TEST REPORT FIRES-FR-109-06-AUNE

Cables with integrity function FE180/E90
Type – (N)HXH, (N)HXCH, JE H(St)H

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Slovak national accreditation service

TEST REPORT

Test report number: **FIRES-FR-109-06-AUNE**
Tested property: Function in fire
Test method: DIN 4102 – 12:1998-11, ZP – 27/2006

Date of issue: **09. 10. 2006**

Name of the product: Cables with integrity function FE180/E90
Type – (N)HXH, (N)HXCH, JE H(St)H

Manufacturer: **Zaklady Kablowe Bitner Celina Bitner,** Friedleina 3/3, 30-009 Kraków, Poland – producer of cables
Baks, 05-480 Karczew, Jagodne 5, Poland – producer of construction

Sponsor: **Zaklady Kablowe Bitner Celina Bitner,** Friedleina 3/3, 30-009 Kraków, Poland – producer of cables

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Task No.: S-FR-06/021-06/008/2
Specimen received: 30. 08. 2006
Date of the fire test: 08. 09. 2006
Technician responsible for the technical side of this report: Peter Rusnák, Miroslav Hudák

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1. INTRODUCTION

This test report contains the results of the test carried out at the testing laboratory of FIRES s.r.o. in Batizovce. The purpose of the test was product classification. The test specimens was power non-halogen cables with circuit integrity maintenance. Persons witnessing the test:

Representatives of the sponsor: Mr. Adam Cichoń (Zaklady Kablowe Bitner)
Mr. Jacek Kliczek (BAKS)

Test directed by: Štefan Rástocký
Test carried out by: Peter Rusnák, Miroslav Hudák

Operator: Alexander Reľovský

2. MEASURING EQUIPMENT

Identification number	Measuring equipment	Note
F 90 002	Horizontal test furnace for fire testing	-
F 69 005	PLC system for data acquisition and control TECOMAT NS 950	-
F 40 008	Software Control Web 2000	
F 40 009	Control and communication software to PLC TECOMAT NS 950	
F 40 010	Visual and calculating software to PLC TECOMAT NS 950	-
F 40 011	Driver Tecomat – CW – 2000 (software)	-
F 71 008, F 71 009	Transducer of differential pressure (+50až-150) Pa	pressure inside the test furnace
F 04 501, F 04 502, F 04 503, F 04 504 F 04 505, F 04 506, F 04 507, F 04 508	Plate thermometers	temperature inside the test furnace, according to EN 1363-1 a DIN 4102-2
F 04 701	Sheathed thermocouple type K ϕ 3 mm	ambient temperature
F 69 009	PLC system for data acquisition and climate control TECOMAT TC 604	climatic conditions
F 60 001 – F 60 009	Temperature and relative air humidity sensors	climatic conditions
F 54 039	Racking meter	-
F 57 005	Digital stop-watch	-
F 57 002	Digital stop-watch	-
F 96 015	Test signal panel	-

3. PREPARATION OF THE SPECIMEN

Testing laboratory didn't take off individual components of the specimen. 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 was carried out by workers of company BAKS according to requirements of the sponsor. Mounting of cables and weights into the supporting system was carried out by workers of the test sponsor.

4. PREPARATION OF THE TEST

4.1 DESCRIPTION OF THE SPECIMEN STRUCTURE

Test specimen was comprised from supporting system with accessories – power and communication non-halogen cables, cable trays, cable ladders, ceiling ledges with clamps UEF, UDF, UKO and sleeves – OZOE, OZMO

Cables: (N)HXH - 4x1,5 RE E90 MICA (12 x)
(N)HXH - 4x50 RM E90 MICA (8 x)
(N)HXCH - 4x1,5 RE/ 1,5 E90 MICA(8 x)
(N)HXCH - 4x10 RE/ 10 E90 MICA (4 x)
(N)HXCH - 4x50 RM/ 25 E90 MICA (8 x)
JE-H(St)H - 2x2x0,8 E90 MICA (12 x)

Supporting system: was made by cable ladders, trays, individual clamps, clamps in ceiling ledges. Supporting system was made by three vertical ceiling hangers type WCE which horizontal brackets type WMCO were fixed to. Vertical hangers were fixed to concrete ceiling by means of dowels PSRO M10 x 80 in spacing of 1200 mm. Fixation and arrangement of horizontal brackets are visible in appendix No.12 of this report. Two trays type KCOP300H60/3 were fixed to horizontal brackets from one side of vertical consoles and two ladders type DGOP400H60/3 were fixed from other side of vertical hangers. Trays and ladders were fixed to horizontal brackets by means of screws M8 with nuts M8 through clamps type ZMO. Joints of trays and ladders was realized by means of connecting components type (BLO300, LPOLH60) at tray and type LDOCHE60E at ladder and by means of screws M8 with nuts M8 – 20 bolted joints at tray and 12 bolted joints at ladder. From outside, horizontal brackets were fixed through grips type UPWO by means of threaded bar PGM10 fixed from both sides by nut M10 with washer M10 to ceiling hanger type USOV. Ceiling hangers were fixed to ceiling by dowels type PSRO M10.
Ceiling assembling was realized by means of clamps type: UEF, UDF, OZMO, OZOE which were fixed to ceiling by dowels SRO M6 x 30 and by means of ceiling ledge, which was fixed to concrete ceiling by three dowels PSRO M8 x 75. Clamps type UKO were inserted to this ceiling ledge. Number of components and arrangement are visible in drawing.

Cable penetration through the wall of test furnace was sealed by mineral wool Nobasil.
Load capacity: bearing system was loaded with maximal tolerance according to the standard:

- trays with 10 kg/m and ladders with 20 kg/m.

Loading with steel chain was used as the equivalent load.

More detailed information about specimen construction is shown in the drawings which form the appendix of this test report. Drawings were delivered by the sponsor of the test.

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

4.2 DESCRIPTION OF THE SPECIMEN FIXATION

The test specimen was fixed on the ceiling of the test furnace which was created from concrete panels made of common shocked concrete of class B 20, 240 mm thick.
The type of specimen fixation into the test furnace is visible in drawing documentation and it was selected by the sponsor.

4.3 SPECIMEN INSPECTION

Before and after the fire testing, conformity of the test specimen with drawing was checked. The specimen corresponded to the drawing which create appendix of this report.
Specimen inspection consisted of visual review of the test specimen as well as size verification (number and cross sections of conductors, thickness, measurements of cables and trays).

4.4 CLIMATIC CONDITIONING

Test specimens were stored in the climatic hall and conditioned according to EN 1363-1 under the following climatic conditions:

Relative air humidity [%]		**Ambient air temperature [°C]**	
mean	standard deviation	mean	standard deviation
43,5	5,2	25,5	0,3

The equilibrium state of test specimen humidity was not determined. The test specimen did not comprise hygroscopic material.

5. CARRYING OUT THE TEST

5.1 TEST CONDITIONS

Conditions in the test furnace (temperature, pressure, content O_2 content) as well as conditions in the testing room (ambient temperature) corresponded to EN 1363-1 and DIN 4102-2 during the whole test. Detailed information is shown in appendices of this report or in quality records of the testing laboratory.

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

Date of fire test	**Relative air humidity [%]**	**Ambient air temperature [°C]**
08. 09. 2006	40,6	20,5

5.2 TEST RESULTS

The measured values are shown in tables that form an integral part of this test report.

5.3 EVALUATION OF THE TEST

SPECIMENS	Time to first failure/interruption of conductor
Specimens 1,2: cable (N)HXCH - 4x50 RM E90	**90 minutes no failure**
Specimens 3,4: cable (N)HXH - 4x1,5 RE E90	**90 minutes no failure**
Specimens 5:6 cable (N)HXCH - 4x50 RM / 25 E90	**90 minutes no failure**
Specimens 7,8: cable (N)HXH - 4x50 RM E90	**32 minutes**
Specimens 9,10: cable (N)HXH - 4x1,5 RE E90	**90 minutes no failure**
Specimens 11,12: cable (N)HXCH - 4x10 RE/10 E90	**90 minutes no failure**
Specimens 13:14 cable (N)HXH - 4x1,5 RE E90	**90 minutes no failure**
Specimens 15,16: cable (N)HXCH - 4x10 RE/10 E90	**90 minutes no failure**
Specimens 17,18: cable (N)HXH - 4x1,5 RE E90	**90 minutes no failure**
Specimens 19,20: cable (N)HXCH - 4x1,5 RE/1,5 E90	**90 minutes no failure**
Specimens 21,22: cable (N)HXCH - 4x50 RM/25 E90	**90 minutes no failure**
Specimens 23,24: cable (N)HXH - 4x50 RM E90	**38 minutes**
Specimens 25,26: cable (N)HXCH - 4x1,5 RE/1,5 E90	**90 minutes no failure**
Specimens 27,28: cable (N)HXH - 4x1,5 RE E90	**90 minutes no failure**
Specimens 29,30: cable (N)HXH - 4x50 RM E90	**42 minutes**
Specimens 31,32: cable (N)HXCH - 4x1,5 RE/1,5 E90	**90 minutes no failure**
Specimens 33,34: cable (N)HXH - 4x1,5 RE E90	**90 minutes no failure**
Specimens 35,36: cable (N)HXH - 4x50 RM E90	**90 minutes no failure**
Specimens 37,38: cable (N)HXCH - 4x50 RM/25 E90	**42 minutes**
Specimens 39,40: cable (N)HXCH - 4x50 RM/25 E90	**90 minutes no failure**
Specimens 52: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 53: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 54: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 55: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 56: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 57: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 58: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 59: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 60: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 61: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 62: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**
Specimens 63: cable JE-H(St)H 2x2x0,8 E90	**90 minutes no failure**

The fire test was discontinued in 95th minute at the request of sponsor.

6. CLOSING

- 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 EN 1363-1 and DIN 4102 – 12:1998-11. Any significant deviation with respect to size, constructional details, loads, stresses, edges 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 Ltd. 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 Ltd. Batizovce.

Report checked by: Marek Gorlický
Translated by: Marek Rusnák

Issued by: **Responsible for the technical side of this report:**

Ing. Štefan Rástocký
leader of the testing laboratory

Miroslav Hudák. Peter Rusnák
technician of the testing laboratory

7. NORMATIVE REFERENCES

DIN 4102 – 2:1977-09	Fire behavior of building materials and elements - requirements and testing
DIN 4102 – 12:1998-11	Fire resistance of electric cable systems required to maintain circuit integrity
STN EN 1363-1:2001	Fire resistance tests – Part 1: General requirements
ZP – 27/2006	ZP for determination of functionality classes of cables and cable supporting construction – in case of fire

8. LIST OF APPENDICES

Appendix 1	Measured values inside the test furnace
Appendix 2	Measured values inside the test furnace / graph
Appendix 3	Measured times of tested specimens from V1 to V8
Appendix 4	Measured times of tested specimens from V9 to V16
Appendix 5	Measured times of tested specimens from V17 to V24
Appendix 6	Measured times of tested specimens from V25 to V32
Appendix 7	Measured times of tested specimens from V33 to V40
Appendix 8	Measured times of tested specimens from V52 to V63
Appendix 9	Layout of cables in the test furnace
Appendix 10-11	Photos taken before and after the fire test
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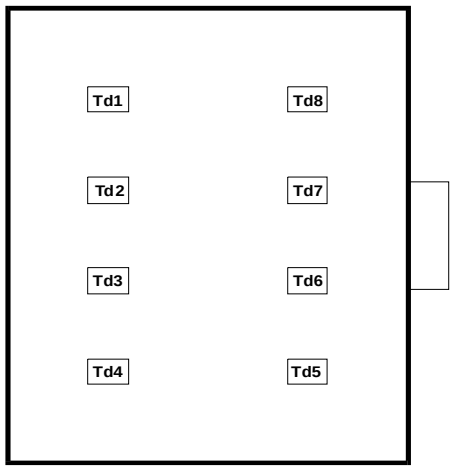
Measured values inside the test furnace

