

Symbols

Temperature

Admissible ambient temperature for continuous duty operation



Weather

Resistance to severe weather conditions



Impacts

Cable mechanical resistance to impacts



Chemical attacks

Resistance to chemicals



Fire Performances



Smoke-Corrosivity-Toxicity

Smoke density, corrosivity and toxicity



Flexibility



Halogen free



Lead free



Water-tightness



Electro Magnetic Interference



Handling cables

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RHEYCORD® NSHTOEJ	0.6/1 (1.2) kV	2
RHEYCORD®(RTS) (N)SHTOEJ	0.6/1 (1.2) kV	3
RHEYCORD®-PUR R	300/500 V - 0.6/1 (1.2) kV	4
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BUFLEX® SEM	3.6/6 (7.2) up to 12/20 (24) kV	6
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3. CABLE CHARACTERISTICS

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Introduction

I About Nexans

Nexans is the worldwide leader in the cable industry with an industrial presence in 29 countries and commercial activities in 65 countries, Nexans employs 20,000 people. We manufacture a complete range of reliable, high performance cables and components for various applications and requirements.



Production Plants

Moenchengladbach Production Plant (Germany)



Nexans Deutschland Industries
Bonnenbroicher Straße 2 - 14
41238 Moenchengladbach
Germany
Phone: +49 2166 27 0
Fax: +49 2166 27 22 82

Lyon Production Plant (France)



Nexans France
170, avenue Jean Jaurès
69353 Lyon - Cedex 07
France
Phone: +33 472 72 24 24
Fax: +33 472 72 95 74

H07VVH6-F **PVC Flat Cables**



H07VVH6-F PVC Flat Cables

450/750 V

Applications

Power and control flat cables can be used on festoon systems on handling equipments e.g. overhead cranes. Specially designed for indoor and outdoor applications.

Design

1. Conductor

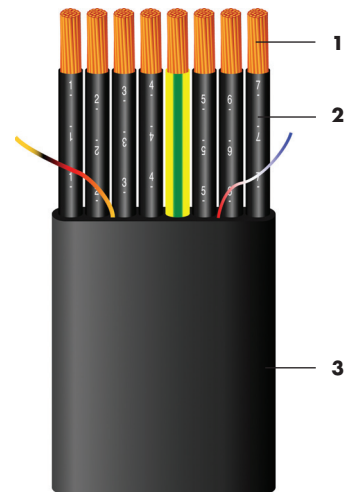
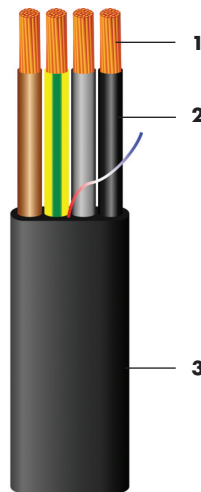
Flexible plain copper
class 5
IEC 60228

2. Insulation

PVC, threads are placed in each group of cores to strip the outer sheath.

3. Outer sheath

PVC
Colour: black



Marking

H07VVH6-F or 07VVH6-F
Number of cores - Cross-section
NEXANS year - week

Cores Identification

in accordance with HD 308 S2
4 cores:
black - grey - green/yellow - brown
5 cores:
black - grey - green/yellow - brown - blue
>5 cores:
black with white printed numbers
+ green/yellow

Standards

HD 359 S2
IEC 60227 part 6

H07VVH6-F

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	construction characteristics see page 3.1 E	
Tests	Bending test	
Travelling Festoon speed	up to 120 m/min	

Chemical properties

Oil, acid and alkaline resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	450/750 V
Maximum operating voltage in AC systems	U _m	750 V
Test voltage	2.5 kV - 50 Hz in AC	
Current rating (A)	see electrical characteristics page 3.2 B	
Max. temperature at the conductor :		
- in service	+ 70 °C	
- in short circuit	+ 150 °C	
Max. surface temperature :		
- fixed installation	- 35 °C up to + 60 °C	
- mobile operation	- 25 °C up to + 60 °C	



Flexible



Lead free compound



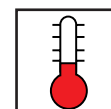
Good



Good



Oil resistant



-25 + 60 °C

H07VVH6-F

	Number of cores and nominal cross-section (mm ²)	Outer dimensions approx. (mm)	Weight approx. (kg/km)
POWER	4 G 4*	21 x 6.5	300
	4 G 6*	23 x 7	390
	4 G 10*	29 x 9	620
	4 G 16*	37 x 11	990
	4 G 25*	46 x 13.5	1,550
	4 G 35*	51 x 14.8	2,030
	4 G 50*	56 x 16.5	2,650
	4 G 70*	63 x 18	3,650
	4 G 95*	73 x 20.5	4,550
	5 G 4*	25 x 6.5	380
	5 G 6*	28 x 7	480
	5 G 10*	35 x 9	780
	5 G 16*	43 x 11	1,200
	7 G 4*	37 x 6.5	550
	7 G 6*	41 x 7	700
CONTROL	4 G 1.5*	15 x 5	150
	4 G 2.5*	18.5 x 6	210
	5 G 1.5*	18 x 5	180
	5 G 2.5*	22 x 6	260
	7 G 1.5*	26 x 5	260
	7 G 2.5*	32 x 6	380
	8 G 1.5*	29 x 5	300
	8 G 2.5*	35 x 6	405
	10 G 1.5*	35 x 5	360
	12 G 1.5*	40.5 x 5	420
	12 G 2.5*	50.5 x 6	620
	12 G 4	57 x 6.5	880
	14 G 1.5*	48 x 5	490
	16 G 1.5*	54 x 5	560
	18 G 1.5*	58 x 5	620

*Stocked products

Options

- Cables without earth core (green/yellow) on request
- Remark: <HAR> CENELEC types are only up to 16 mm²

VCVH6-F

Screened PVC Flat Cables



VCVH6-F

Screened PVC Flat Cables

Applications

Used for hoisting control systems in festoons on overhead cranes.
Copper screens are efficient against electro magnetic disturbances caused by power and control cables.

Control 300/500 V
Power 0.6/1 (1.2) kV

Design

1. Conductor

Flexible plain copper
class 5
IEC 60228

2. Insulation

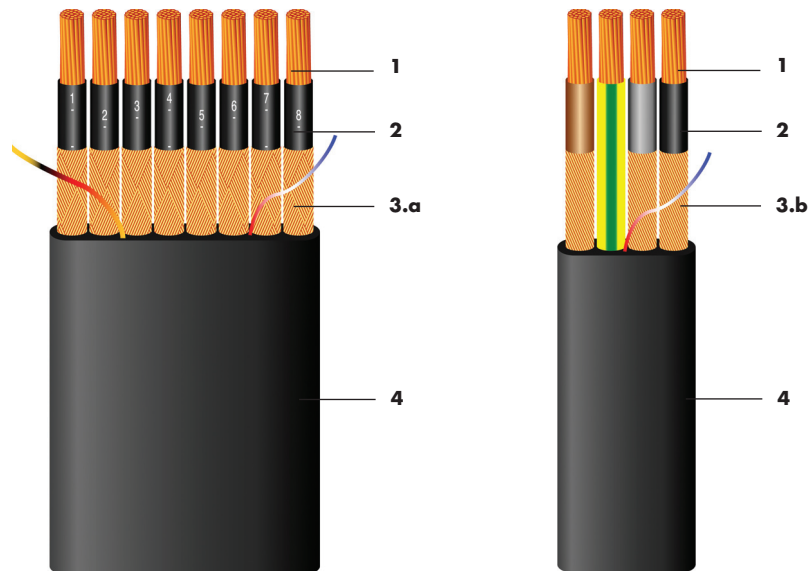
PVC

3. Screen

- a. Plain copper braid
- b. Plain copper spinning on phase cores.
Earth core is unscreened.

4. Outer-sheath

PVC
Colour: black



Marking

VCVH6-F
Number of cores - cross-section
voltage - NEXANS - year - week

Cores Identification

power:
black-grey-brown
earth conductor: green/yellow

control:
black with white printed
numbers

Standards

Nexans specification

VCVH6-F Screened PVC Flat Cables

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	see construction characteristics page 3.1 E	
Tests	Bending test	
Travelling Festoon speed	up to 120 m/min	

Chemical properties

Oil, acid and alkaline resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Control cables:		
Nominal voltage	U ₀ /U	300/500 V
Maximum operating voltage in AC systems	U _m	500 V
Capacitance between cores:		170 nF/km
Capacitance between core and screen:		350 nF/km
Power cables:		
Nominal voltage	U ₀ /U	0.6/1 kV
Maximum operating voltage in AC systems	U _m	1.2 kV
Test voltage:		
- Control	2.0 kV - 50 Hz in AC	
- Power	2.5 kV - 50 Hz in AC	
Current rating (A)	see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 70 °C	
- in short circuit	+ 150 °C	
Max. surface temperature:		
- fixed installation	- 35 °C up to + 60 °C	
- mobile operation	- 25 °C up to + 60 °C	



Flexible



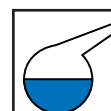
Good



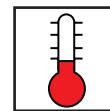
Lead free compound



Good



Good



-25 + 60 °C



Good

VCVH6-F Screened PVC Flat Cables

	Number of cores and nominal cross-section (mm ²)	Outer dimensions approx. (mm)	Weight approx. (kg/km)
CONTROL	4 x 1.5*	18 x 5.5	220
	8 x 1.5*	34 x 5.5	430
	12 x 1.5*	50 x 5.5	650
POWER	4 G 4*	23 x 7	360
	4 G 6*	29 x 9	580
	4 G 10*	37 x 11	900
	4 G 16*	46 x 14	1,280
	4 G 25*	50 x 14.5	1,800
	4 G 35*	55 x 16	2,300

*Stocked products

Options

- Other cross-sections on request

RHEYFLAT®-N NGFLGOEU-J **Rubber Flat Festoon Cables**



RHEYFLAT®-N NGFLGOEU-J

Rubber Flat Festoon Cables

Applications

300/500 V

Used for festoon and handling systems, machine tools, lifts and e-chain cable carrier systems.
For applications with high mechanical stress and frequent bending in one plane only.

Design

1. Conductor

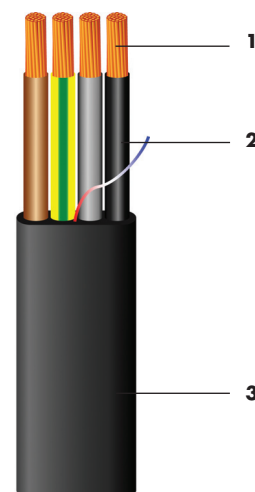
Flexible, plain copper,
 $\leq 25 \text{ mm}^2$: extra flexible stranded, class 6
 $\geq 35 \text{ mm}^2$: flexible stranded, class 5 according to IEC 60228/ DIN VDE 0295

2. Insulation

EPR rubber compound
3GI3 refer to
DIN VDE 0207 part 20

3. Outer sheath

PCP, rubber compound
5GM3 refer to
DIN VDE 0207 part 21
Colour: black



Marking

RHEYFLAT-N NGFLGOEU-J
Number of cores - Cross-section
300/500 V - NEXANS - year

Cores Identification

DIN VDE 0293 part 308/
HD 308 S2
4 cores:
green/yellow - brown -
black - grey
5 cores:
green/yellow - blue -
brown - black - grey
 ≥ 5 cores:
black with white printed
numbers - green/yellow

Standards

DIN VDE 0250 part 809

RHEYFLAT®-N NGFLGOEU-J

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298, see construction characteristics page 3.1 E	
Tests	Bending test	
Festoon speed	up to 180 m/min	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	300/500 V
Maximum operating voltage in AC systems	U _m	500 V
Maximum operating voltage in DC systems	V _m	750 V
Test voltage (according to DIN VDE 0250 part 809)	2.0 kV in AC	
Current rating (A)	according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 50 °C up to + 80 °C	
- mobile operation	- 35 °C up to + 80 °C	



