FIRES
The Experts On Fire Safety

TEST REPORT FIRES-FR-245-12-AUNE

Cable bearing system and fireboxes BAKS with cables business
Fabryka Kabli MADEX s. j.

Reg. No. 041/S-159

The Experts on Fire Safety

TEST REPORT

FIRES-FR-245-12-AUNE

Tested property:	Function in fire
Test method:	STN 92 0205: 2012 (ZP-27/2008, DIN 4102-12: 1998-11)
Date of issue:	14. 12. 2012
Name of the product:	Cable bearing system and fireboxes BAKS with cables business Fabryka Kabli MADEX s. j.
Manufacturer:	BAKS Kazimierz Sielski, ul. Jagodne 5, 05 - 480 Karczew, Poland - producer of construction Fabryka Kabli MADEX s. j., Stefanówka, ul. Żurawia 96, 05 – 462 Wiązowna, Poland – producer of cables
Sponsor:	BAKS Kazimierz Sielski, ul. Jagodne 5, 05-480 Karczew, Poland
Task No.:	PR-12-0441
Specimens received:	06. 12. 2012
Date of the test:	13. 12. 2012

Technician responsible for the technical side of this report: Bc. Dávid Šubert

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1. INTRODUCTION

This test report contains the results of test carried out by laboratory of FIRES, s.r.o. in Batizovce, accredited by SNAS for testing. Certificate of accreditation No.: S-159. The purpose of the test was to gain information for product classification.

Test of function in fire was carried out according to standard STN 92 0205: 2012. Similar standards and regulations for tests of function in fire are ZP-27/2008 PAVUS and DIN 4102-12: 1998-11.

Deviations from standard at the test according to ZP-27/2008: This test was carried out according to standard STN 92 0205: 2012 and meets also all requirements of ZP-27/2008 and test results can be directly used for classification of tested cables according to ZP-27/2008. There are no deviations identified in process and carrying out of test.

Deviations from standard at the test according to DIN 4102-12: 1998-11: This test was carried out according to standard STN 92 0205: 2012 and meets requirements of DIN 4102-12: 1998-11. Basic deviation in process and carrying out of test between these standards is in measuring and in control of temperature in the test furnace. According to STN 92 0205: 2012, plate thermometers according to EN 1363-1: 1999 are used. According to DIN 4102-12: 1998-11, common thermocouples of construction which was used for this measurement till issue of EN 1363-1:1999 are used. Measurement by plate thermometers acc. to EN 1363-1: 1999 can be considered as stricter method of temperature control in test furnace in compare with thermocouples used till issue of EN 1363-1: 1999. Therefore, it is possible to use results of test according to STN 92 025: 2012 for classification of tested cables according to DIN 4102-12: 1998-11, but not conversely. Identified deviation results in stricter course of test and it can lead to reduced classification of tested cables what is accepted as enhanced security in practice.

Representatives from the sponsor's side witnessing the test:

Mr. Jacek Kliczek	BAKS Kazimierz Sielski
Mr. Dariusz Gowronski	BAKS Kazimierz Sielski
Mr. Norbert Łuczak	BAKS Kazimierz Sielski
Mr. Artur Twardowski	Fabryka Kabli MADEX s. j.
Mr. Ireneusz Lipiński	Fabryka Kabli MADEX s. j.
Mr. Juraj Antol	STRADER s.r.o.

test directed by	Ing. Marek Gorlický
test carried out by	Bc. Dávid Šubert
operator	Miroslav Hudák

2. MEASURING EQUIPMENT

Identification number	Measuring equipment	Note
F 90 004	Vertical test furnace for fire resistance testing	-
F 69 010	PLC system for data acquisition and control TECOMAT TC 700	-
F 40 017	Control and communication software to PLC TECOMAT TC 700	-
F 40 018	SW Reliance	-
F 40 019	Visual and calculating software to PLC TECOMAT TC 700	-
F 40 020	Driver Tecomat – Reliance (SW)	-
F 69 009	PLC system for data acquisition and climate control TECOMAT TC 604	-
F 60 001 - F 60 009	Sensors of temperature and relative air humidity	climatic conditions measuring
F 71 008, F 71 009	Transducer of differential pressure (–50 to + 150) Pa	pressure inside the test furnace

Identification number	Measuring equipment	Note
F 10 521 - F 10 528	Plate thermometers	temperature inside the test furnace, according to EN 1363-1
F 10 701	Sheathed thermocouple type K Ø 3 mm	ambient temperature
F 54 020	Digital calliper (0 to 200) mm	-
F 54 059	Racking meter	-
F 57 007	Digital stop-watch	-
F 96 015	Test signal panel	-

3. PREPARATION OF THE SPECIMENS

Testing laboratory didn't take off individual components of the specimens. Components take-off and its delivering to the testing laboratory were carried out by the test sponsor. Assembling of the supporting system into the test furnace and mounting of cables and weights into the supporting system was carried out by workers of BAKS Kazimierz Sielski and Fabryka Kabli MADEX s. j. under supervision of laboratory technician.

4. PREPARATION OF THE TEST

4.1 DESCRIPTION OF THE SPECIMENS STRUCTURE

Test specimen comprised from cable bearing system BAKS Kazimierz Sielski company – cable trays, cable ladders, cable clips and fireboxes with accessories (consoles, supports, hangers etc.) and power and communication halogen free cables of Fabryka Kabli MADEX s. j. company.

Cables

Used cables by test:	NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE	(14x)
	NHXH FE180 PH90/E90 0,6/1kV 4x50 RM	(18x)
	NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE	(12x)
	NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM	(8x)
	NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE	(10x)
	HTKSH PH90 1x2x1,0	(19x)
	HTKSHekw PH90 1x2x1,0	(16x)

The length of cables was 5,1 m, 3,5 m from that was exposed to fire.

Power and communication halogen free cables were fixed in the trays, ladders and mesh trays by steel clips in the points of allowed bending radius.

Cable bearing systems were made of following constructions:

Suspension tracks No. 1 and 2

Tracks are made of three consoles (WPC/WPCO1000) which were fixed to ceiling by two threaded rods (PG M10) in spacing of 1200 mm. Two brackets (WMC/WMCO400) were fixed to consoles by screws (SM M10x30). Holders (UPW/UPWO) were fixed at the end of brackets with screws (SGN M8x14). Brackets were fixed through these holders by threaded rods (PG M10) with washer and nuts M10 to ceiling holders (USV/USOV).

Tracks No. 1:

Cable trays (KCP/KCOP400H60/3, steel sheet thickness 1,5 mm) fixed together by two junctions (LPP/LPOP H60N) and screws (SGN M8x14) on sides and by junction (BL/BLO400N) and screws (SGN M6x12) on the bottom. Trays were fixed to supports by screws (SGN M6x12) and loaded with 10kg.m^{-1}.

Track No. 2:
Cable ladders (DGOP400H60/B400, steel sheet thickness 1,5 mm, spacing of transoms 150 mm) fixed together by two junctions (LDC/LDOCH60N) and screws (SGN M8x14) on sides. Ladders were fixed to supports by junctions (ZM/ZMO) and by screws (SGN M8x14) and loaded with 20kg.m^{-1}.

Suspension tracks No. 3 - 8
Tracks are made of three console combined of two horizontal supports (CWP/CWOP40H40/05) which are fixed to two threaded rods (PGM10) by washers (PP10) and nuts (NSM10). Threaded rods were fixed to ceiling in spacing of 1500 mm.

Track No. 3:
Cable mesh trays (KDS/KDSO400H60/3, steel wire ∅ 4,5 mm) fixed together by junctions (USS/USSO). Mesh trays were fixed to supports by junctions (ZS/ZSO) and loaded with 20kg.m^{-1}. Cables were fixed to ledges by cable clips (UKZ/UKZO1).

Track No. 4:
Cable mesh trays (KDS/KDSO400H60/3, steel wire ∅ 4,5 mm) fixed together by junctions (USS/USSO). Mesh trays were fixed to supports by junctions (ZS/ZSO) and loaded with 20kg.m^{-1}. Cables were fixed to ledges by cable clips (UKZ/UKZO1).

Tracks No. 5:
Cable trays (KGJ/KGOJ400H60/3, steel sheet thickness 0,9 mm) fixed together by screws (SGN M6x12). Trays were fixed to supports by screws (SGN M6x12) and loaded with 20kg.m^{-1}.

Tracks No. 6:
Cable trays (KGL/KGOL300H60/3, steel sheet thickness 0,7 mm) fixed together by screws (SGN M6x12). Trays were fixed to supports by screws (SGN M6x12) and loaded with 20kg.m^{-1}.

Tracks No. 7:
Cable trays (KGL/KGOJ400H60/3, steel sheet thickness 0,9 mm) fixed together by screws (SGN M6x12). Trays were fixed to supports by screws (SGN M6x12) and loaded with 20kg.m^{-1}.

Tracks No. 8:
Cable trays (KGL/KGOL300H60/3, steel sheet thickness 0,7 mm) fixed together by screws (SGN M6x12). Trays were fixed to supports by screws (SGN M6x12) and loaded with 20kg.m^{-1}.

Track No. 9
Supporting construction was made of gypsum boards 12 mm thick fixed to side wall of furnace. Track was made of cable clips (UDF) which were fixed to gypsum boards by dowels (MOLLY 5x52/58) in spacing of 600 mm.

Track No. 10
Track was made of two fireboxes (BAKS PMO1) and two fireboxes (BAKS PMO2) fixed to ceiling. Cables which were connected to firebox were fixed to ceiling by cable clips KSA in spacing of 600 mm.

Suspension track No. 11
Cable mesh trays (KDSO60H60/B60, steel wire ∅ 4,5 mm) fixed together by junctions (USSO). Trays were fixed to ceiling by holders (WKS/WKSO60) and threaded rods (PG M6) and loaded with 1,5kg.m^{-1}.

Track No. 12
Ceiling ledges (SDOP 700) were fixed to ceiling by threaded rods (PG M6) in spacing of 600 mm. Cables were fixed to ledges by cable clips (UK/UKO1).

Track No. 13
Track was made of ceiling clips (KSA) which were fixed to ceiling by in spacing of 600 mm.

Track No. 14
Track was made of cable holders (UDF) which were fixed to side wall of furnace by dowels (KMHM – 4x60) in spacing of 600 mm.

All bearing systems were from steel, galvanized according to the Sendzimir method PN-EN 10327:2005.

More detailed information about construction of specimens is shown in the drawings which form an integral part of this test report. Drawings were delivered by sponsor.

All the information about technical specifications of used materials and semi-products, information about their type sign were delivered by sponsor. This information was not subject of the inspection of specimens. Parameters which were checked are quoted in paragraph 4.3.

4.2 DESCRIPTION OF SPECIMENS FIXATION

The test specimens were fixed on the ceiling of the test furnace which was created from aerated concrete panels with dimensions (4000 x 600 x 240) mm – 6 pieces and fixed to side walls made of aerated concrete blocks YTONG, 250 mm thick. Ceiling panels were jointed by beam which provides balance deflection of the ceiling.

The type of specimen's fixation into the test furnace is shown in drawing documentation and it was selected by the sponsor.

4.3 INSPECTION OF SPECIMENS

Before and after the function in fire test, conformity of drawings and test specimens was checked. Specimens corresponded to the drawings which are part of this test report. Inspection of specimens consisted of visual review of the test specimens, used materials as well as size verification (number and cross sections of conductors, thickness, measurements of cables and trays) and also the way of specimens fixation to supporting construction was subject of inspection.

4.4 CLIMATIC CONDITIONING OF SPECIMENS

Test specimens were stored in the hall of testing laboratory under the following climatic conditions:

Ambient air temperature [°C]

mean	19,6
standard deviation	1,6

Relative air humidity [%]

mean	45,9
standard deviation	2,6

The humidity equilibrium state of test specimens was not determined. Test specimens did not comprise hygroscopic materials.

5. CARRYING OUT OF THE TEST

5.1 TEST GENERALLY

The test was carried out in horizontal test furnace with dimensions of (3500 x 3000 x 2750) mm (length x width x height).

5.2 CONDITIONS OF THE TEST

Conditions in the test furnace (temperature – standard temperature/time curve, pressure, content of O_2) as well as in the testing room (ambient temperature) corresponded to EN 1363-1 during the test. Detailed information is part of this test report, or in Quality records of the testing laboratory.

Values characterizing environment in the testing room directly before the test:

Date of the test	Relative air humidity [%]	Ambient air temperature [°C]
13. 12. 2012	44,3	18,3

5.3 RESULTS OF THE TEST

Measured values are stated in this test report.

6. CLOSING

Evaluation of the test:

Specimen No.	Cables	Track No.	Time to first failure / interruption of conductor
1	2 cables NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM	14	90 minutes no failure / interruption
2	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
3	2 cables NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE		90 minutes no failure / interruption
4	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE		90 minutes no failure / interruption
5	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE	8	90 minutes no failure / interruption
6	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE		90 minutes no failure / interruption
7	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		71 minutes
8	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
9	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE	7	90 minutes no failure / interruption
10	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE		90 minutes no failure / interruption
11	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
12	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
13	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x50 RM	13	90 minutes no failure / interruption
14	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
15	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE	6	90 minutes no failure / interruption
16	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE		90 minutes no failure / interruption
17	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM		90 minutes no failure / interruption
18	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM		90 minutes no failure / interruption
19	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE	5	90 minutes no failure / interruption
20	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE		90 minutes no failure / interruption
21	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM		90 minutes no failure / interruption
22	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM		87 minutes
23	2 cables NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE	12	90 minutes no failure / interruption
24	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		81 minutes
25	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE	11	90 minutes no failure / interruption
26	2 cables NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE		90 minutes no failure / interruption
27	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE	4	90 minutes no failure / interruption
28	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE		90 minutes no failure / interruption
29	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM		90 minutes no failure / interruption
30	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM		90 minutes no failure / interruption
31	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE	3	90 minutes no failure / interruption
32	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		90 minutes no failure / interruption
33	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE		90 minutes no failure / interruption
34	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE		90 minutes no failure / interruption
35	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
36	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
37	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE + fireboxes PMO2	10	90 minutes no failure / interruption
38	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE + fireboxes PMO2		90 minutes no failure / interruption

Specimen No.	Cables	Track No.	Time to first failure / interruption of conductor
39	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE	2	90 minutes no failure / interruption
40	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		90 minutes no failure / interruption
41	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
42	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
43	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE	1	90 minutes no failure / interruption
44	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		90 minutes no failure / interruption
45	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
46	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM		90 minutes no failure / interruption
47	2 cables NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE	9	42 minutes
48	2 cables NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE		90 minutes no failure / interruption
49	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE		90 minutes no failure / interruption
52	2 cables HTKSHekw PH90 1x2x1,0	14	90 minutes no failure / interruption
53	2 cables HTKSH PH 90 1x2x1,0		90 minutes no failure / interruption
54	2 cables HTKSH PH 90 1x2x1,0	8	26 minutes
55	2 cables HTKSH PH 90 1x2x1,0	7	36 minutes
56	2 cables HTKSHekw PH90 1x2x1,0	6	23 minutes
57	2 cables HTKSHekw PH90 1x2x1,0	5	34 minutes
58	2 cables HTKSH PH 90 1x2x1,0	12	90 minutes no failure / interruption
59	2 cables HTKSH PH 90 1x2x1,0	11	79 minutes
60	2 cables HTKSHekw PH90 1x2x1,0		47 minutes
61	2 cables HTKSHekw PH90 1x2x1,0	4	28 minutes
62	2 cables HTKSH PH 90 1x2x1,0	3	30 minutes
63	cable HTKSH PH 90 1x2x1,0 + fireboxes PMO1	10	90 minutes no failure / interruption
64	2 cables HTKSHekw PH90 1x2x1,0	2	31 minutes
65	2 cables HTKSH PH 90 1x2x1,0		28 minutes
66	2 cables HTKSHekw PH90 1x2x1,0	1	35 minutes
67	2 cables HTKSH PH 90 1x2x1,0		39 minutes
68	2 cables HTKSHekw PH90 1x2x1,0	9	90 minutes no failure / interruption
69	2 cables HTKSH PH 90 1x2x1,0		90 minutes no failure / interruption

The fire test was discontinued in 94th minute at the request of test sponsor.

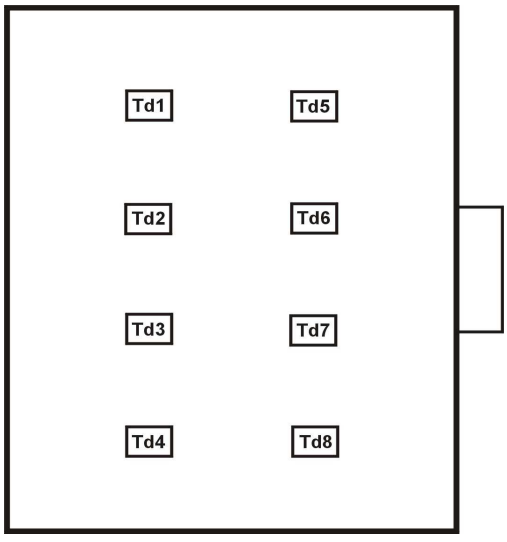
Specimens S1 – S49 were tested by three-phase voltage supply 3 x 230/400V with bulbs 240V / 60 W.
Specimens S52 – S69 were tested by one-phase voltage supply 1 x 110V with LED diodes 3V /0,03W.
Circuit breakers with rating 3 A were used.

Measured values inside the test furnace

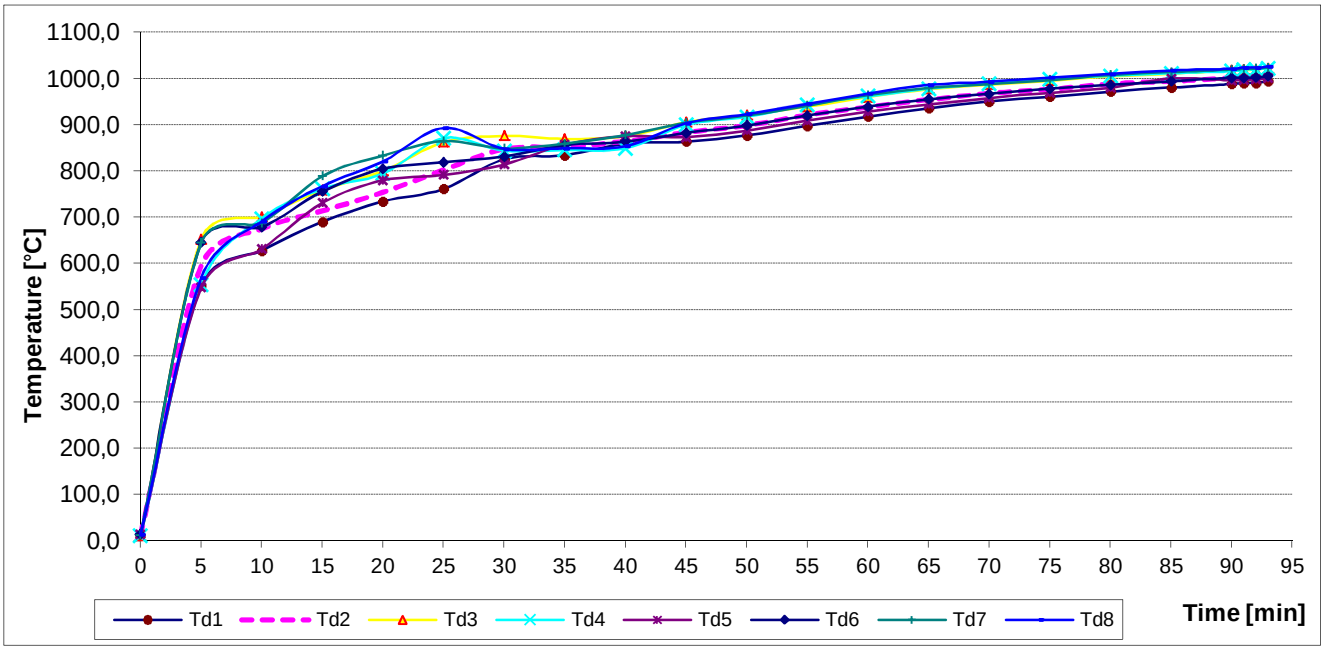
Time	Temperature [°C]											Deviation	Pressure
t [min]	Td1	Td2	Td3	Td4	Td5	Td6	Td7	Td8	Tave	Tn	To	d_e [%]	p [Pa]
0	11,1	10,6	10,8	11,4	13,4	13,4	13,2	14,0	12,2	20,0	18,3	0,0	17,8
5	552,5	594,5	652,7	554,8	548,1	645,1	645,0	568,8	595,2	576,0	18,4	-1,0	17,7
10	628,1	675,0	701,6	697,1	631,1	678,3	687,7	691,0	673,7	678,0	18,4	-0,1	18,3
15	690,4	714,0	758,5	761,7	731,2	755,9	789,2	767,7	746,1	739,0	18,5	0,2	17,7
20	734,5	754,2	800,6	794,6	780,1	805,2	833,9	821,1	790,5	781,0	18,5	0,4	18,2
25	761,3	802,7	862,8	871,4	792,0	819,0	864,8	893,5	833,4	815,0	18,6	0,7	17,8
30	826,0	848,0	876,3	844,2	814,5	831,7	849,0	848,2	842,2	842,0	18,6	0,7	17,7
35	834,5	852,2	869,7	846,2	857,4	856,1	859,5	849,5	853,1	865,0	18,7	0,3	17,6
40	859,5	864,6	875,6	849,3	875,4	863,8	878,2	854,2	865,1	885,0	18,7	0,0	17,6
45	863,9	883,8	906,1	900,2	873,4	882,8	904,8	903,6	889,8	902,0	18,8	-0,2	17,7
50	877,0	898,8	921,1	917,3	888,0	898,8	920,2	923,4	905,6	918,0	18,8	-0,3	18,3
55	898,4	921,2	939,6	943,1	909,0	919,9	942,0	946,0	927,4	932,0	18,9	-0,4	18,3
60	918,3	939,3	960,7	962,3	928,8	939,3	964,3	968,0	947,6	945,0	19,0	-0,4	18,2
65	936,5	954,9	977,5	978,3	944,2	955,5	980,0	986,7	964,2	957,0	19,0	-0,3	18,3
70	950,4	968,4	987,1	989,5	958,6	967,6	988,4	993,4	975,4	968,0	19,0	-0,2	17,7
75	961,3	977,2	995,7	998,9	969,6	978,6	997,3	1002,8	985,2	979,0	19,1	-0,1	17,6
80	972,4	988,9	1004,5	1006,4	980,8	986,9	1008,2	1010,0	994,8	988,0	19,1	0,0	17,9
85	981,0	994,5	1010,9	1011,8	1000,3	994,5	1014,3	1017,9	1003,2	997,0	19,2	0,0	17,8
90	988,8	1002,3	1018,0	1016,2	996,4	1002,3	1019,9	1021,6	1008,2	1006,0	19,3	0,0	17,6
91	990,4	1003,1	1019,4	1019,5	997,4	1002,0	1021,5	1024,4	1009,7	1008,0	19,3	0,0	18,2
92	991,2	1005,0	1020,0	1019,8	998,7	1002,8	1022,2	1023,8	1010,4	1009,0	19,2	0,0	18,0
93	994,9	1007,2	1022,8	1022,7	1001,6	1005,7	1024,2	1026,7	1013,2	1011,0	19,3	0,0	17,6

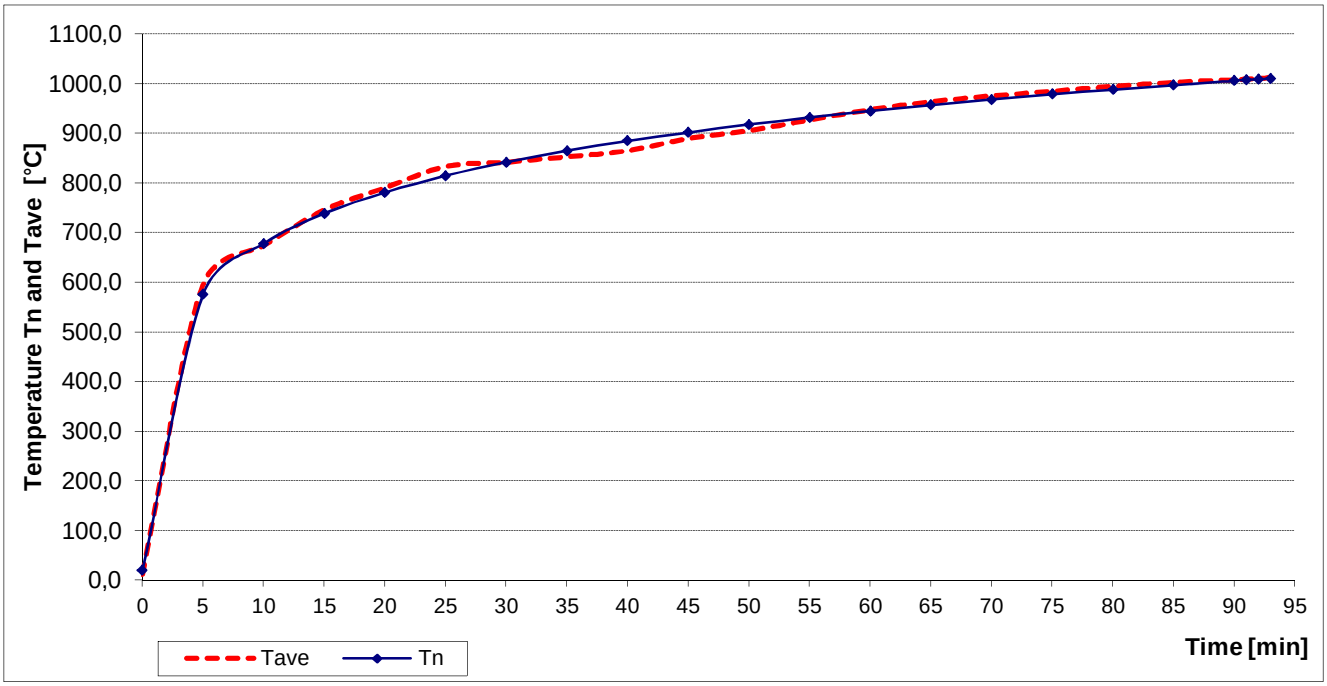
Tave Average temperature in the test furnace calculated from plate thermometers
Tn Standard temperature in the test furnace laid down to test guideline
To Ambient temperature
d_e Deviation of the average temperature from the standard temperature calculated according to test guideline
p Pressure inside the test furnace measured under the ceiling of the test furnace