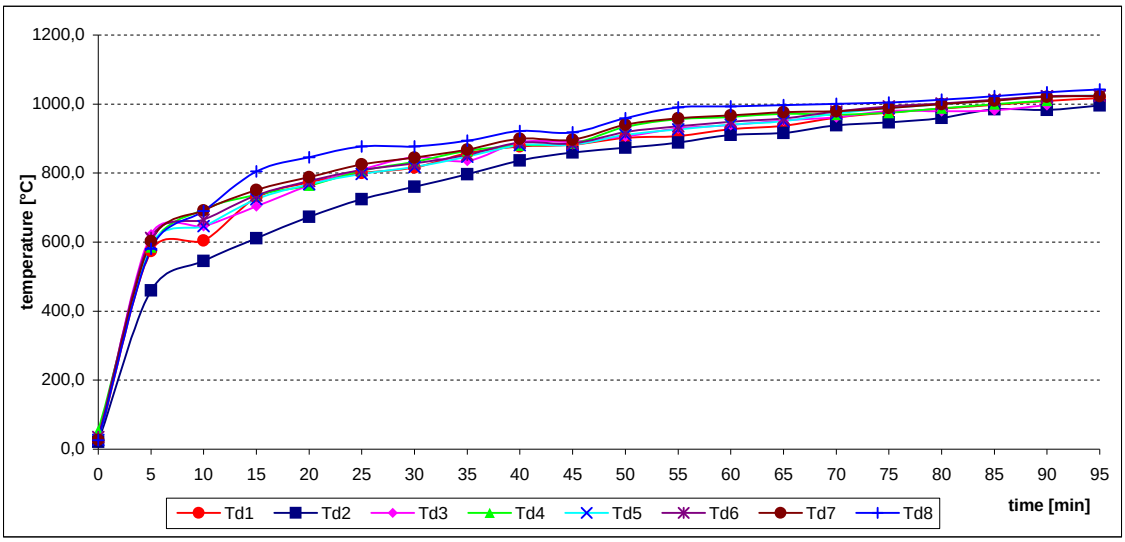
Time	Temperature [°C]											Deviation	Pressure [Pa]
t [min]	Td1	Td2	Td3	Td4	Td5	Td6	Td7	Td8	Tave	Tn	To	d_e [%]	p
0	22,5	21,4	24,7	53,8	27,0	35,6	27,0	26,0	29,5	20,0	20,4	26,0	0,0
5	574,2	460,4	622,1	585,0	592,8	611,6	602,5	580,8	591,2	576,2	19,1	-8,6	8,4
10	604,8	545,0	646,3	693,2	646,7	665,3	692,0	689,5	665,3	678,3	19,7	-4,4	10,4
15	728,7	610,7	703,9	737,0	724,3	735,1	751,5	805,0	746,9	738,5	20,0	-3,0	12,5
20	773,4	673,6	764,0	764,2	767,9	777,0	788,5	845,9	786,2	781,3	19,4	-1,8	13,4
25	800,5	724,0	810,1	806,6	797,8	808,2	825,0	877,2	819,2	814,6	19,1	-1,2	13,5
30	815,9	760,5	846,1	832,6	818,0	827,8	844,6	876,9	836,0	841,8	19,0	-1,0	13,7
35	857,6	796,2	835,5	864,6	847,9	853,5	868,4	894,0	854,6	864,8	18,2	-1,1	14,4
40	877,3	836,2	888,9	880,0	880,7	888,8	899,2	921,5	883,4	884,7	17,9	-1,1	10,9
45	881,8	859,6	890,9	886,0	881,8	886,0	896,7	917,7	887,1	902,3	17,3	-1,0	13,3
50	901,9	873,8	906,3	934,2	910,5	918,6	940,0	959,0	919,7	918,1	17,3	-1,0	14,3
55	906,7	888,3	929,6	956,3	926,2	936,0	958,8	990,3	937,5	932,3	17,4	-0,9	14,3
60	927,8	910,3	939,6	962,6	940,5	948,4	967,5	993,1	950,0	945,3	17,8	-0,8	14,8
65	936,3	916,2	952,6	971,7	950,3	957,9	976,6	996,9	958,0	957,3	17,3	-0,7	14,6
70	960,5	938,8	961,8	968,8	972,8	978,4	979,6	1001,0	971,4	968,4	17,3	-0,6	15,8
75	975,4	946,4	980,2	975,1	988,1	993,0	988,5	1004,0	981,5	978,7	18,1	-0,5	15,8
80	986,6	959,4	979,1	987,2	1000,0	1002,0	999,5	1013,0	992,8	988,4	17,6	-0,5	13,9
85	997,9	984,4	982,1	999,5	1011,0	1013,0	1010,0	1023,0	1005,7	997,4	16,9	-0,4	13,8
90	1009,0	983,3	996,7	1010,0	1022,0	1023,0	1021,0	1034,0	1014,9	1005,9	17,0	-0,3	14,7
95	1017,0	995,6	996,3	1013,0	1025,0	1024,0	1023,0	1042,0	1020,2	1014,0	17,5	-0,2	15,9

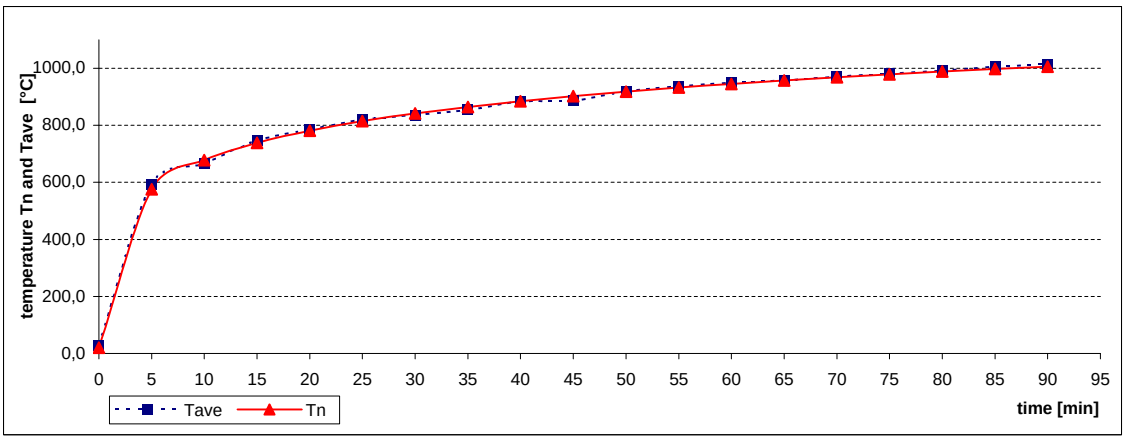
Tave Average temperature in the test furnace calculated from plate thermometers
Tn Standard temperature in the test furnace laid down to test guideline
To Ambient temperature
d_e Deviation of the average temperature from the standard temperature calculated according to test guideline
p Pressure inside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

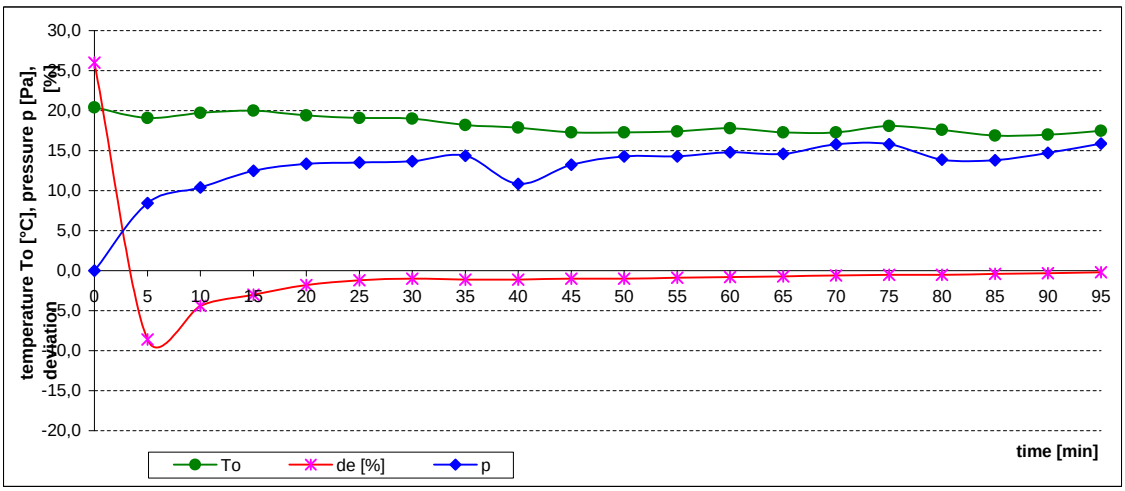
Layout of measuring points in the test furnace:



Measured values inside the test furnace / graph







Measured time of tested specimens from V1 to V8

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V1	1-L1	no failure
	2-L2	no failure
	3-L3	no failure
	4-PEN	no failure
V2	5-L1	no failure
	6-L2	no failure
	7-L3	no failure
	8-PEN	no failure
V3	9-L1	no failure
	10-L2	no failure
	11-L3	no failure
	12-PEN	no failure
V4	13-L1	no failure
	14-L2	no failure
	15-L3	no failure
	16-PEN	no failure
V5	17-L1	no failure
	18-L2	no failure
	19-L3	no failure
	20-PEN	no failure
V6	21-L1	no failure
	22-L2	no failure
	23-L3	no failure
	24-PEN	no failure
V7	25-L1	35:36
	26-L2	35:36
	27-L3	no failure
	28-PEN	no failure
V8	29-L1	47:52
	30-L2	32:49
	31-L3	32:49
	32-PEN	no failure

Specimens 1,2: cable (N)HXCH - 4x50 RM E90
Specimens 3,4: cable (N)HXH - 4x1,5 RE E90
Specimens 5:6 cable (N)HXCH - 4x50 RM / 25 E90
Specimens 7,8: cable (N)HXH - 4x50 RM E90

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 V9 to V16

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V9	33-L1	no failure
	34-L2	no failure
	35-L3	no failure
	36-PEN	no failure
V10	37-L1	no failure
	38-L2	no failure
	39-L3	no failure
	40-PEN	no failure
V11	41-L1	no failure
	42-L2	no failure
	43-L3	no failure
	44-PEN	no failure
V12	45-L1	no failure
	46-L2	no failure
	47-L3	no failure
	48-PEN	no failure
V13	49-L1	no failure
	50-L2	no failure
	51-L3	no failure
	52-PEN	no failure
V14	53-L1	no failure
	54-L2	no failure
	55-L3	no failure
	56-PEN	no failure
V15	57-L1	no failure
	58-L2	no failure
	59-L3	no failure
	60-PEN	no failure
V16	61-L1	no failure
	62-L2	no failure
	63-L3	no failure
	64-PEN	no failure

Specimens 9,10: cable (N)HXH - 4x1,5 RE E90
Specimens 11,12: cable (N)HXCH - 4x10 RE/10 E90
Specimens 13:14 cable (N)HXH - 4x1,5 RE E90
Specimens 15,16: cable (N)HXCH - 4x10 RE/10 E90

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 V17 to V24

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V17	65-L1	no failure
	66-L2	no failure
	67-L3	no failure
	68-PEN	no failure
V18	69-L1	no failure
	70-L2	no failure
	71-L3	no failure
	72-PEN	no failure
V19	73-L1	no failure
	74-L2	no failure
	75-L3	no failure
	76-PEN	no failure
V20	77-L1	no failure
	78-L2	no failure
	79-L3	no failure
	80-PEN	no failure
V21	81-L1	no failure
	82-L2	no failure
	83-L3	no failure
	84-PEN	no failure
V22	85-L1	no failure
	86-L2	no failure
	87-L3	no failure
	88-PEN	no failure
V23	89-L1	38:09
	90-L2	38:09
	91-L3	43:13
	92-PEN	no failure
V24	93-L1	45:59
	94-L2	45:59
	95-L3	46:43
	96-PEN	no failure

Specimens 17,18: cable (N)HXH - 4x1,5 RE E90
Specimens 19,20: cable (N)HXCH - 4x1,5 RE/1,5 E90
Specimens 21,22: cable (N)HXCH - 4x50 RM/25 E90
Specimens 23,24: cable (N)HXH - 4x50 RM E90

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 V25 to V31

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V25	97-L1	no failure
	98-L2	no failure
	99-L3	no failure
	100-PEN	no failure
V26	101-L1	no failure
	102-L2	no failure
	103-L3	no failure
	104-PEN	no failure
V27	105-L1	no failure
	106-L2	no failure
	107-L3	no failure
	108-PEN	no failure
V28	109-L1	no failure
	110-L2	no failure
	111-L3	no failure
	112-PEN	no failure
V29	113-L1	no failure
	114-L2	no failure
	115-	no failure
	116-PEN	no failure
V30	117-L1	no failure
	118-L2	42:12
	119-L3	54:01
	120-PEN	no failure
V31	121-L1	no failure
	122-L2	no failure
	123-L3	no failure
	124-PEN	no failure
V32	125-L1	no failure
	126-L2	no failure
	127-L3	no failure
	128-PEN	no failure

Specimens 25,26: cable (N)HXCH - 4x1,5 RE/1,5 E90
Specimens 27,28: cable (N)HXH - 4x1,5 RE E90
Specimens 29,30: cable (N)HXH - 4x50 RM E90
Specimens 31,32: cable (N)HXCH - 4x1,5 RE/1,5 E90

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 V33 to V40

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V33	129-L1	no failure
	130-L2	no failure
	131-L3	no failure
	132-PEN	no failure
V34	133-L1	no failure
	134-L2	no failure
	135-L3	no failure
	136-PEN	no failure
V35	137-L1	no failure
	138-L2	no failure
	139-L3	no failure
	140-PEN	no failure
V36	141-L1	no failure
	142-L2	no failure
	143-L3	no failure
	144-PEN	no failure
V37	145-L1	no failure
	146-L2	no failure
	147-L3	no failure
	148-PEN	no failure
V38	149-L1	no failure
	150-L2	42:12
	151-L3	54:01
	152-PEN	no failure
V39	153-L1	no failure
	154-L2	no failure
	155-L3	no failure
	156-PEN	no failure
V40	157-L1	no failure
	158-L2	no failure
	159-L3	no failure
	160-PEN	no failure

Specimens 33,34: cable (N)HXH - 4x1,5 RE E90	
Specimens 35,36: cable (N)HXH - 4x50 RM E90	
Specimens 37,38: cable (N)HXCH - 4x50 RM/25 E90	
Specimens 39,40: cable (N)HXCH - 4x50 RM/25 E90	

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.

