2:1996) IEEE Std 4-2013
1	Lightning impulse test (ITT) 1,2 / 50µs ($U_{max} = 2\,500\text{ kV}_{top}$)	Oil-immersed or dry power transformers	SR EN 60076-3:2003 (CEI 60076-3:2000) clauses 13,14 SR EN 60076-3:2013 (CEI 60076-3:2013), clauses 13,14 SR EN 60076-4:2003 (CEI 60076-4:2002), clauses 7,9,10,11 SR EN 60076-11:2005 (CEI 60076-11: 2004), clause 21 IEEE Std C57.98-2011, clauses 2, 4, 5, 6 IEEE Std C57.12.00-2010, clause 5.10 IEEE Std C.57.12.90-2010, clause 10.3 IEEE Std C.57.12.91-2011, clause 10.3 PT-01-IT.03
Tap-changers		CEI 60214 -1:2014, clause 5.2.8 SR EN 60214 -1:2004 (CEI 60214 -1:2003), clause 5.2.8 CEI 60214 -2:2004 PT-01-IT.47	
Current transformers		SR EN 61869-1:2010 (CEI 61869-1:2007), clauses 7.2.3,7.4.1,7.4.2 SR EN 61869-2:2013 (CEI 61869-2:2012), clause 7.2.3 CEI 61869-4:2013, clause 7.2.3 SR EN 60044-8:2004 (CEI 60044-8:2002), clauses 8.3, 10.1 PT-01-IT.10	
Voltage transformers		SR EN 61869-1:2010 (CEI 61869-1:2007), clauses 7.2.3,7.4.1,7.4.2 SR EN 61869-3:2012 (CEI 61869-3:2011), clauses 7.2.3 CEI 61869-4:2013, clauses 7.2.3 SR EN 61869-5:2012 (CEI 61869-5:2011), clauses 7.2.3, 7.4.1, 7.4.2 SR EN 60044-7:2001 (CEI 60044-7:1999), clauses 8.1, 8.8,10.1 PT-01-IT.09	
		Alternating current	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 SR EN 62271-102:2003+A1:2012-A2:2013 (CEI 62271-102:2003+A1:2011+A2:2013), clause 6.2 PT-01-IT.14



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

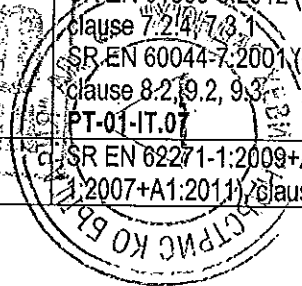
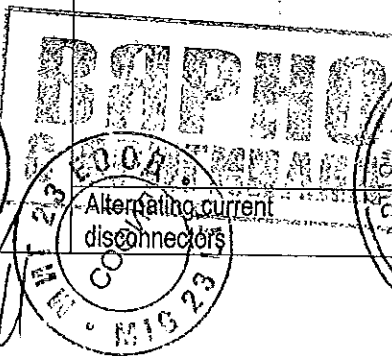
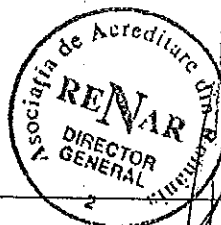
No.	Type / Name of the test	Material / product	Reference document
		Alternating current circuit - breakers	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 SR EN 62271-100:2009+A1:2013 (CEI 62271-100:2008+A1:2012), clause 6.2 SR EN 62271-103:2012 (CEI 62271-103:2011), clause 6.2 PT-01-IT.16
		AC metal-enclosed switchgear and controlgear	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 SR EN 62271-200:2012 (CEI 62271-200:2011), clause 6.2 PT-01-IT.17
		AC Enclosed busbars	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 IEEE Std 1043-1996 PT-01-IT.20
		Insulated bushings	SR EN 60137:2008 (CEI 60137:2008), clauses 8.2 and 9.2 SR EN 50386:2011+A1:2014 (EN 50386:2010 + A1:2013) PT-01-IT.23
		Ceramic material or glass insulators	SR EN 60383-1:2002 (CEI 60383-1:1993), clauses 13,15 SR EN 60383-2:1996 (CEI 60383-2:1993), clause 9 SR EN 60168:1997+A1:2004+A2:2001 (CEI 60168:1994+A1:1997+A2:2000), clause 4.5 PT-01-IT.39
		Composite insulators	SR EN 61109:2009 (CEI 61109:2008), clauses 10,11.1 SR EN 61952:2008 (CEI 61952:2008), clauses 10,11 SR EN 61462:2008 (CEI 61462:2007), clause 7.2.5.2 PT-01-IT.39
		Polymeric insulators	SR EN 62217:2013 (CEI 62217:2012), clause 9.2.7.3 PT-01-IT.39
		Organic material insulators	SR EN 60660:2001 (CEI 60660:1999), clauses 3.3 and 3.6 PT-01-IT.39
		Power cables with extruded insulation, terminals and their accessories	SR CEI 60502-1:2006 (CEI 60502-1:2004), clause 17.4 SR EN 60230:2002 (CEI 60230:1966) SR EN 61442:2006 (CEI 61442:2005), clause 6 CEI 60502-2:2014, clause 18.1.7 SR CEI 60502-2:2006 (CEI 60502-2:2005), clause 18.1.7 CEI 60502-4:2010, clauses 8, 9 CEI 60840:2011, clauses 10.12 and 12.4 HD 628-S1, clause 8 HD 629.1 S2, clause 7 PT-01-IT.38



000360

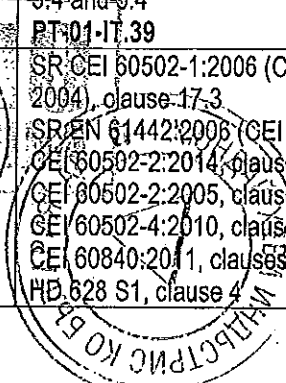
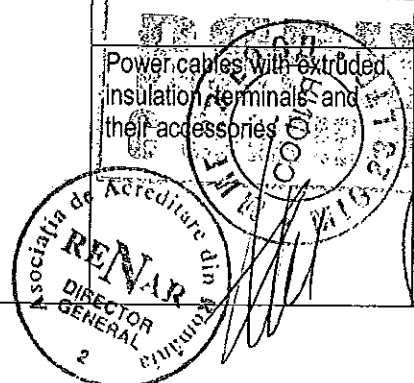
Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Non-linear resistor type gapped surge arresters	SR EN 60099-1:2002+A1:2003 (CEI 60099-1:1999), clause 8.3 PT-01-IT.25
		Metal-oxide surge arresters without gaps	SR EN 60099-4:2005+A1:2007+A2:2009 (CEI 60099-4:2009), clause 8.2.6 PT-01-IT.39
		Reactors, grounding resistors	SR EN 60076-6:2009 (CEI 60076-6:2007), clauses 7.8.10.4, 7.8.10.5 SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 PT-01-IT.26
		Capacitive dividers, coupling capacitors, shunt capacitors	SR EN 60358-1:2013 (CEI 60358-1:2012), clause 10.1 CEI 60871-1:2014, clause 15.2 CEI 60871-1:2005, clause 16 CEI 60831-1:2014, clause 15 CEI 60831-1:2002, clause 15 PT-01-IT.41
		High voltage current limiting fuses	SR EN 60282-1:2010 (CEI 60282-1:2009+A1:2014), clause 6.4.4 PT-01-IT.33
2	Alternative applied voltage test (AV) ($U_{max} = 1000 \text{ kV}_{ef}$)	Oil-immersed or dry power transformers	SR EN 60076-3:2003 (CEI 60076-3:2000), clause 11 SR EN 60076-3:2013 (CEI 60076-3:2013), clause 10 SR EN 60076-11:2005 (CEI 60076-11:2004), clause 19 IEEE Std C57.12.00-2010, clause 5.10 IEEE Std C57.12.90-2010, clause 10.6 PT-01-IT.02
		Tap-changers	CEI 60214 -1:2014, clause 5.2.8 SR EN 60214 -1:2004 (CEI 60214 -1:2003), clause 5.2.8 CEI 60214 -2:2004 PT-01-IT.47
		Current instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clauses 7.2.4, 7.3.1, 7.3.3, 7.3.4 SR EN 61869-2:2013 (CEI 61869-2:2012), clause 7.3.1 CEI 61869-4:2013, Table 10, clause 7.3.1 SR EN 60044-8:2004 (CEI 60044-8:2002), clause 8.4, 9.2 PT-01-IT.08
		Voltage instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clause 7.2.4, 7.3.1, 7.3.3, 7.3.4 SR EN 61869-3:2012 (CEI 61869-3:2011), clause 7.3.1 CEI 61869-4:2013, Table 10, clause 7.3.1 SR EN 61869-5:2012 (CEI 61869-5:2011), clause 7.2.4, 7.3.1 SR EN 60044-7:2001 (CEI 60044-7:1999), clause 8.2, 9.2, 9.3 PT-01-IT.07
		Alternating current disconnectors	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

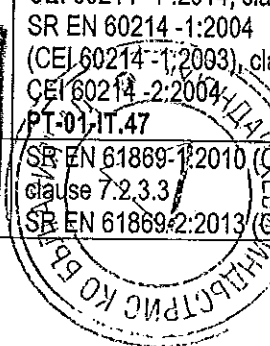
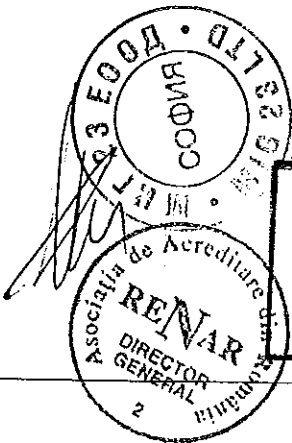
No.	Type / Name of the test	Material / product	Reference document
			SR EN 62271-102:2003+A1:2012+A2:2013 (CEI 62271-102:2001+A1:2011+A2:2013), clause 6.2 PT-01-IT.13
		Alternating current circuit - breakers	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 SR EN 62271-100:2009+A1:2013 (CEI 62271-100:2008+A1:2012), clause 6.2 SR EN 62271-103:2012 (CEI 62271-103:2011), clause 6.2 PT-01-IT.15
		AC metal enclosed switchgear and controlgear	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 SR EN 62271-200:2012 (CEI 62271-200:2011), clauses 6.2, 6.10.4 and 7.1 PT-01-IT.18
		AC enclosed busbars	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 SR EN 60071-2:1999 (CEI 60071-2:1996), clause 5 IEEE Std 1043-1996 PT-01-IT.19
		Bushings	SR EN 60137:2008, clause 8.2 and 9.3,9.5 CEI 60137:2008, clause 8.2 and 9.3,9.5 SR EN 50386:2011+A1:2014 (EN 50386:2010 + A1:2013) PT-01-IT.22
		Ceramic material or glass insulators	SR EN 60383-1:2002 (CEI 60383-1:1993), clauses 13, 14, 15, 16 SR EN 60383-2:1996 (CEI 60383-2:1993), clauses 7,10 SR EN 60168:1997+A1:2004+A2:2001 (CEI 60168:1994+A1:1997+A2:2000), clauses 4.7, 4.8, 4.9, 4.10 PT-01-IT.39
		Composite insulators	SR EN 61109:2009 (CEI 61109:2008), clauses 10, 11.1 SR EN 61952:2008 (CEI 61952:2008), clauses 10, 11 SR EN 61462:2008 (CEI 61462:2007), clauses 7.2.2, 7.2.5.3 PT-01-IT.39
		Polymeric insulators	SR EN 62217:2013 (CEI 62217:2012), clauses 9.2.3; 9.2.4 and 9.2.7.4 PT-01-IT.39
		Organic material insulators	SR EN 60660:2001 (CEI 60660:1999), clauses 3.4 and 5.4 PT-01-IT.39
		Power cables with extruded insulation, terminals and their accessories	SR CEI 60502-1:2006 (CEI 60502-1:2004), clause 17.3 SR EN 61442:2006 (CEI 61442:2005), clause 4 CEI 60502-2:2014, clause 18.1.8 CEI 60502-2:2005, clause 18.1.8 CEI 60502-4:2010, clauses 8, 9 CEI 60840:2011, clauses 9.3 and 12.4 HD 628 S1, clause 4



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

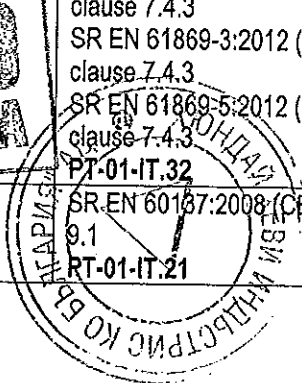
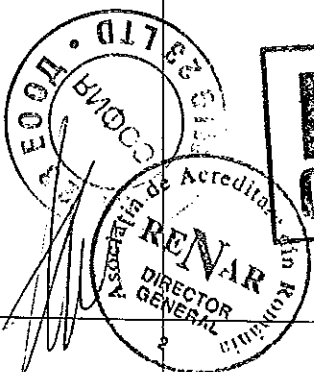
S

No.	Type / Name of the test	Material / product	Reference document
			HD 629.1 S2, clause 7 PT-01-IT.38
		Non-linear resistor type gapped surge arresters	SR EN 60099-1:2002+A1:2003 (CEI 60099-1:1999), clause 8.2 PT-01-IT.29
		Metal-oxide surge arresters without gaps	SR EN 60099-4:2005+A1:2007+A2:2009 (CEI 60099-4:2009), clauses 8.2.8, 9 PT-01-IT.39
		Reactors, grounding resistors	SR EN 60076-6:2009 (CEI 60076-6:2007), clause 7.8.10.2 SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 PT-01-IT.30
		Capacitive dividers, coupling capacitors, shunt capacitors	SR EN 60358-1:2013 (CEI 60358-1:2012), clauses 9.2.3, 10.2.1 CEI 60871-1:2014, clauses 9.2, 10, 15.1 CEI 60871-1:2005, clauses 9.2, 10, 15.1 CEI 60831-1:2014, clauses 9, 10 CEI 60831-1:2002, clauses 9, 10 PT-01-IT.41
		High voltage current limiting fuses	SR EN 60282-1:2010 (CEI 60282-1:2009+A1:2014), clauses 6.4.5, 6.4.6 PT-01-IT.33
3.	Induced alternative voltage test ($f_{max} = 150$ Hz)	Oil-immersed or dry power transformers, reactors	SR EN 60076-3:2003 (CEI 60076-3:2000), clause 12 SR EN 60076-3:2013 (CEI 60076-3:2013), clauses 11, 12 SR EN 60076-11:2005 (CEI 60076-11:2004), clause 20 SR EN 60076-6:2009 (CEI 60076-6:2007), clause 7.8.10.3 IEEE Std C57.12.00-2010, clause 5.10 IEEE Std C57.12.90-2010, clauses 10.7, 10.8 PT-01-IT.04
4	Switching impulse test (SI) 250/2500 μ s ($U_{max} = 1500$ kV _{top/peak})	Oil-immersed power transformers	SR EN 60076-3:2003 (CEI 60076-3:2000), clause 15 SR EN 60076-3:2013 (CEI 60076-3:2013), clause 14 SR EN 60076-4:2003 (CEI 60076-4:2002), clauses 8, 9, 10, 11 IEEE Std C57.98:2011, clauses 2, 4, 5, 6 IEEE Std C57.12.00-2010, clause 5.10 IEEE Std C57.12.90-2010, clause 10.3 PT-01-IT.06
		Reactors	SR EN 60076-6:2009 (CEI 60076-6:2007), clause 7.8.10.6 PT-01-IT.26
		Tap-changers	CEI 60214 -1 :2014, clause 5.2.8 SR EN 60214 -1:2004 (CEI 60214 -1:2003), clause 5.2.8 CEI 60214 -2:2004 PT-01-IT.47
		Transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clause 7.2.3.3 SR EN 61869-2:2013 (CEI 61869-2:2012),



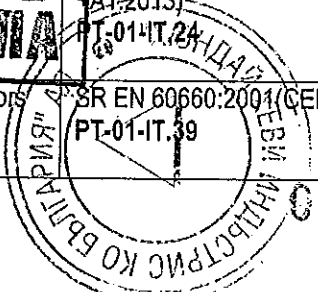
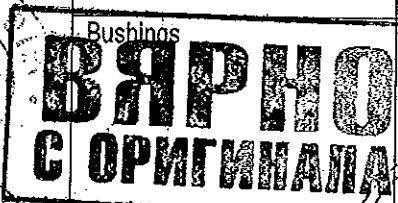
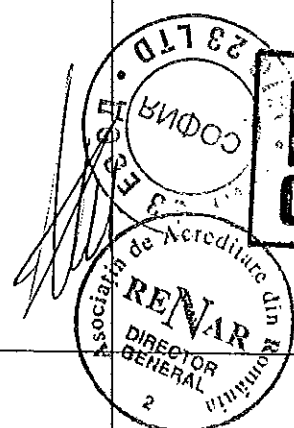
Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
			clause 7.2.3.3 CEI 61869-4:2013, clause 7.2.3.3 SR EN 60044-8:2004 (CEI 60044-8:2002), clause 8.3 PT-01-IT.12
		Voltage instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clause 7.2.3.3 SR EN 61869-3:2012 (CEI 61869-3:2011), clause 7.2.3.3 CEI 61869-4:2013, clause 7.2.3.3 SR EN 61869-5:2012 (CEI 61869-5:2011), clause 7.2.3.3 SR EN 60044-7:2001 (CEI 60044-7:1999), clause 8.1 PT-01-IT.12
		Alternating current disconnectors	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 SR EN 62271-102:2003+A1:2012+A2:2013 (CEI 62271-102:2001+A1:2011+A2:2013), clause 6.2 PT-01-IT.28
		Alternating current circuit-breakers	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.2 SR EN 62271-100:2009+A1:2013 (CEI 62271-100:2008+A1:2012), clause 6.2 SR EN 62271-103:2012 (CEI 62271-103:2011), clause 6.2 PT-01-IT.27
		Ceramic material or glass insulators	SR EN 60383-2:1996 (CEI 60383-2:1993), clause 11 SR EN 60168:1997+A1:2004+A2:2001 (CEI 60168:1994+A1:1997+A2:2000), clause 4.6 PT-01-IT.39
		Composite insulators	SR EN 61109:2009 (CEI 61109:2008), clause 11 SR EN 61952:2008 (CEI 61952:2008), clause 11 PT-01-IT.39
5	Capacities and tan δ measurement	Power transformers	SR EN 60076-1:2012 (CEI 60076-1:2011), clauses 11.1.2.2, 11.1.4 PT-01-IT.01
		Current instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clause 7.4.3 SR EN 61869-2:2013 (CEI 61869-2:2012), clause 7.4.3 PT-01-IT.32
		Voltage instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clause 7.4.3 SR EN 61869-3:2012 (CEI 61869-3:2011), clause 7.4.3 SR EN 61869-5:2012 (CEI 61869-5:2011), clause 7.4.3 PT-01-IT.32
		Bushings	SR EN 60137:2008 (CEI 60137:2008), clause 9.1 PT-01-IT.21



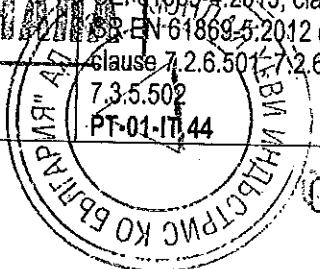
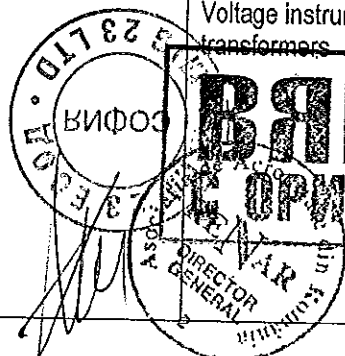
Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Power cables with extruded insulation	CEI 60502-2:2014, clause 18.1.5 CEI 60502-2:2005, clause 18.1.5 CEI 60840:2011, clause 12.4.5 PT-01-IT.38
		Capacitive dividers, coupling capacitors, shunt capacitors	SR EN 60358-1:2013 (CEI 60358-1:2012), clauses 6.2.5, 9.2.2 CEI 60871-1:2014, clauses 7, 8, 14 CEI 60871-1:2005, clauses 7, 8, 14 CEI 60831-1:2014, clauses 7, 8, 14 CEI 60831-1:2002, clauses 7, 8, 14 PT-01-IT.30
6	Partial discharge measurement (mln.1 pC)		SR EN 60270:2003 (CEI 60270:2000)
		Oil-immersed or dry power transformers, reactors	SR EN 60076-3:2003 (CEI 60076-3:2000), clause 12 SR EN 60076-3:2013 (CEI 60076-3:2013), clause 11.3 SR EN 60076-11:2005 (CEI 60076-11: 2004), clause 22 SR EN 60076-6:2009 (CEI 60076- 6:2007), clause 7.8.10 IEEE Std C57.12.90-2010 IEEE Std C57.12.91-2011 IEEE Std C57.113-2010 PT-01-IT.05
		Tap-changers	CEI 60214-1:2014, clause 5.2.8 SR EN 60214 -1:2004 (CEI 60214 -1:2003), clause 5.2.8 CEI 60214 -2:2004 PT-01-IT.47
		Current instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clauses 5.3.3.1, 7.3.2 SR EN 61869-2:2013 (CEI 61869-2:2012) CEI 61869-4:2013, Table 10 SR EN 60044-8:2004 (CEI 60044-8:2002), clause 9.2 PT-01-IT.11
		Voltage instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clauses 5.3.3.1, 7.3.2 SR EN 61869-3:2012 (CEI 61869-3:2011), clause 7.3.2 CEI 61869-4:2013, Table 10 SR EN 61869-5:2012 (CEI 61869-5:2011), clause 7.3.2 SR EN 60044-7:2001 (CEI 60044-7:1999), clause 9.2 PT-01-IT.11
		Bushings	SR EN 60137:2008 (CEI 60137:2008), clauses 8.2, 9.4 SR EN 50386:2011+A1:2014 (EN 50386:2010+A1:2013) PT-01-IT.24
		Organic material insulators	SR EN 60660:2001 (CEI 60660:1999), clause 3.5 PT-01-IT.39



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Power cables with extruded insulation, terminals and their accessories	CEI 60502-2:2014, clause 18.2.5 CEI 60502-2:2005, clause 18.2.5 CEI 60840:2011, clause 9.2 SR EN 61442:2006 (CEI 61442:2005), clause 7 HD 620 part 10, Section C HD 628 S1 HD 629.1 S2, clause 7 PT-01-IT.38
		Metal-oxide surge arresters without gaps	SR EN 60099-4:2005+A1:2007+A2:2009 (CEI 60099-4:2009), clause 8.8 PT-01-IT.42
		Capacitive dividers, coupling capacitors, shunt capacitors	SR EN 60358-1:2013 (CEI 60358-1:2012), clauses 6.2.3, 9.2.4 CEI 60871-1:2014, clause 11 CEI 60871-1:2005, clause 11 PT-01-IT.41
7	Direct current (DC) high voltage test ($U_{max} = 1000$ kV)	Electric cables, terminals and connections for electric cables	SR EN 60229:2009 (CEI 60229:2007), clause 3.1 SR EN 61442:2006 (CEI 61442:2005), clause 5 CEI 60840:2011, clause 12.3 HD 628 S1, clause 5 HD 629.1 S2, clause 7 PT-01-IT.34
8	Combined high-voltage test (LI or SI; AC; DC)	High-voltage switchgear and controlgear	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clauses 6.2.5.2b, 6.2.6.2 SR EN 62271-100:2009+A1:2013 (CEI 62271-100:2008+A1:2012), clause 6.2 SR EN 62271-102:2003+A1:2012+A2:2013 (CEI 62271-102:2001+A1:2011+A2:2013), clause 6.2 SR EN 62271-103:2012 (CEI 62271-103:2011), clause 6.2 PT-01-IT.35
		Early streamer emission lightning protection systems	NFC 17-102:2011 (Annex C) UNE 21186:2011 (Annex C) PT-01-IT.37
9	Evaluation of effectiveness of the early streamer emission devices	Early streamer emission lightning protection systems	NFC 17-102:2011 (Annex C) UNE 21186:2011 (Annex C) PT-01-IT.37
10	Errors determination test (Test for accuracy)	Current instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clauses 3.4, 5.6, 7.2.6, 7.3.5 SR EN 61869-2:2013 (CEI 61869-2:2012), clauses 7.2.6.201, 7.2.6.202, 7.3.5.201, 7.3.5.202 CEI 61869-4:2013, clause 7.3.5 PT-01-IT.43
		Voltage instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clauses 3.4, 5.6, 7.2.6, 7.3.5 SR EN 61869-3:2012 (CEI 61869-3:2011), clauses 7.2.6.301, 7.2.6.302, 7.3.5.301, 7.3.5.302 CEI 61869-4:2013, clause 7.3.5 SR EN 61869-5:2012 (CEI 61869-5:2011), clause 7.2.6.501, 7.2.6.502, 7.3.5.501, 7.3.5.502 PT-01-IT.44



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

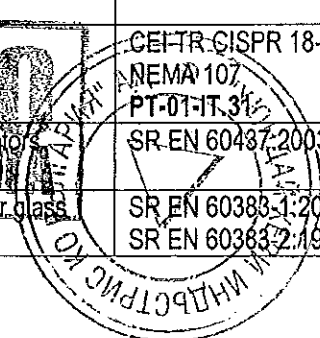
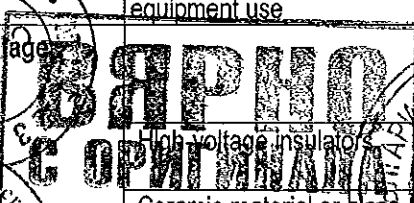
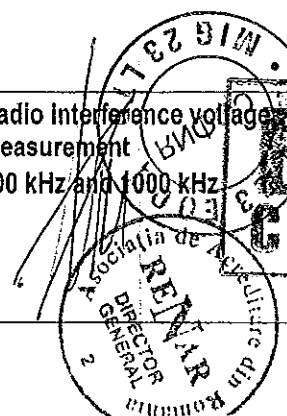
No.	Type / Name of the test	Material / product	Reference document
11	Measurement of frequency response	Power transformers	SR EN 60076-18:2013 (CEI 60076-18: 2012) PT-01-IT.40
II ELECTROMAGNETIC COMPATIBILITY TESTS			
II.1. EMISSIONS MEASUREMENTS			
12	Conducted radio disturbance measurement (9 ÷ 30 000) kHz		CISPR 16-SER:2013 PT-01-CEM.01
		Lifts, escalators and moving walks	SR EN 12015:2005, clauses 6.2, 6.3, 6.4 EN 12015:2014, clauses 6.2, 6.3, 6.4
		Uninterruptible power systems (UPS)	SR EN 62040-2:2006, (EN 62040-2:2006, CEI 62040: 2005), clauses 6.4.1 ÷ 6.4.4
		Railway equipment	SR EN 50121-3-2:2007 (EN 50121-3-2: 2006), clause 7, CEI 62236-3-2:2008, clause 7 SR EN 50121-4:2007 (EN 50121-4:2006), clause 5, CEI 62236-4:2008, clause 5 SR EN 50121-5:2007 (EN 50121-5:2006), clause 5 CEI 62236-5:2008, clause 5 SR EN 50155:2007 (EN 50155:2007), Clause 12.2.8.2
		Electronic taximeters	SR EN 50148:2001 (EN 50148:1995), Clause 11.2
		Measuring relays and protection equipment	SR EN 60255-25:2003 (EN 60255-25:2000, CEI 60255-25:2000), clause 4.1 SR EN 60255-26:2010 (EN 60255-26:2009, CEI 60255-26:2008), clause 4.1 SR EN 60255-26:2014 (EN 60255-26:2013, CEI 60255-26:2013), clause 4.1
		Electrical apparatus for the detection and measurement of gases	SR EN 50270:2007 (EN 50270:2006), clause 5
		Road traffic signal systems	SR EN 50293:2013 (EN 50293:2012), clause 2
		Industrial, scientific and medical equipment	SR EN 55011:2010+A1:2011, (EN 55011:2009+A1:2010, CISPR 11:2010), clause 8.2
		Sound and television broadcast receivers and associated equipment	SR EN 55013:2003+A1:2004+A2:2006 (EN 55013:2001+A1:2003+A2:2006), SR EN 55013:2014 (EN 55013:2013), CISPR 13:2009, clause 5.3
		Household appliances, electric tools and similar apparatus	SR EN 55014-1:2007+A1:2009+A2:2012 (EN 55014-1:2006+A1:2009+A2:2011, CISPR 14-1:2011), clause 5
		Electrical lighting and similar equipment	SR EN 55015:2014 (EN 55015:2013, CISPR 15:2013), clause 8
		Information technology equipment	SR EN 55022:2011 (EN 55022:2010), CISPR 22:2008), clause 9
		Multimedia equipment	SR EN 55032:2012 (EN 55032:2012), CISPR 32:2012), clause A1
High-voltage switchgear and controlgear	SR EN 62271-1:2009+A1:2012 (EN 62271-1:2008+A1:2011, CEI 62271-1:2011), clause 6.9.1.2		
Electrical equipment used in the commercial and light-industrial environments	SR EN 61000-6-3:2007+A1:2011 (EN 61000-6-3:2007+A1:2011, CEI 61000-6-3:2011), clause 7		

ВЕРНО
С ОПИНАМ

RENAR
DIRECTOR GENERAL
Page 9/13

Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Electrical equipment used in industrial environments	SR EN 61000-6-4:2007+A1:2011 (EN 61000-6-4:2007+A1:2011, CEI 61000-6-4:2006+A1:2011), clause 7
		Low voltage power supplies, d.c. output	SR EN 61204-3:2003 (EN 61204-3:2000, CEI 61204-3:2011), clause 6.3
		Electrical equipment for measurement, control and laboratory use	SR EN 61326-1:2013 (EN 61326-1:2013, CEI 61326-1:2012), clause 7
		Adjustable speed electrical power drive systems	SR EN 61800-3:2005+A1:2012 (EN 61800-3:2004+A1:2012, CEI 61800-3: 2012), clause 6.3.1.2
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007 (EN 50470-1:2006), clause 7.4.13 SR EN 62052-11:2004 (EN 62052-11:2003, CEI 62052-11:2003), clause 7.5.8 SR EN 62052-21:2005 (EN 62052-21:2004, CEI 62052-21:2004), clause 7.7
		Telecommunication network equipment	ETSI EN 300386:2012, clause 6
		Radio equipment and services	ETSI EN 301489-1:2011, clauses 8.3, 8.4, 8.7
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2: 2007, CEI 60601-1-2:2007), EN 60601-1-2:2014,(CEI 60601-1-2:2014), clause 6.1.1
		Equipment and communication systems for signalling on low-voltage electrical installations	SR EN 50065-1:2011 (EN 50065-1:2011), clause 7.2
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012 (EN 61439-1:2011, CEI 61439-1:2011), clause J.10.12.2.2
		Machine tools	SR EN 50370-1:2005 (EN 50370-1:2005), Annex A
		Electrical and electronically auto sub-assemblies (ESA)	Directive 2009/19/CE, clause 6.9 Directive 2009/64/CE, clause 6.9 ISO 7637-1:2002+A1:2008 ISO 7637-2:2011, clause 4.3 STD 515-0003:2009, clause 4.1
		Vehicles, boats and internal combustion engines	SR EN 55012:2008+A1:2010 (EN 55012:2007+A1:2009, CISPR 12:2009), clauses 5 and 6
		Receivers used on board vehicles, boats, and internal combustion engines	SR EN 55025:2009 (EN 55025:2008, CISPR 25:2008), clauses 6.2, 6.3
		Electrical and electromechanical subsystems and equipment intended for military equipment use	MIL-STD-461F:2007, Method CE 102
13	Radio interference voltage measurement 500 kHz and 1000 kHz	High voltage insulators Ceramic material or glass insulators	CEI-TR-CISPR 18-2:2010, clause 4.5 NEMA 107 PT-01-IT-31 SR EN 60437:2003 (CEI 60437:1997) SR EN 60383-1:2002 (CEI 60383-1:1993) SR EN 60383-2:1996 (CEI 60383-2:1993)



M

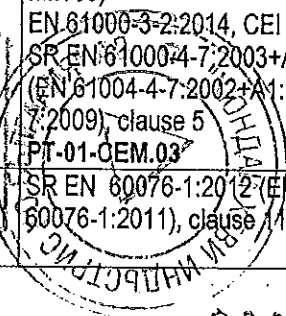
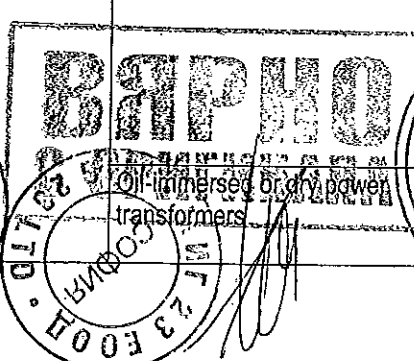
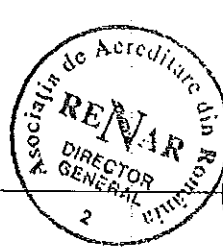
(

(

Annex no. 1 to Accreditation Certificate no. LI 1036

Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
			SR EN 60168:1997+A1:2004+A2:2001 (CEI 60168:1994+A1:1997+A2:2000), clause 6.1.2
		Composite insulators	SR EN 61109:2009 (CEI 61109:2008)
		Overhead lines fittings	SR EN 61284:2000 (CEI 61284:1997), clause 14
		Metal-oxide surge arresters without gaps	SR EN 60099-4:2005+A1:2007+A2:2009 (CEI 60099-4:2009), clause 8.14
		Line traps	CEI 60353:1989, clause 11
		High-voltage switchgear and controlgear	SR EN 62271-1:2009+A1:2012 (CEI 62271-1:2007+A1:2011), clause 6.3
		Alternating-current circuit-breakers	SR EN 62271-100:2009+A1:2013 (CEI 62271-100:2008+A1:2012), clause 6.3 SR EN 62271-103:2012 (CEI 62271-103:2011), clause 6.3
		Alternating current switches	SR EN 62271-102:2003+A1:2012+A2:2013 (CEI 62271-102:2001+A1:2011+A2:2013), clause 6.3
		Current instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clauses 6.11.2, 7.2.5.1 SR EN 61869-2:2013 (CEI 61869-2:2012) CEI 61869-4:2013, Table 10 SR EN 60044-8:2004 (CEI 60044-8:2002), clause 8.5
		Voltage instrument transformers	SR EN 61869-1:2010 (CEI 61869-1:2007), clauses 6.11.2, 7.2.5.1 SR EN 61869-3:2012 (CEI 61869-3:2011), clause 7.2.5 CEI 61869-4:2013, Table 10 SR EN 61869-5:2012 (CEI 61869-5:2011) SR EN 60044-7:2001 (CEI 60044-7:1999), clause 8.5
14	Disturbance power measurement (30 ÷ 1000) MHz		CISPR 16-SER:2011 PT-01-CEM.02
		Sound and television broadcast receivers and associated equipment	SR EN 55013:2003+A1:2004+A2:2006 (EN 55013:2001+A1:2003+A2:2006), SR EN 55013:2014 (EN 55013:2013), CISPR 13:2009, clause 4.5
		Household appliances, electric tools and similar apparatus	SR EN 55014-1:2007+A1:2009+A2:2012 (EN 55014-1:2006+A1:2009+A2:2011, CISPR 14-1:2011), clause 5
		Low voltage power supplies, c.c. output	SR EN 61204-3:2003 (EN 61204-3:2000, CEI 61204-3:2011), clause 6.4.2
		Equipment and communication systems for signalling on low-voltage electrical installations	SR EN 50065-1:2011 (EN 50065-1:2011), clause 7.4
15	Harmonic current emissions measurement (50 ÷ 2 000) Hz		SR EN 61000-3-2:2006+A1:2010+A2:2010 (EN 61000-3-2:2006+A1:2009+A2:2009, CEI 61000-3-2:2009) EN 61000-3-2:2014, CEI 61000-3-2:2014 SR EN 61000-4-7:2003+A1:2009 (EN 61004-4-7:2002+A1:2009, CEI 61000-4-7:2009), clause 5 PT-01-OEM.03
		Oil-immersed or dry power transformers	SR EN 60076-1:2012 (EN 60076-1:2011, CEI 60076-1:2011), clause 11.1.4



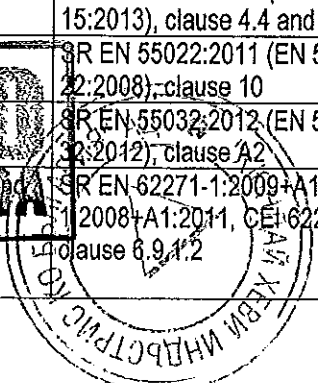
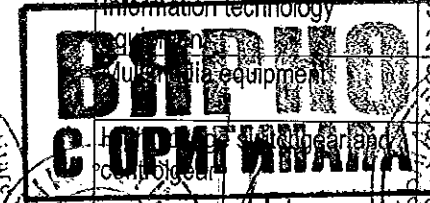
Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Lifts, escalators and moving walks	SR EN 12015:2005 (EN 12015:2004), EN 12015:2014, clause 6.6
		Uninterruptible power systems (UPS)	SR EN 62040-2:2006 (EN 62040-2:2006), clause 6.4.5
		Railway equipment	SR EN 50155:2007 (EN 50155:2007), clause 10.2.8.2
		Electrical apparatus for the detection and measurement of gases	SR EN 50270:2007 (EN 50270:2006), clause 5
		Electrical equipment used in residential, commercial and light-industrial environments	SR EN 61000-6-3:2007+A1:2011 (EN 61000-6-3:2007+A1:2011, CEI 61000-6-3:2011), clause 7
		Low voltage power supplies, c.c. output	SR EN 61204-3:2003 (EN 61204-3:2000) CEI 61204-3:2011, clause 6.2.2
		Electrical equipment for measurement, control and laboratory use	SR EN 61326-1:2013 (EN 61326-1:2013, CEI 61326-1:2012), clause 7
		Adjustable speed electrical power drive systems	SR EN 61800-3:2005+A1:2012 (EN 61800-3:2004+A1:2012, CEI 61800-3:2012), clause 6.2.3
		Telecommunication network equipment	SR EN 300386:2012, clause 6.1
		Radio equipment and services	ETSI EN 301489-1:2011, clause 8.5
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2: 2007, CEI 60601-1-2:2007), EN 60601-1-2:2014 (CEI 60601-1-2:2014), clause 6.1.3.1
16	Voltage fluctuations and flicker measurement (P_{fb} , P_{st} , $d(t)$, d_c , d_{max})		SR EN 61000-3-3:2009 (EN 61000-3-3:2008, CEI 61000-3-3:2008) SR EN 61000-3-3:2014 (EN 61000-3-3:2013, CEI 61000-3-3:20013) PT-01-CEM.04
		Lifts, escalators and moving walks	SR EN 12015:2005 (EN 12015:2004), EN 12015:2014, clause 6.5
		Electrical apparatus for the detection and measurement of gases	SR EN 50270:2007 (EN 50270:2006), clause 5
		Electrical equipment used in residential, commercial and light-industrial environments	SR EN 61000-6-3:2007+A1:2011 (EN 61000-6-3:2007+A1:2011, CEI 61000-6-3: 2011), clause 7
		Low voltage power supplies, c.c. output	SR EN 61204-3:2003 (EN 61204-3:2000, CEI 61204-3:2011), clause 6.2.3
		Electrical equipment for measurement, control and laboratory use	SR EN 61326-1:2013 (EN 61326-1:2013, CEI 61326-1:2012), clause 7
		Adjustable speed electrical power drive systems	SR EN 61800-3:2005+A1:2012 (EN 61800-3:2004+A1:2012, CEI 61800-3:2012), clause 6.2.3
		Telecommunication network equipment	ETSI EN 300386:2012, clause 6.1
		Radio equipment and services	ETSI EN 301489-1:2011, clause 8.6
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2: 2007, CEI 60601-1-2:2007), EN 60601-1-2:2014 (CEI 60601-1-2:2014), clause 6.1.3.2

000370

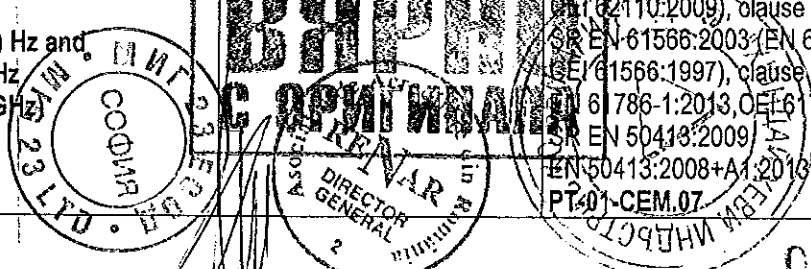
Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
17	Radiated disturbance measurement (0,009 ÷ 1000) MHz		CISPR 16-SER: 2013 PT-01-CEM.05
		Lifts, escalators and moving walks	SR EN 12015:2005 (EN 12015:2004), EN 12015:2014, clause 6.1
		Electrical and electronically auto sub-assemblies (ESA)	Directive 2009/19/CE, (72/ 245/ CEE), clauses 6.5, 6.6 Directive 2009/64/CE, ANNEX I, clause 6.5, 6.6 STD 515-0003: 2009, clause 4.2
		Vehicles, boats and internal combustion engines	SR EN 55012:2008+A1:2010 (EN 55012:2007+A1:2009, CISPR 12:2009), clause 5 and 6
		Receivers used on board vehicles, boats and internal combustion engines	SR EN 55025:2009 (EN 55025:2008, CISPR 25:2008), clause 6.4
		Railway equipment	SR EN 50121-1:2007 (EN 50121-1:2006), clause 4 SR EN 50121-3-2:2007 (EN 50121-3-2: 2006), clause 7 SR EN 50121-4:2007 (EN 50121-4:2006), clause 5 SR EN 50121-5:2007 (EN 50121-5:2006), clause 5 CEI 62236-1:2008, clause 4 CEI 62236-3-2:2008, clause 7 CEI 62236-4:2008, clause 5 CEI 62236-5:2008, clause 5
		Electronic taximeters	SR EN 50148:2001 (EN 50148:1995), clause 11.2
		Measuring relays and protection equipment	SR EN 60255-25:2003 (EN 60255-25:2000, EN 60255-25:2000), clause 6.4 SR EN 60255-26:2010 (EN 60255-26:2009, CEI 60255-26:2008), clause 4.1 SR EN 60255-26:2014 (EN 60255-26:2013, CEI 60255-26:2013), clause 4.1
		Electrical apparatus for the detection and measurement of gases	SR EN 50270:2007 (EN 50270:2006), clause 5
		Road traffic signal systems	SR EN 50293:2013 (EN 50293:2012), clause 2
		Industrial, scientific and medical equipment	SR EN 55011:2010+A1:2010, (EN 55011:2009+A1:2010, CISPR 11:2010), clauses 8.3, 8.4, 9.
		Sound and television broadcast receivers and associated equipment	SR EN 55013:2003+A1:2004+A2:2006 (EN 55013:2001+A1:2003+A2:2006), SR EN 55013:2014 (EN 55013:2013), CISPR 13:2009, clauses 5.7, 5.8
		Household appliances, electric tools and similar apparatus	SR EN 55014-1:2007+A1:2009+A2:2012 (EN 55014-1:2006+A1:2009+A2:2011, CISPR 14-1:2011), clause 9
		Electrical lighting equipment	SR EN 55015:2014 (EN 55015:2013, CISPR 15:2013), clause 4.4 and clause 9
		Information technology	SR EN 55022:2011 (EN 55022:2010), CISPR 22:2008, clause 10
		Audio equipment	SR EN 55032:2012 (EN 55032:2012), CISPR 32:2012, clause A2
		Cordless power tools	SR EN 62271-1:2009+A1:2012 (EN 62271-1:2008+A1:2011, CEI 62271-1:2011), clause 6.9.1.2



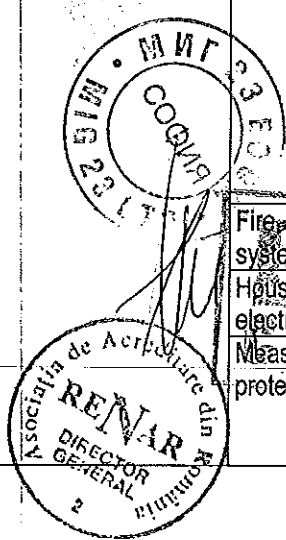
Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Electrical equipment used in residential, commercial and light-industrial environments	SR EN 61000-6-3:2007+A1:2011 (EN 61000-6-3:2007+A1:2011, CEI 61000-6-3:2011), clause 7
		Electrical equipment used in industrial environments	SR EN 61000-6-4:2007+A1:2011 (EN 61000-6-4:2007+A1:2011, CEI 61000-6-4:2006+A1:2011), clause 7
		Low voltage power supplies, c.c. output	SR EN 61204-3:2003 (EN 61204-3:2000), CEI 61204-3:2011, clause 6.4
		Electrical equipment for measurement, control and laboratory use	SR EN 61326-1:2013 (EN 61326-1:2013, CEI 61326-1:2012), clause 7
		Adjustable speed electrical power drive systems	SR EN 61800-3:2005+A1:2012 (EN 61800-3:2004+A1:2012, CEI 61800-3:2012), clause 6.3.1.3
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007 (EN 50470-1:2006), clause 7.4.13 SR EN 62052-11:2004 (EN 62052-11:2003, CEI 62052-11:2003), clause 7.5.8 SR EN 62052-21:2005 (EN 62052-21:2004, CEI 62052-21:2004), clause 7.7
		Telecommunication network equipment	ETSI EN 300386:2012, clause 6
		Radio equipment and services	ETSI EN 301489-1:2011, clause 8.2.
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2: 2007, CEI 60601-1-2:2007), EN 60601-1-2:2014, (CEI 60601-1-2:2014), clause 6.1.1
		Equipment and communication systems for signalling on low-voltage electrical installations	SR EN 50065-1:2011 (EN 50065-1:2011), clause 7.3
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012 (EN 61439-1:2011, CEI 61439-1:2011), clause J.10.12.2.2
		Machine tools	SR EN 50370-1:2005 (EN 50370-1:2005), Annex A
		Electrical and electromechanical subsystems and equipment intended for military equipment use (10 kHz ÷ 18 GHz)	MIL-STD-461F:2007, Methods RE 102, RE 103
18	Insertion attenuation measurement (0,01 ÷ 1000) MHz		CISPR 16-SER: 2013 PT-01-CEM.06
		Electrical lighting and similar equipment (150 ÷ 1605) kHz	SR EN 55015:2014 (EN 55015:2013, CISPR 15:2013), clause 7
		Passive filtering devices	SR EN 55017:2012 (EN 55017:2011) CISPR 17:2011), clause 4
19	Electromagnetic fields measurement H:(5 ÷ 32 000) Hz and (27÷ 1000) MHz E:(5 Hz ÷ 60 GHz)		SR EN 62110:2010 (EN 62110:2009) (EN 62110:2009), clause 4 SR EN 61566:2003 (EN 61566:1997) (CEI 61566:1997), clause 6.2 SR EN 61786-1:2013 (EN 61786-1:2013), clause 5.6 SR EN 50413:2009 EN 50413:2008+A1:2013, clause 5.2 PT-01-CEM.07



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Industrial environments: substations, energy distribution plants, industrial halls etc. (50 Hz)	Directive 2013/35/UE SR EN 62110:2010 (EN 62110:2009, SR EN 50499:2009 (EN 50499:2008), clause 8.9
		Residential environments: office buildings, firm, residences, etc.	OMS 1193: 2006 SR EN 61566:2003 (EN 61566:1997; CEI 61566:1997), clause 6.2 CEI 61786:1998, clause 5. 6
		Medical power supply units (50 Hz)	SR EN ISO 11197:2009, (ISO 11197:2004), clause 36.101
		Lighting equipment	SR EN 62493:2010 (EN 62493:2010, CEI 62493:2009), clause 6
20	Measuring the effectiveness of electromagnetic shielding (9 kHz + 18 GHz)		PT-01-CEM.08
		Electromagnetic shielded enclosures	IEEE 299: 2006
		Anechoic chambers	SR EN 50147-1:1998 (EN 50147-1:2006)
		Mechanical structures for electronic equipments	SR EN 61587-3:2007 (EN 61587-3:2006), CEI 61587-3:2006
		Mechanical structures for electronic equipment	SR EN 60297-3:2005-2009, EN 60297-3:2004-2010, CEI 60297-3:2004-2010
		Durable Rigid Wall Relocatable Structures	ASTM E1851-09
		Planar Materials	ASTM D4935-10
21	Measurement of specific absorption rate (SAR)	Mobile terminals	SR EN 50360:2007+A1:2012 (EN 50360:2001+A1:2012), SR EN 62209-1:2007 (EN 62209-1:2006, CEI 62209-1:2005) PT-01-CEM.10
II.2. IMMUNITY TESTS			
22	Electrical fast transient/burst immunity test (0,2 ÷ 4) kV		SR EN 61000-4-4:2013 (EN 61000-4-4:2012, CEI 61000-4-4:2012) PT-01-CEM.11
		Lifts, escalators and moving walks	SR EN 12016:2013 (EN 12016:2013), clause 4
		Uninterruptible power systems (UPS)	SR EN 62040-2:2006 (EN 62040-2:2006), clause 7.3
		Railway equipment	SR EN 50121-1:2007 (EN 50121-1:2006, CEI 62236-1:2008), clause 4 SR EN 50121-3-2:2007 (EN 50121-3-2:2006, CEI 62236-3-2:2008), clause 8 SR EN 50121-4:2007 (EN 50121-4:2006, CEI 62236-4:2008), clause 6 SR EN 50121-5:2007 (EN 50121-5:2006, CEI 62236-5:2008), clause 6 SR EN 50155:2007 (EN 50155:2007), clause 12.2.7.3
		Fire intruder, social alarm systems	SR EN 50130-4:2012, (EN 50130- 4:2011+A1:2014), clause 12
		Household and similar electrical appliances	SR EN 60335-1:2012 (EN 60335-1:2012, CEI 60335-1:2010), clause 19.11.4.4
		Measuring relays and protection equipment	SR EN 60255-22-4:2008 (EN 60255-22-4: 2008, CEI 60255-22-4:2008)
			SR EN 60255-26:2010 (EN 60255-26:2009, CEI 60255-26:2008), clause 4.2



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
			SR EN 60255-26:2014 (EN 60255-26:2013, CEI 60255-26:2013), clause 4.2
		Electrical apparatus for the detection and measurement of gases	SR EN 50270:2007 (EN 50270:2006), clause 4 ISO/PAS 3930:2009, clause 5.7.d, 5.7.e, A.13 SR EN 12405-1+A2:2011 (EN 12405-1+A2:2010), clause A.8
		Road traffic signal systems	SR EN 50293:2001 (EN 50293:2000), clause 3 SR EN 50293:2013 (EN 50293:2012), clause 3
		Household appliances, electric tools and similar apparatus	SR EN 55014-2:2001+A1:2003+A2:2009 (EN 55014-2:1997+A1:2001+A2:2008, CISPR 14-2:2008), clause 4.2 and 5.2
		Information technology equipment	SR EN 55020:2007+A11:2012, (EN 55020:2007+A11:2011+A1:2014, CISPR 20:2006), clause 5.6 CISPR 20:2013, clause 5.9
		High-voltage switchgear and controlgear	SR EN 62271-1:2009+A1:2012 (EN 62271-1:2008+A1:2011), CEI 62271-1:2011, clause 6.9.2.3
		Electrical equipment used in residential, commercial and light-industrial environments	SR EN 61000-6-1:2007 (EN 61000-6-1:2007, CEI 61000-6-1:2005), clause 8
		Electrical equipment used in industrial environments	SR EN 61000-6-2:2006 (EN 61000-6-2:2005, CEI 61000-6-2:2005), clause 8
		Low voltage power supplies, c.c. output	SR EN 61204-3: 2003 (EN 61204-3: 2000, CEI 61204-3: 2000), clause 7.2
		Electrical equipment for measurement, control and laboratory use	SR EN 61326-1:2013 (EN 61326-1:2013, CEI 61326-1:2012), clause 6.2
		Equipment for general lighting purposes	SR EN 61547:2010 (EN 61547:2009, CEI 61547:2009), clause 5.5
		Adjustable speed electrical power drive systems	SR EN 61800-3:2005+A1:2012 (EN 61800-3:2004+A1:2012, CEI 61800-3:2012), clause 5.3
		Electricity metering equipment (a.c.)	SR EN 50470-1: 2007 (EN 50470-1: 2006) clause 7.4 SR EN 62052-11: 2004 (EN 62052-11: 2003, CEI 62052-11: 2003), clause 7.5.4 SR EN 62052-21: 2005 (EN 62052-21: 2004, CEI 62052-21: 2004), clause 7.6.5
		Telecommunication network equipment	ETSI EN 300386:2012, clause 5.2
		Radio equipment and services	ETSI EN 301489-1:2011, clause 9.4
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2: 2007, CEI 60601-1-2:2007), EN 60601-1-2:2014, (CEI 60601-1-2:2014), clause 6.2.4
		Non-automatic weighing instruments	SR EN 45501/AC:2004 (EN 45501:1992), EN 45501:2014, clause B.3.2 OIML R 76-1:2006, clause B.3.2
		Liquids other than water dispensers	OIML R 117-1:2007, clauses A.11.4, A.11.6
		Equipment and communication systems for signalling on low-voltage electrical installations	SR EN 50065-2-1:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-2:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7

