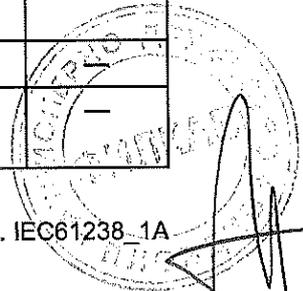




PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	potential points as indicated in Figure 3 and annex B		P
	Precision of resistance measurements, indirect method		—
	voltage: max. $\pm 0,5 \%$ or $\pm 10 \mu V$ , actual precision .....	$\pm 0,5 \%$	P
	current: max. $\pm 0,5 \%$ or $\pm 0,1 A$ , actual precision.....	$\pm 0,5 \%$	P
	Precision of resistance measurements, direct method: better than $\pm 1 \%$ or $\pm 0,5 \mu \Omega$ , 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: $\pm 2 \text{ }^\circ C$ or better, actual accuracy .....	$\pm 1,0 \text{ }^\circ C$	P

<b>6.3</b>	<b>Heat cycle test</b>		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. 1.1...1.6	P
	current is circulated in the test loop, bringing the reference conductor to $120 \text{ }^\circ C$ at equilibrium		N/A
	measured temperature of the median connector ...:	$100,1 \text{ }^\circ C$	—
	reference conductor temperature ( $120 \text{ }^\circ C \leq \Theta_R \leq 140 \text{ }^\circ C$ ) .....	$121,5 \text{ }^\circ C$	—
	equilibrium current $I_N$ .....	155 A	—
6.3.1 b)	Non insulation-piercing branch connectors		N/A
	test circuit according to	<input type="checkbox"/> Figure 1 <input type="checkbox"/> Figure 2	—
	current is circulated in the test loop, bringing the reference conductor to $120 \text{ }^\circ C$ at equilibrium		N/A
	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 ( $120 \text{ }^\circ C \leq \Theta_R \leq 140 \text{ }^\circ C$ ) .....		—

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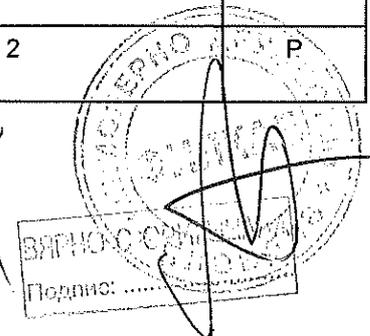


ВАННО С ОПИТНИКА  
Познач: .....



PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
	equilibrium current $I_N$ ..... :		—
6.3.1 c)	Insulation-piercing connectors (IPC)		N/A
	test circuit according to	<input type="checkbox"/> Figure 1 <input type="checkbox"/> 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. 1.1... 1.6	—
	current is circulated in the loop until the main reference conductor temperature reaches the value $\Theta_R$ determined in 6.3.1 with a tolerance of +6 °C	120 °C + 126 °C	P
	the median connector temperature is stable within 2 °C over a 10 min period		P
	current flow time ( $t_1$ ) ..... :	34 min	—
	accelerated heating used	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	—
	accelerated heating time ..... :	0 min	—
	accelerated heating time according to Table 1		N/A
	cooling time ( $t_2$ ) ..... :	11 min	—
	After cooling, the temperature of all connectors and the reference conductor $\leq 35$ °C		P
	accelerated cooling used with ambient air	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	—
6.3.3	Subsequent heat cycles	Sample No. 1.1... 1.6	—
	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
	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

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**PN-EN 61238-1**

Clause	Requirement – Test	Result - Remark	Verdict
6.3.4	Short-circuit tests (for Class A connectors only)	Sample No. 1.1...1.6	P
	six short circuits applied after the 200th heat cycle		P
	short-circuit current .....	2,58 kA + 2,63 kA	—
	short-circuit current raises the reference conductors from a temperature of $\leq 35$ °C to a temperature between 250 °C and 270 °C		P
	measured temperature of the reference conductor:	252,5 °C + 259,8 °C	P
	duration of the short-circuit current (1 s below 25 kA, $\leq 5$ s above 25 kA) .....	1,31 s + 1,36 s	P
	the test loop cooled to a temperature $\leq 35$ °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 $\delta$ , 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 $\beta$ , 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 $\lambda$ calculated according to annex E, clause E.6 .....	See TABLE 7	P
	maximum temperature $\theta_{max}$ 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	<input type="checkbox"/> Yes <input type="checkbox"/> No	—
	six connectors satisfy the requirements shown in table 2		P
	values of $\delta$ do not exceed 0,3		P
	values of $\beta$ do not exceed 0,3		P
	values of $D$ do not exceed 0,15		P
	values of $\lambda$ do not exceed 2,0		P
	values of $\theta_{max}$ do not exceed $\theta_{ref}$		P

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## PN-EN 61238-1

Clause	Requirement – Test	Result - Remark	Verdict
<b>7</b>	<b>Mechanical tests</b>		<b>P</b>
7.1	Test method		—
	the test is made on three connectors different from those used for the electrical test	Sample No. 1.7...1.9	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 <sup>2</sup> of cross-section per second		P
7.2	Requirements		P
	tensile force applied during one minute	Conductor of 25 mm <sup>2</sup> Al; 1 min	P
	force for aluminium, (40×A [mm <sup>2</sup> ], max. 20 000) .. :	1000 N	P
	force for copper, (60×A [mm <sup>2</sup> ], 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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ВЕРНО С ОРИГИНАЛОМ  
Подпис: .....



PN-EN 61238-1

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]	0,4072	0,4039	0,4058	0,4013	0,4007	0,4023	0,4826
	θ [°C]	19,6	19,6	19,7	19,6	19,6	19,5	19,7
200.*	R [mΩ]	0,4242	0,4163	0,4199	0,4178	0,4116	0,4225	0,4837
	θ [°C]	21,9	21,4	21,4	21,4	21,6	22,2	21,1
200.*	R [mΩ]	0,4249	0,4194	0,4243	0,4191	0,4157	0,4279	0,4787
	θ [°C]	21,1	20,8	20,6	20,7	20,8	21,2	21,4
250.	R [mΩ]	0,4294	0,4216	0,4261	0,4217	0,4176	0,4349	0,4802
	θ [°C]	23,7	23,3	23,2	23,6	23,6	23,7	23,7
325.	R [mΩ]	0,4300	0,4213	0,4257	0,4216	0,4183	0,4340	0,4806
	θ [°C]	22,3	22,3	22,3	22,3	22,4	22,6	22,7
400.	R [mΩ]	0,4300	0,4211	0,4263	0,4218	0,4186	0,4340	0,4805
	θ [°C]	24,3	23,9	23,7	24,2	24,2	24,3	24,4
475.	R [mΩ]	0,4294	0,4209	0,4261	0,4221	0,4196	0,4353	0,4801
	θ [°C]	22,2	22,2	22,2	22,3	22,4	22,5	22,6
550.	R [mΩ]	0,4305	0,4218	0,4263	0,4228	0,4204	0,4354	0,4806
	θ [°C]	23,4	23,3	23,3	23,5	23,4	23,6	23,7
625.	R [mΩ]	0,4304	0,4222	0,4267	0,4230	0,4209	0,4362	0,4810
	θ [°C]	24,3	24,0	23,8	24,2	24,1	24,3	24,5
700.	R [mΩ]	0,4305	0,4219	0,4264	0,4232	0,4207	0,4363	0,4809
	θ [°C]	21,0	21,1	21,1	21,2	21,3	21,4	21,1
775.	R [mΩ]	0,4293	0,4212	0,4255	0,4222	0,4204	0,4356	0,4794
	θ [°C]	21,3	20,9	20,9	21,3	21,1	21,4	21,3
850.	R [mΩ]	0,4301	0,4216	0,4262	0,4232	0,4208	0,4365	0,4803
	θ [°C]	21,3	21,1	21,0	21,2	21,4	21,5	21,5
925.	R [mΩ]	0,4300	0,4213	0,4259	0,4231	0,4210	0,4361	0,4795
	θ [°C]	22,7	22,7	22,7	22,8	22,9	23,1	23,0
1000.	R [mΩ]	0,4299	0,4214	0,4262	0,4229	0,4214	0,4364	0,4803
	θ [°C]	21,0	21,0	21,0	21,1	21,1	21,2	21,0

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

Supplementary information: Sample No. 1.1...1.6 (conductor of 25 mm<sup>2</sup>)

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ВЕРНО С ОРИГИНАЛОМ  
Подпись: .....





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6.4		TABLE 3: connector resistance factor k, calculated according to annex E, clause E.2						P	
Parameters:		L <sub>a</sub> =	150 mm	L <sub>b</sub> =	150 mm	L <sub>r</sub> =	410 mm	L <sub>f</sub> =	70 mm
cycle		connectors							
		j=1	j=2	j=3	j=4	j=5	j=6		
0.		0,6566	0,6165	0,6396	0,5850	0,5777	0,5971		
200.*		0,8513	0,7556	0,7992	0,7738	0,6987	0,8307		
200.*		0,9128	0,8455	0,9054	0,8418	0,8002	0,9495		
250.		0,9514	0,8563	0,9111	0,8575	0,8075	1,0185		
325.		0,9543	0,8482	0,9018	0,8519	0,8117	1,0030		
400.		0,9557	0,8472	0,9106	0,8557	0,8167	1,0044		
475.		0,9528	0,8491	0,9125	0,8637	0,8332	1,0248		
550.		0,9603	0,8543	0,9092	0,8665	0,8373	1,0201		
625.		0,9547	0,8548	0,9096	0,8646	0,8390	1,0253		
700.		0,9573	0,8526	0,9074	0,8684	0,8380	1,0280		
775.		0,9591	0,8601	0,9127	0,8723	0,8503	1,0361		
850.		0,9597	0,8561	0,9122	0,8756	0,8463	1,0378		
925.		0,9662	0,8599	0,9161	0,8819	0,8563	1,0407		
1000.		0,9573	0,8536	0,9122	0,8719	0,8536	1,0366		

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

Supplementary information: Sample No. 1.1...1.6 (conductor of 25 mm<sup>2</sup>)

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Προσφώνη: .....



PN-EN 61238-1

6.4		TABLE 4: initial scatter $\delta$ , 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.	$K_0$	0,6121	0,6121	0,6121	0,6121	0,6121	0,6121	
	$s_0$	0,0313	0,0313	0,0313	0,0313	0,0313	0,0313	
	$\delta$	0,0844	0,0844	0,0844	0,0844	0,0844	0,0844	
Supplementary information: Sample No. 1.1...1.6 (conductor of 25 mm <sup>2</sup> )								

6.4		TABLE 5: mean scatter $\beta$ , 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	$\underline{k}$	0,9572	0,8538	0,9105	0,8664	0,8354	1,0250	
	$\underline{K}$	0,9081	0,9081	0,9081	0,9081	0,9081	0,9081	
	$s$	0,0722	0,0722	0,0722	0,0722	0,0722	0,0722	
	$\beta$	0,1312	0,1312	0,1312	0,1312	0,1312	0,1312	
Supplementary information: Sample No. 1.1...1.6 (conductor of 25 mm <sup>2</sup> )								

6.4		TABLE 6: 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	-0,0007	-0,0006	-0,0025	-0,0048	-0,0034	
	$\underline{k}$	0,9572	0,8538	0,9105	0,8664	0,8354	1,0250	
	$IM$	0,0094	0,0082	0,0066	0,0289	0,0575	0,0332	
	$s_j$	0,0030	0,0038	0,0032	0,0040	0,0053	0,0066	
	$S$	0,0065	0,0092	0,0073	0,0096	0,0131	0,0133	
	$D$	0,0159	0,0174	0,0139	0,0385	0,0706	0,0465	
Supplementary information: Sample No. 1.1...1.6 (conductor of 25 mm <sup>2</sup> )								

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Подпись: .....



PN-EN 61238-1

6.4		TABLE 7: resistance factor ratio $\lambda$ , calculated according to annex E, clause E.6						P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$k_0$	0,6566	0,6165	0,6396	0,5850	0,5777	0,5971	
200.*	$\lambda=$	1,2965	1,2256	1,2495	1,3227	1,2095	1,3912	
200.*	$\lambda=$	1,3902	1,3715	1,4156	1,4390	1,3851	1,5902	
250.	$\lambda=$	1,4490	1,3890	1,4245	1,4658	1,3978	1,7057	
325.	$\lambda=$	1,4534	1,3758	1,4099	1,4562	1,4051	1,6798	
400.	$\lambda=$	1,4555	1,3742	1,4237	1,4627	1,4137	1,6821	
475.	$\lambda=$	1,4511	1,3773	1,4267	1,4764	1,4423	1,7163	
550.	$\lambda=$	1,4625	1,3857	1,4215	1,4812	1,4494	1,7084	
625.	$\lambda=$	1,4540	1,3865	1,4221	1,4779	1,4523	1,7171	
700.	$\lambda=$	1,4580	1,3830	1,4187	1,4844	1,4506	1,7217	
775.	$\lambda=$	1,4607	1,3951	1,4270	1,4911	1,4719	1,7352	
850.	$\lambda=$	1,4616	1,3886	1,4262	1,4968	1,4649	1,7381	
925.	$\lambda=$	1,4715	1,3948	1,4323	1,5075	1,4823	1,7429	
1000.	$\lambda=$	1,4580	1,3846	1,4262	1,4904	1,4776	1,7361	

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

Supplementary information: Sample No. 1.1...1.6 (conductor of 25 mm<sup>2</sup>)

BBS TRF No: IEC61238 1A  
 Подпис: .....



Attachment No. 1

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

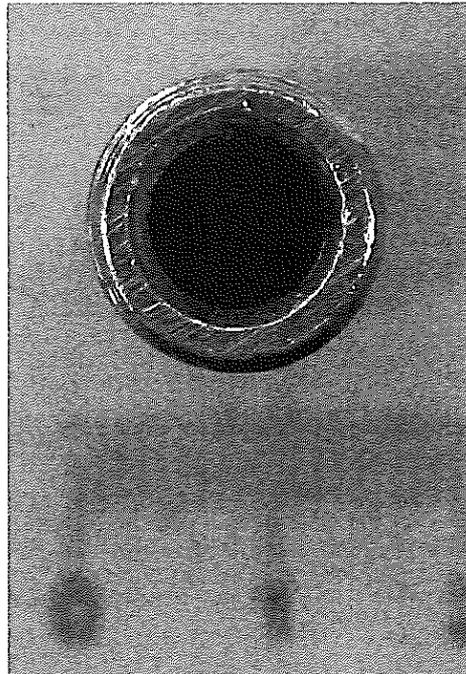
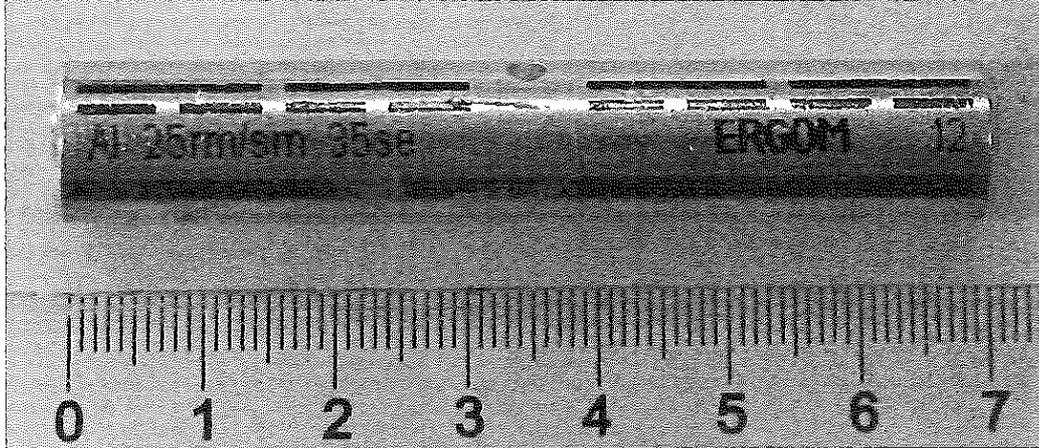
Clause	Tests	Sample No.	Verdict
6	Electrical tests	1.1...1.6	P
7	Mechanical tests	1.7...1.9	P

МІНІСТЕРСТВО СІЛЬСЬКОГО ГOSПДАРСТВА  
України  
Полтавська область  
Полтавський національний технічний університет імені Юрія Федьковича  
Полтава

I-POB-07/01-Z3w9



Photos of the samples:



Aluminium through connector LAC 25

I-POB-07/01-Z3w9

ВЕРНО С ОРИГИНАЛОМ  
Подпись: .....



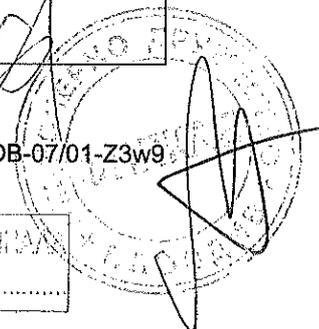
Photos of the samples (continued):



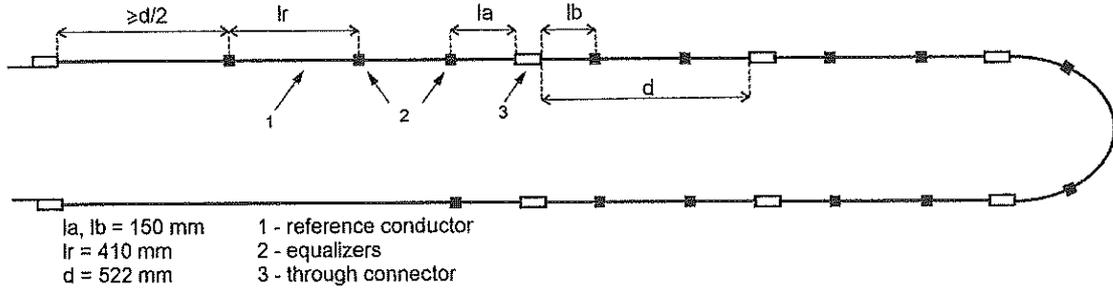
Test circuit of LAC 25

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I-POB-07/01-Z3w9



ВАЖНО С ОРИГИНАЛОМ  
Подпис: .....



The configuration and dimensions of the test circuit of LAC 25

I-POB-07/01-Z3w9



ВАННО С ОРГАНИЗМА  
Подпис: .....



Attachment No. 2

Roncówki rurowe aluminiowe

ERGOM

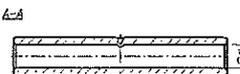
Łączniki rurowe nieobciążalne mechanicznie, typu LA i LAC

Materiał AL  
 Pokrycie LAC - pokrywanie z LAC  
 Wykonanie DIN 46267/2 - dotyczy części rurowe  
 Napięcie 1-10 kV



Uwaga!  
 - łączniki LA są wypełnione specjalnym smarem kontaktowym i zapakowane są w folię.  
 - żyły sektorowe muszą zostać zabezpieczone na okągło.

LAC - pokrywanie



Typ	Art. nr	Przekrój [mm <sup>2</sup> ]		Wymiary [mm]			Zaprasowanie			Zakres	Δ <sub>z</sub> [kg]
		m <sup>2</sup> /m	cm <sup>2</sup> /cm	L	d	D	Hr. gniazda	Iz/s	Iz/w		
LA 10	E1216-0110010101	10	16	55	5,2	15,0	8	3-1	3-3	100	10h
LA 16	E1216-0110010120	16	25	55	5,6	17,0	7	1-1	3-3	100	1,5h
LA 25	E1216-0110010150	25	35	70	6,8	17,0	12	2-2	4-4	100	1,8h
LA 35	E1216-0110010160	35	50	85	8,0	16,0	4	2-2	5-5	100	2,6h
LA 50	E1216-0110010180	50	70	95	9,8	16,0	10	2-2	5-5	100	3,2h
LA 70	E1216-0110010200	70	95	105	11,2	18,5	8	2-2	6-6	100	5,2h
LA 95	E1216-0110010210	95	120	115	12,2	22,0	27	3-3	4-4	95	1,2h
LA 120	E1216-0110010230	120	150	105	14,1	25,0	22	3-3	6-6	95	1,8h
LA 150	E1216-0110010250	150	175	125	16,1	25,0	25	3-3	7-7	95	4,7h
LA 185	E1216-0110010280	185	240	135	18,3	28,5	28	3-3	7-7	95	7,9h
LA 240	E1216-0110010320	240	300	140	21,0	32,0	31	3-3	8-8	95	8,7h
LA 300	E1216-0110010350	300	-	145	23,3	36,0	34	3-3	-	75	5,0h
LA 400	E1216-0110010380	400	-	210	28,0	38,5	38	4-4	-	75	9,7h
LA 500	E1216-0110010400	500	-	240	33,0	40,0	41	4-4	-	75	12,0h
LA 615	E1216-0110010420	615	-	280	37,0	42,0	52	4-4	-	75	17,2h
LA 800	E1216-0110010450	800	-	330	42,0	48,0	58	5-5	-	75	24,0h
LA 1000	E1216-0110010480	1000	-	390	48,0	50,0	60	5-5	-	75	34,0h

1) d - średnica zewnętrzna, [mm] - średnica zewnętrzna okągła

Technologia zerlewanie krawędzi i łączenia rurowe (LA)

Dołączane o złączach rurowych

I-POB-07/01-Z3w9

ВАРНО С ОФИЦИАЛ  
 Подпись: .....



## List of test equipment used:

Clause	Measurement / testing	Testing / measuring equipment / material used	Range used	Calibration date
6	Electrical tests	Thermohygrometer LB-701 (800/01704)	Auto	2015-12-14
		KRP arrangement (801/50681)	—	2016-06-20
		Shunts 25 kA RST (801/50064-2A)	25 kA	2016-08-16
		Measuring tape 3 m (W-52157)	(0 ... 3) m	2014-01-14
		Stopwatch (W-52162)	s, min	2016-02-12
		Temperature meter TMP (801/02707)	(0 ... 300) °C	2016-03-16
		Current transformer JL-4 (NF-00905)	400/5 A	2014-01-29
		Ammeter LE-3P (W-51675)	6 A	2016-04-04
		Shunt B3 (W-52051)	100 A / 150 mV	2014-03-28
		Multimeter FLUKE (8/50591)	mV AC, DC	2015-12-14
	Multimeter FLUKE (8/02480)	mV AC, DC	2016-04-26	
7	Mechanical tests	Measuring tape 3 m (W-52157)	(0 ... 3) m	2014-01-14
		Stopwatch (W-52162)	(0 ... 60) s	2016-02-12
		Dynamometer FB50K (801/02722)	1000 N	2016-06-09
		Thermohygrometer LB-701 (800/01704)	Auto	2015-12-14

I-POB-07/01-Z3w9



ВЕРНО С ОРИГИНАЛОМ  
Подпись: .....



od 1933 r.

ASSOCIATION of POLISH ELECTRICIANS  
QUALITY TESTING OFFICE  
ul. M. Pożaryskiego 28, 04-703 Warszawa, Poland

tel./fax: +48-22-815 65 80

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-16.081/16.069/2/E

Data of issue ..... : 2017-01-20

Total number of pages ..... : 14

Tested by ..... : Krzysztof Podgórnjak  
(name + position + signature) Specialist

на основании чл. 36а, ал. 3  
от ЗОП

Authorized by ..... : Dariusz Szczepanowski  
(name + position + signature) 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





**Test item description** .....: Aluminium through connector  
**Trade Mark** .....: 

**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 70

**Ratings** .....: Nominal cross-sectional area: 25 mm<sup>2</sup> + 300 mm<sup>2</sup> / This report covers test of 70 mm<sup>2</sup>

**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:**

<b>Test performer</b> (in the case of partial tests): N/A	<b>Testing location/address</b> (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
<b>Number of tests with F (Fail) verdict:</b>	0
<b>Summary conformity/non-conformity with standardization document</b> (if apply):	N/A
<b>Summary of compliance with National Differences</b> (if apply): Provide list of standards.	N/A
<b>Opinion and interpretation if needed:</b>	N/A
<b>Other additional information</b> (as requested by the applicant):	N/A

**Copy of marking plate:**



LAC 70

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<b>Test item particular:</b>	
Classification of installation and use .....	: N/A
Supply Connection .....	: N/A
<b>Date (s) of receipt of test item</b> .....	: 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)
<b>Date (s) of performance of tests</b> .....	: 2016-09-02...2017-01-20
<b>Possible test case verdicts:</b>	
- 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)	
<b>Test report general remarks:</b>	
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 IECCE.	
<b>Production place(s)</b> .....	Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź
<b>General product information:</b>	
Tests were carried out on samples of aluminium tin-plated through connectors type LAC, nominal cross sectional area 25 mm <sup>2</sup> + 300 mm <sup>2</sup> . According to the standard and as agreed with the manufacturer for the tests were prepared four loops: 25 mm <sup>2</sup> , 70 mm <sup>2</sup> , 120 mm <sup>2</sup> and 300 mm <sup>2</sup> cross sectional area. This report covers test of 70 mm <sup>2</sup> , LAC 70.	
Electro-hydraulic presses HKP 22 EL with die KP22-W70 was used to crimp testing samples LAC 70. Die KP22-W70 with fangs is dedicated for cables of RMC construction. Size DIN18. Cable YAKY 1x70 mm <sup>2</sup> RMC 0,6/1kV, manufacturer Drut-Plast was used to electrical and mechanical tests of through connectors LAC 70.	
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

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ВЕРНО С ОРИГИНАЛОМ

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Clause	Requirement – Test	Result - Remark	Verdict
<b>Identification</b>			—
	<b>Connector</b>		—
	Type of connector	<input checked="" type="checkbox"/> through connector <input type="checkbox"/> branch connector <input type="checkbox"/> terminal lug	—
	Nominal cross-sectional area .....	70 mm <sup>2</sup>	—
	Class of connector	<input checked="" type="checkbox"/> Class A <input type="checkbox"/> Class B	—
<b>5.1</b>	<b>Conductor</b>		—
	conductor material .....	Al	—
	nominal cross-sectional area .....	70 mm <sup>2</sup> RMC	—
	actual conductor area .....	70 mm <sup>2</sup> RMC	—
	leading dimensions and shape .....	Unprepared cable	—
	type of conductor (solid or stranded).....	70 mm <sup>2</sup> - stranded	—
	details of conductor construction (in the case of stranded conductors).....	70 mm <sup>2</sup> – stranded cable, round, 12 wires	—
	compacted / non-compacted .....	Compacted	—
	flexible .....	No	—
	number of wires .....	12 wires	—
	direction of lay.....	Left	—
	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) .....	—	—
<b>5.2</b>	<b>Connectors and tooling</b>		—
	assembly technique .....	Crimp connection	—
	tooling and necessary settings .....	Electro-hydraulic presses HKP 22 EL with die KP22-W70. Die KP22-W70 with fangs is dedicated for cables of RMC construction. Size DIN18	—
	preparation of contact surfaces .....	Through connector filled with contact grease	—
	type, reference number and other identification of the connector .....	LAC 70: surface: tin-plated; material: Al	—

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PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
<b>6</b>	<b>Electrical tests</b>		<b>P</b>
<b>6.1</b>	<b>Installation</b>		<b>P</b>
	six connectors fitted in accordance with the manufacturer's instructions		<b>P</b>
	welded equalizers used	Yes	<b>P</b>
	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		<b>N/A</b>
	ambient temperature of the test location (between 15 °C and 30 °C) .....	19 °C + 23 °C	<b>P</b>
	the test loop is dismantlable for short-circuit test (class A connectors only)		<b>N/A</b>
	the technology of the sectioning joints do not influence the measurements		<b>N/A</b>
	bolts or screws of the connectors were not retightened under test		<b>N/A</b>
<b>6.1.1</b>	<b>Through connectors and terminal lugs</b>		<b>—</b>
	test loop and dimensions according to Figure 1	See Attachment No. 2	<b>P</b>
	linking bars used (in case of terminal lugs)		<b>N/A</b>
	the palms bolted to the linking bars in accordance with the manufacturer's instructions		<b>N/A</b>
	linking bars have the same dimensions and material as the palm		<b>N/A</b>
	palm connected direct to palm		<b>N/A</b>
<b>6.1.2</b>	<b>Branch connectors</b>		<b>—</b>
	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)		<b>N/A</b>
	In other cases, test loop and dimensions according to Figure 2		<b>N/A</b>
<b>6.2</b>	<b>Measurements</b>		<b>P</b>
<b>6.2.1</b>	<b>Electrical resistance measurements</b>		<b>P</b>
	measurements made at stages throughout the test as specified in 6.3		<b>P</b>
	method used	<input checked="" type="checkbox"/> indirect <input type="checkbox"/> direct	
	indirect method: measuring current is 10 % of the heat cycling current	LAC 70: 15,5 A + 18 A	<b>P</b>

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Clause	Requirement – Test	Result - Remark	Verdict
	potential points as indicated in Figure 3 and annex B		P
	Precision of resistance measurements, indirect method		—
	voltage: max. $\pm 0,5 \%$ or $\pm 10 \mu V$ , actual precision .....	$\pm 0,5 \%$	P
	current: max. $\pm 0,5 \%$ or $\pm 0,1 A$ , actual precision.....	$\pm 0,5 \%$	P
	Precision of resistance measurements, direct method: better than $\pm 1 \%$ or $\pm 0,5 \mu \Omega$ , 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: $\pm 2 \text{ }^\circ C$ or better, actual accuracy .....	$\pm 1,0 \text{ }^\circ C$	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. 2.1...2.6	P
	current is circulated in the test loop, bringing the reference conductor to $120 \text{ }^\circ C$ at equilibrium		N/A
	measured temperature of the median connector ...:	$101,8 \text{ }^\circ C$	—
	reference conductor temperature ( $120 \text{ }^\circ C \leq \Theta_R \leq 140 \text{ }^\circ C$ ) .....	$127,4 \text{ }^\circ C$	—
	equilibrium current $I_N$ .....	305 A	—
6.3.1 b)	Non insulation-piercing branch connectors		N/A
	test circuit according to	<input type="checkbox"/> Figure 1 <input type="checkbox"/> Figure 2	N/A
	current is circulated in the test loop, bringing the reference conductor to $120 \text{ }^\circ C$ at equilibrium		N/A
	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 ( $120 \text{ }^\circ C \leq \Theta_R \leq 140 \text{ }^\circ C$ ) .....		—

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Clause	Requirement – Test	Result - Remark	Verdict
6.3.4	Short-circuit tests (for Class A connectors only)	Sample No. 2.1...2.6	P
	six short circuits applied after the 200th heat cycle		P
	short-circuit current .....	8,11 kA + 8,15 kA	—
	short-circuit current raises the reference conductors from a temperature of $\leq 35$ °C to a temperature between 250 °C and 270 °C		P
	measured temperature of the reference conductor:	257,0 °C + 265,9 °C	P
	duration of the short-circuit current (1 s below 25 kA, $\leq 5$ s above 25 kA) .....	1,26 s + 1,27 s	P
	the test loop cooled to a temperature $\leq 35$ °C after each short circuit		P

<b>6.4</b>	<b>Assessment of results</b>		P
	Calculated parameters:		—
	connector resistance factor $k$ , calculated according to annex E, clause E.2 .....	See TABLE 3	—
	initial scatter $\delta$ , 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 $\beta$ , 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 $\lambda$ calculated according to annex E, clause E.6 .....	See TABLE 7	P
	maximum temperature $\theta_{max}$ on each connector, recorded according to annex E, clause E.7 .....	See TABLE 2	P

<b>6.5</b>	<b>Requirements</b>		P
	more than four connectors satisfy the requirements shown in table 2		N/A
	one full re-test performed	<input type="checkbox"/> Yes <input type="checkbox"/> No	—
	six connectors satisfy the requirements shown in table 2		P
	values of $\delta$ do not exceed 0,3		P
	values of $\beta$ do not exceed 0,3		P
	values of $D$ do not exceed 0,15		P
	values of $\lambda$ do not exceed 2,0		P
	values of $\theta_{max}$ do not exceed $\theta_{ref}$		P

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Clause	Requirement – Test	Result - Remark	Verdict
7	<b>Mechanical tests</b>		P
7.1	Test method		—
	the test is made on three connectors different from those used for the electrical test	Sample No. 2.7...2.9	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 <sup>2</sup> of cross-section per second		P
7.2	Requirements		P
	tensile force applied during one minute	Conductor of 70 mm <sup>2</sup> Al; 1 min	P
	force for aluminium, (40×A [mm <sup>2</sup> ], max. 20 000) .. :	2800 N	P
	force for copper, (60×A [mm <sup>2</sup> ], 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: 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]	0,1476	0,1472	0,1434	0,1448	0,1435	0,1446	0,1804
	θ [°C]	21,4	21,2	21,0	21,0	21,5	21,5	21,6
200.*	R [mΩ]	0,1490	0,1495	0,1445	0,1480	0,1447	0,1468	0,1802
	θ [°C]	22,0	21,9	21,7	21,7	21,9	22,1	22,1
200.*	R [mΩ]	0,1560	0,1521	0,1475	0,1496	0,1479	0,1506	0,1802
	θ [°C]	19,7	19,7	19,7	19,7	19,4	19,9	19,9
250.	R [mΩ]	0,1573	0,1529	0,1480	0,1513	0,1484	0,1519	0,1803
	θ [°C]	20,4	20,5	20,3	20,2	20,5	20,6	20,4
325.	R [mΩ]	0,1576	0,1528	0,1481	0,1514	0,1482	0,1522	0,1798
	θ [°C]	22,9	22,4	22,0	22,0	22,4	22,6	23,0
400.	R [mΩ]	0,1582	0,1534	0,1486	0,1518	0,1488	0,1526	0,1800
	θ [°C]	21,6	21,5	21,4	21,4	21,6	21,6	21,6
475.	R [mΩ]	0,1576	0,1530	0,1482	0,1516	0,1481	0,1518	0,1793
	θ [°C]	21,6	21,6	21,3	21,3	21,7	21,7	21,8
550.	R [mΩ]	0,1584	0,1537	0,1486	0,1522	0,1491	0,1529	0,1801
	θ [°C]	21,5	21,6	21,4	21,3	21,6	21,5	21,5
625.	R [mΩ]	0,1584	0,1531	0,1487	0,1522	0,1488	0,1526	0,1796
	θ [°C]	20,9	21,0	20,8	20,7	20,9	21,1	20,8
700.	R [mΩ]	0,1586	0,1535	0,1488	0,1526	0,1484	0,1527	0,1799
	θ [°C]	22,2	22,1	22,0	22,0	22,4	22,3	22,4
775.	R [mΩ]	0,1590	0,1541	0,1495	0,1526	0,1490	0,1525	0,1802
	θ [°C]	19,1	19,2	19,2	19,2	19,2	19,4	19,0
850.	R [mΩ]	0,1586	0,1537	0,1493	0,1524	0,1488	0,1525	0,1798
	θ [°C]	21,1	20,7	20,3	20,1	20,7	21,1	20,8
925.	R [mΩ]	0,1592	0,1538	0,1499	0,1528	0,1492	0,1530	0,1802
	θ [°C]	19,3	19,8	19,7	19,7	19,9	19,9	19,5
1000.	R [mΩ]	0,1592	0,1540	0,1499	0,1529	0,1492	0,1531	0,1800
	θ [°C]	19,2	19,4	19,3	19,1	19,5	19,4	19,1

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

**Supplementary information:** Sample No. 2.1...2.6 (conductor of 70 mm<sup>2</sup>)

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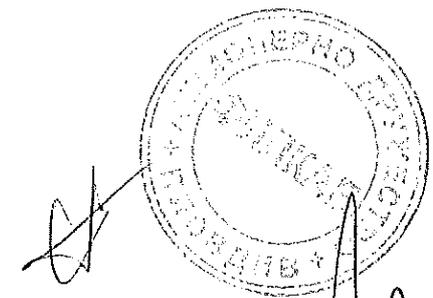
## PN-EN 61238-1

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.	$\vartheta_{max}$ [°C]	101,8	98,7	96,0	100,5	105,0	102,7	127,4
200.*	$\vartheta_{max}$ [°C]	105,2	108,6	102,6	104,1	107,7	111,4	131,2
200.*	$\vartheta_{max}$ [°C]	104,5	105,6	100,8	99,8	105,3	105,9	129,4
250.	$\vartheta_{max}$ [°C]	108,0	108,0	103,6	103,6	107,1	108,1	132,7
325.	$\vartheta_{max}$ [°C]	106,3	107,0	102,1	101,6	105,8	107,4	131,9
400.	$\vartheta_{max}$ [°C]	105,3	107,6	101,5	100,9	101,6	103,0	130,3
475.	$\vartheta_{max}$ [°C]	103,9	108,1	102,6	102,4	104,4	106,0	130,9
550.	$\vartheta_{max}$ [°C]	104,1	107,6	99,8	103,3	104,4	105,1	131,3
625.	$\vartheta_{max}$ [°C]	105,2	108,6	99,3	104,3	105,7	105,7	132,8
700.	$\vartheta_{max}$ [°C]	107,0	108,6	102,5	104,0	106,4	109,3	130,1
775.	$\vartheta_{max}$ [°C]	105,2	107,2	99,9	103,9	106,6	108,6	129,3
850.	$\vartheta_{max}$ [°C]	104,7	105,7	101,0	102,4	105,3	108,0	129,6
925.	$\vartheta_{max}$ [°C]	105,6	107,6	101,6	102,3	106,1	108,2	131,2
1000.	$\vartheta_{max}$ [°C]	105,6	107,4	101,4	102,4	106,3	108,3	131,0

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

Supplementary information: Sample No. 2.1...2.6 (conductor of 70 mm<sup>2</sup>)

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ВЛЮД С ОЧИНАВА  
Подпис: .....



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6.4		TABLE 3: connector resistance factor k, calculated according to annex E, clause E.2						P	
Parameters:		L <sub>a</sub> =	150 mm	L <sub>b</sub> =	150 mm	L <sub>r</sub> =	460 mm	L <sub>j</sub> =	105 mm
cycle		connectors							
		j=1	j=2	j=3	j=4	j=5	j=6		
0.		0,7261	0,7164	0,6241	0,6581	0,6265	0,6533		
200.*		0,7658	0,7780	0,6564	0,7415	0,6613	0,7123		
200.*		0,9360	0,8412	0,7293	0,7804	0,7391	0,8047		
250.		0,9646	0,8577	0,7387	0,8188	0,7484	0,8334		
325.		0,9819	0,8650	0,7505	0,8309	0,7529	0,8504		
400.		0,9930	0,8762	0,7594	0,8372	0,7642	0,8567		
475.		0,9944	0,8821	0,7648	0,8478	0,7623	0,8527		
550.		0,9949	0,8806	0,7565	0,8441	0,7687	0,8611		
625.		1,0074	0,8781	0,7708	0,8562	0,7733	0,8659		
700.		1,0057	0,8815	0,7671	0,8596	0,7574	0,8621		
775.		1,0089	0,8898	0,7780	0,8533	0,7658	0,8509		
850.		1,0063	0,8869	0,7797	0,8552	0,7675	0,8577		
925.		1,0138	0,8825	0,7877	0,8582	0,7707	0,8631		
1000.		1,0174	0,8908	0,7910	0,8640	0,7740	0,8689		

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

**Supplementary information:** Sample No. 2.1...2.6 (conductor of 70 mm<sup>2</sup>)



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ВЕРНО С СЕРТИФИКАТОМ  
Подпись: .....



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6.4		TABLE 4: initial scatter $\delta$ , 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.	$K_0$	0,6674	0,6674	0,6674	0,6674	0,6674	0,6674	
	$s_0$	0,0440	0,0440	0,0440	0,0440	0,0440	0,0440	
	$\delta$	0,1088	0,1088	0,1088	0,1088	0,1088	0,1088	
Supplementary information: Sample No. 2.1...2.6 (conductor of 70 mm <sup>2</sup> )								

6.4		TABLE 5: mean scatter $\beta$ , 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	$\underline{k}$	0,9989	0,8792	0,7677	0,8478	0,7641	0,8566	
	$\underline{K}$	0,8524	0,8524	0,8524	0,8524	0,8524	0,8524	
	$s$	0,0862	0,0862	0,0862	0,0862	0,0862	0,0862	
	$\beta$	0,1669	0,1669	0,1669	0,1669	0,1669	0,1669	
Supplementary information: Sample No. 2.1...2.6 (conductor of 70 mm <sup>2</sup> )								

6.4		TABLE 6: 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	$b$	-0,0043	-0,0026	-0,0046	-0,0038	-0,0019	-0,0021	
	$\underline{k}$	0,9989	0,8792	0,7677	0,8478	0,7641	0,8566	
	$IM$	0,0430	0,0296	0,0599	0,0448	0,0249	0,0245	
	$s_j$	0,0063	0,0055	0,0047	0,0062	0,0058	0,0073	
	$S$	0,0131	0,0129	0,0127	0,0151	0,0157	0,0176	
	$D$	0,0561	0,0425	0,0726	0,0599	0,0406	0,0421	
Supplementary information: Sample No. 2.1...2.6 (conductor of 70 mm <sup>2</sup> )								

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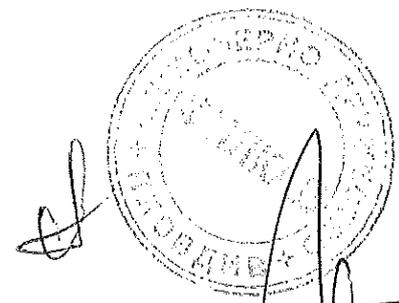


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6.4		TABLE 7: resistance factor ratio $\lambda$ , calculated according to annex E, clause E.6						P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$k_0$	0,7261	0,7164	0,6241	0,6581	0,6265	0,6533	
200.*	$\lambda=$	1,0547	1,0860	1,0518	1,1267	1,0555	1,0903	
200.*	$\lambda=$	1,2891	1,1742	1,1686	1,1858	1,1797	1,2317	
250.	$\lambda=$	1,3285	1,1972	1,1836	1,2442	1,1946	1,2757	
325.	$\lambda=$	1,3523	1,2074	1,2025	1,2626	1,2018	1,3017	
400.	$\lambda=$	1,3676	1,2231	1,2168	1,2721	1,2198	1,3113	
475.	$\lambda=$	1,3695	1,2313	1,2254	1,2883	1,2168	1,3052	
550.	$\lambda=$	1,3702	1,2292	1,2121	1,2826	1,2270	1,3181	
625.	$\lambda=$	1,3874	1,2257	1,2351	1,3010	1,2343	1,3254	
700.	$\lambda=$	1,3851	1,2305	1,2291	1,3062	1,2089	1,3196	
775.	$\lambda=$	1,3895	1,2420	1,2466	1,2966	1,2223	1,3025	
850.	$\lambda=$	1,3859	1,2380	1,2493	1,2995	1,2251	1,3129	
925.	$\lambda=$	1,3962	1,2319	1,2621	1,3041	1,2302	1,3211	
1000.	$\lambda=$	1,4012	1,2434	1,2674	1,3129	1,2354	1,3300	

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

Supplementary information: Sample No. 2.1...2.6 (conductor of 70 mm<sup>2</sup>)



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ВЪПРО С ОПРАВКА  
Подпис: .....



Attachment No. 1

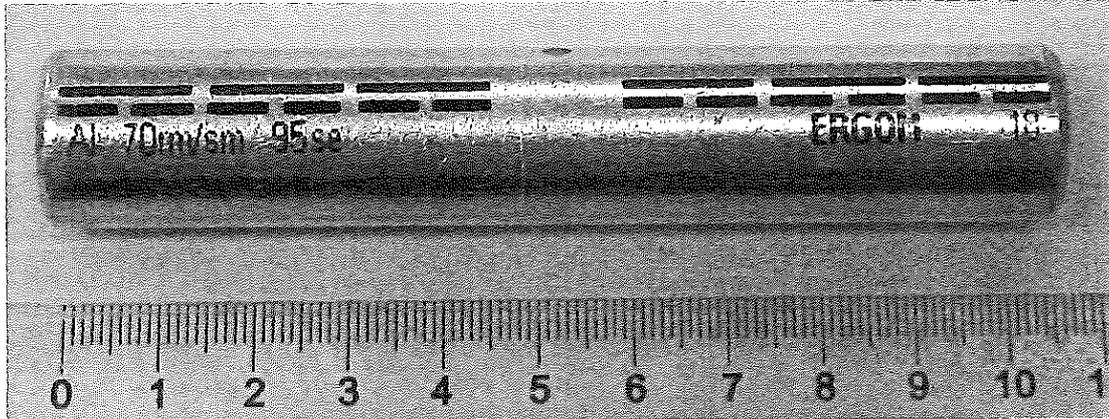
Summary of the test results according to EN 61238-1:

Clause	Tests	Sample No.	Verdict
6	Electrical tests	2.1...2.6	P
7	Mechanical tests	2.7...2.9	P

ВРЕНО С ОМРЕЖБАНА  
Подпис: .....



Photos of the samples:



Aluminium through connector LAC 70

I-POB-07/01-Z3w9

*[Handwritten signature]*

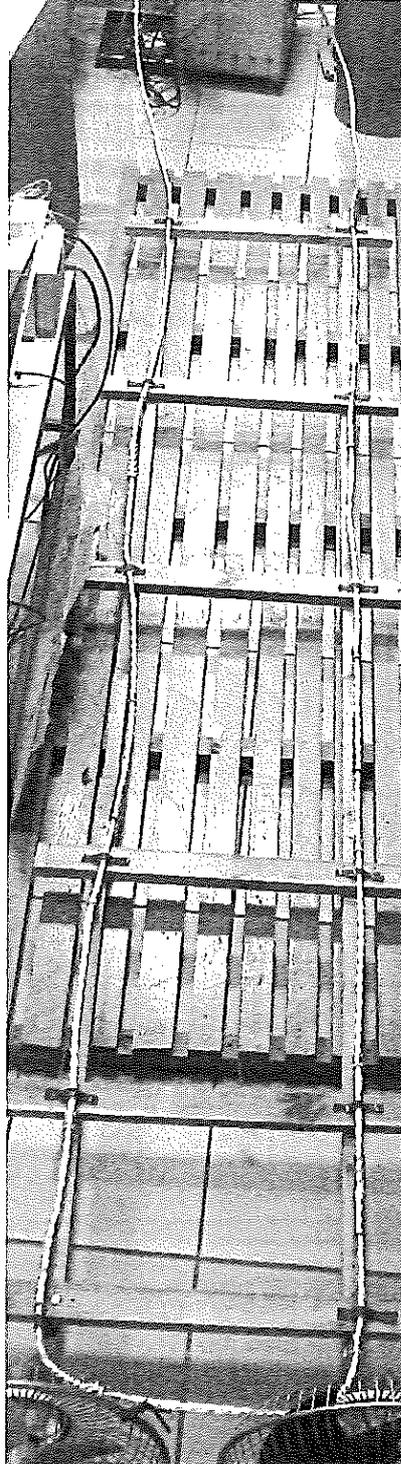
*[Handwritten signature]*

*[Circular official stamp]*

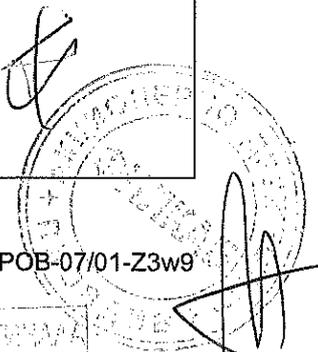
ВАННО С ОУТРАВА  
Подпис: .....