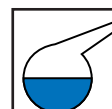
Flexible



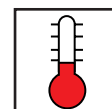
Good



Good



Oil resistant



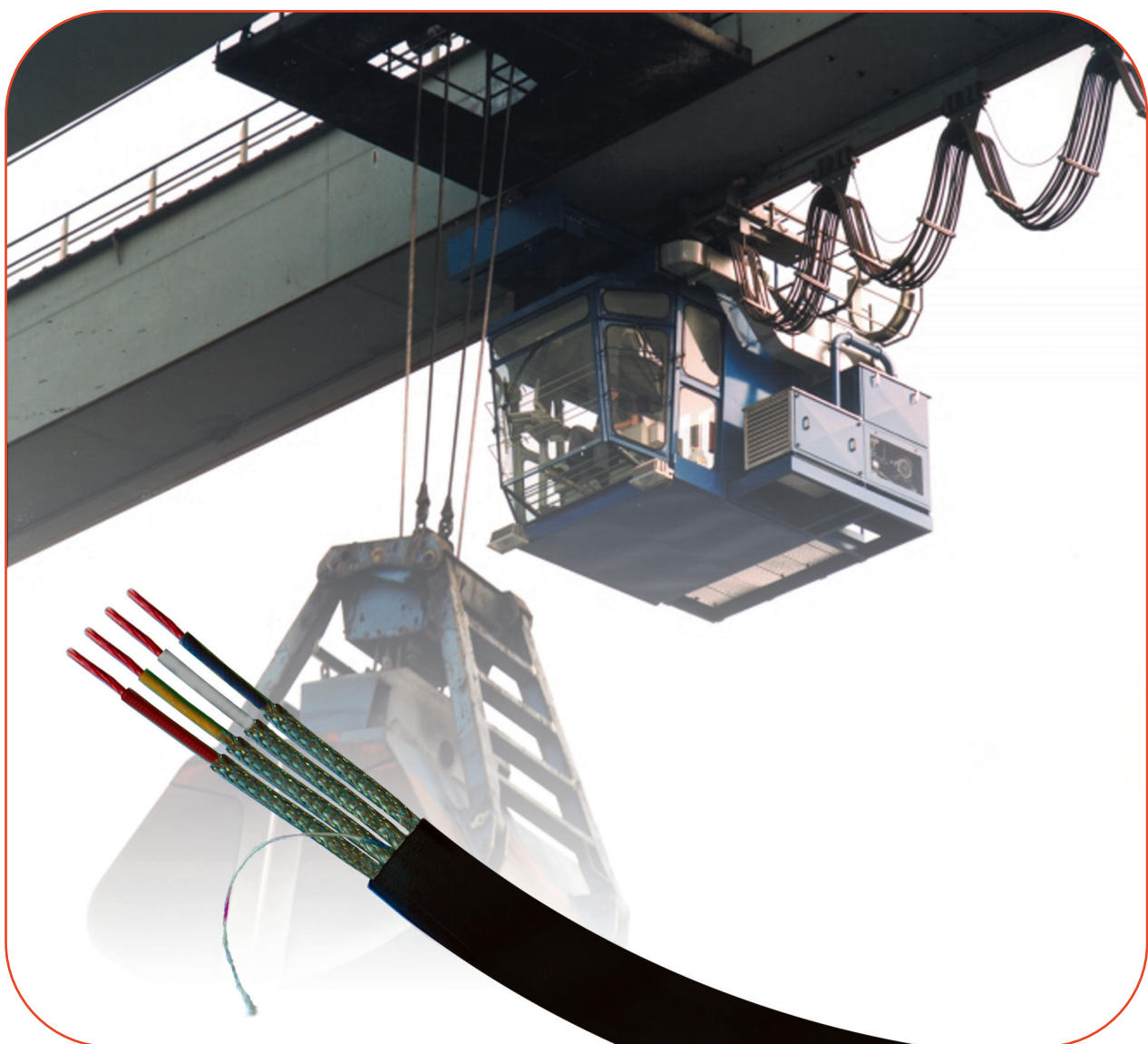
-35 + 80 °C

RHEYFLAT®-N NGFLGOEU-J

	Number of cores and nominal cross-section (mm²)	Outer dimensions approx. (mm)	Weight approx. (kg/km)
CONTROL	4 x 1.5*	6.2 x 17.5	200
	5 x 1.5*	6.2 x 21.5	240
	7 x 1.5 *	6.2 x 29.0	360
	8 x 1.5 *	6.2 x 31.5	370
	10 x 1.5*	6.5 x 40.0	520
	12 x 1.5*	6.5 x 47.0	620
	24 x 1.5*	12.5 x 55.0	1,300
	4 x 2.5*	7.5 x 21.0	280
	5 x 2.5*	7.5 x 27.0	400
	7 x 2.5*	7.5 x 35.0	520
	8 x 2.5*	7.5 x 39.0	550
	12 x 2.5*	8.0 x 56.0	800
	24 x 2.5*	16.0 x 68.0	1,850
POWER	4 x 4*	9.0 x 26.0	410
	5 x 4*	9.0 x 32.0	560
	7 x 4*	9.0 x 42.0	700
	4 x 6*	9.5 x 29.0	600
	5 x 6*	9.5 x 35.0	650
	7 x 6*	9.5 x 42.0	850
	4 x 10*	11.0 x 33.0	800
	5 x 10	11.0 x 44.0	1,000
	4 x 16*	13.0 x 38.0	1,150
	5 x 16*	13.0 x 50.0	1,450
	4 x 25*	15.0 x 49.5	1,700
	5 x 25*	16.0 x 60.0	2,200
	7 x 25	16.0 x 80.0	3,060
	4 x 35*	17.0 x 55.0	2,200
	7 x 35	17.0 x 88.0	3,900
	4 x 50*	19.0 x 63.0	3,000
	4 x 70*	22.0 x 71.0	4,000
	4 x 95*	25.0 x 80.0	5,300
	4 x 120*	27.0 x 86.0	6,400

*Stocked products
24 cores = 6 bunches of 4 cores

RHEYFLAT®-N (N)GFLCGOEU-J **Screened Rubber Flat Festoon Cables**



RHEYFLAT®-N (N)GFLCGOEU-J

Screened Rubber Flat Festoon Cables

Applications

300/500 V

Used for festoon and handling systems, machine tools, lifts and e-chain cable carrier systems. For applications with high mechanical stress and frequent bending in one plane only. Copper screens are efficient against electro magnetic disturbances caused by power cables.

Design

1. Conductor

Flexible, plain copper,
≤ 25 mm²: extra flexible
stranded, class 6
≥ 35 mm²: flexible stranded,
class 5
according to IEC 60228/
DIN VDE 0295

2. Insulation

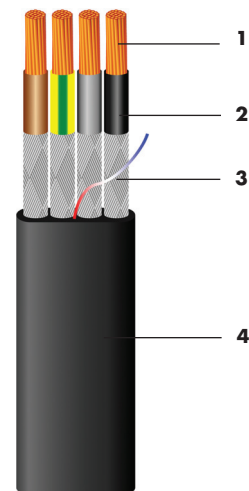
EPR, rubber compound
3GI3 refer to
DIN VDE 0207 part 20

3. Screen

Tinned copper braid,
coverage >80%

4. Outer sheath

PCP, rubber compound
5GM3 refer to
DIN VDE 0207 part 21
Colour: black



Marking

RHEYFLAT-N (N)GFLCGOEU-J
Number of cores - Cross-section
300/500 V - NEXANS - year

Cores Identification

DIN VDE 0293 part 308/
HD 308 S2
4 cores:
green/yellow - brown -
black - grey
5 cores:
green/yellow - blue -
brown - black - grey
≥ 5 cores:
black with white printed
numbers - green/yellow

Standards

In line with
DIN VDE 0250 part 809

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298, see construction characteristics page 3.1 E	
Tests	Bending test	
Festoon speed	up to 180 m/min	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	300/500 V
Maximum operating voltage in AC systems	U _m	500 V
Maximum operating voltage in DC systems	V _m	750 V
Test voltage (according to DIN VDE 0250 part 809)	2.0 kV in AC	
Current rating (A)	according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 50 °C up to + 80 °C	
- mobile operation	- 35 °C up to + 80 °C	



Flexible



Good



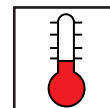
Good



Good



Oil resistant



-35 + 80 °C

RHEYFLAT®-N (N)GFLCGOEU-J

	Number of cores and nominal cross-section (mm ²)	Outer dimensions approx. (mm)	Weight approx. (kg/km)
CONTROL	4 x 1.5 C*	18.5 x 6.5	220
	8 x 1.5 C*	36 x 7.5	470
	12 x 1.5 C*	54.5 x 8.5	745
	4 x 2.5 C*	22.5 x 7.5	320
	12 x 2.5 C*	69.5 x 9.5	1,180
POWER	4 x 4 C*	29 x 10.5	505
	4 x 6 C*	31 x 10.5	605
	4 x 10 C*	36 x 11.5	840
	4 x 16 C*	41.5 x 13.5	1,180
	4 x 25 C	47 x 15	1,605
	4 x 35 C*	55 x 17	2,520
	4 x 50 C	66 x 20.5	3,000
BUS	4 x (2x1) C*	37 x 12.5	640

* Stocked products

Options

- Special cold resistant compound
- With integrated optical fiber element
- Further options upon request

LSHF **Halogen Free Flat Cables**



LSHF

Halogen Free Flat Cables

Applications

0.6/1 (1.2) kV

Power and control flat cables are used on festoon systems on handling equipments. Special design where halogen free and low smoke material are required.
(e.g. nuclear plants)

Design

1. Conductor

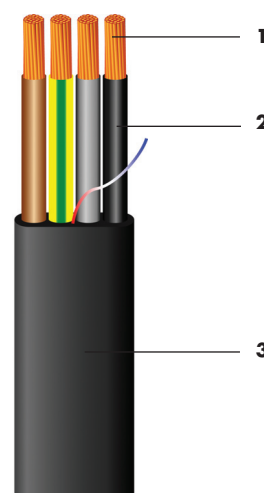
Flexible plain copper
class 5
IEC 60228

3. Outer sheath

Polyolefin
Halogen Free Compound
Colour: black

2. Insulation

Halogen Free Compound



Marking

LSHF
Number of cores - cross-section
0.6/1 kV - NEXANS
year - week

Cores Identification

In accordance with HD 308 S2
4 cores:
black - grey - green/yellow - brown
5 cores:
black - grey - green/yellow - brown - blue
> 5 cores:
black with white printed numbers - green/yellow

Standards

Nexans specification

LSHF Halogen Free Flat Cables

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	see construction characteristics page 3.1 E	
Tests	Bending test	
Travelling Festoon speed	up to 120 m/min	

Chemical properties

For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame and fire-retardant.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	0.6/1 kV
Maximum operating voltage in AC systems	U _m	1.2 kV
Test voltage	3.5 kV - 50 Hz in AC	
Current rating (A)	see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- in short circuit	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 40 °C up to + 60 °C	
- mobile operation	- 25 °C up to + 60 °C	



Flame and Fire Retardant



Flexible



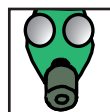
Good



Halogen free compound



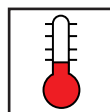
Low smoke
IEC 61034



Low toxicity
IEC 60754



Low corrosivity
IEC 60754



-25 + 60 °C

LSHF Halogen Free Flat Cables

	Number of cores and nominal cross-section (mm ²)	Outer dimensions approx. (mm)	Weight approx. (kg/km)
POWER	4 G 1.5*	16 x 5	110
	4 G 2.5*	19 x 5.7	170
	4 G 4	21 x 6.5	250
	4 G 6	23.5 x 7	330
	4 G 10 *	29 x 9	550
	4 G 16	35 x 10.4	800
	4 G 25	45.5 x 13.5	1,350
	4 G 35	50.5 x 14.8	1,800
	4 G 50	56 x 16.5	2,400
	4 G 70	63 x 18	3,250
CONTROL	8 G 1.5 *	29 x 5	220
	8 G 2.5 *	35 x 5	330
	12 G 1.5*	41 x 5	320
	12 G 2.5	51 x 5.7	490

*Stocked products

RHEYFESTOON® (N)3GRD5G Flexible Round Festoon Cables



RHEYFESTOON® (N)3GRD5G

Flexible Round Festoon Cables

Applications

0.6/1 (1.2) kV

Heavy duty rubber cable for control and power supplies. For festoon applications with mechanical tensile stress compared with dynamic stress.