**БВРНО
С ОПИТНА**

Asociația de Accreditare din România
RENAR
 DIRECTOR GENERAL
 2

COPIE
 23

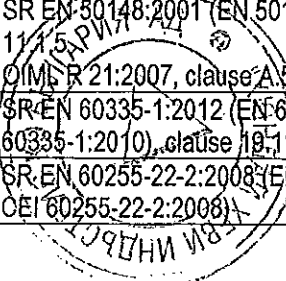
COPIE
 53

Annex no. 1 to Accreditation Certificate no. LI 1036

Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Equipment for general lighting purposes	SR EN 61547:2010 (EN 61547:2009, CEI 61547:2009), clause 5.7
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007 (EN 50470-1:2006), clause 7.4.9 SR EN 62052-11:2004 (EN 62052-11:2003, CEI 62052-11:2003), clause 7.5.6 SR EN 62052-21:2005 (EN 62052-21:2004, CEI 62052-21:2004), clause 7.6.7
		Telecommunication network equipment	ETSI EN 300386:2012, clause 5.3
		Radio equipment and services	ETSI EN 301489-1:2011, clause 9.8
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2: 2007, CEI 60601-1-2:2007), EN 60601-1-2:2014, CEI 60601-1-2:2014), clause 6.2.5
		Non-automatic weighing instruments	OIML R 76-1:2006, clause B.3.3
		Liquids other than water dispenser	OIML R117-1:2007, clause A.11.7, A.11.10
		Equipment and communication systems for signalling on low-voltage electrical installations	SR EN 50065-2-1:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-2:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-3:2003+A1:2006 (EN 50065-1:2003 + A1:2005), clause 7
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012 (EN 61439-1:2011, CEI 61439-1:2011), clause J.10.12.1.2
		Machine tools	SR EN 50370-2:2003 (EN 50370-2:2003), Annex A
24	Electrostatic discharge immunity test (0,2 ÷ 25) kV		SR EN 61000-4-2:2009 (EN 61000-4-2:2009, CEI 61000-4-2:2008) PT-01-CEM.13
		Lifts, escalators and moving walks	SR EN 12016:2013 (EN 12016:2013), clause 4
		Railway equipment	SR EN 50121-1:2007 (EN 50121-1:2006, CEI 62236-1:2008), clause 4 SR EN 50121-3-2:2007 (EN 50121-3-2:2006, CEI 62236-3-2:2008), clause 8 SR EN 50121-4:2007 (EN 50121-4:2006, CEI 62236-4:2008), clause 6 SR EN 50121-5:2007 (EN 50121-5: 2006, CEI 62236-5:2008), clause 6 SR EN 50155:2007 (EN 50155:2007), clause 12.2.7.2
		Uninterruptible power systems (UPS)	SR EN 62040-2:2006 (EN 62040-2:2006), clause 7.3
		Fire, intruder, social alarm systems	SR EN 50130-4:2012 (EN 50130-4:2011+A1:2014), clause 9
		Electronic taximeters	SR EN 50148:2001 (EN 50148:1995), clause 11.7.5 OIML R 21:2007, clause A.5.4.6
		Household and similar electrical appliances	SR EN 60335-1:2012 (EN 60335-1:2012, CEI 60335-1:2010), clause 19.1.4.1
		Measuring relays and protection equipment	SR EN 60255-22-2:2008 (EN 60255-22-2:2008, CEI 60255-22-2:2008)

**ВЪРНО
С ОПИТНАТА**



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
			SR EN 60255-26:2010 (EN 60255-26:2009, CEI 60255-26:2008), clause 4.2 SR EN 60255-26:2014 (EN 60255-26:2013, CEI 60255-26:2013), clause 4.2
		Electrical apparatus for the detection and measurement of gases	SR EN 50270:2007 (EN 50270:2006), clause 4 ISO/PAS 3930:2009, clause 5.7.g, A.15 SR EN 12405-1+A2:2011 (EN 12405-1+A2:2010), clause A.10
		Road traffic signal systems	SR EN 50293:2001 (EN 50293:2000), clause 3 SR EN 50293:2013 (EN 50293:2012), clause 3
		Household appliances, electric tools and similar apparatus	SR EN 55014-2:2001+A1:2003+A2:2009 (EN 55014-2:1997+A1: 2001+A2: 2008, CISPR 14-2:2008), clause 5.1
		Sound and television broadcast receivers and associated equipment	SR EN 55020:2007+A11: 2012 (EN 55020:2007+A11;2011+A1:2014, CISPR 20:2006), clause 5.9 CISPR 20:2013, clause 5.9
		Information technology equipment	SR EN 55024:2011 (EN 55024:2010, CISPR 24:2010), clause 4.2.1
		Electrical equipment used in residential, commercial and light-industrial environments	SR EN 61000-6-1:2007 (EN 61000-6-1:2007, CEI 61000-6-1:2005), clause 8
		Electrical equipment used in industrial environments	SR EN 61000-6-2:2006 (EN 61000-6-2:2005, CEI 61000-6-2:2005), clause 8
		Low voltage power supplies, c.c. output	SR EN 61204-3:2003 (EN 61204-3:2000, CEI 61204-3:2000), clause 7.2
		Electrical equipment for measurement, control and laboratory use	SR EN 61326-1:2013 (EN 61326-1:2013, CEI 61326-1:2012), clause 6.2
		Equipment for general lighting purposes	SR EN 61547:2010 (EN 61547:2009, CEI 61547:2009), clause 5.2
		Adjustable speed electrical power drive systems	SR EN 61800-3:2005+A1:2012 (EN 61800-3:2004+A1:2012, CEI 61800-3:2012), clause 5.3
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007 (EN 50470-1:2006), clause 7.4.5 SR EN 62052-11:2004 (EN 62052-11:2003, CEI 62052-11:2003), clause 7.5.2 SR EN 62052-21:2005 (EN 62052-21:2004, CEI 62052-21:2004), clause 7.6.3
		Telecommunication network equipment	ETSI EN 300386:2012, clause 5.1
		Radio equipment and services	ETSI EN 301489-1:2011, clause 9.3
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2: 2007, CEI 60601-1-2:2007), EN 60601-1-2:2014, (CEI 60601-1-2:2014), clause 6.2.2
		Electrical and electronically auto sub-assemblies (ESA)	ISO 10605:2008+Cor.1:2010 Volyp STD 515-0003:2009, clause 8
		Non-automatic weighing instruments	SR EN 45501/AC:2004 (EN 45501:1992), clause B.3.3 EN 45501:2014, clause B.3.3 OIML R 76-1:2006, clause B.3.4
		Liquids other than water dispenser	OIML R117-1:2007, clause A.11.5

ВРПНО
С ОПИШУВАЊА

REINAR
 DIRECTOR GENERAL

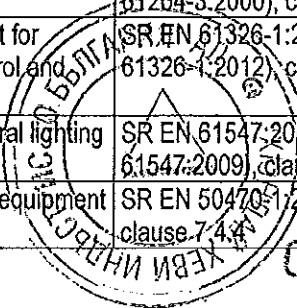
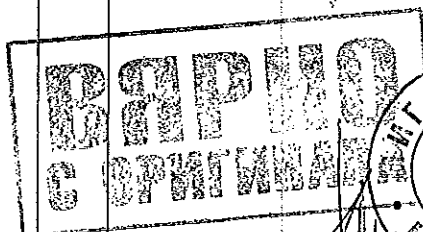
CO 149
 23 ED

AC KO B...
 77000

Annex no. 1 to Accreditation Certificate no. LI 1036

Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Equipment and communication systems for signalling on low-voltage electrical installations	SR EN 50065-2-1:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-2:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-3:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012 (EN 61439-1:2011, CEI 61439-1:2011), clause J.10.12.1.2
		Machine tools	SR EN 50370-2:2003 (EN 50370-2:2003), Annex A
25	Voltage dips, short interruptions and voltage variations immunity tests. (0 ÷ 100 %) U _N ; U _N = 250 V max.		SR EN 61000-4-11:2005 (EN 61000-4-11:2004, CEI 61000-4-11:2004) PT-01-CEM.14
		Lifts, escalators and moving walks	SR EN 12016:2013 (EN 12016:2013), clause 4
		Uninterruptible power systems (UPS)	SR EN 62040-2:2006 (EN 62040-2:2006), clause 7.6
		Railway equipment	SR EN 50155:2007 (EN 50155:2007), clause 10.2.6.1
		Fire, intruder, social alarm systems	SR EN 50130-4: 2012 (EN 50130-4:2011+A1:2014), clause 8
		Household and similar electrical appliances	SR EN 60335-1:2012 (EN 60335-1:2012, CEI 60335-1:2010), clause 19.11.4.6
		Measuring relays and protection equipment	SR EN 60255-11:2010 (EN 60255-11:2010, CEI 60255-11:2008) SR EN 60255-26:2010 (EN 60255-26:2009, CEI 60255-26:2008), clause 4.2 SR EN 60255-26:2014 (EN 60255-26:2013, CEI 60255-26:2013), clause 4.2
		Electrical apparatus for the detection and measurement of gases	SR EN 50270:2007 (EN 50270:2006), clause 4 ISO/PAS 3930:2009, clause 5.7.c, A.12 SR EN 12405-1+A2:2011 (EN 12405-1+A2:2010), clause A.7
		Road traffic signal systems	SR EN 50293:2001 (EN 50293:2000), clause 3 SR EN 50293:2013 (EN 50293:2012), clause 3
		Household appliances, electric tools and similar apparatus	SR EN 55014-2:2001+A1:2003+A2:2009 (EN 55014-2:1997+A1:2001+A2:2008, CISPR 14-2:2008), clause 5.7
		Information technology equipment	SR EN 55024:2011 (EN 55024:2010, CISPR 24:2010), clause 4.2.6
		Electrical equipment used in residential, commercial and light-industrial environments	SR EN 61000-6-1:2007 (EN 61000-6-1:2007, CEI 61000-6-1:2005), clause 8
		Electrical equipment used in industrial environments	SR EN 61000-6-2:2006 (EN 61000-6-2:2005, CEI 61000-6-2:2005), clause 8
		Low voltage power supplies, one output	SR EN 61204-3:2003 (EN 61204-3:2000, CEI 61204-3:2000), clause 7.2
		Electrical equipment for measurement, control and laboratory use	SR EN 61326-1:2013 (EN 61326-1:2013, CEI 61326-1:2012), clause 6.2
		Equipment for general lighting purposes	SR EN 61547:2010 (EN 61547:2009, CEI 61547:2009), clause 5.8
		Electricity metering equipment (a.c.)(c.a.)	SR EN 50470-1:2007 (EN 50470-1:2006), clause 7.4.4

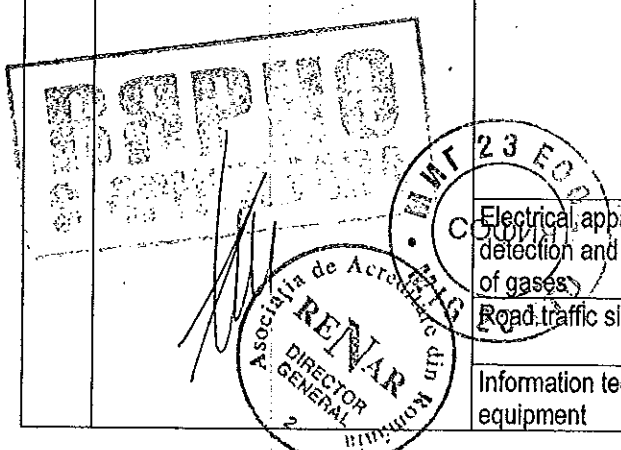


000378

Annex no. 1 to Accreditation Certificate no. LI 1036

Annex no. 1 Issue Date: 10.10.2014

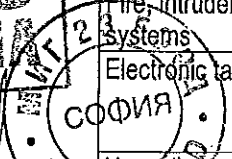
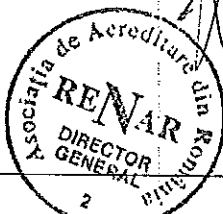
No.	Type / Name of the test	Material / product	Reference document
			SR EN 62052-11:2004 (EN 62052-11:2003, CEI 62052-11:2003), clause 7.1.2 SR EN 62052-21:2005 (EN 62052-21:2004, CEI 62052-21:2004), clause 7.6.8
		Adjustable speed electrical power drive systems	SR EN 61800-3:2005+A1:2012 (EN 61800-3:2004+A1:2012, CEI 61800-3:2012), clause 5.3
		High-voltage switchgear and controlgear	SR EN 62271-1:2009+A1:2012 (EN 62271-1:2008+A1:2011, CEI 62271-1:2011), clause 6.9.3.3
		Telecommunication network equipment	ETSI EN 300386: 2012, clause 5.6
		Radio equipment and services	ETSI EN 301489-1:2011, clause 9.7
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2:2007, CEI 60601-1-2:2007), EN 60601-1-2:2014, (CEI 60601-1-2:2014), clause 6.2.7
		Non-automatic weighing instruments	SR EN 45501/AC:2004 (EN 45501:1992), clause B.3.1 EN 45501:2014, clause B.3.1 OIML R 76-1:2006, clause B.3.1
		Liquids other than water dispenser	OIML R117-1:2007, clause A.11.3
		Equipment and communication systems for signalling on low-voltage electrical installations.	SR EN 50065-2-1:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-2:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-3:2003 + A1:2006 (EN 50065-1:2003 + A1:2005), clause 7
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012 (EN 61439-1:2011, CEI 61439-1:2011), clause J.10.12.1.2
		Machine tools	SR EN 50370-2:2003 (EN 50370-2:2003), Annex A
26	Magnetic field immunity test (0 ÷ 100) A/m; 50 Hz (0 ÷ 1000) A/m; 8/20 µs		SR EN 61000-4-8:2010 (EN 61000-4-8:2010, CEI 61000-4-8:2009) SR EN 61000-4-9:2003+A1:2003 (EN 61000-4-9:1993+A1:2001, CEI 61000-4-9:2001) PT-01-CEM.15
		Uninterruptible power systems (UPS)	SR EN 62040-2:2006 (EN 62040-2:2006, CEI 62040-2:2005), clause 7.5
		Railway equipment	SR EN 50121-1:2007 (EN 50121-1:2006, CEI 62236-1:2008), clause 4 SR EN 50121-3-2:2007 (EN 50121-3-2:2006, CEI 62236-3-2:2008), clause 8 SR EN 50121-4:2007 (EN 50121-4:2006, CEI 62236-4:2008), clause 6 SR EN 50121-5:2007 (EN 50121-5:2006, CEI 62236-5:2008), clause 6
		Electrical apparatus for the detection and measurement of gases	SR EN 50270:2007 (EN 50270:2006), clause 4 ISO/PAS 3930:2009, clause 5.7, A.18
		Road traffic signal systems	SR EN 50293:2001 (EN 50293:2000), clause 3 SR EN 50293:2013 (EN 50293:2012), clause 3
		Information technology equipment	SR EN 55024:2011 (EN 55024:2010, CISPR 24:2010), clause 4.2.4



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Electrical equipment used in residential, commercial and light-industrial environments	SR EN 61000-6-1:2007 (EN 61000-6-1:2007, CEI 61000-6-1:2005), clause 8
		Electrical equipment used in industrial environments	SR EN 61000-6-2:2006 (EN 61000-6-2:2005, CEI 61000-6-2:2005), clause 8
		Equipment for general lighting purposes	SR EN 61547:2010 (EN 61547:2009, CEI 61547:2009), clause 5.4
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007 (EN 50470-1:2006), clause 7.4.12 SR EN 62052-21:2005 (EN 62052-21:2004, CEI 62052-21:2004), clause 7.6.10
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2:2007, CEI 60601-1-2:2007, clause 6.2.8 EN 60601-1-2:2014, (CEI 60601-1-2:2014), clause 6.2.7
		Road vehicles	ISO 11452-8:2007
		Equipment and communication systems for signalling on low-voltage electrical installations	SR EN 50065-2-1:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-2:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-3:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012 (EN 61439-1:2011, CEI 61439-1:2011), clause J.10.12.1.2
		Machine tools	SR EN 50370-2: 2003 (EN 50370-2: 2003), Annex A
27	Radiated radio-frequency electromagnetic field immunity test (80 ÷ 6000) MHz		SR EN 61000-4-3: 2006 + A1: 2008 + A2: 2011, (EN 61000-4-3: 2006 + A1:2008 + A2: 2010), CEI 61000-4-3: 2010 SR EN 61000-4-20: 2011 (EN 61000-4-20: 2010, CEI 61000-4-20: 2010) PT-01-CEM.16
		Lifts, escalators and moving walks	SR EN 12016:2013 (EN 55016:2013), clause 7
		Uninterruptible power systems (UPS)	SR EN 62040-2:2006 (EN 62040-2:2006), clause 7.3
		Railway equipment	SR EN 50121-1:2007 (EN 50121-1:2006, CEI 62236-1:2008), clause 4 SR EN 50121-3-2:2007 (EN 50121-3-2:2006, CEI 62236-3-2:2008), clause 8 SR EN 50121-4:2007 (EN 50121-4:2006, CEI 62236-4:2008), clause 6 SR EN 50121-5:2007 (EN 50121-5: 2006, CEI 62236-5: 2008), clause 6
		Fire, intruder, social alarm systems	SR EN 50130-4:2012 (EN 50130-4:2011+A1:2014), clause 10
		Electronic taximeters	SR EN 50148:2001 (EN 50148:1995), clause 11.1.4 OIML R 21:2007, clause A.5.4.5.1
		Household and similar electrical appliances.	SR EN 60335-1:2003 + A1, A2, A11 + A15: 2005 + 2012 (EN 60335-1: 2010, CEI 60335-1: 2010), clause 19.11.4.2.3
		Measuring relays and protection equipment	SR EN 60255-11:2010 (EN 60255-11:2010, CEI 60255-11:2008) SR EN 60255-26:2010 (EN 60255-26:2009, CEI

БРАВО С ОФИЦИАЛНО



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
			60255-26:2008), clause 4.2 SR EN 60255-26:2014 (EN 60255-26:2013, CEI 60255-26:2013), clause 4.2
		Electrical apparatus for the detection and measurement of gases	SR EN 50270:2007 (EN 50270:2006), clause 4 ISO/PAS 3930:2009, clause 5.7.b, A.17.1 SR EN 12405-1 + A2:2011 (EN 12405-1+A2:2010), clause A.9
		Road traffic signal systems	SR EN 50293:2001 (EN 50293:2000), clause 3 SR EN 50293:2013 (EN 50293:2012), clause 3
		Household appliances, electric tools and similar apparatus	SR EN 55014-2:2001+A1:2003 + A2:2009 (EN 55014-2:1997+A1:2001+A2:2008, CISPR 14-2:2008), clause 5.5
		Information technology equipment	SR EN 55024:2011 (EN 55024:2010, CISPR 24:2010), clause 4.2.3.2
		Electrical equipment used in residential, commercial and light-industrial environments	SR EN 61000-6-1:2007 (EN 61000-6-1:2007, CEI 61000-6-1:2005), clause 8
		Electrical equipment used in industrial environments	SR EN 61000-6-2:2006 (EN 61000-6-2:2005, CEI 61000-6-2:2005), clause 8
		Low voltage power supplies, c.c. output	SR EN 61204-3:2003 (EN 61204-3:2000, CEI 61204-3:2000), clause 7.2
		Electrical equipment for measurement, control and laboratory use	SR EN 61326-1:2013 (EN 61326-1:2013, CEI 61326-1:2012), clause 6.2
		Equipment for general lighting purposes	SR EN 61547:2010 (EN 61547:2009, CEI 61547:2009), clause 5.3
		Adjustable speed electrical power drive systems	SR EN 61800-3:2005+A1:2012 (EN 61800-3:2004+A1:2012, CEI 61800-3:2012), clause 5.3
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007 (EN 50470-1:2006) clause 7.4.6 SR EN 62052-11:2004 (EN 62052-11:2003, CEI 62052-11:2003), clause 7.5.3 SR EN 62052-21:2005 (EN 62052-21:2004, CEI 62052-21:2004), clause 7.6.4
		Telecommunication network equipment	ETSI EN 300386:2012, clause 5.5
		Radio equipment and services	ETSI EN 301489-1:2011, clause 9.2
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2: 2007, CEI 60601-1-2:2007), clause 6.2.3 EN 60601-1-2:2014, (CEI 60601-1-2:2014), clause 6.2.3
		Non-automatic weighing instruments	SR EN 45501/AC:2004 (EN 45501:1992), clause B.3.4 EN 45501:2014, clause B.3.4 OIML R 76-1:2006, clause B.3.5
		Liquids other than water dispenser	OIML R117-1:2007, clause A.11.11.1, A.11.11.2
		Equipment and communication systems for signalling on low-voltage electrical installations	SR EN 50065-2-1:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7 SR EN 50065-2-2:2003+A1:2006 (EN 50065-1:2003 + A1:2006), clause 7 SR EN 50065-2-3:2003+A1:2006 (EN 50065-1:2003+A1:2005), clause 7
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012 (EN 61439-1:2011, CEI 61439-1:2011), clause J.10.12.1.2

ВЯТНО
С ОРГАНІЗАЦІЇ

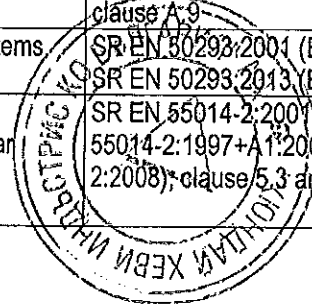
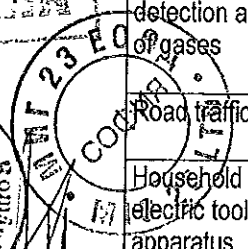
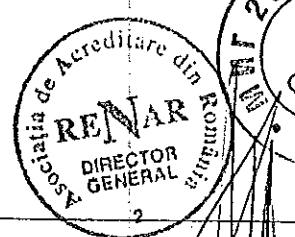
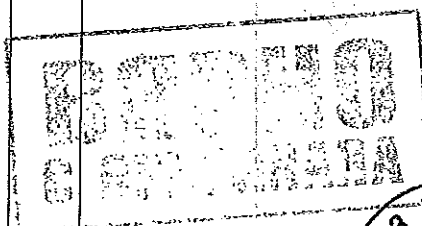
Asociația de Accreditare din România
REVAR
DIRECTOR GENERAL

МІЛС
СОВНА

НАСТРІС К
XEBN

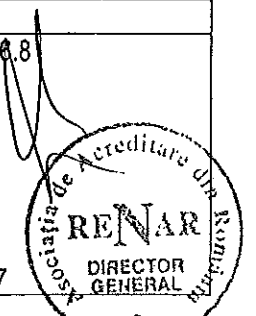
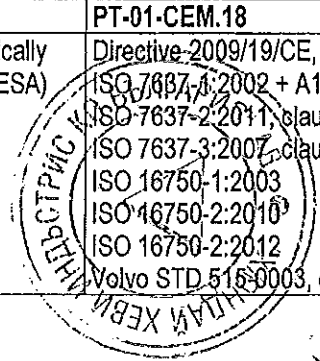
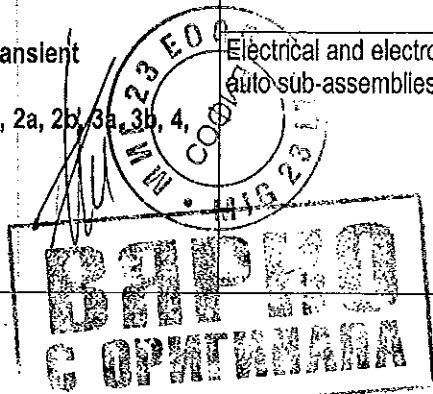
Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Machine tools	SR EN 50370-2:2003 (EN 50370-2:2003), Annex A
		Electrical and electronically auto sub-assemblies (ESA) (0,01 ÷ 6000) MHz	Directive 2009/19/CE, clause 6.7 ISO 11452-1:2005 ISO 11452-2:2011 ISO 11452-4:2005 ISO 11452-5:2002 ETSI EN 301489-1:2008 Volvo STD 515-0003:2009, clause 7
		Electrical and electromechanical subsystems and equipment intended for military equipment use (0,01 ÷ 6000) MHz	MIL-STD-461E:1999, Method RS103 MIL-STD-461F:2007, Method RS103
28	Immunity to conducted disturbances, induced by radio-frequency fields (0,15 ÷ 80) MHz	<p>Lifts, escalators and moving walks</p> <p>Uninterruptible power systems (UPS)</p> <p>Railway equipment</p> <p>Fire, intruder, social alarm systems</p> <p>Electronic taximeters</p> <p>Household and similar electrical appliances</p> <p>Measuring relays and protection equipment</p> <p>Electrical apparatus for the detection and measurement of gases</p> <p>Road traffic signal systems</p> <p>Household appliances, electric tools and similar apparatus</p>	<p>SR EN 61000-4-6:2009 (EN 61000-4-6:2009, CEI 61000-4-6:2008)</p> <p>SR EN 61000-4-6:2014 (EN 61000-4-6:2014, CEI 61000-4-6:2013)</p> <p>PT-01-CEM.17</p> <p>SR EN 12016:2013 (EN 12016:2013), clause 7</p> <p>SR EN 62040-2: 2006 (EN 62040-2:2006), clause 7.3</p> <p>SR EN 50121-1:2007 (EN 50121-1:2006, CEI 62236-1:2008), clause 4</p> <p>SR EN 50121-3-2:2007 (EN 50121-3-2:2006, CEI 62236-3-2:2008), clause 8</p> <p>SR EN 50121-4:2007 (EN 50121-4:2006, CEI 62236-4:2008), clause 6</p> <p>SR EN 50121-5:2007 (EN 50121-5:2006, CEI 62236-5:2008), clause 6</p> <p>SR EN 50155:2007 (EN 50155:2007), clause 12.2.8.1</p> <p>SR EN 50130-4:2012(EN 50130-4:2011+A1:2014), clause 11</p> <p>OIML R 21:2007, clause A.5.4.5.2</p> <p>SR EN 60335-1:2012 (EN 60335-1:2012, CEI 60335-1:2010), clause 19.11.4.5</p> <p>SR EN 60255-11:2010 (EN 60255-11:2010, CEI 60255-11:2008)</p> <p>SR EN 60255-26:2010 (EN 60255-26:2009, CEI 60255-26:2008), clause 4.2</p> <p>SR EN 60255-26:2014 (EN 60255-26:2013, CEI 60255-26:2013), clause 4.2</p> <p>SR EN 50270:2007 (EN 50270:2006), clause 4</p> <p>ISO/PAS 3930:2009, clause 5.7.1, A.17.2</p> <p>SR EN 12405-1+A2:2011 (EN 12405-1:2010), clause A.9</p> <p>SR EN 50293:2004 (EN 50293:2000), clause 3</p> <p>SR EN 50293:2013 (EN 50293:2012), clause 3</p> <p>SR EN 55014-2:2001+A1:2003+A2: 2009 (EN 55014-2:1997+A1:2001+A2: 2008, C/SPR 14-2:2008), clause 5.3 and clause 5.4</p>



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

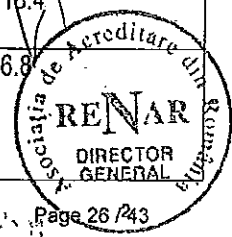
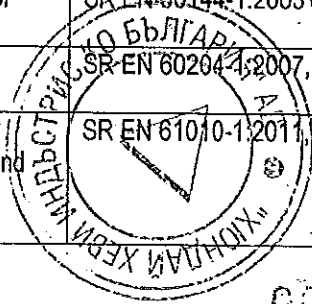
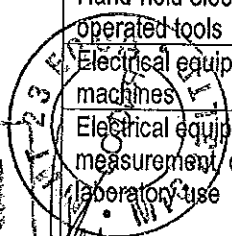
No.	Type / Name of the test	Material / product	Reference document
		Information technology equipment	SR EN 55024:2011 (EN 55024:2010, CISPR 24:2010), clause 4.2.3.3
		Electrical equipment used in residential, commercial and light-industrial environments	SR EN 61000-6-1:2007 (EN 61000-6-1:2007, CEI 61000-6-1:2005), clause 8
		Electrical equipment used in industrial environments	SR EN 61000-6-2:2006 (EN 61000-6-2:2005, CEI 61000-6-2:2005), clause 8
		Low voltage power supplies, c.c. output	SR EN 61204-3:2003 (EN 61204-3:2000, CEI 61204-3:2000), clause 7.2
		Electrical equipment for measurement, control and laboratory use	SR EN 61326-1:2013 (EN 61326-1:2013, CEI 61326-1:2012), clause 6.2
		Equipment for general lighting purposes	SR EN 61547:2010 (EN 61547:2009, CEI 61547:2009), clause 5.6
		Adjustable speed electrical power drive systems	SR EN 61800-3:2005 + A1:2012 (EN 61800-3:2004 + A1:2012, CEI 61800-3:2012), clause 5.3
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007 (EN 50470-1:2006) clause 7.4.8 SR EN 62052-11:2004 (EN 62052-11:2003, CEI 62052-11:2003), clause 7.5.5 SR EN 62052-21:2005 (EN 62052-21:2004, CEI 62052-21:2004), clause 7.6.6
		Telecommunication network equipment	ETSI EN 300386:2012, clause 5.4
		Radio equipment and services	ETSI EN 301489-1:2011, clause 9.5
		Medical electrical equipment	SR EN 60601-1-2:2007 (EN 60601-1-2:2007, CEI 60601-1-2:2007), EN 60601-1-2:2014, (CEI 60601-1-2:2014), clause 6.2.6
		Non-automatic weighing instruments	OIML R 76-1:2006, clause B.3.6
		Liquids other than water dispenser	OIML R117-1:2007, clause A.11.11.3
		Equipment and communication systems for signalling on low-voltage electrical installations	SR EN 50065-2-1:2003 + A1:2006 (EN 50065-1:2003 + A1:2005), clause 7 SR EN 50065-2-2:2003 + A1:2006 (EN 50065-1:2003 + A1:2005), clause 7 SR EN 50065-2-3:2003 + A1:2006 (EN 50065-1:2003 + A1:2005), clause 7
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012 (EN 61439-1:2011, CEI 61439-1:2011), clause J.10.12.1.2
		Machine tools	SR EN 50370-2:2003 (EN 50370-2:2003), Annex A
29	Immunity to transient disturbances (Pulses type 1, 2a, 2b, 3a, 3b, 4, 5, etc.)	Electrical and electronically auto sub-assemblies (ESA)	PT-01-CEM.18 Directive 2009/19/CE, clause 6.8 ISO 7637-1:2002 + A1: 2008 ISO 7637-2:2011, clause 4.4 ISO 7637-3:2007, clause 3 ISO 16750-1:2003 ISO 16750-2:2010 ISO 16750-2:2012 Volvo STD 515:2003, clause 7



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

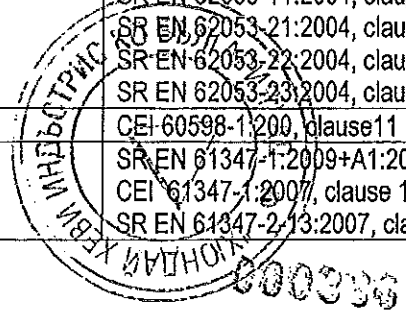
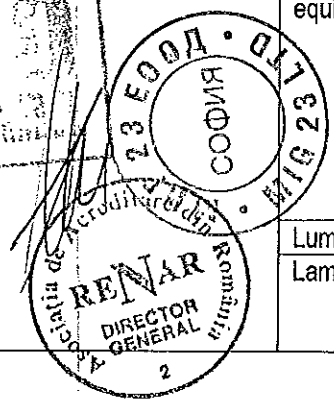
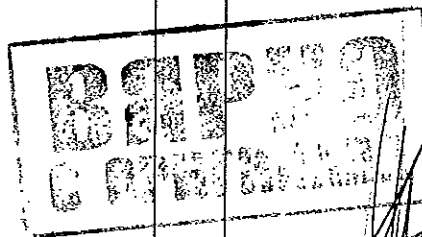
No.	Type / Name of the test	Material / product	Reference document
		Electronic taximeters	SR EN 50148:2001 (EN 50148:1995), clause 11.1.2 and clause 11.1.3 OIML R 21:2007, clause A.5.4.3, A.5.4.7.1, A.5.4.7.2
		Alarm systems for road vehicles	SR CEI 60839-10-1:2001 (CEI 60839-10-1:1995), clause 5.3.7
		Electrical and electromechanical subsystems and equipment intended for military equipment use	MIL-STD-461E:1999, Methods CS114 MIL-STD-461F:2007, Methods CS114
		Non-automatic weighing instruments	OIML R 76:1-2006, clause B.3.7
		Electrical apparatus for the detection and measurement of gases	ISO/PAS 3930:2009, clause 5.7.b, A.14
30	Immunity to oscillatory waves and damped oscillatory waves test (100 kHz; 1 MHz; max. 6 kV)		SR EN 61000-4-12:2007 (EN 61000-4-12:2006, CEI 61000-4-12:2006) SR EN 61000-4-18:2007 +A1:2011, (EN 61000-4-18:2007 + A1:2010, CEI 61000-4-18:2011) PT-01-CEM.19
		High-voltage switchgear and controlgear	SR EN 62271-1:2009 + A1:2012, (EN 62271-1:2008 + A1:2011), CEI 62271-1:2011, clause 6.9.2.4
		Railway equipment	SR EN 50121-1:2007 (EN 50121-1:2006, CEI 62236-1:2008), clause 4 SR EN 50121-5:2007 (EN 50121-5:2006, CEI 62236-5:2008), clause 6
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007 (EN 50470-1:2006) clause 7.4.10 SR EN 62052-11:2004 (EN 62052-11:2003, CEI 62052-11:2003), clause 7.5.7 SR EN 62052-21:2005 (EN 62052-21:2004, CEI 62052-21:2004), clause 7.6.13
		Measuring relays and protection equipment	SR EN 60255-11:2010 (EN 60255-11:2010, CEI 60255-11:2008) SR EN 60255-26:2010 (EN 60255-26:2009, CEI 60255-26:2008), clause 4.2 SR EN 60255-26:2014 (EN 60255-26:2013, CEI 60255-26:2013), clause 4.2
III. LOW VOLTAGE EQUIPMENTS TESTS			
31	Dielectric strength test		PT-01-JT.01
		Household and similar electrical appliances	SR EN 60335-1:2012, clauses 13.3, 16.3 CEI 60335-1:2010, clauses 13.3, 16.3 completed with clauses 13.3, 16.3 in the standards specified in the Note at the end of the document, for each type of tested product
		Hand-held electric motor operated tools	SR EN 60144-1:2003+A2:2004, clause 15.3
		Electrical equipment of machines	SR EN 60204-1:2007, clause 18.4
		Electrical equipment for measurement, control and laboratory use	SR EN 61010-1:2011, clause 6.8

**БЪЛГАРСКО
ОПТИМАЛА**



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

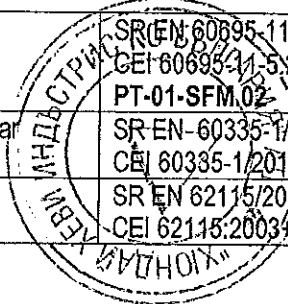
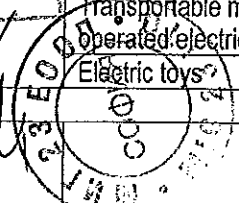
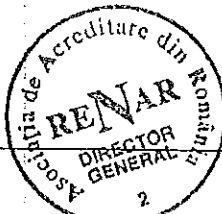
No.	Type / Name of the test	Material / product	Reference document
		Low-voltage switchgear and controlgear assemblies	SR EN 60439-1:2001, clause 8.2.4.1 CEI 61439-1:2011, clause 10.5.2 SR EN 62208:2012, clause 9.11
		High-voltage switchgear and controlgear	CEI 62271-1:2007+A1:2011, clause 6.10.3 CEI 62271-103:2011, clause 6.10.3 CEI 62271-200:2011, clause 6.10.3 CEI 62271-202:2014, clause 6.10.3 CEI 62271-203:2011, clause 6.10
		Audio, video and similar electronic apparatus	SR EN 60065:2003+A1:2006+A11:2009 + A12:2011+A2:2011, clause 15.2
		Transportable motor-operated electric tools	SR EN 61029-1:2009+A11:2011, clause 25
		Luminaires	CEI 60598-1:2008, clause 7.2.3
		Lamp controlgear	SR EN 61347-1:2009+A1:2011, clause 9 CEI 61347-1:2007, clause 9 SR EN 61347-2-13:2007, clause 10
		Electric vehicle conductive charging system	SR EN 61851-22:2003, clause 9.2
33	Measurement of clearances and creepage distances		PT-01-JT.03
		Household and similar electrical appliances	SR EN 60335-1:2012, clause 29 CEI 60335-1:2010, clause 29 completed with clauses 29 in the standards specified in the Note at the end of the document, for each type of tested product
		Hand-held electric motor operated tools	SR EN 50144-1:2003+A2:2004, clause 27
		Electrical equipment for measurement, control and laboratory use	SR EN 61010-1:2011, clause 6.7
		Low-voltage switchgear and controlgear assemblies	SR EN 60439-1:2001, clause 8.2.5 CEI 61439-1:2011, clause 10.4
		Low-voltage switchgear and controlgear	SR EN 60947-1:2008+A1:2011, clauses 7.2.3.3, 7.2.3.4 CEI 60947-1:2007, clauses 7.2.3.3, 7.2.3.4 CEI 60947-2:2006+A1:2009, clauses 7.2.3.3, 7.2.3.4 CEI 60947-3:2008, clause 7.1.4 CEI 60947-4-1:2009, clause 8.1.4
		Transportable motor-operated electric tools	SR EN 61029-1:2009+A11:2011, clause 27
		Electric toys	SR EN 62115:2006+A2+AC:2011, clause 18
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007, clause 5.6 SR EN 50470-2:2007, clause 5 SR EN 50470-3:2007, clause 5 SR EN 62052-11:2004, clause 5.6 SR EN 62053-11:2004, clause 5 SR EN 62053-21:2004, clause 5 SR EN 62053-22:2004, clause 5 SR EN 62053-23:2004, clause 5
		Luminaires	CEI 60598-1:2008, clause 11
		Lamp controlgear	SR EN 61347-1:2009+A1:2011, clause 16 CEI 61347-1:2007, clause 16 SR EN 61347-2-13:2007, clause 18



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
34	Insulation resistance measurement		PT-01-JT.04
		Hand-held electric motor operated tools	SR EN 50144-1:2003+A2:2004, clause 15.2
		Electrical equipment of machines	SR EN 60204-1:2007, clause 18.3
		Low-voltage switchgear and controlgear assemblies	SR EN 60439-1:2001, clause 8.3.4 CEI 61439-1:2011, clause 11.9
		Audio, video and similar electronic apparatus	SR EN 60065:2003+A1:2006+A11:2009 + A12:2011+A2:2011, clause 10.3
		Transportable motor-operated electric tools	SR EN 61029-1:2009+A11:2011 clause 15.2
		Railway equipment	SR EN 50155:2007, clauses 12.2.9, 12.2.9.1
		Luminaires	CEI 60598-1:2008, clause 10.2.1
		Lamp controlgear	SR EN 61347-1:2009+A1:2011, clause 11 CEI 61347-1:2007, clause 11 SR EN 61347-2-13:2007, clause 11
		Electric vehicle conductive charging system	SR EN 61851-22:2003, clause 10.1.3
		Electrical accessories	CEI 60898-1:2002+A1:2002+A2:2003, clause 9.7.2
35	Power and current measurement		PT-01-JT.06
		Household and similar electrical appliances	SR EN 60335-1: 2012, clause 10 CEI 60335-1:2010, clause 10 completed with clauses 10 in the standards specified in the Note at the end of the document, for each type of tested product
		Hand-held electric motor operated tools	SR EN 50144-1:2003+A2:2004, clause 10
		Transportable motor-operated electric tools	SR EN 61029-1:2009+A11:2011, clause 10
		Electric toys	SR EN 62115:2006+A2+AC:2011, clause 8
36	Heating determination		PT-01-JT.07
		Household and similar electrical appliances	SR EN 60335-1:2012, clause 11 CEI 60335-1:2010, clause 11 completed with clauses 11 in the standards specified in the Note at the end of the document, for each type of tested product
		Hand-held electric motor operated tools	SR EN 50144-1:2003+A2:2004, clause 11
		Information technology equipment	SR EN 60950-1:2006 +A12:2011, clauses 4.5.2 - 4.5.4
		Audio, video and similar electronic apparatus	SR EN 60065:2003+A1:2006+A11:2009 + A12:2011+A2:2011, clause 7.1
		Transportable motor-operated electric tools	SR EN 61029-1:2009+A11:2011, clause 11
		Electric toys	SR EN 62115:2006+A2+AC:2011, clause 9
37	IV . FIRE HAZARD TESTING Needle-flame test		SR EN 60895-11-5:2005 CEI 60895-11-5:2004 PT-01-SFM.02
		Household and similar electrical appliances	SR EN 60335-1:2012, clause 30.2.4 CEI 60335-1:2010, clause 30.2.4
		Electric toys	SR EN 62115:2006 A2+AC:2011, clause 19.2 CEI 62115:2003+A1:2004+A2:2010, clause 19

**БАНК
С ОПИТОВАНА**



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Luminaires	SR EN 60598-1:2009:A11:2009 clause 13.3. CEI 60598-1:2014, clause 13.3.1
		Lamp controlgear	SR EN 61347-1:2009 + A1:2011, clause 18.4 CEI 61347-1:2007+A1:2010+A2:2012, clause 18.4
		Information technology equipment	SR EN 60950-1:2006+A12:2011, clause 4.6.2. CEI 60950-1:2005+A1:2009+A2:2013, clause 4.6.2.
		Audio, video and similar electronic apparatus	SR EN 60065/2003+A1/2006+A11/2009+ A12/2011+ A2/2011, clause G.2. CEI 60065:2014 clause G2
38	Glowing/hot-wire based test		SR EN 60695-2-12:2011 SR EN 60695-2-13:2011 CEI 60695-2-10:2013 CEI 60695-2-11:2014 CEI 60695-2-12:2014 CEI 60695-2-13:2014 PT-01-SFM.03
		Household and similar electrical appliances	SR EN 60335-1:2012, clause 30.2. CEI 60335-1:2010, clause 30.2.
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012, clause 10.2.3.3 CEI 61439-1:2011, clause 10.2.3.3.
		Electricity metering equipment (a.c.)	SR EN 62052-21:2005, clause 5.8 CEI 62052-21:2004, clause 5.8 SR EN 62052-11:2004, clause 5.8 CEI 62052-11:2003, clause 5.8
		Electric toys	SR EN 62115:2006 A2+AC:2011, clause 19.2 CEI 62115:2003+A1:2004+A2:2010, clause 19
		Low-voltage switchgear and controlgear	SR EN 60947-1:2008 + A1:2011, clause 8.2. CEI 60947-1:2007+ A1:2010, clause 8.2.1.1.1
		Empty enclosures for low-voltage switchgear and controlgear assemblies	SR EN 62208:2012 clause 9.8. CEI 62208:2011, clause 9.8.3
		Luminaires	SR EN 60598-1:2009:A11:2009, clause 13.3. CEI 60598-1:2014, clause 13.3.2
		Low voltage fuses	SR EN 60269-1:2008+ A1:2010 clause 8.11 CEI 60269-1:2014, clause 8.11.2.2
		Circuit-breakers	SR EN 60947-2:2007:A2:2013, clause 8.2. CEI 60947-2:2009+A2:2013, clause 8.2.
		Lamp controlgear	SR EN 61347-1:2009 + A1:2011, clause 18.3 CEI 61347-1:2007+A1:2010+A2:2012, clause 18.3
		Electrical accessories	SR EN 60898-1:2004 :A13:2013, clause 9.15 CEI 60898-1:2003, clause 9.15
		Plugs, socket-outlets, vehicle connectors and vehicle inlets	SR EN 62196-1:2012:A11:2013, clause 29.4. CEI 62196-1: 2014, clause 29.4
39	50 W horizontal and vertical flame test methods		SR EN 60695-11-10:2014 CEI 60695-11-10:2013 PT-01-SFM.04
		Household and similar electrical appliances	SR EN 60335-1:2012, clause 30.2. CEI 60335-1:1999, clause 30.2.
		Indoor post insulators	SR EN 60660:2005, clause 3.12 CEI 60660:1999, clause 3.12

BRP
C OPTIMAN

Asociația de Accreditare din România
RENAR
DIRECTOR GENERAL

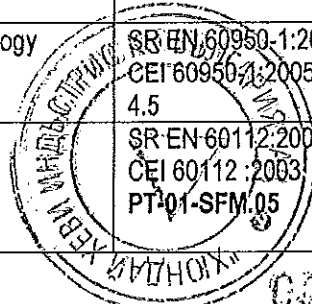
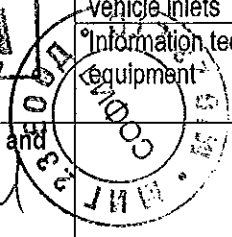
КОНСТРУКТИВНИ
КЕРНИ МАШИНИ

Annex no. 1 to Accreditation Certificate no. LI 1036

Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Polymeric HV insulators for indoor and outdoor use with a nominal voltage > 1000 V	SR EN 62217:2013, clause 9.3.4. CEI 62217:2012, clause 9.3.4.
		Composite insulators for overhead lines	SR EN 61109:2009, clause 10 CEI 61109:2008, clause 10
		Measuring relays and protection equipment	SR EN 60255-27:2006, clause 7.5. CEI 60255-27:2013, clause 7.5.
		Low-voltage switchgear and controlgear	SR EN 60947-1:2008 + A1:2011, clause 8.2 SR EN 60947-2:2007+A2:2013, clause 8.2 CEI 60947-1:2007+ A1:2010 , clause 8.2.1.1.2.a) CEI 60947-2:2009+A2:2013, clause 8.2.
		Insulators for overhead lines - Composite line post insulators for A.C. systems with a nominal voltage greater than 1000 V	SR EN 61952:2008, clause 9.1. CEI 61952:2008, clause 9.1.
		Information technology equipment	SR EN 60950-1:2006 + A12:2011, clause 4.7 CEI 60950-1:2005+A1:2009+A2:2013, clause 4
40	Ball pressure test		SR EN 60695-10-2 :2004 CEI 60695-10-2 :2003 + AC 2006 PT-01-SFM.01
		Household and similar electrical appliances	SR EN 60335-1:2012, clause 30.2.4. CEI 60335-1:2010, clause 30.2.4
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012 clause 10.2.3 CEI 61439-1:2011, clause 10.2.3.2.
		Transportable motor-operated electric tools	SR EN 61029-1:2009+A11:2011, clause 28.1 CEI 61029-1: 1990 clause 28
		Electric toys	SR EN 62115:2006+A2+AC:2011, clause 19.1 CEI 62115:2003+A1:2004+A2:2010 clause 19
		Hand-held electric motor operated tools	SR EN 50144-1:2003+A2:2004, clause 28.1
		Electrical equipment for measurement, control and laboratory use	SR EN 61010-1:2011, clause 10.5.3 CEI 61010-1:2010 clause 10.5.3
		Luminaires	SR EN 60598-1:2009/A11:2009, clause 13 CEI 60598-1:2014, clause 13.2.1
		Empty enclosures for low-voltage switchgear and controlgear assemblies	SR EN 62208:2012, clause 9.8.2 CEI 62208:2011, clause 9.8.2
		Lamp controlgear	SR EN 61347-1:2009, clause 18.1 + A1:2011 CEI 61347-1:2007+A1:2010+A2:2012, clause 18.1
		Electrical accessories	SR EN 60898-1:2004/A13:2013, clause 9.14 CEI 60898-1:2003, clauses 9.14.2, 9.14.3
		Plugs, socket-outlets, vehicle connectors and vehicle inlets	SR EN 62196-1:2012:A11:2012, clause 29.3 CEI 62196-1:2014 clause 29.3
		Information technology equipment	SR EN 60950-1:2006+A12:2011, clause 4.5.5 CEI 60950-1:2005+A1:2009+A2:2013, clause 4.5
41	Determination of the proof and the comparative tracking indices of solid insulating materials		SR EN 60112:2004/A1:2010 CEI 60112:2003 PT-01-SFM.05

**ВЯРНО
С ОРИГИНАЛА**



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

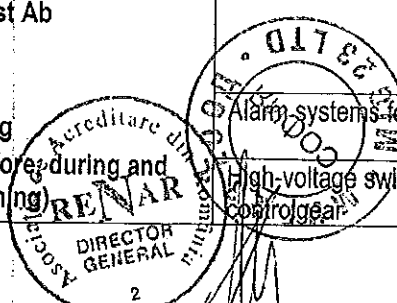
No.	Type / Name of the test	Material / product	Reference document
		Household and similar electrical appliances	SR EN 60335-1:2012, clause 30.2.4. CEI 60335-1:2010, clause 30.2.4
		Transportable motor-operated electric tools	SR EN 61029-1:2009+A11:2011, clause 28.3 CEI 61029-1: 1990 clause 28.3
		Hand-held electric motor operated tools	SR EN 50144-1:2003+A2:2004, clause 28.3
		Low voltage fuses	SR EN 60269-1:2008+ A1:2010, clause 8.2.5 CEI 60269-1:2014, clause 8.2.5
		Luminaire	SR EN 60598-1:2009+A11:2009, clause 13.4 CEI 60598-1:2014, clause 13.4
		Information technology equipment	SR EN 60950-1:2006 + A12:2011, clause 2.10.4 CEI 60950-1:2005 + A1:2009+A2:2013, clause 2.10.4
		Plugs, socket-outlets, vehicle connectors and vehicle inlets	SR EN 62196-1:2012/A11:2013, clause 29.5. CEI 62196-1:2014, clause 29

V. ENVIRONMENTAL TESTS

42	Damp heat, steady state Humidity $_{max}$ 99 % a) conditioning b) testing (before, during and after conditioning)		SR EN 60068-2-78:2013 CEI 60068-2-78 : 2012 PT-01-SFM.06
		Alarm systems for vehicles	SR EN 60839-10-1: 2001 clause 5.3.2. CEI 60839-10-1:1995, clause 5.3.2.
		Electric toys	SR EN 62115:2006+A2+AC:2011, clause 11.2 CEI 62115:2003+A1:2004+A2:2010, clause 11
		Hand-held electric motor operated tools	SR EN 50144-1:2003+A2:2004, clause 14.3
		Information technology equipment	SR EN 60950-1:2006 + A12:2011 CEI 60950-1:2005+A1:2009+A2:2013, clause 2.9.2 and clause 4.6.5.
		Non-automatic weighing instruments	SR EN 45501:2004, clause B.2.2 EN 45501:2014, clause B.2.2
		Insulating hollow tubes for electrical purposes	SR EN 61235:1999, clause 9.1.3 CEI 61235:1993, clause 9.1.
		Low voltage fuses	SR EN 60269-1:2008+A1:2010 clause 8.2.2.3. CEI 60269-1:2014, clause 8.2.2.3.2
		Road vehicles - electrical and electronic equipment	ISO 16750-4:2010, clause 5.7
		Lamp controlgear	SR EN 61347-1:2009 + A1:2011, clause 11 CEI 61347-1:2007+A1:2010+A2:2012, clause 11
		Electrical accessories	SR EN 60898-1:2004/A13:2013, clause 9.7 CEI 60898-1:2003, clause 9.7
		Early streamer emission lightning protection systems	NF C 17-102:2011, Annex C 3.3.1.
		Post insulators of organic material	SR EN 60660:2005, clause 3.11 CEI 60660:1999, clause 3.11
		AC electric vehicle charging station	SR EN 61851-22:2003, clause 11.1.4.1) CEI 61851-22:2004, clause 11.1.