Photos of the samples (continued):



Test circuit of LAC 70

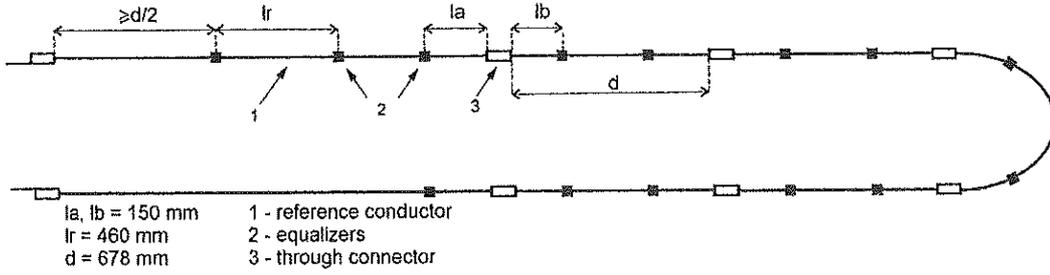


I-POB-07/01-Z3w9

ВНЕШНОЕ С ОУМОНОВА  
Подпись: .....



Attachment No. 2



The configuration and dimensions of the test circuit of LAC 70

I-POB-07/01-Z3w9

ВЕРНО С ОРИГИНАЛОМ  
Подпись: .....



Attachment No. 2

Koncówki rurowe aluminiowe

ERGOM

Łączniki rurowe nieobciążalne mechanicznie, typu LA i LAC

**Materiał** Al  
**Pokrycie** 1-2-3-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22-23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100-101-102-103-104-105-106-107-108-109-110-111-112-113-114-115-116-117-118-119-120-121-122-123-124-125-126-127-128-129-130-131-132-133-134-135-136-137-138-139-140-141-142-143-144-145-146-147-148-149-150-151-152-153-154-155-156-157-158-159-160-161-162-163-164-165-166-167-168-169-170-171-172-173-174-175-176-177-178-179-180-181-182-183-184-185-186-187-188-189-190-191-192-193-194-195-196-197-198-199-200-201-202-203-204-205-206-207-208-209-210-211-212-213-214-215-216-217-218-219-220-221-222-223-224-225-226-227-228-229-230-231-232-233-234-235-236-237-238-239-240-241-242-243-244-245-246-247-248-249-250-251-252-253-254-255-256-257-258-259-260-261-262-263-264-265-266-267-268-269-270-271-272-273-274-275-276-277-278-279-280-281-282-283-284-285-286-287-288-289-290-291-292-293-294-295-296-297-298-299-300-301-302-303-304-305-306-307-308-309-310-311-312-313-314-315-316-317-318-319-320-321-322-323-324-325-326-327-328-329-330-331-332-333-334-335-336-337-338-339-340-341-342-343-344-345-346-347-348-349-350-351-352-353-354-355-356-357-358-359-360-361-362-363-364-365-366-367-368-369-370-371-372-373-374-375-376-377-378-379-380-381-382-383-384-385-386-387-388-389-390-391-392-393-394-395-396-397-398-399-400-401-402-403-404-405-406-407-408-409-410-411-412-413-414-415-416-417-418-419-420-421-422-423-424-425-426-427-428-429-430-431-432-433-434-435-436-437-438-439-440-441-442-443-444-445-446-447-448-449-450-451-452-453-454-455-456-457-458-459-460-461-462-463-464-465-466-467-468-469-470-471-472-473-474-475-476-477-478-479-480-481-482-483-484-485-486-487-488-489-490-491-492-493-494-495-496-497-498-499-500-501-502-503-504-505-506-507-508-509-510-511-512-513-514-515-516-517-518-519-520-521-522-523-524-525-526-527-528-529-530-531-532-533-534-535-536-537-538-539-540-541-542-543-544-545-546-547-548-549-550-551-552-553-554-555-556-557-558-559-560-561-562-563-564-565-566-567-568-569-570-571-572-573-574-575-576-577-578-579-580-581-582-583-584-585-586-587-588-589-590-591-592-593-594-595-596-597-598-599-600-601-602-603-604-605-606-607-608-609-610-611-612-613-614-615-616-617-618-619-620-621-622-623-624-625-626-627-628-629-630-631-632-633-634-635-636-637-638-639-640-641-642-643-644-645-646-647-648-649-650-651-652-653-654-655-656-657-658-659-660-661-662-663-664-665-666-667-668-669-670-671-672-673-674-675-676-677-678-679-680-681-682-683-684-685-686-687-688-689-690-691-692-693-694-695-696-697-698-699-700-701-702-703-704-705-706-707-708-709-710-711-712-713-714-715-716-717-718-719-720-721-722-723-724-725-726-727-728-729-730-731-732-733-734-735-736-737-738-739-740-741-742-743-744-745-746-747-748-749-750-751-752-753-754-755-756-757-758-759-760-761-762-763-764-765-766-767-768-769-770-771-772-773-774-775-776-777-778-779-780-781-782-783-784-785-786-787-788-789-790-791-792-793-794-795-796-797-798-799-800-801-802-803-804-805-806-807-808-809-810-811-812-813-814-815-816-817-818-819-820-821-822-823-824-825-826-827-828-829-830-831-832-833-834-835-836-837-838-839-840-841-842-843-844-845-846-847-848-849-850-851-852-853-854-855-856-857-858-859-860-861-862-863-864-865-866-867-868-869-870-871-872-873-874-875-876-877-878-879-880-881-882-883-884-885-886-887-888-889-890-891-892-893-894-895-896-897-898-899-900-901-902-903-904-905-906-907-908-909-910-911-912-913-914-915-916-917-918-919-920-921-922-923-924-925-926-927-928-929-930-931-932-933-934-935-936-937-938-939-940-941-942-943-944-945-946-947-948-949-950-951-952-953-954-955-956-957-958-959-960-961-962-963-964-965-966-967-968-969-970-971-972-973-974-975-976-977-978-979-980-981-982-983-984-985-986-987-988-989-990-991-992-993-994-995-996-997-998-999-1000-1001-1002-1003-1004-1005-1006-1007-1008-1009-1010-1011-1012-1013-1014-1015-1016-1017-1018-1019-1020-1021-1022-1023-1024-1025-1026-1027-1028-1029-1030-1031-1032-1033-1034-1035-1036-1037-1038-1039-1040-1041-1042-1043-1044-1045-1046-1047-1048-1049-1050-1051-1052-1053-1054-1055-1056-1057-1058-1059-1060-1061-1062-1063-1064-1065-1066-1067-1068-1069-1070-1071-1072-1073-1074-1075-1076-1077-1078-1079-1080-1081-1082-1083-1084-1085-1086-1087-1088-1089-1090-1091-1092-1093-1094-1095-1096-1097-1098-1099-1100-1101-1102-1103-1104-1105-1106-1107-1108-1109-1110-1111-1112-1113-1114-1115-1116-1117-1118-1119-1120-1121-1122-1123-1124-1125-1126-1127-1128-1129-1130-1131-1132-1133-1134-1135-1136-1137-1138-1139-1140-1141-1142-1143-1144-1145-1146-1147-1148-1149-1150-1151-1152-1153-1154-1155-1156-1157-1158-1159-1160-1161-1162-1163-1164-1165-1166-1167-1168-1169-1170-1171-1172-1173-1174-1175-1176-1177-1178-1179-1180-1181-1182-1183-1184-1185-1186-1187-1188-1189-1190-1191-1192-1193-1194-1195-1196-1197-1198-1199-1200-1201-1202-1203-1204-1205-1206-1207-1208-1209-1210-1211-1212-1213-1214-1215-1216-1217-1218-1219-1220-1221-12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## List of test equipment used:

Clause	Measurement / testing	Testing / measuring equipment / material used	Range used	Calibration date
6	Electrical tests	Thermohygrometer (W-02513)	Auto	2016-08-25
		KRP arrangement (801/50681)	—	2016-06-20
		Shunts 25 kA RST (801/50064-2A)	25 kA	2016-08-16
		Measuring tape 3 m (W-52157)	(0 ... 3) m	2014-01-14
		Stopwatch (W-52063)	s, min	2016-02-12
		Temperature meter TMP (801/02707)	(0 ... 300) °C	2016-03-16
		Current transformer JL-4 (NF-00905)	400/5 A	2014-01-29
		Ammeter LE-3P (W-51675)	6 A	2016-04-04
		Shunt B3 (W-52051)	100 A / 150 mV	2014-03-28
		Multimeter FLUKE (8/50591)	mV AC, DC	2015-12-14
		Multimeter FLUKE (8/02480)	mV AC, DC	2016-04-26
7	Mechanical tests	Measuring tape 3 m (W-52157)	(0 ... 3) m	2014-01-14
		Stopwatch (W-52063)	(0 ... 60) s	2016-02-12
		Dynamometer FB50K (801/02722)	2800 N	2016-06-09
		Thermohygrometer LB-701 (800/01704)	Auto	2015-12-14

I-POB-07/01-Z3w9

Подпись: .....



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ASSOCIATION of POLISH ELECTRICIANS  
QUALITY TESTING OFFICE  
ul. M. Pożaryskiego 28, 04-703 Warszawa, Poland

tel./fax: +48 22 815 65 80

TESTING LABORATORY



AB 044



TEST REPORT

EN 61238-1

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

Report Reference No. .... : LA-16.081/16.069/3/E

Data of issue ..... : 2017-01-20

Total number of pages ..... : 14

Tested by ..... : Krzysztof Podgórnjak  
(name + position + signature) Specialist

на основании чл. 36а, ал. 3  
от ЗОП

Authorized by ..... : Dariusz Szczepanowski  
(name + position + signature) 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



**Test item description** .....: Aluminium through connector  
**Trade Mark** .....: 

**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 120

**Ratings** .....: Nominal cross-sectional area: 25 mm<sup>2</sup> + 300 mm<sup>2</sup> / This report covers test of 120 mm<sup>2</sup>

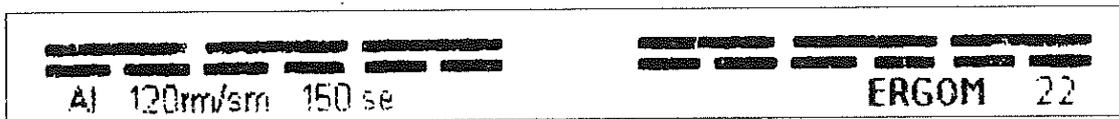
**List of Attachments:**

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:**

<b>Test performer</b> (in the case of partial tests): N/A	<b>Testing location/address</b> (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
<b>Number of tests with F (Fail) verdict:</b>	0
<b>Summary conformity/non-conformity with standardization document</b> (if apply):	N/A
<b>Summary of compliance with National Differences</b> (if apply): Provide list of standards.	N/A
<b>Opinion and interpretation if needed:</b>	N/A
<b>Other additional information</b> (as requested by the applicant):	N/A

**Copy of marking plate:**



LAC 120



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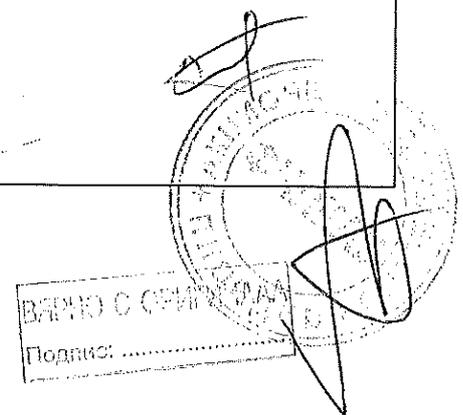
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<b>Test item particular:</b>	
Classification of installation and use .....	: N/A
Supply Connection .....	: N/A
<b>Date (s) of receipt of test item .....</b>	: 2016-09-02 (Sample No 1.1...1.9, 2.7...2.9) 2016-10-12 (Sample No 1.10, 2.10, 3.1...3.10, 4.10) 2016-10-21 (Sample No 4.1...4.9) 2016-10-26 (Sample No 2.1...2.6)
<b>Date (s) of performance of tests .....</b>	: 2016-09-02...2017-01-20
<b>Possible test case verdicts:</b>	
- 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)
<b>Test report general remarks:</b>	
1. <b>The test results presented in this report relate only to the object tested.</b> 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 IECCE.	
<b>Production place(s) .....</b>	: Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź
<b>General product information:</b>	
Tests were carried out on samples of aluminium tin-plated through connectors type LAC, nominal cross sectional area 25 mm <sup>2</sup> ÷ 300 mm <sup>2</sup> . According to the standard and as agreed with the manufacturer for the tests were prepared four loops: 25 mm <sup>2</sup> , 70 mm <sup>2</sup> , 120 mm <sup>2</sup> and 300 mm <sup>2</sup> cross sectional area. This report covers test of 120 mm <sup>2</sup> , LAC 120.	
Foot operated hydraulic pump HN 702 M + crimping head GK 22 C with die KP22-W120 was used to crimp testing samples LAC 120. Die KP22-W120 with fangs is dedicated for cables of RMC construction. Size DIN 22. Cable YAKY 1x120 RMC 0,6/1kV, manufacturer NKT Cables was used to electrical and mechanical tests of through connectors LAC 120.	
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

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Clause	Requirement – Test	Result - Remark	Verdict
<b>Identification</b>			—
	<b>Connector</b>		—
	Type of connector	<input checked="" type="checkbox"/> through connector <input type="checkbox"/> branch connector <input type="checkbox"/> terminal lug	—
	Nominal cross-sectional area .....	120 mm <sup>2</sup>	—
	Class of connector	<input checked="" type="checkbox"/> Class A <input type="checkbox"/> Class B	—
<b>5.1</b>	<b>Conductor</b>		—
	conductor material .....	Al	—
	nominal cross-sectional area .....	120 mm <sup>2</sup> RMC	—
	actual conductor area .....	120 mm <sup>2</sup> RMC	—
	leading dimensions and shape .....	Unprepared cable	—
	type of conductor (solid or stranded) .....	120 mm <sup>2</sup> - stranded	—
	details of conductor construction (in the case of stranded conductors) .....	120 mm <sup>2</sup> – stranded cable, round, 24 wires	—
	compacted / non-compacted .....	Compacted	—
	flexible .....	No	—
	number of wires .....	24 wires	—
	direction of lay .....	Left	—
	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) .....	—	—
<b>5.2</b>	<b>Connectors and tooling</b>		—
	assembly technique .....	Crimp connection	—
	tooling and necessary settings .....	Foot operated hydraulic pump HN 702 M + crimping head GK 22 C with die KP22-W120. Die KP22-W120 with fangs is dedicated for cables of RMC construction. Size DIN 22	—
	preparation of contact surfaces .....	Through connector filled with contact grease	—
	type, reference number and other identification of the connector .....	LAC 120: surface: tin-plated; material: Al	—

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Clause	Requirement – Test	Result - Remark	Verdict
<b>6</b>	<b>Electrical tests</b>		P
<b>6.1</b>	<b>Installation</b>		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) .....	20 °C + 25 °C	P
	the test loop is dismantlable for short-circuit test (class A connectors only)	Short-circuit test performed without dismantling, loop divided on two section 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		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
<b>6.2</b>	<b>Measurements</b>		P
6.2.1	Electrical resistance measurements		P
	measurements made at stages throughout the test as specified in 6.3		P
	method used	<input checked="" type="checkbox"/> indirect <input type="checkbox"/> direct	

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Clause	Requirement – Test	Result - Remark	Verdict
	indirect method: measuring current is 10 % of the heat cycling current	LAC 120: 35 A + 36 A	P
	potential points as indicated in Figure 3 and annex B		P
	Precision of resistance measurements, indirect method		—
	voltage: max. $\pm 0,5 \%$ or $\pm 10 \mu\text{V}$ , actual precision .....	$\pm 0,5 \%$	P
	current: max. $\pm 0,5 \%$ or $\pm 0,1 \text{ A}$ , actual precision .....	$\pm 0,5 \%$	P
	Precision of resistance measurements, direct method: better than $\pm 1 \%$ or $\pm 0,5 \mu\Omega$ , 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: $\pm 2 \text{ }^\circ\text{C}$ or better, actual accuracy .....	$\pm 1,0 \text{ }^\circ\text{C}$	P

<b>6.3</b>	<b>Heat cycle test</b>		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 $120 \text{ }^\circ\text{C}$ at equilibrium		P
	measured temperature of the median connector ...:	$100,8 \text{ }^\circ\text{C}$	—
	reference conductor temperature ( $120 \text{ }^\circ\text{C} \leq \Theta_R \leq 140 \text{ }^\circ\text{C}$ ) .....	$121,7 \text{ }^\circ\text{C}$	—
	equilibrium current $I_N$ .....	410 A	—
6.3.1 b)	Non insulation-piercing branch connectors		N/A
	test circuit according to	<input type="checkbox"/> Figure 1 <input type="checkbox"/> Figure 2	—
	current is circulated in the test loop, bringing the reference conductor to $120 \text{ }^\circ\text{C}$ at equilibrium		N/A
	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 ...:		—

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Clause	Requirement – Test	Result - Remark	Verdict
	reference conductor temperature ( $120\text{ °C} \leq \Theta_R \leq 140\text{ °C}$ )..... :		—
	equilibrium current $I_N$ ..... :		—
6.3.1 c)	Insulation-piercing connectors (IPC)		N/A
	test circuit according to	<input type="checkbox"/> Figure 1 <input type="checkbox"/> 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 $\Theta_R$ determined in 6.3.1 with a tolerance of +6 °C	120 °C + 126 °C	P
	the median connector temperature is stable within 2 °C over a 10 min period		P
	current flow time ( $t_1$ ) ..... :	52 min	—
	accelerated heating used	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	—
	accelerated heating time ..... :	—	—
	accelerated heating time according to Table 1	10 min	N/A
	cooling time ( $t_2$ ) ..... :	17 min	—
	After cooling, the temperature of all connectors and the reference conductor $\leq 35\text{ °C}$		P
	accelerated cooling used with ambient air	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> 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
	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

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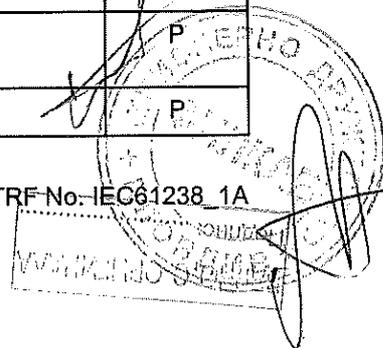
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Clause	Requirement – Test	Result - Remark	Verdict
	maximum temperature of each connector measured	See TABLE 2	P
6.3.4	Short-circuit tests (for Class A connectors only)	Sample No. 3.1...3.6	P
	six short circuits applied after the 200th heat cycle	Short-circuit test performed without dismantling, loop divided on two section for test	P
	short-circuit current .....	I half: 11,44 kA + 11,63 kA, II half: 11,41 kA + 11,53 kA	—
	short-circuit current raises the reference conductors from a temperature of $\leq 35$ °C to a temperature between 250 °C and 270 °C		P
	measured temperature of the reference conductor:	I half: 260,5 °C + 263,8 °C, II half: 251,4 °C + 258,8 °C	P
	duration of the short-circuit current (1 s below 25 kA, $\leq 5$ s above 25 kA) .....	I half: 1,31 s + 1,44 s, II half: 1,40 s + 1,43 s	P
	the test loop cooled to a temperature $\leq 35$ °C after each short circuit		P

<b>6.4</b>	<b>Assessment of results</b>		P
	Calculated parameters:		—
	connector resistance factor <i>k</i> , calculated according to annex E, clause E.2 .....	See TABLE 3	—
	initial scatter $\delta$ , between the six initial values of <i>k</i> measured prior to heat cycling, calculated according to annex E, clause E.3 .....	See TABLE 4	P
	mean scatter $\beta$ , between the six values of <i>k</i> averaged over the last 11 measurement intervals, calculated according to annex E, clause E.4 .....	See TABLE 5	P
	change in resistance factor <i>D</i> for each of the six connectors, calculated according to annex E, clause E.5 .....	See TABLE 6	P
	resistance factor ratio $\lambda$ calculated according to annex E, clause E.6 .....	See TABLE 7	P
	maximum temperature $\theta_{max}$ on each connector, recorded according to annex E, clause E.7 .....	See TABLE 2	P

<b>6.5</b>	<b>Requirements</b>		P
	more than four connectors satisfy the requirements shown in table 2		N/A
	one full re-test performed	<input type="checkbox"/> Yes <input type="checkbox"/> No	—
	six connectors satisfy the requirements shown in table 2		P
	values of $\delta$ do not exceed 0,3		P

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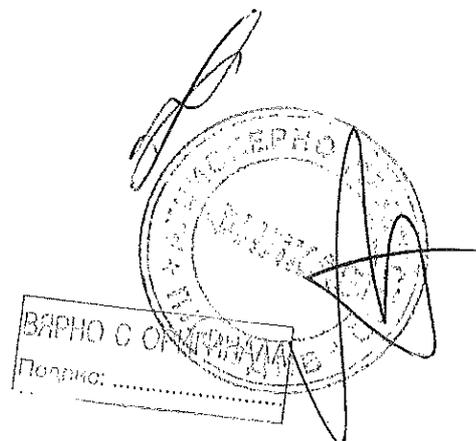




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Clause	Requirement – Test	Result \ Remark	Verdict
	values of $\beta$ do not exceed 0,3		P
	values of $D$ do not exceed 0,15		P
	values of $\lambda$ do not exceed 2,0		P
	values of $\vartheta_{max}$ do not exceed $\vartheta_{ref}$		P
<b>7</b>	<b>Mechanical tests</b>		<b>P</b>
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 <sup>2</sup> of cross-section per second		P
7.2	Requirements		P
	tensile force applied during one minute	Conductor of 120 mm <sup>2</sup> Al; 1 min	P
	force for aluminium, (40×A [mm <sup>2</sup> ], max. 20 000) .. :	4800 N	P
	force for copper, (60×A [mm <sup>2</sup> ], 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: 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]	0,0961	0,0984	0,0976	0,0972	0,0979	0,0963	0,1273	
	θ [°C]	23,1	23,1	23,2	23,2	23,2	23,4	22,8	
200.*	R [mΩ]	0,0972	0,0994	0,0989	0,0991	0,0995	0,0978	0,1273	
	θ [°C]	23,4	23,5	23,6	23,6	23,5	23,6	23,4	
200.*	R [mΩ]	0,0990	0,1000	0,0987	0,1014	0,1026	0,1003	0,1271	
	θ [°C]	22,3	22,6	22,8	22,9	22,9	23,0	22,5	
250.	R [mΩ]	0,0988	0,1003	0,1015	0,1019	0,1025	0,1005	0,1269	
	θ [°C]	20,5	20,7	20,9	21,0	21,1	20,6	20,6	
325.	R [mΩ]	0,0991	0,1004	0,1019	0,1024	0,1027	0,1004	0,1267	
	θ [°C]	21,2	21,0	21,0	21,0	20,9	21,1	21,2	
400.	R [mΩ]	0,0991	0,1006	0,1024	0,1024	0,1028	0,1008	0,1275	
	θ [°C]	22,4	21,7	21,2	21,6	21,8	22,3	22,4	
475.	R [mΩ]	0,0990	0,1004	0,1024	0,1023	0,1029	0,1004	0,1271	
	θ [°C]	21,8	22,0	22,1	22,1	22,2	22,4	21,8	
550.	R [mΩ]	0,0991	0,1004	0,1026	0,1022	0,1030	0,1006	0,1273	
	θ [°C]	21,1	21,0	21,0	21,0	21,0	21,4	21,2	
625.	R [mΩ]	0,0989	0,1005	0,1028	0,1028	0,1030	0,1009	0,1275	
	θ [°C]	24,4	24,3	23,8	24,1	24,3	24,3	24,3	
700.	R [mΩ]	0,0990	0,1007	0,1027	0,1024	0,1031	0,1007	0,1272	
	θ [°C]	24,8	24,4	24,3	24,2	24,3	24,8	24,7	
775.	R [mΩ]	0,0989	0,1007	0,1026	0,1024	0,1030	0,1007	0,1270	
	θ [°C]	20,0	20,2	20,4	20,4	20,3	20,3	20,1	
850.	R [mΩ]	0,0989	0,1008	0,1023	0,1023	0,1027	0,1004	0,1268	
	θ [°C]	20,9	21,0	21,1	21,1	21,1	21,3	21,0	
925.	R [mΩ]	0,0993	0,1006	0,1027	0,1022	0,1029	0,1007	0,1270	
	θ [°C]	21,8	21,8	21,8	21,8	21,8	22,2	22,1	
1000.	R [mΩ]	0,0989	0,1008	0,1027	0,1026	0,1032	0,1010	0,1270	
	θ [°C]	21,8	20,9	20,4	20,8	21,0	21,6	21,9	

(\*) 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<sup>2</sup>)

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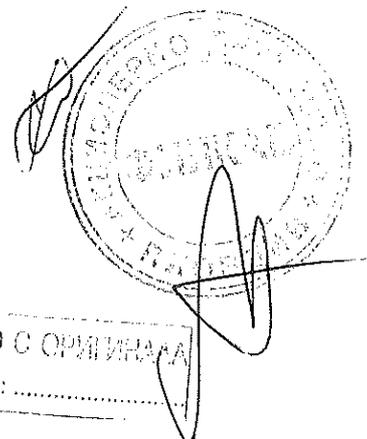
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6.3.3		TABLE 2: maximum temperature of each connector measured						P
cycle		connectors						reference conductor
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$\vartheta_{max}$ [°C]	103,3	99,3	101,3	100,8	100,4	99,1	121,7
200.*	$\vartheta_{max}$ [°C]	104,5	97,7	101,7	103,2	101,8	96,8	124,8
200.*	$\vartheta_{max}$ [°C]	103,6	98,7	99,9	102,3	102,3	99,1	123,5
250.	$\vartheta_{max}$ [°C]	100,9	97,4	98,3	101,3	98,5	97,2	121,8
325.	$\vartheta_{max}$ [°C]	104,1	99,1	100,4	103,4	101,9	99,3	125,3
400.	$\vartheta_{max}$ [°C]	102,6	96,3	98,6	102,1	101,4	97,4	123,4
475.	$\vartheta_{max}$ [°C]	103,3	98,4	101,1	102,9	101,5	96,2	125,5
550.	$\vartheta_{max}$ [°C]	101,4	96,5	99,0	101,5	100,9	90,2	123,1
625.	$\vartheta_{max}$ [°C]	102,6	97,8	100,6	101,9	102,0	91,3	124,9
700.	$\vartheta_{max}$ [°C]	103,9	99,9	102,3	104,4	102,8	95,4	125,5
775.	$\vartheta_{max}$ [°C]	101,1	97,0	97,6	100,8	98,7	95,4	122,8
850.	$\vartheta_{max}$ [°C]	101,3	96,0	98,4	100,8	99,2	93,1	123,1
925.	$\vartheta_{max}$ [°C]	102,3	96,9	99,6	102,1	101,0	88,4	124,2
1000.	$\vartheta_{max}$ [°C]	103,1	97,1	99,5	103,1	101,3	90,0	125,5

(\* ) 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<sup>2</sup>)

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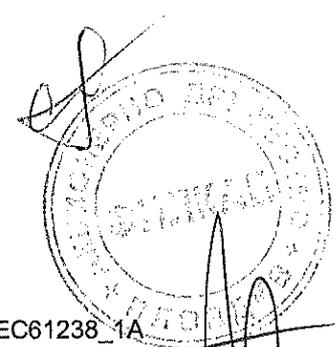


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6.4		TABLE 3: connector resistance factor k, calculated according to annex E, clause E.2							P
Parameters:		L <sub>a</sub> =	165 mm	L <sub>b</sub> =	165 mm	L <sub>r</sub> =	500 mm	L <sub>j</sub> =	105 mm
cycle		connectors							
		j=1	j=2	j=3	j=4	j=5	j=6		
0.		0,4526	0,5387	0,5087	0,4938	0,5200	0,4601		
200.*		0,4938	0,5761	0,5574	0,5648	0,5798	0,5162		
200.*		0,5657	0,6032	0,5545	0,6557	0,7006	0,6144		
250.		0,5629	0,6192	0,6642	0,6792	0,7017	0,6267		
325.		0,5826	0,6314	0,6878	0,7066	0,7179	0,6314		
400.		0,5602	0,6162	0,6835	0,6835	0,6984	0,6237		
475.		0,5657	0,6182	0,6931	0,6894	0,7119	0,6182		
550.		0,5648	0,6135	0,6958	0,6808	0,7107	0,6210		
625.		0,5528	0,6125	0,6984	0,6984	0,7059	0,6275		
700.		0,5615	0,6252	0,7001	0,6888	0,7150	0,6252		
775.		0,5662	0,6337	0,7049	0,6974	0,7199	0,6337		
850.		0,5708	0,6422	0,6985	0,6985	0,7135	0,6272		
925.		0,5812	0,6299	0,7087	0,6899	0,7162	0,6337		
1000.		0,5662	0,6374	0,7087	0,7049	0,7274	0,6449		

(\*) 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<sup>2</sup>)



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6.4		TABLE 4: initial scatter $\delta$ , 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.	$K_0$	0,4957	0,4957	0,4957	0,4957	0,4957	0,4957	
	$s_0$	0,0339	0,0339	0,0339	0,0339	0,0339	0,0339	
	$\delta$	0,1128	0,1128	0,1128	0,1128	0,1128	0,1128	
Supplementary information: Sample No. 3.1...3.6 (conductor of 120 mm <sup>2</sup> )								

6.4		TABLE 5: mean scatter $\beta$ , 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	$\underline{k}$	0,5668	0,6254	0,6949	0,6925	0,7126	0,6285	
	$\underline{K}$	0,6535	0,6535	0,6535	0,6535	0,6535	0,6535	
	$s$	0,0560	0,0560	0,0560	0,0560	0,0560	0,0560	
	$\beta$	0,1414	0,1414	0,1414	0,1414	0,1414	0,1414	
Supplementary information: Sample No. 3.1...3.6 (conductor of 120 mm <sup>2</sup> )								

6.4		TABLE 6: 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	$b$	-0,0004	-0,0019	-0,0034	-0,0012	-0,0017	-0,0013	
	$\underline{k}$	0,5668	0,6254	0,6949	0,6925	0,7126	0,6285	
	$IM$	0,0071	0,0304	0,0489	0,0173	0,0239	0,0207	
	$s_j$	0,0091	0,0085	0,0063	0,0089	0,0064	0,0061	
	$S$	0,0332	0,0281	0,0188	0,0266	0,0186	0,0201	
	$D$	0,0403	0,0585	0,0677	0,0439	0,0425	0,0408	
Supplementary information: Sample No. 3.1...3.6 (conductor of 120 mm <sup>2</sup> )								

ВЕРНО СОСРЕДНЕНА  
Подпис: .....

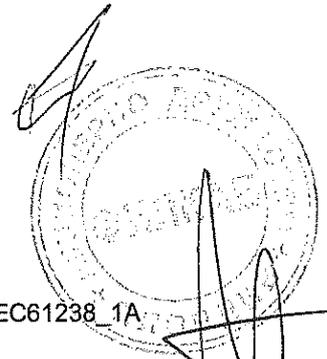


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6.4		TABLE 7: resistance factor ratio $\lambda$ , calculated according to annex E, clause E.6						P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$k_0$	0,4526	0,5387	0,5087	0,4938	0,5200	0,4601	
200.*	$\lambda=$	1,0910	1,0694	1,0957	1,1438	1,1150	1,1219	
200.*	$\lambda=$	1,2499	1,1197	1,0900	1,3279	1,3473	1,3354	
250.	$\lambda=$	1,2437	1,1494	1,3057	1,3755	1,3494	1,3621	
325.	$\lambda=$	1,2872	1,1721	1,3521	1,4309	1,3806	1,3723	
400.	$\lambda=$	1,2377	1,1439	1,3436	1,3842	1,3431	1,3556	
475.	$\lambda=$	1,2499	1,1476	1,3625	1,3961	1,3690	1,3436	
550.	$\lambda=$	1,2479	1,1389	1,3678	1,3787	1,3667	1,3497	
625.	$\lambda=$	1,2214	1,1370	1,3729	1,4143	1,3575	1,3638	
700.	$\lambda=$	1,2406	1,1606	1,3763	1,3949	1,3750	1,3588	
775.	$\lambda=$	1,2510	1,1764	1,3857	1,4123	1,3844	1,3773	
850.	$\lambda=$	1,2612	1,1921	1,3731	1,4145	1,3721	1,3632	
925.	$\lambda=$	1,2841	1,1693	1,3932	1,3971	1,3773	1,3773	
1000.	$\lambda=$	1,2510	1,1832	1,3932	1,4275	1,3988	1,4017	

(\*) 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<sup>2</sup>)



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ВРЕДНО С ОМЕТНА  
Подпис: .....

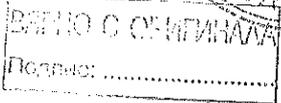


Attachment No. 1

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

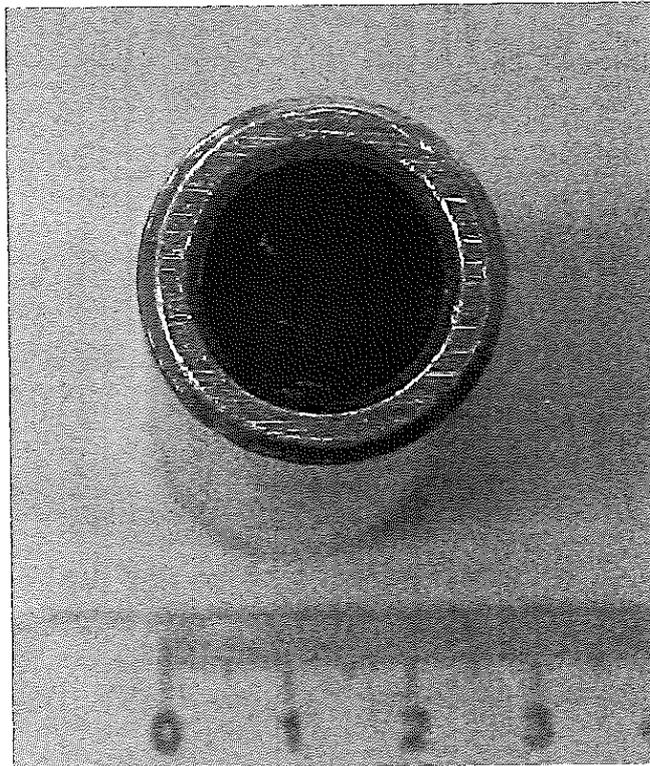
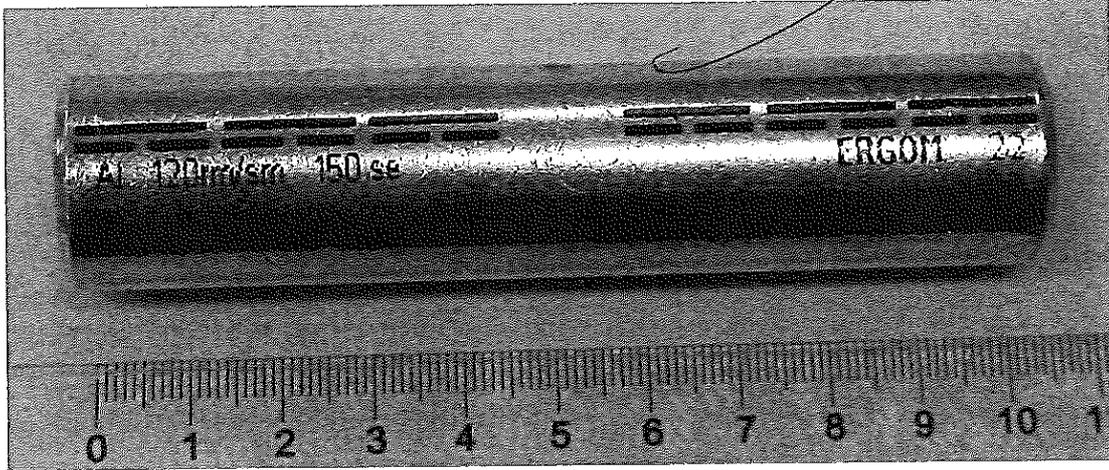
Clause	Tests	Sample No.	Verdict
6	Electrical tests	3.1...3.6	P
7	Mechanical tests	3.7...3.9	P

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Photos of the samples:



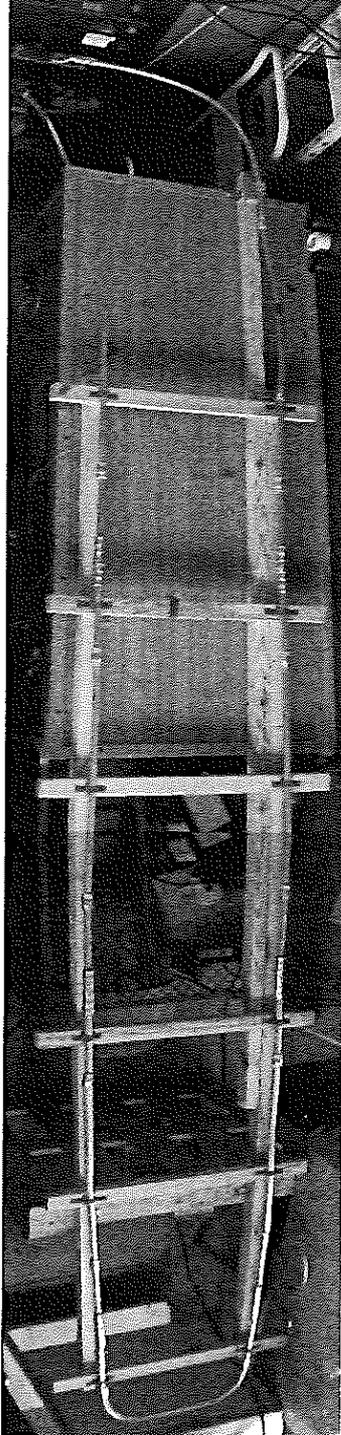
Aluminium through connector LAC 120

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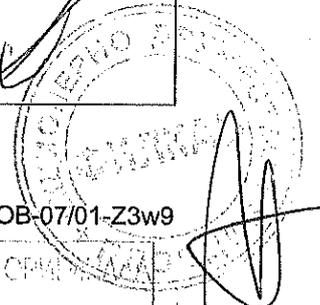
ВАРНИО С ОРГИНАЛА  
Подпис: .....



Photos of the samples (continued):



Test circuit of LAC 120

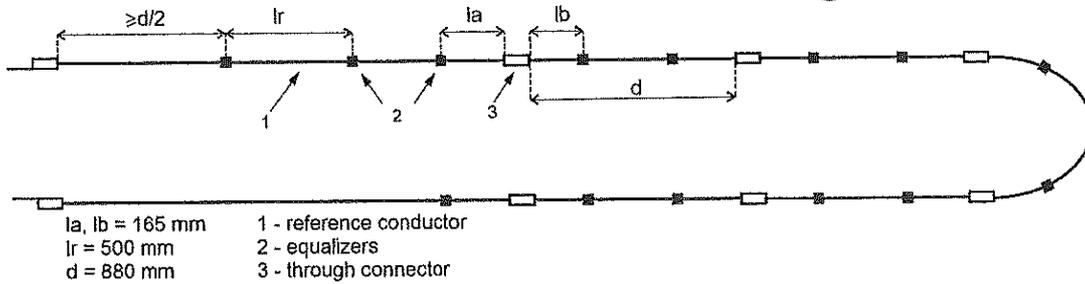


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ВНЕШНИЙ СЕРТИФИКАТ  
Подпись: .....



Attachment No. 2



The configuration and dimensions of the test circuit of LAC 120

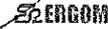
I-POB-07/01-Z3w9

Подпись: .....



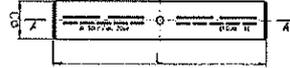
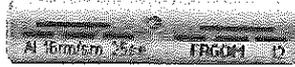
Attachment No. 2

Rurówki aluminiowe



Łączniki rurowe nieobciążalne mechanicznie, typu LA i LAC

**Materiał** Al  
**Pokrycie** 1 - 100% cynk w proszku, Al - 100%  
**Wykonanie** DIN 46267/2 - odcyzy części rurowej  
**Napięcie** 1-10 kV



**Uwaga!**  
 - łączniki LA są wyposażone specjalnym smarem kontaktowym i zapalane są w folię,  
 - żyły sekcyjne muszą zostać izolowane na okrągło

LAC - cynkowane

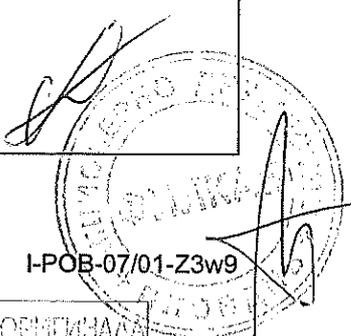


smar kontaktowy		Przekrój [mm <sup>2</sup> ]		Wymiary [mm]			Zaprasowanie			UW	Δ% [kg]
Typ	Art. nr	mm <sup>2</sup> /m	mm <sup>2</sup> /m	L	d	D	Na gniazda	Luz	Luz	mm	kg
LA 10	1026-0100000000	10	16	50	5,0	10,0	0	1-1	3-3	100	1,00
LA 16	1026-0100000000	16	25	55	5,4	10,0	0	1-1	3-3	100	1,10
LA 25	1026-0100000000	25	35	70	6,4	12,0	0	2-2	4-4	100	1,60
LA 35	1026-0100000000	35	50	85	8,0	14,0	0	2-2	5-5	100	2,60
LA 50	1026-0100000000	50	70	95	9,8	16,0	0	2-2	5-5	100	3,50
LA 70	1026-0100000000	70	95	105	11,2	18,5	0	3-3	6-6	100	5,00
LA 95	1026-0100000000	95	120	110	13,2	22,0	0	3-3	6-6	100	5,70
LA 120	1026-0100000000	120	140	105	14,1	25,0	0	3-3	6-6	100	5,70
LA 150	1026-0100000000	150	175	110	16,3	25,0	0	3-3	7-7	100	6,20
LA 185	1026-0100000000	185	210	115	18,3	28,1	0	3-3	7-7	100	7,90
LA 240	1026-0100000000	240	300	145	21,0	32,0	0	3-3	8-8	100	9,30
LA 300	1026-0100000000	300	-	145	25,1	36,0	0	3-3	-	25	5,00
LA 400	1026-0100000000	400	-	210	29,0	38,5	0	4-4	-	25	9,20
LA 500	1026-0100000000	500	-	210	33,0	42,0	0	4-4	-	25	10,50
LA 625	1026-0100000000	625	-	300	35,0	50,0	0	5-5	-	25	15,20
LA 800	1026-0100000000	800	-	300	40,0	58,0	0	5-5	-	25	18,00
LA 1000	1026-0100000000	1000	-	350	44,0	60,0	0	5-5	-	25	18,00

UW - bez smarowania / 0 - bez smarowania

Technologie zera i niskie emisje i łączniki rurowe AL

Dołączanie do listy częściowa 1/2008



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ВАНКО С ОРНИКОВА  
 Подпись: .....



## List of test equipment used:

Clause	Measurement / testing	Testing / measuring equipment / material used	Range used	Calibration date
6	Electrical tests	Thermohygrometer (W-02513)	Auto	2016-08-25
		KRP arrangement (801/50681)	—	2016-06-20
		Shunts 25 kA RST (801/50064-2A)	25 kA	2016-08-16
		Measuring tape 3 m (W-52157)	(0 ... 3) m	2014-01-14
		Stopwatch (W-52063)	s, min	2016-02-12
		Temperature meter TMP (NF: YWRWM020018)	(0 ... 300) °C	2015-11-03
		Current transformer UTT-6M2Z (W-51338)	1200/5 A	2015-05-28
		Ammeter LE-3P (W-51675)	6 A	2016-04-04
		Shunt B7 (W-52132)	100 A / 300 mV	2014-05-27
		Multimeter FLUKE (8/50591)	mV AC, DC	2015-12-14
		Multimeter FLUKE (8/02480)	mV AC, DC	2016-04-26
7	Mechanical tests	Measuring tape 3 m (W-52157)	(0 ... 3) m	2014-01-14
		Stopwatch (W-52063)	(0 ... 60) s	2016-02-12
		Dynamometer FB50K (801/02722)	4800 N	2016-06-09
		Thermohygrometer LB-701 (800/01704)	Auto	2015-12-14

I-POB-07/01-Z3w9

ВЕРИО С СМЕТНА  
Подпис: .....



od 1933 r.

ASSOCIATION of POLISH ELECTRICIANS  
QUALITY TESTING OFFICE  
ul. M. Pożaryskiego 28, 04-703 Warszawa, Poland

tel./fax: +48 22 815 65 80

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-16.081/16.069/4/E

Data of issue ..... : 2017-01-20

Total number of pages ..... : 15

Tested by ..... : Krzysztof Podgórnjak  
(name + position + signature) Specialist

на основании чл. 36а, ал. 3  
от ЗОП

Authorized by ..... : Dariusz Szczepanowski  
(name + position + signature) 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

ВСТУПИЛО С СИМВОЛИКА  
Порядок: .....



