Nexans

Railway Cables
Rolling Stock

October 2005

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The following data have been rigorously compiled. However, they only constitute guidelines and do not obviate the need for private examination of products supplied by us to establish suitability for the intended purpose.

Processing and use of the products are conducted outside our control and are therefore exclusively your responsibility.

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Introduction

About Nexans

Nexans is the worldwide leader in the cable industry. With a comprehensive product portfolio we offer cable and system solutions to customers in the infrastructure, industry and building markets. Nexans employs 17,000 people in 29 countries and had sales in the region of € 4 billion in 2003.

As full provider of railway cables, we are one of the biggest suppliers in the market. Our range of products includes cables both for the "rolling stock" industry and for energy and information transfer in the railway infrastructure industry.

By consistently meeting the needs of our customers, we constantly strive to improve our position. Our company DIN EN ISO 9001 certification is stimulated by regular internal and external audits.

Cables for "Rolling Stock" rail vehicles

The market for railway cables is characterised by the multitude of international, national and company-specific regulations. Furthermore, customer requirements are not all the same.

With the introduction of new European standards, the course is being set for standardisation and precision.

As a result of these new European standards, NEXANS is organising its product range so as to meet customer needs in the best possible way in terms of price, technical requirements and delivery availability. These efforts are mainly intended to protect people and systems from the effects of fire damage.

Stemming from a long tradition in the rail industry, Nexans uses halogen free, non-toxic cables and wires. Ever since the 70s, RHEYHALON cables and wires have been and continue to be installed and used successfully worldwide.

"Rolling Stock" products

Nexans as a full provider of railway cables has a product range suitable for all applications.

- Halogen free high-voltage wires
- Halogen free medium-voltage wires for 6 kV and 3 kV voltage ranges
- Halogen free single and multicore wiring cables for internal wiring up to 1 kV
- Halogen free electronic and bus cables
- Wires with circuit integrity performance in case of fire
- Jumper cables
- Wires with integral connectors and system technology
- Customer-specific solutions

Technology and Application

Conductors for power cables in accordance with EN 50264

Nexans uses class 5 (in special applications also class 6) tinned flexible conductors for railway cables in accordance with IEC 60228 (exception: cables for 150 °C contain blank conductors).

In cables with a nominal cross-section of over 50 mm², Nexans also uses copper wires with a maximum single wire diameter of 0.41 mm (here, IEC 60228 stipulates a maximum of 0.51 mm).

The quality of our conductors thus exceeds standard requirements.

This increases flexibility and therefore ease of application, not to mention the life of the cable. The following table contains details of the copper conductors that Nexans inserts in railway cables. The data relate to cables with standard and reduced insulation thickness. Conductor assembly is in accordance with IEC 60228/DIN VDE 0295.

Statements on conductors for electronic cables (control lines and BUS cables) can be seen in the current data sheets.

Nominal cross-section mm²	Single wire diameter max. mm	Conductor diameter guideline mm	Conductor resistance at 20 °C (class 5) max. Ω/km (blank)	Ω/km (verzinnt)
0.5	0.21	1.0	39.0	40.1
0.75	0.21	1.2	26.0	26.7
1	0.21	1.35	19.5	20.0
1.5	0.26	1.6	13.3	13.7
2.5	0.26	2.0	7.98	8.21
4	0.31	2.7	4.95	5.09
6	0.31	3.2	3.30	3.39
10	0.41	4.1	1.91	1.95
16	0.41	5.3	1.21	1.24
25	0.41	6.6	0.780	0.795
35	0.41	7.8	0.554	0.554
50	0.41	9.2	0.386	0.393
70	0.41	11.0	0.272	0.277
95	0.41	12.8	0.206	0.21
120	0.41	14.3	0.161	0.164
150	0.41	16.0	0.129	0.132
185	0.41*	17.8	0.106*	0.108*
240	0.41*	20.4	0.0801*	0.0817*
300	0.41*	22.7	0.0641*	0.0654*
400	0.41*	26.6	0.0486	0.0495
500	0.41*	32.0	0.0384	0.0391

*) fulfils requirements for conductor class 6 (most finely stranded) in accordance with IEC 60228 / DIN VDE 0295

Insulation and outer sheath

Halogen free materials, synonymous with non-toxicity, minimal corrosivity, low smoke and flame retardance, are used in our RHEYHALON products. Materials are networked for improvement of mechanical qualities as well as temperature resistance of the insulation.

Temperatures and overload temperatures

Using the Arrhenius equation, the life of a cable is defined as an assumed life of 20,000 h. In line with EN 50343, a projection to 100,000 h is realistic. The temperatures defined in our data sheets (data cables are excluded) refer to this period.

EN 50264 defines two overload categories for cables at 90 °C and 150 °C: 160 °C/50 h for 90 °C and 250 °C/50 h for 150 °C. This means that for a period of less than or equal to 50 hours, increased conductor temperatures can be withstood, while the operability of the cables remains unimpaired. This has the advantage that short-time temperature increases can be identified and more serious damage such as fires can be prevented.

Nominal voltage/ operating voltage

Nominal voltage of a cable refers to the reference voltage for which the cable is designed, in accordance with EN 50264, Part 1. Electrical tests also refer to this nominal voltage. The operating voltage may not exceed the corresponding maximum permissible nominal voltage.

Power cables and control lines

Power cables are described by the combination of voltages presented below:

Nominal voltage: U_0 / U (U_{max})

U_0: r.m.s value between a phase conductor and earth

U: r.m.s. value between phase conductors of a multicore cable or a system of single-core cables

U_{max}: highest constant permissible operating voltage

U_{max}: U + 10 % for U < 1 kV
U_{max}: U + 20 % for U ≥ 1 kV

Direct voltage: $U_{DC} = 1.5\ U_0$

U_{DC}: direct voltage between insulated conductors and earth

In EN 50264, applicable to power cables, the voltage ranges 0.6/1 kV, 1.8/3 kV and 3.6/6 kV are defined. For each of these voltage ranges, the standard stipulates specific insulation thickness requirements. Here, the central element of European standardization is crystallized, namely, avoidance of accidents.

Cables for data and information transmission

Nominal voltage:
U (peak voltage)

Here, operating voltage may not exceed U.

Environmental conditions

Cables are suitable for fixed installation in rail vehicles up to

– 40 °C and are oil and diesel resistant, depending on type.

Qualities in case of fire

The task of protecting people and buildings from the effects of fire damage is becoming increasingly important. Cable installation must significantly support this task.

For this reason, the new European standards EN 50264 and EN 50306 only describe cables and wires made from halogen free materials that minimise the risk of damage to persons and property. These materials refer to hazard levels 1 – 4 as defined

in prEN 45545-1. These levels define the degree of possibility of personal injury as the result of a fire. Amongst other things, they also form the basis of the requirements for materials used in rail vehicles.

Thus, from the starting point of hazard level 1 (HL 1), cable and wire requirements increase with regard to maximum permissible smoke production and toxicity.

Tests

In addition to conventional tests, halogen free cables undergo tests for corrosivity, toxicity, flame retardance and smoke density.

These tests are conducted in NEXANS laboratories or in external institutes.

Corrosivity

Corrosive gases produced in case of fire cause damage to vehicles and facilities. For this reason, they must be prevented.

According to EN 50267-2-2, a material is not corrosive if its combustion gases meet the stipulated target values for conductivity (≤ 10 µ s/mm) and pH value (≥ 4.3).

Toxicity

In accordance with EN 50305-9.2, a toxicity index (ITC) is calculated following analysis and titration of combustion gases. The aforementioned hazard levels require that certain toxicity indices are not exceeded.

The toxicity indices for power cables listed in the following table are derived from EN 50264.

HL	ITC
HL 1	not specified
HL 2 / HL 3	5 (max)
HL 4	3 (max)

The required toxicity indices for cables and wires, depending on hazard level, in accordance with EN 50306 (thin wall) are displayed in the following table:

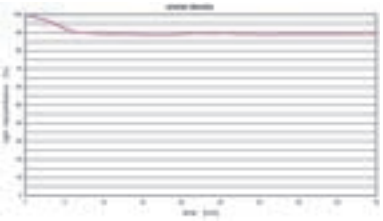
HL	ITC	
	Insulation and sheath S1	EM101-104 and sheath S2
HL 1	not stipulated	not stipulated
HL 2 / HL 3	10 (max)	5 (max)
HL 4	6 (max)	3 (max)

Flame retardance

It is primarily when installed as conductor bundles that cables and wires represent potential fire-propagating media. For this reason, particularly flame-retardant cables are required. Flame retardance testing is carried out in one of two ways.

In accordance with EN 50265-2-1, testing is carried out on a single vertically arranged cable. For so-called bundle-conductor fire testing in accordance with EN 50266-2-4 and EN 50305 9.1, a gas burner flame is applied to the bottom of a vertically arranged conductor bundle in a test furnace. Following completion of the flame retardance test, maximum charring must not exceed a stipulated level.

Smoke density



Sample test result

Fumes produced during a fire make it more difficult for people to escape or be rescued. They also make it difficult to localise the source of the fire. For smoke density testing, the cube test (EN 50268-2) is used at both national and international levels.

In a cubic test room of 3m edge length, cable specimens are burned using alcohol. The light transmission of the smoke is then measured. The following table shows the minimum percentages of light transmission depending on hazard level:

HL	Light transmission
HL 1	25 %
HL 2 / HL 3	50 %
HL 4	70 %

Technology and Application
Current Carrying Capacity

Current Carrying Capacity

Current carrying capacity values refer to EN 50343, "Railway applications - Rolling stock - Rules for installation of cabling" and are based on maximum conductor temperatures of 90 °C and 150 °C defined in 3 b. The ambient temperature is 45 °C. The following table shows the current carrying capacities for a cable installed in midair.

Current carrying capacity for cables in accordance with EN 50264

Nominal cross section of copper conductor mm^2	Current carrying capacity Conductor temp. 90 °C (max) Ambient temp. 45 °C I [A]	Current carrying capacity Conductor temp. 150 °C (max) Ambient temp. 45 °C I [A]
0.5	14	-
0,75	16	-
1	20	-
1.5	25	-
2.5	33	46
4	46	64
6	60	84
10	85	119
16	110	154
25	150	211
35	190	267
50	240	337
70	300	422
95	360	506
120	425	598
150	490	689
185	560	788
240	675	950
300	775	1091
400	950	1337

Ambient temperature

External conditions such as ambient temperature and bundling must be taken into account when determining actual current carrying capacity. The following tables show the corresponding k_1 modification factors depending on an ambient temperature differing from 45 °C. Current carrying capacity decreases or increases depending on these factors

Maximum conductor temperature 90 °C

Temperature °C	10	20	30	40	45	50	60	70
k_1	1.33	1.25	1.15	1.05	1	0.94	0.82	0.66

Maximum conductor temperature 150 °C

Temperature °C	– 50	– 30	– 10	10	30	45	60	80	100	120
k_1	1.38	1.3	1.23	1.15	1.06	1	0.92	0.81	0.69	0.53

Bundling

The following table shows the k_2 reduction factors for cable bundling. If cables are installed in cable channels, an additional reduction factor of 0.76 must be taken into account.

Number of cables	1	2	3	4	5	8	12	16	20	25	30	35	40
k_2 single-layer	1.00	0.91	0.85	0.78	0.75	0.74	0.73	0.72					
k_2 multi-layer			0.80	0.71	0.65	0.52	0.45	0.41	0.34	0.30	0.28	0.27	0.26

Overload

In case of overload, the conductor can withstand higher temperatures for a short time (50 h). The following tables show the modification factors for calculating the maximum permissible current.

Maximum conductor temperature 90 °C / ambient temperature 45 °C

Temperature °C	90 °C	160 °C (Overload)
m_O	1.00	1.46

Maximum conductor temperature 150 °C / ambient temperature 45 °C

Temperature °C	90 °C	250 °C (Overload)
m_O	1.00	1.25

Short-circuit

In the case of a short-circuit, conductors must not be heated over the permissible short-circuit temperature. This is derived in accordance with IEC 60725 or DIN VDE 0298, Part 4, depending on the permissible operating temperature of the conductor (conductor temperature at the start of the short-circuit). The following table shows the rated short-time current density J_{th} for the defined temperatures 90 °C and 150 °C in the case of a short-circuit lasting one second. The rated short-time current can be calculated from this with the relevant cross-section.

Temperature [°C]	Permissible short-circuit temperature [°C]	rated short-time current density J_{th} [A/mm²]
90	200 (tinned conductor)	122
150	350	146

Emergency running properties

In rail vehicles, emergency running properties (i.e. the functioning of a cable over a certain period in the case of a fire) are often necessary. For this reason, items such as power supply, lighting systems, sirens, loudspeakers and doors must remain operational for the warning and evacuation of people.

In order to achieve emergency running properties, conductors are provided with a mineral wrapping. The required protection is afforded depending on the type and thickness of the wrapping.

In addition to international standards such as EN 50200 and IEC 60331, there are various other national standards for testing emergency running properties. In EN 50200, cables are tested for resistance of insulation under exposure to flame and mechanical loads.

BUS technology

Nexans provides a wide range of cables for digital transmission in rail vehicles. MVB, WTB and UIC buses are some examples. In addition to these products,

Nexans is in a position to deliver specialised cables according to customer requirements, such as multi-paired data cables or data cables with insulation resistance.

Vehicle-connecting cables

Vehicle-connecting cables, which link vehicles for power and information transmission, make up another division of our product range.

For these, application-specific designs are created and special materials are used for high flexibility.

We offer tailored solutions for specific applications within the scope of your projects.

