Attachment No. 2

KRAC 50/12	E12KA-01010301300	M12	√	9,8	16,0	42	62	25	70	50	16	3	6
KRAC 50/14	E12KA-01010301400	M14	–	9,8	16,0	42	62	25	70	50	16	3	5
KRAC 70/8	E12KA-01010301500	M8	√	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/10	E12KA-01010301600	M10	√	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/12	E12KA-01010301700	M12	√	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/14	E12KA-01010301800	M14	–	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/16	E12KA-01010301900	M16	–	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 95/10	E12KA-01010302000	M10	√	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 95/12	E12KA-01010302100	M12	√	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 95/14	E12KA-01010302200	M14	–	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 95/16	E12KA-01010302300	M16	–	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 120/10	E12KA-01010302400	M10	√	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 120/12	E12KA-01010302500	M12	√	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 120/14	E12KA-01010302600	M14	–	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 120/16	E12KA-01010302700	M16	√	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 150/10	E12KA-01010302800	M10	√	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/12	E12KA-01010302900	M12	√	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/14	E12KA-01010303000	M14	–	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/16	E12KA-01010303100	M16	√	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/20	E12KA-01010303200	M20	–	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 185/10	E12KA-01010303300	M10	√	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/12	E12KA-01010303400	M12	√	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/14	E12KA-01010303500	M14	–	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/16	E12KA 01010303600	M16	√	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/20	E12KA-01010303700	M20	–	18,3	28,5	60	91	30	240	185	28	3	6

Product data sheet (continued):

I-POB-07/01-Z3w9

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Attachment No. 2

KRAC 240/10	E12KA-01010303800	M10	--	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/12	E12KA-01010303900	M12	√	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/14	E12KA-01010304000	M14	–	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/16	E12KA-01010304100	M16	√	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/20	E12KA-01010304200	M20	–	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 300/12	E12KA-01010304400	M12	√	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 300/14	E12KA-01010304500	M14	–	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 300/16	E12KA-01010304600	M16	√	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 300/20	E12KA-01010304700	M20	√	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 500/16	E12KA-01010305201	M16	√	29,0	44,0	80	122	44	-	500	44	4	-

ASSOCIATION of POLISH ELECTRICIANS
QUALITY TESTING OFFICE
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since 1933
TESTING LABORATORY

AB 044

TEST REPORT
PN-EN 61238-1
Compression and mechanical connectors for power cables for rated voltages up 36 kV (U_m = 42 kV)
Part 1: Test methods and requirements (IEC 61238-1:2003, modified)

Report Reference No. ..... :	LA-17.062/17.045/3/E	
Data of issue ..... :	2017-12-29	
Total number of pages ..... :	19	
Tested by ..... : (name + position + signature)	Krzysztof Podgórniak Specialist	на основание чл. 36а, ал. 3 от ЗОП
Authorized by ..... : (name + position + signature)	Dariusz Szczepanowski Manager of LA	
Testing application number ..... :	C-A-17-062/17.045	
Test item reference ..... :	S-A-17-045	
Scope of test ..... :	☒ - type test	☐ - partial test
Test specification:		
Standard/procedure ..... :	☒ PN-EN 61238-1:2004, EN 61238-1:2003, IEC 61238-1:2003 (Second Edition)	
Non-standard test methods ..... :	N/A	
Non-accredited test methods ..... :	N/A	
Applicant's name ..... :	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o.	
Address ..... :	ul. Nowe Sady 10, 94-102 Łódź	

The BBJ test report form is not permitted for commercial purposes without written approval of the BBJ Testing Laboratory

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Test item description ..... :	Aluminium terminals longitudinally sealed
Trade Mark ..... :	ERGOM®
Manufacturer ..... :	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź
Model/Typ reference ..... :	KRAC 16 ÷ 300 / This report covers test of KRAC 120/12
Ratings ..... :	Nominal cross-sectional area: 16 mm^2 ÷ 300 mm^2 / This report covers test of 120 mm^2

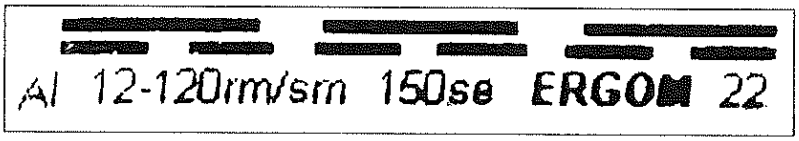
List of Attachments:

Attachment No.	Attachment No.	Attachment No.
1	Summary of the test result	1
2	Product information and photos of samples	6

Summary of testing:

Test performer (in the case of partial tests): N/A	**Testing location/address** (if different from page 1) : Stowarzyszenie Elektryków Polskich, Biuro Badawcze ds. Jakości Association of Polish Electrician, Quality Testing Office ul. M. Rapackiego 13, 20-150 Lublin, POLAND
Number of tests with F (Fail) verdict:	0
Summary conformity/non-conformity with standardization document (if apply):	N/A
Summary of compliance with National Differences (if apply): Provide list of standards.	N/A
Opinion and interpretation if needed:	N/A
Other additional information (as requested by the applicant):	N/A

Copy of marking plate:



KRAC 120/12

ВЯРНО С ОРИГИНАЛА
Подпис I-POB-07/01-Z3w9

Test item particular:	
Classification of installation and use ..... :	N/A
Supply Connection ..... :	N/A
Date (s) of receipt of test item ..... :	2017-06-23 (Sample No. 1.1...1.7, 4.1...4.7) 2017-07-20 (Sample No. 2.1...2.21) 2017-09-11 (Sample No. 3.1...3.21) 2017-10-06 (Sample No. 4.8...4.19) 2017-10-13 (Sample No. 1.8...1.21)
Date (s) of performance of tests ..... :	2017-06-28...2017-12-29
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement .....:	F (Fail)
Test report general remarks:	
1. The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.	
2. "(See Enclosure #)" refers to additional information appended to the report..	
3. "(See appended table)" refers to a table appended to the report	
4. Throughout this report a comma is used as the decimal separator.	
5. Test Report Form is based on TRF No.: IEC61238_1A, copyrighted by IECEE.	
Production place(s) .....:	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź

ВЯРНО С ОРИГИНАЛА
Подпис: .....

General product information:

Tests were carried out on samples of aluminium terminals longitudinally sealed type KRAC, nominal cross sectional area 16 mm^2 ÷ 300 mm^2.
According to the standard and as agreed with the manufacturer for the tests were prepared four loops: 16 mm^2, 70 mm^2, 120 mm^2 and 300 mm^2 cross sectional area.
This report covers test of 120 mm^2, KRAC 120/12.

Electro-hydraulic presses HKP 22 EL with hexagonal die KP22-W120 was used to crimp testing terminals KRAC 120. Hexagonal die KP22-W120 is dedicated to aluminium terminals with a DIN-conforming tubular part (size DIN 22) for crimping cables RMC/RMV.
Cable YAKY 1x120 mm^2 RMV 0,6/1kV, manufacturer NKT was used to electrical and mechanical tests of terminals KRAC 120.
Torque for screw of terminal lugs was 27,7 Nm ÷ 29,1 Nm.

Samples were marked for the tests as S-A-17-045/1.1...1.21, S-A-17-045/2.1...2.21, S-A-17-045/3.1...3.21 and S-A-17-045/4.1...4.19. In the Test Report abbreviated marking of the samples, as the samples No. 1.1...1.21, 2.1...2.21, 3.1...3.21, 4.1...4.19 is used.

Type:	No.:
KRAC 16/10	1.1...1.21
KRAC 70/12	2.1...2.21
KRAC 120/12	3.1...3.21
KRAC 300/12	4.1...4.19

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
Identification			—
	Connector		—
	Type of connector	☐ through connector ☐ branch connector ☒ terminal lug	—
	Nominal cross-sectional area ..... :	120 mm^2	—
	Class of connector	☒ Class A ☐ Class B	—
5.1	**Conductor**		—
	conductor material..... :	Al	—
	nominal cross-sectional area..... :	120 mm^2 RMV	—
	actual conductor area ..... :	120 mm^2 RMV	—
	leading dimensions and shape..... :	Unpreparted cable	—
	type of conductor (solid or stranded) ..... :	120 mm^2 - stranded	—
	details of conductor construction (in the case of stranded conductors) ..... :	120 mm^2 – stranded cable, round, 23 wires	—
	compacted / non-compacted ..... :	Compacted	—
	flexible ..... :	No	—
	number of wires ..... :	23 wires	—
	direction of lay ..... :	Right	—
	plating..... :	No plating	—
	type of impregnation, if any ..... :	—	—
	approximate indication of hardness (annealed, half-hard, hard)..... :	Hard	—
	type of insulation (in case of insulation-piercing connectors)..... :	—	—
5.2	**Connectors and tooling**		—
	assembly technique ..... :	Crimp connection	—
	tooling and necessary settings ..... :	Electro-hydraulic presses HKP 22 EL with hexagonal die KP22-W120. Hexagonal die KP22-W120 is dedicated to aluminium terminals with a DIN-conforming tubular part for crimping cables RMC/RMV. Size DIN 22; torque wrench	—
	preparation of contact surfaces ..... :	Terminal lug filled with contact grease	—

ВЯРНО С ОРИГИНАЛА
Подпис: .....

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	type, reference number and other identification of the connector .....:	KRAC 120: surface: tin-plated; material: Al	—
6	**Electrical tests**		P
6.1	**Installation**		P
	six connectors fitted in accordance with the manufacturer's instructions		P
	welded equalizers used	Yes	P
	in case of insulation-piercing connectors, the insulation retained on the conductor under the connector, and for a distance of at least 100 mm outside the connector		N/A
	ambient temperature of the test location (between 15 °C and 30 °C) .....:	18 °C...24 °C	P
	the test loop is dismantleable for short-circuit test (class A connectors only)	Short-circuit test performed without dismantling, loop divided on two sections for test	N/A
	the technology of the sectioning joints do not influence the measurements		N/A
	bolts or screws of the connectors were not retightened under test		P
6.1.1	Through connectors and terminal lugs		—
	test loop and dimensions according to Figure 1	See Attachment No. 2	P
	linking bars used (in case of terminal lugs)	Without use of linking bars	N/A
	the palms bolted to the linking bars in accordance with the manufacturer's instructions		N/A
	linking bars have the same dimensions and material as the palm		N/A
	palm connected direct to palm	Direct connected (see Attachment No. 2)	P
6.1.2	Branch connectors		—
	branch connector is treated as a through connector between the main and the branch (size of branch cable equal to the main, or immediately above or below the main)		N/A
	In other cases, test loop and dimensions according to Figure 2		N/A
6.2	**Measurements**		P
6.2.1	Electrical resistance measurements		P
	measurements made at stages throughout the test as specified in 6.3		P

ВЯРНО С ОРИГИНАЛА
Подпис: .....

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	method used	☒ indirect ☐ direct	—
	indirect method: measuring current is 10 % of the heat cycling current	KRAC 120: 36 A ÷ 38 A	P
	potential points as indicated in Figure 3 and annex B		P
	Precision of resistance measurements, indirect method		—
	voltage: max. ±0,5 % or ±10 µV, actual precision ..... :	±0,5 %	P
	current: max. ±0,5 % or ±0,1 A, actual precision ..... :	±0,5 %	P
	Precision of resistance measurements, direct method: better than ±1 % or ±0,5 µΩ, actual precision ..... :	—	N/A
6.2.2	Temperature measurements		P
	stages as specified in 6.3		P
	the temperature of connectors and reference conductor measured at the points as indicated in Figure 3	Figure 3a, 3e, 3f	P
	thermocouples used as reference method	Yes	P
	total accuracy of temperature measurements: ±2 °C or better, actual accuracy ..... :	±2,0 °C	P
6.3	**Heat cycle test**		P
	power frequency current used	AC 50 Hz	P
6.3.1	First heat cycle		—
6.3.1 a)	Non insulation-piercing through connectors and terminal lugs	Sample No. 3.1...3.6	P
	current is circulated in the test loop, bringing the reference conductor to 120 °C at equilibrium		P
	measured temperature of the median connector . :	Sample No. 3.3: 103,3 °C	—
	reference conductor temperature (120 °C ≤ Θ_R ≤ 140 °C) ..... :	126,2 °C	—
	equilibrium current I_N ..... :	425 A	—
6.3.1 b)	Non insulation-piercing branch connectors		N/A
	test circuit according to	☐ Figure 1 ☐ Figure 2	—
	current is circulated in the test loop, bringing the reference conductor to 120 °C at equilibrium		N/A

ВЯРНО С ОРИГИНАЛА
Подпис: .....

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	current in all individual branch adjusted so that each branch reference temperature is the same as the main reference temperature		N/A
	measured temperature of the median connector ..:		—
	reference conductor temperature (120 °C ≤ Θ_R ≤ 140 °C) .....:		—
	equilibrium current I_N .....:		—
6.3.1 c)	Insulation-piercing connectors (IPC)		N/A
	test circuit according to	☐ Figure 1 ☐ Figure 2	—
	isolated reference conductor used		N/A
	permitted temperature of the cable .....:		—
	temperature of the median connector is set 10 K above permitted temperature of the cable		N/A
	measured temperature of the median connector ..:		—
	temperature of the reference conductor(s) is(are) set max.15 K above permitted temperature of the cable		N/A
	temperature of the isolated reference conductor(s) at equilibrium .....:		N/A
	equilibrium current I_N .....:		—
6.3.2	Second heat cycle	Sample No. 3.1...3.6	—
	current is circulated in the loop until the main reference conductor temperature reaches the value Θ_R determined in 6.3.1 with a tolerance of +6 °C	126 °C ÷ 132 °C	P
	the median connector temperature is stable within 2 °C over a 10 min period		P
	current flow time (t_1) .....:	49 min	—
	accelerated heating used	☒ Yes ☐ No	—
	accelerated heating time .....:	17 min	—
	accelerated heating time according to Table 1	10 min	P
	cooling time (t_2) .....:	15 min	—
	After cooling, the temperature of all connectors and the reference conductor ≤ 35 °C		P
	accelerated cooling used with ambient air	☒ Yes ☐ No	—
6.3.3	Subsequent heat cycles	Sample No. 3.1...3.6	—
	a total of 1000 heat cycles performed		P
	Measurements performed at the following cycles:		—
	Class A: 0, 200 (before and after short-circuit test), 250, then every 75		P

ВЯРНО С ОРИГИНАЛА
Подпис: .....

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Class B: 0, 250, then every 75		N/A
	cold resistance and temperature of each connector and reference conductor/conductors measured	See TABLE 1/1 and TABLE 1/2	P
	maximum temperature of each connector measured	See TABLE 2	P
6.3.4	Short-circuit tests (for Class A connectors only)	Sample No. 3.1...3.6	P
	six short circuits applied after the 200th heat cycle	Short-circuit test performed without dismantling, loop divided on two sections for test	P
	short-circuit current .....:	I half: 11,71 kA ÷ 11,78 kA, II half: 11,61 kA ÷ 11,68 kA	—
	short-circuit current raises the reference conductors from a temperature of ≤35 °C to a temperature between 250 °C and 270 °C		P
	measured temperature of the reference conductor:	I half: 254,6 °C ÷ 256,4 °C, II half: 252,2 °C ÷ 259,2 °C	P
	duration of the short-circuit current (1 s below 25 kA, ≤5 s above 25 kA) .....:	I half: 1,37 s ÷ 1,40 s, II half: 1,39 s ÷ 1,44 s	P
	the test loop cooled to a temperature ≤ 35 °C after each short circuit		P

6.4	**Assessment of results**		P
	Calculated parameters:		—
	connector resistance factor *k*, calculated according to annex E, clause E.2 .....:	See TABLE 3/1 and TABLE 3/2	—
	initial scatter δ, between the six initial values of *k* measured prior to heat cycling, calculated according to annex E, clause E.3 .....:	See TABLE 4/1 and TABLE 4/2	P
	mean scatter β, between the six values of *k* averaged over the last 11 measurement intervals, calculated according to annex E, clause E.4 .....:	See TABLE 5/1 and TABLE 5/2	P
	change in resistance factor *D* for each of the six connectors, calculated according to annex E, clause E.5 .....:	See TABLE 6/1 and TABLE 6/2	P
	resistance factor ratio λ calculated according to annex E, clause E.6 .....:	See TABLE 7/1 and TABLE 7/2	P
	maximum temperature Θ_{max} on each connector, recorded according to annex E, clause E.7 .....:	See TABLE 2	P

6.5	**Requirements**		P
	more than four connectors satisfy the requirements shown in table 2		N/A
	one full re-test performed	☐ Yes ☐ No	—

ВЯРНО С ОРИГИНАЛА
Подпис: .....

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	six connectors satisfy the requirements shown in table 2		P
	values of δ do not exceed 0,3	See TABLE 4/1 and TABLE 4/2	P
	values of β do not exceed 0,3	See TABLE 5/1 and TABLE 5/2	P
	values of D do not exceed 0,15	See TABLE 6/1 and TABLE 6/2	P
	values of λ do not exceed 2,0	See TABLE 7/1 and TABLE 7/2	P
	values of Θ_{max} do not exceed Θ_{ref}	See TABLE 2	P
7	**Mechanical tests**		P
7.1	Test method		—
	the test is made on three connectors different from those used for the electrical test	Sample No. 3.7...3.9	P
	connectors are fitted as for the electrical test of 6.1		P
	the conductor lengths, between connectors or between connector and tensile test machine jaws, are more than 500 mm		P
	the rate of application of the load do not exceed 10 N/mm^2 of cross-section per second		P
7.2	Requirements		P
	tensile force applied during one minute	Conductor of 120 mm^2 Al; 1 min	P
	force for aluminium, (40×A [mm^2], max. 20 000) ..:	40 x 120 = 4800 N	P
	force for copper, (60×A [mm^2], max. 20 000) .....:		N/A
	in case the connector is electrically tested for conductors with difference cross-sectional area, the different joints tested individually to the above requirements		N/A
	no slipping during the tensile test		P

ВЯРНО С ОРИГИНАЛА
Подпис: .....

PN-EN 61238-1

6.3.3	TABLE 1/1: cold resistance and temperature of the connectors							—
cycle		connectors						reference conductor
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	R [mΩ]	0,0515	0,0523	0,0514	0,0511	0,0511	0,0511	0,0704
	Θ [°C]	19,9	20,5	20,4	20,5	20,3	20,2	20,1
200.*	R [mΩ]	0,0519	0,0528	0,0518	0,0514	0,0516	0,0511	0,0708
	Θ [°C]	21,0	21,3	21,3	21,5	21,5	21,6	20,9
200.*	R [mΩ]	0,0537	0,0554	0,0536	0,0530	0,0533	0,0532	0,0708
	Θ [°C]	23,0	23,4	23,7	23,5	23,5	23,6	23,1
250.	R [mΩ]	0,0538	0,0559	0,0537	0,0528	0,0532	0,0533	0,0708
	Θ [°C]	21,7	21,8	22,1	22,2	22,2	21,9	21,9
325.	R [mΩ]	0,0540	0,0560	0,0541	0,0533	0,0535	0,0537	0,0709
	Θ [°C]	21,7	22,3	22,3	22,4	22,5	22,7	21,8
400.	R [mΩ]	0,0539	0,0558	0,0539	0,0530	0,0535	0,0537	0,0708
	Θ [°C]	19,3	19,6	19,9	20,0	20,1	20,0	19,3
475.	R [mΩ]	0,0538	0,0559	0,0540	0,0532	0,0534	0,0537	0,0707
	Θ [°C]	20,2	20,6	20,7	20,8	20,7	20,8	20,3
550.	R [mΩ]	0,0538	0,0561	0,0541	0,0533	0,0535	0,0534	0,0709
	Θ [°C]	21,0	21,5	21,7	21,8	21,8	21,7	21,0
625.	R [mΩ]	0,0539	0,0560	0,0540	0,0532	0,0535	0,0536	0,0706
	Θ [°C]	21,2	21,5	21,8	21,8	21,8	21,8	21,4
700.	R [mΩ]	0,0539	0,0558	0,0540	0,0531	0,0534	0,0536	0,0707
	Θ [°C]	22,9	23,2	23,6	23,6	23,5	23,4	22,8
775.	R [mΩ]	0,0539	0,0559	0,0540	0,0532	0,0535	0,0536	0,0705
	Θ [°C]	23,6	24,0	24,3	24,3	24,2	24,2	23,6
850.	R [mΩ]	0,0539	0,0560	0,0540	0,0532	0,0534	0,0538	0,0706
	Θ [°C]	21,4	21,7	22,0	22,0	21,9	22,0	21,5
925.	R [mΩ]	0,0540	0,0560	0,0539	0,0534	0,0534	0,0537	0,0706
	Θ [°C]	20,9	21,2	21,4	21,5	21,5	21,5	21,0
1000.	R [mΩ]	0,0538	0,0557	0,0538	0,0533	0,0534	0,0537	0,0705
	Θ [°C]	18,6	19,2	19,3	19,5	19,3	19,1	18,8
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 3.1...3.6 (conductor of 120 mm^2)								

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6.3.3	TABLE 1/2: cold resistance and temperature of the connectors							
cycle		connectors						reference conductor
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	R [mΩ]	0,0035	0,0035	0,0036	0,0038	0,0037	0,0037	0,0704
	Θ [°C]	20,0	20,6	20,5	20,6	20,4	20,4	20,1
200.*	R [mΩ]	0,0039	0,0036	0,0036	0,0037	0,0036	0,0038	0,0708
	Θ [°C]	21,1	21,5	21,5	21,6	21,6	21,8	20,9
200.*	R [mΩ]	0,0035	0,0035	0,0037	0,0037	0,0037	0,0035	0,0708
	Θ [°C]	23,1	23,5	23,7	23,6	23,6	23,6	23,1
250.	R [mΩ]	0,0035	0,0036	0,0037	0,0038	0,0035	0,0035	0,0708
	Θ [°C]	21,8	22,0	22,3	22,5	22,4	22,1	21,9
325.	R [mΩ]	0,0035	0,0036	0,0037	0,0038	0,0035	0,0035	0,0709
	Θ [°C]	22,0	22,4	22,5	22,5	22,6	22,8	21,8
400.	R [mΩ]	0,0036	0,0036	0,0037	0,0038	0,0035	0,0035	0,0708
	Θ [°C]	19,4	19,7	20,0	20,0	20,3	20,0	19,3
475.	R [mΩ]	0,0035	0,0035	0,0036	0,0038	0,0034	0,0036	0,0707
	Θ [°C]	20,3	20,7	20,8	20,9	20,8	21,0	20,3
550.	R [mΩ]	0,0035	0,0035	0,0036	0,0038	0,0034	0,0035	0,0709
	Θ [°C]	21,1	21,6	21,9	21,9	21,9	21,9	21,0
625.	R [mΩ]	0,0035	0,0034	0,0036	0,0038	0,0037	0,0035	0,0706
	Θ [°C]	21,2	21,6	21,9	21,9	21,9	21,9	21,4
700.	R [mΩ]	0,0035	0,0035	0,0036	0,0038	0,0035	0,0035	0,0707
	Θ [°C]	22,9	23,3	23,8	23,8	23,7	23,7	22,8
775.	R [mΩ]	0,0035	0,0035	0,0037	0,0037	0,0035	0,0036	0,0705
	Θ [°C]	23,7	24,1	24,4	24,3	24,4	24,3	23,6
850.	R [mΩ]	0,0035	0,0035	0,0037	0,0037	0,0035	0,0035	0,0706
	Θ [°C]	21,5	21,8	22,1	22,2	22,1	22,2	21,5
925.	R [mΩ]	0,0035	0,0035	0,0037	0,0037	0,0037	0,0035	0,0706
	Θ [°C]	21,0	21,3	21,4	21,6	21,7	21,7	21,0
1000.	R [mΩ]	0,0035	0,0035	0,0036	0,0037	0,0035	0,0035	0,0705
	Θ [°C]	18,6	19,2	19,4	19,4	19,3	19,1	18,8
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 3.1...3.6 – palm of terminal lug (conductor of 120 mm^2)								

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6.3.3	TABLE 2: maximum temperature of each connector measured							P
cycle		connectors						reference conductor
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	Θ_{max} [°C]	101,4	102,4	103,3	104,0	100,7	104,4	126,2
200.*	Θ_{max} [°C]	96,0	101,1	104,3	104,4	100,5	107,0	129,1
200.*	Θ_{max} [°C]	103,0	109,9	111,8	111,4	108,7	113,8	129,1
250.	Θ_{max} [°C]	103,4	110,5	111,5	110,9	107,7	112,7	129,4
325.	Θ_{max} [°C]	102,0	109,5	110,0	111,2	109,0	112,7	130,6
400.	Θ_{max} [°C]	103,0	111,4	109,5	111,7	109,1	112,7	129,7
475.	Θ_{max} [°C]	100,1	108,6	107,7	109,8	106,9	111,6	126,8
550.	Θ_{max} [°C]	101,4	108,4	108,2	109,8	107,1	113,2	127,5
625.	Θ_{max} [°C]	102,4	110,6	108,3	110,8	108,0	112,1	129,0
700.	Θ_{max} [°C]	101,2	109,4	106,2	108,6	106,1	111,1	129,7
775.	Θ_{max} [°C]	98,2	105,4	101,5	102,5	101,4	107,0	128,1
850.	Θ_{max} [°C]	100,0	106,0	104,0	104,1	103,0	107,7	131,3
925.	Θ_{max} [°C]	98,3	105,8	101,7	103,5	101,6	107,4	127,3
1000.	Θ_{max} [°C]	98,2	105,3	101,4	103,0	101,6	107,3	127,3
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 3.1...3.6 (conductor of 120 mm^2)								

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6.4	TABLE 3/1: connector resistance factor k, calculated according to annex E, clause E.2							P
Parameters:		L_a=	165 mm	L_b=	— mm	L_r=	290 mm	L_{jt}=	60 mm
cycle		**connectors**							
		j=1	**j=2**	**j=3**	**j=4**	**j=5**	**j=6**		
0.		0,7827	0,8376	0,7758	0,7552	0,7552	0,7552		
200.*		0,7919	0,8533	0,7851	0,7578	0,7714	0,7373		
200.*		0,9148	1,0308	0,9080	0,8670	0,8875	0,8806		
250.		0,9216	1,0650	0,9148	0,8533	0,8806	0,8875		
325.		0,9339	1,0703	0,9408	0,8862	0,8999	0,9135		
400.		0,9284	1,0581	0,9284	0,8670	0,9011	0,9148		
475.		0,9298	1,0733	0,9434	0,8887	0,9024	0,9229		
550.		0,9203	1,0771	0,9408	0,8862	0,8999	0,8930		
625.		0,9379	1,0817	0,9448	0,8900	0,9105	0,9174		
700.		0,9366	1,0665	0,9434	0,8819	0,9024	0,9161		
775.		0,9461	1,0832	0,9530	0,8981	0,9187	0,9255		
850.		0,9379	1,0817	0,9448	0,8900	0,9037	0,9311		
925.		0,9448	1,0817	0,9379	0,9037	0,9037	0,9242		
1000.		0,9392	1,0695	0,9392	0,9050	0,9118	0,9324		
(*) rows marked with asterisk can be omitted in case of connectors type "B"									
Supplementary information: Sample No. 3.1...3.6 (conductor of 120 mm^2)									

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6.4	TABLE 3/2: connector resistance factor k, calculated according to annex E, clause E.2							P
Parameters:		L_a=	165 mm	L_b=	— mm	L_r=	290 mm	L_{jp}=	35 mm
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.		0,4176	0,4166	0,4260	0,4429	0,4339	0,4310	
200.*		0,4519	0,4197	0,4206	0,4384	0,4165	0,4401	
200.*		0,4062	0,4118	0,4272	0,4336	0,4319	0,4138	
250.		0,4057	0,4157	0,4367	0,4417	0,4140	0,4059	
325.		0,4099	0,4156	0,4272	0,4405	0,4147	0,4116	
400.		0,4236	0,4198	0,4283	0,4480	0,4056	0,4090	
475.		0,4139	0,4131	0,4258	0,4444	0,4037	0,4188	
550.		0,4055	0,4142	0,4170	0,4429	0,3978	0,4104	
625.		0,4145	0,4010	0,4262	0,4414	0,4326	0,4138	
700.		0,4052	0,4115	0,4166	0,4444	0,4080	0,4078	
775.		0,4121	0,4149	0,4301	0,4335	0,4146	0,4179	
850.		0,4156	0,4063	0,4309	0,4326	0,4114	0,4112	
925.		0,4159	0,4089	0,4335	0,4300	0,4394	0,4142	
1000.		0,4126	0,4135	0,4241	0,4392	0,4113	0,4101	
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 3.1…3.6 – palm of terminal lug (conductor of 120 mm^2)								

6.4	TABLE 4/1: initial scatter δ, between the six initial values of k measured prior to heat cycling, calculated according to annex E, clause E.3							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$\underline{K_0}$	0,7770	0,7770	0,7770	0,7770	0,7770	0,7770	
	s_0	0,0320	0,0320	0,0320	0,0320	0,0320	0,0320	
	δ	0,0680	0,0680	0,0680	0,0680	0,0680	0,0680	
Supplementary information: Sample No. 3.1…3.6 (conductor of 120 mm^2)								

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6.4	TABLE 4/2: initial scatter δ, between the six initial values of k measured prior to heat cycling, calculated according to annex E, clause E.3							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$\underline{K_0}$	0,4280	0,4280	0,4280	0,4280	0,4280	0,4280	
	s_0	0,0101	0,0101	0,0101	0,0101	0,0101	0,0101	
	δ	0,0389	0,0389	0,0389	0,0389	0,0389	0,0389	
Supplementary information: Sample No. 3.1...3.6 – palm of terminal lug (conductor of 120 mm^2)								

6.4	TABLE 5/1: mean scatter β, between the six values of k averaged over the last 11 measurement intervals, calculated according to annex E, clause E.4							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	$\underline{k}$	0,9342	1,0735	0,9392	0,8864	0,9032	0,9162	
	$\underline{K}$	0,9421	0,9421	0,9421	0,9421	0,9421	0,9421	
	s	0,0673	0,0673	0,0673	0,0673	0,0673	0,0673	
	β	0,1179	0,1179	0,1179	0,1179	0,1179	0,1179	
Supplementary information: Sample No. 3.1...3.6 (conductor of 120 mm^2)								

6.4	TABLE 5/2: mean scatter β, between the six values of k averaged over the last 11 measurement intervals, calculated according to annex E, clause E.4							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	$\underline{k}$	0,4122	0,4122	0,4269	0,4399	0,4139	0,4119	
	$\underline{K}$	0,4195	0,4195	0,4195	0,4195	0,4195	0,4195	
	s	0,0115	0,0115	0,0115	0,0115	0,0115	0,0115	
	β	0,0452	0,0452	0,0452	0,0452	0,0452	0,0452	
Supplementary information: Sample No. 3.1...3.6 – palm of terminal lug (conductor of 120 mm^2)								

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6.4	TABLE 6/1: change in resistance factor *D* for each of the six connectors, calculated according to annex E, clause E.5							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	*b*	-0,0019	-0,0013	-0,0016	-0,0037	-0,0019	-0,0031	
	k	0,9342	1,0735	0,9392	0,8864	0,9032	0,9162	
	M	0,0203	0,0121	0,0170	0,0417	0,0210	0,0338	
	s_j	0,0060	0,0074	0,0089	0,0092	0,0074	0,0104	
	S	0,0133	0,0143	0,0196	0,0215	0,0170	0,0235	
	D	0,0336	0,0264	0,0366	0,0632	0,0380	0,0573	
Supplementary information: Sample No. 3.1...3.6 (conductor of 120 mm^2)								