**Test item description** ..... : Aluminium through connector  
**Trade Mark** ..... :   
**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 300  
**Ratings** ..... : Nominal cross-sectional area: 25 mm<sup>2</sup> + 300 mm<sup>2</sup> / This report covers test of 300 mm<sup>2</sup>

**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:**

<b>Test performer</b> (in the case of partial tests): N/A	<b>Testing location/address</b> (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
<b>Number of tests with F (Fail) verdict:</b>	0
<b>Summary conformity/non-conformity with standardization document</b> (if apply):	N/A
<b>Summary of compliance with National Differences</b> (if apply): Provide list of standards.	N/A
<b>Opinion and interpretation if needed:</b>	N/A
<b>Other additional information</b> (as requested by the applicant):	N/A

**Copy of marking plate:**



Al 240mm<sup>2</sup>/sm 300se **ERGOM 32**

**LAC 300**

I-POB-07/01-Z3w9

Получено: .....



<b>Test item particular:</b>	
Classification of installation and use .....	: N/A
Supply Connection .....	: N/A
<b>Date (s) of receipt of test item .....</b>	: 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)
<b>Date (s) of performance of tests .....</b>	: 2016-09-02...2017-01-20
<b>Possible test case verdicts:</b>	
- 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)	
<b>Test report general remarks:</b>	
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 IECCE.	
<b>Production place(s) .....</b>	: Zakłady Aparatury Elektrycznej ERGOM Sp. z o.o. ul. Nowe Sady 10, 94-102 Łódź
<b>General product information:</b>	
Tests were carried out on samples of aluminium tin-plated through connectors type LAC, nominal cross sectional area 25 mm <sup>2</sup> ÷ 300 mm <sup>2</sup> . According to the standard and as agreed with the manufacturer for the tests were prepared four loops: 25 mm <sup>2</sup> , 70 mm <sup>2</sup> , 120 mm <sup>2</sup> and 300 mm <sup>2</sup> cross sectional area. This report covers test of 300 mm <sup>2</sup> , LAC 300.	
Electro-hydraulic pump HE 702 E + crimping head GKP 22 with die KP22-W300 was used to crimp testing samples LAC 300. Die KP22-W300 with fangs is dedicated for cables of RMC construction. Size DIN 34. Cable YAKY 1x300 RMC 0,6/1kV, manufacturer PRYSMIAN was used to electrical and mechanical tests of through connectors LAC 300.	
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

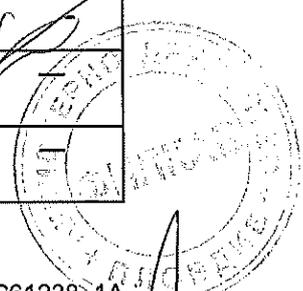
I-POB-07/01-Z3w9

LABORATORIUM  
Poznań



PN-EN 61238-1

Clause	Requirement – Test	Result - Remark	Verdict
<b>Identification</b>			—
	<b>Connector</b>		—
	Type of connector	<input checked="" type="checkbox"/> through connector <input type="checkbox"/> branch connector <input type="checkbox"/> terminal lug	—
	Nominal cross-sectional area .....	300 mm <sup>2</sup>	—
	Class of connector	<input checked="" type="checkbox"/> Class A <input type="checkbox"/> Class B	—
<b>5.1</b>	<b>Conductor</b>		—
	conductor material .....	Al	—
	nominal cross-sectional area .....	300 mm <sup>2</sup> RMC	—
	actual conductor area .....	300 mm <sup>2</sup> RMC	—
	leading dimensions and shape .....	Unprepared cable	—
	type of conductor (solid or stranded) .....	300 mm <sup>2</sup> - stranded	—
	details of conductor construction (in the case of stranded conductors) .....	300 mm <sup>2</sup> – stranded cable, round, 37 wires	—
	compacted / non-compacted .....	Compacted	—
	flexible .....	No	—
	number of wires .....	37 wires	—
	direction of lay .....	Left	—
	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) .....	—	—
<b>5.2</b>	<b>Connectors and tooling</b>		—
	assembly technique .....	Crimp connection	—
	tooling and necessary settings .....	Electro-hydraulic pump HE 702 E + crimping head GKP 22 with die KP22-W300. Die KP22-W300 with fangs is dedicated for cables of RMC construction. Size DIN 34	—
	preparation of contact surfaces .....	Through connector filled with contact grease	—
	type, reference number and other identification of the connector .....	LAC 300: surface: tin-plated; material: Al	—



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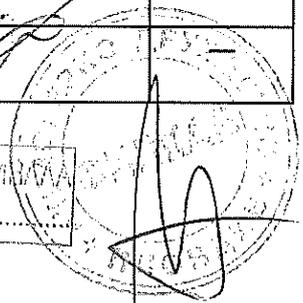
BY: [Signature]  
Date: .....



PN-EN 61238-1			
Clause	Requirement – Test	Result - Remark	Verdict
<b>6</b>	<b>Electrical tests</b>		P
<b>6.1</b>	<b>Installation</b>		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) .....	17 °C...22 °C	P
	the test loop is dismantlable for short-circuit test (class A connectors only)	Short-circuit test performed without dismantling, loop divided on section 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		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
<b>6.2</b>	<b>Measurements</b>		P
6.2.1	Electrical resistance measurements		P
	measurements made at stages throughout the test as specified in 6.3		P
	method used	<input checked="" type="checkbox"/> indirect <input type="checkbox"/> direct	

TRF No. IEC61238\_1A

СЕРТИФИКАТ  
 Испытано: .....





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Clause	Requirement – Test	Result - Remark	Verdict
	indirect method: measuring current is 10 % of the heat cycling current	LAC 300: 67 A <del>70 A</del>	P
	potential points as indicated in Figure 3 and annex B		P
	Precision of resistance measurements, indirect method		—
	voltage: max. $\pm 0,5 \%$ or $\pm 10 \mu V$ , actual precision .....	$\pm 0,5 \%$	P
	current: max. $\pm 0,5 \%$ or $\pm 0,1 A$ , actual precision .....	$\pm 0,5 \%$	P
	Precision of resistance measurements, direct method: better than $\pm 1 \%$ or $\pm 0,5 \mu \Omega$ , 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: $\pm 2 \text{ }^\circ C$ or better, actual accuracy .....	$\pm 1,0 \text{ }^\circ C$	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. 4.1...4.6	P
	current is circulated in the test loop, bringing the reference conductor to $120 \text{ }^\circ C$ at equilibrium		P
	measured temperature of the median connector ..	$102,7 \text{ }^\circ C$	—
	reference conductor temperature ( $120 \text{ }^\circ C \leq \Theta_R \leq 140 \text{ }^\circ C$ ) .....	$120,6 \text{ }^\circ C$	—
	equilibrium current $I_N$ .....	720 A	—
6.3.1 b)	Non insulation-piercing branch connectors		N/A
	test circuit according to	<input type="checkbox"/> Figure 1 <input type="checkbox"/> Figure 2	—
	current is circulated in the test loop, bringing the reference conductor to $120 \text{ }^\circ C$ at equilibrium		N/A
	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 ..		

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Clause	Requirement – Test	Result - Remark	Verdict
	reference conductor temperature ( $120\text{ °C} \leq \Theta_R \leq 140\text{ °C}$ ) .....		—
	equilibrium current $I_N$ .....		—
6.3.1 c)	Insulation-piercing connectors (IPC)		N/A
	test circuit according to	<input type="checkbox"/> Figure 1 <input type="checkbox"/> 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. 4.1...4.6	—
	current is circulated in the loop until the main reference conductor temperature reaches the value $\Theta_R$ determined in 6.3.1 with a tolerance of +6 °C	120 °C + 126 °C	P
	the median connector temperature is stable within 2 °C over a 10 min period		P
	current flow time ( $t_1$ ) .....	51 min	—
	accelerated heating used	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	—
	accelerated heating time .....	16 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 $\leq 35\text{ °C}$		P
	accelerated cooling used with ambient air	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	—
6.3.3	Subsequent heat cycles	Sample No. 4.1...4.6	—
	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
	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

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Clause	Requirement – Test	Result - Remark	Verdict
	maximum temperature of each connector measured	See TABLE 2	P
6.3.4	Short-circuit tests (for Class A connectors only)	Sample No. 4.1...4.6	P
	six short circuits applied after the 200th heat cycle	Short-circuit test performed without dismantling, loop divided on section for test	P
	short-circuit current .....	I connector: 25,38 kA ± 25,52 kA, II connector: 25,38 kA ± 25,52 kA, III connector: 26,35 kA ± 26,63 kA, IV connector: 25,05 kA ± 25,09 kA, V connector: 27,29 kA ± 27,53 kA, VI connector: 28,12 kA ± 28,61 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 connector: 252,2 °C ± 258,9 °C, II connector: 259,2 °C ± 263,8 °C, III connector: 255,3 °C ± 268,4 °C, IV connector: 252,0 °C ± 256,4 °C, V connector: 253,9 °C ± 265,1 °C, VI connector: 251,6 °C ± 257,4 °C	P
	duration of the short-circuit current (1 s below 25 kA, ≤5 s above 25 kA) .....	I connector: 1,70 s ± 1,73 s, II connector: 1,71 s ± 1,73 s, III connector: 1,54 s ± 1,66 s, IV connector: 1,76 s ± 1,85 s, V connector: 1,49 s ± 1,52 s, VI connector: 1,37 s ± 1,42 s	P
	the test loop cooled to a temperature ≤ 35 °C after each short circuit		P

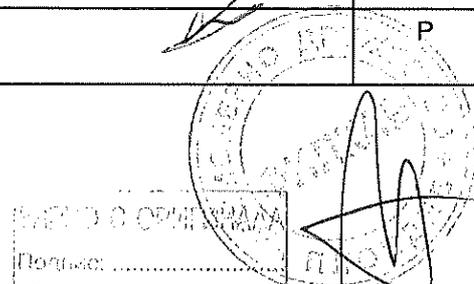
TRF No. IEC61238\_1A  
 Подпись: .....



## PN-EN 61238-1

Clause	Requirement – Test	Result - Remark	Verdict
<b>6.4</b>	<b>Assessment of results</b>		P
	Calculated parameters:		—
	connector resistance factor $k$ , calculated according to annex E, clause E.2 .....	See TABLE 3	—
	initial scatter $\delta$ , 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 $\beta$ , 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 $\lambda$ calculated according to annex E, clause E.6 .....	See TABLE 7	P
	maximum temperature $\vartheta_{max}$ on each connector, recorded according to annex E, clause E.7 .....	See TABLE 2	P
<b>6.5</b>	<b>Requirements</b>		P
	more than four connectors satisfy the requirements shown in table 2		N/A
	one full re-test performed	<input type="checkbox"/> Yes <input type="checkbox"/> No	—
	six connectors satisfy the requirements shown in table 2		P
	values of $\delta$ do not exceed 0,3		P
	values of $\beta$ do not exceed 0,3		P
	values of $D$ do not exceed 0,15		P
	values of $\lambda$ do not exceed 2,0		P
	values of $\vartheta_{max}$ do not exceed $\vartheta_{ref}$		P
<b>7</b>	<b>Mechanical tests</b>		P
7.1	Test method		—
	the test is made on three connectors different from those used for the electrical test	Sample No. 4.7...4.9	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 <sup>2</sup> of cross-section per second		P

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Clause	Requirement – Test	Result - Remark	Verdict
7.2	Requirements		P
	tensile force applied during one minute	Conductor of 300 mm <sup>2</sup> Al; 1 min	P
	force for aluminium, (40×A [mm <sup>2</sup> ], max. 20 000) ... :	12 000 N	P
	force for copper, (60×A [mm <sup>2</sup> ], 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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БАННО С ОБЩИНАТА  
 Форма: .....

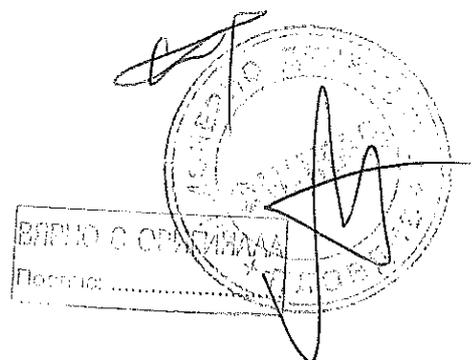


## PN-EN 61238-1

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]	0,0640	0,0645	0,0656	0,0658	0,0671	0,0677	0,0716	
	θ [°C]	20,7	20,5	20,5	20,5	20,8	20,9	20,6	
200.*	R [mΩ]	0,0644	0,0660	0,0666	0,0668	0,0696	0,0694	0,0715	
	θ [°C]	18,2	17,9	17,9	18,1	18,3	19,0	18,9	
200.*	R [mΩ]	0,0729	0,0698	0,0693	0,0706	0,0702	0,0715	0,0716	
	θ [°C]	19,5	19,8	19,6	19,2	19,7	19,9	19,4	
250.	R [mΩ]	0,0742	0,0713	0,0702	0,0726	0,0719	0,0745	0,0715	
	θ [°C]	18,7	17,7	18,9	18,4	18,9	19,1	18,9	
325.	R [mΩ]	0,0742	0,0715	0,0706	0,0730	0,0718	0,0757	0,0715	
	θ [°C]	19,4	18,9	19,3	19,1	19,3	19,5	19,7	
400.	R [mΩ]	0,0743	0,0714	0,0707	0,0730	0,0719	0,0765	0,0714	
	θ [°C]	21,7	21,3	21,4	21,3	21,4	21,9	21,9	
475.	R [mΩ]	0,0747	0,0720	0,0708	0,0731	0,0724	0,0766	0,0716	
	θ [°C]	19,6	19,3	19,5	19,6	19,6	20,2	19,8	
550.	R [mΩ]	0,0745	0,0717	0,0709	0,0729	0,0720	0,0767	0,0714	
	θ [°C]	18,9	18,5	18,7	18,4	18,7	19,2	19,3	
625.	R [mΩ]	0,0745	0,0719	0,0709	0,0731	0,0720	0,0768	0,0713	
	θ [°C]	17,0	16,0	16,5	16,8	17,0	17,4	17,2	
700.	R [mΩ]	0,0747	0,0719	0,0709	0,0733	0,0722	0,0769	0,0716	
	θ [°C]	18,8	18,1	18,9	18,5	18,8	19,4	19,1	
775.	R [mΩ]	0,0748	0,0717	0,0708	0,0730	0,0721	0,0769	0,0714	
	θ [°C]	15,9	16,8	17,0	17,1	17,1	17,4	17,3	
850.	R [mΩ]	0,0747	0,0717	0,0708	0,0730	0,0720	0,0771	0,0714	
	θ [°C]	19,7	19,5	19,4	19,2	19,4	20,0	19,7	
925.	R [mΩ]	0,0746	0,0718	0,0709	0,0730	0,0721	0,0771	0,0714	
	θ [°C]	18,5	18,2	18,1	17,9	18,1	18,5	18,7	
1000.	R [mΩ]	0,0746	0,0718	0,0706	0,0728	0,0719	0,0771	0,0714	
	θ [°C]	17,0	16,3	16,6	17,3	16,8	17,3	17,3	

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

Supplementary information: Sample No. 4.1...4.6 (conductor of 300 mm<sup>2</sup>)





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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.	$\theta_{max}$ [°C]	101,3	101,9	104,2	102,7	101,6	103,1	120,6	
200.*	$\theta_{max}$ [°C]	99,7	101,9	102,0	99,9	103,0	102,8	123,4	
200.*	$\theta_{max}$ [°C]	110,6	111,1	107,5	102,3	110,4	111,7	122,6	
250.	$\theta_{max}$ [°C]	111,8	112,0	108,6	104,2	112,6	112,5	123,8	
325.	$\theta_{max}$ [°C]	112,1	109,1	109,8	105,9	112,8	113,3	125,4	
400.	$\theta_{max}$ [°C]	111,1	106,5	106,8	102,2	105,8	113,1	125,5	
475.	$\theta_{max}$ [°C]	111,3	109,0	109,3	105,0	111,1	113,8	123,4	
550.	$\theta_{max}$ [°C]	108,4	107,6	108,0	103,4	108,6	113,4	123,9	
625.	$\theta_{max}$ [°C]	111,4	109,3	109,7	105,7	112,5	114,8	125,3	
700.	$\theta_{max}$ [°C]	109,7	107,8	108,3	102,4	109,5	113,8	124,7	
775.	$\theta_{max}$ [°C]	110,3	108,0	108,3	104,3	111,1	113,9	123,8	
850.	$\theta_{max}$ [°C]	108,9	105,6	106,2	101,1	108,5	112,0	122,5	
925.	$\theta_{max}$ [°C]	109,0	105,9	106,6	101,6	107,5	112,0	122,6	
1000.	$\theta_{max}$ [°C]	108,4	105,5	106,2	101,2	108,3	112,3	122,2	

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

**Supplementary information:** Sample No. 4.1...4.6 (conductor of 300 mm<sup>2</sup>)

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6.4		TABLE 3: connector resistance factor k, calculated according to annex E, clause E.2						P	
Parameters:		L <sub>a</sub> =	260 mm	L <sub>b</sub> =	260 mm	L <sub>r</sub> =	710 mm	L <sub>f</sub> =	145 mm
cycle		connectors							
		j=1	j=2	j=3	j=4	j=5	j=6		
0.		0,7933	0,8275	0,9027	0,9164	1,0053	1,0463		
200.*		0,8218	0,9314	0,9725	0,9862	1,1779	1,1642		
200.*		1,4019	1,1899	1,1558	1,2447	1,2173	1,3062		
250.		1,4929	1,2943	1,2190	1,3834	1,3354	1,5135		
325.		1,4929	1,3080	1,2464	1,4108	1,3286	1,5957		
400.		1,5087	1,3099	1,2619	1,4196	1,3442	1,6596		
475.		1,5250	1,3404	1,2583	1,4156	1,3678	1,6550		
550.		1,5225	1,3304	1,2756	1,4127	1,3510	1,6733		
625.		1,5315	1,3529	1,2842	1,4353	1,3598	1,6894		
700.		1,5250	1,3336	1,2652	1,4293	1,3541	1,6755		
775.		1,5430	1,3304	1,2687	1,4196	1,3579	1,6870		
850.		1,5362	1,3304	1,2687	1,4196	1,3510	1,7008		
925.		1,5293	1,3373	1,2756	1,4196	1,3579	1,7008		
1000.		1,5293	1,3373	1,2550	1,4059	1,3442	1,7008		
(*) rows marked with asterisk can be omitted in case of connectors type "B"									
Supplementary information: Sample No. 4.1... 4.6 (conductor of 300 mm <sup>2</sup> )									

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6.4		TABLE 4: initial scatter $\delta$ , 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.	$K_0$	0,9153	0,9153	0,9153	0,9153	0,9153	0,9153	
	$s_0$	0,0980	0,0980	0,0980	0,0980	0,0980	0,0980	
	$\delta$	0,1767	0,1767	0,1767	0,1767	0,1767	0,1767	
Supplementary information: Sample No. 4.1... 4.6 (conductor of 300 mm <sup>2</sup> )								

6.4		TABLE 5: mean scatter $\beta$ , 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	$k$	1,5215	1,3277	1,2617	1,4156	1,3502	1,6592	
	$K$	1,4227	1,4227	1,4227	1,4227	1,4227	1,4227	
	$s$	0,1456	0,1456	0,1456	0,1456	0,1456	0,1456	
	$\beta$	0,1689	0,1689	0,1689	0,1689	0,1689	0,1689	
Supplementary information: Sample No. 4.1... 4.6 (conductor of 300 mm <sup>2</sup> )								

6.4		TABLE 6: 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	$b$	-0,0041	-0,0034	-0,003	-0,0016	-0,0015	-0,0141	
	$k$	1,5215	1,3277	1,2617	1,4156	1,3502	1,6592	
	$IMI$	0,0269	0,0256	0,0238	0,0113	0,0111	0,0850	
	$s_j$	0,01	0,0132	0,0154	0,013	0,0108	0,0348	
	$S$	0,0136	0,0206	0,0253	0,0190	0,0166	0,0434	
	$D$	0,0405	0,0462	0,0491	0,0303	0,0277	0,1284	
Supplementary information: Sample No. 4.1... 4.6 (conductor of 300 mm <sup>2</sup> )								

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6.4		TABLE 7: resistance factor ratio $\lambda$ , calculated according to annex E, clause E.6						P
cycle		connectors						
		j=1	j=2	j=3	j=4	j=5	j=6	
0.	$k_0$	0,7933	0,8275	0,9027	0,9164	1,0053	1,0463	
200.*	$\lambda=$	1,0359	1,1256	1,0773	1,0762	1,1717	1,1127	
200.*	$\lambda=$	1,7672	1,4379	1,2804	1,3582	1,2109	1,2484	
250.	$\lambda=$	1,8819	1,5641	1,3504	1,5096	1,3284	1,4465	
325.	$\lambda=$	1,8819	1,5807	1,3807	1,5395	1,3216	1,5251	
400.	$\lambda=$	1,9018	1,5830	1,3979	1,5491	1,3371	1,5862	
475.	$\lambda=$	1,9223	1,6198	1,3939	1,5447	1,3606	1,5818	
550.	$\lambda=$	1,9192	1,6077	1,4131	1,5416	1,3439	1,5993	
625.	$\lambda=$	1,9305	1,6349	1,4226	1,5662	1,3526	1,6146	
700.	$\lambda=$	1,9223	1,6116	1,4016	1,5597	1,3470	1,6014	
775.	$\lambda=$	1,9450	1,6077	1,4055	1,5491	1,3507	1,6123	
850.	$\lambda=$	1,9365	1,6077	1,4055	1,5491	1,3439	1,6255	
925.	$\lambda=$	1,9278	1,6161	1,4131	1,5491	1,3507	1,6255	
1000.	$\lambda=$	1,9278	1,6161	1,3903	1,5342	1,3371	1,6255	

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

Supplementary information: Sample No. 4.1...4.6 (conductor of 300 mm<sup>2</sup>)

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Подпис: .....



Attachment No. 1

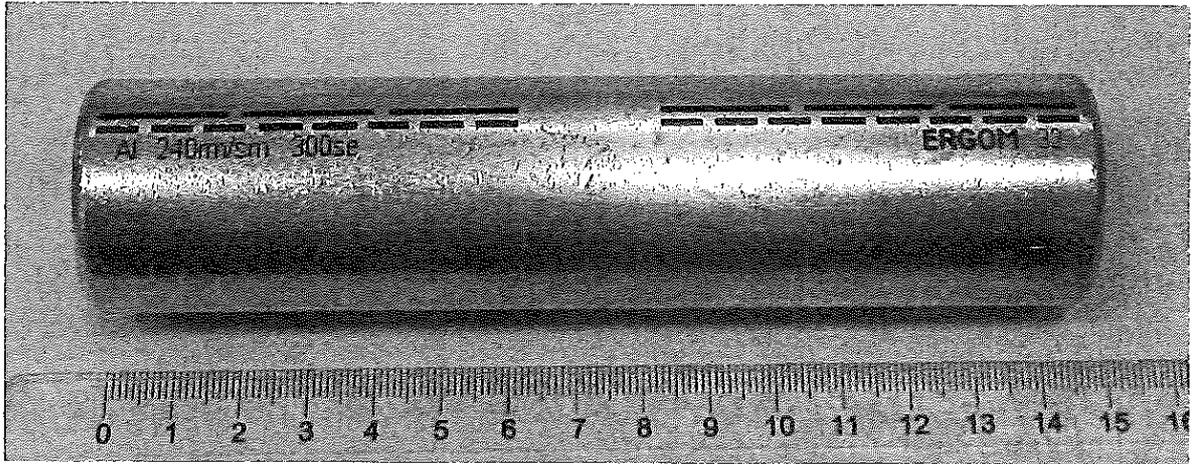
Summary of the test results according to EN 61238-1:

Clause	Tests	Sample No.	Verdict
6	Electrical tests	4.1...4.6	P
7	Mechanical tests	4.7...4.9	P

СЕРТИФИКАТ  
№: .....



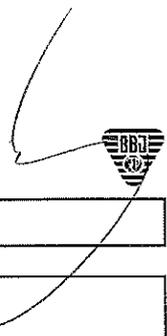
Photos of the samples:



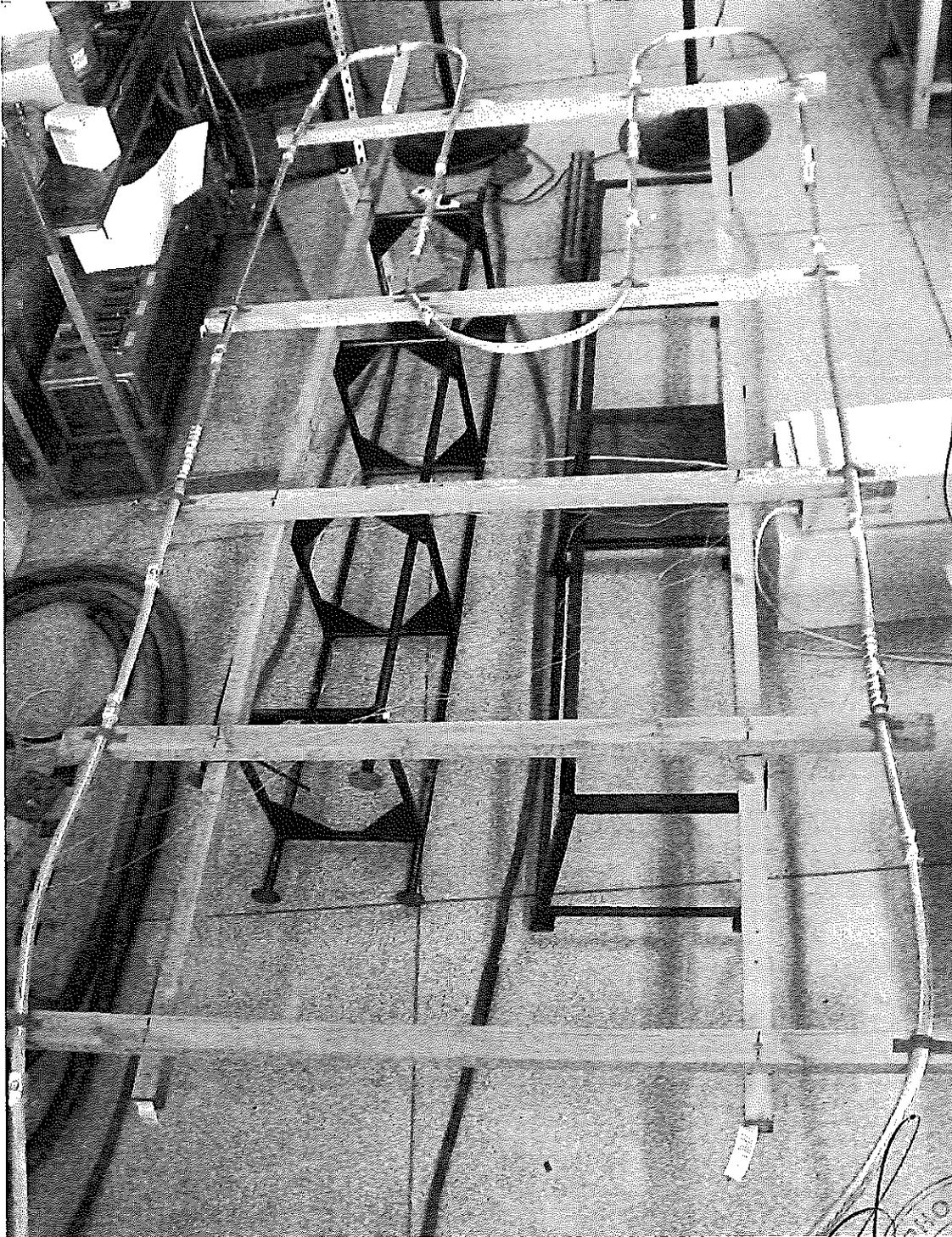
Aluminium through connector LAC 300

I-POB-07/01-Z3w9

ВЕРНО С ОРИГИНАЛОМ  
Подпись: .....



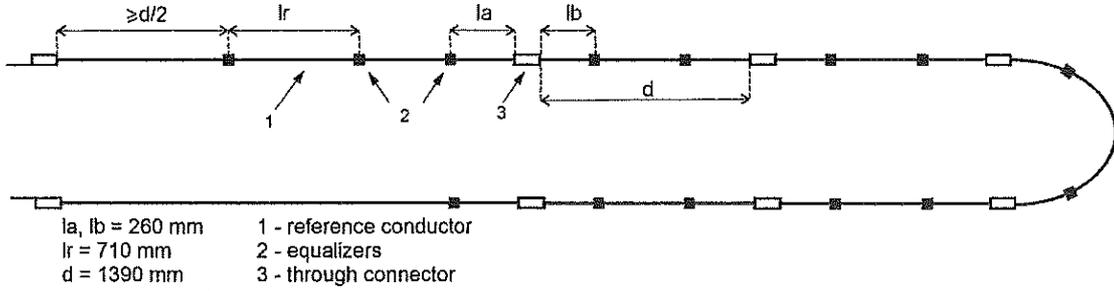
Photos of the samples (continued):



Test circuit of LAC 300

A handwritten signature in black ink, located below the caption and to the left of the stamp.

An official circular stamp is located in the bottom right corner. It contains text in Cyrillic, including 'ВЕРИФИКАЦИОННЫЙ ЦЕНТР' and 'СЕРТИФИКАЦИЯ'. Below the stamp is a rectangular stamp with the text 'ВЕРИФИКАЦИОННЫЙ ЦЕНТР' and 'I-POB-07/01-Z3w9'. Below this is a line for a signature, 'Подпись: .....', followed by a handwritten signature.



The configuration and dimensions of the test circuit of LAC 300

*[Handwritten signature]*

*[Handwritten signature]*

*[Circular stamp]*

ВАЖНО С ОБЯЗКА  
Подпис: .....



Attachment No. 2

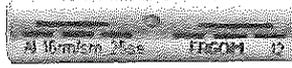
Karta katalogowa wyrobu



Ilościówki rurowe aluminiowe

Łączniki rurowe nieobciążalne mechanicznie, typu LA i LAC

**Materiał** Al  
**Pokrycie** 1-10 kV  
**Wykonanie** DIN 46267/2 - całościowy, rurowy  
**Napięcie** 1-10 kV



A-A



**Uwaga!**  
 - Izolacja: A są wypełnione specjalnym smarem kontaktowym i zapalane są w tobie.  
 - Zły wykonawca musi zostać przeto rozważone okrągło

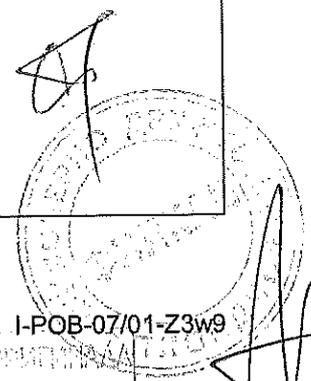
LAC - cynowane

smar kontaktowy		Przebieg [mm <sup>2</sup> ]		Wymiary [mm]			Zaprzewozanie			ΔU [kV]	ΔU [kV]
Typ	Art. nr	mm <sup>2</sup> /m	te/st	L	d	D	Regulacja	Is/s	La/w	ΔU [kV]	ΔU [kV]
LA 70	172A-0110010100	7	16	52	5,0	110	70	14	2-2	100	1,05
LA 75	172A-0110010200	10	25	55	5,6	120	75	14	3-3	100	1,50
LA 25	172A-0110010300	25	35	70	6,2	120	75	22	2-2	100	1,82
LA 35	172A-0110010400	35	50	80	7,0	140	75	22	2-2	100	2,60
LA 50	172A-0110010500	50	70	85	8,0	140	75	22	2-2	100	3,35
LA 70	172A-0110010600	70	95	105	11,2	165	75	35	6-6	100	5,10
LA 95	172A-0110010700	95	120	105	11,2	220	75	35	6-6	100	5,70
LA 120	172A-0110010800	120	150	105	11,2	230	75	35	6-6	100	7,20
LA 150	172A-0110010900	150	200	125	16,5	250	75	35	7-7	100	8,75
LA 185	172A-0110011000	185	240	125	16,5	265	75	35	7-7	100	9,70
LA 240	172A-0110011100	240	300	145	21,0	320	75	35	8-8	100	13,50
LA 300	172A-0110011200	300	-	145	21,0	350	75	35	-	100	15,00
LA 400	172A-0110011300	400	-	200	28,0	385	75	44	-	100	21,20
LA 500	172A-0110011400	500	-	200	35,0	440	75	44	-	100	27,20
LA 625	172A-0110011500	625	-	300	43,0	520	75	52	-	100	33,20
LA 800	172A-0110011600	800	-	300	43,0	580	75	52	-	100	39,20
LA 1050	172A-0110011700	1050	-	350	44,0	650	75	52	-	100	49,20

172 - 172A-0110011800 - 172A-0110011900

Technologia wykonania: 172A-0110011800 - 172A-0110011900

Definicje maszyn i urządzeń: 172A-0110011800 - 172A-0110011900



I-POB-07/01-Z3w9

Подпись: .....

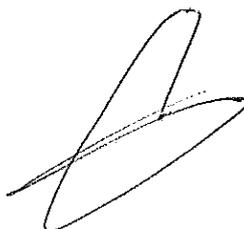


## List of test equipment used:

Clause	Measurement / testing	Testing / measuring equipment / material used	Range used	Calibration date
6	Electrical tests	Thermohygrometer (W-02509)	Auto	2016-08-25
		KRP arrangement (801/50681)	—	2016-06-20
		Shunts 50 kA (801/50064-B)	50 kA	2016-08-16
		Measuring tape 3 m (W-52157)	(0 ... 3) m	2014-01-14
		Stopwatch (W-52063)	s, min	2016-02-12
		Temperature meter TMP (NF: YWRWM020019)	(0 ... 300) °C	2015-11-03
		Current transformer UTT-6M2Z (W-51338)	1200/5 A	2015-05-28
		Ammeter LE-3P (W-51675)	6 A	2016-04-04
		Shunt B3 (W-52051)	100 A / 150 mV	2014-03-28
		Multimeter FLUKE (8/50591)	mV AC, DC	2015-12-14
		Multimeter FLUKE (8/02480)	mV AC, DC	2016-04-26
		7	Mechanical tests	Measuring tape 3 m (W-52157)
Stopwatch (W-52063)	(0 ... 60) s			2016-02-12
Dynamometer FB50K (801/02722)	12000 N			2016-06-09
Thermohygrometer LB-701 (800/01704)	Auto			2015-12-14

**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 СПЕЦИФИКАЦИИПриложение 12

## УДОСТОВЕРЕНИЕ ЗА СЪОТВЕТСТВИЕ

№ 2114131.100/A

Издава се на: Z.A.E. ERGOM Sp. zo.o.  
ul. Nowe Sady  
10 94-102 Лодз  
ПОЛША

За продукт: Гилза за кербоване

Търговска марка: ERGOM

Тип/модел LA 120 Aluminium

Размер: 120 mm<sup>2</sup> Aluminium

Произведени от: Z.A.E. ERGOM Sp. zo.o.  
ul. Nowe Sady  
10 94-102 Лодз  
ПОЛША

Предмет: Електрическо изпитване на типа, състоящо се от изпитвания на топлинния цикъл, включително изпитвания на късо съединение

Изисквания: EN/IEC 61238-1:2003 clause: 6, Електрически изпитания (Клас А)

Това удостоверение се издава на базата на проведени изпитвания KEMA, резултатите от които се намират в поверително досие № 2114131.01 издадено на 28 Ноември, 2008.

Изпитването беше проведено върху шест мостри от продукта, предоставени от производителя. Удостоверението не включва оценка на продукцията на производителя. Съответствието на продукцията му с мострата, тествана от KEMA, не е отговорност на KEMA.

KEMA Quality B.V.  
Arnhem, 28 Ноември, 2008

на основание чл. 36а, ал. 3  
от ЗОП

H.R.M. Varends  
Мениджър сертифициране

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KEMA Quality B.V. Utrechtseweg 310, 6812 AR Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands T +31 26 3 56 20 00 F +31 26 3 52 58 00 [customer@kema.com](mailto:customer@kema.com) [www.kema.com](http://www.kema.com) Registered Arnhem 09085396

Experience you can trust.  
Подпис: .....



# ATTESTATION OF CONFORMITY

No. 2114131.100/A

Issued to: Z.A.E. ERGOM Sp. z o.o.  
ul. Nowe Sady 10  
94-102 L6DZ  
POLAND

For the product: Compression connector

Trade name: ERGOM

Type/Model: LA 120 Aluminium

Ratings: 120 mm<sup>2</sup> Aluminium

Manufactured by: Z.A.E. ERGOM Sp. z o.o.  
ul. Nowe Sady 10  
94-102 L6DZ  
POLAND

Subject: Electrical type test consisting of heat cycle tests including short-circuit tests.

Requirements: EN/IEC 61238-1:2003 clause: 6, Electrical tests (Class A)

This Attestation is granted on account of an examination by KEMA, the results of which are laid down in a confidential test report no. 2114131.01 issued on November 28, 2008.

The examination has been carried out on six specimens of the product, submitted by the manufacturer. The Attestation does not include an assessment of the manufacturer's production. Conformity of his production with the specimen tested by KEMA is not the responsibility of KEMA

KEMA Quality B.V.  
Arnhem, November 28, 2008

на основании чл. 36а, ал. 3  
от ЗОП

H.R.M. Barends  
Certification Manager

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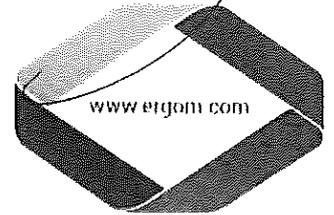
KEMA Quality B.V. Utrechtseweg 310, 6812 AR Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands  
T +31 26 3 56 20 00 F +31 26 3 52 58 00 customer@kema.com www.kema.com Registered Arnhem 09085396

Experience you can trust.  
Подпись: .....

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, 2015-05-07

### Сертификат за качество 50/2015

1. **Производител на продукта:** ZAE ERGOM Sp. z o. o  
94-102 Lodz ul. Nowe Sady 10
2. **Име на продукта:** Алуминиева гилза за кербоване тип LA
3. **Класификация на продукта:** PKWiU 31.20.27-70.00
4. **Приложение на продукта и обхват на употреба:** използва се за свързване на алуминиеви проводници
5. **Техническа спецификация:** Накрайниците са в съответствие с норма PN-90-E-06401/02 и тръбната част е в съответствие с DIN 46267/2.
6. **Партида обхваната от декларацията:** продукти, закупени от клиента.

**Декларирам с пълна отговорност, че продуктът отговаря на техническата спецификация съгласно точки 4 и 5.**

Dział Kontroli Jakości

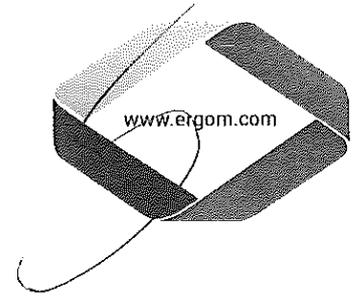
на основание чл. 36а, ал. 3  
от ЗОП

Ръководител отдел Контрол на качеството

WIRING ACCESSORIES  
CABLE/CABLE TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS

ISO  
9001

VAT: PL7260129071, Regan: 473076927, KRS: 00001324270  
Sgd Rejonowy dla todzi - Srodmiestia w todzi, XX Wydzial Krajowego Rejestru Sadowego  
Initial Capital ERGOM Z.A.E. : 1 0.400.000,00 PLN  
Bank Zachodni WBK SA II/O Lodz, BIC: WBK PPLPP, IBAN: PL 16 1090 1304 00000000 3634 8970



Łódź 07.05.2015

### Quality certificate 50/2015

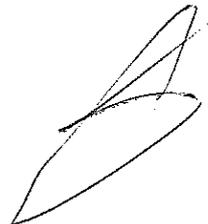
- 1. Product manufacturer:** ZAE ERGOM Sp. z o. o  
94-102 Łódź ul. Nowe Sady 10
- 2. Product name:** Aluminum cable joint type LA
- 3. Product classification:** PKWiU 31.20.27-70.00
- 4. Product application and the range of usage:** used for termination of aluminum conductors of electrical wires.
- 5. Technical specification:** Terminals are compliant with norm PN-90-E-06401/02 and tubular part is according to DIN 46267/2.
- 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 Jakości

на основании чл. 36а, ал. 3  
от ЗОП

Quality control dept. manager



VAT: PL 7260129071; Regon: 473076927; KRS: 0000132427

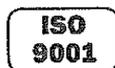
Sąd Rejonowy dla Łodzi – Śródmieście w Łodzi, XX Wydział Krajowego Rejestru Sądowego

Initial Capital ERGOM Z.A.E.: 10 000 000,00 PLN

Bank Zachodni WBK SA II/O Łódź, BIC: WBK PPLPP IBAN: PL 16 1090 1304 0000 0000 3034 8970



WIRING ACCESSORIES  
CABLE TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS



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](mailto:export@ergom.com)



Lodz, 04.10.2017

### Декларация за съответствие 80/2017

- Производител на продукта:** ZAE ERGOM Sp. z o. o  
94-102 Лодз ул. Nowe Sady 10
- Име на продукта:** Кабелни обувки и гилзи: KDA/KDAC, KRA/KRAC, LA/LAC
- Класификация на продукта:** PKWiU 27.33.13.0
- Приложение на продукта и обхват на употреба:** използва се за завършване и свързване на алуминиеви проводници
- Техническа спецификация:** продукти, произведени от алуминиеви тръби и пръти, които имат химически състав, съответстващ на нормата EN 573-3 (Алуминий и алуминиеви сплави)

**1. Партида в обхвата на декларацията:** продукти, закупени от клиента.

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

Dział Kontroli Jakości

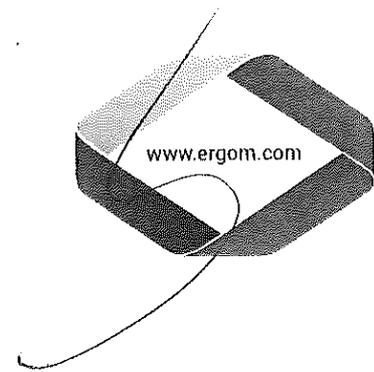
на основание чл. 36а, ал. 3  
от ЗОП

Ръководител отдел Контрол на качеството

WIRING ACCESSORIES  
CABLE TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS



VAT: PL7260129071, Regan: 473076927, KRS: 0000132427  
Sgd Rejonowy dla todzi - Srodmiescia w todzi, XX Wydzial Krajowego Rejestru Sadowego  
Initial Capital ERGOM Z.A.E. : 1 0.400.000,00 PLN  
Bank Zachodni WBK SA II/O Lodz, BIC: WBK PPLPP, IBAN: PL 16 1090 1304 00000000 3034 8970



Łódź, 04.10.2017

### Declaration of conformity 80/2017

- Product manufacturer:** ZAE ERGOM Sp. z o.o.  
94-102 Łódź ul. Nowe Sady 10
  - Product name:** Cable terminals and joints: KDA/KDAC, KRA/KRAC, LA/LAC
  - Product classification:** PKWiU 27.33.13.0
  - Product application and the range of usage:** used for termination of aluminum conductors of energetics wires
  - Technical specification:** products made from aluminum pipes and rods having the chemical composition compliant with norm EN 573-3 (Aluminum and aluminum alloys)
- 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 Jakości  
*Specialist Jakos*

на основании чл. 36а, ал. 3  
от ЗОП

Quality control dept. manager



AKCESORIA DO OKABLOWANIA  
KOŃCÓWKI KABLOWE  
NARZĘDZIA DLA ELEKTRYKÓW  
ROZDZIELNICE I OBUDOWY



*[Signature]*  
Sąd Rejonowy dla Łodzi - Śródmieście w Łodzi, XX Wydział Krajowego Rejestru Sądowego  
Kapitał Zakładowy ZAE ERGOM: 1 400 000,00 zł  
Konto bankowe: Bank Zachodni WBK S.A. II O/Łódź 39 1090 1304 0000 0000 3000 5564

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](mailto:bbj@bbj.pl)

## СЕРТИФИКАТ ЗА СЪОТВЕТВИЕ Z nr Z/12/003/17

Доставчик:  
(Име и адрес)

Zakład Aparatury Elektrycznej ERGOM Sp. z o.o.  
ul. Nowe Sady 10  
94-102 Лодз, Полша

Производител:  
(Име и адрес)

Zakład Aparatury Elektrycznej ERGOM Sp. z o.o.  
ul. Nowe Sady 10  
94-102 Лодз, Полша

Име на продукта:

алуминиеви кабелни обувки без преграда

Тип (модел)

LAC  
(списък с варианти от другата страна на сертификата)

Техническа информация

номинално сечение 25 mm<sup>2</sup> – 300 mm<sup>2</sup>  
Клас А

Вид сертификационна схема

1а в съответствие с PN-EN ISO/IEC 17067

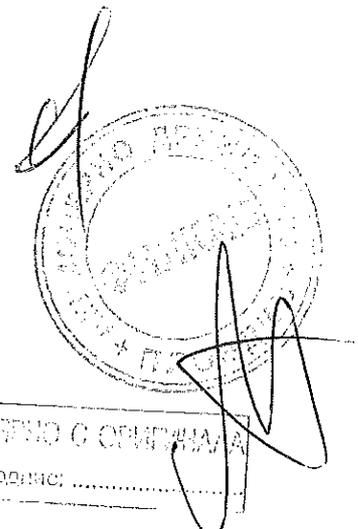
*Мостра от горепосочения продукт е изпитана и е установено, че е в съответствие с изискванията на стандарта (ите) и / или нормативния документ:*

Стандарт(и)/нормативни документи	Изпитателни протоколи №	Издаден от
PN-EN 61238-1:2004 (IEC 61238-1:2003)	LA-16.081/16.069/1 LA-16.081/16.069/2 LA-16.081/16.069/3 LA-16.081/16.069/4	SEP - BBJ

*Изпитателния протокол е неразделна част от този сертификат  
Варшава, 2017-01-31*



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



BIURO G. OMIJANIA  
Подпис: .....