Design

1. Conductor

Flexible, plain copper, "FSC", better than IEC 60228 class 5

2. Insulation

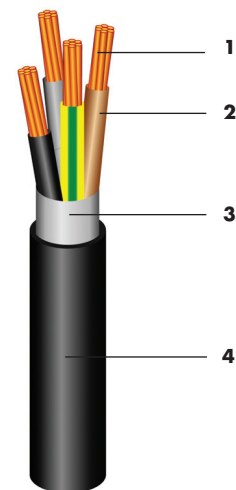
RHEYCLEAN-HEPR better than IEC 60502-1

3. Inner sheath

Special synthetic rubber, better than EM6 according to prEN 50363

4. Outer sheath

PCP, compound EM7 according to prEN 50363
Colour: black



Marking

RHEYFESTOON (N)3GRD5G
Number of cores - cross-section
0.6/1 kV - NEXANS - year
VDE Reg.No. 7891

Cores Identification

DIN VDE 0293 part 308/
HD 308 S2
4 cores:
green/yellow - brown - black - grey
5 cores:
green/yellow - blue - brown - black - grey
≥ 5 cores:
black with white printed numbers - green/yellow (in the outer layer)
6 cores design:
brown - black - grey - 3 green/yellow (in the interstices)

Standards

In line with DIN VDE 0250 part 812.
VDE Reg.No. 7891

RHEYFESTOON® (N)3GRD5G

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298,	
Tests	see construction characteristics page 3.1 E	
Festoon speed	alternating/reversed bending test, roller bending test,	
	torsional resistance test	
	up to 240 m/min, higher speed upon request	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	0.6/ 1 kV
Maximum operating voltage in AC systems	U _m	1.2 kV
Maximum operating voltage in DC systems	V _m	1.8 kV
Test voltage (according to DIN VDE 0250 part 809):		
- Power	3.0 kV in AC	
- Control	2.0 kV in AC	
Current rating (A)	according to DIN VDE 0298 part 4,	
	see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 50 °C up to + 80 °C	
- mobile operation	- 35 °C up to + 80 °C	



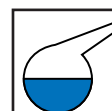
Flexible



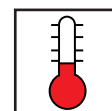
Excellent



Good



Oil resistant



-35 + 80 °C

RHEYFESTOON® (N)3GRD5G

	Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)	Max. tensile load (N)
		Min. (mm)	Max. (mm)		
POWER	1 x 35*	12	14	400	525
	1 x 50*	15	17	600	750
	1 x 70*	16	18	800	1,050
	1 x 95*	18	20	1,000	1,425
	1 x 120*	20	22	1,300	1,800
	1 x 150	23	25	1,700	2,250
	1 x 185	25	27	2,000	2,775
	4 x 4*	14	16	350	240
	4 x 6*	16	18	500	360
	4 x 10*	19	21	700	600
	4 x 16*	22	25	1,100	960
	4 x 25*	26	29	1,600	1,500
	4 x 35*	29	32	2,100	2,100
	4 x 50*	35	38	3,000	3,000
	3 x 35 + 3 x 16/3	27	30	1,750	1,575
	3 x 50 + 3 x 25/3	31	33	2,500	2,250
	3 x 70 + 3 x 35/3	36	39	3,600	3,150
	3 x 95 + 3 x 50/3	41	44	4,500	4,275
	5 x 4*	16	19	500	300
	5 x 6*	17	20	600	450
	5 x 10*	20	23	900	750
	5 x 16*	24	27	1,350	1,200
	5 x 25*	29	33	2,000	1,900
CONTROL	12 x 1.5	15	17	450	270
	18 x 1.5	17	19	650	405
	24 x 1.5*	21	23	850	540
	30 x 1.5	22	24	950	675
	36 x 1.5	23	26	1,100	810
	12 x 2.5*	17	20	600	450
	18 x 2.5*	20	23	900	650
	24 x 2.5*	23	26	1,150	900
	30 x 2.5*	26	29	1,350	1,125
	36 x 2.5	28	31	1,600	1,350
BUS	6 x (2 x 0.5) C*	20	22	780	180
	6 x (2 x 1) C*	24	27	810	180
	9 x (2 x 0.5) C*	26	29	990	270
	9 x (2 x 1) C*	33	36	1,080	270
	12 x 1 (C)	16	18	590	180

* Stocked products

Options

- Further numbers of cores and cross-section upon request

RHEYFESTOON®(C) (N)3GRDGC5G

Flexible Screened Round Festoon Cables



RHEYFESTOON®(C) (N)3GRDGC5G

Flexible Screened Round Festoon Cables

Applications

0.6/1 (1.2) kV

Heavy duty rubber cable for power supply. For festoon applications with mechanical tensile stress compared with dynamic stress.
Especially developed to prevent electrical and electromagnetic disturbances and to protect parallel laying control cables against interferences.

Design

1. Conductor

Flexible, plain copper, "FSC"
better than IEC 60228
class 5

2. Insulation

RHEYCLEAN-HEPR
better than IEC 60502-1

3. Inner sheath

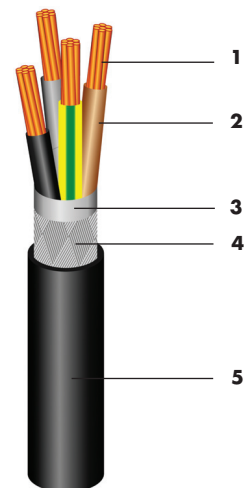
Special synthetic rubber,
better than EM6, according
to prEN 50363

4. EMC - Screen

Composite screen of tinned
copper wires and synthetic
threads.
Coverage >80%

5. Outer sheath

PCP, compound EM7
according to prEN 50363
Colour: black



Marking

RHEYFESTOON(C)
(N)3GRDGC5G-J
Number of cores - cross-section
0.6/1 kV - NEXANS - year
VDE Reg.No. 7891

Cores Identification

DIN VDE 0293 part 308/
HD 308 S2
6 cores design:
- three phase cores:
brown - black - grey
- three protection cores:
green/yellow in the interstices

Standards

In line with DIN VDE 0250
part 812.
VDE Reg.No. 7891

RHEYFESTOON®(C) (N)3GRDGC5G

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298, see construction characteristics page 3.1 E	
Tests	Bending test	
Festoon speed	up to 240 m/min (higher speed upon request)	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	0.6/ 1 kV
Maximum operating voltage in AC systems	U _m	1.2 kV
Maximum operating voltage in DC systems	V _m	1.8 kV
Test voltage (according to DIN VDE 0250 part 809): - Power - Control Current rating (A)	3.0 kV in AC 2.0 kV in AC according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor: - in service - under short-circuit conditions Max. surface temperature: - fixed installation - mobile operation	+ 90 °C + 250 °C - 50 °C up to + 80 °C - 35 °C up to + 80 °C	



Flexible



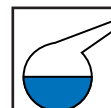
Excellent



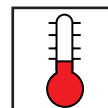
Good



Good



Oil resistant



-35 + 80 °C

RHEYFESTOON®(C) (N)3GRDGC5G

Number of cores and nominal cross-section (mm ²)	Outer diameter		Weight approx. (kg/km)	Max. tensile load. (N)
	Min. (mm)	Max. (mm)		
3x4 + 3x4/3*	18	20	600	240
3x6 + 3x6/3	19	21	780	360
3x10 + 3x10/3	20	22	1,050	600
3x16 + 3x16/3	22	25	1,200	960
3x25 + 3x16/3	26	29	1,600	1,500
3x35 + 3x16/3*	29	32	2,000	2,100
3x50 + 3x25/3*	33	36	2,500	3,000

*Stocked products

Options

- Further numbers of cores and cross-section upon request

RHEYCORD®-OFE M Flexible Cables with Optical Fiber Elements (OFE)



RHEYCORD®-OFE M

Flexible Cables with Optical Fiber Elements (OFE)

Applications

For data transmission without electromagnetic smog.
Used in festoon and e-chain systems on cranes and other material handling equipments.

Design

1. Optical Fibers

Fiber diameter:
9/125 µm
50/125 µm
62.5/125 µm
Fibers layed in a jelly filled high performance thermoplastic tube.

2. Strain Relief

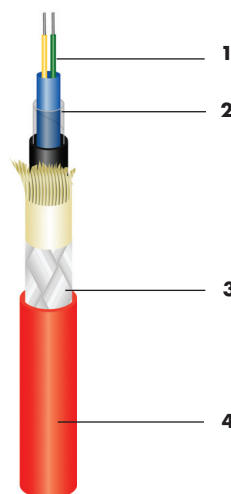
High-end synthetic rovings

3. Reinforcement

Braid, synthetic threads with very high tensile strength

4. Outer sheath

PCP, rubber compound
5GM5 refer to
DIN VDE 0207 part 21
Colour: orange



Marking

RHEYCORD-OFE M
Number of fibers - Diameter
NEXANS - year

Fibers Identification

DIN VDE 0888

Standards

In line with
DIN VDE 0168

RHEYCORD®-OFE M

Cable Characteristics

Mechanical properties

Torsional stress	$\leq 120 \text{ }^{\circ}/\text{m}$
Bending radii	see construction characteristics page 3.1 E
Tests	alternating/reversed bending test, roller bending test, torsional resistance test
Travelling speed (festoon, e-chain)	up to 240 m/min (for higher speed contact us)

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Optical and Thermal properties

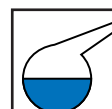
Max. surface temperature:	
- fixed installation	- 40 °C up to + 80 °C
- mobile operation	- 30 °C up to + 60 °C
Optical properties	see general characteristics page 3.3 B



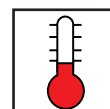
Flexible



Good



Oil resistant



-30 + 60 °C

RHEYCORD®-OFE M

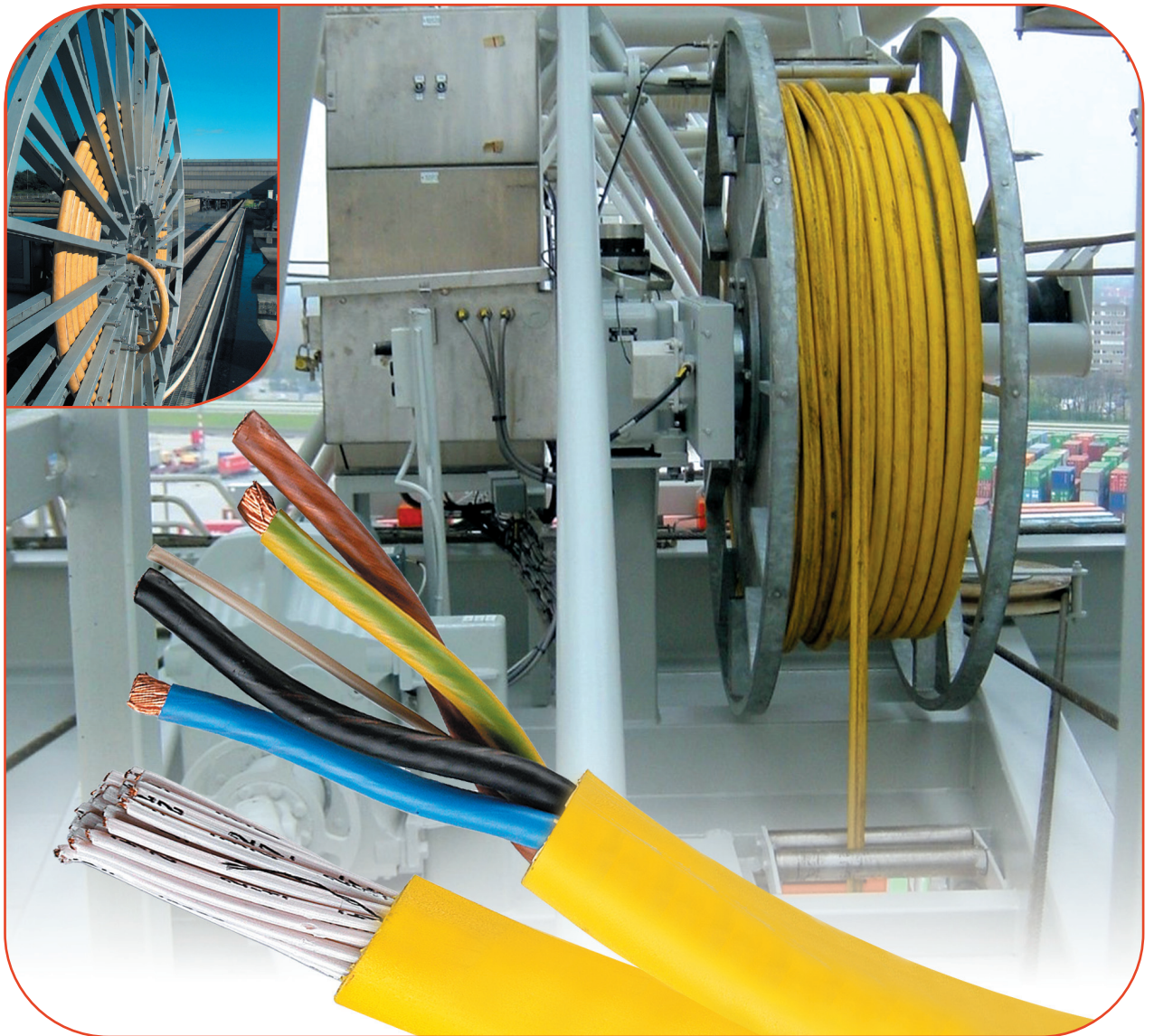
	Types	Outer diameter		Weight approx. (kg/km)	Max. tensile load. (N)
		Min. (mm)	Max. (mm)		
MULTI-MODE/ GRADED INDEX	6 G 50/ 125	9	11	100	800
	12 G 50 / 125*				
	18 G 50/ 125				
	24 G 50 / 125				
	6 G 62.5 / 125				
	12 G 62.5 / 125*				
	18 G 62.5 / 125				
	24 G 62.5 / 125				
MONO-MODE/ SINGLE MODE	6 E 9 / 125	9	11	100	800
	12 E 9 / 125*				
	18 E 9 / 125				
	24 E 9 / 125				

* Stocked products

Options

- Pre-assembled with plugs

BUFLEX® DGR Control and Power Reeling Cables



BUFLEX® DGR

Control and Power Reeling Cables

Applications

0.6/1 (1.2) kV

Cables with reinforced polyurethan sheath, especially designed for reeling applications.