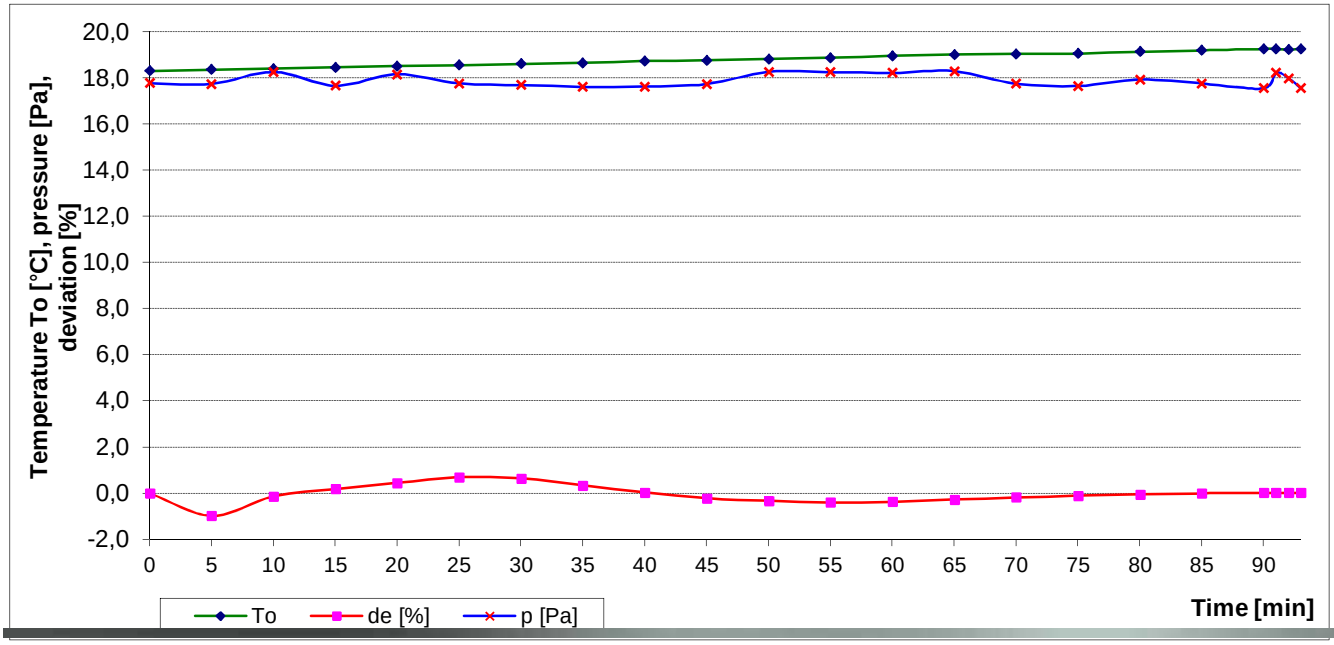
Layout of measuring points inside the test furnace:



Measured values inside the test furnace /graph







Measured time of tested specimens from S1 to S10 - power cables

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S1	1-L1	no failure / interruption
	2-L2	no failure / interruption
	3-L3	no failure / interruption
	4-PEN	no failure / interruption
S2	5-L1	no failure / interruption
	6-L2	no failure / interruption
	7-L3	no failure / interruption
	8-PEN	no failure / interruption
S3	9-L1	no failure / interruption
	10-L2	no failure / interruption
	11-L3	no failure / interruption
	12-PEN	no failure / interruption
S4	13-L1	no failure / interruption
	14-L2	no failure / interruption
	15-L3	no failure / interruption
	16-PEN	no failure / interruption
S5	17-L1	no failure / interruption
	18-L2	no failure / interruption
	19-L3	no failure / interruption
	20-PEN	no failure / interruption
S6	21-L1	no failure / interruption
	22-L2	no failure / interruption
	23-L3	no failure / interruption
	24-PEN	no failure / interruption
S7	25-L1	71:30
	26-L2	x
	27-L3	x
	28-PEN	x
S8	29-L1	no failure / interruption
	30-L2	no failure / interruption
	31-L3	no failure / interruption
	32-PEN	no failure / interruption
S9	33-L1	no failure / interruption
	34-L2	no failure / interruption
	35-L3	no failure / interruption
	36-PEN	no failure / interruption
S10	37-L1	no failure / interruption
	38-L2	no failure / interruption
	39-L3	no failure / interruption
	40-PEN	no failure / interruption

Specimen No.	Cables
1	2 cables NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM
2	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
3	2 cables NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE
4	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE
5	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE
6	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE
7	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
8	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
9	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE
10	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE

x Conductor was turned off manually after permanent interruption / failure of other conductors in the cable
Power cables were tested by three-phase voltage supply 3 x 230/400V with bulbs 240V / 60 W.
Circuit breakers with rating 3 A were used.

Measured time of tested specimens from S11 to S20 - power cables

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S11	41-L1	no failure / interruption
	42-L2	no failure / interruption
	43-L3	no failure / interruption
	44-PEN	no failure / interruption
S12	45-L1	no failure / interruption
	46-L2	no failure / interruption
	47-L3	no failure / interruption
	48-PEN	no failure / interruption
S13	49-L1	no failure / interruption
	50-L2	no failure / interruption
	51-L3	no failure / interruption
	52-PEN	no failure / interruption
S14	53-L1	no failure / interruption
	54-L2	no failure / interruption
	55-L3	no failure / interruption
	56-PEN	no failure / interruption
S15	57-L1	no failure / interruption
	58-L2	no failure / interruption
	59-L3	no failure / interruption
	60-PEN	no failure / interruption
S16	61-L1	no failure / interruption
	62-L2	no failure / interruption
	63-L3	no failure / interruption
	64-PEN	no failure / interruption
S17	65-L1	no failure / interruption
	66-L2	no failure / interruption
	67-L3	no failure / interruption
	68-PEN	no failure / interruption
S18	69-L1	no failure / interruption
	70-L2	no failure / interruption
	71-L3	no failure / interruption
	72-PEN	no failure / interruption
S19	73-L1	no failure / interruption
	74-L2	no failure / interruption
	75-L3	no failure / interruption
	76-PEN	no failure / interruption
S20	77-L1	no failure / interruption
	78-L2	no failure / interruption
	79-L3	no failure / interruption
	80-PEN	no failure / interruption

Specimen No.	Cables
11	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
12	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
13	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
14	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
15	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE
16	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE
17	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM
18	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM
19	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE
20	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE

Power cables were tested by three-phase voltage supply 3 x 230/400V with bulbs 240V / 60 W.
Circuit breakers with rating 3 A were used.

Measured time of tested specimens from S21 to S30 - power cables

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S21	81-L1	no failure / interruption
	82-L2	no failure / interruption
	83-L3	no failure / interruption
	84-PEN	no failure / interruption
S22	85-L1	x
	86-L2	x
	87-L3	87:21
	88-PEN	x
S23	89-L1	no failure / interruption
	90-L2	no failure / interruption
	91-L3	no failure / interruption
	92-PEN	no failure / interruption
S24	93-L1	x
	94-L2	81:02
	95-L3	x
	96-PEN	x
S25	97-L1	no failure / interruption
	98-L2	no failure / interruption
	99-L3	no failure / interruption
	100-PEN	no failure / interruption
S26	101-L1	no failure / interruption
	102-L2	no failure / interruption
	103-L3	no failure / interruption
	104-PEN	no failure / interruption
S27	105-L1	no failure / interruption
	106-L2	no failure / interruption
	107-L3	no failure / interruption
	108-PEN	no failure / interruption
S28	109-L1	no failure / interruption
	110-L2	no failure / interruption
	111-L3	no failure / interruption
	112-PEN	no failure / interruption
S29	113-L1	no failure / interruption
	114-L2	no failure / interruption
	115-L3	no failure / interruption
	116-PEN	no failure / interruption
S30	117-L1	no failure / interruption
	118-L2	no failure / interruption
	119-L3	no failure / interruption
	120-PEN	no failure / interruption

Specimen No.	Cables
21	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM
22	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM
23	2 cables NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE
24	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
25	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE
26	2 cables NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE
27	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE
28	cable NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE
29	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM
30	cable NHXCH FE180 PH90/E90 0,6/1kV 4x50/25 RM

x Conductor was turned off manually after permanent interruption / failure of other conductors in the cable
Power cables were tested by three-phase voltage supply 3 x 230/400V with bulbs 240V / 60 W.
Circuit breakers with rating 3 A were used.

Measured time of tested specimens from S31 to S40 - power cables

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S31	121-L1	no failure / interruption
	122-L2	no failure / interruption
	123-L3	no failure / interruption
	124-PEN	no failure / interruption
S32	125-L1	no failure / interruption
	126-L2	no failure / interruption
	127-L3	no failure / interruption
	128-PEN	no failure / interruption
S33	129-L1	no failure / interruption
	130-L2	no failure / interruption
	131-L3	no failure / interruption
	132-PEN	no failure / interruption
S34	133-L1	no failure / interruption
	134-L2	no failure / interruption
	135-L3	no failure / interruption
	136-PEN	no failure / interruption
S35	137-L1	no failure / interruption
	138-L2	no failure / interruption
	139-L3	no failure / interruption
	140-PEN	no failure / interruption
S36	141-L1	no failure / interruption
	142-L2	no failure / interruption
	143-L3	no failure / interruption
	144-PEN	no failure / interruption
S37	145-L1	no failure / interruption
	146-L2	no failure / interruption
	147-L3	no failure / interruption
	148-PEN	no failure / interruption
S38	149-L1	no failure / interruption
	150-L2	no failure / interruption
	151-L3	no failure / interruption
	152-PEN	no failure / interruption
S39	153-L1	no failure / interruption
	154-L2	no failure / interruption
	155-L3	no failure / interruption
	156-PEN	no failure / interruption
S40	157-L1	no failure / interruption
	158-L2	no failure / interruption
	159-L3	no failure / interruption
	160-PEN	no failure / interruption

Specimen No.	Cables
31	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE
32	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE
33	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE
34	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE
35	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
36	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
37	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE + fireboxes PMO2
38	cable NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE + fireboxes PMO2
39	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE
40	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE

Power cables were tested by three-phase voltage supply 3 x 230/400V with bulbs 240V / 60 W.
Circuit breakers with rating 3 A were used.

Measured time of tested specimens from S41 to S49 - power cables

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S41	161-L1	no failure / interruption
	162-L2	no failure / interruption
	163-L3	no failure / interruption
	164-PEN	no failure / interruption
S42	165-L1	no failure / interruption
	166-L2	no failure / interruption
	167-L3	no failure / interruption
	168-PEN	no failure / interruption
S43	169-L1	no failure / interruption
	170-L2	no failure / interruption
	171-L3	no failure / interruption
	172-PEN	no failure / interruption
S44	173-L1	no failure / interruption
	174-L2	no failure / interruption
	175-L3	no failure / interruption
	176-PEN	no failure / interruption
S45	177-L1	no failure / interruption
	178-L2	no failure / interruption
	179-L3	no failure / interruption
	180-PEN	no failure / interruption
S46	181-L1	no failure / interruption
	182-L2	no failure / interruption
	183-L3	no failure / interruption
	184-PEN	no failure / interruption
S47	185-L1	42:26
	186-L2	42:26
	187-L3	x
	188-PEN	x
S48	189-L1	no failure / interruption
	190-L2	no failure / interruption
	191-L3	no failure / interruption
	192-PEN	no failure / interruption
S49	193-L1	no failure / interruption
	194-L2	no failure / interruption
	195-L3	no failure / interruption
	196-PEN	no failure / interruption

Specimen No.	Cables
41	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
42	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
43	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE
44	cable NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE
45	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
46	cable NHXH FE180 PH90/E90 0,6/1kV 4x50 RM
47	2 cables NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE
48	2 cables NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE
49	2 cables NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE

x Conductor was turned off manually after permanent interruption / failure of other conductors in the cable

Power cables were tested by three-phase voltage supply 3 x 230/400V with bulbs 240V / 60 W.

Circuit breakers with rating 3 A were used.

Measured time of tested specimen S52 to S61 - communication cables

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S52A	209-L	no failure / interruption
	210-PEN	no failure / interruption
S52B	211-L	no failure / interruption
	212-PEN	no failure / interruption
S53A	213-L	no failure / interruption
	214-PEN	no failure / interruption
S53B	215-L	no failure / interruption
	216-PEN	no failure / interruption
S54A	217-L	30:23
	218-PEN	x
S54B	219-L	26:16
	220-PEN	x
S55A	221-L	37:48
	222-PEN	x
S55B	223-L	36:59
	224-PEN	x
S56A	225-L	24:41
	226-PEN	x
S56B	227-L	23:29
	228-PEN	x
S57A	229-L	34:04
	230-PEN	x
S57B	231-L	34:53
	232-PEN	x
S58A	233-L	no failure / interruption
	234-PEN	no failure / interruption
S58B	235-L	no failure / interruption
	236-PEN	no failure / interruption
S59A	237-L	no failure / interruption
	238-PEN	no failure / interruption
S59B	239-L	79:27
	240-PEN	x
S60A	241-L	47:58
	242-PEN	x
S60B	243-L	no failure / interruption
	244-PEN	no failure / interruption
S61A	245-L	29:59
	246-PEN	x
S61B	247-L	28:11
	248-PEN	x

Specimen No.	Cables
52	2 cables HTKSHekw PH90 1x2x1,0
53	2 cables HTKSH PH 90 1x2x1,0
54	2 cables HTKSH PH 90 1x2x1,0
55	2 cables HTKSH PH 90 1x2x1,0
56	2 cables HTKSHekw PH90 1x2x1,0
57	2 cables HTKSHekw PH90 1x2x1,0
58	2 cables HTKSH PH 90 1x2x1,0
59	2 cables HTKSH PH 90 1x2x1,0
60	2 cables HTKSHekw PH90 1x2x1,0
61	2 cables HTKSHekw PH90 1x2x1,0

x Conductor was turned off manually after permanent interruption / failure of other conductors in the cable
Signal cables were tested by three-phase voltage supply 1 x 110V with LED diods 3V / 0,03W.
Circuit breakers with rating 3 A were used.

Measured time of tested specimens from S62 to S67 - communication cables

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S62A	249-L	30:18
	250-PEN	x
S62B	251-L	38:12
	252-PEN	x
S63A	253-L	no failure / interruption
	254-PEN	no failure / interruption
S63B	255-L	no failure / interruption
	256-PEN	no failure / interruption
S64A	257-L	34:22
	258-PEN	x
S64B	259-L	31:21
	260-PEN	x
S65A	261-L	28:56
	262-PEN	x
S65B	263-L	28:25
	264-PEN	x
S66A	265-L	35:26
	266-PEN	x
S66B	267-L	35:40
	268-PEN	x
S67A	269-L	39:44
	270-PEN	x
S67B	271-L	65:14
	272-PEN	x
S68A	273-L	no failure / interruption
	274-PEN	no failure / interruption
S68B	275-L	no failure / interruption
	276-PEN	no failure / interruption
S69A	273-L	no failure / interruption
	274-PEN	no failure / interruption
S69B	275-L	no failure / interruption
	276-PEN	no failure / interruption

Specimen No.	Cables
62	2 cables HTKSH PH 90 1x2x1,0
63	cable HTKSH PH 90 1x2x1,0 + fireboxes PMO1
64	2 cables HTKSHekw PH90 1x2x1,0
65	2 cables HTKSH PH 90 1x2x1,0
66	2 cables HTKSHekw PH90 1x2x1,0
67	2 cables HTKSH PH 90 1x2x1,0

x Conductor was turned off manually after permanent interruption / failure of other conductors in the cable
Signal cables were tested by three-phase voltage supply 1 x 110V with LED diods 3V / 0,03W.
Circuit breakers with rating 3 A were used.

PHOTOS

Photo taken before the test.

Photo taken before the test.

Photo taken before the test.

PHOTOS

Photo taken before the test.

Photo taken before the test.

Photo taken before the test.

PHOTOS

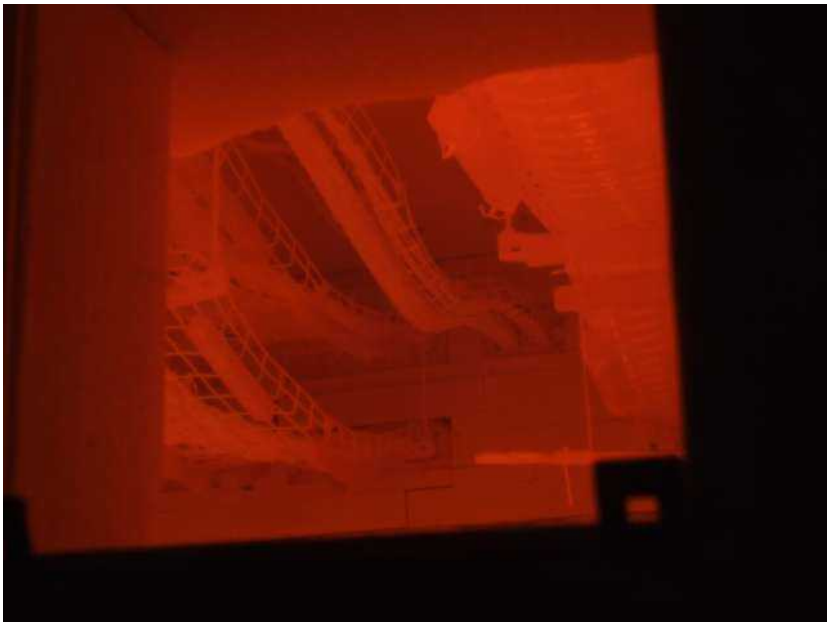


Photo taken during the test.

Photo taken during the test.

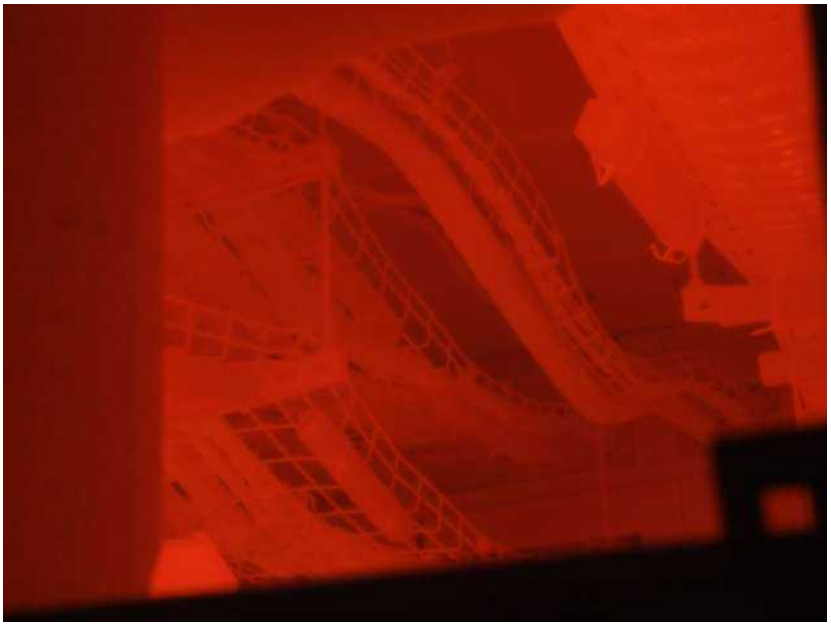


Photo taken during the test.

PHOTOS

Photo taken after the test.

Photo taken after the test.

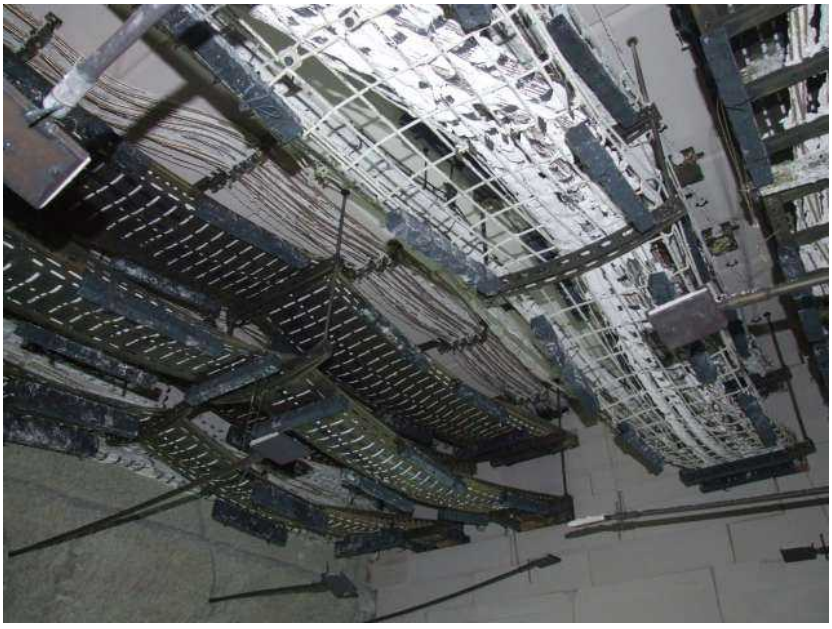


Photo taken after the test.

PHOTOS

Photo taken after the test.

Photo taken after the test.

Photo taken after the test.

FABRYKA KABLI MADEX

TECHNICAL DESCRIPTION OF FIRE RESISTANT INSTALLATION CABLES HTKSH PH90; HTKSHekw PH90

1. Technical parameters:

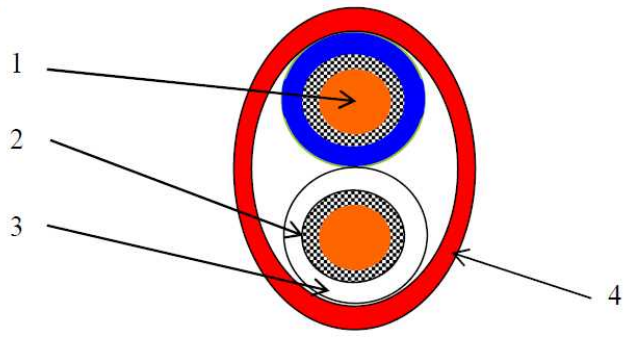
Conductor loop resistance	≤ 48 Ω/km
Insulation resistance	≥ 500 MΩ x km
Working capacity of HTKSH cables	≤ 120 nF/km
Working capacity of HTKSHekw cables	≤ 200 nF/km
Test voltage (50Hz, 1min.); RMS value conductor/conductor and conductor/shield	1,5KV a.c. or 2,25kV d.c.
Temperature range: - during installation - operating	-5°C do +50°C -30°C do +70°C
Voltage rating, Vrms	300V
Minimum bending radius	10 x outer diameter of the cable
Flame retardance	PN-EN 60332-1-2, IEC 60332-1
Resistance to fire	PH 90 PN-EN 50200
Corrosivity of gases issued during fire	PN-EN 50267-2-3 pH ≥ 4,3; conductivity ≤ 10μSmm^{-1}
Smoke density	PN-EN 50268-2 transmittance not less than 70%

2. Construction:
   a) conductor: solid, soft and annealed copper wire according to PN-EN 60228,
   b) flame barrier: mica tape
   c) insulation: cross-linked low smoke halogen free polymer type HM2
   d) twisting: two insulated conductors stranded together
   e) cable' core: pairs stranded in layers and wrapped with polyester tape; number of pairs in cable 1 - 10
   f) screen of cable core: Al/PET tape with CuSn drain wire
   f) sheath: low smoke halogen free flame retardant polymer type HM2; color – red

3. Application: For installation in dry and wet rooms, also for direct bedding in concrete, but not for direct burial in ground and not for use in water. The cable has improved flame retardant and may be used in public buildings with high safety requirements and is suitable for control voltages and data transfer in alarm and fire alarm systems.