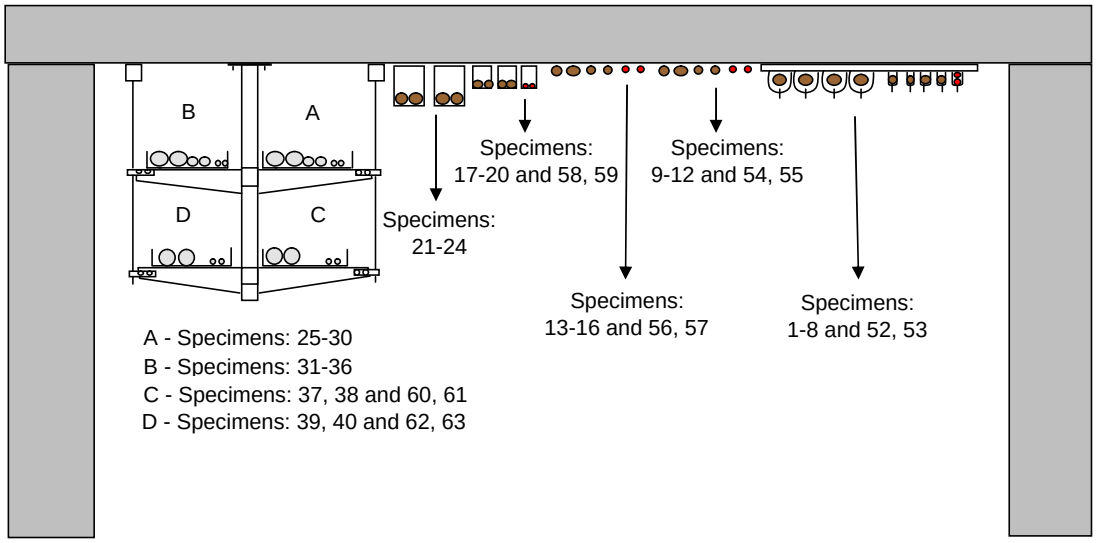
Measured time of tested specimens from V52 to V63

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V52	209-L	no failure
	210-PEN	no failure
	211-L	no failure
	212-PEN	no failure
V53	213-L	no failure
	214-PEN	no failure
	215-L	no failure
	216-PEN	no failure
V55	217-L	no failure
	218-PEN	no failure
	219-L	no failure
	220-PEN	no failure
V56	221-L	no failure
	222-PEN	no failure
	223-L	no failure
	224-PEN	no failure
V57	225-L	no failure
	226-PEN	no failure
	227-L	no failure
	228-PEN	no failure
V58	229-L	no failure
	230-PEN	no failure
	231-L	no failure
	232-PEN	no failure
V59	233-L	no failure
	234-PEN	no failure
	235-L	no failure
	236-PEN	no failure
V60	237-L	no failure
	238-PEN	no failure
	239-L	no failure
	240-PEN	no failure
V61	241-L	no failure
	242-PEN	no failure
	243-L	no failure
	244-PEN	no failure
V62	245-L	no failure
	246-PEN	no failure
	247-L	no failure
	248-PEN	no failure
V63	249-L	no failure
	250-PEN	no failure
	251-L	no failure
	252-PEN	no failure

Specimens 52 - 63: cable JE-H(St)H 2x2x0,8 E90	

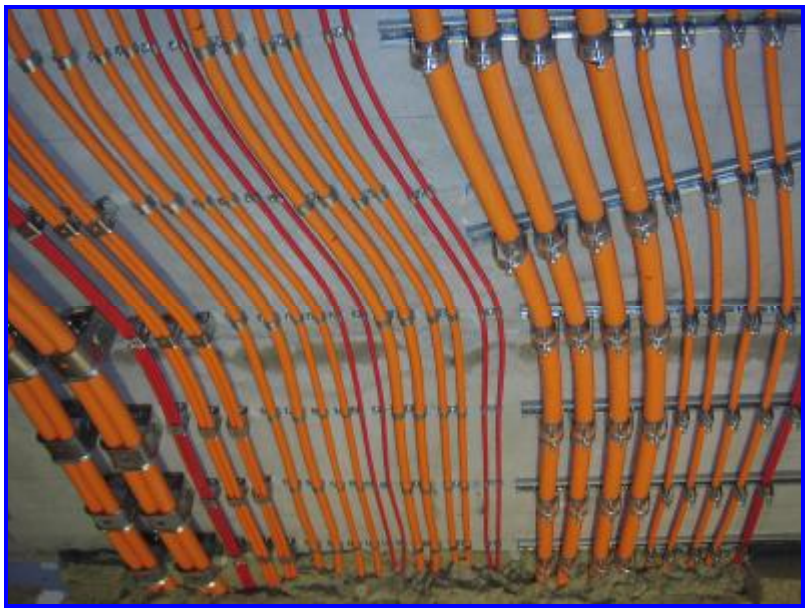
Signal cables were tested by three-phase voltage supply 1 x 110V with LED diods 3V / 0,3W.
Circuit breakers with rating 3 A were used.

Layout of cables in the test furnace



Specimens 1,2: cable (N)HXCH - 4x50 RM E90	Specimens placed in ceiling profile ledges with clips UKO
Specimens 3,4: cable (N)HXH - 4x1,5 RE E90	Specimens placed in ceiling profile ledges with clips UKO
Specimens 5:6 cable (N)HXCH - 4x50 RM / 25 E90	Specimens placed in ceiling profile ledges with clips UKO
Specimens 7,8: cable (N)HXH - 4x50 RM E90	Specimens placed in ceiling profile ledges with clips UKO
Specimens 9,10: cable (N)HXH - 4x1,5 RE E90	Specimens placed in ceiling clips UEF
Specimens 11,12: cable (N)HXCH - 4x10 RE/10 E90	Specimens placed in ceiling clips UEF
Specimens 13:14 cable (N)HXH - 4x1,5 RE E90	Specimens placed in ceiling clips UDF
Specimens 15,16: cable (N)HXCH - 4x10 RE/10 E90	Specimens placed in ceiling clips UDF
Specimens 17,18: cable (N)HXH - 4x1,5 RE E90	Specimens placed in ceiling clips OZMO
Specimens 19,20: cable (N)HXCH - 4x1,5 RE/1,5 E90	Specimens placed in ceiling clips OZMO
Specimens 21,22: cable (N)HXCH - 4x50 RM/25 E90	Specimens placed in ceiling clips OZOE
Specimens 23,24: cable (N)HXH - 4x50 RM E90	Specimens placed in ceiling clips OZOE
Specimens 25,26: cable (N)HXCH - 4x1,5 RE/1,5 E90	Specimens placed in the upper ladder
Specimens 27,28: cable (N)HXH - 4x1,5 RE E90	Specimens placed in the upper ladder
Specimens 29,30: cable (N)HXH - 4x50 RM E90	Specimens placed in the upper ladder
Specimens 31,32: cable (N)HXCH - 4x1,5 RE/1,5 E90	Specimens placed in the upper tray
Specimens 33,34: cable (N)HXH - 4x1,5 RE E90	Specimens placed in the upper tray
Specimens 35,36: cable (N)HXH - 4x50 RM E90	Specimens placed in the upper tray
Specimens 37,38: cable (N)HXCH - 4x50 RM/25 E90	Specimens placed in the lover ladder
Specimens 39,40: cable (N)HXCH - 4x50 RM/25 E90	Specimens placed in the lower tray
Specimens 52: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in ceiling profile ledges with clips UKO
Specimens 53: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in ceiling profile ledges with clips UKO
Specimens 54: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in ceiling clips UEF
Specimens 55: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in ceiling clips UEF
Specimens 56: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in ceiling clips UDF
Specimens 57: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in ceiling clips UDF
Specimens 58: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in ceiling clips OZMO
Specimens 59: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in ceiling clips OZMO
Specimens 60: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in the lover ladder
Specimens 61: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in the lover ladder
Specimens 62: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in the lower tray
Specimens 63: cable JE-H(St)H 2x2x0,8 E90	Specimens placed in the lower tray

Photos taken before the test



Photos taken after the termination of the test

Badanie systemów tras kablowych wg normy DIN 4102-12

w FIRES Batizowce, Słowacja.

w dniu 04- 08.09 .2006

MIKA (E90)

Typ kabla / Parametry kabla i trasy kablowej	NHXH 4x1,5RE E90	NHXH 4x50RM E90	NHXCH 4x1,5RE/ 1,5 E90	NHXCH 4x10RE/ 10 E90	NHXCH 4x50RM/ 25 E90	JE-H(St)H 2x2x0,8 E90
Oznaczenie kabla na rysunku	1	2	3	4	5	6
Średnica kabla [mm]	16,1-17,0	36,1-39,35	17,5-18,4	25,1-25,75	41,5-43,5	11,45-12,8
Ciężar kabla [kg/m]	0,39	2,98	0,45	1,1	3,59	0,18
1. Korytko 60x300 mm, - podpory - 1200 mm, - obciążenie 10 kg/m.	2	2	2	-	-	-
2. Drabinka 60x400 mmm, - podpory - 1200 m, - obciążenie 20 kg/m.	2	2	2	-	-	-
3 Korytko 60x300 mm, - podpory - 1200 mm, - obciążenie 10 kg/m.	-	-	-	-	2	2
4. Drabinka 60x400 mmm, - podpory - 1200 m, - obciążenie 20 kg/m.	-	-	-	-	2	2
5. Uchwyt UEF - mocowanie co 300 mm - obciążenie 1,0 kg /m,	2	-	-	2	-	2
6. Uchwyt UDF - mocowanie co 300 mm - obciążenie 1,0 kg /m,	2	-	-	2	-	2
7. Obejmy OZMO - mocowanie co 300 mm - obciążenie 1,0 kg/uchwyt	2	-	2	-	-	2
8. Obejmy OZO - mocowanie co 300 mm, - obciążenie 3 kg/uchwyt	-	2	-	-	2	-
9. Uchwyty UKO na szynach - mocowanie co 300 mm, - obciążenie 3 kg/uchwyt	2	2	2	-	2	2
Ilość odcinków [szt.]	12	8	8	4	8	12

Długość odcinka wynosi 7 m

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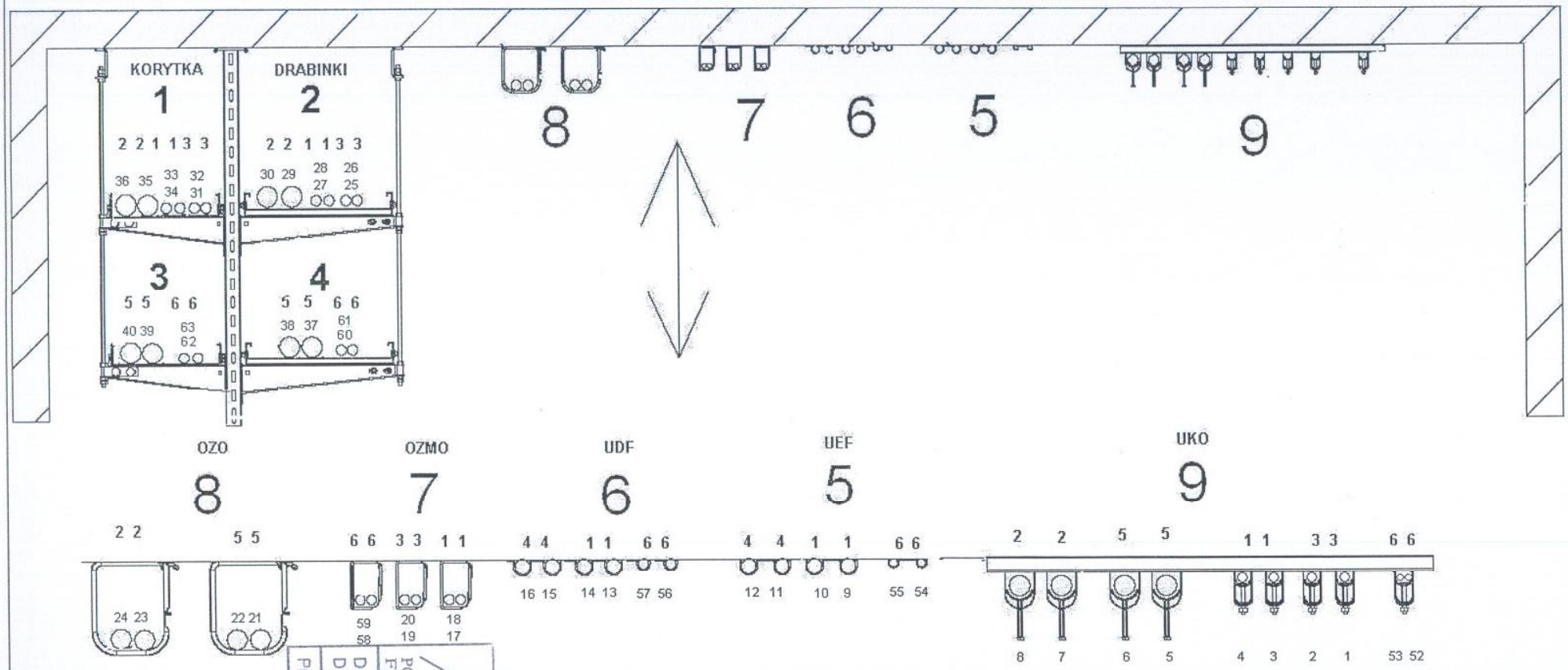
Príloha č./Appendix No. 12

wsad kabli na E 90 MIKCA



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Document No. FIRES - EP - 2006 - MIKA

Príloha č./Appendix No. 13

Dátum/Date 08.09.2006

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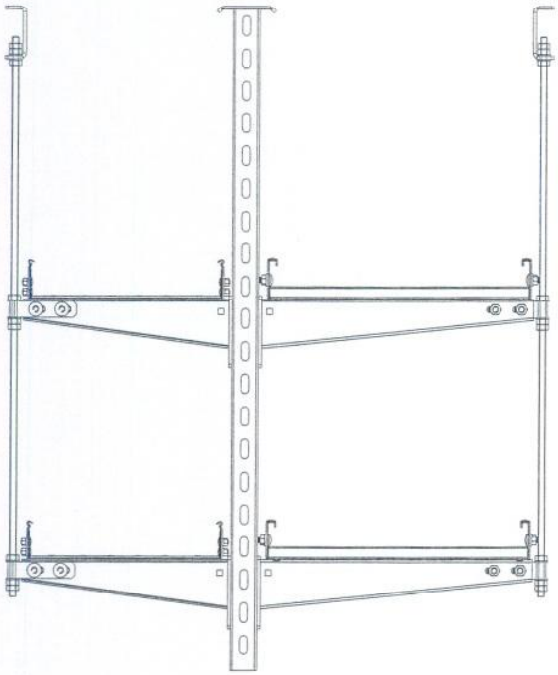
	Odchyłka wymiarów nietolerowanych		Materiał: Gatunek		Masa [kg]	Podziałka	Format	A4
			Nr normy	PN-EN 10142 + A1 : 1997		7:100	Arkusz	1
			półfabrykat (nr normy)				Arkuszy	1
Projektował	Nazwisko		Podpis	Data	Nazwa rysunku			
Rysował		J.Grochowski						
Sprawdził								
Zatwierdził					Nr programu		Nr zmiany	
Profesjonalne Systemy Tras Kablowych					Nazwa pomiaru			