Допълнителна информация

Списък на варианти:

Тип	Номинално сечение [mm <sup>2</sup> ]
LAC 25	25
LAC 35	35
LAC 50	50
LAC 70	70
LAC 95	95
LAC 120	120
LAC 150	150
LAC 185	185
LAC 240	240
LAC 300	300

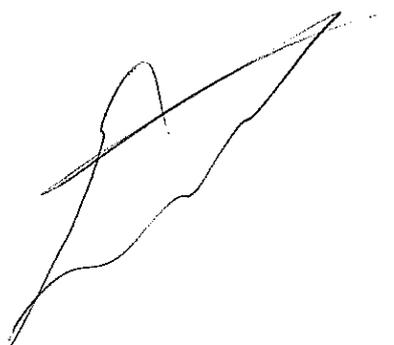
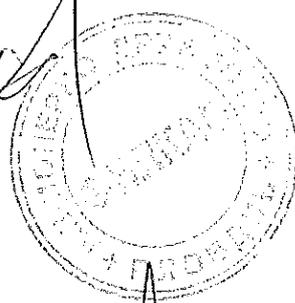
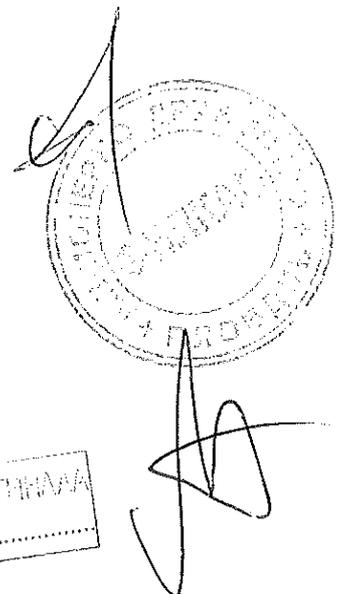
NC-A 16.037

Per. № S-A-16-069

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/12/003/17

No. Z/12/003/17

**Dostawca:** Zakład Aparatury Elektrycznej ERGOM Sp. z o.o.  
(Nazwa i adres) ul. Nowe Sady 10  
*Supplier:* 94-102 Łódź, Poland  
(Name and address)

**Producent:** Zakład Aparatury Elektrycznej ERGOM Sp. z o.o.  
(Nazwa i adres) ul. Nowe Sady 10  
*Manufacturer:* 94-102 Łódź, Poland  
(Name and address)

**Nazwa wyrobu:** Łączniki rurowe aluminiowe.  
*Name of the product:* Aluminium through connector.

**Typ (model):** LAC...  
*Type (model):* (wykaz wykonań na drugiej stronie certyfikatu)  
(list of variations on the other side of the certificate)

**Dane techniczne:** Przekrój znamionowy: 25 mm<sup>2</sup> + 300 mm<sup>2</sup>;  
*Technical data:* Klasa A.  
Rated cross-section: 25 mm<sup>2</sup> + 300 mm<sup>2</sup>;  
Class A.

**Typ programu certyfikacji:** 1a według PN-EN ISO/IEC 17067  
*Type of certification scheme:* 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) i/lub 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)	LA-16.081/16.069/1 LA-16.081/16.069/2 LA-16.081/16.069/3 LA-16.081/16.069/4	SEP - BBJ

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

Kierownik Jednostki Certyfikującej  
Certification Body Manager

на основании чл. 36а, ал. 3  
от ЗОП

Zbigniew Brzozowski

Подпись:

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

BBJ



AC 012



Warszawa, 2017-01-31

**Informacje dodatkowe:**  
*Additional information:*

**Wykaz odmian:**  
*List of variations:*

Typ Type	Przekrój znamionowy [mm <sup>2</sup> ] Rated cross-section [mm <sup>2</sup> ]
LAC 25	25
LAC 35	35
LAC 50	50
LAC 70	70
LAC 95	95
LAC 120	120
LAC 150	150
LAC 185	185
LAC 240	240
LAC 300	300

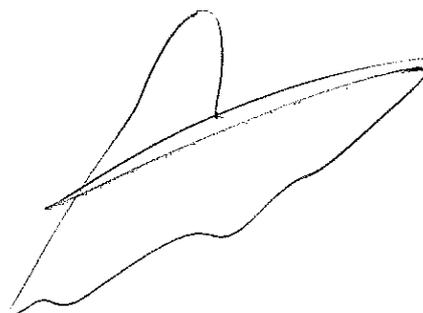
NC-A 16.037

Nr rej. S-A-16-069  
Reg. No. S-A-16-069

**Rozdzielnik:**  
*Copy to:*

1. Zakład Aparatury Elektrycznej ERGOM Sp. z o.o.  
ul. Nowe Sady 10  
94-102 Łódź, Poland
2. NC

ВНЕШНЕЕ ОТДЕЛЕНИЕ  
Подпись: .....

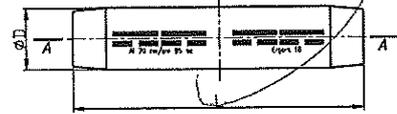
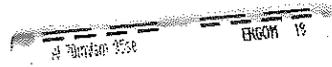
  
**Приложение 2 към Техническо предложение****За обособена позиция № 2:****„Доставка на арматура за проводници (кабелни обувки, съединители и накрайници)“****ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ  
ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ****Приложение 13**

## Butt connectors LAW ... type

**Material** Al.  
**Design** uncoated.  
**Voltage** 10+30 kV.

**Note!**

- terminals are filled with special contact grease and packed in foil;
- sector shaped conductors must be rounded with special dies.



A-A



Type	Item No.	Cross section [mm <sup>2</sup> ]		Dimension [mm]			Die code No.	Crimping		Packaging [pc]	Weight of package [kg]
		mm / sm	re / se	L	d	D		No. of crimping wide	No. of crimping narrow		
LAW 16	E12KA-01100300100	16	25	90	5,6	12,0	12	2-2	4-4	1	0,010
LAW 25	E12KA-01100300200	25	35	90	6,8	12,0	12	2-2	4-4	1	0,020
LAW 35	E12KA-01100300300	35	50	90	8,0	14,0	14	2-2	4-4	1	0,030
LAW 50	E12KA-01100300400	50	70	90	9,8	16,0	16	2-2	4-4	1	0,035
LAW 70	E12KA-01100300500	70	95	95	11,2	18,5	18	2-2	4-4	1	0,047
LAW 95	E12KA-01100300600	95	120	100	13,2	22,5	22	2-2	4-4	1	0,072
LAW 120	E12KA-01100300700	120	150	105	14,7	23,0	22	2-2	4-4	1	0,075
LAW 150	E12KA-01100300800	150	185	105	16,3	25,0	25	2-2	4-4	1	0,090
LAW 185	E12KA-01100300900	185	240	125	18,3	28,5	28	2-2	5-5	1	0,140
LAW 240	E12KA-01100301010	240	300	125	21,0	32,0	32	2-2	5-5	1	0,160
LAW 300	E12KA-01100301100	300	-	125	23,3	34,0	34	2-2	5-5	1	0,190
LAW 400	E12KA-01100301200	400	-	150	26,0	38,5	38	3-3	-	1	0,260
LAW 500	E12KA-01100301300	500	-	170	29,0	44,0	44	3-3	-	1	0,400
LAW 625	E12KA-01100301401	625	-	200	35,0	52,0	52	3-3	-	1	0,640
LAW 800	E12KA-01100301501	800	-	235	40,0	58,0	58	3-3	-	1	0,710
LAW 1000	E12KA-01100301601	1000	-	235	44,0	60,0	60	3-3	-	1	0,830

Crimping technology for tubular terminals 146

Crimping tools and hydraulic presses 144

*[Handwritten signature]*

*[Handwritten signature]*

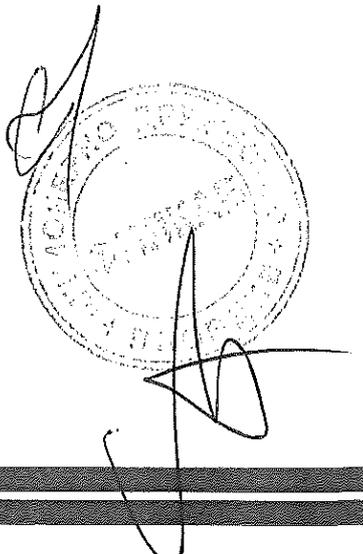
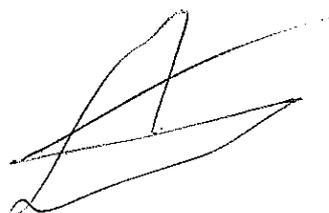
*[Circular stamp]*

ВЕРИЛИ С ОРГАНИЗАЦИЈА

Получено: .....

**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 14**



Applicant : ERGOM Zakład Aparatury Elektrycznej sp. z o.o.  
 ul. Nowe Sady 10  
 94-102 Łódź  
 POLAND

Application Date : 2006-09-03

Order Number : 2096180.00-QUA/IND

Subject : Mechanical testings

Trademark : ERGOM

Type(s) : LA, size 10 III 500

Amherst, November 1, 2006

Manufacturer/ Production sites: ERGOM Zakład Aparatury Elektrycznej sp. z o.o.  
 ul. Nowe Sady 10  
 94-102 Łódź  
 POLAND

Overview of tests : Mechanical tests according to clause 7 of the Test Requirements

Test Requirements : IEC 61236-1:2005-5 Compression and mechanical connectors

Tested by : H.H.M. Versteegen на основании чл. 36а, ал. 3 от ЗОП

Checked by : H.G.M. Kormelink

Contents

- Mechanical tests
- Tables, preparation of the samples, test information
- Product information, LA
- Common and relevant connector design criteria
- Tools
- Impression of the testings
- Test samples LA

Van 0435e-06

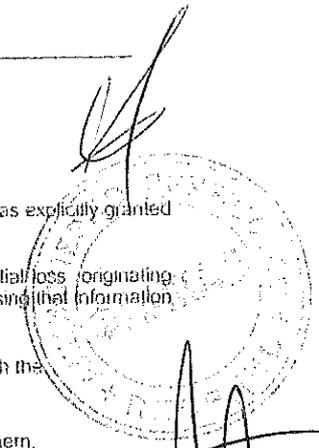
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ВЕРНО С ОРИГИНАЛОМ  
 Подпись: .....

ALPH-TR04eng  
 Revision 1.1

Product information:

Trademark: : ERGOM  
 Product : Conductor connections  
 Type(s) : LA  
 Range : size 10 till 500

Mechanical tests

The purpose of the tests is to ensure an acceptable mechanical strength for the connections to the conductors of power cables

The product information is given in annex LA

Selection of the samples.

Due to the fact that the manufacturer could clearly demonstrate common and relevant connector design criteria the samples have been selected as follows

- if a connector family consists of four sizes the minimum and maximum cross-sections are selected for tests
- if a connector family consists of five sizes the minimum and maximum and one intermediate cross-sections are selected for tests
- if a connector family consists of six or more sizes the minimum and maximum and two intermediate cross-sections are selected for tests

The selected samples are given in Table 1 and Table 2.

See annex Common and relevant connector design criteria for a family of connectors.

Sample preparation

The samples have been prepared and fitted according to the manufacturers instructions  
Details of the preparation are given in Table 1, Preparation of the samples.  
Information about the tools is given in the annex Tools

- Tool H6

Test method

The test has been made on three samples of each type. The samples are fitted according the manufactures instructions.

The conductor lengths, between are at least 500 mm.

than in a tensile strength equipment the force on the sample was increased slowly to

60 times the cross-section of the conductor if there made of copper,

40 times the cross-section of the conductor if there made of aluminium

With a maximum of 20000N and maintained for 1 minute.

The test forces are given in Table 2, Test force 1.

On request of the manufacturer the tests haven been carried out at a value of 1.05 times the test force 1.

These values are given in Table 2, Test force 2



ВЕРНО С ОУЩЕЛН  
 Подпис: .....

Then, on request of the manufacturer the test force was further increased till a value as given in table 2.  
Test force 2

For details see the following photo annexes:  
- impression of the testings  
- test samples LA

#### Test results

The test results are given in Table 2:

- The samples withstood the test force 2 during one minute, no slipping occurred
- The samples withstood the test force 3, no slipping occurred

#### Quality assurance

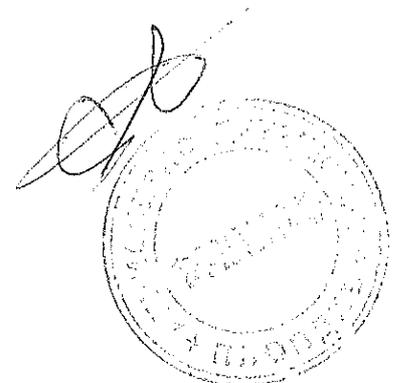
Preparing and filling the samples, and testings have been carried in the Laboratories of  
ERGOM Zakład Aparatury Elektrycznej sp.z o.o.  
ul. Nowe Sady 10  
94-102 Łódź, Poland.

The ERGOM organisation has been certified for ISO 9001 by Polski Rejestr Statkow S.A. (Polish Ship Register S.A.)

All activities have been carried out by:  
Piotr Mirowski, ERGOM RW  
Grzegorz Rosocha, ERGOM RW  
Adam Michalski, ERGOM PJ  
Tomek Fijałkowski ERGOM PJ  
Wojciech Durka, ERGOM PJ

and have been witnessed by H.H.M. Versteegen, KEMA Quality B.V., The Netherlands.

The testings have been carried out on tensile strength equipment  
VEM WPM, serial number 60/R10  
intended for forces of 10 kN, 25 kN and 50 kN within an accuracy of 0,78%  
The equipment was calibrated June 5, 2006 by Okręgowy Urząd Miar w Łodzi (Local Office of Measures in Łódź).



MEASUREMENT  
Metsu 1.0

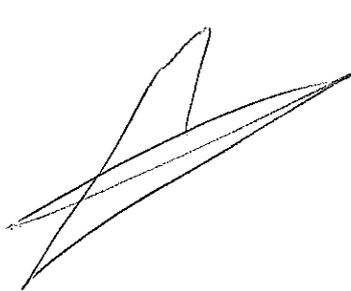
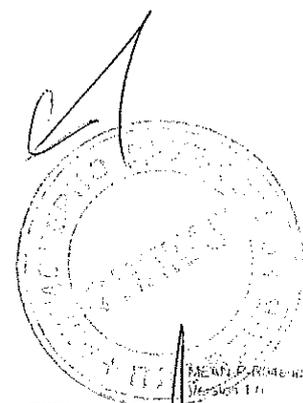
ЗЕРНО С ОРГАНИКА  
Площадь: .....

Table 1  
Preparation of the samples

sample information			tooling information	
Type designation	cross-section (mm <sup>2</sup> ) mm <sup>2</sup>	number of samples	die number	tools
LA 10	10	3	10	HH400
LA 70	70	3	16	HH400
LA 240	240	3	32	HH400
LA 500	500	3	44	HH630

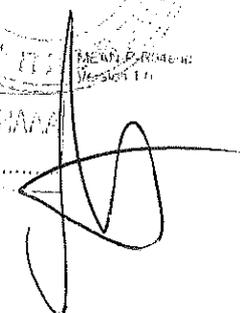
Table 2  
tests results

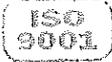
sample information			Test results			
Type designation	cross-section mm <sup>2</sup>	number of samples	mult. factor	test force 1 (N)	test force 2 (N)	test force 3 (N)
LA 10	10	3	40	400	420	820
LA 70	70	3	40	2800	2940	4000
LA 240	240	3	40	9600	10080	23000
LA 500	500	3	40	20000	21000	30000

ВАРИАНТ С ОБЪЕМНЫМ

Подпись: .....





www.ergom.com

**Końcówki rurowe aluminiowe / Aluminium tubular terminals /  
Алюминиевые трубчатые наконечники**

**Łączniki rurowe nieobciążalne mechanicznie, typu LA...**

**Non-tension compression joints, LA... type**

**Трубчатые соединители без возможности механической нагрузки типа LA...**

Material: Al  
Powłoka: bez powłoki  
Wykonanie: DIN 46207.2  
Napięcie: 110 kV  
Narzędzia do zakisłania: p. 6/30

Material: Al  
Surface: uncoated  
Design: DIN 46207.2  
Voltage: 110 kV  
Stripping tools: p. 6/30

Material: Al  
Покрывтие: без покрытия  
Исполнение: ЕСК 46207.2  
Напряжение: 110 кВ  
Зажимные инструменты: с. 6/30



Typ / Type	Długość / Length [mm]	Typ / Type	Długość / Length [mm]	Przekrój / Cross section		Wymiary / Dimensions			Ciężar / Weight [g]	Ciężar / Weight [kg]	Zapora powietrza / Stripping / Air protection		
				mm	mm	d	D	l			No. of strips / No. of strips	Mech. / Mech.	Typ / Typ.
LA 10	100	LA 10 BS	100	10	10	10	10	10	10	0,01	1	1	1
LA 16	160	LA 16 BS	160	16	16	16	16	16	16	0,02	2	1	1
LA 25	250	LA 25 BS	250	25	25	25	25	25	25	0,03	3	1	1
LA 35	350	LA 35 BS	350	35	35	35	35	35	35	0,05	5	1	1
LA 50	500	LA 50 BS	500	50	50	50	50	50	50	0,08	8	1	1
LA 70	700	LA 70 BS	700	70	70	70	70	70	70	0,12	12	1	1
LA 95	950	LA 95 BS	950	95	95	95	95	95	95	0,18	18	1	1
LA 120	1200	LA 120 BS	1200	120	120	120	120	120	120	0,25	25	1	1
LA 150	1500	LA 150 BS	1500	150	150	150	150	150	150	0,35	35	1	1
LA 175	1750	LA 175 BS	1750	175	175	175	175	175	175	0,45	45	1	1
LA 200	2000	LA 200 BS	2000	200	200	200	200	200	200	0,55	55	1	1
LA 250	2500	LA 250 BS	2500	250	250	250	250	250	250	0,85	85	1	1
LA 300	3000	LA 300 BS	3000	300	300	300	300	300	300	1,15	115	1	1
LA 350	3500	LA 350 BS	3500	350	350	350	350	350	350	1,45	145	1	1
LA 400	4000	LA 400 BS	4000	400	400	400	400	400	400	1,75	175	1	1
LA 450	4500	LA 450 BS	4500	450	450	450	450	450	450	2,05	205	1	1
LA 500	5000	LA 500 BS	5000	500	500	500	500	500	500	2,35	235	1	1
LA 600	6000	LA 600 BS	6000	600	600	600	600	600	600	2,95	295	1	1
LA 800	8000	LA 800 BS	8000	800	800	800	800	800	800	4,15	415	1	1
LA 1000	10000	LA 1000 BS	10000	1000	1000	1000	1000	1000	1000	5,35	535	1	1

**Uwagi /**

LA...BS - bez styku  
Długość 500 - wyprodukowana przez firmę Strömberg  
kontaktowa 110 kV z izolacją z PVC i folią.  
Typ...nieobciążalny mechanicznie, typowa konstrukcja  
typ LA...BS.

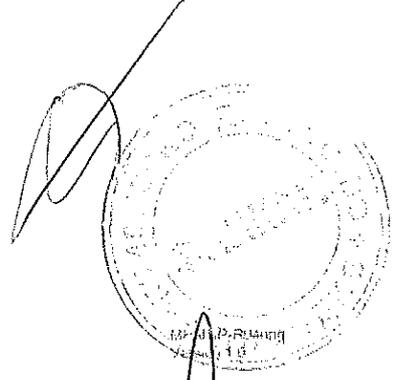
**Remark /**

LA...BS - without contact pressure  
Terminals are filled with special contact grease  
and packed in foil.  
Contact shaped stripping tools must be combined  
with special dies.

**Примечание /**

LA...BS - без контактной смазки.  
Соединительные наконечники поставляются специально  
герметизированные с помощью специального герметика  
и фольги.  
Специально разработанные инструменты должны быть  
использованы в сочетании со специальными матрицами.

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WYMAGANIE O OCHRONIE DZIAŁA  
Podpis: .....



Tools

Hydraulic head HH 400 type

Crimping head used together with hydraulic pump. General purpose, practical, reliable. Enables easy crimping. Designed for crimping of terminals and forming of segmental cores. Supplied in plastic box.

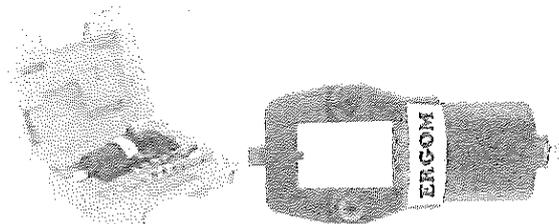
Provides crimping force: at least 200 kN.

Length: 240 mm

Weight: 3,80 kg

Working pressure: 70 MPa

Item No. 340-060100



Hydraulic head HH 630 type

Crimping head used together with hydraulic pump. General purpose, practical, reliable. Enables easy crimping. Designed for crimping terminals and forming segmental cores.

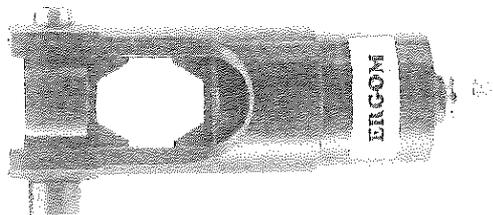
Provides crimping force: at least 250 kN.

Length: 260 mm

Weight: 6,50 kg

Working pressure: 70 MPa

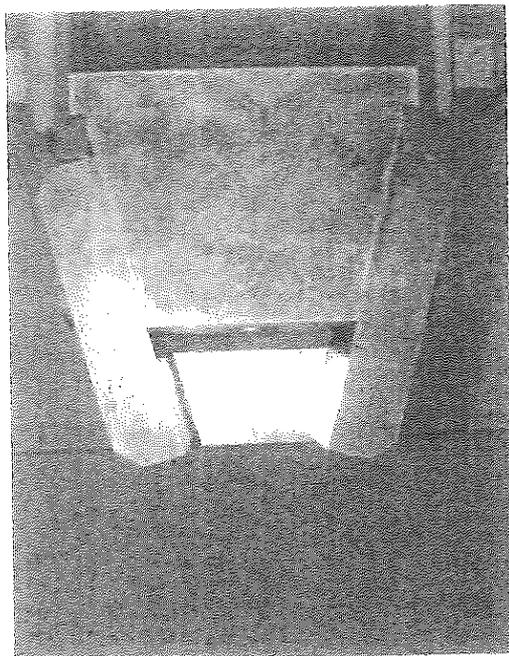
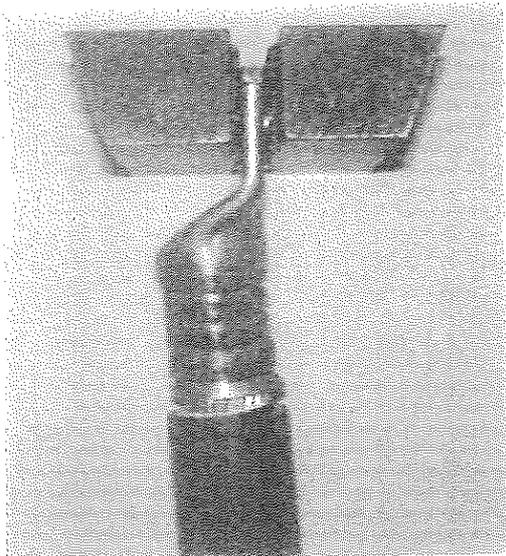
Item No. 340-070100



Handwritten signatures and a circular stamp. The stamp contains the text 'KEMA' and 'MEAN P. ...'. Below the stamp is a rectangular box with the text 'ВЕРНО С ОРИГИНАЛОМ' and 'Подпись: ...'.

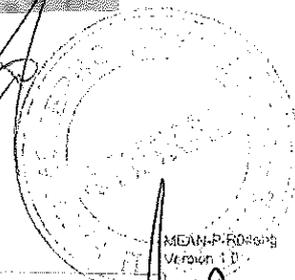


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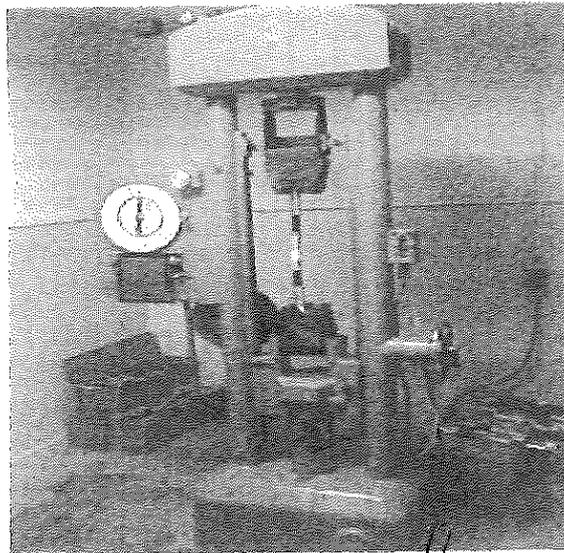
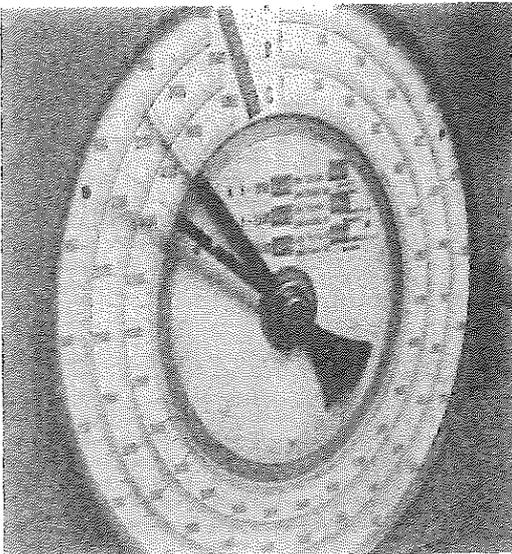
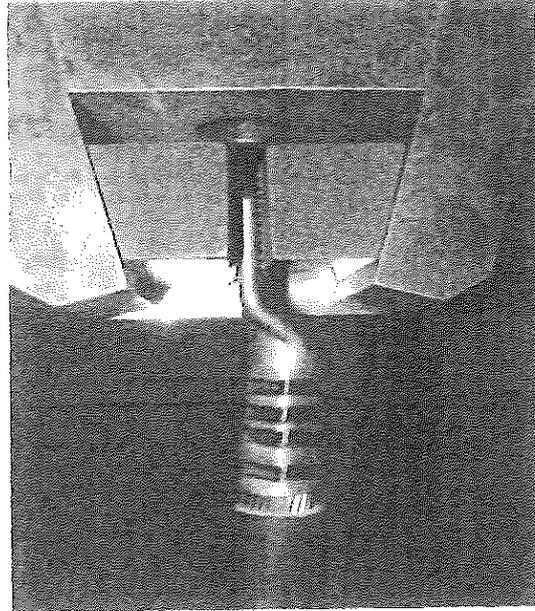
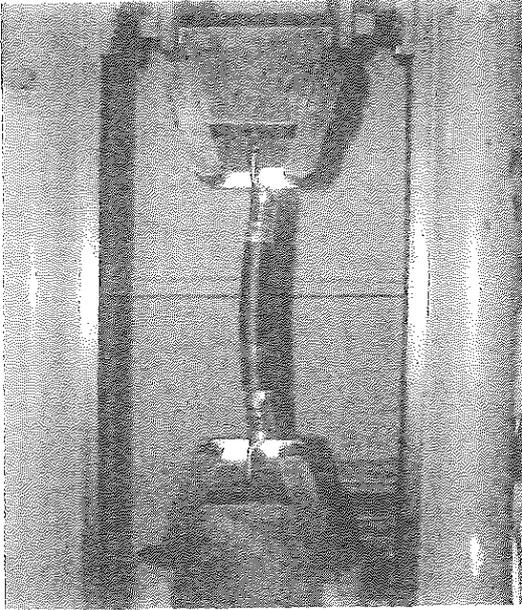
MDAN-Processing  
Version 1.0

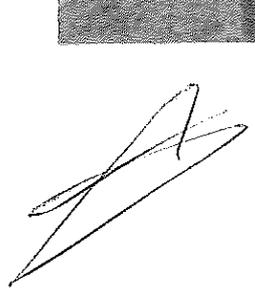
БАНК О ОРГАНИЗАЦИИ

Подпись: .....

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5






ВСТУПО С СРБИЈАМА  
Поднос: .....

5

Test samples LA

Photo 1 LA 10

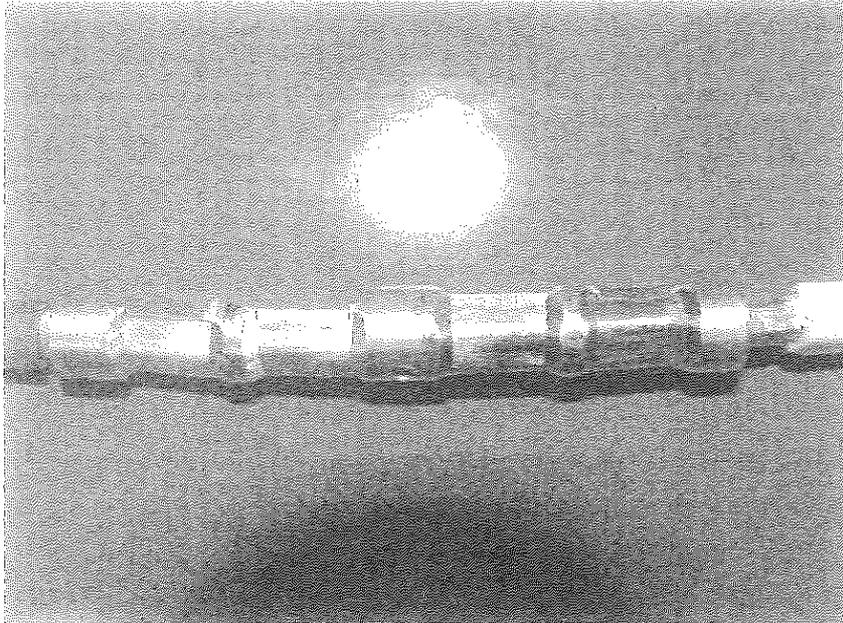
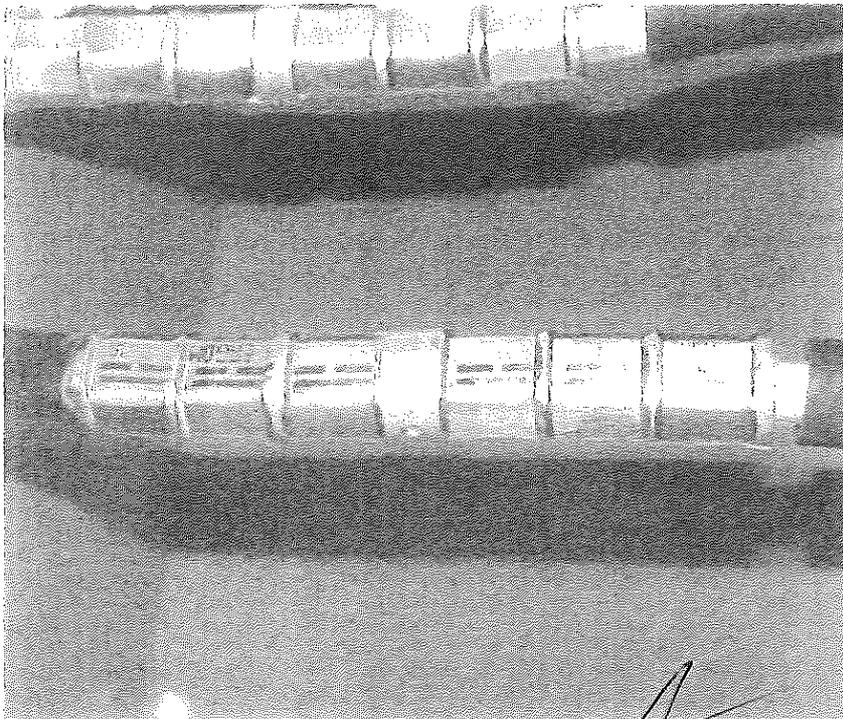
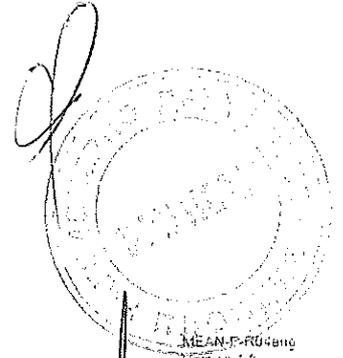


Photo 2 LA 70



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Повтор: .....

Photo 3 LA 240

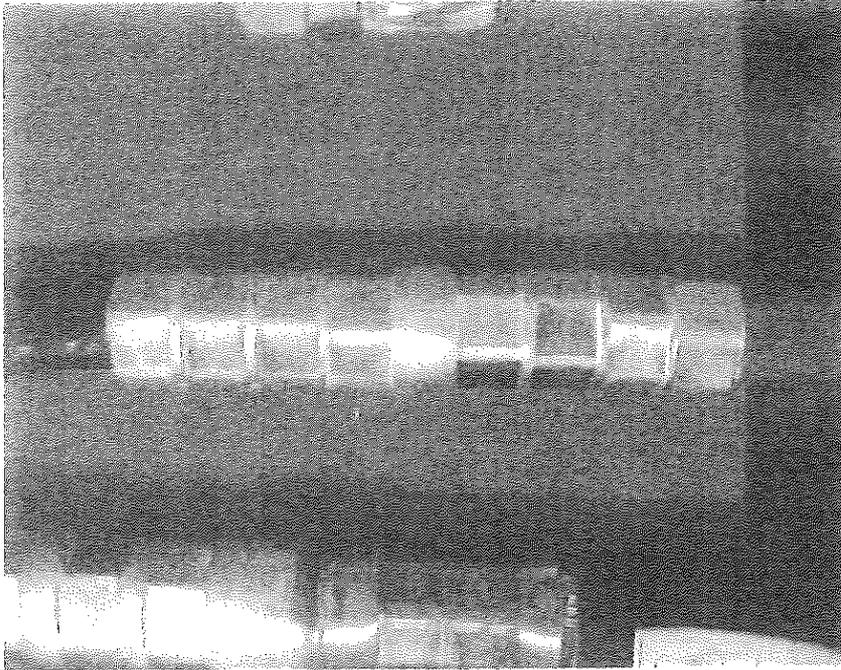
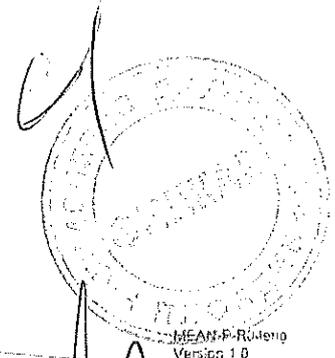
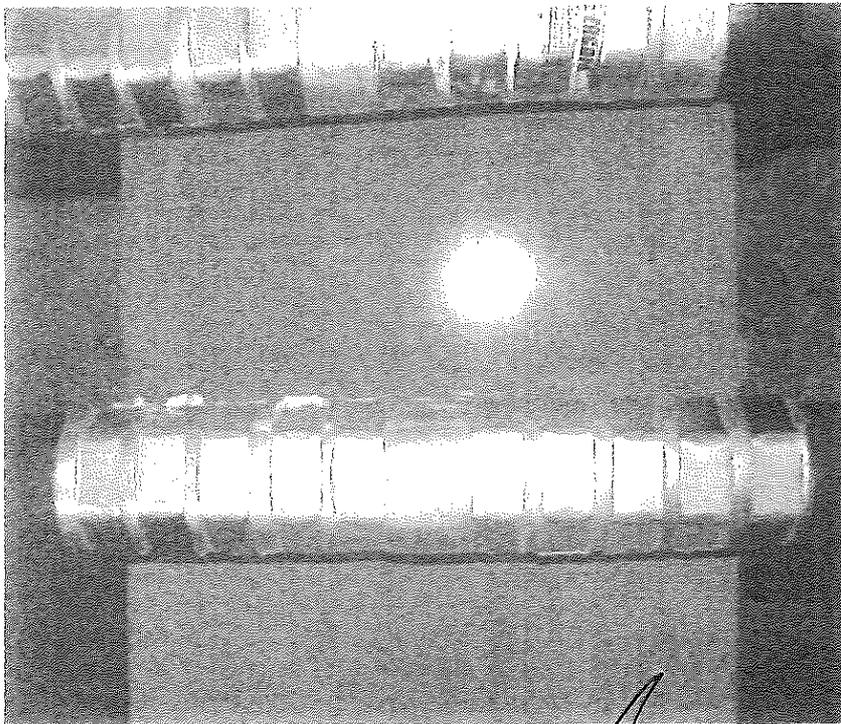


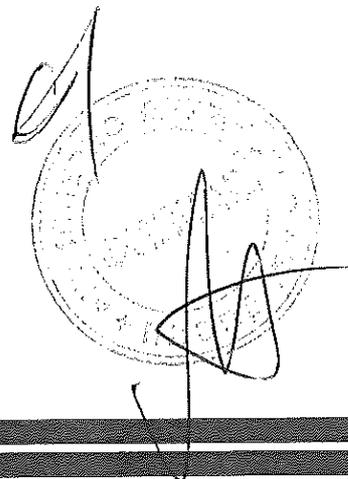
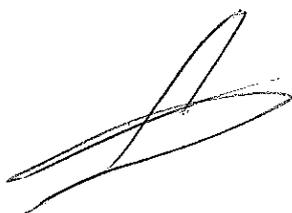
Photo 4 LA 500



MEAN-F-RuJeng  
Version 1.0  
Подпис:

**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 15**

**Писмо до:**

<b>До</b> Whoever it may concern	<b>Факс</b>	<b>На вниманието на:</b>
<b>От</b> Kasper Nijkamp	<b>Тел.</b> +31 26 356 2850	<b>Наш №</b> KNIJ/20-04-2011
<b>Факс</b> +31 26 352 5800	<b>E-mail</b> kasper.nijkamp@dekra.com	
<b>Дата</b> януари 2011	<b>Бр. страници</b>	

Относно: Прехвърляне на бизнеса с Ниско напрежение от KEMA на DEKRA

Да послужи пред когото трябва

През ноември 2009 г. KEMA продаде своя бизнес за тестване и сертифициране при ниско напрежение на DEKRA. Като част от стратегията си, KEMA реши да се съсредоточи върху консултантски услуги и изпитвания за средно и високо напрежение и да продаде бизнеса с ниско напрежение. През ноември 2009 г. DEKRA придоби изцяло бизнеса с ниско напрежение (от потребителски електропродукти до прекъсвачи ниско напрежение). В резултат на това името на компанията се промени от 1 януари 2011 г. от KEMA Quality B.V. на DEKRA Certification B.V.

За DEKRA процедурата представляваше придобиване на платформа. Това означава, че няма промени в управлението и персонала на организацията за изпитвания и сертифициране при ниско напрежение. Всички лица за контакт, договори, акредитации и изпитвания остават непроменени.

**В това отношение изискваме отсега нататък да посочвате "DEKRA" за всяко оборудване ниско напрежение (до 1000 V AC и 1500 V DC), вместо "KEMA".**

Като DEKRA ние ще продължим да предлагаме сертификати за качество KEMA-KEUR и KEMA сертификати за изпитване на качеството, както и протоколи от изпитване на качеството на KEMA за определен период от време, за да постигнем плавен преход. Това се дължи на факта, че името на KEMA Quality е добре познато на пазара. Освен това ще започнем да издаваме сертификат DEKRA за изпитване и протоколи от изпитвания, за да позволим на крайните потребители, консултанти и фирми за комунални услуги да се запознаят с марката DEKRA. Така че през следващите години можете да очаквате да получите два комплекта сертификати и протоколи от изпитвания от производителите на оборудване ниско напрежение, един с марката "KEMA Quality" и един с марката "DEKRA".

DEKRA

DEKRA

Надяваме се, че горепосоченото обяснение изяснява прехвърлянето на бизнеса с ниско напрежение от KEMA към DEKRA и че става ясно, че ще продължим да издаваме KEMA сертификати за изпитване на качеството в допълнение към DEKRA сертификатите за изпитване.

Ако имате допълнителни въпроси или нужда от допълнителни действия от наша страна, моля, уведомете ни, като се свържете с г-н Kasper Nijkamp на тел. +31 26 356 2850 или на [kasper.nijkamp@dekra.com](mailto:kasper.nijkamp@dekra.com).

DEKRA Certification B.V.

Бивша KEMA Quality B.V.

подпис – не се чете

на основание чл. 36а, ал. 3  
от ЗОП

Mr. Kasper Nijkamp

Мениджър Бизнес развитие, компоненти

ВЕРНО С ОРГИНАЛА  
Подпис: .....

**Letter To:**

<b>To</b> Whoever it may concern	<b>Fax</b>	<b>Attn.:</b>
<b>From</b> Mr. Kasper Nijkamp	<b>Phone</b> +31 26 356 2850	<b>Our Reference</b> KNIJ/20-04-2011
<b>Fax</b> +31 26 352 5800	<b>E-mail</b> <a href="mailto:kasper.nijkamp@dekra.com">kasper.nijkamp@dekra.com</a>	
<b>Date</b> January 2011	<b>Number of pages</b>	

Subject: Transfer of Low Voltage business of KEMA to DEKRA

To whomever it may concern,

In November 2009 KEMA sold its Low Voltage Testing & Certification business to DEKRA. As part of their strategy KEMA decided to focus on consultancy services and medium and high voltage testing and to sell the low voltage business. In November 2009 the complete Low Voltage business (ranging from electrical consumer products upto low voltage switchgear assemblies) was therefore acquired by DEKRA. As a result the name changed from 1<sup>st</sup> of January 2011 from KEMA Quality B.V. into DEKRA Certification B.V.

For DEKRA it was a platform acquisition. This means that there are no changes in management and staff of the Low Voltage testing and certification organization. All contact persons, contracts, accreditations and test facilities remain the same.

**In that respect we would like to request you to specify "DEKRA" for all Low Voltage equipment (upto 1000 V AC and 1500 V DC) from now onwards instead of "KEMA".**

As DEKRA, we will continue to offer KEMA-KEUR certification and KEMA Quality Test Certificates and KEMA Quality Test Reports for a considerable period of time to achieve a smooth transition. This because of the recognition of the KEMA Quality name in the market. In addition, we will start to issue a DEKRA Test Certificate and Test Report to the market in order to let end-users, consultants and utility companies become familiar with the DEKRA brand. So, for the coming years you can expect to receive two sets of certificates and test reports from Low Voltage equipment manufacturers, one branded with "KEMA Quality" and one branded with "DEKRA".



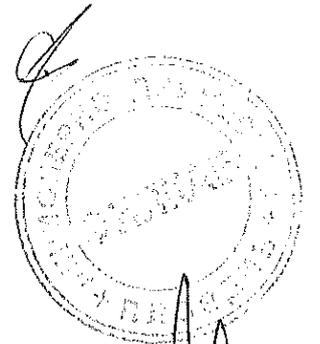
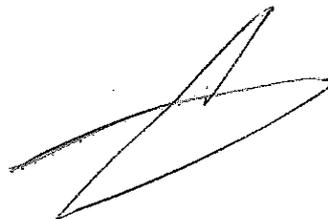
I hope the above explanation clarifies the transfer of the Low Voltage business from KEMA to DEKRA and that it is clear that we will continue to issue a KEMA Quality Test Certificate in addition to a DEKRA Test Certificate.

In case you have any further questions or if you require any further action from our side please let us know by contacting Mr. Kasper Nijkamp at +31 26 356 2850 or [kasper.nijkamp@dekra.com](mailto:kasper.nijkamp@dekra.com).

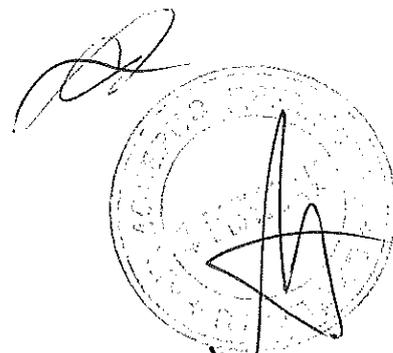
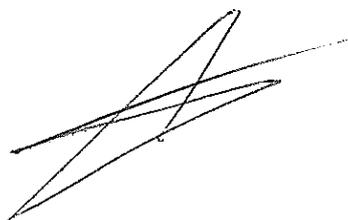
DEKRA Certification B.V.  
Former KEMA Quality B.V.

на основание чл. 36а, ал. 3  
от ЗОП

Mr. Kasper Nijkamp  
Business Development Manager Components

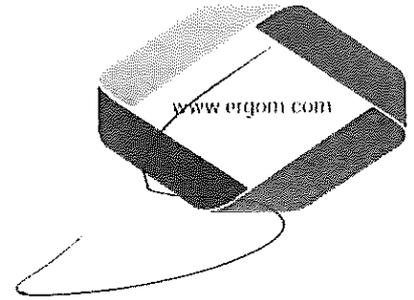


ВАРНО С ОБРАЗОВА  
Подпис: .....

**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 16**



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

Превод от английски език

### Декларация за съответствие 94/2015

Отнасяща се за: Алуминиеви кабелни съединители тип LAW и LAWP

С настоящото Отделът по качество декларира, че алуминиевите кабелни съединители тип LAW и LAWP, предложени от Z.A.E. ERGOM Ltd. са произведени в съответствие с техническата документация.

Dział Kontroli Jakości

на основание чл. 36а, ал. 3  
от ЗОП

Ръководител отдел Контрол на качеството

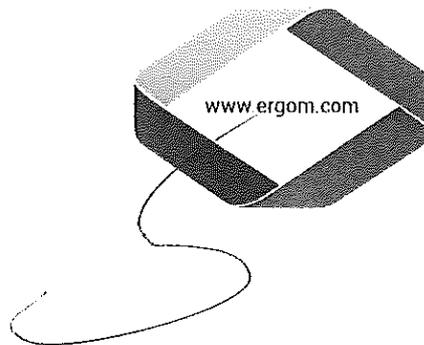


WIRING ACCESSORIES  
CABLE TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS



VAT: PL7260129071, Regan: 473076927, KRS: 0000132427  
Sgd Rejonowy dla łodzi - Srodmiescia w łodzi, XX Wydział Krajowego Rejestru Sądowego  
Initial Capital ERGOM Z.A.E. : 1 0.400.000,00 PLN  
Bank Zachodni WBK SA II/O Lodz, BIC: WBK PPLPP, IBAN: PL 16 1090 1304 00000000 3034 8970

Подпис: .....



Łódź 2015-07-27

## Declaration of conformity 94/2015

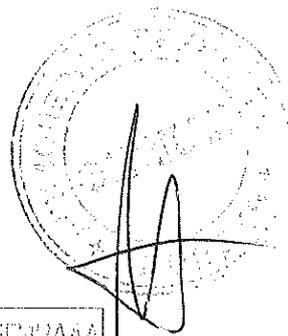
Concerning :Aluminum cable joints type LAW and LAWP

Quality Department hereby certify that the aluminum cable joints type LAW and LAWP type offered by Z.A.E. Ergom Ltd are manufactured accordingly to the Technical Documentation.