Overview Cables

Power Cables RHEYHALON

Voltage	Cable type	Designation	Data sheet	Page
300 / 500 V	Single core	(N)HXFAF	SOM1-R-004	11
	Multi core	(N)HXSLOE-OZ	SOM1-R-152	15
		(N)HXSLOE-JZ	SOM1-R-152	
	Multi core screened	(N)HXCSLOE-OZ	SOM1-R-153	19
		(N)HXCSLOE-JZ	SOM1-R-153	
0,6 / 1 kV	Single core	(N)HXAF	SOM1-R-061	23
	Single core with circuit integrity	(N)MHXAF	SOM1-R-146	27
	Single core screened	HXCHXOE	SOM1-R-057	29
	Multi core	(N)HXSLOE-OZ	SOM1-R-150	31
		(N)HXSLOE-JZ	SOM1-R-150	
	Multi core screened	(N)HXCSLOE-OZ	SOM1-R-151	35
		(N)HXCSLOE-JZ	SOM1-R-151	
	Multi core screened with circuit integrity	(N)MHXCSLOE-OZ	SOM1-R-141	39
1,8 / 3 kV	Single core	4GKW-EN	SOM1-R-001	41
	Cable with sheath	NSHXAFOE EN	SOM1-R-005	45
		(N)S2HXAFOE	SOM1-R-035	49
	Cable with sheath screened	(N)SHXAFCOE	SOM1-R-006	53
		(N)S2HXAFCOE	SOM1-R-041	55
3,6 / 6 kV	Cable with sheath	NSHXAFOE EN 9GKW	SOM1-R-119	57
		(N)S2HXAFOE	SOM1-R-034	61
	Cable with sheath screened	(N)S2HXAFCOE	SOM1-R-040	65
26/45 kV	Cable with sheath screened	(N)TMCGCHXOE	SOM1-R-030	67

Elektronic Cables

Voltage	Cable type	Designation	Data sheet	Page
300 V	Single core	TAZ	SN 43035	69
	Control cable	MAZ +HXOE	SN 43032	71
	Control cable screened	MAZ CHXOE	SN 43032	73
300 / 500 V	Control cable with circuit integrity, unscreened and screened	MSZ	SN 43033	77

Bus Cables

Cable type	Designation	Data sheet	Page
Bus cable MVB	Bus cable (120 Ω)	DB 459530	81
Bus cable WTB	UIC cable (120 Ω)	DB 459830	83
UIC BUS	Bus cable (120 Ω)	DB 459555	85
UIC 9-core	Bus cable (120 Ω)	DB 459533	87
UIC 11-core	Bus cable (120 Ω)	DB 459571	91
UIC 18-core	Bus cable (120 Ω)	DB 459534	93
UIC 20-core	Bus cable (120 Ω)	DB 459535	97

SOM1-R-004 E edition 10/2005

RHEYHALON (N)HXFAF
0,5 mm² to 4 mm²

300/500 (550) V

Application

For inside wiring in railway vehicles (locomotives, trains, trolleybusses), switching stations and control panels. Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.

Serves request with regard to Hazard Level 4 acc. to EN 45545-1

Design in line with EN 50264-3-1 table 1

1. Conductor

Flexible stranded tinned copper, acc. to DIN VDE 0295/IEC 60228/HD 383 class 5.

2. Insulation

Special cross-linked EPR, rubber type EI107 acc. to EN 50264-1, oil resistant

Cable marking

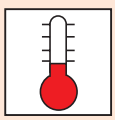
Ink-marking white on black core, others black
RHEYHALON VDE-Reg.-Nr. 7626
(N)HXFAF 1.5 mm² 300/500V

Core colours

Black (BK); greenyellow (GNYE); grey (GY); white (WH); blue (BU)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH value ≥ 4,3
conductivity
≤ 2,5 µS/mm

Toxic
inoccuous
EN 50305-9.2

Flame retardant
and self extinguish
EN 50265-2-1
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)HXFAF

Technical data

Type-No. reel	Type-No. ring	Type-No. pail	Colour	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 4001	7947 4002		BK	0.5	1.7	1.9	0.015	7
7947 4101	7947 4102	7947 4103	BK	0.75	1.8	2.0	0.018	9.5
7947 4201	7947 4202	7947 4203	BK	1	2.1	2.3	0.021	12
7947 4301	7947 4302	7947 4303	BK	1.5	2.4	2.8	0.025	17.5
7947 4401	7947 4402	7947 4403	BK	2.5	2.8	3.2	0.0332	26.5
7947 4501	7947 4502	7947 4503	BK	4	3.5	3.9	0.04	40
7947 4121	7947 4122	7947 4123	GY	0.75	1.8	2.0	0.018	9.5
7947 4221	7947 4222	7947 4223	GY	1	2.1	2.3	0.021	12
7947 4031	7947 4032		WH	0.5	1.7	1.9	0.015	7
7947 4131	7947 4132	7947 4133	WH	0.75	1.8	2.0	0.018	9.5
7947 4231	7947 4232	7947 4233	WH	1	2.1	2.3	0.021	12
7947 4331	7947 4332	7947 4333	WH	1.5	2.4	2.8	0.025	17.5
7947 4431	7947 4432	7947 4433	WH	2.5	2.8	3.2	0.0332	26.5
7947 4531	7947 4532	7947 4533	WH	4	3.5	3.9	0.04	40
7947 4041	7947 4042		BU	0.5	1.7	1.9	0.015	7
7947 4141	7947 4142	7947 4143	BU	0.75	1.8	2.0	0.018	9.5
7947 4241	7947 4242	7947 4243	BU	1	2.1	2.3	0.021	12

RHEYHALON (N)HXFAF

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 300/500 (550) V
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 450 V DC
Testing a.c. voltage (5 minutes)	U = 2 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 3 D
Free moved	≥ 5 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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RHEYHALON
(N)HXSLOE-OZ n x ... / (N)HXSLOE-JZ n x ...

300/500 (550) V

Application

For use in railway vehicles (locomotives, trains, trolleybusses etc.), switching stations and control panels. Installation in cable ducts, tubes and outside. Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.

Satisfies performance requirements to Hazard Level 4 acc. to EN 45545-1.

Design in line with EN 50264-3-2

1. Conductor
Flexible stranded tinned copper,
acc. to DIN VDE 0295 / IEC 60228 / HD 383 class 5

2. Insulation
Special cross-linked EPR, rubber type EI 110 acc. to EN 50264-1

3. Outer sheath
Special cross-linked EVA, rubber type EM 104 acc. to EN 50264-1, oil and diesel oil resistant, ozon- and UV-resistant.

Cable marking

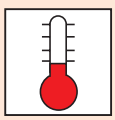
Ink marking white:
RHEYHALON VDE-Reg. Nr. 7967
(N)HXSLOE-OZ EN 50264-3-2
300 V n x ... M FA-Nr.

Core colours

(... OZ) black (BK) with white numbers
(... JZ) black (BK) with white numbers and 1 core green/yellow (GNYE)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2
Toxizitätsindex 3

Flame resistant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)HXSLOE-OZ n x ... / (N)HXSLOE-JZ n x ...

Technical data

Type-No.	Type	Number of cores	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 0310	OZ	2	0.75	4.6	5.0	0.16	45
7947 0355	OZ	2	1	5.3	5.7	0.18	53
7947 0707	OZ	2	1.5	6.1	6.7	0.25	75
7947 0420	OZ	3	1.5	6.5	7.1	0.28	90
7947 0706	OZ	4	1.5	7.3	8.0	0.34	130
7947 1098	OZ	5	1.5	7.9	8.5	0.40	140
7947 0705	OZ	6	1.5	8.5	9.3	0.55	165
7947 0501	OZ	7	1.5	9.4	10.2	0.65	200
7947 0711	OZ	9	1.5	11.6	12.4	0.9	290
7947 0708	OZ	15	1.5	13.4	14.2	1.0	360
7947 0709	OZ	20	1.5	15.0	16.0	1.3	460
7947 0710	OZ	2	2.5	6.8	7.2	0.30	95
7947 0421	OZ	6	2.5	9.7	10.3	0.55	240
7947 0422	OZ	6	4	11.7	15.5	1.2	340
7947 0916	JZ	3	1	5.5	5.9	0.20	65
7947 0076	JZ	3	1.5	6.5	7.1	0.28	90
7947 0315	JZ	5	1.5	7.9	8.5	0.40	140
7947 0917	JZ	7	1.5	9.4	10.2	0.65	200
7947 0500	JZ	9	1.5	11.6	12.4	0.9	290
7947 0194	JZ	18	1.5	14.2	15.2	1.2	420
79471051	JZ	3	2.5	7.2	7.6	0.35	120
7947 0938	JZ	5	2.5	8.7	9.3	0.5	190
7947 0451	JZ	18	2.5	16.3	17.5	1.2	600
7947 0452	JZ	25	2.5	19.6	21	1.6	800

Other cross-sections on request.

RHEYHALON (N)HXSLOE-OZ n x ... / (N)HXSLOE-JZ n x ...

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 300/500 (550) V
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 450 V DC
Testing a.c. voltage (5 minutes)	U = 2 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 4 D
Free moved	≥ 5 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-153 E edition 10/2005

RHEYHALON
(N)HXCSLOE-OZ n x ... / (N)HXCSLOE-JZ n x ...

300/500 (550) V

Application

For use in railway vehicles (locomotives, trains, trolleybusses etc.), switching stations an control panels.
Installation in cable ducts, tubes and outside.
Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.
Satisfies performance requirements to Hazard Level 4 acc. to EN 45545-1

Design in line with EN 50264-3-2

1. Conductor
Flexible stranded tinned copper, acc. to DIN VDE 0295 / IEC 60228 / HD 383 class 5

2. Insulation
Special cross-linked EPR, rubber type EI 110 acc. to EN 50264-1

3. Separator
Optional foil or tape

4. Screen
Tinned copper-braid acc. to EN 50264-3.1 / 3.2

5. Separator
Optional foil or tape

6. Outer sheath
Special black cross-linked EVA, rubber type EM 104 acc. to EN 50264-1, oil and diesel oil resistant

Cable marking

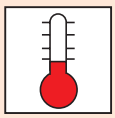
Ink marking white:
RHEYHALON VDE-Reg. Nr. 7967
(N)HXCSLOE-OZ
EN 50264-3-2 S
300 V n x ... M FA-Nr.

Core colours

(... OZ) black (BK) with white numbers
(... JZ) black (BK) black (BK) with white No. and 1 core green/yellow (GNYE)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2
Toxizitätsindex 3

Flame retartand and self extiguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)HXCSLOE-OZ n x ... / (N)HXCSLOE-JZ n x ...

Technische Daten

Type-No.	Type	Numbers of core	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 0397	OZ	3	1.5	7.7	8.3	0.28	110
7947 0409	OZ	4	1.5	8.5	9.2	0.34	150
7947 0398	OZ	5	1.5	9.1	9.7	0.40	170
7947 0399	OZ	9	1.5	12.8	13.6	0.90	250
7947 0400	OZ	19	1.5	15.8	16.8	1.30	530
7947 0308	OZ	5	2.5	9.9	10.5	0.50	230
7947 0480	OZ	2	10	14.5	15.8	0.80	440
7947 0391	JZ	7	1.5	10.6	11.4	0.65	240

Other cross sections on request

RHEYHALON (N)HXCSLOE-OZ n x ... / (N)HXCSLOE-JZ n x ...

Technische Daten

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 300/500 (550) V
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 450 V DC
Testing a.c. voltage (5 minutes)	U = 2 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 4 D
Free moved	≥ 8 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-061 E edition 10/2005

RHEYHALON (N)HXAF
0.5 mm² to 240 mm²

0.6/1 (1.2) kV

Application

For inside wiring in railway vehicles (locomotives, trains, trolleybusses), switching stations and control panels. Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.

Serves request with regard to Hazard Level 4 acc. to EN 45545-1

Design according to EN 50264-3-1 table 1

1. Conductor

Flexible stranded tinned copper, acc. to DIN VDE 0295/IEC 60228/HD 383 class 5

2. Insulation

Special cross-linked EPR, rubber type EI107 acc. to EN 50264-1, oil resistant

Cable marking

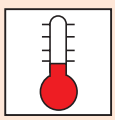
Ink-marking white on black core, black on green/yellow corer
RHEYHALON VDE-Reg.-Nr. 7629
(N)HXAF 0.6/1kV
EN 50264-3-1 600V 1.5 F

Core colours

Black (BK); green/yellow (GNYE); other colours on request

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Toxic inoccuous
EN 50305-9.2

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)HXAF

Technical data

Type-No. reel	Type-No. coil	Type-No. pail	Colour	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
79472001	79472002		BK	0.5	2.1	2.3	0.025	9
79472101	79472102	79472103	BK	0.75	2.2	2.4	0.028	11
79472201	79472202	79472203	BK	1	2.5	2.7	0.032	14
79472301	79472302	79472303	BK	1.5	2.8	3.2	0.04	20
79472401	79472402	79472403	BK	2.5	3.2	3.6	0.05	29
79472501	79472502	79472503	BK	4	3.9	4.3	0.06	43
79472601	79472602		BK	6	4.4	4.8	0.07	62
79472701	79472702		BK	10	5.5	5.9	0.10	105
79472801	79472802		BK	16	6.5	7.1	0.12	170
79472901	79472902		BK	25	8.1	8.7	0.18	250
79473001	79473002		BK	35	9.2	9.8	0.22	360
79473101			BK	50	11.3	11.9	0.28	500
79473201			BK	70	13.2	13.8	0.35	700
79473301			BK	95	15.0	15.6	0.45	1.000
79473401			BK	120	16.1	16.7	0.6	1.250
79473501			BK	150	18.7	19.3	0.65	1.500
79473601			BK	185	21.0	21.6	0.8	1.800
79473701			BK	240	23.8	24.6	0.9	2.350
79472311	79472312	79472313	GNYE	1.5	2.8	3.2	0.04	20
79472411	79472412	79472413	GNYE	2.5	3.2	3.6	0.05	29
79472511	79472512	79472513	GNYE	4	3.9	4.3	0.06	43
79472611	79472612		GNYE	6	4.4	4.8	0.07	62
79472711	79472712		GNYE	10	5.5	5.9	0.10	105
79472811	79472812		GNYE	16	6.5	7.1	0.12	170
79472911	79472912		GNYE	25	8.1	8.7	0.18	250
79473011	79473012		GNYE	35	9.2	9.8	0.22	360
79473111			GNYE	50	11.3	11.9	0.28	500
79473211			GNYE	70	13.2	13.8	0.35	700
79473311			GNYE	95	15.0	15.6	0.45	1.000
79473411			GNYE	120	16.1	16.7	0.60	1.250
79473511			GNYE	150	18.7	19.3	0.65	1.500
79473611			GNYE	185	21.0	21.6	0.80	1.800

RHEYHALON (N)HXAF

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 0.6/1.0 (1.2) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 0.9 kV DC
Testing a.c. voltage (5 minutes)	U = 3.5 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 3 D
Free moved	≥ 5 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-146 E edition 10/2005

RHEYHALON (N)MHXAF
1.5 mm² and 16 mm²

0.6/1 (1.2) kV

Application

Flexible cable with emergency operating features for inner wiring in rail vehicles (trains, locomotives, trolleybusse, etc.), switching stations and control panels. Current carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.