4. Drawing of cable test specimens

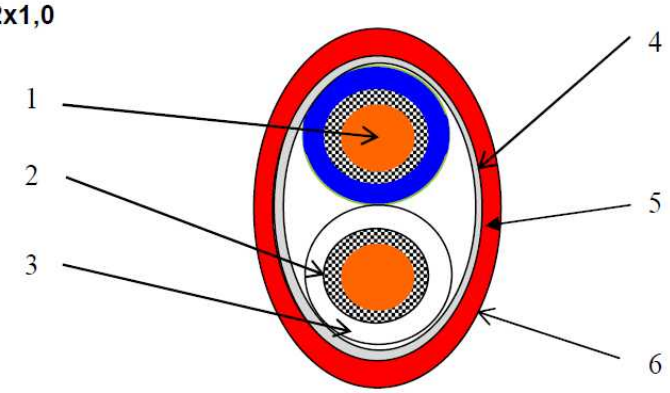
   a) **HTKSH PH90 1x2x1,0**



(ed. 30.04.2012) 1

Legend:
1 – solid copper conductor, diameter 0,98mm
2 – mica tape, diameter over tape 1,5mm
3 – insulation: low smoke halogen free flame retardant polymer, diameter 2,30mm
4 – sheath: low smoke halogen free flame retardant polymer, diameter 6,30mm

b) HTKSHekw PH90 1x2x1,0



Legend:
1 – solid copper conductor, diameter 0,98mm
2 – mica tape, diameter over tape 1,5mm
3 – insulation: low smoke halogen free flame retardant polymer, diameter 2,30mm
4 – polyester tape, diameter 3,90mm
5 – Al/PET tape, diameter over tape 3,95mm
6 – sheath: low smoke halogen free flame retardant polymer, diameter 6,60mm

5. Materials characteristic

4.1. Conductor – soft copper wires with following properties:
- elongation at break A_{100} 15÷20%
- tensile strength R_m min. 200 MPa

4.2. Mica tape
- thickness 0,125±0,015mm
- tensile strength min. 100 N/cm
- dielectric constant 1,2
- dielectric strength > 1,2 kV/layer

4.3. Insulation - cross-linked low smoke halogen free polymer
- tensile strength 14 N/mm^2
- elongation at break 180%
- hardness 58^{o}Sh D
- oxygen index 36%

4.4. Al/PET tape 9/12 (thickness of aluminum 9µ; thickness of polyester 12µ)
- tensile strength - 36N/15mm
- elongation at break - 11

4.5. Sheath:
- tensile strength 11 MPa
- elongation at break 150%
- hardness 58^{o}Sh D
- oxygen index 45%

FABRYKA KABLI MADEX

TECHNICAL DESCRIPTION OF FIRE RESISTANT CABLE NHXH FE180 PH90/E90 0,6/1 kV

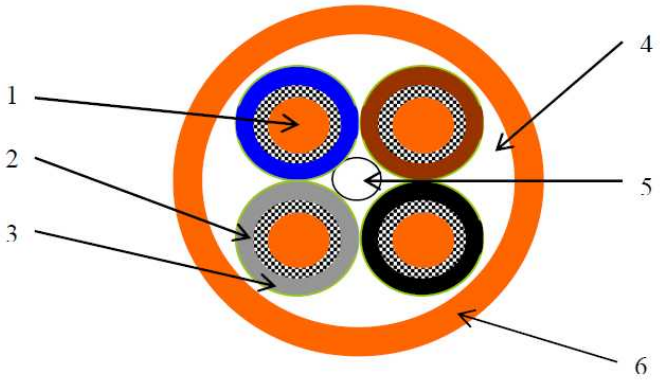
1. Technical parameters:

Nominal voltage U_o/U	0,6/1 kV
Conductor resistance – maximal value at temp. 20°C	according to PN-EN 60228
Test voltage	4 kV, 50 Hz
Insulation resistance - minimal value	10^{11} Ω·cm
Temperature range: - during installation - operating	-5°C do +50°C -25°C do +90°C
Maximum temperature for short circuit conditions	+ 250°C
Minimum bending radius: - one core cables - multi core cables	15 x outer diameter of the cable 12 x outer diameter of the cable
Flame retardance	PN-EN 60332-1-2, IEC 60332-1, PN-EN 60332-3-24, IEC 60332-3-24
Fire resistance of electric cable systems required to maintain circuit integrity	E90 DIN 4102-12
Circuit integrity	PN-IEC 60331-21 180min (FE180) temp. 750°C
Resistance to fire	PH 90 PN-EN 50200; PN-EN 50362
Corrosivity of gases issued during fire	PN-EN 50267-2-3 pH ≥ 4,3; conductivity ≤ 10μSmm^{-1}
Smoke density	PN-EN 50268-2 transmittance not less than 70%

2. Construction:
   a) conductor: copper according to PN-EN 60228,
      RE - round solid class 1
      RM – multiwire (stranded) class 2
   b) flame barrier: mica tape
   c) insulation: cross-linked low smoke halogen free polymer type HXI1
   d) Core identification: according to PN-HD 308; (J) means yellow – green protective conductor
   e) filling sheath: extruded halogen free flame retardant compound
   f) sheath: low smoke halogen free flame retardant polymer type HM4; color – orange

3. Application: For installation in dry and wet rooms, also for direct bedding in concrete, but not for direct burial in ground and not for use in water. The cable has improved flame retardant and may be used in public buildings with high safety requirements and is suitable for installation in fire alarm systems, safety lightning and other emergency electrical supply systems.

4. Drawing of cable test specimens



(ed. 30.04.2012) 1

Legend:

a) **NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE**
1 – solid copper conductor, diameter 1,37mm
2 – mica tapes (3 tapes thickness 0,125mm + 1 tape thickness 0,10mm with overlapping 20%), diameter over tapes - 2,4mm
3 – insulation: cross-linked low smoke halogen free polymer, diameter 4,58mm
4 – filling sheath: low smoke halogen free flame retardant polymer, diameter 13,20mm
5 – filler element: low smoke halogen free flame retardant polymer, diameter 1,82mm
6 – sheath: low smoke halogen free flame retardant polymer, diameter 16,10mm

b) **NHXH FE180 PH90/E90 0,6/1kV 4x50RM**
1 – multiwire (stranded) class 2 copper conductor, diameter 8,18mm
2 – mica tapes (3 tapes thickness 0,125mm + 1 tape thickness 0,10mm with overlapping 20%), diameter over tapes – 9,3mm
3 – insulation: cross-linked low smoke halogen free polymer, diameter 11,77mm
4 – filling sheath: low smoke halogen free flame retardant polymer, diameter 29,8mm
5 – filler element: low smoke halogen free flame retardant polymer, diameter 4,78mm
6 – sheath: low smoke halogen free flame retardant polymer, diameter 33,70mm

5. Materials characteristic

4.1. Conductor – soft copper wires with following properties:
- elongation at break A_{100} - 15÷20%
- tensile strength R_m - min. 200 MPa

4.2. Mica tape

- thickness	0,125±0,015mm	0,10±0,015
- tensile strength	min. 100 N/cm	min. 100 N/cm
- dielectric constant	1,2	1,2
- dielectric strength	> 1,2 kV/layer	> 1 kV/layer

4.3. Insulation - cross-linked low smoke halogen free polymer
- tensile strength - 11,5 N/mm^2
- elongation at break - 280%
- hardness - 45^{o}Sh D
- oxygen index - 33%

4.4. Filling sheath - halogen free compound with low emission of toxic and corrosives gases

4.5. Sheath:
- tensile strength - 12 MPa
- elongation at break - 180%
- hardness - 50^{o}Sh D
- oxygen index - 40%

FABRYKA KABLI MADEX

TECHNICAL DESCRIPTION OF FIRE RESISTANT CABLE NHXCH FE180 PH90/E90 0,6/1 kV

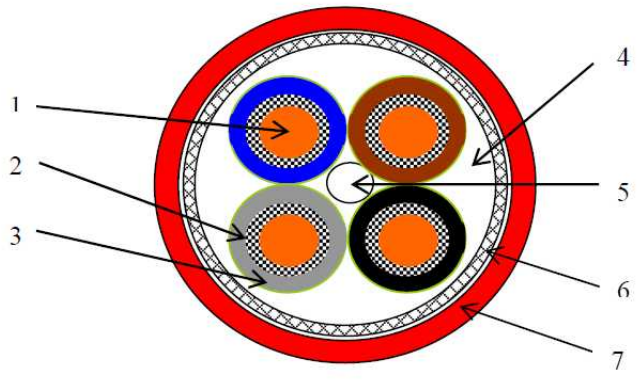
1. Technical parameters:

Nominal voltage U_o/U	0,6/1 kV
Conductor resistance – maximal value at temp. 20°C	according to PN-EN 60228
Test voltage	4 kV, 50 Hz
Insulation resistance - minimal value	10^{11} Ω·cm
Temperature range: - during installation - operating	-5°C do +50°C -25°C do +90°C
Maximum temperature for short circuit conditions	+ 250°C
Minimum bending radius: - one core cables - multi core cables	15 x outer diameter of the cable 12 x outer diameter of the cable
Flame retardance	PN-EN 60332-1-2, IEC 60332-1, PN-EN 60332-3-24, IEC 60332-3-24
Fire resistance of electric cable systems required to maintain circuit integrity	E90 DIN 4102-12
Circuit integrity	PN-IEC 60331-21 180min (FE180) temp. 750°C
Resistance to fire	PH 90 PN-EN 50200; PN-EN 50362
Corrosivity of gases issued during fire	PN-EN 50267-2-3 pH ≥ 4,3; conductivity ≤ 10μSmm^{-1}
Smoke density	PN-EN 50268-2 transmittance not less than 70%

2. Construction:
   a) conductor: copper according to PN-EN 60228,
      RE - round solid class 1
      RM – multiwire (stranded) class 2
   b) flame barrier: mica tape
   c) insulation: cross-linked low smoke halogen free polymer type HXI1
   d) core identification: according to PN-HD 308; (J) means yellow – green protective conductor
   e) filling sheath: extruded low smoke halogen free flame retardant compound
   f) concentric conductor: helically applied Cu-wires + counter helix
   g) sheath: low smoke halogen free flame retardant polymer type HM4; color – orange

3. Application: For installation in dry and wet rooms, also for direct bedding in concrete, but not for direct burial in ground and not for use in water. The cable has improved flame retardant and may be used in public buildings with high safety requirements and is suitable for installation in fire alarm systems, safety lightning and other emergency electrical supply systems.

4. Drawing of cable test specimens



(ed. 30.04.2012)

Legend:

a) NHXCH FE180 PH90/E90 0,6/1kV 4x1,5RE

1 – solid copper conductor, diameter 1,37mm
2 – mica tapes (3 tapes thickness 0,125mm + 1 tape thickness 0,10mm with overlapping 20%), diameter over tapes - 2,4mm
3 – insulation: cross-linked low smoke halogen free polymer, diameter 4,51mm
4 – filling sheath: low smoke halogen free flame retardant polymer, diameter 13,20mm
5 – filler element: low smoke halogen free flame retardant polymer, diameter 1,74mm
6 – concentric conductor, diameter 13,60mm
7 – sheath: low smoke halogen free flame retardant polymer, diameter 17,35mm

b) NHXCH FE180 PH90/E90 0,6/1kV 4x50RM

1 – multiwire (stranded) class 2 copper conductor, diameter 8,14mm
2 – mica tapes (3 tapes thickness 0,125mm + 1 tape thickness 0,10mm with overlapping 20%), diameter over tapes – 9,3mm
3 – insulation: cross-linked low smoke halogen free polymer, diameter 11,71mm
4 – filling sheath: low smoke halogen free flame retardant polymer, diameter 30,35mm
5 – filler element: low smoke halogen free flame retardant polymer, diameter 4,80mm
6 – concentric conductor, diameter 31,5mm
7 – sheath: low smoke halogen free flame retardant polymer, diameter 36,80mm

5. Materials characteristic

4.1. Conductor – soft copper wires with following properties:
- elongation at break A_{100} 15÷20%
- tensile strength R_m min. 200 MPa

4.2. Mica tape

- thickness	0,125±0,015mm	0,10±0,015
- tensile strength	min. 100 N/cm	min. 100 N/cm
- dielectric constant	1,2	1,2
- dielectric strength	> 1,2 kV/layer	> 1 kV/layer

4.3. Insulation - cross-linked low smoke halogen free polymer
- tensile strength 11,5 N/mm^2
- elongation at break 280%
- hardness 45^{o}Sh D
- oxygen index 33%

4.4. Filling sheath - a thermoplastic halogen free compound with oxygen index 40%

4.5. Concentric conductor

soft copper wires + counter helix made of copper tape thickness 0,1mm and wrapped with polyester foil

4.6. Sheath:
- tensile strength 12 MPa
- elongation at break 180%
- hardness 50^{o}Sh D
- oxygen index 40%

DRAWINGS

Nr	Nr Fires	Czas	Symbol kaba	Pozycja	Konstrukcja mocowania, odległość, obciążenie
1	46		NHXH FE180 PH90/E90 0,6/1kV 4x50RM	1	Korytko kablowe KCP/KCOP 400H60/... B-400 1.2 m /10kg/m / grubość blachy 1,5 mm Mocowanie : Wspornik WPC/WPCO1000, Wysięgnik WMC/WMCO400 , pręt gwintowany PG M10 za pomocą uchwytu USV/USOV
2	45		NHXH FE180 PH90/E90 0,6/1kV 4x50RM		
3	67		HTKSH PH90 1x2x1,0		
4			HTKSH PH90 1x2x1,0		
5	66		HTKSHekw PH90 1x2x1,0		
6			HTKSHekw PH90 1x2x1,0		
7	44		NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		
8	43		NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		
9	42		NHXH FE180 PH90/E90 0,6/1kV 4x50RM	2	Drabina kablowa DGP/DGOP400H60/... B-400 1.2 m /20kg/m / grubość blachy 1,5 mm Mocowanie : Wspornik WPC/WPCO1000, Wysięgnik WMC/WMCO400 , pręt gwintowany PG M10 za pomocą uchwytu USV/USOV
10	41		NHXH FE180 PH90/E90 0,6/1kV 4x50RM		
11	65		HTKSH PH90 1x2x1,0		
12			HTKSH PH90 1x2x1,0		
13	64		HTKSHekw PH90 1x2x1,0		
14			HTKSHekw PH90 1x2x1,0		
15	40		NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		
16	39		NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		
17	36		NHXH FE180 PH90/E90 0,6/1kV 4x50RM	3	Korytko siatkowe KDS/ KDSO 400H60/... B-400 1.5 m /20kg/m / grubość drutu fi 4,5 mm Mocowanie : Ceownik CWP/CWOP40H40/05, pręt gwintowany PG M10
18	35		NHXH FE180 PH90/E90 0,6/1kV 4x50RM		
19	34		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
20	33		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
21	62		HTKSH PH90 1x2x1,0		
22			HTKSH PH90 1x2x1,0		
23	32		NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		
24	31		NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		
25	30		NHXCH FE180 PH90/E90 0,6/1kV 4x50/25RM	4	Korytko siatkowe KDS/ KDSO 400H60/... B-400 1.5 m /20kg/m / grubość drutu fi 4,5 mm Mocowanie : Ceownik CWP/CWOP40H40/05, pręt gwintowany PG M10
26	29		NHXCH FE180 PH90/E90 0,6/1kV 4x50/25RM		
27	28		NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE		
28	27		NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE		
29	61		HTKSHekw PH90 1x2x1,0		
30			HTKSHekw PH90 1x2x1,0		
31	22		NHXCH FE180 PH90/E90 0,6/1kV 4x50/25RM	5	Korytko kablowe KGJ/KGOJ 400H60/... B-400 1.5 m /20kg/m / grubość blachy 0,9 mm Mocowanie : Ceownik CWP/CWOP40H40/05, pręt gwintowany PG M10
32	21		NHXCH FE180 PH90/E90 0,6/1kV 4x50/25RM		
33	20		NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE		
34	19		NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE		
35	57		HTKSHekw PH90 1x2x1,0		
36			HTKSHekw PH90 1x2x1,0		
37	18		NHXCH FE180 PH90/E90 0,6/1kV 4x50/25RM	6	Korytko kablowe KGL/KGOL 300H60/... B-300 1.5 m /20kg/m / grubość blachy 0,7 mm Mocowanie : Ceownik CWP/CWOP40H40/05, pręt gwintowany PG M10
38	17		NHXCH FE180 PH90/E90 0,6/1kV 4x50/25RM		
39	16		NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE		
40	15		NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE		
41	56		HTKSHekw PH90 1x2x1,0		
42			HTKSHekw PH90 1x2x1,0		

DRAWINGS

Nr	Nr Fires	Czas	Symbol kaba	Pozycja	Konstrukcja mocowania, odległość, obciążenie
43	12		NHXH FE180 PH90/E90 0,6/1kV 4x50RM	7	Korytko kablowe KGJ/KGOJ 400H60/... B-400 1.5 m /20kg/m / grubość blachy 0,9 mm Mocowanie : Ceownik CWP/CWOP40H40/05, pręt gwintowany PG M10
44	11		NHXH FE180 PH90/E90 0,6/1kV 4x50RM		
45	10		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
46	9		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
47	55		HTKSH PH90 1x2x1,0		
48			HTKSH PH90 1x2x1,0		
49	8		NHXH FE180 PH90/E90 0,6/1kV 4x50RM	8	Korytko kablowe KGL/KGOL 300H60/... B-300 1.5 m /20kg/m / grubość blachy 0,7 mm Mocowanie : Ceownik CWP/CWOP40H40/05, pręt gwintowany PG M10
50	7		NHXH FE180 PH90/E90 0,6/1kV 4x50RM		
51	6		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
52	5		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
53	54		HTKSH PH90 1x2x1,0		
54			HTKSH PH90 1x2x1,0		
55	47		NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE	9	Uchwyt kablowy UDF. Mocowanie do płyty gips karton co 600mm za pomocą kołka MOLLY 5x52/58
56			NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		
57	48		NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE		
58			NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE		
59	49		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
60			NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
61	68		HTKSHekw PH90 1x2x1,0		
62			HTKSHekw PH90 1x2x1,0		
63	69		HTKSH PH90 1x2x1,0		
64			HTKSH PH90 1x2x1,0		
65	38		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE	10	Obejma kablowa KSA Mocowanie co 600mm + puszki PMO1 i PMO2
66	63		HTKSH PH90 1x2x1,0		
67	37		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
68	26		NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE	11	Korytko siatkowe KDS/KDSO 60H60/... B-60 1.5 m /1,5kg/m / grubość drutu fi 4,5 mm Mocowanie : wieszak WKS/WKSO 60, pręt gwintowany PG M6
69			NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE		
70	25		NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
71			NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE		
72	60		HTKSHekw PH90 1x2x1,0		
73			HTKSHekw PH90 1x2x1,0		
74	59		HTKSH PH90 1x2x1,0		
75			HTKSH PH90 1x2x1,0		
76	24		NHXH FE180 PH90/E90 0,6/1kV 4x50RM	12	Uchwyty kablowe UK1/UKO1+ SDP/SDOP 700. Mocowanie co 600mm
77			NHXH FE180 PH90/E90 0,6/1kV 4x50RM		
78	23		NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		
79			NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE		
80	58		HTKSH PH90 1x2x1,0		
81			HTKSH PH90 1x2x1,0		

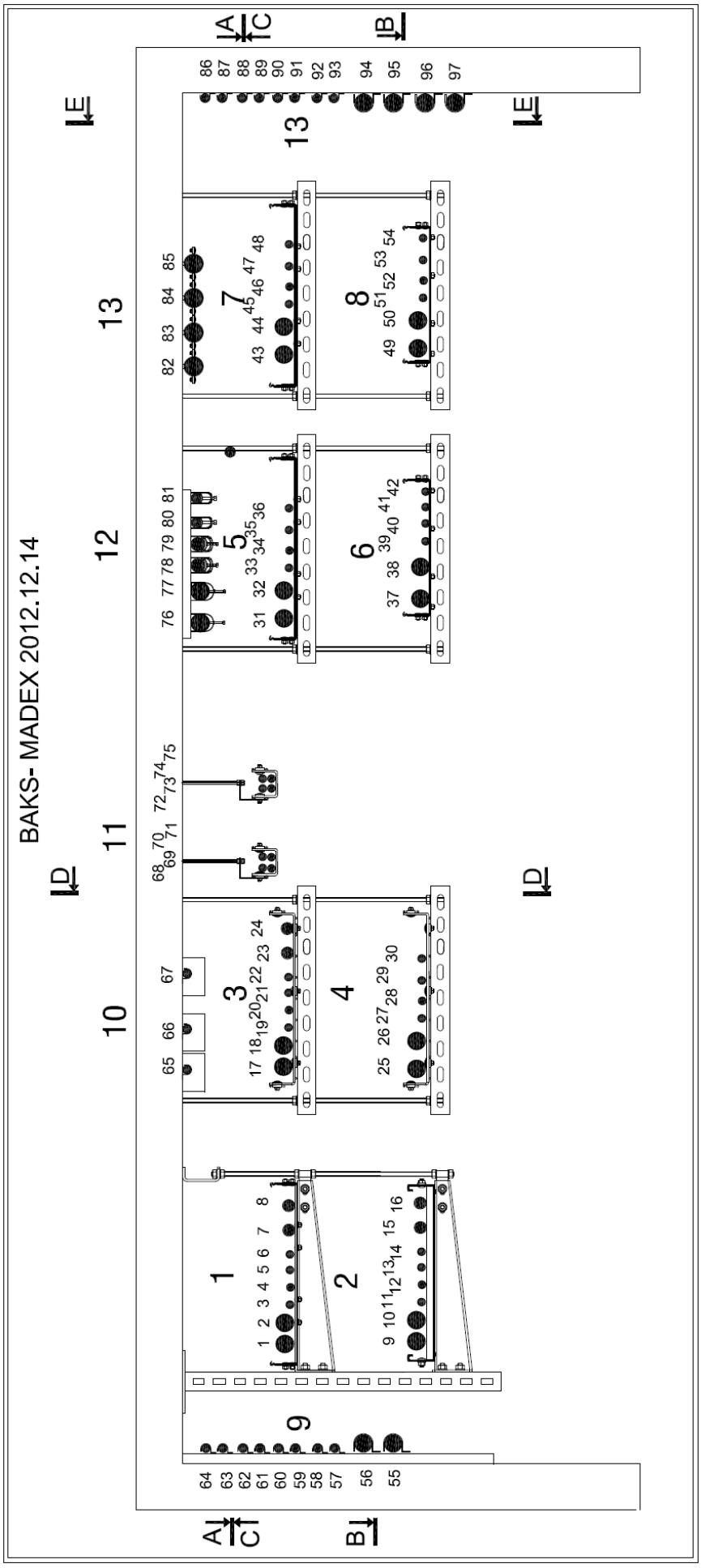
DRAWINGS

Nr	*Nr Fires*	*Czas*	*Symbol kaba*	*Pozycja*	*Konstrukcja mocowania, odległość, obciążenie*
82	**14**		**NHXH FE180 PH90/E90 0,6/1kV 4x50RM**	**13**	**Obejma kablowa KSA Mocowanie co 600mm**
83			**NHXH FE180 PH90/E90 0,6/1kV 4x50RM**		
84	**13**	**test**	**NHXH FE180 PH90/E90 0,6/1kV 4x50RM**		
85		**test**	**NHXH FE180 PH90/E90 0,6/1kV 4x50RM**		
86	**53**		**HTKSH PH90 1x2x1,0**	**14**	**Uchwyt kablowy UDF. Mocowanie do Ytongu co 600mm za pomocą kołka xxxx 6x30**
87			**HTKSH PH90 1x2x1,0**		
88	**52**		**HTKSHekw PH90 1x2x1,0**		
89			**HTKSHekw PH90 1x2x1,0**		
90	**4**		**NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE**		
91			**NHXH FE180 PH90/E90 0,6/1kV 4x1,5 RE**		
92	**3**		**NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE**		
93			**NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5 RE**		
94	**2**		**NHXH FE180 PH90/E90 0,6/1kV 4x50RM**		
95			**NHXH FE180 PH90/E90 0,6/1kV 4x50RM**		
96	**1**		**NHXCH FE180 PH90/E90 0,6/1kV 4x50/25RM**		
97			**NHXCH FE180 PH90/E90 0,6/1kV 4x50/25RM**		