6.4	TABLE 6/2: change in resistance factor *D* for each of the six connectors, calculated according to annex E, clause E.5							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	*b*	-0,0003	0,0007	0,0002	0,0011	-0,0012	-0,0003	
	k	0,4122	0,4122	0,4269	0,4399	0,4139	0,4119	
	M	0,0073	0,0170	0,0047	0,0250	0,0290	0,0073	
	s_j	0,0057	0,0049	0,0065	0,0045	0,0121	0,0041	
	S	0,0286	0,0246	0,0315	0,0212	0,0605	0,0206	
	D	0,0359	0,0416	0,0362	0,0462	0,0895	0,0279	
Supplementary information: Sample No. 3.1...3.6 – palm of terminal lug (conductor of 120 mm^2)								

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6.4	**TABLE 7/1: resistance factor ratio λ, calculated according to annex E, clause E.6**							**P**
cycle		**connectors**						
		j=1	**j=2**	**j=3**	**j=4**	**j=5**	**j=6**	
0.	k_0	0,7827	0,8376	0,7758	0,7552	0,7552	0,7552	
200.*	λ=	1,0118	1,0187	1,0120	1,0034	1,0215	0,9763	
200.*	λ=	1,1688	1,2307	1,1704	1,1480	1,1752	1,1660	
250.	λ=	1,1775	1,2715	1,1792	1,1299	1,1660	1,1752	
325.	λ=	1,1932	1,2778	1,2127	1,1735	1,1916	1,2096	
400.	λ=	1,1862	1,2633	1,1967	1,1480	1,1932	1,2113	
475.	λ=	1,1879	1,2814	1,2160	1,1768	1,1949	1,2221	
550.	λ=	1,1758	1,2859	1,2127	1,1735	1,1916	1,1825	
625.	λ=	1,1983	1,2914	1,2178	1,1785	1,2056	1,2148	
700.	λ=	1,1966	1,2733	1,2160	1,1678	1,1949	1,2131	
775.	λ=	1,2088	1,2932	1,2284	1,1892	1,2165	1,2255	
850.	λ=	1,1983	1,2914	1,2178	1,1785	1,1966	1,2329	
925.	λ=	1,2071	1,2914	1,2089	1,1966	1,1966	1,2238	
1000.	λ=	1,1999	1,2769	1,2106	1,1984	1,2074	1,2346	
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 3.1...3.6 (conductor of 120 mm^2)								

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6.4	TABLE 7/2: resistance factor ratio λ, calculated according to annex E, clause E.6							P
cycle		**connectors**						
		j=1	**j=2**	**j=3**	**j=4**	**j=5**	**j=6**	
0.	k_0	0,4176	0,4166	0,4260	0,4429	0,4339	0,4310	
200.*	λ=	1,0821	1,0074	0,9873	0,9898	0,9599	1,0211	
200.*	λ=	0,9727	0,9885	1,0028	0,9790	0,9954	0,9601	
250.	λ=	0,9715	0,9978	1,0251	0,9973	0,9541	0,9418	
325.	λ=	0,9816	0,9976	1,0028	0,9946	0,9558	0,9550	
400.	λ=	1,0144	1,0077	1,0054	1,0115	0,9348	0,9490	
475.	λ=	0,9911	0,9916	0,9995	1,0034	0,9304	0,9717	
550.	λ=	0,9710	0,9942	0,9789	1,0000	0,9168	0,9522	
625.	λ=	0,9926	0,9626	1,0005	0,9966	0,9970	0,9601	
700.	λ=	0,9703	0,9878	0,9779	1,0034	0,9403	0,9462	
775.	λ=	0,9868	0,9959	1,0096	0,9788	0,9555	0,9696	
850.	λ=	0,9952	0,9753	1,0115	0,9767	0,9481	0,9541	
925.	λ=	0,9959	0,9815	1,0176	0,9709	1,0127	0,9610	
1000.	λ=	0,9880	0,9926	0,9955	0,9916	0,9479	0,9515	
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 3.1...3.6 – palm of terminal lug (conductor of 120 mm^2)								

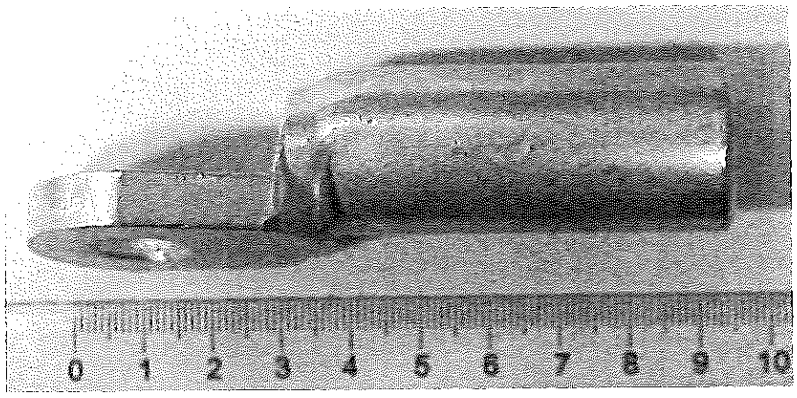
Attachment No. 1

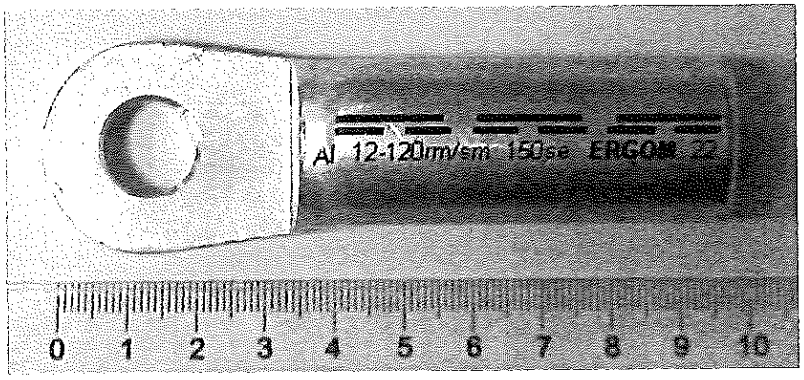
Summary of the test results according to PN-EN 61238-1:

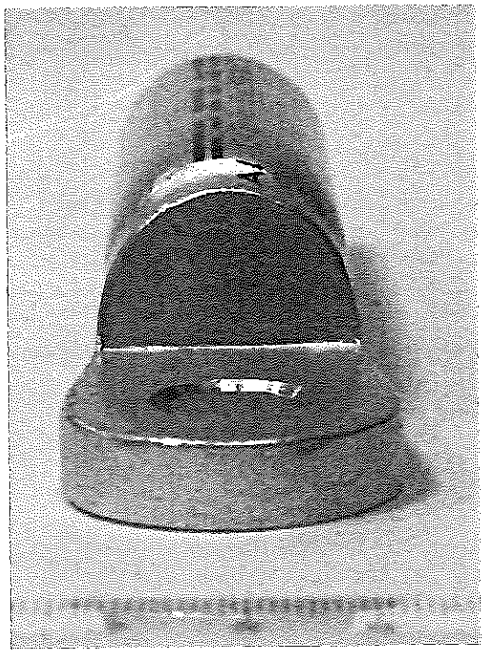
Clause	Tests	Sample No.	Verdict
6	Electrical tests	3.1...3.6	P
7	Mechanical tests	3.7...3.9	P

Attachment No. 2

Photos of the samples:







Terminal lug KRAC 120/12

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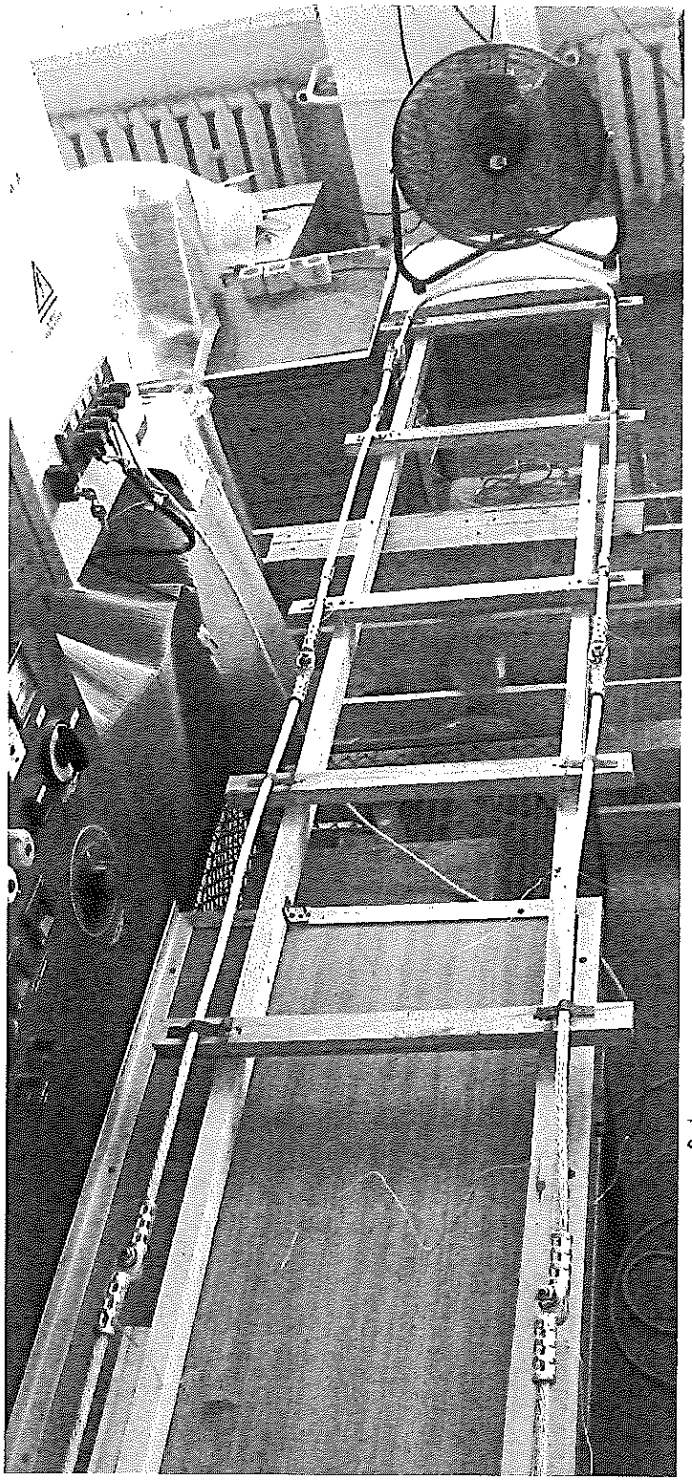
Attachment No. 2

Photos of the samples (continued):



Test circuit of KRAC 120/12

I-POB-07/01-Z3w9

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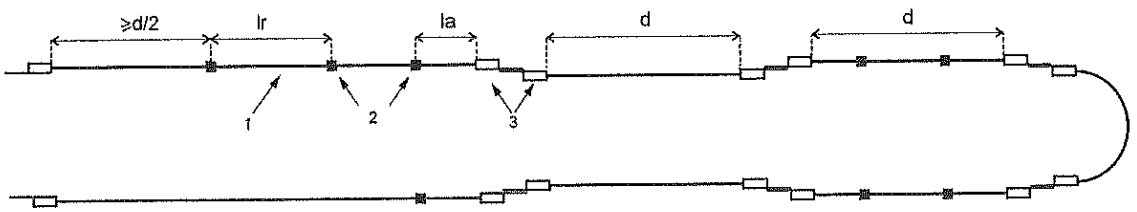
Attachment No. 2



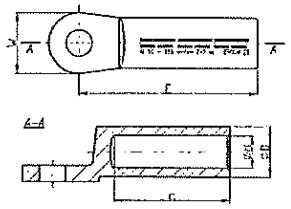
la = 165 mm 1 - reference conductor
lr = 290 mm 2 - equalizer
d = 880 mm 3 - terminal lug

The configuration and dimensions of the test circuit of KRAC 120/12

Attachment No. 2

Product data sheet:

Aluminium terminals longitudinally sealed KRAC type



Product name	Aluminium terminals longitudinally sealed KRAC type
Category	Tubular Al
Material	Al.
Surface	tin-plated
Note!	– terminals are filled with special contact grease and packed in foil; – sector shaped conductors must be rounded with special dies.

mechanical details

Material	Al.
Surface	tin-plated

Name	SKU	Size of bolt dia	DIN	d	D	a min	E	W	Cross section re [mm²]	Cross section rm/sm [mm²]	Die code No.	No. of crimping wide	No. of crimping narrow
KRAC 16/8	E12KA-01010300100	M8	–	5,4	12,0	30	50	25	25	16	12	2	4
KRAC 16/10	E12KA-01010300200	M10	–	5,4	12,0	30	50	25	25	16	12	2	4
KRAC 16/12	E12KA-01010300300	M12	–	5,4	12,0	30	50	25	25	16	12	2	4
KRAC 25/8	E12KA-01010300400	M8	√	6,8	12,0	30	50	25	35	25	12	2	4
KRAC 25/10	E12KA-01010300500	M10	√	6,8	12,0	30	50	25	35	25	12	2	4
KRAC 25/12	E12KA-01010300600	M12	√	6,8	12,0	30	50	25	35	25	12	2	4
KRAC 35/8	E12KA-01010300700	M8	√	8,0	14,0	42	62	25	50	35	14	3	5
KRAC 35/10	E12KA-01010300800	M10	√	8,0	14,0	42	62	25	50	35	14	3	5
KRAC 35/12	E12KA-01010300900	M12	√	8,0	14,0	42	62	25	50	35	14	3	5
KRAC 35/14	E12KA-01010301000	M14	–	8,0	14,0	42	62	25	50	35	14	3	5
KRAC 50/8	E12KA-01010301100	M8	√	9,8	16,0	42	62	25	70	50	16	3	5
KRAC 50/10	E12KA-01010301200	M10	√	9,8	16,0	42	62	25	70	50	16	3	5

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ВЯРНО С ОРИГИНАЛА
Подпис: .....

Attachment No. 2

Product data sheet (continued):

KRAC 50/12	E12KA-01010301300	M12	√	9,8	16,0	42	62	25	70	50	16	3	5
KRAC 50/14	E12KA-01010301400	M14	–	9,8	16,0	42	62	25	70	50	16	3	5
KRAC 70/8	E12KA-01010301500	M8	√	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/10	E12KA-01010301600	M10	√	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/12	E12KA-01010301700	M12	√	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/14	E12KA-01010301800	M14	–	11,2	18,5	52	72	26	95	70	18	3	6
KRAC 70/16	E12KA-01010301900	M16	–	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 95/10	E12KA-01010302000	M10	√	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 95/12	E12KA-01010302100	M12	√	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 95/14	E12KA-01010302200	M14	-	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 95/16	E12KA-01010302300	M16	-	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 120/10	E12KA-01010302400	M10	√	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 120/12	E12KA-01010302500	M12	√	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 120/14	E12KA-01010302600	M14	–	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 120/16	E12KA-01010302700	M16	√	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 150/10	E12KA-01010302800	M10	√	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/12	E12KA-01010302900	M12	√	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/14	E12KA-01010303000	M14	–	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/16	E12KA-01010303100	M16	√	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/20	E12KA-01010303200	M20	–	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 185/10	E12KA-01010303300	M10	√	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/12	E12KA-01010303400	M12	√	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/14	E12KA-01010303500	M14	–	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/16	E12KA-01010303600	M16	√	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/20	E12KA-01010303700	M20	–	18,3	28,5	60	91	30	240	185	28	3	6

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Attachment No. 2

Product data sheet (continued):

KRAC 240/10	E12KA-01010303800	M10	-	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/12	E12KA-01010303900	M12	√	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/14	E12KA-01010304000	M14	–	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/16	E12KA-01010304100	M16	√	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/20	E12KA-01010304200	M20	-	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 300/12	E12KA-01010304400	M12	√	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 300/14	E12KA-01010304500	M14	–	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 300/16	E12KA-01010304600	M16	√	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 300/20	E12KA-01010304700	M20	√	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 500/16	E12KA-01010305201	M16	√	29,0	44,0	80	122	44	-	500	44	4	-

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ВЯРНО С ОРИГИНАЛА

Подпис: .....

ASSOCIATION of POLISH ELECTRICIANS
QUALITY TESTING OFFICE
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tel./fax: +48 22 815 65 80
since 1933
TESTING LABORATORY

AB 044

TEST REPORT
1. PN-EN 61238-1
Compression and mechanical connectors for power cables for rated voltages up 36 kV (U_m = 42 kV)
Part 1: Test methods and requirements (IEC 61238-1:2003, modified)

Report Reference No. ..... :	LA-17.062/17.045/4/E	
Data of issue ..... :	2017-12-29	
Total number of pages ..... :	20	
Tested by ..... : (name + position + signature)	Krzysztof Podgórniak Specialist	на основание чл. 36а, ал. 3 от ЗОП
Authorized by ..... : (name + position + signature)	Dariusz Szczepanowski Manager of LA	
Testing application number ..... :	C-A-17-062/17.045	
Test item reference ..... :	S-A-17-045	
Scope of test ..... :	☒ - type test	☐ - partial test
Test specification:		
Standard/procedure ..... :	☒ PN-EN 61238-1:2004, EN 61238-1:2003, IEC 61238-1:2003 (Second Edition)	
Non-standard test methods ..... :	N/A	
Non-accredited test methods ..... :	N/A	
Applicant's name ..... :	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o.	
Address ..... :	ul. Nowe Sady 10, 94-102 Łódź	

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Test item description ..... :	Aluminium terminals longitudinally sealed
Trade Mark ..... :	ERGOM®
Manufacturer ..... :	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź
Model/Typ reference ..... :	KRAC 16 ÷ 300 / This report covers test of KRAC 300/16
Ratings ..... :	Nominal cross-sectional area: 16 mm^2 ÷ 300 mm^2 / This report covers test of 300 mm^2

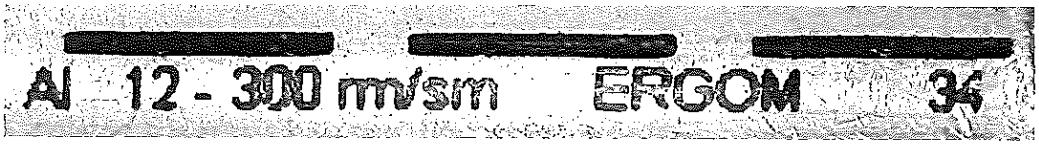
List of Attachments:

Attachment No.	Attachment No.	Attachment No.
1	Summary of the test result	1
2	Product information and photos of samples	6

Summary of testing:

Test performer (in the case of partial tests): N/A	**Testing location/address** (if different from page 1) : Stowarzyszenie Elektryków Polskich, Biuro Badawcze ds. Jakości Association of Polish Electrician, Quality Testing Office ul. M. Rapackiego 13, 20-150 Lublin, POLAND
Number of tests with F (Fail) verdict:	0
Summary conformity/non-conformity with standardization document (if apply):	N/A
Summary of compliance with National Differences (if apply): Provide list of standards.	N/A
Opinion and interpretation if needed:	N/A
Other additional information (as requested by the applicant):	N/A

Copy of marking plate:



KRAC 300/12

I-POB-07/01-Z3w9

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Test item particular:	
Classification of installation and use	: N/A
Supply Connection	: N/A
Date (s) of receipt of test item ..... :	2017-06-23 (Sample No. 1.1...1.7, 4.1...4.7) 2017-07-20 (Sample No. 2.1...2.21) 2017-09-11 (Sample No. 3.1...3.21) 2017-10-06 (Sample No. 4.8...4.19) 2017-10-13 (Sample No. 1.8...1.21)
Date (s) of performance of tests ..... :	2017-06-28...2017-12-29
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement .....:	F (Fail)
Test report general remarks:	
1. The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.	
2. "(See Enclosure #)" refers to additional information appended to the report..	
3. "(See appended table)" refers to a table appended to the report	
4. Throughout this report a comma is used as the decimal separator.	
5. Test Report Form is based on TRF No.: IEC61238_1A, copyrighted by IECEE.	
Production place(s) .....:	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź

ВЯРНО С ОРИГИНАЛА
Подпис: .....

General product information:

Tests were carried out on samples of aluminium terminals longitudinally sealed type KRAC, nominal cross sectional area 16 mm^2 ÷ 300 mm^2.
According to the standard and as agreed with the manufacturer for the tests were prepared four loops: 16 mm^2, 70 mm^2, 120 mm^2 and 300 mm^2 cross sectional area.
This report covers test of 300 mm^2, KRAC 300/12.

Electro-hydraulic presses HKP 22 EL with hexagonal die KP22-W300 was used to crimp testing terminals KRAC 300. Hexagonal die KP22-W300 is dedicated to aluminium terminals with a DIN-conforming tubular part (size DIN 34) for crimping cables RMC/RMV.
Cable YAKXS 1x300 mm^2 RMC 0,6/1kV, manufacturer ELPAR was used to electrical and mechanical tests of terminal KRAC 300.
Torque for screw of terminal lugs was 27,7 Nm ÷ 29,6 Nm.

Samples were marked for the tests as S-A-17-045/1.1...1.21, S-A-17-045/2.1...2.21, S-A-17-045/3.1...3.21 and S-A-17-045/4.1...4.19. In the Test Report abbreviated marking of the samples, as the samples No. 1.1...1.21, 2.1...2.21, 3.1...3.21, 4.1...4.19 is used.

Type:	No.:
KRAC 16/10	1.1...1.21
KRAC 70/12	2.1...2.21
KRAC 120/12	3.1...3.21
KRAC 300/12	4.1...4.19

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
Identification			—
	Connector		—
	Type of connector	☐ through connector ☐ branch connector ☒ terminal lug	—
	Nominal cross-sectional area ..... :	300 mm^2	—
	Class of connector	☒ Class A ☐ Class B	—
5.1	**Conductor**		—
	conductor material..... :	Al	—
	nominal cross-sectional area..... :	300 mm^2 RMC	—
	actual conductor area ..... :	300 mm^2 RMC	—
	leading dimensions and shape..... :	Unpreparted cable	—
	type of conductor (solid or stranded) ..... :	300 mm^2 - stranded	—
	details of conductor construction (in the case of stranded conductors) ..... :	300 mm^2 – stranded cable, round, 37 wires	—
	compacted / non-compacted..... :	Compacted	—
	flexible..... :	No	—
	number of wires..... :	37 wires	—
	direction of lay ..... :	Right	—
	plating..... :	No plating	—
	type of impregnation, if any ..... :	—	—
	approximate indication of hardness (annealed, half-hard, hard)..... :	Half-hard	—
	type of insulation (in case of insulation-piercing connectors) ..... :	—	—
5.2	**Connectors and tooling**		—
	assembly technique ..... :	Crimp connection	—
	tooling and necessary settings ..... :	Electro-hydraulic presses HKP 22 EL with hexagonal die KP22-W300. Hexagonal die KP22-W300 is dedicated to aluminium terminals with a DIN-conforming tubular part for crimping cables RMC/RMV. Size DIN 34; torque wrench	—
	preparation of contact surfaces ..... :	Terminal lug filled with contact grease	—

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	type, reference number and other identification of the connector .....:	KDA 300: surface: tin-plated; material: Al	—
6	**Electrical tests**		P
6.1	**Installation**		P
	six connectors fitted in accordance with the manufacturer's instructions		P
	welded equalizers used	Yes	P
	in case of insulation-piercing connectors, the insulation retained on the conductor under the connector, and for a distance of at least 100 mm outside the connector		N/A
	ambient temperature of the test location (between 15 °C and 30 °C) .....:	16 °C...21 °C	P
	the test loop is dismantleable for short-circuit test (class A connectors only)	Short-circuit test performed without dismantling, loop divided on six sections for test	N/A
	the technology of the sectioning joints do not influence the measurements		N/A
	bolts or screws of the connectors were not retightened under test		P
6.1.1	Through connectors and terminal lugs		—
	test loop and dimensions according to Figure 1	See Attachment No. 2	P
	linking bars used (in case of terminal lugs)	Without use of linking bars	N/A
	the palms bolted to the linking bars in accordance with the manufacturer's instructions		N/A
	linking bars have the same dimensions and material as the palm		N/A
	palm connected direct to palm	Direct connected (see Attachment No. 2)	P
6.1.2	Branch connectors		—
	branch connector is treated as a through connector between the main and the branch (size of branch cable equal to the main, or immediately above or below the main)		N/A
	In other cases, test loop and dimensions according to Figure 2		N/A
6.2	**Measurements**		P
6.2.1	Electrical resistance measurements		P
	measurements made at stages throughout the test as specified in 6.3		P

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	method used	☒ indirect ☐ direct	—
	indirect method: measuring current is 10 % of the heat cycling current	KRAC 300: 66 A ÷ 71 A	P
	potential points as indicated in Figure 3 and annex B		P
	Precision of resistance measurements, indirect method		—
	voltage: max. ±0,5 % or ±10 μV, actual precision ..... :	±0,5 %	P
	current: max. ±0,5 % or ±0,1 A, actual precision ..... :	±0,5 %	P
	Precision of resistance measurements, direct method: better than ±1 % or ±0,5 μΩ, actual precision ..... :	—	N/A
6.2.2	Temperature measurements		P
	stages as specified in 6.3		P
	the temperature of connectors and reference conductor measured at the points as indicated in Figure 3	Figure 3a, 3e, 3f	P
	thermocouples used as reference method	Yes	P
	total accuracy of temperature measurements: ±2 °C or better, actual accuracy ..... :	±2,0 °C	P
6.3	**Heat cycle test**		P
	power frequency current used	AC 50 Hz	P
6.3.1	First heat cycle		—
6.3.1 a)	Non insulation-piercing through connectors and terminal lugs	Sample No. 4.8...4.13	P
	current is circulated in the test loop, bringing the reference conductor to 120 °C at equilibrium		N/A
	measured temperature of the median connector . :	Sample No. 4.10: 101,3 °C	—
	reference conductor temperature (120 °C ≤ Θ_R ≤ 140 °C) ..... :	128,3 °C	—
	equilibrium current I_N ..... :	730 A	—
6.3.1 b)	Non insulation-piercing branch connectors		N/A
	test circuit according to	☐ Figure 1 ☐ Figure 2	—
	current is circulated in the test loop, bringing the reference conductor to 120 °C at equilibrium		N/A

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	current in all individual branch adjusted so that each branch reference temperature is the same as the main reference temperature		N/A
	measured temperature of the median connector ..:		—
	reference conductor temperature (120 °C ≤ Θ_R ≤ 140 °C) .....:		—
	equilibrium current I_N .....:		—
6.3.1 c)	Insulation-piercing connectors (IPC)		N/A
	test circuit according to	☐ Figure 1 ☐ Figure 2	—
	isolated reference conductor used		N/A
	permitted temperature of the cable .....:		—
	temperature of the median connector is set 10 K above permitted temperature of the cable		N/A
	measured temperature of the median connector ..:		—
	temperature of the reference conductor(s) is(are) set max.15 K above permitted temperature of the cable		N/A
	temperature of the isolated reference conductor(s) at equilibrium .....:		N/A
	equilibrium current I_N .....:		—
6.3.2	Second heat cycle	Sample No. 4.8...4.13	—
	current is circulated in the loop until the main reference conductor temperature reaches the value Θ_R determined in 6.3.1 with a tolerance of +6 °C	128 °C ÷ 134 °C	P
	the median connector temperature is stable within 2 °C over a 10 min period		P
	current flow time (t_1) .....:	54 min	—
	accelerated heating used	☒ Yes ☐ No	—
	accelerated heating time .....:	17 min	—
	accelerated heating time according to Table 1	15 min	P
	cooling time (t_2) .....:	19 min	—
	After cooling, the temperature of all connectors and the reference conductor ≤ 35 °C		P
	accelerated cooling used with ambient air	☒ Yes ☐ No	—
6.3.3	Subsequent heat cycles	Sample No. 4.8...4.13	—
	a total of 1000 heat cycles performed		P
	Measurements performed at the following cycles:		
	Class A: 0, 200 (before and after short-circuit test), 250, then every 75		P

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Class B: 0, 250, then every 75		N/A
	cold resistance and temperature of each connector and reference conductor/conductors measured	See TABLE 1/1 and TABLE 1/2	P
	maximum temperature of each connector measured	See TABLE 2	P
6.3.4	Short-circuit tests (for Class A connectors only)	Sample No. 4.8...4.13	P
	six short circuits applied after the 200th heat cycle	Short-circuit test performed without dismantling, loop divided on six sections for test	P
	short-circuit current .....:	I section: 27,39 kA ÷ 27,64 kA, II section: 27,45 kA ÷ 27,65 kA, III section: 27,48 kA ÷ 27,84 kA, IV section: 28,05 kA ÷ 28,19 kA, V section: 27,08 kA ÷ 27,23 kA, VI section: 30,08 kA ÷ 30,14 kA	—
	short-circuit current raises the reference conductors from a temperature of ≤35 °C to a temperature between 250 °C and 270 °C		P
	measured temperature of the reference conductor:	I section: 256,9 °C ÷ 262,3 °C, II section: 251,1 °C ÷ 255,9 °C, III section: 251,4 °C ÷ 260,3 °C, IV section: 252,8 °C ÷ 259,6 °C, V section: 262,4 °C ÷ 268,0 °C, VI section: 255,2 °C ÷ 267,8 °C	P
	duration of the short-circuit current (1 s below 25 kA, ≤5 s above 25 kA) .....:	I section: 1,45 s ÷ 1,46 s, II section: 1,40 s ÷ 1,43 s, III section: 1,38 s ÷ 1,43 s, IV section: 1,36 s ÷ 1,38 s, V section: 1,54 s ÷ 1,55 s, VI section: 1,19 s ÷ 1,20 s	P
	the test loop cooled to a temperature ≤ 35 °C after each short circuit		P

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
6.4	**Assessment of results**		P
	Calculated parameters:		—
	connector resistance factor k, calculated according to annex E, clause E.2 .....:	See TABLE 3/1 and TABLE 3/2	—
	initial scatter δ, between the six initial values of k measured prior to heat cycling, calculated according to annex E, clause E.3 .....:	See TABLE 4/1 and TABLE 4/2	P
	mean scatter β, between the six values of k averaged over the last 11 measurement intervals, calculated according to annex E, clause E.4 .....:	See TABLE 5/1 and TABLE 5/2	P
	change in resistance factor D for each of the six connectors, calculated according to annex E, clause E.5 .....:	See TABLE 6/1 and TABLE 6/2	P
	resistance factor ratio λ calculated according to annex E, clause E.6 .....:	See TABLE 7/1 and TABLE 7/2	P
	maximum temperature Θ_{max} on each connector, recorded according to annex E, clause E.7 .....:	See TABLE 2	P
6.5	**Requirements**		P
	more than four connectors satisfy the requirements shown in table 2		N/A
	one full re-test performed	☐ Yes ☐ No	—
	six connectors satisfy the requirements shown in table 2		P
	values of δ do not exceed 0,3	See TABLE 4/1 and TABLE 4/2	P
	values of β do not exceed 0,3	See TABLE 5/1 and TABLE 5/2	P
	values of D do not exceed 0,15	See TABLE 6/1 and TABLE 6/2	P
	values of λ do not exceed 2,0	See TABLE 7/1 and TABLE 7/2	P
	values of Θ_{max} do not exceed Θ_{ref}	See TABLE 2	P
7	**Mechanical tests**		P
7.1	Test method		—
	the test is made on three connectors different from those used for the electrical test	Sample No. 4.1...4.3	P
	connectors are fitted as for the electrical test of 6.1		P
	the conductor lengths, between connectors or between connector and tensile test machine jaws, are more than 500 mm		P