Satisfies performance requirements to Hazard Level 4 acc. to EN 45545-1. Circuit integrity acc. to EN 50200 (15 minutes).

Design in line with EN 50264-3-1 table 1

1. Conductor
Flexible stranded tinned copper acc. to IEC 60228 / DIN VDE 0295 class 5

2. Minerally conductor wrapping

3. Insulation
Special cross-linked EVA rubber type EI107 acc. to EN 50264-1, oil resistant, ozone- and UV-resistant

Cable marking

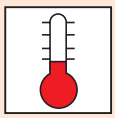
Marking white on black cores, black on greenyellow cores:
RHEYHALON (N)MHXAF
1,5 0,6/1 (1,2) kV

Core colours

Black (BK); greenyellow (GNYE); Other colours on request

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)MHXAF

Technical data

Type-No.	Colour	Cross-section mm^2	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 1107	BK	1.5	3.7	4.5	0.04	23
7947 1096	BK	16	6.8	8.0	0.13	180

Other cross-sections on request.

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 0.6/1.0 (1.2) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 0.9 kV DC
Testing a.c. voltage (5 minutes)	U = 3.5 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 10 D
Free moved	≥ 25 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-057 E edition 10/2005

RHEYHALON HXCHXOE
2.5 mm² to 25 mm²

0.6/1 kV

Application

For use in railway vehicles (locomotives, trains, trolleybusses etc.), switching stations and control panels. Installation in cable ducts, tubes and outside. Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.

Satisfies performance requirements to Hazard Level 4 acc. to EN 45545-1

Design in line with EN 50264-3-1

1. Conductor
Flexible stranded tinned copper, acc. to DIN VDE 0295 / IEC 60228 / HD 383 class 5

2. Insulation
Special cross-linked EPR, rubber type EI 110 acc. to EN 50264-1

3. Separator
Optional foil or tape

4. Screen
Tinned copper wire braid, Covering approx. 85 %

5. Separator
Optional foil or tape

6. Outer sheath
Special cross-linked black EVA, rubber type EM 104 acc. to EN 50264-1, oil and diesel oil resistant, ozon and UV-resistant

Cable marking

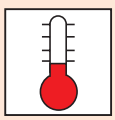
Ink marking white, otherwise black:
RHEYHALON HXCHXOE
1 x ... 0.6/1 kV FA-Nr.

Core colour

black (BK)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2
Toxizitätsindex 3

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON HXCHXOE

Technical data

Type-No.	Colour	Cross-section mm²	Ø over screen mm	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 0443	BK	2.5	4.3	5.3	5.9	0.16	65
7947 0427	BK	4	4.9	5.9	6.5	0.17	85
7947 0428	BK	6	5.6	6.8	7.5	0.24	110
7947 0429	BK	10	7	8.3	9	0.31	180
7947 0430	BK	16	8.1	9.2	9.9	0.33	235
7947 0445	BK	25	9.8	11.1	11.8	0.46	350

Other cross-section on request.

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 0.6/1.0 (1.2) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 0.9 kV DC
Testing a.c. voltage (5 minutes)	U = 3.5 kV
Coupling resistance 10 kHz – 30 MHz	≤ 50 Ω/km

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 3 D
Free moved	≥ 5 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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RHEYHALON
(N)HXSLOE-OZ n x ... / (N)HXSLOE-JZ n x ...

0.6/1 (1.2) kV

Application

For use in railway vehicles (locomotives, trains, trolleybusses etc.), switching stations and control panels. Installation in cable ducts, tubes and outside. Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.

Satisfies performance requirements to Hazard Level 4 acc. to EN 45545-1

Design according to EN 50264-3-2

1. Conductor
Flexible stranded tinned copper,
acc. to DIN VDE 0295 / IEC 60228 / HD 383 class 5

2. Insulation
Special cross-linked black EPR, rubber type EI110 acc. to EN 50264-1

3. Outer sheath
Special cross-linked black EVA, rubber type EM 104 acc. to EN 50264-1, oil and diesel oil resistant, ozon and UV-resistant

Cable marking

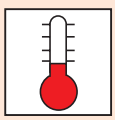
Ink marking white:
RHEYHALON VDE-Reg. Nr. 7968
(N)HXSLOE-OZ
EN 50264-3-2
600 V n x ... M FA-Nr.

Core colours

(... OZ) black (BK) with white numbers
(... JZ) black (BK) with white numbers and 1 core green/yellow

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrovisity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2
Toxizitätsindex 3

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)HXSLOE-OZ n x ... / (N)HXSLOE-JZ n x ...

Technical data

Type-No.	Type	Number of coes	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 0453	OZ	2	1.5	7.2	7.8	0.21	75
7947 0454	OZ	3	1.5	7.7	8.3	0.32	100
7947 0455	OZ	4	1.5	8.5	9.2	0.4	125
7947 0457	OZ	3	2.5	8.5	9.0	0.4	130
7947 0458	OZ	4	2.5	9.4	10.0	0.5	170
7947 1104	OZ	5	2.5	10.4	10.9	0.6	220
7947 1105	OZ	6	2.5	11.0	11.8	0.7	260
7947 0459	OZ	7	2.5	12.0	12.8	0.9	300
7947 0919	OZ	3	4	9.7	10.6	0.5	195
7947 0920	OZ	3	6	11.5	12.4	0.65	280
7947 0921	OZ	3	10	14.5	15.5	0.7	475
7947 0924	OZ	4	10	16.3	17.4	0.8	590
7947 0517	OZ	2	16	16.4	17.6	0.8	550
7947 0516	OZ	4	16	20.6	21.8	1.2	800
7947 1066	JZ	3	1.5	7.7	8.3	0.32	100
7947 1067	JZ	4	1.5	8.5	9.2	0.4	145
7947 1068	JZ	5	1.5	9.9	10.4	0.55	170
7947 1069	JZ	7	1.5	11.5	12.3	0.7	235
7947 0473	JZ	3	2.5	8.5	9.0	0.4	130
7947 0922	JZ	5	2.5	10.4	10.9	0.6	220
7947 1070	JZ	7	2.5	12.0	12.8	0.9	330
7947 0915	JZ	3	6	11.6	12.4	0.65	285

Other cross-sections on request.

RHEYHALON (N)HXSLOE-OZ n x ... / (N)HXSLOE-JZ n x ...

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 0.6/1.0 (1.2) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 0.9 kV DC
Testing a.c. voltage (5 minutes)	U = 3.5 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 4 D
Free moved	≥ 5 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-151 E edition 10/2005

RHEYHALON
(N)HXCSLOE-OZ n x ... / (N)HXCSLOE-JZ n x ...

0.6/1 (1.2) kV

Application

For use in railway vehicles (locomotives, trains, trolleybusses etc.), switching stations and control panels. Installation in cable ducts, tubes and outside. Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.

Satisfies performance requirements to Hazard Level 4 acc. to EN 45545-1

Design in line with EN 50264-3-2

1. Conductor
Flexible stranded tinned copper,
acc. to DIN VDE 0295 / IEC 60228 / HD 383 class 5

2. Insulation
Special cross-linked EPR, rubber type EI 110 acc. to EN 50264-1

3. Separator
Optional foil or tape

4. Screen
Tinned copper wire braid, acc. to EN 50264-3.1 / 3.2

5. Separator
Optional foil or tape

6. Outer sheath
Special cross-linked black EVA, rubber type EM 104 acc. to EN 50264-1, oil and diesel oil resistant, ozon and UV-resistant

Cable marking

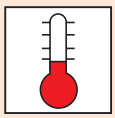
Ink marking white:
RHEYHALON VDE-Reg. Nr. 7968
(N)HXCSLOE-OZ 0,6/1 (1,2) kV
EN 50264-3-2 S
600 V n x ... M FA-Nr.

Core colours

(... OZ) black (BK) with white numbers
(... JZ) black (BK) with white numbers and 1 core green/yellow

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2
Toxizitätsindex 3

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)HXCSLOE-OZ n x ... / (N)HXCSLOE-JZ n x ...

Technical data

Type-No.	Type	Number of coes	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 1052	OZ	3	1				
7947 1099	OZ	2	1.5	7.7	8.6	0.25	90
7947 1053	OZ	3	1.5	8.3	9.3	0.28	120
7947 0464	OZ	3	2.5	9.5	10.4	0.55	190
7947 1103	OZ	4	2.5	10.7	11.7	0.6	230
7947 0436	OZ	4	4	13.0	14.0	0.6	330
7947 0570	OZ	3	6	13.0	14.0	0.7	350
7947 0413	OZ	3	10	17.0	18.0	1.0	560
7947 0240	OZ	3	16	20.0	21.3	1.5	950
7947 1100	JZ	3	1.5	8.3	9.3	0.28	120
7947 1106	JZ	4	1.5	9.8	10.5	0.4	150
7947 0571	JZ	3	2.5	9.5	10.4	0.55	190

Other cross-sections on request.

RHEYHALON (N)HXCSLOE-OZ n x ... / (N)HXCSLOE-JZ n x ...

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 0.6/1.0 (1.2) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 0.9 kV DC
Testing a.c. voltage (5 minutes)	U = 3.5 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 4 D
Free moved	≥ 8 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-141 E edition 10/2005

RHEYHALON
(N)MHXCSLOE-OZ n x ... / (N)MHXCSLOE-JZ n x ...

0.6/1 (1.2) kV

Application

Flexible cable with emergency operating features for inner wiring in rail vehicles (trains, locomotives, trolleybusse, etc.), switching stations and control panels. Installation in cable ducts, tubes and outside.

Current carrying capacity acc. to EN 50343 as well as VDE 0298 part 4. Satisfies performance requirements to Hazard Level 4 acc. to EN 45545-1.
Circuit integrity acc. to EN 50200 (15 minutes)

Design in line with EN 50264-3-2

1. Conductor
Flexible stranded tinned copper acc. to IEC 60228 / DIN VDE 0295 class 5

2. Minerally conductor wrapping

3. Insulation
Special cross-linked EPR rubber EI 110 acc. to EN 50264-1

4. Separator
Optional foil or tape

5. Screen
Tinned copper wire braid acc. to EN 50264-3.1 / 3.2

6. Separator
Optional foil or tape

7. Outer sheath
Special cross-linked EVA rubber type EM 104 acc. to EN 50264-1, oil and diesel oil resistant, ozone and uv-resistant

Cable marking

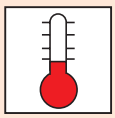
Ink marking white:
RHEYHALON
(N)MHXCSLOE-OZ
2 x 1.5 600/1000 V
Production lot No.

Core colours

(... OZ) black (BK) with white numbers
(... JZ) black (BK) with white numbers and 1 core green/yellow

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2
Toxizitätsindex 3

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)MHXCSLOE-OZ n x ... / (N)MHXCSLOE-JZ n x ...

Technical data

Type-No.	Type	Number of coes	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 0573	OZ	2	1.5	8.5	9.5	0.3	130
7947 1097	OZ	2	10	14.5	15.8	0.8	440

Other cross-sections on request.

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 0.6/1.0 (1.2) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 0.9 kV DC
Testing a.c. voltage (5 minutes)	U = 3.5 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 10 D
Free moved	≥ 25 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-001 E edition 10/2005

RHEYHALON 4GKW-EN
25 mm² to 400 mm²

1.8/3 (3.6) kV

Application

For protected durable installation in railway vehicles (locomotives, trains, trolleybusses, etc.), switching stations and control panels. Installation in cable ducts, pipes and tubes.

Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.
Serves request with regard to Hazard Level 4 acc. to EN 45545-1

Design according to EN 50264-3-1 table 2

1. Conductor

Flexible stranded tinned copper, acc. to DIN VDE 0295/IEC 60228/HD 383 class 5, conductor wrapping optional

2. Insulation

Sandwich cover of special cross-linked EPR, type EI 107 acc. to EN 50264-1 with oil- and dieseloil resistant outer layer

Cable marking

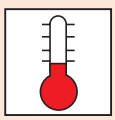
Ink-marking white on black core
RHEYHALON VDE-Reg.-Nr. 7904
4GKW-EN 1,8/3 kV
EN 50264-3-1 1800V 25 F
Production lot No.:

Core colours

black (BK)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON 4GKW-EN

Technical data

Type-No.	Colour	Cross-section mm^2	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 1306	BK	25	10.3	10.9	0.4	290
7947 1307	BK	35	11.4	12.0	0.46	400
7947 1308	BK	50	13.3	13.9	0.60	550
7947 1309	BK	70	15.3	15.9	0.75	750
7947 1310	BK	95	17.0	17.6	0.85	970
7947 1311	BK	120	19.3	19.9	1.10	1.250
7947 1312	BK	150	21.6	22.2	1.35	1.550
7947 1313	BK	185	23.5	24.1	1.50	1.900
7947 1314	BK	240	26.6	27.2	1.90	2.450
7947 1315	BK	300	29.3	30.1	2.20	3.050
7947 1316	BK	400	34.1	34.9	3.50	4.000

RHEYHALON 4GKW-EN

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 1.8/3.0 (3.6) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 2.7 kV DC
Testing a.c. voltage (5 minutes)	U = 6.5 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100,000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 5 D
Free moved	≥ 10 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-005 E edition 10/2005

RHEYHALON NSHXAFOE EN
2.5 mm² to 400 mm²

1.8/3 (3.6) kV

Application

For inside and outside use in railway vehicles (locomotives, trains, trolleybusses, etc.), switching stations and control panels. Installation in cable ducts, tubes and outside.
For wiring in switching stations and distribution boards up to 1000 V, this cable is short-circuit and earth fault save.
Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.
Serves request with regard to Hazard Level 4 acc. to EN 45545-1

Design according to EN 50264-3-1 table 3

1. Conductor
Flexible stranded tinned copper, acc. To DIN VDE 0295/IEC 60228/ HD 383 class 5, conductor wrapping optional

2. Insulation
Special cross-linked EPR, rubber type EI 110 acc. to EN 50264-1

3. Outer sheath
Special cross-linked EPR, rubber type EI 104 acc. to EN 50264-1, oil- and dieseloil resistant

Cable marking

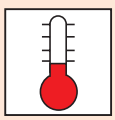
Ink-marking white on black core
RHEYHALON VDE-Reg.-Nr. 7905
NSHXAFOE EN 1.8/3 kV
EN 50264-3-1 T 1800V 2.5 M
Production lot No.:

Core colours

black (BK)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON NSHXAFOE EN

Technical data

Type-No.	Colour	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 1321	BK	2.5	6.2	6.5	0.22	60
7947 1322	BK	4	6.8	7.2	0.25	80
7947 1323	BK	6	7.4	7.9	0.3	100
7947 1324	BK	10	8.7	9.2	0.35	160
7947 1325	BK	16	9.8	10.6	0.45	230
7947 1326	BK	25	12.3	13.1	0.7	340
7947 1327	BK	35	13.3	14.2	0.8	450
7947 1328	BK	50	14.6	15.7	0.85	600
7947 1329	BK	70	16.7	17.7	1.15	820
7947 1330	BK	95	19.2	20.2	1.3	1.050
7947 1331	BK	120	20.8	21.8	1.4	1.300
7947 1332	BK	150	22.9	23.9	1.7	1.600
7947 1333	BK	185	25.0	26.5	2.1	1.950
7947 1334	BK	240	27.9	29.3	2.3	2.500
7947 1335	BK	300	30.6	32.0	2.6	3.100
7947 1336	BK	400	34.2	36.0	3.6	4.000

RHEYHALON NSHXAFOE EN

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 1.8/3.0 (3.6) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 2.7 kV DC
Testing a.c. voltage (5 minutes)	U = 6.5 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100,000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 6 D
Free moved	≥ 10 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-035 E edition 10/2005

RHEYHALON (N)S2HXAFOE
2.5 mm² to 300 mm²

1.8/3 (3.6) kV

Application

For use in railway vehicles (trains, locomotives, trolleybussen, etc.), switching stations and control panels. Installation in cable ducts, tubes and outside. For wiring in switching stations and distribution boards up to 1000 V, this cable is short-circuit and earth fault save.
Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.
Serves request with regard to Hazard Level 4 acc. to EN 45545-1

Design in line with VDE 0250 part 606 E

1. Application
Flexible stranded plain copper class 5 acc. to DIN VDE 0295 / IEC 60228 / HD 383, conductor wrapping optional

2. Insulation
High grade silicon

3. Outer sheath
High grade silicon, colour: red

Calbe marking

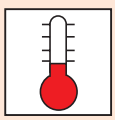
Marking white
RHEYHALON 180
(N)S2HXAFOE 2.5 1.8/3 kV

Cor colours

red (RD)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 65 °C/180 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)S2HXAFOE

Technical data

Type-No.	Colour	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 0375	RD	2.5	6.2	6.5	0.19	60
7947 0376	RD	4	6.8	7.2	0.22	80
7947 0377	RD	6	7.4	7.9	0.23	100
7947 0378	RD	10	8.7	9.2	0.32	160
7947 0379	RD	16	9.8	10.6	0.38	220
7947 0380	RD	25	12.3	13.1	0.58	330
7947 0381	RD	35	13.3	14.2	0.65	440
7947 0382	RD	50	14.6	15.7	0.75	580
7947 0383	RD	70	16.7	17.7	0.89	790
7947 0384	RD	95	19.2	20.2	1.12	1.040
7947 0385	RD	120	20.8	21.8	1.25	1.280
7947 0386	RD	150	22.9	23.9	1.47	1.580
7947 0387	RD	185	25.0	26.5	1.84	1.900
7947 0388	RD	240	27.9	29.3	2.14	2.480
7947 0389	RD	300	30.6	32.0	2.57	3.050

RHEYHALON (N)S2HXAFOE

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 1.8/3.0 (3.6) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 2.7 kV DC
Testing a.c. voltage (5 minutes)	U = 6.5 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 150 °C/100,000 h ≤ 180 °C/20,000 h
Conductor under short-circuit conditions (tinned)	≤ 350 °C

Operating in cold	
min. permissible ambient temperature	≥ – 65 °C

Min. bending radii	
Fixed installation	≥ 6 D
Free moved	≥ 10 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-006 E edition 10/2005

RHEYHALON (N)SHXAFCOE
35 mm² to 150 mm²

1.8/3 (3.6) kV

Application

For use in railway vehicles (trains, locomotives, trolleybussen, etc.), switching stations and control panels. Installation in cable ducts, tubes and outside. For wiring in switching stations and distribution boards up to 1000 V, this cable is short-circuit and earth fault save.

Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.
Satisfies performance requirements to Hazard Level 4 acc. to EN 45545-1

Design according to EN 50264-3-1

1. Conductor
Flexible stranded tinned copper, acc. to DIN VDE 0295 / IEC 60228 and HD 383 class 5

2. Insulation
Special cross-linked EPR, rubber type EI 110 acc. to EN 50264-1

3. Separator
Optional foil or tape

4. Screen
Tinned copper wire braid, cross-section 10 mm²

5. Separator
Optional foil or tape

6. Outer sheath
Black special cross-linked EVA, rubber type EM 104 acc. to EN 50264-1, oil and diesel oil resistant, ozon- and UV-resistant

Cable marking

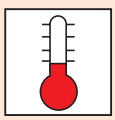
Ink marking white:
RHEYHALON
VDE-Reg.-Nr. 9682
(N)SHXAFCOE 1.8/3 kV
EN 50264-3-1 S 1800V 50 M
FA-Nr.

Core colours

black (BK)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2
Toxizitätsindex 3

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)SHXAFCOE

Technical data

Type-No.	Colour	Cross-section mm²	Ø over screen mm	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 0252	BK	35	12.8	14.5	16.0	0.95	590
7947 0326	BK	50	14.5	16.0	17.5	1.0	750
7947 0259	BK	70	16.5	17.5	19.0	1.3	950
7947	BK	120	20.5	21.5	23.5	1.6	1500
7947 0415	BK	150	22.5	24.0	26.0	2.0	1800

Other cross-section on request.

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 1.8/3.0 (3.6) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 2.7 kV DC
Testing a.c. voltage (5 minutes)	U = 6.5 kV
Coupling resistance 10 kHz – 30 MHz	≤ 50 Ω/km

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100.000 h ≤ 120 °C/20.000 h
Overload	≤ 160 °C / 50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 6 D
Free moved	≥ 10 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-041 E edition 10/2005

RHEYHALON (N)S2HXAFCOE
1 x ...

1.8/3 (3.6) kV

Application

For use in railway vehicles (trains, locomotives, trolleybussen, etc.), switching stations and control panels. Installation in cable ducts, tubes and outside. For wiring in switching stations and distribution boards up to 1000 V, this cable is short-circuit and earth fault save.

Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.
Serves request with regard to Hazard Level 4 acc. to EN 45545-1

Design in line with VDE 0250 part 606 E

1. Conductor
Flexible stranded plain copper class 5 acc. to DIN VDE 0295 / IEC 60228 / HD 383, conductor wrapping optional

2. Insulation
High grade silicon

3. Separator
Foil or tape

4. screen
Tinned copper wire braid, covering appr. 85 %

5. Separator
Foil or tape

6. Outer sheath
High grade silicon, colour: red

Cable marking

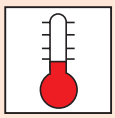
Marking white
RHEYHALON KF2U 180
(N)S2HXAFCOE 50 1.8/3 kV

Core colours

red (RD)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 65 °C/180 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2

Flame retardant
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)S2HXAFCOE

Technical data

Type-No.	Colour	Cross-section mm²	Ø over screen approx. mm	Outer Ø min. mm	Outer Ø max. mm	Capacity approx. µF/km	Caloric load approx. kWh/m	Weight approx. kg/km
7947 1074	RD	50	14.3	16.6	17.6	0.59	0.75	700
7947 1078	RD	150	23.7	25.4	26.4	0.8	1.54	1.810

Other cross-section on request.

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 1.8/3.0 (3.6) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 2.7 kV DC
Testing a.c. voltage (5 minutes)	U = 6.5 kV
Coupling resistance 10 kHz – 30 MHz: at Ø over braid ≤ 10 mm	≤ 150 Ω/km
Coupling resistance 10 kHz – 30 MHz: at Ø over braid > 10 mm	≤ 50 Ω/km

Max. operating temperature at conductor	
Conductor at normal operation	≤ 150 °C/100.000 h ≤ 180 °C/20.000 h
Conductor under short-circuit conditions (tinned)	≤ 350 °C

Operating in cold	
min. permissible ambient temperature	≥ – 65 °C

Min. bending radii	
Fixed installation	≥ 6 D
Free moved	≥ 10 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-119 E edition 10/2005

RHEYHALON NSHXAFOE EN 9GKW

2.5 mm² to 400 mm²

3.6/6 (7.2) kV

Application

For inside and outside use in railway vehicles (locomotives, trains, trolleybusses, etc.), switching stations and control panels. Installation in cable ducts, tubes and outside.
For wiring in switching stations and distribution boards up to 1000 V, this cable is short-circuit and earth fault save.
Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.
Serves request with regard to Hazard Level 4 acc. to EN 45545-1

Design according to EN 50264-3-1 table 4

1. Conductor
Flexible stranded tinned copper, acc. to DIN VDE 0295/IEC 60228/HD 383 class 5, conductor wrapping optional

2. Screen
Conductive tape or extruded conductive layer

3. Insulation
Special cross-linked EPR, rubber type EI 110 acc. to EN 50264-1

4. Outer sheath
Special cross-linked EPR, rubber type EI 104 acc. to EN 50264-1, oil- and dieseloil resistant.

Cable marking

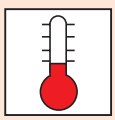
Ink-marking white on black core
RHEYHALON VDE-Reg.-Nr. 7906
NSHXAFOE EN (9GKW)
3.6/6 kV
EN 50264-3-1 T 3600V 2.5 M
Production lot No.:

Core colours

black (BK)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON NSHXAFOE EN 9GKW

Technical data

Type-No.	Colour	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 1341	BK	2.5	8.9	9.3	0.5	115
7947 1342	BK	4	9.6	10.0	0.55	130
7947 1343	BK	6	10.3	10.7	0.65	160
7947 1344	BK	10	11.4	12.0	0.75	210
7947 1345	BK	16	12.9	13.5	0.85	300
7947 1346	BK	25	14.7	15.3	1.0	400
7947 1347	BK	35	16.0	16.6	1.2	520
7947 1348	BK	50	17.5	18.1	1.4	650
7947 1359	BK	70	19.2	19.8	1.6	880
7947 1350	BK	95	21.5	22.1	1.9	1.150
7947 1351	BK	120	23.5	24.1	2.2	1.400
7947 1352	BK	150	24.7	25.5	2.4	1.700
7947 1353	BK	185	26.9	27.7	2.6	2.050
7947 1354	BK	240	29.5	30.3	2.9	2.600
7947 1355	BK	300	31.7	32.5	3.6	3.200
7947 1356	BK	400	35.8	36.6	4.1	4.100

RHEYHALON NSHXAFOE EN 9GKW

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 3.6/6.0 (7.2) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 5.4 kV DC
Testing a.c. voltage (5 minutes)	U = 12 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 90 °C/100,000 h ≤ 120 °C/20,000 h
Overload	≤ 160 °C/50 h
Conductor under short-circuit conditions (tinned)	≤ 350 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 6 D
Free moved	≥ 10 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-034 E edition 10/2005

RHEYHALON (N)S2HXAFOE
4 mm² to 300 mm²

3.6/6 (7.2) kV

Application

For use in railway vehicles (trains, locomotives, trolleybussen, etc.), switching stations and control panels. Installation in cable ducts, tubes and outside. For wiring in switching stations and distribution boards up to 1000 V, this cable is short-circuit and earth fault save.

Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.
Serves request with regard to Hazard Level 4 acc. to EN 45545-1

Design in line with VDE 0250 part 606 E

1. Conductor
Flexible stranded plain copper class 5 acc. to DIN VDE 0295 / IEC 60228 / HD 383, conductor wrapping optional

2. Insulation
High grade silicon

3. Outer sheath
High grade Silikon, colour: yellow

Cable marking

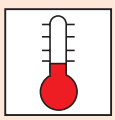
Marking white
RHEYHALON 180
(N)S2HXAFOE 4 3.6/6 kV

Core colours

yellow (YE)

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 und 4
BS 6853



– 65 °C/180 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)S2HXAFOE

Technical data

Type-No.	Colour	Cross-section mm²	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 0361	YE	4	9.4	10.4	0.47	140
7947 0362	YE	6	10.3	11	0.50	160
7947 0363	YE	10	11.4	12	0.57	210
7947 0364	YE	16	12.9	13.7	0.71	300
7947 0365	YE	25	14.7	15.5	0.91	400
7947 0366	YE	35	16	17	1.00	520
7947 0367	YE	50	17.5	18.5	1.15	650
7947 0368	YE	70	19.2	20.5	1.34	880
7947 0369	YE	95	21.5	22.5	1.63	1.150
7947 0370	YE	120	23.5	24.5	1.85	1.400
7947 0371	YE	150	24.7	27	2.15	1.700
7947 0372	YE	185	26.9	28.5	2.34	2.000
7947 0373	YE	240	29.5	31	3.10	2.600
7947 0374	YE	300	31.7	33.5	3.96	3.150

RHEYHALON (N)S2HXAFOE

Technical data

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 3.6/6.0 (7.2) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 6.5 kV DC
Testing a.c. voltage (5 minutes)	U = 11 kV

Max. operating temperature at conductor	
Conductor at normal operation	≤ 150 °C/100,000 h ≤ 180 °C/20,000 h
Conductor under short-circuit conditions (tinned)	≤ 350 °C

Operating in cold	
min. permissible ambient temperature	≥ – 65 °C

Min. bending radii	
Fixed installation	≥ 6 D
Free moved	≥ 10 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-040 E edition 10/2005

RHEYHALON (N)S2HXAFCOE
1 x ...

3.6/6 (7.2) kV

Application

For use in railway vehicles (trains, locomotives, trolleybussen, etc.), switching stations and control panels. Installation in cable ducts, tubes and outside. For wiring in switching stations and distribution boards up to 1000 V, this cable is short-circuit and earth fault save.

Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 4.
Serves request with regard to Hazard Level 4 acc. to EN 45545-1

Design in line with VDE 0250 part 606 E

1. Conductor
Flexible stranded plain copper class 5 acc. to DIN VDE 0295 / IEC 60228 / HD 383, conductor wrapping optional

2. Insulation
High grade silicon

3. Separator
Foil or tape

4. Screen
Tinned copper wire braid, covering appr. 85 %

5. Separator
Foil or tape

6. Outer sheath
High grade silicon
Colour: yellow

Cable marking

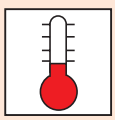
Marking white:
RHEYHALON KF2U 180
(N)S2HXAFCOE 70 3.6/6 kV

Core colours

yellow

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 65 °C/180 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4
EN 50266-2-5
EN 50305-9.1

Low smoke
EN 50268-2

RHEYHALON (N)S2HXAFCOE

Technical data

Type-No.	Colour	Cross-section mm²	Ø over screen approx. mm	Outer Ø min. mm	Outer Ø max. mm	Capacity approx. µF/km	Caloric load approx. kWh/m	Weight approx. kg/km
7947 1084	YE	70	19.1	21.3	22.3	0.46	1.30	1.050
7947 0560	YE	95	21.4	23.6	24.6	0.48	1.57	1.350

Other cross-section on request.

Electrical properties	
Nominal voltage	U_0/U (U_{max}) = 3.6/6.0 (7.2) kV
Max. operating voltage in d.c. installations, one-sided earthed	V_0 = 6.5 kV DC
Testing a.c. voltage (5 minutes)	U = 11 kV
Coupling resistance 10 kHz – 30 MHz: at Ø over braid ≤ 10 mm	≤ 150 Ω/km
Coupling resistance 10 kHz – 30 MHz: at Ø over braid > 10 mm	≤ 50 Ω/km

Max. operating temperature at conductor	
Conductor at normal operation	≤ 150 °C/100,000 h ≤ 180 °C/20,000 h
Conductor under short-circuit conditions (tinned)	≤ 350 °C

Operating in cold	
min. permissible ambient temperature	≥ – 65 °C

Min. bending radii	
Fixed installation	≥ 6 D
Free moved	≥ 10 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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SOM1-R-030 E edition 10/2005

RHEYHALON (N)TMCGCHXOE
1 x ...

26/45 (54) kV

Application

For inside and outside use in railway vehicles. Installation in cable ducts, tubes.
On request available: completely pre-assembled flexible cables with plugs and sealing ends, electrically tested.

Current-carrying capacity acc. to EN 50343 as well as VDE 0298 part 5.
Satisfies performance requirements to Hazard Level 4 acc. to EN 45545-1

Design in line with IEC 60502/EN 50264

1. Conductor
Flexible stranded tinned copper, acc. to DIN VDE 0295 / IEC 60228 / HD 383 class 5

2. Inner conductive layer
conductive rubber

3. Insulation
dielectric, heat and ozon resistant, high-grade Ethylene-Propylene-rubber according EI 105 / EN 50264-1

4. Outer conductive layer
conductive rubber (Thermo-Strip)

5. Screen
single wire, tinned (Ø 0,6 mm), separator

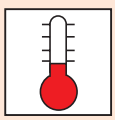
6. Outer sheath
according EM 104 / EN 50264-1, oil- and diesel oil resistant, ozon- und uv resistant, colour: black

Cable marking

Ink marking white e.g.:
RHEYHALON VDE-Reg.-Nr. 7969
(N)TMCGCHXOE 1x95mm²
RF/16 25/45 kV Year

Standards

DIN 5510 part 1
Flame protection class 1, 2, 3 and 4
BS 6853



– 40 °C/90 °C

Halogen free
EN 50267-2-1
EN 60684-2

No corrosivity
EN 50267-2-2
pH-Wert ≥ 4,3
conductivity
≤ 2,5 µS/mm

Non-toxic
EN 50305-9.2
Toxizitätsindex 3

Flame retardant
and self extinguish
EN 50265-2-1
EN 50266-2-4

Low smoke
EN 50268-2

RHEYHALON (N)TMCGCHXOE

Technical data

Type-No.	Cross-section mm²	Cross-section screen mm²	Ø above conductive layer approx. mm	Outer Ø min. mm	Outer Ø max. mm	Caloric load approx. kWh/m	Weight approx. kg/km
7947 0574	50	16	29	34,0	35,0	7	2.100
7947 0575	95	16	32	38,0	40,0	8	2.500
7947 0576	150	16	36	41,0	43,0	10	3.200
7947 0577	240	25	40	45,0	48,0	11	4.300

Other cross-section on request.

Electrical properties		
Nominal voltage		U_0/U (U_{max}) = 26/45 (55) kV
Max. operating voltage		$V_{0\ max}$ = 32 kV
Test voltage	Core/Screen (5 minutes) Core/Screen (5 minutes)	U = 70 kV U = 75 kV
Partial discharge measurement by 52 kV, on pre-assembled flexible cable		≤ 5 pC

Max. operating temperature at conductor	
Conductor in operation	≤ 90 °C/100,000 h ≤ 120 °C/20,000 h
Overload	≤ 160 °C/50 h
Conductor under short-circuit conditions (tinned)	≤ 200 °C

Operating in cold	
min. permissible ambient temperature	≥ – 40 °C

Min. bending radii	
Fixed installation	≥ 6 D
Free moved	≥ 10 D
D = cable Ø	

Special conditions relating temperature and bending radii (e.g. by compelled guidance into cluthes, wagon transition and boogies) on request.

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ELCURAIL/RHEYHALON TAZ

Cables for Rolling Stock

300 V

Application

For the internal wiring of equipment in railway rolling stock.
Thinwall-Wiring for electronic equipment.
Current carrying capacity according to EN 50343.

Design with reference to EN 50306

1. Conductor

Tinned copper, finely stranded (19 and 37 strands), conductor according to EN 50306, part 2, table 1

2. Insulation

High-Tec Polymer
Core colours: wh = white

Cable marking

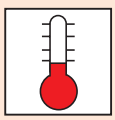
Continuos printing in contrasting colors [manufacturer identification] + type identification

Core colours

white

Standards

DIN 5510 part 1
Hazard level 1 - 4



105 °C/
100,000 h*

Halogen free
EN 50 267-2-1
EN 60 684-2

No corrosivity
EN 50 267-2-2

Non-toxic
EN 50305

Flame resistance
and self-extinguish
EN 50305

Low smoke
EN 50 268-2

* derived from the Arrhenius curve for 20,000 h

ELCURAIL/RHEYHALON TAZ

Technical data

Type-No.	Cross-section mm²	Number of strands	Conductor resistance at 20 °C max. Ω/km	Conductor-Ø min. mm	Conductor-Ø max. mm	Insulation wall-thickness min. mm	Outer-Ø min. mm	Outer-Ø max. mm	Weight approx. kg/km	Fireload approx. kWh/m
455705	0.5	19	40.1	0.80	0.95	0.18	1.15	1.45	5	0.009
455706	0.75	19	26.7	1.00	1.15	0.18	1.35	1.65	8	0.011
455707	1	19	20.0	1.10	1.30	0.18	1.45	1.80	10	0.012
455708	1.5	37	13.7	1.45	1.65	0.22	1.95	2.30	15	0.015
455709	2.5	37	8.21	1.85	2.15	0.28	2.50	2.85	26	0.022

Maximum admissible operating temperature at conductor	
Conductor in operation:	≤ 105 °C/100,000 h

Minimum admissible bending radii	
Implementation	D ≥ 2 D
fixed installation	D ≥ 3 D
D = cable diameter	

All tests were arranged on representative samples.

This cable is neither useful for multiple bending nor for torsion. If needed any single case must be decided.

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ELCURAIL/RHEYHALON MAZ +HXOE

Cables for Rolling Stock

300 V

Application

Ultra-Thinwall Control Cable for use of electronic equipment railway rolling stock. Use for protected laying in circuits, tubes, instruments and switchboards. Current carrying capacity according to EN 50343.

Design with reference to EN 50306

1. Conductor
tinned copper, finely stranded (19 + 37 strands) conductor according to EN 50306, part 2, table 1

2. Insulation
Cross-linked special polymere

3. Cores
Stranding in layers

4. Separator
Foil or band

5. Outer sheath
Cross-linked, mineral oil and fuel resistant HFFR-compound, EM 104 acc. to EN 50264, part 1 colour: black

Cable marking

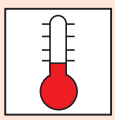
continuos printing in contrasting colors [manufacturer identification] + type identification resp. manufacturers identification thread

Core colours

up to 10 cores colored; core: 1-white, 2-brown, 3-blue, 4-black, 5-red, 6-yellow, 7-green, 8-grey, 9-orange, 10 violet; > 10 cores: all cores white with numbers

Standards

DIN 5510 part 1
Hazard level 1 - 4



90 °C/ 100,000 h*

Halogen free EN 50 267-2-1 EN 60 684-2

No corrosivty EN 50 267-2-2

Non-oxic EN 50305

Flame resistance and self-extinguish EN 50305

Low smoke EN 50 268-2

* derived from the Arrhenius curve for 20,000 h

ELCURAIL/RHEYHALON MAZ +HXOE

Technical data

Type-No.	Number of cores	Cross-section mm²	Conductor-Ø min./max. mm	Insulation-wall-thickn. min. mm	Ø above screen ca. mm	Outer sheath wall-thickn. min. mm	Outer-Ø min. mm	Outer-Ø max. mm	Weight approx. kg/km	Fireload approx. kWh/m
45977610	16	0.5	0.80 / 0.90	0.13	-	0.5	7.4	8.0	130	0.198
45977210	2	0.75	1.00 / 1.10	0.13	-	0.33	3.9	4.5	28	0.066
45978210	2	1.0	1.15 / 1.25	0.13	-	0.33	4.2	4.8	35	0.076
45978310	3	1.0	1.15 / 1.25	0.13	-	0.33	4.7	5.3	46	0.095
45978410	4	1.0	1.15 / 1.25	0.13	-	0.33	5.3	5.9	55	0.102
45979010	10	1.0	1.15 / 1.25	0.13	-	0.5	7.9	8.6	164	0.244
45979110	12	1.0	1.15 / 1.25	0.13	-	0.5	8.3	8.9	168	0.293
45984510	25	1.0	1.15 / 1.25	0.13	-	0.75	12.0	13.0	320	0.551
45979210	2	1.5	1.45 / 1.58	0.13	-	0.33	5.0	5.8	50	0.110
45979310	3	1.5	1.45 / 1.58	0.13	-	0.33	5.6	6.1	62	0.116
45979510	5	1.5	1.45 / 1.58	0.13	-	0.33	6.3	6.9	100	0.163
45979610	6	1.5	1.45 / 1.58	0.13	-	0.5	7.3	8.1	128	0.213
45979810	8	1.5	1.45 / 1.58	0.13	-	0.5	7.9	8.7	161	0.260
45982210	12	1.5	1.45 / 1.58	0.13	-	0.5	9.7	10.5	227	0.317
45982510	25	1.5	1.45 / 1.58	0.13	-	0.92	14.7	15.6	495	0.751
45983210	2	2.5	1.90 / 2.05	0.13	-	0.33	6.1	6.9	78	0.156
45983310	3	2.5	1.90 / 2.05	0.13	-	0.33	7.1	7.9	106	0.181
45983510	5	2.5	1.90 / 2.05	0.13	-	0.5	8.3	9.3	175	0.289
45983610	6	2.5	1.90 / 2.05	0.13	-	0.5	9.1	9.9	210	0.336
45985510	25	2.5	1.90 / 2.05	0.13	-	1.0	19.0	20.1	842	1.361

Maximum admissible operating temperature at the conductor	
Conductor in operation:	≤ 90 °C/100,000 h
Application in cold areas:	> – 40 °C

Minimum admissible bending radii	
fixed installation	D ≤ 12 mm ≥ 3 D D > 12 mm ≥ 4 D
operation caused movement	D ≤ 12 mm ≥ 5 D D > 12 mm ≥ 6 D
D = cable diameter	

Operational Conditions	
nominal voltage:	300 V
test alternating voltage (core/core) 1 minute	2000 V/AC
current carrying capacity	according to EN 50 343

All tests were arranged on representative samples.

