TEST REPORT FIRES-FR-162-07-AUNE

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

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FIRES
The Experts on Fire Safety

SNAS
Reg. No. 041/S-159

Testing laboratory No. 041/S-159 accredited by
Slovak national accreditation service

TEST REPORT

Test report number: **FIRES-FR-162-07-AUNE**
Tested property: Function in fire
Test method: DIN 4102 – 12:1998-11

Date of issue: **20. 09. 2007**

Name of the product: Cables with integrity function FE180/E90
Type – NHXH, NHXCH, (N)HXH, (N)HXCH, HTKSH, 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
NIEDAX KLEINHUIS POLSKA Sp. z o. o., ul, Zagórska 133,
42-680 Tarnowskie Góry, Poland - producer of construction
CABLOFIL, ul. T. Kościuszki 227, 40-600 Katowice, Poland - producer of construction
OBO BETTERMANN Polska Sp. z o.o., ul. Krakowiaków 68/70, Warszawa, Poland - producer of construction
HILTI Center I, ul. Pulawska 395, 02-801 Warszawa, Poland - producer of construction
Spelsberg elektro sp. z o.o., Aleja Mlodych 26-28, 41-106 Siemianowice Ślaskie, Poland - producer of construction

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

Task No.: PR-07-0245
Specimen received: 06. 08. 2007
Date of the fire test: 09. 08. 2007
Technician responsible for the technical side of this report: Miroslav Hudák

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Number of pages:	6	Number of appendices:	44
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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 and communication non-halogen cables with circuit integrity maintenance. Persons witnessing the test:

Representatives of the sponsor: Mrs. Alina Rychlik - Paradowska (Zaklady Kablowe Bitner)
Mr. Jan Krajewski (Zaklady Kablowe Bitner)
Mr. Grzegorz Rokicki (CABLOFIL)

Test directed by: Marek Gorlický
Test carried out by: 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 (-50 až +150) Pa	pressure inside the test furnace
F 06 501, F 06 502, F 06 503, F 06 504 F 06 505, F 06 506, F 06 507, F 06 508	Plate thermometers	temperature inside the test furnace, according to EN 1363-1 a DIN 4102-2
F 06 701	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 54 055	Racking meter	-
F 57 007	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 businesses BAKS, NIEDAX, OBO BETTERMANN, HILTI, Spelsberg and CABLOFIL 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 comprised from power and communication non-halogen cables and supportings systems:
- BAKS with accessories – ceiling ledges with clamps UKO1, clamps UEF and sleeves – OZMO;
- NIEDAX with accessories – clamps SAS;
- HILTI with accessories – clamps X-FB;
- OBO Bettermann with accessories – trays WDK and sleeves (type 1015);
- Spelsberg with accessories – boxes WKE;
- CABLOFIL with accessories – basket cable trays.

Cables:	NHXH - 4x1,5 RE E90 MICA	(2 x)
	NHXH - 4x50 RM E90 MICA	(4 x)
	(N)HXH - 4x1,5 RE E90 CERAMIC	(2 x)
	(N)HXCH - 4x1,5 RE/1,5 E90 CERAMIC	(4 x)
	(N)HXCH - 4x10 RE/10 E90 CERAMIC	(2 x)
	JE-H(St)H - 2x2x0,8 E90 MICA	(17 x)
	JE-H(St)H - 2x2x0,8 E90 CERAMIC	(4 x)
	HTKSH(ekw) - 2x1 FE180/PH90	(13 x)

Supporting system BAKS: ceiling installation were used for specimen test.
Ceiling installation: was made by cable clips UEF and sleeves OZMO, which were fixed to ceiling by dowels (type SRO M6x30) in spacing of 300 mm and by ceiling ledges (type SDOC 600) which were fixed to ceiling by three dowels (type PRSO M8x75) in spacing of 300 mm. Cables were fixed to ledges by clips (type UKO1) in spacing of 300 mm.
Types of individual components are from catalogue BAKS 8/2006.
Supporting system NIEDAX: ceiling installation were used for specimen test.
Ceiling installation: was made by cable clips SAS depending on the diameter of cable which were fixed to ceiling by dowels (type DAM M6x50) in spacing of 300 mm and boxes Spelsberg WKE 2 and WKE 3.
Supporting system OBO Bettermann: ceiling installation were used for specimen test.
Ceiling installation: was made by cable sleeves (type 1015) depending on the diameter of cable which were fixed to ceiling by dowels (type FNA II 6) in spacing of 300 mm and trays WDK 20050.
Supporting system HILTI: ceiling installation were used for specimen test.
Ceiling installation: was made by cable clips X-FB depending on the diameter of cable which were fixed to ceiling by nails (type DBZ, X-DNI, X-DW, X-ZF, X-GN, X-GHP) in spacing of 300 mm.
Supporting system CABLOFIL: suspension track were used for specimen test.
Suspension track No. 1: was made by hangers (type C41S400) which were fixed to ceiling by two dowels (type HKD-S10x40) in spacing of 1200 mm. Booms (type CU150) were fixed by screws (type VHM10x40) at each hanger. Trays (type CF54/100) were fixed at booms. Bearing system was loaded with 10 kg/m.
Suspension track No. 2: was made by hangers combined of two console (type CEQ100) and threaded bar M8 to ceiling by dowels (type HKD-S8x40) in spacing of 1200 mm. Trays (type CF54/50) were fixed at consoles. Bearing system was loaded with 2 kg/m.
Suspension track No. 3: was made by hangers combined of horizontal support (type R21S100) and two threaded bar M8 with washers and nuts M8 to ceiling by two dowels (type HKD-S8x40) in spacing of 1200 mm. Trays (type CF54/50) were fixed at horizontal supports. Bearing system was loaded with 5 kg/m.
Suspension track No. 4: was made by hangers combined of horizontal support (type CM50XL) and threaded bar M8 with washers and nuts M8 to ceiling by dowels (type HKD-S8x40) in spacing of

1200 mm. Trays (type CF30/100) were fixed at horizontal supports. Bearing system was loaded with 5 kg/m. Types of individual components are from catalogue CABLOFIL 9/2006.

Cable penetration through the wall of test furnace was sealed by mineral wool Rockwool.
Loading with steel chain were 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, 150 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
46,3	2,1	23,8	0,5

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]**
09. 08. 2007	58,0	19,5

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
Specimen 1: cable (N)HXCH - 4x10 RE/10 E90 CERAMIC		**74 minutes**
Specimen 2: cable (N)HXCH - 4x10 RE/10 E90 CERAMIC		**65 minutes**
Specimen 3: cable (N)HXH - 4x1,5 RE E90 CERAMIC		**90 minutes no failure/interruption**
Specimen 4: cable (N)HXH - 4x1,5 RE E90 CERAMIC		**70 minutes**
Specimen 5: cable (N)HXCH - 4x1,5 RE/1,5 E90 CERAMIC		**85 minutes**
Specimen 6: cable (N)HXCH - 4x1,5 RE/1,5 E90 CERAMIC		**63 minutes**
Specimen 7: cable NHXH - 4x50 RM E90 MICA		**64 minutes**
Specimen 8: cable NHXH - 4x50 RM E90 MICA		**79 minutes**
Specimen 9: cable (N)HXCH - 4x1,5 RE/1,5 E90 CERAMIC		**68 minutes**
Specimen 10: cable (N)HXCH - 4x1,5 RE/1,5 E90 CERAMIC		**62 minutes**
Specimen 11: cable NHXH - 4x50 RM E90 MICA		**76 minutes**
Specimen 12: cable NHXH - 4x50 RM E90 MICA		**71 minutes**
Specimens 13,14: cables NHXH - 4x1,5 RE E90 MICA		**90 minutes no failure/interruption**
Specimens 52,53: cables JE-H(St)H - 2x2x0,8 E90 MICA		**90 minutes no failure/interruption**
Specimen 54A:	bundle of six cables HTKSH(ekw) - 2x1 FE180/PH90	**62 minutes**
Specimen 54B:		**52 minutes**
Specimens 55A,B:		**50 minutes**
Specimen 56A:		**62 minutes**
Specimen 56B:		**60 minutes**
Specimens 57, 58, 59, 60, 61, 62:	bundle of six cables JE-H(St)H - 2x2x0,8 E90 MICA	**90 minutes no failure/interruption**
Specimens 63, 64: cables JE-H(St)H - 2x2x0,8 E90 MICA		**90 minutes no failure/interruption**
Specimens 65: cables JE-H(St)H - 2x2x0,8 E90 MICA		**90 minutes no failure/interruption**
Specimens 66: cables JE-H(St)H - 2x2x0,8 E90 CERAMIC		**57 minutes**
Specimens 67: cables JE-H(St)H - 2x2x0,8 E90 MICA		**86 minutes**
Specimens 68A,B: cables HTKSH(ekw) - 2x1 FE180/PH90		**55 minutes**
Specimen 69: cable JE-H(St)H - 2x2x0,8 E90 MICA		**90 minutes no failure/interruption**
Specimens 70A,B: cables HTKSH(ekw) - 2x1 FE180/PH90		**51 minutes**
Specimen 71: cable HTKSH(ekw) - 2x1 FE180/PH90		**76 minutes**
Specimen 72: cable JE-H(St)H - 2x2x0,8 E90 MICA		**90 minutes no failure/interruption**
Specimens 73A,B: cables HTKSH(ekw) - 2x1 FE180/PH90		**56 minutes**
Specimens 74: cables JE-H(St)H - 2x2x0,8 E90 CERAMIC		**50 minutes**
Specimen 75: cable JE-H(St)H - 2x2x0,8 E90 MICA		**54 minutes**

The fire test was discontinued in 92nd minute at the request of sponsor.

Specimens S1 – S14 were tested by three-phase voltage supply 3 x 230/400V with bulbs 240V / 60 W.
Specimens S52 – S75 were tested by one-phase voltage supply 1 x 110V with LED diods 3V / 0,03W.

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: Ing. Štefan Rástocký
Translated by: Ing. Marek Rusnák

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

Ing. Štefan Rástocký
leader of the testing laboratory

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

Miroslav Hudák
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

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Appendix 8	Layout of cables in the test furnace
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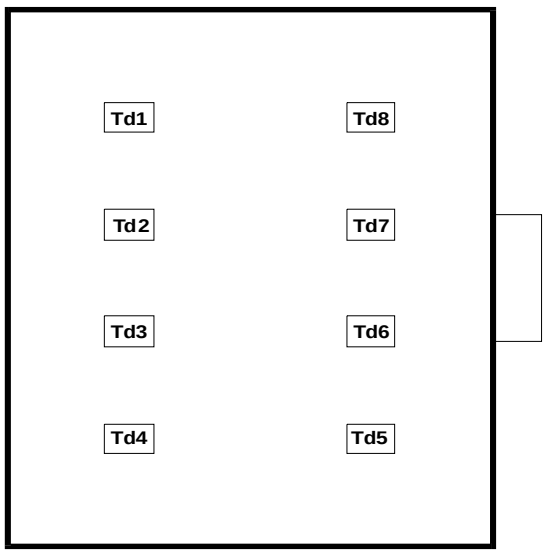
Measured values inside the test furnace

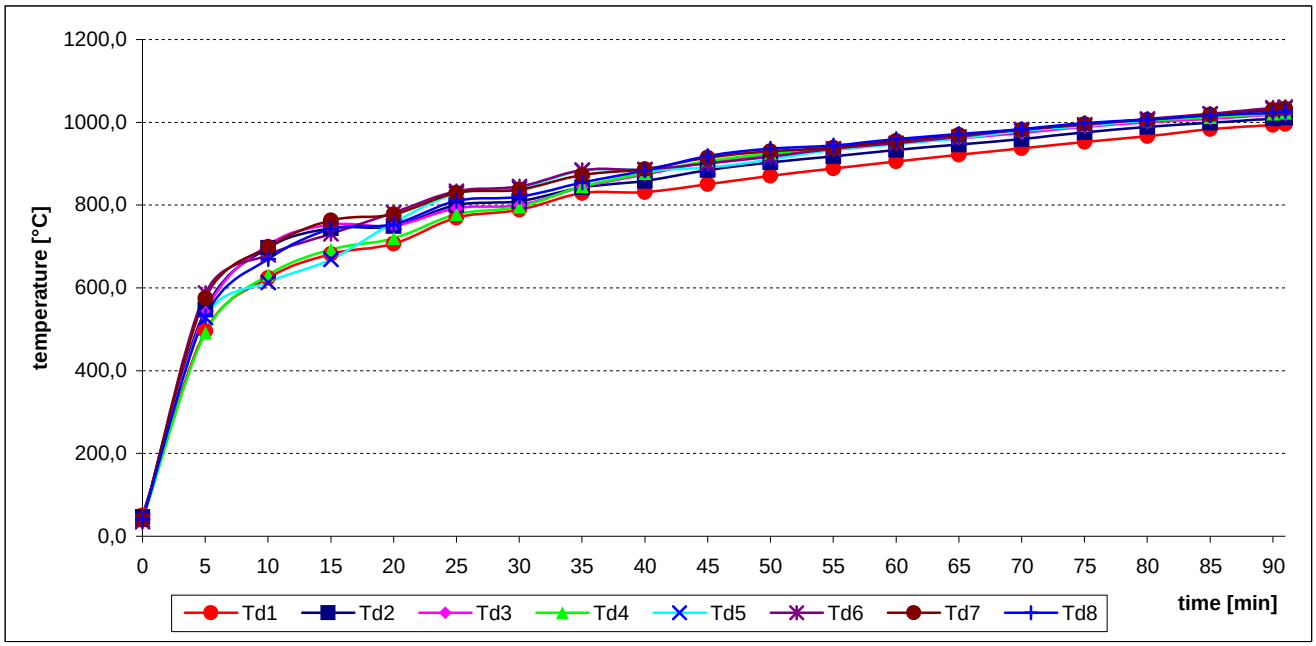
Time t [min]	Temperature [°C]											Deviation d_e [%]	Pressure p [Pa]
	Td1	Td2	Td3	Td4	Td5	Td6	Td7	Td8	Tave	Tn	To		
0	50,4	46,3	45,7	39,8	39,2	34,7	39,3	40,7	42,0	20,0	18,2	0,0	5,0
5	495,6	548,0	540,1	491,5	527,8	587,4	574,9	531,7	537,1	576,4	18,7	-8,8	12,8
10	623,7	696,8	703,4	631,3	613,3	679,8	698,7	669,3	664,5	678,4	19,0	-4,5	14,0
15	682,3	744,1	753,2	692,9	668,7	730,7	763,2	742,0	722,1	738,6	19,3	-3,5	14,3
20	706,9	749,1	749,9	719,9	757,7	781,7	777,5	753,5	749,5	781,4	18,4	-3,3	14,8
25	769,2	800,0	792,8	777,6	827,9	833,7	829,4	810,0	805,1	814,6	18,1	-2,6	16,1
30	788,5	809,8	800,4	795,7	840,5	844,8	837,6	820,7	817,3	841,8	17,6	-2,5	16,3
35	828,5	842,7	843,8	845,3	883,4	884,3	872,6	854,3	856,9	864,8	17,5	-2,3	19,3
40	831,3	858,6	873,7	877,1	885,1	885,7	887,2	883,8	872,8	884,7	17,2	-2,2	18,9
45	850,5	884,9	904,1	906,4	890,6	901,0	914,5	918,7	896,3	902,3	17,5	-2,0	19,2
50	870,3	903,1	920,7	925,0	909,8	917,2	930,1	936,0	914,0	918,1	18,5	-1,8	18,6
55	888,1	917,5	933,3	938,2	934,1	936,1	938,8	944,2	928,8	932,3	19,1	-1,7	18,7
60	905,5	933,1	948,4	953,0	947,2	949,4	954,6	959,7	943,9	945,3	18,8	-1,5	18,9
65	921,3	946,6	961,2	965,5	961,0	965,3	969,4	971,7	957,8	957,3	18,7	-1,4	18,6
70	937,5	959,9	974,3	980,2	979,4	983,1	982,2	983,8	972,6	968,4	18,9	-1,3	18,5
75	952,6	975,7	988,7	992,6	991,0	994,0	995,9	998,2	986,1	978,7	19,0	-1,1	17,4
80	966,6	989,2	999,8	1004,0	1005,0	1008,0	1006,0	1007,0	998,5	988,4	18,8	-1,0	18,1
85	983,2	999,1	1008,0	1012,0	1020,0	1021,0	1018,0	1017,0	1010,3	997,4	18,8	-0,8	18,4
90	993,6	1009,0	1018,0	1021,0	1033,0	1035,0	1030,0	1023,0	1020,8	1005,9	18,7	-0,7	18,0
91	995,8	1011,0	1019,0	1023,0	1035,0	1037,0	1033,0	1026,0	1022,7	1007,6	18,7	-0,7	17,9

