

TEST REPORT FIRES-FR-040-07-AUNE

Cables with integrity function Type – HTKSH, HTKSHekw



FIRES, s.r.o.

Notifikovaná osoba č./ Notified Body No.: 1396

Autorizovaná osoba reg. č./ Approved Body No.: SK01

Osloboditeľov 282, 059 35 Batizovce, Slovakia

Tel.+421 52 775 2298, Fax+421 52 7881412, e-mail: info@fires.sk, www.fires.sk



Reg. No. 041/S-159

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

TEST REPORT

Test report number: **FIRES-FR-040-07-AUNE**
Tested property: Function in fire
Test method: DIN 4102 – 12:1998-11

Date of issue: **19. 03. 2007**

Name of the product: Cables with integrity function
Type – HTKSH, HTKSHekw

Manufacturer: **TECHNOKABEL S.A.**, Nasielska 55, 04-343 Warszawa, Poland
– producer of cables

Baks, Jagodne 5, 05-480 Karczew, Poland – producer of construction

Sponsor: **TECHNOKABEL S.A.**, Nasielska 55, 04-343 Warszawa, Poland

Task No.: PR-07-0052

Specimen received: 16. 02. 2007

Date of the fire test: 22. 02. 2007

Technician responsible for the technical side of this report: Miroslav Hudák

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Test reports: 3

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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. Test specimens were communication non-halogen cables with circuit integrity maintenance. Persons witnessing the test:

Representatives of the sponsor: Mr. Mariusz Kwiatkowski (TECHNOKABEL)
Mr. Jacek Kliczek (BAKS)

Test directed by: Ing. Štefan Rástocký
Test carried out by: Miroslav Hudák
Operator: Ján Hurajt

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 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 57 005	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 comprised from communication non-halogen cables and supporting system BAKS with accessories – cable trays, cable ladders, ceiling ledges with clamps UKO1, clamps UEF, UDF and sleeves – OZO, OZMO.

Cables: HTKSHekw 1x2x2,3 FE180 PH90/E30 (22 x)
HTKSHekw 1x2x2,3 FE180 PH90/E30-E60 (22 x)
HTKSH 4x2x0,8 FE180 PH90/E30-E60 (22 x)
HTKSH 4x2x0,8 FE180 PH90/E30-E90 (22 x)

Supporting system: suspension track and ceiling installation were used for specimen test.

Suspension track: was made by three hangers (type WPCO 800) which were fixed to ceiling by four dowels (type PSRO M10x80) in spacing of 1500 mm. Two booms (type WMCO 400) were fixed by screws (type SM M10 x 20) at each hanger. Holders (type UPWO) were fixed at the end of booms. Booms were fixed through these holders by threaded bar M10 with washers and nuts M10 to ceiling holder (type USOV) which was fixed to ceiling by dowel (type PSRO M10x80).

Two trays (type KCOP 400H60/3) were fixed at upper booms and jointed together by two junctions (type LPOPH60N) and by sheet (type BLO N) with screws M6 (type SGN M6x12). Trays were fixed to booms by screws M6 (type SGN M6x12).

Two ladders (type DGOP 400H60/3) were fixed at bottom booms and jointed together by junction (type LDOCH60N) with screws M8 (type SGN M8x14). Ladders were fixed to booms by clips (type ZMO) with screws M8 (type SGN M8x14).

Ceiling installation: was made by cable clips UDF, UEF and sleeves OZO, OZMO, which were fixed to ceiling by dowels (type SRO M6x30) in spacing of 300 mm and 600 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 and 600 mm.

Types of individual components are from catalogue BAKS 8/2006.

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

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 drawings was checked. The specimen corresponded to the drawings 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 specimen was 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
51,1	3,2	19,3	3,4

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 O₂ 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]
22. 02. 2007	37,9	13,6

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 HTKSHekw 1x2x2,3 FE180 PH90/E30	88 minutes
Specimen 2: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	54 minutes
Specimen 3: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	62 minutes
Specimen 4: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	72 minutes
Specimens 5,6: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	56 minutes
Specimen 7: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	61 minutes
Specimen 8: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	67 minutes
Specimen 9: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	60 minutes

SPECIMENS	Time to first failure/interruption of conductor
Specimen 10: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	77 minutes
Specimen 11: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	60 minutes
Specimen 12: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	54 minutes
Specimen 13: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	69 minutes
Specimen 14: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	65 minutes
Specimen 15: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	54 minutes
Specimen 16: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	69 minutes
Specimen 17: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	90 minutes no failure
Specimen 18: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	67 minutes
Specimen 19: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	64 minutes
Specimen 20: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	72 minutes
Specimen 21: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	79 minutes
Specimen 22: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	59 minutes
Specimen 23: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	65 minutes
Specimen 24: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	58 minutes
Specimen 25: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	78 minutes
Specimen 26: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	67 minutes
Specimen 27: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	59 minutes
Specimen 28: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	30 minutes
Specimen 29: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	66 minutes
Specimen 30: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	62 minutes
Specimen 31: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	62 minutes
Specimen 32: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	56 minutes
Specimen 33: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	78 minutes
Specimen 34: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	70 minutes
Specimen 35: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	72 minutes
Specimen 36: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	66 minutes
Specimen 37: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	48 minutes
Specimen 38: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	59 minutes
Specimen 39: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	51 minutes
Specimen 40: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	45 minutes
Specimen 41: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	77 minutes
Specimen 42: cable HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	66 minutes
Specimen 43: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	59 minutes
Specimen 44: cable HTKSHekw 1x2x2,3 FE180 PH90/E30	51 minutes
Specimen 52A: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	84 minutes
Specimen 52B: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	83 minutes
Specimens 53A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	90 minutes no failure
Specimen 54A: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	86 minutes
Specimen 54B: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure
Specimens 55A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	90 minutes no failure
Specimens 56A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	90 minutes no failure
Specimen 57A: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure
Specimen 57B: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	38 minutes
Specimens 58A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	90 minutes no failure
Specimen 59A: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	84 minutes
Specimen 59B: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure
Specimens 60A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	90 minutes no failure

SPECIMENS	Time to first failure/interruption of conductor
Specimens 61A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure
Specimens 62A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	90 minutes no failure
Specimens 63A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure
Specimen 64A: cable HTKSH 4x2x0,8 FE180 PH90/E30-E90	30 minutes
Specimen 64B: cable HTKSH 4x2x0,8 FE180 PH90/E30-E90	39 minutes
Specimens 65A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure
Specimens 66A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	90 minutes no failure
Specimens 67A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure
Specimen 68A: cable HTKSH 4x2x0,8 FE180 PH90/E30-E90	53 minutes
Specimen 68B: cable HTKSH 4x2x0,8 FE180 PH90/E30-E90	51 minutes
Specimens 69A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure
Specimens 70A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	90 minutes no failure
Specimen 71A: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure
Specimen 71B: cable HTKSH 4x2x0,8 FE180 PH90/E30-E60	88 minutes
Specimens 72A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	90 minutes no failure
Specimens 73A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	90 minutes no failure

The fire test was discontinued in 93rd 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: Ing. Štefan Rástocký

Translated by: Marek Rusnák

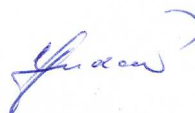
Issued by:



Ing. Štefan Rástocký
leader of the testing laboratory



Responsible for the technical side of this report:



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

8. LIST OF APPENDICES

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Appendix 6	Measured times of tested specimens from V25 to V32
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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	23,4	23,8	40,5	27,1	31,5	31,9	49,4	29,9	32,2	20,0	15,9	0,0	-0,1
5	591,4	628,3	679,5	608,9	587,9	617,9	679,1	553,2	618,3	576,2	15,0	-11,4	9,4
10	664,2	708,9	719,1	684,9	680,0	707,2	738,6	668,5	696,4	678,4	12,9	-3,0	7,4
15	722,8	709,9	735,6	750,9	723,2	704,8	755,7	717,0	727,5	738,5	11,9	-2,4	10,5
20	777,7	776,6	780,7	752,4	784,9	778,5	786,6	715,3	769,1	781,3	11,5	-2,4	15,1
25	799,4	800,3	804,5	801,8	812,7	821,2	826,1	780,1	805,8	814,6	11,6	-1,7	10,9
30	809,2	816,4	840,1	856,4	834,9	861,7	873,0	842,0	841,7	841,8	11,3	-1,4	9,6
35	830,9	840,1	863,5	879,9	851,8	883,5	897,4	868,6	864,5	864,8	11,6	-1,2	11,5
40	853,2	864,6	888,3	904,4	872,8	904,5	921,7	894,5	888,0	884,7	11,3	-1,0	13,4
45	873,6	886,6	907,7	920,3	891,2	923,5	940,6	918,3	907,7	902,3	11,1	-0,8	10,5
50	891,4	904,3	923,0	935,8	906,0	938,0	956,3	937,4	924,0	918,1	11,2	-0,6	12,5
55	909,0	921,8	941,3	952,8	923,2	954,2	974,6	959,2	942,0	932,3	11,2	-0,4	10,0
60	932,2	940,8	937,4	934,8	952,6	974,8	957,9	947,1	947,2	945,3	11,2	-0,3	12,1
65	915,0	933,3	950,4	943,7	926,8	937,1	963,3	925,2	936,9	957,3	11,3	-0,9	11,2
70	973,1	990,4	1010,0	1015,0	973,6	1009,0	1030,0	1003,0	1000,5	968,4	10,9	-0,7	11,5
75	979,4	987,8	989,3	985,7	998,6	1017,0	1010,0	997,5	995,7	978,7	11,0	-0,4	10,2
80	985,4	993,5	995,5	990,3	1005,0	1022,0	1019,0	997,7	1001,1	988,4	11,1	-0,3	10,1
85	994,8	1002,0	1003,0	997,1	1015,0	1030,0	1023,0	1004,0	1008,6	997,4	11,1	-0,2	10,6
90	1023,0	1014,0	1010,0	993,2	1020,0	1014,0	1002,0	981,8	1007,3	1005,9	10,9	-0,2	11,6
91	1024,0	1015,0	1012,0	994,5	1023,0	1015,0	1003,0	983,7	1008,8	1007,6	11,0	-0,2	11,0
92	1027,0	1017,0	1015,0	996,8	1024,0	1017,0	1005,0	984,4	1010,8	1009,2	11,1	-0,2	11,3

Tave Average temperature in the test furnace calculated from plate thermometers

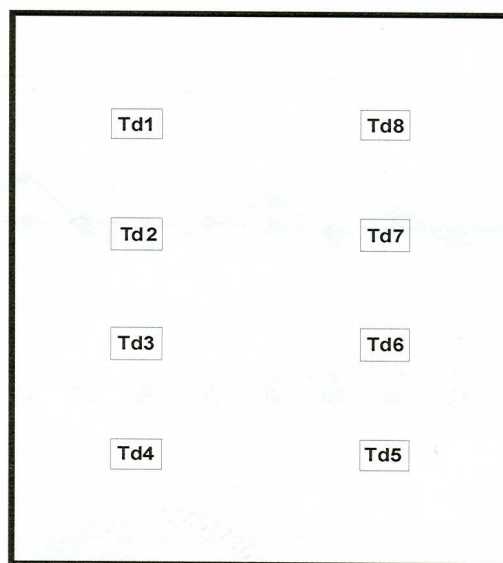
Tn Standard temperature in the test furnace laid down to test guideline

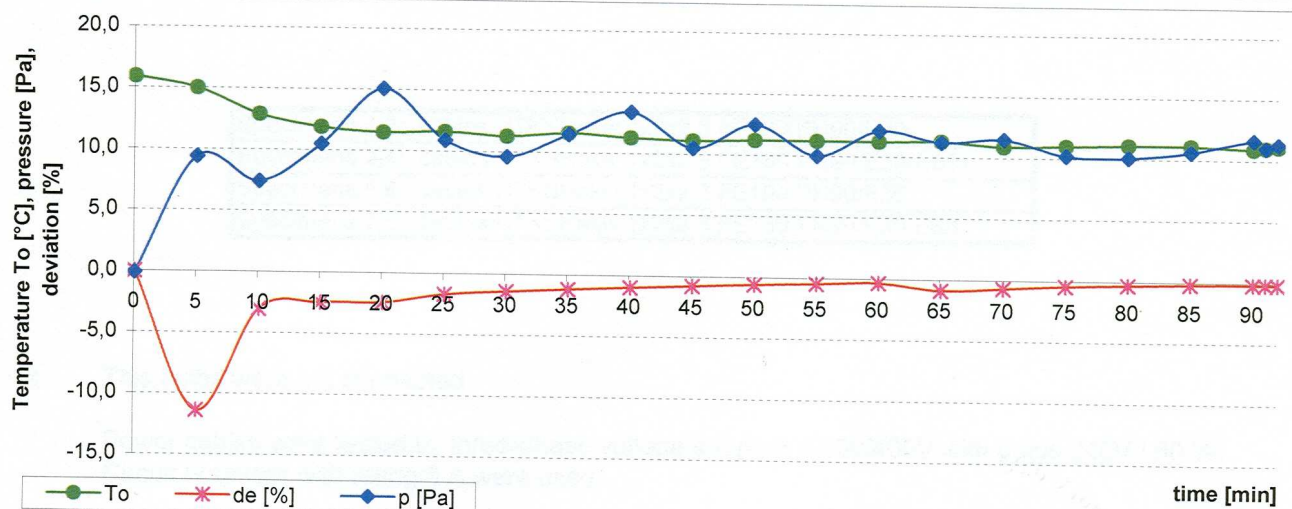
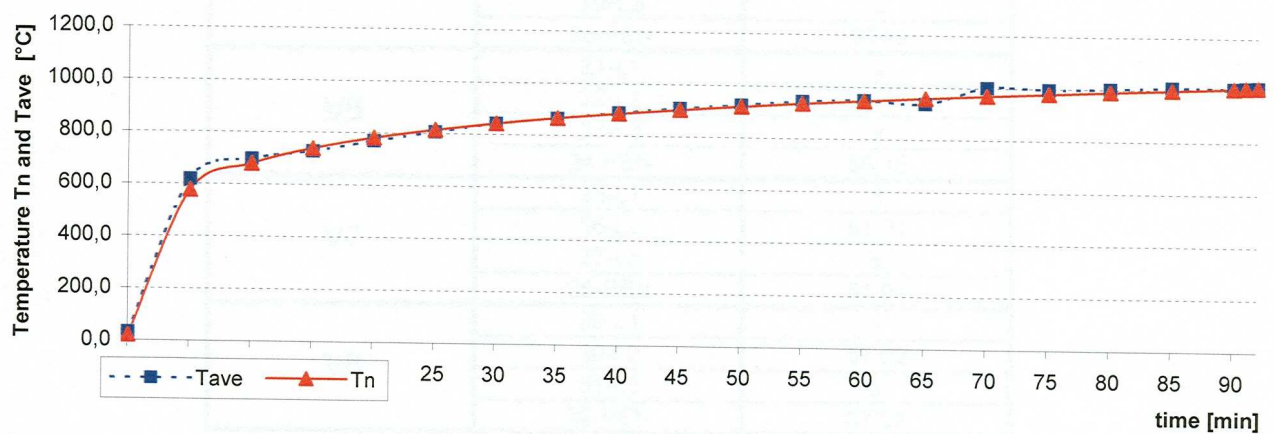
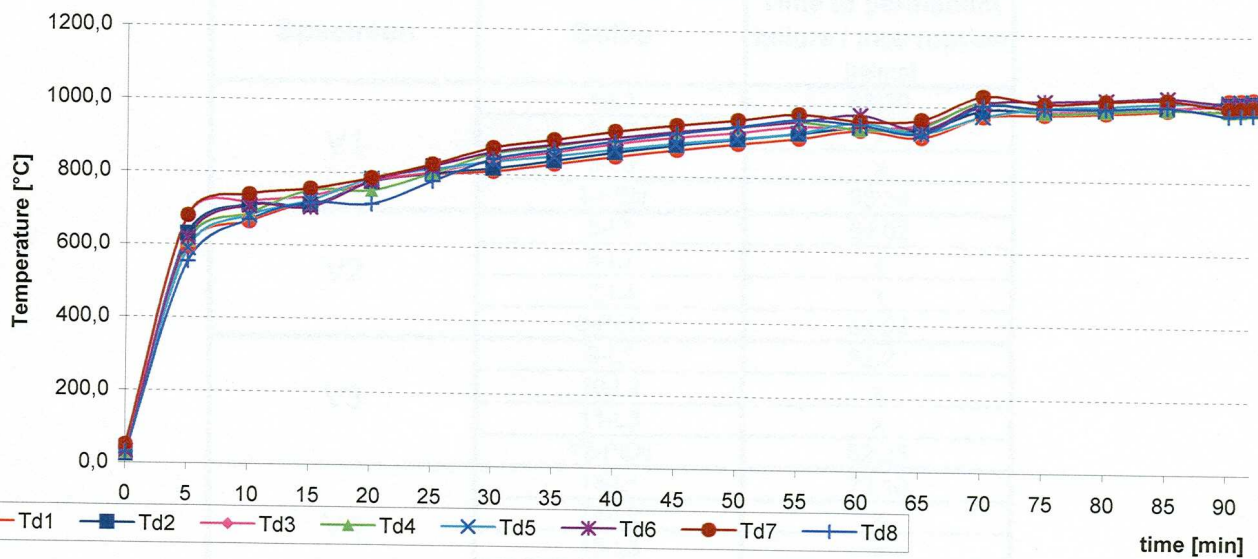
To Ambient temperature