Due to high mechanical properties of PUR, Buflex cables could be used in hard conditions as quarries, mines ...

Design

1. Conductor

Flexible plain copper, class 5
IEC 60228

2. Insulation

XLPE

3. Filler + Inner Sheath

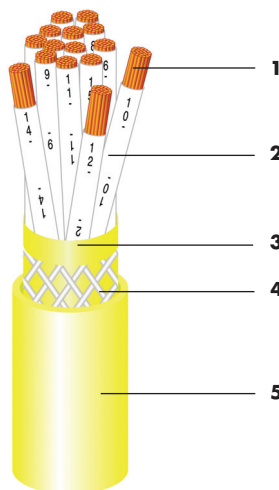
4. Reinforcement

Anti twist element

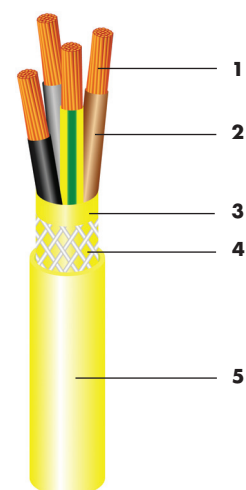
5. Outer sheath

PUR

Colour: yellow



Control



Power

Marking

BUFLEX DGR - 0.6/1 kV

Number of cores - cross-section

NEXANS - year - week

Cores Identification

Control:

white with printed numbers

Power:

4 cores:

black - brown - grey -
green/yellow (3 earth cores
for sizes $\geq 25 \text{ mm}^2$)

5 cores:

black - brown - grey - blue -
green/yellow

Standards

Nexans specification

BUFLEX® DGR **Cable Characteristics**

Mechanical properties

Max. tensile load	20 N/mm ² of copper cross section
Bending radii	see construction characteristics page 3.1 E
Tests	Bending test, torsional test
Reeling speed	up to 120 m/min (for higher speed contact us)

Chemical properties

Oil resistant.
 For outdoor applications. Moisture, UV and ozone resistance.
 Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

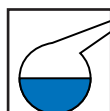
Nominal voltage	U ₀ /U	0.6/1 kV
Maximum operating voltage in AC systems	U _m	1.2 kV
Test voltage (according to DIN VDE 0250 part 809):		
- Power	3.5 kV in AC	
- Control	2.5 kV in AC	
Current rating (A)	see electrical characteristics page 3.2 B	
Max. temperature at the conductor :		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature :		
- fixed installation	- 40 °C up to + 80 °C	
- mobile operation	- 30 °C up to + 80 °C	



Good



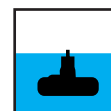
Excellent



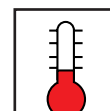
Oil resistant



Flexible



Good



-30 +80°C

	Number of cores and nominal cross-section (mm ²)	Outer diameter		Weight approx. (kg/km)	Max. tensile load (N)
		Min. (mm)	Max. (mm)		
POWER	4 G 2.5*	10	11.5	180	200
	4 G 4*	11.5	13	260	320
	4 G 6*	13	14.5	370	480
	4 G 10*	15.5	17	580	800
	4 G 16*	19.5	21.5	920	1,280
	3 x 25 + 3 G 6*	23.5	25.5	1,240	1,800
	3 x 35 + 3 G 6*	27	29.5	1,640	2,400
	3 x 50 + 3 G 10*	30	32.5	2,240	3,600
	3 x 70 + 3 G 16*	35	37.5	3,100	5,100
	3 x 95 + 3 G 16*	39	42	3,890	6,600
	3 x 120 + 3 G 25*	44	47	5,080	8,700
	3 x 150 + 3 G 25*	49	52.5	6,160	10,500
	3 x 185 + 3 G 35	54.5	58.5	7,680	13,200
	3 x 240 + 3 G 50	60.5	64.5	9,870	17,400
	3 x 300 + 3 G 50	68.5	72.5	12,300	21,000
	5 G 2.5	11	12.5	220	250
	5 G 4	13	14.5	320	400
	5 G 6*	15	16.5	450	600
	5 G 10	18	20	700	1,000
	5 G 16*	22	24	1,100	1,600
	5 G 25	27	29.5	1,550	2,500
	5 G 35	31	33.5	2,050	3,500
CONTROL	7 x 1.5	11.5	13	210	210
	12 x 1.5	16	17.5	330	360
	18 x 1.5	16	17.5	410	540
	24 x 1.5	19	21.5	680	720
	36 x 1.5	22	24	900	1,080
	7 x 2.5	12.5	14	30	350
	12 x 2.5*	18.5	20.5	610	600
	18 x 2.5*	18.5	20.5	740	900
	24 x 2.5	22.5	24.5	1,050	1,200
	36 x 2.5*	25	28	1,430	1,800
	42 x 2.5	27	29.5	1,500	2,100
	26 x 2.5 + (4 x 2.5)C*	24.5	27	1,260	1,500

*Stocked products

RHEYCORD® NSHTOEU-J Reeling Cables



RHEYCORD® NSHTOEU-J

Reeling Cables

Applications

0.6/1 (1.2) kV

Rubber reeling cable for control and power supplies.

For applications with high mechanical stress, especially for simultaneous tensile and torsional stress.

Suitable for motor-driven reels, spring-operated reels and hoisting systems.

Design

1. Conductor

Flexible, tinned copper, "FSC" better than IEC 60228 class 5

2. Insulation

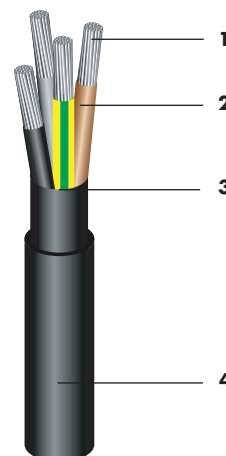
EPR, rubber compound 3GI3 refer to DIN VDE 0207 part 20

3. Inner sheath

PCP, rubber compound 5GM3 refer to DIN VDE 0207 part 21

4. Outer sheath

PCP, rubber compound 5GM3 refer to DIN VDE 0207 part 21, low abrasion and notch resistant, with anti-torsion braid integrated in the sheath
Colour: black



Marking

RHEYCORD NSHTOEU-J
Number of cores - cross-section
0.6/1 kV - NEXANS <VDE>
year

Cores Identification

DIN VDE 0293 part 308/
HD 308 S2
4 cores:
green/yellow - brown -
black - grey
5 cores:
green/yellow - blue - brown -
black - grey
≥ 5 cores:
black with white printed numbers -
green/yellow (in the outer layer)

Standards

DIN VDE 0250 part 814

RHEYCORD® NSHTOEU-J

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298,	
Tests	see construction characteristics page 3.1 E	
Reeling speed	alternating/reversed and roller bending test,	
	torsional resistance test	
	up to 120 m/min	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	0.6/1 kV
Maximum operating voltage in AC systems	U _m	1.2 kV
Maximum operating voltage in DC systems	V _m	1.8 kV
Test voltage (according to DIN VDE 0250 part 809):		
- Power	2.5 kV in AC	
- Control	2.0 kV in AC	
Current rating (A)	according to DIN VDE 0298 part 4,	
	see electrical characteristics page 3.2 B	
Max. temperature at the conductor :		
- in service	+ 90 °C	
- under short-circuit conditions	+ 200 °C	
Max. surface temperature :		
- fixed installation	- 45 °C up to + 80 °C	
- mobile operation	- 35 °C up to + 80 °C	



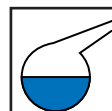
Flexible



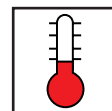
Good



Good



Oil resistant



-35 + 80 °C

	Number of cores and nominal cross-section (mm ²)	Outer diameter		Weight approx. (kg/km)
		Max. (mm)	Min. (mm)	
CONTROL	3 x 1.5*	12	14	210
	4 x 1.5*	13	15	250
	5 x 1.5 *	14	16	285
	7 x 1.5 *	18	20	405
	12 x 1.5*	20	22	570
	18 x 1.5*	24	26	790
	24 x 1.5*	27	29	1,000
	30 x 1.5*	30	32	1,215
	42 x 1.5*	36	39	1,700
	4 x 2.5*	15	17	320
	5 x 2.5*	17	19	430
	7 x 2.5*	20	22	525
	12 x 2.5*	23	25	750
	18 x 2.5	27	29	1,060
	24 x 2.5*	32	34	1,455
	30 x 2.5	33	35	1,575
	50 x 2.5*	45	47	2,855
POWER	4 x 4*	18	20	465
	4 x 6*	20	22	585
	4 x 10*	24	26	900
	4 x 16*	27	29	1,235
	4 x 25*	33	35	1,830
	4 x 35*	36	38	2,360
	4 x 50*	42	44	3,210
	4 x 70*	47	49	4,345
	4 x 95*	54	56	5,565
	4 x 120*	61	63	6,895
	5 x 4*	19	21	550
	5 x 6*	22	24	730
BUS	6 x (2 x 1.5) C*	28	31	980
COMPOSITE	19 x 2.5 + 5 x 1.5 (CE)*	31	33	1,450
	25 x 2.5 + 5 x 1.5 (CE)*	35	37	1,850

*Stocked products
(CE): individual screen

Options

- Further numbers of cores and cross-section upon request
- Integrated BUS system cable
- Integrated Optical Fiber Elements
- Special cold resistant compound

RHEYCORD®(RTS) (N)SHTOEU-J Extra Heavy Duty Reeling Cables



RHEYCORD®(RTS) (N)SHTOEU-J

Extra Heavy Duty Reeling Cables

Applications

0.6/1 (1.2) kV

Extra heavy duty rubber reeling cable for control and power supplies. For applications with high mechanical stress, especially for simultaneous tensile and torsional stress. Suitable for motor-driven reels, spring-operated reels, drum spreader and hoisting systems.

Design

1. Conductor

Flexible, plain copper, "FSC" better than IEC 60228 class 5

2. Insulation

RHEYCLEAN-HEPR better than IEC 60502-1

3. Inner sheath

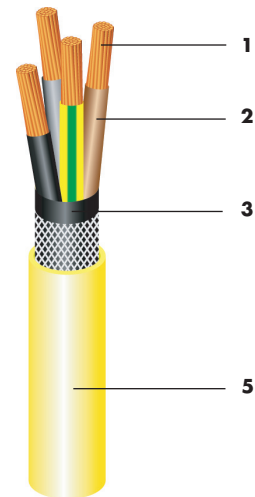
Special synthetic rubber, based on PCP

4. Central strength member

(only for spreader cable)

5. Outer sheath

PCP, new special sandwich construction with incorporated anti-torsion braid for a optimum of flexibility and heavy duty. Abrasion and notch resistant. Colour: yellow



Marking

RHEYCORD(RTS) (N)SHTOEU-J
Number of cores - cross-section
0.6/1 kV - NEXANS - year

Cores Identification

DIN VDE 0293 part 308/
HD 308 S2
4 cores:
green/yellow - brown -
black - grey
5 cores:
green/yellow - blue - brown -
black - grey
≥ 5 cores:
black with white printed numbers -
green/yellow (in the outer layer)
6 cores design:
brown - black - grey -
3 green/yellow (in the interstices)

Standards

In line with DIN VDE 0250
part 814

RHEYCORD®(RTS) (N)SHTOEU-J

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298,	
Tests	see construction characteristics page 3.1 E	
	alternating/reversed and roller bending test,	
	torsional resistance test	
Reeling speed	up to 240 m/min (for higher speed contact us)	
Hoisting speed	up to 160 m/min (for higher speed contact us)	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	0.6/1 kV
Maximum operating voltage in AC systems	U _m	1.2 kV
Maximum operating voltage in DC systems	V _m	1.8 kV
Test voltage (according to DIN VDE 0250 part 809):		
- Power	3.0 kV in AC	
- Control	2.0 kV in AC	
Current rating (A)	according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 50 °C up to + 80 °C	
- mobile operation	- 40 °C up to + 80 °C	