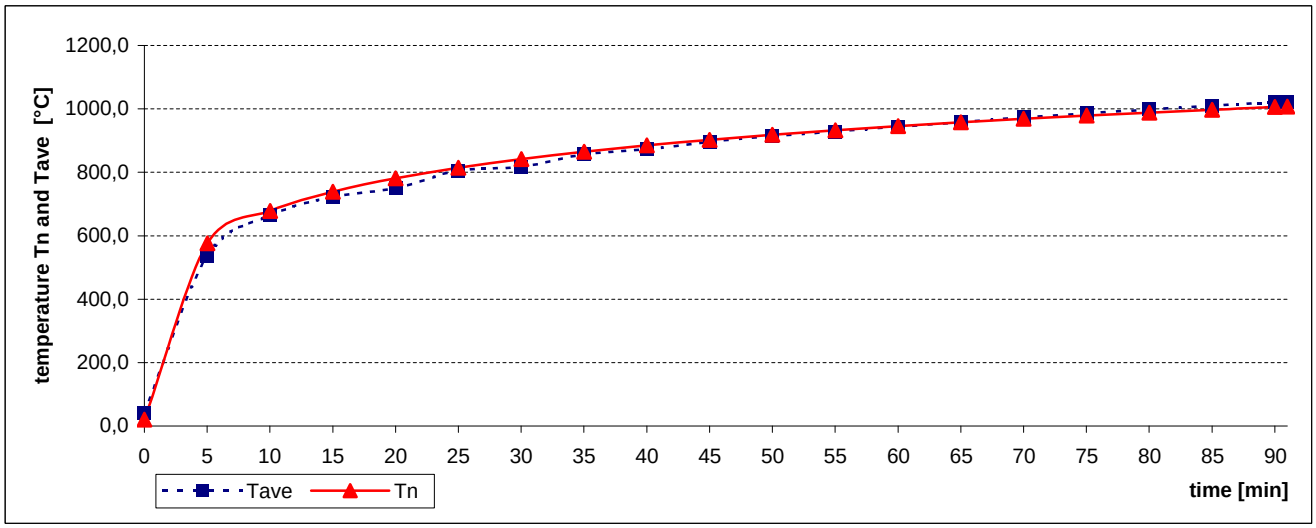
Tave Average temperature in the test furnace calculated from plate thermometers
Tn Standard temperature in the test furnace laid down to test guideline
To Ambient temperature
d_e Deviation of the average temperature from the standard temperature calculated according to test guideline
p Pressure inside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

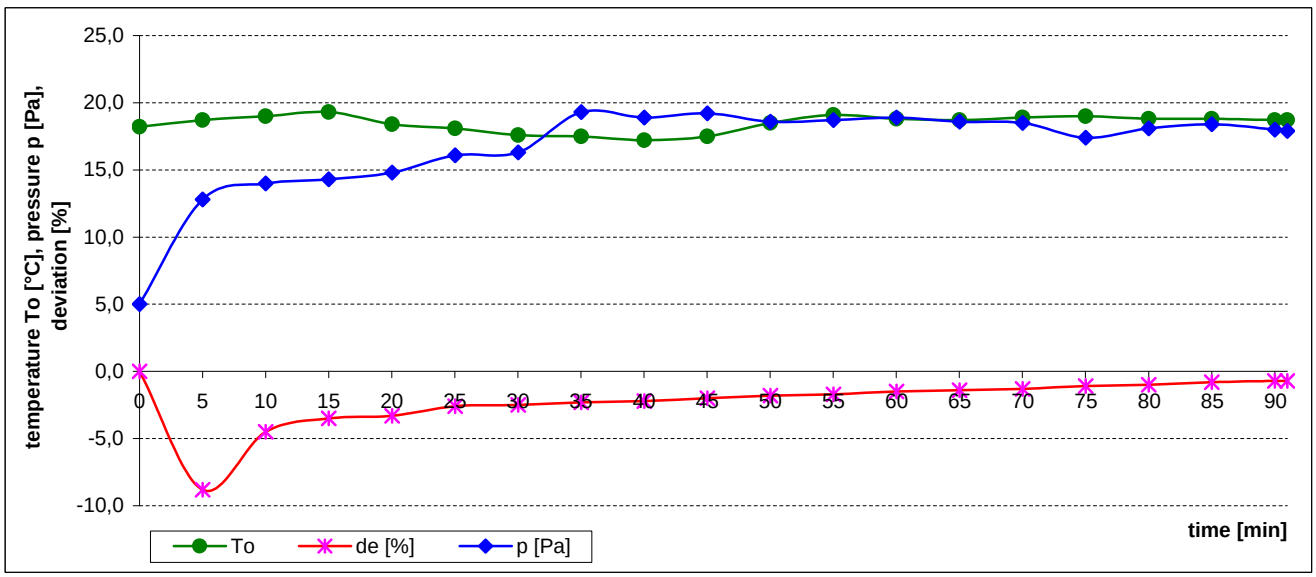
Layout of measuring points in the test furnace:



Measured values inside the test furnace / graph







Measured time of tested specimens from S1 to S8

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S1	1-L1	74:27
	2-L2	74:27
	3-L3	74:27
	4-PEN	74:27
S2	5-L1	x
	6-L2	65:24
	7-L3	65:24
	8-PEN	x
S3	9-L1	no failure / interruption
	10-L2	no failure / interruption
	11-L3	no failure / interruption
	12-PEN	no failure / interruption
S4	13-L1	70:59
	14-L2	70:59
	15-L3	x
	16-PEN	x
S5	17-L1	x
	18-L2	x
	19-L3	85:20
	20-PEN	x
S6	21-L1	63:27
	22-L2	63:27
	23-L3	x
	24-PEN	x
S7	25-L1	64:36
	26-L2	64:36
	27-L3	x
	28-PEN	x
S8	29-L1	79:46
	30-L2	79:46
	31-L3	x
	32-PEN	x

Specimens 1,2: cables (N)HXCH - 4x10 RE/10 E90 CERAMIC
Specimens 3,4: cables (N)HXH - 4x1,5 RE E90 CERAMIC
Specimens 5.6: cables (N)HXCH - 4x1,5 RE/1,5 E90 CERAMIC
Specimens 7,8: cables NHXH - 4x50 RM E90 MICA

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 S9 to S14

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S9	33-L1	68:38
	34-L2	68:38
	35-L3	68:38
	36-PEN	68:38
S10	37-L1	x
	38-L2	x
	39-L3	62:25
	40-PEN	x
S11	41-L1	x
	42-L2	x
	43-L3	76:13
	44-PEN	x
S12	45-L1	71:06
	46-L2	71:06
	47-L3	x
	48-PEN	x
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

Specimens 9,10: cables (N)HXCH - 4x1,5 RE/1,5 E90 CERAMIC
Specimens 11,12: cables NHXH - 4x50 RM E90 MICA
Specimens 13,14: cables NHXH - 4x1,5 RE E90 MICA

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 S52 to S59

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S52	209-L	no failure / interruption
	210-PEN	no failure / interruption
	211-L	no failure / interruption
	212-PEN	no failure / interruption
S53	213-L	no failure / interruption
	214-PEN	no failure / interruption
	215-L	no failure / interruption
	216-PEN	no failure / interruption
S54A	217-L	62:52
	218-PEN	62:52
S54B	219-L	52:59
	220-PEN	52:59
S55A	221-L	50:19
	222-PEN	50:19
S55B	223-L	50:00
	224-PEN	50:00
S56A	225-L	62:53
	226-PEN	62:53
S56B	227-L	60:53
	228-PEN	60:53
S57	229-L	no failure / interruption
	230-PEN	no failure / interruption
	231-L	no failure / interruption
	232-PEN	no failure / interruption
S58	233-L	no failure / interruption
	234-PEN	no failure / interruption
	235-L	no failure / interruption
	236-PEN	no failure / interruption
S59	237-L	no failure / interruption
	238-PEN	no failure / interruption
	239-L	no failure / interruption
	240-PEN	no failure / interruption

Specimens 52,53: cables JE-H(St)H - 2x2x0,8 E90 MICA
Specimens 54,55,56: bundle of six cables HTKSH(ekw) - 2x1 FE180/PH90
Specimens 57,58,59,60,61,62: bundle of six cables JE-H(St)H - 2x2x0,8 E90 MICA

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 S60 to S67

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S60	241-L	no failure / interruption
	242-PEN	no failure / interruption
	243-L	no failure / interruption
	244-PEN	no failure / interruption
S61	245-L	no failure / interruption
	246-PEN	no failure / interruption
	247-L	no failure / interruption
	248-PEN	no failure / interruption
S62	249-L	no failure / interruption
	250-PEN	no failure / interruption
	251-L	no failure / interruption
	252-PEN	no failure / interruption
S63	253-L	no failure / interruption
	254-PEN	no failure / interruption
	255-L	no failure / interruption
	256-PEN	no failure / interruption
S64	257-L	no failure / interruption
	258-PEN	no failure / interruption
	259-L	no failure / interruption
	260-PEN	no failure / interruption
S65	261-L	no failure / interruption
	262-PEN	no failure / interruption
	263-L	no failure / interruption
	264-PEN	no failure / interruption
S66	265-L	57:37
	266-PEN	57:37
	267-L	x
	268-PEN	x
S67	269-L	86:21
	270-PEN	86:21
	271-L	x
	272-PEN	x

Specimens 57,58,59,60,61,62: bundle of six cables JE-H(St)H - 2x2x0,8 E90 MICA
Specimens 63,64: cables JE-H(St)H - 2x2x0,8 E90 MICA
Specimens 65: cables JE-H(St)H - 2x2x0,8 E90 MICA
Specimens 66: cables JE-H(St)H - 2x2x0,8 E90 CERAMIC
Specimens 67: cables JE-H(St)H - 2x2x0,8 E90 MICA

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 S68 to S75

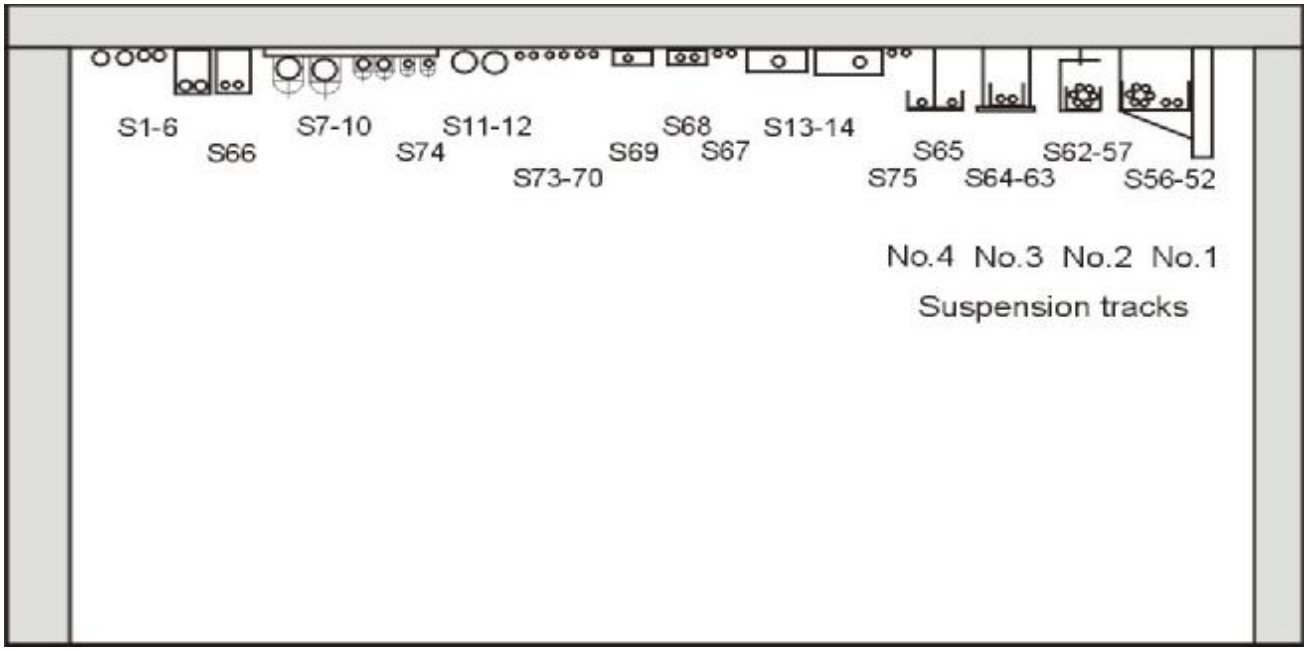
Specimen	Bulbs	Time to permanent failure / interruption [min:s]
S68A	273-L	55:29
	274-PEN	55:29
S68B	275-L	55:17
	276-PEN	55:17
S69	277-L	no failure / interruption
	278-PEN	no failure / interruption
	279-L	no failure / interruption
	280-PEN	no failure / interruption
S70A	281-L	51:10
	282-PEN	51:10
S70B	283-L	51:18
	284-PEN	51:18
S71A	285-L	76:33
	286-PEN	76:33
S71B	287-L	-
	288-PEN	-
S72	289-L	no failure / interruption
	290-PEN	no failure / interruption
	291-L	no failure / interruption
	292-PEN	no failure / interruption
S73A	293-L	56:38
	294-PEN	56:38
S73B	295-L	56:17
	296-PEN	56:17
S74	297-L	50:06
	298-PEN	50:06
	299-L	x
	300-PEN	x
S75	301-L	54:14
	302-PEN	54:14
	303-L	54:49
	304-PEN	54:49

Specimens 68: cables HTKSH(ekw) - 2x1 FE180/PH90
Specimen 69: cable JE-H(St)H - 2x2x0,8 E90 MICA
Specimens 70: cables HTKSH(ekw) - 2x1 FE180/PH90
Specimen 71: cable HTKSH(ekw) - 2x1 FE180/PH90
Specimen 72: cable JE-H(St)H - 2x2x0,8 E90 MICA
Specimens 73: cables HTKSH(ekw) - 2x1 FE180/PH90
Specimens 74: cables JE-H(St)H - 2x2x0,8 E90 CERAMIC
Specimen 75: cable JE-H(St)H - 2x2x0,8 E90 MICA

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

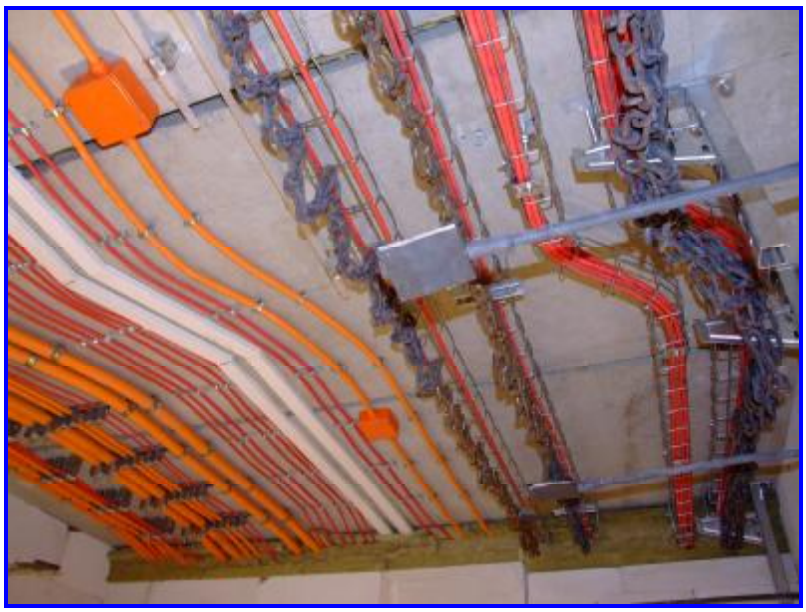
Signal cables were tested by three-phase voltage supply 1 x 110V with LED diods 3V / 0,3W. Circuit breakers with rating 3 A were used.