43	Cold test – test Ab T_{min} - 40 °C a) conditioning b) testing (before, during and after conditioning)		SR EN 60068-2-2:2007, clause 5.6 CEI 60068-2-1 : 2002, clause 5.2.6 PT-01-SFM.07
		Alarm systems for vehicles	SR EN 60839-10-1: 2001, clause 5.3.2.1 CEI 60839-10-1:1995, clause 5.3.1.5
		High-voltage switchgear and controlgear	SR EN 62271-1:2009/A1:2012, clause 6.10.5 CEI 62271-1:2007+A1:2011, clause 6.10.5.2

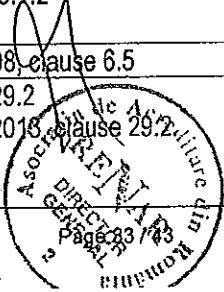
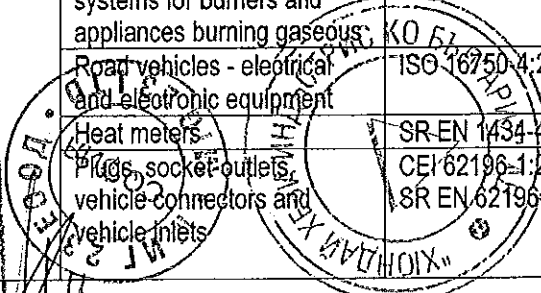
**ВЕРНО
С ОПРИМКА**



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Electronic taximeters	SR EN 50148:2001, clause 10.9 OIML R21 clause 5.4.1
		Electricity metering equipment (a.c.)	SR EN 50470-1:2008, clause 6.3.3 CEI 62052-21:2004, clause 6.3.2 CEI 62052-11:2003, clause 6.3.2. NML 005-05, clause 3.10 NML 027-05, clause 4.3
		Non-automatic weighing instruments	SR EN 45501:2004, clause A.5.3 EN 45501:2014, clause B.5.3
		Automatic burner control systems for burners and appliances burning gaseous	BS EN 298:2012, clause 6.5.2.2.1.a)
		Road vehicles - electrical and electronic equipment	ISO 16750-4:2010, clause 5.1.1
		Heat meters	SR EN 1434-4:2007 + AC 2008, clause 6.6
		AC electric vehicle charging station	SR EN 61851-22:2003, clause 11.1.5 CEI 61851-22:2001, clause 11.1.5
		Information technology equipment	SR EN 60950-1:2006+A12:2011; clause 4.6.5 CEI 60950-1:2005+A1:2009+A2:2013, clause 2.9.2 and 4.6.5
		Liquids other than water dispenser	OIML R 117-1, clause A 10.6
44	Dry heat test / test Bb T_{max}: +180° C a) conditioning b) testing (before, during and after conditioning)		SR EN 60068-2-2:2008, clauses 5.2, 6 CEI 60068-2-2:2007, clauses 5.2, 6 PT-01-SFM.08
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012, clause 10.2.3.1 CEI 61439-1:2011, clause 10.2.3.1
		Alarm systems for vehicles	SR EN 60839-10-1: 2001, clause 5.3.1 CEI 60839-10-1:1995, clause 5.3.1.5.
		High-voltage switchgear and controlgear	SR EN 62271-1:2009/A1:2012, clause 6.10.5 CEI 62271-1:2007+A1:2011, clause 6.10.5.3
		Electronic taximeters	SR EN 50148:2001, clause 10.7. OIML R21, clause 5.4.1
		Electricity metering equipment (a.c.)	SR EN 50470-1:2008, clause 6.3.2. SR EN 62052-21:2005, clause 6.3.1 SR EN 62052-11:2004, clause 6.3.2. CEI 62052-21:2004, clause 6.3.1 CEI 62052-11:2003, clause 6.3.2. NML 027-05, clause 4.3 NML 005-05, clause 3.10
		Electrical equipment for measurement, control and laboratory use	SR EN 61010-1:2011, clause 10.5.2 CEI 61010-1:2010, clause 10.5
		Non-automatic weighing instruments	SR EN 45501:2004, clause A.5.3 EN 45501:2014, clause B.5.3
		Automatic burner control systems for burners and appliances burning gaseous	BS EN 298:2012, clause 6.5.2.2.1.a)
		Road vehicles - electrical and electronic equipment	ISO 16750-4:2010, clause 5.1.2
		Heat meters	SR EN 1434-4:2007+ A 2008, clause 6.5
		Plugs, socket outlets, vehicle connectors and vehicle inlets	CEI 62196-1:2014, clause 29.2 SR EN 62196-1:2012/A11:2013, clause 29.2

ВЯРНО
С ОРИГИНАЛА



000391

Annex no. 1 to Accreditation Certificate no. LI 1036

Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Information technology equipment	SR EN 60950-1:2006 + A2:2014, clause 4.6.5 CEI 60950-1:2005+A1:2009+A2:2013, clauses 2.9.2 and 4.6.5
		Liquids other than water dispenser	OIML R 117-1 clause A 10.5
45	Change of temperature test- test Na and test Nb T = (-40 +180) °C a) conditioning b) testing (before, during and after conditioning)		SR EN 60068-2-14:2010, clauses 7 and 8 CEI 60068-2-14:2009, clauses 7 and 8 PT-01-SFM.09
		Metal-oxide surge arresters	SR EN 60099-4: 2005+A1:2007+A2:2009, clause 8.10.3.1. CEI 60099-4:2014, clause 8.10.3.1.
		Indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV	SR EN 60660:2005, clause 3.13 CEI 60660 : 1999, clause 3.13
		Road vehicles - electrical and electronic equipment	ISO 16750-4:2010, clause 5.3.
		Information technology equipment	SR EN 60950-1:2006+A12:2011, clause 4.6.5 CEI 60950-1:2005+A1:2009+A2:2013, clauses 2.9.2, 4.6.5
46	Damp heat, cyclic (12 h + 12 h cycle) - test Db Humidity _{max} 99 % a) conditioning b) testing (before, during and after conditioning)		SR EN 60068-2-30:2006 CEI 60068-2-30:2005 PT-01-SFM.10
		High-voltage switchgear and controlgear	SR EN 62271-1:2009/A1:2012, clause 6.10.5 CEI 62271-1:2011, clause 6.10.5.5
		Electricity metering equipment (a.c.)	SR EN 50470-1:2008, clause 6.3.4 SR EN 62052-21:2005, clause 6.3.3 CEI 62052-21:2004, clause 6.3.3 SR EN 62052-11:2004, clause 6.3.3 CEI 62052-11:2003, clause 6.3.3. NML 005-05, clause 3.10 NML 027-05, clause 4.3
		Low-voltage switchgear and controlgear assemblies	SR EN 61439-1:2012, clause 10.2.2.2 CEI 61439-1:2011, clause 10.2.2.2
		Empty enclosures for low-voltage switchgear and controlgear assemblies	SR EN 62208:2012, clause 9.12 CEI 62208:2011, clause 9.12
		Gas meters - Conversion devices	SR EN 12405-1+A2:2011, clause A5
		Road vehicles - electrical and electronic equipment	ISO 16750-4:2010, clause 5.6
		Heat meters	SR EN 1434-4:2007+ AC 2008, clause 6.9
		Electronic taximeters	SR EN 50148:2001, clause 10.8 OIML R21, clause 5.4.2
		Electricity metering equipment (a.c.)	EN 50470-1:2008, clause 6.3.4.
		Electric vehicle charging station	SR EN 61851-22:2003, clause 11.1.4.2 CEI 61851-22:2001, clause 11.1.4.2
			Liquids other than water dispenser
47	Salt mist test a) conditioning		SR EN 60068-2-11: 2001 CEI 60068-2-11: 1999 PT-01-SFM.11

ВЪРНА С ОПРИМНАТА

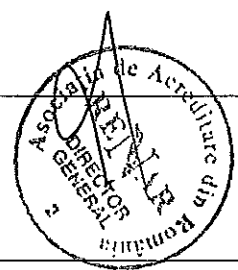
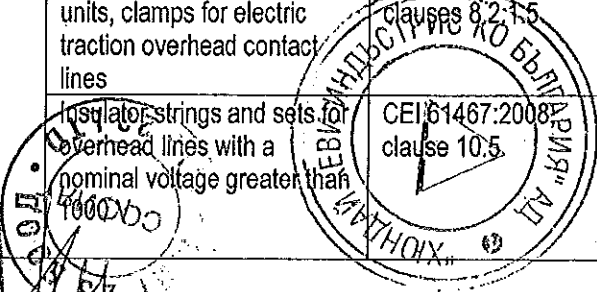
КЕМ ВЪВЕДЕНИ

Association of Accredited
DIRECTOR GENERAL
Page 1/1

Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		with a nominal voltage greater than 1000 V	
		Indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V	SR EN 60168:1997+A1:2004+A2:2001 (CEI 60168:1994 +A1:1997+A2:2000), clause 5.2.6
		Indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV	SR EN 60660:2001 (CEI 60660:1999), clause 3.7.2.c)
		Instrument transformers (Current transformers)	SR EN 61869-1:2010 (CEI 61869-1:2007), clause 7.4.5
		Instrument transformers (Inductive voltage transformers)	SR EN 61869-1:2010 (CEI 61869-1:2007), clause 7.4.5
		Instrument transformers (Capacitor voltage transformers)	SR EN 61869-1:2010 (CEI 61869-1:2007), clause 7.4.5
		Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V	CEI 62155:2003, clause 7.2.4
		Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV	CEI 62231:2006, clauses 8.3.3; 9.3.2; 10.4.2
		Overhead line structures	CEI 60652:2005
		Fittings for overhead lines	SR EN 61284:2000, clauses 11.3.1; 11.4.1; 11.4.2; 11.4.3; 11.5.1; 11.5.2; 11.6.1; 11.6.2; 11.7
		Compression and mechanical connectors for power cables for rated voltages up to 36 kV ($U_m=42$ kV)	CEI 61238-1:2004, clause 7
		Ceramic or glass insulators for overhead lines with a nominal voltage above 1000V - insulator units for a.c. systems	SR EN 60383-1:2002, clauses 19.2; 19.4; 33.1; 33.2
		Spacers for overhead lines	CEI 61854:1998, clauses 7.5.1.1; 7.5.4.1; 7.5.4.2; 7.5.6
		Fittings for insulators, post units, clamps for electric traction overhead contact lines	SR EN 50119:2010, clauses 8.2; 1.5
		Insulator strings and sets for overhead lines with a nominal voltage greater than 1000V	CEI 61467:2008, clause 10.5

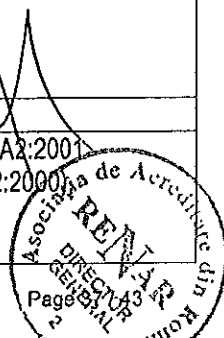
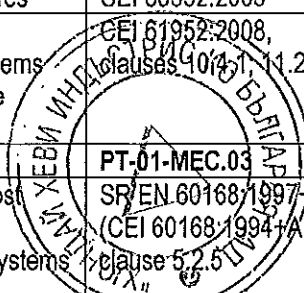
**ВЯРНО
С ОПРИГИНАЛА**



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
54	Mechanical bending test		PT-01-MEC.02
		Indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V	SR EN 60168:1997+A1:2004+A2:2001 (CEI 60168:1994+A1:1997+A2:2000), clauses 5.2.4; 5.3; 5.9
		Indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV	SR EN 60660: 2001(CEI 60660:1999), clauses 3.7.2.a; 3.8; 3.9; 3.13
		Instrument transformers (Current transformers)	SR EN 61869-1:2010 (CEI 61869-1: 2007), clause 7.4.5
		Instrument transformers (Inductive voltage transformers)	SR EN 61869-1:2010 (CEI 61869-1: 2007), clause 7.4.5
		Instrument transformers (Capacitor voltage transformers)	SR EN 61869-1:2010 (CEI 61869-1: 2007), clause 7.4.5
		Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V	CEI 62155:2003, clause 7.2.2
		Pressurized and unpressurized composite hollow insulators for use in electrical equipment with rated voltage greater than 1000 V	CEI 61462: 2007, clause 8.5; 9.4
		Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV	CEI 62231:2006, clauses 8.3.1; 9.3.1; 10.4.1
		Insulated bushings for alternating voltages above 1000 V	SR EN 60137:2008 (CEI 60137:2008), clause 8.9
		Polymeric insulators for indoor and outdoor use, for a.c. systems with a nominal voltage greater than 1000 V	SR EN 62217:2013 (CEI 62217:2012), clause 9
		Metal-oxide surge arresters without gaps for a.c. systems	SR EN 60099-4:2005+A1:2007+A2:2009 (CEI 60099-4: 2009), clauses 8.9; 10.8.9.3.b)
		Overhead line structures	CEI 60652:2005
		Composite line post insulators for a.c. systems with a nominal voltage greater than 1000 V	CEI 61952:2008, clauses 10.4.1, 11.2.1
55	Mechanical torsion test		PT-01-MEC.03
		Indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages	SR EN 60168:1997+A1:2004+A2:2001 (CEI 60168:1994+A1:1997+A2:2000), clause 5.2.5

**ВЪРНО
С ОРИГИНАЛА**

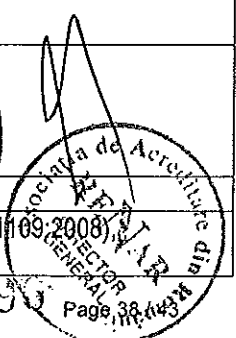
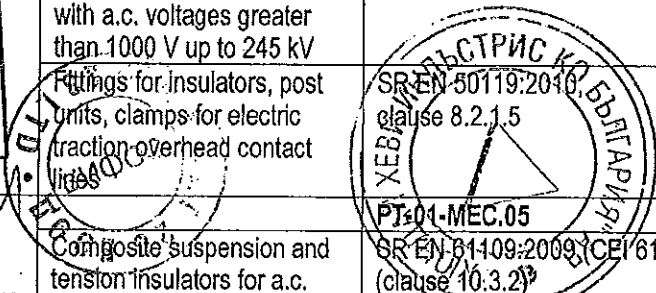


000395

Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		greater than 1000 V	
		Indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV	SR EN 60660:2001 (CEI 60660:1999), clause 3.7.2.b)
		Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V	CEI 62155:2003, clause 7.2.3
		Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV	CEI 62231:2006, clause 8.3.2
		Metal-oxide surge arresters without gaps for a.c. systems	SR EN 60099-4:2005+A1:2007+A2:2009 (CEI 60099-4: 2009), clause 10.8.9.3.1.1
		Spacers for overhead lines	CEI 61854:1998, clauses 7.5.1.2; 7.5.2; 7.5.3
		Fittings for overhead lines	SR EN 61284:2000, clause 11.4.5
		Overhead line structures	CEI 60652:2005
		Fittings for insulators, post units, clamps for electric traction overhead contact lines	SR EN 50119:2010, clause 8.2.1.4
56	Mechanical compression test		PT-01-MEC.04
		Indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V	SR EN 60168:1997+A1:2004+A2:2001 (CEI 60168:1994+A1:1997+A2:2000), clause 5.2.7
		Indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV	SR EN 60660:2001 (CEI 60660:1999), clause 3.7.2.c)
		Hollow pressurized and unpressurized ceramic and glass insulators for use in electrical equipment with rated voltages greater than 1000 V	CEI 62155:2003, clause 7.2.5
		Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV	CEI 62231:2006, clause 9.3.3
		Fittings for insulators, post units, clamps for electric traction overhead contact lines	SR EN 50119:2010, clause 8.2.1.5
57	Tensile – temperature test		PT-01-MEC.05
		Composite suspension and tension insulators for a.c.	SR EN 61409:2009 (CEI 61409:2008), clause 10.3.2)

**ВЯРНО
С ОРЪГИНАЛА**

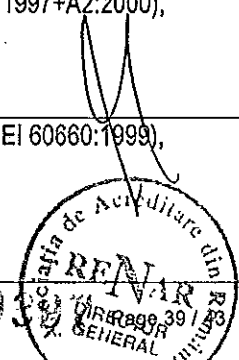
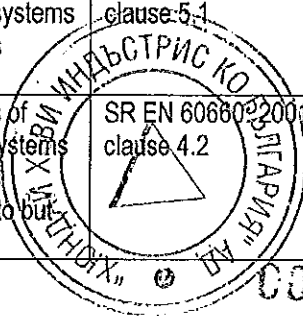


030395

Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		systems with a nominal voltage greater than 1000 V Ceramic or glass insulators for overhead lines with a nominal voltage above 1000V - insulator units for a.c. systems	SR EN 60383-1:2002(CEI 60383-1:1993) clauses 20; 33.1
58	Bending – temperature test	Polymeric insulators for indoor and outdoor use, for a.c. systems with a nominal voltage greater than 1000 V Composite line post insulators for a.c. systems with a nominal voltage greater than 1000 V Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV Metal-oxide surge arresters without gaps for a.c. systems	PT-01-MEC.05 SR EN 62217:2013(CEI 62217:2012), clause 9.2.7.2 SR EN 61952:2008 (CEI 61952:2008), clause 10.3 CEI 62231:2006, clause 8.2.4 SR EN 60099-4:2005+A1:2007+A2:2009 (CEI 60099-4:2009), clause 10.8.9.3.1.2
59	Test for mechanical bending strength as a function of temperature	Indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV	SR EN 60660:2001(CEI 60660:1999) clause 3.9 PT-01-MEC.06
60	Sudden load release pre-stressing	Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1000 V	CEI 61109:2008 (SR EN 61109:2009), clause 10.3.1 PT-01-MEC.06
61	Visual examination, marking, inspection of dimensional characteristics	Composite suspension and tension insulators for a.c. systems with a nominal voltage greater than 1000 V Composite line post insulators for a.c. systems with a nominal voltage greater than 1000 V Ceramic or glass insulators for overhead lines with a nominal voltage above 1000V - insulator units for a.c. systems Indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1000 V Indoor post insulators of organic material for systems with nominal voltages greater than 1 kV up to but not including 300 kV	PT-01-MEC.07 SR EN 61109:2009 (CEI 61109:2008), clause 12.2 SR EN 61952:2008, clauses 12.2; 13.2 SR EN 60383-1:2002 (CEI 60383-1:1993), clauses 17; 21 SR EN 60168:1997+A1:2004+A2:2001 (CEI 60168: 1994+A1:1997+A2:2000), clause 5.1 SR EN 60660:2001(CEI 60660:1999), clause 4.2

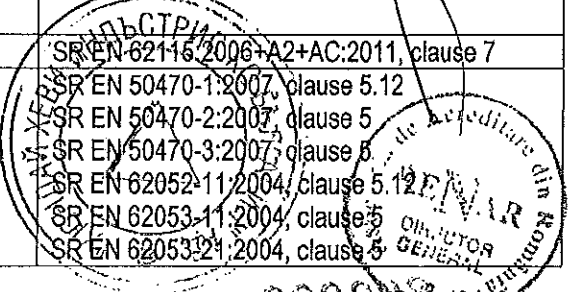
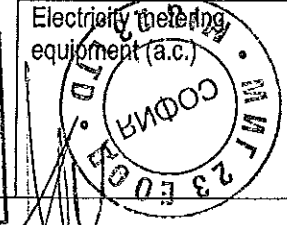
BRP HD
C OPINTINATA



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
		Pressurized and unpressurized composite hollow insulators for use in electrical equipment with rated voltage greater than 1000 V	CEI 61462: 2007, clause 9.3
		Composite station post insulators for substations with a.c. voltages greater than 1000 V up to 245 kV	CEI 62231:2006, clauses 9.1; 10.2
		Insulated bushings for alternating voltages above 1000 V	SR EN 60137: 2008 (CEI 60137:2008), clause 8.13
		Fittings for overhead lines	SR EN 61284: 2000, clauses 7; 8
		Spacers for overhead lines	CEI 61854: 1998, clauses 7.1; 7.2
		Early streamer emission lightning protection systems	NFC 17-102: 2011, clauses C.3.1.1; C.3.1.2; C.3.2
		Polymeric insulators for indoor and outdoor use, for a.c. systems with a nominal voltage greater than 1000 V	SR EN 62217: 2013 (CEI 62217:2012), clause 9.2.7.2
		Household and similar electrical appliances	SR EN 60335-1:2012, clause 7 CEI 60335-1:2010, clause 7 completed with clauses 7 in the standards specified in the Note at the end of the document, for each type of tested product
		Hand-held electric motor operated tools	SR EN 50144-1:2003+A2:2004, clause 7
		Electrical equipment of machines	SR EN 60204-1:2007, clause 16
		Electrical equipment for measurement, control and laboratory use	SR EN 61010-1:2011, clauses 5.1, 5.2, 5.3
		Low-voltage switchgear and controlgear assemblies	SR EN 60439-1:2001, clause 5 CEI 61439-1:2011, clause 6.1 and clause 10.2.7 SR EN 62208:2012, clause 9.3
		Information technology equipment	SR EN 60950-1:2006+A12:2011, clause 1.7
		Audio, video and similar electronic apparatus	SR EN 60065:2003+A1:2006+A11:2009 + A12:2011+A2:2011, clause 5
		Low-voltage switchgear and controlgear	SR EN 60947-1:2008+A1:2011, clause 5.2 CEI 60947-1:2007, clause 5.2 CEI 60947-2:2006+A1:2009, clause 5.2 CEI 60947-3:2008, clause 5.2 CEI 60947-4-1:2009, clause 6.2
		Transportable motor-operated electric tools	SR EN 61029-1:2009+A11:2011, clause 7
		Electric toys	SR EN 62115:2006+A2+AC:2011, clause 7
		Electricity metering equipment (a.c.)	SR EN 50470-1:2007, clause 5.12 SR EN 50470-2:2007, clause 5 SR EN 50470-3:2007, clause 5 SR EN 62052-11:2004, clause 5.12 SR EN 62053-11:2004, clause 5 SR EN 62053-21:2004, clause 5

**ВЯРНО
С ОРГАНИЗАЦИЯТА**

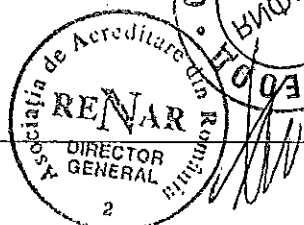
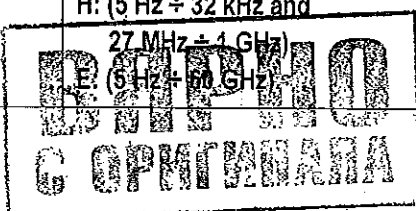


Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
			SR EN 62053-22:2004, clause 5 SR EN 62053-23:2004, clause 5
		Luminaires	CEI 60598-1:2008, clause 3
		Lamp controlear	SR EN 61347-1:2009+A1:2011, clause 7 CEI 61347-1:2007, clause 7 SR EN 61347-2-13:2007, clause 7
		Electric vehicle conductive charging systems	SR EN 61851-22:2003, clause 14
		Electrical accessories	CEI 60898-1:2002+A1:2002+A2:2003, clause 6 and clause 9.3
62	Mechanical impact test		PT-01-MEC.08
		Low-voltage switchgear and controlgear assemblies	CEI 61439-1:2011, clause 10.2.6 CEI 62262:2002, clause 6 SR EN 62208:2012, clause 9.7 SR EN 60068-2-75:2002, clause 4
		High-voltage switchgear and controlgear	CEI 62271-1:2007+A1:2011, clause 6.7.2 CEI 62271-100:2008+A1:2012, clause 6.7 CEI 62271-102:2001+A1:2011, clause 6.7 CEI 62271-103:2011, clause 6.7 CEI 62271-200:2011, clause 6.7.2 CEI 62271-201:2006, clause 6.7.2 CEI 62271-202:2014, clause 6.101.3 CEI 62271-203:2011, clause 6.7.2 CEI 62262:2002 SR EN 60068-2-75:2002, clause 4
		Electric vehicle conductive charging system	SR EN 61851-22:2003, clause 11.2.2
63	Tightness test of the liquid-filled electromagnetic unit	Instrument transformers (Capacitor voltage transformers)	SR EN 61869-5:2012 (CEI 61869-5:2011) clause 7.2.8.501 PT-01-MEC.09
64	Operating and mechanical endurance tests	Alternating current disconnectors and earthing switches	SR EN 62271-102:2003+A1:2012 +A2:2013 (CEI 62271-102:2001+A1:2011) clause 6.102 PT-01-MEC.10
65	Water immersion pre-stressing test	Polymeric insulators for indoor and outdoor use, for a.c. systems with a nominal voltage greater than 1000 V	SR EN 62217:2013 (CEI 62217:2012) clause 9.2.6 PT-01-MEC.11
66	Specific tests for empty enclosures and assemblies for low-voltage switchgear and controlgear	Empty enclosures and assemblies for low-voltage switchgear and controlgear	CEI 61439-1:2011, clause 10.2.5 SR EN 62208:2012, clauses 9.4; 9.5; 9.6 PT-01-MEC.12

B. Tests performed on site

No.	Type / Name of the test	Material / product	Reference document
67	Measurement of frequency response	Power transformers	SR EN 60076-18:2013 (CEI 60076-18:2012) PT-01-IT.40
68	Electromagnetic fields measurement H: (5 Hz ÷ 32 kHz and 27 MHz ÷ 1 GHz) E: (5 Hz ÷ 10 GHz)		SR EN 62110:2010 (EN 62110:2009) (CEI 62110:2009), clause 4 SR EN 61566:2003 (EN 61566:1997) (CEI 61566:1997), clause 6.2 CEI 61786:1998, clause 5, 6 EN 61786:2014 (CEI 61786:2013), clause 5, 6



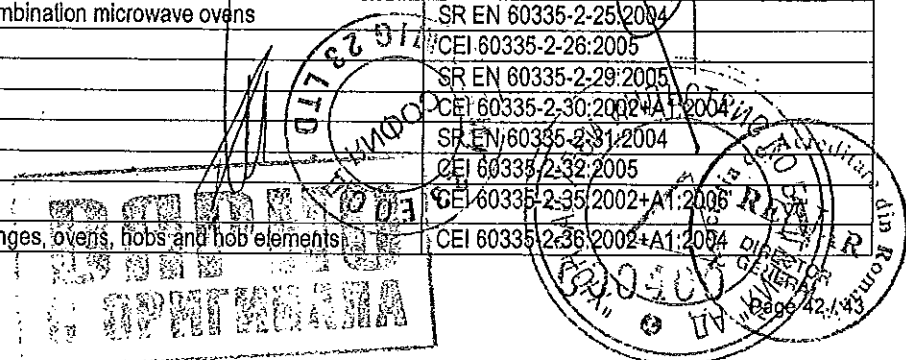
Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Type / Name of the test	Material / product	Reference document
			PT-01-CEM.07
		Residential environments: office buildings, firm residences etc.	OMS 1193:2006 SR EN 61566:2003 (EN 61566:1997; CEI 61566:1997), clause 6.2 CEI 61786:1998, clause 5, 6 EN 61786:2014 (CEI 61786:2013), clause 5, 6
		Medical power supply units	SR EN ISO 11197:2009 (ISO 11197:2004), clause 36.101
		Lighting equipment	SR EN 62493:2010 (EN 62493:2010, CEI 62493:2009), clause 6
69	Measuring the effectiveness of electromagnetic shielding (9 kHz ÷ 18 GHz)		PT-01-CEM.08
		Electromagnetic shielded enclosures	IEEE 299:2006
		Anechoic chambers	SR EN 50147-1:1998 (EN 50147-1:1998)
		Durable rigid wall relocatable structures	ASTM E1851-09
70.	Measurement of radiated emissions produced by vehicles (9 kHz ÷ 1 GHz)		PT-01-CEM.09
		Railway equipment	SR EN 50121-2:2007 (EN 50121-2:2006, CEI 62236-2:2008), clause 5 SR EN 50121-3-1:2007 (EN 50121-3-1:2006, CEI 62236-3-1:1998), clause 6.3
		Road vehicles	Directive 2009/19/CE, clauses 6.2 and 6.3 Directive 2009/64/CE, clauses 6.2 and 6.3

NOTE:

Household and similar electrical appliances have particular requirements for tests in SR EN 60335-2-XX or IEC 60335-2-XX, as follows:

No.	Product name	Reference document
1.	Vacuum cleaners and water-suction cleaning appliances	SR EN 60335-2-2:2004+A1:2005
2.	Electric irons	SR EN 60335-2-3:2004
3.	Spin extractors	SR EN 60335-2-4:2004
4.	Dishwashers	CEI 60335-2-5:2002+A1:2005
5.	Cooking ranges, cooking tables, ovens and similar fixed electrical appliances	SR EN 60335-2-6:2004+A1:2005
6.	Washing machine	CEI 60335-2-7:2002+A1:2004+A2:2006
7.	Shavers, hair clippers and similar electrical appliances	CEI 60335-2-8:2002+A1:2005
8.	Grills, toasters and similar portable cooking appliances	CEI 60335-2-9:2002+A1:2004+A2:2006
9.	Floor treatment machines and wet scrubbing machines	CEI 60335-2-10:2005
10.	Warming plates and similar appliances	SR EN 60335-2-12:2004
11.	Deep fat fryers, frying pans and similar appliances	SR EN 60335-2-13:2004+A1:2005
12.	Kitchen machines	CEI 60335-2-14:2006
13.	Appliances for heating liquids	SR EN 60335-2-15:2004+A1:2006
14.	Food waste disposers	CEI 60335-2-16:2005
15.	Blankets, pads and similar flexible heating appliances	CEI 60335-2-17:2002+A1:2006
16.	Storage water heaters	SR EN 60335-2-21:2004+A1:2006
17.	Appliances for skin or hair care	SR EN 60335-2-23:2004
18.	Refrigerating appliances, ice-cream appliances and ice-makers	CEI 60335-2-24:2002+A1:2005
19.	Microwave ovens, including combination microwave ovens	SR EN 60335-2-25:2004
20.	Clocks	CEI 60335-2-26:2005
21.	Battery chargers	SR EN 60335-2-29:2005
22.	Room heaters	CEI 60335-2-30:2002+A1:2004
23.	Range hoods	SR EN 60335-2-31:2004
24.	Massage appliances	CEI 60335-2-32:2005
25.	Instantaneous water heaters	CEI 60335-2-35:2002+A1:2006
26.	Commercial electric cooking ranges, ovens, hobs and hob elements	CEI 60335-2-36:2002+A1:2004



Annex no. 1 to Accreditation Certificate no. LI 1036
Annex no. 1 Issue Date: 10.10.2014

No.	Product name	Reference document
27.	Commercial electric deep fat fryers.	CEI 60335-2-37:2005
28.	Commercial electric griddles	CEI 60335-2-38:2005
29.	Commercial electric multi-purpose cooking pans	CEI 60335-2-39:2002+A1:2004
30.	Electrical heat pumps, air-conditioners and dehumidifiers	SR EN 60335-2-40:2004+A12:2005
31.	Pumps	SR EN 60335-2-41:2004
32.	Commercial electric forced convection ovens, steam cookers and steam-convection ovens	CEI 60335-2-42:2005
33.	Clothes dryers and towel rails	CEI 60335-2-43:2004+A1:2005
34.	Ironers	CEI 60335-2-44:2003
35.	Portable heating tools and similar appliances	SR EN 60335-2-45:2004
36.	Commercial electric boiling pans	CEI 60335-2-47:2002
37.	Commercial electric grillers and toasters	CEI 60335-2-48:2005
38.	Commercial electric hot cupboards	CEI 60335-2-49:2005
39.	Stationary circulation pumps for heating and service water installations	CEI 60335-2-51:2005
40.	Oral hygiene appliances	CEI 60335-2-52:2005
41.	Electrical appliances for use with aquariums and garden ponds	CEI 60335-2-55:2005
42.	Projectors and similar appliances	SR EN 60335-2-56:2004
43.	Commercial electric dishwashing machines	CEI 60335-2-58:2005
44.	Insect killers	CEI 60335-2-59:2002+A1:2006
45.	Commercial electric rinsing sinks	CEI 60335-2-62:2005
46.	Air-cleaning appliances	CEI 60335-2-65:2005
47.	Water-Bed Heaters	CEI 60335-2-66:2003
48.	Milking Machines	CEI 60335-2-70:2004
49.	Fixed Immersion heaters	SR EN 60335-2-73:2004
50.	Portable immersion heaters	SR EN 60335-2-74:2004
51.	Commercial dispensing appliances and vending machines	CEI 60335-2-75:2002+A1:2004
52.	Electric fence energizers	CEI 60335-2-76:2002+A1:2006
53.	Electric outdoors barbecues	CEI 60335-2-78:2005
54.	Fans	CEI 60335-2-80:2005+A1:2006
55.	Foot warmers and heating mats	CEI 60335-2-81:2002+A1:2007
56.	Amusement machines and personal service machines	CEI 60335-2-82:2005
57.	Heated gullies for roof drainage	CEI 60335-2-83:2003
58.	Toilets	CEI 60335-2-84:2005
59.	Fabric steamers	CEI 60335-2-85:2005
60.	Electric fishing machines	CEI 60335-2-86:2002+A1:2005
61.	Animal stunning electrical equipment	CEI 60335-2-87:2003
62.	Commercial microwave ovens	CEI 60335-2-90:2006
63.	Drives for vertically moving garage doors for residential use	CEI 60335-2-95:2002+A1:2004
64.	Flexible sheet heating elements for room heating	CEI 60335-2-96:2002+A1:2003
65.	Humidifiers	CEI 60335-2-98:2002+A1:2004
66.	Commercial electric hoods	CEI 60335-2-99:2003
67.	Gas, oil and solid-fuel burning appliances having electrical connections	CEI 60335-2-102:2004 +A1:2008
68.	Drives for gates, doors and windows	CEI 60335-2-103:2006
69.	Appliances to recover and/or recycle refrigerant from air conditioning and refrigeration equipment	CEI 60335-2-104:2004
70.	Multifunctional shower cabinets	CEI 60335-2-105:2004

End of document

DIRECTOR GENERAL
Cătălina Viorica NEAGUE



000401

(

(

СТОЛИЧНА РЕГИОНАЛНА ЗДРАВНА ИНСПЕКЦИЯ

София 1000, ул. "Цар Симеон" № 169 А, п.к 1303
Тел./факс 931 13 39 e-mail uok@srzl.bg

ОРГАН ЗА КОНТРОЛ ОТ ВИДА А

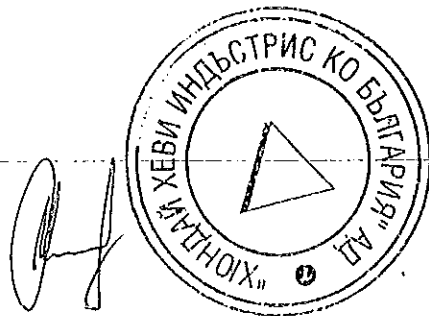

СЕРТИФИКАТ ЗА КОНТРОЛ

№ 170578 / 13.04.2017 г

- Идентификация на клиента:
"Хюндай Хеви Индъстрис Ко България" АД / бул. "Рожен" №41, гр. София Ивайло
Паунов Райков - отговорник качество, Заявление №170578 / 21.03.2017 г.
- Идентификация на контролирания обект/продукт:
Завод за производство на трансформатори и стъпални регулатори - обект в експлоатация
бул. "Рожен" №41, гр. София
- Контролирани параметри:
Химични агенти във въздух на работна среда
Химични агенти във въздух на работна среда-прах
Взел пробата/извършил контрола: Камелия Тегаркова - изп. пробовчемач ФХИЖС
- ЗАКЛЮЧЕНИЕ:**
КОНТРОЛИРАНИЯТ ПАРАМЕТЪР НА ПРАХА ИНХАЛАБИЛНА ФРАКЦИЯ СЪОТВЕТСТВА НА
ИЗИСКВАНИЯТА НА НАРЕДБА №13, ОБН., ДВ, БР. 8/2004 г.
КОНТРОЛИРАНИТЕ ХИМИЧНИ АГЕНТИ ВЪГЛЕРОДЕН ОКСИД, АЗОТЕН ДИОКСИД И МАСЛЕНИ
АЕРОЗОЛИ СЪОТВЕТСТВАТ НА ИЗИСКВАНИЯТА НА НАРЕДБА №13, ОБН., ДВ, БР. 8/2004 г.

Приложение: Неразделна част от настоящия "Сертификат за контрол", съдържащ
общо 7 страници, са Протокол /и No No:

170578-3-10201 / 11.04.2017 г. / 2 стр.
170578-3-10501 / 11.04.2017 г. / 4 стр.

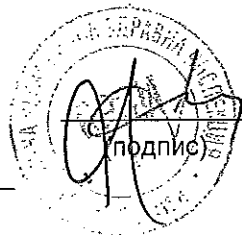


Зам. ръководител на Орган за
контрол от вида А:

д-р В. Люцканова

Извършил оценка на съответствието:

(подпис)



Не се допуска използването на копия от настоящия сертификат или на части от него
освен с писмено разрешение на органа за контрол, издал сертификата. Сертификатът може
да бъде отнет при неправомерно позоваване или неправилна употреба.

000402

МИНИСТЕРСТВО НА ЗДРАВЕОПАЗВАНЕТО
СТОЛИЧНА РЕГИОНАЛНА ЗДРАВНА ИНСПЕКЦИЯ
УЛ. "ВРАНЯ" № 20
ДИРЕКЦИЯ "ЛАБОРАТОРНИ ИЗСЛЕДВАНИЯ"
ОРГАН ЗА КОНТРОЛ ОТ ВИД А
УЛ. "ЦАР СИМЕОН" № 169 А

**ПРОТОКОЛ
ОТ КОНТРОЛ НА ПРАХ В
РАБОТНА СРЕДА**

№ 170578-3-10201 11.04.2017 г.
ден месец година

1. ОБЕКТ: Завод за производство на трансформатори и стънални регулатори / обект в експлоатация
2. АДРЕС: бул. "Рожен" №41, гр. София
3. ЗАЯВИТЕЛ: Ивайло Паунов Райков - отговорник качество, Заявление №170578 / 21.03.2017 г. / "Хюндай Хеви Индъстрис Ко България" АД / бул. "Рожен" №41, гр. София

4. КОНТРОЛИРАНИ ПАРАМЕТРИ: Инхалабилна фракция

5. РАБОТНО МЯСТО № 1: Цех Трансформатори - заварки, Участък "Монтаж"

заети лица /бр./	24	наблюдава- ни лица /бр./	10	професия	монтъори	експозиция /ч./	4	работно време /ч./	8
------------------	----	--------------------------	----	----------	----------	-----------------	---	--------------------	---

ДАТА НА ПРОБОВЗЕМАНЕ: 05.04.2017 г.

7. ВЗЕЛ ПРОБАТА: Камелия Тегаркова - изпълнител пробовземач

8. ТЕХНОЛОГИЧЕН ПРОЦЕС: заваряване на намотки - прекъснат

/непрекъснат; прекъснат/

9. ВИД НА СЪОРЪЖЕНИЕТО: /машина, инсталация/ - ОКСИЖЕН

10. ИЗПОЛЗВАНИ СУРОВИНИ И МАТЕРИАЛИ: медни намотки, метали

11. ВЕНТИЛАЦИЯ: естествена аерация

/вид, състояние/

12. НОРМАТИВНИ ИЗИСКВАНИЯ: НАРЕДБА №13, обн., ДВ, бр. 8/2004 г.

13. МЕТОД ЗА КОНТРОЛ: БДС 2200:1985; БДС EN 689:2001; БДС EN-482:2012+A1:2015

14. СРЕДСТВА ЗА ИЗМЕРВАНЕ:

ПРОБОВЗЕМНА АПАРАТУРА 2Ах20Б

идент. № 1

АНАЛИТИЧНА АПАРАТУРА МПФД-8

идент. № 11473, СК №832/10.09.2016 г.

Везна електронна ACCULAB ATIPION ATL 224-1 BD2245

идент. № 22309926, СК №41/19.05.2015 г.

Термометър живачен

идент. № усл. №4А, СК №82J/16.10.2015 г.

Барометър анероиден

идент. № 3272, СК №33-ИН/04.08.2016 г.

Сепаратор (микроциклон) за 20 l/min

идент. № №SG-9, СП №124/11.11.2016 г.

Електронен секундомер

идент. № усл. №1, СК №0783/06.06.2016 г.

ТИП ПРОБОВЗЕМЕН ФИЛТЪР ФПП-15

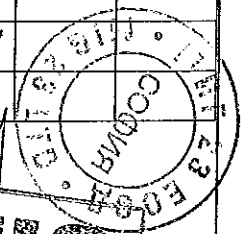
15. НАЧИН НА ПРОБОВЗЕМАНЕ: стационарно

/стационарно, персонално/

16. ВИД ПРАХ: прах железен (оксиди, агломерати, шлака, стомана, чугун), съдържащ под 2% св. кр. силициев диоксид в респирабилната фракция

17. РЕЗУЛТАТИ ОТ КОНТРОЛА:

КАСЕТА №	Инхалабилна фракция	14																	
	Респирабилна фракция	15																	
ДЕБИТ АСПИРИРАН ВЪЗДУХ dm ³ / min	Инхалабилна фракция	20																	
	Респирабилна фракция	20																	
ПРОДЪЛЖИТЕЛНОСТ НА ПРОБОВЗЕМАНЕ /min/	Инхалабилна фракция	180																	
	Респирабилна фракция	180																	



ПОКАЗАТЕЛИ				Средно-прегледна концентрация mg/m ³	ГРАНИЧНИ СТОЙНОСТИ		КРАТНОСТ	ХИГИЕННА ОЦЕНКА	
					[mg/m ³]	[бр.вл./см ³]		ВОДЕЩ ПАРАМЕТЪР	НИВО
ПРИВЕС, mg	Инхалабилна фракция	1,1							
	Респирабилна фракция	0,6							
Vo, dm ³	Инхалабилна фракция	3129,8							
	Респирабилна фракция	3129,8							
МАСОВА КОНЦЕНТРАЦИЯ, mg/m ³	Инхалабилна фракция	0,35			0,18±0,002	6,0	0,03	инх. фр.	
	Респирабилна фракция	0,19			0,09±0,004			респ. фр.	
	% респирабилна фракция	50,0							
СВОБОДЕН КРИСТАЛЕН СИЛИЦИЕВ ДИОКСИД, mg/m ³	Инхалабилна фракция								
	Респирабилна фракция								
СВОБОДЕН КРИСТАЛЕН СИЛИЦИЕВ ДИОКСИД, %	Инхалабилна фракция								
	Респирабилна фракция								
АЗБЕСТОВ ПРАХ	% на азбеста								
	бр. влакна/см ³								

Забележка: Резултатите от изследванията се отнасят само за контролираната проба.
Извлечения от протокола не могат да се размножават без писменото съгласие на ОКА.

Настоящият протокол е неразделна част от "СЕРТИФИКАТ ЗА КОНТРОЛ". № 170578 / 2017 г.
Информацията, получена в процеса на контролната дейност е конфиденциална.

ПРОВЕЛ КОНТРОЛА И ИЗВЪРШИЛ ОЦЕНКА НА СЪОТВЕТСТВИЕТО: ЕМ. ПОНОВА
(фамилия, подпис)

от

НАЧАЛНИК ОТДЕЛ ФХИЖС: В. ЙОРДАНОВА
(фамилия, подпис)



000404

МИНИСТЕРСТВО НА ЗДРАВЕОПАЗВАНЕТО
 СТОЛИЧНА РЕГИОНАЛНА ЗДРАВНА ИНСПЕКЦИЯ
 УЛ. "ВРАНЯ" № 20
 ДИРЕКЦИЯ "ЛАБОРАТОРНИ ИЗСЛЕДВАНИЯ"
 ОРГАН ЗА КОНТРОЛ ОТ ВИД А
 УЛ. "ЦАР СИМЕОН" № 169 А

ПРОТОКОЛ
ОТ ХИМИЧЕН КОНТРОЛ НА
ХИМИЧНИ АГЕНТИ ВЪВ ВЪЗДУХА
НА РАБОТНАТА СРЕДА

№ 170578-3-10501 11.04.2017 г.
 ден месец година

1. **ОБЕКТ:** Завод за производство на трансформатори и стъпални регулатори / обект в експлоатация
2. **АДРЕС:** бул. "Рожен" №41, гр. София
3. **ЗАЯВИТЕЛ:** Ивайло Паунов Райков - отговорник качество, Заявление №170578 / 21.03.2017 г. / "Хюндай Хевн Индъстрис Ко България" АД / бул. "Рожен" №41, гр. София
4. **КОНТРОЛИРАНИ ПАРАМЕТРИ:** Въглероден оксид
 Азотен диоксид
5. **ДАТА НА ПРОБОНАБИРАНЕ:** 05.04.2017 г.

№	Работно място	Брой работници	Експозиция в часове	Вентилация
1.	Цех трансформаторен - заварки	24	4	естествена аерация

6. **ВЗЕЛ ПРОБИТЕ:** Камелия Тегаркова - изпълнител пробовземач

7. **ПРИСЪСТВАЛ ПРЕДСТАВИТЕЛ НА ОБЕКТА:** Евдокия Филипова - охрана на труда
 /име, фамилия/

8. **НОРМАТИВНИ ИЗИСКВАНИЯ:** НАРЕДБА №13, обн., ДВ, бр. 8/2004 г.

9. **МЕТОДИ ЗА КОНТРОЛ:** БДС EN 689:2001; БДС EN 482:2012+A1:2015; Методически указания за определяне на токсични газове и пари във въздуха на работната среда по линейно-колориметрични методи, книга 2, изд. МА, НИХПЗ, Сдружение "Хигиенс", 1987 г.; ОКА7.1ПКЗ-1

10. **СРЕДСТВА ЗА ИЗМЕРВАНЕ:**

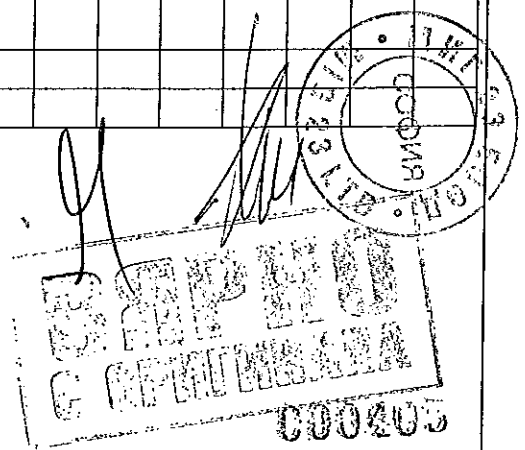
Дрегеров мех
 инд. тръбички

идент. № 12923 СП №95/02.09.2016 г.
 идент. № 3711-2 /2017; 2211-2/2015

11. **УСЛОВИЯ ПРИ ПРОБОНАБИРАНЕ:**

Химичен агент	Азотен диоксид			Въглероден оксид											
	1'	1'	1'	2'	2'	2'									
Показател															
Брой проби по интервали	1'	1'	1'	2'	2'	2'									
Час на интервала	II		IV	VI											
Дебит на аспириране - dm ³ /min	1/10			1/10											
Vt - dm ³	1			1											
Vo - dm ³	0,9			0,9											
Атмосферно налягане - Hgmm	714														
Температура - С°	22														
Експозиция в часове	1	2	1	1	2	1									

[Handwritten signature]



12. РЕЗУЛТАТИ ОТ КОНТРОЛА:

№	Химичен агент	Метод за контрол	Концентрация на химичния агент в mg/m^3 на интервали			Средно-претеглена концентрация mg/m^3	Гранична стойност mg/m^3
			I инт.	II инт.	III инт.		
1	Въглероден оксид	Методично указание "Хигитест" 87 г.	8,5	7,7	7,7	3,95±0,42	40,0
2	Азотен диоксид	Методично указание "Хигитест" 87 г.	1,03	0,7	0,9	0,42±0,25	4,0

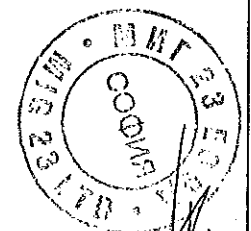
Забележка: Резултатите от изследванията се отнасят само за контролираната проба.
Извлечения от протокола не могат да се размножават без писменото съгласие на ОК.
Настоящият протокол е неразделна част от "СЕРТИФИКАТ ЗА КОНТРОЛ" № 170578 / 2017 г.
Информацията, получена в процеса на контролната дейност е конфиденциална.

ПРОВЕЛ КОНТРОЛА ЕМ. ПОПОВА
ИЗВЪРШИЛ
ОЦЕНКА НА
СЪОТВЕТСТВИЕТО:

да

НАЧАЛНИК ОТДЕЛ ФХИЖС: В. ЙОРДАНОВА

(фамилия, подпис)



600206

МИНИСТЕРСТВО НА ЗДРАВЕОПАЗВАНЕТО
СТОЛИЧНА РЕГИОНАЛНА ЗДРАВНА ИНСПЕКЦИЯ
УЛ. "ВРАНЯ" № 20
ДИРЕКЦИЯ "ЛАБОРАТОРНИ ИЗСЛЕДВАНИЯ"
ОРГАН ЗА КОНТРОЛ ОТ ВИД А
УЛ. "ЦАР СИМЕОН" № 169 А

ПРОТОКОЛ
ОТ ХИМИЧЕН КОНТРОЛ НА
ХИМИЧНИ АГЕНТИ ВЪВ ВЪЗДУХА
НА РАБОТНАТА СРЕДА

№ 170578-3-10501 11.04.2017 г.
ден месец година

1. **ОБЕКТ:** Завод за производство на трансформатори и стъпални регулатори / обект в експлоатация
2. **АДРЕС:** бул. "Рожен" №41, гр. София
3. **ЗАЯВИТЕЛ:** Ивайло Паунов Райков - отговорник качество, Заявление №170578 / 21.03.2017 г. / "Хюндай Хеви Индъстрис Ко България" АД / бул. "Рожен" №41, гр. София
4. **КОНТРОЛИРАНИ ПАРАМЕТРИ:** Маслени аерозоли
5. **ДАТА НА ПРОБОНАБИРАНЕ:** 05.04.2017 г.

№	Работно-място	Брой работници	Експозиция в часове	Вентилация
2.	Цех трансформатори - при вакуум филтър преса - хале "Монтаж"	10	4	естествена аерация

6. **ВЗЕЛ ПРОБИТЕ:** Камелия Гегаркова - изпълнител правоземач

7. **ПРИСЪСТВАЛ ПРЕДСТАВИТЕЛ НА ОБЕКТА:** Евдокия Филипова - охрана на труда
/име, фамилия/

8. **НОРМАТИВНИ ИЗИСКВАНИЯ:** НАРЕДБА №13, обн., ДВ, бр. 8/2004 г.

9. **МЕТОДИ ЗА КОНТРОЛ:** БДС EN 689:2001; БДС EN 482:2012+A1:2015; БДС 16406:1986; ОКА7.1ПКЗ-2

10. СРЕДСТВА ЗА ИЗМЕРВАНЕ:

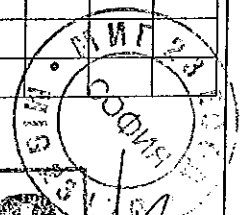
Аспиратор	идент. № 96/98022
Везна електронна ACCULAB ATILON ATL 224-1 ED2245	идент. № 22309926, СК №41/19.05.2015 г.
UV-VIS "Lambda 25"	идент. № 101N6012605, СК №2/23.10.2015 г.
МПФД-8	идент. № 16954, СК №830/10.09.2016 г.
Термометър живачен	идент. № 4А, СК №82J/16.10.2015 г.
Барометър анероиден	идент. № 3272, СК №33-ИН/04.08.2016 г.

УСЛОВИЯ ПРИ ПРОБОНАБИРАНЕ:

Химичен агент	Маслени аерозоли			Показател	1 ²	2 ²	3 ²	4 ²	5 ²	6 ²	7 ²	8 ²	9 ²	10 ²
	1 ²	2 ²	3 ²											
Брой проби по интервали	1 ²	2 ²	3 ²											
Час на интервала	II	IV	VI											
Дебит на аспириране -- dm ³ /min	10/10													
Vt - dm ³	10													
Vo - dm ³	9													
Атмосферно налягане -- Hgmm	714													
Температура - С°	20°													
Експозиция в часове	1	2	1											



ВЯРНО
С ОРГИНИЗАЦИЯ



12. РЕЗУЛТАТИ ОТ КОНТРОЛА:

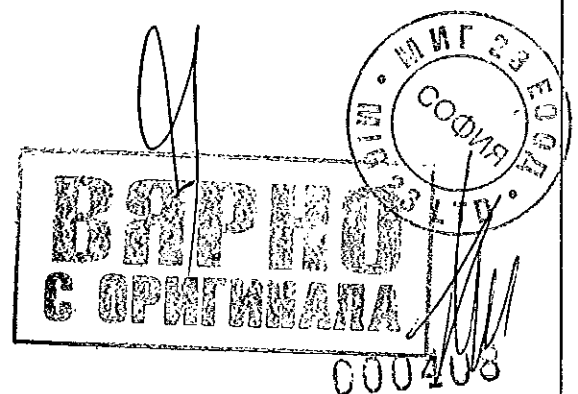
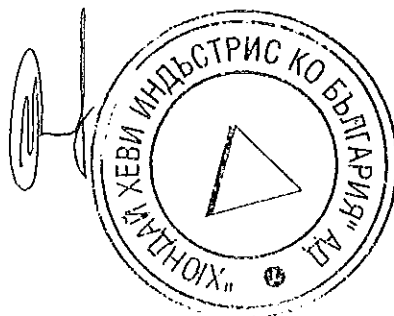
№	Химичен агент	Метод за контрол	Концентрация на химичния агент в mg/m^3 на интервали			Средно-претеглена концентрация mg/m^3	Гранична стойност mg/m^3
			I инт.	II инт.	III инт.		
1	Маслени аерозоли	БДС 16406	под ГКО	под ГКО	под ГКО	под ГКО	5,0

Забележка: Резултатите от изследванията се отнасят само за контролираната проба. Извлечения от протокола не могат да се размножават без писменото съгласие на ОК.
Настоящият протокол е неразделна част от "СЕРТИФИКАТ ЗА КОНТРОЛ" № 170578 / 2017 г.
Информацията, получена в процеса на контролната дейност е конфиденциална.

ПРОВЕЛ КОНТРОЛА ЕМ. ПОПОВА
И ИЗВЪРШИЛ (фамилия, подпис)
ОЦЕНКА НА
СЪОТВЕТСТВИЕТО:

да

НАЧАЛНИК ОТДЕЛ ФХИЖС: В. ЙОРДАНОВА
(фамилия, подпис)



000403

(

(

ОРГАН ЗА КОНТРОЛ от вида С при НАЯ КОНСУЛТ ООД

гр. София, ж.к. „Овча купел 1”, бл. 430, тел. 02 423 80 87,
 GSM: 0896 300 159, факс: 02 956 12 35, e-mail: naia2007@abv.bg

Сертификат за акредитация рег. № 86 ОКС/ 02.02.2016 г., валиден до 30.04.2017 г.,
 издаден от ИА БСА, съгласно изискванията на стандарт БДС EN ISO/IEC 17020:2012

**СЕРТИФИКАТ ЗА КОНТРОЛ
 № 2917/ 22.03.2017 г.**

1. Идентификация на клиента:
 „Хюндай Хеви Индъстрис Ко. България” АД –
 гр. София, бул. „Рожен” № 41

2. Идентификация на контролирания обект:
 Завод за производство на трансформатори и стъпални регулатори –
 гр. София, бул. „Рожен” № 41

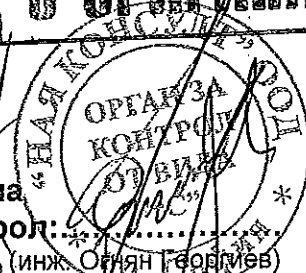
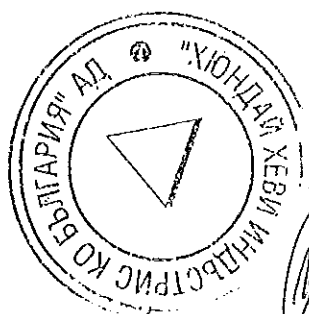
3. Контролирани параметри:
 3.1. Температура на въздуха, относителна влажност на въздуха и
 скорост на движение на въздуха

4. Заключение (оценка на съответствието) от извършения контрол:
 4.1. Контролираните параметри на микроклимата - температура на
 въздуха, относителна влажност на въздуха и скорост на движение
 на въздуха в обект – завод за производство на трансформатори и
 стъпални регулатори – гр. София, бул. „Рожен” № 41 съответстват на
 допустимите гранични стойности съгласно изискванията на
 Наредба № РД-07-3/ 18.07.2014 г. (ДВ, бр. 63/2014 г.).

Приложение: Протокол № 2917-1 от 22.03.2017 г. е неразделна част от
 сертификата за контрол, общо 4 стр.

Дата: 22.03.2017 г.

Ръководител на
 органа за контрол:
 (инж. Огнян Георгиев)



ОРГАН ЗА КОНТРОЛ от вида С при НАЯ КОНСУЛТ ООД

гр. София, ж.к. „Овча купел 1”, бл. 430, тел. 02 423 80 87,
GSM: 0896 300 159, факс: 02 956 12 35, e-mail: naia2007@abv.bg

Сертификат за акредитация рег. № 86 ОКС/ 02.02.2016 г., валиден до 30.04.2017 г.,
издаден от ИА БСА, съгласно изискванията на стандарт БДС EN ISO/IEC 17020:2012

ПРОТОКОЛ № 2917-1/ 22.03.2017 година ОТ КОНТРОЛ НА ПАРАМЕТРИТЕ НА МИКРОКЛИМАТ

1. Клиент: „Хюндай Хеви Индъстрис Ко. България” АД –
гр. София, бул. „Рожен” № 41
(идентификация на клиента)

2. Обект: Завод за производство на трансформатори и стъпални регулатори –
гр. София, бул. „Рожен” № 41
(наименование, вид на обекта, подобект, адрес)

3. Вид на обекта: **на обект в експлоатация**
(на нов или в употреба/експлоатация обект/съоръжение)

4. Основание за контрола: **Заявка № 1629 от 20.03.2017 г.**
(заявка/възлагателно писмо №.../дата..., договор №.../дата...)

5. Контролиран параметър:

- 5.1. Температура на въздуха, °C
5.2. Относителна влажност на въздуха, φ%
5.3. Скорост на движение на въздуха, m/s

6. Нормативни актове:

- 6.1. Метод за контрол: БДС 16686
6.2. Нормативни изисквания: Наредба № РД-07-3/ 18.07.2014г. (ДВ, бр. 63/2014г.)