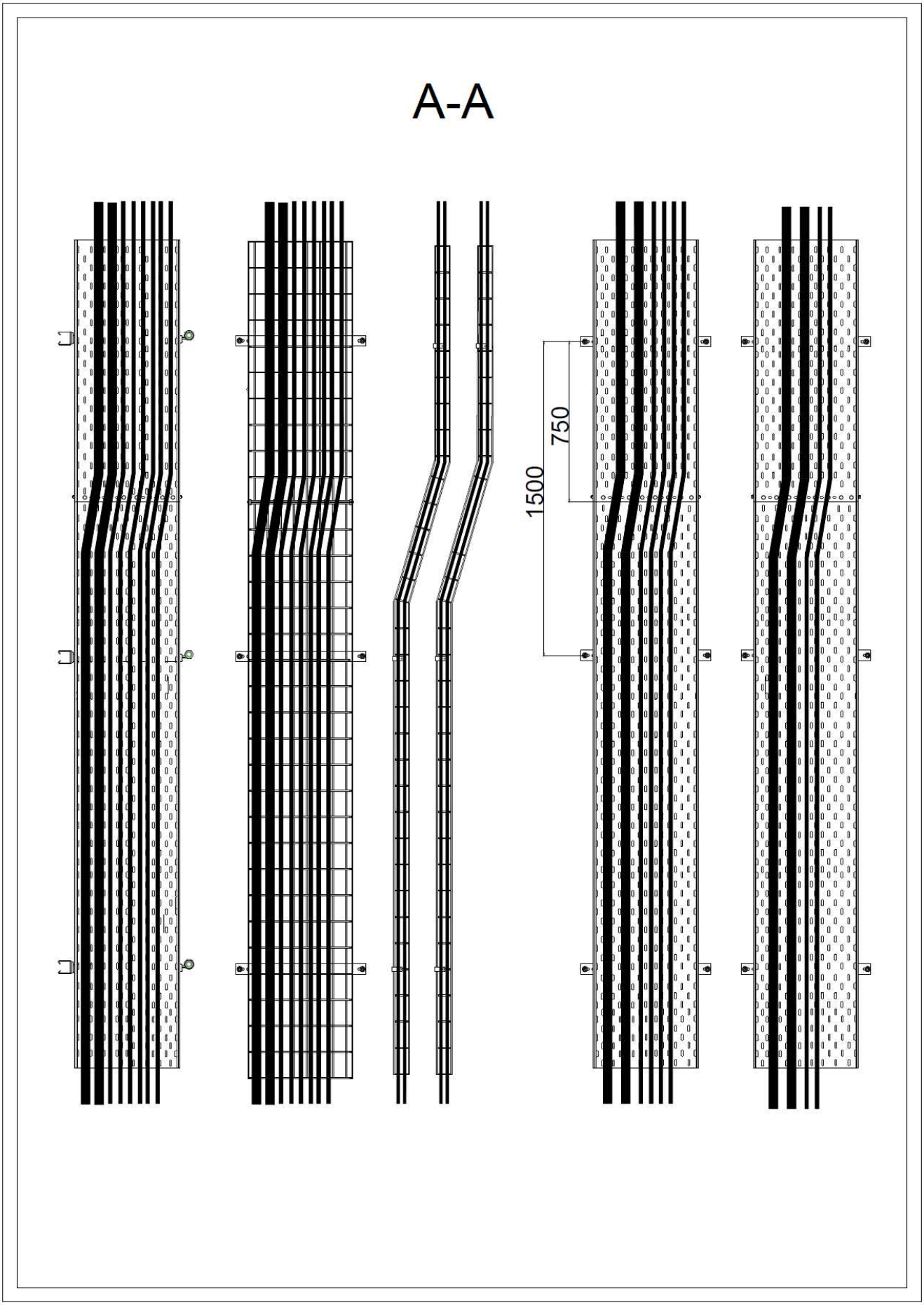
Zestawienie kabli Madex:

Lp.	Symbol kabla	Ilosć [szt.]	Średnica [mm]	Ciężar kabla [kg/m]
1	**HTKSH PH90 1x2x1,0**	19	5,5	0,046
2	**HTKSHekw PH90 1x2x1,0**	16	6,7	0,05
3	**NHXH FE180 PH90/E90 0,6/1kV 4x1,5RE**	14	15,4	0,34
4	**NHXH FE180 PH90/E90 0,6/1kV 4x50RM**	18	33	2,56
5	**NHXCH FE180 PH90/E90 0,6/1kV 4x1,5/1,5RE**	12	17,3	0,39
6	**NHXCH FE180 PH90/E90 0,6/1kV 4x50/25RM**	8	37,5	2,92
	NHXH-J FE180 PH90/E90 0,6/1kV 5x16 RE	10	27,7	1,39