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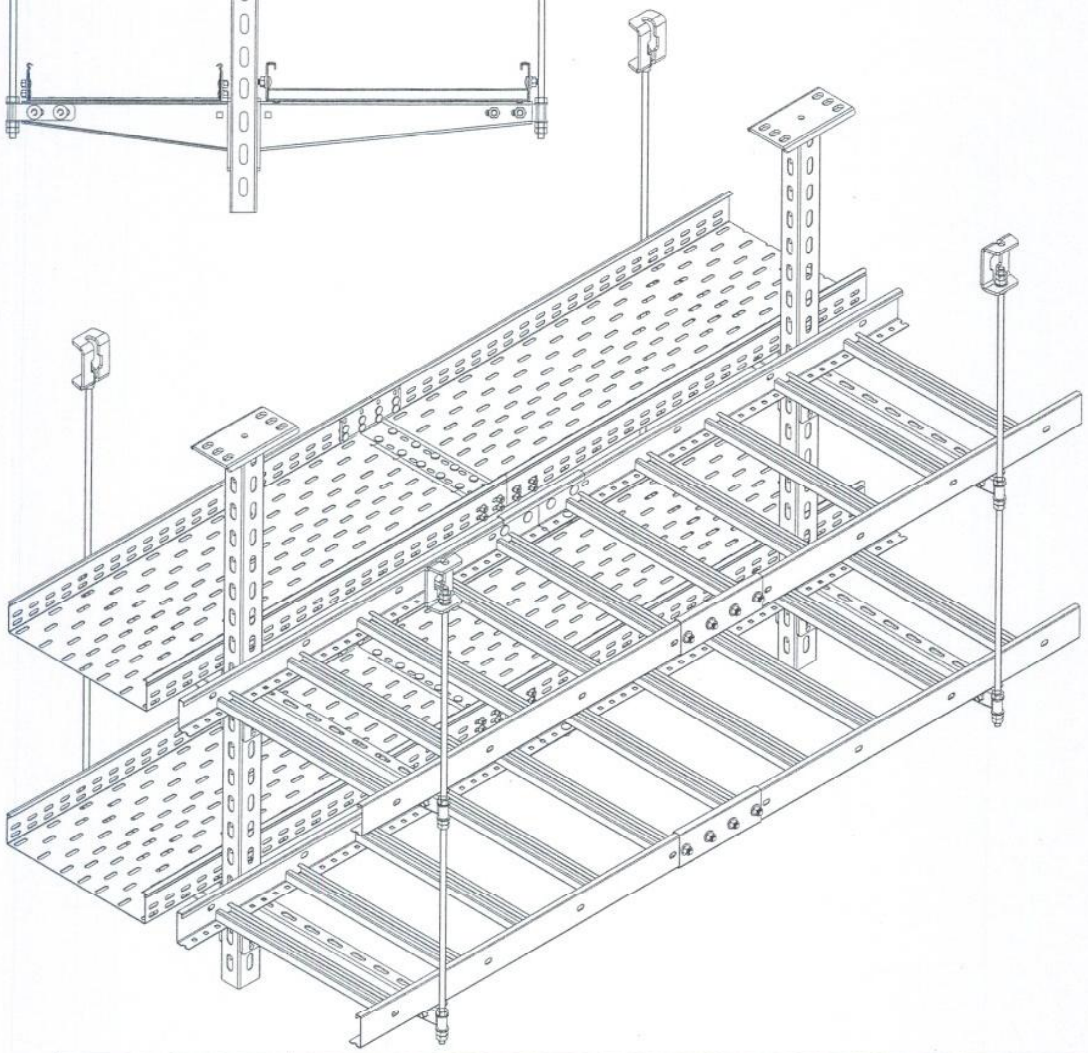
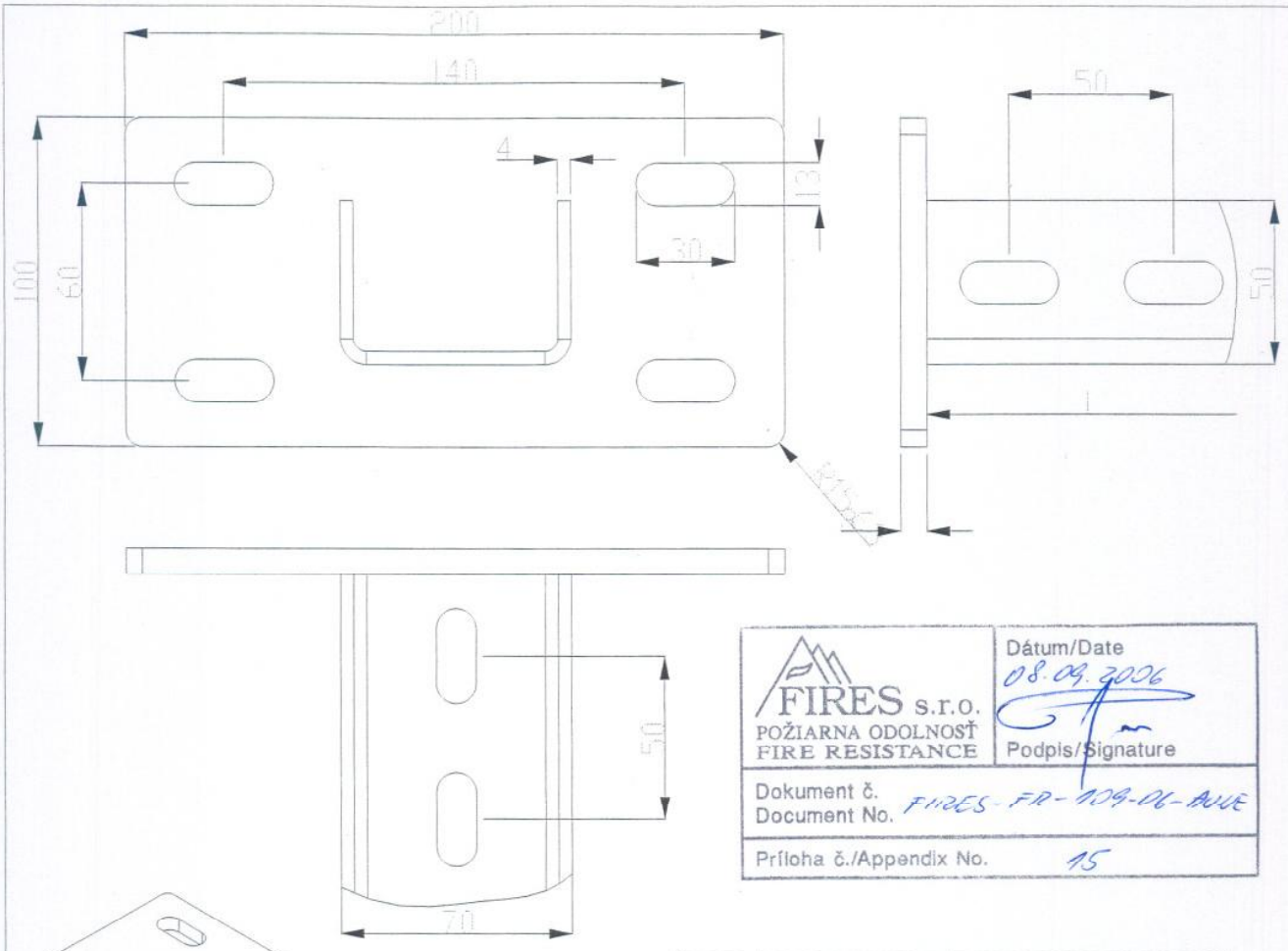
Dokument č. / Document No. FIRES-FR-909-06-ADWE

Príloha č./Appendix No. 14



	Odchyłki wymiarów nietolerowanych		Materiał	Gatunek		Masa (kg)	Podziałka 1:10	Format A4
				Nr normy	PN-EN 10327:2005			Arkusz 1
				półfabrykat (nr normy)				Arkuszy 1

Projektował	Nazwisko	Podpis	Data	Nazwa rysunku	
Rysował	J.Grochowski		28-Jun-06		
Sprawdził					
Zatwierdził				Nr programu	Nr zmiany
Profesjonalne Systemy Tras Kablowych				Nazwa zakładu	



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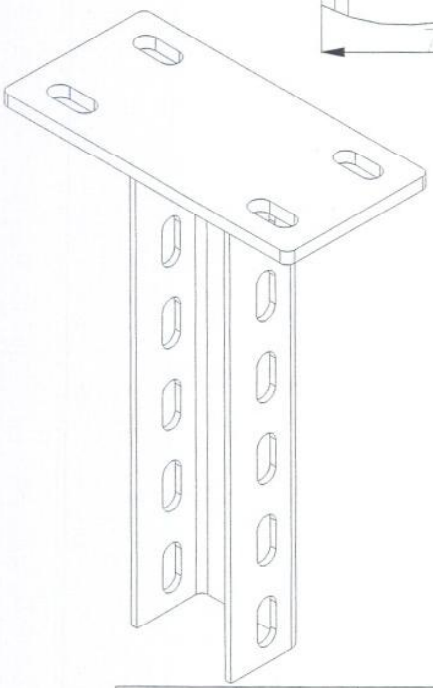
Dokument č./Document No. FIRES-FR-109-06-AUGE

Príloha č./Appendix No. 15



Nr	Nazwa	L
1	WPCE_200	200
2	WPCE_300	300
3	WPCE_400	400
4	WPCE_500	500
5	WPCE_600	600
6	WPCE_700	700
7	WPCE_800	800
8	WPCE_900	900
9	WPCE_1000	1000
10	WPCE_2000	2000

Odchyłki wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka 1:2	Format A4
			Nr normy	PN-EN 10142 + A1 : 1997			Arkusz 1
			półfabrykat (nr normy)				Arkuszy 1

Projektował	Nazwisko	Podpis	Data	Nazwa rysunku
Rysował	J.Grochowski			WPCE
Sprawdził				Nr programu
Zatwierdził				Nr zmiany

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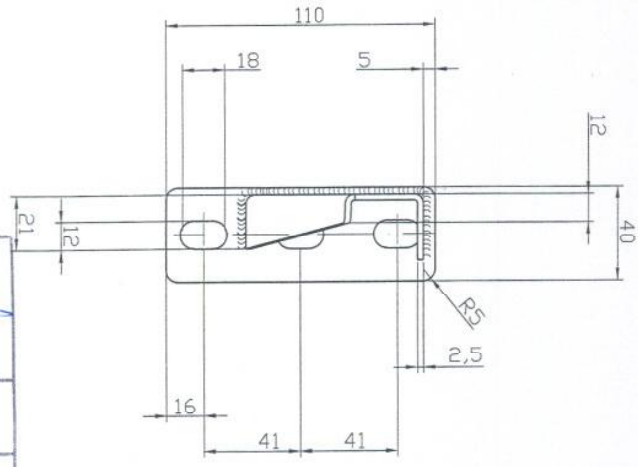
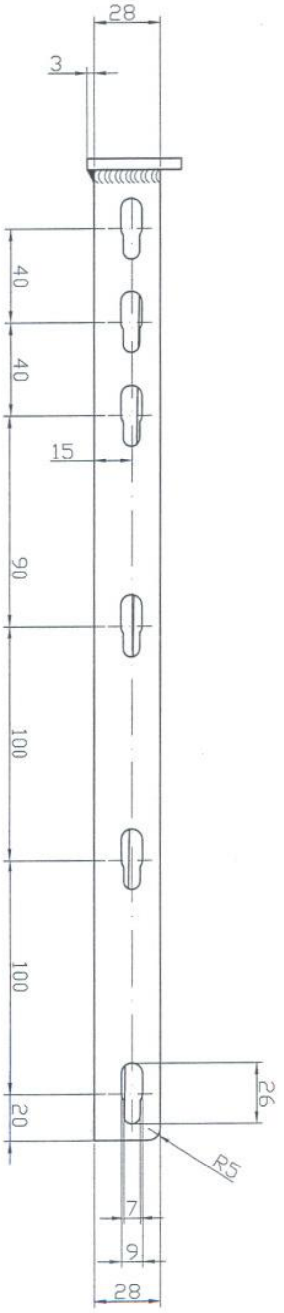
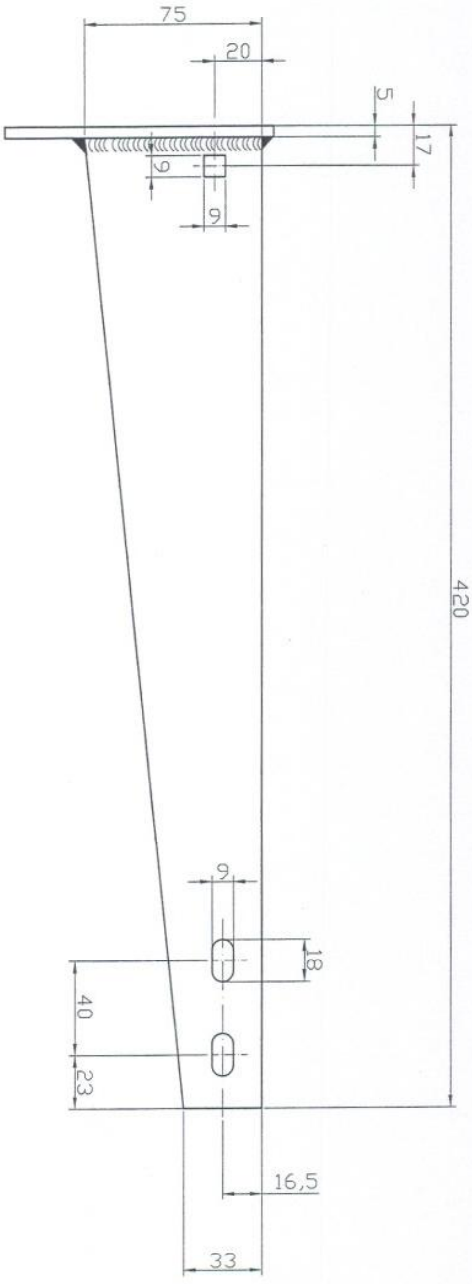
Príloha č./Appendix No. 16