Dział Kontroli Jakości

на основании чл. 36а, ал. 3  
от ЗОП

Quality control dept. manager



WIRING ACCESSORIES  
CABLE TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS



Суд Rejonowy dla Łodzi – Śródmieście w Łodzi, XX Wydział Krajowego Rejestru Sądowego  
Initial Capital ERGOM Z.A.E. - 10.400.000,00 PLN  
Bank Zachodni WBK SA I/O Łódź, BIC: WBK PPLPP, IBAN: PL 16 1090 1304 0000 0000 3034 8970

## УДОСТОВЕРЕНИЕ ЗА СЪОТВЕТСТВИЕ

№. 2114131.100/A

Издава се на: Z.A.E. ERGOM Sp. zo.o.  
ul. Nowe Sady  
10 94-102 Лодз  
ПОЛША

За продукт: Гилза за кербоване

Търговска марка: ERGOM

Тип/модел LA 120 Aluminium

Размер: 120 mm<sup>2</sup> Aluminium

Произведени от: Z.A.E. ERGOM Sp. zo.o.  
ul. Nowe Sady  
10 94-102 Лодз  
ПОЛША

Предмет: Електрическо изпитване на типа, състоящо се от изпитвания на топлинния цикъл, включително изпитвания на късо съединение

Изисквания: EN/IEC 61238-1:2003 clause: 6, Електрически изпитания (Клас А)

Това удостоверение се издава на базата на проведени изпитвания KEMA, резултатите от които се намират в поверително досие № 2114131.01 издадено на 28 Ноември, 2008.

Изпитването беше проведено върху шест мостри от продукта, предоставени от производителя. Удостоверението не включвата оценка на продукцията на производителя. Съответствието на продукцията му с мострата, тествана от KEMA, не е отговорност на KEMA.

KEMA Quality B.V.  
Arnhem, 28 Ноември, 2008

на основание чл. 36а, ал. 3  
от ЗОП

H.R.M. Barends  
Мениджър сертифициране

\* Публикуването на този документ е позволено. Публикуването изцяло или частично и / или възпроизвеждането по какъвто и да е начин на съдържанието на гореспоменатия (те) доклад (и) не е позволено, освен ако изрично не е дадено разрешение или в доклада (ите) или в предишното писмо.

KEMA Quality B.V. Utrechtseweg 310, 6812 AR Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands T +31 26 3 56 20 00 F +31 26 3 52 58 00 [customer@kema.com](mailto:customer@kema.com) [www.kema.com](http://www.kema.com) Registered Arnhem 09085396

ОТРИЦАТЕЛНО С ОПИТИЕТА  
Experience you can trust.  
Подпис: .....



# ATTESTATION OF CONFORMITY

No. 2114131.100/A

Issued to: Z.A.E. ERGOM Sp. z o.o.  
ul. Nowe Sady 10  
94-102 L6DZ  
POLAND

For the product: Compression connector

Trade name: ERGOM

Type/Model: LA 120 Aluminium

Ratings: 120 mm<sup>2</sup> Aluminium

Manufactured by: Z.A.E. ERGOM Sp. z o.o.  
ul. Nowe Sady 10  
94-102 L6DZ  
POLAND

Subject: Electrical type test consisting of heat cycle tests including short-circuit tests.

Requirements: EN/IEC 61238-1:2003 clause: 6, Electrical tests (Class A)

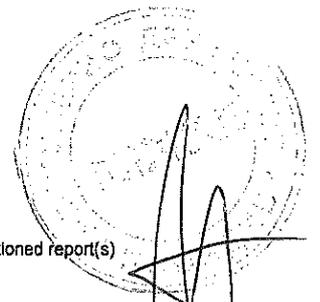
This Attestation is granted on account of an examination by KEMA, the results of which are laid down in a confidential test report no. 2114131.01 issued on November 28, 2008.

The examination has been carried out on six specimens of the product, submitted by the manufacturer. The Attestation does not include an assessment of the manufacturer's production. Conformity of his production with the specimen tested by KEMA is not the responsibility of KEMA

KEMA Quality B.V.  
Arnhem, November 28, 2008

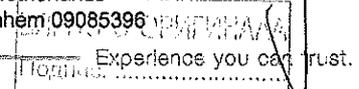
на основании чл. 36а, ал. 3  
от ЗОП

H.R.M. Barends  
Certification Manager



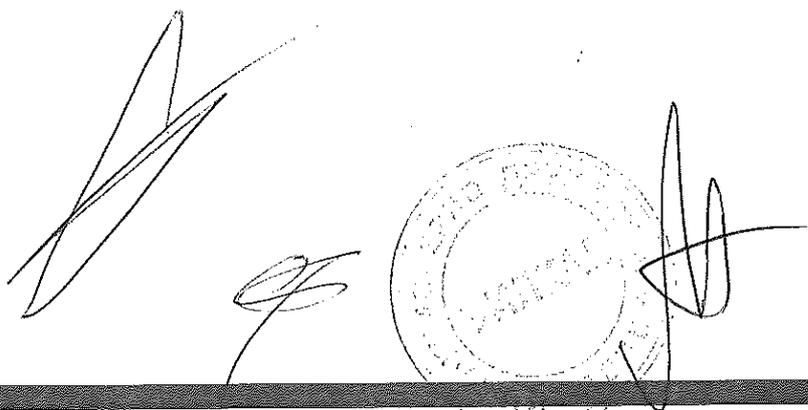
\*Publication of this document is allowed. Publication in total or in part and/or reproduction in whatever way of the contents of the above mentioned report(s) is not allowed unless permission has been explicitly given either in the report(s) or by previous letter.

KEMA Quality B.V. Utrechtseweg 310, 6812 AR Arnhem P.O. Box 5185, 6802 ED Arnhem The Netherlands  
T +31 26 3 56 20 00 F +31 26 3 52 58 00 customer@kema.com www.kema.com Registered Arnhem 09085396



**Приложение 2 към Техническо предложение**За обособена позиция № 2:

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

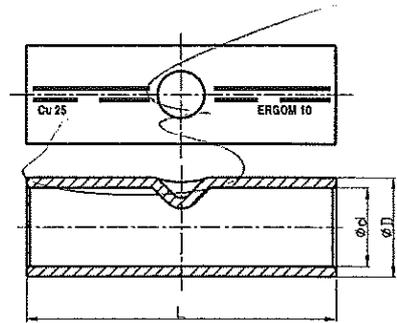
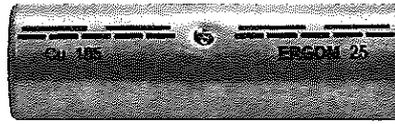
ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ  
ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ**Приложение 17**The image shows three handwritten signatures in black ink. To the right of the signatures is a circular stamp with a dotted border. The text inside the stamp is partially legible and appears to be in Bulgarian, possibly indicating a company or official seal. The signatures are written over a white background.

## Butt connectors KLD type



**Material** Cu.  
**Surface** tin-plated.  
**Design** DIN 46267 part 1.  
**Napięcie** 1÷10 kV.

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



Type	Item No.	Cross section (mm <sup>2</sup> )	Dimension (mm)			Die code No.	Crimping		Packaging [pc]	Weight of package [kg]
			ℓ	d	D		Nc/w	Nc/n		
KLD 10	E11KM-02060100100	10	30	4,5	6,0	6	1-1	2-2	100	0,38
KLD 16	E11KM-02060100200	16	50	5,5	8,5	8	1-1	2-2	100	1,49
KLD 25	E11KM-02060100300	25	50	7,0	10,0	10	1-1	2-2	100	1,80
KLD 35	E11KM-02060100400	35	50	8,2	12,5	12	1-1	2-2	100	3,15
KLD 50	E11KM-02060100500	50	56	10,0	14,5	14	1-1	3-3	100	4,40
KLD 70	E11KM-02060100600	70	56	11,5	16,5	16	1-1	3-3	100	5,50
KLD 95	E11KM-02060100700	95	70	13,5	19,0	18	2-2	4-4	50	4,40
KLD 120	E11KM-02060100800	120	70	15,5	21,0	20	2-2	4-4	50	4,90
KLD 150	E11KM-02060100900	150	80	17,0	23,5	22	2-2	4-4	50	7,40
KLD 185	E11KM-02060101000	185	85	19,0	25,5	25	2-2	5-5	50	8,55
KLD 240	E11KM-02060101100	240	90	21,5	29,0	28	2-2	5-5	50	11,95
KLD 300	E11KM-02060101200	300	100	24,5	32,0	32	2-2	-	25	7,55
KLD 400	E11KM-02060101300	400	150	27,5	38,5	38	3-3	-	25	19,30
KLD 500	E11KM-02060101400	500	160	31,0	42,0	42	3-3	-	25	22,80
KLD 625	E11KM-02060101500	625	160	34,5	44,0	44	3-3	-	10	8,50
KLD 800	E11KM-02060101601	800	200	40,0	52,0	52	3-3	-	10	15,10
KLD 1000	E11KM-02060101701	1000	200	44,0	58,0	58	3-3	-	10	19,80

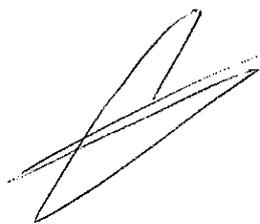
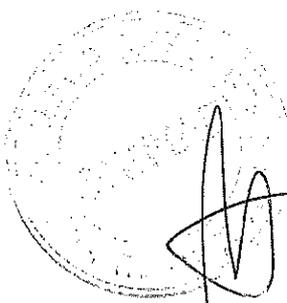
Nc/w = No. of crimping wide | Nc/n = No. of crimping narrow

Technologia zaciskania końcówek i łączników rurowych Cu wg DIN %s

Dedykowane praski ręczne i hydrauliczne %s

*[Handwritten signatures and stamps]*

БАСИО С ОМОНОВА  
 Подпись: .....

**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 18**  
  
  


**ИНСТИТУТ ПО ЕНЕРГЕТИКА**

01-330 Варшава ул. Mory 8 tel./fax 22 836-80-16 e-mail: [ewp@ien.com.pl](mailto:ewp@ien.com.pl) [www.ien.com.pl/ewp](http://www.ien.com.pl/ewp)



**INSTITUTE OF POWER ENGINEERING**  
**ЛАБОРАТОРИЯ ВИСОКО НАПРЕЖЕНИЕ**  
**HIGH CURRENT LABORATORY**



AB 323

**ПРОТОКОЛ ОТ ИЗПИТВАНЕ**  
**ЕWP/31/Е/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<sup>2</sup>,  
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

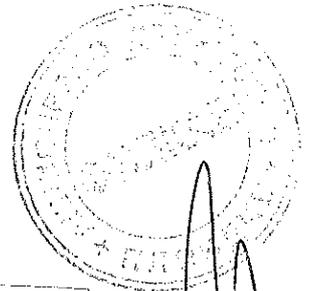
подпис: не се чете

**Одобрил Мениджър на лабораторията:**

mgr inz. Maciej Owsinski

подпис: не се чете

Варшава, 03.02.2017r.



Резултатите от изпитването се отнасят само за тествания обект. Лабораторията не разрешава без писменото съгласие на лабораторията публикуването или възпроизвеждането на протокола в различна форма от пълно копие

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 35mm<sup>2</sup>, 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

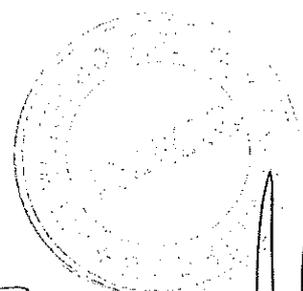
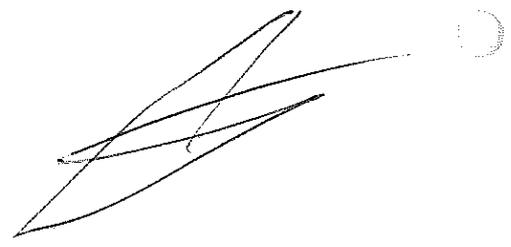
**AUTORYZOWAŁ  
KIEROWNIK BADAŃ:**

mgr inż. Grzegorz Zaboklicki  
на основании чл. 36а, ал. 3  
от ЗОП

Warszawa, 03.02.2017r.

**ZATWIERDZIŁ  
KIEROWNIK LABORATORIUM**

mgr inż. Maciej Owsieński  
на основании чл. 36а, ал. 3  
от ЗОП

**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 19**



Лодз, 10.02.2016

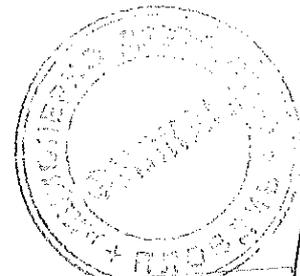
## Декларация за съответствие 08/2016

1. **Производител:** ZAE ERGOM Sp. z o. o  
94-102 Lodz ul. Nowe Sady 10
2. **Продукт:** Медни кабелни съединители (гилзи) **KLD**
3. **Класификация:** PKW i U 27.33.130
4. **Употреба и обхват на използване:** използва се за завършек на медни жила на проводници.
5. **Техническа спецификация:** Накрайниците съответстват на изискванията на DIN 46267-1.
6. **Партида, която е обхваната от декларацията:** 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



Вариант с оригинала  
Подпис: .....



Łódź 10.02.2016

## Declaration of conformity 08/2016

1. **Product manufacturer:** ZAE ERGOM Sp. z o.o.  
94-102 Łódź ul. Nowe Sady 10
2. **Product name :** Copper tubular cable joints type KLD.

**Product classification:** PKW i U 27.33.130

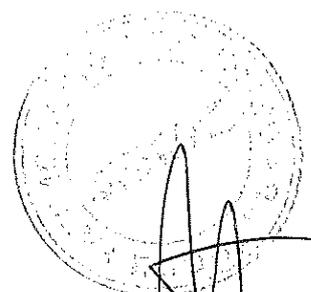
- 3.
4. **Product application and the range of usage:** used for termination of copper conductors of energetics wires.
5. **Technical specification:** Terminals are compliant with norm DIN 46267-1
6. **Batch covered by the declaration:** products purchased by the customer.

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

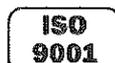
Dział Kontroli Jakości  
*Specialist w obs. Jakości*

на основании чл. 36а, ал. 3  
от ЗОП

Quality control dept. manager



AKCESORIA DO OKABLOWANIA  
KOŃCÓWKI KABLOWE  
NARZĘDZIA DLA ELEKTRYKÓW  
ROZDZIELNICE I OBUDOWY



NIP: 726-01-29 071, Regon: 473076927; KRS: 0000132427  
Sąd Rejonowy dla Łodzi - Śródmieście 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



Превод от английски език

Lodz 08.05.2015

## Сертификат за качество 60/2015

**Производител на продукта:** ZAE ERGOM Sp. z o. o  
Nowe Sady 10  
94-102 Lodz  
Poland

**Тип на продукта:** Кабелен гилзи KLD

Отделът по Качество на Z.A.E. ERGOM Sp. z o. o с настоящето декларира, че кабелните гилзи KDR отговарят на следните спецификации:

- отговарят на DIN 46267 за конструкция
- отговарят на данните в каталога на ERGOM

Dział Kontroli Jakości  
Spółzistwo z os. z o. o.

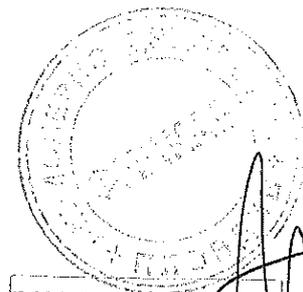
на основание чл. 36а, ал. 3  
от ЗОП

Мениджър Отдел Качество

WIRING ACCESSORIES  
TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS

ISO  
9001

VAT: PL7260129071, Regan: 473076927, KRS: 0000132427  
Sgd Rejonowy dla todzi - Srodmiescia w todzi, XX Wydzial Krajowego Rejestru Sądowego  
Initial Capital ERGOM Z.A.E. : 1 0.400.000,00 PLN  
Bank Zachodni WBK SA II/O Lodz, BIC: WBK PPLPP, IBAN: PL 16 1090 1304 00000000 3034 8970



ВАННО С ОБЯЗАН  
Подпис: .....



Łódź, 08.05.2015

## QUALITY CERTIFICATE 60/2015

**Producer :** Z.A.E. ERGOM Sp. z o.o.  
Nowe Sady 10  
94-102 Łódź  
Poland

**Type of equipment:** cable joints, KLD type

Quality Department of Z.A.E. ERGOM Sp. z o.o. hereby declare that cable lugs KDR meets following specifications:

- meets DIN 46267 design
- meets data in the ERGOM Catalogue

Dział Kontroli Jakości

на основании чл. 36а, ал. 3  
от ЗОП

Quality control dept. manager



WIRING ACCESSORIES  
CABLE TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS

ISO  
9001

VAT: PL.7260129071, Regon: 473076927, KRS: 0000132427  
Sąd Rejonowy dla Łodzi – Śródmieście 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: WBKPPLPR, IBAN: PL 16 1090 1304 0000 3034 8970



**ИНСТИТУТ ПО ЕНЕРГЕТИКА**  
Изследователски институт  
01-330 Варшава, ул. Mory 8  
тел. +48 22 34 51 299, факс. +48 22 836 63 63  
[instytut.energetyki@icn.com.pl](mailto:instytut.energetyki@icn.com.pl)

## СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ

№ 071/2018  
Издание № 01 от 23.07.2018

Име и адрес на  
Притежателя сертификата: Отдел Електрическо Оборудване ERGOM Sp. z o. o.  
ул. Нови сад 10  
94-102 Лодз

Име на продукта: Медни тръбни кабелни обувки / кабелни гилзи съгласно DIN

Тип: KDR 25-240/ KLD 25-240

Производител: Отдел Електрическо Оборудване ERGOM Sp. z o. o.  
ул. Нови сад 10  
94-102 Лодз, Полша

Параметри и приложение: Според приложението  
Свързване и завършване на медни кабели с жила клас 2 с  
параметри съгласно приложението

Продуктът отговаря на  
изискванията на: PN-EN 61238-1:2004

Според докладите  
направени от: Институт по енергетика, ZAE ERGOM

Номер на докладите за  
оценка на продукта: DZC/186c/E-2016-5

Номер на протоколите  
за изпитване: 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

Период на валидност: от 23 юли 2018 г. до 22 юли 2021 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.

Списъкът с доказаните параметри е включен в приложенията на сертификата за съответствие.

Брой приложения: 1

**СИСТЕМАТА НА СПЕЦИФИКАЦИЯ НА ПРОДУКТА ТУПУ 1а (PN-EN ISO/IEC 17067:2014-01)**  
(параметрите на продукта са потвърдени с типови изпитания)

Варшава, 23.07.2018 г.

ДИРЕКТОР  
НА ИНСТИТУТА ПО ЕНЕРГЕТИКА  
подпис: не се чете  
Проф. Д-р инж. Иржи Пржибиш

ВЕРНО С ОПИГНАЛА  
Подпис: .....

# ПРИЛОЖЕНИЕ КЪМ СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ

№ 071/2018

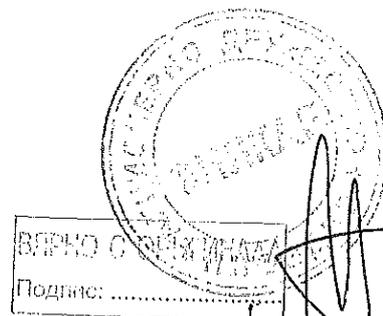
Издание № 01 от 23.07.2018

СПИСКЪК НА ДОКАЗАНИ ПАРАМЕТРИ

Параметри	KDR 25-240	KLD 25-240
Клас	A	A
Форма на кабелите/жилата (mm <sup>2</sup> )	rmv, rmc, rm, sm / 25÷240	rmv, rmc, rm, sm / 25÷240
Първоначално напукване $\delta^{1)}$	$\leq 0,30$	$\leq 0,30$
Междинно напукване $\beta^{2)}$	$\leq 0,30$	$\leq 0,30$
Коефициент на устойчивост $\lambda^{3)}$	$\leq 2,0$	$\leq 2,0$
Промяна в коефициент на устойчивост $D^{4)}$	$\leq 0,15$	$\leq 0,15$
Максимална температура $\theta_{max}^{5)}$	$\leq \theta_{ref}$	$\leq \theta_{ref}$
Допустима сила на опън (N)	$\leq 60 \times A^{6)} Cu$	$\leq 60 \times A^{6)} Cu$

## ЗАБЕЛЕЖКИ:

- 1) <sup>1)</sup> Средната стойност на коефициентите на устойчивост на 6 гилзи (обувки) преди първия цикъл на нагряване;
- 2) <sup>2)</sup> Средната стойност на коефициентите на устойчивост на 6 гилзи (обувки) изчислени на база последните 11 отчетени измервания. С нея се определя дали всички гилзи (обувки) от даден вид се характеризират с подобни промени в устойчивостта по време на цикъла на нагряване;
- 3) <sup>3)</sup> Коефициент на устойчивост на тестваните гилзи (обувки) по време на цикъла на нагряване спрямо първоначалния коефициент на устойчивост;
- 4) <sup>4)</sup> Стойността показва промяната на степен на устойчивост на база на последните 11 измерени стойности;
- 5) <sup>5)</sup> Температура на гилзи (обувки) отнесена към температурата на съответната секция;
- 6) <sup>6)</sup> Номинално сечение





AC 117

INSTYTUT ENERGETYKI

Research Institute

01-330 Warszawa, ul. Mory 8

tel. +48 22 34 51 299

fax. +48 22 836 63 63

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 connectors 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 23<sup>rd</sup> of July 2017 until 22<sup>nd</sup> 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)

pp of the DIRECTOR OF  
INSTYTUT ENERGETYKI

на основании 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

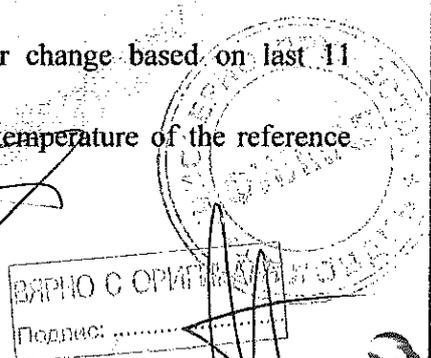
Issue No. 01 of 2018.07.23

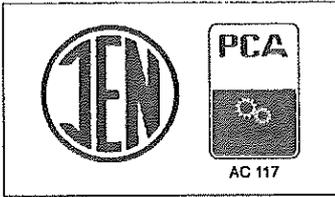
#### LIST OF EVIDENCED PARAMETERS

Element type	KDR 25-240	KLD 25-240
Class	A	A
Shape of Cu cables /conductors [mm <sup>2</sup> ]	rmv, rmc, rm, sm / 25 ÷ 240	rmv, rmc, rm, sm / 25 ÷ 240
Initial scatter $\delta^{1)}$	$\leq 0,30$	$\leq 0,30$
Mean scatter $\beta^{2)}$	$\leq 0,30$	$\leq 0,30$
Resistance factor ratio $\lambda^{3)}$	$\leq 2,0$	$\leq 2,0$
Change in resistance factor D <sup>4)</sup>	$\leq 0,15$	$\leq 0,15$
Maximum temperature $\theta_{max}^{5)}$	$\leq \theta_{ref}$	$\leq \theta_{ref}$
Permissible tensile force [N]	$\leq 60 \times A^{6)}$ Cu	$\leq 60 \times A^{6)}$ Cu

#### NOTES:

- 1) <sup>1)</sup> The average value of the resistance factors of six connectors (lugs) before the first heating cycle.
- 2) <sup>2)</sup> 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) <sup>3)</sup> Resistance factor ratio of tested connector (lug) during the heat cycle test in relation to the initial resistance factor.
- 4) <sup>4)</sup> The value specifies the size of the resistance factor change based on last 11 measurements readings.
- 5) <sup>5)</sup> Temperature of the connector (lug) referenced to the temperature of the reference section.
- 6) <sup>6)</sup> Nominal cross-sectional area





**ИНСТИТУТ ПО ЕНЕРГЕТИКА**  
Изследователски институт  
01-330 Варшава, ул. Мору 8  
тел. +48 22 34 51 299, факс. +48 22 836 63 63  
[instytut.energetyki@icn.com.pl](mailto:instytut.energetyki@icn.com.pl)

**СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ**  
**№ 071/2018**  
Издание № 03 от 18.12.2019

Име и адрес на  
Притежателя сертификата: Отдел Електрическо Оборудване ERGOM Sp. z o. o.  
ул. Нови сад 10  
94-102 Лодз

Име на продукта: Медни тръбни кабелни обувки / Кабелни гилзи

Тип: KDR 10-240/ KLD 10-240

Производител. Отдел Електрическо Оборудване ERGOM Sp. z o. o.  
ул. Нови сад 10  
94-102 Лодз, Полша

Параметри и приложение: Според приложението  
Свързване и завършване на медни кабели с жила клас 2 с  
параметри съгласно приложението

Продуктът отговаря на  
изискванията на: IEC 61238-1:2003 (изд. 2.0)

Според докладите  
направени от: Институт по енергетика, ZAE ERGOM, SEP-BBJ

Номер на докладите за  
оценка на продукта: DZC/186c/E-2016-5

Номер на протоколите  
за изпитване: 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

Период на валидност: от 18 февруари 2019 г. до 22 юли 2021 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.

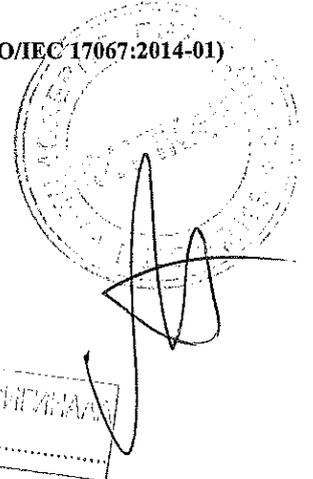
Списъкът с доказаните параметри е включен в приложенията на сертификата за съответствие.

Брой приложения: 1

**СИСТЕМАТА НА СПЕЦИФИКАЦИЯ НА ПРОДУКТА PC 1\_1a (Програма 1a съгл. PN-EN ISO/IEC 17067:2014-01)**  
(параметрите на продукта са потвърдени с типови изпитания)

Варшава, 18.02.2019 г.

ДИРЕКТОР  
НА ИНСТИТУТА ПО ЕНЕРГЕТИКА  
подпис: не се чете  
Д-р инж. Томаш Галка



# ПРИЛОЖЕНИЕ КЪМ СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ

№ 071/2018

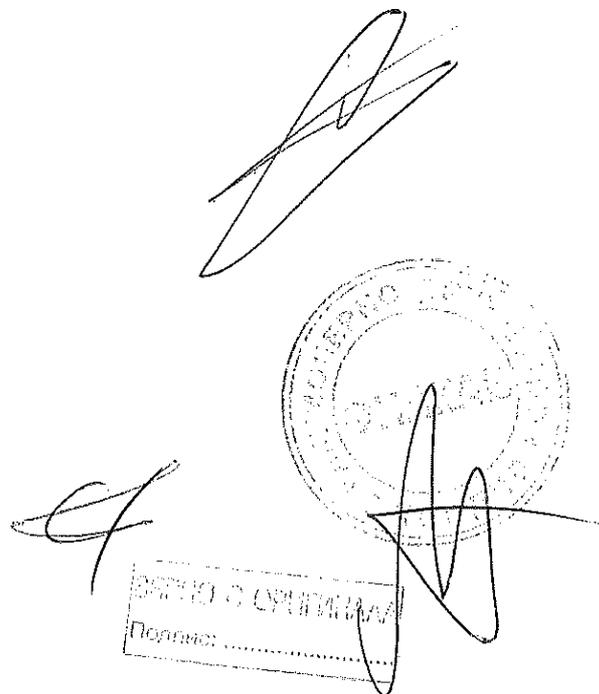
Издание № 03 от 18.12.2019

СПИСЪК НА ДОКАЗАНИ ПАРАМЕТРИ

Параметри	KDR 10-240	KLD 10-240
Клас	A	A
Форма на кабелите/жилата (mm <sup>2</sup> )	rmv, rmc, rm, sm / 10÷240	rmv, rmc, rm, sm / 10÷240
Първоначално напукване $\delta^1$ )	$\leq 0,30$	$\leq 0,30$
Междинно напукване $\beta^2$ )	$\leq 0,30$	$\leq 0,30$
Коефициент на устойчивост $\lambda^3$ )	$\leq 2,0$	$\leq 2,0$
Промяна в коефициент на устойчивост $D^4$ )	$\leq 0,15$	$\leq 0,15$
Максимална температура $\theta_{max}^5$ )	$\leq \theta_{ref}$	$\leq \theta_{ref}$
Допустима сила на опън (N)	$\leq 60xA^6$ ) Cu	$\leq 60xA^6$ ) Cu

## ЗАБЕЛЕЖКИ:

- 1) <sup>1)</sup> Средната стойност на коефициентите на устойчивост на 6 гилзи (обувки) преди първия цикъл на нагряване;
- 2) <sup>2)</sup> Средната стойност на коефициентите на устойчивост на 6 гилзи (обувки) изчислени на база последните 11 отчетени измервания. С нея се определя дали всички гилзи (обувки) от даден вид се характеризират с подобни промени в устойчивостта по време на цикъла на нагряване;
- 3) <sup>3)</sup> Коефициент на устойчивост на тестваните гилзи (обувки) по време на цикъла на нагряване спрямо първоначалния коефициент на устойчивост;
- 4) <sup>4)</sup> Стойността показва промяната на степен на устойчивост на база на последните 11 измерени стойности;
- 5) <sup>5)</sup> Температура на гилзи (обувки) отнесена към температурата на съответната секция;
- 6) <sup>6)</sup> Номинално сечение



ПОДПИС: .....



AC 117

INSTYTUT ENERGETYKI

Research Institute

01-330 Warszawa, ul. Mory 8

tel. +48 22 34 51 299

fax. +48 22 836 63 63

instytut.energetyki@icn.com.pl

# 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 18<sup>th</sup> of February 2019 until 22<sup>nd</sup> 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)

DIRECTOR OF  
INSTYTUT ENERGETYKI  
на основании чл. 36а, ал. 3  
от ЗОП

dr hab. inż. Tomasz Gaika prof. IEN

Warsaw, 2019.02.18



AC 117

### APPENDIX TO CERTIFICATE OF CONFORMITY

No. 071/2018

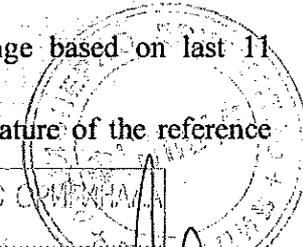
Issue No. 03 of 2019.02.18

#### LIST OF EVIDENCED PARAMETERS

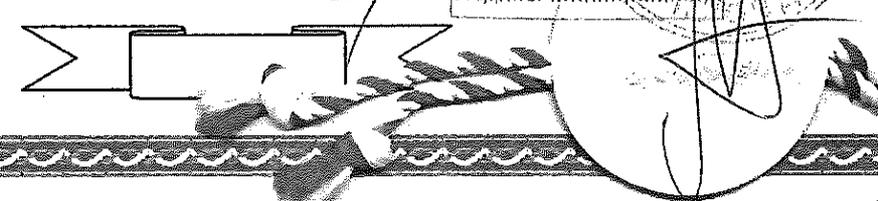
Element type	KDR 10-240	KLD 10-240
Class	A	A
Shape of Cu cables /conductors [mm <sup>2</sup> ]	rmv, rmc, rm, sm / 10 ÷ 240	rmv, rmc, rm, sm / 10 ÷ 240
Initial scatter $\delta^{1)}$	$\leq 0,30$	$\leq 0,30$
Mean scatter $\beta^{2)}$	$\leq 0,30$	$\leq 0,30$
Resistance factor ratio $\lambda^{3)}$	$\leq 2,0$	$\leq 2,0$
Change in resistance factor $D^{4)}$	$\leq 0,15$	$\leq 0,15$
Maximum temperature $\theta_{max}^{5)}$	$\leq \theta_{ref}$	$\leq \theta_{ref}$
Permissible tensile force [N]	$\leq 60xA^{6)}$ Cu	$\leq 60xA^{6)}$ Cu

#### NOTES:

- 1) <sup>1)</sup> The average value of the resistance factors of six connectors (lugs) before the first heating cycle.
- 2) <sup>2)</sup> 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) <sup>3)</sup> Resistance factor ratio of tested connector (lug) during the heat cycle test in relation to the initial resistance factor.
- 4) <sup>4)</sup> The value specifies the size of the resistance factor change based on last 11 measurements readings.
- 5) <sup>5)</sup> Temperature of the connector (lug) referenced to the temperature of the reference section.
- 6) <sup>6)</sup> Nominal cross-sectional area



ВЕРНО С ОМІННА  
Підпис: .....



# 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](http://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**

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моля свържете се с местния представител на UL за обслужване на клиенти на адрес <http://ul.com/aboutul/locations/>

# 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.

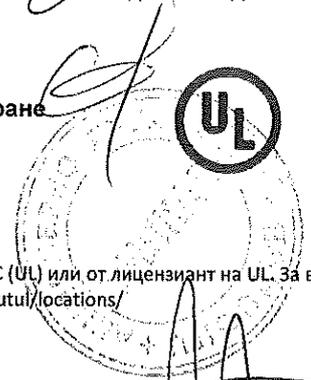
USL, CNL както следва, Неизолирани кабелни обувки серии KW (вилкови) включват следните модели №:

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



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ПОЛНО С ОРИГИНАЛ  
Подпис: .....

# СЕРТИФИКАТ ЗА СЪОТВЕТСТВИЕ

3

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

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

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

USL, CNL както следва, Неизолирани кабелни гилзи серии SKL (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.

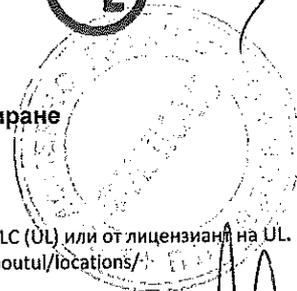
Неизолирани кабелни гилзи за кербоване серии KLD (Гилзи за свързване на кабели) включват следните модели №:

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



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# 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** WIRE CONNECTORS AND SOLDERING LUGS  
**representative samples of** 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](http://www.ul.com/database) for additional information

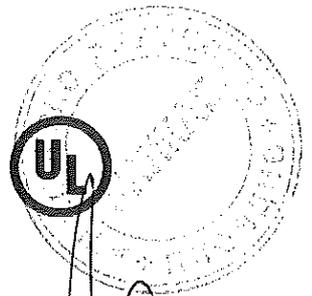
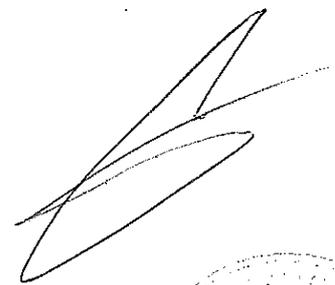
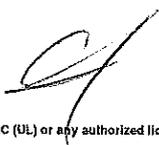
Only those products bearing the UL Certification Mark should be considered as being covered by UL's Certification and Follow-Up Service.

Look for the UL Certification Mark on the product.

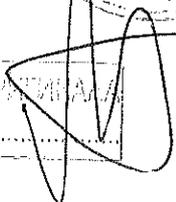
на основании чл. 36а, ал. 3  
от ЗОП

Bruce Mahrenholz, Director North American Certification Program  
UL LLC

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ВЕРНО С ОРАВИА  
Подписано: .....



# 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):

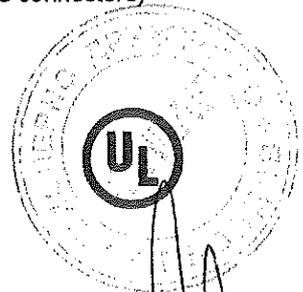
Cat. Nos.: KW 1/2.5, KW 1/3, KW 1/3.5, KW 1/4, KW 1/4 W, KW 1/5, KW 1/6, KW 1/8, KW 1/10, KW 2.5/3, KW 2.5/3.5, KW 2.5/4, KW 2.5/4 W, KW 2.5/5, KW 2.5/6, KW 2.5/8, KW 2.5/10, KW 2.5/12, KW 6/3.5, KW 6/4, KW 6/5, KW 6/6, KW 6/8, KW 6/10, KW 10/5, KW 10/6, KW 10/8, KW 10/10, KW 16/5, KW 16/6, KW 16/8, KW 16/10.

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

на основании 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/about/locations/>



# 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 основании чл. 36а, ал. 3  
от ЗОП

Bruce Mahrenholz, Director North American Certification Program  
UL LLC

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Превод от английски език

Lodz 2018-01-12

### Сертификат за качество 03/2018

**Отнася се до:** Якост на опън на кабелни гилзи  
**Тип на продукта:** Кабелни гилзи KLD

С настоящето декларираме, че оферираните от ERGOM медни кабелни гилзи са произведени в съответствие с изискванията на EN 61238-1 и имат следните сили на счупване:

1. Сечение 150 мм<sup>2</sup> – 900 daN
2. Сечение 185 мм<sup>2</sup> – 1100 daN
3. Сечение 240 мм<sup>2</sup> – 1440 daN
4. Сечение 300 мм<sup>2</sup> – 1800 daN
5. Сечение 400 мм<sup>2</sup> – 2400 daN

Dział Kontroli Jakości

на основание чл. 36а, ал. 3  
от ЗОП

Мениджър Отдел Качество

WIRING ACCESSORIES  
TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS

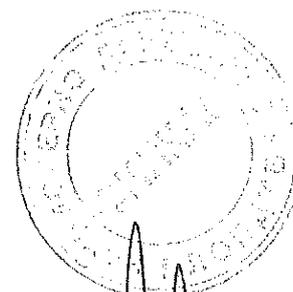
ISO  
9001

VAT: PL7260129071, Regan: 473076927, KRS: 0000132427

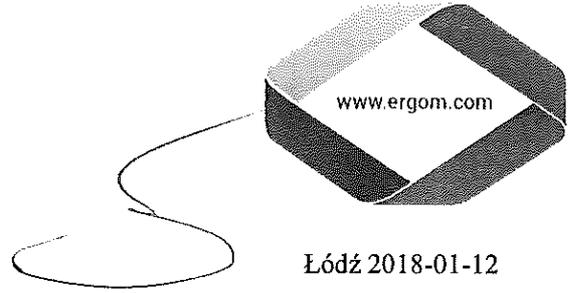
Sgd Rejonowy dla łodzi - Śródmieścia w łodzi, XX Wydział Krajowego Rejestru Sądowego

Initial Capital ERGOM Z.A.E. : 1 0.400.000,00 PLN

Bank Zachodni WBK SA II/O Łódź, BIC: WBK PPLPP, IBAN: PL 16 1090 1304 00000000 3034 8970



СЕРТИФИКАТ  
№ 03/2018



## 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<sup>2</sup> – 900 daN
2. Cross section 185 mm<sup>2</sup> – 1100 daN
3. Cross section 240 mm<sup>2</sup> – 1440 daN
4. Cross section 300 mm<sup>2</sup> – 1800 daN
5. Cross section 400 mm<sup>2</sup> – 2400 daN

Quality control dept. manager.

Dział Kontroli Jakości  
*Specialist / c/s Jakości*

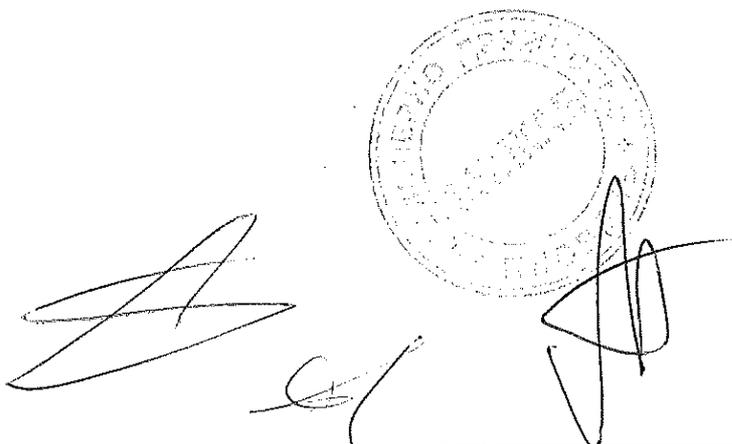
на основании чл. 36а, ал. 3  
от ЗОП



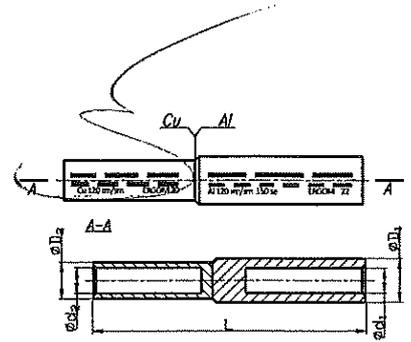
AKCESORIA DO OKABLOWANIA  
KOŃCÓWKI KABLOWE  
NARZĘDZIA DLA ELEKTRYKÓW  
ROZDZIELNICE I OBUDOWY



NIP: 726-01-29 071, Regon: 473076927, KRS: 0000132427  
Sąd Rejonowy dla Łodzi - Śródmieście 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

**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 20**

## Aluminium-copper butt connectors LMAN type



**Material** Al-Cu.  
**Surface** uncoated.  
**Design** DIN 46235 – concern only the tubular (Cu) part of terminal.  
 DIN 46329 – concern only the tubular (Al) part of terminal.  
**Napięcie** 1=10 kV.

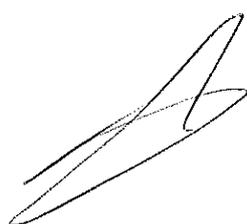
**Note!**  
 – terminals are filled with special contact grease and packed in foil;  
 – sector shaped conductors must be rounded with special dies.