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	88:30
	2-L2	x
	3-L3	x
	4-PEN	88:30
V2	5-L1	54:02
	6-L2	x
	7-L3	x
	8-PEN	54:02
V3	9-L1	62:23
	10-L2	x
	11-L3	x
	12-PEN	62:23
V4	13-L1	72:10
	14-L2	x
	15-L3	x
	16-PEN	72:10
V5	17-L1	x
	18-L2	56:49
	19-L3	x
	20-PEN	56:49
V6	21-L1	x
	22-L2	56:16
	23-L3	x
	24-PEN	56:16
V7	25-L1	x
	26-L2	61:01
	27-L3	x
	28-PEN	61:01
V8	29-L1	x
	30-L2	67:02
	31-L3	x
	32-PEN	67:02

Specimens 1,2: cables HTKSHekw 1x2x2,3 FE180 PH90/E30
Specimens 3,4: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60
Specimens 5,6: cables HTKSHekw 1x2x2,3 FE180 PH90/E30
Specimens 7,8: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60

x This bulbs were not connected.

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	x
	34-L2	x
	35-L3	60:12
	36-PEN	60:12
V10	37-L1	x
	38-L2	x
	39-L3	77:35
	40-PEN	77:35
V11	41-L1	x
	42-L2	x
	43-L3	60:44
	44-PEN	60:44
V12	45-L1	x
	46-L2	x
	47-L3	54:02
	48-PEN	54:02
V13	49-L1	69:00
	50-L2	x
	51-L3	x
	52-PEN	69:00
V14	53-L1	65:16
	54-L2	x
	55-L3	x
	56-PEN	65:16
V15	57-L1	54:18
	58-L2	x
	59-L3	x
	60-PEN	54:18
V16	61-L1	69:19
	62-L2	x
	63-L3	x
	64-PEN	69:19

Specimens 9,10: cables HTKSHekw 1x2x2,3 FE180 PH90/E30
Specimens 11,12: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60
Specimens 13,14: cables HTKSHekw 1x2x2,3 FE180 PH90/E30
Specimens 15,16: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60

x This bulbs were not connected.

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	x
	66-L2	no failure
	67-L3	x
	68-PEN	no failure
V18	69-L1	x
	70-L2	67:15
	71-L3	x
	72-PEN	67:15
V19	73-L1	x
	74-L2	64:32
	75-L3	x
	76-PEN	64:32
V20	77-L1	x
	78-L2	72:23
	79-L3	x
	80-PEN	72:23
V21	81-L1	x
	82-L2	x
	83-L3	79:10
	84-PEN	79:10
V22	85-L1	x
	86-L2	x
	87-L3	59:47
	88-PEN	59:47
V23	89-L1	x
	90-L2	x
	91-L3	65:59
	92-PEN	65:59
V24	93-L1	x
	94-L2	x
	95-L3	58:42
	96-PEN	58:42

Specimens 17,18: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60

Specimens 19,20: cables HTKSHekw 1x2x2,3 FE180 PH90/E30

Specimens 21,22: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60

Specimens 23,24: cables HTKSHekw 1x2x2,3 FE180 PH90/E30

x This bulbs were not connected.

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 V32

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V25	97-L1	78:44
	98-L2	x
	99-L3	x
	100-PEN	78:44
V26	101-L1	67:59
	102-L2	x
	103-L3	x
	104-PEN	67:59
V27	105-L1	59:11
	106-L2	x
	107-L3	x
	108-PEN	59:11
V28	109-L1	30:13
	110-L2	x
	111-L3	x
	112-PEN	30:13
V29	113-L1	x
	114-L2	66:15
	115-	x
	116-PEN	66:15
V30	117-L1	x
	118-L2	62:06
	119-L3	x
	120-PEN	62:06
V31	121-L1	x
	122-L2	62:15
	123-L3	x
	124-PEN	62:15
V32	125-L1	x
	126-L2	56:02
	127-L3	x
	128-PEN	56:02

Specimens 25,26: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60

Specimens 27,28: cables HTKSHekw 1x2x2,3 FE180 PH90/E30

Specimens 29,30: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60

Specimens 31,32: cables HTKSHekw 1x2x2,3 FE180 PH90/E30

x This bulbs were not connected.

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	x
	130-L2	x
	131-L3	78:33
	132-PEN	78:33
V34	133-L1	x
	134-L2	x
	135-L3	70:39
	136-PEN	70:39
V35	137-L1	x
	138-L2	x
	139-L3	72:01
	140-PEN	72:01
V36	141-L1	x
	142-L2	x
	143-L3	66:54
	144-PEN	66:54
V37	145-L1	48:02
	146-L2	x
	147-L3	x
	148-PEN	48:02
V38	149-L1	59:36
	150-L2	x
	151-L3	x
	152-PEN	59:36
V39	153-L1	51:48
	154-L2	x
	155-L3	x
	156-PEN	51:48
V40	157-L1	45:56
	158-L2	x
	159-L3	x
	160-PEN	45:56

Specimens 33,34: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60
Specimens 35,36: cables HTKSHekw 1x2x2,3 FE180 PH90/E30
Specimens 37,38: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60
Specimens 39,40: cables HTKSHekw 1x2x2,3 FE180 PH90/E30

x This bulbs were not connected.

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 V41 to V44

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V41	161-L1	x
	162-L2	77:59
	163-L3	x
	164-PEN	77:59
V42	165-L1	x
	166-L2	66:29
	167-L3	x
	168-PEN	66:29
V43	169-L1	x
	170-L2	59:55
	171-L3	x
	172-PEN	59:55
V44	173-L1	x
	174-L2	51:48
	175-L3	x
	176-PEN	51:48

Specimens 41,42: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60

Specimens 43,44: cables HTKSHekw 1x2x2,3 FE180 PH90/E30

x This bulbs were not connected.