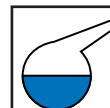
Extra flexible



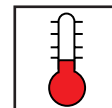
Good



Good



Oil resistant



-40 + 80 °C

	Number of cores and nominal cross-section (mm ²)	Outer diameter		Weight approx. (kg/km)	Tensile load (N)
		Min. (mm)	Max. (mm)		
CONTROL	4 x 1.5	11	13	200	180
	5 x 1.5*	13	15	260	225
	7 x 1.5*	15	17	330	315
	12 x 1.5*	18	21	475	540
	18 x 1.5*	21	24	640	810
	24 x 1.5*	24	26	875	1,080
	30 x 1.5	26	29	940	1,350
	36 x 1.5	29	32	1,200	1,620
	44 x 1.5	32	35	1,500	1,980
	56 x 1.5	37	40	2,000	2,520
	4 x 2.5*	13	16	270	300
	5 x 2.5*	15	17	330	375
	7 x 2.5*	17	20	450	525
	12 x 2.5*	20	23	620	900
	18 x 2.5*	24	27	895	1,350
	24 x 2.5*	26	28	1,135	1,800
	30 x 2.5*	28	31	1,550	2,250
	36 x 2.5*	31	33	1,525	2,700
	44 x 2.5*	34	36	1,865	3,300
	56 x 2.5	38	41	2,250	4,200
POWER	4 x 4*	15	17	355	480
	4 x 6*	17	19	505	720
	4 x 10*	20	22	735	1,200
	4 x 16*	24	26	1,060	1,920
	4 x 25*	29	31	1,600	3,000
	5 x 4*	17	19	490	600
	5 x 6*	19	21	625	900
	5 x 10*	22	24	950	1,500
	5 x 16*	25	28	1,315	2,400
	3 x 35 + 3 x 25/3*	29	32	1,780	3,150
	3 x 50 + 3 x 25/3*	33	36	2,450	4,500
	3 x 70 + 3 x 35/3*	39	41	3,445	6,300
	3 x 95 + 3 x 50/3	44	46	4,800	8,550
	3 x 120 + 3 x 70/3	50	54	5,800	10,800
	3 x 150 + 3 x 70/3	53	56	6,700	13,500
	3 x 185 + 3 x 95/3	58	61	8,100	16,650
	3 x 240 + 3 x 120/3	67	69	10,570	21,600
COMPOSITE	19 x 2.5 + 5 x 1 CE*	25	28	1,090	1,575
	25 x 2.5 + 5 x 1 CE*	28	31	1,315	2,025
BUS	6 x (2 x 0.5) C	22	24	790	360
	6 x (2 x 1) C*	26	28	850	360
DRUM SPREADER	46 x 1	25	29	960	3,200
	24 x 2.5*	26	28	1,135	3,800
	30 x 2.5	28	31	1,550	4,700
	36 x 2.5*	31	33	1,520	5,700
	44 x 2.5*	34	36	1,865	6,900
	56 x 2.5*	38	41	2,250	8,800

*Stocked products CE: individual screen

Options

- Further numbers of cores and cross-section upon request
- Integrated BUS system cable
- Integrated Optical Fiber Elements
- Special cold resistant compound



RHEYCORD®-PUR R

Reeling Cables with PUR Outer Sheath

Applications

Halogen and silicone free PUR reeling cable for control and power supplies.
Used e.g. in spring operated reels, drag chains and other drum applications.

300/500 V
0.6/1 (1.2) kV

Design

1. Conductor

Flexible, plain copper, "FSC" better than IEC 60228 class 5

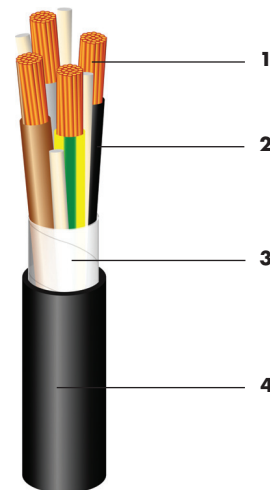
2. Insulation

Special TPE-E, thermoplastic polyester elastomer

3. Anti-torsion braid

4. Outer sheath

PUR
refer to HD 22.10.
Heavy duty abrasion and notch-resistant
Colour: black



Marking

RHEYCORD PUR-R
Number of cores - cross-section
Voltage - NEXANS - year

Core Identification

DIN VDE 0298 part 308/
HD 308 S2
4 cores:
green/yellow - brown -
black - grey
5 cores:
green/yellow - blue - brown -
black - grey
>5 cores:
black with white printed numbers -
green/yellow (in the outer layer)

Standards

Nexans specification

RHEYCORD®-PUR R

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298,	
Tests	see construction characteristics page 3.1 E	
Speed limits	alternating/reversed and roller bending test, drag e-chain test, torsional resistance test up to 180 m/min	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Silicone and halogen free.

Electrical and Thermal properties

Nominal voltage:		
- cross section $\leq 1 \text{ mm}^2$	U ₀ /U	300/500 V
- cross section $\geq 1.5 \text{ mm}^2$	U ₀ /U	0.6/1 kV
Test voltage:		
- Power	3.0 kV in AC	
- Control	2.0 kV in AC	
Current rating (A)	see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 50 °C up to + 80 °C	
- mobile operation	- 40 °C up to + 80 °C	



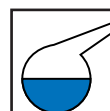
Extra flexible



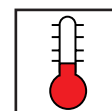
Good



Good



Oil resistant



-40 + 80 °C

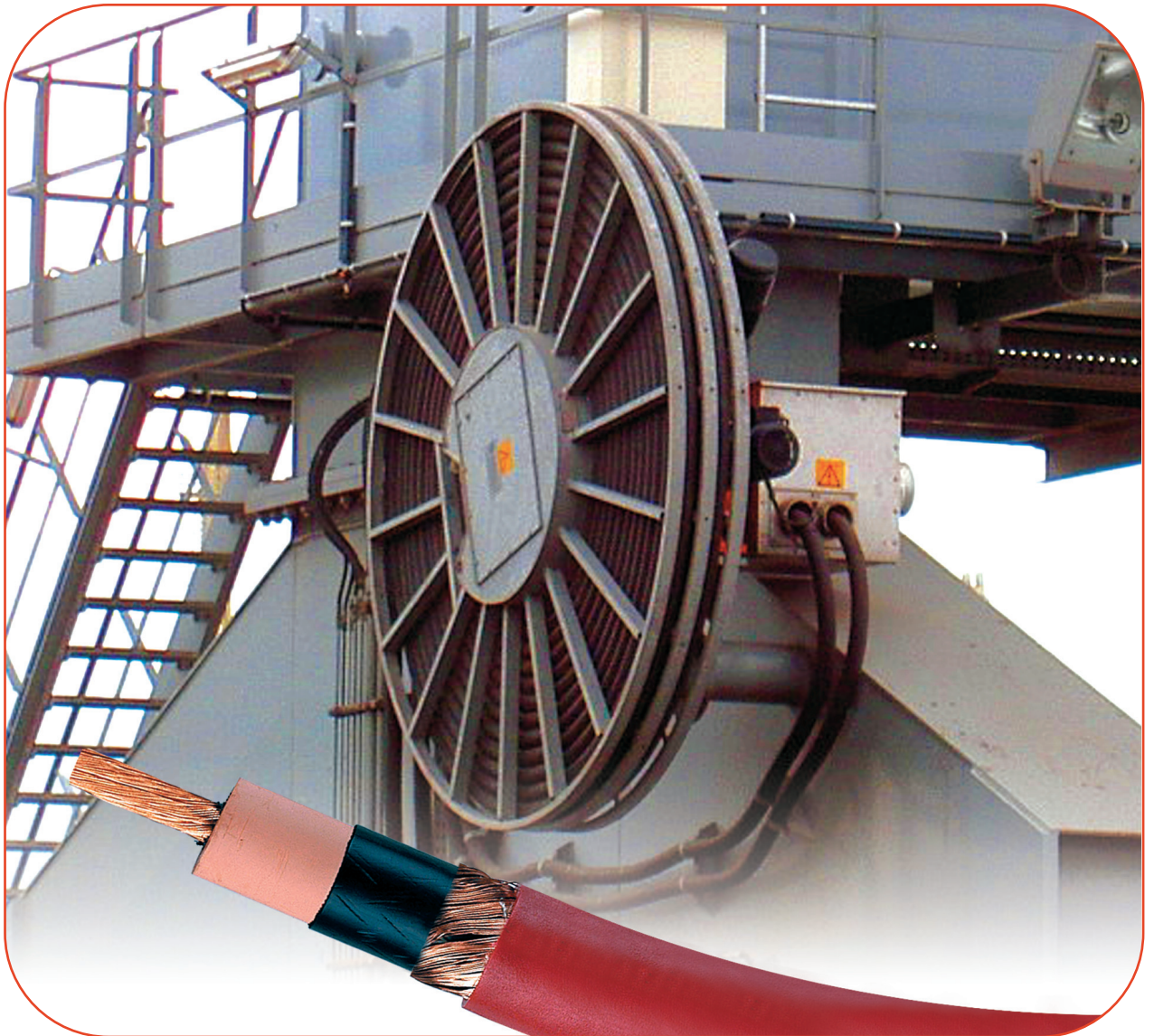
	Number of cores and nominal cross-section (mm ²)	Outer diameter approx. (mm)	Weight approx. (kg/km)
CONTROL	4 x 1.5	8	98
	5 x 1.5	9	128
	7 x 1.5	11	210
	12 x 1.5*	17	330
	18 x 1.5*	20	520
	25 x 1.5	23	660
	30 x 1.5	24	700
	42 x 1.5	28	950
	4 x 2.5*	9	143
	5 x 2.5*	10	184
	7 x 2.5*	13	240
	12 x 2.5*	19	470
	18 x 2.5*	23	700
	25 x 2.5*	26	950
	30 x 2.5*	28	1,040
	36 x 2.5	30	1,240
	42 x 2.5	32	1,462
POWER	4 x 4*	11	219
	4 x 6*	13	295
	4 x 10*	17	536
	4 x 16*	19	830
	4 x 25*	24	1,190
	4 x 35	28	1,660
	4 x 50	34	2,580
	4 x 70	42	3,240
	4 x 95	48	3,795
	4 x 120	53	4,800
	4 x 150	57	5,920
	5 x 4*	12	270
	5 x 6*	13	360
	5 x 10*	19	665
	5 x 16*	23	782
COMPOSITE	19 x 2.5 + 5 x 1.5 (CE)*	24	860
	25 x 2.5 + 5 x 1.5 (CE)*	26	1,040
BUS	3 x (2 x 1)C	16	410

* Stocked products
(CE): individual screen

OPTIONS

- Further numbers of cores and cross-section upon request

BUFLEX® SC
Flexible Single Core Cables



BUFLEX® SC

Flexible Single Core Cables

Applications

Flexible single core cables designed for mobile applications (e.g. reels and/or festoons).

**1.8/3 (3.6) kV
up to 12/20 (24) kV**

Design

1. Conductor

Flexible, plain copper
Class 5
IEC 60228

2. Semi conductive layer

3. Insulation

EPR

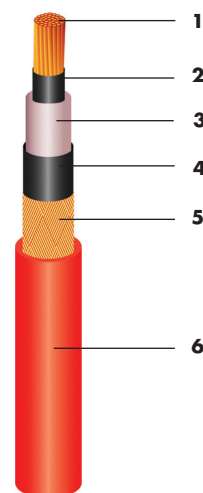
4. Semi conductive layer

5. Screen

Copper braid or spinning

6. Outer sheath

PUR
Colour: red



Marking

BUFLEX SC - Voltage
1 x cross-section
NEXANS - year - week

Core Identification

Single core design

Standards

Nexans specification

BUFLEX® SC **Cable Characteristics**

Mechanical properties

Max. tensile load	≤ 20 N/mm ²
Bending radii	see construction characteristics page 3.1 E
Tests	Bending test, torsional resistance test
Reeling speed	up to 60 m/min

Chemical properties

Oil resistant.
 For indoor and outdoor applications. Moisture, UV and ozone resistance.
 Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	1.8/3 kV to 12/20 kV
Maximum operating voltage in AC systems	U _m	1.2 x nominal voltage
Test voltage (according to DIN VDE 0250 part 809)	2 x U ₀ between conductor and screen in AC	
Current rating (A)	see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 40 °C up to + 80 °C	
- mobile operation	- 30 °C up to + 80 °C	



Flexible



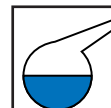
Excellent



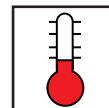
Good



Good



Oil resistant



-30 + 80 °C

■ BUFLEX® SC

Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)	Tensile load (N)
	Min. (mm)	Max. (mm)		
1.8/3 (3.6) kV up to 8.7/15 (18) kV				
1 x 25	17.5	19.5	550	500
1 x 35	19.0	21.0	680	700
1 x 50	20.0	22.0	880	1,000
1 x 70	22.0	24.5	1,170	1,400
1 x 95	24.0	26.5	1,500	1,900
1 x 120	26.0	28.5	1,840	2,400
1 x 150	28.0	30.5	2,230	3,000
12/20 (24) kV				
1 x 25	21.0	23.0	660	500
1 x 35	21.5	23.5	780	700
1 x 50	22.0	24.0	950	1,000
1 x 70	24.5	26.5	1,250	1,400
1 x 95	26.0	28.0	1,570	1,900
1 x 120	27.5	30.0	1,900	2,400
1 x 150	29.0	31.5	2,300	3,000

*Stocked products

■ Options

- 18/30 (36) kV cables can be manufactured on request
- Other colours on request

BUFLEX® SEM Reeling Cables



BUFLEX® SEM

Reeling Cables

3.6/6 (7.2) kV
up to 12/20 (24) kV

Applications

Cables with reinforced polyurethan sheath, are especially designed for reeling and tunnelling applications. Also used for grabs unloaders.