Type	Item No.	Cross section Al [mm <sup>2</sup> ]		Cross section Cu [mm <sup>2</sup> ]	Dimension [mm]	Dimension Al [mm]		Dimension Cu [mm]		Crimping				Packaging [pc]	Weight of package [kg]	
		mm / sm	re / se			mm / sm	L	d <sub>1</sub>	D <sub>1</sub>	d <sub>2</sub>	D <sub>2</sub>	Die code No. Al	Die code No. Cu			No. of crimping wide Al
LMAN 25/10	E13KC-01030100100			10	60			4,5	6,0	6						0,16
LMAN 25/16	E13KC-01030100200			16				5,5	8,5	8						0,21
LMAN 25/25	E13KC-01030100300	25	35	25	65	6,8	12,0	7,0	10,5	12	10	2	1	4	2	0,22
LMAN 25/35	E13KC-01030100400			35				8,2	12,5	12						0,36
LMAN 35/16	E13KC-01030100500			16				5,5	8,5	8						0,30
LMAN 35/25	E13KC-01030100600			25	77			7,0	10,5	14	10	3	1	5	2	0,32
LMAN 35/35	E13KC-01030100700	35	50	35		8,0	14,0	8,2	12,5	12					10	0,97
LMAN 35/50	E13KC-01030100800			50	86			10,0	14,5	14			2		3	0,54
LMAN 50/16	E13KC-01030101000			16				5,5	8,5	8						0,37
LMAN 50/25	E13KC-01030101100			25	77			7,0	10,5	16	10	3	1	5	2	0,39
LMAN 50/35	E13KC-01030101200	50	70	35		9,8	16,0	8,2	12,5	12					10	0,45
LMAN 50/50	E13KC-01030101300			50	86			10,0	14,5	14						0,54
LMAN 70/16	E13KC-01030101400			16				5,5	8,5	8						0,53
LMAN 70/25	E13KC-01030101500			25	87			7,0	10,5	10			1		2	0,54
LMAN 70/35	E13KC-01030101600			35				8,2	12,5	12						0,60
LMAN 70/50	E13KC-01030101700	70	95	50	96	11,2	18,5	10,0	14,5	18	14	3		6	3	0,70
LMAN 70/70	E13KC-01030101800			70				11,5	16,5	16						0,75
LMAN 70/95	E13KC-01030101900			95	102			13,5	19,0	18			2			1,10
LMAN 70/120	E13KC-01030102000			120				15,5	21,0	20					4	1,20
LMAN 95/16	E13KC-01030102100			16				5,5	8,5	8						0,78
LMAN 95/25	E13KC-01030102200			25	93			7,0	10,5	10			1		2	0,80
LMAN 95/35	E13KC-01030102300			35				8,2	12,5	12						0,86
LMAN 95/50	E13KC-01030102400	95	120	50	102	13,2	22,0	10,0	14,5	22	14	3		6	3	0,96
LMAN 95/70	E13KC-01030102500			70				11,5	16,5	16						1,02
LMAN 95/95	E13KC-01030102600			95	108			13,5	19,0	18			2			1,17
LMAN 95/120	E13KC-01030102700			120				15,5	21,0	20					4	1,26
LMAN 120/16	E13KC-01030102800			16				5,5	8,5	8						0,83
LMAN 120/25	E13KC-01030102900			25	93			7,0	10,5	10					2	0,84
LMAN 120/35	E13KC-01030103000			35				8,2	12,5	12						0,90
LMAN 120/50	E13KC-01030103100	120	150	50	102	14,7	23,0	10,0	14,5	22	14	3	3	6	3	1,00
LMAN 120/70	E13KC-01030103200			70				11,5	16,5	16						1,10
LMAN 120/95	E13KC-01030103300			95	108			13,5	19,0	18						1,22
LMAN 120/120	E13KC-01030103400			120				15,5	21,0	20					4	1,26
LMAN 150/16	E13KC-01030103500			16				5,5	8,5	8						1,03
LMAN 150/25	E13KC-01030103600			25	97			7,0	10,5	10			1		2	1,05
LMAN 150/35	E13KC-01030103700			35				8,2	12,5	12						1,11
LMAN 150/50	E13KC-01030103800			50	106			10,0	14,5	25	14	3		6	3	1,21
LMAN 150/70	E13KC-01030103900	150	185	70		16,3	25,0	11,5	16,5	16						1,26
LMAN 150/95	E13KC-01030104000			95				13,5	19,0	18			2			1,43
LMAN 150/120	E13KC-01030104100			120	112			15,5	21,0	20					4	1,48
LMAN 150/150	E13KC-01030104200			150				17,0	23,5	22						1,63
LMAN 185/50	E13KC-01030104300			50				10,0	14,5	14						1,58
LMAN 185/70	E13KC-01030104400			70	109			11,5	16,5	16						1,64
LMAN 185/95	E13KC-01030104500			95				13,5	19,0	18						1,80
LMAN 185/120	E13KC-01030104600	185	240	120	115	18,3	28,5	15,5	21,0	28	20	3		6		1,85
LMAN 185/150	E13KC-01030104700			150				17,0	23,5	22						2,02
LMAN 185/185	E13KC-01030104800			185	120			19,0	25,5	25						2,17

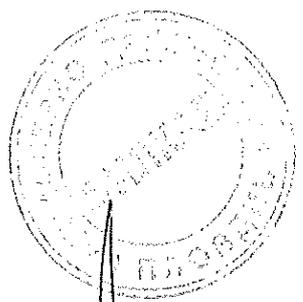
Type	Item No.	Cross section Al [mm <sup>2</sup> ]		Dimension [mm]	Dimension Al [mm]		Dimension Cu [mm]		Die code No. Al	Die code No. Cu	Crimping				Packaging [pc]	Weight of package [kg]	
		mm / sm	re / se		mm / sm	L	d <sub>1</sub>	D <sub>1</sub>			d <sub>2</sub>	D <sub>2</sub>	No. of crimping wide Al	No. of crimping wide Cu			No. of crimping narrow Al
LMAN 240/50	E13KC-01030104900			50	121		10,0	14,5		14					3	2,06	
LMAN 240/70	E13KC-01030105000			70			11,5	16,5		16						2,12	
LMAN 240/95	E13KC-01030105100			95			13,5	19,0		18						2,28	
LMAN 240/120	E13KC-01030105200	240	300	120	127	21,0	32,0	15,5	21,0	32	20	3	2	8	4	10	2,34
LMAN 240/150	E13KC-01030105300			150			17,0	23,5		22						2,50	
LMAN 240/185	E13KC-01030105400			185	132		19,0	25,5		25					5	2,65	
LMAN 240/240	E13KC-01030105500			240			21,5	29,0		28					-	2,91	
LMAN 300/120	E13KC-01030105600			120			15,5	21,0		20					4	2,78	
LMAN 300/150	E13KC-01030105700			150			17,0	23,5		22						3,11	
LMAN 300/185	E13KC-01030105800	300	-	185	150	23,3	34,0	19,0	25,5	34	25	3	2	-	5	10	3,27
LMAN 300/240	E13KC-01030105900			240			21,5	29,0		28					-		3,75
LMAN 300/300	E13KC-01030106000			300			24,5	32,0		32							4,17

Technologia zaciskanie końcówek i łączników rurowych Al-Cu  %s

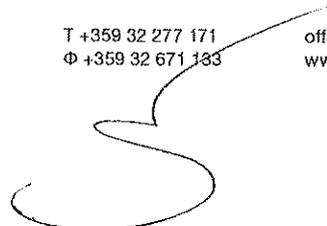
Dedykowane praski ręczne i hydrauliczne  %s



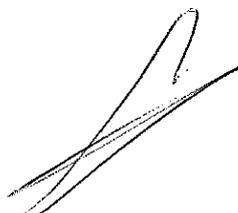
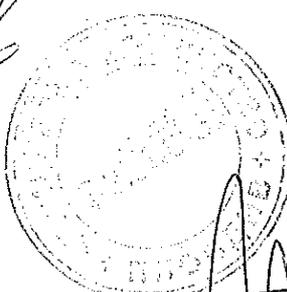
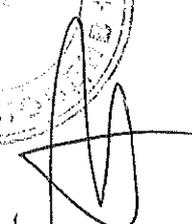




ERGOM S.p.A.  
 Poznań: .....  
 www.ergom.com

**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 СПЕЦИФИКАЦИИПриложение 21  
  
  




# ATTESTATION OF CONFORMITY

No. 2096180.06

Issued to: ERGOM Zakład Aparatury Elektrycznej sp. z o.o.  
ul. Nowe Sady 10  
94-102 Łódź  
POLAND

For the product: Conductor connection

Trade name: ERGOM

Type/Model: LMAN

Ratings: size 25/10 till 300/300

Manufactured by: ERGOM Zakład Aparatury Elektrycznej sp. z o.o.  
ul. Nowe Sady 10  
94-102 Łódź  
POLAND

Subject: Mechanical testings

Requirements: IEC 61236-1:2005-5 Compression and mechanical connectors.  
clause 7, Mechanical tests

This Attestation is granted on account of an examination at Ergom Laboratories at Łódź, Poland and witnessed by KEMA, the results of which are laid down in a confidential file no. 2096180.06.

The examination has been carried out on one single specimen of the product, submitted by the manufacturer. The Attestation does not include an assessment of the manufacturer's production. Conformity of his production with the specimen tested by KEMA is not the responsibility of KEMA

KEMA Quality B.V.  
Arnhem, November 1, 2006

на основании чл. 36а, ал. 3  
от ЗОП

C.A. Valencia  
Certification Manager

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T +31 26 3 59 26 00 F +31 26 3 52 58 00 customer@kema.com www.kema.com Registered Arnhem 0908539a



Applicant : ERGOM Zakład Aparatury Elektrycznej sp. z o.o.  
 ul. Nowe Sady 10  
 94-102 Łódź  
 POLAND

Application Date : 2006-09-03

Order Number : 2096180.00-QUA/IND

Subject : Mechanical testings

Trademark : ERGOM

Type(s) : LMAN, size 25/10 (III) 300/300

Amhem, November 1, 2006

Manufacturer/ Production sites : ERGOM Zakład Aparatury Elektrycznej sp. z o.o.  
 ul. Nowe Sady 10  
 94-102 Łódź  
 POLAND

Overview of tests : Mechanical tests according to clause 7 of the Test Requirements

Test-Requirements : IEC 61236-1:2005-5 Compression and mechanical connectors

Tested by : H.H.M. Versteeger на основании чл. 36а, ал. 3 от ЗОП

Checked by : H.G.M. Kormelink

Contents

- Mechanical tests
- Tables, preparation of the samples, test information
- Product information, LMAN
- Common and relevant connector design criteria
- Tools
- Impression of the testings
- Test samples LMAN

Vsn

0435f-06

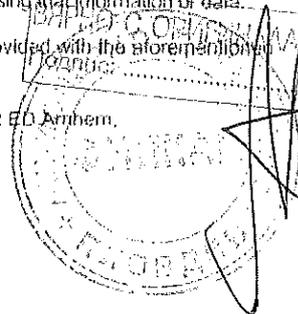
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 Telefax: +31 26 3 52 58 00



MAN-P-004 enq  
6/2005 1.1

### Product information:

Trademark : ERGOM  
Product : Conductor connections  
Type(s) : LMAN  
Range : size 25/10 till 300/300

### Mechanical tests

The purpose of the tests is to ensure an acceptable mechanical strength for the connections to the conductors of power cables.

The product information is given in annex LMAN

### Selection of the samples

Due to the fact that the manufacturer could clearly demonstrate common and relevant connector design criteria the samples have been selected as follows:

if a connector family consists of four sizes the minimum and maximum cross-sections are selected for tests

if a connector family consists of five sizes the minimum and maximum and one intermediate cross-sections are selected for tests

if a connector family consists of six or more sizes the minimum and maximum and two intermediate cross-sections are selected for tests.

The selected samples are given in Table 1 and Table 2.

See annex Common and relevant connector design criteria for a family of connectors

### Sample preparation

The samples have been prepared and fitted according to the manufacturers instructions  
Details of the preparation are given in Table 1, Preparation of the samples.  
Information about the tools is given in the annex Tools

### Test method

The test has been made on three samples of each type. The samples are fitted according to the manufactures instructions

The conductor lengths, between are at least 500 mm.  
then in a tensile strength equipment the force on the sample was increased slowly to 60 times the cross section of the conductor if there made of copper,  
40 times the cross-section of the conductor if there made of aluminium  
With a maximum of 20000N and maintained for 1 minute  
The test forces are given in Table 2, Test force 1

On request of the manufacturer the tests haven been carried out at a value of 1.05 times the test force 1.  
These values are given in Table 2, Test force 2.

Then on request of the manufacturer the test force was further increased till a value as given in table 2,  
Test force 2

ВЕРНО С СЕРТИФИКАТОМ  
Подпись: .....

For details see the following photo annexes:  
impression of the testings  
test samples LMAN

Test results

The test results are given in Table 2:  
The samples withstood the test force 2 during one minute, no slipping occurred  
The samples withstood the test force 3, no slipping occurred.

Quality assurance

Preparing and fitting the samples, and testings have been carried in the Laboratories of  
ERGOM Zakład Aparatury Elektrycznej sp.z o.o.  
ul. Nowe Sady 10  
94 102 Lodz, Poland.

The ERGOM organisation has been certified for ISO 9001 by Polski Rejestr Statkow S.A. (Polish Ship  
Registar S.A.)

All activities have been carried out by:  
Piotr Mirowski, ERGOM RW  
Grzegorz Rosocha, ERGOM RW  
Adam Michalski, ERGOM PJ  
Tomek Fijałkowski ERGOM PJ  
Wojciek Durko, ERGOM PJ

and have been witnessed by H.H.M. Versteegen, KEMA Quality B.V., The Netherlands.

The testings have been carried out on tensile strength equipment  
VEM WPM, serial number 60/R10  
intended for forces of 10 kN, 25 kN and 50 kN within an accuracy of 0.78%  
The equipment was calibrated June 5, 2006 by Okregowy Urząd Miar w Łodzi (Local Office of Measures  
in Łódź)

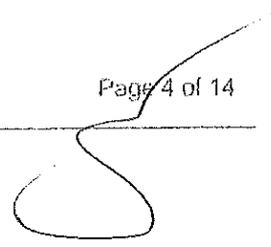
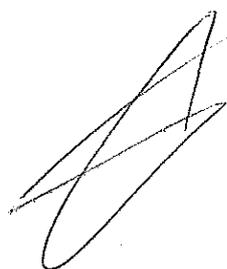


Table 1  
Preparation of the samples

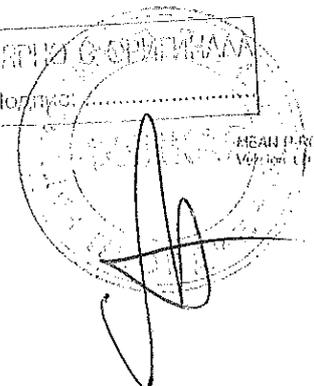
sample information				tooling information			
Type designation	cross-section (mm <sup>2</sup> )		number of samples	for Cu connections		for Al connections	
	AL	Cu		die number	tools	die number	tools
LMAN 25/10	25	10	3	6	K22	12	HH400
LMAN 35/35	35	35	3	12	H44	14	HH400
LMAN 70/35	70	35	3	12	H44	18	HH400
LMAN 120/120	120	120	3	20	K22	22	HH400
LMAN 150/95	150	95	3	18	H44	25	HH630
LMAN 240/240	240	240	3	28	H6	32	HH400
LMAN 300/300	300	300	3	32	H6	34	HH630

Table 2  
tests  
results

sample information				test results			
Type designation	cross-section (mm <sup>2</sup> )		number of samples	mult. factor	test force 1 (N)	test force 2 (N)	test force 3 (N)
	AL	Cu					
LMAN 25/10	25	10	3	60	600	630	1500
LMAN 35/35	35	35	3	40	1400	1470	4000
LMAN 70/35	70	35	3	60	2100	2205	4000
LMAN 120/120	120	120	3	40	4800	5040	6000
LMAN 150/95	150	95	3	60	5700	5985	8000
LMAN 240/240	240	240	3	40	9600	10080	20000
LMAN 300/300	300	300	3	40	12000	12600	23000




ВРЪЗКА С ОПРАВИЛНИКА  
Получено: .....



КЕМА П.Р.040001  
Версия 1.0



www.ergom.com

**Koneciki rurowe Al-Cu / Al-Cu Tubular terminals /  
Al-Cu Трубчатые наконечники**

**Łączniki  
aluminiowo-miedziane  
typu LMAN**

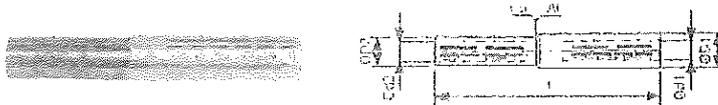
Material: Al-Cu  
Package: 2000 pcs  
Voltage: 1500 V  
Koneciki do zaciskania: 10, 12, 14

**Aluminium-copper  
butt connectors  
LMAN type**

Material: Al-Cu  
Surface: anodized  
Voltage: 1500 V  
Crimping tool: p. 112

**Алюминиево-медные  
трубчатые соединители  
типа LMAN**

Material: Al-Cu  
Покрытие: без покрытия  
Напряжение: 1500 В  
Зажимные инструменты: с. 112



Typ / Type / Typ	Przekrój / Cross section / Сечение		Wymiary / Dimensions / Размеры					Ciężar / Weight / Масса	Zajmowanie / Crimping / Зажимание	Liczba zacisków / No. of wires / Исп. провод.						Art. nr / Item No. / Арт. №	
	mm	mm	Al		Cu		mm			mm	Mech. Meas.		Elec. Meas.		Al		Cu
			d1	d2	d3	d4					M	Cu	Al	Cu			
LMAN 20/10	20	10			10	10		0.11	4						20-10-001		
LMAN 25/10	25	10			10	10		0.11	4						25-10-001		
LMAN 25/12	25	12			12	12		0.11	4						25-12-001		
LMAN 25/14	25	14			14	14		0.11	4						25-14-001		
LMAN 30/12	30	12			12	12		0.11	4						30-12-001		
LMAN 30/14	30	14			14	14		0.11	4						30-14-001		
LMAN 30/16	30	16			16	16		0.11	4						30-16-001		
LMAN 35/14	35	14			14	14		0.11	4						35-14-001		
LMAN 35/16	35	16			16	16		0.11	4						35-16-001		
LMAN 35/18	35	18			18	18		0.11	4						35-18-001		
LMAN 40/16	40	16			16	16		0.11	4						40-16-001		
LMAN 40/18	40	18			18	18		0.11	4						40-18-001		
LMAN 40/20	40	20			20	20		0.11	4						40-20-001		
LMAN 45/18	45	18			18	18		0.11	4						45-18-001		
LMAN 45/20	45	20			20	20		0.11	4						45-20-001		
LMAN 45/22	45	22			22	22		0.11	4						45-22-001		
LMAN 50/20	50	20			20	20		0.11	4						50-20-001		
LMAN 50/22	50	22			22	22		0.11	4						50-22-001		
LMAN 50/24	50	24			24	24		0.11	4						50-24-001		
LMAN 55/22	55	22			22	22		0.11	4						55-22-001		
LMAN 55/24	55	24			24	24		0.11	4						55-24-001		
LMAN 55/26	55	26			26	26		0.11	4						55-26-001		
LMAN 60/24	60	24			24	24		0.11	4						60-24-001		
LMAN 60/26	60	26			26	26		0.11	4						60-26-001		
LMAN 60/28	60	28			28	28		0.11	4						60-28-001		
LMAN 65/26	65	26			26	26		0.11	4						65-26-001		
LMAN 65/28	65	28			28	28		0.11	4						65-28-001		
LMAN 65/30	65	30			30	30		0.11	4						65-30-001		
LMAN 70/28	70	28			28	28		0.11	4						70-28-001		
LMAN 70/30	70	30			30	30		0.11	4						70-30-001		
LMAN 70/32	70	32			32	32		0.11	4						70-32-001		
LMAN 75/30	75	30			30	30		0.11	4						75-30-001		
LMAN 75/32	75	32			32	32		0.11	4						75-32-001		
LMAN 75/34	75	34			34	34		0.11	4						75-34-001		
LMAN 80/32	80	32			32	32		0.11	4						80-32-001		
LMAN 80/34	80	34			34	34		0.11	4						80-34-001		
LMAN 80/36	80	36			36	36		0.11	4						80-36-001		
LMAN 85/34	85	34			34	34		0.11	4						85-34-001		
LMAN 85/36	85	36			36	36		0.11	4						85-36-001		
LMAN 85/38	85	38			38	38		0.11	4						85-38-001		
LMAN 90/36	90	36			36	36		0.11	4						90-36-001		
LMAN 90/38	90	38			38	38		0.11	4						90-38-001		
LMAN 90/40	90	40			40	40		0.11	4						90-40-001		
LMAN 95/38	95	38			38	38		0.11	4						95-38-001		
LMAN 95/40	95	40			40	40		0.11	4						95-40-001		
LMAN 95/42	95	42			42	42		0.11	4						95-42-001		
LMAN 100/40	100	40			40	40		0.11	4						100-40-001		
LMAN 100/42	100	42			42	42		0.11	4						100-42-001		
LMAN 100/44	100	44			44	44		0.11	4						100-44-001		
LMAN 105/42	105	42			42	42		0.11	4						105-42-001		
LMAN 105/44	105	44			44	44		0.11	4						105-44-001		
LMAN 105/46	105	46			46	46		0.11	4						105-46-001		
LMAN 110/44	110	44			44	44		0.11	4						110-44-001		
LMAN 110/46	110	46			46	46		0.11	4						110-46-001		
LMAN 110/48	110	48			48	48		0.11	4						110-48-001		
LMAN 115/46	115	46			46	46		0.11	4						115-46-001		
LMAN 115/48	115	48			48	48		0.11	4						115-48-001		
LMAN 115/50	115	50			50	50		0.11	4						115-50-001		
LMAN 120/48	120	48			48	48		0.11	4						120-48-001		
LMAN 120/50	120	50			50	50		0.11	4						120-50-001		
LMAN 120/52	120	52			52	52		0.11	4						120-52-001		
LMAN 125/50	125	50			50	50		0.11	4						125-50-001		
LMAN 125/52	125	52			52	52		0.11	4						125-52-001		
LMAN 125/54	125	54			54	54		0.11	4						125-54-001		
LMAN 130/52	130	52			52	52		0.11	4						130-52-001		
LMAN 130/54	130	54			54	54		0.11	4						130-54-001		
LMAN 130/56	130	56			56	56		0.11	4						130-56-001		
LMAN 135/54	135	54			54	54		0.11	4						135-54-001		
LMAN 135/56	135	56			56	56		0.11	4						135-56-001		
LMAN 135/58	135	58			58	58		0.11	4						135-58-001		
LMAN 140/56	140	56			56	56		0.11	4						140-56-001		
LMAN 140/58	140	58			58	58		0.11	4						140-58-001		
LMAN 140/60	140	60			60	60		0.11	4						140-60-001		
LMAN 145/58	145	58			58	58		0.11	4						145-58-001		
LMAN 145/60	145	60			60	60		0.11	4						145-60-001		
LMAN 145/62	145	62			62	62		0.11	4						145-62-001		
LMAN 150/60	150	60			60	60		0.11	4						150-60-001		
LMAN 150/62	150	62			62	62		0.11	4						150-62-001		
LMAN 150/64	150	64			64	64		0.11	4						150-64-001		
LMAN 155/62	155	62			62	62		0.11	4						155-62-001		
LMAN 155/64	155	64			64	64		0.11	4						155-64-001		
LMAN 155/66	155	66			66	66		0.11	4						155-66-001		
LMAN 160/64	160	64			64	64		0.11	4						160-64-001		
LMAN 160/66	160	66			66	66		0.11	4						160-66-001		
LMAN 160/68	160	68			68	68		0.11	4						160-68-001		
LMAN 165/66	165	66			66	66		0.11	4						165-66-001		
LMAN 165/68	165	68			68	68		0.11	4						165-68-001		
LMAN 165/70	165	70			70	70		0.11	4						165-70-001		
LMAN 170/68	170	68			68	68		0.11	4						170-68-001		
LMAN 170/70	170	70			70	70		0.11	4						170-70-001		
LMAN 170/72	170	72			72	72		0.11	4						170-72-001		
LMAN 175/70	175	70			70	70		0.11	4						175-70-001		
LMAN 175/72	175	72			72	72		0.11	4						175-72-001		
LMAN 175/74	175	74			74	74		0.11	4						175-74-001		
LMAN 180/72	180	72			72	72		0.11	4						180-72-001		
LMAN 180/74	180	74			74	74		0.11	4						180-74-001		
LMAN 180/76	180	76			76	76		0.11	4						180-76-001		
LMAN 185/74	185	74			74	74		0.11	4						185-74-001		
LMAN 185/76	185	76			76	76		0.11	4						185-76-001		
LMAN 185/78	185	78			78	78		0.11	4						185-78-001		
LMAN 190/76	190	76			76	76		0.11	4						190-76-001		
LMAN 190/78	190	78			78	78		0.11	4						190-78-001		
LMAN 190/80	190	80			80	80											

## COMMON AND RELEVANT CONNECTOR DESIGN CRITERIA FOR FAMILY OF CONNECTOR

Connector type LMAN

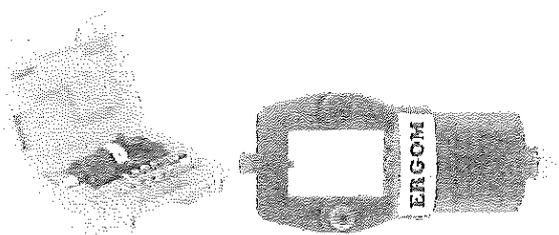
- cross section size series for both parts of connector ( inner and outer diameter of aluminum and copper part ) are based on the same standards:
  - \* for Aluminum – DIN 46267/2 standard
  - \* for Copper – DIN 46267/1 standard
- the same production technology for all sizes
- the same place of production's location – one workplace (machine and tool) for all sizes equipped with changeable working pad for each size
- the same quality control procedure for production in progress ( dimensional control and control of AL/CU connection's durability based on bending under angle of  $90^{\circ}$  )
- the same grade of material for all series
  - \* Aluminum bar – EN AW-EAL99,5 O-d acc to PN-EN 754-3 standard
  - \* Copper bar – EN 13601-CW004A-R250 acc to PN-EN 13601 standard
- the same supplier of Aluminum material for all sizes
- the same supplier of Copper material for all sizes
- the same application for all sizes – Connector are used for electrical connection of two wires of different cross-section and different materials
- the same crimping technology for all sizes – connector are crimped using tools with so called "hexagon" crimping dies – proper die size for size of connector
- The same way of marking – there is a code overprinted on every connector to indicate:
  - \* Connector cross-section
  - \* Die code number to crimp a connector
  - \* Graphic code of number and position of compressions required, made with narrow dies (hand tools) or wide dies (hydraulic tools)

Actual ERGOM production programs based on cross-section range from  $10 \text{ mm}^2$  up to  $300 \text{ mm}^2$ .  
For type test program terminal up to  $300 \text{ mm}^2$  should be taken into consideration.

KEMA Polska Sp. z o.o.  
Podpis: .....

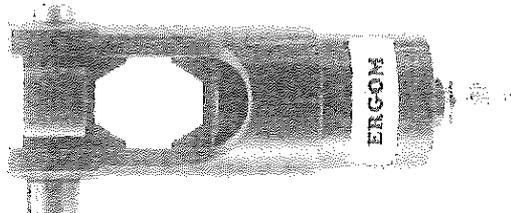
**Hydraulic head HH 400 type**

Crimping head used together with hydraulic pump. General purpose, practical, reliable. Enables easy crimping. Designed for crimping of terminals and forming of segmental cores. Supplied in plastic box. Provides crimping force: at least 200 kN  
Length: 240 mm  
Weight: 3.80 kg.  
Working pressure: 70 Mpa  
Item No: 340-060100

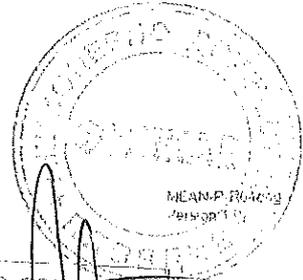


**Hydraulic head HH 630 type**

Crimping head used together with hydraulic pump. General purpose, practical, reliable. Enables easy crimping. Designed for crimping terminals and forming segmental cores. Provides crimping force: at least 250 kN.  
Length: 260 mm  
Weight: 6.50 kg  
Working pressure: 70 MPa  
Item No: 340-070100

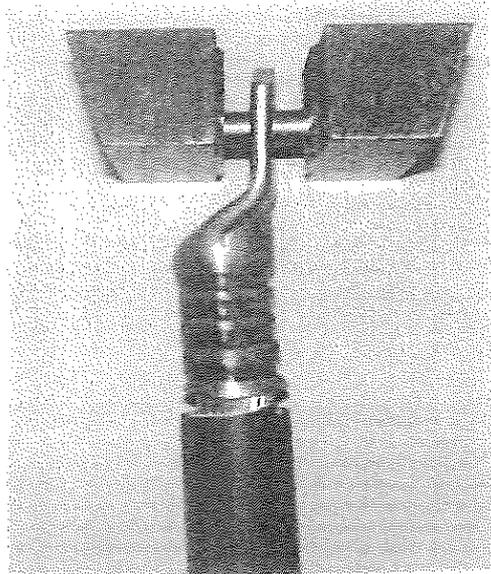
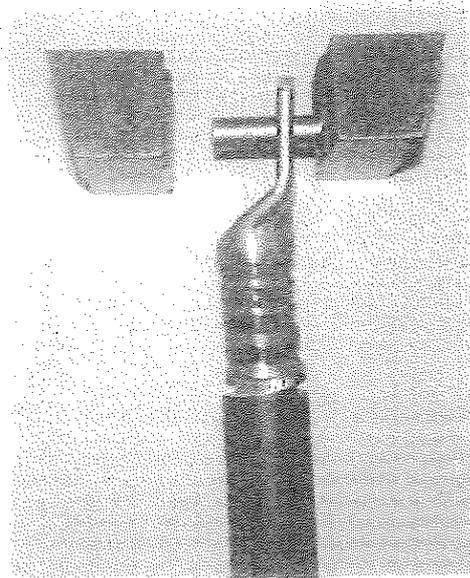
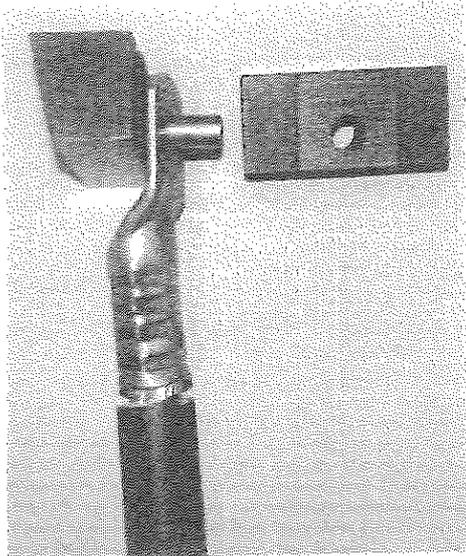
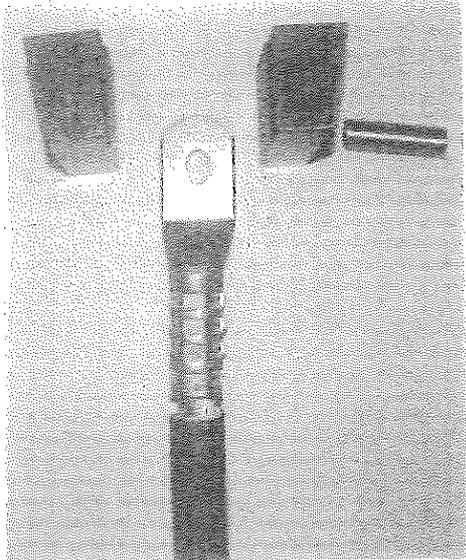


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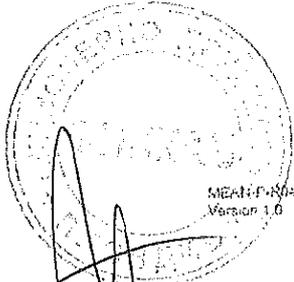


ВЕРНО С СЕРТИФИКАТА  
Подпись: *[Handwritten signature]*

Impression of the testings

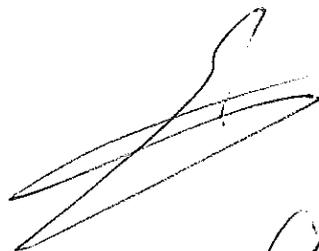
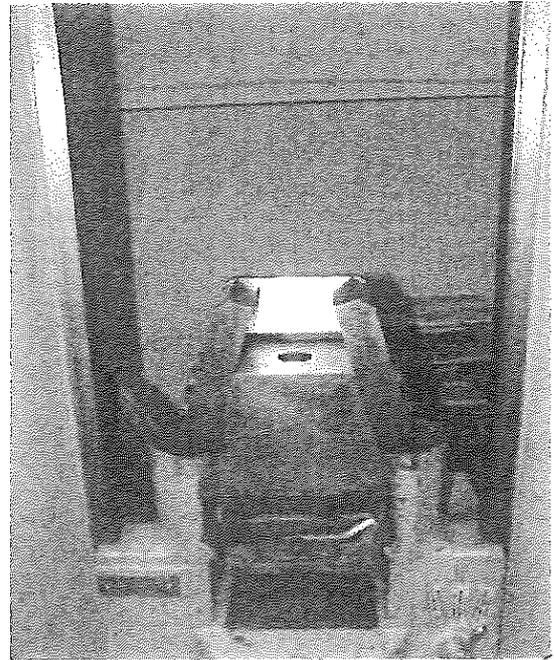
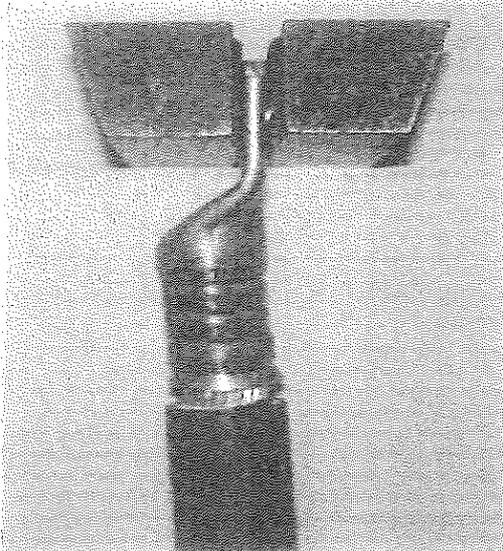


*[Handwritten signature]*

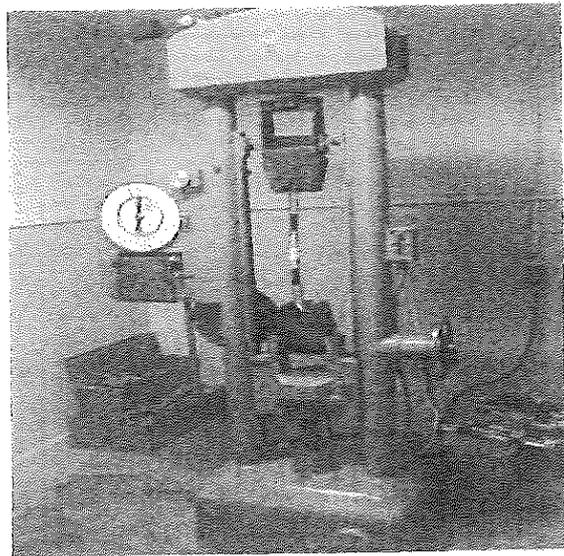
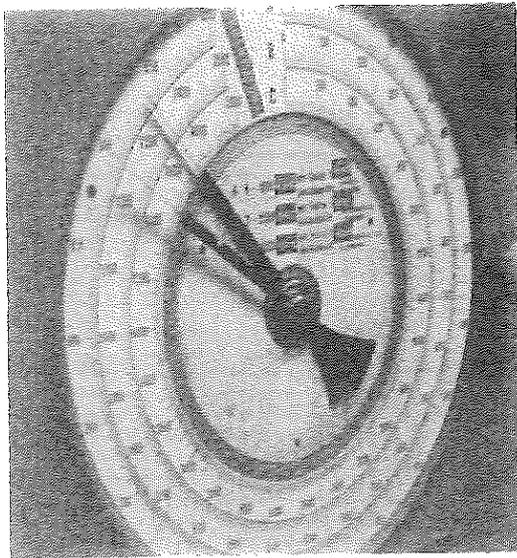
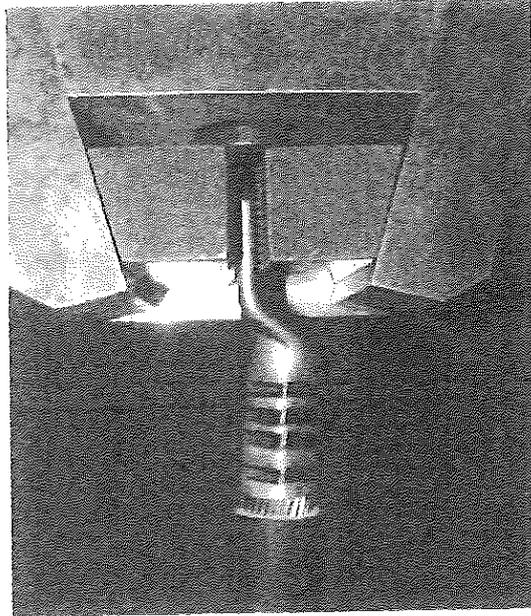
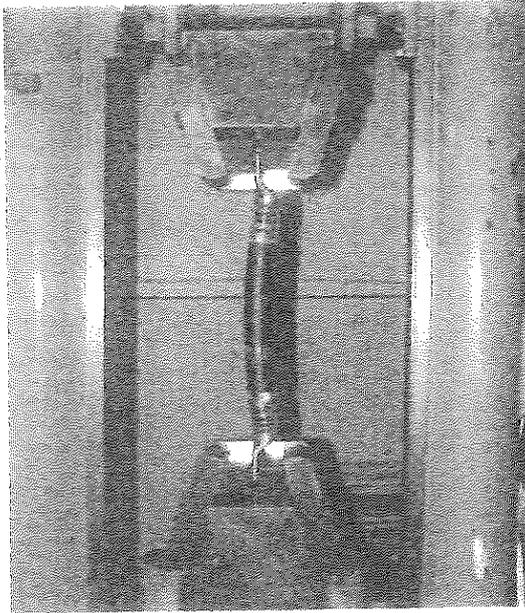


MEAN-F-N-Heng  
Version 1.0

ВСПИХО ОУСТАНОВА  
Подпис: \_\_\_\_\_

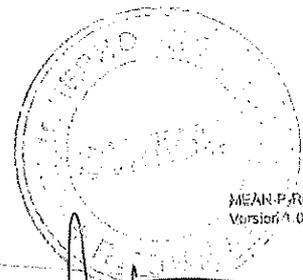


ВЗРНО С ОРИГИНАЛА  
Подпись: \_\_\_\_\_



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*[Handwritten signature]*



MEAN-P-R04eng  
Version 1.0

ВЕРНО С...  
Подпись: *[Handwritten signature]*

Test samples LMAN

Photo 1 LMAN 25/10

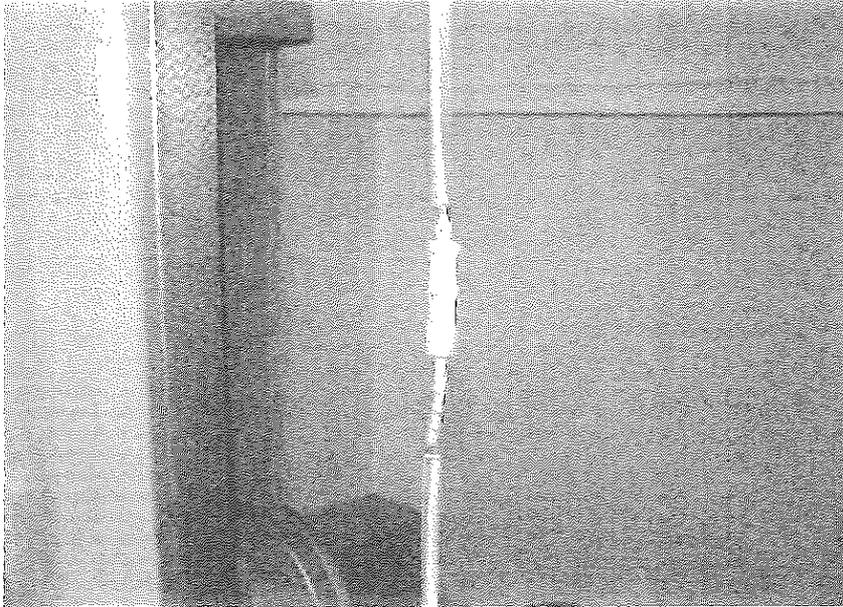
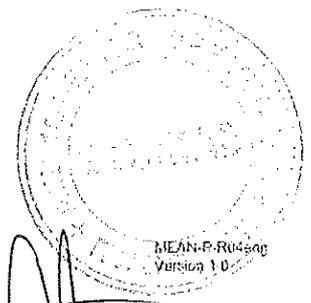
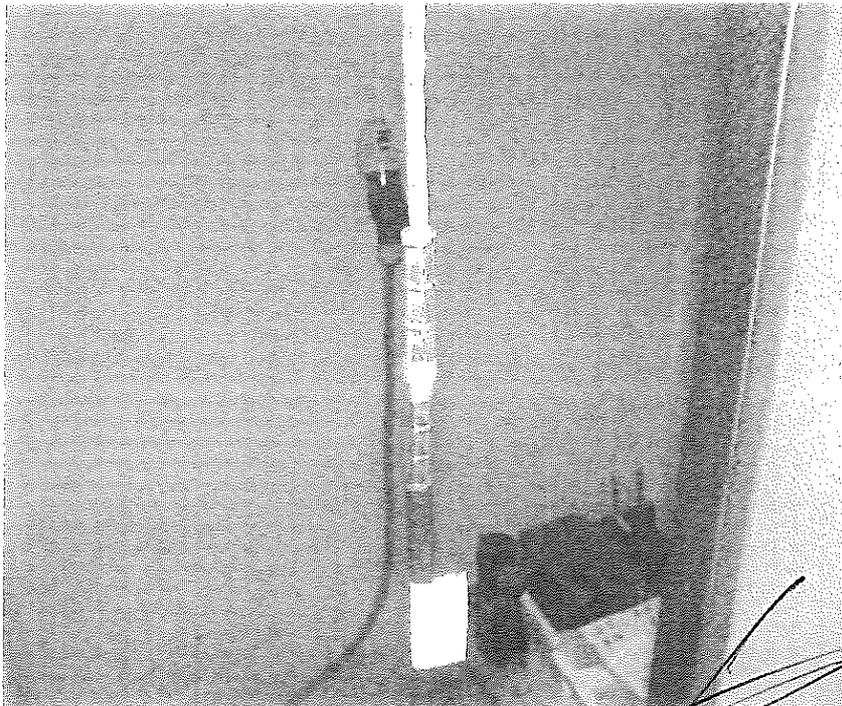


Photo 2 LMAN 35/35



*[Handwritten signature]*

ВЕРНО С СРАВНЕНИЕМ  
Подпись: *[Handwritten signature]*

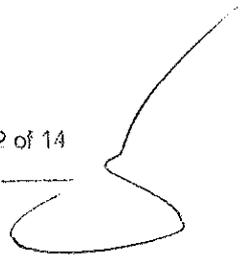


Photo 3 LMAN 70/35

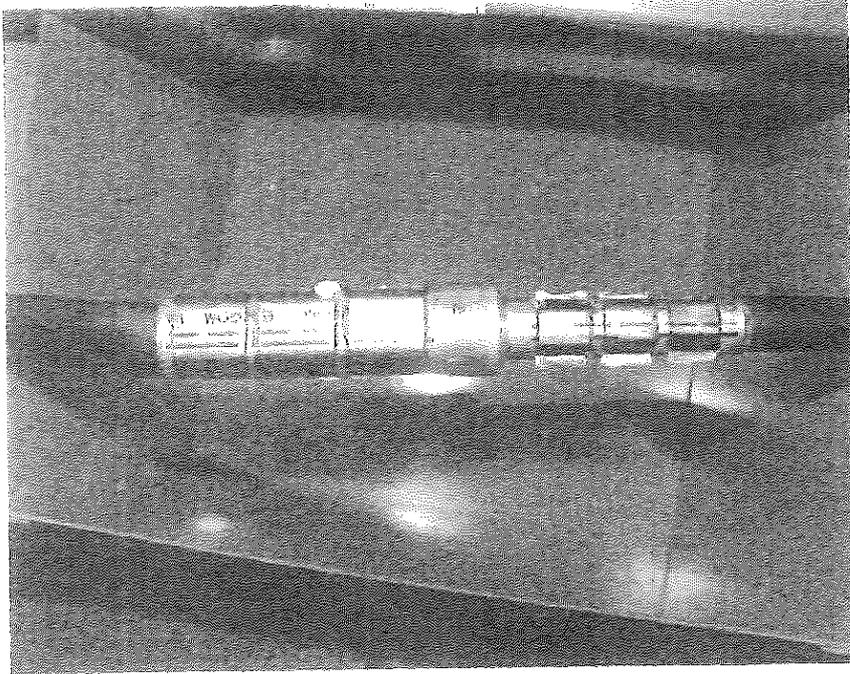
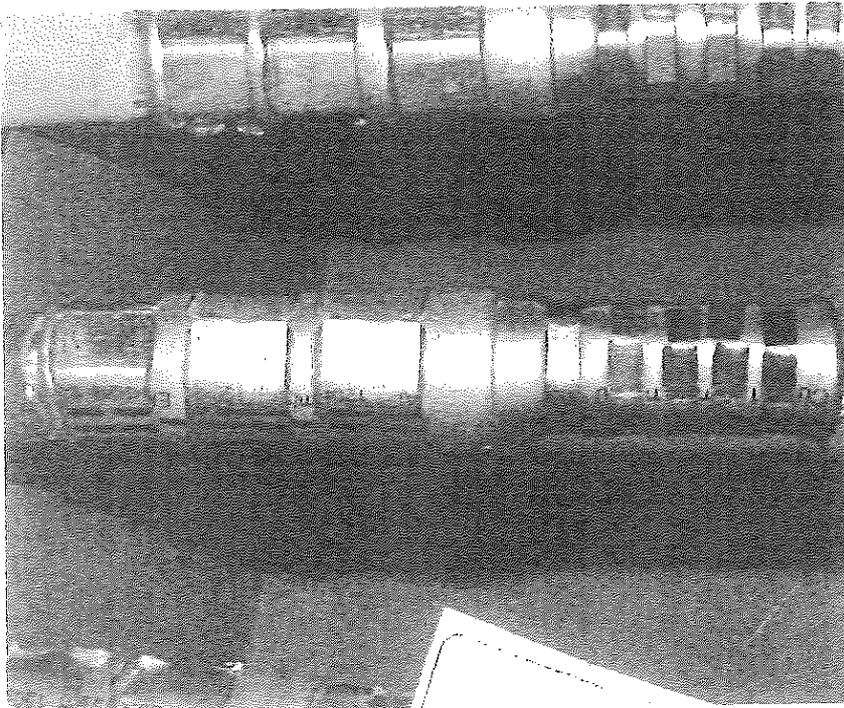
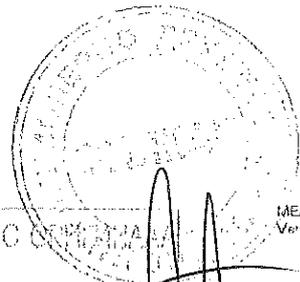


Photo 4 LMAN 120/120



*[Handwritten signatures]*



ВЕРНО С СОВМЕЩА  
Подпись: .....