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 V59

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V52A	209-L	84:45
	210-PEN	84:45
V52B	211-L	83:05
	212-PEN	83:05
V53A	213-L	no failure
	214-PEN	no failure
V53B	215-L	no failure
	216-PEN	no failure
V54A	217-L	86:40
	218-PEN	86:40
V54B	219-L	no failure
	220-PEN	no failure
V55A	221-L	no failure
	222-PEN	no failure
V55B	223-L	no failure
	224-PEN	no failure
V56A	225-L	no failure
	226-PEN	no failure
V56B	227-L	no failure
	228-PEN	no failure
V57A	229-L	no failure
	230-PEN	no failure
V57B	231-L	no failure
	232-PEN	38:41
V58A	233-L	no failure
	234-PEN	no failure
V58B	235-L	no failure
	236-PEN	no failure
V59A	237-L	84:45
	238-PEN	84:45
V59B	239-L	no failure
	240-PEN	no failure

Specimens 52A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60
Specimens 53A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 54A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60
Specimens 55A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 56A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 57A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60
Specimens 58A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 59A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60

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

Measured time of tested specimens from V60 to V67

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V60A	241-L	no failure
	242-PEN	no failure
V60B	243-L	no failure
	244-PEN	no failure
V61A	245-L	no failure
	246-PEN	no failure
V61B	247-L	no failure
	248-PEN	no failure
V62A	249-L	no failure
	250-PEN	no failure
V62B	251-L	no failure
	252-PEN	no failure
V63A	253-L	no failure
	254-PEN	no failure
V63B	255-L	no failure
	256-PEN	no failure
V64A	257-L	30:13
	258-PEN	30:13
V64B	259-L	39:27
	260-PEN	39:27
V65A	261-L	no failure
	262-PEN	no failure
V65B	263-L	no failure
	264-PEN	no failure
V66A	265-L	no failure
	266-PEN	no failure
V66B	267-L	no failure
	268-PEN	no failure
V67A	269-L	no failure
	270-PEN	no failure
V67B	271-L	no failure
	272-PEN	no failure

Specimens 60A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 61A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60
Specimens 62A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 63A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60
Specimens 64A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 65A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60
Specimens 66A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 67A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60

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

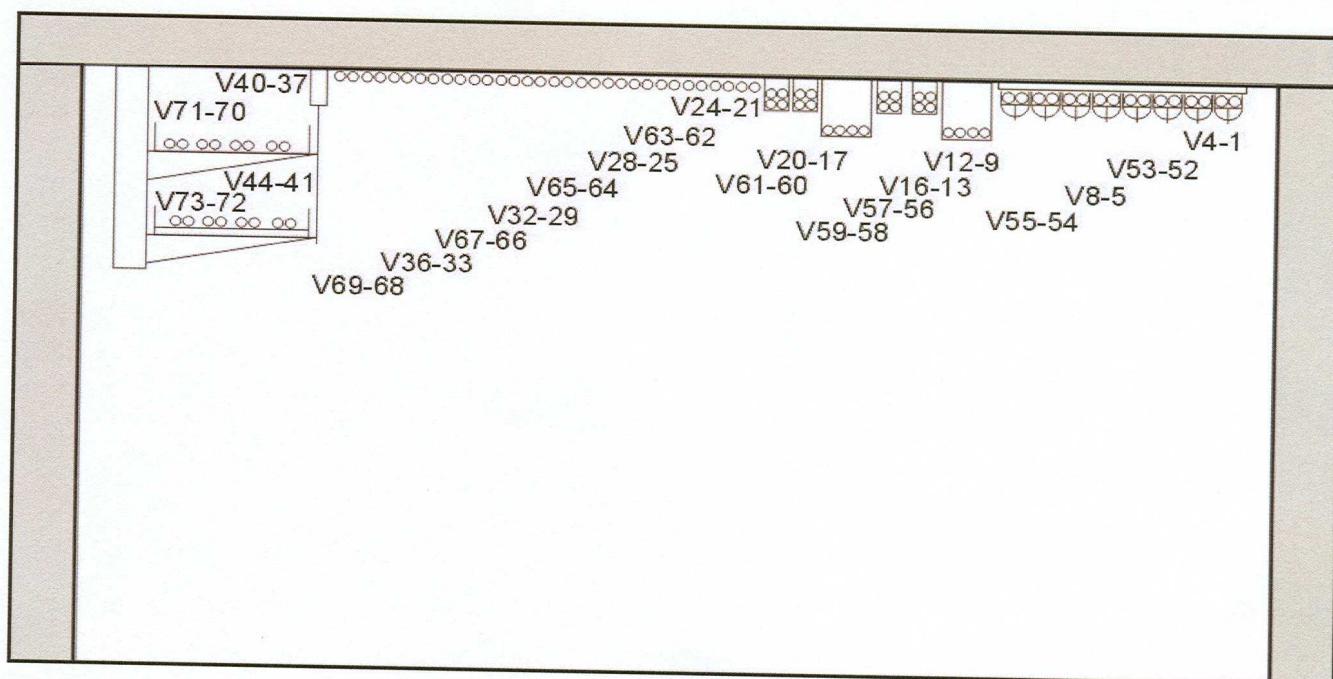
Measured time of tested specimens from V68 to V73

Specimen	Bulbs	Time to permanent failure / interruption [min:s]
V68A	273-L	53:21
	274-PEN	53:21
V68B	275-L	51:04
	276-PEN	51:04
V69A	277-L	no failure
	278-PEN	no failure
V69B	279-L	no failure
	280-PEN	no failure
V70A	281-L	no failure
	282-PEN	no failure
V70B	283-L	no failure
	284-PEN	no failure
V71A	285-L	no failure
	286-PEN	no failure
V71B	287-L	88:00
	288-PEN	88:00
V72A	289-L	no failure
	290-PEN	no failure
V72B	291-L	no failure
	292-PEN	no failure
V73A	293-L	no failure
	294-PEN	no failure
V73B	295-L	no failure
	296-PEN	no failure

Specimens 68A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 69A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60
Specimens 70A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 71A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60
Specimens 72A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90
Specimens 73A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60

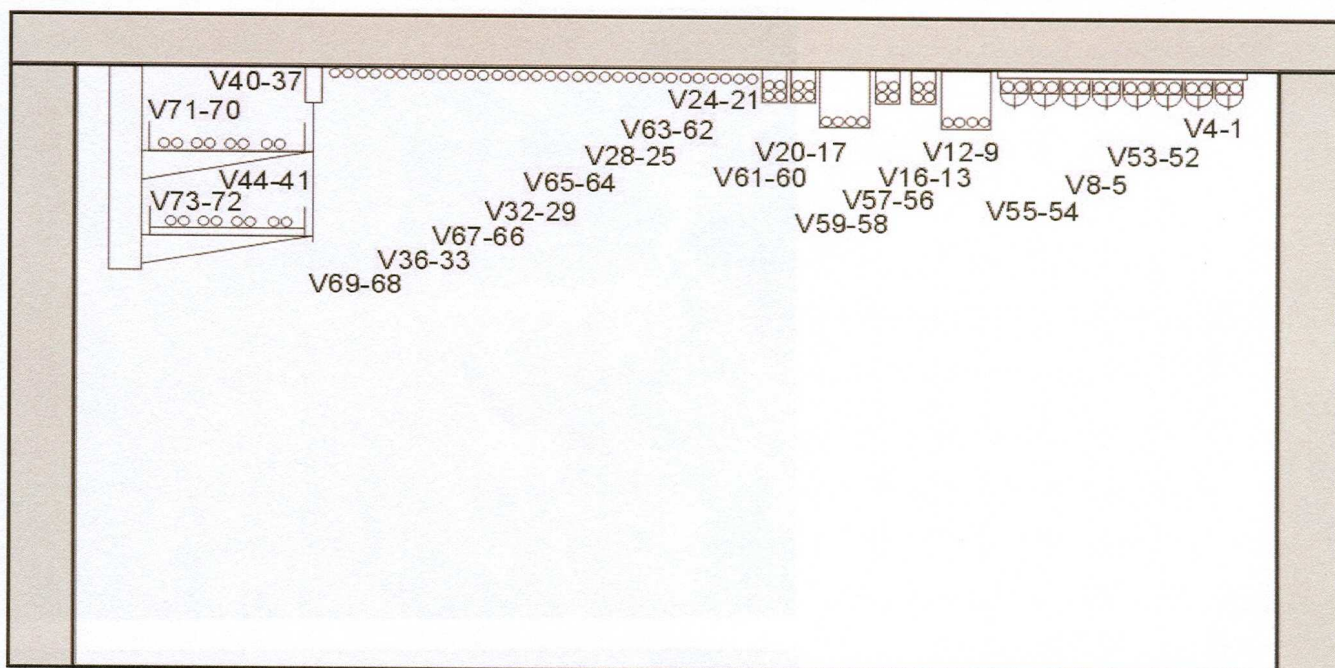
Signal cables were tested by three-phase voltage supply 1 x 110V with LED diodes 3V / 0,3W. Circuit breakers with rating 3 A were used.