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	the rate of application of the load do not exceed 10 N/mm^2 of cross-section per second		P
7.2	Requirements		P
	tensile force applied during one minute	Conductor of 300 mm^2 Al; 1 min	P
	force for aluminium, (40×A [mm^2], max. 20 000) .. :	40 x 300 = 12 000 N	P
	force for copper, (60×A [mm^2], max. 20 000) ..... :		N/A
	in case the connector is electrically tested for conductors with difference cross-sectional area, the different joints tested individually to the above requirements		N/A
	no slipping during the tensile test		P

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6.3.3	TABLE 1/1: cold resistance and temperature of the connectors							
cycle		connectors						reference conductor
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	R [mΩ]	0,0324	0,0327	0,0322	0,0318	0,0325	0,0325	0,0451
	Θ [°C]	19,7	19,6	20,1	20,2	20,1	20,2	20,0
200.*	R [mΩ]	0,0324	0,0329	0,0324	0,0319	0,0326	0,0327	0,0452
	Θ [°C]	18,1	18,1	18,3	18,3	18,3	18,3	18,3
200.*	R [mΩ]	0,0340	0,0346	0,0358	0,0342	0,0344	0,0357	0,0451
	Θ [°C]	17,3	17,2	17,7	17,6	17,4	17,5	17,7
250.	R [mΩ]	0,0341	0,0345	0,0359	0,0344	0,0344	0,0359	0,0450
	Θ [°C]	17,9	17,9	18,5	18,3	18,0	18,0	18,3
325.	R [mΩ]	0,0342	0,0347	0,0361	0,0345	0,0344	0,0360	0,0451
	Θ [°C]	18,5	18,3	18,8	18,7	18,5	18,6	19,1
400.	R [mΩ]	0,0342	0,0348	0,0360	0,0344	0,0345	0,0360	0,0451
	Θ [°C]	19,0	18,8	19,6	19,4	19,0	19,1	19,4
475.	R [mΩ]	0,0342	0,0348	0,0362	0,0344	0,0345	0,0360	0,0451
	Θ [°C]	19,6	19,5	20,3	20,1	19,6	20,0	19,8
550.	R [mΩ]	0,0343	0,0348	0,0362	0,0345	0,0346	0,0361	0,0452
	Θ [°C]	19,6	19,5	20,3	20,0	19,6	19,8	19,8
625.	R [mΩ]	0,0342	0,0346	0,0360	0,0344	0,0344	0,0360	0,0451
	Θ [°C]	16,6	16,5	17,1	17,1	16,8	17,0	17,0
700.	R [mΩ]	0,0342	0,0347	0,0361	0,0344	0,0345	0,0360	0,0451
	Θ [°C]	18,7	18,5	19,2	18,9	18,6	18,8	18,8
775.	R [mΩ]	0,0342	0,0347	0,0363	0,0345	0,0345	0,0360	0,0451
	Θ [°C]	17,5	17,4	17,6	17,6	17,5	17,7	17,6
850.	R [mΩ]	0,0342	0,0348	0,0361	0,0345	0,0345	0,0360	0,0451
	Θ [°C]	18,7	18,5	19,1	18,9	18,5	18,7	18,6
925.	R [mΩ]	0,0343	0,0347	0,0360	0,0344	0,0344	0,0360	0,0450
	Θ [°C]	16,1	15,9	16,7	16,4	16,0	16,2	16,3
1000.	R [mΩ]	0,0344	0,0347	0,0361	0,0345	0,0346	0,0360	0,0451
	Θ [°C]	18,2	18,1	18,5	18,5	18,3	18,5	18,2
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 4.8...4.13 (conductor of 300 mm^2)								

6.3.3	TABLE 1/2: cold resistance and temperature of the connectors							
cycle		connectors						reference conductor
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	R [mΩ]	0,0017	0,0018	0,0017	0,0018	0,0017	0,0018	0,0451
	Θ [°C]	19,8	19,8	20,2	20,2	20,1	20,3	20,0
200.*	R [mΩ]	0,0017	0,0017	0,0018	0,0018	0,0017	0,0018	0,0452
	Θ [°C]	18,1	18,1	18,4	18,5	18,5	18,4	18,3
200.*	R [mΩ]	0,0017	0,0018	0,0018	0,0018	0,0017	0,0017	0,0451
	Θ [°C]	17,4	17,2	17,7	17,7	17,5	17,6	17,7
250.	R [mΩ]	0,0017	0,0018	0,0018	0,0018	0,0017	0,0017	0,0450
	Θ [°C]	17,9	17,8	18,5	18,3	18,1	18,0	18,3
325.	R [mΩ]	0,0017	0,0019	0,0017	0,0018	0,0017	0,0017	0,0451
	Θ [°C]	18,5	18,4	18,9	18,8	18,5	18,7	19,1
400.	R [mΩ]	0,0017	0,0018	0,0017	0,0018	0,0018	0,0017	0,0451
	Θ [°C]	19,1	18,9	19,7	19,5	19,0	19,2	19,4
475.	R [mΩ]	0,0017	0,0019	0,0017	0,0017	0,0017	0,0018	0,0451
	Θ [°C]	19,7	19,5	20,4	20,2	19,7	20,1	19,8
550.	R [mΩ]	0,0017	0,0019	0,0017	0,0018	0,0017	0,0017	0,0452
	Θ [°C]	19,6	19,5	20,4	20,1	19,6	19,9	19,8
625.	R [mΩ]	0,0017	0,0018	0,0018	0,0018	0,0017	0,0017	0,0451
	Θ [°C]	16,7	16,5	17,2	17,2	16,9	17,1	17,0
700.	R [mΩ]	0,0017	0,0018	0,0017	0,0018	0,0017	0,0017	0,0451
	Θ [°C]	18,7	18,5	19,3	18,9	18,6	18,8	18,8
775.	R [mΩ]	0,0017	0,0018	0,0017	0,0017	0,0017	0,0017	0,0451
	Θ [°C]	17,5	17,4	17,7	17,7	17,5	17,7	17,6
850.	R [mΩ]	0,0017	0,0019	0,0017	0,0017	0,0017	0,0017	0,0451
	Θ [°C]	18,7	18,5	19,1	18,9	18,5	18,8	18,6
925.	R [mΩ]	0,0017	0,0018	0,0017	0,0017	0,0017	0,0017	0,0450
	Θ [°C]	16,1	15,9	16,7	16,4	16,1	16,2	16,3
1000.	R [mΩ]	0,0017	0,0018	0,0017	0,0017	0,0018	0,0017	0,0451
	Θ [°C]	18,2	18,1	18,6	18,5	18,4	18,6	18,2
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 4.8...4.13 – palm of terminal lug (conductor of 300 mm^2)								

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6.3.3	TABLE 2: maximum temperature of each connector measured							P
cycle		connectors						reference conductor
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	Θ_{max} [°C]	96,6	98,2	101,3	99,9	101,6	103,2	128,3
200.*	Θ_{max} [°C]	94,3	97,2	99,7	97,0	100,9	102,1	132,0
200.*	Θ_{max} [°C]	106,0	104,5	109,9	108,2	113,0	109,7	133,2
250.	Θ_{max} [°C]	103,0	101,8	107,9	107,6	109,6	109,9	131,6
325.	Θ_{max} [°C]	104,1	103,5	110,6	109,6	110,4	112,6	131,9
400.	Θ_{max} [°C]	103,3	103,6	111,8	109,1	110,3	113,2	131,2
475.	Θ_{max} [°C]	106,5	107,2	112,8	111,1	110,6	113,6	133,4
550.	Θ_{max} [°C]	102,1	104,5	109,8	107,6	108,8	110,1	130,0
625.	Θ_{max} [°C]	103,1	101,7	108,9	105,8	107,8	110,0	130,2
700.	Θ_{max} [°C]	104,9	104,1	110,4	108,8	111,4	111,1	129,8
775.	Θ_{max} [°C]	106,2	103,5	109,3	107,1	109,1	110,9	131,9
850.	Θ_{max} [°C]	106,9	105,5	110,9	108,1	111,1	111,2	129,1
925.	Θ_{max} [°C]	104,7	103,2	108,7	106,3	110,4	109,6	129,3
1000.	Θ_{max} [°C]	104,1	103,9	108,2	106,8	110,1	110,2	129,3
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 4.8...4.13 (conductor of 300 mm^2)								

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6.4	**TABLE 3/1: connector resistance factor k, calculated according to annex E, clause E.2**							**P**
Parameters:		L_a=	260 mm	L_b=	— mm	L_r=	445 mm	L_{jt}=	73 mm
cycle		**connectors**						
		j=1	**j=2**	**j=3**	**j=4**	**j=5**	**j=6**	
0.		0,8110	0,8515	0,7840	0,7299	0,8245	0,8245	
200.*		0,8092	0,8766	0,8092	0,7418	0,8362	0,8496	
200.*		1,0272	1,1083	1,2705	1,0543	1,0813	1,2570	
250.		1,0566	1,1108	1,3005	1,0973	1,0973	1,3005	
325.		1,0543	1,1219	1,3111	1,0948	1,0813	1,2976	
400.		1,0543	1,1354	1,2976	1,0813	1,0948	1,2976	
475.		1,0543	1,1354	1,3246	1,0813	1,0948	1,2976	
550.		1,0654	1,1329	1,3217	1,0924	1,1059	1,3082	
625.		1,0543	1,1083	1,2976	1,0813	1,0813	1,2976	
700.		1,0543	1,1219	1,3111	1,0813	1,0948	1,2976	
775.		1,0543	1,1219	1,3381	1,0948	1,0948	1,2976	
850.		1,0543	1,1354	1,3111	1,0948	1,0948	1,2976	
925.		1,0837	1,1379	1,3140	1,0973	1,0973	1,3140	
1000.		1,0813	1,1219	1,3111	1,0948	1,1083	1,2976	
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 4.8...4.13 (conductor of 300 mm^2)								

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6.4	TABLE 3/2: connector resistance factor k, calculated according to annex E, clause E.2						P
Parameters:	L_a=	260 mm	L_b=	— mm	L_r=	445 mm	L_{jp}=	49 mm

cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.		0,3460	0,3663	0,3371	0,3634	0,3488	0,3547	
200.*		0,3479	0,3507	0,3643	0,3611	0,3499	0,3530	
200.*		0,3386	0,3714	0,3551	0,3587	0,3469	0,3522	
250.		0,3484	0,3719	0,3562	0,3544	0,3481	0,3466	
325.		0,3416	0,3787	0,3488	0,3544	0,3454	0,3409	
400.		0,3415	0,3566	0,3470	0,3594	0,3648	0,3501	
475.		0,3403	0,3817	0,3447	0,3422	0,3516	0,3660	
550.		0,3472	0,3738	0,3400	0,3677	0,3480	0,3439	
625.		0,3351	0,3606	0,3536	0,3566	0,3427	0,3424	
700.		0,3460	0,3659	0,3501	0,3599	0,3487	0,3419	
775.		0,3460	0,3705	0,3492	0,3522	0,3502	0,3465	
850.		0,3417	0,3778	0,3444	0,3444	0,3501	0,3446	
925.		0,3468	0,3695	0,3477	0,3454	0,3458	0,3407	
1000.		0,3465	0,3639	0,3484	0,3461	0,3543	0,3391	

(*) rows marked with asterisk can be omitted in case of connectors type "B"

Supplementary information: Sample No. 4.8...4.13 – palm of terminal lug (conductor of 300 mm^2)

6.4	TABLE 4/1: initial scatter δ, between the six initial values of k measured prior to heat cycling, calculated according to annex E, clause E.3	P

cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$\underline{K_0}$	0,8042	0,8042	0,8042	0,8042	0,8042	0,8042	
	s_0	0,0425	0,0425	0,0425	0,0425	0,0425	0,0425	
	δ	0,0872	0,0872	0,0872	0,0872	0,0872	0,0872	

Supplementary information: Sample No. 4.8...4.13 (conductor of 300 mm^2)

6.4	TABLE 4/2: initial scatter δ, between the six initial values of k measured prior to heat cycling, calculated according to annex E, clause E.3							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$\underline{K_0}$	0,3527	0,3527	0,3527	0,3527	0,3527	0,3527	
	s_0	0,0110	0,0110	0,0110	0,0110	0,0110	0,0110	
	δ	0,0515	0,0515	0,0515	0,0515	0,0515	0,0515	
Supplementary information: Sample No. 4.8...4.13 – palm of terminal lug (conductor of 300 mm^2)								

6.4	TABLE 5/1: mean scatter β, between the six values of k averaged over the last 11 measurement intervals, calculated according to annex E, clause E.4							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	$\underline{k}$	1,0606	1,1258	1,3126	1,0901	1,0950	1,3003	
	$\underline{K}$	1,1641	1,1641	1,1641	1,1641	1,1641	1,1641	
	s	0,1123	0,1123	0,1123	0,1123	0,1123	0,1123	
	β	0,1592	0,1592	0,1592	0,1592	0,1592	0,1592	
Supplementary information: Sample No. 4.8...4.13 (conductor of 300 mm^2)								

6.4	TABLE 5/2: mean scatter β, between the six values of k averaged over the last 11 measurement intervals, calculated according to annex E, clause E.4							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	$\underline{k}$	0,3437	0,3701	0,3482	0,3530	0,3500	0,3457	
	$\underline{K}$	0,3518	0,3518	0,3518	0,3518	0,3518	0,3518	
	s	0,0095	0,0095	0,0095	0,0095	0,0095	0,0095	
	β	0,0446	0,0446	0,0446	0,0446	0,0446	0,0446	
Supplementary information: Sample No. 4.8...4.13 – palm of terminal lug (conductor of 300 mm^2)								

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6.4	TABLE 6/1: change in resistance factor *D* for each of the six connectors, calculated according to annex E, clause E.5							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	*b*	-0,0021	-0,0007	-0,0011	-0,0005	-0,0010	-0,0004	
	k	1,0606	1,1258	1,3126	1,0901	1,0950	1,3003	
	|M|	0,0198	0,0062	0,0084	0,0046	0,0091	0,0031	
	s_j	0,0094	0,0106	0,0122	0,0073	0,0080	0,0057	
	S	0,0183	0,0195	0,0192	0,0139	0,0151	0,0091	
	D	0,0381	0,0257	0,0276	0,0185	0,0242	0,0122	
Supplementary information: Sample No. 4.8...4.13 (conductor of 300 mm^2)								

6.4	TABLE 6/2: change in resistance factor *D* for each of the six connectors, calculated according to annex E, clause E.5							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	*b*	-0,0002	0,0004	0,0003	0,0010	0,0001	0,0009	
	k	0,3437	0,3701	0,3482	0,3530	0,3500	0,3457	
	|M|	0,0058	0,0108	0,0086	0,0283	0,0029	0,0260	
	s_j	0,0042	0,0081	0,0045	0,0075	0,0061	0,0072	
	S	0,0253	0,0453	0,0268	0,0440	0,0361	0,0431	
	D	0,0311	0,0561	0,0354	0,0723	0,0390	0,0691	
Supplementary information: Sample No. 4.8...4.13 – palm of terminal lug (conductor of 300 mm^2)								

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6.4	TABLE 7/1: resistance factor ratio λ, calculated according to annex E, clause E.6							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	k_0	0,8110	0,8515	0,7840	0,7299	0,8245	0,8245	
200.*	λ=	0,9978	1,0295	1,0321	1,0163	1,0142	1,0304	
200.*	λ=	1,2666	1,3016	1,6205	1,4444	1,3115	1,5246	
250.	λ=	1,3028	1,3045	1,6588	1,5034	1,3309	1,5773	
325.	λ=	1,3000	1,3176	1,6723	1,4999	1,3115	1,5738	
400.	λ=	1,3000	1,3334	1,6551	1,4814	1,3278	1,5738	
475.	λ=	1,3000	1,3334	1,6895	1,4814	1,3278	1,5738	
550.	λ=	1,3137	1,3305	1,6858	1,4966	1,3413	1,5867	
625.	λ=	1,3000	1,3016	1,6551	1,4814	1,3115	1,5738	
700.	λ=	1,3000	1,3176	1,6723	1,4814	1,3278	1,5738	
775.	λ=	1,3000	1,3176	1,7068	1,4999	1,3278	1,5738	
850.	λ=	1,3000	1,3334	1,6723	1,4999	1,3278	1,5738	
925.	λ=	1,3363	1,3363	1,6760	1,5034	1,3309	1,5937	
1000.	λ=	1,3333	1,3176	1,6723	1,4999	1,3442	1,5738	
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 4.8...4.13 (conductor of 300 mm^2)								

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6.4	TABLE 7/2: resistance factor ratio λ, calculated according to annex E, clause E.6							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	k_0	0,3460	0,3663	0,3371	0,3634	0,3488	0,3547	
200.*	λ=	1,0055	0,9574	1,0807	0,9937	1,0032	0,9952	
200.*	λ=	0,9786	1,0139	1,0534	0,9871	0,9946	0,9930	
250.	λ=	1,0069	1,0153	1,0567	0,9752	0,9980	0,9772	
325.	λ=	0,9873	1,0339	1,0347	0,9752	0,9903	0,9611	
400.	λ=	0,9870	0,9735	1,0294	0,9890	1,0459	0,9870	
475.	λ=	0,9835	1,0420	1,0225	0,9417	1,0080	1,0319	
550.	λ=	1,0035	1,0205	1,0086	1,0118	0,9977	0,9696	
625.	λ=	0,9685	0,9844	1,0489	0,9813	0,9825	0,9653	
700.	λ=	1,0000	0,9989	1,0386	0,9904	0,9997	0,9639	
775.	λ=	1,0000	1,0115	1,0359	0,9692	1,0040	0,9769	
850.	λ=	0,9876	1,0314	1,0217	0,9477	1,0037	0,9715	
925.	λ=	1,0023	1,0087	1,0314	0,9505	0,9914	0,9605	
1000.	λ=	1,0014	0,9934	1,0335	0,9524	1,0158	0,9560	
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 4.8...4.13 – palm of terminal lug (conductor of 300 mm^2)								

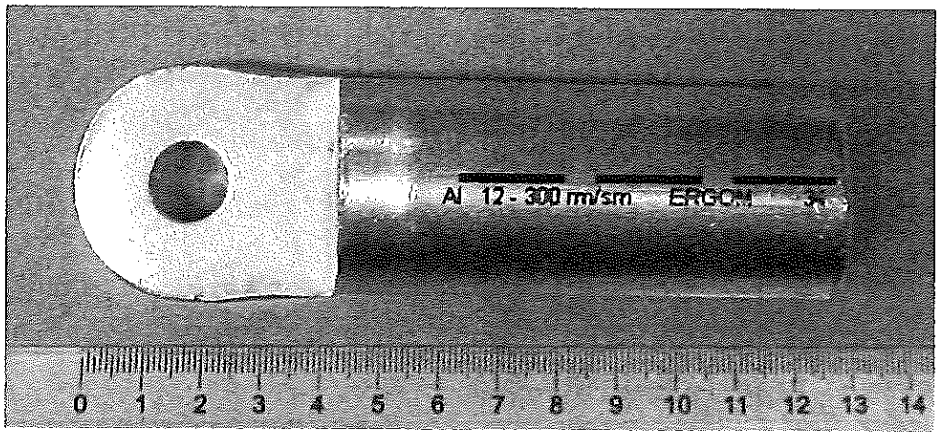
Attachment No. 1

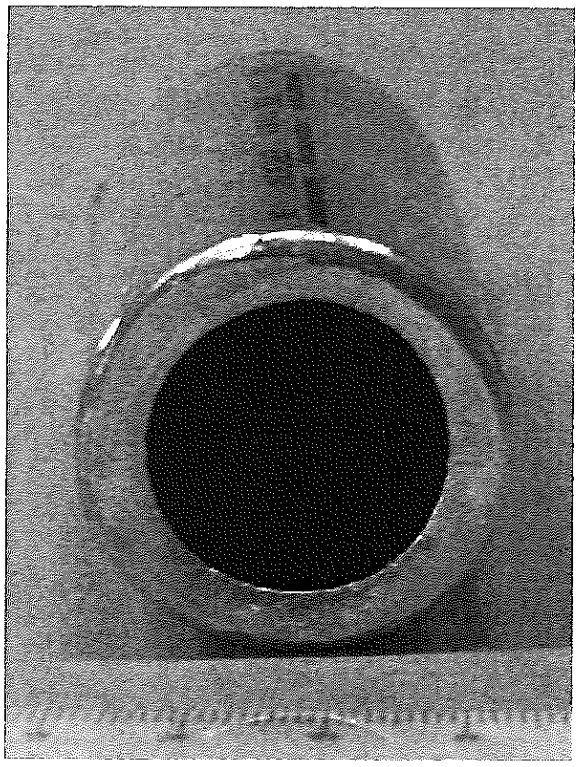
Summary of the test results according to PN-EN 61238-1:

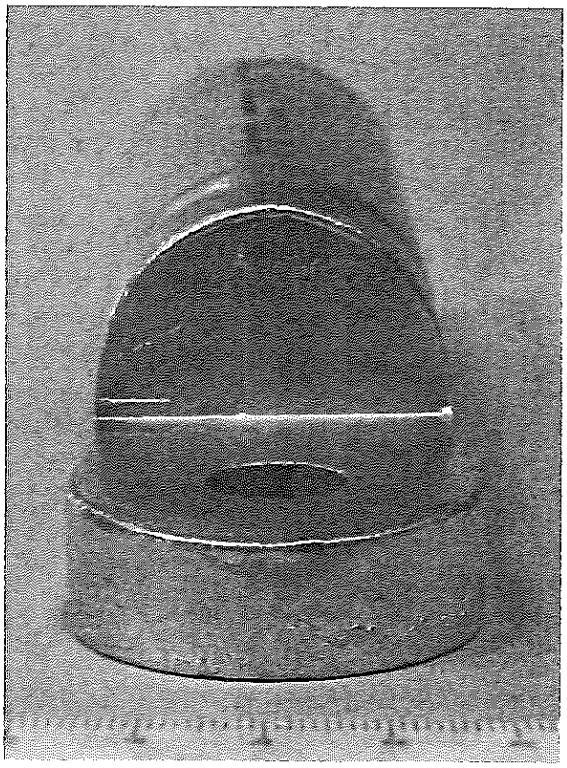
Clause	Tests	Sample No.	Verdict
6	Electrical tests	4.8...4.13	P
7	Mechanical tests	4.1...4.3	P

Attachment No. 2

Photos of the samples:





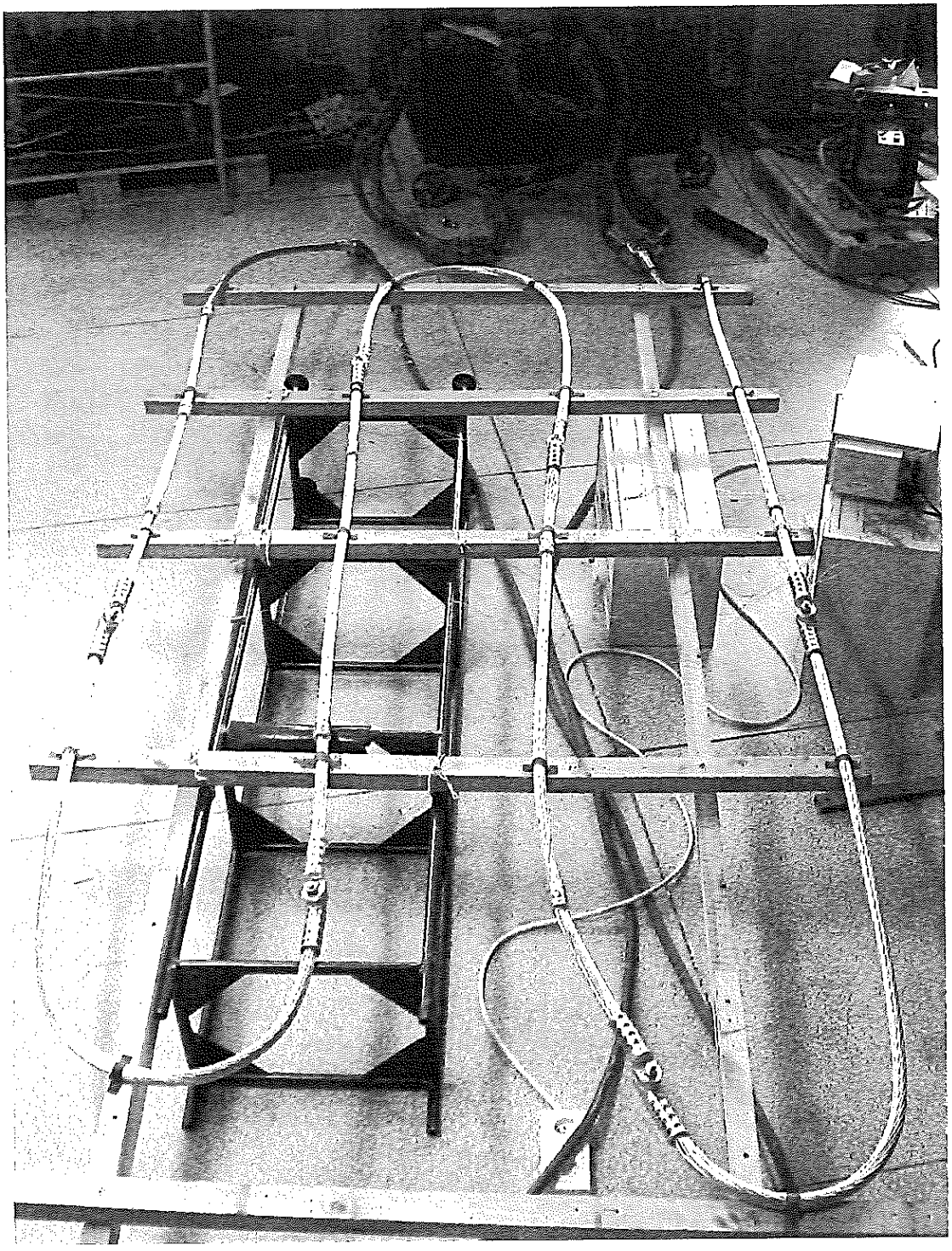


Terminal lug KRAC 300/12

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Attachment No. 2

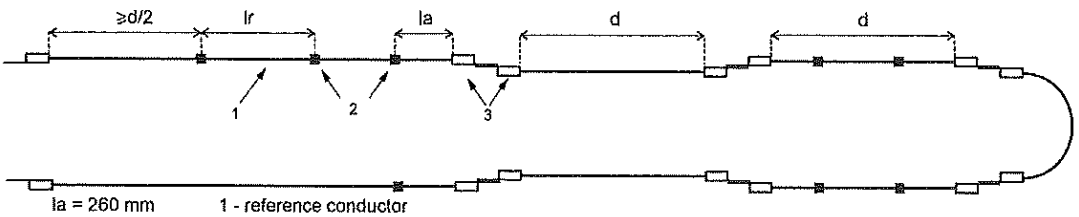
Photos of the samples (continued):



Test circuit of KRAC 300/12

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Attachment No. 2

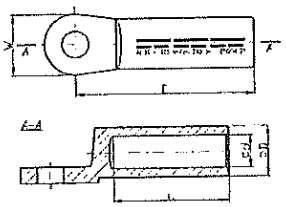


la = 260 mm
lr = 445 mm
d = 1450 mm

1 - reference conductor
2 - equalizer
3 - terminal lug

The configuration and dimensions of the test circuit of KRAC 300/12

Aluminium terminals longitudinally sealed KRAC type



Product name	Aluminium terminals longitudinally sealed KRAC type
Category	Tubular Al
Material	Al.
Surface	tin-plated
Note!	– terminals are filled with special contact grease and packed in foil; – sector shaped conductors must be rounded with special dies.

mechanical details

Material	Al.
Surface	tin-plated

Name	SKU	Size of bolt dia	DIN	d	D	a min	E	W	Cross section re [mm²]	Cross section rm/sm [mm²]	Die code No.	No. of crimping wide	No. of crimping narrow
KRAC 16/8	E12KA-01010300100	M8	–	5,4	12,0	30	50	25	25	16	12	2	4
KRAC 16/10	E12KA-01010300200	M10	–	5,4	12,0	30	50	25	25	16	12	2	4
KRAC 16/12	E12KA-01010300300	M12	–	5,4	12,0	30	50	25	25	16	12	2	4
KRAC 25/8	E12KA-01010300400	M8	√	6,8	12,0	30	50	25	35	25	12	2	4
KRAC 25/10	E12KA-01010300500	M10	√	6,8	12,0	30	50	25	35	25	12	2	4
KRAC 25/12	E12KA-01010300600	M12	√	6,8	12,0	30	50	25	35	25	12	2	4
KRAC 35/8	E12KA-01010300700	M8	√	8,0	14,0	42	62	25	50	35	14	3	5
KRAC 35/10	E12KA-01010300800	M10	√	8,0	14,0	42	62	25	50	35	14	3	5
KRAC 35/12	E12KA-01010300900	M12	√	8,0	14,0	42	62	25	50	35	14	3	5
KRAC 35/14	E12KA-01010301000	M14	–	8,0	14,0	42	62	25	50	35	14	3	5
KRAC 50/8	E12KA-01010301100	M8	√	9,8	16,0	42	62	25	70	50	16	3	5
KRAC 50/10	E12KA-01010301200	M10	√	9,8	16,0	42	62	25	70	50	16	3	5

Product data sheet (continued):

I-POB-07/01-Z3w9

ВЯРНО С ОРИГИНАЛА

Подпис: .....

Attachment No. 2

KRAC 50/12	E12KA-01010301300	M12	√	9,8	16,0	42	62	25	70	50	16	3	5
KRAC 50/14	E12KA-01010301400	M14	–	9,8	16,0	42	62	25	70	50	16	3	5
KRAC 70/8	E12KA-01010301500	M8	√	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/10	E12KA-01010301600	M10	√	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/12	E12KA-01010301700	M12	√	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/14	E12KA-01010301800	M14	–	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 70/16	E12KA-01010301900	M16	–	11,2	18,5	52	72	25	95	70	18	3	6
KRAC 95/10	E12KA-01010302000	M10	√	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 95/12	E12KA-01010302100	M12	√	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 95/14	E12KA-01010302200	M14	–	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 95/16	E12KA-01010302300	M16	–	13,2	22,0	56	75	25	120	95	22	3	6
KRAC 120/10	E12KA-01010302400	M10	√	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 120/12	E12KA-01010302500	M12	√	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 120/14	E12KA-01010302600	M14	–	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 120/16	E12KA-01010302700	M16	√	14,7	23,0	56	80	30	150	120	22	3	6
KRAC 150/10	E12KA-01010302800	M10	√	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/12	E12KA-01010302900	M12	√	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/14	E12KA-01010303000	M14	–	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/16	E12KA-01010303100	M16	√	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 150/20	E12KA-01010303200	M20	–	16,3	25,0	60	90	30	185	150	25	3	6
KRAC 185/10	E12KA-01010303300	M10	√	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/12	E12KA-01010303400	M12	√	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/14	E12KA-01010303500	M14	–	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/16	E12KA-01010303600	M16	√	18,3	28,5	60	91	30	240	185	28	3	6
KRAC 185/20	E12KA-01010303700	M20	–	18,3	28,5	60	91	30	240	185	28	3	6

Product data sheet (continued):

Attachment No. 2

KRAC 240/10	E12KA-01010303800	M10	-	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/12	E12KA-01010303900	M12	√	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/14	E12KA-01010304000	M14	–	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/16	E12KA-01010304100	M16	√	21,0	32,0	70	103	38	300	240	32	3	8
KRAC 240/20	E12KA-01010304200	M20		21,0	32,0	70	103	38	300	240	32	3	8
KRAC 300/12	E12KA-01010304400	M12	√	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 300/14	E12KA-01010304500	M14	–	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 300/16	E12KA-01010304600	M16	√	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 300/20	E12KA-01010304700	M20	√	23,3	34,0	70	103	38	-	300	34	3	-
KRAC 500/16	E12KA-01010305201	M16	√	29,0	44,0	80	122	44	-	500	44	4	-

I-POB-07/01-Z3w9

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www.filkab.com

Приложение 2 към Техническо предложение

За обособена позиция № 2:

„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)“

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

Приложение 3

Превод от английски език

ИНСТИТУТ ПО ЕНЕРГЕТИКА
Изследователски институт
Отдел сертифициране

ul. Mory 8, 01-330 Варшава, Полша
Тел.: +48 22 34 51 299
Факс: +48 22 836 63 63
www.ien.cofn.pl

ДОКАЗАТЕЛСТВО ЗА ОДОБРЯВАНЕ НА ПОДИЗПЪЛНИТЕЛ НА

ОТДЕЛ СЕРТИФИЦИРАНЕ НА ИНСТИТУТ ПО ЕНЕРГЕТИКА

в обхвата на лабораторните тестове

№ LBU-001/2016

(Издание 01)

Потвърждава се, че:

1. Стенд за тестови цикъл № 1, 2, 3
2. Механична изпитателна стойка за якост
3. Изпитвателен стенд за измерване на съпротивлението

намиращи се в
ZAE ERGOM Sp. z o.o.,
10 Nowe Sady Str., 94-102 Лодз, Полша

отговаря на критериите за техническите изисквания, посочени в точки 4 и 5 от PN-EN ISO / IEC 17025: 2005 (EN ISO / I EC 17025: 2005) и е получил признание на отдел по сертификация на IEn в рамките на извършването на лабораторни тестове и измервания за собствено ползване на фирмата и за отдел по сертификация на IEn.