MEAN-PR04eng  
Ver.01 10

Photo 5 LMAN 150/95

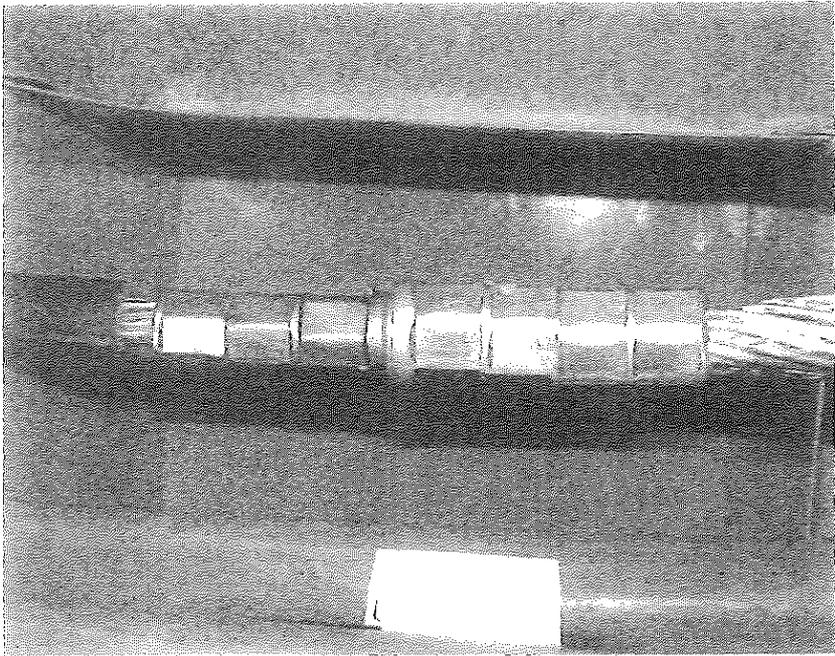


Photo 6 LMAN 240/240

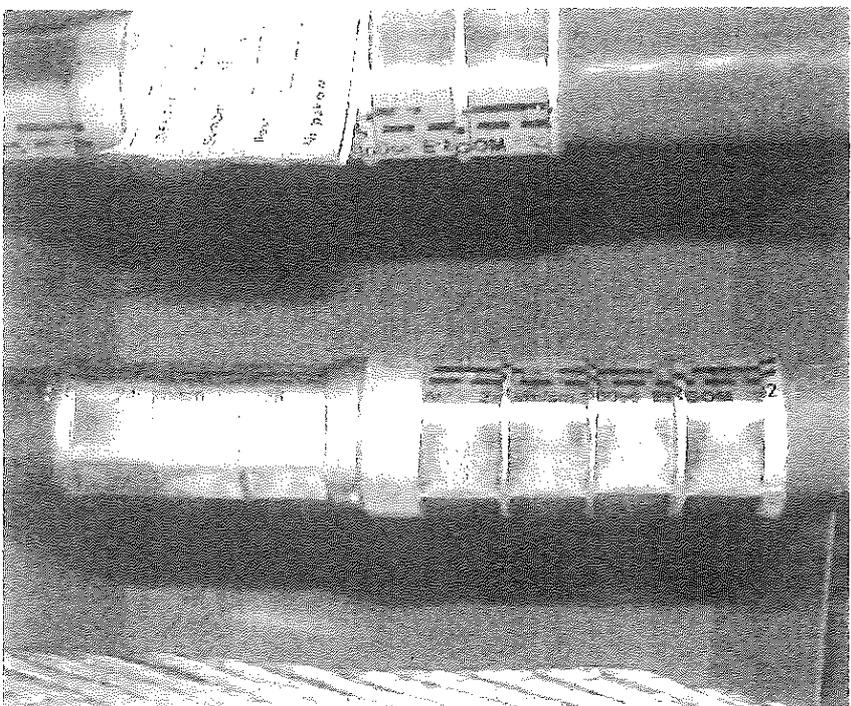
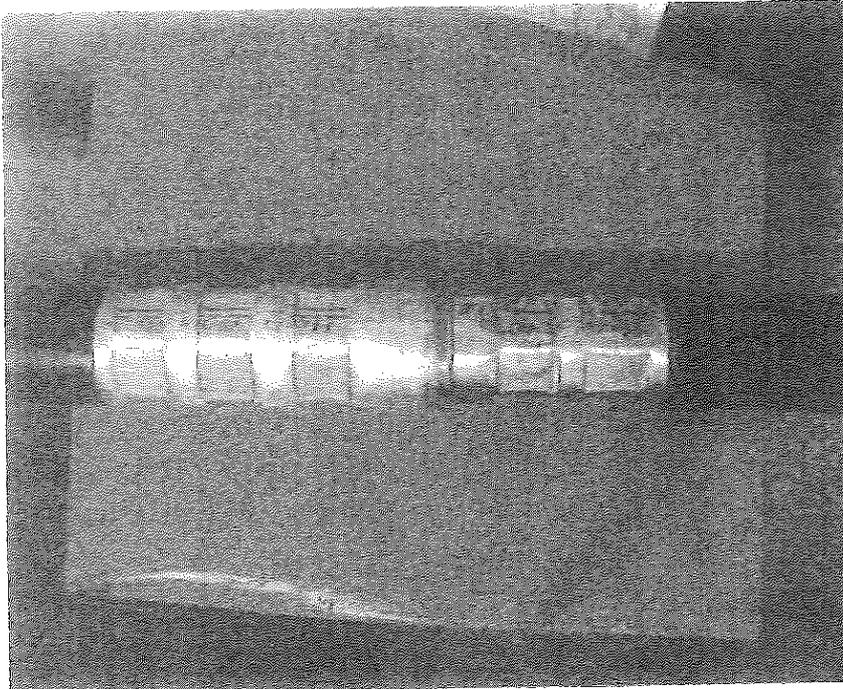


Photo 7 LMAN 300/300



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ВЕРНО С ОРГАНИЗАЦИЕЙ  
Подпись: .....



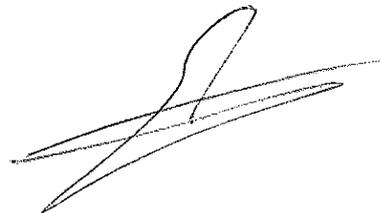
**Приложение 2 към Техническо предложение**

За обособена позиция № 2:

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

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ  
ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ

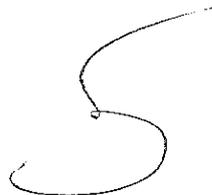
**Приложение 22**



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



Лодз, 06.05.2015

## Декларация за съответствие 52/2015

1. **Производител:** ZAE ERGOM Sp. z o. o  
94-102 Lodz ul. Nowe Sady 10
2. **Продукт:** Алуминиево-медни кабелни съединители **LMAN**
3. **Класификация:** PKWiU 31.20.27-70.00
4. **Употреба и обхват на използване:** използва се за завършек на алуминиево-медни жила на проводници.
5. **Техническа спецификация:** Накрайниците съответстват на изискванията на PN-90-E-06401/02.
6. **Партида, която е обхваната от декларацията:** продукти, закупени от клиента.

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

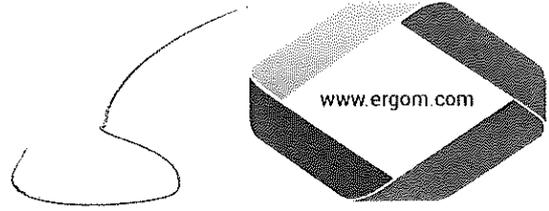
Dział Kontroli Jakości  
Specjalista ds. Jakości

на основание чл. 36а, ал. 3  
от ЗОП

Ръководител отдел Контрол на качеството



ВЕРНО С ОПИГ  
Подпис: .....



Łódź 06.05.2015

## DECLARATION OF CONFORMITY 52/2015

- 1. Product manufacturer:** ZAE ERGOM Sp. z o. o  
94-102 Łódź ul. Nowe Sady 10
- 2. Product name:** Aluminum-copper butt connectors type LMAN
- 3. Product classification:** PKWiU 31.20.27-70.00
- 4. Product application and the range of usage:** used for termination of aluminum-copper conductors of electrical wires.
- 5. Technical specification:** Terminals are compliant with norm PN-90-E-06401/02 .
- 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 Jakości  
Специализированный отдел  
на основании чл. 36а, ал. 3  
от ЗОП

Quality control dept. manager



**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 23**A handwritten signature in black ink is positioned above a circular stamp. The stamp contains illegible text and a signature. To the left of the stamp is another handwritten mark, possibly a date or initials.

## 2 ERGOM

### Технология за кримпване на тръбни кабелни обувки Al-Cu

Изработени като: пръстеновидни обувки, свързващи обувки, кабелни накрайници

**Материали:** всеки видове - E-Al клас съгласно с DIN 40501 Teil 3 or DIN 1712 Teil 2.

E-Cu клас съгласно с DIN 40500 Teil 2, 3 or DIN 1787.

**Покритие:** без покритие

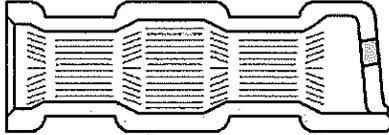
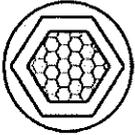
#### Приложение:

Пръстовидните обувки се използват за свързване на кабелна връзка на винтово съединение към шина, комутационна апаратура и др. Гилзите се използват за електрическо свързване на два проводника с различно напречно сечение и различни материали (LMAN, LMAN 36). Гилзите направени с тези конектри не могат да бъдат механично свързани. Алуминиево-медните кабелни накрайници (BMAN) се използват за свързване на жица с гилзата.

#### Технология за кримпване:

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

много  
гилзи  
броят

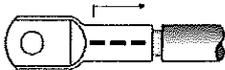


Благодарение на компресираща форма на гилзата се постига връзка с високи механични и електрически параметри. Въпреки това, такива се нуждаят от няколко компресии на обувката. Колкото повече е на компресиите, толкова по-добре е за гилзата.

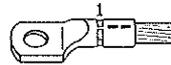
Много важно в случай на силови връзки, при които се изисква предаване на големи мощности и ток. "Шестоъгълната" компресия се нуждае от още по-голяма сила, за да се навива обувката. така че при такава компресия (дори при малка напречна секция) ZAE ERGOM препоръчва използването на хидравлични инструменти или ръчни инструменти с по-високо механично съотношение (управлявани с двете ръце). 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)



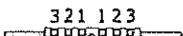
1. Първи натиск (външен)



2. Втори натиск (отвън навън)



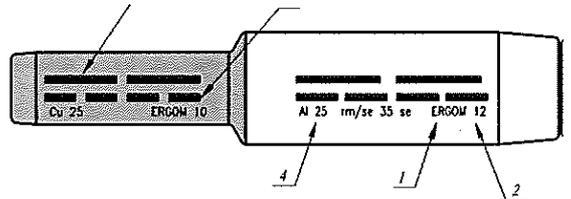
3. Първи натиск от другата страна (вътрешен)



4. Втори натиск от другата страна (отвън навън)



2. Втори натиск (отвън навън)

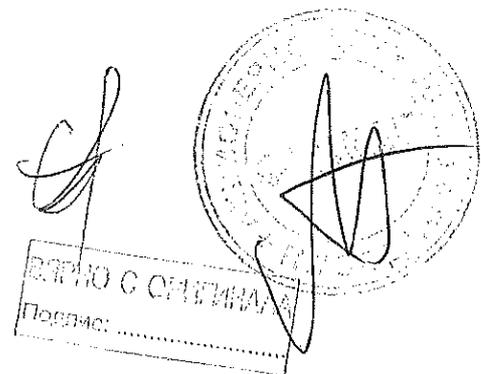


Всяка обувка е означена с маркировка и е напечатана:

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

Пример за подобен код е даден по-долу.

1. Търговска марка.
2. Номер.
3. Маркиране на мястото и броя повторения на натиск.
- 3а. Механично: тясно.
- 3б. 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.

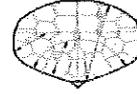
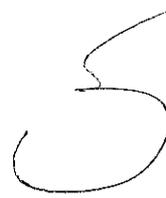
**Types of cable wires**



Кръгъл многожичен кабел (rm)



Кръгъл проводник (re)

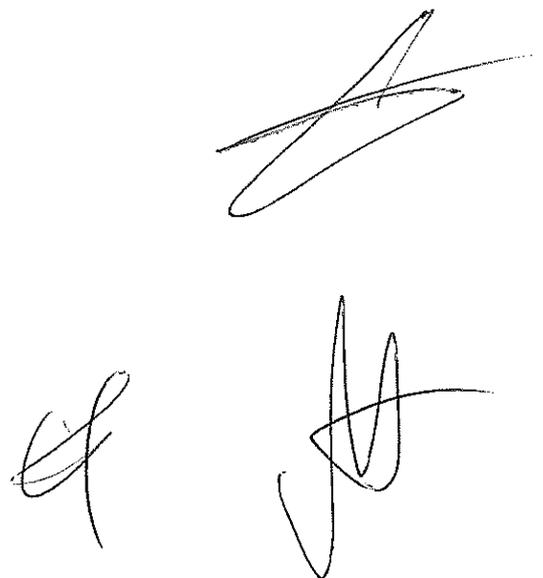


Разделен многожичен (sm)



Разделен проводник (se)

Секторните проводници трябва да бъдат заоблени със специални матрици.  
[www.ergom.com](http://www.ergom.com)



## Crimping technology for tubular terminals Al-Cu

Made as: ring terminals, connecting terminals, pin terminals.

**Materials:** all types – E-Al grade acc. to DIN 40501 Teil 3 or DIN 1712 Teil 2.  
E-Cu grade acc. to DIN 40500 Teil 2, 3 or DIN 1787.

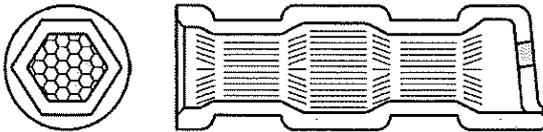
**Surface:** without coating.

**Application:**

Ring terminals (KCA; TMA) are used for connecting wire by means of a screw joint to bus-bar, switchgear, etc. Tubular connectors are used for electric connection of two wires of different cross-sections and different materials (LMAN; LMAN 36). This joint cannot be stressed mechanically. Aluminium-copper pin terminals (BMAN) are used for connecting wire to screw joints.

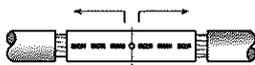
**Crimping technology:**

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

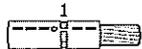
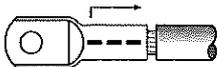


Thanks to such compressing shape joint with very high mechanical and electrical parameters is achieved. However, such joints need several compressions of terminal. The higher compression number the better the joint is.

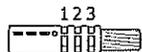
It is very important in case of power joints where transmission of large power and currents is required. The "hexagon" compression needs still considerable force to crimp a terminal so in case of such compression (even small wire cross-section) ZAE ERGOM recommends use of hydraulic tools or hand-tools 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.



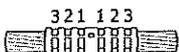
1. First compression (inside)



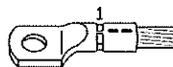
2. Further compression (from inside to outside)



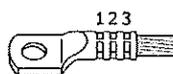
3. First compression on the other side (inside)



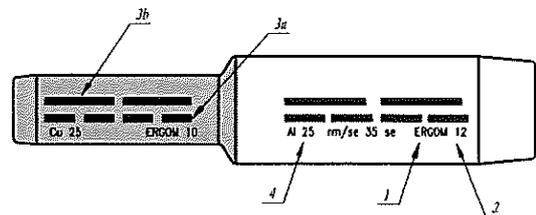
4. Further compressions on the other side (from inside to outside)



1. First compression (inside)



2. Further compression (from inside to outside)



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).

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

**Types of cable wires**



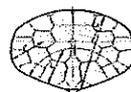
round multiwire

(rm)



round one-wire

(re)



sectored multiwire

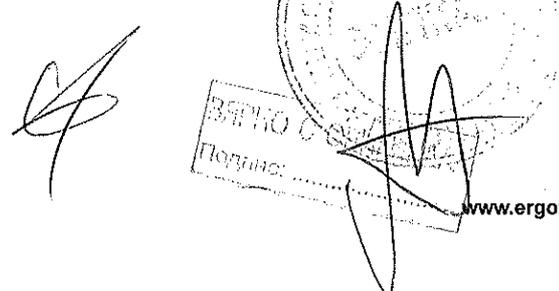
(sm)



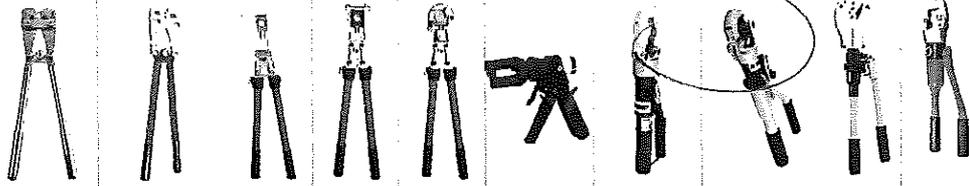
sectored one-wire

(se)

Sector shaped conductors must be rounded with special dies.



## Ręczne i hydrauliczne praski zaciskowe / Crimping



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

Narzędzie / Tool / Инструмент

Przekrój / Cross section / Сечение

[mm<sup>2</sup>]  
[mm<sup>2</sup>]

	KD 5/6 KT**)	KD 6/6 KT AI	KD 6/6 KT***)	KD 6F/6 KT***)	EK 18	EK 19	EK 22	ZHK 4	HK 5	HK 22	UH 60	PBM 6	PHK-300
16	•	•	•	•	•	•	•	•	•	•	•	•	•
25	•	•	•	•	•	•	•	•	•	•	•	•	•
35	•	•	•	•	•	•	•	•	•	•	•	•	•
50	•	•	•	•	•	•	•	•	•	•	•	•	•
70		•	•	•	•	•	•	•	•	•	•	•	•
95		•	•	•	•	•	•	•	•	•	•	•	•*)...)
120		•	•	•	•	•	•	•	•	•	•	•	•*)...)
150				•	•	•	•	•	•	•	•	•	•*)...)
185					•	•	•			•	•	•	•*)...)
240										•	•	•	
300													

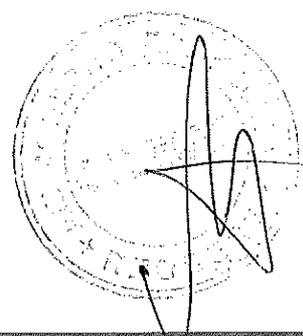
\*) z dodatkowym zestawem matryc PHK-R / with additional die set PHK-R type / с дополнительным набором матриц PHK-R

\*\*\*) dotyczy części Cu łącznika / concern to Cu part of joint / проблемы разъем Cu

\*\*\*\*) dotyczy części Al łącznika / concern to Al part of joint / проблемы разъем Al

Взято с оригинала  
Подпись: \_\_\_\_\_



**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 24**

## Końcówki tulejkowe izolowane typu HI

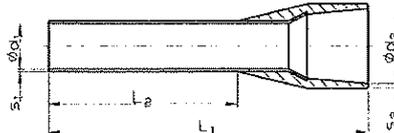
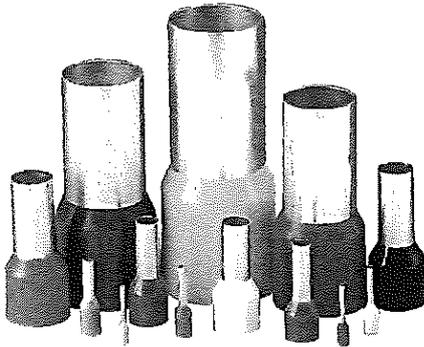
## Insulated cord-end terminals HI type

## Втулочные наконечники типа HI с изоляцией

**Materiał:** Cu.  
**Pokrycie:** cynowane.  
**Izolacja:** poliamid lub polipropylen.  
**Temp. pracy:**  
 -30÷+95 °C – poliamid 6,6;  
 -30÷+100 °C – polipropylen  
**Wykonanie:** DIN 46228/4.

**Material:** Cu  
**Surface:** tin-plated.  
**Insulation:** polyamide or polypropylene.  
**Operating temp.:**  
 -30÷+95 °C – polyamide 6.6;  
 -30÷+100 °C – polypropylene.  
**Standard:** DIN 46228/4.

**Материал:** Cu.  
**Покрытие:** лужёные.  
**Изоляция:** полиамид или полипропилен.  
**Рабочая темп.:**  
 -30÷+95 °C – полиамид 6,6;  
 -30÷+100 °C – полипропилен.  
**Исполнение:** DIN 46228/4.



Typ Type Тип	"Kolor niemiecki" "German colour" "Немецкий цвет"		Kolor wg DIN Colour acc. to DIN Цвет согл. DIN		"Kolor francuski" (F) "French colour" (F) "Французский цвет" (F)		Przekrój Cross section Сечение		Części Parts Части				Waga Weight Вес			
	Kolor Colour Цвет	Art. nr Item No. Арт. №	Kolor Colour Цвет	Art. nr Item No. Арт. №	Kolor Colour Цвет	Art. nr Item No. Арт. №	[mm <sup>2</sup> ] [мм <sup>2</sup> ]	AWG	L1	L2	d1	d2		s1	s2	
HI 0,14/6 <sup>*)</sup>		E08KH-02010100101		E08KH-02010100101		E08KH-02010100201	0,14	26	10,0	6	0,70	1,6	0,15	0,25	500	0,020
HI 0,25/6 <sup>*)</sup>		E08KH-02010100301		E08KH-02010100401		E08KH-02010100501	0,25	24	10,0	6	0,75	1,8	0,15	0,25	500	0,025
HI 0,25/8 <sup>*)</sup>		E08KH-02010100601		E08KH-02010100701		E08KH-02010100801			12,0	8						0,035
HI 0,34/6 <sup>*)</sup>		E08KH-02010100901		E08KH-02010100901		E08KH-02010101001			10,0	6						0,035
HI 0,34/8 <sup>*)</sup>		E08KH-02010101101		E08KH-02010101101		E08KH-02010101201	0,34	22	12,0	8	0,80	2,0	0,15	0,25	500	0,040
HI 0,5/6 <sup>*)</sup>		E08KH-02010101301		E08KH-02010101401		E08KH-02010101401			12,0	6						0,035
HI 0,5/8 <sup>*)</sup>		E08KH-02010101501		E08KH-02010101601		E08KH-02010101601	0,5	20	14,0	8	1,00	2,6	0,15	0,25	500	0,040
HI 0,5/10 <sup>*)</sup>		E08KH-02010101701		E08KH-02010101801		E08KH-02010101801			16,0	10						0,045
HI 0,75/6		E08KH-02010101901		E08KH-02010102001		E08KH-02010102101			12,0	6						0,035
HI 0,75/8		E08KH-02010102201		E08KH-02010102301		E08KH-02010102401	0,75	20	14,0	8	1,20	2,8	0,15	0,25	500	0,040
HI 0,75/10		E08KH-02010102501		E08KH-02010102601		E08KH-02010102701			16,0	10						0,050
HI 0,75/12		E08KH-02010102801		E08KH-02010102901		E08KH-02010103001			18,0	12						0,055
HI 1/6 <sup>*)</sup>		E08KH-02010103101		E08KH-02010103201		E08KH-02010103201			12,0	6						0,045
HI 1/8 <sup>*)</sup>		E08KH-02010103301		E08KH-02010103401		E08KH-02010103401			14,0	8						0,050
HI 1/10 <sup>*)</sup>		E08KH-02010103501		E08KH-02010103601		E08KH-02010103601	1	18	16,0	10	1,40	3,0	0,15	0,25	500	0,055
HI 1/12 <sup>*)</sup>		E08KH-02010103701		E08KH-02010103801		E08KH-02010103801			18,0	12						0,065
HI 1,5/8 <sup>*)</sup>		E08KH-02010104001		E08KH-02010104101		E08KH-02010104101			14,0	8						0,055
HI 1,5/10 <sup>*)</sup>		E08KH-02010104201		E08KH-02010104301		E08KH-02010104301			16,0	10						0,070
HI 1,5/12 <sup>*)</sup>		E08KH-02010104401		E08KH-02010104501		E08KH-02010104501	1,5	16	18,0	12	1,70	3,5	0,15	0,25	500	0,070
HI 1,5/18 <sup>*)</sup>		E08KH-02010104601		E08KH-02010104701		E08KH-02010104701			24,0	18						0,095
HI 2,5/8		E08KH-02010104901		E08KH-02010104901		E08KH-02010104801			14,0	8						0,075
HI 2,5/10 <sup>*)</sup>		E08KH-02010105001		E08KH-02010105001		E08KH-02010105101			16,0	10						0,090
HI 2,5/12 <sup>*)</sup>		E08KH-02010105201		E08KH-02010105201		E08KH-02010105301	2,5	14	18,0	12	2,20	4,2	0,15	0,25	500	0,095
HI 2,5/18 <sup>*)</sup>		E08KH-02010105401		E08KH-02010105401		E08KH-02010105501			24,0	18						0,120
HI 4/10 <sup>*)</sup>		E08KH-02010105601		E08KH-02010105601		E08KH-02010105701			17,0	10						0,145
HI 4/12 <sup>*)</sup>		E08KH-02010105801		E08KH-02010105801		E08KH-02010105901	4	12	20,0	12	2,80	4,8	0,20	0,30	500	0,155
HI 4/18 <sup>*)</sup>		E08KH-02010106001		E08KH-02010106001		E08KH-02010106101			26,0	18						0,215

<sup>\*)</sup> Wielkości nie objęte normą DIN.

<sup>\*)</sup> Sizes out of DIN standard.

<sup>\*)</sup> Величины не входящие в норму DIN.

<sup>\*\*)</sup> Dla tych przekrojów niemiecki kolor izolacji jest taki sam jak kolor wg DIN w związku z tym występuje wyłącznie wykonanie "N".

<sup>\*\*)</sup> For these cross sections german and DIN colours are the same therefore there exist only "N" design.

<sup>\*\*)</sup> Для этих сечений цвет "N" такой же как цвет согласно DIN, потому существует только исполнение "N".

<sup>\*\*\*)</sup> Dla tych przekrojów kolor izolacji "F" jest taki sam jak kolor wg DIN w związku z tym występuje wyłącznie wykonanie "DIN".

<sup>\*\*\*)</sup> For these cross sections "F" and DIN colours are the same therefore there exist only "DIN" design.

<sup>\*\*\*)</sup> Для этих сечений цвет "F" такой же как цвет согласно DIN, потому существует только исполнение "DIN".

Oznaczenia typów izolacji / Description of types of insulation / Обозначение типов изоляции

HI 1 7 8

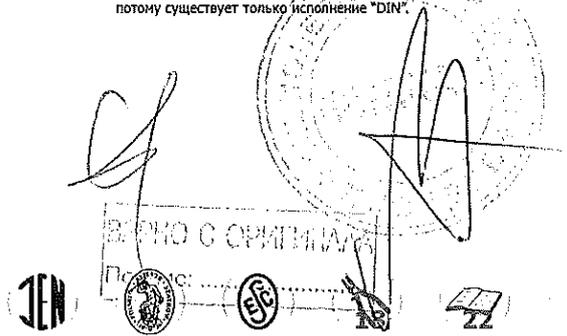
"Kolor niemiecki" / "German colour" / "Немецкий цвет"

HI 1 7 8 DIN

Kolor wg DIN / Colour acc. to DIN / Цвет согл. DIN

HI 1 7 8 F

"Kolor francuski" (F) / "French colour" (F) / "Французский цвет" (F)



Typ Type Тип	"Kolor niemiecki" "German colour" "Немецкий цвет"		Kolor wg DIN Colour acc. to DIN Цвет согл. DIN		"Kolor francuski" (F) "French colour" (F) "Французский цвет" (F)		Przekrój Cross section Сечение									
	Kolor Colour Цвет	Art. nr Item No. Арт. №	Kolor Colour Цвет	Art. nr Item No. Арт. №	Kolor Colour Цвет	Art. nr Item No. Арт. №	[mm <sup>2</sup> ] [mm <sup>2</sup> ]	AWG	L1	L2	d1	d2	s1	s2	Weight	
HI 6/12		E08KH-02010106201		E08KH-02010106301		E08KH-02010106401	6	10	20,0	12	3,50	6,3	0,20	0,30	100	0,045
HI 6/18		E08KH-02010106501		E08KH-02010106601		E08KH-02010106701			26,0	18						0,055
HI 10/12		E08KH-02010106801		E08KH-02010106901		E08KH-02010107001			22,0	12						0,060
HI 10/15 <sup>*)</sup>		E08KH-02010107101		E08KH-02010107201		E08KH-02010107301	10	8	25,0	15	4,50	7,6	0,20	0,40	100	0,070
HI 10/18		E08KH-02010107401		E08KH-02010107501		E08KH-02010107601			28,0	18						0,075
HI 16/12		E08KH-02010107701		E08KH-02010107801		E08KH-02010107901			24,0	12						0,080
HI 16/18		E08KH-02010108001		E08KH-02010108101		E08KH-02010108201	16	6	30,0	18	5,80	8,8	0,20	0,40	100	0,095
HI 25/16		E08KH-02010108301		E08KH-02010108401		E08KH-02010108501			30,0	16						0,060
HI 25/22		E08KH-02010108601		E08KH-02010108701		E08KH-02010108801	25	4	36,0	22	7,30	11,2	0,20	0,40	50	0,075
HI 35/16 <sup>**)</sup>		E08KH-02010108901		E08KH-02010109001		E08KH-02010109001			30,0	16						0,065
HI 35/25 <sup>**)</sup>		E08KH-02010109101		E08KH-02010109201		E08KH-02010109201	35	2	39,0	25	8,30	12,7	0,20	0,40	50	0,085
HI 50/20 <sup>**)</sup>		E08KH-02010109301		E08KH-02010109401		E08KH-02010109401			36,0	20						0,080
HI 50/25 <sup>**)</sup>		E08KH-02010109501		E08KH-02010109601		E08KH-02010109601	50	1	40,0	25	10,30	15,0	0,30	0,50	50	0,100
HI 70/20 <sup>**)</sup>		E08KH-02010109701		E08KH-02010109701		E08KH-02010109701	70	2/0	37,0	20	13,50	16,0	0,40	0,60	50	0,120
HI 95/25 <sup>**)</sup>		E08KH-02010109801		E08KH-02010109801		E08KH-02010109801	95	3/0	44,0	25	14,50	18,0	0,40	0,60	25	0,135
HI 120/27 <sup>**)</sup>		E08KH-02010109901		E08KH-02010109901		E08KH-02010109901	120	4/0	48,0	27	16,50	20,0	0,45	0,70	25	0,220
HI 150/32 <sup>**)</sup>		E08KH-02010110001		E08KH-02010110001		E08KH-02010110001	150	5/0	58,0	32	19,50	23,0	0,50	1,00	25	0,290

<sup>\*)</sup> Wielkości nie objęte normą DIN.

<sup>\*\*)</sup> Dla tych przekrojów niemiecki kolor izolacji jest taki sam jak kolor wg DIN w związku z tym występuje wyłącznie wykonanie "N".

<sup>\*\*\*)</sup> Dla tych przekrojów kolor izolacji "F" jest taki sam jak kolor wg DIN w związku z tym występuje wyłącznie wykonanie "DIN".

<sup>\*)</sup> Sizes out of DIN standard.

<sup>\*\*)</sup> For these cross sections german and DIN colours are the same therefore there exist only "N" design.

<sup>\*\*\*)</sup> For these cross sections "F" and DIN colours are the same therefore there exist only "DIN" design.

<sup>\*)</sup> Величины не входящие в норму DIN.

<sup>\*\*)</sup> Для этих сечений цвет "N" такой же как цвет согласно DIN, потому существует только исполнение "N".

<sup>\*\*\*)</sup> Для этих сечений цвет "F" такой же как цвет согласно DIN, потому существует только исполнение "DIN".

Oznaczenia typów izolacji / Description of types of insulation / Обозначение типов изоляции

- HI 1 7 8** "Kolor niemiecki" / "German colour" / "Немецкий цвет"
- HI 1 7 8 DIN** Kolor wg DIN / Colour acc. to DIN / Цвет согл. DIN
- HI 1 7 8 F** "Kolor francuski" (F) / "French colour" (F) / "Французский цвет" (F)

Nazwy kolorów patrz str. 22 / Name of colors, see on page 23 / Название цветов см. стр. 24

*[Handwritten signature]*

*[Handwritten signature]*

*[Handwritten signature]*

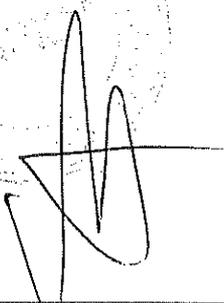
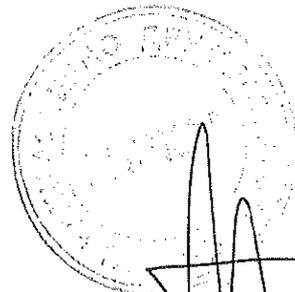
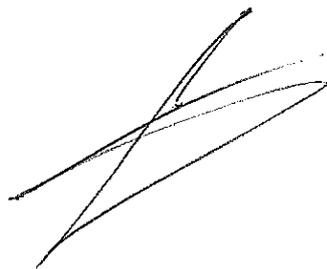
ВЕРНО С СЕРТИФИКАТОМ  
Подпись: \_\_\_\_\_

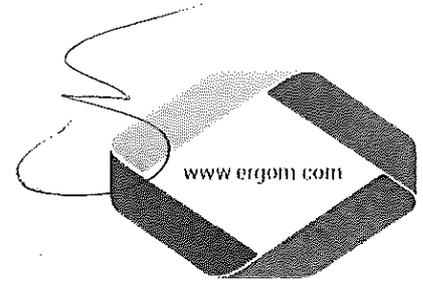
www.ergom.com



**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 25**



Лодз, 27.07.2015

## Декларация за съответствие 86/2015

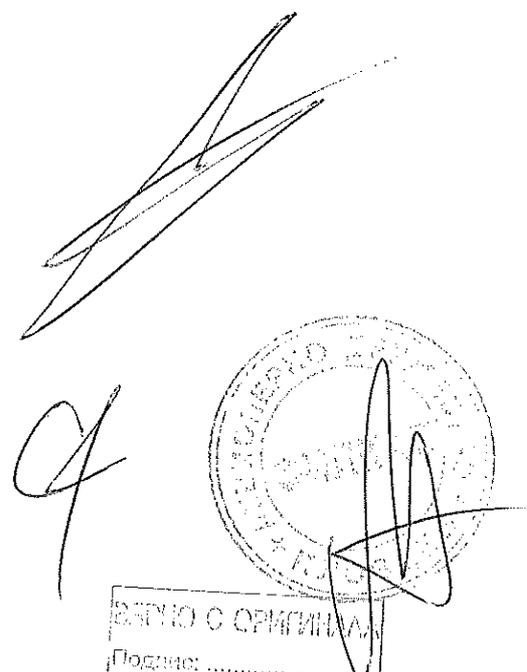
- 1. Производител:** ZAE ERGOM Sp. z o. o  
94-102 Lodz ul. Nowe Sady 10
- 2. Продукт:** Изолирани медни тръбни кабелни накрайници **NI**
- 3. Класификация:** PKWi U 31.20.27-70.00
- 4. Употреба и обхват на използване:** използва се за завършек на медни жила на проводници.
- 5. Техническа спецификация:** Накрайниците съответстват на изискванията на DIN 46229/4.
- 6. Партида, която е обхваната от декларацията:** продукти, закупени от клиента.

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

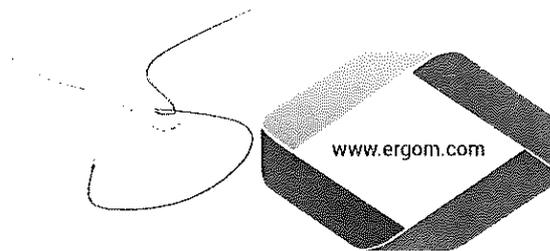
Dział Kontroli Jakości  
Specjalistyczny Zakład

на основание чл. 36а, ал. 3  
от ЗОП

Ръководител отдел Контрол на качеството



ПОДПИСАНО С ОРМЕНИНА  
Подпис: \_\_\_\_\_



Łódź 27.07.2015

## Declaration of conformity 86/2015

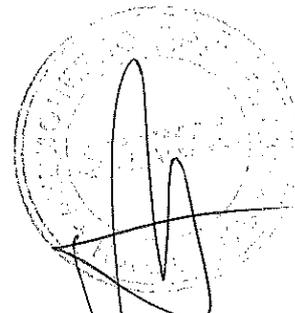
1. **Product manufacturer:** ZAE ERGOM Sp. z o. o  
94-102 Łódź ul. Nowe Sady 10
2. **Product name:** Insulated copper cord-end terminals type HI
3. **Product classification:** PKWi U 31.20.27-70.00
4. **Product application and the range of usage:** used for termination of copper conductors of energetics wires.
5. **Technical specification:** Terminals are compliant with norm DIN 46228/4
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 Jakości  
Specjalista ds. Jakości

на основании чл. 36а, ал. 3  
от ЗОП

Quality control dept. manager



WIRING ACCESSORIES  
CABLE TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS



VAT: PL7260129071, Regon: 473076927, KRS: 0000132427  
Sąd Rejonowy dla Łodzi - Śródmieście 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

**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 СПЕЦИФИКАЦИИПриложение 26

## Технология за кримпване на кабелни накрайници

Изработени като неизолирани накрайници Н тип според Ergom или изолирани накрайници: HI тип според Ergom.

**Материал:** Cu тръба, E-Cu 57 клас съгласно DIN 1787 или DIN 40500, дебелина 0,15±0,3 mm Изолация полиамид или полипропилен, работна температура -30÷+95 °C – полиамид 6.6; -30÷+100 °C – полипропилен.

**Покритие:** покалаени 3 µm.

**Дизайн:** DIN 46228 Teil 1 – Н тип накрайници DIN 46228 Teil 4 – HI тип накрайници.

**Номинални размери:** съгласно DIN: 0,5÷50 mm<sup>2</sup>, практически размери 0,14÷240 mm<sup>2</sup> се предлагат в значително по-голям диапазон от посочените в стандарта.

**Приложения:** за краища на меден кабел да задържи всички кабелни жила заедно след махане на изолацията и да ги усилва, напр. преди завинтване. Благодарение на ползването на кабелни накрайници е възможно да се постигне по-високо свързващо съпротивление към вибрации както и по-малка вероятност за късо съединение причинено от разхлабено жило на проводника. Чрез изолирани накрайници изолиращият ръкав не е компресиран на жилото, тук играе ролята на предпазна тръба за проводник.

Различните цветове на накрайниците кореспондират с различните номинални сечения на жила. Има три светово кодирани системи за номиналните размери на накрайниците: Немска, Френска (F) и съгласно DIN.

Сечение [mm <sup>2</sup> ]	Немска	Система съгласно DIN	Френска (F)
0,14	Сиво	Сиво	Кафяво
0,25	Синьо	Жълто	Виолетово
0,34	Тюркоаз	Тюркоаз	Розово
0,5	Оранжево	Бяло	Бяло
0,75	Бяло	Сиво	Синьо
1	Жълто	Червено	Червено
1,5	Червено	Черно	Черно
2,5	Синьо	Синьо	Сиво
4	Сиво	Сиво	Оранжево
6	Черно	Жълто	Зелено
10	Слонова кост	Червено	Кафяво
16	Зелено	Синьо	Бяло
25	Кафяво	Жълто	Черно
35	Бежово	Червено	Червено
50	Маслина	Синьо	Синьо
70	Жълто	Жълто	Жълто
95	Червено	Червено	Червено
120	Синьо	Синьо	Синьо
150	Жълто	Жълто	Жълто

### Технология на кримпване

За кримпване използваме инструментите с "трапецовидни" or "квадратни" клещи за кримпване. Кримпващият инструмент до малка степен деформира жилото и обувката за кербоване. Силата на обувката за кербоване върху жилото няма влияние върху съпротивлението на участъка с кабелния накрайник, тъй като действителното налягане се появява в електрическото устройство, към което е свързано жилото. По този начин беше възможно да се проектират компресиращи клещи за кримпване на 0,14÷6 mm<sup>2</sup> или 0,5÷10 mm<sup>2</sup> накрайници на едно място. Използват се клещи с място за 16 mm<sup>2</sup> накрайници използвани за определено сечение.

В случай на квадратно кримпване клещите имат специална конструкция, която се състои от четири подвижни стени да формира квадрат. Това гарантира, че клещите са много добре приспособени към обувката за кербоване в обхват на жилото: 0,08÷6 mm<sup>2</sup> or 4÷16 mm<sup>2</sup>. Такава конструкция улеснява отстраняването на накрайника от кримпващия инструмент след компресия.

Ние използваме същия инструмент за неизолирани накрайници, както и за изолирани, тъй като изолиращият ръкав на изолирания накрайник не е деформиран по време на компресията.

Форма на кримпване – "трапецовидна"	Форма на кримпване – "трапецовидна със"	Форма на кримпване – "квадратна"	Форма на кримпване – "хексагон"

## Crimping technology for cord-end terminals

Made as uninsulated terminals H type acc. to Ergom or insulated terminals: HI type acc. to Ergom.

**Material:** Cu tube, E-Cu 57 grade acc. to DIN 1787 or DIN 40500, thickness 0,15±0,3 mm Insulation polyamide or polypropylene, operating temperature -30÷+95 °C – polyamide 6.6; -30÷+100 °C – polypropylene.

**Surface:** tin-plated 3 µm.

**Design:** DIN 46228 Teil 1 – H type terminals DIN 46228 Teil 4 – HI type terminals.

**Rated sizes:** acc. to DIN: 0,5÷50 mm<sup>2</sup>, practically sizes 0,14÷240 mm<sup>2</sup> are offered in a considerably larger range than given in the standard.

**Application:** for ends of copper cable to hold all cable wires together after taking off the insulation and to stiffen them, e.g. before screwing on. Owing to the use of cord end terminals it is possible to achieve higher connection resistance to vibrations as well as a lower short-circuit hazard caused by a loose wire of conductor. By insulated terminals the insulating sleeve is not compressed on the wire, it plays here a role of protection tubing for conductor.

Various colours of terminals correspond to various rated cross-sections of wires. There are three colour coding systems for rated sizes of terminals: German, French (F) and according to DIN.

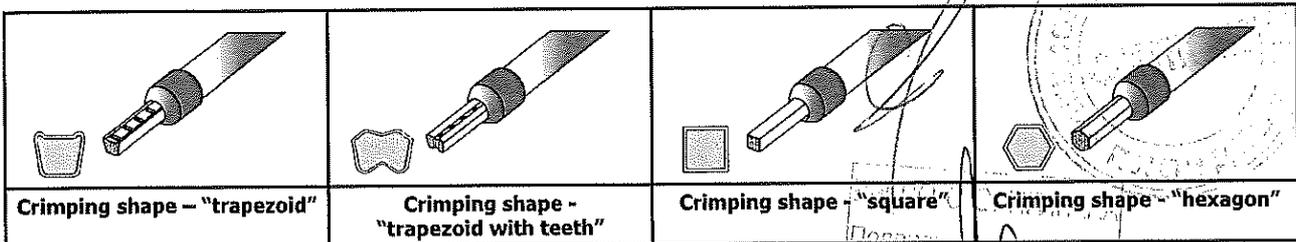
Cross section [mm <sup>2</sup> ]	German	System acc. to DIN	French (F)
0,14	Grey	Grey	Brown
0,25	Blue	Yellow	Violet
0,34	Turquoise	Turquoise	Rose
0,5	Orange	White	White
0,75	White	Grey	Blue
1	Yellow	Red	Red
1,5	Red	Black	Black
2,5	Blue	Blue	Grey
4	Grey	Grey	Orange
6	Black	Yellow	Green
10	Ivory	Red	Brown
16	Green	Blue	White
25	Brown	Yellow	Black
35	Beige	Red	Red
50	Olive	Blue	Blue
70	Yellow	Yellow	Yellow
95	Red	Red	Red
120	Blue	Blue	Blue
150	Yellow	Yellow	Yellow

### Crimping technology

For crimping we use the tools with "trapezoidal" or "square" crimping dies. The crimping tool to a small extent deforms a wire and crimping terminal. The force of crimping terminal on the wire has no influence on the resistance of a wire-terminal passage since actual pressure occurs in the electric device to which the wire is connected. Thus it was possible to design a compression die for crimping a 0,14÷6 mm<sup>2</sup> or 0,5÷10 mm<sup>2</sup> terminals in one seat. The dies with seats for 16 mm<sup>2</sup> terminals designed for a definite wire cross-section are used.

In case of square crimping the die has a special construction which consists of four movable sides to form a square. This ensures that a die is very well adjusted to the crimped terminal, in the wire range: 0,08÷6 mm<sup>2</sup> or 4÷16 mm<sup>2</sup>. Such construction makes it easier to remove the terminal from crimping tool after compression.

We use the same tool for uninsulated terminals as for insulated as the insulating sleeve in the insulated terminal is not deformed while compressing.

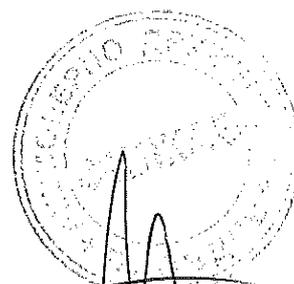






**Приложение 2 към Техническо предложение**За обособена позиция № 2:

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

ИЗИСКВАНИ ДОКУМЕНТИ ОТ ТЕХНИЧЕСКИ  
ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИПриложение 27

## Końcówki oczkowe izolowane KOI

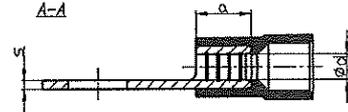
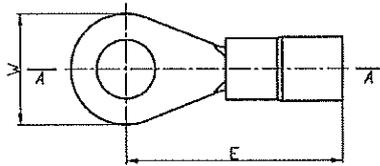
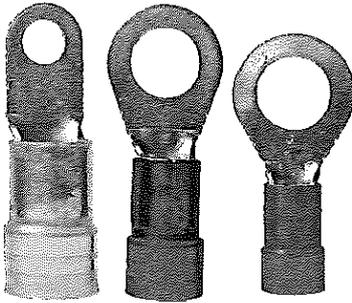
## Insulated ring terminals KOI type

## Очковые наконечники с изоляцией типа KOI

**Material:** Cu.  
**Pokrycie:** cynowane galwanicznie.  
**Izolacja:** poliamid 6.6;  
 poliwęglan – wyróżnik PC  
**Temp. pracy:**  
 -30++95 °C – poliamid 6.6;  
 -50++120 °C – poliwęglan.  
**Wykonanie:** DIN 46237.

**Material:** Cu.  
**Surface:** tin-plated.  
**Insulation:** polyamide 6.6;  
 polycarbonate – discriminant PC  
**Operating Temp.:**  
 -30++95 °C – polyamide 6.6;  
 -50++120 °C – polycarbonate.  
**Design:** DIN 46237.

**Материал:** Cu.  
**Покрывтие:** гальванически лужёные.  
**Изоляция:** полиамид 6.6;  
 поликарбонат – суффикс PC  
**Рабочая темп.:**  
 -30++95 °C – полиамид 6.6;  
 -50++120 °C – поликарбонат.  
**Исполнение:** DIN 46237.