Layout of cables in the test furnace



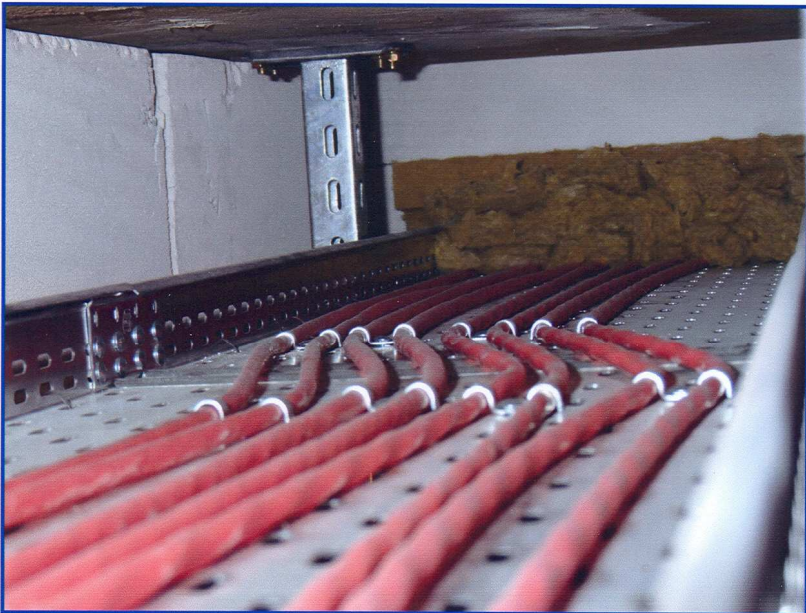
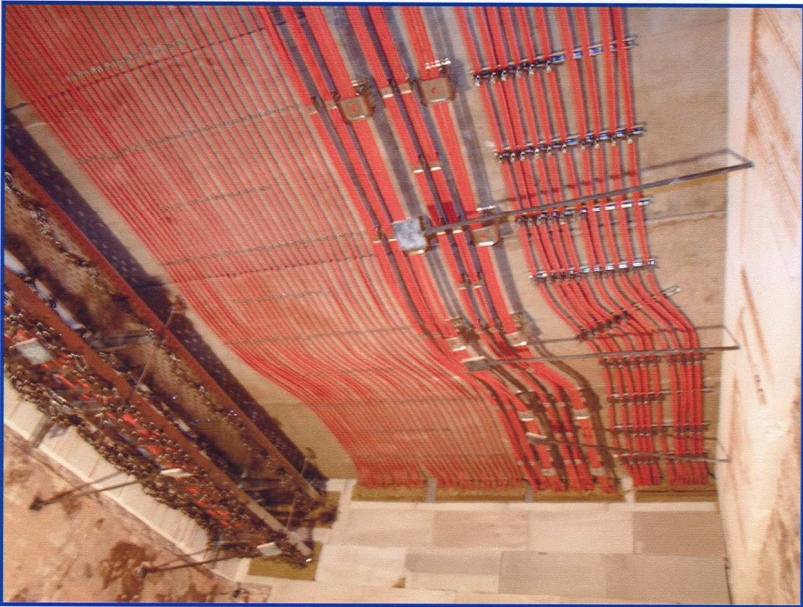
Specimens 1,2: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	Specimens placed in ceiling profile ledges with clips UKO1 in spacing of 600 mm
Specimens 3,4: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	
Specimens 5,6: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	Specimens placed in ceiling profile ledges with clips UKO1 in spacing of 300 mm
Specimens 7,8: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	
Specimens 9,10: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	Specimens placed in ceiling clips OZO in spacing of 600 mm
Specimens 11,12: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	
Specimens 13,14: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	Specimens placed in ceiling clips OZMO in spacing of 300 mm
Specimens 15,16: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	
Specimens 17,18: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	Specimens placed in ceiling clips OZMO in spacing of 600 mm
Specimens 19,20: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	
Specimens 21,22: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	Specimens placed in ceiling clips UDF in spacing of 600 mm
Specimens 23,24: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	
Specimens 25,26: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	Specimens placed in ceiling clips UDF in spacing of 300 mm
Specimens 27,28: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	
Specimens 29,30: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	Specimens placed in ceiling clips UEF in spacing of 300 mm
Specimens 31,32: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	
Specimens 33,34: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	Specimens placed in ceiling clips UEF in spacing of 600 mm
Specimens 35,36: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	
Specimens 37,38: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	Specimens placed in the upper tray
Specimens 39,40: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	
Specimens 41,42: cables HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	
Specimens 43,44: cables HTKSHekw 1x2x2,3 FE180 PH90/E30	Specimens placed in the upper ladder

Layout of cables in the test furnace



Specimens 52A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	Specimens placed in ceiling profile ledges with clips UKO1 in spacing of 600 mm
Specimens 53A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	
Specimens 54A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	Specimens placed in ceiling profile ledges with clips UKO1 in spacing of 300 mm
Specimens 55A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	
Specimens 56A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	Specimens placed in ceiling clips OZMO in spacing of 300 mm
Specimens 57A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	
Specimens 58A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	Specimens placed in ceiling clips OZO in spacing of 600 mm
Specimens 59A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	
Specimens 60A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	Specimens placed in ceiling clips OZMO in spacing of 600 mm
Specimens 61A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	
Specimens 62A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	Specimens placed in ceiling clips UDF in spacing of 600 mm
Specimens 63A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	
Specimens 64A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	Specimens placed in ceiling clips UDF in spacing of 300 mm
Specimens 65A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	
Specimens 66A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	Specimens placed in ceiling clips UEF in spacing of 300 mm
Specimens 67A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	
Specimens 68A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	Specimens placed in ceiling clips UEF in spacing of 600 mm
Specimens 69A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	
Specimens 70A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	Specimens placed in the upper tray
Specimens 71A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	
Specimens 72A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E90	Specimens placed in the upper ladder
Specimens 73A,B: cables HTKSH 4x2x0,8 FE180 PH90/E30-E60	

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.