This cable is neither useful for multiple bending nor for torsion. If needed any single case must be decided.

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ELCURAIL/RHEYHALON MAZ CHXOE

Cables for Rolling Stock

300 V

Application

Ultra-Thinwall Control Cable for use of electronic equipment in railway rolling stock. Use for protected laying in circuits, tubes, instruments and switchboards. Current carrying capacity according to EN 50343.

Design with reference to EN 50306

1. Conductor
Tinned copper, finely stranded (19 x 37 strands) conductor according to EN 50306, part 2, table 1

2. Insulation
cross-linked special polymere

3. Cores
stranding in layers

4. Separator
Foil or band

5. Screen
tinned copper braiding, optical coverage approx. 85 %

6. Separator
Foil or band

7. Outer sheath
cross-linked, mineral oil and fuel resistant HFFR-compound, EM 104 acc. to EN 50264, part 1 colour: black

Cable marking

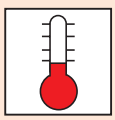
continuos printing in contrasting colors [manufacturer identification] + type identification resp. manufacturers identification thread

Core colours

up to 10 cores colored; core: 1-white, 2-brown, 3-blue, 4-black, 5-red, 6-yellow, 7-green, 8-grey, 9-orange, 10 violet; > 10 cores: all cores white with numbers

Standards

DIN 5510 part 1
Hazard level 1 - 4



90 °C/ 100,000 h*

Halogen free EN 50 267-2-1 EN 60 684-2

No corrosivty EN 50 267-2-2

Non-toxic EN 50305

Flame resistance and self-extinguish EN 50305

Low smoke EN 50 268-2

* derived from the Arrhenius curve for 20,000 h

ELCURAIL/RHEYHALON MAZ CHXOE

Technical data

Type-No.	Number of cores	Cross-section mm²	Conductor-Ø min./max. mm	Insulation-wall-thickn. min. mm	Ø above screen approx. mm	Outer sheath wall-thickn. min. mm	Outer-Ø min. mm	Outer-Ø max. mm	Weight approx. kg/km	Fireload approx. kWh/m
45972210	2	0.5	0.80 / 0.90	0.13	3.2	0.33	4.1	4.5	34	0.072
45972310	3	0.5	0.80 / 0.90	0.13	3.4	0.33	4.2	4.7	39	0.083
45972410	4	0.5	0.80 / 0.90	0.13	3.8	0.33	4.5	5.0	43	0.071
45972510	5	0.5	0.80 / 0.90	0.13	4.2	0.33	5.0	5.5	52	0.092
45972810	8	0.5	0.80 / 0.90	0.13	5.1	0.33	5.8	6.4	77	0.134
45972910	9	0.5	0.80 / 0.90	0.13	5.6	0.33	6.3	6.9	97	0.159
45921210	12	0.5	0.80 / 0.90	0.13	6.2	0.50	7.4	8.0	120	0.153
45971410	15	0.5	0.80 / 0.90	0.13	6.9	0.50	8.1	8.8	155	0.259
45971510	16	0.5	0.80 / 0.90	0.13	6.9	0.50	8.1	8.8	160	0.218
45973210	2	0.75	1.00 / 1.10	0.13	3.6	0.33	4.5	5.0	41	0.076
45973310	3	0.75	1.00 / 1.10	0.13	3.9	0.33	4.8	5.3	49	0.083
45973410	4	0.75	1.00 / 1.10	0.13	4.3	0.33	5.2	5.7	60	0.090
45973610	6	0.75	1.00 / 1.10	0.13	5.3	0.33	6.0	7.0	100	0.170
45973810	8	0.75	1.00 / 1.10	0.13	5.7	0.33	6.5	7.1	108	0.156
45973910	12	0.75	1.00 / 1.10	0.13	7.1	0.50	8.3	9.0	160	0.244
45974210	2	1.0	1.15 / 1.25	0.13	4.0	0.33	4.8	5.3	50	0.085
45974310	3	1.0	1.15 / 1.25	0.13	4.2	0.33	5.1	5.6	60	0.099
45974410	4	1.0	1.15 / 1.25	0.13	4.8	0.33	5.5	6.0	75	0.118
45974510	5	1.0	1.15 / 1.25	0.13	5.2	0.33	5.9	6.5	85	0.112
45974610	6	1.0	1.15 / 1.25	0.13	5.7	0.33	6.4	7.0	101	0.128
45974710	7	1.0	1.15 / 1.25	0.13	5.7	0.33	6.4	7.0	110	0.126
45974810	8	1.0	1.15 / 1.25	0.13	6.2	0.50	7.4	8.0	135	0.147
45922010	10	1.0	1.15 / 1.25	0.13	7.4	0.50	8.6	9.3	174	0.291
45974910	12	1.0	1.15 / 1.25	0.13	7.8	0.50	9.0	9.7	190	0.307
45976910	21	1.0	1.15 / 1.25	0.13	9.6	0.75	11.3	12.2	315	0.495
45971910	25	1.0	1.15 / 1.25	0.13	11.1	0.75	12.8	13.8	370	0.575
45975210	2	1.5	1.45 / 1.58	0.13	4.8	0.33	5.9	6.5	68	0.113
45975310	3	1.5	1.45 / 1.58	0.13	5.2	0.33	5.9	6.5	80	0.116
45975410	4	1.5	1.45 / 1.58	0.13	5.7	0.33	6.4	7.0	101	0.123
45975610	6	1.5	1.45 / 1.58	0.13	6.9	0.50	8.1	8.8	156	0.255
45975810	8	1.5	1.45 / 1.58	0.13	7.5	0.50	8.7	9.3	192	0.279
45976210	2	2.5	1.90 / 2.05	0.13	6.1	0.50	7.2	7.8	112	0.217
45976410	4	2.5	1.90 / 2.05	0.13	7.1	0.50	8.3	9.0	166	0.246

ELCURAIL/RHEYHALON MAZ CHXOE

Technical data

Maximum admissible operating temperature at the conductor	
Conductor in operation:	≤ 90 °C/100,000 h
Application in cold areas:	> – 40 °C

Minimum admissible bending radii	
fixed installation	D ≤ 12 mm ≥ 3 D D > 12 mm ≥ 4 D
operation caused movement	D ≤ 12 mm ≥ 5 D D > 12 mm ≥ 6 D
D = cable diameter	

Operational Conditions	
nominal voltage:	300 V
test alternating voltage (core/core) 1 minute	2000 V/AC
current carrying capacity	according to EN 50 343

All tests were arranged on representative samples.

This cable is neither useful for multiple bending nor for torsion. If needed any single case must be decided.

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MSZ

Screened and unscreened control cables 0.5 mm² to 2.5 mm²
Flame retardant, halogen free with circuit integrity

300 V/500 V

Application

As control and connector cable in safety areas in railway rolling stock with circuit integrity resistance and mineral oil and fuel resistance.

Design with reference to EN 50306

1. Conductor/core
tinned copper strands;
0.5 mm² to 2.5 mm²

2. Insulation
one layer of mica tape, over-lapped, halogen free flame retardant corss-linked polymer (insulation wall thickness see table 1)

3. Stranding
several wires were stranded together in concentrical layers. Filling elements or pads out of halogen free, flame retardant material are allowed.

4. Wrapping
admissible layer, e.g. glass sheet or foil

5. Screening
tinned copper braid, optical coverage approx. 85 %.
If necessary a additional Aluminium luminated plastic foil is used.

6. Separator
halogen free tape or foil overlapped admissible

7. Outer sheath
cross-linked, mineral oil and fuel resistant HFFR-Polyolefin compound EM 104, according to EN 50264, part 1
outer diameter: see table 1
colour: black

Marking

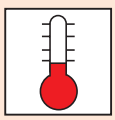
continuos printing in contrasting colors [manufacturer identification] + type identification t intervals of 500 mm resp. manufacturers identification thread

Core colours

up to 10 cores colored; core: 1-white, 2-brown, 3-blue, 4-black, 5-red, 6-yellow, 7-green, 8-grey, 9-orange, 10 violet; > 10 cores: all cores black with numbers

Standards

DIN 5510 part 1
Hazard level 1 - 4
EN 50200 15 min.
BS 6387 AXSZ



90 °C/
100.000 h*

Halogen free
EN 50 267-2-1
EN 60 684-2

No corrosivty
EN 50 267-2-2

Non-toxic
EN 50305

Flame resistance
and self-extinguish
EN 50305

Low smoke
EN 50 268-2

* derived from the Arrhenius curve for 20,000 h

MSZ

Technical data

Type-No.	Number of cores x cross-section nom. Stück x mm	Conductor-Ø min./max. mm²	Insulation wall-thickness min. mm	Ø above screen approx. mm	Outer sheath wall-thickness min. mm	Outer-Ø min./max. mm	Weight approx. kg/km	Fireload approx. kWh/m
45986410	14 x 1.0	1.10 / 1.30	0.20	-	0.56	10.7 / 11.5	225	0.416
45986210	2 x 1.5	1.45 / 1.65	0.22	-	0.42	6.0 / 7.0	69	0.156
45986710	7 x 1.5	1.45 / 1.65	0.22	-	0.56	9.3 / 10.3	174	0.248
45988510	25 x 1.5	1.45 / 1.65	0.22	-	0.56	17.6 / 19.2	625	0.950
45987210	2 x 2.5	1.85 / 2.15	0.22	-	0.56	7.4 / 8.2	91	0.184
45987810	8 x 2.5	1.85 / 2.15	0.28	-	0.56	12.4 / 13.4	314	0.548
45988610	25 x 2.5	1.85 / 2.15	0.28	-	0.56	20.5 / 22.3	945	1.119
45987010	2 x 0.5	0.80 - 0.95	0.18	4.0	0.42	4.9 / 6.1	50	0.104
45988210	2 x 0.75	1.00 / 1.15	0.20	4.8	0.42	5.5 / 6.3	57	0.104
45988310	4 x 0.75	1.00 / 1.15	0.20	5.5	0.42	6.2 / 7.0	78	0.123
45988010	2 x 1.0	1.10 / 1.30	0.20	5.0	0.42	5.8 / 6.4	62	0.123
45988110	6 x 1.0	1.10 / 1.30	0.20	7.2	0.56	8.4 / 9.0	129	0.260
45988410	14 x 1.5	1.45 / 1.65	0.22	11.8	0.56	12.8 / 13.8	326	0.416
45988810	8 x 2.5	1.90 / 2.05	0.28	11.9	0.56	13.0 / 14.0	348	0.558

Poperties		Requirements	
Mechanical properties			
• max. tensile strengt under permeation, static tensile strength and fixed laying		50 N/mm² conductor cross section 15 N/mm² conductor cross section	
• min. admissible bending radii		screened	unscreened
fixed installation	at < 12mm Ø	4D	3D
	at > 12mm Ø	5D	4D
operation caused movement	at < 12mm Ø	8D	4D
	at > 12mm Ø	10D	5D
D = cable diameter			
Thermal properties	Category temperature in operation resp. at laying:		
at conductor	in operation	+ 90 °C/100.000 h*	
	in case of short circuit	+ 200 °C	
outer sheath surface	in operation	– 40 °C to + 90 °C	
	at laying	– 20 °C to + 50 °C	
* derived from the Arrhenius curve for 20.000 h			

This cable is neither useful for multiple bending nor for torsion. If needed any single case must be decided.

MSZ

Technical data

Properties		Requirements	Test according to
Electrical properties			
Conductor resistance		EN 50306-2	EN 50306 Pkt. 6.1
• electrical strength	test voltage Ueff, test duration 5 min		EN 50305 Pkt. 6.2
	core/core	2000 V AC	
	core/screen	2000 V AC	
Emergency running properties			
Insulation resistance		15 min	EN 50200
Circuit integrity		ASXZ	BS 6387

All test were arranged on representative samples.

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BL-02XS(ST)CHX MVB

Databus for rolling stock, halogen free 2 x 2 x 0,5 mm²

Appliction

Connecting cable for the transmission of digital signals up to 10 M Baud in railway rolling stock.