Отдел за сертифициране на IEn потвърждава валидността на процедурите за изпитване и измервания, прилагани за измервателните и изследователските станции в ZAE ERGOM Sp. z o.o, в Лодз за тестване според следните стандарти:

PN-EN 61238-1: 2004
Компресионни и механични свързващи устройства за силови кабели с номинално напрежение до 36 kV (Um = 42 kV) - Част 1: методи за изпитване и изисквания

Признатите методи за изпитване са дадени в Приложение № 1.

Това доказателство за одобрение е валидно от 01.12.2016 до 01.12.2020

Ръководител отдел
сертифициране на IEn
/подпис – не се чете/

mgr inz. Grazyna Wieczorek

Варшава, 01.12.2016

ВЯРНО С ОРИГИНАЛА
Подпис: .....

ПРИЛОЖЕНИЕ № 1 КЪМ ДОКАЗАТЕЛСТВА ЗА ОДОБРЯВАНЕ НА ПОДИЗПЪЛНИТЕЛ НА ОТДЕЛ СЕРТИФИЦИРАНЕ НА ИНСТИТУТ ПО ЕНЕРГЕТИКА № LBU- 001/2016

(Издание 01)

Признати методи за изпитване в обхвата:

1. Измерване на температурата чрез многоканален рекордер тип KD7, произведен от LUMEL.

2. Измерване на механичната якост чрез изпитателна машина за статични изпитвания на опън тип ZDM-5 2213, произведена от RAUNSTEIN.

3. Измерване на съпротивление с цифров инструмент малък тип съпротивление DLR010HD, произведен от MEGGER.

INSTITUTE OF POWER ENGINEERING
Research Institute
Certification Department
ul. Mory 8, 01-330 Warsaw, Poland
Phone +48 22 34 51 299
Fax +48 22 836 63 63
www.ien.com.pl

EVIDENCE OF APPROVAL FOR SUBCONTRACTORS

OF CERTIFICATION DEPARTMENT OF INSTITUTE OF POWER ENGINEERING IN THE RANGE OF LABORATORY TESTING

No. LBU – 001/2016

(Issue 01)

It is confirmed that:

1. *Heat cycle test stand No. 1, 2, 3*
2. *Strength mechanical test stand*
3. *Resistance measurement test stand*

located in the
ZAE ERGOM Sp. z o.o.,
10 Nowe Sady Str., 94-102 Łódź, Poland

meets the criteria for the technical requirements specified in point 4 and 5 of PN-EN ISO / IEC 17025:2005 (EN ISO/IEC 17025:2005) and obtained recognition of Certification Department of IEn in the scope of performing laboratory tests and measurements for company own use and for Certification Department of IEn.

Certification Department of IEn confirms the validity of test and measurements procedures applied for the measurement and research stations at ZAE ERGOM Sp. z o.o. in Łódź for testing according to the following standards:

PN-EN 61238-1:2004
Compression and mechanical connectrors for power cables rated voltages up to 36 kV (Um= 42 kV) – Part 1: test methods and requirements

Recognized test methods are given in Appendix No. 1

This evidence of approval is valid from **01.12.2016** until **01.12.2020**

Head of Certification
Department of IEn

на основание чл. 36а, ал. 3
от ЗОП

mgr inż. Grażyna Wieczorek

Warsaw, 01.12.2016

ВЯРНО С ОРИГИНАЛА
Подпис: .....

APPENDIX No. 1 TO EVIDENCE OF APPROVAL FOR SUBCONTRACTORS OF CERTIFICATION DEPARTMENT OF INSTITUTE OF POWER ENGINEERING No. LBU – 001/2016

(Issue 01)

Recognized test methods in the range:

1. Temperature measurement by means of multichannel screen recorder type KD7 manufactured by LUMEL.
2. Mechanical strength measurement by means of testing machine for static tensile tests type ZDM-5 2213 manufactured by RAUNSTEIN.
3. Resistance Measurement with digital instrument small resistance type DLRO10HD manufactured by MEGGER.

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4004 Пловдив, България
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Ф +359 32 671 133
office@filkab.com
www.filkab.com

Приложение 2 към Техническо предложение

За обособена позиция № 2:

„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)“

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

Приложение 4

Превод от английски език

ERGOM Z.A.E. Sp. z o. o.
Nowe Sady 10 Str., 94-102 Lodz, Poland
(+48)42 689 33 86
export@ergom.com

Декларация за съответствие 58/2015

1. **Производител:** ZAE ERGOM Sp. z o. o
   94-102 Lodz ul. Nowe Sady 10
2. **Продукт:** Алуминиева кабелна обувка **KRAC**
3. **Класификация:** PKWiU 31.20.27-70.00
4. **Употреба и обхват на използване:** използва се за свързване на алуминиеви проводници.
5. **Техническа спецификация:** Обувките отговарят на условията PN-E-06401-02:1990 и DIN 46329.
6. **Партида, която е обхваната от декларация:** продукти закупени от клиента.

С настоящото декларирам с пълна отговорност, че продуктът съответства с техническите спецификации по т. 4 и т. 5.

Dział Kontroli Jako ści
Specjalist. ds Jako
на основание чл. 36а, ал. 3
от ЗОП

Ръ а качеството

ВЯРНО С ОРИГИНАЛА
Подпис: .....

ERGOM Z.A.E. Sp. z o. o.
Nowe Sady 10 Str., 94-102 Lodz, Poland
(+48) 42 689 33 86
export@ergom.com

www.ergom.com

DECLARATION OF CONFORMITY 58/2015

1. **Product manufacturer:** ZAE ERGOM Sp. z o. o
   94-102 Łódź ul. Nowe Sady 10
2. **Product name:** Aluminum cable terminals type KRAC
3. **Product classification:** PKWiU 31.20.27-70.00
4. **Product application and the range of usage:** used for termination of aluminum conductors of energetics wires.
1. **Technical specification:** Terminals are compliant with norm PN-E-06401-02:1990 and DIN 46329.
2. **Batch covered by the declaration:** products purchased by the customer.

I hereby declare with full responsibility, that the product is compliant with the technical specification as per point 4 and 5.

Dział Kontroli Jakości
на основание чл. 36а, ал. 3
от ЗОП

Quality control dept. manager

Превод от английски език

ERGOM Z.A.E. Sp. z o. o.
Nowe Sady 10 Str., 94-102 Lodz, Poland
(+48)42 689 33 86
export@ergom.com

Лодз, 2016-03-02

Сертификат за качество 55/2016

Декларираме, че предлаганите от Ergom алуминиеви кабелни обувки тип KRAC се изработват от суровини съгласно посочените по-долу стандарти:

1) PN-EN 754-3: 2009 Алуминиеви и алуминиеви сплави – пръти и тръби студено изтеглени - част 3. Допустими отклонения в размерите и формите на кръгли пръти.

2) PN-EN 573 - 3: 2013 Алуминиев и алуминиеви сплави - химичен състав и видове изделия - част 3. Химичен състав и видове продукти.

Dział Kontroli Jakości
на основание чл. 36а, ал. 3 от ЗОП

Ръководител отдел Контрол на качеството

ВЕРНО С ОРИГИНАЛА
Подпис: .....

ERGOM Z.A.E. Sp. z o. o.
Nowe Sady 10 Str., 94-102 Lodz, Poland
(+48) 42 689 33 86
export@ergom.com

www.ergom.com

Łódź dn. 2016-03-02

Quality certificate nr 55/2016

We hereby declare that offered by Ergom aluminium cable terminals type KRAC are made of raw materials according to below standards:

1) PN-EN 754-3: 2009 Aluminum and aluminium's alloy – rods and pipes cold drawn – part 3. Tolerances in dimensions and shapes of round rods.
2) PN-EN 573 – 3: 2013 Aluminium i stopy aluminium – chemical composition and product types wrought – part 3. Chemical composition and product types.

Dział Kontroli Jakości
на основание чл. 36а, ал. 3
от ЗОП

Quality control dept. manager

VAT: PL7260129071, Regon: 473076927, KRS: 0000132427
Sąd Rejonowy dla Łodzi – Śródmieścia w Łodzi, XX Wydział Krajowego Rejestru Sądowego
Initial Capital ERGOM Z.A.E. – 10.400.000,00 PLN
Bank Zachodni WBK SA II/O Łódź, BIC: WBK PPLPP, IBAN: PL 16 1090 1304 0000 0000 3034 8970

ПРЕВОД ОТ АНГЛИЙСКИ ЕЗИК

STOWARZYSZENIE ELEKTRYKOW POLSKICH
BIURO BADAWCZE DS. JAKOSCI
04-703 Варшава, ul. Mieczystawa Pozaryskiego 28
Тел.: +48 22 81 2 69 38; факс: +48 22 81 5 65 80; e-mail: bbj@bbj.pl

СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ Z

nr Z/12/060/17

Доставчик: **(Име и адрес)**	**Zaklad Aparatury Elektrycznej ERGOM Sp. z o.o.** **ul. Nowe Sady 10** **94-102 Лодз, Полша**
Производител: **(Име и адрес)**	**Zaklad Aparatury Elektrycznej ERGOM Sp. z o.o.** **ul. Nowe Sady 10** **94-102 Лодз, Полша**
Име на продукта:	**алуминиеви херметични покалаени кабелни обувки**
Тип (модел)	**KRAC** **(списък с варианти от другата страна на сертификата)**
Техническа информация **Клас А**	**номинално сечение 16 mm² – 300 mm²**
Вид сертификационна схема	**1а в съответствие с PN-EN ISO/IEC 17067**

Мостра от горепосочения продукт е изпитана и е установено, че е в съответствие с изискванията на стандарта (ите) и / или нормативния документ:

Стандарт(и)/нормативни документи	*Изпитателни протоколи №*	*Издаден от*
PN-EN 61238-1:2004 EN 61238-1:2003) (IEC 61238-1:2003)	LA-17.062/17.045/1 LA-17.062/17.045/2 LA-17.062/17.045/3 LA-17.062/17.045/4	SEP - BBJ

Изпитателния протокол е неразделна част от този сертификат
Варшава, 2017-12-29

Ръководител сертифициращ орган
/подпис – не се чете)
Zbigniew Brzozowski

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Допълнителна информация

Списък на варианти:

Тип	Номинално сечение [mm^1]
KRAC 16/8; KRAC 16/10; KRAC 16/12	16
KRAC 25/8; KRAC 25/10; KRAC 25/12	25
KRAC 35/8; KRAC 35/10; KRAC 35/12; KRAC 35/14	35
KRAC 50/8; KRAC 50/10; KRAC 50/12; KRAC 50/14	50
KRAC 70/8; KRAC 70/10; KRAC 70/12; KRAC 70/14; KRAC 70/16	70
KRAC 95/10; KRAC 95/12; KRAC 95/14; KRAC 95/16	95
KRAC 120/10; KRAC 120/12; KRAC 120/14; KRAC 120/16	120
KRAC 150/10; KRAC 150/12; KRAC 150/14; KRAC 150/16; KRAC 150/20	150
KRAC 185/10; KRAC 185/12; KRAC 185/14; KRAC 185/16; KRAC 185/20	185
KRAC 240/10; KRAC 240/12; KRAC 240/14; KRAC 240/16; KRAC 240/20	240
KRAC 300/12; KRAC 300/14; KRAC 300/16; KRAC 300/20	300

NC-A 17.400
Рег. № S-A-17-045

Копие до:
1. Zakład Aparatury Elektrycznej ERGOM S,. z o.o.
ul. Nowe Sady 10
94-102 Лодз, Полша

2. NC

ВЕРНО С ОРИГИНАЛА
Подпис: .....

STOWARZYSZENIE ELEKTRYKÓW POLSKICH
BIURO BADAWCZE DS. JAKOŚCI
04-703 Warszawa, ul. Mieczysława Pożaryskiego 28
tel.: +48 22 812 69 38; fax: +48 22 815 65 80; e-mail: bbj@bbj.pl

CERTYFIKAT ZGODNOŚCI Z

CERTIFICATE OF CONFORMITY Z

nr Z/12/060/17
No. Z/12/060/17

Firma nagrodzona Złotą Odznaką Honorową SEP
Company granted with SEP Gold Honour Award

Dostawca: (Nazwa i adres) *Supplier:* (Name and address)	Zakład Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10 94-102 Łódź, Poland
Producent: (Nazwa i adres) *Manufacturer:* (Name and address)	Zakład Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10 94-102 Łódź, Poland
Nazwa wyrobu: *Name of the product:*	Końcówki aluminiowe szczelne cynowane. *Aluminium terminals longitudinally sealed tin-plated.*
Typ (model): *Type (model):*	KRAC (wykaz wykonań na drugiej stronie certyfikatu) *(list of variations on the other side of the certificate)*
Dane techniczne: *Technical data:*	Przekrój znamionowy: 16 mm² ÷ 300 mm²; Klasa A. *Rated cross-section: 16 mm² ÷ 300 mm²;* *Class A.*
Typ programu certyfikacji: *Type of certification scheme:*	1a według PN-EN ISO/IEC 17067 *1a according to PN-EN ISO/IEC 17067*

Próbka wymienionego wyżej wyrobu została zbadana i uznana, jako spełniająca wymagania norm(-y) i/lub dokumentów normatywnych:
A sample of the aforesaid product was tested and found to be in conformity with the requirement of the standard(s)and/or normative document:

Norma(-y)/ dokumenty normatywne *Standard(s)/normative documents*	Raport(-y) z badań nr *Test report(s) No.*	Wydany(-e) przez *Issued by*
PN-EN 61238-1:2004 (EN 61238-1:2003) (IEC 61238-1:2003)	LA-17.062/17.045/1 LA-17.062/17.045/2 LA-17.062/17.045/3 LA-17.062/17.045/4	SEP - BBJ

Raport z badań stanowi integralną część niniejszego certyfikatu
Test Report forms integral part of this Certificate

Warszawa, 2017-12-29

Kierownik Jednostki Certyfikującej
Certification Body Manager
на основание чл. 36а, ал. 3 от ЗОП
Zbigniew Brzozowski

BBJ

PCA Polskie Centrum Akredytacji – Certyfikacja Wyrobów
AC 012

CERTYFIKAT nr Z/12/060/17
CERTIFICATE No. Z/12/060/17

Informacje dodatkowe:
Additional information:

Wykaz odmian:
List of variations:

Typ *Type*	Przekrój znamionowy Rated *cross-section* [mm^2]
KRAC 16/8; KRAC 16/10; KRAC 16/12	16
KRAC 25/8; KRAC 25/10; KRAC 25/12	25
KRAC 35/8; KRAC 35/10; KRAC 35/12; KRAC 35/14	35
KRAC 50/8; KRAC 50/10; KRAC 50/12; KRAC 50/14	50
KRAC 70/8; KRAC 70/10; KRAC 70/12; KRAC 70/14; KRAC 70/16	70
KRAC 95/10; KRAC 95/12; KRAC 95/14; KRAC 95/16	95
KRAC 120/10; KRAC 120/12; KRAC 120/14; KRAC 120/16	120
KRAC 150/10; KRAC 150/12; KRAC 150/14; KRAC 150/16; KRAC 150/20	150
KRAC 185/10; KRAC 185/12; KRAC 185/14; KRAC 185/16; KRAC 185/20	185
KRAC 240/10; KRAC 240/12; KRAC 240/14; KRAC 240/16; KRAC 240/20	240
KRAC 300/12; KRAC 300/14; KRAC 300/16; KRAC 300/20	300

NC-A 17.400
Nr rej. S-A-17-045
Reg. No. S-A-17-045

Rozdzielnik:
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Приложение 2 към Техническо предложение

За обособена позиция № 2:

„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)“

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

Приложение 5

2 ERGOM

Технология за кримпване на алуминиеви кабелни обувки

Изработени като: пръстеновидни обувки, прави, стегнати (тип KRA съгласно Ergom) съгласно DIN 46329; гилзи. При останалите обувки (с изключение на KLA, 2KAm, 2ZA, KLAN) DIN размерите се отнасят само за тръбната част на обувката. Те са изработени като : изправени, пръстовидни обувки (KRA; KRAS; KDA; KDA../2X; 2Kam; тип KA съгласно Ergom); гилзи (LA; LAS; LAD; LAP; LAW; LAWP; KLAN; ZLA; 2ZA тип съгласно Ergom); редуциращи конектори (LA.../...; LAP.../...; LAWP.../...; LAW.../... тип съгласно Ergom); кабелен накрайник (BAW; BAK).

Материали: всики видови - E-Al алуминиева тръба съгласно с DIN 40501 Teil 3 or DIN 1712 Teil 2.

Покритие: без покритие или поцинковани (по заявка).

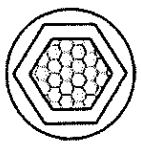
Приложение:

Изправените, пръстовидни обувки се използват за свързване на кабелна връзка на винтово съединение към шина, комутационна апаратура и др. Гилзите се използват за свързване на два алуминиеви проводника с еднакво напречно сечение (LA, LAS, LAP, LAWP, KLAN, ZLA, KLA, 2ZA) или за свързване на два алуминиеви проводника с различно напречно сечение (LA.../...; LAP.../...; LAWP.../...; LAW.../...). Гилзите направени с тези конектри (с изключение на 2ZA, KLA, KLAN, ZLA) не могат да бъдат механично свързани. Алуминиевите кабелни накрайници (BAW, BAK) се използват за свързане на жица с гилзата.

Технология за кримпване:

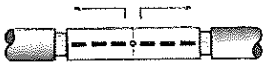
Обувките се навиват с инструменти, които са неречни "шестоъгълни" кримпващи клещи.

много гилзи

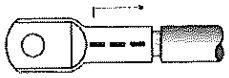


Благодарение на компресираща форма на гилзата се постига връзка с високи механични и електрически параметри. Въпреки това, такива се нуждаят от компресиране на обувката. Колкото повече е броят на компресиите, толкова по-добре е за гилзата.

Много важно в случай на силови връзки, при които се изисква предаване на големи мощности и ток. "Шестоъгълната" компресия се нуждае от още по-голяма сила, за да се навива обувката. така че при такава компресия (дори при малка напречна секция) ZAE ERGOM препоръчва използването на хидравлични инструменти или ръчни инструменти с по-високо механично съотношение. За да се постигне гилзата необходимото качество, се препоръчва да се компресират обувките на "шестоъгълника" по следния начин:

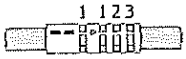


Правилната посока и последователност на притискане на обувката са маркирани със стрелки.

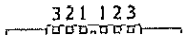


1. Първи натиск (вътрешен)

2. Втори натиск (отвътре навън)

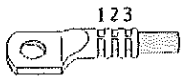


3. Първи натиск от другата страна (вътрешен)



4. Втори натиск от другата страна (отвътре навън)

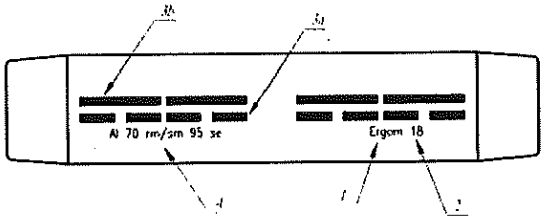
1. First compression (inside)



2. Втори натиск (отвътре навън)

Всяка обувка е означена с маркировка и е напечатана:

- напречно сечение или диаметър на отвора на винта (в случай
пръстовидни обувки)
- трябва да се постави номер на седалката преди да се навие обувката
- графичен код за броя и позицията на необходимите компреси
направени с тесни удари (ръчни инструменти) или широки удар
(хидравлични инструменти).



Пример за подобен код е даден по-долу.

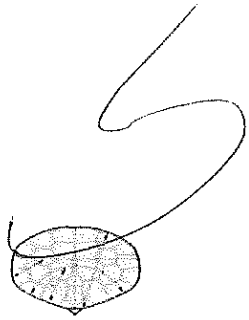
1. Търговска марка.
2. Номер.
3. Маркиране на мястото и броя повторения на натиск.
   3a. Механично: тясно.
   3b. Хидравлично: широко.
4. Код на кабелите (напречно сечение и профил).

Всичко маркирано е препоръчително да бъде кримпнато. Моля, обърнете внимание, че трябва да използвате правилната матрица за напречното сечение, за която е проектирана.

Types of cable wires

Кръгъл многожичен кабел **(rm)**

Кръгъл проводник **(re)**

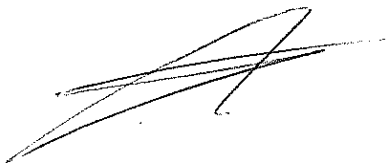


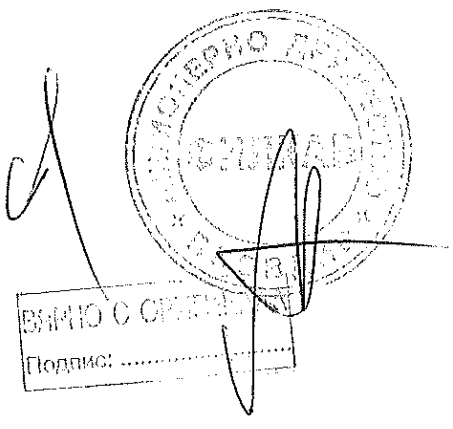
Разделен многожичен **(sm)**

Разделен проводни

Секторните проводници трябва да бъдат заоблени със специални матрици.

www.ergom.com





Crimping technology for tubular terminals Al

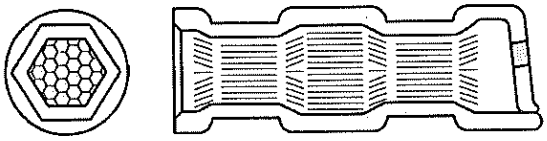
Made as: ring terminals, straight, tight (KRA type acc. to Ergom) in accordance with DIN 46329; butt connectors. In remaining terminals (excepting KLA; 2KAm; 2ZA; KLAN) the DIN dimensions refer only to tubular part of terminal. They are made as: straight ring terminals (KRA; KRAS; KDA; KDA../2X; 2Kam; KA type acc. to Ergom); butt connectors (LA; LAS; LAD; LAP; LAW; LAWP; KLAN; ZLA; 2ZA type acc. to Ergom); reduction connectors (LA.../...; LAP.../...; LAWP.../...; LAW.../... type acc. to Ergom); pin terminals (BAW; BAK).

Materials: all types – E-Al aluminium tube acc. to DIN 40501 Teil 3 or DIN 1712 Teil 2.

Surface: without coating or tin-plated (on request).

Application:
Straight ring terminals are used for connecting wire ny use of a screw joint to a bus-bar, switchgear, etc. Butt connectors are used to join two aluminum wires of the same cross-section to so called "butt" (LA, LAS, LAP, LAWP, KLAN, ZLA, KLA, 2ZA) or to join two aluminum wire of different cross-section (LA.../...; LAP.../...; LAWP.../...; LAW.../...). The joint made with these connectors (excepting 2ZA, KLA, KLAN, ZLA) cannot be stressed mechanically. Aluminium pin terminals (BAW, BAK) are used for connecting wire with screw joint.

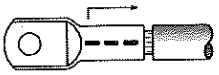
Crimping technology:
Terminals are crimped using tools with so called "hexagon" Crimping dies.

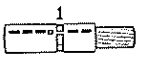


Thanks to such compressing shape joint with very high mechanical and electrical parameters is achieved. However, such joints need several compressions of terminal. The higher compression number the better the joint is.

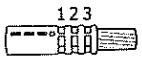
It is very important in case of power joints where transmission of large power and currents is required. The "hexagon" compression needs still considerable force to crimp a terminal so in case of such compression (even small wire cross-section) ZAE ERGOM recommends use of hydraulic tools or hand-tools with higher mechanical ratio (operated with both hands). In order to achieve joint of required quality it is recommended to compress terminals to "hexagon" in the following way:

Correct direction and sequence of terminal compressions are marked with arrows.

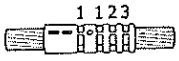




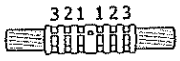
1. First compression (inside)



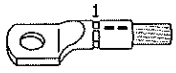
2. Futher compression (from inside to outside)



3. First compression on the other side (inside)



4. Futher compressions on the other side (from inside to outside)

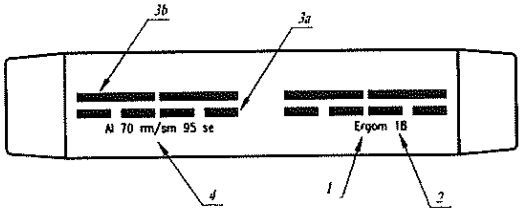


1. First compression (inside)

2. Futher compression (from inside to outside)

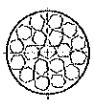
All marked (recommended) crimping must be made. Please pay attention to use proper die for cross-section to which it is designed.

There is marking stamped or overprinted on every terminal to indicate:
- terminal cross-section or screw hole diameter (in case of ring terminals)
- die seat No. to crimp a terminal
- graphic code of number and position of compressions required, made with narrow dies (hand tools) or wide dies (hydraulic tools).

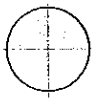


An example of such code is given below.
1. Trade mark.
2. Die seat No.
3. Marking of place and number of compressions.
   3a. Mechanic: narrow die.
   3b. Hydraulic: wide die.
4. Code of cable types (cross-section and profile).

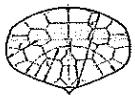
Types of cable wires



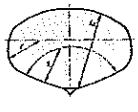
round multiwire **(rm)**



round one-wire **(re)**

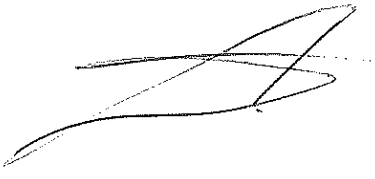


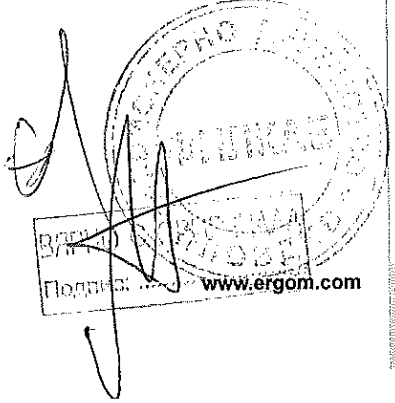
sectored multiwire **(sm)**



sectored one-wire **(se)**

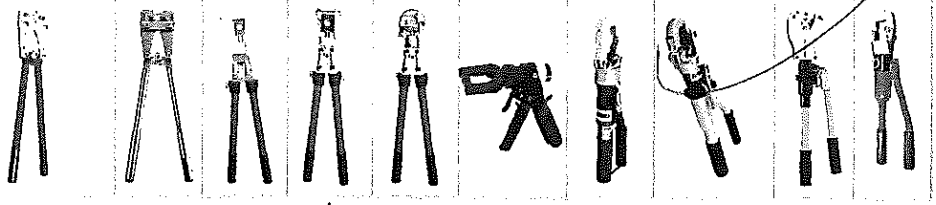
Sector shaped conductors must be rounded with special dies.





ERGOM

Ręczne i hydrauliczne praski zaciskowe / Crimping

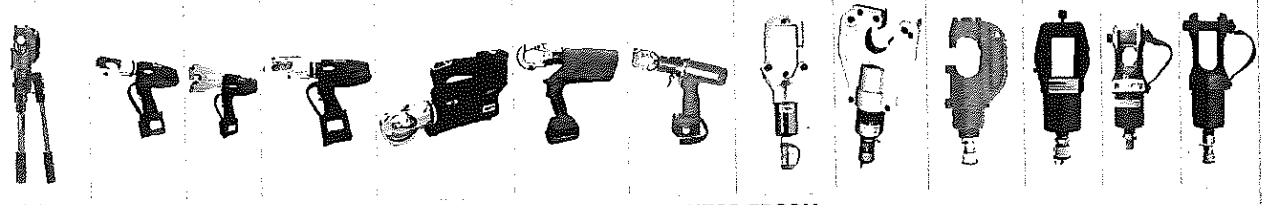


Narzędzia patrz: katalog ŚWIAT NARZĘDZI ERGOM / Tools: see in catalogue ERGOM'S

Narzędzie / Tool / Инструмент	Przekrój / Cross section / Сечение [mm²] [мм²]	KO 6/6 KT Al-c**)	KO 6/6 KT Al-g***)	KO 6F/6 KT Al-c**)	KD 6/6 KT Al	EK 18	EK 19	EK 22	HK 4	HK 5	HK 22	UH 60	PBM 6	PHK-300
	10				●	●	●	●	●	●	●	●	●	●
	16	●	●		●	●	●	●	●	●	●	●	●	●
	25	●	●	●	●	●	●	●	●	●	●	●	●	●
	35	●	●	●	●	●	●	●	●	●	●	●	●	●
KRA/KRAC	50	●	●	●	●	●	●	●	●	●	●	●	●	●
KRAS/KRASC	70	●	●	●	●	●	●	●	●	●	●	●	●	●
KDA/KDAC	95	●	●	●	●	●	●	●		●	●	●	●	●*)
KDA 2X	120	●	●	●	●	●	●	●		●	●	●	●	●*)
LA	150			●		●	●	●		●	●	●	●	●*)
BAW	185					●	●	●			●	●	●	●*)
BAK	240										●	●	●	
LAP	300												●	
LAWP	400													
LAW	500													
	625													
	800													
	1000													

*) z dodatkowym zestawem matryc PHK-R / with additional die set PHK-R type / с дополнительным набором матриц PHK-R
**) tylko do końcówek i łączników cienkościennych / only for thin walled terminals and joints / только к терминалам и разъемы тонкий
***) tylko do końcówek i łączników grubościennych / only for thick walled terminals and joints / только концы и толстых опор

tools and hydraulic presses / Ручные и гидравлические прессы



WORLD OF TOOLS / Инструменты: смотри в каталоге МИР ИНСТРУМЕНТОВ ERGOM

WHPH 2/32	WHPH 2/38	WHPH 2/42	WHPH 4	HO 2 EV	HO 2 EH	HBM 6EV	HP 2/25 EV	HP 2/30 EV	HP 2/42 EV	HP 2/25 EH	HP 2/30 EH	HP 2/42 EH	UH 60EV	HK 22 EV	HK 5 EL	GH 60	GK 22	GBM 6	HPH 2/32	HPH 2/38	HPH 4	HH 400	EH 400	HH 630	EH 630	HH 1000	EH 1000
●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
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●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	●	●
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																										●	●

8

ФИЛКАБ АД
ул. Коматевско шосе 92
4004 Пловдив, България
Т +359 32 277 171
Ф +359 32 671 133
office@filkab.com
www.filkab.com

Приложение 2 към Техническо предложение

За обособена позиция № 2:

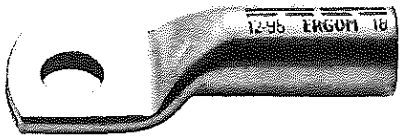
„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)"

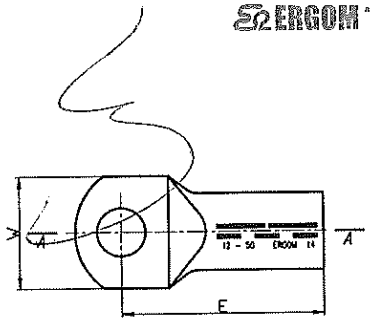
ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

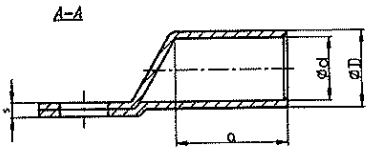
Приложение 6

ERGOM

Tubular terminals KDR and KDM types



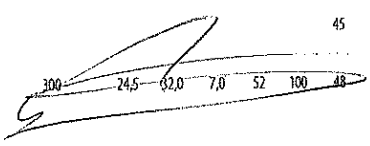


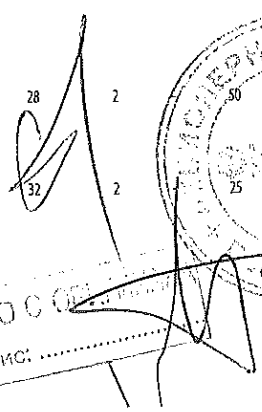


Material Cu.
Surface KDR – tin-plated;
KDM – uncoated.
Design DIN 46235.