Firma TECHNOKABEL - BAKS

MICA 3

w dniu 19-22.02.2007

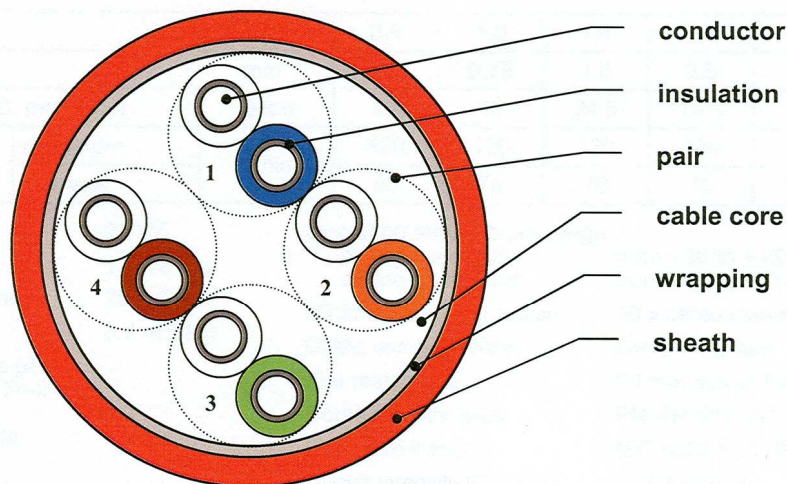
Cables type Parameters of support cables	HTKSHekw 1x2x2,3 FE180 PH90/E30	HTKSHekw 1x2x2,3 FE180 PH90/E30-E60	HTKSH 4x2x0,8 FE180 PH90/E30-E60	HTKSH 4x2x0,8 FE180 PH90/E30-E90
Number of cable on the drawing	1	2	3	4
Cable diameter [mm]	~11,0	~11,4	~10,7	~12,2
Cable weight [kg/m]	0,180	0,185	0,140	0,165
Test voltage [V]	230	230	110	110
1. Tray 60x300 mm, - support - 1500 mm, - load 10 kg/m	2	2	2	2
2. Ladder 60x400 mm, - support - 1500 mm, - load 20 kg/m	2	2	2	2
3. Cable grip UEF - support 300 mm	2	2	2	2
4. Cable grip UEF - support 600 mm	2	2	2	2
5. Cable grip UDF - support 300 mm	2	2	2	2
6. Cable grip UDF - support 600 mm	2	2	2	2
7. Click ring OZMO - support 300 mm - load 1,1kg/click ring	2	2	2	2
8. Click ring OZMO - support 600 mm - load 1,1kg/click ring	2	2	2	2
9. Click ring OZO - support 600 mm - load 6,0kg/click ring	-	-	2	2
10. Click ring OZO - support 600 mm - load 6,0kg/click ring	2	2	-	-
11. Cable grip UK on the rail - support 300 mm	2	2	2	2
12. Cable grip UK on the rail - support 600 mm	2	2	2	2
11. Cable grip UK on the rail - support 300 mm	-	-	-	-

Total test samples [piece]	22	22	22	22
Total length of cables [m]	125,4	125,4	136,8	136,8

Length of sample – 5,7 meters

Length of chamber – 4,0 meters

 FIRES S.T.O. POŽIARNA ODOLNOSŤ FIRE RESISTANCE	Dátum/Date 22.02.2007
	Podpis/Signature 
Dokument č. Document No. FIRES-FR-040-04-AINE	
Príloha č./Appendix No. 16	

HTKSH FE180 PH90/E30-E60**FIRE RESISTANT HALOGEN FREE CABLES****APPLICATIONS**

HTKSH FE180 PH90/E30-E60 fire resistant and halogen free cables are intended for installation in alarm, signalling, transmission, sound warning and similar systems, also for data processing systems and for analogue or digital data transmission in industrial electronics and control applications in objects of sharp fire protection requirements, particularly in fire alarm and fire automatic control systems.

Halogen free cables are applied in locations where, in case of fire, higher safety for human beings and expensive electronic equipment is required.

Functions of the cables are maintained – data are transmitted and power is supplied to equipment which must operate in fire conditions and during fire fighting (e.g. emergency lighting). The cables are flame retardant and their smoke emission is low, emitted fumes are non toxic and non corrosive.

The cables are suitable for indoor installations.

 FIRES s.r.o. POŽIARNA ODOLNOST' FIRE RESISTANCE	Dátum/Date 22.02.2004
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	Dokument č. Document No. <i>FIRES-PR-040-04-AWE</i>
Príloha č./Appendix No. <i>1A</i>	

CONSTRUCTION

- | | | |
|-------------------|---|---|
| conductor | – | bare annealed copper single wire round conductors meeting requirements of class 1 per PN-EN 60228, |
| insulation | – | mica tape and halogen free compound insulation - colours in accordance with PN-92/T-90321 standard, |
| pair | – | insulated conductors twisted into pairs, |
| cable core | – | pairs laid-up into a cable core, |
| wrapping | – | cable core wrapped in a polyester tape, |
| sheath | – | red cable sheath of halogen free compound (oxygen index bigger than 35%). |

HTKSH FE180 PH90/E30-E60

CHARACTERISTICS

The cables maintain their functions for 90 minutes, meeting requirements of PN-EN 50200 standard

Conductor diameter	mm	0.8	1.0	1.4	1.8	2.3	2.8
Conductor cross-section	mm ²	0.5	0.75	1.5	2.5	4	6
DC loop resistance at 20°C, maximum	Ω/km	75	48	24.5	14.9	9.3	6.3
Capacitance between conductors at 1 kHz	maximum	nF/km	120	120	120	120	120
	average		60	70	70	70	100

Operating voltage	240 V	Operating temperature range	
Voltage test	1.5 kV rms	during operation	from - 30 to + 80°C
Insulation resistance, minimum	20 MΩ·km	during installation	from - 5 to + 70°C
Inductance, approximate	0.7 mH/km	Minimum bending radius	10 x cable diameter
Corrosivity of emitted gases per PN-EN 50267-2-3, IEC 60754-2		Cable combustibility	flame retardant
pH, approximate	6.8	Fire resistance	90 minutes at 842°C
conductivity, approximate	0.4 μS/mm	Combustibility tests	PN-EN 60332-1-2 and PN-EN 50200
Smoke density per PN-EN 50268-2-3, IEC 61034-2		Insulation integrity	IEC 60331-21; IEC 60331-11
light transmittance, minimum	94%	Circuit integrity E30-E60	DIN 4102-12
		Reference standards	WT-TK-43 PN-92/T-90320 PN-92/T-90321

CE = the cable meets requirements of the low voltage directive 73/23/EEC and 93/68/EEC

Cable type	Number of pairs (x 2) x conductor diameter	Cable outer diameter (appr.)	Copper index	Cable weight (appr.)
	number x mm	mm	kg/km	kg/km
HTKSH FE180 PH90/E30-E60	4 x 2 x 0,8	10,7	38,4	140

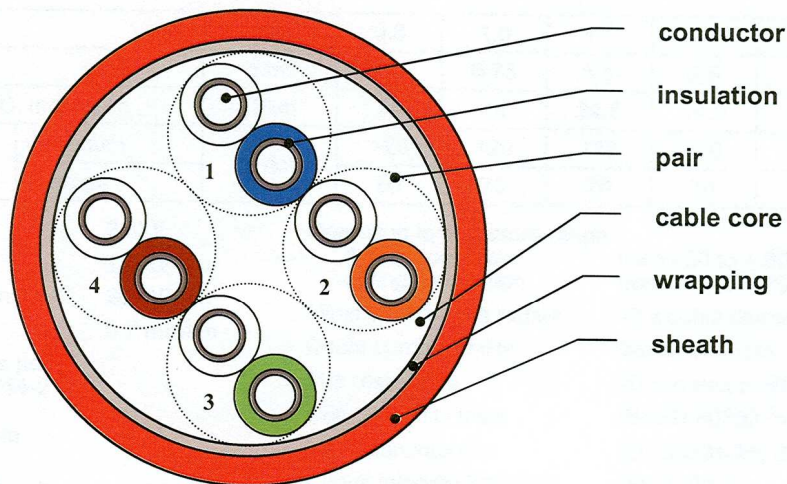
Other diameters and conductor counts available on request.