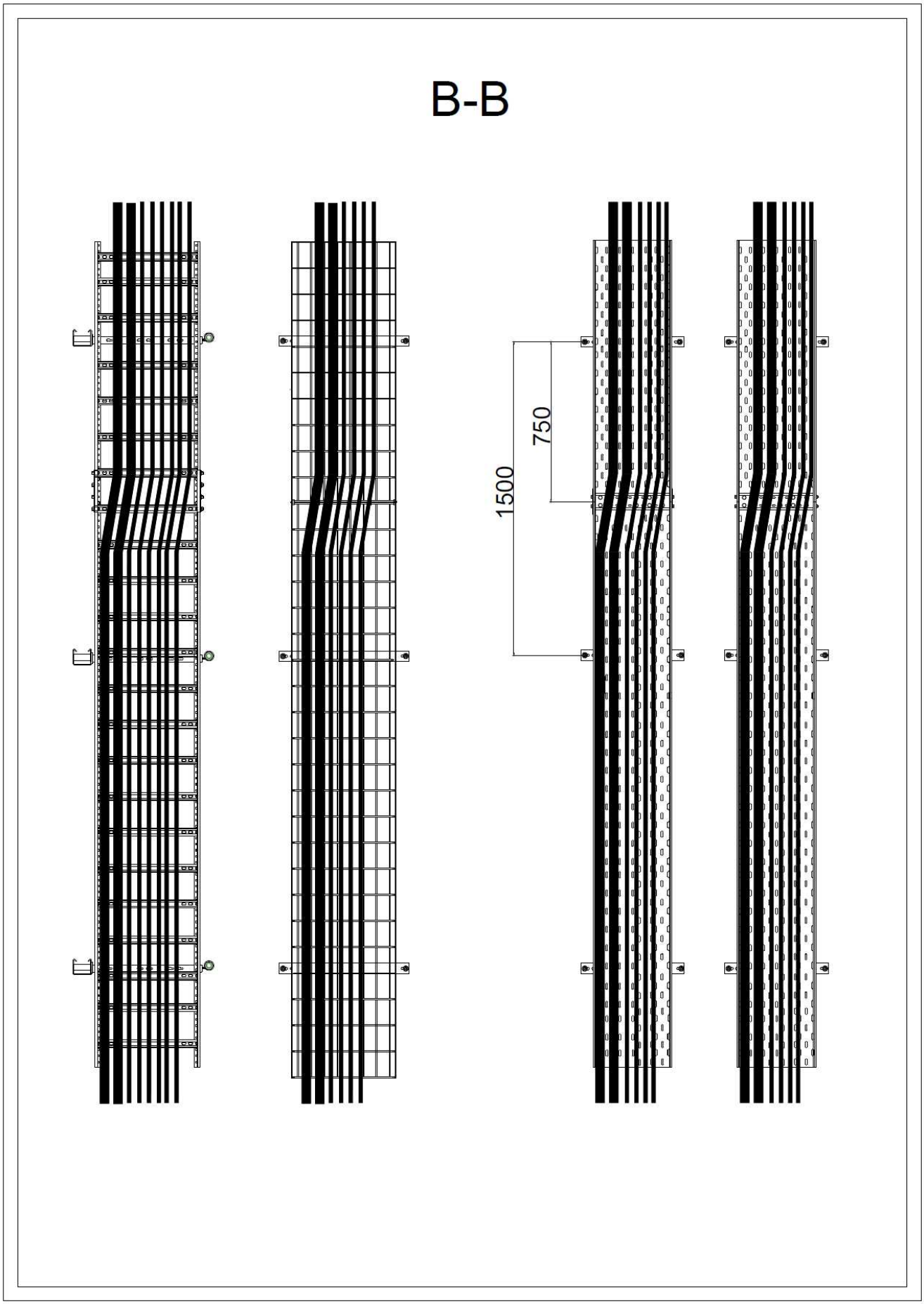
DRAWINGS



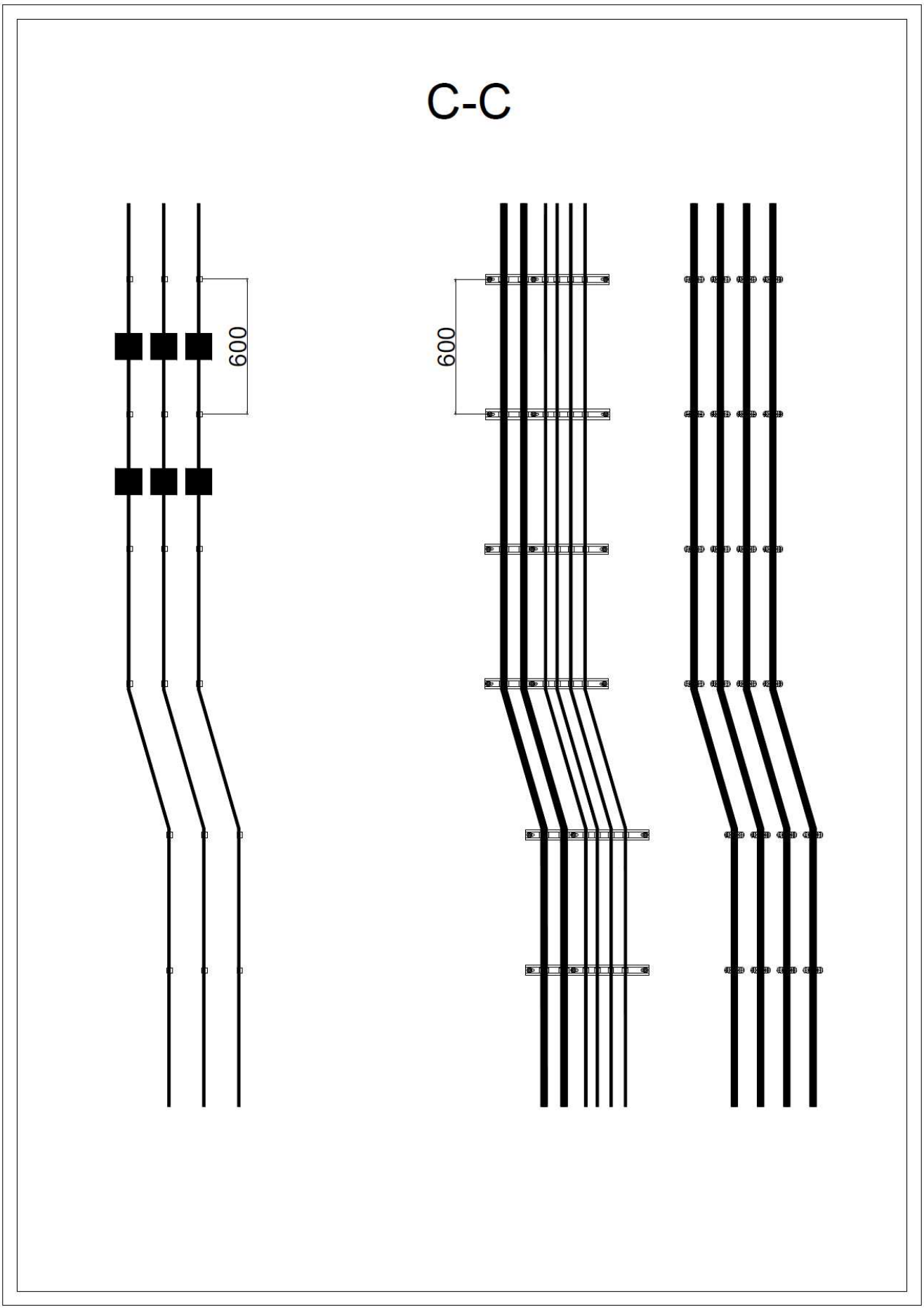
DRAWINGS



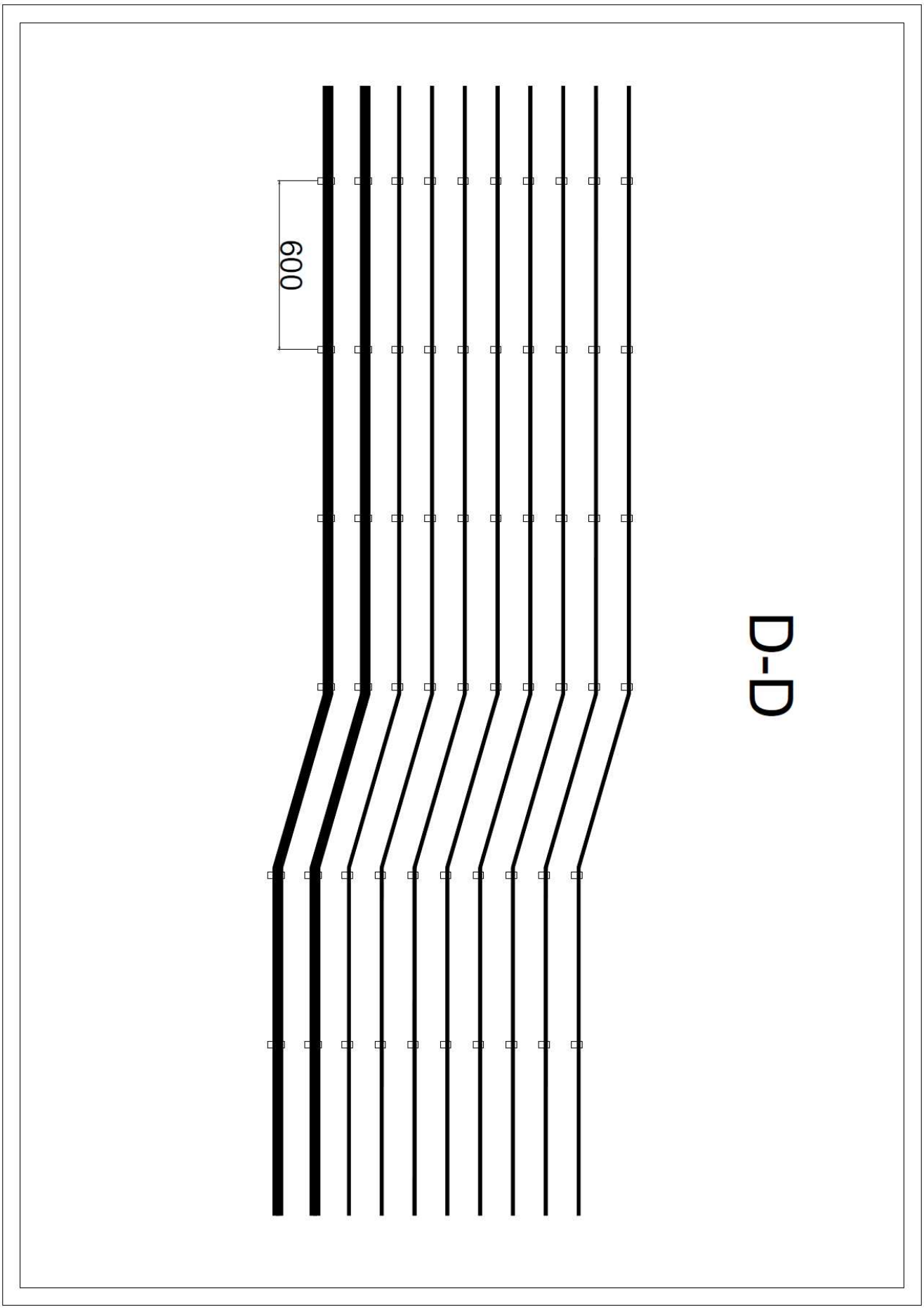
DRAWINGS



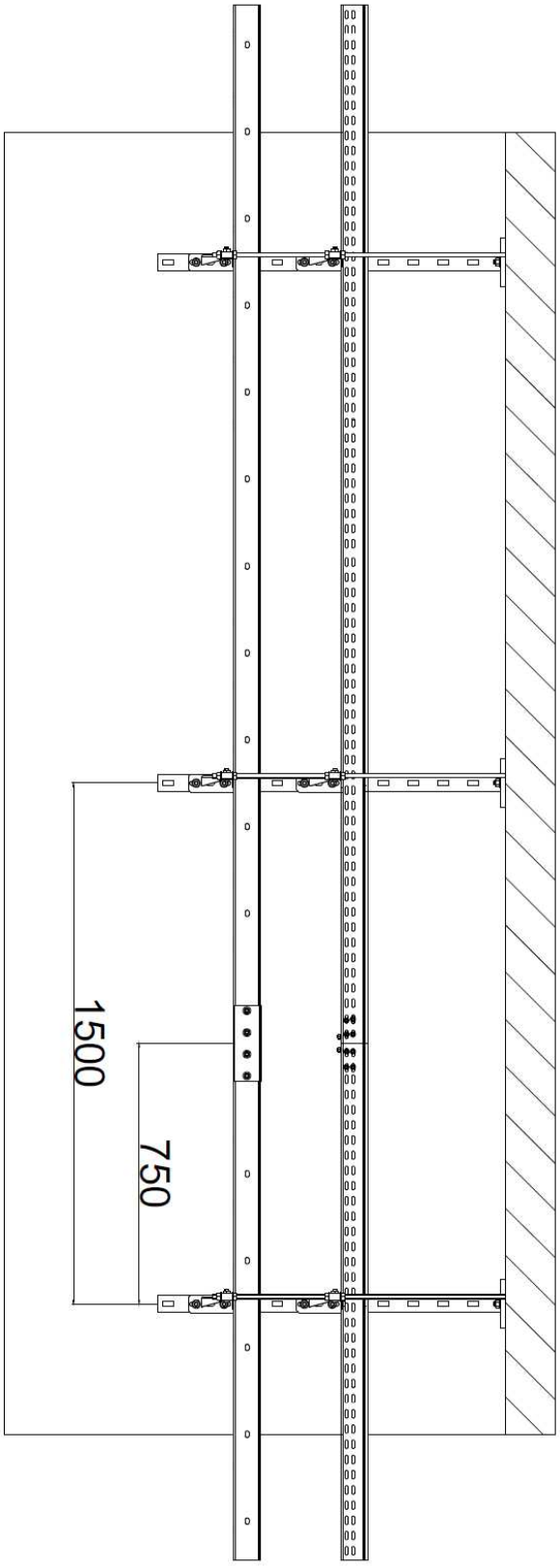
DRAWINGS



DRAWINGS

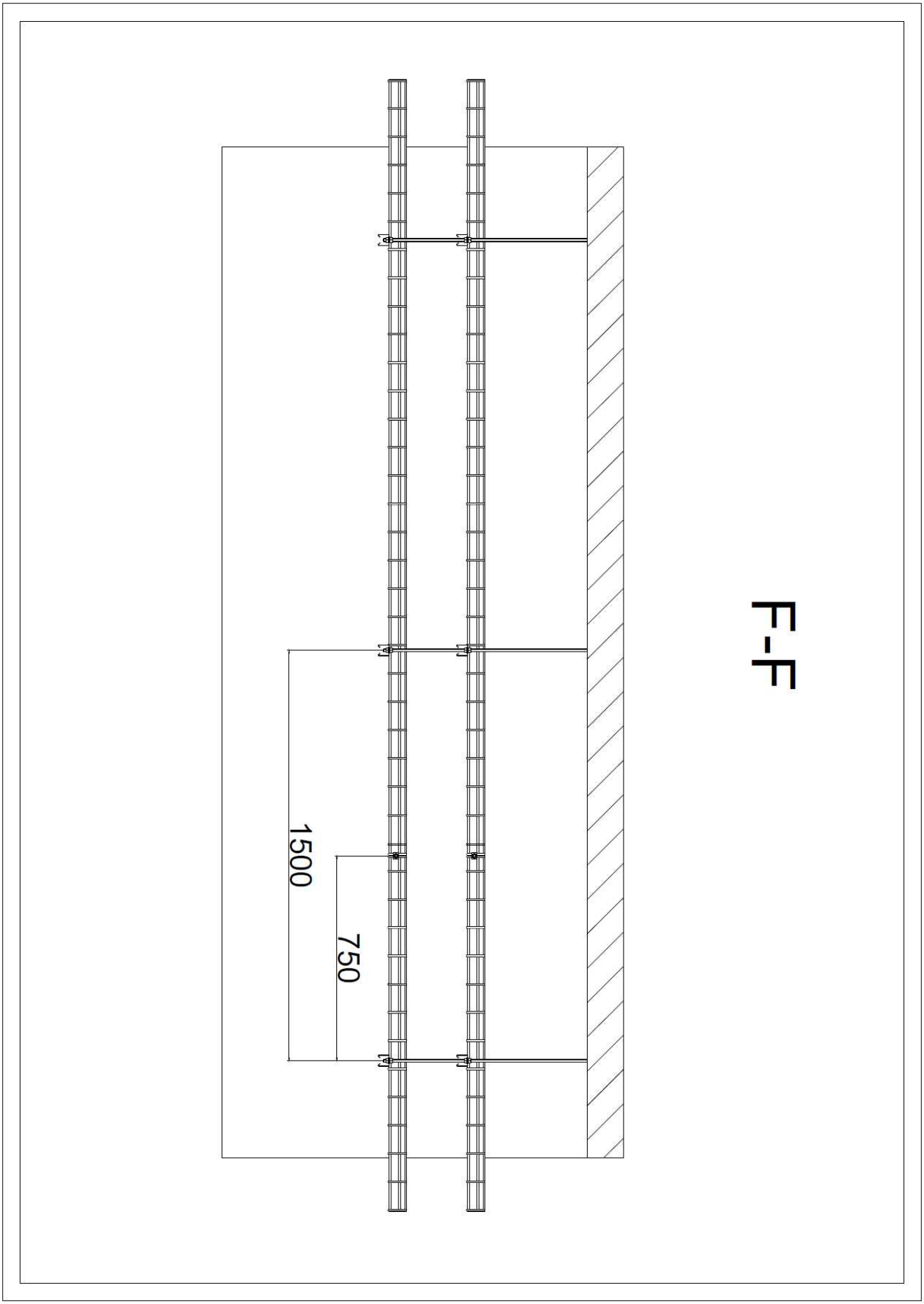


DRAWINGS

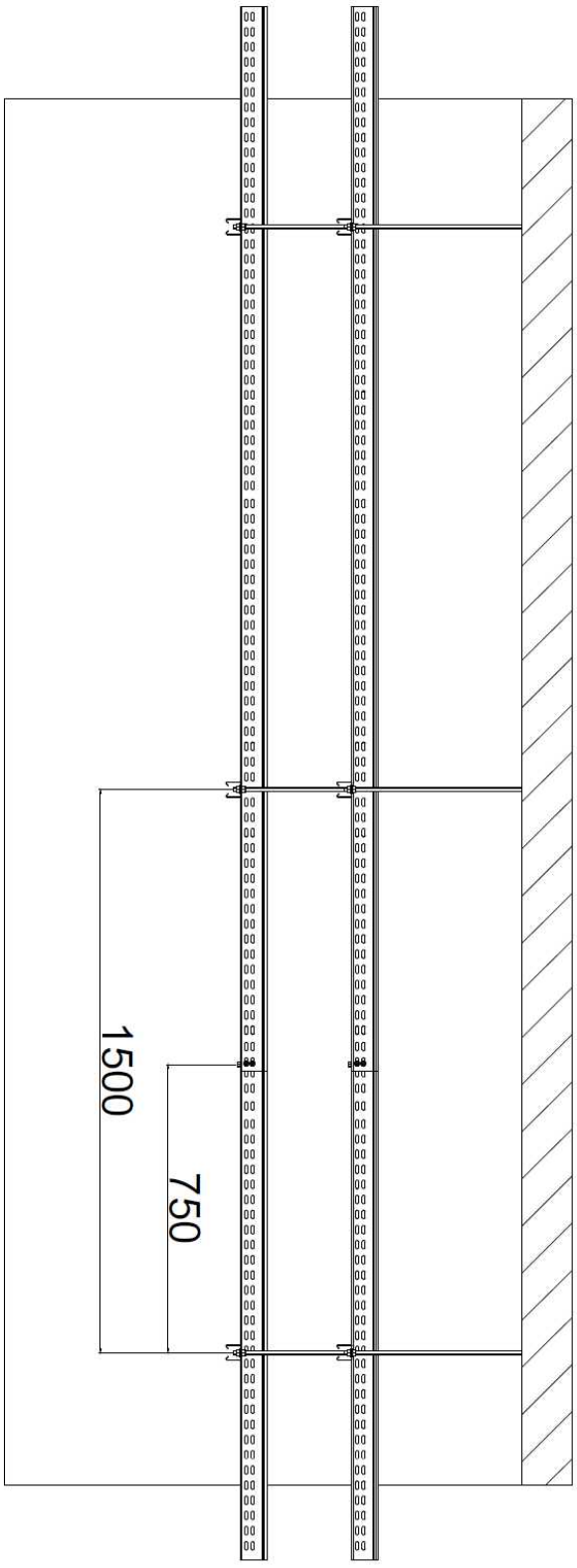


E-E

DRAWINGS

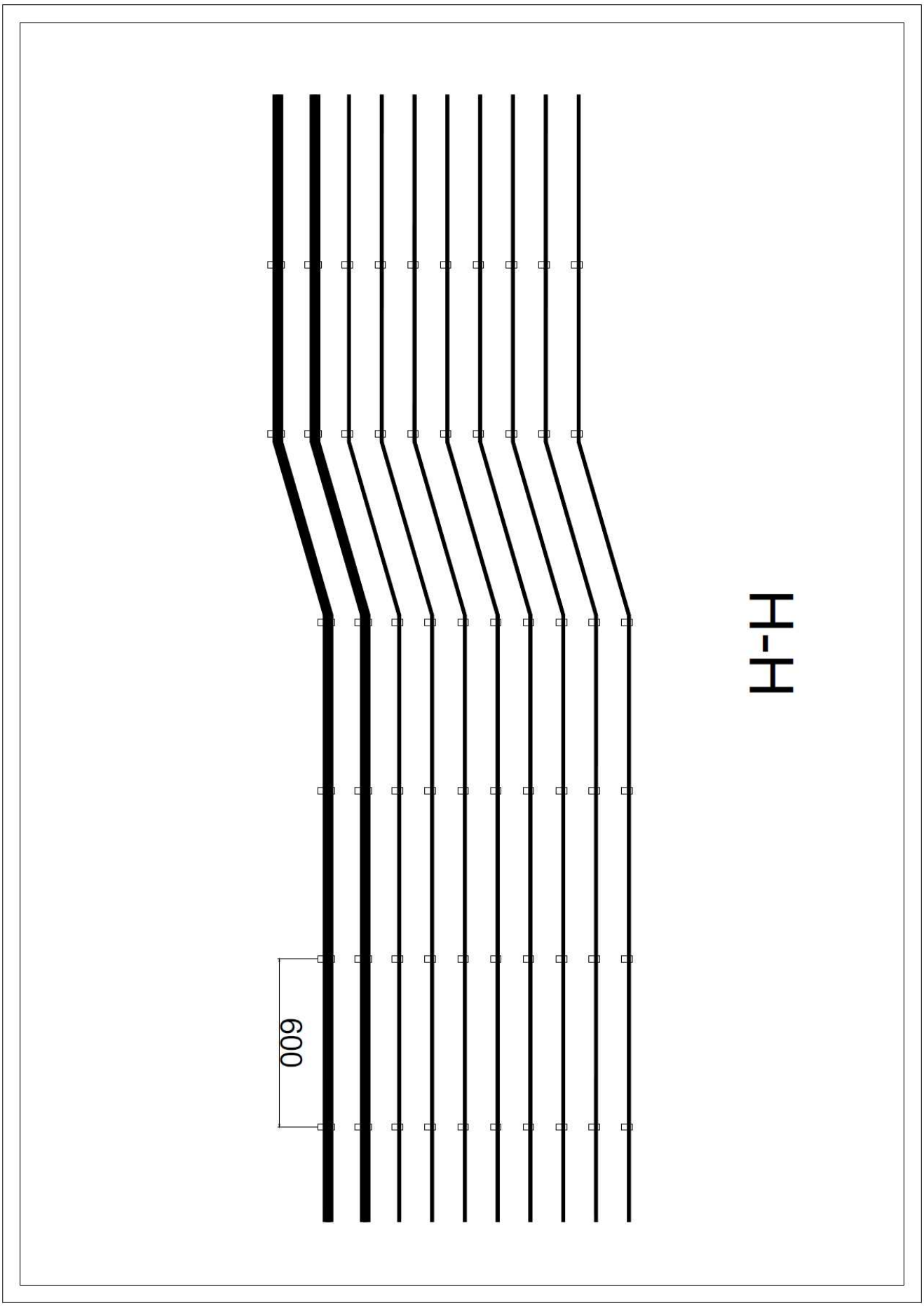


DRAWINGS

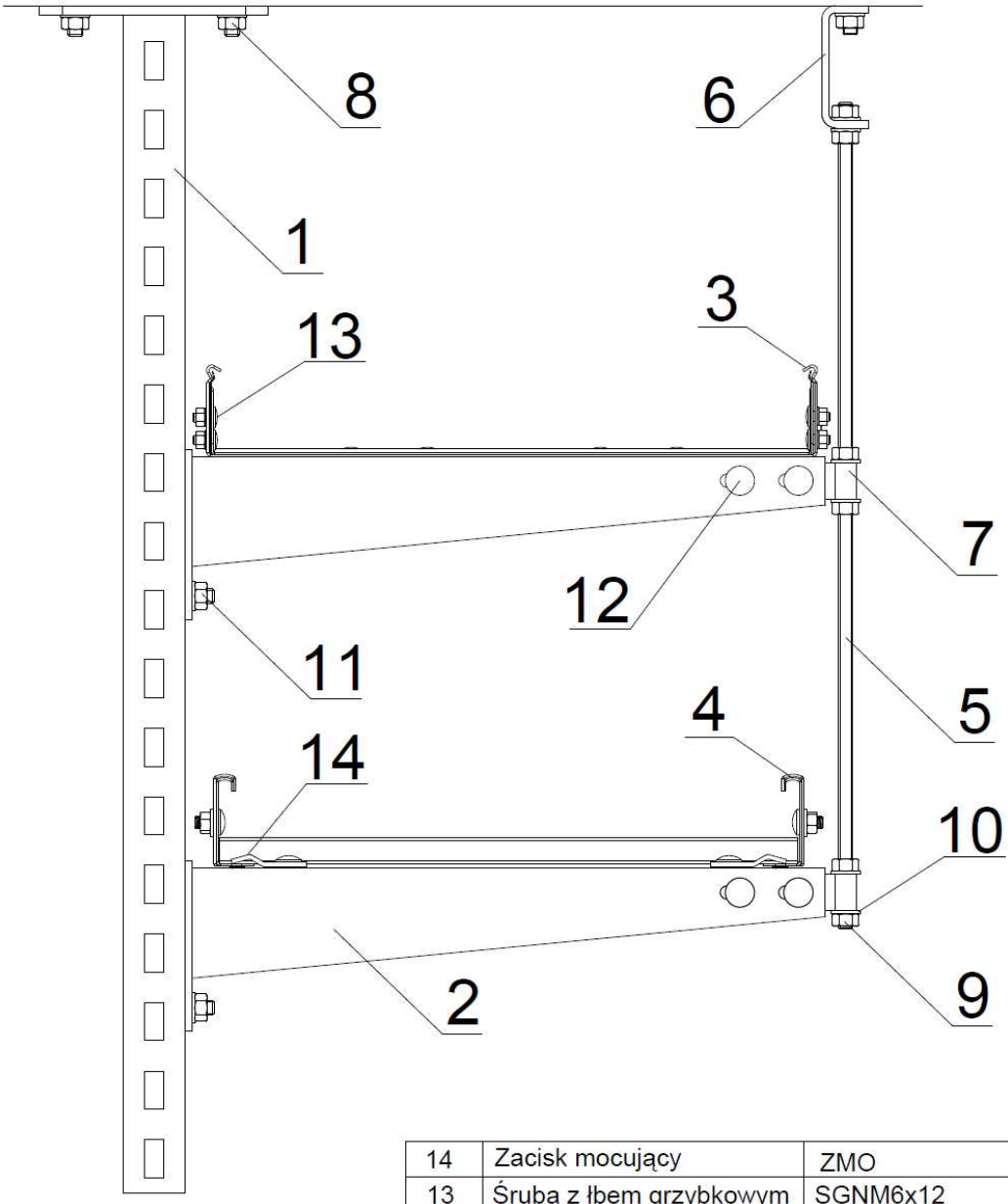


G-G

DRAWINGS

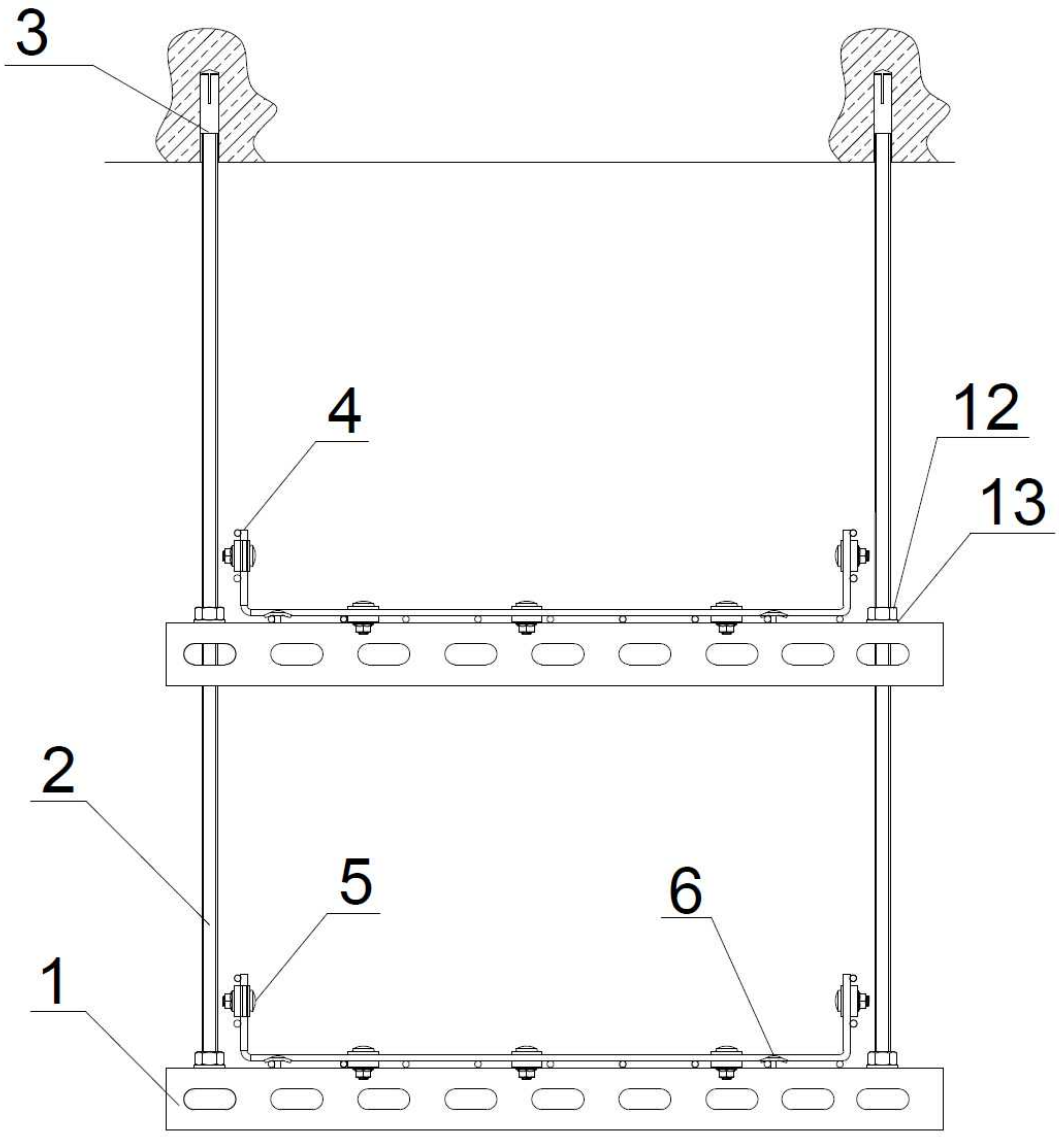


DRAWINGS



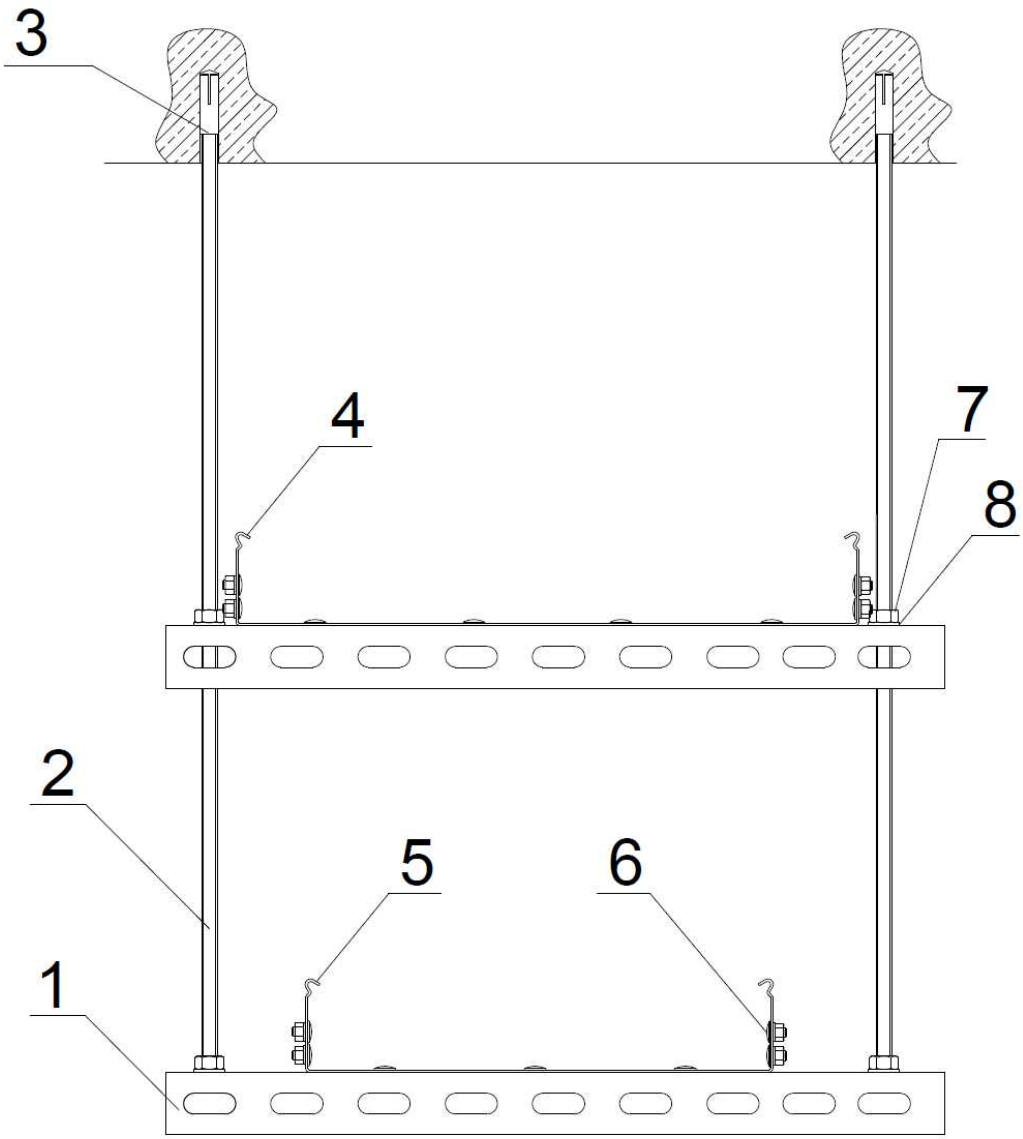
L.p.	Nazwa	Symbol	Szt.
14	Zacisk mocujący	ZMO	2
13	Śruba z łbem grzybkowym	SGNM6x12	8
12	Śruba z łbem grzybkowym	SGNM8x14	6
11	Śruba	SMM10x30	4
10	Podkładka	PP10	6
9	Nakrętka	NSM10	6
8	Śruba tulejowa rozporowa	PSROM10x80	3
7	Uchwyt	UPWO	2
6	Uchwyt sufitowy	USV/USOV	1
5	Pręt gwintowany	PGM10/...	1
4	Drabinka	DGOP600H60/3N	1
3	Korytko	KCP/KCOP400H60/3N	1
2	Wysięgnik	WMC/WMCO400	2
1	Wspornik sufitowy	WPCW/WPCO1000	1

DRAWINGS



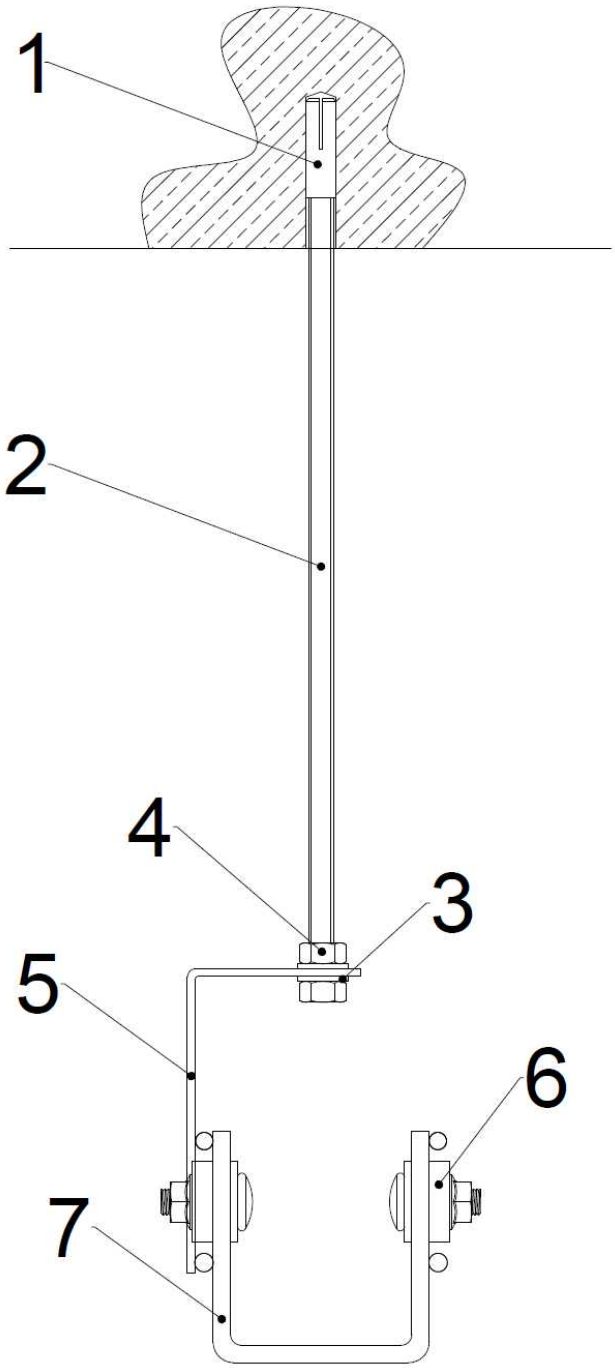
L.p.	Nazwa	Symbol	Szt.
8	Podkładka	PP10	8
7	Nakrętka	NSM10	8
6	Zacisk śrubowy	ZS/ZSO	4
5	Uchwyt śrubowy	USSN/USSO	10
4	Korytko siatkowe	KDS/KDSO400H60/3	2
3	Tuleja rozporowa stalowa	TRSOM10	2
2	Pręt gwintowany	PGM10/...	2
1	Ceownik wzmocniony	CWP/CWOP40H40/05	2

DRAWINGS



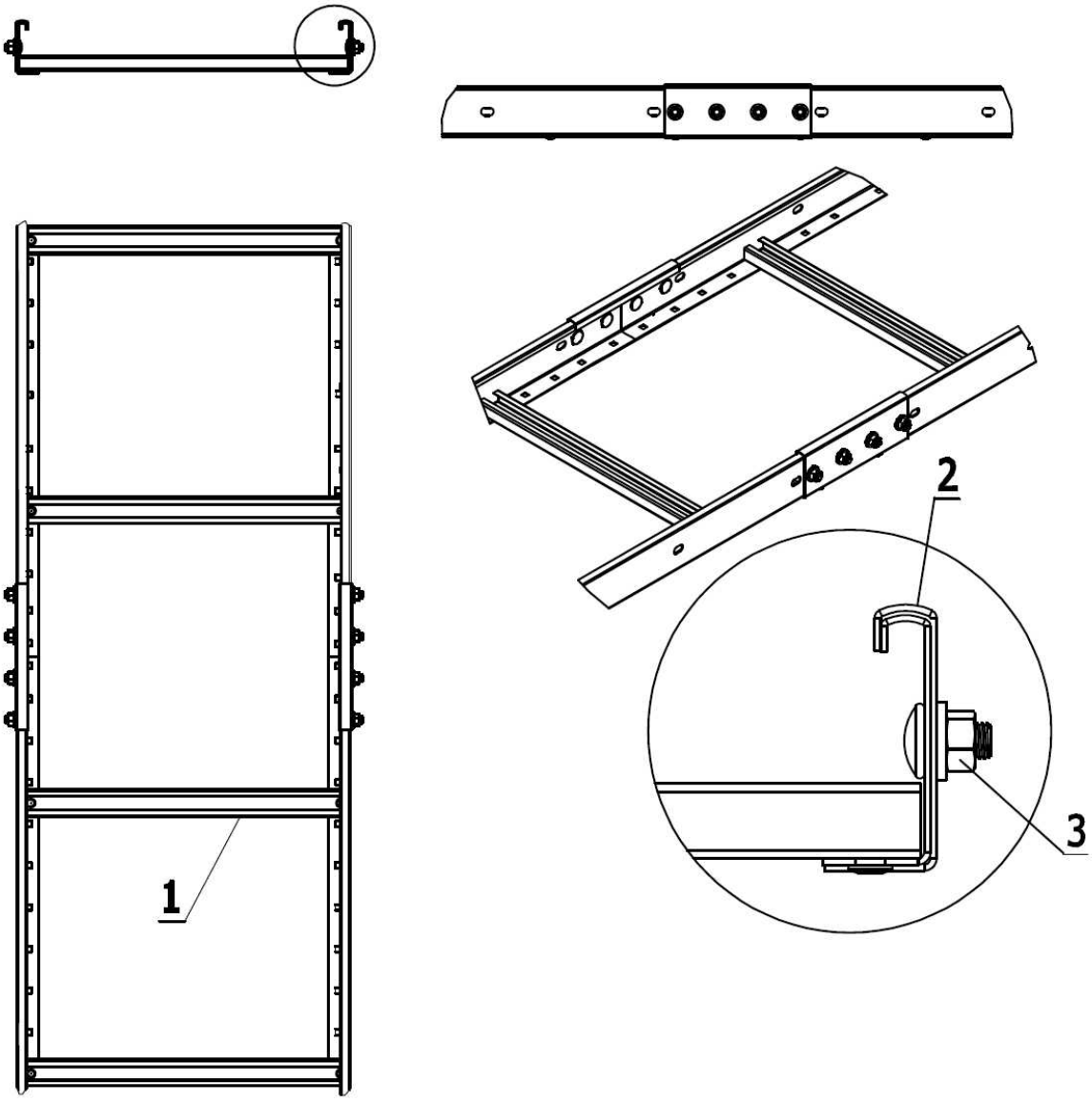
L.p.	Nazwa	Symbol	Szt.
8	Podkładka	PP10	8
7	Nakrętka	NSM10	8
6	Śruba z łbem grzybkowym	SGNM6x12	15
5	Korytko	KGL/KGOL300H60/3	1
4	Korytko	KGJ/KGOJ400H60/3	1
3	Tuleja rozporowa stalowa	TRSOM10	2
2	Pręt gwintowany	PGM10/...	2
1	Ceownik wzmocniony	CWP/CWOP40H40/05	2

DRAWINGS



L.p.	Nazwa	Symbol	Szt.
7	Korytko siatkowe	KDS/KDSO60H60/3	1
6	Uchwyt śrubowy	USSN/USSO	2
5	Wieszak	WKS/WKSO60	1
4	Nakrętka	NSM6	2
3	Podkładka	PP6	2
2	Pręt gwintowany	PGM6/...	1
1	Tuleja rozporowa stalowa	TRSOM6	1

DRAWINGS



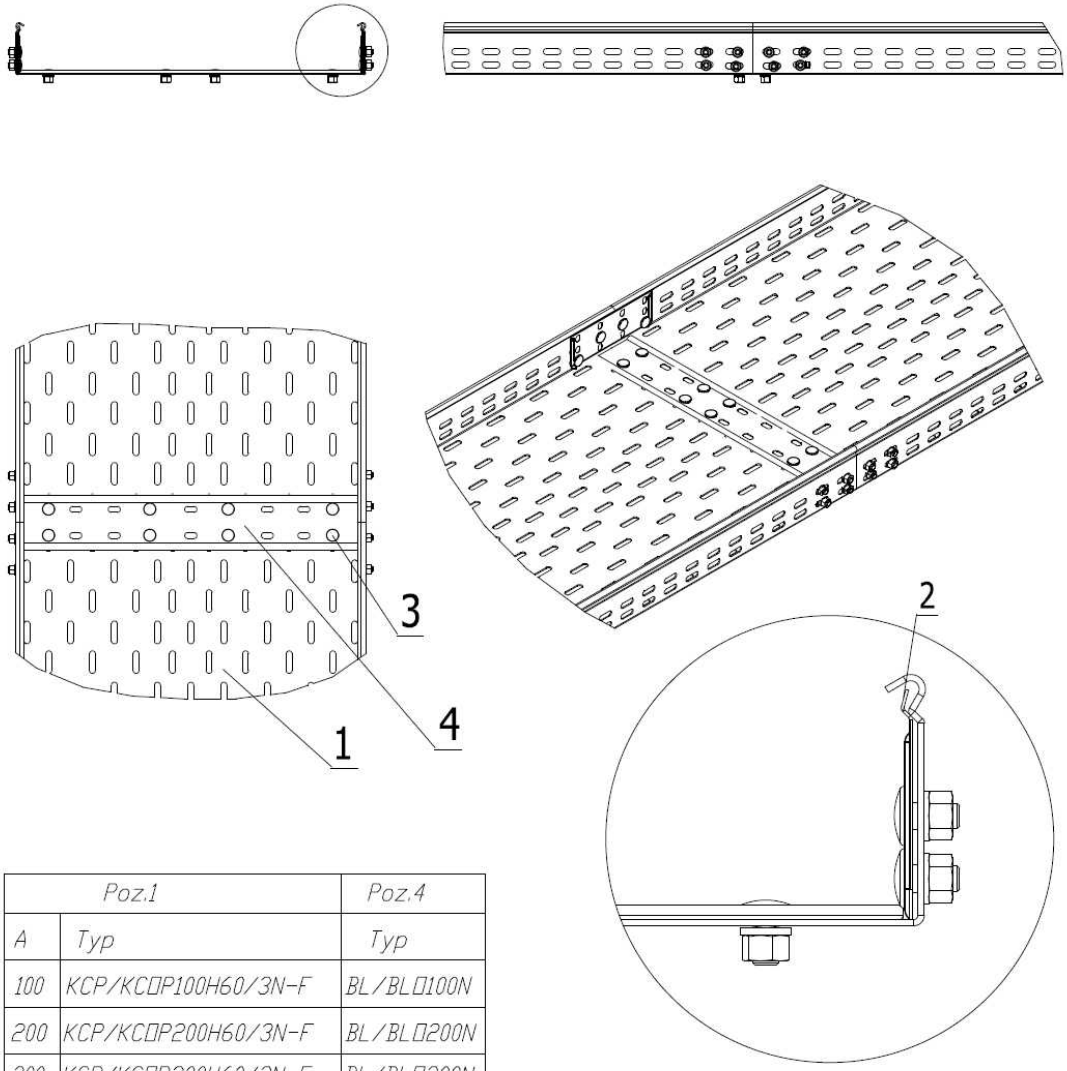
Pos.	Benennung	Zeichnung-Nr	Material	Stck.	Katalogs Nr.
3	Śruba	SGN M8x14		8	
2	Łącznik	LD□CH60N		2	
1	Drabinka	DG□P600H60/3N		2	