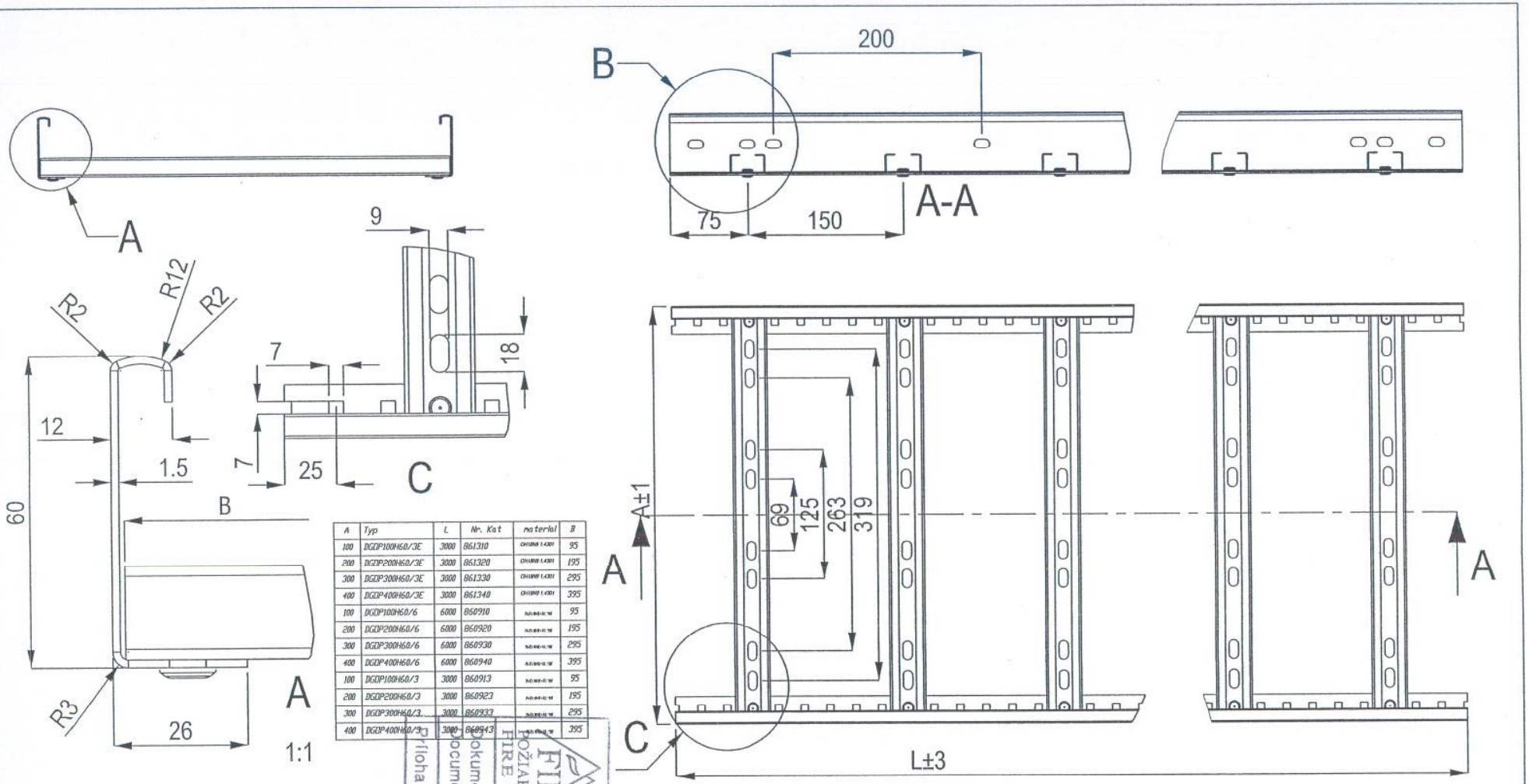




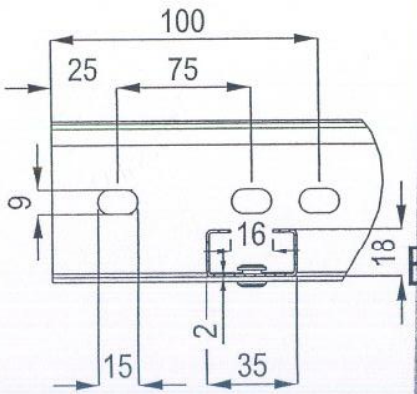


Profesjonalne Systemy Tras Kablowych

Projektował		Dokładność wymiarów nietolerowanych	
Rysował			
Sprawdził			
Zatwierdził			
Nazwisko			
	J.Kuczek	J.Jasiński	
Podpis			
Data	2004.12.29	2004.12.29	2004.12.29
Materiał		Gatunek	
		Nr normy	
		pdfaktywat (or normy	
Nazwa rysunku			
		PN-EN 10142 + A1 :1997	
Masa (kg)			
Podziałka	1:1		
Format	A3		
Arkuszy			
Nr rysunku	800340	Nr programu maszynowego	WMC0400
Nr zmiany			



A	Typ	L	Nr. Kat	material	B
100	DGOP100H60/3E	3000	B61310		95
200	DGOP200H60/3E	3000	B61320		195
300	DGOP300H60/3E	3000	B61330		295
400	DGOP400H60/3E	3000	B61340		395
100	DGOP100H60/6	6000	B60910		95
200	DGOP200H60/6	6000	B60920		195
300	DGOP300H60/6	6000	B60930		295
400	DGOP400H60/6	6000	B60940		395
100	DGOP100H60/3	3000	B60913		95
200	DGOP200H60/3	3000	B60923		195
300	DGOP300H60/3	3000	B60933		295
400	DGOP400H60/3	3000	B60943		395



Odchyłka wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format	A4
			Nr normy	PN-EN 10142 + A1 : 1997		1:5	Arkusz	
			półfabrykat (nr normy)				Arkuszy	

	Nazwisko	Podpis	Data
Projektował	J.GROCHOWSKI		20.10.05
Rysował	J.Grochowski		20.10.05
Sprawdził	T.WLODARCZYK		20.10.05
Zatwierdził	J.KLICZEK		20.10.05

Nazwa rysunku: DGOP400H60/3

Nr programu roboczego: ---

Nr zmiany

BANS Dwustronne Systemy Tras Kablowych

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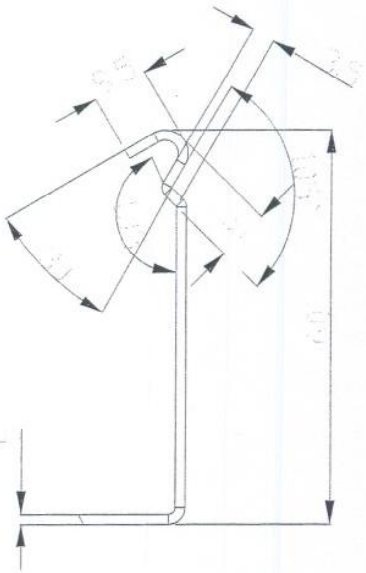
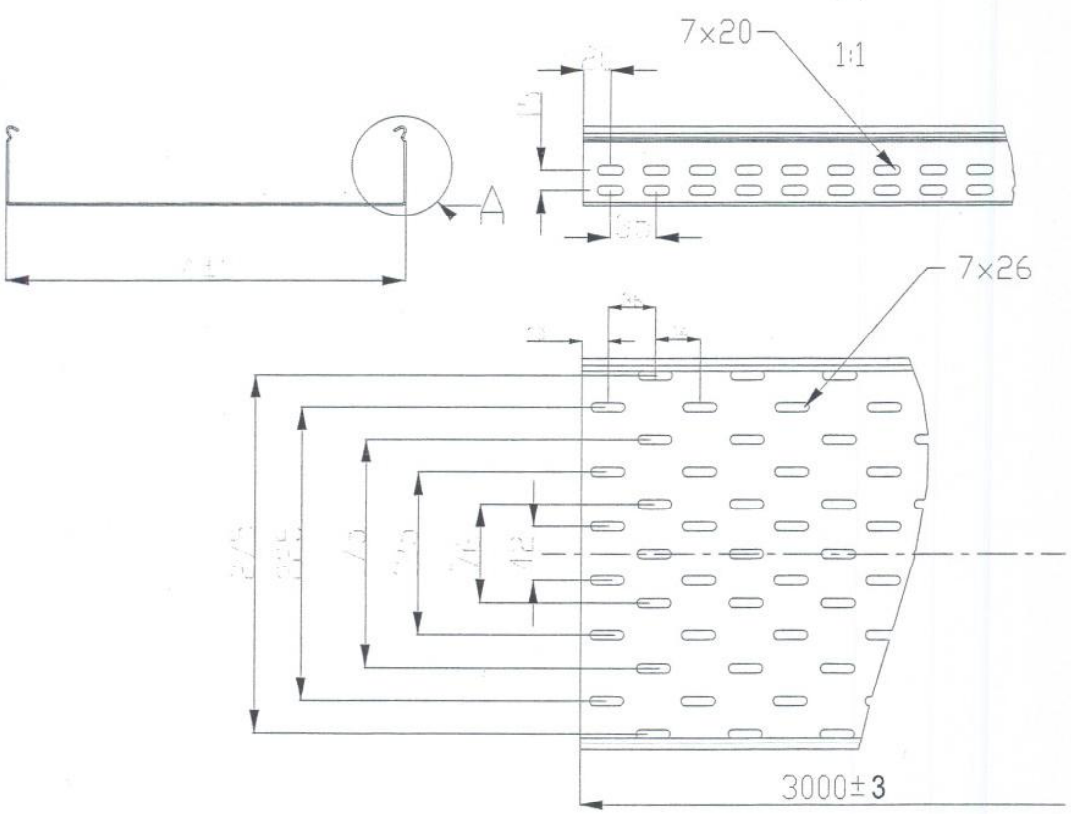
Príloha č./Appendix No. 18

A	Typ	Nr.kat	Materiał
50	KCDP50H60/3E	B61010	DH18N9 1.4301
100	KCDP100H60/3E	B61010	DH18N9 1.4301
200	KCDP200H60/3E	B61020	DH18N9 1.4301
300	KCDP300H60/3E	B61030	DH18N9 1.4301
50	KCDP50H60/3	B60110	PN-EN 10142 + A1 : 1997
100	KCDP100H60/3	B60110	PN-EN 10142 + A1 : 1997
200	KCDP200H60/3	B60120	PN-EN 10142 + A1 : 1997
300	KCDP300H60/3	B60130	PN-EN 10142 + A1 : 1997



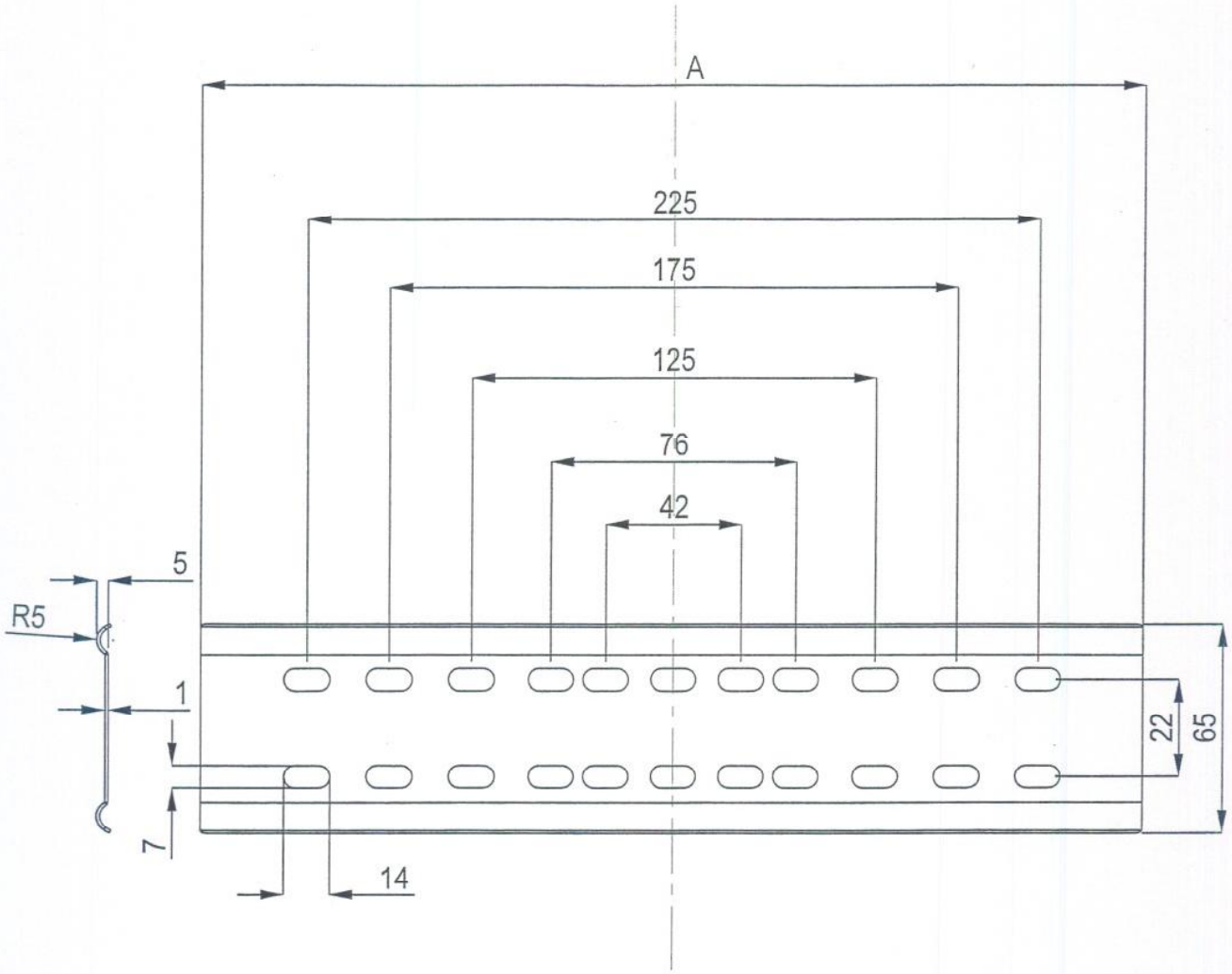


Dachyłka wymiarów) nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka 1:5	Format A4
			Nr normy	PN-EN 10142 + A1 : 1997			Arkusz
			półfabrykat (nr normy)				Arkuszy