7. Условия при контрола:

7.1. Период на годината: студен
(студен, топъл)

7.2. Източници на абнормен микроклимат: няма

7.3. Вид на използваното отопление: Централно парно за позиции № 1, 2, 3, 4, 5, 6, 7, 8, 9, 10,
11, 12 и 13; кондиционери за позиции № 14, 15, 16, 17, 19, 20, 21, 22, 23, 24, 25 и 26; калорифер
за позиция № 18

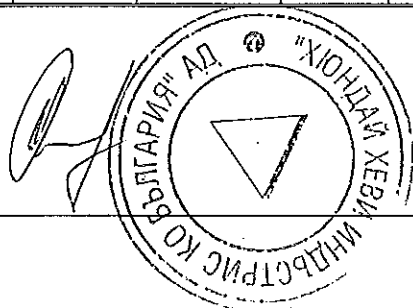
7.4. Наличие на вентилация: Да

7.5. Наличие на климатична инсталация: Не

8. Резултати от контрола:

№ по ред	Място на контрол (цех, участък, помещение) и наименование на работното място	Категория работа	Температура на въздуха, Т°С		Относителна влажност на въздуха, φ%		Скорост на движение на въздуха, m/s	
			Изчислени стойности	Норма	Изчислени стойности	Норма	Изчислени стойности	Норма
1	2	3	4	5	6	7	8	9
Цех „МЗЦ” – участък „Греди”								
1.	Контролна точка -- начало	СТФР	20,5 -21,2	15-23	35,8-38,8	30-75	0,08-0,10	До 0,4
2.	Контролна точка - край	СТФР	20,4 -21,0	15-23	35,7-37,4	30-75	0,07-0,09	До 0,4

1	2	3	4	5	6	7	8	9
Цех „МЗЦ“ – малко хале								
3.	Контролна точка - начало	СТФР	21,0 -21,8	15-23	35,4-38,7	30-75	0,06-0,08	До 0,4
4.	Контролна точка - край	СТФР	21,0-21,9	15-23	35,9-38,6	30-75	0,07-0,10	До 0,4
Цех „МЗЦ“ – голямо хале								
5.	Контролна точка - начало	СТФР	18,4 -19,2	15-23	36,6-40,0	30-75	0,12-0,15	До 0,4
6.	Контролна точка - среда	СТФР	18,6 -19,2	15-23	37,9-40,7	30-75	0,12-0,14	До 0,4
7.	Контролна точка - край	СТФР	18,3 -19,0	15-23	36,9-39,8	30-75	0,13-0,16	До 0,4
ЕМА – ЛАБОРАТОРИЯ „СТЪПАЛЕН РЕГУЛАТОР“								
8.	Зала „Типови изпитвания“	СТФР	20,3 -20,8	15-23	35,4-38,6	30-75	0,07-0,10	До 0,4
9.	Зала „Високоволтови изпитвания“	СТФР	17,8 -18,5	15-23	38,2-41,6	30-75	0,07-0,09	До 0,4
Цех „Трансформатори“ - Участък „Монтаж“								
10.	Контролна точка - начало	СТФР	19,9 -20,7	15-23	33,2-37,0	30-75	0,15-0,19	До 0,4
11.	Контролна точка - край	СТФР	20,2 -20,9	15-23	34,3-37,6	30-75	0,09-0,11	До 0,4
Цех „Трансформатори“ - Участък „Вакуумисти“								
12.	Вакуум филтър преса	СТФР	20,6 -21,4	15-23	31,7-34,6	30-75	0,08-0,10	До 0,4
13.	Парокотелна централа	ЛФР	24,0 -24,5	18-25	33,5-35,5	30-75	0,03-0,06	До 0,2
Цех „СТЪПАЛЕН РЕГУЛАТОР“ – Офис Отдел „Технологичен“								
14.	Контролна точка - ляво	ЛФР	22,3 -23,1	18-25	35,2-38,6	30-75	0,03-0,05	До 0,2
15.	Контролна точка - дясно	ЛФР	22,5 -23,2	18-25	34,4-37,5	30-75	0,04-0,06	До 0,2
ОТДЕЛ „ЕСР“								
16.	Механична Работилница	СТФР	21,1 -22,1	15-23	32,6-35,0	30-75	0,04-0,07	До 0,4
17.	Електро Работилница	СТФР	20,4 -21,3	15-23	32,0-35,6	30-75	0,03-0,05	До 0,4
18.	Компресорно помещение	СТФР	19,6 -20,6	15-23	34,9-37,6	30-75	0,16-0,20	До 0,4
Административна сграда - етаж 3								
19.	Офис-отдел „ЕСР“	ЛФР	21,9 -22,9	18-25	35,4-38,6	30-75	0,03-0,05	До 0,2
Административна сграда - етаж 4								
20.	Офис.ЕМА – контролна точка-ляво	ЛФР	23,0 -24,1	18-25	34,6-37,8	30-75	0,02-0,05	До 0,2
21.	Офис.ЕМА – контролна точка-дясно	ЛФР	23,0 -24,0	18-25	34,6-38,4	30-75	0,03-0,07	До 0,2
22.	Офис Отдел „Продажби трансформатори“ – контролна точка ляво	ЛФР	22,9 -23,9	18-25	36,0-38,6	30-75	0,02-0,04	До 0,2
23.	Офис-Отдел „Продажби трансформатори“ – контролна точка дясно	ЛФР	22,7 -23,9	18-25	34,1-37,9	30-75	0,03-0,05	До 0,2
24.	Офис „Бизнес развитие“	ЛФР	23,4 -24,2	18-25	35,0-37,9	30-75	0,02-0,04	До 0,2
25.	Офис “Продажби стъпални регулатори”	ЛФР	23,0 -23,9	18-25	35,7-38,9	30-75	0,03-0,06	До 0,2
26.	Офис “Главен Юриконсулт”	ЛФР	21,4 -22,4	18-25	31,8-34,7	30-75	0,03-0,04	До 0,2



9. Забележка:

9.1. Резултатите от контрола се отнасят само за контролирания обект и към датите на контрола.

9.2. Протокол № 2917-1 от 22.03.2017 г. е неразделна част от сертификат за контрол № 2917 от 22.03.2017 г.

9.3. Използвани съкращения в колона 3 „Категория работа“: ЛФР – лека физическа работа; СТФР – средно тежка физическа работа.

10. Технически средства за контрол:

10.1. Термоанемометър, тип: Testo 405-V1, идентификационен №41500220/109, СК №09998 от 09.04.2015 г. за измерване на температура и скорост на движение на въздуха;

10.2. Комбиниран уред тип: Testo 410-2, идентификационен №38524398/107, СК №09997 от 09.04.2015 г. за измерване на относителна влажност на въздуха.

(наименование, тип, производител, идентификационен №....., Свидетелство за калибриране СК №.....)

Дати на извършване на контрола: 21.03.2017 г. и 22.03.2017 г.

Извършил контрола:

1. Контролен специалист:

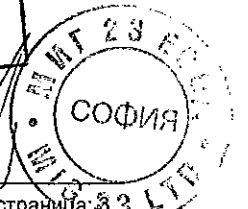
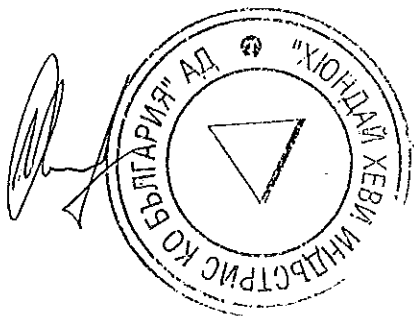
/И. Райков/

Ръководител на орган за контрол:

/инж. О. ГеоргиевС/



[Handwritten signature]



ДЕКЛАРАЦИЯ

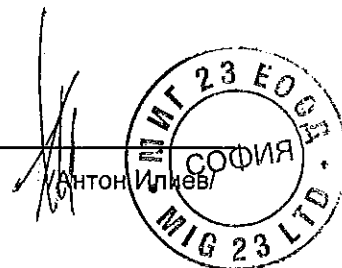
Долуподписаният Антон Иванов Илиев в качеството ми на представляващ Обединение „МИГ - Хюндай“, участник в обществена поръчка с предмет: „Доставка, демонтаж и монтаж на трифазни маслонапълнени понижавачи силови трансформатори 110kV/ Средно напрежение (СрН) и цялото необходимо помощно оборудване“, реф.№ PPD 17-001.

ДЕКЛАРИРАМ, ЧЕ:

Маслото, използвано при доставка на трифазни маслонапълнени понижавачи силови трансформатори 110kV, предмет на горе указаната обществена поръчка, ще бъде без наличието на полихлорирани бифинили (РСВ).

Дата 18.04.2017 г.

Декларатор: _____



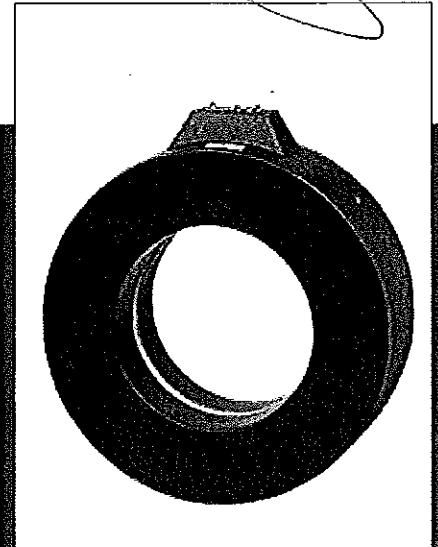
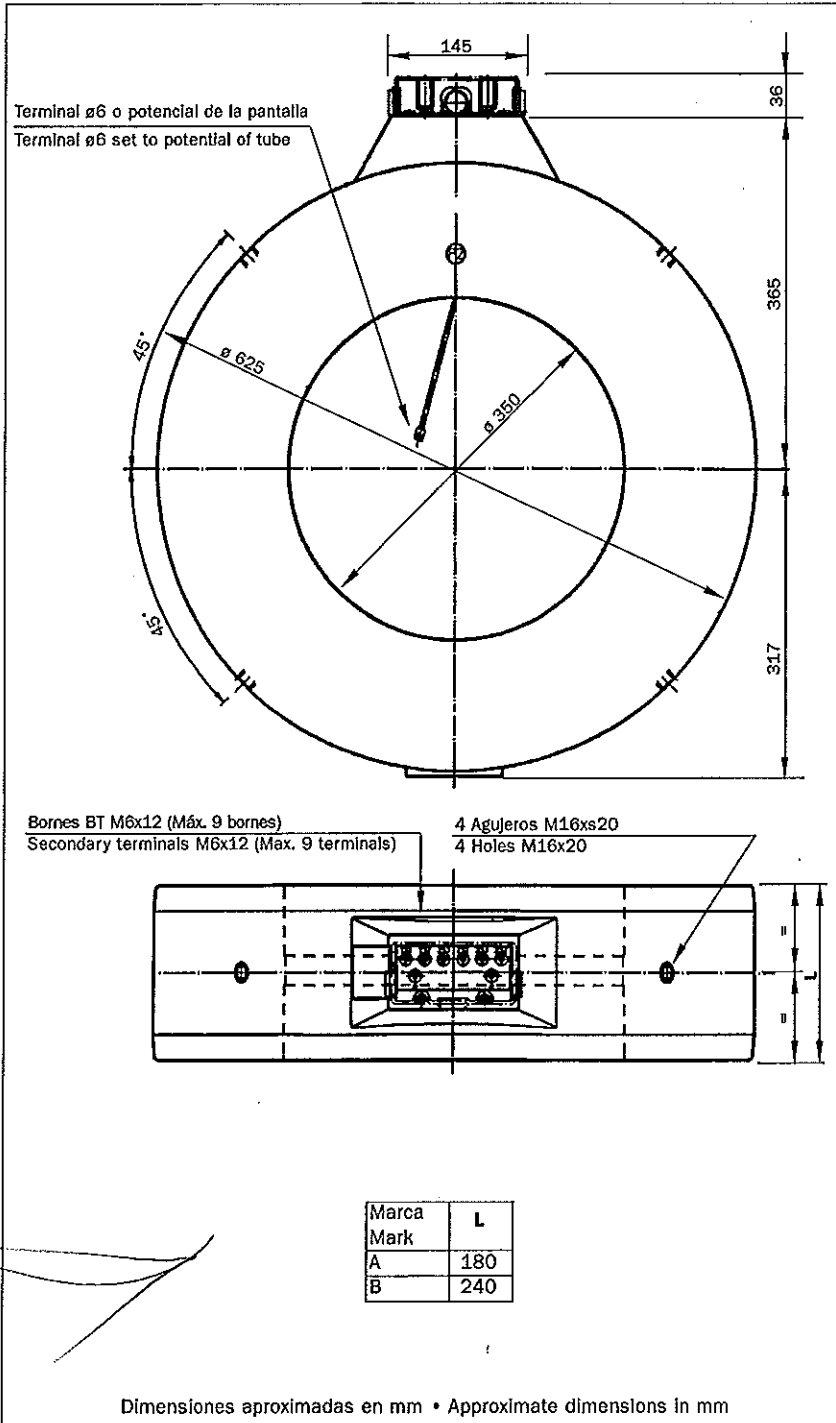
000413



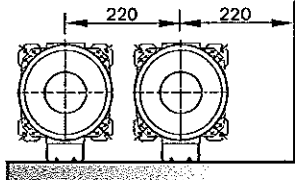
TRANSFORMADOR DE INTENSIDAD CURRENT TRANSFORMER

ABG-24

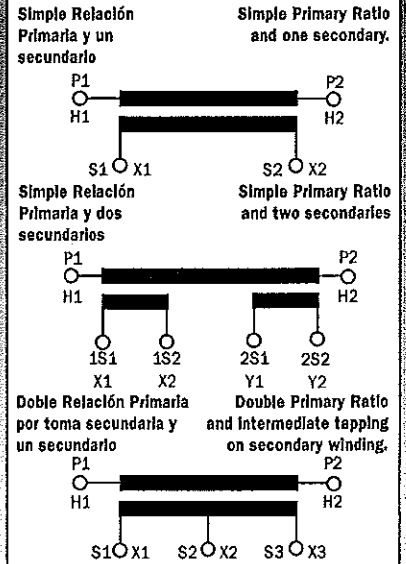
24 (IEC)
25 (IEEE)



DISTANCIAS RECOMENDADAS • SUGGESTED DISTANCES



MARCAJE • MARKING (IEC • IEEE)



DESCRIPCION

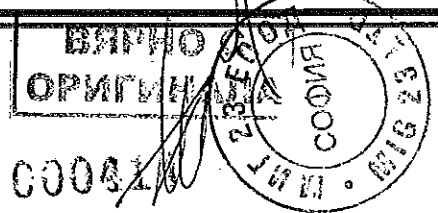
Transformador de intensidad, tipo toroidal, diseñado para servicio interior, encapsulado en resina. Para medida y/o protección. Construibles bajo normas UNE, CEI, VDE, IEEE. Otras normas o características especiales bajo consulta.

DESCRIPTION

Current transformer, toroidal type, valid for indoor service, cast resin. Designed for measurement and/or protection. Manufactured as per standard UNE, IEC, VDE, IEEE. Other standards or special technical specification on request.



www.artech.com



((

(

TRANSFO. INTENSIDAD ABG-24 CURRENT TRANSFORMER
CARACTERISTICAS ELECTRICAS

	UNE•IEC	IEEE
• Tensión nominal de aislamiento (kV)	24	25
• Tensión máxima de servicio (kV)	24	25,5
• Frecuencia de utilización (Hz)	50/60	
• Tensión de ensayo a frecuencia industrial (durante 1 min)		
- Entre primario y secundario, este unido a masa (kV)	50	50
- Entre secundario y masa (kV)	3	2,5
• Ensayo impulso tipo rayo (kV cresta)	125	150
• Intensidad primaria máxima (A)		
- Simple Relación Primaria	10000	
• Intensidad secundaria (bajo pedido 1 ó 2 A)	5A	
• Número de núcleos máximo		
• Sobreintensidad admisible en permanencia (I_N)	1,2	
• Máxima corriente térmica admisible durante 1 seg. (kA)	96	

ELECTRICAL CHARACTERISTICS

• Highest voltage (kV)
• Highest voltage for equipment (kV)
• Frequency (Hz)
• Test voltage at industrial frequency (during 1 min)
- On the primary and secondary (kV)
- On the secondary winding (kV)
• BIL and full wave (kV crest)
• Highest primary current (A)
- Simple Primary Ratio
• Secondary current (1 or 2 A on request)
• Number of cores
• Maximum continuous current (I_N)
• Maxim. (Short-time) thermal current during 1 sec. (kA)

CARACTERISTICAS MECANICAS

• Torque de apriete de la tornillería	
- Tornillo M 6	0,5 m x kg
- Tornillo M 16	5 m x kg
• Peso aproximado	55 Kg
• Borne de tierra de acero (cincado y bicromatado)	
• Cubierta bornes secundarios de polycarbonato	
Bajo pedido se pueden suministrar de acero cincado y bicromatado.	

MECHANICAL CHARACTERISTICS

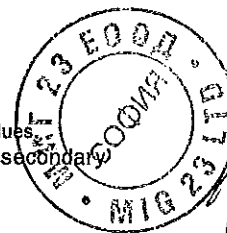
• Torque
- Screw M 6
- Screw M 16
• Approximate weight
• Ground terminal made of steel (zincado and bi-cromated)
• Secondary terminals cover made of polycarbonate.
Can be supplied made of zincado and bi-chromed steel on request.

PRESTACIONES
SERVICES

CLASE DE PRECISION ACCURACY CLASS	POTENCIAS DE PRECISION (VA) PARA LAS DIFERENTES INTENSIDADES PRIMARIAS (A) BURDENS (VA) FOR THE FOLLOWING PRIMARY CURRENTS (A)						Nº de Secundarios Number of Secondaries	
	MARCA A			MARCA B				
	6500	8000	10000	6500	8000	10000		
0,2 5P20	100 75	100 100	100 120	100 200	100 260	100 300	Medida+Proteccion Measure+Protection	Dos Secundarios Two Secondaries
0,2 5P20 5P20				100 30 75	100 35 100	100 30 100	Medida+Proteccion+Proteccion Measure+Protection+Protection	Tres Secundarios Three Secondaries
Simple Relación Primaria Single Primary Ratio	5000 A						I_N max.	

- Estas potencias son orientativas
- Posibilidad Doble Relación Primaria por toma secundario (consultar potencia).

- This rated outputs are orientative values.
- Possible Double Primary Ratio by secondary tapping (consult burden).

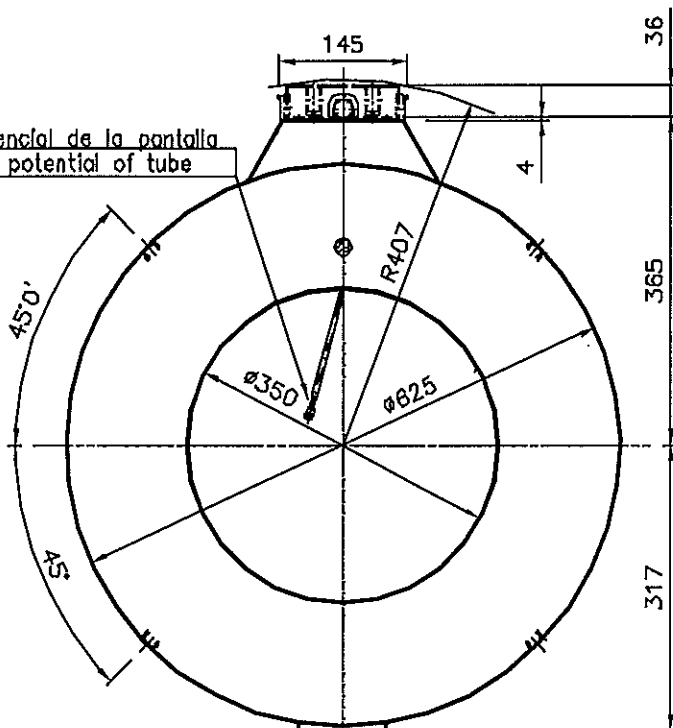


000410

CC

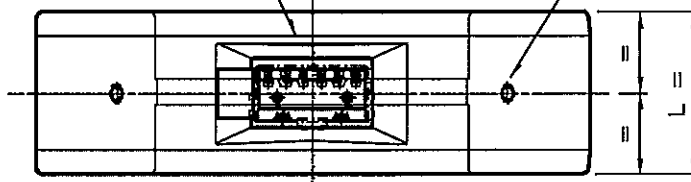
C

Terminal $\varnothing 6$ a potencial de la pantalla
Terminal $\varnothing 6$ set to potential of tube



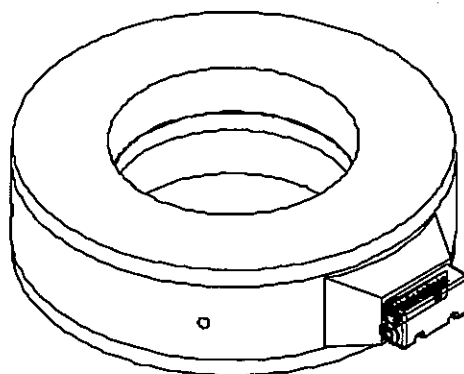
Bornes BT M6X12 (Max.9 bornes)
Secondary terminals M6X12 (Max.9 terminals)

4 Agujeros M16X20
4 Holes M16X20



M 6 - 0,5 mkg
M16 - 5,0 mkg

MARCA MARK	L =	Peso aprox. Approx. weight
A	180	
B	240	111



arteché

Dimensiones aproximadas en mm
Approximate dimensions in mm

TRANSFO DE INTENSIDAD
CURRENT TRANSFORMER

ABG-24

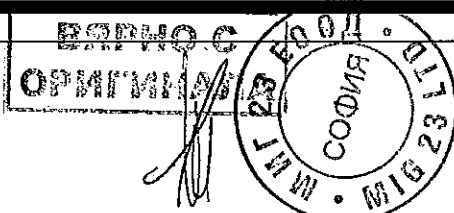
Fecha/Date
22-05-01

Comprobado/Checked
M.A.

Nº Plano
Drawing Nº

4283378

© Copyright by ELECTROTECNICA ARTECHE HERMANOS S.L. Mungia. En "Fecha creación". Todas las derechos reservados. estricto prohibida la reproducción total o parcial del mismo, sin autorización del titular.



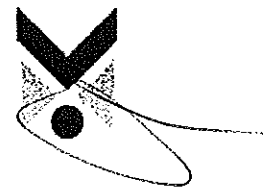
017000

50

51



РЕПУБЛИКА БЪЛГАРИЯ
Български институт по метрология
REPUBLIC OF BULGARIA
Bulgarian Institute of Metrology



УДОСТОВЕРЕНИЕ
ЗА ОДОБРЕН ТИП СРЕДСТВО ЗА ИЗМЕРВАНЕ
Measuring Instrument Type-approval Certificate

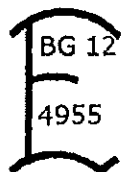
№ 12.02.4955

Издадено на производител: Electrotecnica Artech Hermanos S.A., Испания
Issued to manufacturer:

На основание на: чл. 32, ал. 1 от Закона за измерванията (ДВ, бр. 46 от
In Accordance with: 2002 г., изм. бр. 88 от 05 г., изм. и доп. бр. 95 от 2005 г.)

Относно: токови измервателни трансформатори тип АВГ
In Respect of:

Знак за одобрен тип:
Type Approval Mark:



**Технически и метрологични
характеристики:**
*Technical and metrological
characteristics:*

приложение, неразделна част от настоящото
удостоверение за одобрен тип средство за измерване

Срок на валидност: 15.02.2022 г.
Valid until:

**Вписва се в регистъра на
одобрените за използване
типове средства за
измерване под №:** 4955
Reference №:

**Дата на издаване на
удостоверението за
одобрен тип:** 15.02.2012 г.
Date:



Приложение към удостоверение за одобрен тип № 12.02.4955

Издадено на производител: Electrotecnica Artech Hermanos S.A., Испания

Относно: токови измервателни трансформатори тип АВG

1. Описание на типа:

Токовите измервателни трансформатори тип АВG са тороидален тип и са предназначени за измерване и релейна защита в уредби за средно напрежение. Максималното работно напрежение е до 24 kV.

Токовите трансформатори са отлети с епоксидна смола. Те имат един пръстеновиден лентов магнитопровод, върху който са положени вторичните намотки. Вторичните намотки се отливат в лята смола - по този начин се постига необходимата изолационна и механична здравина.

Вторичните изводи са изведени навън като гъвкави, изолирани съединителни проводници през формованото тяло на трансформатора и фабрично са присъединени към вторичните клеми. Вторичните клеми на трансформатора са разположени в отделна изолирана клемна кутия и са обозначени със стандартни маркировки на изводите.

Измерването на тока се осъществява на принципа на електромагнитната индукция. Токът на кабела, който минава през отвора на тороидалния токов трансформатор, възбужда магнитно поле, което индукира ток във вторичните намотки на токовия трансформатор.

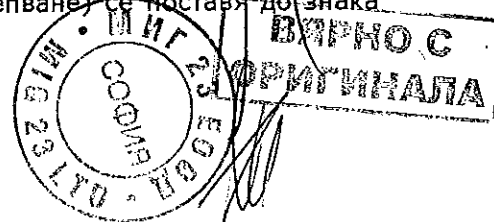
2. Технически и метрологични характеристики:

№	Параметър	Стойност
1.	Максимално работно напрежение, kV	до 24
2.	Номинална честота, Hz	50
3.	Номинален първичен ток, A	2 000....10 000
4.	Номинален вторичен ток, A	1; 5
5.	Клас на точност	0,2S; 0,5
6.	Мощност на вторичните намотки, VA	10; 15; 30; 50; 75; 100; 150; 200; 300
7.	Максимален брой вторични намотки	3

3. Типово означение: АВG

4. Описание на местата, предназначени за поставяне на знаци за проверка:

- Знакът за одобрен тип се нанася до табелката с технически данни.
- Знакът за първоначална проверка (марка за залепване) се поставя до знака за одобрен тип.



LAP017 Folio 1/3

Parque Tecnológico de Bizkaia
C/Peñin, 40R100 100
48160 Leizor (Bizkaia)
Tel: 94 90 80 83 00 (Centralita)
Tel: 94 90 80 83 09

Parque Tecnológico de Bizkaia
C/Peñin, 40R100 100
48160 Leizor (Bizkaia)
Tel: 94 90 80 83 00

te

Test report

TEST OBJECT: 3 Current transformers

DESIGNATION: ABG-24

REQUESTED BY: ELECTROTÉCNICA ARTECHE HNOS., S.A.
Derio Bidea, 28 - 48100 - MUNGIA (BIZKAIA)

MANUFACTURER: ELECTROTÉCNICA ARTECHE HNOS., S.A.

STANDARD: IEC 60044-1:1996 + A1:2000 + A2:2002

RECEIVING DATE: July 9th and September 16th 2008

TESTS DATE: July 17th and September 16th 2008

The test object has been subjected to the test required by the client, applying the procedures specified in the standard indicated before.

THIS DOCUMENT CONSISTS OF:

No of pages: 10 (and annex of 3 pages)

Photographs: Annex

Elisa Ruiz
Test Chief

labein
tecnalia

Luis Martínez
Head of the Electrical Equipment Laboratory

EXSA Y DS
N 41148

Burizena, September 18th 2008

Stamp: ВЪРНО СЪДЪРЖАНИЕ

Stamp: 23 SEP 2008

Stamp: LABORATORIO DE ELECTROEQUIPAMIENTO

Stamp: TECNALIA

The present report refers only and exclusively to the sample tested and at the moment and conditions in which the measures were made.
The partial reproduction of the present document is categorically forbidden without the permission in writing of Labein.

000413

te

INDEX

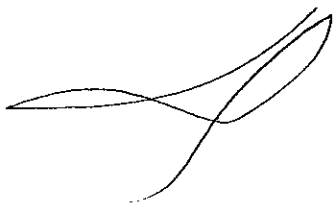
1. DESIGNATION OF THE TEST OBJECT 3

2. TESTS PERFORMED. STANDARD 4

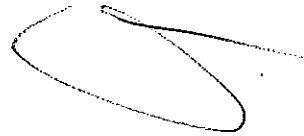
3. DETERMINATION OF CURRENT ERROR AND PHASE DISPLACEMENT FOR MEASURING CURRENT TRANSFORMERS 5

4. DETERMINATION OF CURRENT ERROR AND PHASE DISPLACEMENT OF PROTECTIVE CURRENT TRANSFORMERS 9

Annex PHOTOGRAPHS



be



1. DESIGNATION OF THE TEST OBJECT

3 CURRENT TRANSFORMERS.

The characteristics of the test object, provided by the manufacturer, are the following:

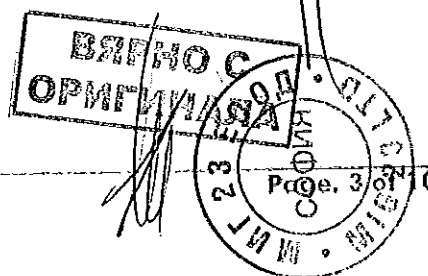
Manufacturer:	ARTECHE		
Type	ABG-24		
Ratio:	8000 / 1 - 1 - 1 A		
Primary terminal markings:	P1-P2		
Rated primary current, I _{pn} :	8000 A		
Secondary terminal markings:	1S1-1S2	2S1-2S2	3S1 3S2
Rated secondary current, I _{sn} :	1 A	1 A	1 A
Accuracy class:	0.2	0.2	5P20
Extended rated current:	120 %	120 %	120 %
Rated insulation level:	24/30/125 kV		
Rated short-time thermal current, I _{th} :	160 kA - 1 s		
Rated dynamic current, I _{dyn} :	400 kA		
Rated frequency:	50 Hz		

The serial numbers are:

- 0807675/1
- 0807675/2
- 0807675/3

The security factor is 5 for the transformer with the serial number 0807675/2 and 4 for the other two transformers.

See photographs of the test objects and its ratings plates in the annex.



te

2. TESTS PERFORMED. STANDARD

The test performed is:

- Determination of errors.

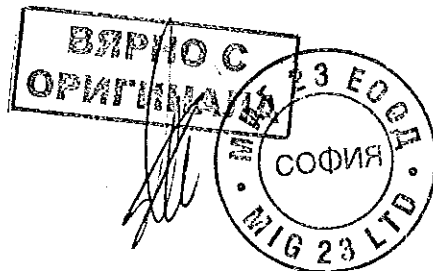
The test has been carried out according to the standard:

**IEC 60044-1:1996 + A1:2000 + A2:2002, "Instrument transformers.
Part 1: Current Transformers".**

The calculation of the uncertainties of the measurements is available

[Handwritten signature]

[Handwritten mark]



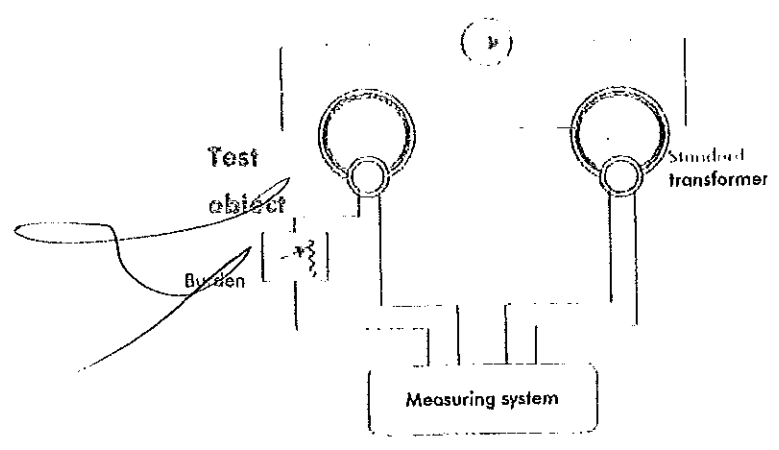
te

3. DETERMINATION OF CURRENT ERROR AND PHASE DISPLACEMENT FOR MEASURING CURRENT TRANSFORMERS

For class 0.2 the current error and phase displacement of current transformers at rated frequency shall not exceed the values given in table 11 of the standard when the secondary burden is any value from 25% to 100% of the rated burden.

The secondary burden used for test purposes shall have a power-factor of 0.8 lagging except that when the burden is less than 5 VA, a power-factor of 1 shall be used. In no case shall the test burden be less than 1 VA.

Test scheme:



ВЯРНО С
ОРИГИНАЛ
М И Г 23 ЕОД
СООМР
LTD

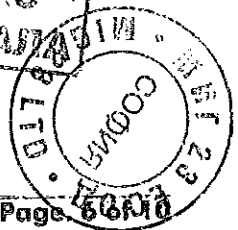
000423

Results:

Serial number 0807675/1

Secondary (Measuring)	Burden (VA)	In (%)	RATIO 8000 /1 A - 120% -Class 0.2			
			Current error (%)		Displacement (min)	
			Measured	Limit	Measure d	Limit
1S1-1S2 (Class 0.2)	20 (100%)	120	-0.06	±0.2	2	±10
		100	0.05	±0.2	0	±10
		20	0.07	±0.35	0	±15
		5	0.07	±0.75	0	±30
	5 (25%)	120	0.03	±0.2	1	±10
		100	0.07	±0.2	0	±10
		20	0.08	±0.35	0	±15
		5	0.08	±0.75	0	±30
2S1-2S2 (Class 0.2)	20 (100%)	120	0.08	±0.2	1	±10
		100	0.09	±0.2	1	±10
		20	0.09	±0.35	0	±15
		5	0.09	±0.75	1	±30
	5 (25%)	120	0.10	±0.2	1	±10
		100	0.10	±0.2	0	±10
		20	0.10	±0.35	0	±15
		5	0.11	±0.75	0	±30

ВАРНО С
ОРИГИНАЛ



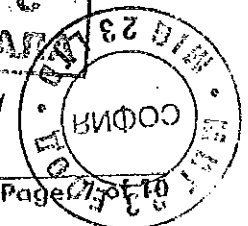
000424

te

Serial number 0807675/2

Secondary (Measuring)	Burden (VA)	In (%)	RATIO 8000 /1 A - 120% -Class 0.2			
			Current error (%)		Displacement (min)	
			Measured	Limit	Measure d	Limit
1S1-1S2 (Class 0.2)	20 (100%)	120	0.10	±0.2	0	±10
		100	0.11	±0.2	0	±10
		20	0.11	±0.35	0	±15
		5	0.10	±0.75	0	±30
	5 (25%)	120	0.11	±0.2	0	±10
		100	0.11	±0.2	0	±10
		20	0.12	±0.35	0	±15
		5	0.12	±0.75	0	±30
2S1-2S2 (Class 0.2)	20 (100%)	120	0.09	±0.2	1	±10
		100	0.10	±0.2	0	±10
	5 (25%)	20	0.10	±0.35	0	±15
		5	0.09	±0.75	0	±30
		120	0.10	±0.2	0	±10
		100	0.10	±0.2	0	±10
		20	0.11	±0.35	0	±15
		5	0.11	±0.75	0	±30

ВЯРНО С
 ОРИГИНАЛ



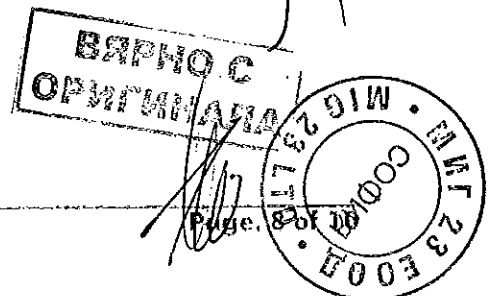
000425

te 0

Serial number 0807675/3

Secondary (Measuring)	Burden (VA)	In (%)	RATIO 8000 /1 A - 120% -Class 0.2			
			Current error (%)		Displacement (min)	
			Measured	Limit	Measure d	Limit
1S1-1S2 (Class 0.2)	20 (100%)	120	0.12	±0.2	1	±10
		100	0.13	±0.2	1	±10
		20	0.13	±0.35	0	±15
		5	0.13	±0.75	1	±30
	5 (25%)	120	0.14	±0.2	1	±10
		100	0.14	±0.2	0	±10
		20	0.14	±0.35	0	±15
		5	0.14	±0.75	0	±30
2S1-2S2 (Class 0.2)	20 (100%)	120	0.13	±0.2	1	±10
		100	0.13	±0.2	1	±10
		20	0.13	±0.35	0	±15
		5	0.13	±0.75	0	±30
	5 (25%)	120	0.14	±0.2	1	±10
		100	0.14	±0.2	0	±10
		20	0.14	±0.35	0	±15
		5	0.14	±0.75	0	±30

Result: CORRECT, the current error and phase displacement do not exceed the limits established in the standard.



Test report No CE36-08-BA-01E

000426

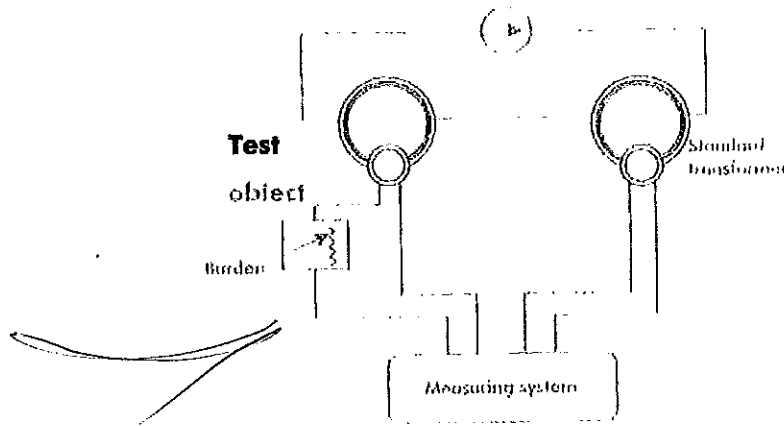
Handwritten mark or signature in the top right corner.

4. DETERMINATION OF CURRENT ERROR AND PHASE DISPLACEMENT OF PROTECTIVE CURRENT TRANSFORMERS

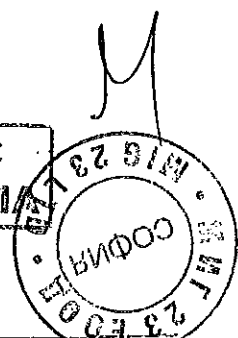
At rated frequency and with rated burden connected, the current error and phase displacement shall not exceed the values given in table 14 of the standard.

The secondary burden used for test purposes shall have a power-factor of 0.8 inductive except that when the burden is less than 5 VA, a power-factor of 1 shall be used. In no case shall the test burden be less than 1 VA.

Test scheme:



ВАРНО С
ОРИГИНАЛ



000427

te

Results:

Serial number 0807675/1

Secondary (Protective)	Burden (VA)	In (%)	RATIO 8000/1 A - 120% - Class 5P20			
			Current error (%)		Displacement (min)	
			Measured	Limit	Measured	Limit
3S1-3S2	30	100	-0.27	±1	0	±60

Serial number 0807675/2

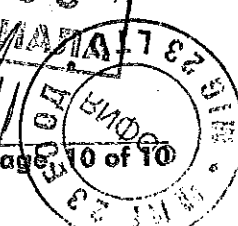
Secondary (Protective)	Burden (VA)	In (%)	RATIO 8000/1 A - 120% - Class 5P20			
			Current error (%)		Current error (%)	
			Measured	Limit	Measured	Limit
3S1-3S2	30	100	-0.10	±1	0	±60

Serial number 0807675/3

Secondary (Protective)	Burden (VA)	In (%)	RATIO 8000/1 A - 120% - Class 5P20			
			Current error (%)		Current error (%)	
			Measured	Limit	Measured	Limit
3S1-3S2	30	100	-0.10	±1	1	±60

Result: **CORRECT**, the current error and phase displacement do not exceed the limits established in the standard.

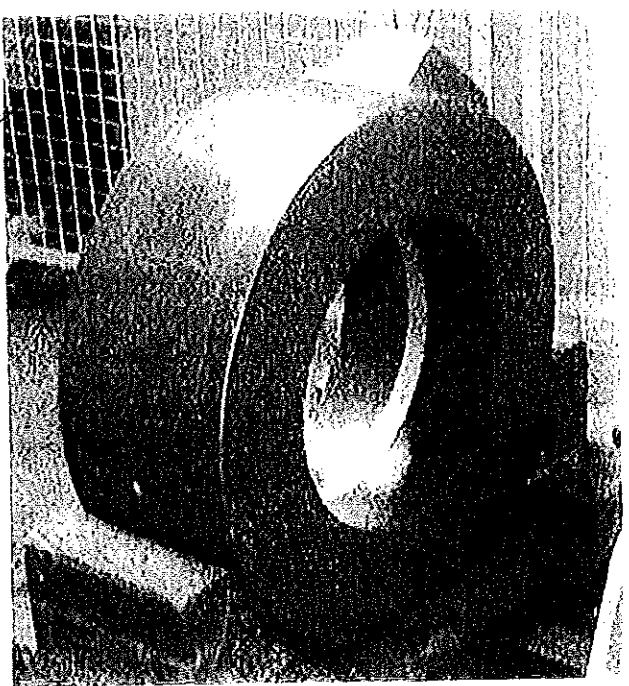
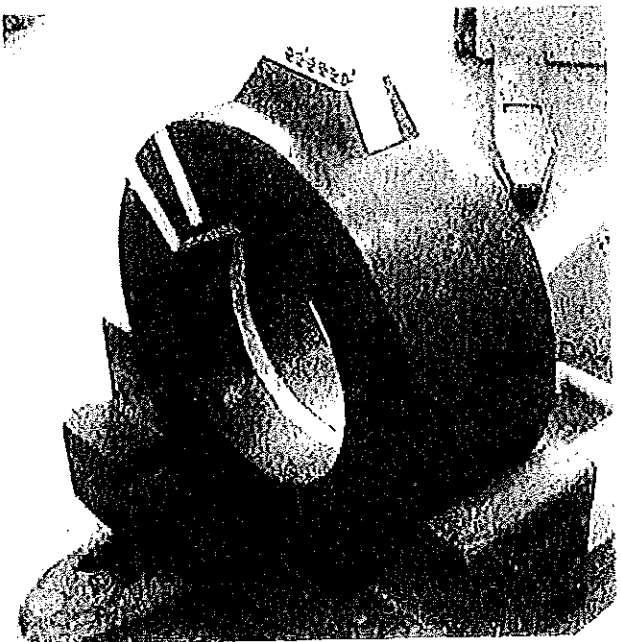
ВЯНО С
ОРИГИНАЛА



000035

te

[Handwritten signature]



[Handwritten scribble]

[Handwritten signature]

Test object

ВЕРНО С
ОРИГИНАЛА

23.0001.017329

РИФДС
ССФДЯ

Аптех. Page 1 of 8

[Handwritten signature]

Test report No CE36-08-BA-01E

000429

te

ARTECHE
CURRENT TRANSFORMER

TYPE **ABG-24**
NUMBER **0807675/2**
RATIO **8000/1-1-1** A

I _{pn}	8000			A
TERM	P1-P2			
I _{sn}	1	1	1	A
TERM	1S1-1S2	2S1-2S2	3S1-3S2	
VA	20	20	30	
CL	0.2	0.2	5P20	
I _{cth} %	120	120	120	
SF	5	5		
kV	24/50/125		50	Hz
I _{th}	180 kA	1 S	400 kA	

ARTECHE
CURRENT TRANSFORMER

TYPE **ABG-24**
NUMBER **0807675/3**
RATIO **8000/1-1-1** A

I _{pn}	8000			A
TERM	P1-P2			
I _{sn}	1	1	1	A
TERM	1S1-1S2	2S1-2S2	3S1-3S2	
VA	20	20	30	
CL	0.2	0.2	5P20	
I _{cth} %	120	120	120	
SF	5	5		
kV	24/50/125		50	Hz
I _{th}	180 kA	1 S	400 kA	

[Handwritten signature]

ARTECHE
CURRENT TRANSFORMER

TYPE **ABG-24**
NUMBER **0807675/1**
RATIO **8000/1-1-1** A

I _{pn}	8000			A
TERM	P1-P2			
I _{sn}	1	1	1	A
TERM	1S1-1S2	2S1-2S2	3S1-3S2	
VA	20	20	30	
CL	0.2	0.2	5P20	
I _{cth} %	120	120	120	
SF	5	5		
kV	24/50/125		50	Hz
I _{th}	180 kA	1 S	400 kA	

[Handwritten signature]

Rating plate of the transformers

ВАЖНО С
ОРИГИНАЛ

СОФИЯ

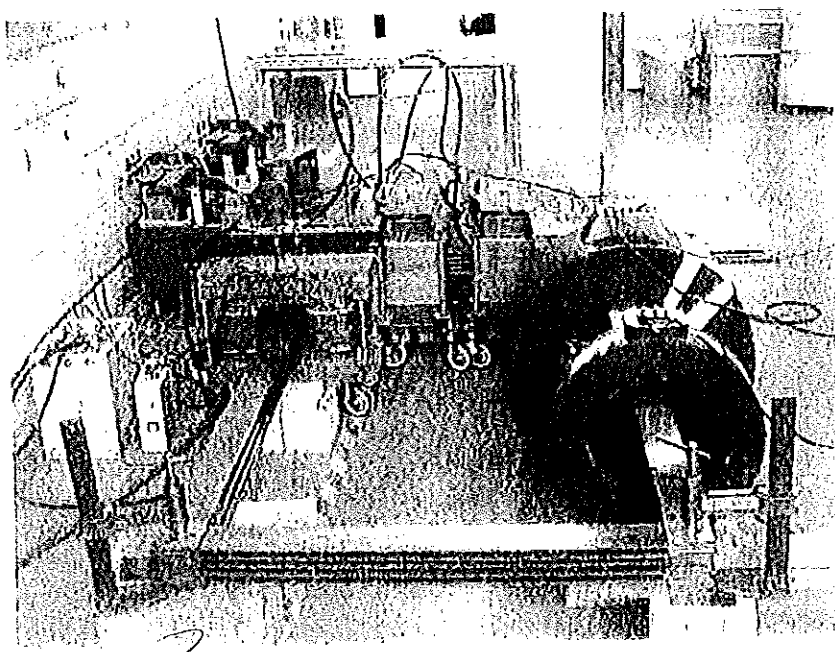
Annex Page 2 of 3

2010 23

000430

te

5

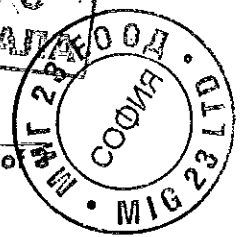


Test arrangement

Handwritten signature or scribble.

Handwritten signature or scribble.

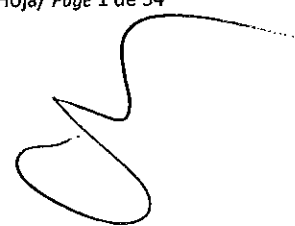
ВАРНО С
ОРИГИНАЛ



(

(

ANEXO TÉCNICO
ACREDITACIÓN Nº 4/LE148
SCHEDULE OF ACCREDITATION



Entidad/Entity: FUNDACIÓN TECNALIA RESEARCH & INNOVATION

Sede/Address Derio: Parque Científico y Tecnológico de Bizkaia, C/ Geldo, Edificio 700;
 48160 Derio (Vizcaya)

Sede /Address Zamudio: Parque Científico y Tecnológico de Bizkaia, Laida Bidea, Edificio 413;
 48170 Zamudio (Vizcaya)

Norma de referencia/Reference Standard: UNE-EN ISO/IEC 17025: 2005

Ensayos en las siguientes áreas / Tests in the following areas:

- Ensayos ambientales / Environmental testing 1
- Ensayos de compatibilidad electromagnética (EMC) y evaluación de la exposición humana a campos electromagnéticos / Tests of electromagnetic compatibility and evaluation of human exposure to electromagnetic fields 6
- Equipos de generación, transporte, distribución y uso de la energía eléctrica, en media y alta tensión / Instruments for generation, transmission, distribution and use of electrical energy, in medium and high voltage 15

Sede / Address Derio

Ensayos ambientales / Environmental testing

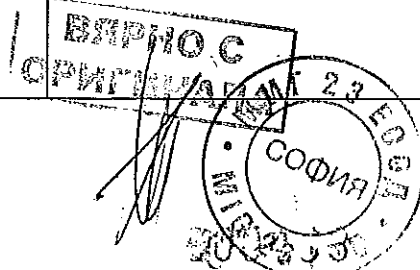
Categoría 0 (Ensayos en el laboratorio permanente)
Category 0 (Tests performed at permanent laboratory)

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/TEST PROCEDURE
Ensayos ambientales en equipos eléctricos y electrónicos/ Environmental testing in electric and electronic equipment		
Equipos y componentes eléctrico-electrónicos Electrical and electronic equipment and components	Frío: Ensayos Ab, Ad y Ae. Temperatura mínima: -40°C Volumen máximo del espécimen: 0,6 m ³ Cold: Tests Ab, Ad and Ae Minimum temperature: -40°C Maximum volume of the specimen: 0.6 m ³	UNE-EN 60068-2-1:2007
	Calor seco: Ensayos Bb, Bd y Be. Temperatura máxima: 85°C Volumen máximo del espécimen: 0,6 m ³ Dry heat: Tests Bb, Bd and Be Maximum temperature: 85°C Maximum volume of the specimen: 0.6 m ³	UNE-EN 60068-2-2:2008

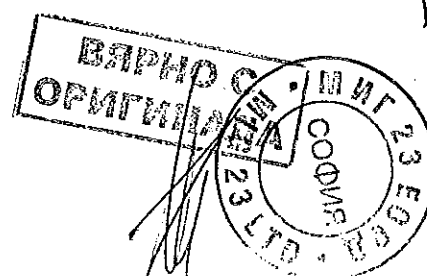
ВЕРНОС
 ОРИГИНАЛ
 ENAC
 017
 MIG 23 LTD



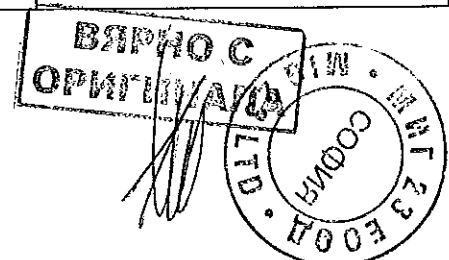
PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
	Ensayo cíclico de calor húmedo (ciclos de 12+12 h). Ensayo Db. Volumen máximo del espécimen: 0,6 m ³ <i>Damp heat, cyclic (12 h + 12 h cycle). Test Db Maximum volume of the specimen: 0.6 m³</i>	UNE-EN 60068-2-30:2006
	Calor húmedo, ensayo continuo. Ensayo Cab Volumen máximo del espécimen: 0,2 m ³ <i>Damp heat, steady state: Test Cab Maximum volume of the specimen: 0.2 m³</i>	UNE-EN 60068-2-78:2013
	Variación de temperatura, Ensayo Na. Rango de temperaturas: -40°C a 85°C Volumen máximo del espécimen: 0,2 m ³ <i>Change of temperature Test Na. Temperature range: -40°C to 85°C Maximum volume of the specimen: 0.2 m³</i>	UNE-EN 60068-2-14:2011
	Vibración sinusoidal. Ensayo Fc. Dimensiones del espécimen inferiores a: 0,6x0,6x0,3 m. Peso inferior a 25 kg Aceleraciones hasta 30 g Frecuencias de 1 a 2000 Hz <i>Vibration (sinusoidal): Test Fc Dimensions of the specimen less than 0.6x0.6x0.3 m Weight less than 25 kg Accelerations up to 30 g Frequencies from 1 to 2000 Hz</i>	UNE-EN 60068-2-6:2008
	Choques. Ensayo Ea Dimensiones del espécimen inferiores a: 0,6x0,6x0,3 m. Peso inferior a 25 kg <i>Shock: Test Ea Dimensions of the specimen less than 0.6x0.6x0.3 m Weight less than 25 kg</i>	UNE-EN 60068-2-27:2011
	Vibración aleatoria de banda ancha. Ensayo Fh Dimensiones del espécimen inferiores a: 0,6x0,6x0,3 m. Peso inferior a 25 kg Aceleraciones RMS hasta 10 m/s ² Frecuencias de 1 a 2000 Hz	UNE-EN 60068-2-64:2009 ETSI EN 300 019-2-2:2013, random vibration



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
	<i>Vibration, broadband random. Test Fh Dimensions of the specimen less than 0.6x0.6x0.3 m Weight less than 25 kg RMS accelerations up to 10 m/s² Frequencies from 1 to 2000 Hz</i>	
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores de energía activa, destinados a uso residencial, comercial y de industria ligera, para uso en redes eléctricas de 50 Hz (índices de clase A, B y C)</p> <p><i>Electricity metering equipment (a.c.) Metering equipment of active energy intended to residential, commercial and light industry for use in 50 Hz electrical networks (class indexes A, B and C)</i></p>	<p>Ensayos climáticos:</p> <ul style="list-style-type: none"> - Humedad relativa - Ensayo de calor seco - Ensayo de frío - Ensayo cíclico de calor húmedo <p>Ensayos mecánicos:</p> <ul style="list-style-type: none"> - Ensayo de vibración sinusoidal - Ensayo de choque <p>Excepto el ensayo de protección contra radiación solar (6.3.5)</p> <p><i>Climatic testing:</i></p> <ul style="list-style-type: none"> - <i>Relative humidity</i> - <i>Dry heat test</i> - <i>Cold test</i> - <i>Damp heat cyclic test</i> - <p><i>Mechanical tests</i></p> <ul style="list-style-type: none"> - <i>Sinusoidal vibration test</i> - <i>Impact test</i> <p><i>Except the test of protection against solar radiation (6.3.5)</i></p>	<p>UNE-EN 50470-1:2007</p>

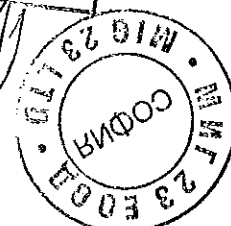


PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores de energía activa, destinados a uso residencial, comercial y de industria ligera, para uso en redes eléctricas de 50 Hz (índices de clase A, B y C)</p> <p><i>Electricity metering equipment (a.c.) Metering equipment of active energy intended to residential, commercial and light industry for use in 50 Hz electrical networks (class indexes A, B and C)</i></p>	<p>Ensayos climáticos:</p> <ul style="list-style-type: none"> - Humedad relativa - Ensayo de calor seco - Ensayo de frío - Ensayo cíclico de calor húmedo <p>Ensayos mecánicos</p> <ul style="list-style-type: none"> - Ensayo de vibración sinusoidal - Ensayo de choque <p>Excepto el ensayo de protección contra radiación solar (6.3.5)</p> <p><i>Climatic testing:</i></p> <ul style="list-style-type: none"> - <i>Relative humidity</i> - <i>Dry heat test</i> - <i>Cold test</i> - <i>Damp heat cyclic test</i> - <p><i>Mechanical tests</i></p> <ul style="list-style-type: none"> - <i>Sinusoidal vibration test</i> - <i>Impact test</i> <p><i>Except the test of protection against solar radiation (6.3.5)</i></p>	<p>UNE-EN 50470-3:2007</p>
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores estáticos o electromecánicos destinados a la medida de energía eléctrica en sistemas de 50Hz y tensión hasta 600V</p> <p><i>Electricity metering equipment (a.c.) Static or electromechanics meters and intended to the measuring of electrical energy in 50 Hz systems and voltage up to 600 V</i></p>	<p>Ensayos climáticos:</p> <ul style="list-style-type: none"> - Humedad relativa - Ensayo de calor seco - Ensayo de frío - Ensayo cíclico de calor húmedo - Ensayo de vibración sinusoidal - Ensayo de choque <p>Excepto el ensayo de protección contra radiación solar (6.3.4)</p> <p><i>Climatic testing:</i></p> <ul style="list-style-type: none"> - <i>Relative humidity</i> - <i>Dry heat test</i> - <i>Cold test</i> - <i>Damp heat cyclic test</i> <p><i>Mechanical tests</i></p> <ul style="list-style-type: none"> - <i>Sinusoidal vibration test</i> - <i>Impact test</i> <p><i>Except the test of protection against solar radiation (6.3.4)</i></p>	<p>UNE-EN 62052-11:2004</p>