Design

1. Conductor

Flexible plain copper
class 5
IEC 60228

2. Semi conductive layer

3. Insulation

EPR

4. Semi conductive layer

5. Protective earth conductor

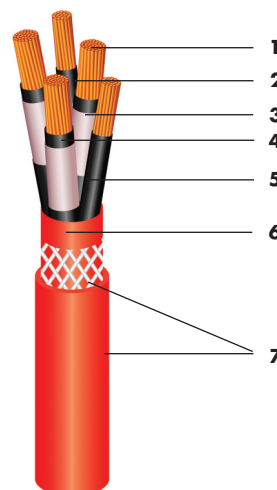
Flexible plain copper
class 5
IEC 60228

6. Semi conductive layer

On earth conductors

7. Outer sheath

PUR
Double layer with
anti twisting reinforcement
Colour: red



Marking

BUFLEX SEM - Voltage
Number of cores - cross-section
NEXANS - year - week

Cores Identification

Six cores design:
- 3 phase cores
- 3 protective earth cores

Standards

Nexans specification

BUFLEX® SEM **Cable Characteristics**

Mechanical properties

Max. tensile load	20 N/mm ² of copper cross section
Bending radii	see construction characteristics page 3.1 E
Tests	alternating/reversed bending test, torsional resistance test
Reeling speed	up to 120 m/min

Chemical properties

Oil resistant.
 For outdoor applications. Moisture, UV and ozone resistance.
 Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

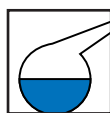
Nominal voltage	U ₀ /U	3.6/6 kV to 12/20 kV
Maximum operating voltage in AC systems	U _m	1.2 x U
Test voltage (according to DIN VDE 0250 part 809)	3.5 x U ₀ in AC	
Current rating (A)	see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 40 °C up to + 80 °C	
- mobile operation	- 25 °C up to + 80 °C	



Good



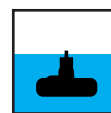
Excellent



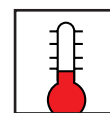
Oil resistant



Flexible



Good



-25 +80°C

Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)	Tensile load (N)
	Min. (mm)	Max. (mm)		
3.6/6 (7.2) kV				
3 x 25 + 3 x 10	35.0	38.0	1,900	2,100
3 x 35 + 3 x 10	38.0	41.0	2,300	2,700
3 x 50 + 3 x 10	41.0	44.0	2,860	3,600
3 x 70 + 3 x 16	45.0	48.0	3,800	5,160
3 x 95 + 3 x 16	49.5	53.0	4,700	6,600
3 x 120 + 3 x 25	54.0	57.5	5,900	8,700
3 x 150 + 3 x 25	57.5	61.5	6,950	10,500
6/10 (12) kV				
3 x 25 + 3 x 10	35.0	38.0	1,900	2,100
3 x 35 + 3 x 10	38.0	41.0	2,300	2,700
3 x 50 + 3 x 10	41.0	44.0	2,860	3,600
3 x 70 + 3 x 16	45.0	48.0	3,800	5,160
3 x 95 + 3 x 16	49.5	53.0	4,700	6,600
3 x 120 + 3 x25	54.0	57.5	5,900	8,700
3 x 150 + 3 x 25	57.5	61.5	6,950	10,500
8.7/15 (18) kV				
3 x 25 + 3 x 10	35.0	38.0	1,900	2,100
3 x 35 + 3 x 10	38.0	41.0	2,300	2,700
3 x 50 + 3 x 10	41.0	44.0	2,860	3,600
3 x 70 + 3 x 16	45.0	48.0	3,800	5,160
3 x 95 + 3 x 16	49.5	53.0	4,700	6,600
3 x 120 + 3 x25	54.0	57.5	5,900	8,700
3 x 150 + 3 x 25	57.5	61.5	6,950	10,500
12/20 (24) kV				
3 x 25 + 3 x 10	44.0	47.0	2,650	2,100
3 x 35 + 3 x 10	44.5	47.5	2,900	2,700
3 x 50 + 3 x 10	45.5	49.0	3,300	3,600
3 x 70 + 3 x 16	49.5	53.0	4,300	5,160
3 x 95 + 3 x 16	53.0	56.5	5,100	6,600

*Stocked products

Options

- Cables with an overall copper braid screen on request
- Cables including a single pair on request
- 18/30 (36) kV cables could be manufactured on request
- Other colours on request

BUFLEX® SEM OFE Reeling Cables with integrated Optical Fibers



BUFLEX® SEM OFE

Reeling Cables with integrated Optical Fibers

Applications

Cables with reinforced polyurethane sheath are especially designed for reeling and tunnelling applications. Also used for grabs unloaders.

**3.6/6 (7.2) kV
up to 12/20 (24) kV**

Design

1. Conductor

Flexible plain copper
class 5
IEC 60228

2. Semi conductive layer

3. Insulation

EPR

4. Semi conductive layer

5. Protective earth conductor

Flexible plain copper
class 5
IEC 60228

6. Semi-conductive

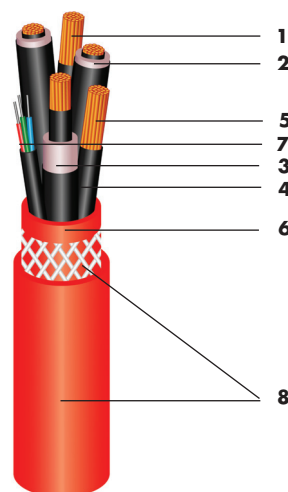
On earth conductor

7. Optical Fibers Element

Multimode 62.5/125 µm

8. Outer sheath

PUR
double layer with
anti twisting reinforcement
Colour: red



Marking

BUFLEX SEM OFE - Voltage
Number of cores - cross-section
NEXANS - year - week

Cores Identification

Six cores design:
- 3 phase cores
- 2 protective earth cores
- 1 optical fiber element

Standards

Nexans specification

BUFLEX® SEM OFE **Cable Characteristics**

Mechanical properties

Max. tensile load	20 N/mm ² of copper cross section
Bending radii	see construction characteristics page 3.1 E
Tests	alternating/reversed bending test, torsional resistance test
Reeling speed	up to 120 m/min

Chemical properties

Oil resistant.
 For outdoor applications. Moisture, UV and ozone resistance.
 Flame-retardant according to IEC 60 332 part 1.

Electrical, Optical and Thermal properties

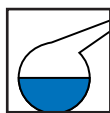
Nominal voltage	U ₀ /U	3.6/6 kV to 12/20 kV
Maximum operating voltage in AC systems	U _m	1.2 x U
Test voltage (according to DIN VDE 0250 part 809)	3.5 x U ₀ in AC	
Current rating (A)	see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 40 °C up to + 80 °C	
- mobile operation	- 25 °C up to + 80 °C	
Optical properties	see general characteristics page 3.3 B	



Good



Excellent



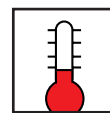
Oil resistant



Flexible



Good



-25 +80°C

Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)	Tensile load (N)
	Min. (mm)	Max. (mm)		
3.6/6 (7.2) kV				
3 × 25 + 2 × 10 + OFE	35.0	38.0	1,900	2,100
3 × 35 + 2 × 10 + OFE	38.0	41.0	2,300	2,700
3 × 50 + 2 × 10 + OFE	41.0	44.0	2,860	3,600
3 × 70 + 2 × 10 + OFE	45.0	48.0	3,800	5,160
3 × 95 + 2 × 10 + OFE	49.5	53.0	4,700	6,600
3 × 120 + 2 × 10 + OFE	54.0	57.5	5,900	8,700
3 × 150 + 2 × 10 + OFE	57.5	61.5	6,950	10,500
6/10 (12) kV				
3 × 25 + 2 × 10 + OFE	35.0	38.0	1,900	2,100
3 × 35 + 2 × 10 + OFE	38.0	41.0	2,300	2,700
3 × 50 + 2 × 10 + OFE	41.0	44.0	2,860	3,600
3 × 70 + 2 × 10 + OFE	45.0	48.0	3,800	5,160
3 × 95 + 2 × 10 + OFE	49.5	53.0	4,700	6,600
3 × 120 + 2 × 10 + OFE	54.0	57.5	5,900	8,700
3 × 150 + 2 × 10 + OFE	57.5	61.5	6,950	10,500
8.7/15 (18) kV				
3 × 25 + 2 × 10 + OFE	35.0	38.0	1,900	2,100
3 × 35 + 2 × 10 + OFE	38.0	41.0	2,300	2,700
3 × 50 + 2 × 10 + OFE	41.0	44.0	2,860	3,600
3 × 70 + 2 × 10 + OFE	45.0	48.0	3,800	5,160
3 × 95 + 2 × 10 + OFE	49.5	53.0	4,700	6,600
3 × 120 + 2 × 10 + OFE	54.0	57.5	5,900	8,700
3 × 150 + 2 × 10 + OFE	57.5	61.5	6,950	10,500
12/20 (24) kV				
3 × 25 + 2 × 10 + OFE	44.0	47.0	2,650	2,100
3 × 35 + 2 × 10 + OFE	44.5	47.5	2,900	2,700
3 × 50 + 2 × 10 + OFE	45.5	49.0	3,300	3,600
3 × 70 + 2 × 10 + OFE	49.5	53.0	4,300	5,160
3 × 95 + 2 × 10 + OFE	53.0	56.5	5,100	6,600

* Stocked products

Options

- Cables with an overall copper braid screen on request
- 18/30 (36) kV cables could be manufactured on request
- Other colours on request

RHEYFIRM®(RTS) (N)TSCGEWTOEUS

Reeling Cables



RHEYFIRM®(RTS) (N)TSCGEWTOEUS

Reeling Cables

Applications

Flexible reeling cable for energy supply. Especially for high and extreme mechanical stress, e.g. torsional stress and high reeling speed.
For deflection into different planes.
Also usable for festoon systems, open-cast and underground mining.

Main applications: Ship to Shore Cranes (STS), Rail Mounted Gantry Cranes (RMG), Ship Unloader, Stacker Reclaimer and other heavy mobile equipment.

**1.8/3 (3.6) kV
up to 18/30 (36) kV**

Design

1. Conductor

Flexible, plain copper, "FSC" better than IEC 60228 class 5

2. Insulation

- Inner semi-conductive layer
- New special insulation compound "RHEYCLEAN" based on EPDM, better than DIN VDE 207 part 20.
- Outer semi-conductive layer, "RHEYSTRIP", easy strip design

3. Protective earth conductor

Flexible, plain copper, "FSC" better than IEC 60228 class 5

4. Semi-conductive layer

5. Inner sheath

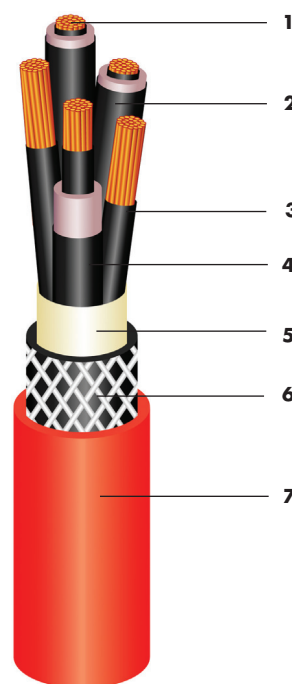
Special synthetic rubber, better than GM1b

6. Reinforcement

Synthetic threads with very high tensile strength as a protection against twist stress and pressure loads

7. Outer sheath

New special sandwich construction for an optimum of flexibility, abrasion resistance and heavy load, special PCP compound, Colour: red



Marking

RHEYFIRM(RTS)
(N)TSCGEWTOEUS
Number of cores - cross-section
Voltage - NEXANS - year

Cores Identification

Six cores design:
- three phase cores
- three protective earth cores
in the interstices.