Odchylka wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format A4
			Nr normy				Arkusz 1
			półfabrykat (nr normy)				Arkuszy 1

Projektował	Nazwisko	Podpis	Data	Nazwa rysunku: DG□P600H60/3N
Rysował				
Sprawdził				
Zatwierdził				Nr programu maszynowego / Nr rysunku / Nr zmiany

Profesjonalne Systemy Tras Kablowych

DRAWINGS



Poz.1		Poz.4
A	Typ	Typ
100	KCP/KC□P100H60/3N-F	BL/BL□100N
200	KCP/KC□P200H60/3N-F	BL/BL□200N
300	KCP/KC□P300H60/3N-F	BL/BL□300N
400	KCP/KC□P400H60/3N-F	BL/BL□400N

L.p.	Nazwa	Symbol	Materiał	Szt.	Nr katalogowy
4	Blacha lacznikowa	BL/BL□400N		1	
3	Śruba z łbem grzybkowym	SGN M6x12		24	
2	Łacznik	LPP/LP□PH60N		2	
1	Koryto	KCP/KC□P400H60/3N		2	

□dchylka wymiarów nietolerowanych

Materiał: Gatunek; Nr normy; półfabrykat (nr normy)

Masa [kg] | Podziałka 7:50 | Format A4 | Arkusz 1 | Arkuszy 1

Projektował	Nazwisko	Podpis	Data
Rysował	J.Grochowski		
Sprawdził			
Zatwierdził			

Nazwa rysunku: Połaczenie KCP/KC□P400H60/3N

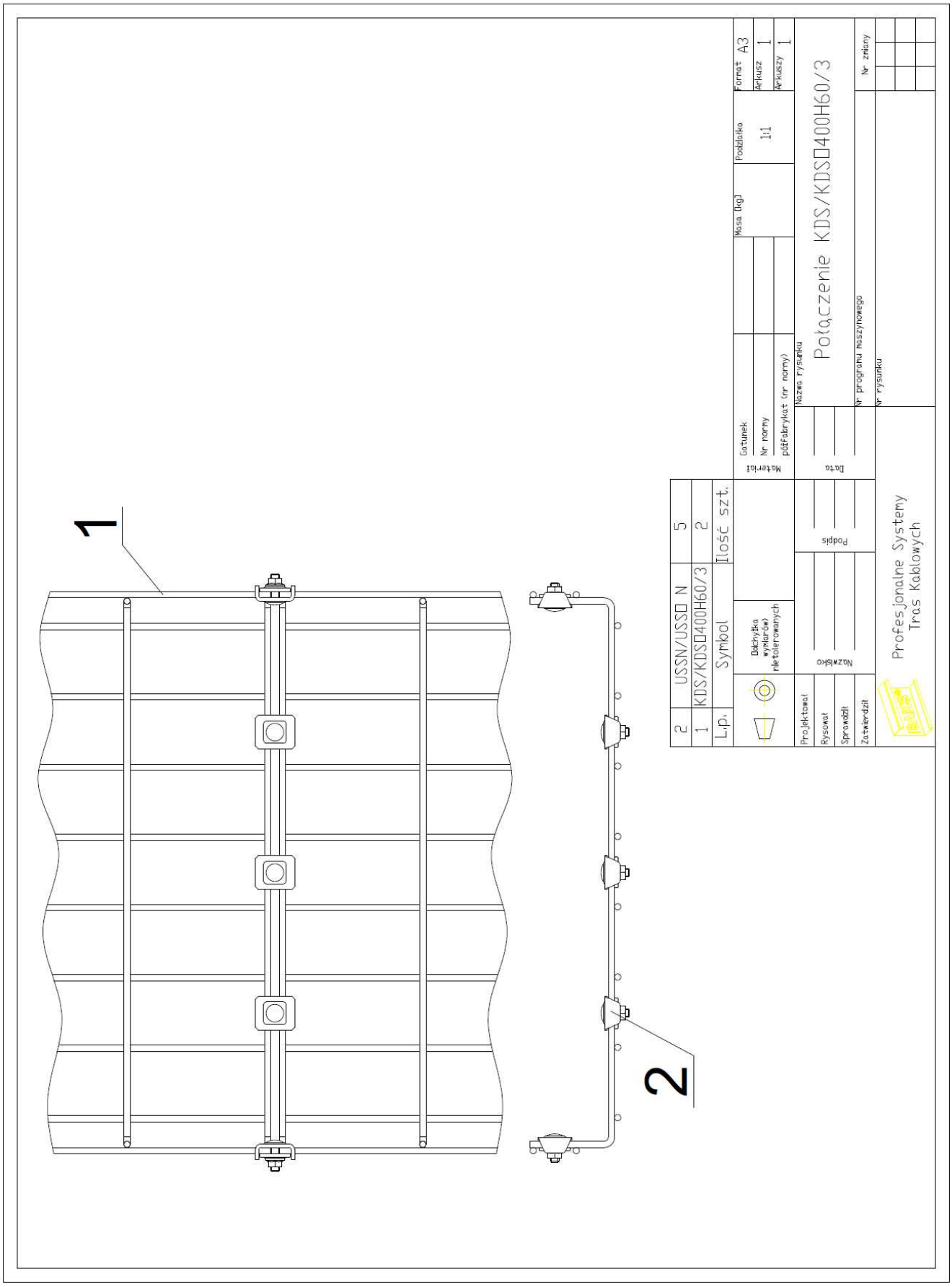
Nr programu maszynowego

Nr rysunku

Nr zmiany

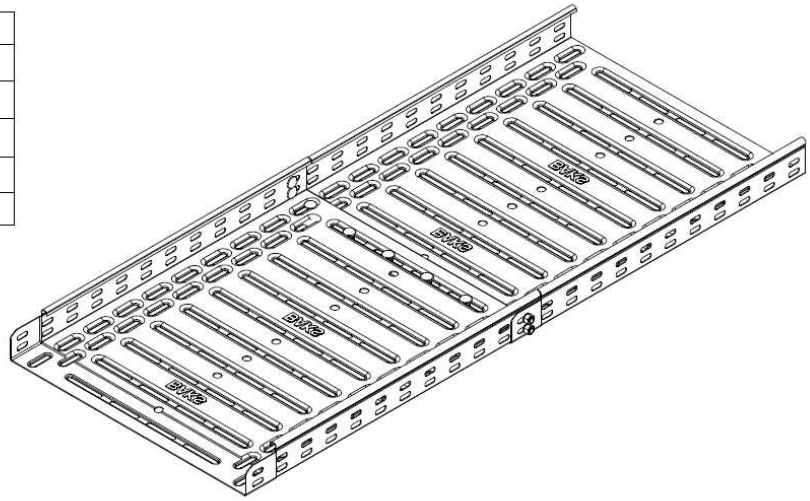
Profesjonalne Systemy Tras Kablowych

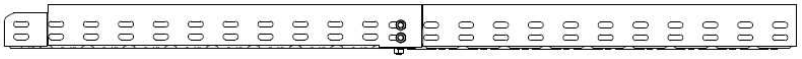
DRAWINGS

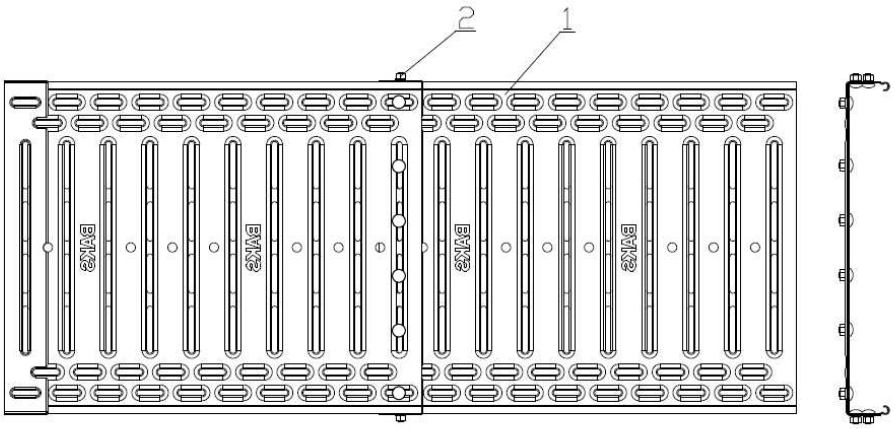

1
2
2 USSN/USSO N 5
1 KDS/KDS400H60/3 2
Lp. Symbol Ilość szt.
Materiał
Gatunek
Nr normy
półfabrykat (nr normy)
Masa (kg)
Podziałka
1:1
Format A3
Arkusz 1
Arkuszy 1
Data
Nazwa rysunku
Połączenie KDS/KDS400H60/3
Nr programu maszynowego
Nr rysunku
Nr zmiany
Projektował
Rysował
Sprawdził
Zatwierdził
Nazwisko
Podpis
Dachówka wymiarowa nietolerowanych
Profesjonalne Systemy Tras Kablowych

DRAWINGS

Poz.1		Poz.2
A	Typ	Ilość
100	KGJ/KGDJ100H60/3	6
200	KGJ/KGDJ200H60/3	7
300	KGJ/KGDJ300H60/3	8
400	KGJ/KGDJ400H60/3	10







L.p.	Nazwa	Symbol	Materiał	Szt.	Nr katalogowy
2	Śruba z łbem grzybkowym	SGN M6x12		10	
1	Korytko	KGJ/KGDJ400H60/3		2	

Dachylka wymiarów nietolerowanych

Materiał: Gatunek; Nr normy; polfabrykat (nr normy)

Masa [kg] | Podziałka | Format A4 | Arkusz 1 | Arkuszy 1

	Nazwisko	Podpis	Data
Projektował			
Rysował			
Sprawdził			
Zatwierdził			

Nazwa rysunku: Połączenie KGJ/KGDJ400H60/3

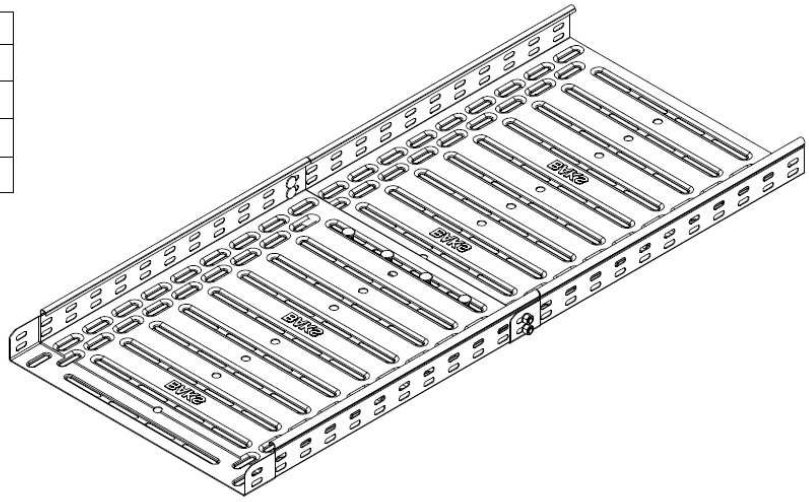
Nr programu maszynowego | Nr zmiany

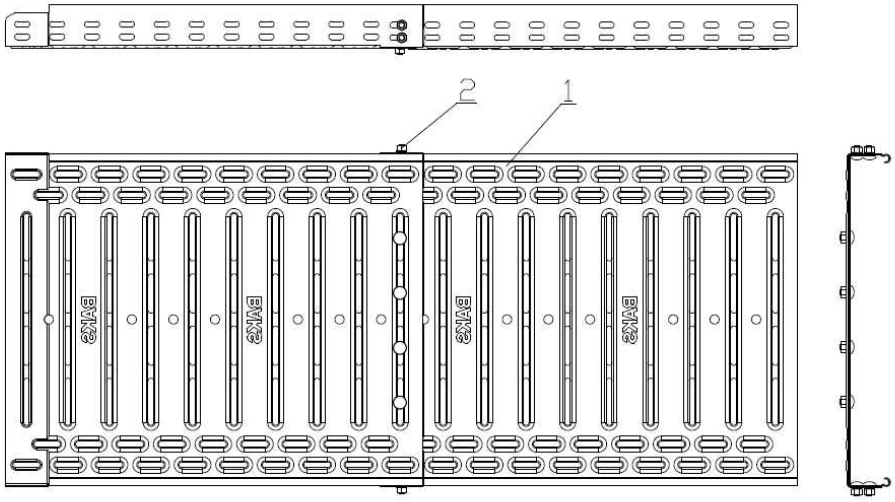
Nr rysunku

Profesjonalne Systemy Tras Kablowych

DRAWINGS

Poz.1		Poz.2
A	Typ	Ilość
100	KGL/KGDL100H60/3	6
200	KGL/KGDL200H60/3	7
300	KGL/KGDL300H60/3	8





L.p.	Nazwa	Symbol	Materiał	Szt.	Nr katalogowy
2	Śruba z łbem grzybkowym	SGN M6x12		8	
1	Korytko	KGL/KGDL300H60/3		2	

Dachylka wymiarów nietolerowanych

Materiał: Gatunek; Nr normy; półfabrykat (nr normy)

Masa [kg] | Podziałka | Format A4 | Arkusz 1 | Arkuszy 1

	Nazwisko	Podpis	Data
Projektował			
Rysował			
Sprawdził			
Zatwierdził			

Nazwa rysunku: Połączenie KGL/KGDL300H60/3

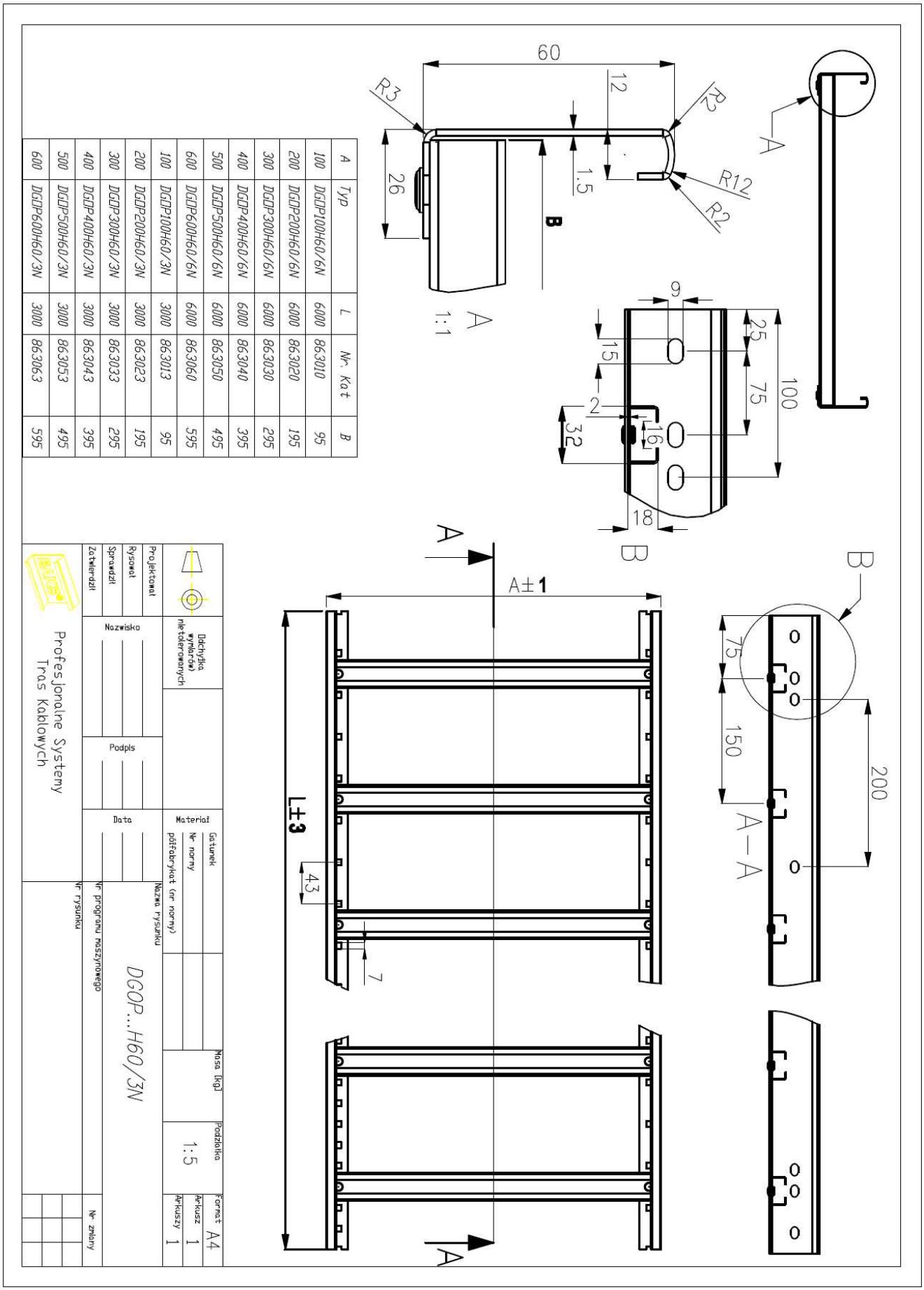
Nr programu maszynowego

Nr rysunku

Nr zmiany

Profesjonalne Systemy Tras Kablowych

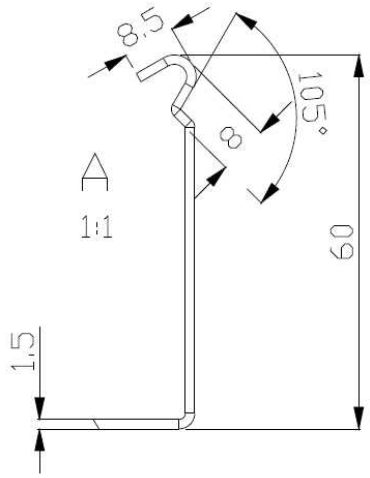
DRAWINGS

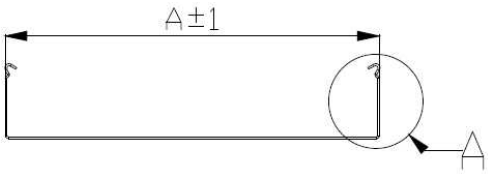


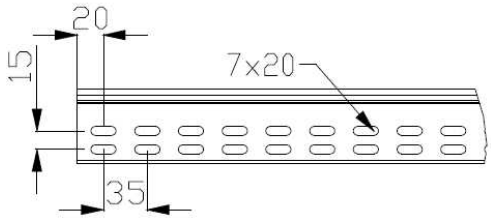
A	Typ	L	Nr. Kat	B
100	DGOP100H60/6N	6000	863010	95
200	DGOP200H60/6N	6000	863020	195
300	DGOP300H60/6N	6000	863030	295
400	DGOP400H60/6N	6000	863040	395
500	DGOP500H60/6N	6000	863050	495
600	DGOP600H60/6N	6000	863060	595
100	DGOP100H60/3N	3000	863013	95
200	DGOP200H60/3N	3000	863023	195
300	DGOP300H60/3N	3000	863033	295
400	DGOP400H60/3N	3000	863043	395
500	DGOP500H60/3N	3000	863053	495
600	DGOP600H60/3N	3000	863063	595

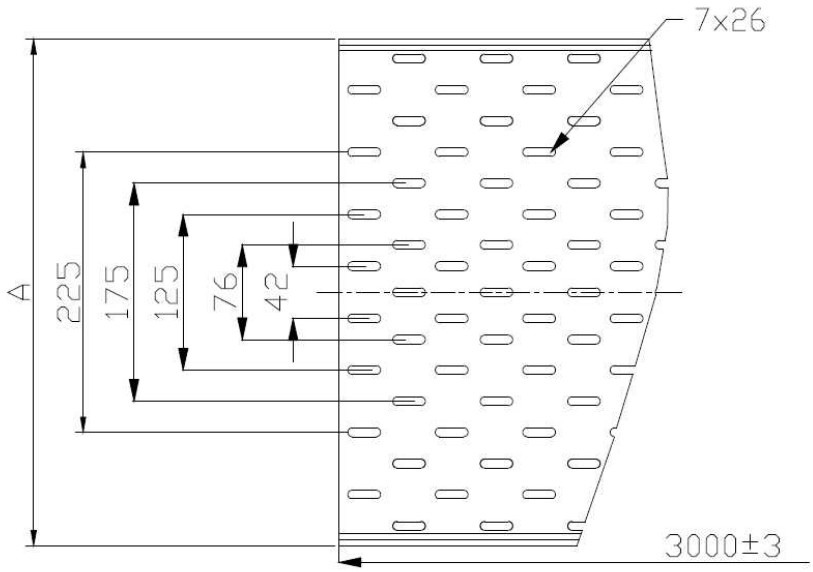
DRAWINGS

Symbol	Szerokość A(mm)	Długość L(mm)
KCP/KC□P100H60/3N	100	3000
KCP/KC□P200H60/3N	200	3000
KCP/KC□P300H60/3N	300	3000
KCP/KC□P400H60/3N	400	3000





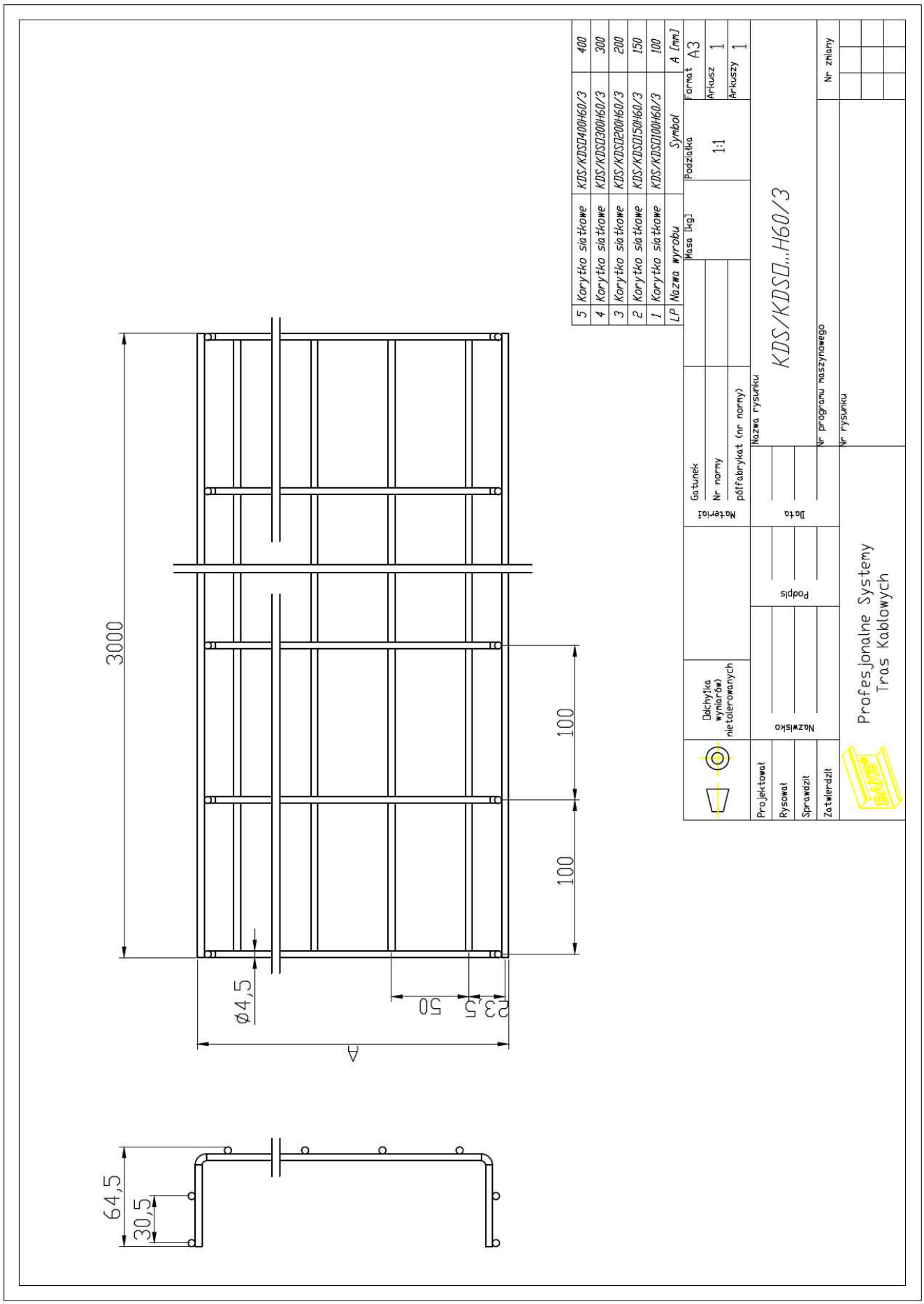




	Odchyłka wymiarów nietolerowanych		Materiał: Gatunek		Masa [kg]	Podziałka 1:5	Format A4
			Nr normy				Arkusz
			półfabrykat (nr normy)				Arkuszy
Projektował			Data	Nazwa rysunku: KCP/KC□P...H60/3N			
Rysował	Nazwisko	Podpis					
Sprawdził				Nr programu maszynowego		Nr zmiany	
Zatwierdził				Nr rysunku			