CONSTRUCTION

 FIRES S.R.O. POŻIARNA ODOLNOŚĆ FIRE RESISTANCE	Dátum/Date 22. 02. 2004
	Podpis/Signature <i>[Signature]</i>
Dokument č. Document No. <i>FIRES-FR-040-04 AWE</i>	
Príloha č./Appendix No. <i>18</i>	

HTKSH FE180 PH90/E30-E90

FIRE RESISTANT HALOGEN FREE CABLES



APPLICATIONS

HTKSH FE180 PH90/E30-E90 fire resistant and halogen free cables are intended for installation in alarm, signalling, transmission, sound warning and similar systems, also for data processing systems and for analogue or digital data transmission in industrial electronics and control applications in objects of sharp fire protection requirements, particularly in fire alarm and fire automatic control systems.

Halogen free cables are applied in locations where, in case of fire, higher safety for human beings and expensive electronic equipment is required.

Functions of the cables are maintained – data are transmitted and power is supplied to equipment which must operate in fire conditions and during fire fighting (e.g. emergency lighting). The cables are flame retardant and their smoke emission is low, emitted fumes are non toxic and non corrosive.

The cables are suitable for indoor installations.

 FIRES S.R.O. POŽIARNA ODOLNOST FIRE RESISTANCE	Dátum/Date 22.02.2004
	Podpis/Signature 
	Dokument č. Document No. FIRES-FR-040-04-AWE
Príloha č./Appendix No. 19	

CONSTRUCTION

conductor	–	bare annealed copper single wire round conductors meeting requirements of class 1 per PN-EN 60228,
insulation	–	mica tape and halogen free compound insulation - colours in accordance with PN-92/T-90321 standard,
pair	–	insulated conductors twisted into pairs,
cable core	–	pairs laid-up into a cable core,
wrapping	–	cable core wrapped in a polyester tape,
sheath	–	red cable sheath of halogen free compound (oxygen index bigger than 35%).

HTKSH FE180 PH90/E30-E90**CHARACTERISTICS**

The cables maintain their functions for 90 minutes, meeting requirements of PN-EN 50200 standard

Conductor diameter	mm	0.8	1.0	1.4	1.8	2.3	2.8
Conductor cross-section	mm ²	0.5	0.75	1.5	2.5	4	6
DC loop resistance at 20°C, maximum	Ω/km	75	48	24.5	14.9	9.3	6.3
Capacitance between conductors at 1 kHz	maximum	nF/km	120	120	120	120	120
	average		60	70	70	100	100

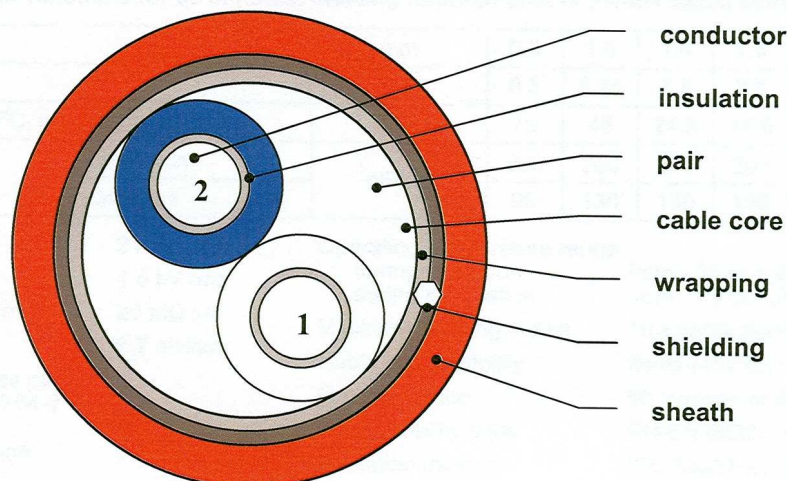
Operating voltage	240 V	Operating temperature range	
Voltage test	1.5 kV rms	during operation	from - 30 to + 80°C
Insulation resistance, minimum	20 MΩ·km	during installation	from - 5 to + 70°C
Inductance, approximate	0.7 mH/km	Minimum bending radius	10 x cable diameter
Corrosivity of emitted gases per PN-EN 50267-2-3, IEC 60754-2		Cable combustibility	flame retardant
pH, approximate	6.8	Fire resistance	90 minutes at 842°C
conductivity, approximate	0.4 μS/mm	Combustibility tests	PN-EN 60332-1-2 and PN-EN 50200
Smoke density per PN-EN 50268-2-3, IEC 61034-2		Insulation integrity	IEC 60331-21; IEC 60331-11
light transmittance, minimum	94%	Circuit integrity E30-E90	DIN 4102-12
		Reference standards	WT-TK-43 PN-92/T-90320 PN-92/T-90321

CE = the cable meets requirements of the low voltage directive 73/23/EEC and 93/68/EEC

Cable type	Number of pairs (x 2) x conductor diameter	Cable outer diameter (appr.)	Copper index	Cable weight (appr.)
	number x mm	mm	kg/km	kg/km
HTKSH FE180 PH90/E30-E90	4 x 2 x 0,8	12,2	38,4	165

Other diameters and conductor counts available on request.

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Príloha č./Appendix No. 20	

HTKSHekw FE180 PH90/E30**FIRE RESISTANT HALOGEN FREE CABLES****APPLICATIONS**

HTKSHekw FE180 PH90/E30 fire resistant and halogen free cables are intended for installation in alarm, signalling, transmission, sound warning and similar systems, also for data processing systems and for analogue or digital data transmission in industrial electronics and control applications in objects of sharp fire protection requirements, particularly in fire alarm and fire automatic control systems.

Halogen free cables are applied in locations where, in case of fire, higher safety for human beings and expensive electronic equipment is required.

Functions of the cables are maintained – data are transmitted and power is supplied to equipment which must operate in fire conditions and during fire fighting (e.g. emergency lighting). The cables are flame retardant and their smoke emission is low, emitted fumes are non toxic and non corrosive.

Cable circuits are protected by an overall electrostatic shield against external electric field interferences.

The cables are suitable for indoor installations.

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Príloha č./Appendix No. <i>21</i>	

CONSTRUCTION

- | | | |
|-------------------|---|---|
| conductor | – | bare annealed copper single wire round conductors meeting requirements of class 1 per PN-EN 60228, |
| insulation | – | mica tape and halogen free compound insulation - colours in accordance with PN-92/T-90321 standard, |
| pair | – | insulated conductors twisted into pairs, |
| cable core | – | pairs laid-up into a cable core, |
| wrapping | – | cable core wrapped in a polyester tape, |
| shielding | – | overall electrostatic shield incorporating a plastic laminated metal foil and a tinned copper drain wire, |
| sheath | – | red cable sheath of halogen free compound (oxygen index bigger than 35%). |

HTKSHekw FE180 PH90/E30

CHARACTERISTICS

The cables maintain their functions for 90 minutes, meeting requirements of PN-EN 50200 standard

Conductor diameter	mm	0.8	1.0	1.4	1.8	2.3	2.8
Conductor cross-section	mm ²	0.5	0.75	1.5	2.5	4	6
DC loop resistance at 20°C, maximum	Ω/km	75	48	24.5	14.9	9.3	6.3
Capacitance between conductors at 1 kHz	maximum	nF/km	200	200	200	200	200
	average		90	130	130	130	150