Note! sector shaped conductors must be rounded with special dies.

tin-plated		uncoated		Cross section	Dimension [mm]						Terminal	Crimping				[kg]
Type	Item No.	Type	Item No.	[mm²]	d	D	s	a	E	W		Die code No.	Nc/w	Nc/n		
KDR 10/5	E11KM-02020100100	KDM 10/5	E11KM-02010100100							9	M5					0,40
KDR 10/6	E11KM-02020100200	KDM 10/6	E11KM-02010100200	10	4,5	6,0	1,5	12	27		M6	6	–	1	100	0,45
KDR 10/8 1)	E11KM-02020100300	KDM 10/8 1)	E11KM-02010100300				1,0			13	M8					0,40
KDR 16/6	E11KM-02020100400	KDM 16/6	E11KM-02010100400							13	M6					1,30
KDR 16/8	E11KM-02020100500	KDM 16/8	E11KM-02010100500	16	5,5	8,5	2,5	20	36		M8	9	1	2	100	1,40
KDR 16/10	E11KM-02020100600	KDM 16/10	E11KM-02010100600							17	M10					
KDR 16/12 1)	E11KM-02020100700	KDM 16/12 1)	E11KM-02010100700				2,0		38	19	M12					
KDR 25/6	E11KM-02020100800	KDM 25/6	E11KM-02010100800							14	M6					
KDR 25/8	E11KM-02020100900	KDM 25/8	E11KM-02010100900				3,0		38	16	M8					1,65
KDR 25/10	E11KM-02020101000	KDM 25/10	E11KM-02010101000	25	7,0	10,0		20		17	M10	10	1	2	100	
KDR 25/12	E11KM-02020101100	KDM 25/12	E11KM-02010101100							19	M12					
KDR 25/14 1)	E11KM-02020101200	KDM 25/14 1)	E11KM-02010101200				2,0		40	21	M14					1,90
KDR 25/16	E11KM-02020101300	KDM 25/16	E11KM-02010101300				1,0		45	25	M16					1,80
KDR 35/6 1)	E11KM-02020101400	KDM 35/6 1)	E11KM-02010101400				4,0			17	M6					3,00
KDR 35/8	E11KM-02020101500	KDM 35/8	E11KM-02010101500				3,5		42		M8					
KDR 35/10	E11KM-02020101600	KDM 35/10	E11KM-02010101600	35	8,2	12,5		20		19	M10	12	1	2	100	3,10
KDR 35/12	E11KM-02020101700	KDM 35/12	E11KM-02010101700				3,0			21	M12					
KDR 35/14	E11KM-02020101800	KDM 35/14	E11KM-02010101800						44	23	M 14					
KDR 35/16	E11KM-02020101900	KDM 35/16	E11KM-02010101900				2,5		45	28	M16					3,30
KDR 50/8	E11KM-02020102000	KDM 50/8	E11KM-02010102000							20	M8					4380
KDR 50/10	E11KM-02020102100	KDM 50/10	E11KM-02010102100							22	M10					4,70
KDR 50/12	E11KM-02020102200	KDM 50/12	E11KM-02010102200	50	10,0	14,5	4,0	28	52	24	M12	14	2	3	100	4,75
KDR 50/14	E11KM-02020102300	KDM 50/14	E11KM-02010102300							26	M 14					4,70
KDR 50/16	E11KM-02020102400	KDM 50/16	E11KM-02010102400							28	M16					4,60
KDR 70/8	E11KM-02020102500	KDM 70/8	E11KM-02010102500								M8					6,00
KDR 70/10	E11KM-02020102600	KDM 70/10	E11KM-02010102600				4,5			24	M10					6,30
KDR 70/12	E11KM-02020102700	KDM 70/12	E11KM-02010102700	70	11,5	16,5		28	55		M12	16	2	3	100	6,40
KDR 70/14	E11KM-02020102800	KDM 70/14	E11KM-02010102800				4,0			26	M 14					6,55
KDR 70/16	E11KM-02020102900	KDM 70/16	E11KM-02010102900							30	M16					6,20
KDR 70/20	E11KM-02020103000	KDM 70/20	E11KM-02010103000				3,0			34	M20					6,65
KDR 95/10	E11KM-02020103200	KDM 95/10	E11KM-02010103200								M10					4,80
KDR 95/12	E11KM-02020103300	KDM 95/12	E11KM-02010103300							28	M12					4,70
KDR 95/14	E11KM-02020103400	KDM 95/14	E11KM-02010103400	95	13,5	19,0	5,0	35	65		M 14	19	2	4	50	4,80
KDR 95/16	E11KM-02020103500	KDM 95/16	E11KM-02010103500							30	M16					4,75
KDR 95/20 1)	E11KM-02020103600	KDM 95/20 1)	E11KM-02010103600				4,0		69	32	M20					
KDR 120/10	E11KM-02020103700	KDM 120/10	E11KM-02010103700								M10					5,70
KDR 120/12	E11KM-02020103800	KDM 120/12	E11KM-02010103800							32	M12					5,65
KDR 120/14	E11KM-02020103900	KDM 120/14	E11KM-02010103900	120	15,5	21,0	5,0	35	70		M14	20	2	4	50	5,75
KDR 120/16	E11KM-02020104000	KDM 120/16	E11KM-02010104000								M16					5,60
KDR 120/20	E11KM-02020104100	KDM 120/20	E11KM-02010104100							38	M20					5,80
KDR 150/10	E11KM-02020104200	KDM 150/10	E11KM-02010104200								M10					8,30
KDR 150/12	E11KM-02020104300	KDM 150/12	E11KM-02010104300							34	M12					8,10
KDR 150/14	E11KM-02020104400	KDM 150/14	E11KM-02010104400	150	17,0	23,5	6,0	40	78		M14	22	2	4	50	8,20
KDR 150/16	E11KM-02020104500	KDM 150/16	E11KM-02010104500								M16					8,00
KDR 150/20	E11KM-02020104600	KDM 150/20	E11KM-02010104600							40	M20					8,20
KDR 185/10	E11KM-02020104700	KDM 185/10	E11KM-02010104700								M10					9,30
KDR 185/12	E11KM-02020104800	KDM 185/12	E11KM-02010104800							37	M12					
KDR 185/14	E11KM-02020104900	KDM 185/14	E11KM-02010104900	185	19,0	25,5	6,0	42	82		M14	25	2	5	50	9,40
KDR 185/16	E11KM-02020105000	KDM 185/16	E11KM-02010105000								M16					9,25
KDR 185/20	E11KM-02020105100	KDM 185/20	E11KM-02010105100							40	M20					9,30
KDR 240/12	E11KM-02020105300	KDM 240/12	E11KM-02010105200								M12					13,70
KDR 240/14	E11KM-02020105400	KDM 240/14	E11KM-02010105300							42	M14					13,50
KDR 240/16	E11KM-02020105500	KDM 240/16	E11KM-02010105400	240	21,5	29,0	6,5	42	92		M16	28	2	5	50	13,60
KDR 240/20	E11KM-02020105600	KDM 240/20	E11KM-02010105500							45	M20					13,80
KDR 300/12 1)	E11KM-02020105700	KDM 300/12 1)	E11KM-02010105600								M12					8,30
KDR 300/14	E11KM-02020105800	KDM 300/14	E11KM-02010105700								M14					8,50
KDR 300/16	E11KM-02020105900	KDM 300/16	E11KM-02010105800								M16					8,55
KDR 300/20	E11KM-02020106000	KDM 300/20	E11KM-02010105900								M20					8,50





Tubular terminals acc. to DIN

tin-plated		uncoated		Cross section	Dimension [mm]						Terminal	Crimping				[kg]
Type	Item No.	Type	Item No.	[mm²]	d	D	s	a	E	W		Die code No.	Nc/w	Nc/n		
KDR 400/14	E11KM-02020106200	KDM 400/14	E11KM-02010106000								M14					16,40
KDR 400/16	E11KM-02020106300	KDM 400/16	E11KM-02010106100	400	27,5	38,5	10,0	70	115	55	M16	38	3	-	25	19,9
KDR 400/20	E11KM-02020106400	KDM 400/20	E11KM-02010106200								M20					17,00
KDR 500/14	E11KM-02020106600	KDM 500/14	E11KM-02010106300								M14					19,80
KDR 500/16 [1]	E11KM-02020106700	KDM 500/16 [1]	E11KM-02010106400	500	31,0	42,0	10,0	70	125	60	M16	42	3	-	25	20,50
KDR 500/20	E11KM-02020106800	KDM 500/20	E11KM-02010106500								M20					20,20
KDR 625/14	E11KM-02020107000	KDM 625/14	E11KM-02010106600								M14					8,20
KDR 625/16 [1]	E11KM-02020107100	KDM 625/16 [1]	E11KM-02010106700	625	34,5	44,0	10,0	81	135	63	M16	44	3	-	10	
KDR 625/20	E11KM-02020107200	KDM 625/20	E11KM-02010106800								M20					8,10
KDR 800/16	E11KM-02020107401	KDM 800/16	E11KM-02010106900	800	40,0	52,0	24	100	165	75	M16	52	3	-	10	14,80
KDR 800/20	E11KM-02020107501	KDM 800/20	E11KM-02010107000								M20					14,70
KDR 1000/16	E11KM-02020107701	KDM 1000/16	E11KM-02010107100	1000	44,0	58,0	28	100	165	85	M16	58	3	-	10	19,30
KDR 1000/20	E11KM-02020107801	KDM 1000/20	E11KM-02010107200								M20					19,10

Nc/w = No. of crimping wide | Nc/n = No. of crimping narrow

[1] *Sizes out of DIN standard.*

Technologia zaciskania końcówek i łączników rurowych Cu wg DIN %s

Dedykowane praski ręczne i hydrauliczne %s

ФИЛКАБ АД
ул. Коматевско шосе 92
4004 Пловдив, България
T +359 32 277 171
Ф +359-32-671 133
office@filkab.com
www.filkab.com

Приложение 2 към Техническо предложение

За обособена позиция № 2:

„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)"

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

Приложение 7

Превод от полски език

ИНСТИТУТ ПО ЕНЕРГЕТИКА
01-330 Варшава ул. Mory 8 tel./fax 22 836-80-16 e-mail: ewp@ien.com.pl www.ien.com.pl/ewp

INSTITUTE OF POWER ENGINEERING
ЛАБОРАТОРИЯ ВИСОКО НАПРЕЖЕНИЕ
HIGH CURRENT LABORATORY

AB 323

ПРОТОКОЛ ОТ ИЗПИТВАНЕ
EWP/31/E/2016

ИЗСЛЕДОВАТЕЛСКИ СЪОРЪЖЕНИЯ:	Кабелни обувки за кербоване KDR 35/10, KOR 35/10; Кабелни гилзи за кербоване KLD 35, KL 35; Тестовете бяха проведени върху кабел: Cu 35mm^2, клас 2
ПРОИЗВОДИТЕЛ:	Z.A.E. ERGOM Sp. z o.o. 94-102 Лодз ул. Nowe Sady 10
ИЗПИТАНИЯТА БЯХА ИЗВЪРШЕНИ:	Z.A.E. ERGOM Sp. z o. o. 94-102 Лодз ул. Nowe Sady 10
ВИД НА ИЗПИТВАНИЯТА:	Тестови изпитвания за компоненти от клас А: електрически и механични изпитвания
ПРОЦЕДУРА НА ИЗПИТВАНЕ:	PN-EN 61238-1: 2004
ДАТА НА ПОЛУЧАВАНЕ:	Август 2016
ДАТА НА ПРОВЕЖДАНЕ НА ИЗПИТВАНЕТО:	Август 2016 - Октомври 2016
РЕЗУЛТАТ ОТ ИЗПИТВАНЕТО:	Положителен
УЧАСТНИЦИ В ИЗСЛЕДВАНЕТО:	Marcin Lis – представител на производителя

Упълномощен мениджър на изпитванията:

mgr inz. Grzegorz Zaboklicki

подпис: не се чете

Одобрил Мениджър на лабораторията:

mgr inz. Maciej Owsinski

подпис: не се чете

Варшава, 03.02.2017г.

ВЕРНО С ОРИГИНАЛА
Подпис: .....

INSTYTUT ENERGETYKI
INSTITUTE OF POWER ENGINEERING
LABORATORIUM WIELKOPRĄDOWE
HIGH CURRENT LABORATORY

01-330 Warszawa
ul. Mory 8
tel./fax 22 836 80-16
e-mail: ewp@ien.com.pl
www.ien.com.pl/ewp

AB 323

RAPORT Z BADAŃ EWP/31/E/2016

OBIEKT BADAŃ:	Końcówki oczkowe: końcówki rurowe typu KDR 35/10, KOR 35/10; Złączki: łączniki typu KLD 35, KL 35; Badania przeprowadzono na przewodzie: rmc Cu 35mm², klasa 2
PRODUCENT:	Z.A.E. ERGOM Sp. z o.o. 94-102 Łódź ul. Nowe Sady 10
BADANIA WYKONANO NA ZAMÓWIENIE:	Z.A.E. ERGOM Sp. z o. o. 94-102 Łódź ul. Nowe Sady 10
RODZAJ BADAŃ:	Badania typu dla elementów klasy A: badania elektryczne i mechaniczne
PROCEDURA BADAŃ:	PN-EN 61238-1: 2004
DATA OTRZYMANIA OBIEKTU:	Sierpień 2016
DATA WYKONANIA BADAŃ:	Sierpień 2016 - Październik 2016
WYNIK BADAŃ:	Pozytywny
W BADANIACH UCZESTNICZYŁ:	Marcin Lis – przedstawiciel producenta

AUTORYZOWAŁ KIEROWNIK BADAŃ:

mgr inż. Grzegorz Zaboklicki

на основание чл. 36а, ал. 3 от ЗОП

Warszawa, 03.02.2017r.

ZATWIERDZIŁ KIEROWNIK LABORATORIUM

mgr inż. Mąciej Owsiński

на основание чл. 36а, ал. 3 от ЗОП

ФИЛКАБ АД
ул. Коматевско шосе 92
4004 Пловдив, България
Т +359 32 277 171
Ф +359 32 671 133
office@filkab.com
www.filkab.com

Приложение 2 към Техническо предложение

За обособена позиция № 2:

„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)“

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

Приложение 8

Превод от английски език

ERGOM Z.A.E. Sp. z o. o.
Nowe Sady 10 Str., 94-102 Lodz, Poland
(+48)42 689 33 86
export@ergom.com

Лодз, 2015-07-27

Декларация за съответствие 71/2015

1. **Производител:** ZAE ERGOM Sp. z o. o
   94-102 Lodz ul. Nowe Sady 10
2. **Продукт:** Медни кабелни обувки KDR, KDM
3. **Класификация:** PKWiU 31.20.27-70.00
4. **Употреба и обхват на използване:** използва се за свързване на медни проводници.
5. **Техническа спецификация:** Обувките отговарят на условията DIN 46235
6. **Партида, която е обхванатата от декларация:** продукти закупени от клиента.

С настоящото декларирам с пълна отговорност, че продуктът съответства с техническите спецификации по т.4 и т.5.

Dział Kontroli Jakości
на основание чл. 36а, ал. 3 от ЗОП

Ръководител отдел Контрол на качеството

ВЯРНО С ОРИГИНАЛА
Подпис: .....

ERGOM Z.A.E. Sp. z o. o.
Nowe Sady 10 Str., 94-102 Lodz, Poland
(+48) 42 689 33 86
export@ergom com

www.ergom.com

Łódź 27.07.2015

Declaration of conformity 71/2015

1. **Product manufacturer:** ZAE ERGOM Sp. z o. o
   94-102 Łódź ul. Nowe Sady 10
2. **Product name :** Copper tubular cable terminals type KDR, KDM
3. **Product classification:** PKWiU 31.20.27-70.00
4. **Product application and the range of usage:** used for termination of copper conductors of energetics wires.
5. **Technical specification:** Terminals are compliant with norm DIN 46235
6. **Batch covered by the declaration:** products purchased by the customer.

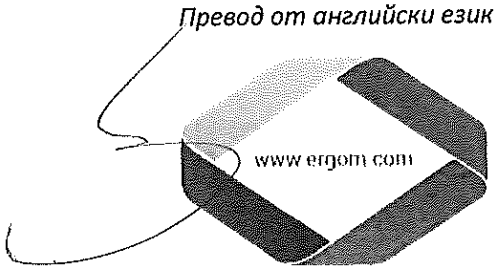
I hereby declare with full responsibility, that the product is compliant with the technical specification as per point 4 and 5.

Dział Kontroli Jako ści
на основание чл. 36а, ал. 3
от ЗОП

Quality control dept. manager

VAT: PL7260129071, Regon: 470076927, KRS: 0000132427
Sąd Rejonowy dla Łodzi – Śródmieścia w Łodzi, XX Wydział Krajowego Rejestru Sądowego
Initial Capital ERGOM Z.A.E. : 10.400.000,00 PLN
Bank Zachodni WBK SA II/O Łódź, BIC: WBK PPLPP, IBAN: PL 16 1090 1304 0000 0000 3034 8970

Превод от английски език



ERGOM Z.A.E. Sp. z o. o.
Nowe Sady 10 Str., 94-102 Lodz, Poland
(+48)42 689 33 86
export@ergom.com

Лодз, 04.10.2017

Декларация за съответствие 81/2017

1. Производител на продукта: ZAE ERGOM Sp. z o. o
94-102 Лодз ul. Новото Сади 10

2. Наименование на продукта: Кабелни обувки: KOR, KDR

3. Класификация на продукта: PKWiU 27.33.13.0

4. Приложение на продукта и обхват на употреба: използва се за свързване на медни проводници

5. Техническа спецификация: продукти, произведени от безшевни медни тръби за електрически цели в съответствие с норма EN 13600 (Мед и медни сплави)

1. Партида, обхванатата от декларацията: продукти, закупени от клиента.

Декларирам с пълна отговорност, че продуктът отговаря на техническата спецификация съгласно точка 5.

Dział Kontroli Jako ci
на основание чл. 36а, ал. 3
от ЗОП

Ръководител отдел Контрол на качеството

ERGOM®

Zakład Aparatury Elektrycznej ERGOM Sp. z o.o.
ul. Nowe Sady 10, 94-102 Łódź, Poland
(+48) 801 000 275
bok@ergom.com

www.ergom.com

Łódź, 04.10.2017

Declaration of conformity 81/2017

1. **Product manufacturer:** ZAE ERGOM Sp. z o. o
   94-102 Łódź ul. Nowe Sady 10
2. **Product name:** Cable terminals: KOR, KDR
3. **Product classification:** PKWiU 27.33.13.0
4. **Product application and the range of usage:** used for termination of copper conductors of energetics wires
5. **Technical specification:** products made from seamless copper pipes for electrical purposes compliant with norm EN 13600 (Copper and copper alloys)
1. **Batch covered by the declaration:** products purchased by the customer.

I hereby declare with full responsibility, that the product is compliant with the technical specification as per point 5.

Dział Kontroli Jako ci
Specialis Kontroli Jako
на основание чл. 36а, ал. 3
от ЗОП

Quality control dept. manager

Превод от полски език

ИНСТИТУТ ПО ЕНЕРГЕТИКА
Изследователски институт
01-330 Варшава, ул. Могу 8
тел. +48 22 34 51 299, факс. +48 22 836 63 63
instytut.energetyki@icn.com.pl

СВРТИФИКАТ IEn
NR 007/2015
(ПОТВЪРЖДЕНИЕ)

Име и адрес Притежател на сертификата:	Отдел Електрическо Оборудване ERGOM Sp. z o. o. ул. Nowe Sady 10 94-102 Лодз
Име на продукта:	Кабелни обувки и конектори
Тип (варианти):	KO, KW, KOI, KWI, KOR, KL, KDR, KRM, KLD, KRA, KDA, KLA, LA, KCA
Производител.	Отдел Електрическо Оборудване ERGOM Sp. z o. o. ул. Nowe Sady 10 94-102 Лодз
Основни параметри и приложение:	Според прикачения файл Кабелни обувки и конектори за свързване на медни или алуминиеви кабели
Продуктът отговаря на изискванията, съдържащи се в:	DIN 46234, DIN 46237, DIN 46235, DIN 46329, DIN 46267-1, DIN 46267-2 и PN-90/E-06401/02[u] в областта на проверка на размерите и електрическите изпитвания
Според докладите направени от:	Лаборатория Високо напрежение на Институт по енергетика
Номер на доклада за оценка на продукта:	EWP/52/E/99 - I EWP/52/E/99 EWP/S2/E/2000 - III EWP/52/E/2000- IV EWP/52/E/2000 - V
Срок на валидност:	от 12 юни 2015 г. до 12 юни 2020 г.

Правото за използване на сертификата за съответствие по време на неговата валидност се отнася само за

- онези образци, които отговарят на горепосочените изисквания и имат идентични свойства (параметри) като проби / проби от продукти, представени за изпитване,
- собственика на сертификата или негов упълномощен представител.

Спецификацията на характеристиките на продукта се съдържа в приложение към този сертификат. Брой прикачени файлове: 1

Моделът за сертифициране включва:
- проучване и оценка на качеството на проекта.
- оценка на системата за качество на доставчика

z up. ДИРЕКТОР
НА ИНСТИТУТА ПО ЕНЕРГЕТИКА
подпис: не се чете
dr hab. in/. Jerzy Przybysz prof. IEn

Варшава, дата 12.06.2015 г.

ВЯРНО С ОРИГИНАЛА
Подпис: .....

УДОСТОВЕРЕНИЕ ЗА СЕРТИФИКАТ IEn
NR 007/2015

НАСТРОЙКА НА ДИАГРАМАТА НА ИЗБРАНИТЕ ПАРАМЕТРИ

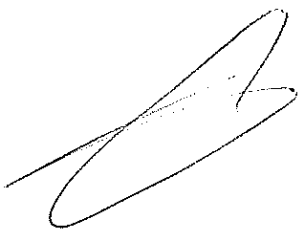
Обхват на сечения	Съответствие на размерите с нормите
KO / 0,5 ÷ 95 mm^2	DIN 46234
KW / 0,5 ÷ 16 mm^2	DIN 46234[2)]
KOI / 0,5 ÷ 95 mm^2	DIN 46237
KWI / 0,5 ÷ 16 mm^2	DIN 46237[2)]
KOR / 0,75 ÷ 625 mm^2	съвместимост с каталога
KL / 4 ÷ 625 mm^2	съвместимост с каталога
KDR / 10 ÷ 1000 mm^2	DIN 46235
KRM / 16 ÷ 500 mm^2	DIN 46235[2)]
KLD / 10 ÷ 1000 mm^2	DIN 46267-1
KRA / 16 ÷ 500 mm^2	DIN 46329
KDA / 16 ÷ 625 mm^2	DIN 46329[2)]
KLA / 16 ÷ 240 mm^2	съвместимост с каталога
LA / 10 ÷ 1000 mm^2	DIN 46267-2
KCA / 16 ÷ 300 mm^2	DIN 46329[2)]

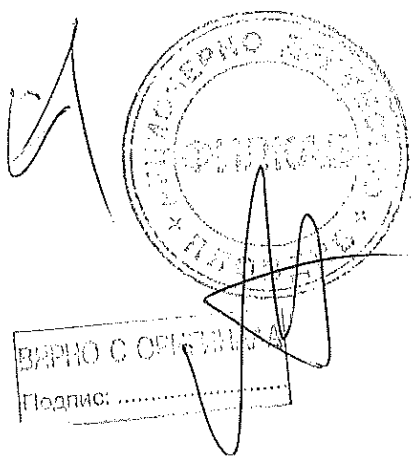
БЕЛЕЖКИ:

[1)]Съответствие със стандартните изисквания PN-90/E-06401/02 в областта на електрическите изследвания това се отнася за конектори от тип: ICO (за 95 mm^2), KW, KOI (за 95 mm^2), KWI, KOR, KL, KRA. KDA, KLA, LA, KCA.

Съответствието с изискванията на стандарта PN-90 / E-06401/02 в областта на електрическите изпитвания се прилага за кабелни обувки и конектори от типа: ICO (до 95 mm2), KW, KOI (до 95 mm2), KWI, KOR, KL, KRA. KDA, KLA, LA, KCA

[2)] Прилага се само към тръбната част





INSTYTUT ENERGETYKI
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CERTYFIKAT IEn

NR 007/2015

(POŚWIADCZENIE)

Nazwa i adres posiadacza certyfikatu:	**Zakład Aparatury Elektrycznej ERGOM Sp. z o. o. ul. Nowe Sady 10 94-102 Łódź**
Nazwa wyrobu:	**Końcówki i złączki kablowe**
Typ (odmiany):	**KO, KW, KOI, KWI, KOR, KL, KDR, KRM, KLD, KRA, KDA, KLA, LA, KCA**
Producent:	**Zakład Aparatury Elektrycznej ERGOM Sp. z o. o. ul. Nowe Sady 10 94-102 Łódź**
Podstawowe parametry i zastosowanie:	**Według załącznika Końcówki i złączki do zakończeń i połączeń miedzianych lub aluminiowych żył roboczych kabli energetycznych**
Wyrób spełnia wymagania zawarte w:	**DIN 46234, DIN 46237, DIN 46235, DIN 46329, DIN 46267-1, DIN 46267-2, oraz PN-90/E-06401/02[1)] w zakresie sprawdzenia wymiarów i badań elektrycznych**
Zgodnie z raportami wykonanymi przez:	**Laboratorium Wielkoprądowe Instytutu Energetyki**
Nr raportu z oceny wyrobu:	**EWP/52/E/99 – I EWP/52/E/99 EWP/52/E/2000 – III EWP/52/E/2000 – IV EWP/52/E/2000 – V**
Okres ważności:	**od 12 czerwca 2015 do 12 czerwca 2020**

Prawo do posługiwania się certyfikatem zgodności w okresie jego ważności dotyczy wyłącznie:

- **tych egzemplarzy, które spełniają wyżej określone wymagania i posiadają identyczne właściwości (parametry) jak wzory/próbki wyrobów przedstawione do badań,**
- **właściciela certyfikatu lub jego upoważnionego przedstawiciela.**

Zestawienie przypisanych parametrów wyrobu zawiera załącznik do niniejszego certyfikatu.
Liczba załączników: 1

Model certyfikacji obejmuje:

- badania i ocenę jakości projektowej,
- ocenę systemu jakości dostawcy.

Warszawa, dnia 12.06.2015 r.

z up. DYREKTORA
INSTYTUTU ENERGETYKI
dr hab. inż. Jerzy Przybysz prof. IEn

ZAŁĄCZNIK CERTYFIKATU IEn
NR 007/2015

ZESTAWIENIE PRZYPISANYCH PARAMETRÓW WYROBU

TYP KOŃCÓWKI / Zakres przekrojów	Zgodność wymiarów z normą
KO / 0.5 ÷ 95 mm²	DIN 46234
KW / 0.5 ÷ 16 mm²	DIN 46234[2)]
KOI / 0.5 ÷ 95 mm²	DIN 46237
KWI / 0.5 ÷ 16 mm²	DIN 46237[2)]
KOR / 0.75 ÷ 625 mm²	zgodność z katalogiem
KL / 4 ÷ 625 mm²	zgodność z katalogiem
KDR / 10 ÷ 1000 mm²	DIN 46235
KRM / 16 ÷ 500 mm²	DIN 46235[2)]
KLD / 10 ÷ 1000 mm²	DIN 46267-1
KRA / 16 ÷ 500 mm²	DIN 46329
KDA / 16 ÷ 625 mm²	DIN 46329[2)]
KLA / 16 ÷ 240 mm²	zgodność z katalogiem
LA / 10 ÷ 1000 mm²	DIN 46267-2
KCA / 16 ÷ 300 mm²	DIN 46329[2)]

UWAGI:

1. [1)] Spełnienie wymagań normy PN-90/E-06401/02 w zakresie badań elektrycznych dotyczy końcówek i złączek typu: KO (do 95 mm²), KW, KOI (do 95 mm²), KWI, KOR, KL, KRA, KDA, KLA, LA, KCA.
2. [2)] Dotyczy tylko części rurkowej

Превод от английски език

ИНСТИТУТ ПО ЕНЕРГЕТИКА
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AC 117

СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ
№ 071/2018
Издание № 1 от 2018.07.23

Име и адрес на притежателя на сертификата:	**Zaklad Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10. 94-102 Лодз**
Име на продукта:	**Медни тръбни кабелни обувки / съединителни гилзи в съответствие с DIN**
Тип:	**KDR 25-240/ KLD 25-240**
Производител:	**Zaklad Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10. 94-102 Лодз**
Параметри и приложение на продукта:	**Съгласно приложението Свързване на медни кабели с жила клас 2 с параметри съгласно приложението**
Продукта е в съответствие с изискванията на:	**IEC 61238-1:2003 (ed. 2.0)**
Съгласно изпитванията направени от:	**Instytut Energetyki, ZAE ERGOM**
Номер на изпитвания за оценка на продуктаs:	**DZC/186c/E/2016-5**
Номер на изпитателни протоколи:	**EWP/35/E/2016-6, EWP/35/E/2016-7, EWP/35/E/2017-11, EWP/35/E/20!8-15, EWP/57/E/2018-3, ERGOM/08/01/2018, ERGOM/06/12/2017, ERGOM/07/12/2017, ERGOM/09/04/2018**
Период на валидност:	**от 23 юли 2017 до 22 юли 2021**

Правото за използване на сертификата за съответствие в срока му на валидност се прилага само за:

- **тези образци, които отговарят на посочените по-горе изисквания и имат същите характеристики (параметри) като образците на модела / продукта, представени за изпитване,**
- **собственик на сертификат или негов упълномощен представител.**

Списъкът на доказаните параметри е включен в приложенията към сертификата за съответствие.
Брой приложения: 1

СИСТЕМАТА НА СЕРТИФИЦИРАНЕ НА ПРОДУКТА Ia (PN-EN ISO / IEC 17067: 2014-01)
(параметри на продукта, потвърдени от типово изпитване)

Варшава, 2018.07.23

ДИРЕКТОР НА
ИНСТИТУТ ПО ЕНЕРГЕТИКА

на основание чл. 36а, ал. 3 от ЗОП

на основание чл. 36а, ал. 3 от ЗОП

dr hab. inż. Jerzy Przybysz prof. IEn

AC 117

ПРИЛОЖЕНИЕ КЪМ СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ
No. 071/2018
Издание № 1 от 2018.07.23

СПИСЪК НА ДОКАЗАНИТЕ ПАРАМЕТРИ

Параметър	KDR 25-240	KLD 25-240
Клас	A	A
Форма на медните кабели / проводници [mm^2]	rmv, rmc, rm / 25 ÷ 240	rmv, rmc, rm sm/ 25 ÷ 240
Първоначално разпръскване δ [1)]	≤ 0,30	≤ 0,30
Средно разпръскване β [2)]	≤ 0,30	≤ 0,30
Коефициент на съпротивление λ [3)]	≤ 2,0	≤ 2,0
Коефициент промяна на съпротивлението D [4)]	≤ 0,15	≤ 0,15
Максимална температура θ_{max} [5)]	≤ θ_{ref}	≤ θ_{ref}
Допустима сила на опън [N]	≤ 60xA [6)] Cu	≤ 60xA [6)] Cu

БЕЛЕЖКИ

1) [1)] Средната стойност на коефициентите на съпротивление на шест съединителя (накрайници) преди първия топлинен цикъл.