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores estáticos de energía activa (clases 1 y 2)</p> <p><i>Electricity metering equipment (a.c.) Static meters for active energy (classes 1 and 2)</i></p>	<p>Ensayos climáticos</p> <ul style="list-style-type: none"> - Humedad relativa - Ensayo de calor seco - Ensayo de frío - Ensayo cíclico de calor húmedo - Ensayo de vibración sinusoidal - Ensayo de choque <p>Excepto el ensayo de protección contra radiación solar (6.3.4)</p> <p><i>Climatic testing:</i></p> <ul style="list-style-type: none"> - <i>Relative humidity</i> - <i>Dry heat test</i> - <i>Cold test</i> - <i>Damp heat cyclic test</i> <p><i>Mechanical tests</i></p> <ul style="list-style-type: none"> - <i>Sinusoidal vibration test</i> - <i>Impact test</i> <p><i>Except the test of protection against solar radiation (6.3.4)</i></p>	<p>UNE-EN 62053-21:2003</p>
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores estáticos de energía reactiva (clases 2 y 3)</p> <p><i>Electricity metering equipment (a.c.) Static meters for reactive energy (classes 2 and 3)</i></p>	<p>Ensayos climáticos:</p> <ul style="list-style-type: none"> - Humedad relativa - Ensayo de calor seco - Ensayo de frío - Ensayo cíclico de calor húmedo - Ensayo de vibración sinusoidal - Ensayo de choque <p>Excepto el ensayo de protección contra radiación solar (6.3.4)</p> <p><i>Climatic testing:</i></p> <ul style="list-style-type: none"> - <i>Relative humidity</i> - <i>Dry heat test</i> - <i>Cold test</i> - <i>Damp heat cyclic test</i> <p><i>Mechanical tests</i></p> <ul style="list-style-type: none"> - <i>Sinusoidal vibration test</i> - <i>Impact test</i> <p><i>Except the test of protection against solar radiation (6.3.4)</i></p>	<p>UNE-EN 62053-23:2003</p>

ВЕРНО С
ОРИГИНАЛА

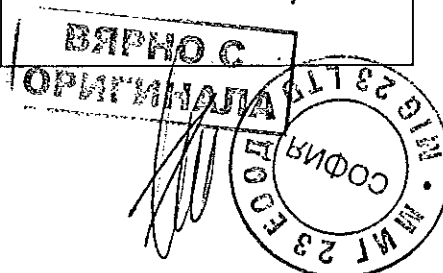


PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
Equipos de medida de la energía eléctrica (c.a). Contadores estáticos de energía activa (clase 0.5 S) <i>Electricity metering equipment (a.c.) Static meters for active energy (class 0.5 S)</i>	Ensayos climáticos: - Humedad relativa - Ensayo de calor seco - Ensayo de frío - Ensayo cíclico de calor húmedo Ensayos mecánicos - Ensayo de vibración sinusoidal - Ensayo de choque Excepto el ensayo de protección contra radiación solar (6.3.4) <i>Climatic testing: - Relative humidity - Dry heat test - Cold test - Damp heat cyclic test Mechanical tests - Sinusoidal vibration test - Impact test</i> Except the test of protection against solar radiation (6.3.4)	UNE-EN 62053-22:2003

Ensayos de compatibilidad electromagnética (EMC) y evaluación de la exposición humana a campos electromagnéticos / *Tests of electromagnetic compatibility and evaluation of human exposure to electromagnetic fields*

Categoría 0 (Ensayos en el laboratorio permanente)
Category 0 (Tests performed at permanent laboratory)

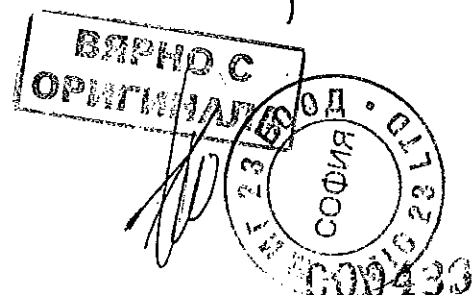
PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
Equipos industriales, científicos y médicos (ICM) <i>Industrial, scientific and medical equipment (ISM)</i>	Emisión: Medida de las perturbaciones radioeléctricas Equipos del grupo 1 Rango de frecuencias hasta 1 GHz Emission: Measurements of the radioelectric disturbances Group 1 equipment Frequency range up to 1 GHz	UNE-EN 55011:2011 UNE-EN 55011/A1:2011



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
Electrodomésticos, herramientas eléctricas y aparatos análogos <i>Household appliances, electric tools and similar apparatus</i>	Emisión: Medida de las perturbaciones radioeléctricas Rango de frecuencias hasta 1GHz <i>Emission: Measurements of the radioelectric disturbances Frequency range up to 1 GHz</i>	UNE-EN 55014-1:2008 UNE-EN 55014-1/A1:2009 UNE-EN 55014-1/A2:2012 UNE-EN 55014-1:ERRATUM:2009
Equipos de la tecnología de la información <i>Information technology equipment</i>	Emisión: Medida de las perturbaciones radioeléctricas Rango de frecuencias hasta 1GHz <i>Emission: Measurements of the radioelectric disturbances Frequency range up to 1 GHz</i>	UNE-EN 55022: 2011 UNE-EN 55022:AC:2012
Equipos eléctricos y electrónicos con corriente de entrada ≤ 16 A por fase <i>Electric and electronic products with current input ≤ 16 A per phase</i>	Emisión: Medida de armónicos de corriente <i>Emission: Measurements of voltage fluctuations and flicker</i>	UNE-EN 61000-3-2:2006 UNE-EN 61000-3-2/A1:2010 UNE-EN 61000-3-2/A2:2010
Equipos eléctricos y electrónicos con corriente de entrada ≤ 16 A por fase <i>Electric and electronic products with current input ≤ 16 A per phase</i>	Emisión: Medida de flicker y fluctuaciones de tensión <i>Emission: Measurements of voltage fluctuations and flicker</i>	UNE-EN 61000-3-3:2013
Equipos eléctricos y electrónicos de entorno residencial, comercial e industria ligera <i>Residential, commercial and light industry environments electric and electronic products</i>	Emisión: Medida de las perturbaciones radioeléctricas <i>Emission: Measurements of the radioelectric disturbances</i>	UNE-EN 61000-6-3:2007 UNE-EN 61000-6-3/A1:2012
Equipos eléctricos y electrónicos de entorno industrial <i>Industrial environments electric and electronic products</i>	Emisión: Medida de las perturbaciones radioeléctricas <i>Emission: Measurements of the radioelectric disturbances</i>	UNE-EN 61000-6-4:2007 UNE-EN 61000-6-4/A1:2011 UNE-EN 61000-6-4:ERRATUM:2008

ВЯРНО С
 ОПИШВАЮЩИ
 МНТ 23
 КОМПЕТЕНЦИ
 МНТ 23
 КОМПЕТЕНЦИ

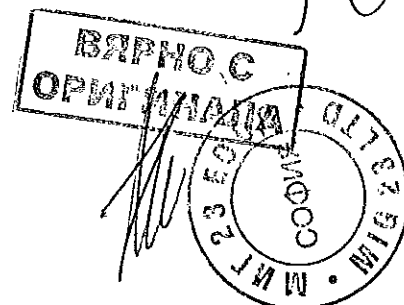
PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
Equipos eléctricos y electrónicos <i>Electric and electronic products</i>	Inmunidad a descargas electrostáticas <i>Immunity to electrostatic discharges</i>	UNE-EN 61000-4-2:2010
	Inmunidad a campos electromagnéticos radiados <i>Frecuencias entre 80 MHz y 3 GHz</i> <i>Intensidad de campo hasta 10 V/m</i> <i>Immunity to radiated electromagnetic fields</i> <i>Frequencies between 80 MHz and 3 GHz</i> <i>Field intensity up to 10 V/m</i>	UNE-EN 61000-4-3:2007 UNE-EN 61000-4-3/A1:2008 UNE-EN 61000-4-3/A2:2011
	Inmunidad a ráfagas de transitorios rápidos <i>Immunity to electrical fast transients</i>	UNE-EN 61000-4-4:2013
	Inmunidad a ondas de choque (surges) <i>Immunity to surge</i>	UNE-EN 61000-4-5:2007 UNE-EN 61000-4-5:CORR:2010
	Inmunidad a las perturbaciones conducidas inducidas por los campos de radiofrecuencia <i>Immunity to conducted disturbances induced by radiofrequency fields</i>	UNE-EN 61000-4-6:2009
	Inmunidad a campos magnéticos amortiguados <i>Volumen efectivo 0,6 m x 0,6 m x 0,5 m</i> <i>Immunity to damped magnetic fields</i> <i>Effective volume: 0.6 m x 0.6 m x 0.5 m</i>	UNE-EN 61000-4-10:1996 UNE-EN 61000-4-10/A1:2001
	Inmunidad a campos magnéticos de frecuencia industrial <i>Volumen efectivo 0,6 m x 0,6 m x 0,5 m</i> <i>Immunity to power frequency magnetic fields</i> <i>Effective volume: 0,6 m x 0,6 m x 0,5 m</i>	UNE-EN 61000-4-8:2011
	Inmunidad a huecos de tensión, interrupciones breves y variaciones de tensión DC <i>Immunity to DC voltage dips, short interruptions and voltage variations</i>	UNE-EN 61000-4-29:2002



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
	Inmunidad a ondas oscilatorias amortiguadas <i>Frecuencias de 100 kHz y 1 MHz</i> <i>Immunity to damped oscillatory waves Frequencies of 100 kHz and 1 MHz</i>	UNE-EN 61000-4-18:2008 UNE-EN 61000-4-18/A1:2011
	Inmunidad a huecos de tensión, interrupciones breves y variaciones de tensión <i>Immunity to voltage dips, short interruptions and voltage variations</i>	UNE-EN 61000-4-11:2005
Dispositivos eléctricos y electrónicos para formar esquemas para la protección destinados a funcionar en sistemas eléctricos <i>Electrical and electronic devices manufactured for configuring schemes for the protection destined to operate in electrical systems</i>	Medidas de resistencia de aislamiento, rigidez dieléctrica e impulso de tensión <i>Measurements of insulation resistance, dielectric test and voltage impulse test</i>	IEC 60255-5:2000 IEC 60255-27:2013 Apto. 10.6.4.2; 10.6.4.3 y 10.6.4.4
Equipos eléctricos y electrónicos de entorno residencial, comercial e industria ligera <i>Residential, commercial and light industry environments electric and electronic products</i>	Inmunidad a las perturbaciones electromagnéticas <i>Immunity to electromagnetic disturbances</i>	UNE-EN 61000-6-1:2007
Equipos eléctricos y electrónicos de entorno industrial <i>Industrial environments electric and electronic products</i>	Inmunidad a las perturbaciones electromagnéticas <i>Immunity to electromagnetic disturbances</i>	UNE-EN 61000-6-2:2006 UNE-EN 61000-6-2:ERRATUM:2009



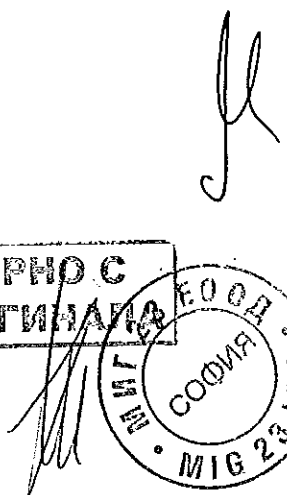
PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Transmisión de señales por la red eléctrica de baja tensión en la banda de frecuencias de 3 kHz a 148,5 kHz</p> <p><i>Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz</i></p>	<p>Requisitos generales, bandas de frecuencia y perturbaciones electromagnéticas</p> <p><i>General requirements, frequency bands and electromagnetic disturbances</i></p>	<p>UNE-EN 50065-1:2012 Capitulo 6 Tensión de salida del transmisor</p>
<p>Transmisión de señales por la red eléctrica de baja tensión en la banda de frecuencias de 3 kHz a 148,5 kHz destinados para uso en entornos residenciales, comerciales y de industria ligera</p> <p><i>Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz and intended to residential, commercial and light industry</i></p>	<p>Requisitos de inmunidad</p> <p><i>Immunity requirements</i></p>	<p>UNE-EN 50065-2-1:2004 UNE-EN 50065-2-1:2004+A1:2006</p>
<p>Transmisión de señales por la red eléctrica de baja tensión en la banda de frecuencias de 3 kHz a 148,5 kHz destinados para uso en entornos industriales</p> <p><i>Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz destined to industry</i></p>	<p>Requisitos de inmunidad</p> <p><i>Immunity requirements</i></p>	<p>UNE-EN 50065-2-2:2004 UNE-EN 50065-2-2:2004+A1:2006 UNE-EN 50065-2-2:2004/A1:2006/CORR A1:2007</p>



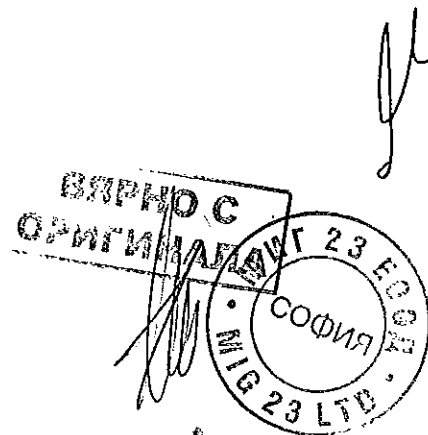
PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Transmisión de señales por la red eléctrica de baja tensión en la banda de frecuencias de 3 kHz a 148,5 kHz destinados para uso por los suministradores y distribuidores de electricidad</p> <p><i>Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz and intended for use by electricity suppliers and distributors</i></p>	<p>Requisitos de inmunidad</p> <p><i>Immunity requirements</i></p>	<p>UNE-EN 50065-2-3:2004. UNE-EN 50065-2-3:2004/A1: 2006</p>
<p>Transmisión de señales por la red eléctrica de baja tensión en la banda de frecuencias de 3 kHz a 148,5 kHz</p> <p><i>Signalling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz</i></p>	<p>Medidas de impedancia</p> <p><i>Impedance measurements</i></p>	<p>UNE-EN 50065-7:2002</p>
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores de energía activa, destinados a uso residencial, comercial y de industria ligera, para uso en redes eléctricas de 50</p>	<p>Emisión:</p> <ul style="list-style-type: none"> - Emisión radiada - Emisión conducida <p><i>Emission:</i></p> <ul style="list-style-type: none"> - <i>Radiated emission</i> - <i>Conducted emission</i> 	<p>UNE-EN 50470-1:2007</p>

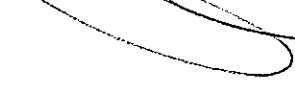

ВЕРНО С
ОРИГИНАЛА

СООБЩАЮЩИЙ
М.П. МИГ 23 ЛТД





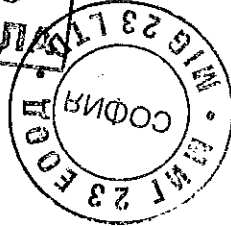
PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Hz (índices de clase A, B y C)</p> <p><i>Electricity metering equipment (a.c.) Metering equipment of active energy intended to residential, commercial and light industry for use in 50 Hz electrical networks (class indexes A, B and C)</i></p>	<p>Ensayos de inmunidad a:</p> <ul style="list-style-type: none"> - Huecos e interrupciones - Descargas Electrostáticas - Inmunidad Radiada - Transitorios rápidos - Inmunidad Conducida - Surge - Ondas oscilatorias amortiguadas <p>Inmunidad Campo Magnético continuo y externo</p> <p><i>Immunity test:</i></p> <ul style="list-style-type: none"> - <i>Dips and interruptions</i> - <i>Electrostatic Discharge</i> - <i>Radiated Immunity</i> - <i>Fast transient</i> - <i>Conducted immunity</i> - <i>Surge</i> - <i>Damped Oscillatory Wave</i> <p><i>Constant and external Magnetic Field Immunity</i></p>	
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores de energía activa, destinados a uso residencial, comercial y de industria ligera, para uso en</p>	<p>Emisión:</p> <ul style="list-style-type: none"> - Emisión radiada - Emisión conducida <p><i>Emission:</i></p> <ul style="list-style-type: none"> - <i>Radiated emission</i> - <i>Conducted emission</i> 	<p>UNE-EN 50470-3:2007</p>



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>redes eléctricas de 50 Hz (Índices de clase A, B y C)</p> <p><i>Electricity metering equipment (a.c.) Metering equipment of active energy intended to residential, commercial and light industry for use in 50 Hz electrical networks (class indexes A, B and C)</i></p>	<p>Ensayos de inmunidad a:</p> <ul style="list-style-type: none"> - Huecos e interrupciones - Descargas Electrostáticas - Inmunidad Radiada - Transitorios rápidos - Inmunidad Conducida - Surge - Ondas oscilatorias amortiguadas <p>Inmunidad Campo Magnético continuo y externo</p> <p><i>Immunity test:</i></p> <ul style="list-style-type: none"> - <i>Dips and interruptions</i> - <i>Electrostatic Discharge</i> - <i>Radiated Immunity</i> - <i>Fast transient</i> - <i>Conducted immunity</i> - <i>Surge</i> - <i>Damped Oscillatory Wave</i> <p><i>Constant and external Magnetic Field Immunity</i></p>	
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores estáticos o electromecánicos destinados a la medida de energía eléctrica en sistemas de 50Hz y tensión hasta 600V</p> <p><i>Electricity metering equipment (a.c.) Static or electromechanics meters and intended to the measuring of electrical energy in 50 Hz systems and voltage up to 600 V</i></p>	<p>Emisión:</p> <ul style="list-style-type: none"> - Emisión radiada - Emisión conducida <p><i>Emission:</i></p> <ul style="list-style-type: none"> - <i>Radiated emission</i> - <i>Conducted emission</i> <p>Ensayos de inmunidad a:</p> <ul style="list-style-type: none"> - Descargas Electrostáticas - Inmunidad Radiada - Transitorios rápidos - Inmunidad Conducida - Surge - Ondas oscilatorias amortiguadas <p><i>Immunity test:</i></p> <ul style="list-style-type: none"> - <i>Electrostatic Discharge</i> - <i>Radiated immunity</i> - <i>Fast transient</i> - <i>Conducted Immunity</i> - <i>Surge</i> - <i>Damped Oscillatory Wave</i> 	<p>UNE-EN 62052-11:2004</p> 



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Equipos de medida de la energía eléctrica (c.a). Contadores estáticos de energía activa (clases 0,5S, 1 y 2)</p> <p><i>Electricity metering equipment (a.c.) Static meters for active energy (classes 0,5S, 1 and 2)</i></p>	<p>Emisión:</p> <ul style="list-style-type: none"> - Emisión radiada - Emisión conducida <p><i>Emission:</i></p> <ul style="list-style-type: none"> - <i>Radiated emission</i> - <i>Conducted emission</i> <p>Ensayos de inmunidad a:</p> <ul style="list-style-type: none"> - Descargas Electrostáticas - Inmunidad Radiada - Transitorios rápidos - Inmunidad Conducida - Surge - Ondas oscilatorias amortiguadas <p><i>Immunity tests:</i></p> <ul style="list-style-type: none"> - <i>Dips and interruptions</i> - <i>Electrostatic Discharge</i> - <i>Radiated immunity</i> - <i>Fast transient</i> - <i>Conducted immunity</i> - <i>Surge</i> - <i>Damped Oscillatory Wave</i> 	<p>UNE-EN 62053-21:2003</p> <p>UNE-EN 62053-22:2003</p>
<p>Equipos de medida de la energía eléctrica (c.a). Contadores estáticos de energía reactiva (clases 1, 1S, 2 y 3)</p> <p><i>Electricity metering equipment (a.c.) Static meters for reactive energy (classes 1, 1S, 2 and 3)</i></p>	<p>Emisión:</p> <ul style="list-style-type: none"> - Emisión radiada - Emisión conducida <p><i>Emission:</i></p> <ul style="list-style-type: none"> - <i>Radiated emission</i> - <i>Conducted emission</i> 	<p>UNE-EN 62053-23:2003</p> <p>UNE-EN 62053-24:2015</p>

Sede /Address Zamudio

Equipos de generacion, transporte, distribucion y uso de la energía electrica, en media y alta tension /
 Instruments for generation, transmission, distribution and use of electrical energy, in medium and high voltage

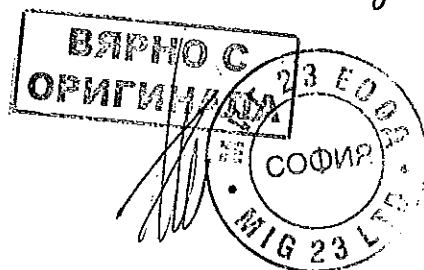
Categoría 0 (Ensayos en el laboratorio permanente)
 Category 0 (Tests performed at permanent laboratory)

PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
Transformadores de distribución y transformadores de media potencia <i>Distribution transformers and medium power transformers</i>	Ensayos tipo, ensayos individuales y ensayos especiales, excepto: - Medida de las características de transmisión de tensiones - Medida de gases disueltos - Medida del calentamiento del punto caliente - Verificación del recubrimiento externo Ver límites en nota 1 <i>Type tests, routine tests and special tests, except:</i> - <i>Determination of transient voltage transfer characteristics</i> - <i>Measurement of dissolved gases</i> - <i>Winding hot-spot temperature-rise measurements</i> - <i>Check of external coating</i> See Note 1 limits	UNE-EN 60076-1:2013 v corr 2015 IEC 60076-1 :2011 UNE-EN 60076-2:2013 IEC 60076-2 :2011 UNE-EN 60076-3: 2002 UNE-EN 60076-3: 2006 ERRATUM UNE-EN 60076-3:2014 UNE-EN 60076-3:2014 v corr:2014 IEC 60076-3:2013 UNE-EN 60076-5:2008 IEC 60076-5:2006 UNE-EN 60076-10:2002 IEC 60076-10:2001 UNE-EN 60076-16:2012 IEC 60076-16:2011
Transformadores de distribución sumergidos en aceite, de 25 kVA a 3150 kVA <i>Oil-immersed distribution transformers, from 25 up to 3150 kVA</i>	Todos los de la norma excepto: - Ensayo de fatiga de las cubas de llenado integral - Características de la pintura <i>All the tests of the standard, except:</i> - <i>Endurance test on corrugated tanks of completely oil filled and hermetically sealed distribution transformers</i> - <i>Tests of painting characteristics</i>	UNE 21428-1:2011 UNE-EN 50464-1:2010 UNE-EN 50464-1/A1:2013 UNE 21428-1-1:2011 UNE 21428-1-2:2011 UNE-EN 50464-1:2010 UNE-EN 50464-2-1 :2010 UNE-EN 50464-2-2 :2010 UNE-EN 50464-2-3 :2010 UNE-EN 50464-3:2010 UNE-EN 50588-1:2016
Transformadores de potencia tipo seco <i>Dry-type power transformers</i>	Todos los de la norma sobre transformadores de distribución y transformadores de media potencia, excepto: - Ensayos de choque térmico, ambientales y de fuego <i>All the tests of the standard on distribution and medium power transformers, except:</i> - <i>Thermal shock, fire behaviour and environmental tests</i>	UNE-EN 60076-11:2005 IEC 60076-11:2004 UNE 21538-1: 2013 UNE-EN 50541-1:2012 UNE-EN 60076-16:2012 IEC 60076-16:2011

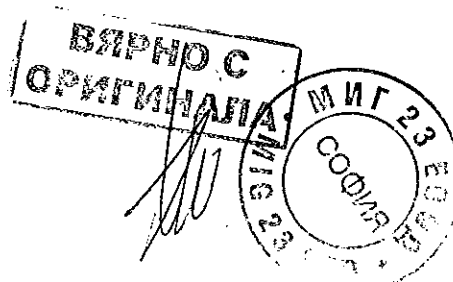
PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
Transformadores autoprotegidos sumergidos en líquido <i>Self-protected liquid-filled transformers</i>	<ul style="list-style-type: none"> - Todos los de la norma realizados por referencia a la serie de normas 60076 - Ensayo de descargas parciales (cap. 12) - Ensayo de impulso tipo rayo del arrollamiento de baja tensión (apdo. 12.4.8) - <i>All the tests of the standard performed by reference to 60076 series</i> - <i>Partial discharges test (chap. 12)</i> - <i>Ray test low-voltage winding impulse (12.4.8)</i> 	UNE-EN 60076-13:2008 IEC 60076-13:2006
Transformadores de medida y protección <i>Instrument transformers</i>	Todos los de la norma Ver límites en nota 1 <i>All the tests of the standard See Note 1 limits</i>	UNE-EN 60044-1:2000 UNE-EN 60044-1/A1:2001 UNE-EN 60044-1/A2:2004 UNE-EN 60044-3:2004
Transformadores de tensión electrónicos <i>Electronic voltage transformers</i>	Ensayos de tipo: <ul style="list-style-type: none"> - Dieléctricos - Ensayo de impulso tipo rayo - Ensayo bajo lluvia para tipo exterior - Ensayo de resistencia a la tensión de impulso para componentes de baja tensión - Precisión Ensayos individuales y ensayos especiales Ver límites en nota 1 <i>Type tests:</i> <ul style="list-style-type: none"> - <i>Dielectric tests</i> - <i>Lightning impulse test</i> - <i>Wet test for outdoor type</i> - <i>Impulse voltage withstand test for low-voltage components.</i> - <i>Accuracy</i> <i>Routine tests and special tests See Note 1 limits</i>	UNE-EN 60044-7: 2001 IEC 60044-7:1999



PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Transformadores de medida y protección</p> <p><i>Instrument transformers</i></p>	<p>Todos los de la norma para transformadores de tensión, transformadores de intensidad para medida y transformadores de intensidad para protección de clase P y PX, excepto:</p> <ul style="list-style-type: none"> -Ensayo de estanquidad de la envolvente en sistemas de gas, a temperatura ambiente (Apdos. 7.2.8 y 7.3.7) y a alta y baja temperatura (Apdo. 7.4.7) -Ensayo de presión sobre la envolvente (Apdos. 7.2.9 y 7.3.8) -Ensayo de impulsos cortados múltiples (Apdo. 7.4.2) -Ensayos mecánicos (Apdo. 7.4.5) -Ensayo de defecto por arco interno (Apdo. 7.4.6) -Ensayo de punto de rocío del gas (Apdo. 7.4.8) -Ensayo de corrosión (Apdo. 7.4.9) -Ensayo de riesgo de incendio (Apdo. 7.4.10) <p>Límite s: -Ensayos dieléctricos Ver límites en nota 1</p> <p><i>All the tests of the standard for voltage transformers, measuring current transformers and class P and PX current transformers for protection, except:</i></p> <ul style="list-style-type: none"> - Enclosure tightness test in gas systems, at ambient temperature (7.2.8 and 7.3.7) and at low and high temperatures (7.4.7) - Pressure test for the enclosure (7.2.9 and 7.3.8) - Multiple chopped impulse test (7.4.2) - Mechanical tests (7.4.5) - Internal arc fault test (7.4.6) - Gas dew point test (7.4.8) - Corrosion test (7.4.9) - Fire hazard test (7.4.10) <p>Limits: - Dielectric tests: See Note 1 limits</p>	<p>UNE-EN 61869-1:2010 v corr 2013 UNE EN 61869-1:2011 ERRATUM IEC 61869-1:2007 UNE-EN 61869-2:2013 IEC 61869-2:2012 UNE-EN 61869-3:2012 IEC 61869-3:2011 IEC 61869-4:2013 IEC 61869-4/CORR1:2014</p>



PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Aparata de alta tensión</p> <p><i>High-voltage switchgear and controlgear</i></p>	<p>Ensayos de tipo:</p> <p>Todos los de la norma excepto:</p> <ul style="list-style-type: none"> - Ensayos CEM sobre circuitos auxiliares y de mando (Apdos. 6.9.1.2, 6.9.2 y 6.9.3) - Aparata en gas: estanquidad (Apdo. 6.8) - Ensayos sísmicos sobre circuitos auxiliares (Apdo. 6.10.5.6) - Ensayo de rayos X para botellas de vacío (Apdo. 6.11) - Aparata de Um > 245 kV: impulso tipo maniobra - Aparata exterior: contaminación artificial <p>Ver límites en nota 1</p> <p>Ensayos individuales:</p> <p>Todos los de la norma excepto estanquidad de aparata en gas (Apdo. 7.4)</p> <p><i>Type tests:</i> <i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - EMC tests on auxiliary and control circuits (6.9.1.2, 6.9.2 and 6.9.3) - Gas insulated switchgear and controlgear: tightness test (6.8) - Seismic tests on auxiliary circuits (6.10.5.6) - X-radiation test procedure for vacuum interrupters (6.11) - Switchgear and controlgear of Um > 245 kV: switching impulse voltage test - Outdoor switchgear and controlgear: Artificial pollution test <p><i>See Note 1 limits</i></p> <p><i>Routine tests:</i> <i>All the tests of the standard, except tightness test in gas insulated switchgear and controlgear (7.4)</i></p>	<p>UNE-EN 62271-1:2009 UNE-EN 62271-1/A1:2011 IEC 62271-1:2007 IEC 62271-1/A1:2011</p>



PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Interruptores automáticos de corriente alterna para alta tensión</p> <p><i>High-voltage alternating-current circuit-breakers</i></p>	<p>Ensayos de tipo: Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Ensayos CEM sobre circuitos auxiliares y de mando (Apdos. 6.9.1.2, 6.9.2 y 6.9.3) - Aparamenta en gas: estanquidad - Ensayos sísmicos sobre circuitos auxiliares - Ensayos de corte - Aparamenta de Um > 245 kV: impulso tipo maniobra - Aparamenta exterior: contaminación artificial y operación bajo condiciones severas de hielo <p>Ensayos individuales: Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Estanquidad de aparamenta en gas <p>Ver límites en nota 1</p> <p><i>Type tests:</i> <i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - <i>EMC tests on auxiliary and control circuits (6.9.1.2, 6.9.2 and 6.9.3)</i> - <i>Gas insulated switchgear and controlgear: Tightness test</i> - <i>Seismic tests on auxiliary circuits</i> - <i>Breaking tests</i> - <i>Switchgear and controlgear of Um > 245 kV: Switching Impulse voltage test</i> - <i>Outdoor switchgear and controlgear: Artificial pollution test and operation under severe ice conditions</i> <p><i>Routine tests:</i> <i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - <i>Gas insulated switchgear and controlgear: tightness test</i> <p><i>See Note 1 limits</i></p>	<p>UNE-EN 62271-100:2011 v-corr 2014 UNE-EN 62271-100/A1:2014 IEC 62271-100:2008 IEC 62271-100/A1:2012 IEC 62271-100/A1:2012 CORRIGENDUM 1</p>



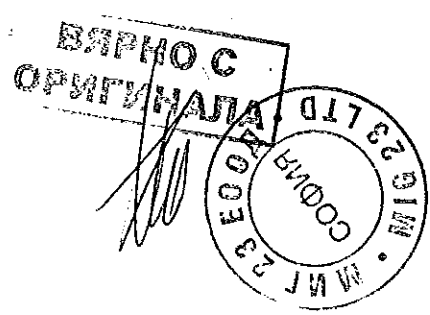
000450

PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/TEST PROCEDURE</i>
<p>Seccionadores y seccionadores de puesta a tierra de corriente alterna para alta tensión</p> <p><i>High-voltage alternating current disconnectors and earthing switches</i></p>	<p>Ensayos de tipo: Todos los de la norma excepto</p> <ul style="list-style-type: none"> - Ensayos CEM sobre circuitos auxiliares y de mando (Apdos. 6.9.1.2, 6.9.2 y 6.9.3) - Aparamenta en gas: estanquidad - Ensayos sísmicos sobre circuitos auxiliares - Aparamenta de Um > 245 kV: impulso tipo maniobra - Aparamenta exterior: contaminación artificial operación bajo condiciones severas de hielo <p>Ensayos individuales: Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Estanquidad de aparamenta en gas <p>Ver límites en nota 1</p> <p><i>Type tests:</i> <i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - EMC tests on auxiliary and control circuits (6.9.1.2, 6.9.2 and 6.9.3) - Gas insulated switchgear and controlgear: tightness test - Seismic tests on auxiliary circuits - Switchgear and controlgear of Um > 245 kV: Switching impulse voltage test - Outdoor switchgear and controlgear: Artificial pollution test and operation under severe ice conditions <p><i>Routine tests:</i> <i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - Gas insulated switchgear and controlgear: tightness test <p>See Note 1 limits</p>	<p>UNE-EN 62271-102:2005 UNE-EN 62271-102:2011 ERRATUM UNE-EN 62271-102/A1:2012 UNE-EN 62271-102:2005/A2:2013 IEC 62271-102:2001 IEC 62271-102:2002 CORRIGENDUM 1 IEC 62271-102:2003 CORRIGENDUM 2 IEC 62271-102:2005 CORRIGENDUM 3 IEC 62271-102:2014 CORRIGENDUM 4 IEC 62271-102/A1:2011 IEC 62271-102/A1:2012 CORRIGENDUM 1 IEC 62271-102/A2:2013</p>

ВЯРНО С
 ОРИГИНАЛА

МТ 23 ЕОФ
 БИФОО
 МТ 23 ЕОФ

PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Interruptores de alta tensión para tensiones asignadas superiores a 1 kV e inferiores a 52 kV</p> <p><i>High voltage switches for rated voltages above 1 kV and less than 52 kV</i></p>	<p>Ensayos de tipo: Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Ensayos CEM (Apdo. 6.9) - Aparamenta en gas: estanquidad - Ensayos sísmicos sobre circuitos auxiliares - Aparamenta exterior: contaminación artificial y operación bajo condiciones severas de hielo <p>Ensayos individuales: Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Estanquidad de aparamenta en gas <p>Ver límites en nota 1</p> <p><i>Type tests: All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - <i>EMC tests (6.9)</i> - <i>Gas insulated switchgear and controlgear: Tightness test</i> - <i>Seismic tests on auxiliary circuits</i> - <i>Outdoor switchgear and controlgear: Artificial pollution test and operation under severe ice conditions.</i> <p><i>Routine tests: All the tests of the standard, except: - Gas insulated switchgear and controlgear: Tightness test</i></p> <p><i>See Note 1 limits</i></p>	<p>UNE-EN 62271-103:2012 IEC 62271-103:2011 IEC 62271-103:2011/Corrigendum 1:2013</p>

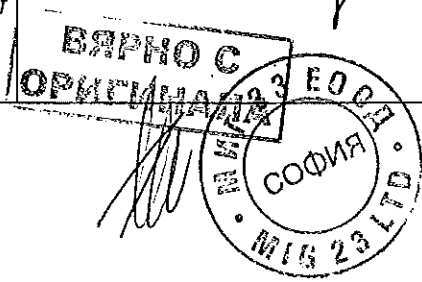
000452


PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Aparamenta bajo envolvente metálica para corriente alterna de tensiones asignadas superiores a 1 kV e inferiores o iguales a 52 kV</p> <p><i>AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV</i></p>	<p>Ensayos de tipo: Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Ensayos CEM (Apdo. 6.9.) - Aparamenta en gas: estanquidad (Apdo. 6.8) - Ensayos sísmicos sobre circuitos auxiliares (Apdo. 6.10.5.6) - Ensayo de rayos X para botellas de vacío (Apdo. 6.11) - Aparamenta exterior: contaminación artificial sobre aisladores (Apdo. 6.2.8) <p>Ver límites en nota 1</p> <p>Ensayos individuales: Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Estanquidad de aparamenta en gas <p><i>Type tests:</i> <i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - <i>EMC tests (6.9)</i> - <i>Gas insulated switchgear and controlgear: tightness test (6.8)</i> - <i>Seismic tests on auxillary circuits (6.10.5.6)</i> - <i>X-radiation test procedure for vacuum interrupters (6.11)</i> - <i>Outdoor switchgear and controlgear: artificial pollution test on insulators (6.2.8)</i> <p><i>See Note 1 limits</i></p> <p><i>Routine tests:</i> <i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - <i>Tightness test on gas insulated switchgear and controlgear</i> 	<p>UNE-EN 62271-200:2012 (Vcorr:2013) UNE-EN 62271-200:2011/AC:2015 IEC 62271-200: 2011 IEC 62271-200:2011/COR1:2015</p>

ВЯРНО С
 ОРИГИНАЛ

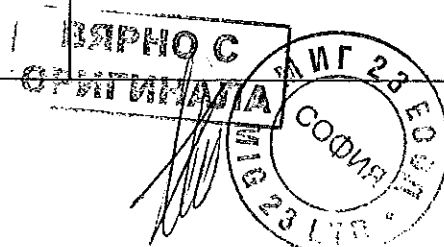
000453

PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Aparamenta bajo envolvente aislante para corriente alterna de tensiones asignadas superiores a 1 kV e inferiores o iguales a 52kV</p> <p><i>AC insulation-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV</i></p>	<p>Ensayos de tipo:</p> <p>Todos los de la norma excepto</p> <ul style="list-style-type: none"> - Ensayos CEM (Apdo.6.9.) - Ensayo de rayos X para botellas de vacío (Apdo. 6.11 de IEC) - Aparamenta en gas: estanquidad (Apdo. 6.8) - Ensayos sísmicos sobre circuitos auxiliares (Apdo. 6.10.5.6) <p>Ensayos individuales:</p> <p>Todos los de la norma excepto estanquidad de aparamenta en gas (Apdo 7.4)</p> <p>Ver límites en nota 1</p> <p><i>Type tests:</i> <i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - EMC tests (6.9) - X-radiation test procedure for vacuum interrupters (6.11 of IEC) - Gas insulated switchgear and controlgear: tightness test (6.8) - Seismic tests on auxiliary circuits (6.10.5.6) <p><i>Routine tests:</i> <i>All the tests of the standard, except tightness test on gas insulated switchgear and controlgear (7.4)</i></p> <p><i>See Note 1 limits</i></p>	<p>UNE-EN 62271-201:2007 UNE-EN 62271-201:2015 IEC 62271-201:2014</p>
<p>Centros de transformación prefabricados</p> <p><i>High voltage/low voltage prefabricated substations</i></p>	<p>Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Ensayos CEM (apdo. 9) <p>Medida de campos electromagnéticos (apdo 6.103 de IEC) Ver límites en nota 1</p> <p><i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - EMC tests (6.9) <p><i>Measurement of electromagnetic fields (section 6.103 of IEC)</i></p> <p><i>See Note 1 limits</i></p>	<p>UNE-EN 62271-202:2007 UNE-EN 62271-202:2015 IEC 62271-202:2014 UNE-EN 62271-202: 2015 AC IEC 62271-202: 2015 CORRIGENDUM 1 UNE-EN 62271-202:2015/AC</p>



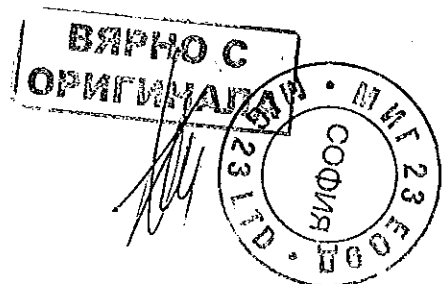
PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Conjuntos compactos de aparamenta para centros de transformación (CEADS)</p> <p><i>Compact equipment assemblies for distribution substations (CEADS)</i></p>	<p>Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Ensayos CEM (apdo. 6.9) - Ensayos de robustez mecánica de cubas herméticas de llenado integral (incluidos en el apdo. 6.201) - Ensayo de estanquidad de la unidad funcional de alta tensión (apdo. 7.4) <p>Ver límites en nota 1</p> <p><i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - EMC tests (6.9) - Mechanical strength tests of hermetically sealed tanks (included in 6.201) - Tightness tests of high voltage functional unit (7.4) <p><i>See Note 1 limits</i></p>	<p>UNE-EN 50532:2011</p>
<p>Aparamenta de interior bajo envolvente de tensiones asignadas superiores a 1 kV e inferiores o iguales a 52 kV para ser utilizada en condiciones climáticas severas</p> <p><i>Indoor enclosed switchgear and controlgear for rated voltages above 1 kV up to and including 52 kV to be used in severe climatic conditions</i></p>	<p>Todos los de la norma</p> <p><i>All the tests of the standard</i></p>	<p>IEC/TS 62271-304:2008 IEC/TS 62271-304:2010 CORRIGENDUM 1</p>
<p>Aparamenta bajo envolvente metálica aislada en SF6 hasta 36 kV</p> <p><i>SF6 insulated metal-enclosed switchgear and controlgear up to 36 kV</i></p>	<p>Ensayo de inmersión</p> <p><i>Immersion test</i></p>	<p>Procedimiento interno PE.EE-27-E Apdo. E.1.</p> <p><i>Internal procedure PE.EE-27-E Section E.1.</i></p>
<p>Fusibles de alta tensión: Fusibles de expulsión</p> <p><i>High voltage fuses: Expulsion fuses</i></p>	<p>Apdo. 8.4, Ensayos dieléctricos Apdo. 8.5, Ensayos de calentamiento Apdo. 8.8.1, Ensayo mecánico de las bases y portafusibles</p> <p><i>Subclause 8.4, Dielectric tests Subclause 8.5, Temperature-rise tests Subclause 8.8.1, Mechanical test of fuse-bases and fuse-carriers</i></p>	<p>IEC 60282-2:2008</p> 

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
Equipos y materiales de alta tensión <i>High voltage equipment and materials</i>	Ensayos de alta tensión: - Ensayos en seco y bajo lluvia - Ensayos con tensión alterna - Ensayos con tensión continua - Ensayos con impulsos tipo rayo Ver límites en nota 1 <i>High voltage tests:</i> - Dry and Wet tests - Tests with Alternating Voltage - Tests with Direct Voltage - Lightning impulse voltage tests <i>See Note 1 limits</i>	UNE-EN 60060-1:2012 Vcorr 2013 IEC 60060-1:2010
Aisladores pasantes (pasatapas) <i>Insulated bushings</i>	Todos los de la norma, excepto: - Ensayo de presión interna - Ensayo de estanquidad en pasatapas con gas o sumergidos en gas Ver límites en nota 1 <i>All the tests of the standard, except:</i> - Internal pressure test - Tightness test on gas-filled and gas-insulated bushings <i>See Note 1 limits</i>	UNE-EN 50180:2011 UNE-EN 50181:2011 UNE EN 60137:2011 IEC 60137:2008
Aisladores de apoyo de interior de materia orgánica para instalaciones de tensión nominal superiores a 1 kV e inferiores a 300 kV <i>Indoor post insulators of organic material for systems with nominal voltages greater than 1kV and below 300 kV</i>	Todos los de la norma Ver límites en nota 1 <i>All the tests of the standard</i> <i>See Note 1 limits</i>	UNE-EN 60660:2001 IEC 60660:1999



ВЕРНО С
 СЕРТИФИКАТ
 23.06.2016
 000456

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Pértigas aislantes de maniobra para alta tensión</p> <p><i>Insulating poles (insulating sticks) for electrical purposes on high-voltage installations</i></p>	<p>Ensayos eléctricos: corriente de fugas (Apdo. 5.2.2)</p> <p>Ensayos mecánicos: ensayo de flexión (Apdo. 5.4.1)</p> <p>Todos los ensayos de la norma, incluido el de lluvia del anexo B, excepto:</p> <ul style="list-style-type: none"> - Verificación de la cabeza (5.3.3) - Ensayo de torsión (5.4.2) - Ensayo de tracción (5.4.3) - Ensayo de colocación y retirada de herramientas acoplables en la cabeza (5.4.4) <p><i>Dielectric tests: leakage current (5.2.2)</i></p> <p><i>Mechanical tests : bending test (5.4.1)</i></p> <p><i>All the standard tests , including rain Annex B, except:</i></p> <ul style="list-style-type: none"> - <i>Verification of the head (5.3.3)</i> - <i>Testing of torque (5.4.2)</i> - <i>Tensile test (5.4.3)</i> - <i>Testing of placement and removal of insert tools in the head (5.4.4)</i> 	<p>UNE-EN 50508:2011</p>
<p>Detectores de tipo capacitivo para utilización con tensiones superiores a 1 kV en corriente alterna</p> <p><i>Capacitive type detectors to be used for voltages exceeding 1 kV a.c.</i></p>	<p>Ensayos funcionales (apdo. 6.2)</p> <p>Ensayos dieléctricos (apdo. 6.3)</p> <p>Ensayos mecánicos (apdo. 6.4)</p> <p>Ensayos específicos (cap. 7)</p> <p>Ver límites en nota 1</p> <p><i>Function tests (6.2)</i></p> <p><i>Dielectric tests (6.3)</i></p> <p><i>Mechanical tests (6.4)</i></p> <p><i>Specific tests (7)</i></p> <p><i>See Note 1 limits</i></p>	<p>UNE-EN 61243-1:2006</p> <p>UNE-EN 61243-1/A1:2011</p> <p>IEC 61243-1:2003</p> <p>IEC 61243-1:2005 CORRIGENDUM 1</p> <p>IEC 61243-1/A1:2009</p>



PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Detectores de tensión tipo bipolar para baja tensión</p> <p><i>Two-pole low-voltage type voltage detectors</i></p>	<p>Ensayos para requisitos funcionales (apdo. 5.3), excepto:</p> <ul style="list-style-type: none"> - Dependencia de la frecuencia (apdo. 5.3.5) - Dependencia del rizado para detectores de tensión con CC (apdo. 5.3.6) <p>Ensayos de requisitos eléctricos (apdo. 5.4), excepto:</p> <p>Protección contra sobretensiones transitorias (apdo. 5.4.5.1)</p> <p>Ensayos de requisitos mecánicos (apdo. 5.5), excepto:</p> <ul style="list-style-type: none"> - Ensayo de vibraciones (apdo. 5.5.4) - Resistencia al calor (apdo. 5.5.9) - Buena adherencia del aislamiento de la parte aislada del electrodo de contacto (apdo. 5.5.10.3) - Ensayos del cable (apdo. 5.5.11) <p>Marcas (apdo. 5.6)</p> <p>Mal uso de la tensión CA/CC (apdo. 5.8.1)</p> <p>Tests for general requirements (5.3), except:</p> <ul style="list-style-type: none"> - Frequency dependency (5.3.5) - Ripple dependency for d.c. voltage detector (5.3.6) <p>Tests for electrical requirements (5.4), except:</p> <ul style="list-style-type: none"> - Protection against transient overvoltages (5.4.5.1) <p>Tests for mechanical requirements (5.5), except:</p> <ul style="list-style-type: none"> - Vibration resistance (5.5.4) - Heat resistance (5.5.9) - Close adhesion of insulation of the Insulated part of the contact electrode (5.5.10.3) - Lead tests (5.5.11) <p>Marking (5.6)</p> <p>AC/DC voltage misuse (5.8.1)</p>	<p>UNE-EN 61243-3:2011 UNE-EN 61243-3:2015 (v corr 2015) IEC 61243-3:2014 IEC 61243-3:2015 CORRIGENDUM 1 IEC 61243-3:2015 CORRIGENDUM 2</p>

ВЯРНО С
ОРИГИНАЛА

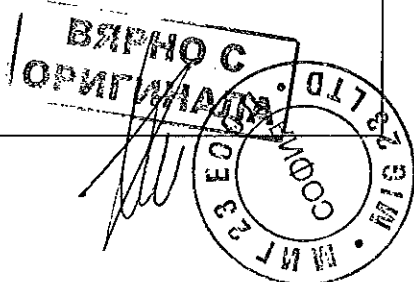
23.06.2016

COOQMS LTD

23.06.2016

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
Aparamenta de baja tensión <i>Low voltage switchgear and controlgear</i>	Todos los de la norma, excepto: <ul style="list-style-type: none"> - Inflamabilidad: ensayos de ignición al hilo caliente y de ignición al arco (Apdo. 8.2.1.1.2) - Ensayos CEM (Apdo. 8.4) <i>All the tests of the standard, except:</i> <ul style="list-style-type: none"> - <i>Flammability: hot wire ignition and arc ignition tests (8.2.1.1.2)</i> - <i>EMC tests (8.4)</i> 	UNE-EN 60947-1 :2008 UNE-EN 60947-1/A1:2011 UNE-EN 60947-1/A2:2015 IEC 60947-1:2007 IEC 60947-1/A1:2010 UNE-EN 60947-1/A2:2015
Interruptores automáticos de baja tensión <i>Low voltage circuit-breakers</i>	Todos los de la norma, excepto: <ul style="list-style-type: none"> - Inflamabilidad: ensayos de ignición al hilo caliente y de ignición al arco (Apdo. 8.2.1.1.2) - Ensayos del anexo B - Anexo J: CEM <i>All the tests of the standard, except:</i> <ul style="list-style-type: none"> - <i>Flammability: hot wire ignition and arc ignition tests (8.2.1.1.2)</i> - <i>Tests of annex B</i> - <i>Annex J: EMC</i> 	UNE-EN 60947-2:2007 UNE-EN 60947-2/A1:2011 UNE-EN 60947-2:2007/A2:2013 IEC 60947-2:2006 IEC 60947-2/A1:2009 IEC 60947-2/A2 :2013
Interruptores, seccionadores, interruptores-seccionadores y combinados fusibles de baja tensión <i>Low voltage switches, disconnectors, switch-disconnectors and fuse-combination units</i>	Todos los de la norma, excepto: <ul style="list-style-type: none"> - Inflamabilidad: ensayos de ignición al hilo caliente y de ignición al arco (Apdo. 8.2.1.1.2) - Ensayos CEM (Apdo. 8.4) - Verificación del calentamiento con efectos solares (D.8.3.11, solo para unidades de exterior) Límites para ensayos dc: 1000 V – 630 A - <i>All the tests of the standard, except:</i> <ul style="list-style-type: none"> - <i>Flammability: hot wire ignition and arc ignition tests (8.2.1.1.2)</i> - <i>EMC tests (8.4)</i> - <i>Temperature rise verification with solar effects(D.8.3.11, for outdoor units only)</i> 	UNE-EN 60947-3:2009 UNE-EN 60947-3:2010 ERRATUM UNE-EN 60947-3/ A1:2013 IEC 60947-3:2008 IEC 60947-3/A1:2012 IEC 60947-3/A1/Corr1:2012 IEC 60947-3/A1:2012/Corr1:2013 IEC 60947-3/A2:2015



PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
Contactores y arrancadores electromecánicos de baja tensión <i>Low voltage electromechanical contactors and motor starters</i>	<i>Todos los de la norma, excepto:</i> - Inflamabilidad: ensayos de ignición al hilo caliente y de ignición al arco (Apdo. 8.2.1.1.2) - Ensayos CEM (Apdo. 9.4) <i>All the tests of the standard, except:</i> - Flammability: hot wire ignition and arc ignition tests (8.2.1.1.2) - EMC tests (9.4)	UNE-EN 60947-4-1:2011 UNE-EN 60947-4-1/A1:2013 IEC 60947-4-1:2009 IEC 61947-4-1/A1:2012
Controladores y arrancadores semiconductores de motores de corriente alterna de baja tensión <i>Low voltage contactors and motor starters – AC semiconductor motor controllers and starters</i>	<i>Todos los de la norma, excepto:</i> - Inflamabilidad: ensayos de ignición al hilo caliente y de ignición al arco (Apdo. 8.2.1.1.2) - Ensayos CEM (Apdo. 9.3.5) <i>All the tests of the standard, except:</i> - Flammability: hot wire ignition and arc ignition tests (8.2.1.1.2) - EMC tests (9.3.5)	UNE-EN 60947-4-2:2013 IEC 60947-4-2:2011 IEC 60947-4-2/CORR1:2012
Conjuntos de aparata de baja tensión <i>Low voltage switchgear and controlgear assemblies</i>	<i>Todos los de la norma, excepto:</i> - Ensayo de radiación ultravioleta (Apdo. 10.2.4) - Ensayos CEM (Apdo. 10.6.2. y anexo J) <i>All the tests of the standard, except:</i> - Resistance to ultra-violet (UV) radiation (10.2.4) - EMC tests (10.6.2 and annex J)	IEC 61439-1:2011 UNE-EN 61439-1:2011 UNE-EN 61439-1:2011/AC:2013 UNE-EN 61439-1:2012 IEC/TR 61439-0:2013
Conjuntos de aparata de potencia de baja tensión <i>Low voltage power switchgear and controlgear assemblies</i>	<i>Todos los de la norma, excepto:</i> - Ensayo de radiación ultravioleta (Apdo. 10.2.4) - Ensayos CEM (Apdo. 10.6.2. y Anexo J) <i>All the tests of the standard, except:</i> - Resistance to ultra-violet (UV) radiation (10.2.4) - EMC tests (Apdo. 10.6.2. y anexo J)	IEC 61439-2:2011 UNE-EN 61439-2:2012
Conjuntos de aparata de baja tensión destinados a ser utilizados por personas comunes <i>Low-voltage distribution boards intended to be operated by ordinary persons</i>	<i>Todos los de la norma, excepto:</i> - Ensayo de radiación ultravioleta (Apdo. 10.2.4) - Ensayos CEM (Apdo. 10.6.2. y anexo J) <i>All the tests of the standard, except:</i> - Resistance to ultra-violet (UV) radiation (10.2.4) - EMC tests (10.6.2. and Annex J)	UNE-EN 61439-3:2012 IEC 61439-3:2012 IEC 61439-3: 2013 Corrigendum 1 