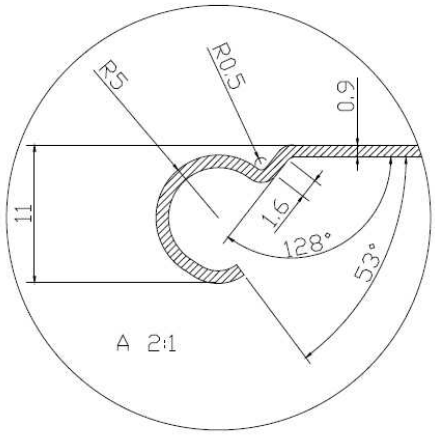
Profesjonalne Systemy Tras Kablowych

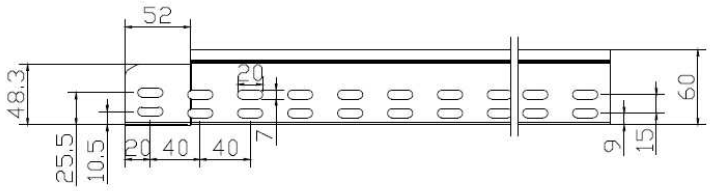
DRAWINGS

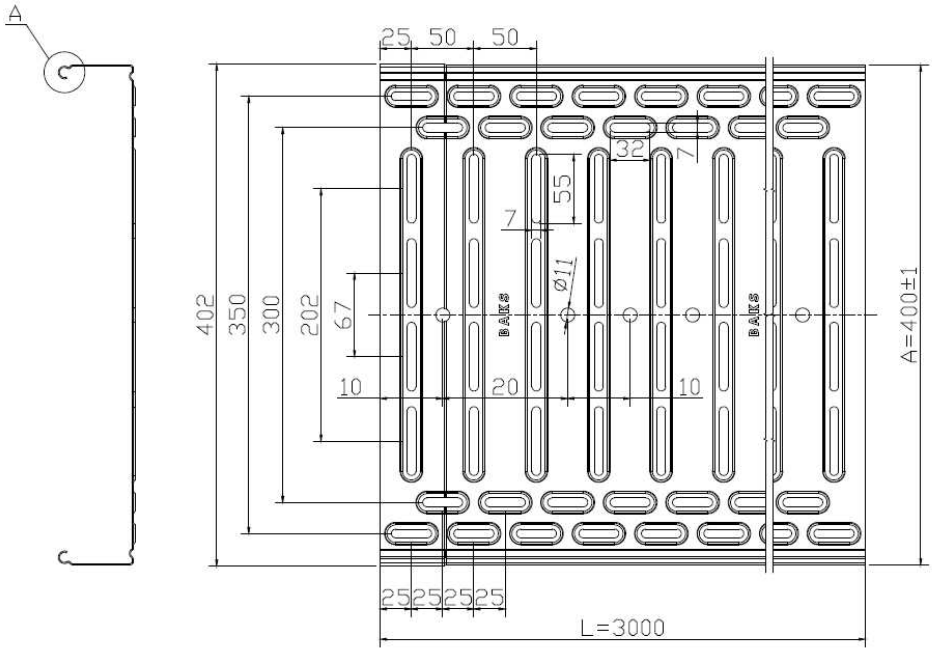

3000
100
100
Ø4,5
50
23,5
A
64,5
30,5
5 Korytko siatkowe KDS/KDSO400H60/3 400
4 Korytko siatkowe KDS/KDSO300H60/3 300
3 Korytko siatkowe KDS/KDSO200H60/3 200
2 Korytko siatkowe KDS/KDSO150H60/3 150
1 Korytko siatkowe KDS/KDSO100H60/3 100
LP Nazwa wyrobu Symbol A [mm]
Masa [kg]
Podziałka 1:1
Format A3
Arkusz 1
Arkuszy 1
Gatunek
Nr normy
półfabrykat (nr normy)
Materiał
Data
Nazwa rysunku
KDS/KDSO...H60/3
Nr programu maszynowego
Nr rysunku
Nr zmiany
Podpis
Nazwisko
Projektował
Rysował
Sprawdził
Zatwierdził
Dachylka wymiarów nietolerowanych
Profesjonalne Systemy Tras Kablowych

DRAWINGS

Typ	Szerokość A(mm)	Długość L(mm)
KGJ/KG□J100H60/3	100	3000
KGJ/KG□J200H60/3	200	3000
KGJ/KG□J300H60/3	300	3000
KGJ/KG□J400H60/3	400	3000



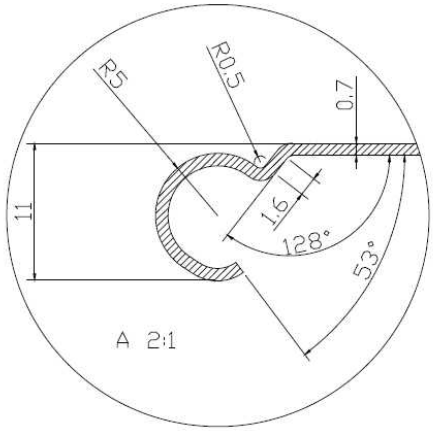


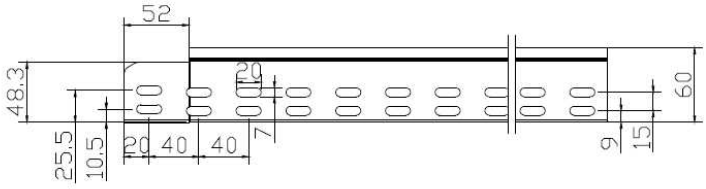


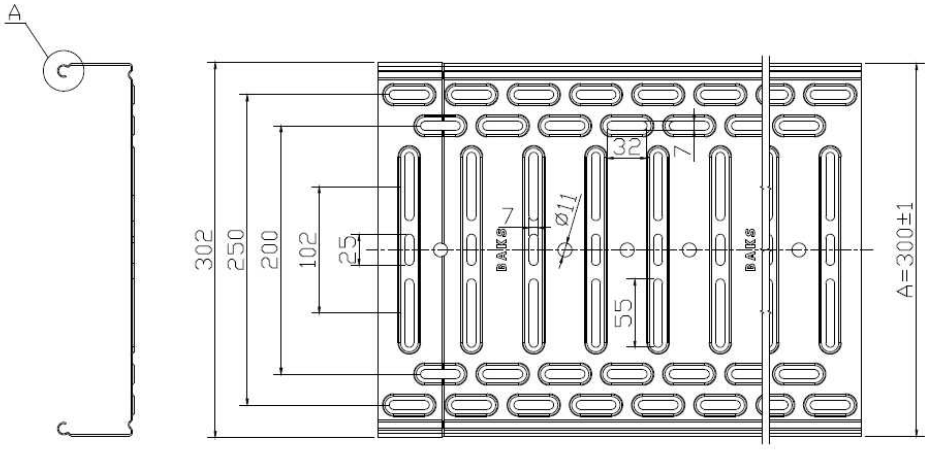
	Dokładność wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka 1:5	Format A4
				Nr normy				Arkusz
				półfabrykat (nr normy)				Arkuszy
Projektował				Nazwa rysunku	KGJ/KG□J...H60/3			
Rysował	Nazwisko	Podpis	Data					
Sprawdził				Nr programu maszynowego			Nr zmiany	
Zatwierdził				Nr rysunku				
BAKS	Profesjonalne Systemy Tras Kablowych							

DRAWINGS

Typ	Szerokość A(mm)	Długość L(mm)
KGL/KGOL100H60/3	100	3000
KGL/KGOL200H60/3	200	3000
KGL/KGOL300H60/3	300	3000

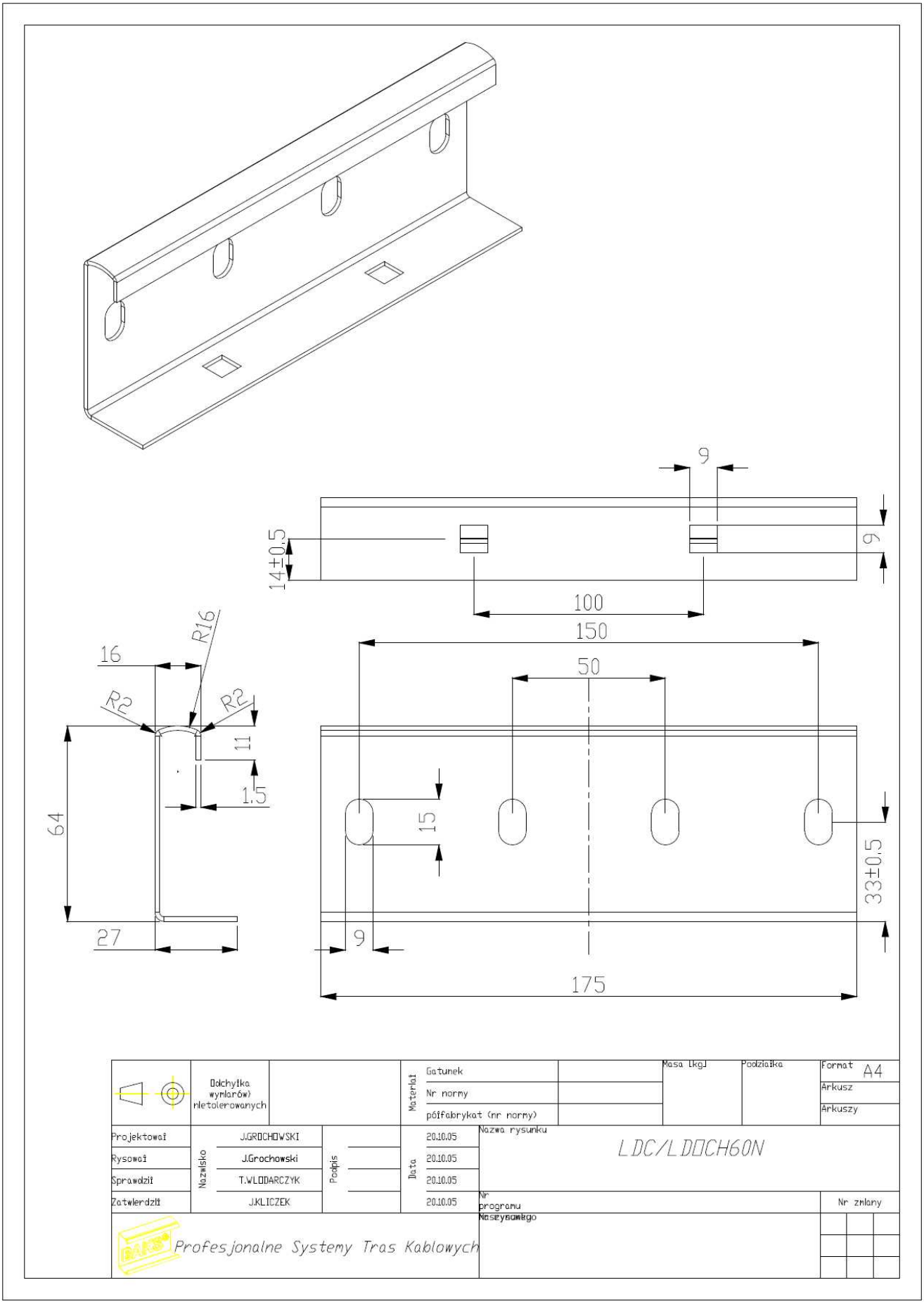




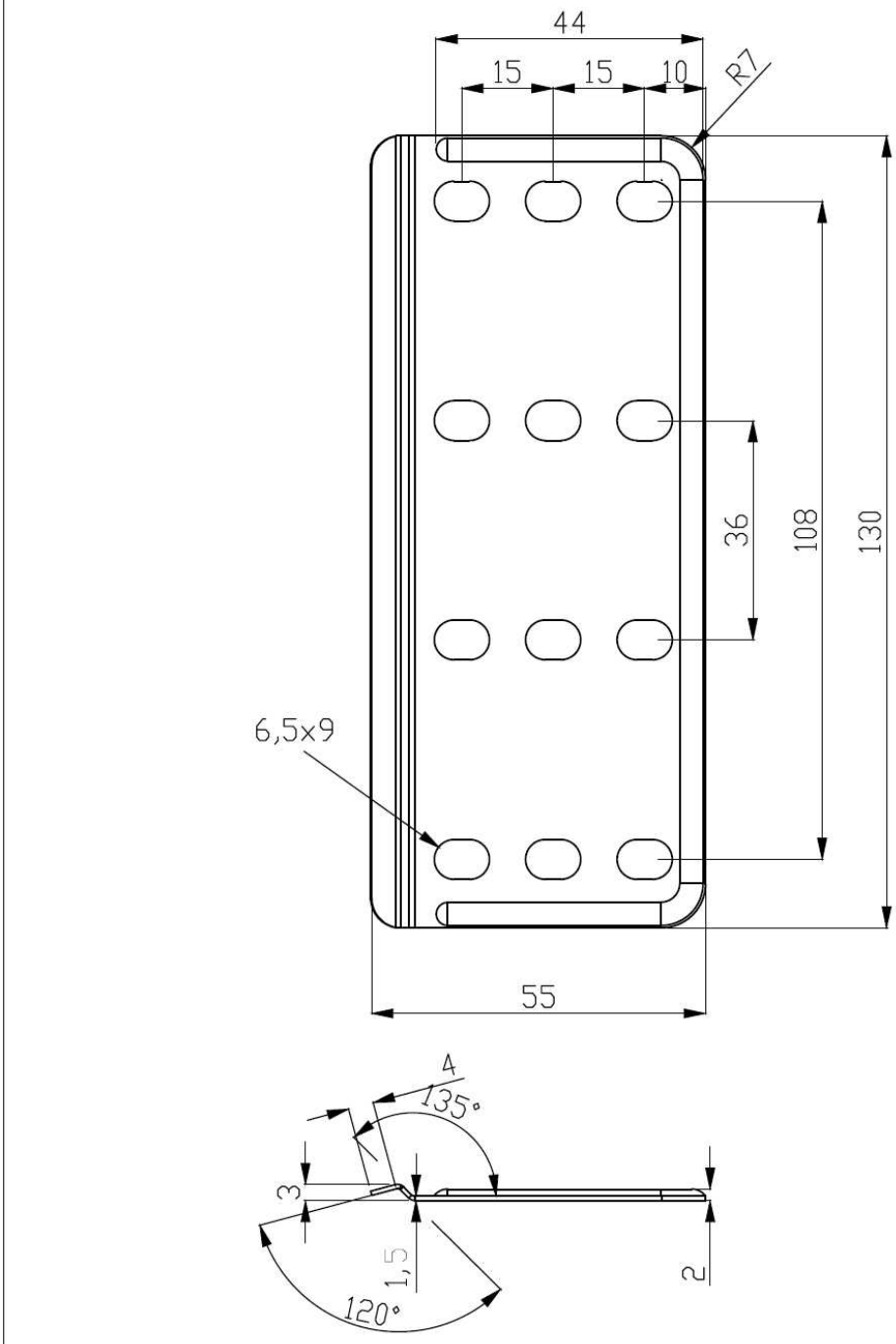


	Dachyika wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka 1:5	Format A4
				Nr normy				Arkusz
				półfabrykat (nr normy)				Arkuszy
Projektował	Nazwisko	Podpis	Data	Nazwa rysunku	KGL/KGOL...H60/3			
Rysował								
Sprawdził				Nr programu maszynowego			Nr zmiany	
Zatwierdził								
	Profesjonalne Systemy Tras Kablowych			Nr rysunku				

DRAWINGS

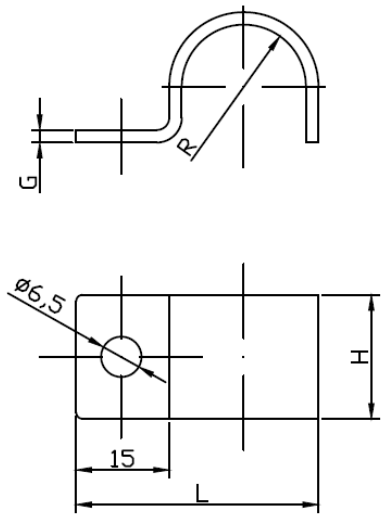

9
14±0.5
9
100
150
50
R16
16
R2
R2
11
1.5
64
15
33±0.5
27
9
175
Dokładność wymiarów nietolerowanych
Materiał
Gatunek
Nr normy
półfabrykat (nr normy)
Masa [kg]
Podziałka
Format A4
Arkusz
Arkuszy
Projektował
Rysował
Sprawdził
Zatwierdził
Nazwisko
J.GRODHOWSKI
J.Grochowski
T.WLODARCZYK
J.KLICZEK
Podpis
Data
20.10.05
20.10.05
20.10.05
20.10.05
Nazwa rysunku
LDC/LDDCH60N
Nr programu
Nr zmiany
Nr rysunku
Profesjonalne Systemy Tras Kablowych

DRAWINGS



	Odchyłka wymiarów) nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka 2:1	Format A4
				Nr normy				Arkusz
				półfabrykat (nr normy)				Arkuszy
Projektował	Nazwisko	J.GRODHOWSKI	Podpis	Data	Nazwa rysunku LPP/LPOPH60N			
Rysował		J.Grochowski						
Sprawdził		T.WLODARCZYK						
Zatwierdził		J.KLICZEK			Nr programu maszynowego		Nr zmiany	
Profesjonalne Systemy Tras Kablowych					Nr rysunku			

DRAWINGS



LP	Nazwa wyrobu	Symbol	Nr Katalogowy	R [mm]	L [mm]	H [mm]	G [mm]
20	Uchwyt kabla	UDF 43	405543	21,5	60,0	20,0	2,0
19	Uchwyt kabla	UDF 40	405540	20,0	57,0	20,0	2,0
18	Uchwyt kabla	UDF 37	405537	18,5	54,0	20,0	2,0
17	Uchwyt kabla	UDF 34	405534	17,0	51,0	20,0	2,0
16	Uchwyt kabla	UDF 31	405531	15,5	48,0	20,0	2,0
15	Uchwyt kabla	UDF 28	405528	14,0	45,0	20,0	2,0
14	Uchwyt kabla	UDF 25	405525	12,5	44,0	20,0	2,0
13	Uchwyt kabla	UDF 22	405522	11,0	41,0	14,0	2,0
12	Uchwyt kabla	UDF 20	405520	10,0	39,0	14,0	2,0
11	Uchwyt kabla	UDF 18	405518	9,0	37,0	14,0	2,0
10	Uchwyt kabla	UDF 16	405516	8,0	35,0	14,0	2,0
9	Uchwyt kabla	UDF 15	405515	7,5	34,0	14,0	2,0
8	Uchwyt kabla	UDF 14	405514	7,0	33,0	14,0	1,2
7	Uchwyt kabla	UDF 12	405512	6,0	30,0	14,0	1,2
6	Uchwyt kabla	UDF 10	405510	5,0	28,0	14,0	1,2
5	Uchwyt kabla	UDF 9	405509	4,5	27,0	14,0	1,2
4	Uchwyt kabla	UDF 8	405508	4,0	26,0	14,0	1,2
3	Uchwyt kabla	UDF 7	405507	3,5	25,0	14,0	1,2
2	Uchwyt kabla	UDF 6	405506	3,0	24,0	14,0	1,2
1	Uchwyt kabla	UDF 5	405505	2,5	23,0	14,0	1,2

Odchyłka wymiarów nietolerowanych	±0,5	Materiał: Gatunek		Masa [kg]	Podziałka	Format A4
		Nr normy	PN-EN 10327:2005	---	1:1	Arkusz --
		półfabrykat (nr normy)	-----			Arkuszy --

	Nazwisko	Podpis	Data
Projektował	Jacek Grochowski		20.10.05
Rysował	Jakub Rudak		20.02.08
Sprawdził	Jacek Kliczek		20.02.08
Zatwierdził	Jacek Kliczek		20.02.08

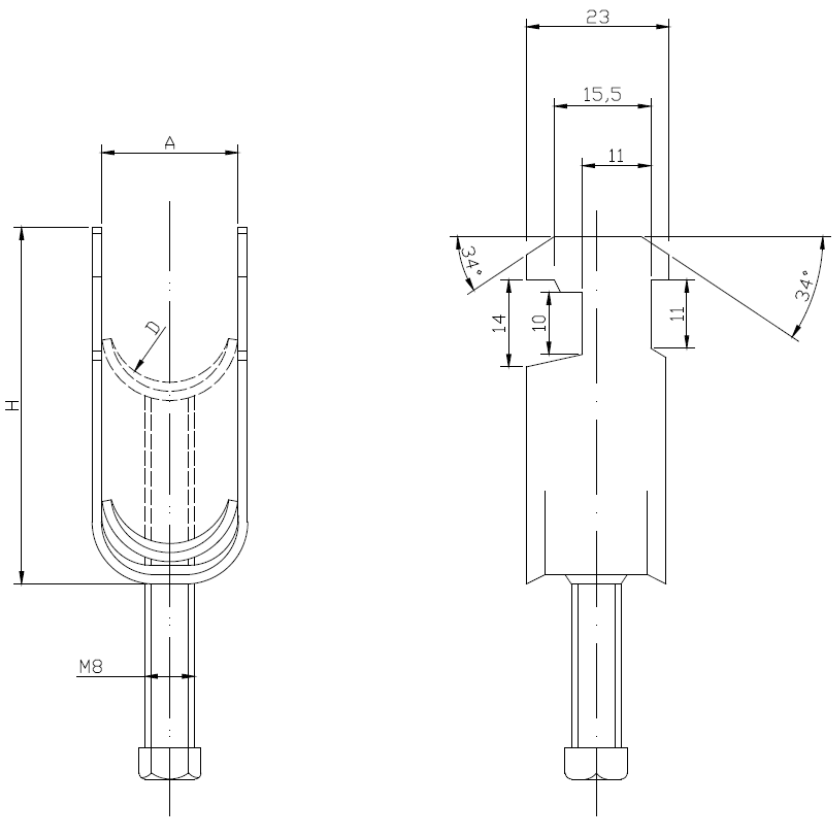
Nazwa rysunku: UDF 5-43

Nr zmiany

Profesjonalne Systemy Tras Kablowych

Nr rysunku: 4055.....