Layout of cables in the test furnace

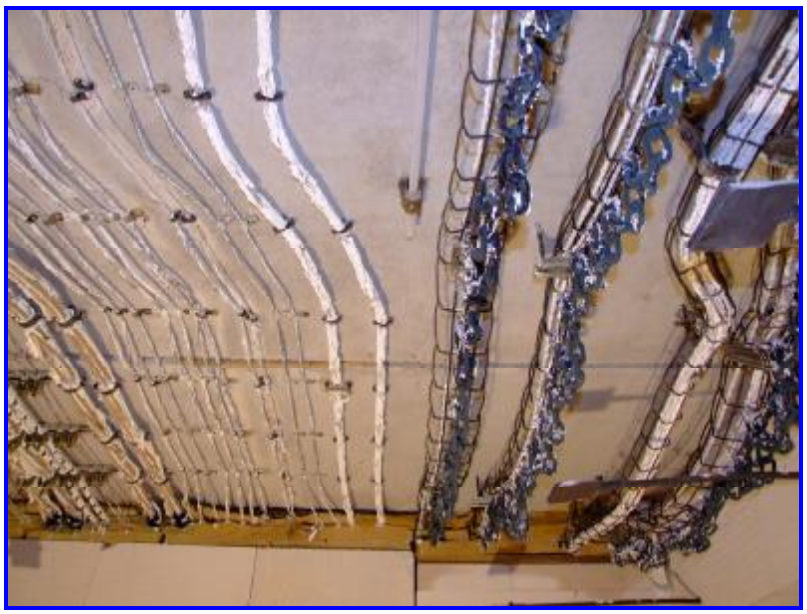


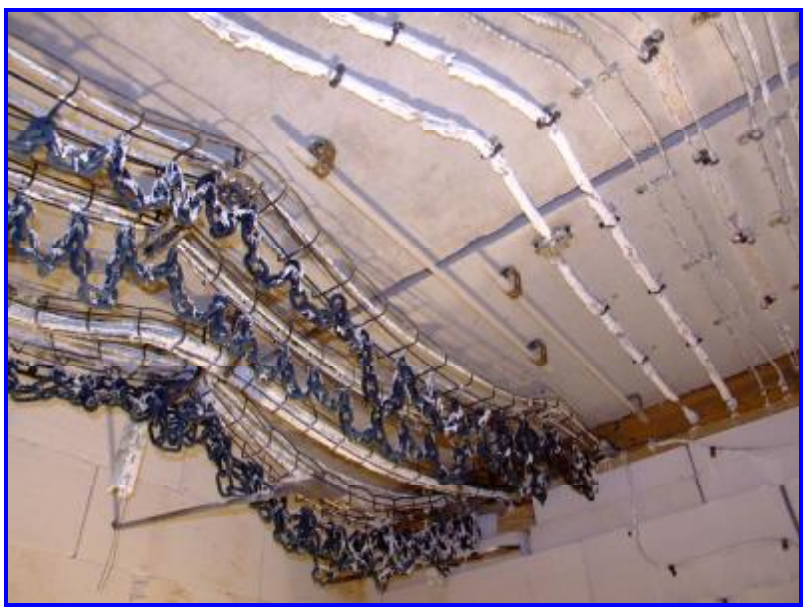
Specimens 1,2: cables (N)HXCH - 4x10 RE/10 E90 CERAMIC Specimens 3,4: cables (N)HXH - 4x1,5 RE E90 CERAMIC	Specimens placed in ceiling clips UEF (BAKS) in spacing of 300 mm
Specimens 5.6: cables (N)HXCH - 4x1,5 RE/1,5 E90 CERAMIC	Specimens placed in ceiling clips OZMO (BAKS) in spacing of 300 mm
Specimens 7,8: cables NHXH - 4x50 RM E90 MICA Specimens 9,10: cables (N)HXCH - 4x1,5 RE/1,5 E90 CERAMIC	Specimens placed in ceiling profile ledges with clips UKO (BAKS) in spacing of 300 mm
Specimens 11,12: cables NHXH - 4x50 RM E90 MICA	Specimens placed in ceiling clips SAS (NIEDAX) in spacing of 300 mm
Specimens 13,14: cables NHXH - 4x1,5 RE E90 MICA	Specimens placed in ceiling clips SAS (NIEDAX) in spacing of 300 mm with box WKE (Spelsberg)
Specimens 52,53: cables JE-H(St)H - 2x2x0,8 E90 MICA Specimens 54,55,56:bundle of six cables HTKSH(ekw) 2x1 FE180/PH90	Specimens placed in the basket cable tray (CABLOFIL) Suspension track No.1
Specimens 57,58,59,60,61,62: bundle of six cables JE-H(St)H - 2x2x0,8 E90 MICA	Specimens placed in the basket cable tray (CABLOFIL) Suspension track No.2
Specimens 63,64: cables JE-H(St)H - 2x2x0,8 E90 MICA	Specimens placed in the basket cable tray (CABLOFIL) Suspension track No.3
Specimens 65: cables JE-H(St)H - 2x2x0,8 E90 MICA	Specimens placed in the basket cable tray (CABLOFIL) Suspension track No.4
Specimens 66: cables JE-H(St)H - 2x2x0,8 E90 CERAMIC	Specimens placed in ceiling clips OZMO (BAKS) in spacing of 300 mm
Specimens 67: cables JE-H(St)H - 2x2x0,8 E90 MICA	Specimens placed in ceiling clips X-FB (HILTI) in spacing of 300 mm
Specimens 68: cables HTKSH(ekw) - 2x1 FE180/PH90 Specimen 69: cable JE-H(St)H - 2x2x0,8 E90 MICA	Specimens placed in the tray WDK (OBO) with ceiling clips X-FB (HILTI) and 1015 (OBO) in spacing of 300 mm
Specimens 70: cables HTKSH(ekw) - 2x1 FE180/PH90 Specimen 71: cable HTKSH(ekw) - 2x1 FE180/PH90 Specimen 72: cable JE-H(St)H - 2x2x0,8 E90 MICA	Specimens placed in ceiling clips X-FB (HILTI) in spacing of 300 mm
Specimens 73: cables HTKSH(ekw) - 2x1 FE180/PH90	Specimens placed in ceiling clips 1015 (OBO) in spacing of 300 mm
Specimens 74: cables JE-H(St)H - 2x2x0,8 E90 CERAMIC	Specimens placed in ceiling profile ledges with clips UKO (BAKS) in spacing of 300 mm
Specimen 75: cable JE-H(St)H - 2x2x0,8 E90 MICA	Specimens placed in ceiling clips 1015 (OBO) in spacing of 300 mm

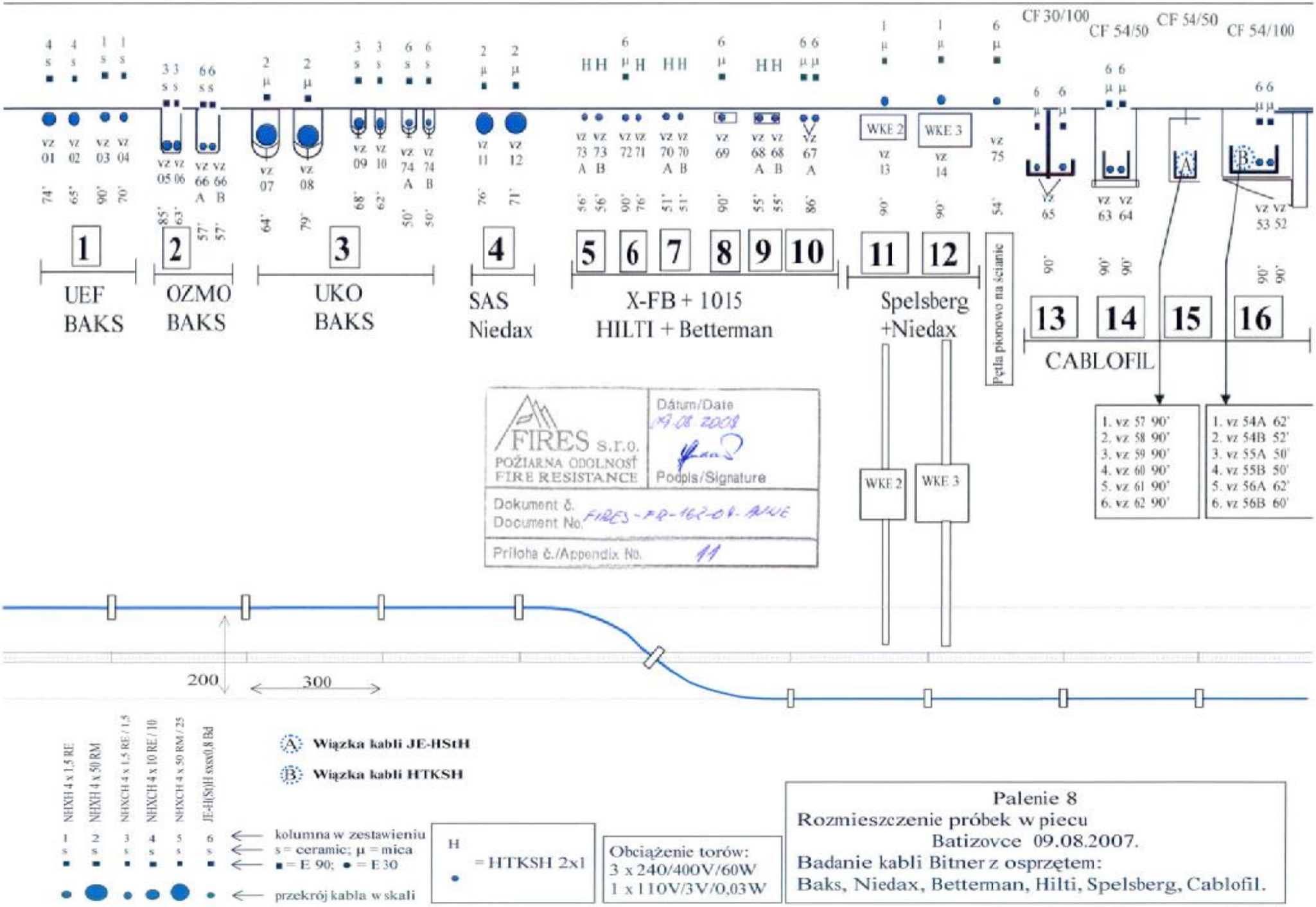
Photos taken before the test



Photos taken after the termination of the test






CF 30/100
CF 54/50
CF 54/50
CF 54/100
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
UEF
BAKS
OZMO
BAKS
UKO
BAKS
SAS
Niedax
X-FB + 1015
HILTI + Betterman
Spelsberg
+Niedax
CABLOFIL
WKE 2
WKE 3
Pętla pionowo na ścianie
FIRES s.r.o.
POŽIARNA ODOLNOSŤ
FIRE RESISTANCE
Dátum/Date
09.08.2007
Podpis/Signature
Dokument č.
Document No. FIRES-FR-162-04-ANNE
Príloha č./Appendix No. 11
1. vz 57 90'
2. vz 58 90'
3. vz 59 90'
4. vz 60 90'
5. vz 61 90'
6. vz 62 90'
1. vz 54A 62'
2. vz 54B 52'
3. vz 55A 50'
4. vz 55B 50'
5. vz 56A 62'
6. vz 56B 60'
200
300
A Wiązka kabli JE-HStH
B Wiązka kabli HTKSH
NHXH 4 x 1,5 RE
NHXH 4 x 50 RM
NHXCH 4 x 1,5 RE / 1,5
NHXCH 4 x 10 RE / 10
NHXCH 4 x 50 RM / 25
JE-H(St)H ssxo0,8 Bd
kolumna w zestawieniu
s = ceramic; μ = mica
■ = E 90; ● = E 30
przekrój kabla w skali
H = HTKSH 2x1
Obciążenie torów:
3 x 240/400V/60W
1 x 110V/3V/0,03W
Palenie 8
Rozmieszczenie próbek w piecu
Batizovce 09.08.2007.
Badanie kabli Bitner z osprzętem:
Baks, Niedax, Betterman, Hilti, Spelsberg, Cablofil.

Badanie systemów tras kablowych wg normy DIN 4102-12 w Fires, Batizovce, w dniu 09.08.2007.

Zestawienie kabli i osprzętu.

Kable BITNER + osprzęt BAKS

	Symbol kabla	średnica [mm] //ciężar [kg/m]	Osprzęt	Odległość podpór	obciążenie	pozycja w piecu
1	(N)HXCH 4 x 10 RE / 10 ceramic	18,5-18,8 // 0,46	Uchwyt UEF Kotwa SROM 6x30	300mm		1
2	(N)HXCH 4 x 10 RE / 10 ceramic	18,5-18,8 // 0,46				
3	(N)HXH 4 x 1,5 RE ceramic	17,3-17,8 //0,42				
4	(N)HXH 4 x 1,5 RE ceramic	17,3-17,8 //0,42				
5	(N)HXCH 4 x 1,5 RE / 1,5 ceramic	18,5-18,8// 0,46	Uchwyt OZMO Kotwa SROM 6x30	300mm		2
6	(N)HXCH 4 x 1,5 RE / 1,5 ceramic	18,5-18,8// 0,46				
66	JE-H(St)H 2 x 2 x 0,8 ceramic	11,5-12,8 //0,14				
66	JE-H(St)H 2 x 2 x 0,8 ceramic	11,5-12,8 //0,14				
7	NHXH 4 x 50 RM mica	40,3-41,4 //3,38	Uchwyt UKO Szczebel SDOC Kotwa PSROM 8x75	300mm		3
8	NHXH 4 x 50 RM mica	40,3-41,4 //3,38				
9	(N)HXCH 4 x 1,5 RE / 1,5 ceramic	18,5-18,8// 0,46				
10	(N)HXCH 4 x 1,5 RE / 1,5 ceramic	18,5-18,8// 0,46				
74	JE-H(St)H 2 x 2 x 0,8 ceramic	11,5-12,8 //0,14				
74	JE-H(St)H 2 x 2 x 0,8 ceramic	11,5-12,8 //0,14				

Kable BITNER + osprzęt NIEDAX

	Symbol kabla	średnica [mm] ciężar [kg/m]	Osprzęt	Odległość podpór	obciążenie	pozycja w piecu
11	NHXH 4 x 50 RM mica	36,1-39,4// 3,0	Uchwyt SAS 47 Kotwa DAM 6x5	300mm		4
12	NHXH 4 x 50 RM mica	36,1-39,4// 3,0				

Kable BITNER + osprzęt HILTI i OBO-Beterman

	Symbol kabla	średnica [mm] ciężar [kg/m]	Osprzęt	Odległość podpór	obciążenie	pozycja w piecu
73B	HTKSH 2x1		Obejma 1015 Kotwa FNA II 6	300 mm		5
73A	HTKSH 2x1		Obejma 1015 Kotwa FNA II 6			5
72	JE-H(St)H 2 x 2 x 0,8 mica	11,5-12,8// 0,18	Uchwyt X-FB...MX Gwoździe X-DNI ..., X-ZF...MX, X-GN...MX, X-GHP...MX, X-DW...MX.	300 mm		6
71	HTKSH 2x1					6
70B	HTKSH 2x1		Uchwyt FB Gwoździe DBZ	300 mm		7
70A	HTKSH 2x1					7
69	JE-H(St)H 2 x 2 x 0,8 mica	11,5-12,8// 0,18	Uchwyt X-FB...MX Gwoździe X-DNI..., X-ZF...MX, X-GN...MX, X-GHP...MX, X-DW...MX. Kanał WDK 20050	300 mm		8
68B	HTKSH 2x1		Obejma 1015 Kotwa FNA II 6 Kanał WDK 20050	300 mm		9
68A	HTKSH 2x1					9
67	JE-H(St)H 2 x 2 x 0,8 mica	11,5-12,8// 0,18	Uchwyt FB Gwoździe DBZ	300 mm		10
67	JE-H(St)H 2 x 2 x 0,8 mica	11,5-12,8// 0,18				10

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Dátum/Date 09.08.2007
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Dokument č./Document No. FIRES-PO-162-09-Anex
Príloha č./Appendix No. 12

Badanie systemów tras kablowych wg normy DIN 4102-12 w Fires, Batizovce, w dniu 09.08.2007.