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
Conjuntos de aparata de baja tensión: conjuntos para obras (CO). <i>Low voltage switchgear and controlgear assemblies: assemblies for construction sites (ACS)</i>	Todos los de la norma, excepto: - Ensayo de verificación de la resistencia a la corrosión en atmósferas fuertemente contaminadas (Apdo. 10.2.2.101) - Ensayo de radiación ultravioleta (Apdo. 10.2.4) - Ensayo de choque (Apdo. 10.2.6.3) - Ensayos CEM (Apdo. 10.6.2. y anexo J) <i>All the tests of the standard, except:</i> - <i>Verification of resistance to corrosion in heavily polluted atmospheres (10.2.2.101)</i> - <i>Resistance to ultra-violet (UV) radiation (10.2.4)</i> - <i>Shock test (10.2.6.3)</i> - <i>EMC tests (10.6.2 and Annex J)</i>	UNE-EN 61439-4:2013 IEC 61439-4:2012 UNE 201008 IN:2012
Conjuntos de aparata de baja tensión para redes de distribución pública <i>Low voltage switchgear and controlgear assemblies for power distribution in networks</i>	Todos los de la norma, excepto: - Ensayo de radiación ultravioleta (Apdo. 10.2.4) - Ensayos CEM (Apdo. 10.6.2 y Anexo J) - Verificación de categoría de inflamabilidad (Apdo. 10.2.3.102) <i>All the tests of the standard, except:</i> - <i>Resistance to ultra-violet (UV) radiation (10.2.4)</i> - <i>EMC tests (10.6.2 and Annex J)</i> - <i>Verification of category of flammability (10.2.3.102)</i>	UNE-EN 61439-5:2011 UNE-EN 61439-5:2015 IEC 61439-5:2014 IEC 61439-5:2014/COR1:2015
Conjuntos de aparata de baja tensión: Canalizaciones prefabricadas <i>Low-voltage switchgear and controlgear assemblies: Busbar trunking systems</i>	Todos los de la norma, excepto: - Ensayo de radiación ultravioleta (Apdo. 10.2.4) - Ensayos CEM (Apdo. 10.6.2. y anexo J) - Resistencia a la propagación de la llama (Apdo. 10.101) - Características cortafuegos (Apdo. 10.102) <i>All the tests of the standard, except:</i> - <i>Resistance to ultra-violet (UV) radiation (10.2.4)</i> - <i>EMC tests (10.6.2 and Annex J)</i> - <i>Resistance to flame-propagation (10.101)</i> - <i>Fire resistance in building penetrations (10.102)</i>	UNE-EN 61439-6:2013 IEC 61439-6:2012

ВЯРНО С
 ОПРИГНАЛНО
 ММГ 23 АВОД
 СОДНА
 ММГ 23 АВОД

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
Conjuntos de apareamiento de baja tensión. Parte 7: Conjuntos para aplicaciones específicos tales como puertos deportivos, campings, plazas de mercado y estaciones de carga de vehículos eléctricos. <i>Low-voltage switchgear and controlgear assemblies-Part 7: Assemblies for specific applications such as marinas, camping sites, market squares, electric vehicles charging stations</i>	Todos los de la norma <i>All the tests of the standards</i>	IEC TS 61439-7:2014
Conjuntos de apareamiento de baja tensión bajo envolvente <i>Enclosed low-voltage switchgear and controlgear assemblies</i>	Ensayo en condiciones de arco debidas a un fallo interno <i>Test under conditions of arcing due to internal fault</i>	UNE-IEC/TR 61641 IN:2011 IEC/TR 61641:2014
Condensadores de potencia: Baterías de compensación del factor de potencia en baja tensión <i>Power Capacitors : Batteries power factor compensation at low voltage</i>	Todos los de la norma <i>All the tests of the standards</i>	IEC 61921:2003 UNE-EN 61921:2004
Fusibles de baja tensión destinados a ser utilizados por personas autorizadas (usos principalmente industriales) <i>Low-voltage fuses for use by authorized persons (fuses mainly for Industrial applications)</i>	Todos los de las normas para las secciones A, B, C, D y F, excepto para la sección A: - Ensayo de corrosión del Apdo. 8.11.2.3 - Ensayo de resistencia a la formación de caminos conductores del Apdo. 8.2.5 <i>All the tests of the standards for fuse systems A, B, C, D and F, except for fuse system A: - Verification of resistance to rusting (8.11.2.3) - Resistance to tracking (8.2.5)</i>	UNE-EN 60269-1:2008 UNE-EN 60269-1/A1:2010 UNE-HD 60269-2:2011 UNE-HD 60269-2:2014 IEC 60269-1:2006 IEC 60269-1/A1:2009 IEC 60269-1/A2:2014 IEC 60269-2:2013

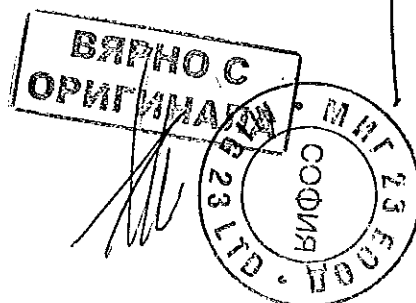
ВЕРНО С
 КОПИЯ
 23 ЕЮ
 СОФИЯ
 LTD

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
Envoltorios de materiales eléctricos <i>Enclosures for electric material</i>	Clasificación de los grados de protección proporcionados por los envoltorios, códigos IP e IK (excepto IPX9 e IK01) <i>Degrees of protection provided by enclosures. Code IP and IK (except IPX9 and IK01)</i>	UNE 20324:1993 UNE 20324/1M:2000 UNE 20324:2004 ERRATUM UNE 20324/2M:2014 IEC 60529:1989 IEC 60529/A1:1999 IEC 60529/A2:2013 IEC 60529:2013 cons./Corr1:2013 IEC 60529:1989-AMD1:1999+AMD2:2013 CSV/COR2:2015 UNE-EN 50102:1996 UNE-EN 50102:2002 CORRIGENDUM UNE-EN 50102/A1:1999 UNE-EN 50102/A1:2002 CORRIGENDUM IEC 62262:2002 UNE-EN 62262:2002
Envoltorios destinadas a los conjuntos de aparatos de baja tensión <i>Empty enclosures for low-voltage switchgear and controlgear assemblies</i>	Ensayos para los envoltorios vacíos, todos los de la norma excepto: - Ensayo de resistencia a la radiación ultravioleta (UV) <i>Tests for empty enclosures, all the tests of the standard except: - Resistance to ultra-violet (UV) radiation</i>	UNE-EN 62208:2012 UNE-EN 62208:2012 V corr 2015 IEC 62208:2011
Materiales aislantes sólidos plásticos <i>Electrical insulating plastic materials</i>	Ensayo del hilo incandescente <i>Glow wire test</i>	UNE-EN 60695-2-10:2002 UNE-EN 60695-2-10:2013 UNE-EN 60695-2-11:2015 UNE-EN 60695-2-12:2011 UNE-EN 60695-2-12:2011/A1:2014 UNE-EN 60695-2-13:2011 UNE-EN 60695-2-13/A1:2014 IEC 60695-2-10:2013 IEC 60695-2-11:2014 IEC 60695-2-12:2010 IEC 60695-2-12/A1:2014 IEC 60695-2-13:2010 IEC 60695-2-13:2012 CORRIGENDUM 1 IEC 60695-2-13/A1:2014

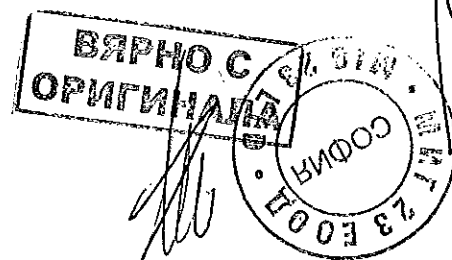
ВЕРНО С
ОРИГИНАЛА

ИМГ 23 ЛС
СОДІЯ

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Equipos portátiles de puesta a tierra o de puesta a tierra y en cortocircuito</p> <p><i>Portable equipment for earthing or earthing and short-circuiting</i></p>	<p>Verificación y comprobación (Apdo. 5.2) Ensayo de corriente de cortocircuito (Apdo. 5.7), (excepto el envejecimiento artificial de conductores según IEC 60068-2-42 del apdo. 5.7.3)</p> <p><i>5.2 Verification and checking Short-circuit current test (5.7), except aged artificially in accordance with IEC 60068-2-42 (5.7.3)</i></p>	<p>IEC 61230:2008 UNE-EN 61230:2011</p>
<p>Conectores mecánicos y de compresión para cables de energía de tensiones asignadas hasta 36 Kv</p> <p><i>Compression and mechanical connectors for power cables for rated voltages up to 30 kV (Um = 36 kV)</i></p>	<p>Ensayos eléctricos (apdo. 6)</p> <p><i>Electric tests (6)</i></p>	<p>IEC 61238-1:2003 UNE-EN 61238-1:2006</p>
<p>Equipo electrónico para uso en instalaciones de potencia</p> <p><i>Electronic equipment for use in power installations</i></p>	<p>Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Ensayos de estanquidad para EE refrigerado por líquido (Apdo. 9.4.3.3.) - Ensayo de conveniencia del barniz o del recubrimiento (Apdo. 9.4.4.4.) - Ensayo de descarga parcial (Apdo. 9.4.5.3.) - Ensayos CEM (Apdos. 9.4.6.1. y 9.4.6.2.) <p><i>All the tests of the standard, except:</i></p> <ul style="list-style-type: none"> - Seal test for liquid-cooled EE (9.4.3.3) - Suitability test of varnish or coating (9.4.4.4) - Partial discharge test (9.4.5.3) - EMC tests (9.4.6.1 and 9.4.6.2) 	<p>UNE-EN 50178:1998</p>
<p>Seguridad de los convertidores de potencia utilizados en sistemas de potencia fotovoltaicos. Parte 1: Requisitos generales</p> <p><i>Safety of power converters for use in photovoltaic power systems. Part1: general requirements</i></p>	<p>Todos los de la norma, excepto:</p> <ul style="list-style-type: none"> - Ensayo de exposición UV (Apdo. 6.4) - Ensayo de resistencia UV materiales polímeros (Apdo. 13.6.4) <p><i>All the tests of the standards except:</i></p> <ul style="list-style-type: none"> - UV Exposure testing (6.4) - UV Resistance test (13.6.4) 	<p>IEC 62109-1:2010 UNE-EN 62109-1:2011</p>



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
Seguridad de los convertidores de potencia utilizados en sistemas de potencia fotovoltaicos. Parte 2: Requisitos particulares para inversores <i>Safety of power converters for use in photovoltaic power systems. Part2: Particular requirements for inverters</i>	Todos los de la norma <i>All the tests of the standards</i>	IEC 62109-2:2011 UNE-EN 62109-2:2013
Requisitos de seguridad para sistemas y equipos de conversión de potencia de semiconductores. Parte 1: Generalidades <i>Safety requirements for power electronic converter systems and equipment. Part 1: general</i>	Todos los de la norma, excepto: -Ensayo de requisitos de aislamiento para frecuencias >30 kHz (Apdo. 4.4.7.11) -Ensayo de Ignición de corriente de arco del Apdo. 5.2.5.2 -Ensayo de Inflamabilidad del Apdo. 5.2.5.5 -Ensayo de Inflamabilidad del aceite del Apdo. 5.2.5.6 -Ensayo de las uniones cementadas del Apdo. 5.2.5.7 -Ensayo de vibraciones para objetos >25kg del Apto. 5.2.6.4 -Ensayo de polvo (Apdo. 5.2.6.6) -Ensayo de niebla salina (Apdo. 5.2.6.5) -Ensayo de presión hidrostática (Apdo. 5.2.7) <i>All the tests of the standards except:</i> -Insulations requirements above 30 kHz (4.4.7.11) -High current arcing ignition test (5.2.5.2) -Flaming oil test (5.2.5.6) -Cemented joints test (5.2.5.7) -vibration test for objects (5.2.6.4) -Salt mist test (5.2.6.5) -Fust and sand test (5.2.6.6) -Hydrostatic pressure test (5.2.7)	IEC 62477-1:2012 EN 62477-1:2012 (EN 62477-1:2012/A11:2014)



PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Equipos generadores en paralelo con redes generales de distribución en baja tensión (requisitos de conexión)</p> <p><i>Micro-generators in parallel with public low-voltage distribution networks (requirements for the connection)</i></p>	<p>Todos los de las normas para equipos de hasta 300 kVA, excepto: UNE-EN 50438:2008</p> <ul style="list-style-type: none"> - Ensayos de compatibilidad electromagnética (Apdo. 5.1) - Ensayo LoM para Austria (última fila de tabla para Austria en Anexo A) <p><i>All the tests of the standards, for equipment up to 300 kVA, except: UNE-EN 50438:2008</i></p> <ul style="list-style-type: none"> - <i>EMC tests (5.1)</i> - <i>LoM test for Austria (last row in table of annex A for Austria)</i> 	<p>UNE-EN 50438:2008 UNE-EN 50438:2008/IS1 UNE-EN 50438:2014 UNE-EN 50438:2014/IS1 DIN V VDE V 0126 -1-1:2013</p> <p>RD 1699/2011, de 18 de noviembre <i>Spanish regulation RD 1699/2011, of november18th</i></p>
<p>Inversores y dispositivos anti-isla</p> <p><i>Inverters and islanding prevention devices</i></p>	<p>Ensayo de prevención de funcionamiento en Isla</p> <p><i>Test of islanding prevention measures</i></p>	<p>UNE-EN 62116:2014 V2 IEC 62116:2014</p>
<p>Inversores Solares (Monofásicos y Trifásicos) y Sistemas Compensadores de Huecos (FACTS) de potencia asignada máxima de 300 kW</p> <p><i>Solar inverters (single-phase and three-phase) and voltage dips compensation systems (FACTS) of rated power up to 300 kW</i></p>	<p>Medida y evaluación de la respuesta de los Sistemas de Conversión Fotovoltaicos (SCFV) ante huecos de tensión, conforme a las condiciones establecidas en el apdo. 5 Anexo III del documento "Procedimientos de Verificación, Validación y Certificación de los requisitos del PO 12.3. sobre la respuesta de las instalaciones eólicas y fotovoltaicas ante huecos de tensión" versión 10 de 26 de enero de 2012 de la Asociación Empresarial Eólica (AEE)</p> <p><i>Measurement and assessment of the response of photovoltaic conversion systems (PVCS) in the event of voltage dips, according to conditions of subclause 5 Annex III of document "Procedure for verification, validation and certification of the requirements of the P.O. 12.3 on the response of wind and solar farms in the event of voltage dips" version 10 of 26th January 2012 of the Spanish Wind Energy Association (AEE)</i></p>	<p>Procedimiento interno PE.EE-88-E</p> <p><i>Internal procedure PE.EE-88-E</i></p>

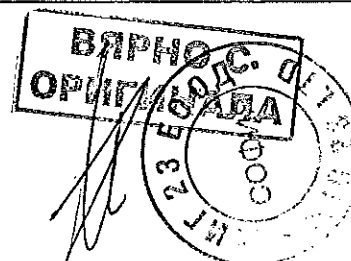
ВЕРНО С
 ОРИГИНАЛОМ

29.06.2016

СОФКОС

23.06.2016

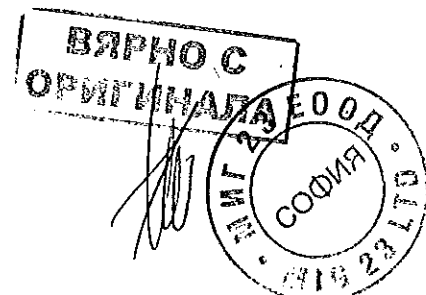
PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
Generadores de potencia conectados a redes de BT, sistemas de protección de interfaz e inversores <i>Power generators connected to low voltage grids, interface protection systems and inverters</i>	Todos los de la norma salvo ensayos CEM <i>All the tests of the standard except EMC tests</i>	CEI 0-21:2012 (Regola técnica di riferimento per la connessione di utenti attivi e passivi alle reti BT delle imprese distributrici di energia elettrica) CEI 0-21:2014-09
Requisitos generales para equipos eléctricos <i>General requirements for electric equipment</i>	Todos los de la norma. <i>All the tests of the standard</i>	AS/NZS 3100:2009 A1:2010 A2:2012 A3:2014 A4:2015
Conexión a la red de sistemas de energía a través de inversores. Requisitos de los inversores <i>Grid connection of energy systems via inverters - inverter requirements</i>	Todos los de la norma. <i>All the tests of the standard</i>	AS/NZS 4777.2:2015
Sistemas fotovoltaicos (FV) – Características da interface de conexão com a rede elétrica de distribuição <i>Photovoltaic (PV) systems – Characteristics of the utility interface</i>	Todos los de la norma. <i>All the tests of the standard</i>	ABNT NB 16149:2013
Sistemas fotovoltaicos (FV) — --Características da interface de conexão com a rede elétrica de distribuição — Procedimento de ensaio de conformidade <i>Photovoltaic (PV) systems — Characteristics of the utility interface — Conformity test procedure</i>	Todos los de la norma. <i>All the tests of the standards</i>	ABNT NBR 16150:2013



PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Cables de potencia con aislamiento extruido y sus accesorios para tensiones asignadas desde 1 kV (Um = 1,2 kV) hasta 30 kV (Um = 36 kV) - Parte 2: Cables para tensiones asignadas desde 6 kV (Um = 7,2 kV) hasta 30 kV (Um = 36 kV)</p> <p><i>Power cables with extruded insulation and their accessories for rated voltages from 1 kV (Um = 1,2 kV) up to 30 kV (Um = 36 kV) - Part 2: Cables for rated voltages from 6 kV (Um = 7,2 kV) up to 30 kV (Um = 36 kV)</i></p>	<p>Apartado 18. Ensayos eléctricos de tipo (excepto ensayo de doblado)</p> <p><i>18.- Electrical type tests (except Bending test)</i></p>	<p>IEC 60502-2:2014</p>
<p>Cables de potencia con aislamiento extruido y sus accesorios para tensiones asignadas superiores a 30 kV (Um = 36 kV) hasta 150 kV (Um = 170 kV)</p> <p><i>Power cables with extruded insulation and their accessories for rated voltages above 30 kV (Um = 36 kV) up to 150 kV (Um = 170 kV)</i></p>	<p>Apartado 12.4. Ensayos eléctricos de tipo sobre sistemas completos de cable (excepto 12.4.3, ensayo de doblado y anexo G, protección exterior para empalmes)</p> <p>Apartado 14 Ensayos eléctricos de tipo sobre cables (excepto 12.4.3 ensayo de doblado)</p> <p>Apartado 15 Ensayos eléctricos de tipo sobre accesorios (excepto anexo G, protección exterior para empalmes)</p> <p><i>12.4 Electrical type tests on complete cable systems (except 12.4.3 Bending test and Annex G Tests of outer protection for joints)</i></p> <p><i>14 Type test on cables (except 12.4.3 Bending test)</i></p> <p><i>15 Type test on accessories (except Annex G Tests of outer protection for joints)</i></p>	<p>IEC 60840:2011 UNE 211632-1:2012</p>

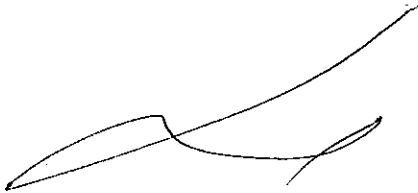


PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Cables de potencia con aislamiento extruido y sus accesorios para tensiones asignadas superiores a 150 kV (Um = 170 kV) hasta 500 kV (Um = 550 kV)</p> <p><i>Power cables with extruded insulation and their accessories for rated voltages above 150 kV (Um = 170 kV) up to 500 kV (Um = 550 kV)</i></p>	<p>Apartado 12.4. Ensayos eléctricos de tipo sobre sistemas completos de cable (excepto 12.4.3, ensayo de doblado y anexo G, protección exterior para empalmes)</p> <p>Apartado 14 Ensayos eléctricos de tipo sobre cables (excepto 12.4.3 ensayo de doblado)</p> <p>Apartado 15 Ensayos eléctricos de tipo sobre accesorios (excepto anexo G, protección exterior para empalmes)</p> <p><i>12.4 Electrical type tests on complete cable systems (except 12.4.3 Bending test and Annex G Tests of outer protection for joints)</i></p> <p><i>14 Type test on cables (except 12.4.3 Bending test)</i></p> <p><i>15 Type test on accessories (except Annex G Tests of outer protection for joints)</i></p>	<p>IEC 62067:2011 UNE 211067-1:2012</p>
<p>Condensadores de acoplamiento y divisores capacitivos</p> <p><i>Coupling capacitors and capacitor dividers</i></p>	<ul style="list-style-type: none"> - Ensayos dieléctricos con corriente alterna, en seco y bajo lluvia (apdos. 9.1 a), 9.2.1 y 9.2.2) - Ensayo de impulsos tipo rayo (apdo. 9.2.5) - Ensayo dieléctrico entre borne de baja tensión y borne de tierra (cap. 10) - Ensayo de descargas parciales (cap 13) <p>Ver límites-en nota 1</p> <p>Otros</p> <ul style="list-style-type: none"> - Comprobación de línea de fuga (cap. 18) <p><i>AC Dry and Wet Dielectric Tests (9.1.a, 9.2.1 and 9.2.2)</i></p> <p><i>Lightning impulse voltage tests (9.2.5)</i></p> <p><i>Dielectric Tests Voltage test between low. voltage terminal and earth terminal (10)</i></p> <p><i>Partial discharge test (13)</i></p> <p>See limits in note 1</p> <p>Others:</p> <ul style="list-style-type: none"> - Verification of creepage (18) 	<p>UNE 21333:1996 IEC 60358:1990</p>

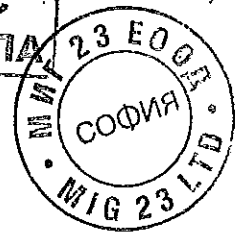


- Making and breaking tests
- Partial discharges test
- Temperature rise test
- Measure of capacitance
- Measurement of dissipation factor
- Measurement of noise level

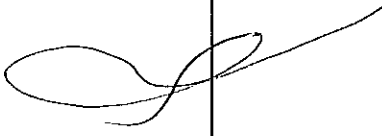
300 MVA, 36 kV
550 kV, ≥ 3 pC
10 kA
100 pF \pm 1 μ F, 15 kV
 $\geq 1 \times 10^{-4}$
Sound pressure method



ВЯРНО С
ОРИГИНАЛА



000472

PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Equipos de tratamiento de la información, incluyendo los equipos eléctricos de oficina y equipos conectables a la red de telecomunicación (excluyendo Destructoras personales hogar/oficina de documentos multimedia)</p> <p><i>Information technology equipment including office electrical equipment and telecommunications networks equipment</i></p> 	<p>Seguridad eléctrica <i>Electrical safety</i></p>	<p>UNE-EN 60950-1:2007 UNE-EN 60950-1:2007 CORRIGENDUM UNE-EN 60950-1/A11:2009 UNE-EN 60950-1/A1:2011 UNE-EN 60950-1/A12:2011</p> <p>Apdos 1.6.2, 1.6.3, 1.7.1, 1.7.2.2, 1.7.2.3, 1.7.2.4, 1.7.2.5, 1.7.3, 1.7.4, 1.7.5, 1.7.6, 1.7.7, 1.7.8, 1.7.9, 1.7.10, 1.7.11, 1.7.12, 1.7.13, 1.7.14, 2.1.1.1, 2.1.1.6, 2.1.1.7, 2.1.2, 2.1.3, 2.3.2, 2.3.3, 2.3.4, 2.6.3.4, 2.6.3.5, 3.1.2, 3.1.3, 3.1.6, 3.1.7, 3.1.8, 3.1.10, 3.2.1, 3.2.2, 3.2.4, 3.2.6, 3.4.1, 3.4.2, 3.4.3, 3.4.4, 3.4.5, 3.4.6, 3.4.7, 3.4.8, 3.4.9, 3.4.10, 3.4.11, 3.5.1, 3.5.2, 3.5.3, 4.1, 4.2.3, 4.2.4, 4.3.1, 4.3.3, 4.3.4, 4.3.5, 4.3.7, 4.4, 4.4.1, 4.4.2, 4.4.3, 4.4.4, 4.5.2, 4.6.1, 4.6.2, 4.6.3, 4.6.4, 5.1, 5.2 y 6.2.</p>

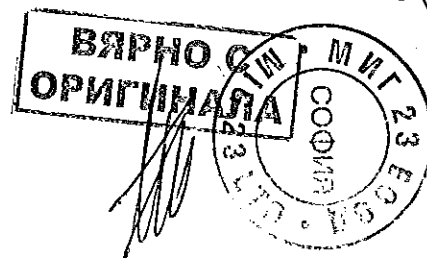
ВЕРНО С
 ОРИГИНАЛОМ

МІГ 23
 СОФІЯ



000473

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores de energía activa, destinados a uso residencial, comercial y de industria ligera, para uso en redes eléctricas de 50 Hz (índices de clase A, B y C)</p> <p><i>Electricity metering equipment (a.c.) Metering equipment of active energy intended to residential, commercial and light industry for use in 50 Hz electrical networks (class indexes A, B and C)</i></p>	<p>Seguridad eléctrica, mecánicas y funcionales</p> <ul style="list-style-type: none"> - Ensayo de tensión de impulso - Ensayos con tensión alterna - Potencia absorbida - Ensayo de calentamiento - Ventana - Tapa de bornes - Distancias en el aire y líneas de fuga - Contador con envolvente. Aislante clase II - Ensayo de martillo de resorte (Eh) - Protección contra penetración de polvo y agua - Resistencia al calor y al fuego <p>Ensayos de precisión (para corrientes iguales o superiores a 20mA)</p> <p><i>Electrical, mechanical and functional safety</i></p> <ul style="list-style-type: none"> - <i>Impulse voltage test</i> - <i>AC voltage test</i> - <i>Absorbed power</i> - <i>Heating</i> - <i>Window</i> - <i>Terminal cover</i> - <i>Clearance and creepage distances</i> - <i>Insulating encased meter of protective class II</i> - <i>Hammer tests (Eh)</i> - <i>Resistance to heat and fire</i> - <i>Protection against penetration of dust and water</i> <p><i>Precision tests (for currents higher or equal to 20mA)</i></p>	<p>UNE-EN 50470-1:2007 Excepto Apdo. 5.4</p>



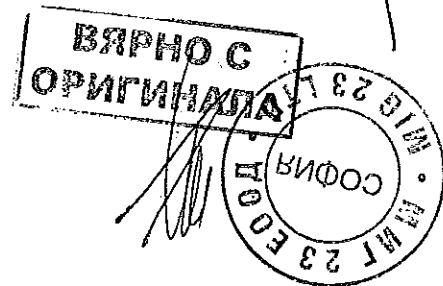
600474

PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores de energía activa, destinados a uso residencial, comercial y de industria ligera, para uso en redes eléctricas de 50 Hz (índices de clase A, B y C)</p> <p><i>Electricity metering equipment (a.c.) Metering equipment of active energy intended to residential, commercial and light industry for use in 50 Hz electrical networks (class indexes A, B and C)</i></p>	<p>Seguridad eléctrica , mecánicos y funcionales</p> <ul style="list-style-type: none"> - Ensayo de tensión de impulso - Ensayos con tensión alterna - Potencia absorbida - Ensayo de calentamiento - Ventana - Tapa de bornes - Distancias en el aire y líneas de fuga - Contador con envolvente. Aislante clase II - Ensayo de martillo de resorte (Eh) - Protección contra penetración de polvo y agua - Resistencia al calor y al fuego <p>Ensayos de precisión (para corrientes iguales o superiores a 20mA)</p> <p><i>Electrical, mechanical and functional safety</i></p> <ul style="list-style-type: none"> - <i>Impulse voltage test</i> - <i>AC voltage test</i> - <i>Absorbed power</i> - <i>Heating</i> - <i>Window</i> - <i>Terminal cover</i> - <i>Clearance and creepage distances</i> - <i>Insulating encased meter of protective class II</i> - <i>Hammer tests (Eh)</i> - <i>Resistance to heat and fire</i> - <i>Protection against penetration of dust and water</i> <p><i>Precision tests (for currents higher or equal to 20mA)</i></p>	<p>UNE-EN 50470-3:2007 Excepto Apdo. 5.4</p>



000475

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores estáticos o electromecánicos destinados a la medida de energía eléctrica en sistemas de 50Hz y tensión hasta 600V</p> <p><i>Electricity metering equipment (a.c.) Static or electromechanics meters and intended to the measuring of electrical energy in 50 Hz systems and voltage up to 600 V.</i></p>	<p>Seguridad eléctrica , mecánicos y funcionales</p> <ul style="list-style-type: none"> - Ensayo de tensión de impulso - Ensayos con tensión alterna - Potencia absorbida - Ensayo de calentamiento - Ventana - Tapa de bornes - Distancias en el aire y líneas de fuga - Contador con envolvente. Aislante clase II - Ensayo de martillo de resorte (Eh) - Protección contra penetración de polvo y agua - Resistencia al calor y al fuego <p>Ensayos de precisión (para corrientes iguales o superiores a 20mA)</p> <p><i>Electrical, mechanical and functional safety</i></p> <ul style="list-style-type: none"> - <i>Impulse voltage test</i> - <i>AC voltage test</i> - <i>Absorbed power</i> - <i>Heating</i> - <i>Window</i> - <i>Terminal cover</i> - <i>Clearance and creepage distances</i> - <i>Insulating encased meter of protective class II</i> - <i>Hammer tests (Eh)</i> - <i>Resistance to heat and fire</i> - <i>Protection against penetration of dust and water</i> <p><i>Precision tests (for currents higher or equal to 20mA)</i></p>	<p>UNE-EN 62052-11:2004 Excepto Apdo. 5.4</p>



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Equipos de medida de la energía eléctrica (c.a.). Contadores estáticos de energía activa (clases 0,5S, 1 y 2)</p> <p><i>Electricity metering equipment (a.c.) Static meters for active energy (classes 0,5S, 1 and 2)</i></p>	<p>Seguridad eléctrica, mecánicos y funcionales</p> <ul style="list-style-type: none"> - Ensayo de tensión de impulso - Ensayos con tensión alterna - Potencia absorbida - Ensayo de calentamiento - Ventana - Tapa de bornes - Distancias en el aire y líneas de fuga - Contador con envolvente. Aislante clase II - Ensayo de martillo de resorte (Eh) - Protección contra penetración de polvo y agua - Resistencia al calor y al fuego <p>Ensayos de precisión (para corrientes iguales o superiores a 20mA)</p> <p><i>Electrical, mechanical and functional safety</i></p> <ul style="list-style-type: none"> - <i>Impulse voltage test</i> - <i>AC voltage test</i> - <i>Absorbed power</i> - <i>Heating</i> - <i>Window</i> - <i>Terminal cover</i> - <i>Clearance and creepage distances</i> - <i>Insulating encased meter of protective class II</i> - <i>Hammer tests (Eh)</i> - <i>Resistance to heat and fire</i> - <i>Protection against penetration of dust and water</i> <p><i>Precision tests (for currents higher or equal to 20mA)</i></p>	<p>UNE-EN 62053-21:2003 Excepto Apdo. 5.4</p> <p>UNE-EN 62053-22:2003 Excepto Apdo. 5.4</p>



000477

PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Equipos de medida de la energía eléctrica (c.a). Contadores estáticos de energía reactiva (clases 1, 1S, 2 y 3)</p> <p><i>Electricity metering equipment (a.c.) Static meters for reactive energy (classes 1, 1S, 2 and 3)</i></p>	<p>Seguridad eléctrica , mecánicos y funcionales</p> <ul style="list-style-type: none"> - Ensayo de tensión de impulso - Ensayos con tensión alterna - Potencia absorbida - Ensayo de calentamiento - Ventana - Tapa de bornes - Distancias en el aire y líneas de fuga - Contador con envoltorio. Aislante clase II - Ensayo de martillo de resorte (Eh) <p>Protección contra penetración de polvo y agua</p> <ul style="list-style-type: none"> - Resistencia al calor y al fuego <p>Ensayos de precisión (para corrientes iguales o superiores a 20mA)</p> <p>Electrical, mechanical and functional safety</p> <ul style="list-style-type: none"> - Impulse voltage test - AC voltage test - Absorbed power - Heating - Window - Terminal cover - Clearance and creepage distances - Insulating encased meter of protective class II - Hammer tests (Eh) - Resistance to heat and fire - Protection against penetration of dust and water <p><i>Precision tests (for currents higher or equal to 20mA)</i></p>	<p>UNE-EN 62053-23:2003 Excepto Apdo. 5.4</p> <p>UNE-EN 62053-24:2015 Excepto Apdo. 5.4</p>

ВЕРНО С
 ОРИГИНАЛА

М.М. СОФРА
 MIG 23 LTD

Categoría I (Ensayos "in situ")
Category I ("on site" Tests)

PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Cables de potencia con aislamiento extruido y sus accesorios, de tensión asignada superior a 150 kV (Um = 170 kV) hasta 500 kV (Um = 550 kV)</p> <p><i>Power cables with extruded insulation and their accessories for rated voltages above 150 kV (Um= 170 kV) up to 500 kV (Um = 550 kV)</i></p>	<p>Ensayos eléctricos después de la instalación (cap. 16):</p> <ul style="list-style-type: none"> - Ensayo de tensión continua de la cubierta exterior (Apdo. 16.2) - Ensayo de tensión en corriente alterna del aislamiento (Apdo. 16.3) <p><i>Electrical tests after installation (chap. 16):</i></p> <ul style="list-style-type: none"> - DC voltage test of the oversheath (16.2) - AC voltage test of the insulation (16.3) 	<p>IEC 62067:2011</p>
<p>Cables de potencia con aislamiento extruido y sus accesorios, de tensión asignada superior a 150 kV (Um = 170 kV) hasta 400 kV (Um = 420 kV)</p> <p><i>Power cables with extruded insulation and their accessories for rated voltages above 150 kV (Um = 170 kV) up to 400 kV (Um = 420 kV)</i></p>	<p>Ensayos eléctricos después de la instalación (cap. 16):</p> <ul style="list-style-type: none"> - Ensayos de comprobación del aislamiento principal: Método 1: Ensayo de tensión soportada a frecuencia industrial. - Ensayo de comprobación de la cubierta - Ensayo de continuidad y resistencia de las pantallas - Ensayo de continuidad y resistencia de los conductores - Medida de descargas parciales del sistema nuevo de cable <p><i>Electrical tests after installation (clause 16):</i></p> <ul style="list-style-type: none"> - Tests to verify the main insulation: Method 1: Power frequency withstand test. - Test to verify the oversheath - Continuity and measurement of the electrical resistance of screen - Continuity and measurement of the electrical resistance of conductor - Partial discharge measurement on the new cable system 	<p>UNE 211067-1:2012</p>

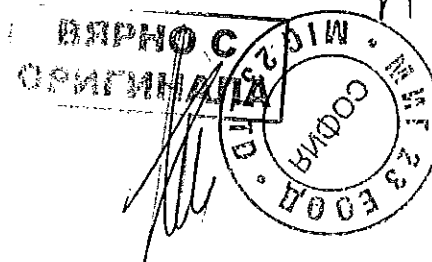


000479

PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Cables de energía con aislamiento extruido y sus accesorios para tensiones asignadas superiores a 36 kV (Um = 42 kV) hasta 150 kV (Um = 170 kV)</p> <p><i>Power cables with extruded insulation and their accessories for rated voltages above 36 kV (Um = 42 kV) up to 150 kV (Um = 170 kV)</i></p>	<p>Ensayos eléctricos después de la instalación:</p> <p>Parte 1.</p> <ul style="list-style-type: none"> - 15.1: ensayo de tensión dc sobre cubierta - 15.2: ensayo de tensión ac sobre el aislamiento. <p>Parte 2.</p> <ul style="list-style-type: none"> - 8.1 Ensayo eléctrico en la cubierta (oversheath) - 8.2 Ensayos eléctricos en los accesorios - 8.3.1. Ensayo de tensión ac sobre el aislamiento con equipo resonante - 8.4 Ensayo eléctrico después de la instalación, cubierta no metálica - 8.8 Ensayo dc de resistencia del conductor <p>Partes 3 a 11: ensayos realizados por referencia a los de las partes 1 y 2, dentro de los rangos siguientes para los ensayos sobre cubiertas y sobre el aislamiento:</p> <ul style="list-style-type: none"> - Ensayos sobre cubierta: 25 kV dc - Ensayos sobre aislamiento: 260 kV, 20 Hz a 300 Hz <p><i>Electrical tests after installation:</i></p> <p>Part 1.</p> <ul style="list-style-type: none"> - 15.1: DC voltage test of the oversheath - 15.2: AC voltage test of the insulation. <p>Part 2.</p> <ul style="list-style-type: none"> - 8.1 Electrical test on oversheath - 8.2 Electrical tests on accessories - 8.3.1 AC voltage test on the insulation with resonant system - 8.4 Electrical test after installation, non-metallic sheath - 8.8 DC conductor resistance test <p>Parts 3 to 11: tests performed by reference to those of parts 1 and 2, in the following ranges for the tests of sheaths and of insulation:</p> <ul style="list-style-type: none"> - Tests of sheaths: 25 kV dc - Tests of insulation: 260 kV, 20 Hz to 300 Hz 	<p>HD 632 S2:2008</p>

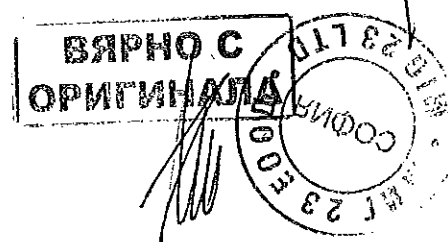


PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Cables de energía con aislamiento extruido y sus accesorios para tensiones asignadas superiores a 36 kV (Um = 42 kV) hasta 150 kV (Um = 170 kV)</p> <p><i>Power cables with extruded insulation and their accessories for rated voltages above 36 kV (Um=42 kV) up to 150 kV (Um=170 kV)</i></p>	<p>Ensayos eléctricos después de la instalación (cap. 16):</p> <ul style="list-style-type: none"> - Ensayo de tensión continua de la cubierta exterior (Apdo. 16.2) - Ensayo de tensión en corriente alterna del aislamiento (Apdo. 16.3) <p><i>Electrical tests after installation (chap. 16):</i></p> <ul style="list-style-type: none"> - DC voltage test of the oversheath (16.2) - AC voltage test of the insulation (16.3) 	<p>IEC 60840:2011</p>
<p>Cables de energía con aislamiento extruido y sus accesorios para tensiones asignadas superiores a 36 kV (Um = 42 kV) hasta 150 kV (Um = 170 kV)</p> <p><i>Power cables with extruded insulation and their accessories for rated voltages above 36 kV (Um=42 kV) up to 150 kV (Um=170 kV)</i></p>	<p>Ensayos eléctricos después de la instalación (cap. 16):</p> <ul style="list-style-type: none"> - Ensayos de comprobación del aislamiento principal. Método 1: Ensayo de tensión soportada a frecuencia industrial. Método 4: Medida de descargas parciales - Ensayo de comprobación de la cubierta - Ensayo de continuidad y resistencia de las pantallas - Ensayo de continuidad y resistencia de los conductores - Medida de descargas parciales del sistema nuevo de cable <p><i>Electrical tests after installation (chap. 16):</i></p> <ul style="list-style-type: none"> - Tests to verify the main insulation: Method 1: Power frequency withstand test. Method 4: Partial discharges measurement. - Test to verify the oversheath - Continuity and measurement of the electrical resistance of screen - Continuity and measurement of the electrical resistance of conductor - Partial discharges measurement on the new cable system 	<p>UNE 211632-1:2012</p>

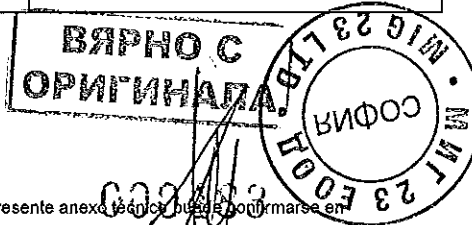


000481

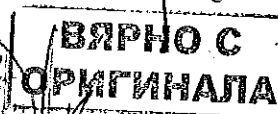
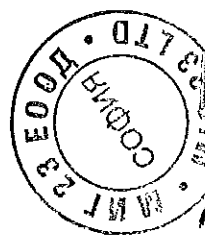
PRODUCTO/MATERIAL A ENSAYAR PRODUCTS/MATERIALS TESTED	ENSAYO TYPE OF TEST	NORMA/PROCEDIMIENTO DE ENSAYO STANDARD SPECIFICATIONS/ TEST PROCEDURE
<p>Sistemas de cables eléctricos de alta tensión en corriente alterna</p> <p><i>AC High voltage cable systems</i></p>	<p>Ensayos previos a la puesta en servicio del sistema nuevo de cable de alta tensión (cap. 4): Sistemas nuevos de cables de tensión asignada superior a 0,6/1 kV e inferior o igual a 87/150 (170 kV) (Apdo. 4.1):</p> <ul style="list-style-type: none"> - Ensayos de comprobación del aislamiento principal (Apdo. 4.1.1). Método 1: Ensayo de tensión soportada a frecuencia industrial. Método 4: Medida de descargas parciales - Ensayo de comprobación de la cubierta (Apdo. 4.1.2) - Ensayo de continuidad y resistencia de las pantallas (Apdo. 4.1.3) - Ensayo de continuidad y resistencia de los conductores (Apdo. 4.1.4) <p><i>Electrical tests after installation of a new high voltage cable system (clause 4): New cable systems of rated voltages above 0.6/1 kV up to 87/150 (170 kV) (4.1):</i></p> <ul style="list-style-type: none"> - Tests of the insulation (4.1.1). Method 1: Power frequency withstand voltage test. Method 4: Partial discharge measurement - Test of the oversheath (4.1.2) - Continuity and measurement of the electrical resistance of screen (4.1.3) - Continuity and measurement of the electrical resistance of conductor (4.1.4) 	<p>UNE 211006:2010</p>



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
<p>Sistemas de cables eléctricos de alta tensión en corriente alterna</p> <p><i>AC High voltage cable systems</i></p>	<p>Sistemas nuevos de cables de tensión asignada superior a 87/150 (170 kV) hasta 220/400 (420 kV) (Apdo. 4.2):</p> <ul style="list-style-type: none"> - Ensayos de comprobación del aislamiento principal (Apdo. 4.2.1): Método 1: Ensayo de tensión soportada a frecuencia industrial. - Ensayo de comprobación de la cubierta (Apdo. 4.2.2) - Ensayo de continuidad y resistencia de las pantallas (Apdo. 4.2.3) - Ensayo de continuidad y resistencia de los conductores (Apdo. 4.2.4) <p>Medida de descargas parciales del sistema nuevo de cable (cap. 5)</p> <p>Ensayo de continuidad y resistencia eléctrica de la pantalla y los conductores de los sistemas nuevos de cable (cap. 6):</p> <p><i>New cable systems of rated voltages above 87/150 (170 kV) up to 220/400 (420 kV) (4.2):</i></p> <ul style="list-style-type: none"> - <i>Tests of the insulation (4.2.1): Method 1: Power frequency withstand voltage test</i> - <i>Test of the oversheath (4.2.2)</i> - <i>Continuity and measurement of the electrical resistance of screen (4.2.3)</i> - <i>Continuity and measurement of the electrical resistance of conductor (4.2.4).</i> <p><i>Partial discharge measurement of a new cable system (chap. 5)</i></p> <p><i>Continuity and measurement of the electrical resistance of screen and conductor of new cable systems (chap. 6)</i></p>	<p>UNE 211006:2010</p>
<p>Líneas eléctricas de alta tensión</p> <p><i>High voltage power lines</i></p>	<p>Medida de impedancia de línea (Apdo. 7.8) Medida de capacidad y tangente de delta (líneas subterráneas)</p> <p><i>Line impedance measurement</i></p> <p><i>Capacity measure and tan delta (underground lines)</i></p>	<p>Procedimiento interno PE.EE-90-E</p> <p><i>Internal procedure PE.EE-90-E v2Abril 2013</i></p>



PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
Equipos y materiales de alta tensión <i>High voltage equipment and materials</i>	Ensayos de alta tensión con tensión alterna Límites: - 260 kV, 20 Hz a 300 Hz <i>High voltage tests with alternating voltage</i> Limits: - 260 kV, 20 Hz to 300 Hz	UNE-EN 60060-3:2006 UNE-EN 60060-3:2007 CORRIGENDUM IEC 60060-3:2006
Cables de energía para material rodante en aplicaciones ferroviarias <i>Power cables of rolling stock for railway applications</i>	Propiedades dieléctricas: Ensayos de rutina (Apdo. 9.3.3.3) <i>Dielectric properties: Routine tests (9.3.3.3)</i>	IEC 60077-1:1999
Envolturas de materiales eléctricos <i>Enclosures for electrical equipment</i>	Clasificación de los grados de protección proporcionados por las envolturas, códigos IP e IK: IP1X a IP4X IPX1 a IPX6 IK02 a IK10 <i>Classification of degrees of protection provided by enclosures, IP and IK code</i> IP1X to IP4X IPX1 to IPX6 IK02 to IK10	UNE 20324:1993 UNE 20324/1M:2000 UNE 20324:2004 ERRATUM UNE 20324/2M:2014 IEC 60529:1989 IEC 60529/A1:1999 IEC 60529/A2:2013 IEC 60529:2013 cons./Corr1:2013 IEC 60529:1989-AMD1:1999+AMD2 :2013 CSV/COR2:2015 UNE-EN 50102:1996 UNE-EN 50102:2002 CORRIGENDUM UNE-EN 50102/A1:1999 UNE-EN 50102/A1:2002 CORRIGENDUM IEC 62262:2002 UNE-EN 62262:2002



000484

PRODUCTO/MATERIAL A ENSAYAR <i>PRODUCTS/MATERIALS TESTED</i>	ENSAYO <i>TYPE OF TEST</i>	NORMA/PROCEDIMIENTO DE ENSAYO <i>STANDARD SPECIFICATIONS/ TEST PROCEDURE</i>
Centros de transformación prefabricados <i>Voltage prefabricated substation</i>	Ensayos dieléctricos a frecuencia industrial de la interconexión de alta tensión (Apdos. 6.2.101.2.2, 6.2.101.4) Ensayos dieléctricos de la interconexión de baja tensión (apdo. 6.2.102) Ensayos de calentamiento (apdo. 6.5) Verificación de la protección (apdo. 6.7) Ensayos funcionales circuitos auxiliares (apdo. 6.10.2) Continuidad eléctrica de las partes metálicas (apdo 6.10.3) <i>Dielectric test on power frequency high voltage interconnections (6.2.101.2.2, 6.2.101.4)</i> <i>Dielectric test on low-voltage interconnections (6.2.102)</i> <i>Temperature rise test (6.5)</i> <i>Verification of the protection (6.7)</i> <i>Functional test auxiliary circuits (6.10.2)</i> <i>Electrical continuity of metallic parts (6.10.3)</i>	UNE-EN 62271-202:2007 UNE-EN 62271-202 :2015 IEC 62271-202:2014 UNE-EN 62271-202: 2015 AC CEI/IEC 62271-202: 2015 CORRIGENDUM 1 UNE -EN 62271-202:2015/AC

Esta revisión corrige las erratas detectadas en la revisión nº 23 de fecha 17/06/2016

This edition corrects mistakes detected in Ed. 23 dated 17/06/2016



000485

ДЕКЛАРАЦИЯ

за конфиденциалност и извършен оглед на обект по предмета на поръчката

Долуподписаният/-ната/ Антон Иванов Илиев, в качеството ми на представляващ Обединение „МИГ - Хюндай“, участник в процедура за възлагане на обществена поръчка с реф. № PPD 17-001 и предмет:

Доставка, демонтаж и монтаж на трифазни маслонапълнени понижаващи силови трансформатори 110kV/Средно напрежение (СрН) и цялото необходимо помощно оборудване,

ДЕКЛАРИРАМ, ЧЕ:

1/ Представител на участника, когото представлявам е извършил оглед на обект: п/ст „Георги Димитров“ и съм запознат със съществуващото положение.

2/ Няма да разпространявам поверителна информация, във връзка с извършения оглед на обекта на Възложителя, като ми е известно, че за поверителна се счита всяка информация, относно пропускателния режим в обекта, организацията на работната сила и работния процес, наличното оборудване и техническите схеми на функционирането му, системите за защита и сигурност в обекта и всичко, което е свързано с наличното оборудване, съоръжения и тяхното функциониране в съответния обект.

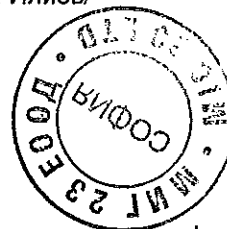
3/ Прилагам документ за извършен оглед, съставен на място в подстанцията.

Приложение: съгласно текста

Дата 18.04.2017г.

Декларатор: _____

/Антон Илиев/



000486

((

(



ДЕКЛАРАЦИЯ

за конфиденциалност и извършен оглед на обект по предмета на поръчката

Долуподписаният/ната/ Дже Хи У, в качеството ми на представляващ фирма „Хюндай Хеви Индъстрис КО.България“ АД, участник в процедура за възлагане на обществена поръчка с реф. № PPD 17-001 и предмет:

Доставка, демонтаж и монтаж на трифазни маслонапълнени понижаващи силови трансформатори 110kV/Средно напрежение (СрН) и цялото необходимо помощно оборудване,

ДЕКЛАРИРАМ, ЧЕ :

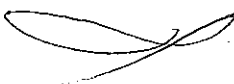
1/ Представител на участника, когото представлявам е извършил оглед на обект: п/ст „Георги Димитров“ и съм запознат със съществуващото положение.

2/ Няма да разпространявам поверителна информация, във връзка с извършения оглед на обекта на Възложителя, като ми е известно, че за поверителна се счита всяка информация, относно пропускателния режим в обекта, организацията на работната сила и работния процес, наличното оборудване и техническите схеми на функционирането му, системите за защита и сигурност в обекта и всичко, което е свързано с наличното оборудване, съоръжения и тяхното функциониране в съответния обект.

3/ Прилагам документ за извършен оглед, съставен на място в подстанцията.

Приложение: съгласно текста

Дата 18.04.2017 г.



Декларатор:  J. H. Woo
Име, подпис и печат/


000487

((

(



ДЕКЛАРАЦИЯ

за извършен оглед на ПС „Георги Димитров 110/Ср.Н

Долуподписаният/-ната/ Антон Иванов Илиев
.....
в качеството ми на представляващ ММТ 234 ЕООД
.....
кандидат за участие в процедура за възлагане на обществена поръчка с предмет: „Доставка, демонтаж и монтаж на трифазни масленапълнени понижаващи силови трансформатори 110kV/Средно напрежение (СрН) и цялото необходимо помощно оборудване“ и реф. № PPD 17-001

ДЕКЛАРИРАМ:

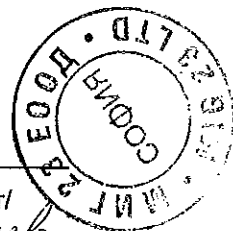
Извърших оглед на обекта, предмет на обществената поръчка и се запознах със съществуващото положение, включително с действащите електрически съоръжения и спецификата на ПС „Георги Димитров 110/Ср.Н.

Дата 27.03.2017 г.

Декларатор: АИ

/име, подпис и печат/

Антон Илиев



Служител на Възложителя допуснал до оглед кандидата:

Кира Илиев Р-ЛБС Илиев
.....
име и фамилия длъжност подпис



000488

CC

C



СЕРТИФИКАТ № OHS-677
CERTIFICATE No.

Удостоверява, че системата за управление на здравето и безопасността при работа на
It is hereby certified that the Occupational Health and Safety Management System of

ХЮНДАЙ ХЕВИ ИНДЪСТРИС КО. БЪЛГАРИЯ АД
HYUNDAI HEAVY INDUSTRIES CO. BULGARIA

БУЛ. РОЖЕН 41, СОФИЯ 1271, БЪЛГАРИЯ
 41, ROZHEN BLVD., 1271 SOFIA, BULGARIA

ЗА СЛЕДНИТЕ ОПЕРАТИВНИ СТРУКТУРИ / IN THE FOLLOWING OPERATIONAL UNITS

БУЛ. РОЖЕН 41, СОФИЯ 1271, БЪЛГАРИЯ
 41, ROZHEN BLVD., 1271 SOFIA, BULGARIA

СЪОТВЕТСТВА НА СТАНДАРТ
 IS IN COMPLIANCE WITH THE STANDARD
BS OHSAS 18001:2007

С ОБЛАСТ НА ПРИЛОЖЕНИЕ / FOR THE FOLLOWING FIELD(S) OF ACTIVITIES

КОНСТРУИРАНЕ, ПРОИЗВОДСТВО, ТЪРГОВИЯ И СЕРВИЗ НА ТРАНСФОРМАТОРИ, СЪПАЛНИ РЕГУЛАТОРИ,
 АПАРАТИ ВИСОКО НАПРЕЖЕНИЕ И РЕЗЕРВНИ ЧАСТИ.

DESIGN, PRODUCTION, SALE AND SERVICING OF TRANSFORMERS, TAP CHANGERS, HIGH VOLTAGE
 APPARATUSES AND SPARE PARTS.

Използването и валидността на сертификата зависят от спазването на правилата на РИНА за сертификация на системи за управление на здравето и безопасността при работа
The use and validity of this certificate are subject to compliance with the RINA document: Rules for the Certification of Occupational Health and Safety Management Systems

Първо издание First Issue	11.08.2011
Настоящо издание Current Issue	30.07.2014
Валидност до Expiry Date	27.07.2017

Ing. Michele Francioni
 (Chief Executive Officer)

Organizzazione & RINA Services S.p.A.
 Via Corsica 12 - 16128 Genova Italy

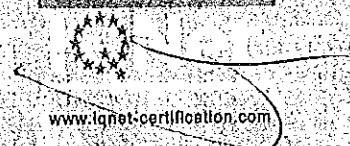
Organizzazione è certificata per i sopra indicati standard dal 3/9/2008.
 This Organisation is certified for the above standard since 3/9/2008.



SCQ N° 002 A SSIN° 001 G
 SQA N° 002 D DAP N° 001 H
 PRD N° 002 B PRS N° 000 C
 GCR N° 003 F LAB N° 009 Z
 Signatory of EA, IAF and RAC
 Medical Reception Agreements



CISQ is a member of



IGNET, the association of the world's first
 class certification bodies, is the largest
 provider of management System
 Certification in the world.
 IGNET is composed of more than 30
 bodies and counts over 150 subsidiaries
 all over the globe.

За информация относно
 валидността на
 сертификата може да
 посетите www.rina.org

For information concerning
 validity of the certificate, you
 can visit the site
www.rina.org

EA:19



Валидността на този сертификат
 зависи от годишните / шестмесечните
 одити и от цялостния преглед на
 системата за управление на всеки три
 години.

The validity of this certificate is dependent
 on an annual / six monthly audit and on a
 complete review, every three years, of the
 management system

CISQ е Италианската
 Федерация на Органите по
 Сертификация на Системи за
 Управление

CISQ is the Italian
 Federation of management
 system Certification Bodies



www.cisq.com

Form CERSIGE-08/2013

CC

C



СЕРТИФИКАТ № EMS-3487/S
CERTIFICATE No.