2) [2)] Средната стойност на коефициентите на съпротивление на шест съединителя (накрайници), изчислени от последните 11 измервания. Определя дали всички конектори (накрайници) от даден тип се характеризират с подобни промени в съпротивлението по време на топлинните цикли.

3) [3)] Коефициент на съпротивление на изпитвания съединител (накрайник) по време на топлинния цикъл към началния коефициент на съпротивлението.

4) [4)] Стойността определя размера на промяната на коефициента на съпротивление въз основа на последните 11 измервания.

5) [5)] Температура на съединителя (накрайника), съпоставена към референтната температура.

6) [6)] Номинална площ на напречното сечение

ВЯРНО С ОРИГИНАЛА
Подпис: .....

AC 117

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instytut.energetyki@ien.com.pl

CERTIFICATE OF CONFORMITY

No. 071/2018

Issue No. 01 of 2018.07.23

Name and address of the Certificate Holder:	**Zakład Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź**
Name of the product:	**Copper tubular cable lugs / butt connetors according to DIN**
Type:	**KDR 25-240/ KLD 25-240**
Manufacturer:	**Zakład Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź**
Parameters and application of the product:	**According to appendix Connection and termination of copper cables with class 2 conductors with parameters according to appendix**
The product meets requirements of:	**IEC 61238-1:2003 (ed. 2.0)**
According to the reports made by:	**Instytut Energetyki, ZAE ERGOM**
Number of the product evaluation reports:	**DZC/186c/E/2016-5**
Number of the test reports:	**EWP/35/E/2016-6, EWP/35/E/2016-7, EWP/35/E/2017-11, EWP/35/E/2018-15, EWP/57/E/2018-3, ERGOM/08/01/2018, ERGOM/06/12/2017, ERGOM/07/12/2017, ERGOM/09/04/2018**
Period of validity:	**from 23rd of July 2017 until 22nd of July 2021**

The right to use the certificate of conformity within its validity period applies only to:

- **these copies that meet the requirements specified above and have the same characteristics (parameters) as the model / product samples submitted for testing,**
- **certificate owner or his authorized representative.**

The list of evidenced parameters is included in the appendices to the certificate of conformity.
Number of appendices: 1

THE SYSTEM OF PRODUCT CERTIFICATION 1a (PN-EN ISO/IEC 17067:2014-01)
(product parameters confirmed by type test)

на основание чл. 36а, ал. 3 от ЗОП

pp of the DIRECTOR OF
INSTYTUT ENERGETYKI

на основание чл. 36а, ал. 3 от ЗОП

dr hab. inż. Jerzy Przybysz prof. IEn

Warsaw, 2018.07.23

AC 117

APPENDIX TO CERTIFICATE OF CONFORMITY
No. 071/2018
Issue No. 01 of 2018.07.23

LIST OF EVIDENCED PARAMETERS

Element type	KDR 25-240	KLD 25-240
Class	A	A
Shape of Cu cables /conductors [mm^2]	rmv, rmc, rm, sm / 25 ÷240	rmv, rmc, rm, sm / 25 ÷ 240
Initial scatter δ[1)]	≤ 0,30	≤ 0,30
Mean scatter β[2)]	≤ 0,30	≤ 0,30
Resistance factor ratio λ[3)]	≤ 2,0	≤ 2,0
Change in resistance factor D[4)]	≤ 0,15	≤ 0,15
Maximum temperature θ_{max}[5)]	≤ θ_{ref}	≤ θ_{ref}
Permissible tensile force [N]	≤ 60xA[6)] Cu	≤ 60xA[6)] Cu

NOTES:

1) [1)] The average value of the resistance factors of six connectors (lugs) before the first heating cycle.
2) [2)] The average value of the resistance factors of six connectors (lugs) calculated from last 11 measurements readings. It specifies if all connectors (lugs) of given type are characterized by similar changes in resistance during the heat cycles.
3) [3)] Resistance factor ratio of tested connector (lug) during the heat cycle test in relation to the initial resistance factor.
4) [4)] The value specifies the size of the resistance factor change based on last 11 measurements readings.
5) [5)] Temperature of the connector (lug) referenced to the temperature of the reference section.
6) [6)] Nominal cross-sectional area

Превод от английски език

ИНСТИТУТ ПО ЕНЕРГЕТИКА
Изследователски институт
01-330 Warszawa, ul. Mory 8
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AC 117

СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ
№ 071/2018
Издание № 3 от 2019.02.18

Име и адрес на притежателя на сертификата:	**Zakład Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10. 94-102 Лодз**
Име на продукта:	**Медни тръбни кабелни обувки / съединителни гилзи в съответствие с DIN**
Тип:	**KDR 10-240/ KLD 10-240**
Производител:	**Zakład Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10. 94-102 Лодз**
Параметри и приложение на продукта:	**Съгласно приложението Свързване на медни кабели с жила клас 2 с параметри съгласно приложението**
Продукта е в съответствие с изискванията на:	**IEC 61238-1:2003 (ed. 2.0)**
Съгласно изпитванията направени от:	**Instytut Energetyki, ZAE ERGOM, SEP-BBJ**
Номер на изпитвания за оценка на продуктаs:	**DZC/186c/E/2016-5**
Номер на изпитателни протоколи:	**EWP/35/E/2016-6, EWP/35/E/2016-7, EWP/35/E/2017-11, LA-18.042/1, EWP/35/E/20!8-15, EWP/57/E/2018-3, ERGOM/08/01/2018, LA-18.042/2, ERGOM/06/12/2017, ERGOM/07/12/2017, ERGOM/09/04/2018**
Период на валидност:	**от 18 февруари 2019 до 22 юли 2021**

Правото за използване на сертификата за съответствие в срока му на валидност се прилага само за:

- **тези образци, които отговарят на посочените по-горе изисквания и имат същите характеристики (параметри) като образците на модела / продукта, представени за изпитване,**
- **собственик на сертификат или негов упълномощен представител.**

Списъкът на доказаните параметри е включен в приложенията към сертификата за съответствие.
Брой приложения: 1

СИСТЕМАТА НА СЕРТИФИЦИРАНЕ НА ПРОДУКТА PC_1a (Програма 1а съгласно PN-EN ISO / IEC 17067: 2014-01)
(параметри на продукта, потвърдени от типово изпитване)

Варшава, 2019.02.18

ДИРЕКТОР НА
ИНСТИТУТ ПО ЕНЕРГЕТИК

на основание чл. 36а, ал. 3 от ЗОП

на основание чл. 36а, ал. 3 от ЗОП

dr hab. inż. Jerzy Przybysz prof. IEn

AC 117

ПРИЛОЖЕНИЕ КЪМ СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ
No. 071/2018
Издание № 3 от 2019.02.18

СПИСЪК НА ДОКАЗАНИТЕ ПАРАМЕТРИ

Параметър	KDR 10-240	KLD 10-240
Клас	A	A
Форма на медните кабели / проводници [mm^2]	rmv, rmc, rm / 10 ÷ 240	rmv, rmc, rm sm/ 10 ÷ 240
Първоначално разпръскване δ [1)]	≤ 0,30	≤ 0,30
Средно разпръскване β [2)]	≤ 0,30	≤ 0,30
Коефициент на съпротивление λ [3)]	≤ 2,0	≤ 2,0
Коефициент промяна на съпротивлението D [4)]	≤ 0,15	≤ 0,15
Максимална температура θ_{max} [5)]	≤ θ_{ref}	≤ θ_{ref}
Допустима сила на опън [N]	≤ 60xA [6)] Cu	≤ 60xA [6)] Cu

БЕЛЕЖКИ

1) [1)] Средната стойност на коефициентите на съпротивление на шест съединителя (накрайници) преди първия топлинен цикъл.

2) [2)] Средната стойност на коефициентите на съпротивление на шест съединителя (накрайници), изчислени от последните 11 измервания. Определя дали всички конектори (накрайници) от даден тип се характеризират с подобни промени в съпротивлението по време на топлинните цикли.

3) [3)] Коефициент на съпротивление на изпитвания съединител (накрайник) по време на топлинния цикъл към началния коефициент на съпротивлението.

4) [4)] Стойността определя размера на промяната на коефициента на съпротивление въз основа на последните 11 измервания.

5) [5)] Температура на съединителя (накрайника), съпоставена към референтната температура.

6) [6)] Номинална площ на напречното сечение

ВЯРНО С ОРИГИНАЛА
Подпис: .....

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AC 117

CERTIFICATE OF CONFORMITY

No. 071/2018

Issue No. 03 of 2019.02.18

Name and address of the Certificate Holder:	**Zakład Aparatury Elektrycznej ERGOM Sp. z o.o. 10 Nowe Sady Str., 94-102 Łódź, Poland**
Name of the product:	**Copper tubular cable lugs / butt connectors**
Type:	**KDR 10-240/ KLD 10-240**
Manufacturer:	**Zakład Aparatury Elektrycznej ERGOM Sp. z o.o. 10 Nowe Sady Str., 94-102 Łódź, Poland**
Parameters and application of the product:	**According to appendix Connection and termination of copper cables with class 2 conductors with parameters according to appendix**
The product meets requirements of:	**IEC 61238-1:2003 (ed. 2.0)**
According to the reports made by:	**Instytut Energetyki, ZAE ERGOM, SEP-BBJ**
Number of the product evaluation reports:	**DZC/186c/E/2016-5**
Number of the test reports:	**EWP/35/E/2016-6, EWP/35/E/2016-7, EWP/35/E/2017-11, LA-18.042/1, EWP/35/E/2018-15, EWP/57/E/2018-3, ERGOM/08/01/2018, LA-18.042/2, ERGOM/06/12/2017, ERGOM/07/12/2017, ERGOM/09/04/2018,**
Period of validity:	**from 18th of February 2019 until 22nd of July 2021**

The right to use the certificate of conformity within its validity period applies only to:

- **these copies that meet the requirements specified above and have the same characteristics (parameters) as the model / product samples submitted for testing,**
- **certificate owner or his authorized representative.**

The list of evidenced parameters is included in the appendices to the certificate of conformity.
Number of appendices:1

THE SYSTEM OF PRODUCT CERTIFICATION PC_1a (Program 1a acc. to PN-EN ISO/IEC 17067:2014-01)
(product parameters confirmed by type test)

на основание чл. 36а, ал. 3 от ЗОП

DIRECTOR OF
INSTYTUT ENERGETYKI

на основание чл. 36а, ал. 3 от ЗОП

Warsaw, 2019.02.18

dr hab. inż. Tomasz Gałka prof. IEn

AC 117

APPENDIX TO CERTIFICATE OF CONFORMITY
No. 071/2018
Issue No. 03 of 2019.02.18

LIST OF EVIDENCED PARAMETERS

Element type	KDR 10-240	KLD 10-240
Class	A	A
Shape of Cu cables /conductors [mm^2]	rmv, rmc, rm, sm / 10 ÷240	rmv, rmc, rm, sm / 10 ÷ 240
Initial scatter δ[1)]	≤ 0,30	≤ 0,30
Mean scatter β[2)]	≤ 0,30	≤ 0,30
Resistance factor ratio λ[3)]	≤ 2,0	≤ 2,0
Change in resistance factor D[4)]	≤ 0,15	≤ 0,15
Maximum temperature θ_{max}[5)]	≤ θ_{ref}	≤ θ_{ref}
Permissible tensile force [N]	≤ 60xA[6)] Cu	≤ 60xA[6)] Cu

NOTES:

1) [1)] The average value of the resistance factors of six connectors (lugs) before the first heating cycle.
2) [2)] The average value of the resistance factors of six connectors (lugs) calculated from last 11 measurements readings. It specifies if all connectors (lugs) of given type are characterized by similar changes in resistance during the heat cycles.
3) [3)] Resistance factor ratio of tested connector (lug) during the heat cycle test in relation to the initial resistance factor.
4) [4)] The value specifies the size of the resistance factor change based on last 11 measurements readings.
5) [5)] Temperature of the connector (lug) referenced to the temperature of the reference section.
6) [6)] Nominal cross-sectional area

СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ

Номер на сертификата	20180822-E475284
Референтен номер на доклада	E475284-20160920
Дата на издаване	2018-Август-22
Издаден на:	Zaklad Aparatury Elektrycznej Ergom Sp. z o. o. Nowe Sady 10 94-102 Лодз Полша
С настоящото се удостоверява, че представителни мостри от	КАБЕЛНИ КОНЕКТОРИ И ЩАНЦОВАНИ КАБЕЛНИ ОБУВКИ Виж допълнителната страница Бяха изследвани от UL в съответствие със Стандарт (и) посочени в този Сертификат.
Стандарт (и) за безопасност:	**UL 486A-486B, CSA C22.2 No. 65-13 - Wire Connectors**
Допълнителна информация:	**Вижте UL Директория за Онлайн Сертифициране на www.ul.com/database за допълнителна информация**

Само тези продукти, които носят UL сертификационната марка, трябва да се считат обхванати от UL Сертифициране и последващо обслужване.

Потърсете UL сертификационната марка на продукта.

Подпис: не се чете

Bruce Mahrenholz, Директор Северноамериканска програма за сертифициране
UL LLC

ВЯРНО С ОРИГИНАЛА
Подпис: .....

СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ

Номер на сертификата	20180822-E475284
Референтен номер на доклада	E475284-20160920
Дата на издаване	2018-Август-22

С настоящето се удостоверява, че представителните мостри от продукта както е посочено в настоящия сертификат са тествани съгласно настоящите изисквания на UL.

USL, CNL както следва, Неизолирани кабелни обувки за кербоване, Серии: K45R, K90R, KO, KW, CKOR, KL, KLD, KOR, KDR and CKL.

USL, CNL както следва, Неизолирани кабелни обувки за кербоване серии K45R (накрайници 45 °) включват следните модели №:
Кат. №: K45R 16/5, K45R 16/6, K45R 16/8, K45R 16/10, K45R 16/12, K45R 25/5, K45R 25/6, K45R 25/8, K45R 25/10, K45R 25/12, K45R 25/14, K45R 35/6, K45R 35/8, K45R 35/10, K45R 35/12, K45R 35/14, K45R 35/16, K45R 50/6, K45R 50/8, K45R 50/10, K45R 50/12, K45R 50/14, K45R 50/16, K45R 50/20, K45R 70/6, K45R 70/8, K45R 70/10, K45R 70/12, K45R 70/14, K45R 70/16, K45R 70/20, K45R 95/8, K45R 95/10, K45R 95/12, K45R 95/14, K45R 95/16 , K45R 95/20, K45R 120/8, K45R 120/10, K45R 120/12, K45R 120/14, K45R 120/16, K45R 120/20, K45R 150/8, K45R 150/10, K45R 150/12, K45R 150/14, K45R 150/16, K45R 150/20, K45R 185/10, K45R 185/12, K45R 185/14, K45R 185/16, K45R 185/20, K45R 240/10, K45R 240/12, K45R 240/14, K45R 240/16, K45R 240/20.

USL, CNL както следва, Неизолирани кабелни обувки за кербоване серии K90R (накрайници 90 °) включват следните модели №:
Кат. №.: K90R 16/5, K90R 16/6, K90R 16/8, K90R 16/10, K90R 16/12, K90R 25/5, K90R 25/6, K90R 25/8, K90R 25/10, K90R 25/12, K90R 25/14, K90R 35/6, K90R 35/8, K90R 35/10, K90R 35/12, K90R 35/14, K90R 50/6, K90R 50/8, K90R 50/10, K90R 50/12, K90R 50/14, K90R 50/16, K90R 50/20, K90R 70/6, K90R 70/8, K90R 70/10, K90R 70/12, K90R 70/14, K90R 70/16, K90R 95/8, K90R 95/10, K90R 95/12, K90R 95/14, K90R 95/16, K90R 95/20, K90R 120/8, K90R 120/10, K90R 120/12, K90R 120/16, K90R 120/20, K90R 150/10, K90R 150/12, K90R 150/14, K90R 150/16, K90R 150/20, K90R 185/10, K90R 185/12, K90R 185/14, K90R 185/16, K90R 185/20, K90R 240/10, K90R 240/12, K90R 240/14, K90R 240/16, K90R 240/20.

USL, CNL както следва, Неизолирани кабелни обувки (щанцовани) серии KO включват следните модели №:
Кат. №: KO 1/2.5, KO 1/3 , KO 1/3.5, KO 1/4, KO 1/5, KO 1/6, KO 1/8, KO 1/10, KO 16/5, KO 16/6, KO 16/8, KO 16/10, KO 25/5, KO 25/6, KO 25/8, KO 25/10, KO 35/6, KO 35/8, KO 35/10, KO 50/6, KO 50/8, KO 50/10, KO 70/6, KO 70/8, KO 70/10, KO 70/12, KO 95/8, KO 95/10, KO 95/12.

USL, CNL както следва, Неизолирани кабелни обувки серии KW (вилкови) включват следните модели №:
Кат. №: KW 1/2.5, KW 1/3, KW 1/3.5, KW 1/4, KW 1/4 W, KW 1/5, KW 1/6, KW 1/8, KW 1/10, KW 2.5/3, KW 2.5/3.5, KW 2.5/4, KW 2.5/4 W, KW 2.5/5, KW 2.5/6, KW 2.5/8, KW 2.5/10, KW 2.5/12, KW 6/3.5, KW 6/4, KW 6/5, KW 6/6, KW 6/8, KW 6/10, KW 10/5, KW 10/6, KW 10/8, KW 10/10, KW 16/5, KW 16/6, KW 16/8, KW 16/10.

USL, CNL както следва, Неизолирани кабелни обувки серии CKOR (прави) включват следните модели №:

Подпис: не се чете
Bruce Mahrenholz, Директор Северноамериканска програма за сертифициране
UL LLC

ВЯРНО С ОРИГИНАЛА
Подпис: .....

СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ

Номер на сертификата	20180822-E475284
Референтен номер на доклада	E475284-20160920
Дата на издаване	2018-Август-22

Кат. №: CKOR 35/8, CKOR 35/10, CKOR 35/12, CKOR 50/8, CKOR 50/10, CKOR 50/12, CKOR 70/8, CKOR 70/10, CKOR 70/12, CKOR 70/16, CKOR 95/10, CKOR 95/12, CKOR 95/16, CKOR 120/10, CKOR 120/12, CKOR 120/16, CKOR 150/10, CKOR 150/12, CKOR 150/16, CKOR 150/20, CKOR 185/10, CKOR 185/12, CKOR 185/16, CKOR 185/20, CKOR 240/12, CKOR 240/16, CKOR 240/20.

USL, CNL както следва, Неизолирани кабелни гилзи серии CKL (Гилзи за свързване на кабели) включват следните модели №:
Кат. №: CKL 35, CKL 50, CKL 70, CKL 95, CKL 120, CKL 150, CKL 185, CKL 240.

USL, CNL както следва, Неизолирани кабелни гилзи серии CKL (Гилзи за свързване на кабели) включват следните модели №:
Кат. №: KL10, KL16, KL25, KL35, KL50, KL70, KL95, KL120, KL150, KL185, KL240.

USL, CNL както следва, Неизолирани кабелни обувки за кербоване серии KOR (Прави) включват следните модели №:
Кат. №: KOR0.75/3, KOR0.75/4, KOR0.75/5, KOR1.5/3, KOR1.5/4, KOR1.5/5, KOR1.5/6, KOR2.5/3, KOR2.5/4, KOR2.5/5, KOR2.5/6, KOR2.5/8, KOR4/4, KOR4/5, KOR4/6, KOR4/8, KOR6/4, KOR6/5, KOR6/6, KOR6/8, KOR6/10, KOR6/12, KOR10/5, KOR10/6, KOR10/8, KOR10/10, KOR10/12, KOR16/5, KOR16/6, KOR16/8, KOR16/10, KOR16/12, KOR25/5, KOR25/6, KOR25/8, KOR25/10, KOR25/12, KOR25/14, KOR35/5, KOR35/6, KOR35/8, KOR35/10, KOR35/12, KOR35/14, KOR35/16, KOR50/6, KOR50/8, KOR50/10, KOR50/12, KOR50/14, KOR50/16, KOR50/20, KOR70/6, KOR70/8, KOR70/10, KOR70/12, KOR70/14, KOR70/16, KOR70/20, KOR95/8, KOR95/10, KOR95/12, KOR95/14, KOR95/16, KOR95/20, KOR120/8, KOR120/10, KOR120/12, KOR120/14, KOR120/16, KOR120/20, KOR150/8, KOR150/10, KOR150/12, KOR150/14, KOR150/16, KOR150/20, KOR185/8, KOR185/10, KOR185/12, KOR185/14, KOR185/16, KOR185/20, KOR240/10, KOR240/12,
KOR240/14, KOR240/16, KOR240/20.

Неизолирани кабелни гилзи за кербоване серии KLD (Гилзи за свързване на кабели) включват следните модели №:
Кат. №: KLD10, KLD16, KLD25, KLD35, KLD50, KLD70, KLD95, KLD120, KLD150, KLD185, KLD240.
Неизолирани кабелни обувки за кербоване серии KDR (Прави) включват следните модели №:
Кат. №: KDR10/5, KDR10/6, KDR10/8, KDR16/6, KDR16/8, KDR16/10, KDR16/12, KDR25/6, KDR25/8, KDR25/10, KDR25/12, KDR25/14, KDR25/16, KDR35/6, KDR35/8, KDR35/10, KDR35/12, KDR35/14, KDR35/16, KDR50/8, KDR50/10, KDR50/12, KDR50/14, KDR50/16, KDR70/8, KDR70/10, KDR70/12, KDR70/14, KDR70/16, KDR70/20, KDR95/8, KDR95/10, KDR95/12, KDR95/14, KDR95/16, KDR95/20, KDR120/10, KDR120/12, KDR120/14, KDR120/16, KDR120/20, KDR150/10, KDR150/12, KDR150/14, KDR150/16, KDR150/20, KDR185/10, KDR185/12, KDR185/14, KDR185/16, KDR185/20, KDR240/10, KDR240/12, KDR240/14, KDR240/16, KDR240/20.

Подпис: не се чете
Bruce Mahrenholz, Директор Северноамериканска програма за сертифициране
UL LLC

ВЯРНО С ОРИГИНАЛА
Подпис: .....

CERTIFICATE OF COMPLIANCE

Certificate Number	20180822-E475284
Report Reference	E475284-20160920
Issue Date	2018-August-22
Issued to:	Zaklad Aparatury Elektrycznej Ergom Sp. z o. o. Nowe Sady 10 94-102 Lodz POLAND
This is to certify that representative samples of	WIRE CONNECTORS AND SOLDERING LUGS See Addendum Page
	Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	UL 486A-486B, CSA C22.2 No. 65-13 - Wire Connectors
Additional Information:	See the UL Online Certifications Directory at www.ul.com/database for additional information

Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.

на основание чл. 36а, ал. 3 от ЗОП

Bruce Mahrenholz, Director North American Certification Program

UL LLC

ВЯРНО С ОРИГИНАЛА
Подпис: .....

CERTIFICATE OF COMPLIANCE

Certificate Number 20180822-E475284
Report Reference E475284-20160920
Issue Date 2018-August-22

This is to certify that representative samples of the product as specified on this certificate were tested according to the current UL requirements.

USL, CNL Listed, Non-insulated Crimp type Wire Connectors, Series: K45R, K90R, KO, KW, CKOR, KL, KLD, KOR, KDR and CKL.

USL, CNL Listed, Non-insulated crimp type wire connector series K45R (Angled-45 degree wire connectors) includes the following model no(s):
Cat. Nos.: K45R 16/5, K45R 16/6, K45R 16/8, K45R 16/10, K45R 16/12, K45R 25/5, K45R 25/6, K45R 25/8, K45R 25/10, K45R 25/12, K45R 25/14, K45R 35/6, K45R 35/8, K45R 35/10, K45R 35/12, K45R 35/14, K45R 35/16, K45R 50/6, K45R 50/8, K45R 50/10, K45R 50/12, K45R 50/14, K45R 50/16, K45R 50/20, K45R 70/6, K45R 70/8, K45R 70/10, K45R 70/12, K45R 70/14, K45R 70/16, K45R 70/20, K45R 95/8, K45R 95/10, K45R 95/12, K45R 95/14, K45R 95/16 , K45R 95/20, K45R 120/8, K45R 120/10, K45R 120/12, K45R 120/14, K45R 120/16, K45R 120/20, K45R 150/8, K45R 150/10, K45R 150/12, K45R 150/14, K45R 150/16, K45R 150/20, K45R 185/10, K45R 185/12, K45R 185/14, K45R 185/16, K45R 185/20, K45R 240/10, K45R 240/12, K45R 240/14, K45R 240/16, K45R 240/20.

USL, CNL Listed, Non-insulated crimp type wire connector series K90R (Angled-90 degree wire connectors) includes the following model no(s):
Cat. Nos.: K90R 16/5, K90R 16/6, K90R 16/8, K90R 16/10, K90R 16/12, K90R 25/5, K90R 25/6, K90R 25/8, K90R 25/10, K90R 25/12, K90R 25/14, K90R 35/6, K90R 35/8, K90R 35/10, K90R 35/12, K90R 35/14, K90R 50/6, K90R 50/8, K90R 50/10, K90R 50/12, K90R 50/14, K90R 50/16, K90R 50/20, K90R 70/6, K90R 70/8, K90R 70/10, K90R 70/12, K90R 70/14, K90R 70/16, K90R 95/8, K90R 95/10, K90R 95/12, K90R 95/14, K90R 95/16, K90R 95/20, K90R 120/8, K90R 120/10, K90R 120/12, K90R 120/16, K90R 120/20, K90R 150/10, K90R 150/12, K90R 150/14, K90R 150/16, K90R 150/20, K90R 185/10, K90R 185/12, K90R 185/14, K90R 185/16, K90R 185/20, K90R 240/10, K90R 240/12, K90R 240/14, K90R 240/16, K90R 240/20.

USL, CNL Listed, Non-insulated crimp type wire connector series KO (Straight/Ring wire connectors) includes the following model no(s):
Cat. Nos.: KO 1/2.5, KO 1/3 , KO 1/3.5, KO 1/4, KO 1/5, KO 1/6, KO 1/8, KO 1/10, KO 16/5, KO 16/6, KO 16/8, KO 16/10, KO 25/5, KO 25/6, KO 25/8, KO 25/10, KO 35/6, KO 35/8, KO 35/10, KO 50/6, KO 50/8, KO 50/10, KO 70/6, KO 70/8, KO 70/10, KO 70/12, KO 95/8, KO 95/10, KO 95/12.

USL, CNL Listed, Non-insulated crimp type wire connector series KW (Fork wire connectors) includes the following model no(s):
Cat. Nos.: KW 1/2.5, KW 1/3, KW 1/3.5, KW 1/4, KW 1/4 W, KW 1/5, KW 1/6, KW 1/8, KW 1/10, KW 2.5/3, KW 2.5/3.5, KW 2.5/4, KW 2.5/4 W, KW 2.5/5, KW 2.5/6, KW 2.5/8, KW 2.5/10, KW 2.5/12, KW 6/3.5, KW 6/4, KW 6/5, KW 6/6, KW 6/8, KW 6/10, KW 10/5, KW 10/6, KW 10/8, KW 10/10, KW 16/5, KW 16/6, KW 16/8, KW 16/10.

USL, CNL Listed, Non-insulated crimp type wire connector series CKOR (Straight wire connectors) includes the following model no(s):

на основание чл. 36а, ал. 3
от ЗОП

Bruce Mahrenholz, Director North American Certification Program

UL LLC

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL. For questions, please contact a local UL Customer Service Representative at http://ul.com/aboutul/locations/

ВЯРНО С ОРИГИНАЛА
Подпис: .....

CERTIFICATE OF COMPLIANCE

Certificate Number	20180822-E475284
Report Reference	E475284-20160920
Issue Date	2018-August-22

Cat. Nos.: CKOR 35/8, CKOR 35/10, CKOR 35/12, CKOR 50/8, CKOR 50/10, CKOR 50/12, CKOR 70/8, CKOR 70/10, CKOR 70/12, CKOR 70/16, CKOR 95/10, CKOR 95/12, CKOR 95/16, CKOR 120/10, CKOR 120/12, CKOR 120/16, CKOR 150/10, CKOR 150/12, CKOR 150/16, CKOR 150/20, CKOR 185/10, CKOR 185/12, CKOR 185/16, CKOR 185/20, CKOR 240/12, CKOR 240/16, CKOR 240/20.

USL, CNL Listed, Non-insulated crimp type wire connector series CKL (Splicing wire connector) includes the following model no(s):
Cat. Nos.: CKL 35, CKL 50, CKL 70, CKL 95, CKL 120, CKL 150, CKL 185, CKL 240.

USL, CNL Listed, Non-insulated crimp type wire connector series KL (Splicing wire connector) includes the following model no(s):
Cat. Nos.: KL10, KL16, KL25, KL35, KL50, KL70, KL95, KL120, KL150, KL185, KL240.

USL, CNL Listed, Non-insulated crimp type wire connector series KOR (Straight wire connectors) includes the following model no(s):
Cat. Nos.: KOR0.75/3, KOR0.75/4, KOR0.75/5, KOR1.5/3, KOR1.5/4, KOR1.5/5, KOR1.5/6, KOR2.5/3, KOR2.5/4, KOR2.5/5, KOR2.5/6, KOR2.5/8, KOR4/4, KOR4/5, KOR4/6, KOR4/8, KOR6/4, KOR6/5, KOR6/6, KOR6/8, KOR6/10, KOR6/12, KOR10/5, KOR10/6, KOR10/8, KOR10/10, KOR10/12, KOR16/5, KOR16/6, KOR16/8, KOR16/10, KOR16/12, KOR25/5, KOR25/6, KOR25/8, KOR25/10, KOR25/12, KOR25/14, KOR35/5, KOR35/6, KOR35/8, KOR35/10, KOR35/12, KOR35/14, KOR35/16, KOR50/6, KOR50/8, KOR50/10, KOR50/12, KOR50/14, KOR50/16, KOR50/20, KOR70/6, KOR70/8, KOR70/10, KOR70/12, KOR70/14, KOR70/16, KOR70/20, KOR95/8, KOR95/10, KOR95/12, KOR95/14, KOR95/16, KOR95/20, KOR120/8, KOR120/10, KOR120/12, KOR120/14, KOR120/16, KOR120/20, KOR150/8, KOR150/10, KOR150/12, KOR150/14, KOR150/16, KOR150/20, KOR185/8, KOR185/10, KOR185/12, KOR185/14, KOR185/16, KOR185/20, KOR240/10, KOR240/12, KOR240/14, KOR240/16, KOR240/20.