Design

1. Conductor/core
tinned Cu strand, nominal cross-section 0,5 mm²/19

2. Insulation
Foam Skin-Polyethylene, cross-linked

3. Star quad
four cores were stranded together to build a star quad

4. Wrapping
at least one layer of non woven tape overlapped

5. Screen
a) aluminium luminated plastic foil overlapped
b) tinned copper braid

6. Separator
non woven tape overlapped

7. Outer sheath
cross-linked HFFR-compound
colour of sheaths: turquoise

Cable marking

continuos printing in contrasting colors [manufacturer identification] + type identification resp. manufacturers identification thread (distance max. 500 mm)

Core colours

pair 1: red, black
pair 2: white, yellow

Standards

DIN 5510 part 1
Hazard level 1 - 4


– 40 °C/+90 °C (20,000 h)

Halogen free EN 50 267-2-1 EN 60 684-2


No corrosivty EN 50 305


Non-toxic EN 50305


Flame resistance and self-extinguish EN 50305


Low smoke EN 50 268-2

BL-02XS(ST)CHX MVB

Technical data

Type-No.	Colour	Cross-section nom. mm²	middle Outer-Ø max. mm	Fireload approx. kWh/m	Weight approx. kg/km
45953050	turquoise	2 x 2 x 0.5	8.0	0.272	100

Properties		Requirements	Test according to
Electrical properties			
test voltage	core/core core/screen	1000 Veff 1500 Veff	EN 50289-1-3 50 Hz 1 min
conductor resistance		≤ 41 Ω/km	EN 50289-1-2
mean characteristic impedance	0.5 MHz - 2 MHz	(120 ± 12) Ω	IEC 61196-1 Teil 11.8.1
Attenuation	1.0 MHz 1.5 MHz 2.0 MHz 3.0 MHz	≤ 1.2 dB/100 m ≤ 1.5 dB/100 m ≤ 1.7 dB/100 m ≤ 2.1 dB/100 m	EN 50289-1-8

Maximum admissible operating temperature at the conductor		
Category temperature:	in operation	– 40 °C/+ 85 °C
Category temperature:	during laying	– 20 °C/+ 50 °C

Minimum admissible bending radius	
Single bending	≥ 5 D
Multiple bending	≥ 10 D
Max. admissible tensile load	50 N/mm² m conductor cross-section
D = cable diameter	

This cable is neither useful for mutiple bendings nor for torsion. If needed any single case must be decided.

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BL-02XS(St)CHXOE 1 P AWG 20 WTB/MVB

Databus for rolling stock WTB halogen free

Application

The cable BL-02XSCHXOE 1 P AWG 20 is used as a connecting cable to transmit digital signals inside railway rolling stock.

Construction

1. Conductor/core
Tinned Cu strand, AWG 20/19

2. Insulation
Foam Skin-Polyethylene, cross-linked

3. Pair
Two cores were stranded to a pair together with two filling elements

4. Wrapping
Minimum one layer of non woven tape wrapped overlapped

5. Screen
Screen composed of a aluminium luminated plastic foil and a tinned copper braid, optical coverage approx. 90 %.

6. Separator
Non woven tape overlapped

7. Outer sheath
Cross-linked mineral oil and fuel resistance HFFR-compound EM 104 according to EN 50264, part 1
Colour: black

Marking

Continuos printing in contrasting colors [manufacturer identification] + type identification resp. manufacturers identification thread

Core colours

Pair: white, black

Standards

DIN 5510 part 1
Hazard level 1 - 4


– 40 °C/+90 °C (20.000 h)

Halogen free EN 50 267-2-1 EN 60 684-2


No corrosivty EN 50 267-2-2


Non-toxic EN 50305-9.2


Flame resistance and self-extinguish EN 50305


Low smoke EN 50 268-2

BL-02XS(St)CHXOE 1 P AWG 20 WTB/MVB

Technical data

Type-No.	Colour	Cross-section nom. mm²	middle Outer-Ø max. mm	Fireload approx. kWh/m	Weight approx. kg/km
45983010	black	1 x 2 x AWG 20/19	8.0	0.272	80

Maximum admissible operating temperature at the conductor	
In operation	– 40 °C/+ 85 °C
During laying	– 20 °C/+ 50 °C

Minimum admissible bending radius	
Single bending	≥ 6 x D
Mulriple bending	≥ 12 x D
Max. admissible tensile loading	50 N/mm² conductor cross-section
D = cable diameter	

Properties		Requirements	Test according to
Electrical properties			
• Test voltage	Core/core	2000 V_{eff}	EN 50289-1-3
	Core/screen	1500 V_{eff}	50 Hz, 1 min
• Conductor resistance		≤ 33,1 Ω/km	EN 50289-1-2
• Mean characteristic impedance	0.5 - 2 MHz	(120 ± 12) Ω	IEC 61196-1 part 11.8.1
• Attenuation	1.0 MHz	≤ 1.1 dB/100 m	EN 50289-1-8
	2.0 MHz	≤ 1.5 dB/100 m	

This cable is neither useful for mutiple bendings nor for torsion. If needed any single case must be decided.

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BL-02XSCHXOE 1 P 0,75

Databus for rolling stock UIC halogen free

Application

Equipment connecting cables for the transmission of digital signals until a baud rate of 10 M inside of rolling stock vehicles.

Design

1. Conductor/core
Tinned Cu strand, nominal cross-section 0,75 mm^2/19

2. Insulation
Foam Skin-Polyethylene, cross-linked

3. Wrapping
Minimum one non woven tape overlapped

4. Screen
Tinned copper wire braiding optical coverage ≥ 90 %

5. Separator
non woven tape overlapped

6. Outer sheath
Cross-linked mineral oil and fuel resistance HFFR-compound EM 104, according to EN 50264,
part 1
Colour: black

Cable marking

Continuos printing in contrasting colors [manufacturer identification] + type identification resp. manufacturers identification thread

Core colours

Pair: white, black

Standards

DIN 5510 part 1
Hazard level 1 - 4

– 40 °C/+90 °C (20.000 h)

Halogen free EN 50 267-2-1 EN 60 684-2

No corrosivty EN 50 267-2-2

Non-toxic EN 50305

Flame resistance and self-extinguish EN 50305

Low smoke EN 50 268-2

BL-02XSCHXOE 1 P 0,75

Technical data

Type-No.	Colour	Cross-section nom. mm²	middle Outer-Ø max. mm	Fireload approx. kWh/m	Weight approx. kg/km
45955510	black	1 x 2 x 0.75	9.0	0.348	110

Maximum admissible operating temperature at the conductor	
In operation	– 40 °C/+85 °C

Minimum admissible bending radii	
Single bending	6 x D
Multiple bending	12 x D
D = cable diameter	

Properties		Requirements	Test according to
Electrical properties			
• Test voltage	Core/core Core/screen	2000 V_{eff} 1500 V_{eff}	EN 50289-1-3 50 Hz, 1 min
• Conductor resistance		≤ 26.7 Ω/km	EN 50289-1-2
• Mean characteristic impedance	1.0 - 10 MHz	(120 ± 12) Ω	IEC 61196-1 part 11.8.1
• Attenuation	1.0 MHz 1.5 MHz 2.0 MHz 3.0 MHz	≤ 1.0 dB/100 m ≤ 1.3 dB/100 m ≤ 1.4 dB/100 m ≤ 1.8 dB/100 m	EN 50289-1-8

This cable is neither useful for mutiple bendings nor for torsion. If needed any single case must be decided.

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UIC 9-core

Screened multicore control cable with data bus, flame retardant, halogen free, as UIC connector cable 9-core

Application

Data cable for rolling stock

Design

a. 4 cores with 10 mm²

b. Combined element
3 cores (with Cu-strand 2 x 6 mm², 2.5 mm²) were twisted with a filling element to a combined element
wrapping: minimum one layer of plastic-foil overlapped
element sheath: TPE

c. UIC Data Bus 0,75 mm²
Two cross-linked wires with copper strands, 0.75 mm²/19 with foam-skin polyethylene insulation, were stranded together with two fillers to a pair.
wrapping: minimum one layer of plastic-foil overlapped
tinned copper braid, optical coverage > 90 %
separating layer: plastic foil, wrapped overlapped
element sheath: TPE
wrapping: non woven tape overlapped

d. Stranding
4 cores a were twisted to a core together with b, the UIC data bus c and two fillers

e. Core wrapping
Non woven tape overlapped

f. Outer sheath
Cross-linked, halogen free, flame retardant outer sheath
colour: black

Cable marking

Continous printing in contrasting colours [manufacturer identification] + type identification resp. manufacturers´ identification thread

Core colours

Core colours in the pair: white, black

Standards

DIN 5510 part 1
Hazard level 1 - 4

– 40 °C/+90 °C (20.000 h)	Halogen free EN 50 267-2-1 EN 60 684-2	No corrosivty EN 50 267-2-2	Non-toxic EN 50305-9.2	Flame resistance and self-extinguish EN 50305	Low smoke EN 50 268-2

UIC 0,75 9-pole

Technical data

Type-No.	Colour	Cross-section nom. mm²	Outer-Ø max. mm	Fireload approx. kWh/m	Weight approx. kg/km
45953310	black	4 x 10 2 x 6 1 x 2.5 2 x 0.75	25	2.32	917

Maximum admissible operating temperature at the conductor	
In operation	– 40 °C/+90 °C

Minimum admissible bending radii	
Single bending	6 x D
Multiple bending	12 x D
max. admissible tensile strength	50 N/mm² Conductor cross-section
D = cable diameter	

All tests were arranged on respresentative samples.

This cable is neither useful for mutiple bendings nor for torsion. If needed any single case must be decided.

UIC 0,75 9-pole

Technical data

Properties		Requirements	Test according to
Electrical properties	**UIC Data Bus 0.75 mm²**		
• Test voltage	Core/core	2000 V_{eff}	EN 50289-1-3
	Core/screen	1500 V_{eff}	50 Hz, 1 min
• Conductor resistance		≤ 26.7 Ω/km	EN 50289-1-2
• Mean characteristic impedance	1.0 - 10 MHz	(120 ± 12) Ω	IEC 61196-1 part 11.8.1
• Attenuation	1.0 MHz	≤ 1.0 dB/100 m	EN 50289-1-8
	1.5 MHz	≤ 1.3 dB/100 m	
	2.0 MHz	≤ 1.4 dB/100 m	
	3.0 MHz	≤ 1.8 dB/100 m	
Electrical properties	**Control cores (2.5 - 10 mm²)**		
• Test voltage	Core/core	2000 V_{eff}	EN 50289-1-3
	Core/screen	1500 V_{eff}	50 Hz, 1 min
• Conductor resistance	10 mm²	≤ 1.95 Ω/km	EN 50289-1-2
	6 mm²	≤ 3.39 Ω/km	
	2.5 mm²	≤ 8.21 Ω/km	

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UIC 11-cores

Screened multicore control cable with data bus, flame retardant, halogen free, as UIC connector cable 11-core

Application

Data cable for rolling stock

Design

A. 4 x Core 10 mm²
Insulation: halogen free, flame retardent thermoplastic High-Tech-Polymer

B. combined element 5 cores
Insulation: halogen free, flame retardent thermoplastic High-Tech-Polymer
Stranding: 2 cores 6 mm², one core 2.5 mm² and 2 cores 1.0 mm² were twisted together with fillers to a combined element
Wrapping: minimum one layer of plastic-foil overlapped
Element sheaths: TPE

C. UIC Data Bus 0.75 mm²
Two cross-linked wires with copper strands, 0.75 mm²/19 and foam-skin polyethylene insulation, were stranded together with two fillers to a pair.
Wrapping: minimum one layer of plastic-foil overlapped
screen: tinned copper wire braiding, optical coverage > 90%
Separating layer: plastic foil, wrapped overlapped
Element sheaths: halogen free, flame retardant TPE outer sheaths
Wrapping: overlapped plastic foil

D. Stranding
4 strands (a) were twisted to a core together with the combined element (b), the UIC data bus (c) and two fillers.

E. Core wrapping
Non woven tape overlapped

F. Outer sheath
Cross-linked, halogen free, flame retardant outer sheath
Colour: black

Cable marking

Continous printing in contrasting colours [manufacturer identification] + type identification resp. manufacturers´ identification thread

Core colours

UIC data bus
Core colours in the pair: white, black

Standards

DIN 5510 part 1
hazard level 1 - 4


– 40 °C/+90 °C (20.000 h)

Halogen free EN 50 267-2-1 EN 60 684-2


No corrosivty EN 50 267-2-2


Non-toxic EN 50305


Flame resistance and self-extinguish EN 50305


Low smoke EN 50 268-2

UIC 11-pole

Technical data

Type-No.	Colour	Cross-section nom. mm²	middle Outer-Ø max. mm	Fireload approx. kWh/m	Weight approx. kg/km
45957110	black	4 x 10 2 x 6 1 x 2.5 2 x 1.0 2 x 0.75	25.0	2.540	969

Properties		Requirements	Test according to
Mechanical properties			
• max. admissible tensile strength		50 N/mm² conductor cross section	
• Bending radii	Single bending Multiple bending	5 x D 12 x D	
D = conductor diameter			
Thermical properties			
max. admissible operating temperature at conductor		– 40 °C bis + 90 °C	
Electrical properties	**UIC Data Bus 0,75 mm²**		
• Test voltage	Core/core Core/screen	2000 V_{eff} 1500 V_{eff}	EN 50289-1-3 50 Hz, 1 min
• Conductor resistance		≤ 26.7 Ω/km	EN 50289-1-2
• Mean characteristic impedance	1.0 - 10 MHz	(120 ± 12) Ω	IEC 61196-1 part 11.8.1
• Attenuation	1.0 MHz 1.5 MHz 2.0 MHz 3.0 MHz	≤ 1.0 dB/100 m ≤ 1.3 dB/100 m ≤ 1.4 dB/100 m ≤ 1.8 dB/100 m	EN 50289-1-8
Electrical properties	**Control cores (1 mm², 2.5 mm², 6 mm², 10 mm²)**		
• Test voltage	Core/core	2000 V_{eff} (1000 V_{eff})*	EN 50289-1-3 50 Hz, 1 min
• Conductor resistance	10 mm² 6 mm² 2.5 mm²	≤ 1.95 Ω/km ≤ 3.39 Ω/km ≤ 8.21 Ω/km	EN 50289-1-2
* only for cores with 1 mm² corss-section			

All tests were arranged on respresentative samples.

This cable is neither useful for mutiple bendings nor for torsion. If needed any single case must be decided.