Zestawienie kabli i osprzętu.

Kable BITNER + osprzęt NIEDAX i Spelsberg

	Symbol kabla	średnica [mm] ciężar [kg/m]	Osprzęt	Odległość podpór	obciążenie	pozycja w piecu
13	NHXH 4 x 1,5 RE mica	16,1-17,0// 0,4	Uchwyt SAS 20 Kotwa DAM 6x5 Box WKE 2-5	300mm		11
14	NHXH 4 x 1,5 RE mica	16,1-17,0// 0,4	Uchwyt SAS 20 Kotwa DAM 6x5 Box WKE 3-5	300 mm		12

Kable BITNER + osprzęt CABLOFIL

	Symbol kabla	średnica [mm] ciężar [kg/m]	Osprzęt	Odległość podpór	obciążenie	pozycja w piecu
65	JE-H(St)H 2 x 2 x 0,8 mica	11,45-12,8// 0,18	Basket cable tray Korytko CF 30/100 Zawieszenie TF8 + CM50XL rys. 1	1,2 m	5 kg	13
65	JE-H(St)H 2 x 2 x 0,8 mica	11,45-12,8// 0,18				13
64	JE-H(St)H 2 x 2 x 0,8 mica	11,45-12,8// 0,18	Basket cable tray Korytko CF 54/50 Zawieszenie 2x TF8 + R21S100 + UC 50 rys. 2	1,2 m	5 kg	14
63	JE-H(St)H 2 x 2 x 0,8 mica	11,45-12,8// 0,18				14
57 - 62	Wiązka 6 kabli JE-H(St)H 2 x 2 x 0,8 mica	11,45-12,8// 0,18	Basket cable tray: Korytko CF 54/50 Zawieszenie TF8 + + 2x CEQ 100 rys. 3	1,2 m	2 kg	15
52	JE-H(St)H 2 x 2 x 0,8 mica	11,45-12,8// 0,18	Basket cable tray: Korytko CF 54/100 Zawieszenie TF8 + Cu150+ +C41S400 rys. 4	1,2 m	10 kg	16
53	JE-H(St)H 2 x 2 x 0,8 mica	11,45-12,8// 0,18				16
54 - 56	Wiązka 6 kabli HTKSH 2x1					16

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POŽIARNA ODOLNOSŤ
FIRE RESISTANCE

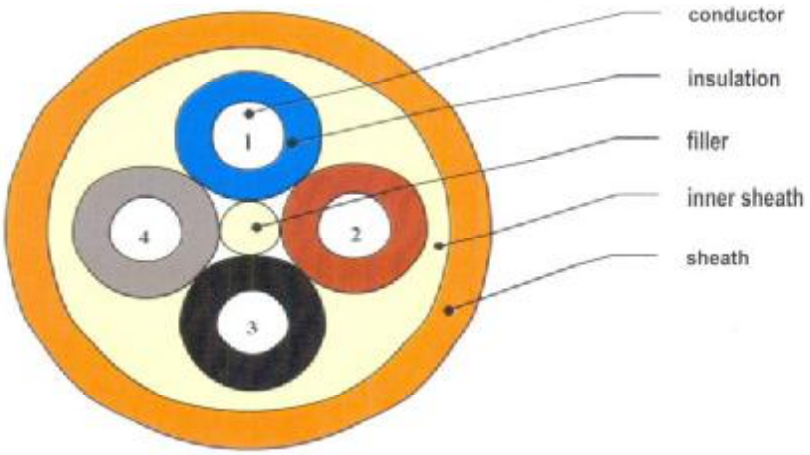
Dátum/Date 09.08.2007
Podpis/Signature

Dokument č./Document No. FIRES-PR-162-08-ANNE

Príloha č./Appendix No. 13

(N)HXH E90

FIRE RESISTANT HALOGEN FREE POWER CABLES



APPLICATIONS

Safety cables are used in all locations where a special protection against fire and fire damage is necessary for human life and equipment and where strict safety regulations have to be met and where large emergency running time is necessary. They may be used indoor and outdoor, but not directly in earth and water. They are considered as protectively insulated.

CONSTRUCTION

conductor - bare copper, solid or stranded acc. to DIN VDE 0295

insulation - cross-linked halogen free ceramic forming polymer compound acc. to DIN VDE 0266

filler - flame resistant, halogen free polymer compound

inner sheath - flame resistant, halogen free polymer compound

sheath - flame resistant, halogen free polymer compound acc. to DIN VDE 0276-604

FIRES s.r.o.
POŽIARNA ODOLNOSŤ
FIRE RESISTANCE

Dátum/Date 09.05.2019

Podpis/Signature

Dokument č./Document No. FIRES-FR-462-01 ANNEX

Príloha č./Appendix No. 19

(N)HXH E90

CHARACTERISTICS

Conductor cross-section	
Number of conductors	Nominal conductor cross-section
n	mm^2
1 ÷ 4	1,5 ÷ 240
5 ÷ 7	1,5 ÷ 70
7 ÷ 10	1,5 ÷ 25
10 ÷ 24	1,5 ÷ 2,5

Operating voltage	0,6/1kV
Voltage test	4000 V, 50 Hz
Insulation resistivity at 90°C, minimum	10^{14}

Operating temperature range during operation	-30°C up to +70°C
during installation	-5°C up to +50°C
Minimum bending radius	15 x D single core 12 x D multi core D = outer diameter
Cable combustibility	
Fire resistance	E90
Combustibility tests	PN-EN 50226:2006, IEC 60332-3
Reference standards	DIN VDE 0266

FIRES s.r.o.
POŽIARNA ODOLNOSŤ
FIRE RESISTANCE

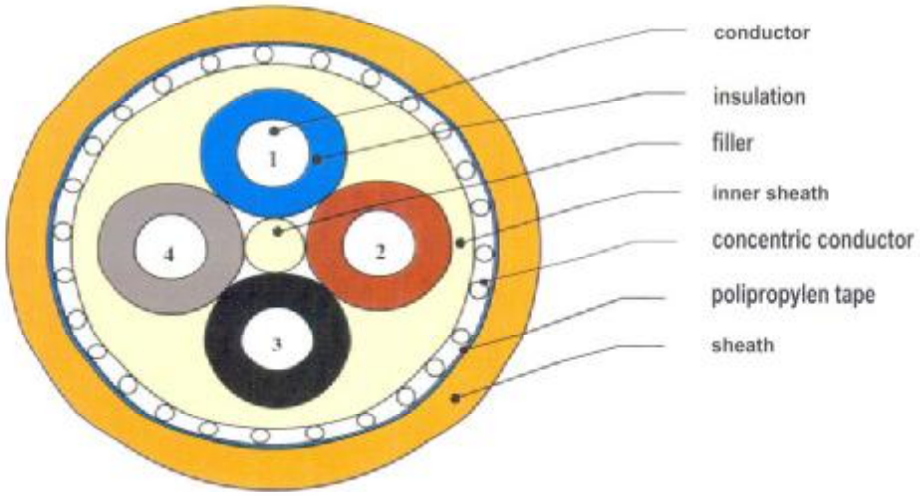
Dátum/Date 09.06.2008
Podpis/Signature

Dokument č.
Document No. FIRES - FR - 462 - 08 - ANNEX

Príloha č./Appendix No. 15

(N)HXCH E90

FIRE RESISTANT HALOGEN FREE POWER CABLES



APPLICATIONS

Safety cables are used in all locations where a special protection against fire and fire damage is necessary for human life and equipment and where strict safety regulations have to be met and where large emergency running time is necessary. They may be used indoor and outdoor, but not directly in earth and water. They are considered as protectively insulated.

CONSTRUCTION

conductor - bare copper, solid or stranded acc. to DIN VDE 0295

insulation - cross-linked halogen free ceramic forming polymer compound acc. to DIN VDE 0266

filler - flame resistant, halogen free polymer compound

inner sheath - flame resistant, halogen free polymer compound

concentric conductor - formed by bare coper wires with counter copper tape

polipropylen tape

sheath - flame resistant, halogen free polymer compound acc. to DIN VDE 0276-604

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POŽIARNA ODOLNOSŤ
FIRE RESISTANCE

Dátum/Date 04.05.2004
Podpis/Signature

Dokument č.
Document No. FIRES-FR-162-04-ANNEX

Príloha č./Appendix No. 16

(N)HXCH E90

CHARACTERISTICS

Conductor cross-section	
Number of conductors	Nominal conductor cross-section
n	mm^2
1 ÷ 4	1,5/1,5 ÷ 150/70
5 ÷ 7	1,5/1,5 ÷ 4/4
10 ÷ 24	1,5/2,5 ÷ 2,5/10

Operating voltage	0.6/1kV
Voltage test	4000 V, 50 Hz
Insulation resistivity at 20°C, minimum	10^{14}

Operating temperature range	
during operation	-30°C up to +70°C
during installation	-5°C up to +50°C
Minimum bending radius	15 x D single core 12 x D multi core D = outer diameter
Cable combustibility	
Fire resistance	E90
Combustibility tests	PN-EN 50226:2006, IEC 60332-3
Reference standards	DIN VDE 0266

FIRES s.r.o.
POŽIARNA ODOLNOSŤ
FIRE RESISTANCE

Dátum/Date 09.08.2008

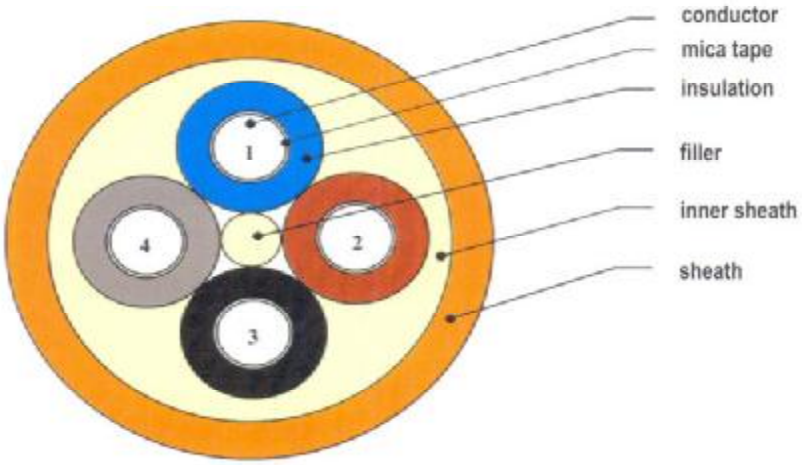
Podpis/Signature

Dokument č./Document No. FIRES-PR-462-09-ANNEX

Príloha č./Appendix No. 19

NHXH E90

FIRE RESISTANT HALOGEN FREE POWER CABLES



APPLICATIONS

Safety cables are used in all locations where a special protection against fire and fire damage is necessary for human life and equipment and where strict safety regulations have to be met and where large emergency running time is necessary. They may be used indoor and outdoor, but not directly in earth and water. They are considered as protectively insulated.

CONSTRUCTION

conductor - bare copper, solid or stranded acc. to DIN VDE 0295

insulation - mica tape and cross-linked halogen free forming polymer compound acc. to DIN VDE 0266

filler - flame resistant, halogen free polymer compound

inner sheath - flame resistant, halogen free polymer compound

sheath - flame resistant, halogen free polymer compound acc. to DIN VDE 0276-604

FIRES s.r.o.
POŽIARNA ODOLNOSŤ
FIRE RESISTANCE
Dátum/Date 09.08.2008
Podpis/Signature
Dokument č./Document No. FIRES-FR-162-08-ANNE
Príloha č./Appendix No. 18

NHXH E90

CHARACTERISTICS

Conductor cross-section	
Number of conductors	Nominal conductor cross-section
n	mm^2
1 ÷ 4	1,5 ÷ 240
5 ÷ 7	1,5 ÷ 70
7 ÷ 10	1,5 ÷ 25
10 ÷ 24	1,5 ÷ 2,5

Operating voltage	0,6/1kV
Voltage test	4000 V, 50 Hz
Insulation resistivity at 90°C, minimum	10^{14}

Operating temperature range	
during operation	-30°C up to +70°C
during installation	-5°C up to +50°C
Minimum bending radius	15 x D single core 12 x D multi core D = outer diameter
Cable combustibility	
Fire resistance	E90
Combustibility tests	PN-EN 50226:2006, IEC 60332-3
Reference standards	DIN VDE 0266

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FIRE RESISTANCE

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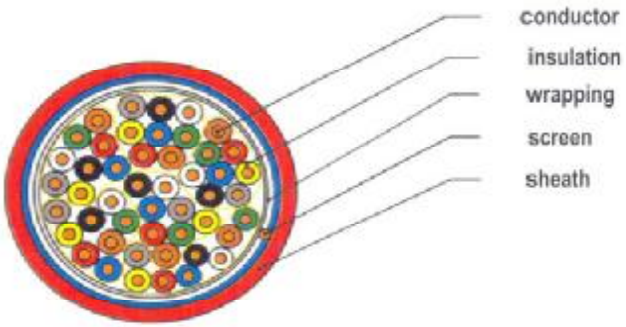
Príloha č./Appendix No. 19

JE-H(St)H CERAMIC E90

FIRE RESISTANT HALOGEN FREE ELECTRONIC AND TELECOMUNICATIONS CABLE



APPLICATIONS

Safety installations cables are used for the transmission od signals and measuring data in control circuits, in locations where a particular protection against fire and fire damage for human life and equipment is necessary.
Installation cables are not admissible for power installation purposes and direct burial.

CONSTRUCTION

conductor - bare copper, solid acc. to DIN VDE 0295
insulation - cross-linked halogen free ceramic forming polymer compound acc. to DIN VDE 0207-23
wrapping - polipropylen and glass-fibre tape
screen - static screen of plastic coated metal foil with a soild, tinned drain wire
sheath - flame resistant, halogen free polymer compound acc. to DIN VDE 0207-5

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Príloha č./Appendix No. 20

JE-H(St)H CERAMIC E90

CHARACTERISTICS

Conductor cross-section	
Number of conductors	Nominal conductor cross-section
n	mm
1 x 2 x .... 80 x 2 x	0,8
1 x 2 x .... 80 x 2 x	1,0

Operating voltage	225V
Voltage test	
core/core	500 V, 50 Hz
core/screen	2000 V, 50 Hz
Insulation resistivity at 90°C, minimum	10^{14}

Operating temperature range	
during operation	-30°C up to +70°C
during installation	-5°C up to +50°C
Minimum bending radius	8 x D single core D = outer diameter
Cable combustibility	
Fire resistance	E90
Combustibility tests	PN-EN 50226:2006, IEC 60332-3
Reference standards	DIN VDE 0815

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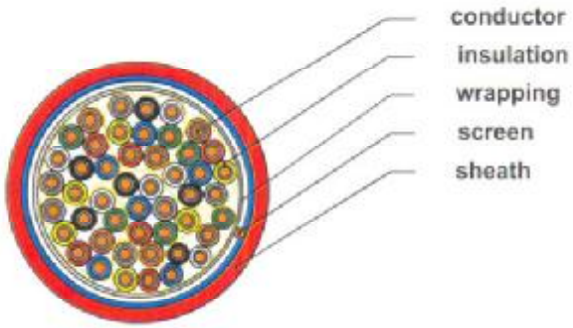
Príloha č./Appendix No. 21

JE-H(St)H MIKA E90

FIRE RESISTANT HALOGEN FREE ELECTRONIC AND TELECOMUNICATIONS CABLE



APPLICATIONS

Safety installations cables are used for the transmission od signals and measuring data in control circuits, in locations where a particular protection against fire and fire damage for human life and equipment is necessary.
Installation cables are not admissible for power installation purposes and direct burial.