Length of lay is optimized for the different applications.

Standards

In line with DIN VDE 0250
part 813
DIN VDE 0295
DIN VDE 0298
DIN VDE 0472
prEN 50363

RHEYFIRM®(RTS) (N)TSCGEWTOEUS

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298, see construction characteristics page 3.1 E	
Tests	alternating/reversed bending test, torsional resistance test	
Reeling speed	up to 190 m/min (for higher speed contact us)	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

EMC	Excellent EMC compatibility due to 6 cores design	
Nominal voltage	U ₀ /U	1.8/ 3 kV to 18/30 kV
Maximum operating voltage in AC systems	U _m	1.2 x U
Maximum operating voltage in DC systems	V _m	1.8 x U
Test voltage (according to DIN VDE 0250 part 809)	11 to 45 kV in AC 27.5 to 107.5 kV in DC	
Current rating (A)	according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 50 °C up to + 80 °C	
- mobile operation	- 35 °C up to + 80 °C	



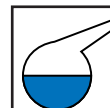
Flexible



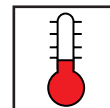
Excellent



Good



Oil resistant



-35 + 80 °C

Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)	Tensile strength (N)
	Min. (mm)	Max. (mm)		
1.8/3 (3.6) kV				
3 x 25 + 3 x 25/3	31	34	1,850	3,000
3 x 35 + 3 x 25/3	34	37	2,320	3,000
3 x 50 + 3 x 25/3	38	41	2,900	3,000
3 x 70 + 3 x 35/3	43	46	3,900	4,200
3 x 95 + 3 x 50/3	49	51	4,900	5,700
3 x 120 + 3 x 70/3	54	57	6,120	7,200
3 x 150 + 3 x 70/3	57	60	7,180	9,000
3 x 185 + 3 x 95/3	62	65	8,600	11,100
3 x 240 + 3 x 120/3	69	72	10,800	14,400
3 x 300 + 3 x 150/3	76	79	13,250	18,000
3.6/6 (7.2) kV				
3 x 25 + 3 x 25/3*	39	42	2,350	3,000
3 x 35 + 3 x 25/3*	42	45	2,900	3,000
3 x 50 + 3 x 25/3	46	49	3,550	3,000
3 x 70 + 3 x 35/3	49	52	4,460	4,200
3 x 95 + 3 x 50/3	55	58	5,500	5,700
3 x 120 + 3 x 70/3	58	61	6,600	7,200
3 x 150 + 3 x 95/3	64	67	8,000	9,000
3 x 185 + 3 x 95/3	68	71	9,300	11,100
3 x 240 + 3 x 120/3	73	76	11,350	14,400
3 x 300 + 3 x 150/3	80	84	13,750	18,000
6/10 (12) kV				
3 x 25 + 3 x 25/3*	39	42	2,350	3,000
3 x 35 + 3 x 25/3*	42	45	2,900	3,000
3 x 50 + 3 x 25/3	46	49	3,550	3,000
3 x 70 + 3 x 35/3	49	52	4,460	4,200
3 x 95 + 3 x 50/3	55	58	5,500	5,700
3 x 120 + 3 x 70/3	58	61	6,600	7,200
3 x 150 + 3 x 95/3	64	67	8,000	9,000
3 x 185 + 3 x 95/3	68	71	9,300	11,100
3 x 240 + 3 x 120/3	73	76	11,350	14,400
3 x 300 + 3 x 150/3	80	84	13,750	18,000
8.7/15 (18) kV				
3 x 25 + 3 x 25/3*	39	42	2,350	3,000
3 x 35 + 3 x 25/3*	42	45	2,900	3,000
3 x 50 + 3 x 25/3	46	49	3,550	3,000
3 x 70 + 3 x 35/3	49	52	4,460	4,200
3 x 95 + 3 x 50/3	55	58	5,500	5,700
3 x 120 + 3 x 70/3	58	61	6,600	7,200
3 x 150 + 3 x 95/3	64	67	8,000	9,000
3 x 185 + 3 x 95/3	68	71	9,300	11,100
3 x 240 + 3 x 120/3	73	76	11,350	14,400
3 x 300 + 3 x 150/3	80	84	13,750	18,000

*Stocked products

RHEYFIRM®(RTS) (N)TSCGEWTOEUS

Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)	Tensile strength (N)
	Min. (mm)	Max. (mm)		
12/20 (24) kV				
3 x 25 + 3 x 25/3	46	49	3,000	3,000
3 x 35 + 3 x 25/3	48	51	3,400	3,000
3 x 50 + 3 x 25/3	50	53	3,900	3,000
3 x 70 + 3 x 35/3	55	58	5,050	4,200
3 x 95 + 3 x 50/3	58	61	5,900	5,700
3 x 120 + 3 x 70/3	61	64	6,950	7,200
3 x 150 + 3 x 70/3	66	69	8,210	9,000
3 x 185 + 3 x 95/3	70	73	9,550	11,100
3 x 240 + 3 x 120/3	77	80	12,200	14,400
3 x 300 + 3 x 150/3	82	85	14,100	18,000
14/25 (30) kV				
3 x 35 + 3 x 25/3	53	56	3,950	3,000
3 x 50 + 3 x 25/3	55	58	4,480	3,000
3 x 70 + 3 x 35/3	58	61	5,460	4,200
3 x 95 + 3 x 50/3	62	65	6,400	5,700
3 x 120 + 3 x 70/3	64	67	7,300	7,200
3 x 150 + 3 x 95/3	69	72	8,710	9,000
3 x 185 + 3 x 95/3	73	76	10,200	11,100
3 x 240 + 3 x 120/3	79	82	12,400	14,400
3 x 300 + 3 x 150/3	84	87	14,600	18,000
18/30 (36) kV				
3 x 35 + 3 x 25/3	60	63	4,830	3,000
3 x 50 + 3 x 25/3	62	65	5,310	3,000
3 x 70 + 3 x 35/3	64	67	6,150	4,200
3 x 95 + 3 x 50/3	66	69	7,000	5,700
3 x 120 + 3 x 70/3	69	72	8,050	7,200
3 x 150 + 3 x 95/3	75	78	9,510	9,000
3 x 185 + 3 x 95/3	77	80	10,800	11,100
3 x 240 + 3 x 120/3	85	88	13,300	14,400
3 x 300 + 3 x 150/3	89	93	15,500	18,000

*Stocked products

Options

- Other sheath qualities and colours on request
- Monitoring conductors: Concentric or as an individual core
- Including signal cores, telecommunication cores
- Pre-assembled with sealing ends upon request

RHEYFIRM®(RTS) (N)TSCGEWTOEUS OFE **Reeling Cables with integrated Optical Fibers**



RHEYFIRM®(RTS) (N)TSCGEWTOEUS OFE

Reeling Cables with integrated Optical Fibers

Applications

Flexible reeling cable for energy supply and data transmission. Especially for high and extreme mechanical stress, e.g. torsional stress and high reeling speed. For deflection into different planes. Also usable for festoon systems, open-cast and underground mining.

Main applications: Ship to Shore Cranes (STS), Rail Mounted Gantry Cranes (RMG), Ship Unloader, Stacker Reclaimer and other heavy mobile equipments.

**1.8/3 (3.6) kV
up to 18/30 (36) kV**

Design

1. Conductor

Flexible, plain copper, "FSC" better than IEC 60228 class 5

2. Insulation

- Inner semi-conductive layer
- New special insulation compound "RHEYCLEAN" based on EPDM, better than DIN VDE 207 part 20.
- Outer semi-conductive layer, "RHEYSTRIP", easy strip design

3. Protective earth conductor

Flexible, plain copper, "FSC" better than IEC 60228 class 5

4. Semi-conductive layer

5. Optical fiber

Fiber diameter
9/125 µm
50/125 µm
62.5/125 µm

6. Inner sheath

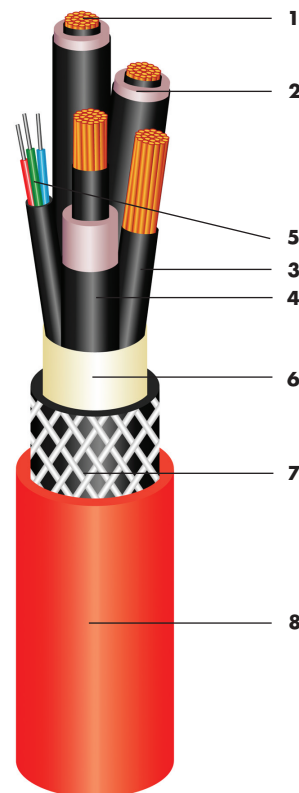
Special synthetic rubber, better than GM1b

7. Reinforcement

Synthetic threads with very high tensile strength as a protection against twist stress and pressure loads

8. Outer sheath

New special sandwich construction for an optimum of flexibility, abrasion resistance and heavy load, special PCP compound
Colour: red



Marking

RHEYFIRM(RTS)
(N)TSCGEWTOEUS OFE
Number of cores - cross-section
Voltage - NEXANS - year

Cores Identification

Split protective earth cores are integrated in two of the three interstices. The optical fiber element is accommodated in the third.
Length of lay is optimized for the different applications

Standards

In line with
DIN VDE 0250 part 813
DIN VDE 0295
DIN VDE 0298
DIN VDE 0472
prEN 50363
DIN VDE 0888

RHEYFIRM®(RTS) (N)TSCGEWTOEUS OFE

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298,	
Tests	see construction characteristics page 3.1 E alternating/reversed and roller bending test, torsional resistance test	
Reeling speed	up to 190 m/min (for higher speed contact us)	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical, optical and Thermal properties

Nominal voltage	U ₀ /U	1.8/ 3 kV to 18/30 kV
Maximum operating voltage in AC systems	U _m	1.2 x U
Maximum operating voltage in DC systems	V _m	1.8 x U
Test voltage (according to DIN VDE 0250 part 809)	11 to 45 kV in AC 27.5 to 107.5 kV in DC	
Current rating (A)	according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 50 °C up to + 80 °C	
- mobile operation	- 35 °C up to + 80 °C	
Optical properties	see general characteristics page 3.3 B	



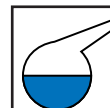
Flexible



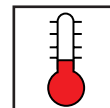
Excellent



Good



Oil resistant



-35 + 80 °C

RHEYFIRM®(RTS) (N)TSCGEWTOEUS OFE

Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)	Tensile strength (N)
	Min. (mm)	Max. (mm)		
1.8/3 (3.6) kV				
3 x 25 + 2 x 25/2 + OFE	31	34	1,820	3,000
3 x 35 + 2 x 25/2 + OFE	34	37	2,280	3,000
3 x 50 + 2 x 25/2 + OFE	38	41	2,850	3,000
3 x 70 + 2 x 35/2 + OFE	43	46	3,830	4,200
3 x 95 + 2 x 50/2 + OFE	49	51	4,810	5,700
3 x 120 + 2 x 70/2 + OFE	54	57	6,000	7,200
3 x 150 + 2 x 70/2 + OFE	57	60	7,040	9,000
3 x 185 + 2 x 95/2 + OFE	62	65	8,430	11,100
3 x 240 + 2 x 120/2 + OFE	69	72	10,590	14,400
3.6/6 (7.2) kV				
3 x 25 + 2 x 25/2 + OFE*	39	42	2,310	3,000
3 x 35 + 2 x 25/2 + OFE*	42	45	2,850	3,000
3 x 50 + 2 x 25/2 + OFE*	46	49	3,480	3,000
3 x 70 + 2 x 35/2 + OFE*	49	52	4,380	4,200
3 x 95 + 2 x 50/2 + OFE	55	58	5,400	5,700
3 x 120 + 2 x 70/2 + OFE	58	61	6,470	7,200
3 x 150 + 2 x 95/2 + OFE	64	67	7,850	9,000
3 x 185 + 2 x 95/2 + OFE	68	71	9,120	11,100
3 x 240 + 2 x 120/2 + OFE	73	76	11,150	14,400
3 x 300 + 2 x 150/2 + OFE	80	84	13,490	18,000
6/10 (12) kV				
3 x 25 + 2 x 25/2 + OFE*	39	42	2,310	3,000
3 x 35 + 2 x 25/2 + OFE*	42	45	2,850	3,000
3 x 50 + 2 x 25/2 + OFE*	46	49	3,480	3,000
3 x 70 + 2 x 35/2 + OFE*	49	52	4,380	4,200
3 x 95 + 2 x 50/2 + OFE	55	58	5,400	5,700
3 x 120 + 2 x 70/2 + OFE	58	61	6,470	7,200
3 x 150 + 2 x 95/2 + OFE	64	67	7,850	9,000
3 x 185 + 2 x 95/2 + OFE	68	71	9,120	11,100
3 x 240 + 2 x 120/2 + OFE	73	76	11,150	14,400
3 x 300 + 2 x 150/2 + OFE	80	84	13,490	18,000
8.7/15 (18) kV				
3 x 25 + 2 x 25/2 + OFE*	39	42	2,310	3,000
3 x 35 + 2 x 25/2 + OFE*	42	45	2,850	3,000
3 x 50 + 2 x 25/2 + OFE*	46	49	3,480	3,000
3 x 70 + 2 x 35/2 + OFE*	49	52	4,380	4,200
3 x 95 + 2 x 50/2 + OFE	55	58	5,400	5,700
3 x 120 + 2 x 70/2 + OFE	58	61	6,470	7,200
3 x 150 + 2 x 95/2 + OFE	64	67	7,850	9,000
3 x 185 + 2 x 95/2 + OFE	68	71	9,120	11,100
3 x 240 + 2 x 120/2 + OFE	73	76	11,150	14,400
3 x 300 + 2 x 150/2 + OFE	80	84	13,490	18,000