Удостоверява, че системата за управление по отношение на околната среда на
It is hereby certified that the Environmental Management System of

ХЮНДАЙ ХЕВИ ИНДЪСТРИС КО. БЪЛГАРИЯ АД
HYUNDAI HEAVY INDUSTRIES CO. BULGARIA

БУЛ. РОЖЕН 41, СОФИЯ 1271, БЪЛГАРИЯ
 41, ROZHEN BLVD., 1271 SOFIA, BULGARIA

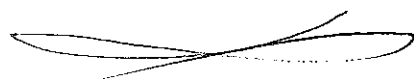
ЗА СЛЕДНИТЕ ОПЕРАТИВНИ СТРУКТУРИ / IN THE FOLLOWING OPERATIONAL UNITS

БУЛ. РОЖЕН 41, СОФИЯ 1271, БЪЛГАРИЯ
 41, ROZHEN BLVD., 1271 SOFIA, BULGARIA

СЪОТВЕТСТВА НА СТАНДАРТ
 IS IN COMPLIANCE WITH THE STANDARD
ISO 14001:2004

О ОБЛАСТ НА ПРИЛОЖЕНИЕ / FOR THE FOLLOWING FIELD(S) OF ACTIVITIES

КОНСТРУИРАНЕ, ПРОИЗВОДСТВО, ТЪРГОВИЯ И СЕРВИЗ НА ТРАНСФОРМАТОРИ, СЪПАЛНИ РЕГУЛАТОРИ,
 АПАРАТИ ВИСОКО НАПРЕЖЕНИЕ И РЕЗЕРВНИ ЧАСТИ.

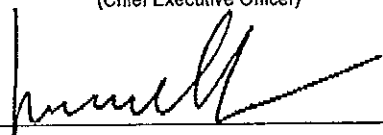


DESIGN, PRODUCTION, SALE AND SERVICING OF TRANSFORMERS, TAP CHANGERS, HIGH VOLTAGE
 APPARATUSES AND SPARE PARTS.

Използването и валидността на сертификата зависи от спазването на правилата на РИНА за сертификация на системи за управление по отношение на околната среда
The use and the validity of this certificate are subject to compliance with the RINA document: Rules for the Certification of Environmental Management Systems
 Валидността на този сертификат зависи от годишните / шестмесечните одити и от цялостния преглед на системата за управление на всеки три години.
The validity of this certificate is dependent on an annual / six monthly audit and on a complete review, every three years, of the management system

Първо издание First Issue	10.08.2011
Настоящо издание Current Issue	30.07.2014
Валидност до Expiry Date	27.07.2017

Ing. Michele Francioni
 (Chief Executive Officer)



RINA Services S.p.A.
 Via Corsica-12 - 16128 Genova Italy

Организацията е сертифицирана по гореуказаните
 стандарти от 03/09/2008.
 This Organisation is certified for the above standard since
 03/09/2008.



SCQ N° 002 A SSIN N° 001 G
 BCAN N° 002 D DAP N° 001 H
 PRO N° 002 B FRS N° 005 C
 SCR N° 003 F LAB N° 0432

Signatory of EA, IAF and ILAC Mutual
 Recognition Agreements



ВЯРНО
ОРИГИНАЛ

CISQ is a member of

www.lqnet-certification.com

IQNet, the association of the world's first class certification bodies, is the largest provider of management System Certification in the world. IQNet is composed of more than 30 bodies and counts over 150 subsidiaries all over the globe.

EA:19

За информация относно валидността на сертификата може да посетите www.rina.org.

For information concerning validity of the certificate, you can visit the site www.rina.org.



CISQ е Италианската Федерация на Организацията по Сертификация на Системи за Управление

CISQ is the Italian Federation of management system Certification Bodies



www.cisq.com

Form CERSIGE-08/2013

CC

CC



СЕРТИФИКАТ № 23637/11/S
CERTIFICATE No.

Удостоверява, че системата за управление на качеството на
 IT IS HEREBY CERTIFIED THAT THE QUALITY MANAGEMENT SYSTEM OF

ХЮНДАЙ ХЕВИ ИНДЪСТРИС КО. БЪЛГАРИЯ АД
HYUNDAI HEAVY INDUSTRIES CO. BULGARIA

БУЛ. РОЖЕН 41, СОФИЯ 1271, БЪЛГАРИЯ
 41, ROZHEN BLVD., 1271 SOFIA, BULGARIA

ЗА СЛЕДНИТЕ ОПЕРАТИВНИ СТРУКТУРИ / IN THE FOLLOWING OPERATIONAL UNITS

БУЛ. РОЖЕН 41, СОФИЯ 1271, БЪЛГАРИЯ
 41, ROZHEN BLVD., 1271 SOFIA, BULGARIA

Съответства на стандарт
 IS IN COMPLIANCE WITH THE STANDARD

ISO 9001:2008

С област на приложение / FOR THE FOLLOWING FIELD(S) OF ACTIVITIES

EA:19

КОНСТРУИРАНЕ, ПРОИЗВОДСТВО, ТЪРГОВИЯ И СЕРВИЗ НА ТРАНСФОРМАТОРИ, СЪПЪЛНИ РЕГУЛАТОРИ,
 АПАРАТИ ВИСОКО НАПРЕЖЕНИЕ И РЕЗЕРВНИ ЧАСТИ.

DESIGN, PRODUCTION, SALE AND SERVICING OF TRANSFORMERS, TAP CHANGERS, HIGH VOLTAGE
 APPARATUSES AND SPARE PARTS.



Информация за изключенията от изискванията на стандарта може да бъде намерена в наръчника по качество

Reference is to be made to the Quality Manual for details regarding the exemptions from the requirements of the standard

Валидността на този сертификат зависи от годишните / шестмесечните одити и от цялостния преглед на системата за управление на всеки три години.
 The validity of this certificate is dependent on an annual / six monthly audit and on a complete review, every three years, of the management system.
 Използването и валидността на сертификата зависят от спазването на правилата на РИНА за сертификация на системи за управление на качеството.
 The use and validity of this certificate are subject to compliance with the RINA document: Rules for the certification of Quality Management Systems

Ing. Michele Francioni
 (Chief Executive Officer)

Първо издание First Issue	10.08.2011
Настоящо издание Current Issue	30.07.2014
Валидност до Expiry Date	27.07.2017

RINA Services S.p.A.
 Via Corsica 12 - 16128 Genova Italy



SGQN° 002 A SSIN° 001 G
 SGA N° 002 D DAP N° 001 H
 PRD N° 002 B PRS N° 066 C
 SCR N° 003 F LAB N° 0832

Signatory of EA, IAF and ILAC Mutual Recognition Agreements



Организацията е сертифицирана по гореуказаните стандарти от 4/9/2009.

This Organisation is certified for the above standard since 4/9/2009.

ВЯРНО С ОРИГИНАЛА

CISQ is a member of

www.iqnet-certification.com

IQNet, the association of the world's first class certification bodies, is the largest provider of management System Certification in the world. IQNet is composed of more than 30 bodies and counts over 150 subsidiaries all over the globe.

За информация относно валидността на сертификата може да посетите www.rina.org

For information concerning validity of the certificate, you can visit the site www.rina.org



Form CERSIGE-08/2013

CORPORATE PRESENTATION



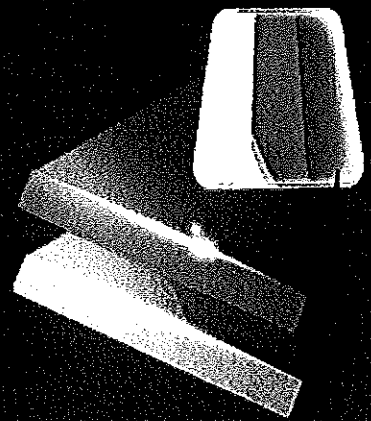
000492

Contents

I Bulgaria Overview

II Company Overview

III Company Products

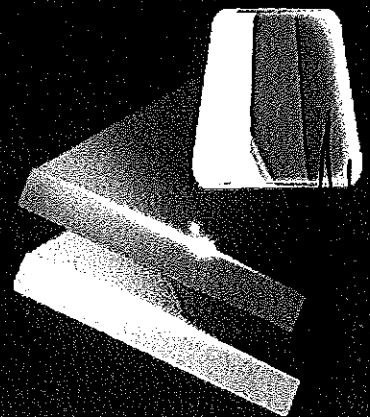


 **HYUNDAI**
HEAVY INDUSTRIES CO. BULGARIA

000493

Chapter I

I Bulgaria Overview



HYUNDAI
HEAVY INDUSTRIES CO. BULGARIA

000494

Bulgaria Overview

1 Area

◀ Land - 111,000 km²

2 Capital

◀ Sofia

3 Population

◀ People - 7,400,000

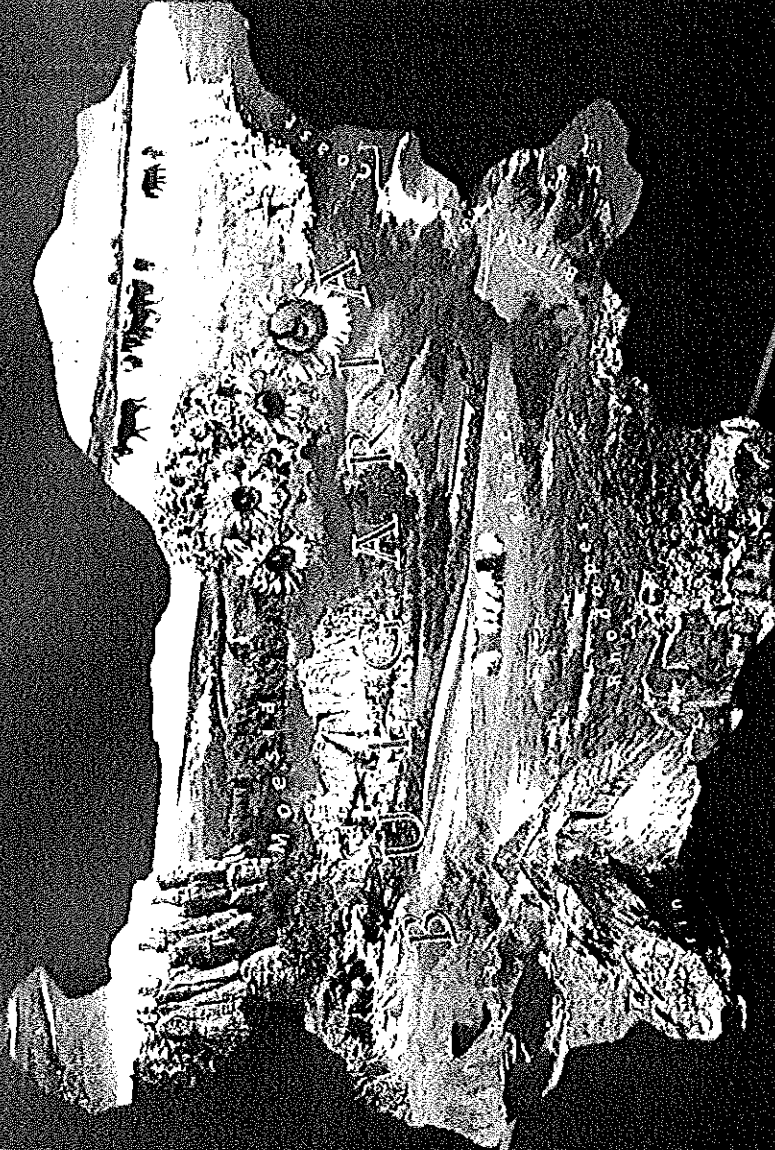
◀ Density - 66,2 per km²

4 Economy

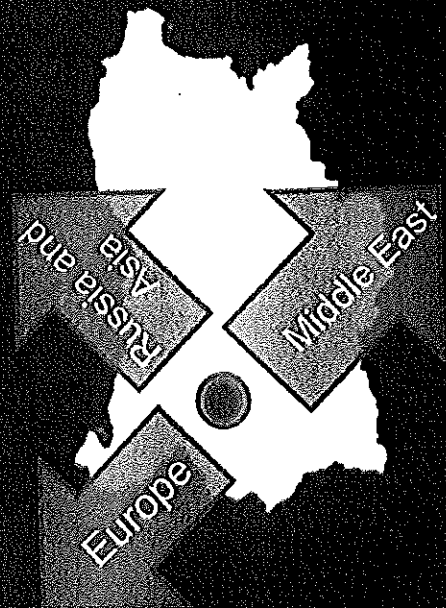
◀ Export driven economy

◀ Fixed Exchange Rate between BGN and EURO

◀ Double Taxation Relief Agreements between BG, EU and USA



Location & Advantages



1 Strategic Location

- ◀ Located in Eastern Europe (Central Balkans)
- ◀ 5 Trans-European Corridors pass through the country.
- ◀ Vital connections to Western Europe, Russia, Asia and Middle East

2 Advantages

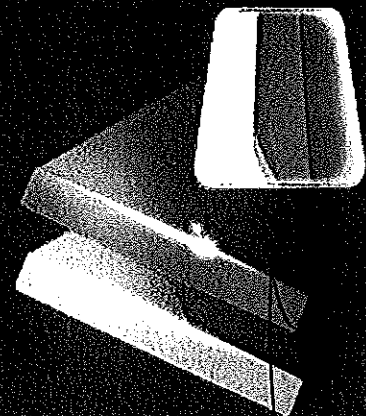
- ◀ Flexibility in production
- ◀ Reliability and quick deliveries
- ◀ Competitive labor cost
- ◀ High Quality

000496

Chapter II

II Company Overview

HYUNDAI

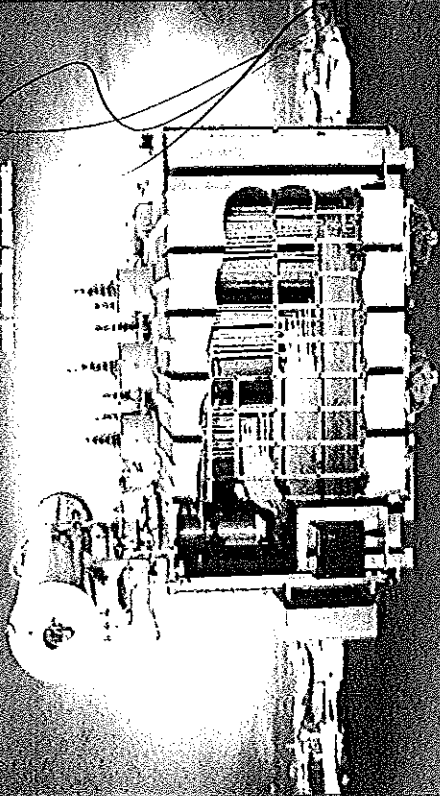


000497

Company Introduction

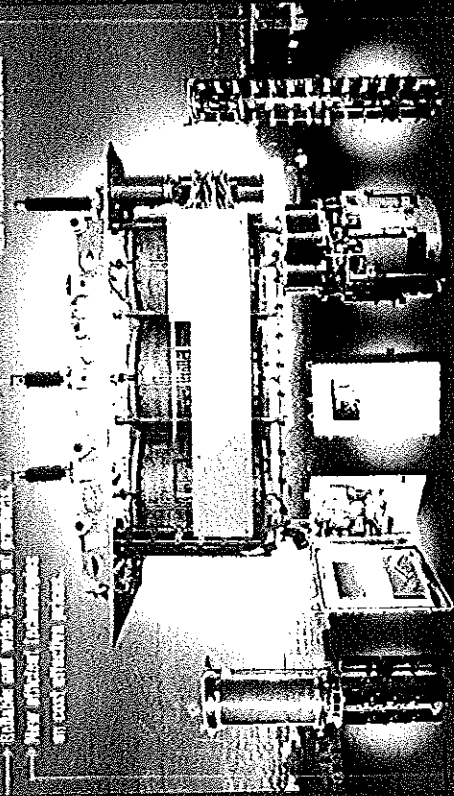
HYUNDAI

HYUNDAI HEAVY INDUSTRIES CO., LTD.



- Large mechanical lifts and easy maintenance.
- Meet the latest technology requirements.
- Reliable and wide range of products.
- New efficient technologies in cost effective price.

HYUNDAI



1 LOCATION

◀ 41, ROJEN BLVD. SOFIA, BULGARIA

2 FACTORY AREA

◀ FACTORY (SOFIA) - 237,208 m²

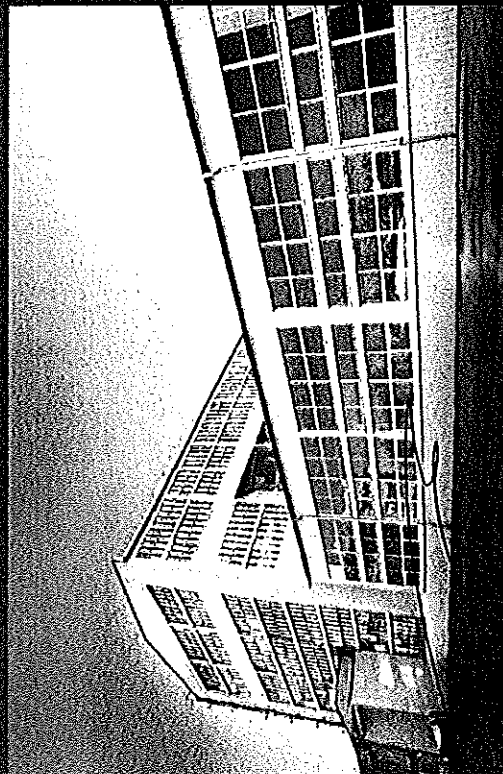
Buildings	Size (m ²)
Administrative	1,657
Metal Welding Workshop	3,981
Transformer Workshop	20,491
Warehouse	4,169
Test laboratories	6,185
Production Facilities	5,096
Tap Changer Workshop	9,075
Others	15,217

000498

Company Introduction



Bulgarian State Enterprise
Global Leader



1 First Steps

◀ In 1997 Hyundai Heavy Industries Ltd., Electro Electric Systems took over the Bulgarian state owned Elprom-Trafo Company

2 Company Mission

◀ HHIB is focused on sales, new markets, development, new business partners and clients

◀ To be a reliable, highly efficient and competitive partner

3 Future Goals

◀ HHIB has an ambitious development program to increase the capacity, efficiency and quality of the company

000499

Company History



1949

The organization was established by merging several small factories creating Electrical Apparatus, Electrical Motors, Transformers and Electrical motors into a State Power Engineering Plant "Vasil Kolarov"



1958

The three main workshops were divided into separate manufacturing divisions: Electrical Apparatus, Transformers and Electrical motors



1991

The production of ELPROM-ENERGO was divided to five newly established independent companies. The Institute was closed and the production of Transformers and Electrical Apparatus was transferred to ELPROM-TRAFQ



1997

The company was privatized by Hyundai Heavy Industries Co. Korea became the main holder of the organization offices. The company name was changed to HYUNDAI ELPROM TRAFQ, SC

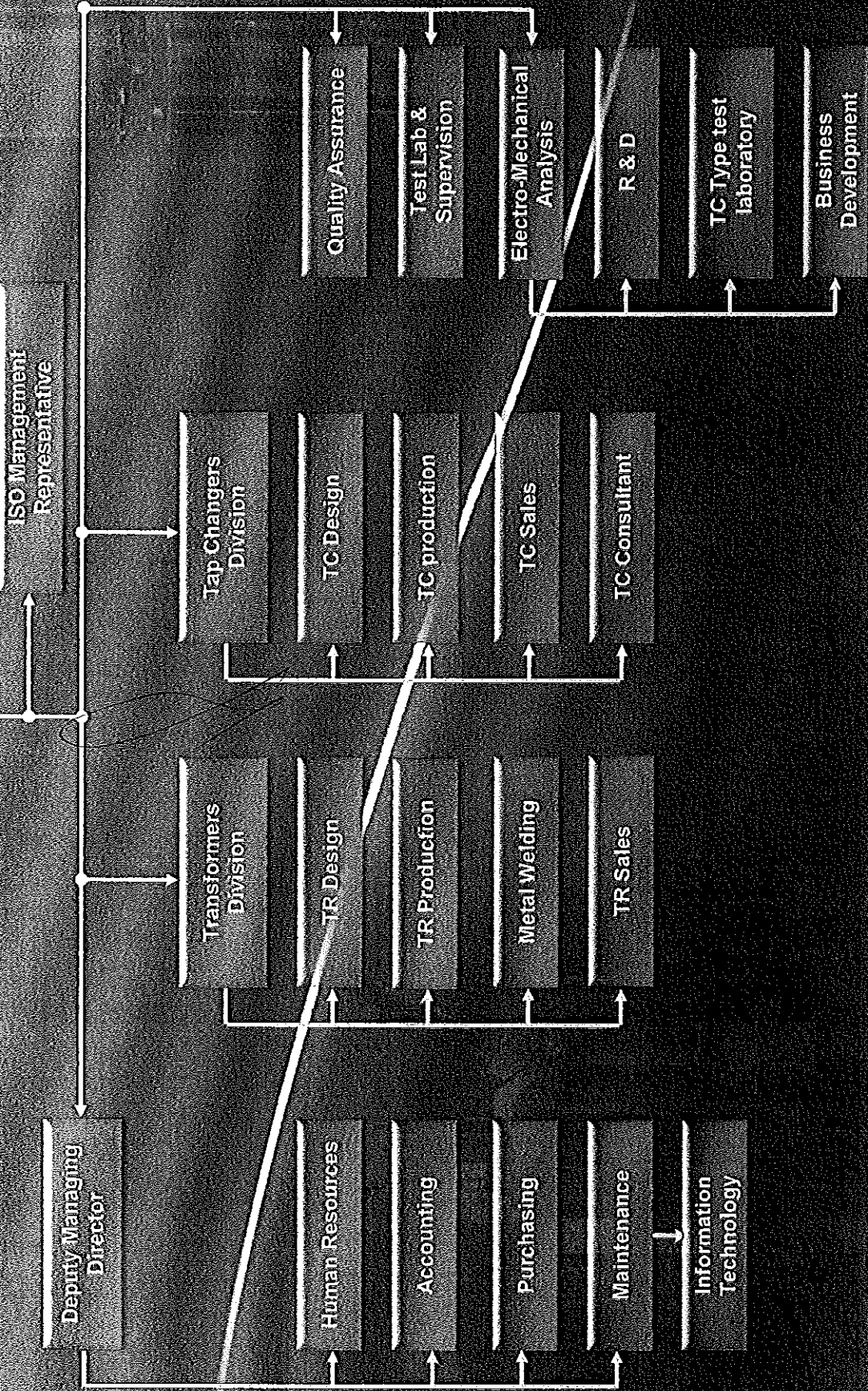
2001

The company name was changed to Hyundai Heavy Industries Co. Bulgaria, JSC

000500

Company Organization Chart

Managing Director

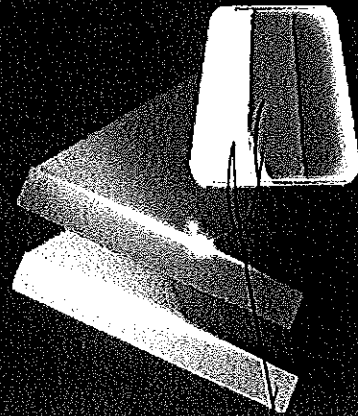


000501

09

Chapter III

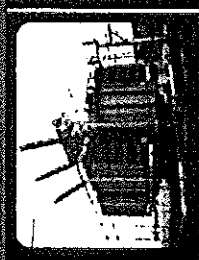
III Company Products



000502

Company Markets and Experience - Transformers

Building a Better Future
Global Leader



TRANSFORMERS

MANUFACTURED

Power Transformers - 2 250 UNITS
Power Transformers - 75 000 MVA



- ◀ Annual production capacity 5 000 MVA
- ◀ Transformer rated capacity up to 250 MVA
- ◀ Transformer rated voltage up to 400 kV

HHIB Transformers have successfully passed type tests

- ◀ KEMA - Netherlands
- ◀ ICMET Craiova - Romania

Asia

Bahrain
Bangladesh
India
Iraq
Jordan
Kuwait
Kazakhstan
Lebanon
Malaysia
Oman
Pakistan
Saudi Arabia
Syria
Turkey
Turkmenistan
UAE

Africa

Algeria
Cape Verde
Egypt
Equatorial
Ghana
Guinea
Kenya
Mali
Morocco
Mozambique
Nigeria
Sudan
Tanzania
Tunisia

Europe

Albania
Bosnia &
Herzegovina
Cyprus
Denmark
Estonia, Finland
France, Greece
Iceland, Ireland
Kosovo
Lithuania
Netherlands
Norway, Moldova
Romania
Russia
Spain, UK
Ukraine

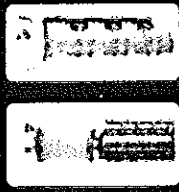
America

Brazil
Cuba
Dominican
Republic
Panama
Jamaica
Venezuela

000503

Company Markets and Experience – Tap-Changers

Building a Better Future
Global Leader



TAP-CHANGERS

MANUFACTURED

Tap Changers - More than 65 000 units

Annual production capacity 2 000 units

The OLTCs have successfully passed type tests

- ▶ KEMA - Netherlands
- ◀ CESI - Italy
- ◀ ZKU - Czech Republic

The OLTCs have been awarded with Golden medals from International Fairs

- ◀ Leipzig - Germany
- ◀ Zagreb - Croatia

Asia

- Bahrain
- China
- Dubai
- India
- Iran, Iraq
- Jordan
- Korea
- Lebanon
- Pakistan
- Saudi Arabia
- Syria
- Thailand
- UAE
- Uzbekistan
- Vietnam
- Mongolia

Africa

- Egypt
- Equatorial Guinea
- Ghana
- Mali
- Morocco
- Tanzania
- Tunisia

Europe

- Albania, Austria
- Belarus, Cyprus
- Bosnia & Herzegovina,
- Czech Republic
- Estonia, Finland,
- France, Greece,
- Hungary, Italy
- Kosovo, Poland
- Lithuania, Spain
- Macedonia, UK
- Moldova, Norway
- Netherlands,
- Ukraine, Portugal
- Romania, Russia
- Turkey, Slovakia
- Switzerland

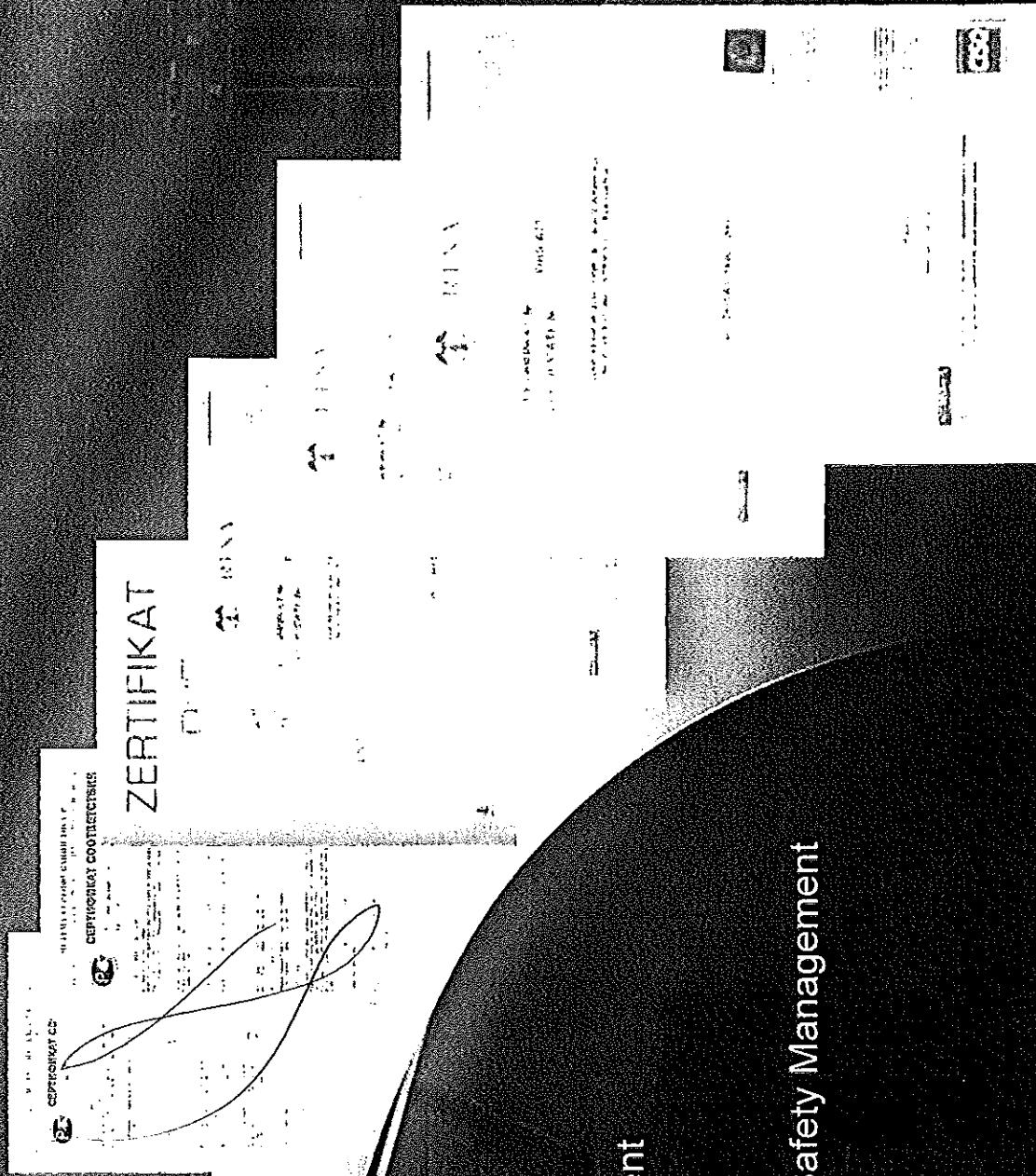
America

- Cuba
- Dominican Republic
- Jamaica
- Mexico
- Brazil
- USA

000000

Certificates & Standards

Building a Better Future
Global Leader



ISO 9001

• Quality Assurance

ISO 14001

• Environment Management

OHSAS 18001

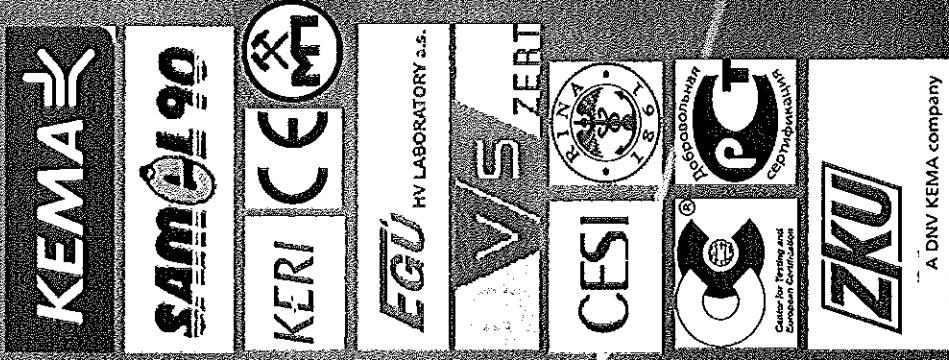
• Occupational Health & Safety Management

EN ISO 3834-2

• Welding Quality

Certificates & Standards

Certificate	Authority	Scope
CE Marking	EU Membership	All Products*
EN	EU	All Products*
BDS	BDS (Bulgaria)	All Products*
DIN	DIN (Germany)	All Products*
ANSI C57.12.00	ANSI (USA)	All Products*
ISO 9001	RINA	All Products*
ISO 14001	RINA	All Products*
OHSAS 18001	RINA	All Products*
ISO 3834-2	DVS Zert	All Products*
KEMA	KEMA (Netherlands)	OLTC & Transformers
IEC 60076	IEC	Power Transformers
GOST P 52749-2007	GOST (Russia)	Power Transformers
GOST 12.2.007.2-75		
GOST 12.2.024-87		
GOST 1516.3-96		
IEC 60214	IEC	OLTC
KERI	KERI (Korea)	OLTC
ZKU	ZKU HV Laboratory	OLTC
CESI	CESI (Italy)	OLTC
GOST 12.2.007.0-75	GOST (Russia)	OLTC
GOST 12.2.007.2-75		
GOST 1516.3-96		
MP	Minproekt (Bulgaria)	MDU
SAMEL90	SAMEL90 (Bulgaria)	MDU
CTEC	CTEC (Bulgaria)	MDU



* All Products – OLTC, OLTC, MDU, HDU, Transformers

00000000

THANK YOU



www.hhi-co.bg

 **HYUNDAI**
HEAVY INDUSTRIES CO. BULGARIA

10-370357

[Handwritten signature]

HHIB performance records for power transformers for years 2000 - 2017

No	Location	Project	Rated power, MVA	Rated Voltages, kV	Units	Year of delivery
1	Bulgaria	AD Tranz	6,67	110/27,5	4	2000
2	Bulgaria	HPP Batak	15	121/10,5	1	2000
3	Bulgaria	HPP Batak	40,5	110/21/10,5	1	2000
4	Bulgaria	HPP Pestera	35	220/105	1	2000
5	Albania	Jacobsen Elektro AS - Norway	100	410/220/30	3	2001
6	Jordan	NEPCO	10	33/11	2	2001
7	Nigeria	NEPA	7,5	33/11	4	2001
8	Nigeria	NEPA	15	33/11	15	2001
9	Oman	AIC - Egypt	120	132/11,5	3	2001
10	Egypt	EETC, S/S El-Eslah	125	220/66/22	2	2002
11	Egypt	REA	25	66/22	3	2002
12	Syria	PEEGT, S/S Swedieh	45,5	230/11,5/6,6	1	2002
13	Bulgaria	HPP St. Kladenetz	45	121/10,5	1	2002
14	Egypt	EETC	125	220/66/11	4	2003
15	Egypt	EETC	125	220/66/11	3	2003
16	Egypt	EETC	125	220/66/22	2	2003
17	Egypt	EETC	125	220/66/22	1	2003
18	Egypt	EETC	75	220/66/22	1	2003
19	Egypt	Trust Chemical Co.	125	220/20/20	2	2003
20	Egypt	EETC	125	220/66/11	1	2003
21	Nigeria	NEPA	7,5	33/11	1	2003
22	Pakistan	WAPDA	160	220/132/11	5	2003
23	Egypt	EETC	125	220/66/11	2	2004
24	Egypt	EETC	125	220/66/11	2	2004
25	Estonia	Gaur	40	347/6,3-6,3 kV	1	2004
26	Jordan	EDCO	10	33/11	2	2004
27	Jordan	EDCO	4	33/3,3	1	2004
28	Albania	KESH, Viora	25	110/20 kV	2	2004
29	Egypt	EETC	125	220/66/11	1	2004
30	Egypt	EETC	150	220/132/11	1	2004
31	Eq. Guinea	Jacobsen Elektro AS - Norway	25	20(15)/11	1	2004
32	France	Solvey - Dombasle	25	10,75(21,5)/11/4,5	2	2004
33	France	Solvey - Dombasle	19	11(22)/10,5	2	2004
34	Bulgaria	HPP Beli Iskar	10	121/6,3	1	2004
35	Bulgaria	HPP Kardzhali	72	121/10,5	1	2004
36	Bulgaria	HPP Ivailovgrad	70	121/10,5	1	2004

000508

No	Location	Project	Rated power, MVA	Rated Voltages, KV	Units	Year of delivery
37	Bulgaria	DSD/RWE	40	32/6,3	3	2004
38	Bulgaria	DSD/RWE	40	220/32	1	2004
39	Albania	KESH - HPP Vau i Dejes	60	242/10,5	1	2005
40	Albania	KESH - HPP Koman	170	242/13,8	1	2005
41	Albania	KESH	120	220/115/37,6	2	2005
42	Egypt	EETC	50	132/36/12	1	2005
43	Jordan	CEGCO	80	132/13,8	1	2005
44	Iraq	Wärtsilä Finland Oy	45	35/11	2	2005
45	Jamaica	Wärtsilä Finland Oy	65	150/11	1	2005
46	Nigeria	NEPA	7,5	33/11	1	2005
47	Nigeria	NEPA	15	33/11	1	2005
48	Bulgaria	EDC Sofia	40	110/21/10,5	2	2005
49	Bulgaria	NEK	40	110/21/16,3	2	2005
50	Bulgaria	HPP Tarmasch	6	115/3,6	1	2005
51	Bulgaria	HPP Pastra	6	115/6,3	1	2005
52	Bulgaria	NEK	40	110/21/16,3	1	2005
53	Ghana	Jacobsen Elektro AS - Norway	26	33/11	15	2005
54	Lithuania	ELGA UAB	10	110/10	2	2005
55	Albania	KESH - HPP Vau i Dejes	60	242/10,5	1	2005
56	Bulgaria	HPP Beli Iskar	11	121/6,3	1	2005
57	Bulgaria	Asarel Meded	8	110/6,3	1	2005
58	Bulgaria	Solvey - Deven	12,5	20/6,3	3	2005
59	Bulgaria	Solvey - Deven	20/16	22/6,3	2	2005
60	Bulgaria	Siemens	10	110/27,5	2	2005
61	Bulgaria	Va-Tech Hydro	50	121/10,5	2	2005
62	Norway	Minihydro AS	5,5	66/6,6	2	2006
63	India	Hyundai Motors	40	210/11	2	2006
64	Cuba	HHIK	8,5	34,5/4,16	18	2006
65	Cuba	HHIK	8,5	13,8/4,16	19	2006
66	Dominica	HHIK	8,5	12,47/4,16	1	2006
67	Malaysia	Wilson Transformer	50	138/11	2	2006
68	Malaysia	Wilson Transformer	6,3	11/6,93	2	2006
69	Saudi Arabia	Mitsubishi Heavy Industries, Japan	19	13,8/4,16	2	2006
70	Finland	Vaasa Engineering Oy	20	110/6,3	1	2006
71	Bahrain	SIDEM, France	42	21/11/11	1	2006
72	Bahrain	SIDEM, France	42	15,75/11/11	1	2006
73	Bahrain	SIDEM, France	6,9	11/2,1/0,42	1	2006
74	Cuba	HHIK	25	115/6,6	11	2006

0

000509

No	Location	Project	Rated power, MVA	Rated Voltages, kV	Units	Year of delivery
75	Cuba	HNIK	12,5	34,5/6,6	6	2006
76	Bulgaria	ENEL Maritza East 3	40	15,75/6,3-6,3	3	2006
77	Bulgaria	NEC - Slanchev Bryag	40	110/21	2	2006
78	Greece	Athena SA	64	150/11	2	2007
79	Greece	Athena SA	12,5	11/6,3	2	2007
80	Iceland	RST Net, Iceland	45	132/34,5	1	2007
81	Bulgaria	NEK	70	121/10,5	1	2007
82	Finland	Vaasa Engineering Oy	10	115/21	1	2007
83	Bulgaria	Solvey - Deven	20	21/6,3	2	2007
84	Bulgaria	Solvey - Deven	12,5	21/6,3	2	2007
85	Bulgaria	Lindegaz	12	110/6	1	2007
86	Bulgaria	ABB	25	110/21/6,3	1	2007
87	Tanzania	Wärtsilä Finland Oy	55	140/11	1	2007
88	Bulgaria	Chelopech	30	110/10,5/6,3	1	2007
89	Bulgaria	TPP Pleven	45	110/11,5/6,3	1	2007
90	Bulgaria	CEZ Bulgaria	40	110/21/21	1	2007
91	The Netherlands	Siemens AG Power Generation	37	31,5/10,5	1	2007
92	Ghana	Volta River Authority	66	161/34,5	2	2007
93	Ghana	Volta River Authority	33	161/34,5	1	2007
94	Ghana	Volta River Authority	25	161/36/11,5	1	2007
95	Ghana	Volta River Authority	33	161/34,5/6,63	1	2007
96	Bulgaria	NEK	40	110/21(6,3)	1	2007
97	Bulgaria	NEK	31,5	110/35/10,5	1	2007
98	Bulgaria	NEK	50	110/21(6,3)	3	2007
99	Bulgaria	Alstom Power Turbo - Systems	60	20/10,5	2	2007
100	Bulgaria	Alstom Power Turbo - Systems	100	20/10,5-10,5	2	2007
101	Spain	Alstom Power Turbo - Systems	35	21/6,75/4,7	1	2007
102	Spain	Alstom Power Turbo - Systems	30	21/6,75/5,6	1	2007
103	Bulgaria	NEK	40	110/21(6,3)	1	2007
104	Venezuela	CADAFE	36	115/13,8	6	2007
105	Pakistan	Wärtsilä Finland Oy - Attok Refinery	85	132/15	3	2008
106	Ghana	Volta River Authority	33	161/34,5/11,5	1	2008
107	Ghana	Volta River Authority	20	69/34,5/11,5	1	2008
108	Ghana	Volta River Authority	33	161/74,5/11,7	1	2008
109	Morocco	Siemens AG Power Generation	22,4	15/6,8/6,8	2	2008
110	Bulgaria	NEK	50	110/21/10,5	2	2008
111	Bulgaria	NEK	50	110/21(6,3)	1	2008
112	Saudi Arabia	SIDEM, France	16	13,8/4,16-4,16	6	2008

No	Location	Project	Rated power, MVA	Rated Voltages, kV	Units	Year of delivery
113	Saudi Arabia	FLUOR / Hyundai Corporation	31,5	34,5/14,5	2	2008
114	Greece	Aluminium S.A. Greece / PPC	170	150/15,75	2	2008
115	UK	Alstom Power Turbo - Systems	40	21/6,75/5,6	4	2008
116	Bulgaria	NEK	23	121/10,5	1	2008
117	UK	Alstom Power Turbo - Systems	35	21/11,5/5,6	3	2008
118	India	Alstom Power Turbo - Systems	35	19/6,75/5,6	1	2008
119	Ireland	Alstom Power Turbo - Systems	32	21/11,5/5,9	1	2008
120	Bulgaria	Neohim	25	110/6,3	1	2008
121	Bulgaria	NEK	50	110/35/10,5	1	2008
122	Ghana	Gold Fields Ghana Ltd. - Tarkwa S/S	33	161/34,5	2	2008
123	Bulgaria	NEK	50	110/21/(6,3)	2	2008
124	Greece	Transport Alstom, France	15	150/27,5	4	2008
125	Egypt	EPPC	75	220/11-11	2	2008
126	Egypt	EETC - Zafarana SS	125	220/22/22	2	2009
127	UAE	Alstom Power Turbo - Systems	100	21/11,5/11,5	3	2009
128	UAE	Alstom Power Turbo - Systems	45	21/11,5/3,6	5	2009
129	Bulgaria	NEK	70	121/10,5	1	2009
130	Bulgaria	NEK	50	110/21/(6,3)	6	2009
131	Bulgaria	AES Maritza East 1	40	110/21	1	2009
132	Bulgaria	Devnja Cement	40	110/6,3/6,3	1	2009
133	Bulgaria	Siemens Bulgaria	10,5	110/27,5	2	2009
134	Egypt	EETC - Bahtem S/S	125	220/72,5/12	3	2009
135	Cuba	HNIK	12,5	115/6,6	3	2009
136	Egypt	EETC - Bahtem S/S	40	66/11	3	2009
137	France	Alstom Power Turbo - Systems	30	21/6,9/5,6	1	2009
138	Egypt	EETC - Sharm El-Sheikh (3) S/S	40	66/22	4	2009
139	Egypt	EETC	125	220/66/11	6	2009
140	Egypt	EETC - Kafr El Zayad S/S	125	220/66/11	2	2009
141	Egypt	EETC - Kafr El Zayad S/S	40	66/11	3	2009
142	Bulgaria	AES GEO Energy - Kavarna	100	110/33	2	2009
143	Bulgaria	Terna	10,5	110/27,5	4	2009
144	Bulgaria	CEZ Bulgaria	63	110/10,5/10,5	1	2009
145	Tunisia	Alstom Power Turbo - Systems	35	21/6,75/5,6	1	2009
146	Bulgaria	Maritza East 2	210	242/18	1	2009
147	Bulgaria	S/S Suvorovo	70	110/20(6,3)	1	2010
148	The Netherlands	Alstom Power Turbo - Systems	45	20/10,5/5,6	3	2010
149	Egypt	EETC - El Zafarana	125	220/22/22	2	2010
150	Egypt	EETC - Abu Kabeer	125	220/66/11	3	2010

000511

No	Location	Project	Rated power, MVA	Rated Voltages, kV	Units	Year of delivery
151	Mali	Wärtsilä Finland Oy	60	150/30	1	2010
152	Kosovo	KEK / TPP "Kosovo B"	48	24/6,6/6,6	1	2010
153	UK	Alstom Power Turbo - Systems	34	21/6,75/3,5	5	2010
154	Romania	Rodax A.T.E.E. - Greece	40	17/6,9	2	2010
155	Bulgaria	ENEL Maritza East 3	40	15,75/6,3-6,3	1	2010
156	Bulgaria	NEK	50	110/21/6,3	5	2010
157	Bulgaria	NEK	50	110/21/10,5	1	2010
158	Egypt	EETC - Baghdad S/S	125	220/66/22	2	2010
159	Egypt	EETC - Bahteem S/S	125	220/66/11	1	2010
160	Egypt	EETC - Damhor Power Station	125	220/66/11	1	2010
161	Albania	Fushe Kruja Cement Factory Sh.P.K	35	220/6,3	1	2010
162	Finland	E.ON - Vaasa Engineering Oy	25	115/21	1	2010
163	Bulgaria	Granatoid	20	115/6,3	1	2010
164	Bulgaria	Granatoid	20	110/21/5	1	2010
165	Bulgaria	Granatoid	2	64/5,25	3	2010
166	Egypt	Global Energy	40	66/22	3	2010
167	Bulgaria	Seul Marine - Korea	15	110/20	4	2010
168	Turkey	Rodax A.T.E.E. - Greece	32	19/6,3	2	2010
169	Jamaica	Wärtsilä Finland Oy	55	72,5/11	2	2010
170	Venezuela	Wärtsilä Finland Oy	36	34,5/13,8	2	2010
171	Cape Verde	Wärtsilä Finland Oy	15	20/11	2	2010
172	Egypt	EETC - Obour S/S	125	220/66/22	3	2011
173	Bulgaria	Maritza East 2	210	242/18	2	2011
174	Egypt	EETC - Naga Hammadi S/S	125	220/66/11	1	2011
175	Egypt	EETC - Al Bostan S/S	125	220/66/11	1	2011
176	Egypt	EETC - Suez 2 S/S	125	220/66/11	2	2011
177	Bulgaria	Ideco - Inigma	20	15,75/6,3 kV	2	2011
178	Egypt	Kharafi National - EDEPC, Al Shabab PP	8	15/6,6 kV	8	2011
179	Egypt	Kharafi National - EDEPC, Damietta PP	8	15/6,6 kV	4	2011
180	Egypt	Kharafi National - EDEPC, Al Shabab PP	165	220/15 kV	8	2011
181	Tanzania	SEMCO Maritime, Denmark	40	220/11 kV	2	2011
182	Egypt	EETC - El Mattar S/S	125	220/66/11	3	2011
183	Egypt	EETC - Quesna S/S	125	220/66/11	1	2011
184	Egypt	EETC - El Zakazeek S/S	125	220/66/11	1	2011
185	Egypt	EETC - El Mahalla S/S	125	220/66/11	1	2011
186	Egypt	EETC - El Kalubia S/S	125	220/66/11	1	2011
187	Turkey	Rodax A.T.E.E. - Greece	21	20/10,5	2	2011
188	Denmark	Nordvestjysk Elforsyning	20	60/10	1	2011

0005

No	Location	Project	Rated power, MVA	Rated Voltages, kV	Units	Year of delivery
189	Finland	Vaasa Engineering Oy	16	117/21	1	2011
190	Morocco	Siemes AG Power Generation	22.4	15/6,8/6,8	1	2011
191	Kosovo	KEK	40	110/21(10,5)/10,5	2	2011
192	Bulgaria	CEZ Bulgaria	63	110/21/10,5	1	2011
193	Egypt	Kharafi National - EDEPC, West Damietta PP	165	220/15 kV	4	2011
194	Egypt	Kharafi National - EDEPC, West Damietta PP	8	15/6,6 kV	4	2011
195	Bulgaria	Eletric city OOD - Bulgaria	22	121/6,3 kV	1	2011
196	Bulgaria	E.ON Bulgaria	50	115/21(10,5)	1	2011
197	Russia	Eurocontact - Russia	7.5	15,75/11	2	2011
198	Egypt	Degla CFM - El Gammal S/S	75	220/22	2	2011
199	Greece	Terna S.A. / PPC	24	150/11	7	2012
200	Finland	Herrfors Nät - Verkko Oy Ab	25	117/21	1	2012
201	Finland	VEO - Westenergy Vaasa	16	117/10,5	1	2012
202	Bulgaria	TPP Maritza East 2	32	110/6,3-6,3	1	2012
203	Kuwait	Alstom Power - Switzerland	40	19/6,8	2	2012
204	Turkmenistan	Energostroyontazh Ltd. - Russia	25	115/38,5/11	2	2012
205	Bangladesh	Wärtsilä Finland Oy	24	33/11	1	2012
206	Bulgaria	Toshel - 92 Ltd.	15	120/20(12)	2	2012
207	Bulgaria	Plama - Pleven	25	110/21(6,3)	1	2012
208	Kosovo	KEK / TPP "Kosovo A"	240	230/15,75	1	2012
209	Greece	EFACEC / PPC	50	150/21	6	2012
210	Estonia	Wärtsilä Finland Oy / Elering	73	115/15	2	2012
211	Kosovo	KEK / ABB Germany - "Pristina" 7 S/S	40	110/10,5(21)/10,5	2	2012
212	Kazakhstan	HHIK / KEGOC	200	220/110/10	1	2012
213	Kazakhstan	HHIK / KEGOC	125	220/110/10	1	2012
214	Kazakhstan	HHIK / KEGOC	125	220/110/6	1	2012
215	Kazakhstan	HHIK / KEGOC	25	220/35/10	3	2012
216	Kuwait	OTV France / SIDEM, France	60	132/11,5	2	2012
217	UK	Wärtsilä Finland Oy - Island of Guernsey	22	34,5/11	1	2012
218	Egypt	EETC - Abu Ghaleb S/S	125	220/66/11	2	2012
219	Egypt	EETC - Ashmoon S/S	125	220/66/11	3	2012
220	Egypt	EETC - Abu Ghaleb S/S	40	66/11	4	2012
221	Egypt	EETC - Ashmoon S/S	40	66/11	4	2012
222	Denmark	Nordvestjysk Elforsyning	20	60/10	1	2012
223	Albania	ABB Austria - HPP Temoves	11	110/6,3	1	2012
224	Bulgaria	Technip, Italy	63	110/15,75	2	2012
225	Bulgaria	E.ON Bulgaria	12,5	21/10,5	1	2012
226	Macedonia	EVN Macedonia - Kumanovo	50	110/21/10,5	1	2012

000513

No	Location	Project	Rated power, MVA	Rated Voltages, KV	Units	Year of delivery
227	Estonia	Alstom Power System S.A. - France	60	35/11-11	1	2013
228	Iraq	ALSTOM Projects India Ltd.	8	15/6,75	4	2013
229	Iraq	ALSTOM Projects India Ltd.	6,8	6,8/0,42	2	2013
230	Algeria	Metka, Greece - Sonelgaz	46	220/11,5-11,5	12	2013
231	Estonia	Alstom Power System S.A. - France	60	18/11-11	1	2013
232	Bulgaria	TPP Sofia	50	115/10,5	1	2013
233	Bulgaria	TPP Sofia	15	10,5/5,3	1	2013
234	Bulgaria	TPP Sofia	6,3	10,5/6,3	1	2013
235	Estonia	Wärtsilä Finland Oy / Elering	73	347/15	3	2013
236	Bulgaria	Siemens - Bulgaria	12,5	110/27,5	4	2013
237	Ghana	Enclave Power Company	33	161/34,5	1	2013
238	Ghana	Enclave Power Company	33	161/11,5	1	2013
239	Macedonia	EVN Macedonia - Kumanovo	50	110/21/10,5	1	2013
240	Jordan	Metka - Greece, Samra project	175	132/15	1	2013
241	Kosovo	KOSTT	40	110/21(10,5)/10,5	1	2013
242	Jordan	Metka - Greece, Samra project	185	135/15	1	2013
243	Mozambique	Wärtsilä Finland Oy / MGEPP	73	275/15	4	2013
244	Armenia	EFACEC / Matur S/S	40	110/35/10	2	2013
245	Egypt	ABB Egypt / BMIC S/S	40	66/11	2	2013
246	Egypt	EETC	125	220/66/11	3	2013
247	Brazil	EFACEC/Eletronorte-Santa Maria S/S	100	230/138-13,8	1	2013
248	Switzerland	Alstom Switzerland	30	21/11,3/5,9	2	2013
249	Switzerland	Alstom Switzerland	15	11/5,9	2	2013
250	Switzerland	Alstom Switzerland	20	22/11,3	1	2013
251	Ukraine	Penstock UK - TPP Harkov	63	115/6,3-6,3	1	2013
252	Kosovo	KEK / TPP "Kosovo A"	20	15,75/6,3	1	2013
253	Brazil	EFACEC / Rondonopolis S/S	100	230/138/13,8	1	2013
254	Brazil	EFACEC / Cauipe S/S	100	230/69	1	2013
255	Brazil	Wärtsilä Finland Oy / Nova Venecia	13	13,8/4,16	1	2013
256	Iraq	SEMCO Maritime, Denmark	10	11/6,6	1	2013
257	Ghana	Zakhem Construction Ghana Ltd.	17	11,5/2,1/6,9	2	2013
258	Bulgaria	Toshel EOOD	10	110/20(6,3)	1	2013
259	Bulgaria	Toshel EOOD	10	110/6,3(6,3)	1	2013
260	Kenya	Wärtsilä Finland Oy	55	66/11	2	2014
261	Jordan	Metka - Greece, Samra project	185	135/15	1	2014
262	Ghana	GRIDCo / Jacobsen Elektro, Norway	33	161/34,5	3	2014
263	Brazil	EFACEC / Itabalana S/S	100	230/69	1	2014
264	Brazil	EFACEC / Natal III S/S	150	230/69	1	2014