CONSTRUCTION

conductor - bare copper, solid acc. to DIN VDE 0295
insulation - mica tape and cross-linked halogen free forming polymer compound acc. to DIN VDE 0207-23
wrapping - polipropylen and glass-fibre tape
screen - static screen of plastic coated metal foil with a soild, tinned drain wire
sheath - flame resistant, halogen free polymer compound acc. to DIN VDE 0207-5

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Príloha č./Appendix No. 22	

JE-H(St)H MIKA E90

CHARACTERISTICS

Conductor cross-section	
Number of conductors	Nominal conductor cross-section
n	mm
1 x 2 x .... 80 x 2 x	0,8
1 x 2 x .... 80 x 2 x	1,0

Operating voltage	225V
Voltage test	
core/core	500 V, 50 Hz
core/screen	2000 V, 50 Hz
Insulation resistivity at 90°C, minimum	10^{14}

Operating temperature range	
during operation	-30°C up to +70°C
during installation	-5°C up to +50°C
Minimum bending radius	8 x D single core D = outer diameter
Cable combustibility	
Fire resistance	E90
Combustibility tests	PN-EN 50226:2006, IEC 60332-3
Reference standards	DIN VDE 0815

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Dátum/Date 04. 08. 2021

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Dokument č.
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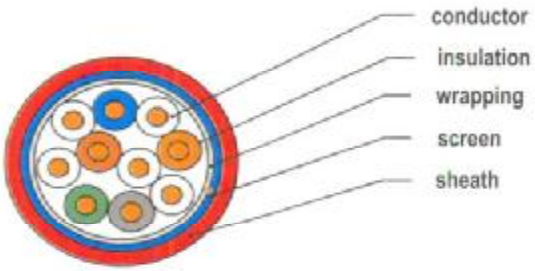
Príloha č./Appendix No. 23

HTKSH(ekw) FE180/PH90

FIRE RESISTANT HALOGEN FREE ELECTRONIC AND TELECOMUNICATIONS CABLE



APPLICATIONS

Safety installations cables are used for the transmission od signals and measuring data in control circuits, in locations where a particular protection against fire and fire damage for human life and equipment is necessary.
Installation cables are not admissible for power installation purposes and direct burial.

CONSTRUCTION

conductor - bare copper, solid acc. to PN-83/E-90150
insulation - mica tape and halogen free forming polymer compound acc. to PN-EN 50290-2-26(U)
wrapping - polipropylen tape
screen - static screen of plastic coated metal foil with a soild, tinned drain wire
sheath - flame resistant, halogen free polymer compound acc. to PN-EN 50290-2-22

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Príloha č./Appendix No. 24

HTKSH(ekw) FE180/PH90

CHARACTERISTICS

Conductor cross-section	
Number of conductors	Nominal conductor cross-section
n	mm
1 x 2 x .... 10 x 2 x	0,8 ÷ 2,3

Operating voltage	225V
Voltage test core/core	1500 V, 50 Hz
core/screen	2000 V, 50 Hz
Insulation resistivity at 90°C, minimum	10^{14}

Operating temperature range during operation during installation	 -30°C up to +70°C -5°C up to +50°C
Minimum bending radius	10 x D single core D = outer diameter
Cable combustibility	
Fire resistance	PH90
Combustibility tests	PN-EN 50226:2006, IEC 60332-3
Reference standards	ZN-CB 25:2005

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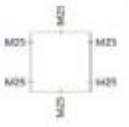
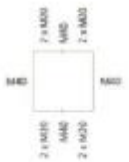
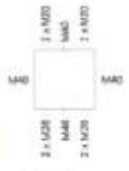
Dokument č.
Document No. FIRES-FR-462-08 ANNEX

Príloha č./Appendix No. 25

Terminal Boxes WKE 2 - 5

		Description	Order No.	Packing Qty
WKE 2 (5 x 6²) 100 x 100 x 50 mm	IP 54	Terminal box according to E DIN IEC 60998-2-5, U_i = 450 V, with guaranteed flame protection E 30 / E 60 / E 90 in accordance with DIN 4102 part 12		
		**WKE 2 (5 x 6²)** as continuity box 0.5 to 6 mm² and terminal box 0.5 to 1.5 mm², with 5-pole terminal block, Number of conductors per clamping point: 8 x 0.5²/ 4 x 0.75²/ 6 x 1.0²/ 6 x 1.5²/ 2 x 2.5²/ 2 x 4.0²/ 2 x 6.0², made from special high temperature resistant ceramic with wall plug set, IP 54 adapters and M25 blanking plugs, seal range 9 - 18.5 mm	860 202 01	12/1
WKE 3 (5 x 10²) 115 x 115 x 66 mm	IP 54	Terminal box according to E DIN IEC 60998-2-5, U_i = 450 V, with guaranteed flame protection E 30 / E 60 / E 90 in accordance with DIN 4102 part 12		
		WKE 3 (5 x 10²) as continuity box 1.0 to 10 mm² and terminal box 1.0 to 4 mm², with 5-pole terminal block, number of conductors per clamping point: 10 x 1.0²/ 8 x 1.5²/ 6 x 2.5²/ 4 x 4.0²/ 2 x 6.0²/ 2 x 10², made from special high temperature resistant ceramic, with wall plug set, IP 54 adapters and blanking plugs M32, seal range 13 - 23 mm, with lead seal set	860 203 01	10/1
WKE 4 (5 x 16²) 165 x 165 x 76 mm	IP 54	Terminal box according to E DIN IEC 60998-2-5, U_i = 450 V, with guaranteed flame protection E 30 / E 60 / E 90 in accordance with DIN 4102 part 12		
		**WKE 4 (5 x 16²)** as continuity box 1.5 to 16 mm² and terminal box 1.5 to 6 mm², with 5-pole terminal block, number of conductors per clamping point: 10 x 1.5² / 8 x 2.5²/ 6 x 4.0 2 / 4 x 6.0²/ 2 x 10²/ 2 x 16², made from special high temperature resistant ceramic, with wall plug set, IP 54 adapters and blanking plugs M20, seal range 17 - 30 mm, with lead seal set	860 204 01	8/1
WKE 4 (8 x 6²) 165 x 165 x 76 mm	IP 54	Terminal box according to E DIN IEC 60998-2-5, U_i = 450 V, with guaranteed flame protection E 30 / E 60 / E 90 in accordance with DIN 4102 part 12		
		**WKE 4 (8 x 6²)** as continuity box 0.5 to 6 mm² and terminal box 0.5 to 1.5 mm², with 8-pole terminal block, Number of conductors per clamping point: 8 x 0.5² / 4 x 0.75² / 6 x 1.0² / 6 x 1.5² / 2 x 2.5² / 2 x 4.0² / 2 x 6.0², made from special high temperature resistant ceramic, with wall plug set IP 54, adapters and M20 blanking plugs, seal range 8 - 13.5 mm and M40, seal range 17-30 mm, with lead seal set	860 214 01	8/1

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Príloha č./Appendix No. 26

Terminal Boxes WKE 2 - 5

High degree of safety
Due to thermosetting plastic enclosure (no danger of short-circuit due to metal walls)

Flexible cable entries
Decide on-site which membrane must be opened

Complete range of accessories
All terminal boxes, including terminal, in-feed connectors and fire protection dowels for concrete

- Ingress protection to IP 54
- Real functional maintenance in the classes E30 to E90 according to DIN 4102, part 12
- Halogen-free thermosetting plastic
- Flexible wiring
- Can be sealed
- Self-extinguishing
- Complete product range including accessories
- Testing certificate of the MPA (material-testing institute
- UL 94-V0
- VDE-authorised
- Colour like RAL 2004

Detailed information about the conductors and the manufacturers can be found on the internet in **www.spelsberg.com** or simply request the test report by fax:
Phone: +49 (0) 23 55 / 892-146, fax: +49 (0) 23 55 / 892-746

Authorised for use with the following cables:

WKE 2 to WKE 5	E30	E60	E90
Supply cables (n x 1.5², to n x 16²) NHXH FE 180 NHXCH (Nearly all standard cables E30 / E60 / E90 of leading manufacturers)	X 13 pieces	X 7 pieces	X 6 pieces
Control cables (mx 0.8) JE-H(St)H Bd FE 180 (Nearly all standard cables E30 / E60 / E90 of leading manufacturers)	X 8 pieces	X 6 pieces	X 5 pieces

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	A	B	C	E	F	G
UEF5	36	14	12	5	R2.5	R24
UEF6	40	14	12	6	R3	R24
UEF7	42	14	12	7	R3.5	R24
UEF8	44	14	12	8	R4	R24
UEF9	46	14	12	9	R4.5	R24
UEF10	48	14	12	10	R5	R24
UEF12	52	14	12	12	R6	R24
UEF14	56	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

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09.08.2004

Podpis/Signature

Dokument č.
Document No. FIRES-FR-162-04-AUKE

Príloha č./Appendix No. 28

Dôkladne
spojovací
materiál

Hmotnosť

Mierka

1:1

Formát A4

Projektoval

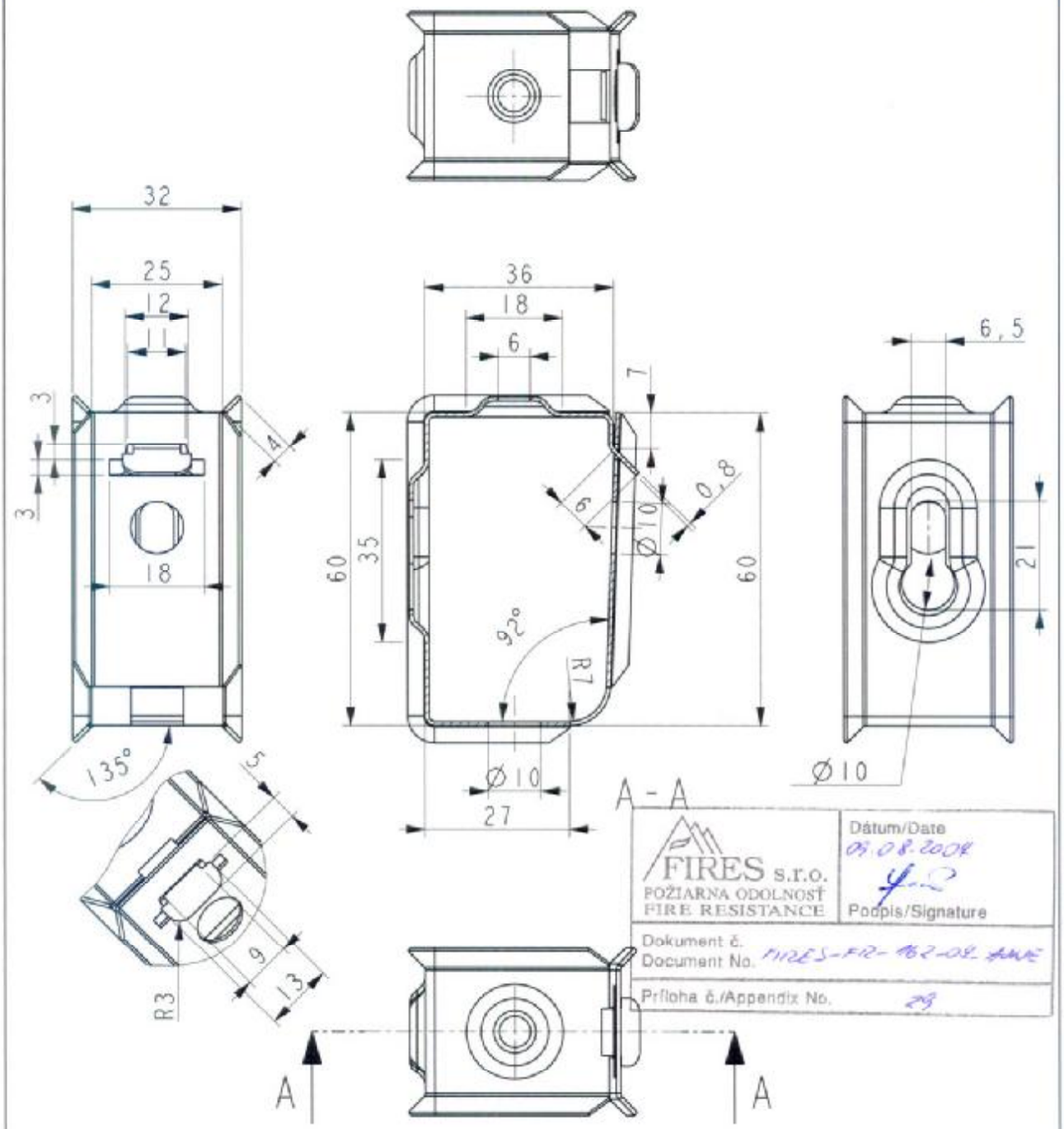
Kreslil

Overoval

Schválil

UEF

Profesjonalne Systemy
Tras Kablowych



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Dátum/Date 05.08.2008

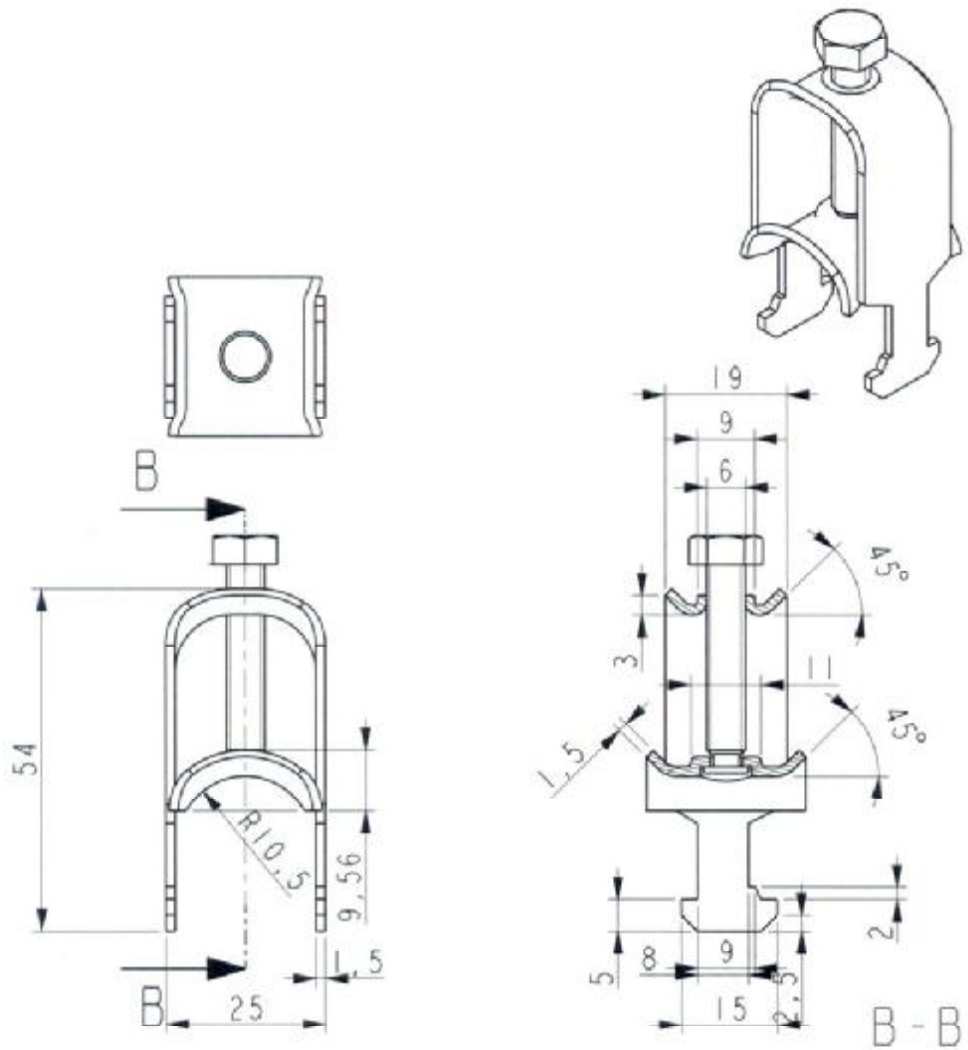
Podpis/Signature

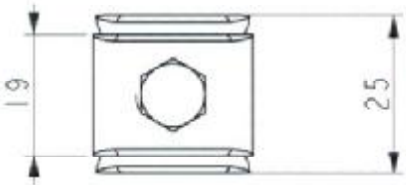
Dokument č. / Document No. FIRES-FR-162-08-ANE