	Nazwisko	Podpis	Data	Nazwa rysunku
Projektował	J.GRODHOWSKI		20.10.05	
Rysował	J.Grochowski		20.10.05	KCDP300H60/3
Sprawdził	T.WLODARCZYK		20.10.05	
Zatwierdził	J.KLICZEK		20.10.05	Nr programu maszynowego: 860130

Nr zmiany

Profesjonalne Systemy Tras Kablowych



A	Typ	Nr.kat	Material
90	BL□100E	861110	OH18N9 1.4301
190	BL□200E	861120	OH18N9 1.4301
290	BL□300E	861130	OH18N9 1.4301
90	BL□100	860310	PN-EN 10142 + A1 : 1997
190	BL□200	860320	PN-EN 10142 + A1 : 1997
290	BL□300	860330	PN-EN 10142 + A1 : 1997

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Príloha č./Appendix No. 19

Odchyłka wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format	A4
			Nr normy	PN-EN 10142 + A1 : 1997		1:2	Arkusz	
			półfabrykat (nr normy)				Arkuszy	

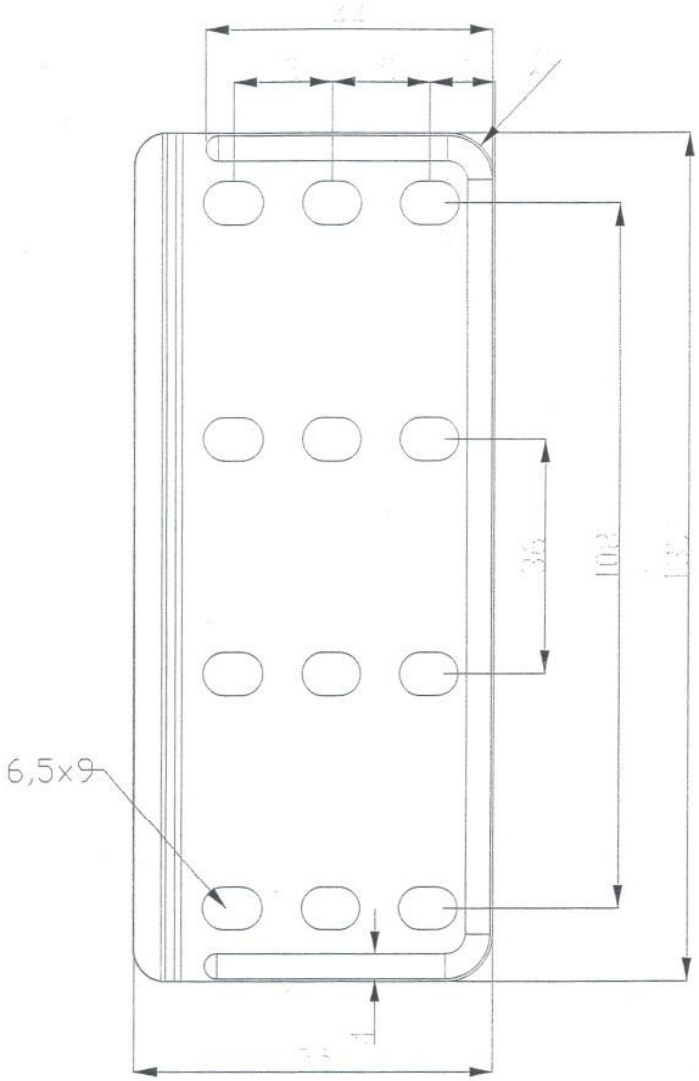
	Nazwisko	Podpis	Data
Projektował	J.GROCHOWSKI		20.10.05
Rysował	J.Grochowski		20.10.05
Sprawdził	T.WLODARCZYK		20.10.05
Zatwierdził	J.KLICZEK		20.10.05

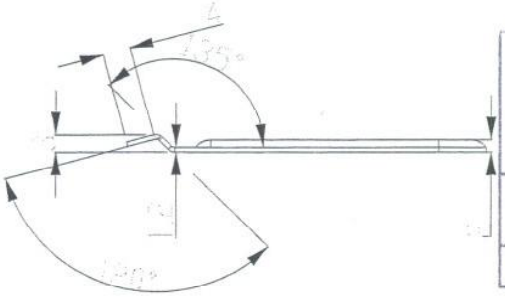
Nazwa rysunku: BLO300

Nr programu maszynowego: 860330

Nr zmiany

Profesjonalne Systemy Tras Kablowych





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Dokument č. / Document No. FIRES-FR-109-06-ANNE

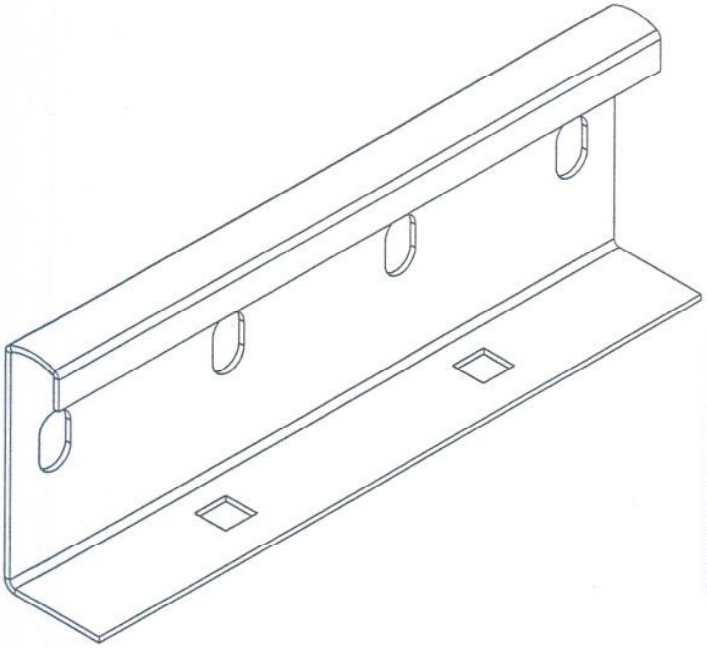
Príloha č./Appendix No. 20

	Odchyłka wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format A4
				Nr normy	PN-EN 10142 + A1 : 1997		1:1	Arkusz
				półfabrykat (nr normy)				Arkuszy

	Nazwisko	Podpis	Data	Nazwa rysunku
Projektował	J.GROCHOWSKI		20.10.05	
Rysował	J.Grochowski		20.10.05	LPOLH60
Sprawdził	T.WLODARCZYK		20.10.05	
Zatwierdził	J.KLICZEK		20.10.05	Nr programu / Nr zmiany

Profesjonalne Systemy Tras Kablowych

Nr rysunku: 860100



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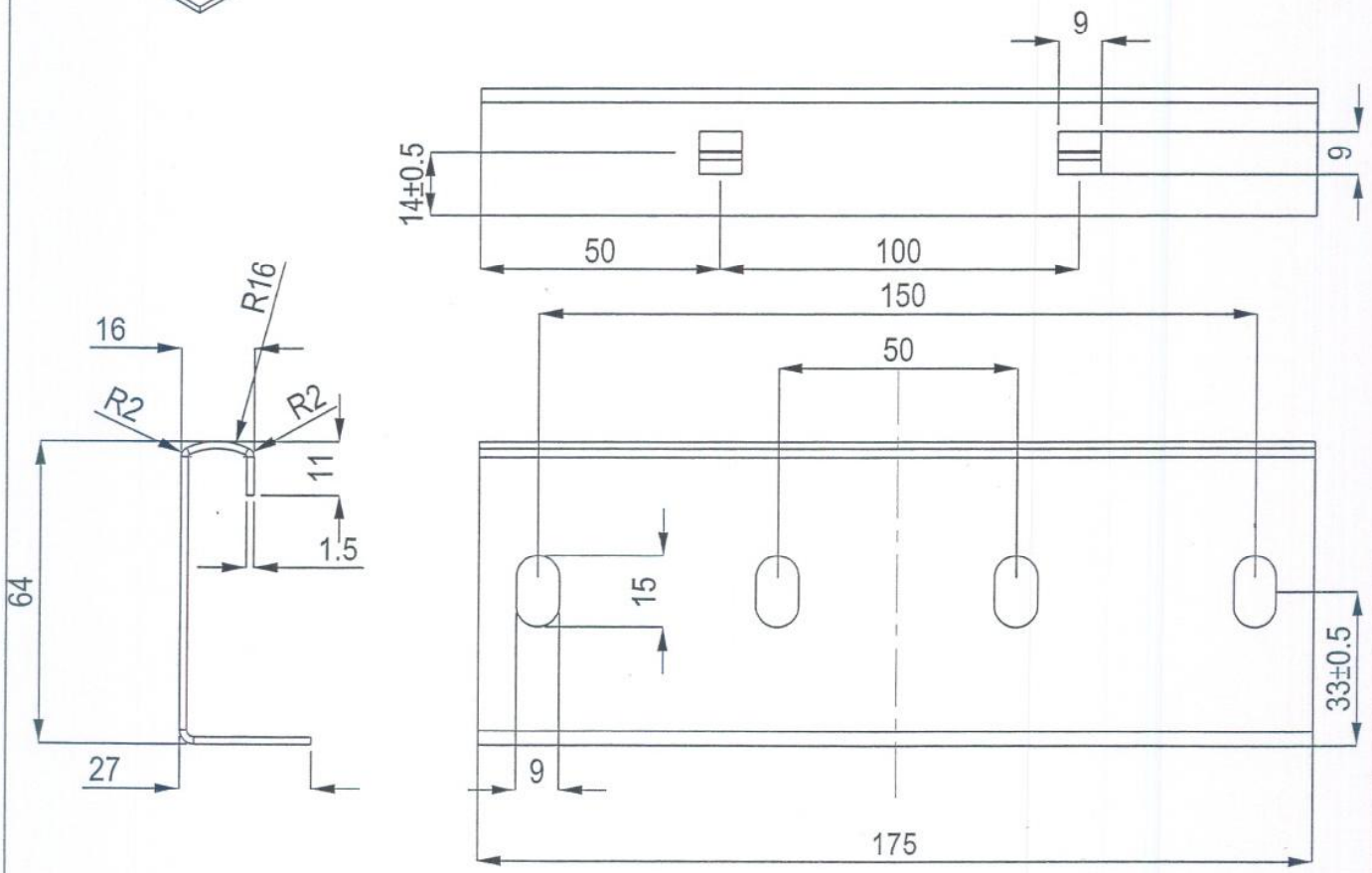
Príloha č./Appendix No. 21



	Odchyłka wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format A4
				Nr normy	PN-EN 10142+A1:1997			Arkusz
				p□□fabrykat (nr normy)				Arkuszy
Projektował	J.GROCHOWSKI		Data	20.10.05	Nazwa rysunku	LDOCH60E LDOCH60		
Rysował	J.Grochowski			20.10.05				
Sprawdził	T.WLODARCZYK			20.10.05				
Zatwierdził	J.KLICZEK			20.10.05	Nr programu			Nr zmiany
					Nr rysunku	861400 860600		

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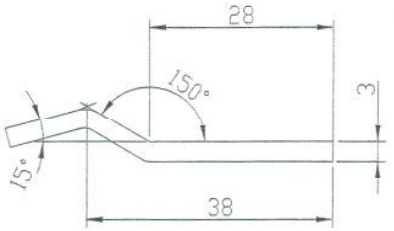

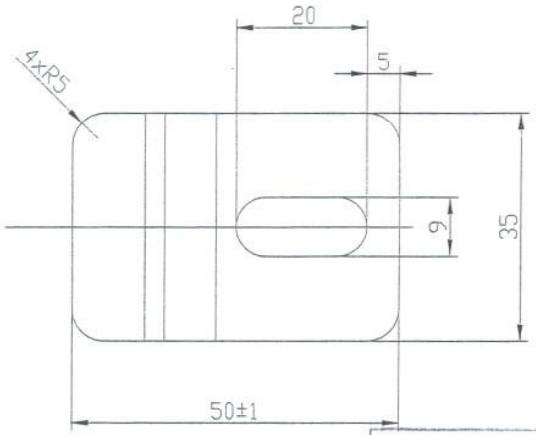

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Dokument č./Document No. FIRES-FR-109-06-ANNEX

Príloha č./Appendix No. 22

	Dachyika wyniarów) nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format A4
				Nr normy	PN-EN 10142 + A1 : 1997	0.025	1:1	Arkusz 1
				półfabrykat (nr normy)				Arkuszy 1