Non-insulated crimp type wire connector series KLD (Splicing wire connector) includes the following model no(s):
Cat. Nos.: KLD10, KLD16, KLD25, KLD35, KLD50, KLD70, KLD95, KLD120, KLD150, KLD185, KLD240.
Non-insulated crimp type wire connector series KDR (Straight wire connectors) includes the following model no(s):
Cat. Nos.: KDR10/5, KDR10/6, KDR10/8, KDR16/6, KDR16/8, KDR16/10, KDR16/12, KDR25/6, KDR25/8, KDR25/10, KDR25/12, KDR25/14, KDR25/16, KDR35/6, KDR35/8, KDR35/10, KDR35/12, KDR35/14, KDR35/16, KDR50/8, KDR50/10, KDR50/12, KDR50/14, KDR50/16, KDR70/8, KDR70/10, KDR70/12, KDR70/14, KDR70/16, KDR70/20, KDR95/8, KDR95/10, KDR95/12, KDR95/14, KDR95/16, KDR95/20, KDR120/10, KDR120/12, KDR120/14, KDR120/16, KDR120/20, KDR150/10, KDR150/12, KDR150/14, KDR150/16, KDR150/20, KDR185/10, KDR185/12, KDR185/14, KDR185/16, KDR185/20, KDR240/10, KDR240/12, KDR240/14, KDR240/16, KDR240/20.

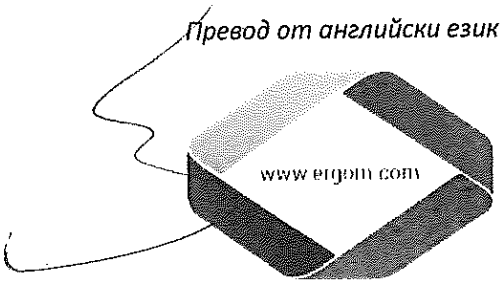
на основание чл. 36а, ал. 3
от ЗОП

Bruce Mahrenholz, Director North American Certification Program

UL LLC

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Превод от английски език



ERGOM Z.A.E. Sp. z o. o.
Nowe Sady 10 Str., 94-102 Lodz, Poland
(+48)42 689 33 86
export@ergom.com

Лодз, 2018-01-12

Сертификат за качество № 03/2018

Отнася се до: Якост на опън на кабелни обувки

С настоящото декларираме, че предлаганите от Ergom медни кабелни обувки се произвеждат в съответствие с изискванията на норма EN61238-1 и притежават следната якост на опън:

1. Напречено сечение 150 мм^2 – 900 daN
2. Напречено сечение 185 мм^2 - 1100 daN
3. Напречено сечение 240 мм^2 - 1440 daN
4. Напречено сечение 300 мм^2 - 1800 daN
5. Напречено сечение 400 мм^2 - 2400 daN

Dział Kontroli Jakości
Specjalista ds. Jakości

на основание чл. 36а, ал. 3 от ЗОП

Ръководител отдел Контрол на качеството

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Zakład Aparatury Elektrycznej ERGOM Sp. z o.o.
ul. Nowe Sady 10, 94-102 Łódź, Poland
(+48) 801 000 275
bok@ergom.com

www.ergom.com

Łódź 2018-01-12

Quality certificate no. 03/2018

Refers to: Tensile breaking strength of cable terminals

We hereby declare, that the offered by Ergom copper cable terminals are produced in compliant with requirements of norm EN61238-1 and have the following breaking forces:

1. Cross section 150 mm^2 – 900 daN
2. Cross section 185 mm^2 – 1100 daN
3. Cross section 240 mm^2 – 1440 daN
4. Cross section 300 mm^2 – 1800 daN
5. Cross section 400 mm^2 – 2400 daN

Quality control dept. manager.

Dział Kontroli Jakości
на основание чл. 36а, ал. 3
от ЗОП

NIP: 726-01-29-071, Regon: 473076927, KRS: 0000132427
Sąd Rejonowy dla Łodzi - Śródmieścia w Łodzi, XX Wydział Krajowego Rejestru Sądowego
Kapitał Zakładowy ZAE ERGOM: 10.400.000,00 zł
Konto bankowe: Bank Zachodni WBK S.A. II O/Łódź 39 1090 1304 0000 0000 3000 5564

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Приложение 2 към Техническо предложение

За обособена позиция № 2:

„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)"

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

Приложение 9

2 ERGOM

Технология за кримпване на алуминиеви кабелни обувки

Изработени като: пръстеновидни обувки, прави, стегнати (тип KRA съгласно Ergom) съгласно DIN 46329; гилзи. При останалите обувки (с изключение на KLA, 2KAm, 2ZA, KLAN) DIN размерите се отнасят само за тръбната част на обувката. Те са изработени като : изправени, пръстовидни обувки (KRA; KRAS; KDA; KDA../2X; 2Kam; тип KA съгласно Ergom); гилзи (LA; LAS; LAD; LAP; LAW; LAWP; KLAN; ZLA; 2ZA тип съгласно Ergom); редуциращи конектори (LA.../...; LAP.../...; LAWP.../...; LAW.../... тип съгласно Ergom); кабелен накрайник (BAW; BAK).

Материали: всики видови - E-Al алуминиева тръба съгласно с DIN 40501 Teil 3 or DIN 1712 Teil 2.

Покритие: без покритие или поцинковани (по заявка).

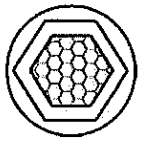
Приложение:

Изправените, пръстовидни обувки се използват за свързване на кабелна връзка на винтово съединение към шина, комутационна апаратура и др. Гилзите се използват за свързване на два алуминиеви проводника с еднакво напречно сечение (LA, LAS, LAP, LAWP, KLAN, ZLA, KLA, 2ZA) или за свързване на два алуминиеви проводника с различно напречно сечение (LA.../...; LAP.../...; LAWP.../...; LAW.../...). Гилзите направени с тези конектри (с изключение на 2ZA, KLA, KLAN, ZLA) не могат да бъдат механично свързани. Алуминиевите кабелни накрайници (BAW, BAK) се използват за свързане на жица с гилзата.

Технология за кримпване:

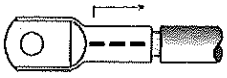
Обувките се навиват с инструменти, които са неречни "шестоъгълни" кримпващи клещи.

много гилзи



Благодарение на компресираща форма на гилзата се постига връзка с високи механични и електрически параметри. Въпреки това, такива се нуждаят от компресиране на обувката. Колкото повече е броят на компресиите, толкова по-добре е за гилзата.

Много важно в случай на силови връзки, при които се изисква предаване на големи мощности и ток. "Шестоъгълната" компресия се нуждае от още по-голяма сила, за да се навива обувката. така че при такава компресия (дори при малка напречна секция) ZAE ERGOM препоръчва използването на хидравлични инструменти или ръчни инструменти с по-високо механично съотношение. За да се постигне гилзата необходимото качество, се препоръчва да се компресират обувките на "шестоъгълника" по следния начин:

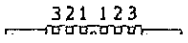


Правилната посока и последователност на притискане на обувката са маркирани със стрелки.

1. Първи натиск (вътрешен)

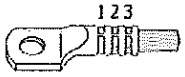
2. Втори натиск (отвътре навън)

3. Първи натиск от другата страна (вътрешен)



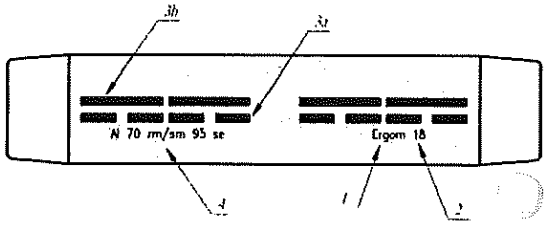
4. Втори натиск от другата страна (отвътре навън)

1. First compression (inside)



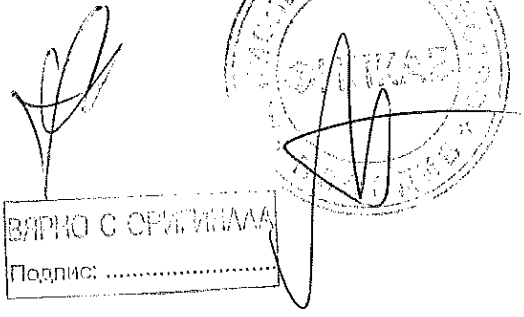
2. Втори натиск (отвътре навън)

Всяка обувка е означена с маркировка и е напечатана:
- напречно сечение или диаметър на отвора на винта (в случай н пръстовидни обувки)
- трябва да се постави номер на седалката преди да се навие обувката
- графичен код за броя и позицията на необходимите компреси направени с тесни удари (ръчни инструменти) или широки удар (хидравлични инструменти).



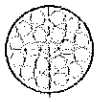
Пример за подобен код е даден по-долу.

1. Търговска марка.
2. Номер.
3. Маркиране на мястото и броя повторения на натиск.
   3a. Механично: тясно.
   3b. Хидравлично: широко.
4. Код на кабелите (напречно сечение и профил).

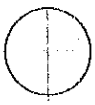


Всичко маркирано е препоръчително да бъде крипнато. Моля, обърнете внимание, че трябва да използвате правилната матрица за напречното сечение, за която е проектирана.

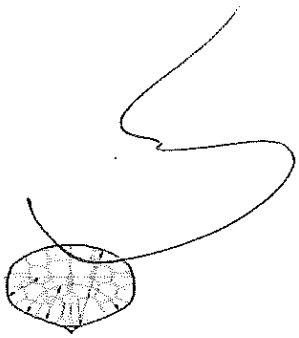
Types of cable wires



Кръгъл многожичен кабел **(rm)**



Кръгъл проводник **(re)**



Разделен многожичен **(sm)**

Разделен проводни

Секторните проводници трябва да бъдат заоблени със специални матрици.
www.ergom.com

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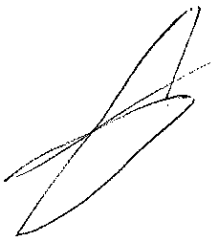
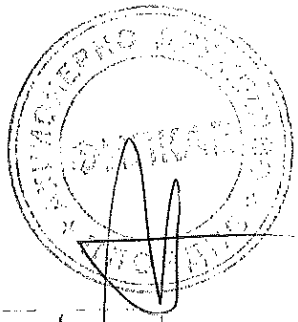




ВЯРНО С ОРИГИНАЛА
Подпис: .....

Crimping technology for tubular terminals and butt connectors

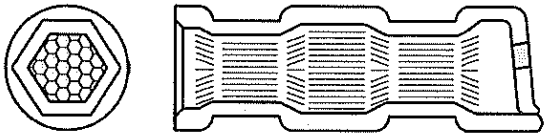
Made as: straight ring terminals (KDR type acc. to Ergom) in accordance with DIN 46235 and connecting terminals (KLD acc. to Ergom type) in accordance with DIN 46267. In remaining terminals the DIN dimensions refer only to the tubular part of terminal. They are made as: straight ring terminals (KDR.../2X; KRM type acc. to Ergom) and angle ring terminals (K90D; KPD type acc. to Ergom); butt connectors (KLD; LMP; LMW; LMWP type acc. to Ergom); reduction connectors (LMP.../...; LMWP.../... type acc. to Ergom); pin terminals (BMW; BMK type acc. to Ergom).

Materials: all types – E-Cu copper tube acc. to DIN 40500 Teil 2, 3 or DIN 1787.

Surface: KDR; KDR .../x2; K90D; K45D; KRM; KLD; LMWP – tin-plated.
KPD; LMP; LMP.../...; LMW; LMWP; HMR; BMW; BMK – not tin-plated.

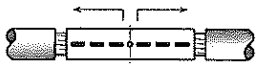
Application:
Straight and angle ring terminals are used for connecting wire by use of screw joint to bus-bar, switchgear, etc. Tubular connectors are used to join two wires of the same cross-section to contact (KLD, LMP, LMW, LMWP) or to joint two wires of different cross-section (LMP.../...; LMWP.../...). This join (except KLD) cannot be stressed mechanically. Copper pin terminals (BMW, BMK) are used for connecting wire with screw joint.

Crimping technology:
Terminals are crimped using tools with so called "hexagon" Crimping dies.

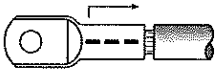


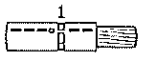
Thanks to such compressing shape joint with very high mechanical and electrical parameters is achieved. However, such joints need several compressions of terminal. The higher compression number the better the joint is.

It is very important in case of power joints where transmission of large power and currents is required. The "hexagon" compression needs still considerable force to crimp a terminal, so in case of such compression (even small wire cross-section) ZAE ERGOM recommends use of hydraulic tools or hand-tools with higher mechanical ratio (operated with both hands). In order to achieve joint of required quality it is recommended to compress terminals to "hexagon" in the following way:

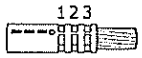


Correct direction and sequence of terminal compressions are marked with arrows.

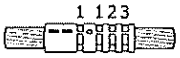




1. First compression (inside)

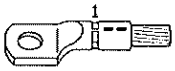


2. Futher compression (from inside to outside)

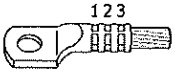


3. First compression on the other side (inside)

4. Futher compressions on the other side (from inside to outside)



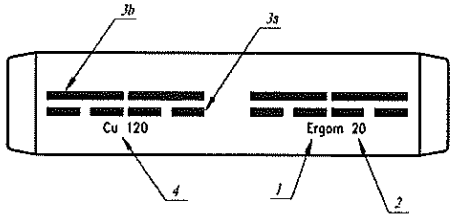
1. First compression (inside)



2. Futher compression (from inside to outside)

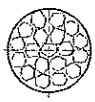
All marked (recommended) crimping must be made. Please pay attention to use proper die for cross-section to which it is designed.

There is marking stamped or overprinted on every terminal to indicate:
- terminal cross-section or screw hole diameter (in case of ring terminals)
- die seat No. to crimp a terminal
- graphic code of number and position of compressions required, made with narrow dies (hand tools) or wide dies (hydraulic tools).

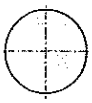


An example of such code is given below.
1. Trade mark.
2. Die seat No.
3. Marking of place and number of compressions.
   3a. Mechanic: narrow die.
   3b. Hydraulic: wide die.
4. Code of cable types (cross-section and profile).

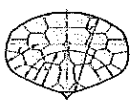
Types of cable wires



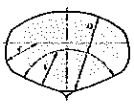
round multiwire **(rm)**



round one-wire **(re)**



sectored multiwire **(sm)**

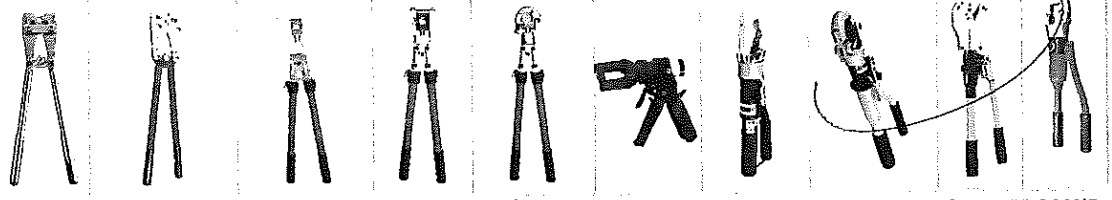


sectored one-wire **(se)**

Sector shaped conductors must be rounded with special dies.

ERGOM

Ręczne i hydrauliczne praski zaciskowe / Crimping



Narzędzia patrz: katalog ŚWIAT NARZĘDZI ERGOM / Tools: see in catalogue ERGOM'S

Narzędzie / Tool / Инструмент Przekrój / Cross section / Сечение [mm²] [кн²]	KD 5/6 KT	KD 6/6 KT	KD 6F/6 KT	EK 18	EK 19	EK 22	HK 4	HK 5	HK 22	UH 60	PBM 6	PHK-300
6	●	●		●	●	●	●	●	●	●		
10	●	●		●	●	●	●	●	●	●		
KDR/KDM 16	●	●		●	●	●	●	●	●	●	●	●
K90D 25	●	●	●	●	●	●	●	●	●	●	●	●
35	●	●	●	●	●	●	●	●	●	●	●	●
K45D 50	●	●	●	●	●	●	●	●	●	●	●	●
KPD 70		●	●	●	●	●	●	●	●	●	●	●
95		●	●	●	●	●	●	●	●	●	●	●
KDR2X/ KDM2X 120		●	●	●	●	●		●	●	●	●	●*)
KRM/KRMC 150			●	●	●	●		●	●	●	●	●*)
185				●	●	●		●	●	●	●	●*)
KLD 240					●	●			●	●	●	●*)
LMP 300									●	●	●	
LMW/LMWC 400												
500												
LMWP 625												
BMV 800												
BMK 1000												

*) z dodatkowym zestawem matryc PHK-R

*) with additional die set PHK-R type

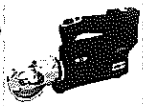
*) с дополнительным наборон матриц PHK-R

ВЯРНО С ОРИГИНАЛА
Подпис: .....

tools and hydraulic presses / Ручные и гидравлические прессы

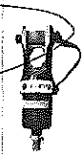













WORLD OF TOOLS / Инструменты: смотри в каталоге МИР ИНСТРУМЕНТОВ ERGOM

WHPH 2/32	WHPH 2/38	WHPH 2/42	WHPH 4	HO 2 EV	HO 2 EH	HBM 6EV	HP 2/25 EV	HP 2/30 EV	HP 2/42 EV	HP 2/25 EH	HP 2/30 EH	HP 2/42 EH	UH 60EV	HK 22 EV	HK 5 EL	GH 60	HK 22	HPH 2/32	HPH 2/38	HPH 4	HH 400	EH 400	HH 630	EH 630	HH 1000	EH 1000
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Ф +359 32 671 133
office@filkab.com
www.filkab.com

Приложение 2 към Техническо предложение

За обособена позиция № 2:

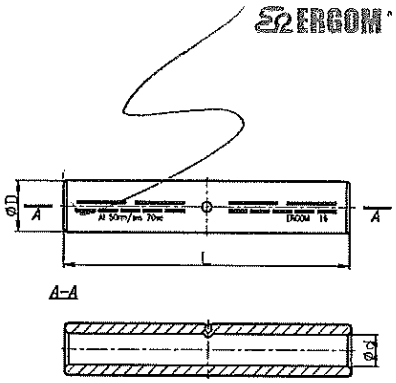
„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)"

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

Приложение 10

ERGOM

Non-tension compression joints LA ... type



Material Al.
Surface uncoated.
Design DIN 46267/2 refers only to tubular part of terminal.
Napięcie 1÷10 kV.

Note!
– L A terminals are filled with special contact grease and packed in foil;
– L A...BS – without contact grease;
– sector shaped conductors must be rounded with special dies.

contact grease		without contact grease		Cross section [mm²]		Dimension [mm]			Crimping				
Type	Item No.	Type	Item No.	rm/sm	re/se	L	d	D	Die code No.	Nc/w	Nc/n		(kg)
LA 10	E12KA-01100100100	LA 10 BS	E12KA-01100200100	10	16	55	5,0	10,0	10	1-1	3-3	100	1,06
LA 16	E12KA-01100100200	LA 16 BS	E12KA-01100200200	16	25	55	5,6	12,0	12	1-1	3-3	100	1,50
LA 25	E12KA-01100100300	LA 25 BS	E12KA-01100200300	25	35	70	6,8	12,0	12	2-2	4-4	100	1,63
LA 35	E12KA-01100100400	LA 35 BS	E12KA-01100200400	35	50	85	8,0	14,0	14	2-2	5-5	100	2,63
LA 50	E12KA-01100100500	LA 50 BS	E12KA-01100200500	50	70	85	9,8	16,0	16	2-2	5-5	100	3,35
LA 70	E12KA-01100100600	LA 70 BS	E12KA-01100200600	70	95	105	11,2	18,5	18	3-3	6-6	100	5,20
LA 95	E12KA-01100100750	LA 95 BS	E12KA-01100200700	95	120	105	13,2	22,0	22	3-3	6-6	50	3,70
LA 120	E12KA-01100100850	LA 120 BS	E12KA-01100200800	120	150	105	14,7	23,0	22	3-3	6-6	50	3,90
LA 150	E12KA-01100100900	LA 150 BS	E12KA-01100200900	150	185	125	16,3	25,0	25	3-3	7-7	50	4,75
LA 185	E12KA-01100101000	LA 185 BS	E12KA-01100201000	185	240	125	18,3	28,5	28	3-3	7-7	50	7,90
LA 240	E12KA-01100101100	LA 240 BS	E12KA-01100201100	240	300	145	21,0	32,0	32	3-3	8-8	50	9,30
LA 300	E12KA-01100101200	LA 300 BS	E12KA-01100201200	300	-	145	23,3	34,0	34	3-3	-	25	5,00
LA 400	E12KA-01100101300	LA 400 BS	E12KA-01100201300	400	-	210	26,0	38,5	38	4-4	-	25	9,30
LA 500	E12KA-01100101400	LA 500 BS	E12KA-01100201400	500	-	210	29,0	44,0	44	4-4	-	25	12,50
LA 625	E12KA-01100101501	LA 625 BS	E12KA-01100201501	625	-	330	35,0	52,0	52	5-5	-	25	12,27
LA 800	E12KA-01100101601	LA 800 BS	E12KA-01100201601	800	-	350	40,0	58,0	58	5-5	-	25	15,00
LA 1000	E12KA-01100101701	LA 1000 BS	E12KA-01100201701	1000	-	350	44,0	60,0	60	5-5	-	25	14,20

Nc/w = No. of crimping wide | Nc/n = No. of crimping narrow

Technologia zaciskania końcówek i łączników rurowych Al %s

Dedykowane praski ręczne i hydrauliczne %s

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www.filkab.com

Приложение 2 към Техническо предложение

За обособена позиция № 2:

„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)“

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

Приложение 11

ASSOCIATION of POLISH ELECTRICIANS
QUALITY TESTING OFFICE
ul. M. Pożaryskiego 28, 04-703 Warszawa, Poland
tel./fax: +48 22 815 65 80
since 1933
TESTING LABORATORY

AB 044

TEST REPORT
PN-EN 61238-1
Compression and mechanical connectors for power cables for rated voltages up 36 kV (U_m = 42 kV)
Part 1: Test methods and requirements (IEC 61238-1:2003, modified)

Report Reference No. ..... :	LA-18.012/2/E	
Data of issue ..... :	2018-03-30	
Total number of pages ..... :	14	
Tested by ..... : (name + position + signature)	Krzysztof Podgórniak Specialist	на основание чл. 36а, ал. 3 от ЗОП
Authorized by ..... : (name + position + signature)	Dariusz Szczepanowski Manager of LA	
Testing application number ..... :	B-A-18-012	
Test item reference ..... :	B-A-18-012	
Scope of test ..... :	☒ - type test	☐ - partial test
Test specification:		
Standard/procedure ..... :	☒ PN-EN 61238-1:2004, EN 61238-1:2003, IEC 61238-1:2003 (Second Edition)	
Non-standard test methods ..... :	N/A	
Non-accredited test methods ..... :	N/A	
Applicant's name ..... :	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o.	
Address ..... :	ul. Nowe Sady 10, 94-102 Łódź	

The BBJ test report form is not permitted for commercial purposes without written approval of the BBJ Testing Laboratory

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Test item description .....:	Aluminium through connector
Trade Mark .....:	ERGOM®
Manufacturer .....:	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź
Model/Typ reference .....:	LAC 16
Ratings .....:	Nominal cross-sectional area: 16 mm^2

List of Attachments:

Attachment No.	Attachment No.	Attachment No.
1	Summary of the test result	1
2	Product information and photos of samples	4
3	List of the equipment used for the test	1

Summary of testing:

Test performer (in the case of partial tests): N/A	**Testing location/address** (if different from page 1) : Stowarzyszenie Elektryków Polskich, Biuro Badawcze ds. Jakości Association of Polish Electrician, Quality Testing Office ul. M. Rapackiego 13, 20-150 Lublin, POLAND
Number of tests with F (Fail) verdict:	0
Summary conformity/non-conformity with standardization document (if apply):	N/A
Summary of compliance with National Differences (if apply): Provide list of standards.	N/A
Opinion and interpretation if needed:	N/A
Other additional information (as requested by the applicant):	N/A

Copy of marking plate:

LAC 16

I-POB-07/01-Z3w9

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Test item particular:

Classification of installation and use ..... : N/A

Supply Connection ..... : N/A

Date (s) of receipt of test item ..... : 2018-01-29 (Sample No. 1.1...1.19, 11.1...11.10)

Date (s) of performance of tests ..... : 2018-02-01...2018-03-29

Possible test case verdicts:

- test case does not apply to the test object .....: N/A
- test object does meet the requirement .....: P (Pass)
- test object does not meet the requirement .....: F (Fail)

Test report general remarks:

1. **The test results presented in this report relate only to the object tested.**
   This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
2. **"(See Enclosure #)" refers to additional information appended to the report..**
3. **"(See appended table)" refers to a table appended to the report**
4. **Throughout this report a comma is used as the decimal separator.**
5. **Test Report Form is based on TRF No.: IEC61238_1A, copyrighted by IECEE.**

Production place(s) .....: Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o.
ul. Nowe Sady 10, 94-102 Łódź

General product information:

Tests were carried out on samples of aluminium through connectors type LAC, nominal cross sectional area 16 mm^2.

Manual hydraulic presses HK 22 C with hexagonal die KP22-12 was used to crimp testing through connectors LAC 16. Hexagonal die KP22-12 is dedicated to aluminium terminals with a DIN-conforming tubular part (size DIN 12) for crimping cables RMC/RMV.
Cable AsXSn 2x16 mm^2 RMC 0,6/1kV, manufacturer NKT Cables was used to electrical and mechanical tests of through connectors LAC 16.

Samples were marked for the tests as B-A-18-012/1.1...1.19 and B-A-18-012/11.1...11.10. In the Test Report abbreviated marking of the samples, as the samples No. 1.1...1.19, 11.1...11.10 were used.

Type:	No.:
KDAC 16/8	1.1...1.19
LAC 16	11.1...11.10

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
Identification			—
	Connector		—
	Type of connector	☒ through connector ☐ branch connector ☐ terminal lug	—
	Nominal cross-sectional area .....:	16 mm^2	—
	Class of connector	☒ Class A ☐ Class B	—
5.1	**Conductor**		—
	conductor material .....:	Al	—
	nominal cross-sectional area .....:	16 mm^2 RMC	—
	actual conductor area .....:	16 mm^2 RMC	—
	leading dimensions and shape .....:	Unpreparted cable	—
	type of conductor (solid or stranded).....:	16 mm^2 - stranded	—
	details of conductor construction (in the case of stranded conductors).....:	16 mm^2 – stranded cable, round, 7 wires	—
	compacted / non-compacted .....:	Compacted	—
	flexible .....:	No	—
	number of wires .....:	7 wires	—
	direction of lay.....:	Right	—
	plating .....:	No plating	—
	type of impregnation, if any.....:	—	—
	approximate indication of hardness (annealed, half-hard, hard) .....:	Hard	—
	type of insulation (in case of insulation-piercing connectors) .....:	—	—
5.2	**Connectors and tooling**		—
	assembly technique .....:	Crimp connection	—
	tooling and necessary settings .....:	Manual hydraulic presses HK 22 C with hexagonal die KP22-12. Hexagonal die KP22-12 is dedicated to aluminium terminals with a DIN-conforming tubular part for crimping cables RMC/RMV. Size DIN 12	—
	preparation of contact surfaces .....:	Through connector filled with contact grease	—

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	type, reference number and other identification of the connector ..... :	LAC 16: surface: tin-plated; material: Al	—
6	**Electrical tests**		P
6.1	**Installation**		P
	six connectors fitted in accordance with the manufacturer's instructions		P
	welded equalizers used	Yes	P
	in case of insulation-piercing connectors, the insulation retained on the conductor under the connector, and for a distance of at least 100 mm outside the connector		N/A
	ambient temperature of the test location (between 15 °C and 30 °C) ..... :	19 °C...23 °C	P
	the test loop is dismantleable for short-circuit test (class A connectors only)		N/A
	the technology of the sectioning joints do not influence the measurements		N/A
	bolts or screws of the connectors were not retightened under test		N/A
6.1.1	Through connectors and terminal lugs		—
	test loop and dimensions according to Figure 1	See Attachment No. 2	P
	linking bars used (in case of terminal lugs)		N/A
	the palms bolted to the linking bars in accordance with the manufacturer's instructions		N/A
	linking bars have the same dimensions and material as the palm		N/A
	palm connected direct to palm		N/A
6.1.2	Branch connectors		—
	branch connector is treated as a through connector between the main and the branch (size of branch cable equal to the main, or immediately above or below the main)		N/A
	In other cases, test loop and dimensions according to Figure 2		N/A
6.2	**Measurements**		P
6.2.1	Electrical resistance measurements		P
	measurements made at stages throughout the test as specified in 6.3		P

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	method used	☒ indirect ☐ direct	—
	indirect method: measuring current is 10 % of the heat cycling current	LAC 16: 10 A ÷ 11 A	P
	potential points as indicated in Figure 3 and annex B		P
	Precision of resistance measurements, indirect method		—
	voltage: max. ±0,5 % or ±10 µV, actual precision .....:	±0,5 %	P
	current: max. ±0,5 % or ±0,1 A, actual precision.....:	±0,5 %	P
	Precision of resistance measurements, direct method: better than ±1 % or ±0,5 µΩ, actual precision .....:	—	N/A
6.2.2	Temperature measurements		P
	stages as specified in 6.3		P
	the temperature of connectors and reference conductor measured at the points as indicated in Figure 3	Figure 3a, 3b	P
	thermocouples used as reference method	Yes	P
	total accuracy of temperature measurements: ±2 °C or better, actual accuracy .....:	±2,0 °C	P
6.3	**Heat cycle test**		P
	power frequency current used	AC 50 Hz	P
6.3.1	First heat cycle		—
6.3.1 a)	Non insulation-piercing through connectors and terminal lugs	Sample No. 11.1...11.6	P
	current is circulated in the test loop, bringing the reference conductor to 120 °C at equilibrium		N/A
	measured temperature of the median connector ..:	Sample No. 11.1: 102,2 °C	—
	reference conductor temperature (120 °C ≤ Θ_R ≤ 140 °C) .....:	138,6 °C	—
	equilibrium current I_N .....:	122 A	—
6.3.1 b)	Non insulation-piercing branch connectors		N/A
	test circuit according to	☐ Figure 1 ☐ Figure 2	—
	current is circulated in the test loop, bringing the reference conductor to 120 °C at equilibrium		N/A

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	current in all individual branch adjusted so that each branch reference temperature is the same as the main reference temperature		N/A
	measured temperature of the median connector . :		—
	reference conductor temperature ($120\ °C \leq \Theta_R \leq 140\ °C$) ..... :		—
	equilibrium current I_N ..... :		—
6.3.1 c)	Insulation-piercing connectors (IPC)		N/A
	test circuit according to	☐ Figure 1 ☐ Figure 2	—
	isolated reference conductor used		N/A
	permitted temperature of the cable ..... :		—
	temperature of the median connector is set 10 K above permitted temperature of the cable		N/A
	measured temperature of the median connector . :		—
	temperature of the reference conductor(s) is(are) set max.15 K above permitted temperature of the cable		N/A
	temperature of the isolated reference conductor(s) at equilibrium ..... :		N/A
	equilibrium current I_N ..... :		—
6.3.2	Second heat cycle	Sample No. 11.1...11.6	—
	current is circulated in the loop until the main reference conductor temperature reaches the value Θ_R determined in 6.3.1 with a tolerance of +6 °C	138 °C ÷ 144 °C	P
	the median connector temperature is stable within 2 °C over a 10 min period		P
	current flow time (t_1) ..... :	33 min	—
	accelerated heating used	☐ Yes ☒ No	—
	accelerated heating time ..... :	—	—
	accelerated heating time according to Table 1		N/A
	cooling time (t_2) ..... :	6 min	—
	After cooling, the temperature of all connectors and the reference conductor ≤ 35 °C		P
	accelerated cooling used with ambient air	☒ Yes ☐ No	—
6.3.3	Subsequent heat cycles	Sample No. 11.1...11.6	—
	a total of 1000 heat cycles performed		P
	Measurements performed at the following cycles:		—
	Class A: 0, 200 (before and after short-circuit test), 250, then every 75		P

ВЯРНО С ОРИГИНАЛА
Подпис: .....