Príloha č./Appendix No. 29

Odchyłka wymiarowa nieotolerowanych		Materiał	Gatunek		Masa [kg]	Podziałka	Format A4
			Nr normy	PN-EN 10142 + A1 : 1997		1 : 1	Arkuszy
			półfabrykat (nr normy)				Arkusz
Projektował							
Rysował	Nazwisko J. Grochowski	Podpis	Data	Nazwa rysunku OZMO			
Sprawdził							
Zatwierdził				Nr programu wprowadzającego			Nr zmiany

Profesjonalne Systemy Tras Kablowych





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Dátum/Date 09.08.2009

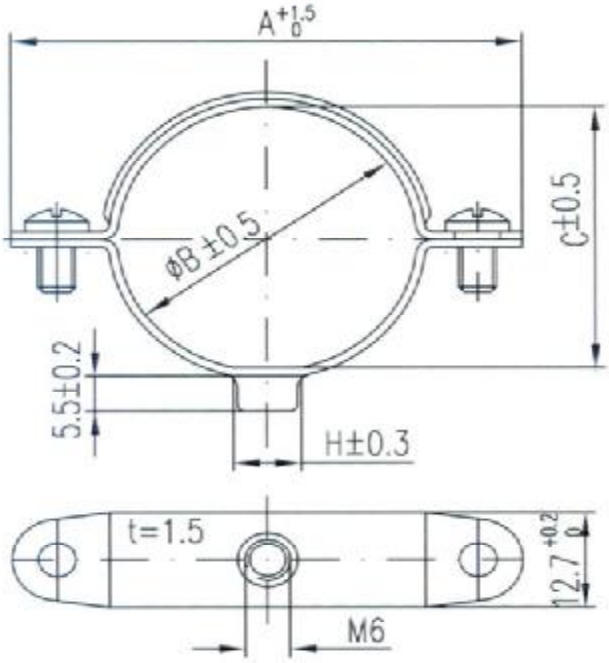
Podpis/Signature

Dokument č. / Document No. FIRES-FR-162-08-AUE

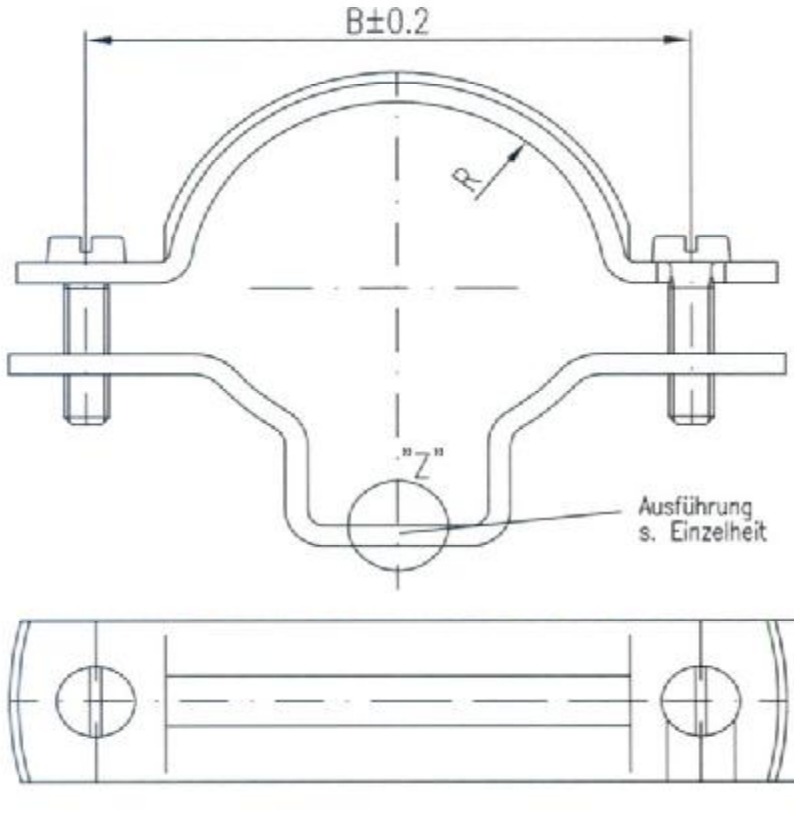
Príloha č./Appendix No. 3D

Odchyłka 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-Jan-06				
Sprawdził							
Zatwierdził				Nr programu maszynowego		Nr zmiany	
				Nr rysunku			

Profesjonalne Systemy Tras Kablowych



Mod.–Nr.	A	B	C	H	Spannbereich
SAS 8	34.7	8	6	5.3	7.5 – 10
SAS 10	35.5	10	8	6	10 – 11
SAS 12	41.3	12	10	6.8	11 – 13
SAS 14	41	14	12	7	13 – 15
SAS 16	41.4	16	14	8	15 – 17
SAS 18	42	18	16	8.3	17 – 19
SAS 20	48.3	20	18	8.3	19 – 21
SAS 22	47.2	22	20	9	21 – 23
SAS 24	54.4	24	22	8	23 – 25
SAS 26	52.7	26	24	8.3	25 – 27
SAS 28	57	28	26	8	27 – 29
SAS 30	62.8	30	28	10	28 – 30



Modell Nr.	Spann-bereich	R	B	b
SAS 38	29–38	18.5	53.7	16
SAS 47	38–47	23.5	65.2	16
SAS 55	47–55	27.5	74.7	18
SAS 63	55–63	31.5	84	18

NIEDAX GmbH & Co. KG
Linz/Rhein

Verwendung:

Ausgabe vom: 25.06.2003

Einzelverlegung Schraubabstandschellen SAS 8 – SAS 63

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Dátum/Date 09.06.2009

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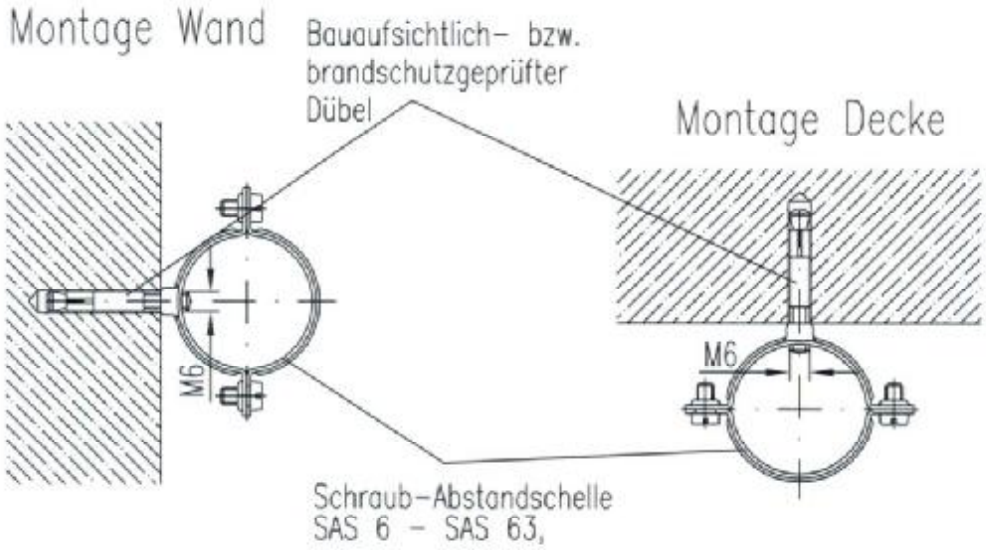
Príloha č./Appendix No. 31



NIEDAX GmbH & Co. KG Linz/Rhein	Verwendung: Einzelverlegung mit Schraubabstandschellen	Ausgabe vom: 25.06.2003

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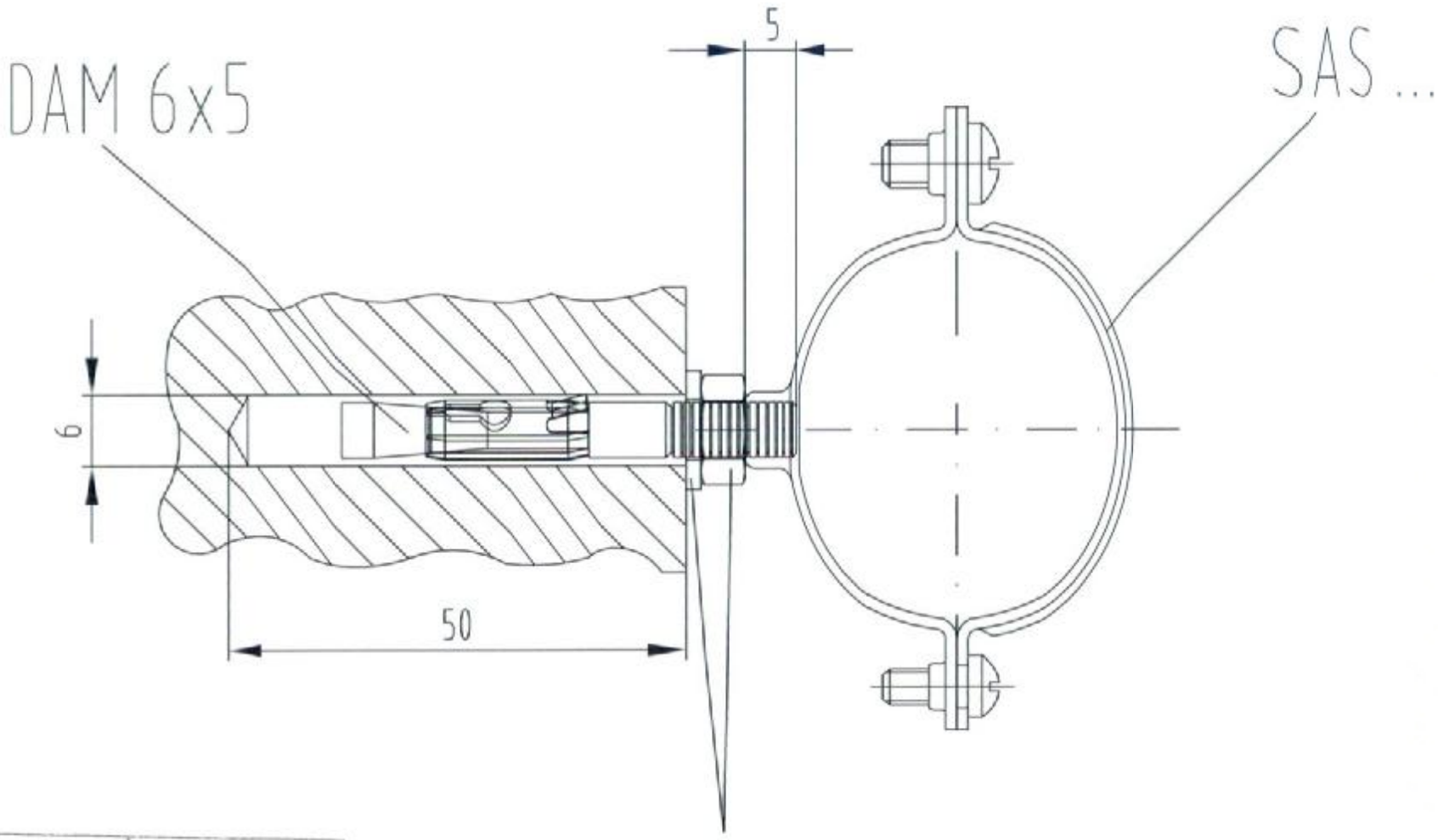
Príloha č./Appendix No. 32	



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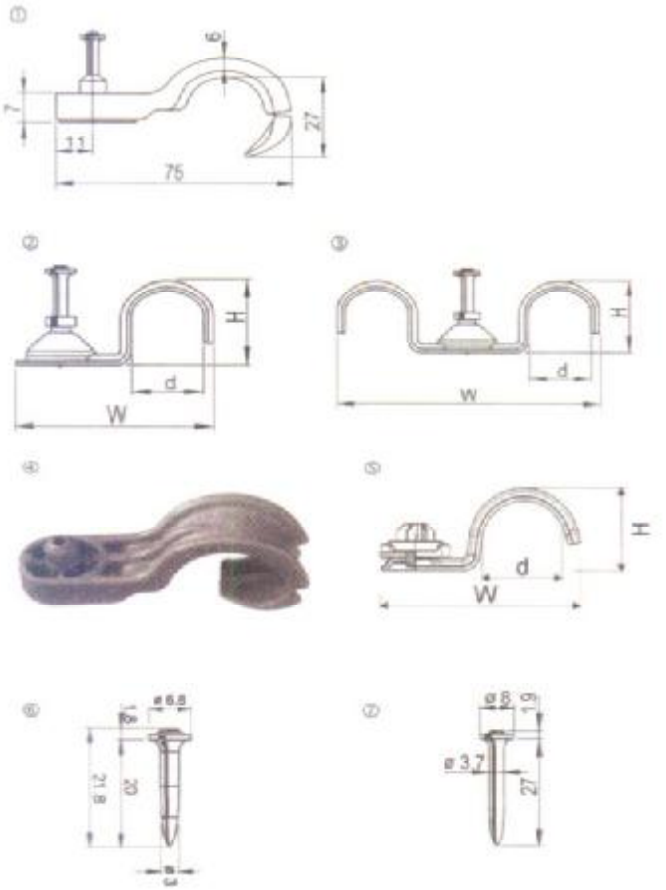
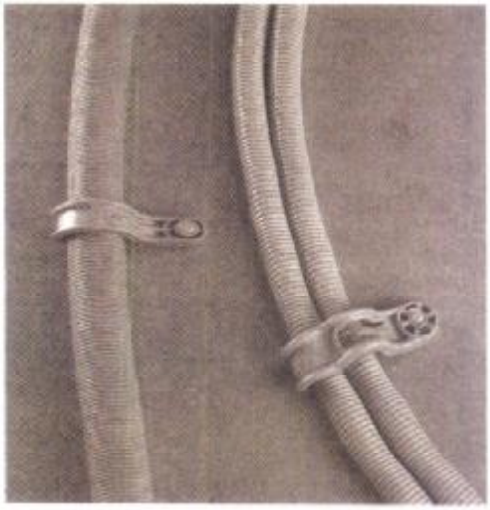
Dokument č.
Document No. FIRES-FR-162-DŘ AUNE

Príloha č./Appendix No. 33

Sechskantmutter und Unterlegscheiben SMU 6

2.29 X-EFC, X-FB Łączniki do mocowania rurek instalacyjnych





X-EFC mocowanie elastycznych przewodów rurowych

X-FB mocowanie rur instalacyjnych, grzewczych

Program łączników (wymiary w mm)