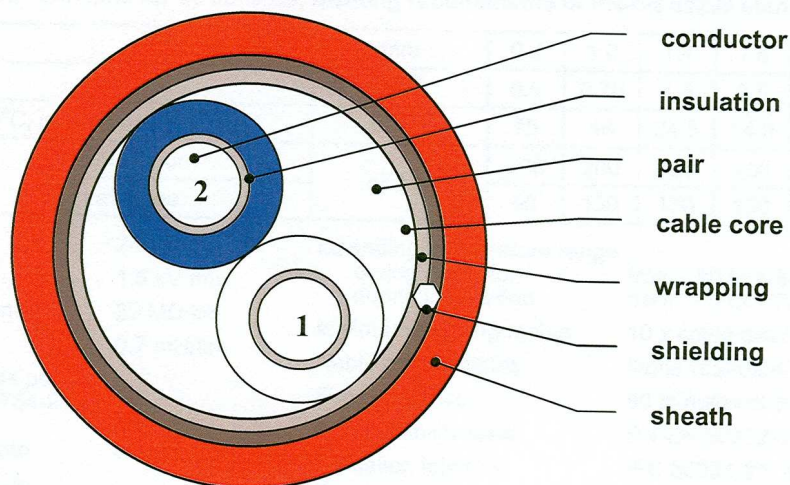
Operating voltage	240 V	Operating temperature range	
Voltage test	1.5 kV rms	during operation	from - 30 to + 80°C
Insulation resistance, minimum	20 MΩ·km	during installation	from - 5 to + 70°C
Inductance, approximate	0.7 mH/km	Minimum bending radius	10 x cable diameter
Corrosivity of emitted gases per PN-EN 50267-2-3, IEC 60754-2		Cable combustibility	flame retardant
pH, approximate	6.8	Fire resistance	90 minutes at 842°C
conductivity, approximate	0.4 μS/mm	Combustibility tests	PN-EN 60332-1-2 and PN-EN 50200
Smoke density per PN-EN 50268-2-3, IEC 61034-2		Insulation integrity	IEC 60331-21; IEC 60331-11
light transmittance, minimum	94%	Circuit integrity E30	DIN 4102-12; U _{test} = 230 V
		Reference standards	WT-TK-43 PN-92/T-90320 PN-92/T-90321

CE = the cable meets requirements of the low voltage directive 73/23/EEC and 93/68/EEC

Cable type	Number of pairs (x 2) x conductor diameter	Cable outer diameter (appr.)	Copper index	Cable weight (appr.)
	number x mm	mm	kg/km	kg/km
HTKSHekw FE180 PH90/E30	1 x 2 x 2,3	11,0	84,8	180

Other diameters and conductor counts available on request.

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Príloha č./Appendix No. <i>22</i>	

HTKSHekw FE180 PH90/E30-E60**FIRE RESISTANT HALOGEN FREE CABLES****APPLICATIONS**

HTKSHekw FE180 PH90/E30 fire resistant and halogen free cables are intended for installation in alarm, signalling, transmission, sound warning and similar systems, also for data processing systems and for analogue or digital data transmission in industrial electronics and control applications in objects of sharp fire protection requirements, particularly in fire alarm and fire automatic control systems.

Halogen free cables are applied in locations where, in case of fire, higher safety for human beings and expensive electronic equipment is required.

Functions of the cables are maintained – data are transmitted and power is supplied to equipment which must operate in fire conditions and during fire fighting (e.g. emergency lighting). The cables are flame retardant and their smoke emission is low, emitted fumes are non toxic and non corrosive.

Cable circuits are protected by an overall electrostatic shield against external electric field interferences.

The cables are suitable for indoor installations.

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	Dokument č. Document No. <i>FIRES-FR-042-04-AWE</i>
Príloha č./Appendix No. <i>23</i>	

CONSTRUCTION

- | | | |
|-------------------|---|---|
| conductor | – | bare annealed copper single wire round conductors meeting requirements of class 1 per PN-EN 60228, |
| insulation | – | mica tape and halogen free compound insulation - colours in accordance with PN-92/T-90321 standard, |
| pair | – | insulated conductors twisted into pairs, |
| cable core | – | pairs laid-up into a cable core, |
| wrapping | – | cable core wrapped in a polyester tape, |
| shielding | – | overall electrostatic shield incorporating a plastic laminated metal foil and a tinned copper drain wire, |
| sheath | – | red cable sheath of halogen free compound (oxygen index bigger than 35%). |

HTKSHekw FE180 PH90/E30-E60

CHARACTERISTICS

The cables maintain their functions for 90 minutes, meeting requirements of PN-EN 50200 standard

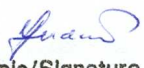
Conductor diameter	mm	0.8	1.0	1.4	1.8	2.3	2.8
Conductor cross-section	mm ²	0.5	0.75	1.5	2.5	4	6
DC loop resistance at 20°C, maximum	Ω/km	75	48	24.5	14.9	9.3	6.3
Capacitance between conductors at 1 kHz	maximum	nF/km	200	200	200	200	200
	average		90	130	130	130	150

Operating voltage	240 V	Operating temperature range	
Voltage test	1.5 kV rms	during operation	from - 30 to + 80°C
Insulation resistance, minimum	20 MΩ·km	during installation	from - 5 to + 70°C
Inductance, approximate	0.7 mH/km	Minimum bending radius	10 x cable diameter
Corrosivity of emitted gases per PN-EN 50267-2-3, IEC 60754-2		Cable combustibility	flame retardant
pH, approximate	6.8	Fire resistance	90 minutes at 842°C
conductivity, approximate	0.4 μS/mm	Combustibility tests	PN-EN 60332-1-2 and PN-EN 50200
Smoke density per PN-EN 50268-2-3, IEC 61034-2		Insulation integrity	IEC 60331-21; IEC 60331-11
light transmittance, minimum	94%	Circuit integrity E30-E60	DIN 4102-12; U _{test} = 230 V
		Reference standards	WT-TK-43 PN-92/T-90320 PN-92/T-90321

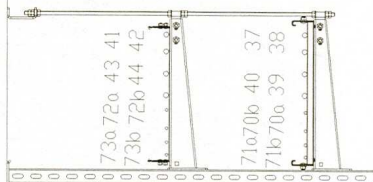
CE = the cable meets requirements of the low voltage directive 73/23/EEC and 93/68/EEC

Cable type	Number of pairs (x 2) x conductor diameter	Cable outer diameter (appr.)	Copper index	Cable weight (appr.)
	number x mm	mm	kg/km	kg/km
HTKSHekw FE180 PH90/E30-E60	1 x 2 x 2.3	11,4	84,8	185

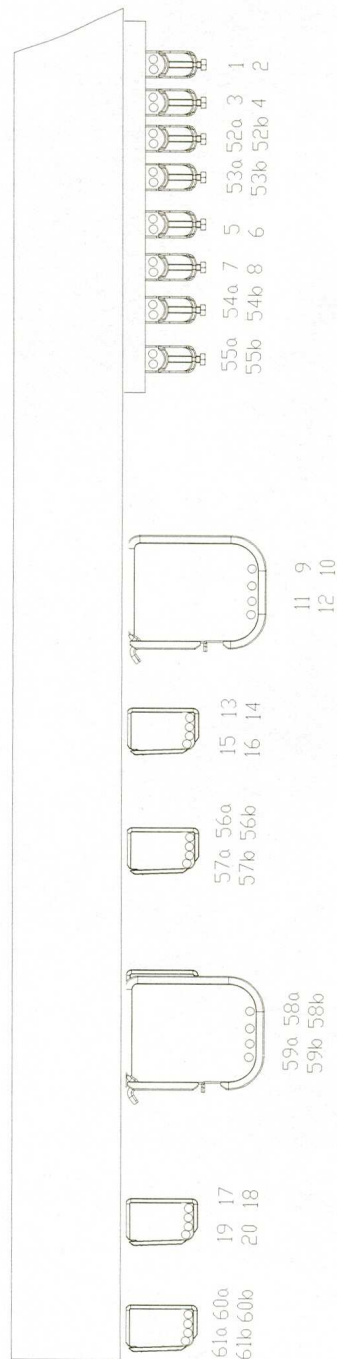
Other diameters and conductor counts available on request.

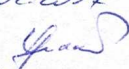
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Príloha č./Appendix No. <i>25</i>	

TECHNOKABEL-BAKS...19-22.02.2007



01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



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Príloha č./Appendix No. 25	