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www.nexans.de

UIC 18-cores

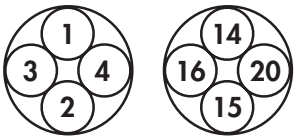
Screened multicore control cable with data bus, flame retardant, halogen free, as UIC connector cable 18-core

Application

Data cable for rolling stock

Assembly

1. Star quad twisting
4 x 4 x 1.0 mm²
Tinned copper wire core, 1.0 mm²/19; insulation: halogen free, flame retardant thermoplastic hightech-polymere.
4 cores were twisted to a star quad
e.g. Quad 1: e.g. Quad 4:



2. UIC Data Bus 0,75 mm²
a) Conductor
Tinned copper strand, 0.75 mm²/19
b) Insulation
Foam-Skin polyethylene, cross-linked
c) Pair
Two cores were standed to a pair together with two fillers
d) Wrapping
Minimum one layer of plastic-foil overlapped
e) Screening
Tinned copper wire braiding
e) Element sheath
TPE

3. Stranding
4 star quads were twisted to a core together with 1 UIC data bus and filling elements

4. Core wrapping
Minimum one layer of plastic-foil overlapped

5. Screen
Tinned copper braid

6. Outer sheath
Cross-linked, halogen free, flame retardant outer sheath
Colour: black

Cable marking

continous printing in contrasting colours [manufacturer identification] + type identification resp. manufacturers´ identification thread

Core colours

UIC data bus: core colours in the pair white, black

Standards

DIN 5510 part 1
Hazard level 1 - 4


– 40 °C/+90 °C (20.000 h)

Halogen free EN 50 267-2-1 EN 60 684-2


No corrosivty EN 50 267-2-2


Non-toxic EN 50305


Flame resistance and self-extinguish EN 50305


Low smoke EN 50 268-2

UIC 18-pole

Technical data

Type-No.	Colour	Cross-section nom. mm²	average outer-Ø max. mm	Fireload approx. kWh/m	Weight approx. kg/km
45953410	black	4 x 4 x 1.0 + 2 x 0.75	18.5	1.132	498

Maximum admissible operating temperature at the conductor	
In operation	– 40 °C/+90 °C

Minimum admissible bending radii	
Single bending	≥ 6 x D
Multiple bending	≥ 12 x D
max. admissible tensile strength	50 N/mm² Conductor cross-section
D = condictor diamatrer	

All tests were arranged on respresentative samples.

This cable is neither useful for mutiple bendings nor for torsion. If needed any single case must be decided.

UIC 18-pole

Technical data

Properties		Requirements	Test according to
Electrical properties	**UIC Data Bus 0.75 mm²**		
• Test voltage	Core/core	2000 V_{eff}	EN 50289-1-3
	Core/screen	1500 V_{eff}	50 Hz, 1 min
• Conductor resistance		≤ 26.7 Ω/km	EN 50289-1-2
• Mean characteristic impedance	1.0 - 10 MHz	(120 ± 12) Ω	IEC 61196-1 part 11.8.1
• Attenuation	1.0 MHz	≤ 1.0 dB/100 m	EN 50289-1-8
	1.5 MHz	≤ 1.3 dB/100 m	
	2.0 MHz	≤ 1.4 dB/100 m	
	3.0 MHz	≤ 1.8 dB/100 m	
Electrical properties	**Control cores (2.5 - 10 mm²)**		
• Test voltage	Core/core	2000 V_{eff}	EN 50289-1-3
	Core/screen	1500 V_{eff}	50 Hz, 1 min
• Conductor resistance	1 mm²	≤ 20 Ω/km	EN 50289-1-2

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UIC 20-cores

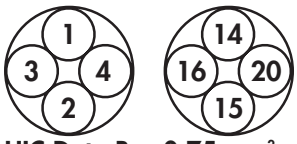
Screened multicore control cable with data bus, flame retardant, halogen free, as UIC-connecting cable 20-core

Application

Data cable for rolling stock

Assembly

1. Star quad twisting
4 x 4 x 1.0 mm²
Cores tinned copper wires, 1 mm²/19;
Inuslation: halogen free, flame retardant thermoplastic hightech-polymere.
4 cores were twisted to a star quad
e.g. Quad 1: e.g. Quad 4:



2. UIC Data Bus 0.75 mm²
a) Conductor
tinned copper wire
b) Insulation
Foam-Skin polyethylene, cross-linked
c) Pair
two cores were standed to a pair together with 2 fillers
d) Wrapping
minimum one layer of plastic-foil overlapped
e) Screening
tinned copper braid
e) Element sheaths
TPE

3. Stranding
4 star quads were twisted together with 2 UIC data buses and several fillers

4. Core wrapping
Minimum one layer of plastic-foil overlapped

5. Screen
tinned copper-wire braid

6. Outer sheath
cross-linked, halogen free, flame retardant outer sheath
colour: black

Cable marking

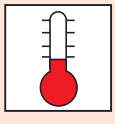
continous printing in contrasting colours
[manufacturer identification] + type identification resp. manufacturers´ identification thread

Aderfarben

pair core colours:
white, black
element outer sheaths: white
with continuous number printint
Bus 1: number 1
Bus 2: number 2

Standards

DIN 5510 part 1
Hazard level 1 - 4


– 40 °C/+90 °C
(20.000 h)

Halogen free
EN 50 267-2-1
EN 60 684-2


No corrosivty
EN 50 267-2-2


Non-toxic
EN 50305


Flame resistance
and self-extinguish
EN 50305


Low smoke
EN 50 268-2

UIC 20-pole

Technical data

Type-No.	Colour	Cross-section nom. mm²	average outer-Ø max. mm	Fireload approx. kWh/m	Weight approx. kg/km
45953510	black	4 x 4 x 1.0 + 2 x 2 x 0.75	23.0	2.272	530

Maximum admissible operating temperature at the conductor	
Conductor under operation	– 40 °C/+90 °C

Minimum admissible bending radii	
Single bending	≥ 5 x D
Multiple bending	≥ 12 x D
max. admissible tensile strength	50 N/mm² conductor cross-section
D = conductor diamatrer	

All tests were arranged on respresentative samples.

This cable is neither useful for mutiple bendings nor for torsion. If needed any single case must be decided.

UIC 20-pole

Technical data

Poperties		Requirements	Test according to
Electrical properties			
• Test voltage	Core/core	2000 V_{eff}	EN 50289-1-3
	Core/screen	1500 V_{eff}	50 Hz, 1 min
• Conductor resistance		≤ 26.7 Ω/km	EN 50289-1-2
• Mean characteristic impedance	1.0 - 10 MHz	(120 ± 12) Ω	IEC 61196-1 part 11.8.1
• Attenuation	1.0 MHz	≤ 1.0 dB/100 m	EN 50289-1-8
	1.5 MHz	≤ 1.3 dB/100 m	
	2.0 MHz	≤ 1.4 dB/100 m	
	3.0 MHz	≤ 1.8 dB/100 m	
Electrical properties	**star quad 1.0 mm²**		
• Test voltage	Core/core	2000 V_{eff}	EN 50289-1-3
	Core/screen	1500 V_{eff}	50 Hz, 1 min
• Conductor resistance		≤ 20 Ω/km	EN 50289-1-2

All tests were arranged on respresentative samples.

This cable is neither useful for mutiple bendings nor for torsion. If needed any single case must be decided.

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Harnesses for Rolling Stock

System-devices more and more gain in importance in view of the prevalent cost pressure in the production on the one hand and with the concurrently bidding of capacity-figures on the other hand.

The so-called modular construction is a "Keyfactor" in view of the cycle-times which have to be reduced and is insofar standing in direct relation to a reduce of production-cost overall.

In this connection Nexans offers all-embracing business activities:

- producibility-analysis for new projects or pilot-projects
- design and technology from the specification until the prototype
- test and qualification for linear continuity in the production
- flexibility in the adaptation of modifications in the serial production
- tough and resistant to many mediums and weather conditions
- access to new technologies via the Nexans Development- and Competence-Centers
- simplified installation by customised packaging
- technical support assures a long economic life-time
- precisely timed on-site delivery

In this way special performances can be designed and produced for each customised solution.

The service-offering is getting rounded by the opportunity that for example coupling-resistances or screen-attenuation for screened system-devices with selected frequency-spans can be measured and documented in our HF measurement centres.

Consequently Nexans is able to offer customised EMV-technical solutions of systems.

The continual search for innovations together with our customers and development-resources is characterising this business group.

CERTIFICATE

DQS GmbH

Deutsche Gesellschaft zur Zertifizierung von Managementsystemen

hereby certifies that the company

Nexans Deutschland Industries GmbH & Co. KG

Bonnenbroicher Str. 2-14
41238 Mönchengladbach
Germany

for the scope

Design, development, production and sales of wires, strands, special cables, telecommunication and data communication cables, cabling systems and active components for data and information networks with logistics at Nexans Logistik GmbH

has implemented and maintains a

Quality and Environmental Management System.

Audits, documented in a report, have verified that this management system fulfils the requirements of the following standards:

DIN EN ISO 9001 : 2000
December 2000 edition

EN ISO 14001 : 2004
November 2004 edition

This certificate is valid until	2008-06-29
Certificate Registration No.	222811 QM/UM
Frankfurt am Main	2005-06-30

Ass. iur. M. Drechsel
Dipl.-Ing. S. Heinloth
MANAGING DIRECTORS

D-60433 Frankfurt am Main, August-Schanz-Straße 21

CERTIFICATE

DQS GmbH
Deutsche Gesellschaft zur Zertifizierung von Managementsystemen

hereby certifies that the company

Nexans Deutschland Industries GmbH & Co. KG
Business Unit Nürnberg

Sieboldstraße 10
90411 Nürnberg

for the scope

Design, development, production and sales of
special cables for energy-, control- and signaltransmission

has implemented and maintains a

Quality Management System.

An audit, documented in a report, has verified that this
quality management system fulfils the requirements
of the following standard:

DIN EN ISO 9001 : 2000
December 2000 edition

This certificate is valid until	2008-04-04
Certificate Registration No.	000848 QM
Frankfurt am Main	2005-04-05

Ass. iur. M. Drechsel — Dipl.-Ing. S. Heinloth

MANAGING DIRECTORS

D-60433 Frankfurt am Main, August-Schanz-Straße 21

CERTIFICATE

DQS GmbH
Deutsche Gesellschaft zur Zertifizierung von Managementsystemen

hereby certifies that the company

Nexans Deutschland Industries GmbH & Co. KG
Business Unit Nürnberg

Sieboldstraße 10
90411 Nürnberg

for the scope

Design, development, production and sales of
special cables for energy-, control- and signaltransmission

has implemented and maintains a

Quality Management System.

An audit, conducted in accordance with the "Rules for certification bodies to ISO/TS 16949:2002 Second Edition" and documented in a report, has verified that this quality management system fulfills the requirements of the following ISO Technical Specification including ISO 9001:2000:

ISO/TS 16949:2002
Second Edition March 2002

(with product design)

Certification audit	2005-02-21 - 2005-02-24
Certification decision	2005-04-05
This certificate is valid until	2008-04-04
Certificate Registration No.	000848 TS2/4655
Issued in Frankfurt am Main, Germany	2005-04-05

Ass. iur. M. Drechsel

Dipl.-Ing. S. Heinloth

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(Tel. +49-69-95 42 70), Germany

2-IAO-QMC-01001

IQNet

THE INTERNATIONAL CERTIFICATION NETWORK

CERTIFICATE

IQNet and
DQS GmbH Deutsche Gesellschaft zur Zertifizierung von Managementsystemen
hereby certifies that the company

Nexans Deutschland Industries GmbH & Co. KG

Bonnenbroicher Str. 2-14
41238 Mönchengladbach
G ermany

for the scope

Design, development, production and sales of wires, strands, special cables, telecommunication and data communication cables, cabling systems and active components for data and information networks with logistics at Nexans Logistik GmbH

has implemented and maintains a

Quality and Environmental Management System.

An audit, documented in a report, has verified that this management system fulfills the requirements of the following standards:

ISO 9001 : 2000 and ISO 14001 : 2004

This certificate is valid until 2008-06-29

Frankfurt am Main 2005-06-30

Registration Number: DE-222811 QM/UM

IQNet

Dr. Fabio Roversi
President of IQNet

Ass. iur. M. Drechsel
S. Heinloth
Managing Directors of DQS GmbH

DQS

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* The list of IQNet partners is valid at the time of issue of this certificate. Updated information is available under www.iqnet-certification.com

Die Bahn DB

Lieferantenbeurteilung
Modul 1 - Qualitätsfähigkeit

Der Lieferant

Nexans Deutschland Industries GmbH & Co. KG
Bonnenbroicher Straße 2-14
D-41238 Mönchengladbach

erhält unter Berücksichtigung folgender Produkte

Nachrichten- / Signalkabel, Bahnleitungen für den Einsatz in Schienenfahrzeugen, Bahnspeiseleitungen und Komponenten

die Bescheinigung, dass er die Anforderungen der Deutschen Bahn AG an einen

Q 1-Lieferanten

erfüllt hat.

Der Nachweis wurde durch eine Beurteilung der fertigungstechnischen und qualitativen Leistungsfähigkeit durch unsere Auditoren in Ihrem Unternehmen am

18.03.2005

erbracht.
Diese Bescheinigung ist gültig bis

März 2006

Deutsche Bahn AG
Technik
Qualitätssicherung Beschaffung
System Fahrweg

Berlin, den 29.03.2005

Leiter

Global expert in cables and cabling systems

Nexans Deutschland Industries GmbH & Co. KG
Business Group Industry
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Sieboldstraße 10 - 90411 Nürnberg - Germany - Telephone +49 911 52 07-239 - Telefax +49 911 52 07-248
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