	Oznaczenie		d	W	H	Opis materiału	Osadzaki DX
①	**X-EFC 1 DNI 27**		-----	-----	-----	Polietylen, szary	**DX 460, DX-A 40**
②	**X-FB 13-DNI27**		13	42	15	Cynkowana stal wg normy DIN 17162-1 (f_u=270-420 N/mm², 10-20 µm Zn)	**DX 460** **DX-A** **DX 36M** **DX 351** **DX E72**
	X-FB 16-DNI27		16	44	18		
	X-FB 18-DNI27	X-FB 18-ZF27	18	46	20		
	X-FB 20-DNI27	X-FB 20-ZF27	20	48	22		
	X-FB 22-DNI27	X-FB 22-ZF27	22	50	24		
	X-FB 24-DNI27	X-FB 24-ZF27	24	52	26		
	X-FB 28-DNI27	X-FB 28-ZF27	28	56	30		
	X-FB 35-DNI27		35	64	37		
	X-FB 40-DNI27		40	69	42		
③	**X-DFB 16-DNI27**		16	66	15		
	X-DFB 18-DNI27	X-DFB 18-ZF27	18	70	18		
	X-DFB 20-DNI27	X-DFB 20-ZF27	20	75	20		
	X-DFB 22-DNI27	X-DFB 22-ZF27	22	79	22		
	X-DFB 24-DNI27	X-DFB 24-ZF27	24	83	24		
	X-DFB 28-DNI27	X-DFB 28-ZF27	28	91	28		
	X-DFB 35-DNI 27		35	106	30		
	X-DFB 40-DNI 27		40	116	37		
④	**X-EFC MX**	zakres średnic mocowanych rurek: 16-32 mm				Polietylen, szary Łącznik bez gwoździa. Zastosowania z: DX 351 MX 27 lub DX 460 MX 72 i gwoździami magazynkowymi.	
⑤	**X-FB MX**	zakres wymiarów d: od 8 mm do 40 mm				Stal ocynkowana. Uchwyt bez gwoździa. Zastosowanie z: GX 100E, DX 351 MX 27 lub DX 460 MX 72 i gwoździami magazynkowymi.	
⑥	**X-GHP 20MX**	Gwoździe do mocowania obejm				Stal, HRC 58±1, Zn 2-8 µm	**GX 100E**
⑦	**X-DNI 27MX**	X-FB MX				Stal, HRC 55,5±1, Zn 5-13 µm	**DX 460, DX 351**

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Príloha č./Appendix No. 34

DBZ Gwoździe klinowe

Cechy:	
	- materiał podłoża: beton
	- proste zamocowanie przelotowe
	- rozprężanie przez wbijanie młotkiem, bez użycia specjalnego narzędzia
	- element z możliwością rozprężania uzupełniającego
	- przydatność do strefy rozciąganej betonu
	- zamocowanie sztywne, nie wybaczające się
Materiał:	
Trzon gwoździa:	- Q + St 36-3 DIN 1654
Klin rozprężający:	- drut lub pręt stalowy, ulepszany cieplnie
Wykończenie powierzchni:	- cynkowana galwanicznie min. 5µm Zn

DBZ

CONC

Beton

Beton zarysowany

Odporność ogniowa

1) W przypadku występowania więcej niż jednego punktu mocowania.

Podstawowe dane dotyczące nośności (pojedynczego gwoździa): DBZ

Dane w tym rozdziale dotyczą nast. warunków

- beton: $f_{cc} \geq 15$ N/mm²
- pominięty wpływ odległości od krawędzi i rozstawu

CONC beton zarysowany

Nośności charakterystyczne, R_k [kN]:

Gwóźdź	DBZ 6/4.5 i DBZ 6/35
Rozciąganie N_{Rk}	2.4
Ścinanie V_{Rk}	3.3

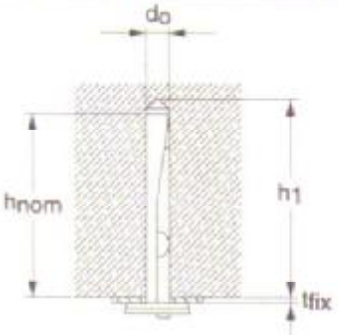
Nośności obliczeniowe, R_d [kN]:

Gwóźdź	DBZ 6/4.5 i DBZ 6/35
Rozciąganie N_{Rd}	1.1
Ścinanie V_{Rd}	1.5

Obciążenia dopuszczalne, R_{rec} [kN]:

Gwóźdź	DBZ 6/4.5 and DBZ 6/35
Rozciąganie N_{Rec}	0.8
Ścinanie V_{Rec}	1.1

Szczegóły osadzania



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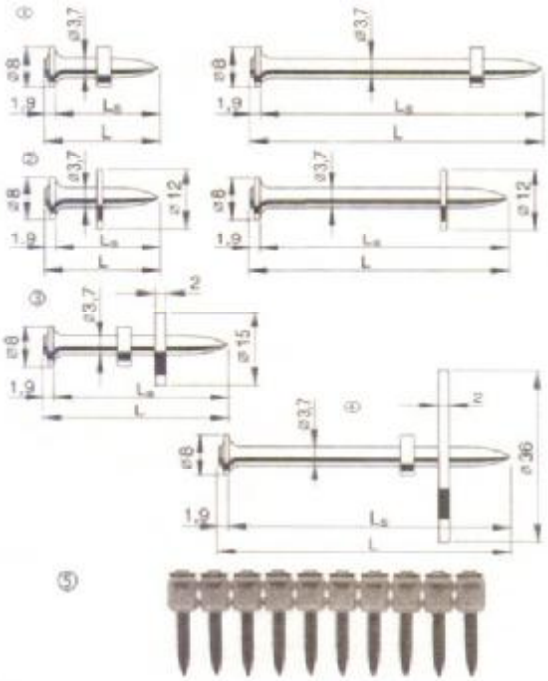
2.16 X-DNI Gwoździe uniwersalne do mocowania do elem. betonowych i stal.



Trzpień łącznika:	stal węglowa,	HRC 55.5 ± 1 HRC 58 ± 1 (**X-DNI 82**)
	powłoka:	Zn, 5 - 13 µm
Podkładka stal:	stal węglowa, powłoka:	Zn, 10 - 20 µm
Podkładka z tworzywa sztucznego:		polietylen

Elementy szkieletu ścianek, deski, łaty mocowane do betonu i stali

Deskowania, bariery itp. zastosowania tymczasowe

Kształtowniki stalowe szkieletowych ścianek działowych do elementów betonowych i stalowych

Aprobaty techniczne i wytyczne wymiarowania

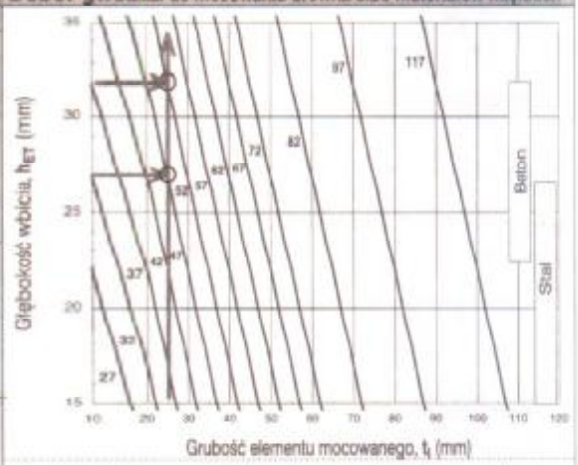
ICBO, Lloyd's, ABS, ITB

Dane techniczne (obciążenia obliczeniowe, ograniczenia stosowania itp.) przedstawione w powyższych aprobatach i wytycznych wymiarowania odzwierciedlają specyficzne uwarunkowania lokalne. Z tego względu dane te mogą różnić się od danych zamieszczonych w niniejszym podręczniku. Jeżeli inwestycja prowadzona jest na obszarze państwa, gdzie obowiązują specyficzne aprobaty i wytyczne dotyczące danego typu zamocowania, to właśnie te krajowe przepisy są miarodajne dla procesu projektowania i wymiarowania. Kopie aprobat technicznych mogą być w razie potrzeby udostępnione przez Hilti.

Program gwoździ (wymiary w mm)

	Oznaczenie	L_s	L	Osadzaki DX [1]
①	**X-DNI 19 P8**	19	20.9	**DX-460** (maks. **X-DNI 72**)
	X-DNI 22 P8	22	23.9	**DX-A40** (maks. **X-DNI 47**)
	Stopniowanie długości co 5 mm			**DX-A41** (maks. **X-DNI 72**)
	X-DNI 62 P8	62	63.9	**DX36M** (maks. **X-DNI 72**)
	X-DNI 72 P8	72	73.9	**DX E72** (maks. **X-DNI 72**)
	X-DNI 82 P8	82	83.9	
②	**X-DNI 22 S12**	22	23.9	**DX-460** (maks. **X-DNI 72**)
	Stopniowanie długości co 5 mm			**DX-A41** (maks. **X-DNI 72**)
	X-DNI 72 S12	72	73.9	**DX-A40** (maks. **X-DNI 47**)
③	**X-DNI27 P8S15**	27	28.9	**DX-460, DX-A41**
	X-DNI32 P8S15	32	33.9	**DX-A40 (maks. X-DNI 47)**
				DX36M
④	**X-DNI32 P8S36**	32	33.9	
	X-DNI52 P8S36	52	53.9	
⑤	**X-DNI 19 MX**	19	20.9	**DX-A40** (≤ **DNI 32__ MX**)
	X-DNI 22 MX	22	23.9	**DX 460**
	Stopniowanie długości co 5 mm			**DX 36M** (≤ **DNI 62__ MX**)
	X-DNI 72 MX	72	73.9	**DX-A41**

Dobór gwoździ do mocowania drewna albo materiałów miękkich



Przykład: Mocowanie łat drewnianych grubości 25 mm do betonu, f_{cc} = 25, h_{ET} = 27 - 32 mm
Pytanie: Jakie gwoździe są odpowiednie?
Odpowiedź: **X-DNI 52 P8 lub X-DNI 52MX**

[1] Ograniczenia długości wbijanych gwoździ dotyczą stosowania osadzaków bez wstępnego ręcznego wbijania gwoździ. Zakres stosowania każdego osadzaka DX może zostać rozszerzony na dłuższe gwoździe przez wstępne ręczne wbijanie gwoździ w element mocowany.

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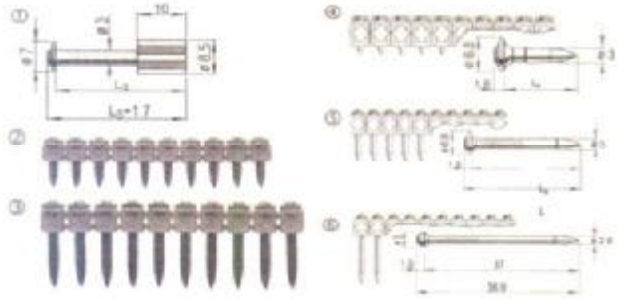
2.20 X-DW, X-ZF, X-EGN, X-GN Gwoździe do mocowania profili ścianek działowych



Aprobaty techniczne i wytyczne wymiarowania

ICBO

Dane techniczne (obciążenia obliczeniowe, ograniczenia stosowania itp.) przedstawione w powyższych aprobatach i wytycznych wymiarowania odzwierciedlają specyficzne uwarunkowania lokalne. Z tego względu dane te mogą różnić się od danych zamieszczonych w niniejszym podręczniku. Jeżeli inwestycja prowadzona jest na obszarze państwa, gdzie obowiązują specyficzne aprobaty i wytyczne dotyczące danego typu zamocowania, to właśnie te krajowe przepisy są miarodajne dla procesu projektowania i wymiarowania. Kopie aprobat technicznych mogą być w razie potrzeby udostępnione przez Hilti.

Program gwoździ (wymiary w mm)

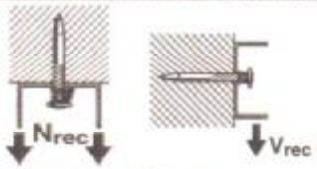
	Oznaczenie	L_s	L	d_{nom}	Twardość HRC	Powłoka Zn (µm)	Osadzaki DX
①	X-DW 20 THP	20	21.7	3.0	53.5 ± 1	2 - 8	DX 351, DX-A40, DX 460, DX 36M
	X-DW 27 THP	27	28.7				
②	X-DW 20 MX	20	21.7	3.0	53.5 ± 1	2 - 8	DX 351, DX-A40, DX 460, DX 36M (z magazynkiem)
	X-DW 27 MX	27	28.7				
③	X-ZF 27 MX	27	28.4	3.5	52.5 ± 1	5 - 13	
④	X-EGN 14 MX	14	15.8	3.0	58 ± 1	2 - 8	GX 100, GX 100E
	X-GHP 20 MX	20	21.8				
⑤	X-GN 20 MX	19	20.9		53.5 ± 1		
	X-GN 27 MX	27	28.9				
	X-GN 32 MX	32	33.9				
⑥	X-GN 39 MX	37	38.9	2.6			

Rozstaw gwoździ

Rozstaw gwoździ na elementach szkieletu ścianek działowych (wg US Gypsum Handbook)

Końce elementów (przy wycięciach na drzwi) mocować 2 gwoździami

Zalecane obciążenia (beton/stal)



200 N dla $h_{ET} \geq 18$ mm
300 N dla $h_{ET} \geq 22$ mm
400 N dla $h_{ET} \geq 27$ mm
400 N dla zamocowań do stali h=4-6 mm

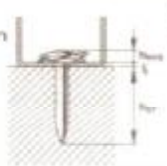
Zalecenia projektowe:
1. Każdy element powinien być mocowany za pomocą przynajmniej 5 łączników
2. Należy zastąpić dostrzeżone wadliwe zamocowania

Kształtowniki stalowe szkieletowych ścianek działowych mocowane do betonu/stali

Oznaczenie	Zakres stosowania	Materiał podłoża
X-DW 27	Kształtowniki metalowe	↓ Beton, wzrastająca klasa (twardość betonu)
X-DW 20		
X-ZF 27	Kształtowniki metalowe	Beton
X-GN 39	Elementy drewniane ($t_f \leq 20$ mm)	Beton/mur z cegły wapienno-piaskowej
X-GN 27	Kształtowniki metalowe	↓ Beton/mur z cegły wapienno-piaskowej, wzrastająca twardość
X-GN 20		
X-GHP	Kształtowniki metalowe	Twardy beton
X-EGN	Kształtowniki metalowe	Stal

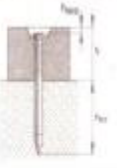
X-DW
h_{NVS} = 2 - 4 mm

X-ZF
h_{NVS} = 2 - 4 mm



X-GN/GHP
h_{NVS} = 2 - 5 mm

X-GN 39
h_{NVS} = 2 - 3 mm

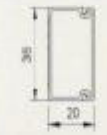


WDK Wand- und Deckenkanäle

WDK Kanal, Typ WDK 20035

Typ	Farbe	Länge mm	Verp. m	Gewicht kg/St.	Art.-Nr. PVC
WDK 20035	reinweiß	2000	28	23.500	6191 04 5
WDK 20035	cremeweiß	2000	28	23.500	6026 37 0
WDK 20035	lichtgrau	2000	28	23.500	6026 38 4
WDK 20035	steingrau	2000	28	23.500	6026 39 2

Kanaloberteil und -unterteil mit Bodenlochung.



Endstück

Typ	Farbe	Maß a mm	Maß b mm	Verp. Stück	Gewicht kg/St.	Art.-Nr. PVC
WDK/HE 20035	reinweiß	35	20	20	0.300	6193 13 7
WDK/HE 20035	cremeweiß	35	20	20	0.300	6162 48 7
WDK/HE 20035	lichtgrau	35	20	20	0.300	5183 65 4
WDK/HE 20035	steingrau	35	20	20	0.300	6159 78 1

Endstück zum Verschließen der WDK-Kanäle.