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	Class B: 0, 250, then every 75		N/A
	cold resistance and temperature of each connector and reference conductor/conductors measured	See TABLE 1	P
	maximum temperature of each connector measured	See TABLE 2	P
6.3.4	Short-circuit tests (for Class A connectors only)	Sample No. 11.1...11.6	P
	six short circuits applied after the 200th heat cycle		P
	short-circuit current .....:	1,59 kA ÷ 1,60 kA	—
	short-circuit current raises the reference conductors from a temperature of ≤35 °C to a temperature between 250 °C and 270 °C		P
	measured temperature of the reference conductor:	251,5 °C ÷ 255,0 °C	P
	duration of the short-circuit current (1 s below 25 kA, ≤5 s above 25 kA) .....:	1,39 s ÷ 1,40 s	P
	the test loop cooled to a temperature ≤ 35 °C after each short circuit		P
6.4	**Assessment of results**		P
	Calculated parameters:		—
	connector resistance factor *k*, calculated according to annex E, clause E.2 .....:	See TABLE 3	—
	initial scatter δ, between the six initial values of *k* measured prior to heat cycling, calculated according to annex E, clause E.3 .....:	See TABLE 4	P
	mean scatter β, between the six values of *k* averaged over the last 11 measurement intervals, calculated according to annex E, clause E.4 .....:	See TABLE 5	P
	change in resistance factor *D* for each of the six connectors, calculated according to annex E, clause E.5 .....:	See TABLE 6	P
	resistance factor ratio λ calculated according to annex E, clause E.6 .....:	See TABLE 7	P
	maximum temperature Θ_{max} on each connector, recorded according to annex E, clause E.7 .....:	See TABLE 2	P
6.5	**Requirements**		P
	more than four connectors satisfy the requirements shown in table 2		N/A
	one full re-test performed	☐ Yes ☐ No	—
	six connectors satisfy the requirements shown in table 2		P
	values of δ do not exceed 0,3	See TABLE 4	P

PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	values of β do not exceed 0,3	See TABLE 5	P
	values of D do not exceed 0,15	See TABLE 6	P
	values of λ do not exceed 2,0	See TABLE 7	P
	values of Θ_{max} do not exceed Θ_{ref}	See TABLE 2	P
7	**Mechanical tests**		P
7.1	Test method		—
	the test is made on three connectors different from those used for the electrical test	Sample No. 11.7...11.9	P
	connectors are fitted as for the electrical test of 6.1		P
	the conductor lengths, between connectors or between connector and tensile test machine jaws, are more than 500 mm		P
	the rate of application of the load do not exceed 10 N/mm^2 of cross-section per second		P
7.2	Requirements		P
	tensile force applied during one minute	Conductor of 16 mm^2 Al; 1 min	P
	force for aluminium, (40×A [mm^2], max. 20 000) .. :	40 x 16 = 640 N	P
	force for copper, (60×A [mm^2], max. 20 000) ..... :		N/A
	in case the connector is electrically tested for conductors with difference cross-sectional area, the different joints tested individually to the above requirements		N/A
	no slipping during the tensile test		P

ВЯРНО С ОРИГИНАЛА
Подпис: .....

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6.3.3	TABLE 1: cold resistance and temperature of the connectors							—
cycle		connectors						reference conductor
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	R [mΩ]	0,6031	0,6032	0,6071	0,6047	0,6032	0,6071	0,6716
	Θ [°C]	19,4	19,5	19,5	19,8	20,0	19,9	19,7
200.*	R [mΩ]	0,6039	0,6056	0,6094	0,6059	0,6037	0,6160	0,6719
	Θ [°C]	18,4	18,7	18,6	18,8	18,9	18,9	18,3
200.*	R [mΩ]	0,6047	0,6095	0,6213	0,6070	0,6049	0,6134	0,6754
	Θ [°C]	19,7	19,9	20,0	20,2	20,4	20,3	19,6
250.	R [mΩ]	0,6047	0,6096	0,6212	0,6064	0,6051	0,6143	0,6757
	Θ [°C]	21,1	21,4	21,4	21,7	21,7	21,5	21,1
325.	R [mΩ]	0,6045	0,6089	0,6218	0,6067	0,6042	0,6143	0,6753
	Θ [°C]	21,4	21,6	21,7	21,9	21,9	21,8	21,8
400.	R [mΩ]	0,6033	0,6074	0,6207	0,6059	0,6030	0,6134	0,6742
	Θ [°C]	22,1	22,4	22,4	22,6	22,8	22,7	22,7
475.	R [mΩ]	0,6035	0,6073	0,6208	0,6058	0,6035	0,6132	0,6740
	Θ [°C]	21,0	21,3	21,3	21,5	21,5	21,5	21,0
550.	R [mΩ]	0,6046	0,6092	0,6223	0,6075	0,6052	0,6148	0,6746
	Θ [°C]	21,6	21,7	21,8	21,9	22,0	22,0	21,7
625.	R [mΩ]	0,6053	0,6096	0,6224	0,6071	0,6046	0,6141	0,6757
	Θ [°C]	24,0	24,2	24,2	24,3	24,4	24,3	23,8
700.	R [mΩ]	0,6033	0,6077	0,6210	0,6053	0,6030	0,6124	0,6730
	Θ [°C]	22,4	22,5	22,4	22,7	22,7	22,7	22,9
775.	R [mΩ]	0,6033	0,6079	0,6216	0,6058	0,6035	0,6131	0,6731
	Θ [°C]	19,5	19,7	19,7	19,9	19,9	19,8	19,6
850.	R [mΩ]	0,6039	0,6073	0,6210	0,6055	0,6031	0,6124	0,6738
	Θ [°C]	20,3	20,6	20,6	20,9	21,0	20,9	20,4
925.	R [mΩ]	0,6035	0,6086	0,6218	0,6066	0,6035	0,6130	0,6734
	Θ [°C]	22,9	23,1	23,1	23,4	23,6	23,3	22,9
1000.	R [mΩ]	0,6029	0,6090	0,6213	0,6053	0,6023	0,6107	0,6731
	Θ [°C]	19,6	19,7	19,7	19,7	19,8	19,9	20,2
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 11.1...11.6 (conductor of 16 mm^2)								

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6.3.3	TABLE 2: maximum temperature of each connector measured							P
cycle		connectors						reference conductor
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	Θ_{max} [°C]	102,2	104,3	92,9	96,6	105,1	97,7	138,6
200.*	Θ_{max} [°C]	107,2	111,0	98,4	105,5	109,3	103,2	141,7
200.*	Θ_{max} [°C]	101,7	110,3	102,2	104,0	109,4	100,1	140,3
250.	Θ_{max} [°C]	104,3	114,4	102,4	106,1	111,8	103,5	143,5
325.	Θ_{max} [°C]	105,0	112,7	103,5	106,4	110,9	102,3	143,6
400.	Θ_{max} [°C]	104,4	113,4	104,2	105,4	111,1	102,8	143,4
475.	Θ_{max} [°C]	104,4	112,8	103,3	106,3	111,7	105,2	142,6
550.	Θ_{max} [°C]	104,6	113,6	99,6	105,8	110,8	105,3	140,9
625.	Θ_{max} [°C]	105,3	114,8	100,9	107,9	112,1	106,6	140,9
700.	Θ_{max} [°C]	103,9	112,4	98,8	106,1	111,5	106,5	142,0
775.	Θ_{max} [°C]	101,4	110,5	99,3	105,2	108,2	101,3	140,6
850.	Θ_{max} [°C]	102,4	111,7	97,6	103,9	109,2	105,5	142,0
925.	Θ_{max} [°C]	103,4	111,3	99,6	104,8	110,0	105,2	140,3
1000.	Θ_{max} [°C]	103,3	110,9	101,6	105,0	110,2	104,1	140,3
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 11.1...11.6 (conductor of 16 mm^2)								

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6.4	TABLE 3: connector resistance factor k, calculated according to annex E, clause E.2							P
Parameters:		L_a=	150 mm	L_b=	150 mm	L_r=	365 mm	L_j=	55 mm
cycle		**connectors**						
		j=1	**j=2**	**j=3**	**j=4**	**j=5**	**j=6**	
0.		0,5049	0,5059	0,5445	0,5208	0,5059	0,5445	
200.*		0,5106	0,5274	0,5650	0,5304	0,5087	0,6302	
200.*		0,4874	0,5345	0,6505	0,5100	0,4893	0,5728	
250.		0,4842	0,5323	0,6463	0,5009	0,4881	0,5785	
325.		0,4865	0,5297	0,6565	0,5081	0,4835	0,5828	
400.		0,4843	0,5246	0,6556	0,5099	0,4813	0,5837	
475.		0,4874	0,5248	0,6577	0,5100	0,4874	0,5829	
550.		0,4929	0,5381	0,6670	0,5214	0,4988	0,5932	
625.		0,4901	0,5323	0,6580	0,5078	0,4832	0,5765	
700.		0,4940	0,5374	0,6686	0,5138	0,4911	0,5838	
775.		0,4940	0,5393	0,6744	0,5186	0,4959	0,5906	
850.		0,4934	0,5269	0,6619	0,5092	0,4856	0,5772	
925.		0,4928	0,5430	0,6731	0,5233	0,4928	0,5864	
1000.		0,4900	0,5502	0,6714	0,5137	0,4841	0,5669	
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 11.1...11.6 (conductor of 16 mm^2)								

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6.4	TABLE 4: initial scatter δ, between the six initial values of k measured prior to heat cycling, calculated according to annex E, clause E.3							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$\underline{K_0}$	0,5211	0,5211	0,5211	0,5211	0,5211	0,5211	
	s_0	0,0191	0,0191	0,0191	0,0191	0,0191	0,0191	
	δ	0,0605	0,0605	0,0605	0,0605	0,0605	0,0605	
Supplementary information: Sample No. 11.1...11.6 (conductor of 16 mm^2)								

6.4	TABLE 5: mean scatter β, between the six values of k averaged over the last 11 measurement intervals, calculated according to annex E, clause E.4							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	$\underline{k}$	0,4900	0,5344	0,6628	0,5124	0,4883	0,5820	
	$\underline{K}$	0,5450	0,5450	0,5450	0,5450	0,5450	0,5450	
	s	0,0673	0,0673	0,0673	0,0673	0,0673	0,0673	
	β	0,2038	0,2038	0,2038	0,2038	0,2038	0,2038	
Supplementary information: Sample No. 11.1...11.6 (conductor of 16 mm^2)								

6.4	TABLE 6/1: change in resistance factor D for each of the six connectors, calculated according to annex E, clause E.5							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
250...1000	b	-0,0009	-0,0016	-0,0022	-0,0012	-0,0004	0,0005	
	$\underline{k}$	0,4900	0,5344	0,6628	0,5124	0,4883	0,5820	
	$\lvert M \rvert$	0,0184	0,0299	0,0332	0,0234	0,0082	0,0086	
	s_j	0,0026	0,0063	0,0051	0,0055	0,0058	0,0074	
	S	0,0110	0,0244	0,0159	0,0222	0,0246	0,0263	
	D	0,0294	0,0543	0,0491	0,0456	0,0328	0,0349	
Supplementary information: Sample No. 11.1...11.6 (conductor of 16 mm^2)								

ВЕРНО С ОРИГИНАЛА
Подпис: .....

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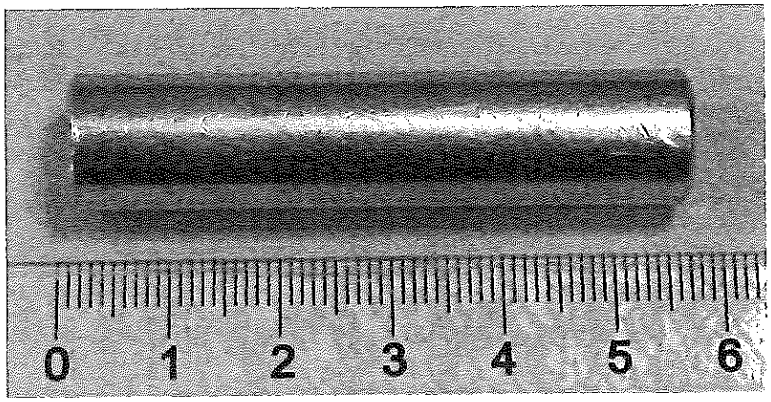
6.4	TABLE 7/1: resistance factor ratio λ, calculated according to annex E, clause E.6							P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	k_0	0,5049	0,5059	0,5445	0,5208	0,5059	0,5445	
200.*	λ=	1,0113	1,0425	1,0376	1,0184	1,0055	1,1574	
200.*	λ=	0,9653	1,0565	1,1947	0,9793	0,9672	1,0520	
250.	λ=	0,95 90	1,0522	1,1870	0,9618	0,9648	1,0624	
325.	λ=	0,9636	1,0470	1,2057	0,9756	0,9557	1,0703	
400.	λ=	0,9592	1,0370	1,2040	0,9791	0,9514	1,0720	
475.	λ=	0,9653	1,0374	1,2079	0,9793	0,9634	1,0705	
550.	λ=	0,9762	1,0636	1,2250	1,0012	0,9860	1,0894	
625.	λ=	0,9707	1,0522	1,2084	0,9750	0,9551	1,0588	
700.	λ=	0,9784	1,0623	1,2279	0,9866	0,9707	1,0722	
775.	λ=	0,9784	1,0660	1,2386	0,9958	0,9802	1,0847	
850.	λ=	0,9772	1,0415	1,2156	0,9777	0,9599	1,0601	
925.	λ=	0,9760	1,0733	1,2362	1,0048	0,9741	1,0770	
1000.	λ=	0,9705	1,0876	1,2331	0,9864	0,9569	1,0411	
(*) rows marked with asterisk can be omitted in case of connectors type "B"								
Supplementary information: Sample No. 11.1...11.6 (conductor of 16 mm^2)								

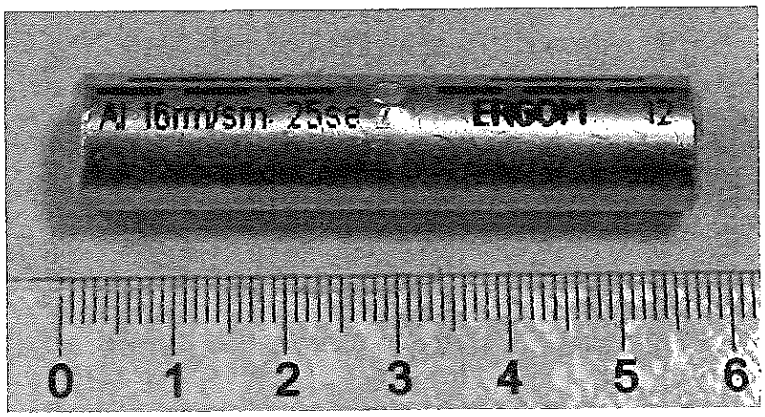
Attachment No. 1

Summary of the test results according to PN-EN 61238-1:2004

Clause	Tests	Sample No.	Verdict
6	Electrical tests	11.1... 11.6	P
7	Mechanical tests	11.7... 11.9	P

Photos of the samples:

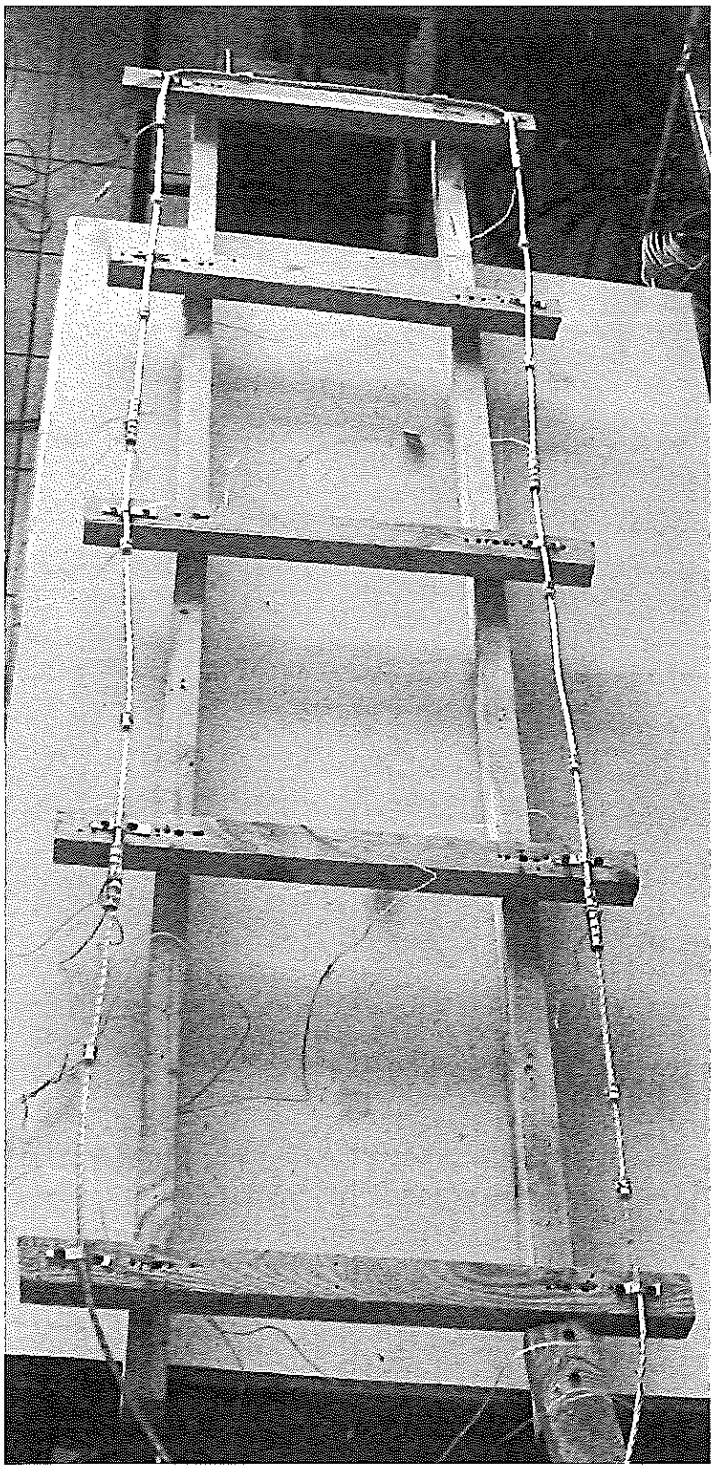




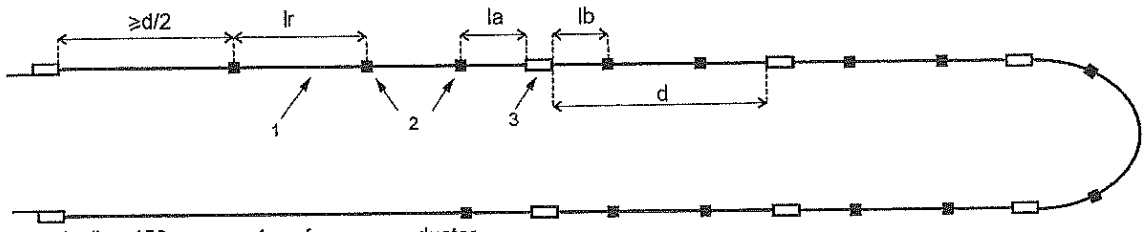
Aluminium tin-plated through connector LAC 16

Верно с оригиналом
Подпис: .....

Photos of the samples (continued):



Test circuit of LAC 16



la, lb = 150 mm
lr = 365 mm
d = 540 mm

1 - reference conductor
2 - equalizers
3 - through connector

The configuration and dimensions of the test circuit of LAC 16

ВЯРНО С ОРИГИНАЛА
Подпис: .....

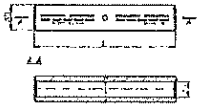
Attachment No. 2

Product data sheet:

Non-tension compression joints LAC... - LAC 16

ERGOM index E12KA-01100100200 unit of measure 100 pcs.
Minimal quantity 0.5 UOM

logistics details	
Product title.	Non-tension compression joints LAC ... type
Type	LAC 16 (100 SZT./PCS)
ERGOM index.	E12KA-01100100200
EAN.	5900003219483
Weight netto	~ 1,416 kg
mechanical details	
Material	Al.
Surface	tin plated
Grease	contact grease
Certificates	
Design	ORI 46267/2 - concern only the tubular part of terminal
Electrical data	
Voltage [kV]	1-10
Sections	
Cross section [mm²]	25
Cross section rm/sm [mm²]	16
crimping	
Die code No	12
No. of crimping wide	1-1
No of crimping narrow	3-3



Sizes	
d	5,6
D	12,6
L	55
Characteristics	
Note!	- L A terminals are filled with special contact grease and packed in foil; - L A...BS - without contact grease; - sector shaped conductors must be rounded with special dies.

I-POB-07/01-Z3w9

ВЯРНО С ОРИГИНАЛА
Подпис: .....

Attachment No. 3

List of test equipment used:

Clause	Measurement / testing	Testing / measuring equipment / material used	Range used	Calibration date
6	Electrical tests	Temperature and humidity meter (W-02512)	Auto	2017-08-07
		KRP arrangement (801/50681)	—	2017-06-14
		Shunts 25 kA RST (801/50064-2C)	25 kA	2016-08-16
		Measuring tape 3 m (W-52157)	(0 ... 3) m	2014-01-14
		Stopwatch (W-52182)	s, min	2017-02-24
		Temperature meter TMP (801/02707)	(0 ... 300) °C	2017-07-20
		Current transformer JL-4 (W-51323)	400/5 A	2016-03-22
		Ammeter LE-3P (801/02824)	6 A	2017-06-21
		Multimeter FLUKE (8/02480)	mV DC	2017-05-15
		Ammeter ML20 (W-51678)	15 A	2017-04-20
7	Mechanical tests	Temperature and humidity meter (W-02506)	Auto	2017-08-07
		Dynamometer FB50K (801/02722)	640 N	2018-01-19
		Measuring tape 3 m (W-52157)	(0 ... 3) m	2014-01-14
		Stopwatch (W-50018)	(0 ... 60) s	2018-02-12

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TESTING LABORATORY

AB 044

TEST REPORT
EN 61238-1
Compression and mechanical connectors for power cables for rated voltages up 36 kV (U_m = 42 kV)
Part 1: Test methods and requirements (IEC 61238-1:2003, modified)

Report Reference No. ..... :	LA-16.081/16.069/1/E	
Data of issue ..... :	2017-01-20	
Total number of pages ..... :	14	
Tested by ..... : (name + position + signature)	Krzysztof Podgórniak Specialist	на основание чл. 36а, ал. 3 от ЗОП
Authorized by ..... : (name + position + signature)	Dariusz Szczepanowski Manager of LA	
Testing application number ..... :	C-A-16-081/16.069	
Test item reference ..... :	S-A-16-069	
Scope of test ..... :	☒ - type test	☐ - partial test
Test specification:		
Standard/procedure ..... :	☒ EN 61238-1:2003, IEC 61238-1:2003 (Second Edition)	
Non-standard test methods ..... :	N/A	
Non-accredited test methods ..... :	N/A	
Applicant's name ..... :	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o.	
Address ..... :	ul. Nowe Sady 10, 94-102 Łódź	

ВЕРНО С ОРИГИНАЛА
Подпис: .....

Test item description ..... :	Aluminium through connector
Trade Mark ..... :	ERGOM®
Manufacturer ..... :	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź
Model/Typ reference ..... :	LAC 25 ÷ 300 / This report covers test of LAC 25
Ratings ..... :	Nominal cross-sectional area: 25 mm^2 ÷ 300 mm^2 / This report covers test of 25 mm^2

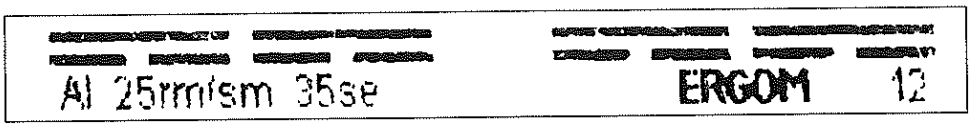
List of Attachments:

Attachment No.	Attachment No.	Attachment No.
1	Summary of the test result	1
2	Product information and photos of samples	4
3	List of the equipment used for the test	1

Summary of testing:

Test performer (in the case of partial tests): N/A	**Testing location/address** (if different from page 1) : Stowarzyszenie Elektryków Polskich, Biuro Badawcze ds. Jakości Association of Polish Electrician, Quality Testing Office ul. M. Rapackiego 13, 20-150 Lublin, POLAND
Number of tests with F (Fail) verdict:	0
Summary conformity/non-conformity with standardization document (if apply):	N/A
Summary of compliance with National Differences (if apply): Provide list of standards.	N/A
Opinion and interpretation if needed:	N/A
Other additional information (as requested by the applicant):	N/A

Copy of marking plate:



LAC 25

I-POB-07/01-Z3w9

Test item particular:	
Classification of installation and use ..... :	N/A
Supply Connection ..... :	N/A
Date (s) of receipt of test item ..... :	2016-09-02 (Sample No 1.1...1.9, 2.7...2.9) 2016-10-12 (Sample No 1.10, 2.10, 3.1...3.10, 4.10) 2016-10-21 (Sample No 4.1...4.9) 2016-10-26 (Sample No 2.1...2.6)
Date (s) of performance of tests ..... :	2016-09-02...2017-01-20
Possible test case verdicts:	
- test case does not apply to the test object .....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement .....:	F (Fail)

Test report general remarks:

1. **The test results presented in this report relate only to the object tested.**
   This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
2. **"(See Enclosure #)" refers to additional information appended to the report..**
3. **"(See appended table)" refers to a table appended to the report**
4. **Throughout this report a comma is used as the decimal separator.**
5. **Test Report Form is based on TRF No.: IEC61238_1A, copyrighted by IECEE.**

Production place(s) .....:	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź

General product information:

Tests were carried out on samples of aluminium tin-plated through connectors type LAC, nominal cross sectional area 25 mm^2 ÷ 300 mm^2.
According to the standard and as agreed with the manufacturer for the tests were prepared four loops: 25 mm^2, 70 mm^2, 120 mm^2 and 300 mm^2 cross sectional area.
This report covers test of 25 mm^2, LAC 25.

Manual hydraulic presses HK 22 C with die KP22-W16/25 was used to crimp testing samples LAC 25.
Die KP22-W16/25 with fangs is dedicated for cables of RMC construction. Size DIN12.
Cable AsXSn 4x25 mm^2 RMC 0,6/1kV, manufacturer NKT Cables was used to electrical and mechanical tests of through connectors LAC 25.

Samples were marked for the tests as S-A-16-069/1.1...1.10, S-A-16-069/2.1...2.10, S-A-16-069/3.1...3.10 and S-A-16-069/4.1...4.10. In the Test Report abbreviated marking of the samples, as the samples No. 1.1...1.10, 2.1...2.10, 3.1...3.10, 4.1...4.10 is used.

Type:	No.:
LAC 25	1.1...1.10
LAC 70	2.1...2.10
LAC 120	3.1...3.10
LAC 300	4.1...4.10

ВЯРНО С ОРИГИНАЛА
Подпис: .....

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Clause	Requirement – Test	Result - Remark	Verdict

Identification			—
	Connector		—
	Type of connector	☒ through connector ☐ branch connector ☐ terminal lug	—
	Nominal cross-sectional area .....:	25 mm^2	—
	Class of connector	☒ Class A ☐ Class B	—
5.1	**Conductor**		—
	conductor material .....:	Al	—
	nominal cross-sectional area .....:	25 mm^2 RMC	—
	actual conductor area .....:	25 mm^2 RMC	—
	leading dimensions and shape .....:	Unpreparted cable	—
	type of conductor (solid or stranded) .....:	25 mm^2 - stranded	—
	details of conductor construction (in the case of stranded conductors) .....:	25 mm^2 – stranded cable, round, 7 wires	—
	compacted / non-compacted .....:	Compacted	—
	flexible .....:	No	—
	number of wires .....:	7 wires	—
	direction of lay .....:	Right	—
	plating .....:	No plating	—
	type of impregnation, if any .....:	—	—
	approximate indication of hardness (annealed, half-hard, hard) .....:	Hard	—
	type of insulation (in case of insulation-piercing connectors) .....:	—	—
5.2	**Connectors and tooling**		—
	assembly technique .....:	Crimp connection	—
	tooling and necessary settings .....:	Manual hydraulic presses HK 22 C with die KP22-W16/25. Die KP22-W16/25 with fangs is dedicated for cables of RMC construction. Size DIN12	—
	preparation of contact surfaces .....:	Through connector filled with contact grease	—
	type, reference number and other identification of the connector .....:	LAC 25: surface: tin-plated; material: Al	—

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Clause	Requirement – Test	Result - Remark	Verdict
6	**Electrical tests**		P
6.1	**Installation**		P
	six connectors fitted in accordance with the manufacturer's instructions		P
	welded equalizers used	Yes	P
	in case of insulation-piercing connectors, the insulation retained on the conductor under the connector, and for a distance of at least 100 mm outside the connector		N/A
	ambient temperature of the test location (between 15 °C and 30 °C) ..... :	19 °C ÷ 24 °C	P
	the test loop is dismantleable for short-circuit test (class A connectors only)		N/A
	the technology of the sectioning joints do not influence the measurements		N/A
	bolts or screws of the connectors were not retightened under test		N/A
6.1.1	Through connectors and terminal lugs		—
	test loop and dimensions according to Figure 1	See Attachment No. 2	P
	linking bars used (in case of terminal lugs)		N/A
	the palms bolted to the linking bars in accordance with the manufacturer's instructions		N/A
	linking bars have the same dimensions and material as the palm		N/A
	palm connected direct to palm		N/A
6.1.2	Branch connectors		—
	branch connector is treated as a through connector between the main and the branch (size of branch cable equal to the main, or immediately above or below the main)		N/A
	In other cases, test loop and dimensions according to Figure 2		N/A

6.2	**Measurements**		P
6.2.1	Electrical resistance measurements		P
	measurements made at stages throughout the test as specified in 6.3		P
	method used	☒ indirect ☐ direct	—
	indirect method: measuring current is 10 % of the heat cycling current	LAC 25: 10,5 A ÷ 13 A	P

ВЯРНО С ОРИГИНАЛА
Подпис: .....