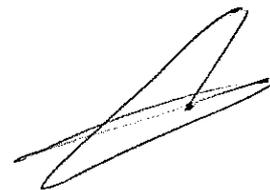
Izolacja / Insulation / Изоляция

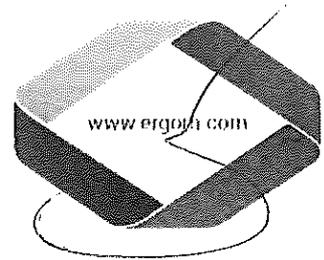
Poliamid 6.6 Polyamide 6.6 Полиамид 6.6		Poliwęglan Polycarbonate Поликарбонат		Kolor Colour Цвет	Przekrój Cross section Сечение [mm <sup>2</sup> /mm <sup>2</sup> ]	Zacisk Terminal Зажим	d	s	W	E	a	100	100	0,030
Typ Type Тип	Art. nr Item No. Арт. №	Typ Type Тип	Art. nr Item No. Арт. №											
KOI 0,5/2 <sup>*)</sup>	E09KO-02010100101	-	-			M 2			5	14				0,030
KOI 0,5/2,5 <sup>*)</sup>	E09KO-02010100201	-	-			M 2,5			5	14				0,025
KOI 0,5/3 <sup>*)</sup>	E09KO-02010100301	-	-			M 3			5	14				0,025
KOI 0,5/3,5 <sup>*)</sup>	E09KO-02010100401	-	-		0,1÷0,5	M 3,5	1,0	0,5	6	16	4	100		0,030
KOI 0,5/4 <sup>*)</sup>	E09KO-02010100501	-	-			M 4			6,5	16				0,030
KOI 0,5/5 <sup>*)</sup>	E09KO-02010100601	-	-			M 5			8	16				0,035
KOI 1/2,5	E09KO-02010100700	KOI 1/2,5 PC	E09KO-02010200100			M 2,5			6	16				0,070
KOI 1/3	E09KO-02010100800	KOI 1/3 PC	E09KO-02010200200			M 3			6	16				0,070
KOI 1/3,5	E09KO-02010100900	KOI 1/3,5 PC	E09KO-02010200300			M 3,5			6	16				0,065
KOI 1/4	E09KO-02010101000	KOI 1/4 PC	E09KO-02010200400			M 4			8	17				0,075
KOI 1/5	E09KO-02010101100	KOI 1/5 PC	E09KO-02010200500		0,75÷1	M 5	1,6	0,8	10	18	5	100		0,090
KOI 1/6 <sup>*)</sup>	E09KO-02010101200	KOI 1/6 PC <sup>*)</sup>	E09KO-02010200600			M 6			10	18				0,085
KOI 1/8 <sup>*)</sup>	E09KO-02010101300	KOI 1/8 PC <sup>*)</sup>	E09KO-02010200700			M 8			14	22				0,135
KOI 1/10 <sup>*)</sup>	E09KO-02010101400	KOI 1/10 PC <sup>*)</sup>	E09KO-02010200800			M 10			14	22				0,110
KOI 2,5/3	E09KO-02010101500	KOI 2,5/3 PC	E09KO-02010200900			M 3			6	17				0,080
KOI 2,5/3,5	E09KO-02010101600	KOI 2,5/3,5 PC	E09KO-02010201000			M 3,5			6	17				0,080
KOI 2,5/4	E09KO-02010101700	KOI 2,5/4 PC	E09KO-02010201100			M 4			8	18				0,090
KOI 2,5/5	E09KO-02010101800	KOI 2,5/5 PC	E09KO-02010201200			M 5			10	20				0,110
KOI 2,5/6	E09KO-02010101900	KOI 2,5/6 PC	E09KO-02010201300		1,5÷2,5	M 6	2,3	0,8	11	22	5	100		0,120
KOI 2,5/8	E09KO-02010102000	KOI 2,5/8 PC	E09KO-02010201400			M 8			14	23				0,150
KOI 2,5/10 <sup>*)</sup>	E09KO-02010102100	KOI 2,5/10 PC <sup>*)</sup>	E09KO-02010201500			M 10			18	24				0,190
KOI 2,5/12 <sup>*)</sup>	E09KO-02010102200	KOI 2,5/12 PC <sup>*)</sup>	E09KO-02010201600			M 12			18	24				0,195
KOI 2,5/16	E09KO-02010102300	KOI 2,5/16 PC <sup>*)</sup>	E09KO-02010201700			M 16			27	32				0,350
KOI 6/3,5 <sup>*)</sup>	E09KO-02010102400	KOI 6/3,5 PC <sup>*)</sup>	E09KO-02010201800			M 3,5			8	20				0,165
KOI 6/4	E09KO-02010102500	KOI 6/4 PC	E09KO-02010201900			M 4			8	20				0,160
KOI 6/5	E09KO-02010102600	KOI 6/5 PC	E09KO-02010202000			M 5			10	21				0,185
KOI 6/6	E09KO-02010102700	KOI 6/6 PC	E09KO-02010202100		4÷6	M 6	3,6	1,0	11	22	6	100		0,190
KOI 6/8	E09KO-02010102800	KOI 6/8 PC	E09KO-02010202200			M 8			14	25				0,235
KOI 6/10	E09KO-02010102900	KOI 6/10 PC	E09KO-02010202300			M 10			18	27				0,300
KOI 6/12 <sup>*)</sup>	E09KO-02010103000	KOI 6/12 PC <sup>*)</sup>	E09KO-02010202400			M 12			18	27				0,240

<sup>\*)</sup> Wielkości nie objęte normą DIN.

<sup>\*)</sup> Sizes out of DIN standard.

<sup>\*)</sup> Величины не входящие в норму DIN.

**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 28**



## Декларация за съответствие 09/2016

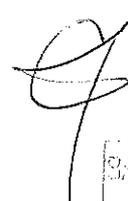
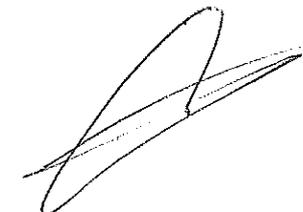
1. **Производител:** ZAE ERGOM Sp. z o. o  
а. 94-102 Lodz ul. Nowe Sady 10
2. **Продукт:** Изолирана медна кабелна обувка **KOI**
3. **Класификация:** PKWiU 31.20.27-70.00
4. **Употреба и обхват на използване:** използва се за завършек на медни жила на проводници.
5. **Техническа спецификация:** Накрайниците съответстват на изискванията на DIN 46237.
6. **Партида, която е обхваната от декларацията:** продукти, закупени от клиента.

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

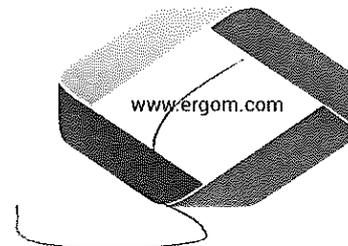
Dział Kontroli Jakości  
Specjalistyczny Laboratorium

на основание чл. 36а, ал. 3  
от ЗОП

Ръководител отдел Контрол на качеството



ВЕРНО С ОРИГИНАЛА  
Подпис: .....



## Declaration of conformity 09/2016

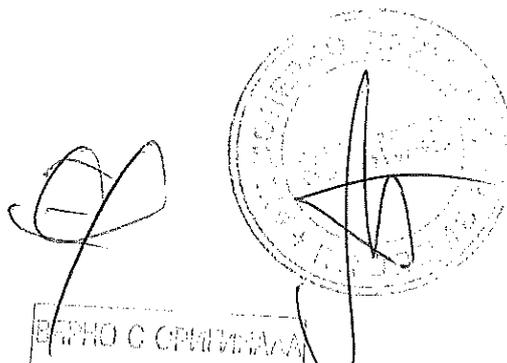
- 1. Product manufacturer:** ZAE ERGOM Sp. z o. o  
94-102 Łódź ul. Nowe Sady 10
- 2. Product name :** Insulated copper ring terminals type KOI.
- 3. Product classification:** PKWiU 31.20.27-70.00
- 4. Product application and the range of usage:** used for termination of copper conductors of energetics wires
- 5. Technical specification:** Terminals are compliant with norm DIN 46237
- 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 Jakości  
~~Specjalista / o/s Jakości~~

на основании чл. 36а, ал. 3  
от ЗОП

Quality control dept. manager



MAT-PL.7260129071, Regon: 473076927, KRS: 0000132427

Sąd Rejonowy dla Łodzi – Śródmieście 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



WIRING ACCESSORIES  
CABLE TERMINALS  
TOOLS FOR ELECTRICIANS  
ENCLOSURES AND SWITCHGEARS



Превод от полски език

ИНСТИТУТ ПО ЕНЕРГЕТИКА

ОТДЕЛ ЕЛЕКТРИЧЕСКИ

01-330 ВАРШАВА, ул. MORY 8, Konto: BIG Bank Gdanski S.A I O/ВАРШАВА Nr 11601029-0327001 Fax:  
836 63 63 Telegram „JENERG”, Telefony: Centrala 836-75-51/9, Dyrektor 836-32-25,

Лаборатория Високо напрежение 9836-80-16

ТЕХНИЧЕСКА ОЦЕНКА Nr IEn EWP-238/99

1. Предмет на оценката: Изпитване на кабелни обувки от типа: KOR; KO; KOI; KW; KWI
2. Клиент: Катедра Електрическо оборудване; ERGOM; ул. Siewna 15A, 94-250 Лодз
3. Изисквания Nr: EWP/52/E/9/99
4. Представени документи: 1) Изследователски доклад Nr EWP /52/E/99-I zdn. 29.12.1999r.  
Институт по енергетика, Варшава

2) Инструкция - „PRASKA RECZNA K 19” Z.A.E. ERGOM,  
Декември.1999г.

3) Инструкция -, ХИДРАВЛИЧНА КОЛЕКТОРНА ГЛАВА НН 630”.  
Z.A.E. ERGOM, Декември.1999г.

5. Оценка:

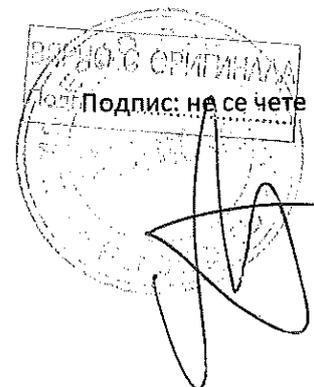
Въз основа на положителните резултати от изпитванията, включени в протокола от изпитването, споменато по-горе в точка 4.1, се счита, че медните кабелни обувки от типа: KOR; KO; KOI; KW; KWI пресовани по начин, съответстващ на инструкциите, посочени в т.4.2) или т.4.3) отговарят на изискванията, определени в стандарта PN-90 / E-06401/02.

Медни обувки:

- Обувка за кербоване KOR с напречно сечение 6... 500mm<sup>2</sup>
- Обувка за щанцоване KO с напречно сечение 1,5... 240mm<sup>2</sup>
- Изолирани кабелни обувки KOI с напречно сечение 1,5... 120mm<sup>2</sup>
- Вилкови крайници KW с напречно сечение 1,5 ... 16 mm<sup>2</sup>
- Вилкови крайници с изолация KWI с напречно сечение 1,5 ... 16mm<sup>2</sup>

са подходящи за ползване в полски електрически мрежи за свързване на медни кабели от клас 1 или 2 съгласно PN-88 / E-90160.

Варшава, 30.12.1999г





# INSTYTUT ENERGETYKI

PION ELEKTRYCZNY

01-330 WARSZAWA, ul. MORY 8, Konto :BIG Bank Gdański S.A I O/Warszawa Nr 11601029-0327001  
Fax: 836 63 63 Telegram „JENERG”, Telefony: Centrala 836-75-51/9, Dyrektor 836-32-25,  
Laboratorium Wielkopiędowe 836-80-16

## OCENA TECHNICZNA Nr IEn EWP-238/99

- 1. Przedmiot oceny:** Końcówki kablowe miedziane typu: KOR; KO; KOI; KW; KWI
- 2. Zamawiający:** Zakład Aparatury Elektrycznej ERGOM; ul. Siewna 15A, 94-250 Łódź
- 3. Zamówienie Nr:** EWP/52 / E / 9/99
- 4. Dostarczone dokumenty:**
  - 1) Raport badań Nr EWP / 52 / E / 99 - I z dn. 29.12.1999r.  
Instytut Energetyki , Warszawa
  - 2) Instrukcja - „ PRASKA RĘCZNA K 19”  
Z.A.E. ERGOM, grudzień.1999r.
  - 3) Instrukcja - „GŁOWICA HYDRAULICZNA ZACISKOWA HH 630”.  
Z.A.E. ERGOM, grudzień.1999r.

### 5. Ocena:

Na podstawie pozytywnych rezultatów badań zawartych w raporcie badań wymienionym wyżej w p. 4.1 uznaje się, że końcówki kablowe miedziane typu: KOR; KO; KOI; KW; KWI zaprasowywane w sposób zgodny z instrukcją wymienioną w p.4.2) lub p.4.3) spełniają wymagania ustalone w normie PN-90/E-06401/02.

- Końcówki miedziane :
- rurowe KOR o przekroju 6... 500mm<sup>2</sup>
  - oczkowe KO o przekroju 1,5... 240mm<sup>2</sup>
  - oczkowe izolowane KOI o przekroju 1,5... 120mm<sup>2</sup>
  - widelkowe KW o przekroju 1,5 ... 16 mm<sup>2</sup>
  - widelkowe izolowane KWI o przekroju 1,5 ... 16mm<sup>2</sup>

nadają się do stosowania w polskich sieciach elektroenergetycznych do zakończeń miedzianych żył roboczych kabli klasy 1 lub 2 wg PN-88/E-90160.

Warszawa, 30.12.1999r

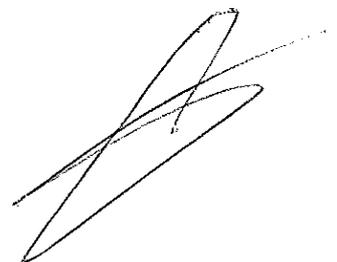
на основании чл. 36а, ал. 3  
от ЗОП

doc. inż. Jerzy Przybysz

Подпись: .....

**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 29**

# Технология за кримпване на изолирани кабелни обувки

Изработени като: пръстеновидни накрайници, вилокови накрайници, изолирани накрайници, иглени накрайници, изолирани гилзи (KOI, KWI, KII, LOI, LWI, KPI, KLI тип съгласно Ergom).

**Материали:**

KOI, KWI, KII, LOI, LWI, KPI: E-Cu листовидна мед с дебелина от 0,8 до 4 [mm] съгласно DIN40500 или DIN 1787.  
 KU, KLI, ZPI: M1E или E-Cu медна тръба съгласно DIN 40500 Teil. 2, 3 или DIN 1787.  
 Изолация: PA (полиамид), PVC (поливинил хлорид), PC, (поликарбонат), свиваща се изолация.  
 Работна температура до 120 °C (според материала).

**Покритие:** покалаени. 4 μm.

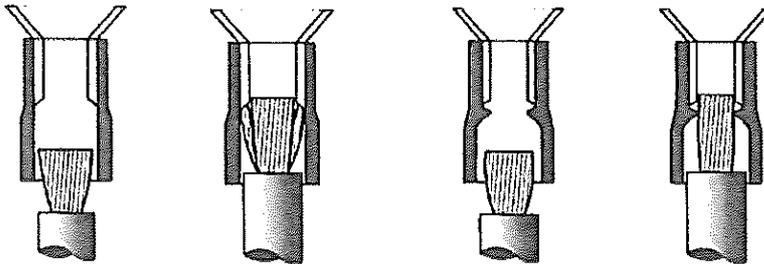
**Дизайн:**

Изработени от медни листове, твърдо запоени. Могат също да бъдат незапоени (LOI, LWI) – не в съответствие с DIN.  
 Пръстеновидни накрайници - KOI, LOI тип (незапоени): DIN 46237.  
 Вилкови накрайници - KWI, LWI тип (незапоени): DIN 46237 (по отношение на тръбната част на накрайника).  
 Изолирани накрайници - KII тип: DIN 46231.  
 Иглени накрайници - KPI тип: DIN 46237 – по отношение на тръбната част на накрайника.  
 Изолирани гилзи - KU, KLI, ZPI, LP, LPO тип: по.

**Номинални размери:**

KOI, LOI, KWI, LWI, KII накрайници: сечения от 0,5 до 6 [mm<sup>2</sup>] (според стандарта), необхванати от стандарт 10 до 120 mm<sup>2</sup>.  
 KU, KPI, KLI, ZPI, LP, LPO изолирани гилзи: сечения 0,5 до 6 [mm<sup>2</sup>].  
 Накрайници с номинални размери до 0,5-6 mm<sup>2</sup> са изработени на принципа на определено сечение на жилото, пр. 6 mm<sup>2</sup> накрайник може да се използва за жила със сечения от 4 to 6 [mm<sup>2</sup>]. Накрайник със сечение над 6 mm<sup>2</sup> може да се използва само за определено сечение на жилото. Има маркировка, отпечатана на всеки накрайник, пр. 2,5-4, да обозначава размера на свързване, за който е изработен накрайника (в този случай M4 и номинално сечение на накрайника 2,5 mm<sup>2</sup>).

**Приложение:**



Фиг. 1

Фиг. 2

Тези накрайници се използват за свързване на жилото чрез а винтово съединение с: шина, комутационна апаратура, електрически устройства и апарати, и т.н. Изолираните гилзи се използват за свързване на две жила в контакт (KU, KLI тип).

**Използваната изолация може да бъде:**

- под формата на PVC тръба (виж фиг. 1) положена на тръбната част на накрайника (изолацията може да бъде разширена в края, за да подsigури влизането на жилото)
- под формата на PA или PC тръба (виж фиг. 2) положена на тръбната част на накрайника и притежаваща конусообразна вътрешна повърхност. Такава конструкция улеснява влизането на жилото и значително подобрява монтажа в сравнение с PVC изолацията. Често е наричано „лесно влизане“.

**Технология за кримпване:**

Накрайниците са кримонати чрез използване на кримпирани инструменти с клещи компресиращи т.нар. "овал" (виж фиг. 3). При тази технология на кримпване не само материалът на накрайника и жилото, но също и материалът на изолацията ръкав, който е притиснат към кримпвания накрайник, се деформира. Ако искаме да направим кримпната свързка с използването на изолирани накрайници, които са заварени преди поставянето върху изолацията, позицията на тази заварка вътре в клещите е безсмислена (виж фиг. 4). Използваната спойка е толкова твърда, че устоява на натиска и деформациите при кримпване. Когато изолирани накрайници с незапоена свързка (LOI, LWI) са кримпвани, позицията на свързката на накрайника в кримпиратите клещи има смисъл заради качеството на свързване (виж фиг. 5).

Фиг. 3

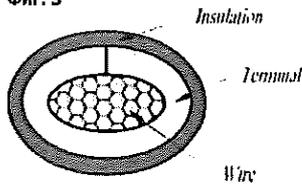


Fig. 4 Изолирани накрайници, запоени преди/след кримпване



Правилната позиция на спойката на накрайника в клещите, по посоката на действие на кримпиратата сила.



Правилната позиция на спойката на накрайника в клещите, срещу посоката на действие на кримпиратата сила.

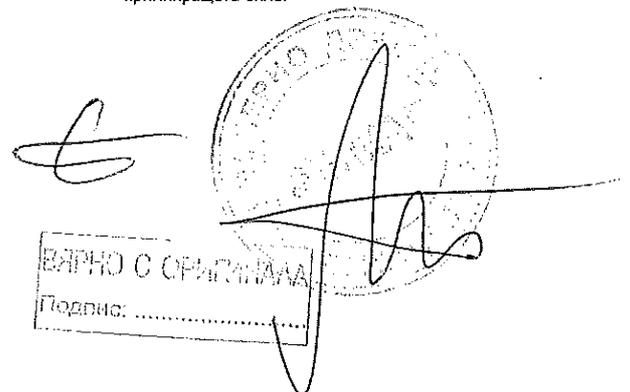
Fig. 5 Изолирани накрайници, незапоени преди / след кримпване



Правилната позиция на спойката на накрайника в клещите, по посоката на действие на кримпиратата сила.



Грешна позиция на спойката на накрайника в клещите, срещу посоката на действие на кримпиратата сила.



# CRIMPING TOOLS / ИНСТРУМЕНТИ ЗЦА КРИМПВАНЕ



KOI  
LOI



KWI  
LWI



KI



KPI



KLI



ZPI



SZ 1,5-6



WZ 10 I / I-6



WS 10 I / I-6



N-Fe+M-A-I-0,5-6



N-Fe-L+M-A-I-0,5-6



N-AL+M-A-I-0,5-6



PWZ 10 / 0,5-10



WZ-D-IN

- 0,5
- 1
- 1,5
- 2,5
- 4
- 6
- 10
- 16
- 25
- 35
- 50
- 70
- 95
- 120



KOIT



KWIT



KLIT



WZ 10 I / I-6



WS 10 I / I-6



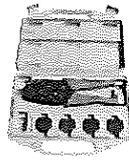
N-Fe+M-A-I-0,5-6



N-Fe-L+M-A-I-0,5-6



N-AL+M-A-I-0,5-6



Zestaw WZ



PWZ 10 / 0,5-10



WZ-TINK-BNC

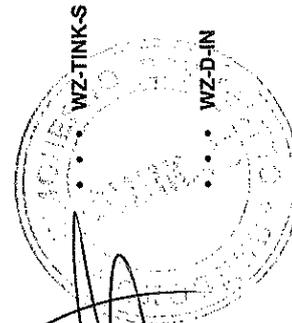


WZ-TINK-S

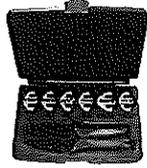
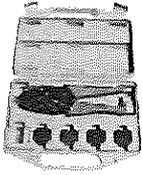
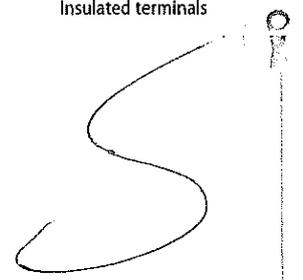


WZ-D-IN

- 1
- 2,5
- 6



СЕРТИФИКАЦИЯ  
Подпись: \_\_\_\_\_



WZ

WZ-TINK-BNC

WZ-TINK-S

EK 18

EK 19

EK 22

- 0,5
- 1
- 1,5
- 2,5
- 4
- 6
- 10
- 16
- 25
- 35
- 50
- 70
- 95
- 120

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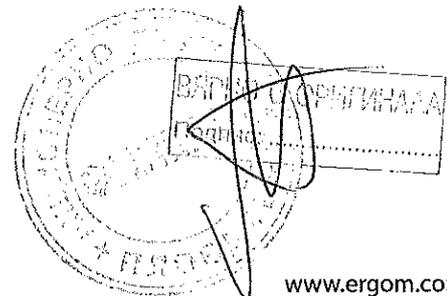
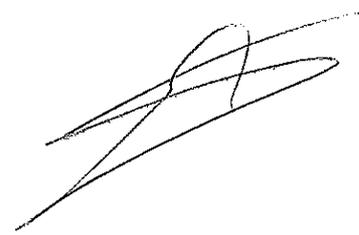
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# HYDRAULIC PRESSES AND HEADS / ХИДРАВВЛИЧНИ ПРЕСИ И ГЛАВИ



K01  
LOI



KWI  
LWI



KII



KPI



KLI



ZPI



HO 2 EH

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HP 2/42 EH

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HP 2/42 EV

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HK 5 EL

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HK 22 EV

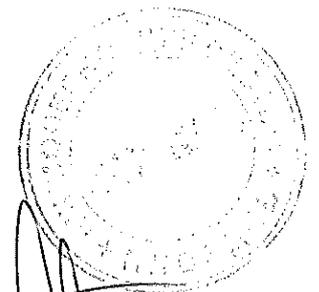
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UH 60 EV

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- 10
- 16
- 25
- 35
- 50
- 70
- 95
- 120



ВЕРНО С ОРИГИНАЛА  
 Подпис: .....



**GH 60**

- 10
- 16
- 25
- 35
- 50
- 70
- 95
- 120



**HPH 2/32**

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**HPH 2/38**

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**HH 400**

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**HH 630**

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**HK 22**

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**UH 60**

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**WHPH 4**

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**WHPH 2/32**

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**WHPH 2/38**

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**WHPH 2/42**

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**HK 4**

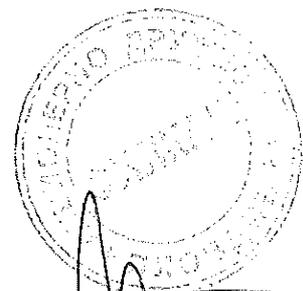
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**HK 5**

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ВАРНО-ОРГАНАЛ  
 Подпис: *[Handwritten signature]*

## Crimping technology for insulated terminals

Made as: ring terminals, spade terminals, pin terminals, blade terminals, butt connectors (KOI, KWI, KII, LOI, LWI, KPI, KLI type acc. to Ergom).

**Material:**

KOI, KWI, KII, LOI, LWI, KPI: E-Cu sheet cooper with thickness of 0,8 to 4 [mm] acc. to DIN40500 or DIN 1787.  
 KLI, KLIT, ZPI: M1E or E-Cu copper tube acc. to DIN 40500 Tell. 2, 3 or DIN 1787.  
 Insulation: PA (polyamide), PVC (polyvinyl chloride), PC, (polycarbonate), shrinkable insulation.  
 Working temperature up to 120 °C (according to material).

**Surface:** tin-plated. 4 µm.

**Design:**

made of copper sheet, hard soldered. Can also be unsoldered (LOI, LWI) – not in conformity with DIN.  
 Ring terminals – KOI, LOI type (unsoldered): DIN 46237.  
 Spade terminals – KWI, LWI type (unsoldered): DIN 46237 (ref. to tubular part of terminal).  
 Pin terminals – KII type: DIN 46231.  
 Blade terminals – KPI type: DIN 46237 – ref. to tubular part of terminal.  
 Butt connectors – KLI, KLIT, ZPI, LP, LPO type: no.

**Rated sizes:**

KOI, LOI, KWI, LWI, KII terminals: cross-section of 0,5 to 6 [mm<sup>2</sup>] (acc. to standard), not hugged with standard 10 to 120 mm<sup>2</sup>.  
 KLI, KPI, KLIT, ZPI, LP, LPO butt connector: cross-section 0,5 to 6 [mm<sup>2</sup>].  
 Terminals with rated sizes up to 0,5÷6 mm<sup>2</sup> are designed in principle for particular wire cross-sections, e.g. 6 mm<sup>2</sup> terminal can be used for the wires with a cross-section of 4 to 6 [mm<sup>2</sup>]. Terminal with a cross-section above 6 mm<sup>2</sup> can be used only for defined wire cross-section. There is marking stamped on every terminal, e.g. 2,5-4, to indicate the joint size for which the terminal is designed (in this case M4 and rated terminal cross-section 2,5 mm<sup>2</sup>).

**Application:**

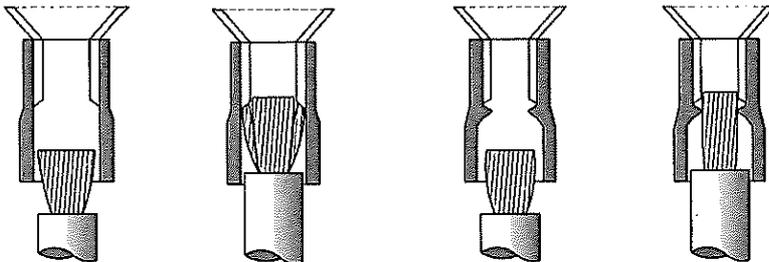


Fig. 1

Fig. 2

These terminals are used for connecting wire by means of a screw joint with: bus-bar, switchgear housing, electric device and apparatus, etc. Butt connectors are used to join two wires in contact (KLI, KLIT type).

**Used insulation may be:**

- in form of PVC tube (see fig. 1) pulled on the tubular part of terminal (insulation can be widened on its end to facilitate inserting of wire)
- in form of PA or PC tube (see fig. 2) pulled on the tubular part of terminal and having a contact inside surface. Such construction enables the entry of the wire to be easier and considerably advances mounting compared with terminal having PVC insulation. It is often called "easy entry".

**Crimping technology:**

Terminals are crimped by use of crimping tools with dies compressing to so called "oval" (see fig. 3). In this crimping technology not only the material of the terminal and wire, but also material of insulating sleeve which is pressed on the terminal part to be crimped, is deformed. If we want to make crimped connection with use of insulated terminals which had seam welded before putting on the insulation, position of this seam inside the die is meaningless (see fig. 4). Used solder is so hard that it resists pressures and deformations when crimping. When insulated terminals with an unsoldered seam (LOI, LWI) are crimped, the position of the terminal seam in the crimping die is meaningful for the joint quality (see fig. 5).

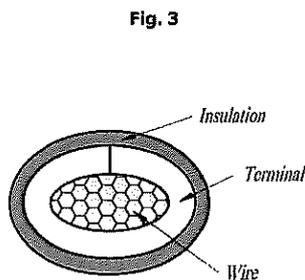
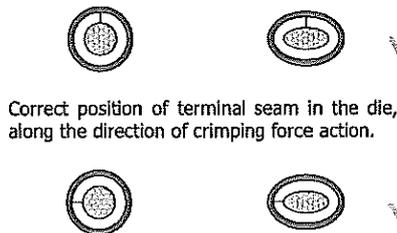


Fig. 3

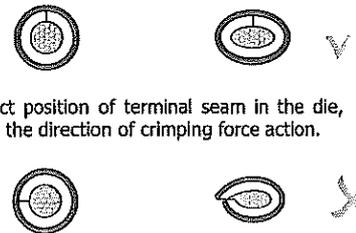
Fig. 4 Insulated terminals, soldered  
before crimping after crimping



Correct position of terminal seam in the die, along the direction of crimping force action.

Correct position of terminal seam in the die, across the direction of crimping force action.

Fig. 5 Insulated terminals, unsoldered  
before crimping after crimping



Correct position of terminal seam in the die, along the direction of crimping force action.

Wrong position of terminal seam in the die, across the direction of crimping force action.

Handwritten signature and a circular stamp. Below the stamp is a rectangular stamp with the text: "СЕРТИФИКАТ" and "Подпись:".

# CRIMPING TOOLS



KOI  
LOI



KWI  
LWI



KII



KPI



KLJ



ZPI



SZ 1,5-6



WZ 10 1/1-6



WS 10 1/1-6



WS 16 1/10-16



N-Fe+M-A-I-0,5-6



N-Fe-L+M-A-I-0,5-6



N-AL+M-A-I-0,5-6



PWZ 10 /0,5-10

- 0,5
- 1
- 1,5
- 2,5
- 4
- 6
- 10
- 16
- 25
- 35
- 50
- 70
- 95
- 120



KOIT



KWIT



KLIT



WZ 10 1/1-6



WS 10 1/1-6



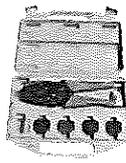
N-Fe+M-A-I-0,5-6



N-Fe-L+M-A-I-0,5-6



N-AL+M-A-I-0,5-6



Zestaw WZ



PWZ 10 /0,5-10



WZ-TINK-BNC



WZ-TINK-S



WZ-D-IN

- 1
- 2,5
- 6

Подпись: .....

5



WZ

WZ-TINK-BNC

WZ-TINK-S

EK 18

EK 19

EK 22

- 0,5
- 1
- 1,5
- 2,5
- 4
- 6
- 10
- 16
- 25
- 35
- 50
- 70
- 95
- 120

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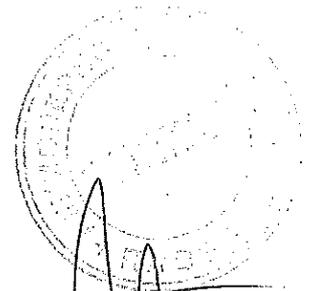
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ВАННО С ОПРАВИЛНА  
Поредно: .....

# HYDRAULIC PRESSES AND HEADS



KOI  
LOI



KWI  
LWI



KII



KPI



KLI



ZPI



HO 2 EH



HO 2 EV



HP 2/42 EH



HP 2/42 EV



HK 5 EL



HK 22 EV



UH 60 EV

- 10
- 16
- 25
- 35
- 50
- 70
- 95
- 120

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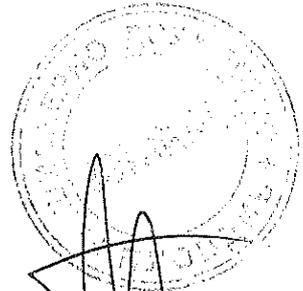
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ВЕРНО С ОРИГИНАЛОМ  
 Подпись: .....

3

С



GH 60



HPH 2/32

HPH 2/38



HH 400



HH 630



HK 22



UH 60

WHPH 4

WHPH 2/32

WHPH 2/38

WHPH 2/42



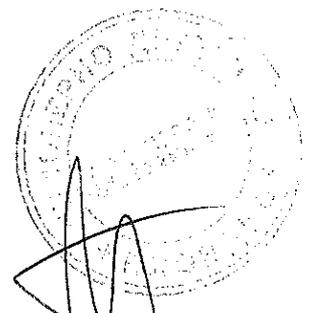
HK 4



HK 5

10  
16  
25  
35  
50  
70  
95  
120

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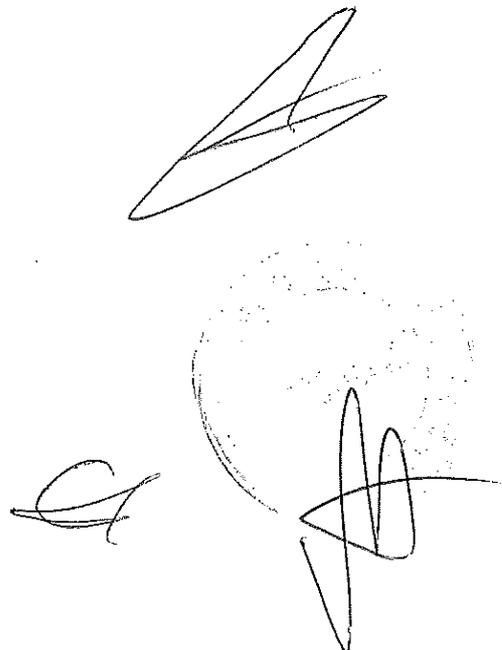


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ВАННО С ОРИГОНАЛ  
Подпис: .....

**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 30**

**ИНСТРУКЦИЯ ЗА ТРАНСПОРТ, СЪХРАНЕНИЕ И СКЛАДИРАНЕ**

За да се защитят от случайни повреди по време на транспорт и съхранение кабелните обувки, накрайници и гилзи трябва да се транспортират и съхраняват в оригиналната опаковка на производителя. При транспорта да се използват закрити превозни средства за да не се допусне навлажняване на опаковките.

Съхранението са препоръчва да бъде в закрити и сухи складови помещения при температура до 40 °С.

Дата: 22.05.2019 г.

Подпис и печат:

  
на основание чл. 36а, ал. 3  
от ЗОП.....  
**Атанас Танчев**  
Изпълнителен Директор

**Приложение 3 към Техническо предложение  
За Обособена позиция № 2**

**СРОКОВЕ ЗА ДОСТАВКА**

№	Наименование	Мярка	Количество със срок на доставка до 7 кал. дни	Количество със срок на доставка до 30 кал. дни
1	2	3	4	5
1	Каб. обувка, Al, пресова херметична 16xM8	бр.	100	400
2	Каб. обувка, Al, пресова херметична 16xM10	бр.	10	20
3	Каб. обувка, Al, пресова херметична 25xM8	бр.	100	300
4	Каб. обувка, Al, пресова херметична 25xM10	бр.	10	20
5	Каб. обувка, Al, пресова херметична 25xM12	бр.	50	150
6	Каб. обувка, Al, пресова херметична 35xM8	бр.	20	100
7	Каб. обувка, Al, пресова херметична 35xM10	бр.	10	20
8	Каб. обувка, Al, пресова херметична 35xM12	бр.	10	20
9	Каб. обувка, Al, пресова херметична 50xM8	бр.	10	20
10	Каб. обувка, Al, пресова херметична 50xM10	бр.	50	150
11	Каб. обувка, Al, пресова херметична 50xM12	бр.	10	20
12	Каб. обувка, Al, пресова херметична 70xM8	бр.	10	20
13	Каб. обувка, Al, пресова херметична 70xM10	бр.	10	20
14	Каб. обувка, Al, пресова херметична 70xM12	бр.	50	150
15	Каб. обувка, Al, пресова херметична 95xM10	бр.	20	100
16	Каб. обувка, Al, пресова херметична 95xM12	бр.	20	100
17	Каб. обувка, Al, пресова херметична 120xM10	бр.	10	20
18	Каб. обувка, Al, пресова херметична 120xM12	бр.	10	50
19	Каб. обувка, Al, пресова херметична 120xM16	бр.	10	20
20	Каб. обувка, Al, пресова херметична 150xM10	бр.	10	50
21	Каб. обувка, Al, пресова херметична 150xM12	бр.	10	20
22	Каб. обувка, Al, пресова херметична 150xM16	бр.	10	20
23	Каб. обувка, Al, пресова херметична 185xM10	бр.	10	20
24	Каб. обувка, Al, пресова херметична 185xM12	бр.	10	20
25	Каб. обувка, Al, пресова херметична 185xM16	бр.	50	150
26	Каб. обувка, Al, пресова херметична 240xM12	бр.	10	20
27	Каб. обувка, Al, пресова херметична 240xM16	бр.	10	20
28	Каб. обувка, Al, пресова херметична 240xM20	бр.	10	20
29	Каб. обувка, Cu, пресова, тръбна 10xM5	бр.	10	20
30	Каб. обувка, Cu, пресова, тръбна 10xM6	бр.	10	20
31	Каб. обувка, Cu, пресова, тръбна 16xM8	бр.	50	150
32	Каб. обувка, Cu, пресова, тръбна 16xM10	бр.	20	100
33	Каб. обувка, Cu, пресова, тръбна 25xM8	бр.	20	50
34	Каб. обувка, Cu, пресова, тръбна 25xM10	бр.	10	50
35	Каб. обувка, Cu, пресова, тръбна 25xM12	бр.	10	20
36	Каб. обувка, Cu, пресова, тръбна 35xM8	бр.	10	50

№	Наименование	Мярка	Количество със срок на доставка до 7 кал. дни	Количество със срок на доставка до 30 кал. дни
1	2	3	4	5
37	Каб. обувка, Си, пресова, тръбна 35xM10	бр.	10	50
38	Каб. обувка, Си, пресова, тръбна 35xM12	бр.	10	20
39	Каб. обувка, Си, пресова, тръбна 50xM8	бр.	10	20
40	Каб. обувка, Си, пресова, тръбна 50xM10	бр.	10	50
41	Каб. обувка, Си, пресова, тръбна 50xM12	бр.	10	20
42	Каб. обувка, Си, пресова, тръбна 70xM8	бр.	10	20
43	Каб. обувка, Си, пресова, тръбна 70xM10	бр.	10	20
44	Каб. обувка, Си, пресова, тръбна 70xM12	бр.	10	20
45	Каб. обувка, Си, пресова, тръбна 95xM10	бр.	10	20
46	Каб. обувка, Си, пресова, тръбна 95xM12	бр.	10	50
47	Каб. обувка, Си, пресова, тръбна 120xM10	бр.	10	20
48	Каб. обувка, Си, пресова, тръбна 120xM12	бр.	10	20
49	Каб. обувка, Си, пресова, тръбна 120xM16	бр.	10	20
50	Каб. обувка, Си, пресова, тръбна 150xM10	бр.	10	20
51	Каб. обувка, Си, пресова, тръбна 150xM12	бр.	10	20
52	Каб. обувка, Си, пресова, тръбна 150xM16	бр.	10	20
53	Каб. обувка, Си, пресова, тръбна 185xM10	бр.	10	20
54	Каб. обувка, Си, пресова, тръбна 185xM12	бр.	10	20
55	Каб. обувка, Си, пресова, тръбна 185xM16	бр.	10	50
56	Каб. обувка, Си, пресова, тръбна 240xM12	бр.	10	20
57	Каб. обувка, Си, пресова, тръбна 240xM16	бр.	10	20
58	Каб. обувка, Си, пресова, тръбна 240xM20	бр.	10	20
59	Каб. съединител, пресов, Al, без прегр., НН 16 mm <sup>2</sup>	бр.	10	50
60	Каб. съединител, пресов, Al, без прегр., НН 25 mm <sup>2</sup>	бр.	10	50
61	Каб. съединител, пресов, Al, без прегр., НН 35 mm <sup>2</sup>	бр.	20	100
62	Каб. съединител, пресов, Al, без прегр., НН 50 mm <sup>2</sup>	бр.	20	100
63	Каб. съединител, пресов, Al, без прегр., НН 70 mm <sup>2</sup>	бр.	20	100
64	Каб. съединител, пресов, Al, без прегр., НН 95 mm <sup>2</sup>	бр.	20	100
65	Каб. съединител, пресов, Al, без прегр., НН 120 mm <sup>2</sup>	бр.	10	50
66	Каб. съединител, пресов, Al, без прегр., НН 150 mm <sup>2</sup>	бр.	20	100
67	Каб. съединител, пресов, Al, без прегр., НН 185 mm <sup>2</sup>	бр.	100	300
68	Каб. съединител, пресов, Al, без прегр., НН 240 mm <sup>2</sup>	бр.	10	20
69	Каб. съединител, пресов, Al, без прегр., СрН 50 mm <sup>2</sup>	бр.	10	20
70	Каб. съединител, пресов, Al, без прегр., СрН 70 mm <sup>2</sup>	бр.	10	20
71	Каб. съединител, пресов, Al, без прегр., СрН 95 mm <sup>2</sup>	бр.	10	20
72	Каб. съединител, пресов, Al, без прегр., СрН 120 mm <sup>2</sup>	бр.	10	20
73	Каб. съединител, пресов, Al, без прегр., СрН 150 mm <sup>2</sup>	бр.	10	20
74	Каб. съединител, пресов, Al, без прегр., СрН 185 mm <sup>2</sup>	бр.	10	20
75	Каб. съединител, пресов, Al, без прегр., СрН 240 mm <sup>2</sup>	бр.	10	20
76	Каб. съединител, Си, пресов, без преграда 10 mm <sup>2</sup>	бр.	10	20
77	Каб. съединител, Си, пресов, без преграда 16 mm <sup>2</sup>	бр.	10	20
78	Каб. съединител, Си, пресов, без преграда 25 mm <sup>2</sup>	бр.	10	20
79	Каб. съединител, Си, пресов, без преграда 35 mm <sup>2</sup>	бр.	10	20

№	Наименование	Мярка	Количество със срок на доставка до кал. дни	Количество със срок на доставка до 30 кал. дни
1	2	3	4	5
80	Каб. съединител, Си, пресов, без преграда 50 mm <sup>2</sup>	бр.	10	20
81	Каб. съединител, Си, пресов, без преграда 70 mm <sup>2</sup>	бр.	10	20
82	Каб. съединител, Си, пресов, без преграда 95 mm <sup>2</sup>	бр.	10	20
83	Каб. съединител, Си, пресов, без преграда 120 mm <sup>2</sup>	бр.	10	20
84	Каб. съединител, Си, пресов, без преграда 150 mm <sup>2</sup>	бр.	10	20
85	Каб. съединител, Си, пресов, без преграда 185 mm <sup>2</sup>	бр.	10	20
86	Каб. съединител, Си, пресов, без преграда 240 mm <sup>2</sup>	бр.	10	20
87	Каб. съединител, пресов, Al-35/Cu-35	бр.	10	20
88	Каб. съединител, пресов, Al-50/Cu-35	бр.	10	20
89	Каб. съединител, пресов, Al-50/Cu-50	бр.	10	20
90	Каб. съединител, пресов, Al-70/Cu-70	бр.	10	20
91	Каб. съединител, пресов, Al-95/Cu-95	бр.	10	20
92	Каб. съединител, пресов, Al-120/Cu-120	бр.	10	20
93	Каб. съединител, пресов, Al-150/Cu-150	бр.	10	20
94	Каб. съединител, пресов, Al-185/Cu-95	бр.	10	20
95	Каб. съединител, пресов, Al-185/Cu-120	бр.	10	20
96	Каб. съединител, пресов, Al-185/Cu-185	бр.	10	20
97	Кабелен накрайник Си, тръбен, с изолация 2,5/L=8	бр.	10	20
98	Кабелен накрайник Си, тръбен, с изолация 2,5/L=18	бр.	10	20
99	Кабелен накрайник Си, тръбен, с изолация 4/L=10	бр.	10	20
100	Кабелен накрайник Си, тръбен, с изолация 4/L=12	бр.	10	20
101	Кабелен накрайник Си, тръбен, с изолация 4/L=18	бр.	10	20
102	Кабелен накрайник Си, тръбен, с изолация 6/L=12	бр.	10	20
103	Кабелен накрайник Си, тръбен, с изолация 6/L=18	бр.	10	20
104	Кабелен накрайник Си, тръбен, с изолация 10/L=12	бр.	10	20
105	Кабелен накрайник Си, тръбен, с изолация 10/L=18	бр.	10	20
106	Кабелен накрайник Си, тръбен, с изолация 16/L=12	бр.	10	50
107	Кабелен накрайник Си, тръбен, с изолация 16/L=18	бр.	10	20
108	Кабелен накрайник Си, тръбен, с изолация 25/L=16	бр.	10	20
109	Кабелен накрайник Си, тръбен, с изолация 25/L=18	бр.	10	20
110	Кабелен накрайник Си, тръбен, с изолация 25/L=22	бр.	10	20
111	Кабелен накрайник Си, тръбен, с изолация 35/L=16	бр.	10	20
112	Кабелен накрайник Си, тръбен, с изолация 35/L=18	бр.	10	20
113	Кабелен накрайник Си, тръбен, с изолация 35/L=25	бр.	10	20
114	Кабелен накрайник Си, тръбен, с изолация 50/L=20	бр.	10	20
115	Кабелен накрайник Си, тръбен, с изолация 50/L=25	бр.	10	20
116	Каб. обувка, Си 6-6, пресова, с изолация	бр.	10	20

**Забележки:**

1/ Срокът на доставките започва да тече от датата на изпращане на поръчката.

2/ Количествата в колона 4, със срок на доставка до 7 /седем/ календарни дни, се доставят след SAP поръчка до посочените в обявлението складове на Възложителя за покриване на спешни нужди на Възложителя.

Възложителят може да поръчва посоченото спешно количество веднъж месечно.

3/ В случай, че крайният срок на доставката съвпада с празничен или неработен ден, то доставката се извършва не по-късно от първия работен ден след изтичането на срока.

4/ При поръчки на Възложителя на количества в рамките на потвърдените от Изпълнителя и недоставени в посочените срокове, ще бъдат налагани неустойки, съгласно условията на договора.

5/ Възложителят може да поръча количества по-малки от посочените в колони 4 и 5.

6/ Възложителят може да поръчва количества по-високи от посочените в колони 4 и 5, като това обстоятелство ще бъде посочено текстово в съответната поръчка изпратена към Изпълнителя. С потвърждението на поръчката, Изпълнителят вписва в същата очаквана дата за доставка на количествата надвишаващи посочените в колони 4 и 5.

7/ Възложителят може да поръчва количества до 10 пъти по-високи от посочените в колона 5. Срокът за доставка на надвишените количества не може да бъде по-дълъг от 180 дни от датата на изпращане на поръчката. При доставка на поръчаните по-високи количества след този срок, Изпълнителят дължи неустойка съгласно условията на договора.

8/ Количествата за доставка в колони 4 и 5 са отделни и независими едно от друго.

9/ Количествата за доставка в колона 5 не включват в себе си количествата за доставка в колона 4.

10/ Възложителят има право да направи едновременно поръчки за доставка на количества от колони 4 и 5.

11/ Възложителят има право да анулира направена поръчка, ако тя е в закъснение с повече от 180 дни от очакваната дата за доставка. Анулирането на поръчка не спира налагането на неустойки към Изпълнителя съгласно условията на договора.

Дата: 22.05.2019 г.

ПОДПИС И ПЕЧАТ:

на основание чл. 36а, ал. 3  
от ЗОП

Атанас Танчев  
Изпълнителен директор  
Филкаб АД