Die Endstücke werden auf den WDK-Kanal aufgedrückt und durch eine Federwirkung gehalten.

WDK Kanal, Typ WDK 20050

Typ	Farbe	Länge mm	Verp. m	Gewicht kg/St.	Art.-Nr. PVC
WDK 20050	reinweiß	2000	42	31.500	6168 73 6
WDK 20050	cremeweiß	2000	42	31.500	6168 70 1

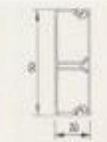
Kanaloberteil und -unterteil mit Bodenlochung.

WDK Kanal, Typ WDK-N 20050

Typ	Farbe	Länge mm	Verp. m	Gewicht kg/St.	Art.-Nr. PVC
WDK-N 20050	reinweiß	2000	42	37.000	6168 74 4
WDK-N 20050	cremeweiß	2000	42	37.000	6168 72 8

Kanaloberteil und -unterteil mit Nagelleiste und Bodenlochung.

Mit einem Nagel kann der WDK-Kanal direkt durch die Nagelleiste an der Wand befestigt werden.



Stoßstellenabdeckung

Typ	Farbe	Maß a mm	Maß b mm	Verp. Stück	Gewicht kg/St.	Art.-Nr. PVC
WDK/HS 20050	reinweiß	53	14	20	0.500	6154 06 9
WDK/HS 20050	cremeweiß	53	14	20	0.500	6162 10 4

Stoßstellenabdeckung zur einwandfreien Verbindung der Kanalsegmente.

Die Formteile sind generell als Haubenformteile ausgelegt.

Inneneckhaube

Typ	Farbe	Maß a mm	Verp. Stück	Gewicht kg/St.	Art.-Nr. PVC
WDK/HI 20050	reinweiß	45	4	2.500	6154 08 9
WDK/HI 20050	cremeweiß	45	4	2.500	6153 08 9

Inneneckhaube zur Richtungsänderung der WDK-Kanäle.

Die Formteile sind generell als Haubenformteile ausgelegt.

Bei Bestellungen bitte immer Artikel-Nr. angeben

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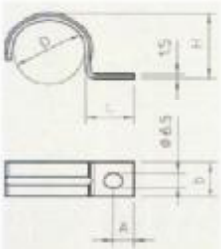
Obejma mocująca

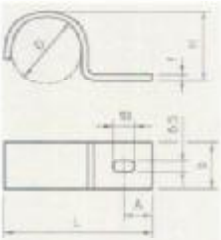
Obejma mocująca



Typ	Do śr. mm	Ilość w kartonie szt.	Opak. szt.	Waga kg/% szt.	Nr kat. St / G
1015	5	3000	100	0.325	1009 02 8
1015	6	2400	100	0.385	1009 03 6
1015	7	2000	100	0.418	1009 04 4
1015	8	2000	100	0.428	1009 05 2
1015	9	2000	100	0.488	1009 06 0
1015	10	2000	100	0.560	1009 07 9
1015	11	1600	100	0.632	1009 08 7
1015	12	1000	100	0.672	1009 10 9
1015	13	1800	100	0.680	1009 11 7
1015	14	1200	100	0.710	1009 16 8
1015	15	1200	100	0.744	1009 18 4
1015	16	1200	100	0.753	1009 19 2
1015	17	1200	100	0.764	1009 20 6
1015	18	1200	100	0.836	1009 21 4
1015	20	1200	100	0.921	1009 23 0
1015	25	1000	100	1.150	1009 42 7
1015	28	1000	100	1.250	1009 36 9

Podstawowe wymiary obejmy mocującej

D mm	L mm	H mm	b mm	A mm
5	16	4	12	7
6	16	5	12	7
7	16	6	12	7
8	16	7	12	7
9	16	8	12	7
10	16	9	12	7
11	16	10	14	7
12	16	11	14	7
13	16	12	14	7
14	16	12,5	14	7
15	16	13,5	14	7
16	16	14	14	7
17	16	15	14	7
18	16	16	14	7
20	16	18	14	7
25	16	22,5	14	7
28	16	25	14	7



Typ	Do śr. mm	Ilość w kartonie szt.	Opak. szt.	Waga kg/% szt.	Nr kat. St / FT
822	6	1000	100	0.885	1014 00 5
822	10	1200	100	1.075	1014 01 3
822	12	400	100	1.450	1014 02 1
822	14	400	100	1.600	1014 03 8
822	16	400	100	1.733	1014 04 6
822	18,5	400	100	1.946	1014 15 0
822	20	600	100	2.125	1014 17 7
822	22,5	500	50	2.338	1014 18 1
822	25	500	50	2.400	1014 20 1
822	28,3	200	50	4.420	1014 21 8
822	32	100	100	5.490	1014 22 2
822	37	100	100	7.100	1014 23 9
822	40	100	100	6.590	1014 24 6
822	50	100	100	7.690	1014 25 4
822	63	100	100	9.260	1014 26 2

Podstawowe wymiary obejmy mocującej

D mm	L mm	H mm	b mm	t mm	A mm
6	23,5	5	20	2	10
10	23,5	9	20	2	10
12	23,5	11	20	2	10
14	23,5	13	20	2	10
15,2	23,5	14	20	2	10
18,6	23,5	17	20	2	10
20,4	23,5	19,4	20	2	10
22,5	23,5	21	20	2	11
28,3	27	26,6	20	3	11
37	30	35	25	3	13
50	32,5	60	25	3	15

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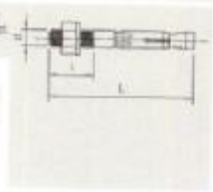
Kołek

Kotwa sworzniowa

Typ	Gwint	Wymiar d mm	Wymiar l mm	Głębokość kotwienia mm	Wymiar L mm	Opak. szt.	Waga kg/% szt.	Nr kat. Bk / G
FNA II 6	M6	6	13	40	53	100	1.400	3498 42 5

Kotwa wbijana z gwintem M6 dla podłoża betonowego.
Atest zgodnie z DIN 4102. Klasa odporności ogniowej F 90.



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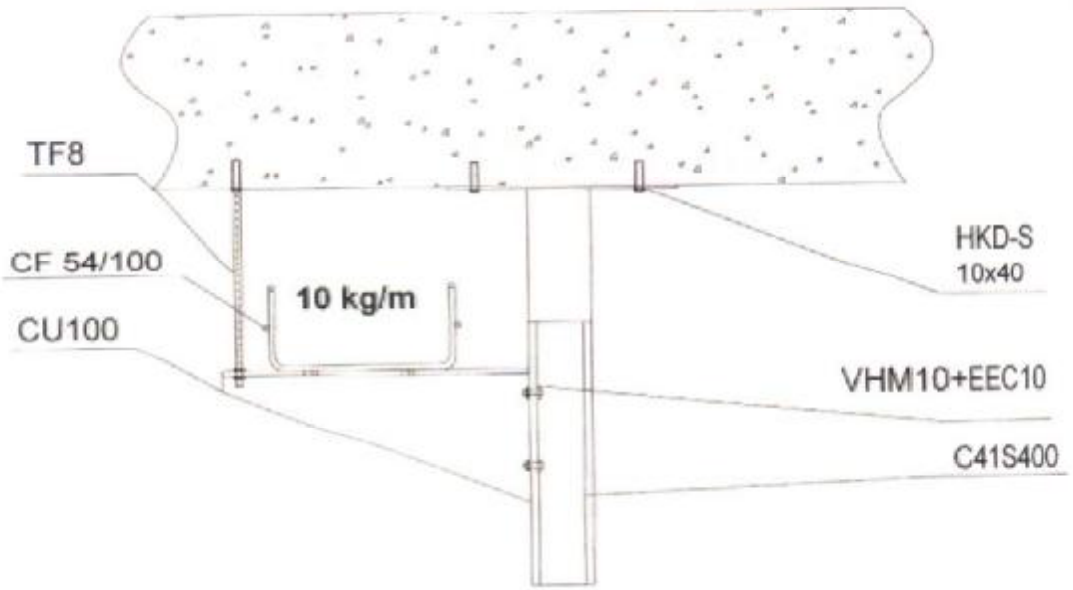
ZESTAWIENIE MATERIAŁÓW

Lp.	Element	Ilość [szt]
1.	CF30/100 EZ	2
2.	pręt gwintowany TF8	3
3.	nakrętka EEC8	12
4.	Wspornik C41S400	3
5.	kotwa HILTI HKD-S10x40	6
6.	Kitasstr	2
7.	Wspornik CU 150	3
8.	Kotwa Hilti HKD-S 8x40	3
9.	VHM10x40+EEC10	12



odległość między mocowaniami
co 1,25 metra

max. obciążenie 10 kg/m

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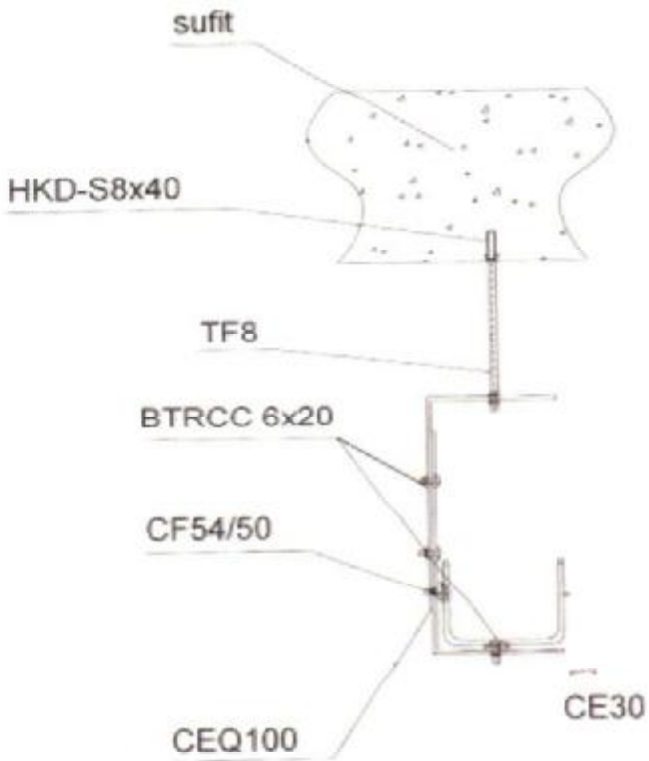
ZESTAWIENIE MATERIAŁÓW

Lp.	Element	Ilość [szt]
1.	CF54/50 EZ	2
2.	pręt gwintowany TF8	3
3.	nakrętka wieńcowa EEC8	6
4.	CEQ 100	6
5.	kotwa HILTI HKD-S8x40	3
6.	zacisk CE30	6
7.	zestaw BTRCC 6x20	9



odległość między mocowaniami
do 1,25 metra

max. obciążenie ? kg/m

FIRES s.r.o.
POŻIARNA ODOLNOŚĆ
FIRE RESISTANCE

Dátum/Date 09. 08. 2019

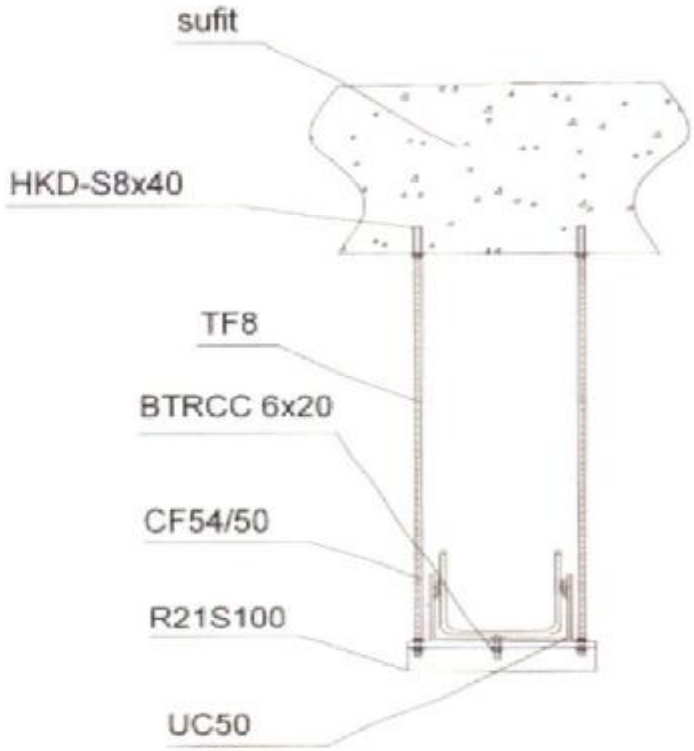
Podpis/Signature

Dokument č.
Document No. FIRES-FR-162-01-AME

Príloha č./Appendix No. 42

ZESTAWIENIE MATERIAŁÓW

Lp.	Element	Ilość [szt]
1.	CF54/50EZ	2
2.	pręt gwintowany TF8	3
3.	nakrętka wieńcowa EEC8	12
4.	UC50	3
5.	kotwa HILTI HKD-S8x40	6
6.	R21S100	3
7.	zestaw BTRCC 6x20	3
8.	Kitasstr	2



odległość między mocowaniami
do 1,25 metra

max. obciążenie ? kg/m

FIRES s.r.o.
POŽIARNA ODOLNOSŤ
FIRE RESISTANCE

Dátum/Date 09.08.2008

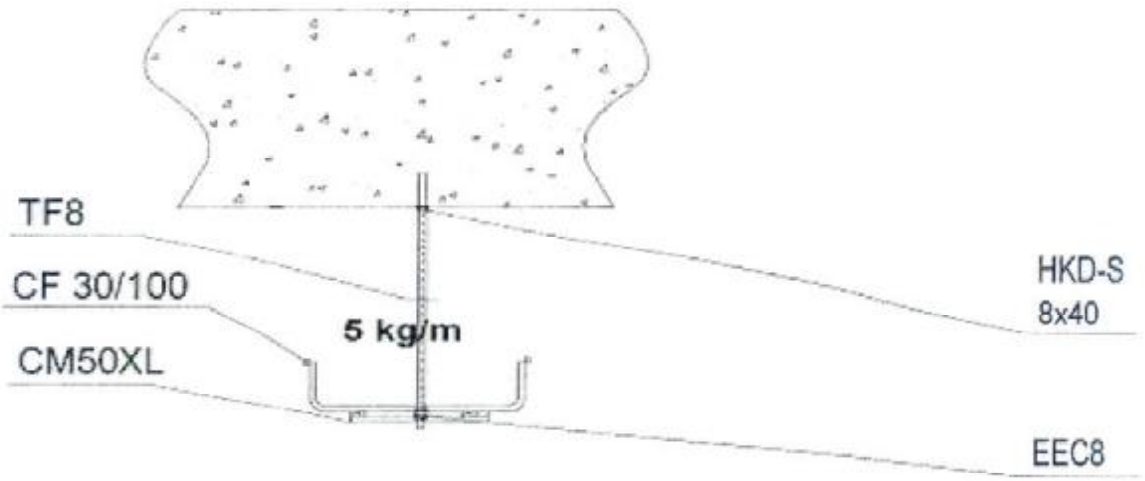
Podpis/Signature

Dokument č./Document No. FIRES-FR-162-08-AUVE

Príloha č./Appendix No. 5

ZESTAWIENIE MATERIAŁÓW

Lp.	Element	Ilość [szt]
1.	CF30/100 EZ	2
2.	pręt gwintowany TF8	3
3.	nakrętka EEC8	6
4.	Wspornik CM50XL	3
5.	kotwa HILTI HKD-S8x40	3
6.	Kitasstr	6



odległość między mocowaniami
co 1,25 metra

max. obciążenie 5 kg/m

FIRES s.r.o.
POŽIARNA ODOLNOSŤ
FIRE RESISTANCE

Datum/Date 06.08.2004

Podpis/Signature

Dokument č. / Document No. FIRES-FR-162-01-ANNE

Príloha č./Appendix No. 44