DRAWINGS

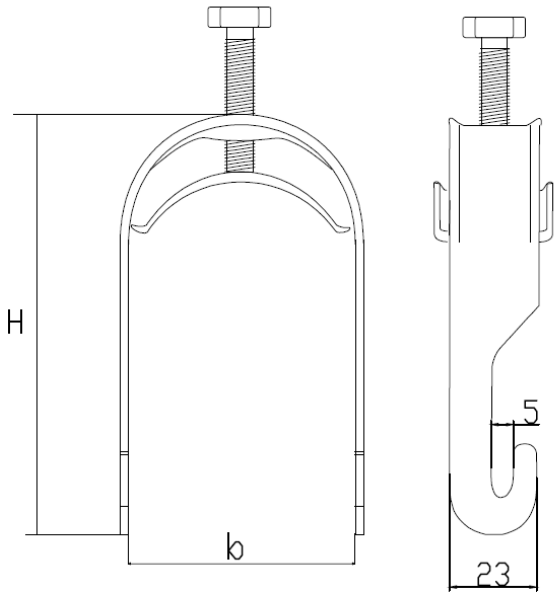


UK/UK□1/64-70	72	116	70
UK/UK□1/58-64	66	103	64
UK/UK□1/46-52	54	97	52
UK/UK□1/40-46	48	86	46
UK/UK□1/34-40	42	78	40
UK/UK□1/28-34	36	71	34
UK/UK□1/22-28	30	61	28
UK/UK□1/16-22	24	57	22
SYMBOL	A[mm]	H[mm]	D[mm]

	Odchyłka wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka 1:1	Format A4
				Nr normy		---		Arkusz 1
				półfabrykat (nr normy)				Arkuszy 1
Projektował	Nazwisko	Podpis	Data	Nazwa rysunku				
Rysował	P.Okniński		20.07.2009	UK/UK□1/...-...				
Sprawdził								
Zatwierdził	J.Kilczek		20.07.2009	Nr programu maszynowego	---		Nr zmiany	
BAKS Profesjonalne Systemy Tras Kablowych				Nr rysunku				

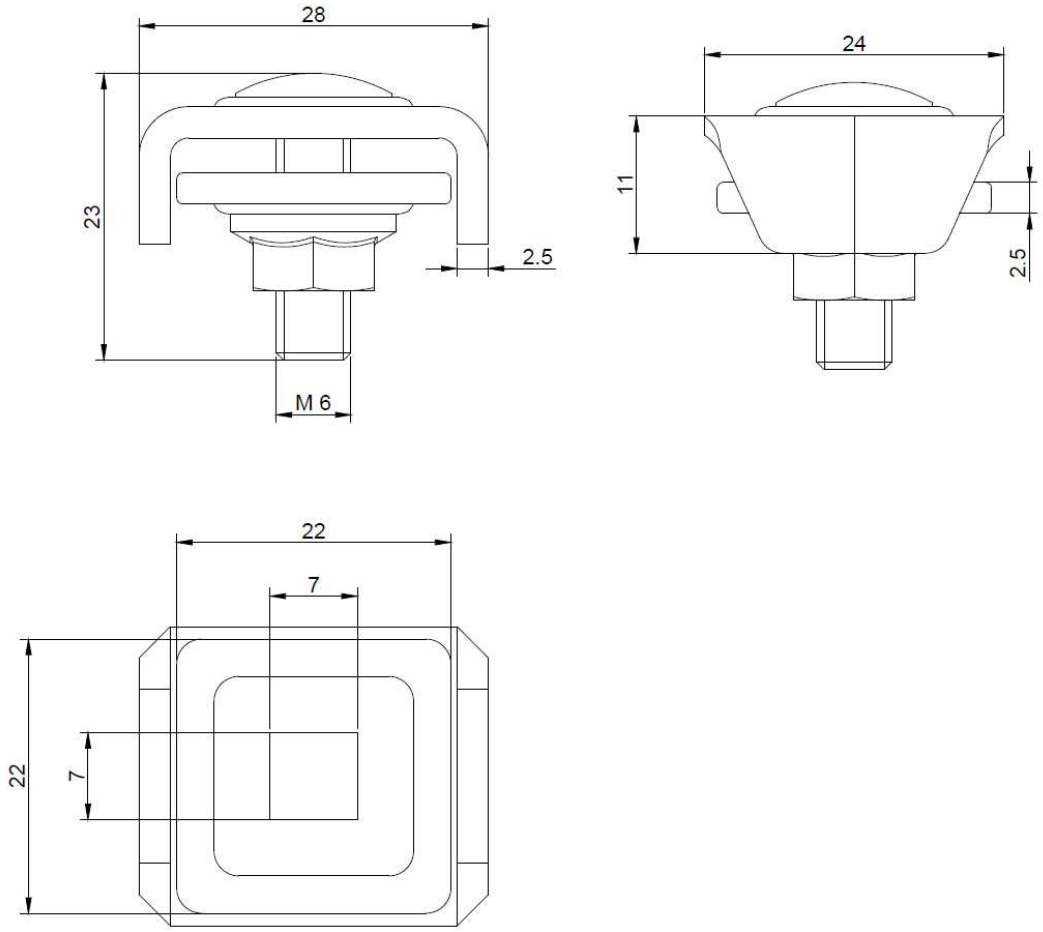
DRAWINGS

L.p.	Symbol	b	H	Śruba
1.	UKZ/UKZ□1/16-22	22mm	61,5mm	M8x40
2.	UKZ/UKZ□1/22-28	28mm	68mm	M8x40
3.	UKZ/UKZ□1/28-34	34mm	76mm	M8x40
4.	UKZ/UKZ□1/34-40	40mm	84,5mm	M8x40
5.	UKZ/UKZ□1/40-46	46mm	91,5mm	M8x50
6.	UKZ/UKZ□1/46-52	52mm	102mm	M8x50
7.	UKZ/UKZ□1/58-64	64mm	111mm	M8x50



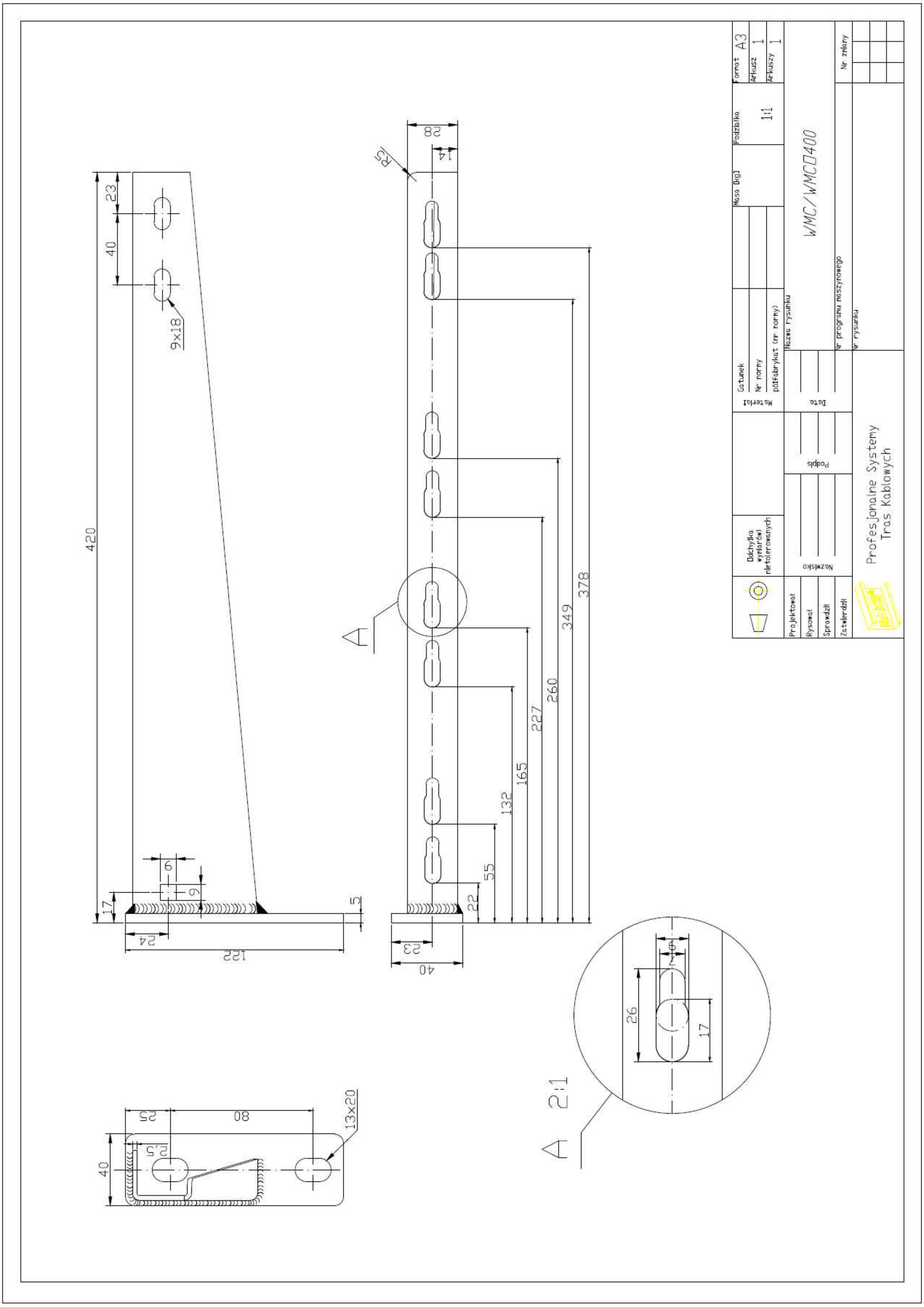
	Odchyłka wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format
				Nr normy		------		Arkusz
				półfabrykat (nr normy)				Arkuszy
Projektował	Nazwisko	Podpis	Data	Nazwa rysunku	UKZ/UKZ□1/...			
Rysował								
Sprawdził								
Zatwierdził				Nr programu maszynowego	—			Nr zmiany
BAKS Profesjonalne Systemy Tras Kablowych				Nr rysunku				

DRAWINGS

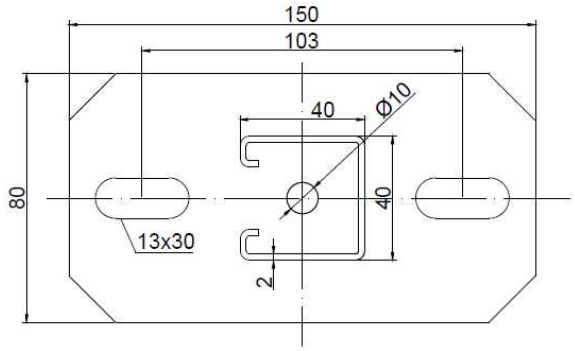


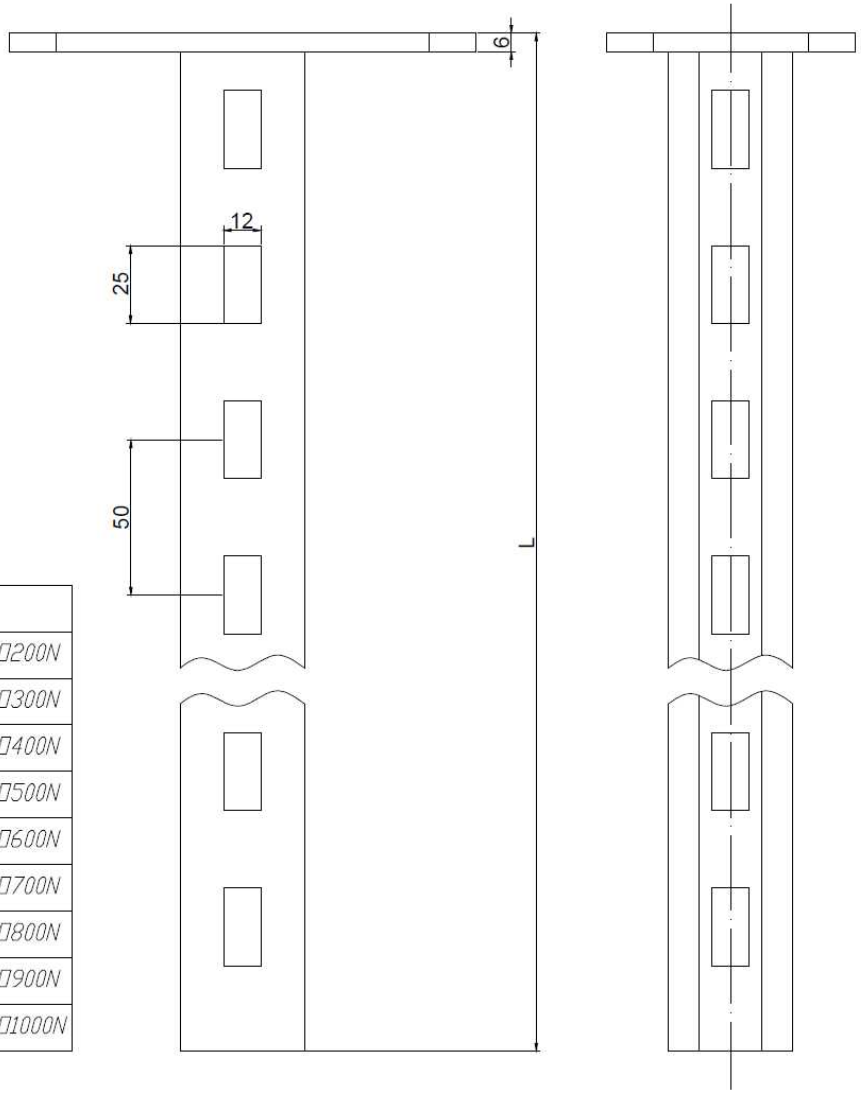
	Odchyłka wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format A4
				Nr normy				Arkusz 1
				półfabrykat (nr normy)		------	2:1	Arkuszy 1
Projektował	Nazwisko	Podpis	Data	Nazwa rysunku				
Rysował	M.Sobolewski			USSN/USS□				
Sprawdził	J.Kliczek							
Zatwierdził	J.Kliczek			Nr programu maszynowego				Nr zmiany
BAKS Profesjonalne Systemy Tras Kablowych				Nr rysunku				

DRAWINGS


WMC/WMCD400
Profesjonalne Systemy Tras Kablowych
Format A3
Arkusz 1
Arkuszy 1
Podziałka 1:1
2:1

DRAWINGS

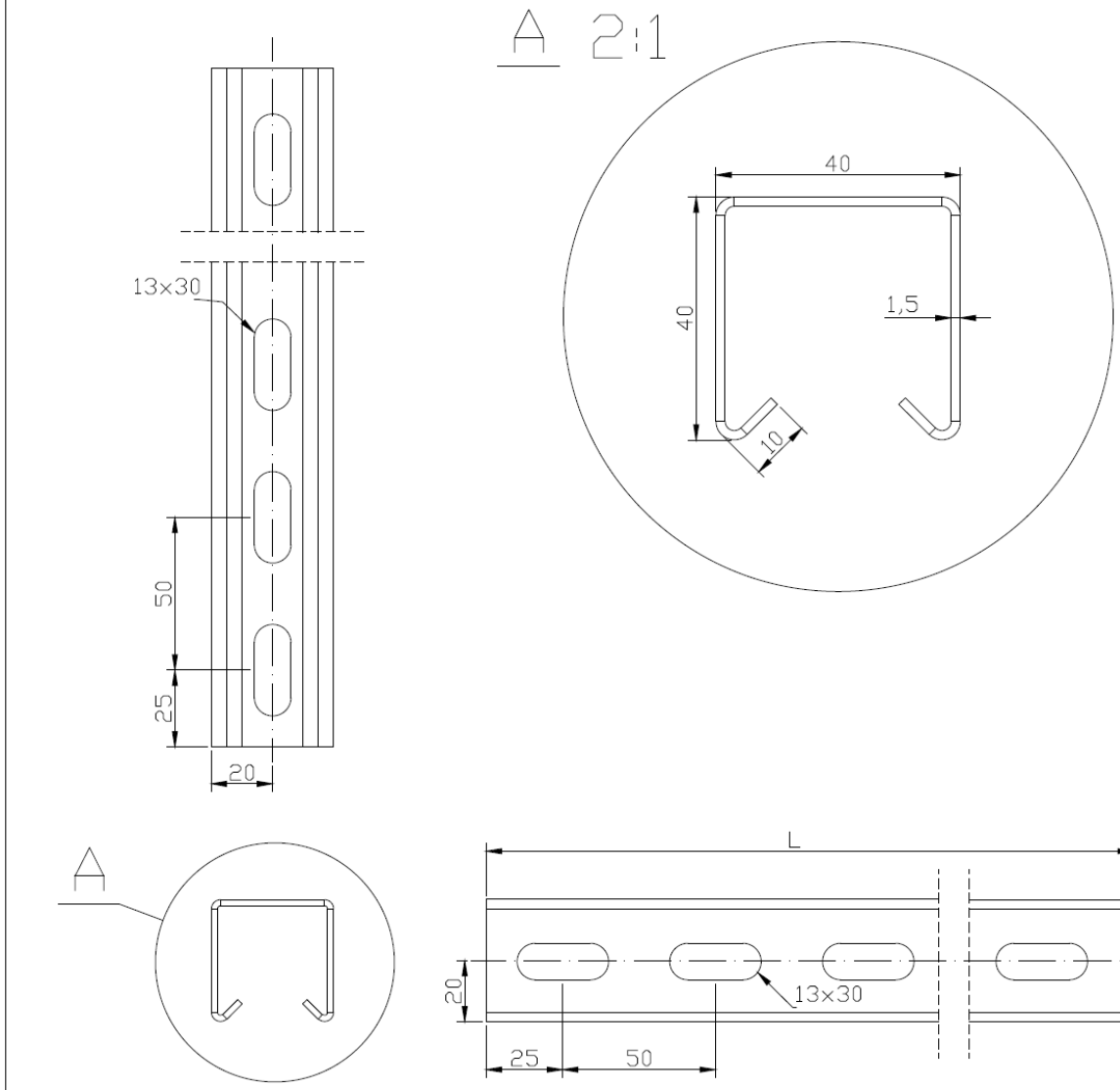




L	Typ
200	WPCW/WPC□200N
300	WPCW/WPC□300N
400	WPCW/WPC□400N
500	WPCW/WPC□500N
600	WPCW/WPC□600N
700	WPCW/WPC□700N
800	WPCW/WPC□800N
900	WPCW/WPC□900N
1000	WPCW/WPC□1000N

	Odchyłka wymiarów nietolerowanych		Materiał: Gatunek		Masa [kg]	Podziałka 1:1	Format A4
			Nr normy				Arkusz 1
			półfabrykat (nr normy)				Arkuszy 1
Projektował			Nazwa rysunku: WPCW/WPC□...N				
Rysował	Nazwisko	Podpis	Data				
Sprawdził							
Zatwierdził			Nr programu maszynowego				Nr zmiany
Profesjonalne Systemy Tras Kablowych			Nr rysunku				

DRAWINGS



LP	Nazwa wyrobu	Symbol	Nr Katalogowy	L [mm]	Masa [kg]
7	Ceownik wzmocniony	CWP/CW□P40H40/ 2		2000	3,50
6	Ceownik wzmocniony	CWP/CW□P40H40/07		700	1,23
5	Ceownik wzmocniony	CWP/CW□P40H40/06		600	1,05
4	Ceownik wzmocniony	CWP/CW□P40H40/05		500	0,88
3	Ceownik wzmocniony	CWP/CW□P40H40/04		400	0,70
2	Ceownik wzmocniony	CWP/CW□P40H40/03		300	0,53
1	Ceownik wzmocniony	CWP/CW□P40H40/02		200	0,35

Odchyłka wymiarów nietolerowanych	Grubość (mm) 1,5	Materiał: Gatunek: Blacha stal. cynk. met. Sendzimira	Masa [kg] ---	Podziałka 1:1	Format A4
		Nr normy: PN-EN 10327:2005			Arkusz --
		półfabrykat (nr normy): -----			Arkuszy --

	Nazwisko	Podpis	Data
Projektował	Jacek Grochowski		
Rysował	Jakub Rudak		
Sprawdził	Jacek Kliczek		
Zatwierdził	Jacek Kliczek		

Nazwa rysunku: CWP/CW□P40H40/...

Nr zmiany

Profesjonalne Systemy Tras Kablowych

Nr rysunku

System E-30, E-90 - Puszki łączeniowo-rozgałęźne

Puszka łączeniowo-rozgałęźna

PMO1 (5/6)

PMO1 (5/3)

PMO1 (3/3)

PMO1

SYMBOL	nr katalogowy	szt
PMO1(5/6)	801100	1
PMO1(5/3)	801200	1
PMO1(3/3)	801300	1
PMO1 E		
PMO1(5/6) E	801101	1
PMO1(5/3) E	801201	1
PMO1(3/3) E	801301	1

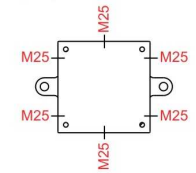
INFORMACJA TECHNICZNA

Stosowana jako puszka:
- przelotowa o przekroju kabla od 0,5 mm² do 6 mm²,
- rozgałęźna o przekroju kabla od 0,5 mm² do 1,5 mm².

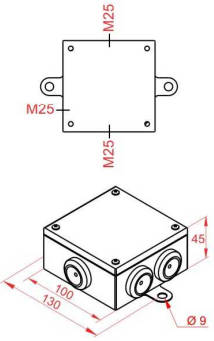
Puszka wykonywana jest w wersji :
PMO1 5/6 - 5 kostek zaciskowych, 6 dławików gumowych
PMO1 5/3 - 5 kostek zaciskowych, 3 dławiki gumowe
PMO1 3/3 - 3 kostki zaciskowe, 3 dławiki gumowe
PMO1 5/6 E - 5 kostek zaciskowych, 6 dławików gumowych
PMO1 5/3 E - 5 kostek zaciskowych, 3 dławiki gumowe
PMO1 3/3 E - 3 kostki zaciskowe, 3 dławiki gumowe

Maksymalne przekroje żył i ich ilość mieszcząca się w gnieździe kostki:
5 x 0,5 mm² **1 x 2,5 mm²**
5 x 0,75 mm² **1 x 4 mm²**
4 x 1 mm² **1 x 6 mm²**
3 x 1,5 mm²

PMO1 (5/6)



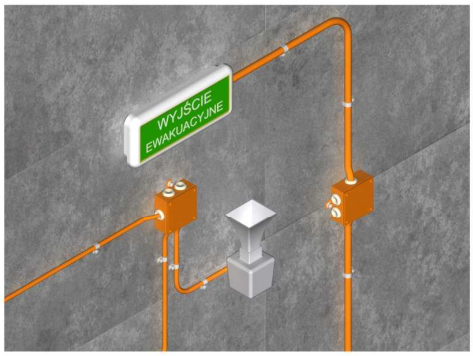
PMO1 (5/3) I PMO1 (3/3)



ZASTOSOWANIE

Puszka łączeniowa i rozgałęźna, Ui=400 V, z trwałym zachowaniem funkcji łączenia E30 / E60 / E90 wg DIN 4102 część 12.
Stopień ochrony IP54, zakres uszczelnienia od 7 mm do 18,5 mm. Mocowanie poprzez zewnętrzne uchwyty montażowe: do betonu za pomocą kołków stalowych SROM6x30, do drabinek i korytek kablowych za pomocą śruby SGKM6x12.

Puszka łączeniowo-rozgałęźna



PMO2 (5/6)

PMO2 (5/3)

PMO2 (3/3)

PMO2

SYMBOL	nr katalogowy	szt
PMO2(5/6)	802010	1
PMO2(5/3)	802020	1
PMO2(3/3)	802030	1
PMO2 E		
PMO2(5/6) E	802011	1
PMO2(5/3) E	802021	1
PMO2(3/3) E	802031	1

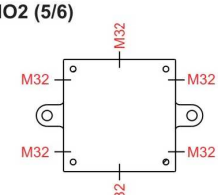
INFORMACJA TECHNICZNA

Stosowana jako puszka:
- przelotowa o przekroju kabla od 1,0 mm² do 10 mm²,
- rozgałęźna o przekroju kabla od 1,0 mm² do 4 mm²,

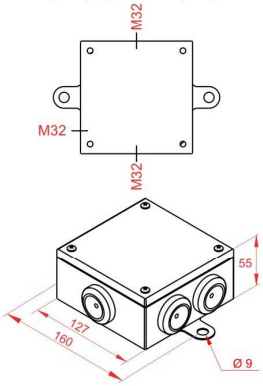
Puszka wykonywana jest w wersji :
PMO2 5/6 - 5 kostek zaciskowych, 6 dławików gumowych
PMO2 5/3 - 5 kostek zaciskowych, 3 dławiki gumowe
PMO2 3/3 - 3 kostki zaciskowe, 3 dławiki gumowe
PMO2 5/6 E - 5 kostek zaciskowych, 6 dławików gumowych
PMO2 5/3 E - 5 kostek zaciskowych, 3 dławiki gumowe
PMO2 3/3 E - 3 kostki zaciskowe, 3 dławiki gumowe

Maksymalne przekroje żył i ich ilość mieszcząca się w gnieździe kostki:
6 x 1 mm² **2 x 4 mm²**
6 x 1,5 mm² **1 x 6 mm²**
4 x 2,5 mm² **1 x 10 mm²**

PMO2 (5/6)



PMO2 (5/3) I PMO2 (3/3)



ZASTOSOWANIE

Puszka łączeniowa i rozgałęźna, Ui=400 V, z trwałym zachowaniem funkcji łączenia E30 / E60 / E90 wg DIN 4102 część 12. Stopień ochrony Ip54, zakres uszczelnienia od 11 mm do 24 mm Mocowanie poprzez zewnętrzne uchwyty montażowe: do betonu za pomocą kołków stalowych SROM6x30, do drabinek i korytek kablowych za pomocą śruby SGKM6x12.

MATERIAŁ

PMO1, PMO2, - blacha stalowa, malowana proszkowo RAL 2003
PMO1 E, PMO2 E, - blacha kwasoodporna, 1.4301 malowana proszkowo RAL 2003
Kostka zaciskowa wykonana jest ze specjalnej ceramiki odpornej na wysokie temperatury, dławik wykonany jest z tworzywa bezhalogenowego mocowanie poprzez zewnętrzne uchwyty montażowe

7. FINAL PROVISION

§ This report details the method of construction, the test conditions and results obtained when the specific element of construction described herein was following the procedure outlined in STN EN 1363-1, and where appropriate STN 92 0205:2012. Any significant deviation with respect to size, constructional details, loads, stresses, edge or end conditions other than those allowed under the field of direct application in the relevant test method is not covered by this report.

§ Because of the nature of the fire resistance testing and consequent difficulty in quantifying the uncertainty of measurement of fire resistance, it is not possible to provide a stated degree of accuracy of the result.

§ The test results refer only to the tested subjects. This test report is not an approval of the tested product by the test laboratory or the accreditation body overseeing the laboratory's activities. The test was carried out on testing equipment that is the property of FIRES, s.r.o., Batizovce. Without the written permission of the test laboratory this test report may be copied and/or distributed only as the whole. Any modifications of the test report can be made only by the fire resistance test laboratory FIRES, s.r.o., Batizovce.

Approved by:

Ing. Štefan Rástocký
leader of the testing laboratory

SKÚŠOBNÉ LABORATÓRIUM • PRÜFLABORATORIUM • TESTING LABORATORY • FIRES The Experts on Fire Safety -1-

Prepared by:

Bc. Dávid Šubert
technician of the testing laboratory

8. NORMATIVE REFERENCES

STN EN 1363-1: 2001	Fire resistance tests. Part 1: General requirements
STN 92 0205:2012	Fire behaviour of construction products and building constructions.Circulit integrity maintenance of cable systems. Requirements, testing and classification.
DIN 4102 – 2:1977-09	Fire behaviour of building materials and elements - requirements and testing
DIN 4102 – 12:1998-11	Fire resistance of electric cable systems required to maintain circuit integrity
ZP-27/2008 PAVUS	Test method for determination of functionality class of cables and cable loadbearing constructions - cable circuits in case of fire

THE END OF THE TEST REPORT