0005

No	Location	Project	Rated power, MVA	Rated Voltages, kV	Units	Year of delivery
265	Ghana	Enclave Power Company	66	161/34,5	1	2014
266	Ghana	Enclave Power Company	33	161/11,5	1	2014
267	Bulgaria	Energoremont Holding - TPP Sofia	15	115/6,3	1	2014
268	Switzerland	Alstom Switzerland - Birr project	20	19-22/3,6	1	2014
269	Venezuela	Wärtsilä Finland Oy - Pequiven III	20	24/13,8	1	2014
270	Greece	Aluminium S.A. Greece	36,6	15/17,354	1	2014
271	Greece	Aluminium S.A. Greece	31,5	18/2 x 0,895	1	2014
272	Egypt	Inter Machinex Ltd. / KIMA	12,5	30/0,15	1	2014
273	Albania	Fushe Kruja Cement Factory Sh.P.K	35	220/6,3	1	2014
274	Georgia	Çalik Enerji - Gardabani CCPP	110	220/11	1	2014
275	Georgia	Çalik Enerji - Gardabani CCPP	100	220/11	2	2014
276	Georgia	Çalik Enerji - Gardabani CCPP	15	11/6,3	2	2014
277	Germany	Alstom Switzerland - GuD Niehl 3	30	21/6,45/5,9	1	2014
278	Cape Verde	Wärtsilä Finland Oy	15	20/11	2	2014
279	Cape Verde	Wärtsilä Finland Oy	7	20/11	2	2014
280	Kosovo	KOSTT - SS Skenderaj	40	110/21(10,5)/10,5	1	2014
281	Moldova	GNF Spain	40	15,75/6,3-6,3	1	2014
282	Bulgaria	Maritza East 2	40	15,75/6,3-6,3	2	2014
283	Panama	Constructora Urbana, S.A.	6	13,2/0,48	1	2014
284	Armenia	EFACEC Austria - S/S Kashen	16	110/35/6	1	2014
285	Kosovo	KOSTT - SS Prishtina 2	40	110/21(10,5)/10,5	1	2014
286	Iraq	ALSTOM Middle East FZE	20	15/6,3	2	2015
287	Iraq	ALSTOM Middle East FZE	6,8	6/1,8/0,42	2	2015
288	Bulgaria	Aktor S.A. - Helector S.A. MBT plant	10	110/20(6,3)	1	2015
289	Turkey	Gama, Turkey - Kirikkale	34	17/6,9	2	2015
290	Egypt	ABB Egypt - El-Markby steel	15	66/22	1	2015
291	Egypt	ABB Egypt - El-Markby steel	65	66/33	1	2015
292	Mexico	ALSTOM Power Inc.	15	20/2,8	1	2015
293	Ghana	Jacobsen Elektro AS, Norway/GRIDCo	33	161/11,5	1	2015
294	Bulgaria	TPP Gorna Orjahovitza	6,3	21/6,3	1	2015
295	Egypt	Oraskom - EDEPC, Assuit SCPP	165	220/15	8	2015
296	Egypt	Oraskom - EDEPC, Assuit SCPP	16	15/6,9	8	2015
297	Egypt	Oraskom - EDEPC, West Damietta SCPP	165	220/15	4	2015
298	Egypt	Oraskom - EDEPC, West Damietta SCPP	10	15/6,9	4	2015
299	Egypt	Arcosteel - Egypt	80	220/22,5	1	2015
300	Indonesia	Wartsila Finland Oy - Arun project	60	157/11	4	2015
301	Dominican Republic	Technimont, Italy - Power Plant CDEEE	47,5	22/6,9	4	2015
302	Bulgaria	Energopro - HPP Spanchevo	34	121/10,5	1	2015

No	Location	Project	Rated power, MVA	Rated Voltages, kV	Units	Year of delivery
303	Greece	TERNA - Tithorea	15	150/27,5	1	2015
304	Greece	TERNA - Agios Giorgios project	75	150/21	2	2015
305	Dominican Republic	Technimont, Italy - Power Plant CDEEE	47,5 MVA	138/6,9	1	2015
306	Ukraine	Kvant Servis - TPP Harkov	63	115/6,3-6,3	1	2015
307	Panama	SEMCO Maritime, Denmark - Patacon PP	10,5	13,8/13,8	1	2015
308	Bulgaria	PSS Bulgaria - HPP Pasarel	25	118/10,5	1	2015
309	France	Alstom Power System S.A. - France	12	15/6,9	1	2016
310	Ghana	Enclave Power Company - DAWA project	66	330/34,5	2	2016
311	Bulgaria	TPP Maritza East 2	32/16-16	16/6,3-6,3	2	2016
312	UK	Air Products Plc. - UK	20	22/7	2	2016
313	The Netherlands	Siemens AG - Aftero Moerdijk	150	150/15,75	1	2016
314	The Netherlands	Siemens AG - Aftero Moerdijk	30	15,75/10,5	1	2016
315	British Virgin Islands	Wärtsilä Finland Oy - BVIEC Phase V	35	34,5/13,2	2	2016
316	British Virgin Islands	Wärtsilä Finland Oy - BVIEC Phase V	15	34,5/13,2	1	2016
317	Egypt	EL-Sewedy PS/IEPC - Al Shabab CCPP	125	220/66	2	2016
318	Kosovo	KEK / TPP "Kosovo A"	240	230/15,75	1	2016
319	Zambia	Wärtsilä Finland Oy - Ndola Energy Phase II	75	66/15	2	2016
320	Bulgaria	AMYLUM Bulgaria	25	110/6,3	1	2016
321	Bulgaria	PSS Bulgaria - HPP Pasarel	20	118/10,5	1	2016
322	Latvia	JSC „Augstsprieguma tiklis” - SS "Jecabpils"	10	115/21/6,3	1	2016
323	Bulgaria	Energoremont Holding - TPP Sofia	15	110/6,3	1	2016
324	Ukraine	Kvant Plus	25	115/38,5/11	1	2016
325	Albania	MIG 23 - Bistrica	80	160/115/(6,6)	1	2016
326	Bosnia & Herzegovina	Bicakcic d.o.o., BiH - Ilijas foundry	25	110/20	1	2016
327	UK	Wärtsilä Finland Oy - Island of Guernsey	22	34,5/11	1	2016
328	Ukraine	Kvant Plus - SS "Ilici"	40	115/38,5/11	1	2016
329	Indonesia	Wärtsilä Finland Oy - Jipe 23 MW PP	30	20/11	1	2016
330	Saudi Arabia	Wärtsilä Finland Oy - Yamama Cement Plant	35	33/13,8	6	2016
331	Finland	Tecnicas Reunidas, Spain - Kilpilahti	50,5	117/10,5	2	2016
332	Ukraine	Kvant Plus - TPP Zmiev	32	15,75/6,3-6,3	1	2016
333	Armenia	EFACEC Austria - S/S Kashen	20	110/35/6	1	2016
334	Egypt	Borg al Arab Plant	25	22/11	2	2017
335	Saudi Arabia	Wärtsilä Finland Oy - Yamama Cement Plant	35	33/13,8	4	2017
336	Saudi Arabia	Wärtsilä Finland Oy - Yamama Cement Plant	15	33/13,8	1	2017
337	Greece	CNI - S/S Agiorgitika	50	150/21	1	2017
338	Argentina	Wärtsilä Finland Oy - Central Termica Pilar	63	138/13,2	2	2017
339	UK	Vaasa Engineering Oy - Nordbord Inverness	15	33/11	2	2017
340	Latvia	JSC „Augstsprieguma tiklis” - SS "Koknese"	10	115/21	1	Under manufacturing


00000010

No	Location	Project	Rated power, MVA	Rated Voltages, kV	Units	Year of delivery
341	Kazakhstan	HHIK - Karabatan CCPP	63	115/11	6	Under manufacturing
342	Kazakhstan	HHIK - Karabatan CCPP	45	110/10,5	2	Under manufacturing
343	Latvia	AS "Augstsprieguma tīkls" - SS „Daugavpils”	125	330/115/10,5	1	Under manufacturing
344	Spain	SerIDOM Servicios Integrados Idom SAU	135	161/11,5/11,5	1	Under manufacturing
345	Spain	SerIDOM Servicios Integrados Idom SAU	72	161/11,5	1	Under manufacturing
346	Spain	SerIDOM Servicios Integrados Idom SAU	66	22/6,6/11,5	2	Under manufacturing
347	Bulgaria	EVN Bulgaria - S/S Tsaratsovo	50	110/20	1	Under manufacturing
348	Turkey	Exergy, Italy-Kuyucak Jeotermal Elektrik Uretim	26	154/11	1	Under manufacturing
349	Albania	DOKO sh.p.k - Elbasan	42	110/10,5	2	Under manufacturing
350	Venezuela	Wärtsilä Finland Oy - Petro Miranda	22	34,5/13,8	2	Under manufacturing
351	Argentina	GE Switzerland - Tucuman PP	12	15,75/6,75	1	Under manufacturing
352	Philippines	Wärtsilä Finland Oy - Masbate Gold Extension	7	13,8/4,16	1	Under manufacturing
353	Armenia	EFACEC Austria - S/S HVEN 4	25	110/10	2	Under manufacturing
354	Argentina	Wärtsilä Projects Oy - Central Loma La Lata	63	138/13,2	2	Under manufacturing
355	Ghana	Elecnor, Spain - Kumasi S/S (GRIDCO)	200	330/161/34,5	2	Under manufacturing
356	Ghana	Eiffage Energie - Kintampo S/S (GRIDCO)	200	330/161/34,5	2	Under manufacturing
357	Kosovo	KOSTT - S/S Pristina 6	40	110/10(20)	2	Under manufacturing
358	Kosovo	KOSTT - S/S Mitrovica	40	110/10(20)	2	Under manufacturing
359	Kosovo	KOSTT - S/S Drenasi	40	220/35/10(20)	2	Under manufacturing
360	Bosnia & Herzegovina	Bicakcic d.o.o., BIH - S/S Hak	40	110/36,75/10,5(21)	1	Under manufacturing
361	Ukraine	Kvant Plus - S/S Central Kievenergo	63	115/11-11	2	Under manufacturing
362	Greece	TERNA - Vermio project	50	150/21	1	Under manufacturing
363	Greece	TERNA - Aliveri project	50	150/21	1	Under manufacturing
364	Greece	TERNA - Ptolemais Unit V	125	16,25/15,75/10,5	2	Under manufacturing
365	Greece	TERNA - Ptolemais Unit V	125	21/15,75/10,5	1	Under manufacturing
366	UK	Wärtsilä Finland Oy - Centrica, Brigg	62	132/11/11	1	Under manufacturing
367	UK	Wärtsilä Finland Oy - Centrica, Peterborough	62	132/11/11	1	Under manufacturing
368	Armenia	Cobra, Spain - Yerevan	200	220/110	1	Under manufacturing
369	Armenia	Cobra, Spain - Yerevan	27,5	110/35/6	2	Under manufacturing
TOTAL					763	

000517



Siemens H-Pos: 100; 3EK7 150-5CD4

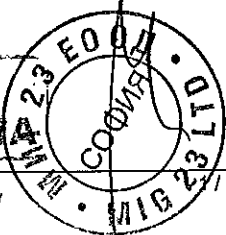
Cage design 

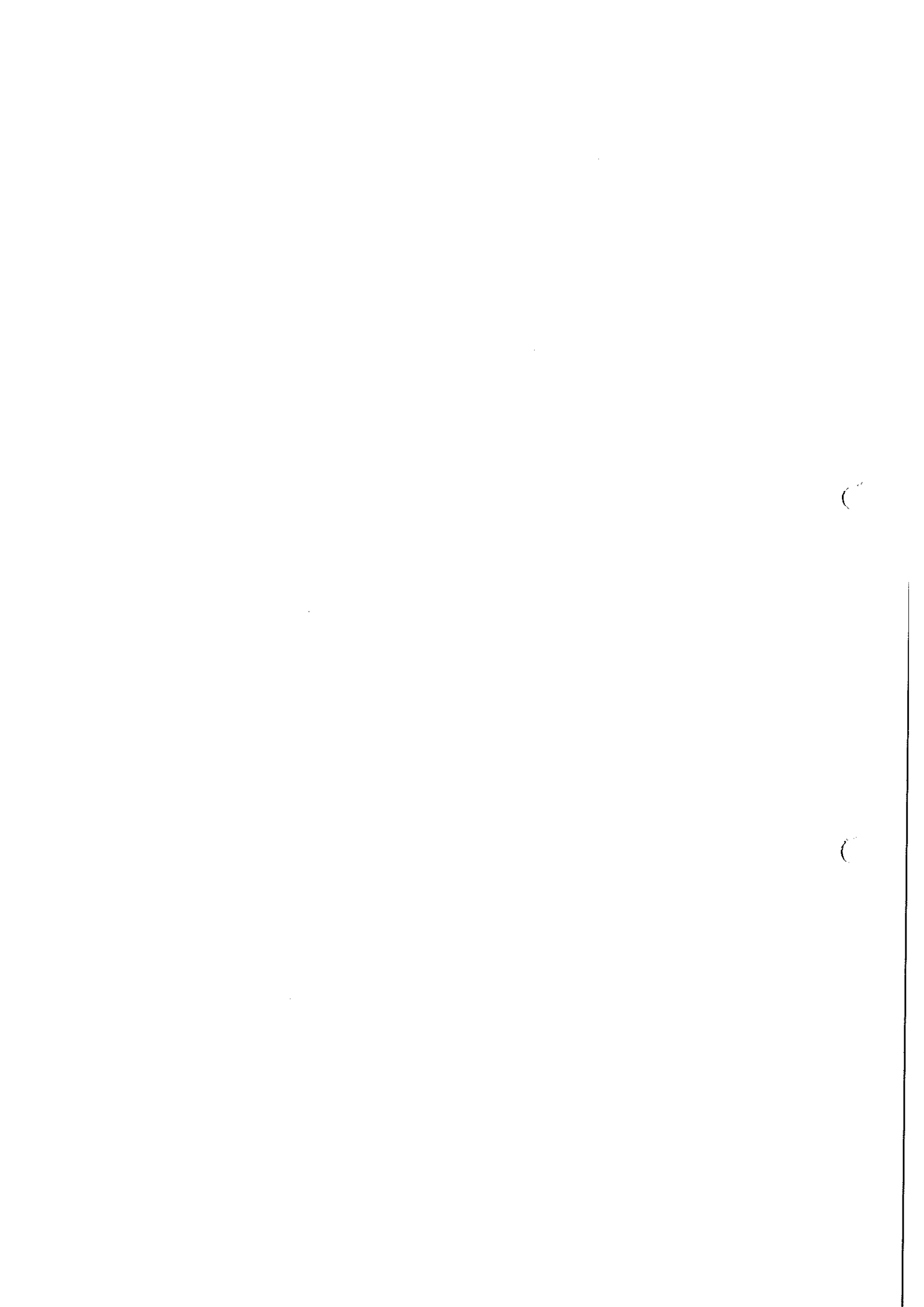
System Information		
Nominal System Voltage (Un)	10,5	kV
Highest Voltage of Equipment (Um)	12,0	kV
Basic Insulation Level (BIL)	145	kV
Maximum altitude of installation (a.s.l.)	1000	m
Neutral system earthing	isolated	
Power Frequency	48 ... 62	Hz
Electrical data		
Applied Standard	IEC 60099-4	
Arrester classification		
Designation	DH	
Nominal discharge current (In, 8/20 µs)	10	kA
Wth	4,5	kJ/kV
Rated voltage (Ur)	15,0	kV
Maximum continuous operating voltage (Uc / MCOV)	12,0	kV
Line discharge class	2	
Long duration impulse current withstand (2 ms)	550	A
High current impulse withstand (4/10 µs)	100	kA
Rated short circuit current (0,2 s)	20,0	kA
Maximum residual voltage at :		
10 kA 1/2 µs	46,4	kV
5 kA 8/20 µs	39,0	kV
10 kA 8/20 µs	41,9	kV
20 kA 8/20 µs	48,2	kV
40 kA 8/20 µs	55,7	kV
500 A 30/60 µs	32,3	kV
1 kA 30/60 µs	33,5	kV
2 kA 30/60 µs	35,2	kV
Temporary overvoltage for 1 s	16,1	kV
Temporary overvoltage for 10 s	15,0	kV
Energy discharge capability - thermal	4,40	kJ/kV _r
Energy discharge capability - impulse	2,70	kJ/kV _r
Power Frequency withstand voltage (1min, wet)	67,0	kV
Lightning impulse withstand voltage (1,2/50 µs)	144	kV
Mechanical data		
Height (H)	240	mm
Minimum creepage distance	605	mm
Weight (G)	2,4	kg
Color of housing	grey	
Specified long-term load SLL (F _{stat}) ³	1450	N
Specified short-term load SSL (F _{dyn}) ³	2080	N
Accessories		
Line terminal	Clamp, washer, nut M12	
Ground terminal	Washer, nut M12	

³ Values without accessories

AL: N
ECCN: N

ВЯРНО С
ОРИГИНАЛА





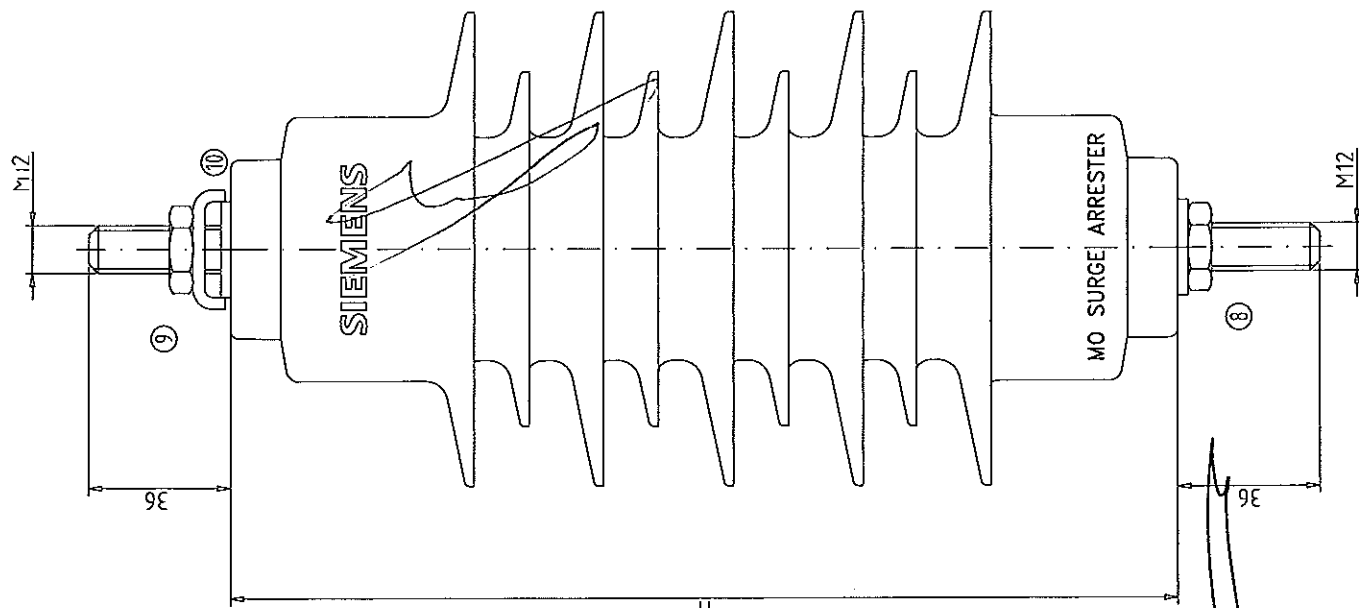
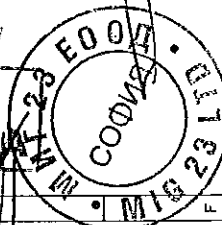
Wichtigste sowie Verändrungs-, Verabreichung und/oder Beschriftung
 dieser Dokumente, Verabreichung und Leitung seiner Inhalte sind
 weiterhin soweit nicht ausdrücklich getrennt Zusammenhängen
 insbesonders zu beachten. Alle Rechte für den Fall der Patent-,
 Gebrauchsmuster- oder Geschmackschutzverletzung vorbehalten.

Технически важни промени, издаване и/или маркировка
 на тези документи, издаване и управление на техните
 съдържания и осигуряване на тяхната връзка са
 допълнително изрично посочени в отделни документи
 за целта. Всички права за патент и/или авторски
 права са запазени. Всички права за патент и/или авторски
 права са запазени. Всички права за патент и/или авторски
 права са запазени.

Технически важни промени, издаване и/или маркировка
 на тези документи, издаване и управление на техните
 съдържания и осигуряване на тяхната връзка са
 допълнително изрично посочени в отделни документи
 за целта. Всички права за патент и/или авторски
 права са запазени. Всички права за патент и/или авторски
 права са запазени. Всички права за патент и/или авторски
 права са запазени.

100

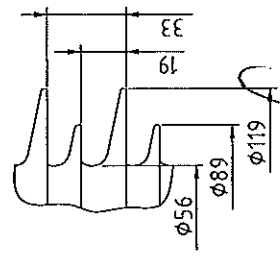
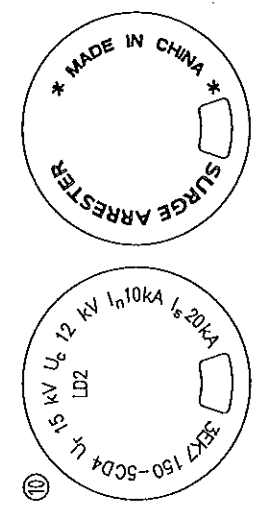
ВЯРНО С
 ОРИГИНАЛА



①	Type	②	U _c kV	③	U _c kV	④	G kg	⑤	n	⑥	SLL N	⑦	k mm
	3EK7 150-5CD4	15	12	12	240	2,4	1	14,50	2080	605			

1. Type
2. Rated voltage
3. Continuous operating voltage
4. Total weight, approx.
5. Number of units
6. Max. permissible pull at insulator top, Values without accessories
7. Min. creepage distance
8. Washer, nut M12
9. Clamp, washer, nut M12
10. Name plate

Remarks
 Frequency: 48 ... 62 Hz
 Altitude above sea level: up to 1000 m
 Material and color of insulator: directly molded silicone housing, grey



SA 24 and 12kV CEZ Bulgaria		Siemens EOOD	
Index	Remark	Appr.	Date
			30.03.2017
First issue	Current update	CAD-drawing	
30.03.2017			
Drawn by	Checked		
Symonians	H.-J. Westphal		
Approved by	Standard		
AL: N		f. type	
ECCN: N		type	
SIEMENS		Surge arrester 3EK7	
EM HP AR / 27128611.0100		B01-	
Replacement for drawing number		Sheet no.	
Prepared by		Index	
file: 27128611-0100.dwg			



HighPROTEC-2 | PROTECTION TECHNOLOGY MADE SIMPLE

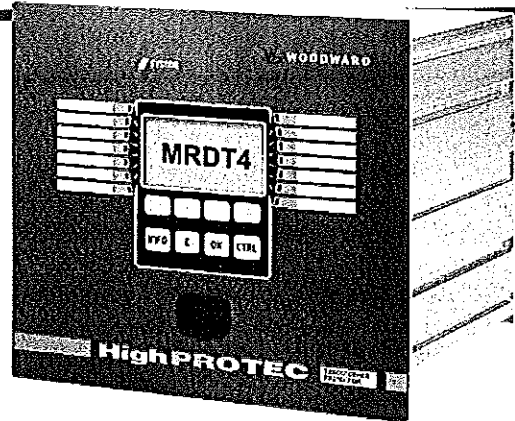
MRDT4-2 | TRANSFORMER DIFFERENTIAL PROTECTION RELAY

**NEW
FEATURES**

- DNP 3.0
- Multiple Communication with one device
- ANSI-Menus structure
- Page Editor
- New front plate with USB
- IEC61850 with LC interface

APPLICATION

The various protective functions of the MRDT4 are specifically tailored to the protection of two winding transformers. The device offers in addition to the differential protection various communication and backup protection functions. Furthermore the MRDT4 can be used for generator differential protection.



ALL INCLUSIVE:

- All protection features without extra charge
- Parameter setting and evaluation software
- Disturbance record analysis software

TRANSFORMER PHASE DIFFERENTIAL PROTECTION

- Stabilized phase differential protection with transients and C.T. saturation detection
- Various selectable transformer groups
- Zero sequence removal
- Three point slope characteristic
- High set element (non-restraint)

TWO ELEMENTS GROUND DIFFERENTIAL PROTECTION

- Three point slope characteristic
- High set element (non-restraint)

BACKUP PROTECTION

- 4 Elements Overcurrent/short-circuit protection (non-directional)
- 4 Elements Earth fault protection (non-directional)
- Tripping characteristics: DEFT
ANSI: NINV, VINV, EINV,
IEC: NINV, VINV, LINV, EINV, RXIDG
Thermal Flat, IT, I2T, I4T

TWO ELEMENTS UNBALANCED LOAD PROTECTION

- Supervision by definite time or tripping characteristic

RECORDERS

- Disturbance recorder: 120 s non volatile
- Fault recorder: 20 faults
- Event recorder: 300 events
- Trend recorder: 4000 non volatile entries

ADDITIONAL HIGHLIGHTS

- Inrush
- Thermal replica
- Four elements external protection
- Plausibility checks
- Adaptive parameter sets
- Status display
- Masking of unused functions
- Breaker Manager and Breaker wear

COMPREHENSIVE MEASURED VALUES AND STATISTICS

- THD (total harmonic distortion)
- Current phasors and angles
- RMS and fundamental
- Sequence currents
- Differential currents

TEMPERATURE PROTECTION

- Buchholz (sudden pressure), ext. oil temperature, and aux. temperature protection via digital input
- Temperature measurement via external RTD-box (option)

SUPERVISION

- Current transformer supervision
- Circuit breaker failure protection
- Trip circuit supervision
- Cold load pickup
- Switch onto fault

COMMISSIONING SUPPORT

- USB connection
- Customizable Display (Single-Line, ...)
- Customizable Inserts
- Copy and compare parameter sets
- Configuration files are convertible
- Forcing and disarming of output relays
- Fault simulator
- Graphical display of tripping characteristics
- 7 languages selectable within the relay

COMMUNICATION OPTIONS

- IEC61850
- Profibus DP
- Modbus RTU or Modbus TCP
- IEC60870-5-103
- DNP 3.0 (RTU, TCP, UDP)

CONTROL

- Two breakers (or isolators/grounding switches)
- Breaker wear

LOGIC

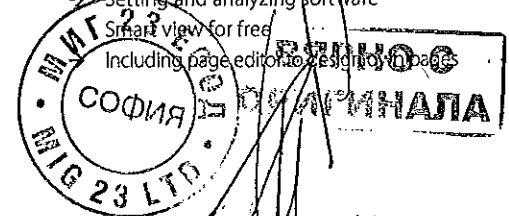
- Up to 80 logic equations for protection, control and monitoring

TIME SYNCHRONISATION

- SNTP or IRIG-B00X

PC TOOLS

- Setting and analyzing software
- Smart view for free including page editor to design the pages



000520



FUNCTIONAL OVERVIEW

Protective Functions		
Transformer differential protection (2 windings), Id: Curve with zero point and three settable slopes and highset element (Id>>), Inrush stabilisation / detection of 2nd, 4th and 5th harmonics	1	87T
Restricted earth fault IdG, IdG>>, characteristics similar to 87T	2	87TN
I, time overcurrent and short circuit protection (non-directional) Multiple reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)	4	50P, 51P
I2>, unbalanced load protection with evaluation of the negative phase sequence currents	2	46
ThR, overload protection with thermal replica for transformers IEC60255-8, alarm and trip threshold	1	49T
IH2/In, inrush detection with evaluation of the 2nd harmonic	2	Inrush
IG, earth overcurrent and short circuit protection (non-directional) Tremendous reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)	4	50N, 51N
Exp, External alarm and trip functions	4	
Control and Logic		
Control: Position indication, supervision time management and interlockings for 2 breakers		
Logic: Up to 80 logic equations, each with 4 inputs, selectable logical gates, timers and memory function		
Supervision Functions		
CBF, circuit breaker failure protection for both circuit breakers	2	50BF
TCS, trip circuit supervision	2	74TC
CTS, current transformer supervision	2	60L
CLPU, cold load pickup	1	
SOTF, switch onto fault	1	
BW, breaker wear	2	
Non volatile event recorder up to 120 s with 32 samples per cycles		
THD supervision		

APPROVALS



certified regarding UL508 (Industrial Controls)



certified regarding CSA-C22.2 No. 14 (Industrial Controls)



certified by EAC (Eurasian Conformity)

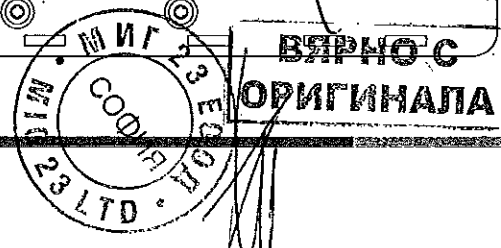
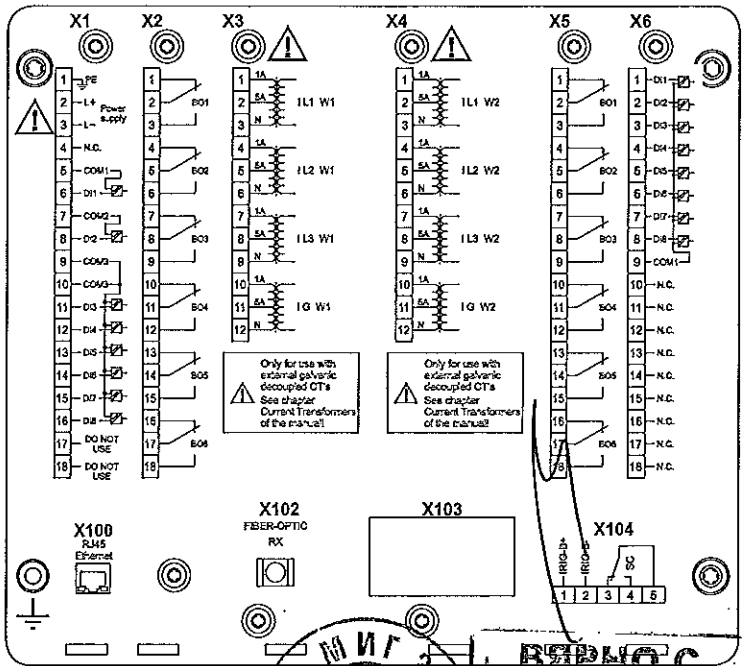


Type tested (and certified) regarding IEC60255-1

complies with IEEE 1547-2003 amended by IEEE 1547a-2014

complies with ANSI C37.90-2005

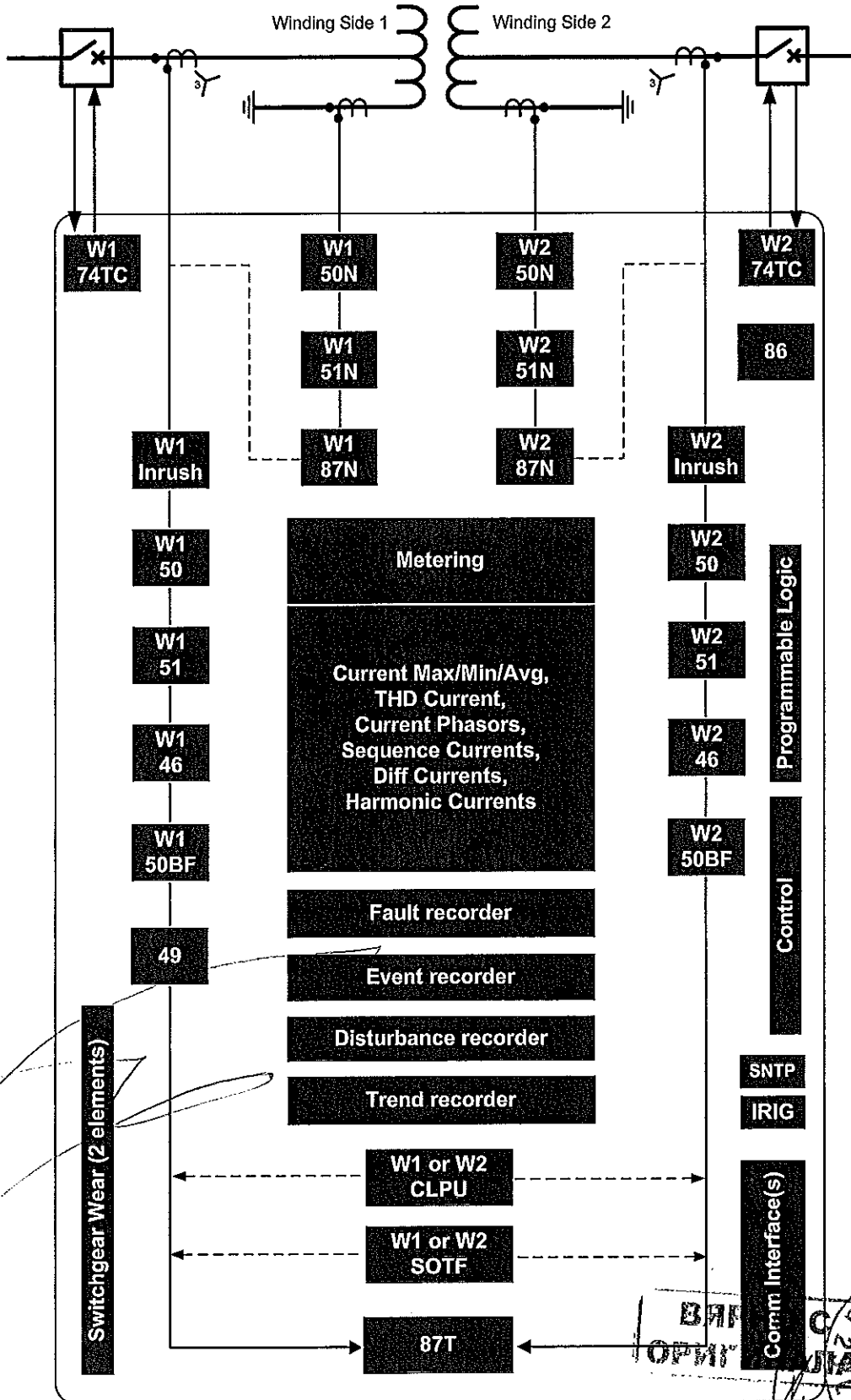
CONNECTIONS (EXAMPLE)



FUNCTIONAL OVERVIEW IN ANSI FORM

MRDT4

Typical Configuration



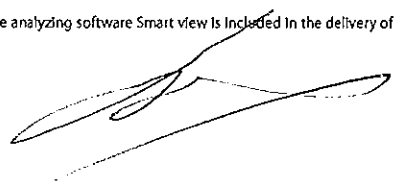


ORDER FORM MRDT4-2

Non-directional Transformer Differential Protection				MRDT4 -2
Version 2 with USB, enhanced communication and user options				
Digital Inputs	Binary output relays	Housing	Large display	
8	7	B2	-	A
16	13	B2	-	D
Hardware variants				
Phase Current 5 A/1 A, W1/W2 Ground Current 5 A/1 A				0
Phase Current 5 A/1 A, W1 Sen. Gr. Curr. 5 A/1 A, W2 Gr. Curr. 5 A/1 A				1
Phase Current 5 A/1 A, W1 Gr. Curr. 5 A/1 A, W2 Sen. Gr. Curr. 5 A/1 A				2
Phase Current 5 A/1 A, W1/W2 Sen. Gr. Curr. 5 A/1 A				3
Housing and mounting				
Door mounting				A
Door mounting 19" (flush mounting)				B
Communication protocol				
Without protocol				A
Modbus RTU, IEC60870-5-103, DNP3.0 RTU RS485/terminals				B*
Modbus TCP, DNP3.0 TCP/UDP Ethernet 100 MB/RJ45				C*
Profibus-DP optic fiber/ST-connector				D*
Profibus-DP RS485/D-SUB				E*
Modbus RTU, IEC60870-5-103, DNP3.0 RTU optic fiber/ST-connector				F*
Modbus RTU, IEC60870-5-103, DNP3.0 RTU RS485/D-SUB				G*
IEC61850, Modbus TCP, DNP3.0 TCP/UDP Ethernet 100MB/RJ45				H*
IEC60870-5-103, Modbus RTU, DNP3.0 RTU RS485/terminals				I*
Modbus TCP, DNP3.0 TCP/UDP Ethernet 100 MB/RJ45				J*
IEC61850, Modbus TCP, DNP3.0 TCP/UDP Optical Ethernet 100MB/LC duplex connector				K*
Modbus TCP, DNP3.0 TCP/UDP Optical Ethernet 100MB/LC duplex connector				L*
Harsh Environment Option				
None				A
Conformal Coating				B
Available menu languages (In every device)				
Standard English/German/Spanish/Russian/Polish/Portuguese/French				

* Within every communication option only one communication protocol is usable. Smart view can be used in parallel via the Ethernet Interface (RJ45).

The parameterizing- and disturbance analyzing software Smart view is included in the delivery of HighPROTEC devices.



Current Inputs	8 (1 A and 5 A) with automatic CT Disconnect
Digital Inputs	Switching thresholds adjustable via software
Power supply	Wide range power supply 24 V _{DC} - 270 V _{DC} / 48 V _{AC} - 230 V _{AC} (-20/+10%)
Terminals	All terminals plug type
Type of enclosure	IP54
Dimensions of housing (W x H x D)	19" flush mounting: 212.7 mm x 173 mm x 208 mm 8.374 in. x 6.810 in. x 8.189 in. Door mounting: 212.7 mm x 183 mm x 208 mm 8.374 in. x 7.200 in. x 8.189 in.
Weight (max. components)	approx. 4 kg

CONTACT:

North & Central America

Phone: +1 970 962 7331
E-mail: SalesPGD_NAandCA@woodward.com

South America

Phone: +55 193708 4800
E-mail: SalesPGD_SA@woodward.com

Europe

Phone: +49 2152 145 331
E-mail: SalesPGD_EUROPE@woodward.com

Middle East & Africa

Phone: +971 2 6275185
E-mail: SalesPGD_MEA@woodward.com

Russia

Phone: +7 812 319 3007
E-mail: SalesPGD_RUSSIA@woodward.com

China

Phone: +86 512 8818 5515
E-mail: SalesPGD_CHINA@woodward.com

India

Phone: +91 124 4399 500
E-mail: SalesPGD_INDIA@woodward.com

ASEAN & Oceania

Phone: +49 711 78954 510
E-mail: SalesPGD_ASEAN@woodward.com



© Woodward
All Rights Reserved | 09/2015

HighPROTEC-2

ТЕХНОЛОГИЯ ЗА ЗАЩИТА
НАПРАВЕНА ПРОСТО

MCA4-2

РЕЛЕЙНА ЗАЩИТА И УПРАВЛЕНИЕ ЗА ИЗВОД,
МРЕЖА И ГЕНЕРАТОР

WOODWARD

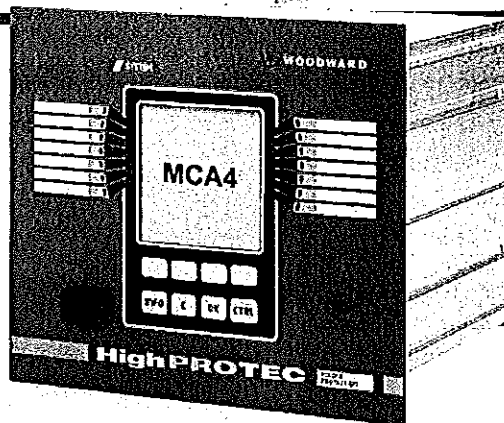
NEW
FEATURES

- DNP 3.0
- Multiple Communication with one device
- ANSI Menu structure
- Page Editor
- New front plate with USB
- IEC61850 with LC interface

Приложение

MCA4 е прецизно и надеждно реле за защита, управление и мониторинг на извод, мрежа и генератор. Като последно поколение серия от SEG/Woodward, MCA4 включва всички ANSI и IEC стандарти за постигане на съвместимост с постоянно променящите се изисквания при взаимосвързаност на мрежите. Гъвкавостта по отношение на хардуер, софтуер, приложение, потребителски интерфейс и комуникации, прави MCA4 подходяща при днешните изисквания, а също така и в бъдеще. Хардуерът е проектиран да работи при всички номинални стойности, в комбинация с функции по защита и управление.

Софтуерът за параметризиране и анализ Smart view е подходящ за всички HighPROTEC устройства.



Подробен

пакет защита ⁽¹⁾

- Шест елемента фазна MT3 посочна или непосочна (ANSI/IEC/51C/51V).
- Четири елемента земна защита ⁽²⁾ непосочна или посочна.
- Два елемента защита от небалансиран товар.
- Напреженова защита ⁽²⁾
- шест елемента, по избор: $V<$, $V>$, $V<(t)$.
- Шест елементна супервизия по небаланс на напрежение.
- Гъвкав четвърти напреженов вход. ⁽²⁾
- Избор от VE> или VX (за синхро-чек).
- Проверка по синхронизъм (синхро-чек)
- Генератор-Система или Система-Система.
- Всеки от шестте елемента на честотната защита може да се използва като: $f<$, $f>$, ROCOF, vector surge...
- Шест елемента мощностна защита, всеки може да се използва като: $P>$, $P<$, Pq , $Q>$, $Q<$, Qr , $S>$, $S<$
- Два елемента защита по $\cos \phi$ (PF)

Качество на енергията

- THD защита (общо хармонично изкривяване)

Управление на потребление/ Върхови стойности

Върхови ст-ти на ток и мощност. Средно потребление на ток и енергия

Пакет при взаимосвързване на мрежи

Този пакет е обобщен под отделно меню

- Разпределение на товара в зависимост от посоката.
- FRT (LVRT): Настройваеми FRT-профили, координирани с АПВ.
- QV-Защита: Защита по Мин. напреж.-Реактивна мощност
- Автоматична защита по честота:
- Шест елемента конфигурируеми като: $f<$, $f>$, df/dt (ROCOF), Vector Surge CB-Intertripping
- Проверка по синхронизъм
- (Генератор-мрежа, мрежа-мрежа), опции на пр. при захранена линия-незахранена шина

Супервизия по средноквадратични стойности
→ Настройваеми (VDE-AR 4105)

Регистратори

- Аварии: 120 s енергонезависими
- Повреди: 20 повреди
- Събития: 300 събития
- Аналогови ст-ти: 4000 енергонезависими въвеждания

Помощни инструменти

- Софтуер за параметризиране и анализ Smart view
- Включен редактор на еднолинейна мнемо схема

Поддръжка

- USB връзка
- Програмируем дисплей (Single-Line, ...)
- Програмируеми входове
- Копиране и сравняване на параметри
- Конвертируеми конфиг. файлове
- Сработване и деактивиране на изходи
- Симулатор на повреди: ток и напреж.
- Графики на изключвателни х-ки
- 7 езика избираеми в релето

Опции за комуникация

- IEC61850
- Profibus DP
- Modbus RTU или Modbus TCP
- IEC60870-5-103
- DNP 3.0 (RTU, TCP, UDP)

Управление

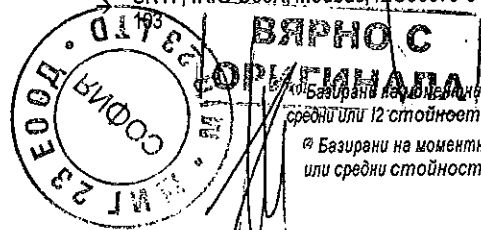
- на до шест съоръжения (прекъсвачи, разединители или земни ножеве)
- Износване на прекъсвача

Логика

- до 80 логически уравнения за защита, управление и мониторинг

Синхронизация по време

- SNTP, IRIG-B00X, Modbus, IEC60870-5-



000524

Преглед на функциите

	ИТЕМЪН/У	ANSI
Защитни функции		
I, MTO, MT3, всички елементи могат да бъдат конфигурирани като посочни или непосочни. Множество опции за ресет (мигновени, време независими, ресет характеристики съгл. IEC и ANSI). Контролирана по напрежение максималнотокова защита посредством адаптивни параметри Зависима от напрежението максималнотокова защита Максималнотокова защита при обратен фазов ред	6	50P, 51P, 67P 51C 51V 51Q
I2>, защита от небалансиран товар с оценка на токовете на обратна последователност	2	46
IB, защита от претоварване с термична реплика и отделни стойности за аларма и изключване	1	49
IN2/п, регистриране на намагнитващ товар и оценка по 2ри хармоник	1	Inrush
IG, земна отсечка, земна защита, всички елементи могат да бъдат конфигурирани като посочни или непосочни. Множество опции за ресет (мигновени, време независими, ресет характеристики съгл. IEC и ANSI)..	4	50N, 51N, 67N
V<, V>, V(t)<, мин.- и макс. напрежена защита, време зависима мин.напрежена защита	6	27, 59
Супервизия по асиметрия на напрежението (V012) V1, мин. и макс. напрежение на права последователност V2, макс. напрежение на обратна последователност	6	47
Всеки от шестте елемента честотна защита се използва като: f< fs, df, dt, ROCOF, DF/DT, vector surge, ...	6	81U/O, 81R, 78
VX, защита остатъчно напрежение или напрежение на шини за Synch Check	2	25 or 59N
AR, Автоматично повторно включване (АПВ)	1	79
Exp, Функции външна аларма и изключване	4	
PQS, Мощностна защита	6	32, 37
PF, Фактор на мощност	2	55
FRT, блокировка по минимално напрежение (опция координиране с АПВ)	27 (t)	27 (t, AR)
Q(V), Защита (зависима по мин.напрежение посочна реактивна мощност с деактивиране на АПВ)		
UFLS (разпределение на товара в зависимост от посоката на активна мощност)		
10-минутна супервизия на средно-квадратични ст-ти: настройваема съгл. VDE-AR 4105		
Synch Check		25
Управление и логики		
Управление: Индикация на позицията, супервизия на времето и взаимни блокировки за до 6 съоръжения		
Логики: до 80 броя, всяка с по 4 входа, избираеми логически уравнения и таймери		
Функции по супервизия		
CBF, Защита от повреда на прекъсвача	1	50BF
TCS, следене на изключвателната верига	1	74TC
LOR, загуба на потенциал	1	60FL
FF, повреда на предпазител чрез цифров вход	1	60FL
CTS, следене състоянието на токов трансформатор	1	60L
CLPU, студен старт	1	
SOTF, превкл. върху к.с.	1	
Супервизия на потребление и върхови ст-ти (ток и мощност)		
THD супервизия		
Износване на прекъсвач		
Регистратори: Аварии, Повреди, Събития, Аналогови ст-ти		



Форма за поръчка MCA4-2

Посочна защита на извод				MCA4 -2
Версия 2 с USB връзка, разширена комуникация и потребителски опции				
Цифрови входа	Цифрови изхода	корпус	широк диспл.	
8	7	B2	X	A
16	13	B2	X	D
Хардуерен вариант 2				
Фазов ток 5 A/1 A, Земен ток 5 A/1 A				0
Фазов ток 5 A/1 A, Чувств. земен ток 5 A/1 A				1
Корпус и монтаж				
Вграден				A
Вграден 19" (релеен шкаф)				B
Комуникационен протокол				
Без протокол				A
Modbus RTU, IEC60870-5-103, DNP3.0 RTU RS485/клеморед				B*
Modbus TCP, DNP3.0 TCP/UDP Ethernet 100 MB/RJ45				C*
Profibus-DP оптика/ST-конектор				D*
Profibus-DP RS485/D-SUB				E*
Modbus RTU, IEC60870-5-103, DNP3.0 RTU оптика/ST-конектор				F*
Modbus RTU, IEC60870-5-103, DNP3.0 RTU RS485/D-SUB				G*
IEC61850, Modbus TCP, DNP3.0 TCP/UDP Ethernet 100MB/RJ45				H*
IEC60870-5-103, Modbus RTU, DNP3.0 RTU RS485/клеморед				I*
Modbus TCP, DNP3.0 TCP/UDP Ethernet 100 MB/RJ45				J*
IEC61850, Modbus TCP, DNP3.0 TCP/UDP Optical Ethernet 100MB/LC duplex connector				K*
Modbus TCP, DNP3.0 TCP/UDP Optical Ethernet 100MB/LC duplex connector				L*
Опция за замърсена среда				
Без				A
Защитно покритие				B
Език на менюто (във всяко устройство)				
English/German/Spanish/Russian/Polish/Portuguese/French				

* За всяка опция на комуникацията се използва само един протокол.
Smart view може да се използва паралелно през Ethernet интерфейс (RJ45).

Софтуерът за параметризиране и анализ Smart view е включен в доставката на HighPROTEC устройствата.

Токови входове	4 (1 A и 5 A) с автоматично закъсяване	
Напреженови входове	4 (0-800 V)	
Цифрови входове	Праговете на заработване се настр. чрез софтуера	
Захранване	Широкообхватно захранване 24 V _{DC} - 270 V _{DC} / 48 V _{AC} - 230 V _{AC} (-20/+10%)	
Клеми	Всички клеми са изваждаеми	
Тип на покритието	IP54	
Размери на корпуса	19" монтаж	212.7 mm x 173 mm x 208 mm 8.374 in. x 6.811 in. x 8.189 in.
(Ш x В x Д)	Вграден монтаж:	212.7 mm x 183 mm x 208 mm 8.374 in. x 7.205 in. x 8.189 in.
Тегло (максимално)	прибл. 4.2 kg / 9.259 lb	

Контакти:

Северна и Централна Америка

Phone: +1 970 962 7331
E-mail: SalesPGD_NAandCA@woodward.com

Южна Америка

Phone: +55 19 3708 4800
E-mail: SalesPGD_SA@woodward.com

Европа

Phone: +49 2152 145 331
E-mail: SalesPGD_EUROPE@woodward.com

Близък Изток и Африка

Phone: +971 2 6275185
E-mail: SalesPGD_MEA@woodward.com

Русия

Phone: +7 812 319 3007
E-mail: SalesPGD_RUSSIA@woodward.com

Китай

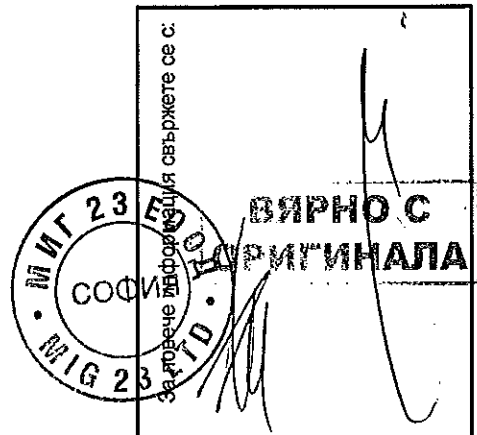
Phone: +86 512 8818 5515
E-mail: SalesPGD_CHINA@woodward.com

Индия

Phone: +91 124 4399 500
E-mail: SalesPGD_INDIA@woodward.com

Азия и Океания

Phone: +49 711 78954 510
E-mail: SalesPGD_ASEAN@woodward.com



© Woodward

All Rights Reserved, 09/2015

000527

Declaration of conformity

We, Woodward Kempen GmbH, a reputable manufacturer of digital relay protections, established under laws of Germany, and having a head office at Krefelder Weg 47, 47906 Kempen, Germany, herewith

Certify

That

The offered protection relays type MCA4-2, MRDT4-2 support the following communication protocols:

IEC 60870-5-103, IEC 61850-5, MODBUS RTU, MODBUS TCP/IP
for optical or electrical connection.

Signed for and on behalf of Woodward Kempen GmbH

Maciej Madej

Sales Support Engineer

000520



Декларация за съответствие

Ние, Уудуорд Кемпен ГмбХ, реномиран производител на цифрови релейни защиты, основани според законите на Германия и имащи главен офис на Крефелдер Вег 47, 47906 Кемпен, Германия, с настоящото

Декларираме

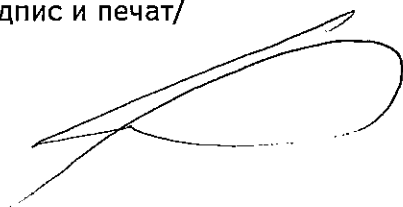
че

Оферираните от нас релейни защиты, тип MCA4-2, MRDT4-2 поддържат следните комуникационни протоколи:

IEC 60870-5-103, IEC 61850-5, MODBUS RTU, MODBUS TCP/IP
за оптична или електрическа връзка.

Подписано за и от името на Уудуорд Кемпен ГмбХ,

/подпис и печат/



ВЯРНО С
ОРИГИНАЛА



Handwritten signature over stamp

000520

ДЕКЛАРАЦИЯ

за приемане на условията в проекта на договор

Долуподписаният/-ната/ Антон Иванов Илиев в качеството ми на представляващ Обединение „МИГ - Хюндай“ (името на участника) участник в обществена поръчка с предмет: „Доставка, демонтаж и монтаж на трифазни маслонапълнени понижаващи силови трансформатори 110kV/ Средно напрежение (СрН) и цялото необходимо помощно оборудване“, реф.№ PPD 17-001, обособена позиция № 6 /ОП6/, подстанция /ПС/ „Георги Димитров“.

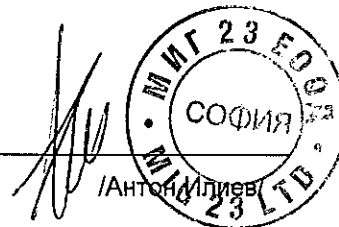
(посочва се № и наименование на обособената позиция)

ДЕКЛАРИРАМ, ЧЕ:

Приемам условията в проекта на договор, приложен в документацията за участие.

Дата 18.04.2017г.

Декларатор: _____



/Антон Илиев/

000530

(

((

(

(

ДЕКЛАРАЦИЯ
за срока на валидност на офертата

Долуподписаният/ -ата Антон Иванов Илиев,

(собствено, бащино, фамилно име)

притежаващ/а лична карта №641903354, издадена на 01.02.2011г. от МВР – гр. София,

адрес: гр. София, ж.к. Света Троица, бл. 339Б, ет.4, ап.14 ,

(постоянен адрес)

в качеството ми на Управител

(посочва се длъжността)

на Обединение „МИГ – Хюндай”,

(посочете наименованието на участника)

участник в процедура за възлагане на обществена поръчка с предмет: „Доставка, демонтаж и монтаж на трифазни маслонапълнени понижавачи силови трансформатори 110kV/ Средно напрежение (СрН) и цялото необходимо помощно оборудване”,

(наименование на поръчката)

Обособена позиция №6 /ОП6/, подстанция /ПС/ „Георги Димитров”

(посочва се № и наименование на обособената позиция)

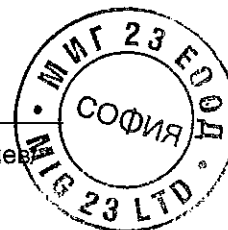
ДЕКЛАРИРАМ, ЧЕ:

С подаване на настоящата оферта, направените от нас предложения и поети ангажименти са валидни за срока, посочен в обявлението, считано от крайния срок за подаване на офертите.

Дата 18.04.2017г.

Декларатор: _____

/Антон Илиев



000531

C. 6

C. 7