	Nazwisko	Podpis	Data	Nazwa rysunku
Projektował	T.Grudniewski		2004.12.29	
Rysował	J.Josiński		2004.12.29	ZMO
Sprawdził	J.Kliczek		2004.12.29	
Zatwierdził	J.Kliczek		2004.12.29	Nr programu maszynowego ---

Nr zmiany

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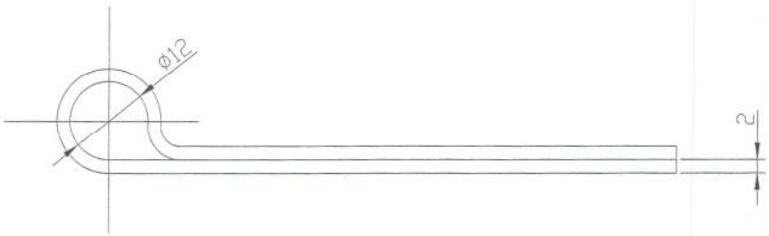
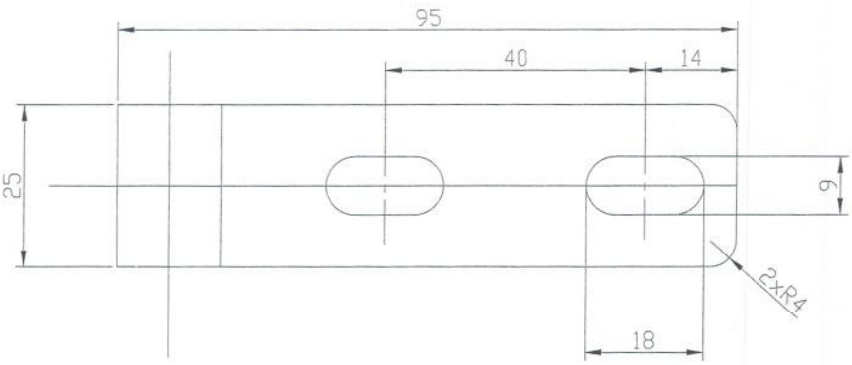
Nr rysunku 802900





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Dokument č. / Document No. FIRES-FR-1109-06-ALKE

Príloha č./Appendix No. 23

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

Projektował	J.Grochowski		Data	Nazwa rysunku	
Rysował	J.Grochowski	Podpis		UPW□	
Sprawdził	J.Kliczek			Nr programu maszynowego ---	Nr zmiany
Zatwierdził	J.Kliczek			Nr rysunku 803300	

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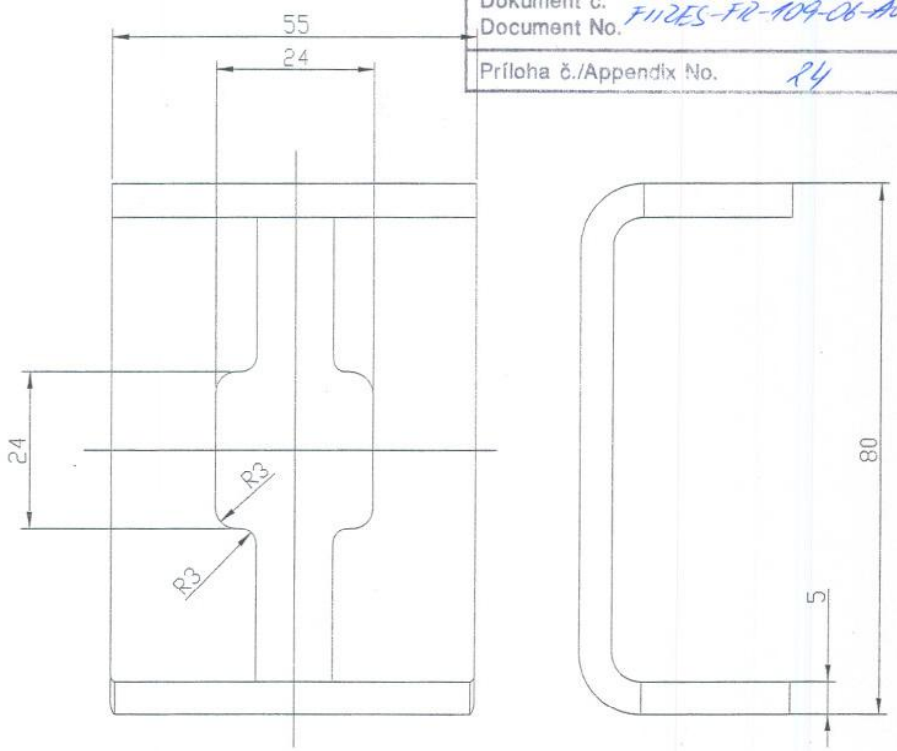
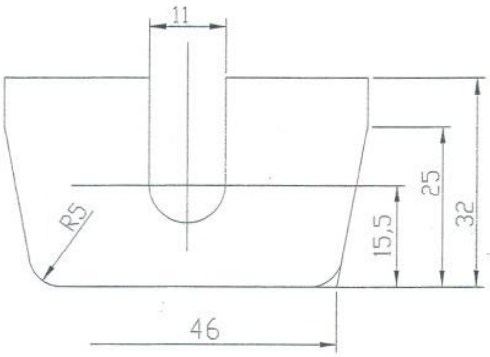
Príloha č./Appendix No. 24





Ocynk galwaniczny

Odchyłki wymiarów nietolerowanych		Materiał	Gatunek	St3S	Masa [kg]	Podziałka	Format	A4
			Nr normy	PN-EN 10142 + A1 : 1997		1:1	Arkusz	1
			półfabrykat (nr normy)				Arkuszy	1

	Nazwisko	Podpis	Data	Nazwa rysunku
Projektował	T.Grudniewski		2004.12.29	
Rysował	J.Jasiński		2004.12.29	USOV
Sprawdził	J.Kliczek		2004.12.29	
Zatwierdził	J.Kliczek		2004.12.29	Nr programu maszynowego ---

Nr zmiany

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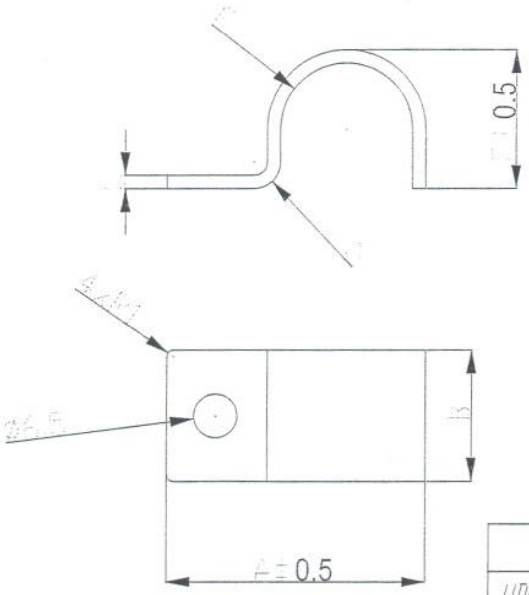
Nr rysunku: 803700



	A	B	C	E	F	G
UDF5	23	14	1.2	5	R2.5	R2.4
UDF6	24	14	1.2	6	R3	R2.4
UDF7	25	14	1.2	7	R3.5	R2.4
UDF8	26	14	1.2	8	R4	R2.4
UDF9	27	14	1.2	9	R4.5	R2.4
UDF10	28	14	1.2	10	R5	R2.4
UDF12	30	14	1.2	12	R6	R2.4
UDF14	33	20	2	15	R7	R4
UDF15	34	20	2	16	R7.5	R4
UDF16	35	20	2	17	R8	R4
UDF18	37	20	2	19	R9	R4
UDF20	39	20	2	21	R10	R4
UDF22	41	20	2	23	R11	R4
UDF25	44	20	2	26	R12.5	R4

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Príloha č./Appendix No. 25

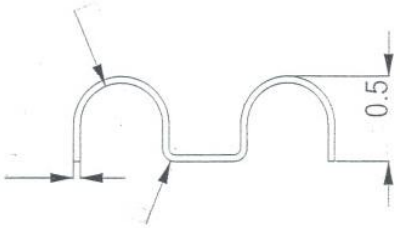
Dachyłka wymiarów nietolerowanych		Materiał: Gatunek		Masa [kg]	Podziałka 1:1	Format A4
		Nr normy	PN-EN 10142 + A1 : 1997			Arkusz 1
		półfabrykat (nr normy)				Arkuszy 1

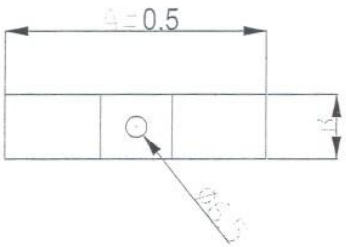
	Nazwisko	Podpis	Data	Nazwa rysunku
Projektował	J.GROCHOWSKI		20.10.04	UDF
Rysował	J.GROCHOWSKI		20.10.04	
Sprawdził	T.WŁODARCZYK		20.10.04	
Zatwierdził	J.KLICZEK		20.10.04	Nr programu naszynowego ---

Profesjonalne Systemy Tras Kablowych

Nr rysunku ---

Nr zmiany





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Príloha č./Appendix No. 26

	A	B	C	E	F	G
UEF5	38	14	1.2	5	R2.5	R2.4
UEF6	40	14	1.2	6	R3	R2.4
UEF7	42	14	1.2	7	R3.5	R2.4
UEF8	44	14	1.2	8	R4	R2.4
UEF9	46	14	1.2	9	R4.5	R2.4
UEF10	48	14	1.2	10	R5	R2.4
UEF12	52	14	1.2	12	R6	R2.4
UEF14	58	20	2	15	R7	R4
UEF15	60	20	2	16	R7.5	R4
UEF16	62	20	2	17	R8	R4
UEF18	66	20	2	19	R9	R4
UEF20	70	20	2	21	R10	R4
UEF22	74	20	2	23	R11	R4
UEF25	80	20	2	26	R12.5	R4

Odchyłka wymiarów nietolerowanych

Materiał: Gatunek; Nr normy: PN-EN 10142 + A1 : 1997; półfabrykat (nr normy)

Masa [kg]

Podziałka: 1:1

Format: A4

Arkusz: 1

Arkuszy: 1

	Nazwisko	Podpis	Data
Projektował	J.GRODCHOWSKI		20.10.04
Rysował	J.GRODCHOWSKI		20.10.04
Sprawdził	T.WŁODARCZYK		20.10.04
Zatwierdził	J.KLICZEK		20.10.04

Nazwa rysunku: UEF

Nr programu maszynowego: ---

Nr zmiany

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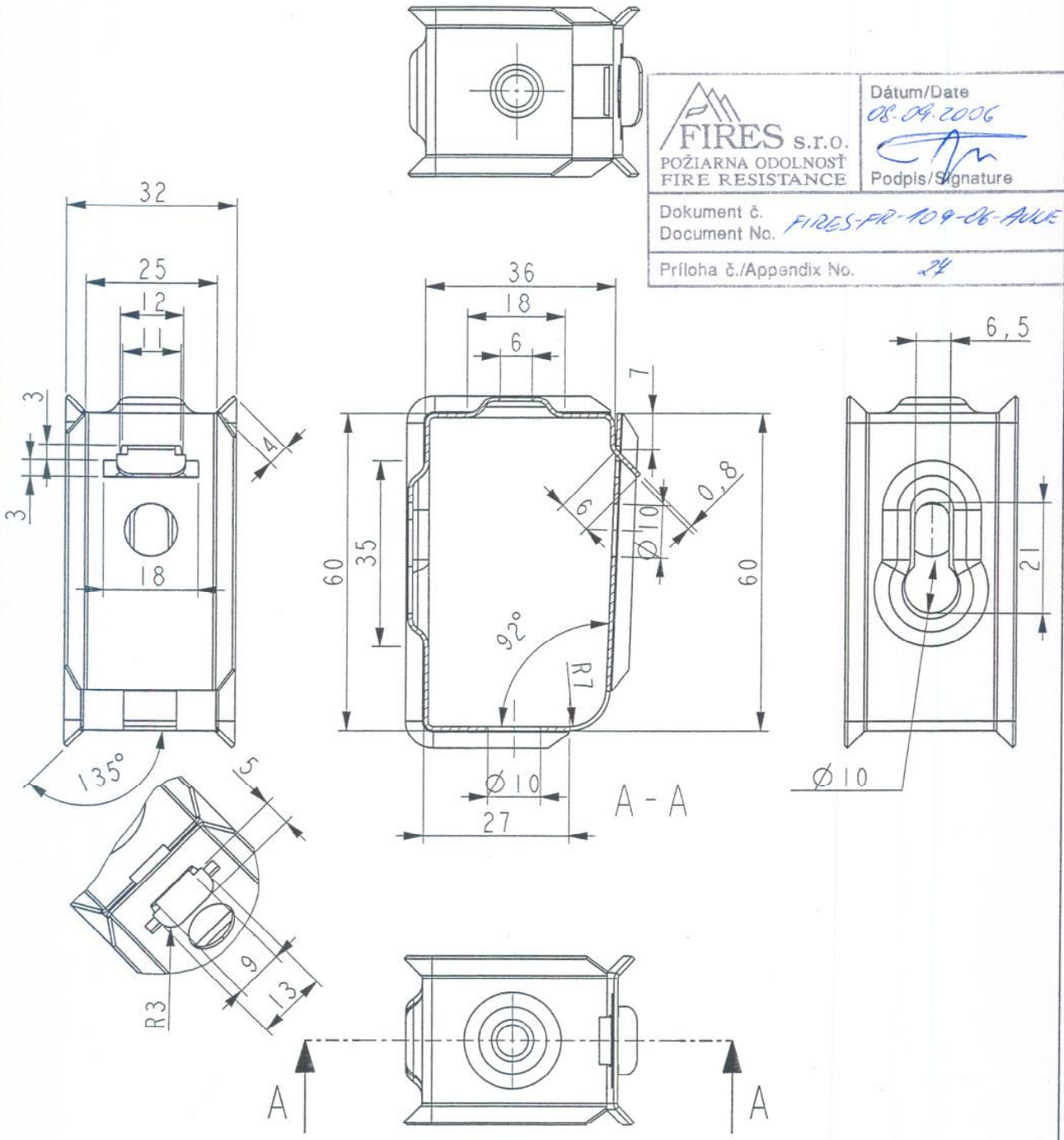
Nr rysunku: ---



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FIRE RESISTANCE

Dátum/Date 08.09.2006
Podpis/Signature

Dokument č. / Document No. FIRES-FR-109-06-AUKE

Príloha č./Appendix No. 24

Odchyłka wymiarów nietolerowanych	Materiał: Gatunek		Masa [kg]	Podziałka 1 : 1	Format A4	
	Nr normy	PN-EN 10142 + A1 : 1997			Arkusz	
	półfabrykat (nr normy)				Arkuszy	

Projektował	Nazwisko	Podpis	Data	Nazwa rysunku
Rysował	J.Grochowski			OZMO
Sprawdził				
Zatwierdził				Nr programu / Nr rysunku / Nr zmiany

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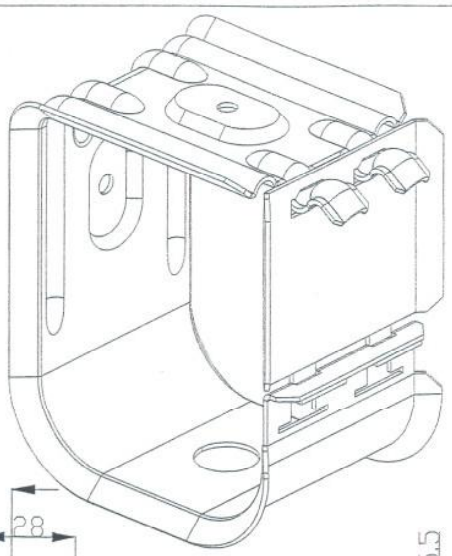
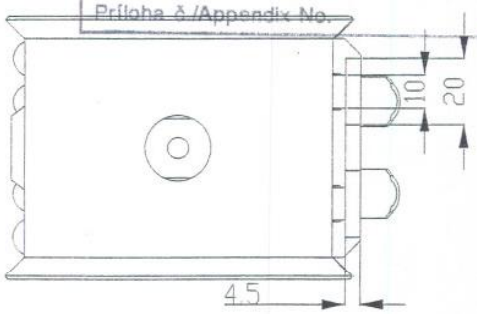
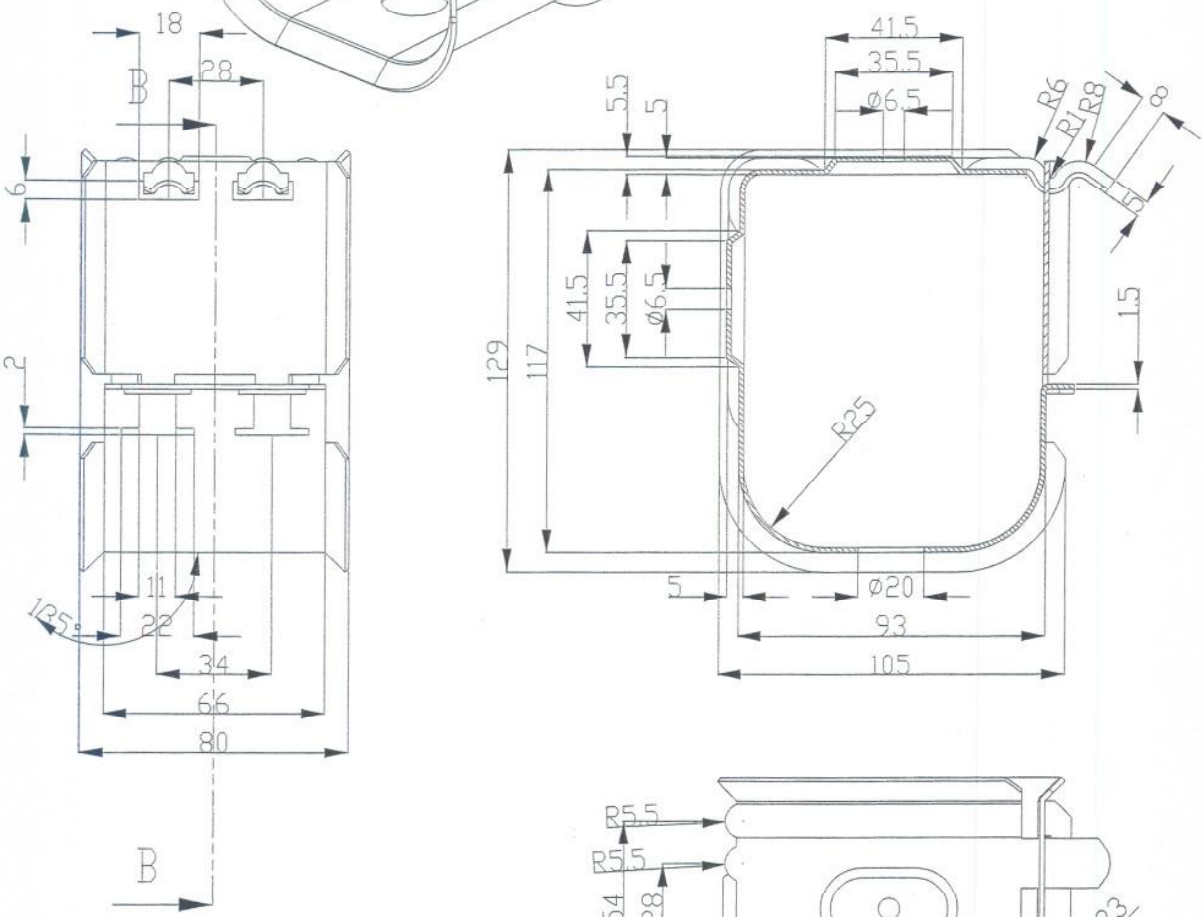
Dokument č. / Document No. FIRES-FR-109-06-AKKE

Príloha č./Appendix No. 28







Odchyłki wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format A4
			Nr normy	PN-EN 10142 + A1 : 1997		1:2	Arkusz 1
			półfabrykat (nr normy)				Arkuszy 1

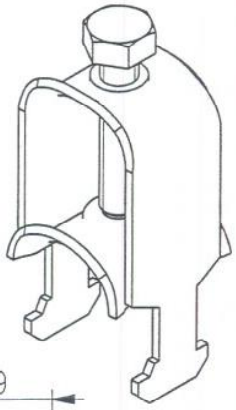
Projektował	T.Grudniewski		Data	Nazwa rysunku: Obejma zatrzaskowa OZOE
Rysował	T.Grudniewski			
Sprawdził	J.Kliczek			
Zatwierdził	J.Kliczek			Nr programu maszynowego

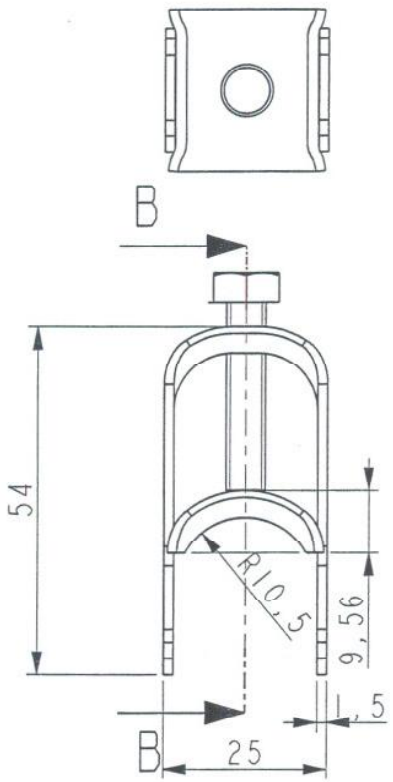
Nazwisko | Podpis

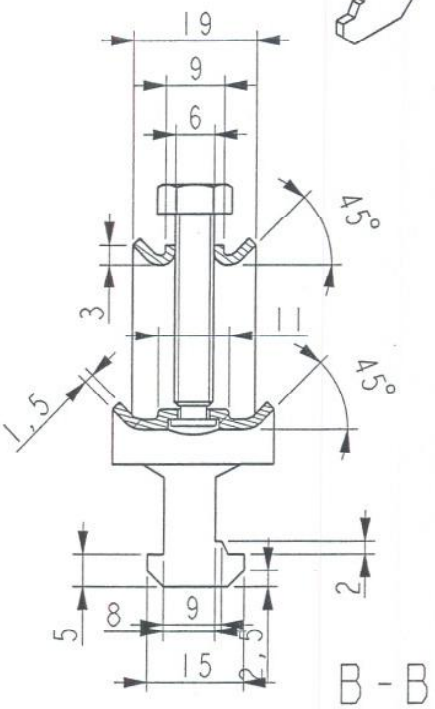
Nr zmiany

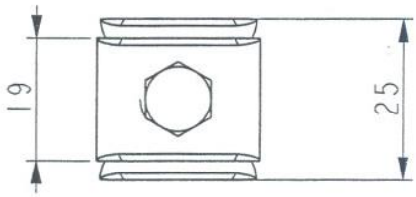
Profesjonalne Systemy Tras Kablowych

Nr rysunku









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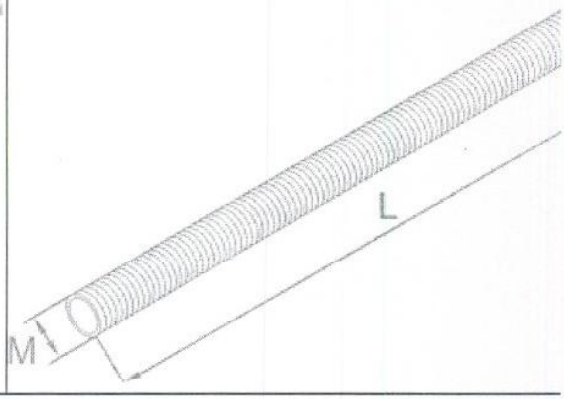
Príloha č./Appendix No. 29

	Odchylka wymiarów nietolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka 1:1	Format A4
				Nr normy	PN-EN 10327:2005			Arkusz 1
				półfabrykat (nr normy)				Arkuszy 1
Projektował					Nazwa rysunku			
Rysował	Nazwisko J.Grochowski	Podpis	Data 28-Jun-06					
Sprawdził								
Zatwierdził				Nr programu maszynowego			Nr zmiany	
BAKS Profesjonalne Systemy Tras Kablowych				Nr rysunku				

Threaded rod PGM



Threaded rod PGM...					
SYMBOL	thread M mm	length L mm	kg 1 pc.		catalogue number
PGM5/1	5	1000	0,12	50	650101
PGM5/2	5	2000	0,24	50	650201
PGM6/1	6	1000	0,16	50	650301
PGM6/2	6	2000	0,23	50	650401
PGM8/01	8	100	0,03	50	650501
PGM8/02	8	200	0,06	50	650601
PGM8/03	8	300	0,09	50	650701
PGM8/1	8	1000	0,32	50	650801
PGM8/2	8	2000	0,64	25	650901
PGM10/1	10	1000	0,49	25	651001
PGM10/2	10	2000	1,00	25	651101
PGM12/1	12	1000	0,72	25	651201
PGM12/2	12	2000	1,44	25	651301
PGM10/1	10	1000	0,49	25	651001
PGM12/1	12	1000	0,72	25	651201

Application:
Suspending of cable channels.

Material:
Steel, electro galvanized
On order: Powder painting

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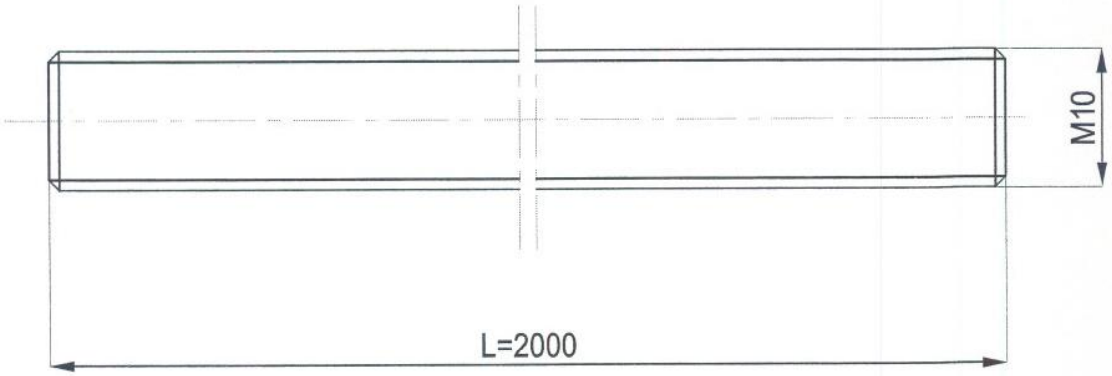
Dokument č./Document No. FIRES-FR-109-06-ANJE

Príloha č./Appendix No. 30



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Príloha č./Appendix No. 37

Odchyłka wymiarów) nietolerowanych	Materiał: Gatunek	5,8	Masa [kg]	Podziałka	Format	A4
	Nr normy	——	---	2:1	Arkusz	1
	półfabrykat (nr normy)				Arkuszy	1

	Nazwisko	Podpis	Data	Nazwa rysunku
Projektował	J.GROCHOWSKI		20.10.05	PGM10
Rysował	J.Grochowski		20.10.05	
Sprawdził	T.WLODARCZYK		20.10.05	
Zatwierdził	J.KLICZEK		20.10.05	Nr programu maszynowego ---

Nr zmiany

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Nr rysunku ---