*Stocked products

RHEYFIRM®(RTS) (N)TSCGEWTOEUS OFE

Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)	Tensile strength (N)
	Min. (mm)	Max. (mm)		
12/20 (24) kV				
3 × 25 + 2 × 25/2 + OFE	46	49	2,940	3,000
3 × 35 + 2 × 25/2 + OFE	48	51	3,340	3,000
3 × 50 + 2 × 25/2 + OFE	50	53	3,830	3,000
3 × 70 + 2 × 35/2 + OFE	55	58	4,950	4,200
3 × 95 + 2 × 50/2 + OFE	58	61	5,790	5,700
3 × 120 + 2 × 70/2 + OFE	61	64	6,820	7,200
3 × 150 + 2 × 70/2 + OFE	66	69	8,050	9,000
3 × 185 + 2 × 95/2 + OFE	70	73	9,360	11,100
3 × 240 + 2 × 120/2 + OFE	77	80	11,200	14,400
3 × 300 + 2 × 150/2 + OFE	82	85	13,850	18,000
14/25 (30) kV				
3 × 35 + 2 × 25/2 + OFE*	53	56	3,880	3,000
3 × 50 + 2 × 25/2 + OFE*	55	58	4,390	3,000
3 × 70 + 2 × 35/2 + OFE*	58	61	5,360	4,200
3 × 95 + 2 × 50/2 + OFE	62	65	6,280	5,700
3 × 120 + 2 × 70/2 + OFE	64	67	7,160	7,200
3 × 150 + 2 × 95/2 + OFE	69	72	8,540	9,000
3 × 185 + 2 × 95/2 + OFE	73	76	10,050	11,100
3 × 240 + 2 × 120/2 + OFE	79	82	12,150	14,400
3 × 300 + 2 × 150/2 + OFE	84	87	14,310	18,000
18/30 (36) kV				
3 × 50 + 2 × 25/2 + OFE*	62	65	5,210	3,000
3 × 70 + 2 × 35/2 + OFE*	64	67	6,030	4,200
3 × 95 + 2 × 50/2 + OFE	66	69	6,870	5,700
3 × 120 + 2 × 70/2 + OFE	69	72	7,890	7,200
3 × 150 + 2 × 95/2 + OFE	75	78	9,320	9,000
3 × 185 + 2 × 95/2 + OFE	77	80	10,590	11,100
3 × 240 + 2 × 120/2 + OFE	85	88	13,050	14,400
3 × 300 + 2 × 150/2 + OFE	89	93	15,230	18,000

*Stocked products

Options

- Other sheath qualities and colours on request
- Monitoring conductors: Concentric or as an individual core
- Including signal cores, telecommunication cores
- Pre-assembled with sealing ends upon request

RHEYFIRM®(RS)-FLAT (N)TSFLCGCWOEUS

Reeling Flat Cables with/without Integrated Optical Fibers



RHEYFIRM®(RS)-FLAT (N)TSFLCGCWOEUS

Reeling Flat Cables with/without Integrated Optical Fibers

Applications

Flexible flat reeling cable for data transmission and for energy supply. Especially for high and extreme mechanical stress used in Ship to Shore Cranes (STS), Rail Mounted Gantry Cranes (RMG) and other heavy mobile equipments.

3.6/6 (7.2) kV

6/10 (12) kV

8.7/15 (18) kV

Design

1. Conductor

Flexible, plain copper, "FSC" better than IEC 60228 class 5

2. Insulation

- Inner semi-conductive layer
- New special insulation compound "RHEYCLEAN" based on EPDM, better than DIN VDE 207 part 20.
- Outer semi-conductive layer, "RHEYSTRIP", easy strip design

3. Protective earth conductor

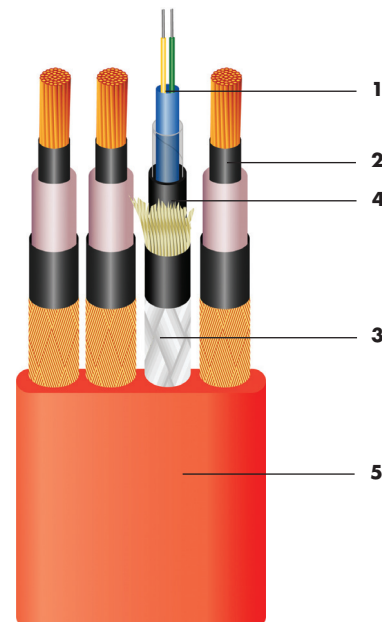
Individually concentric mixed braid of tinned copper wires and high-tech polyamid yarn

4. Optical Fiber

Fiber diameter
9/125 µm
50/125 µm
62.5/125 µm

5. Outer sheath

Special PCP compound
Colour: red



Marking

RHEYFIRM(RS)-FLAT
(N)TSFLCGCWOEUS
Number of cores - cross-section
Voltage - NEXANS - year

Core Identification

Parallel arranged

Standards

In line with
DIN VDE 0250 part 813
DIN VDE 0295
DIN VDE 0298
DIN VDE 0472
pr EN 50363

RHEYFIRM®(RS)-FLAT (N)TSFLCGCWOEUS

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	20 N/mm ²
Bending radii	according to DIN VDE 298, see construction characteristics page 3.1 E
Tests	Bending test
Reeling speed	on request

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical, Optical and Thermal properties

Nominal voltage	U ₀ /U	3.6/6 kV to 8.7/15 kV
Maximum operation voltage in AC systems	U _m	1.2 x U
Maximum operation voltage in DC systems	V _m	1.8 x U
Test voltage (according to DIN VDE 0250 part 813)	11 kV to 24 kV in AC 27.5 kV to 60 kV in DC	
Current rating (A)	according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature:		
- fixed installation	- 50 °C up to + 80 °C	
- mobile operation	- 35 °C up to + 80 °C	
Optical properties	see general characteristics page 3.3 B	



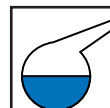
Flexible



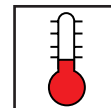
Excellent



Good



Oil resistant



-35 + 80 °C

RHEYFIRM®(RS)-FLAT (N)TSFLCGCWOEUS

Number of cores and nominal cross-section (mm²)	Outer dimensions		Weight approx. (kg/km)	Tensile strength (N)
	Min. (mm)	Max. (mm)		
3.6/6 kV				
4 x 35	24 x 77	25 x 79	3,600	2,800
3 x 35/35 + OFE	24 x 77	25 x 79	3,600	2,100
4 x 50	26 x 83	27 x 85	4,400	4,000
3 x 50/50 + OFE	26 x 83	27 x 85	4,400	3,000
6/10 kV				
4 x 35	26 x 78	27 x 80	3,900	2,800
3 x 35/35 + OFE	26 x 78	27 x 80	3,900	2,100
8.7/15 kV				
4 x 35	27 x 79	28 x 81	4,200	2,800
3 x 35/35 + OFE	27 x 79	28 x 81	4,200	2,100

Options

- Voltage level 0.6/1 (1.2) kV on request
- Other sheath qualities and colours
- Including signal cores, telecommunication cores
- Pre-assembled with sealing ends upon request

RHEYCORD®-OFE R Flexible Cables with Optical Fiber Elements (OFE)



RHEYCORD®-OFE R

Flexible Cables with Optical Fiber Elements (OFE)

Applications

For data transmission without electromagnetic smog.
Especially for reeling applications. Further used for festoon and e-chain systems on cranes and other material handling equipments.

Design

1. Optical Fiber

Fiber diameter:
9/125 µm
50/125 µm
62.5/125 µm
Fibers layed in a jelly filled high performance thermoplastic tube.

2. Strain Relief

High-end synthetic rovings

3. Reinforcement

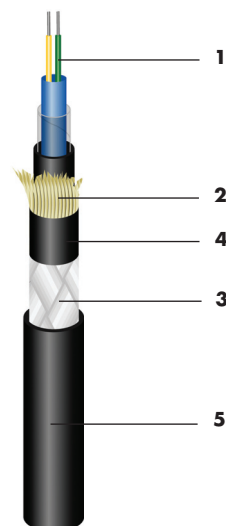
Braid, synthetic threads with very high tensile strength

4. Inner sheath

PCP, rubber compound
5GM5 refer to
DIN VDE 0207 part 21

5. Outer sheath

PCP, rubber compound
5GM5 refer to
DIN VDE 0207 part 21,
heavy duty abrasion and
notch-resistant
Colour: black



Marking

RHEYCORD-OFE R
Number of fibers - Diameter
NEXANS - year

Fibers Identification

DIN VDE 0888

Standards

In line with
DIN VDE 0888
DIN VDE 0168

RHEYCORD®-OFE R

Cable Characteristics

Mechanical properties

Torsional stress	$\leq 120^\circ/\text{m}$
Bending radii	see construction characteristics page 3.1 E
Tests	alternating/reversed and roller bending test, torsional resistance test
Travelling speed:	
- festoon, e-chain	up to 240 m/min (for higher speed contact us)
- reeling speed	up to 120 m/min

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Optical and Thermal properties

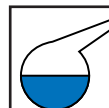
Optical properties	see general characteristics page 3.3 B
Max. surface temperature:	
- fixed installation	-40 °C up to +80 °C
- mobile operation	-30 °C up to +60 °C



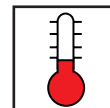
Flexible



Good



Oil resistant



-30 + 60 °C

RHEYCORD®-OFE R

	Types	Outer diameter		Weight approx. (kg/km)	Max. tensile load. (N)
		Min. (mm)	Max. (mm)		
MULTI-MODE/ GRADED INDEX	6 G 50/ 125	14	16	240	2,000
	12 G 50 / 125				
	18 G 50/ 125				
	24 G 50 / 125				
	6 G 62.5 / 125				
	12 G 62.5 / 125*				
	18 G 62.5 / 125				
	24 G 62.5 / 125				
MONO-MODE/ SINGLE MODE	6 E 9 / 125	14	16	240	2,000
	12 E 9 / 125				
	18 E 9 / 125				
	24 E 9 / 125				

* Stocked products

Options

- Pre-assembled with plugs

RHEYCORD®-OFE SR **Flexible Cables with Optical Fibers Elements (OFE) and integrated steel strength member**



RHEYCORD®-OFE SR

Flexible Cables with Optical Fiber Elements (OFE) and integrated steel strength member

Applications

For data transmission without electromagnetic smog.
Especially for high speed reeling applications and extreme tensile load in cranes and other material handling equipments.

Design

1. Optical Fiber

Fiber diameter:
9/125 µm
50/125 µm
62.5/125 µm
Fibers layed in a jelly filled high performance thermoplastic tube.

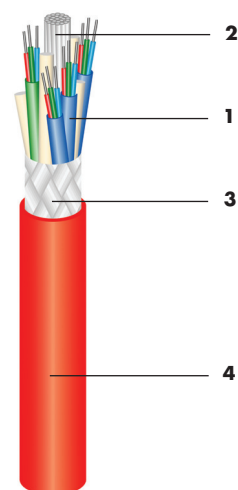
2. Special coated steel rope

3. Reinforcement

Braid, synthetic threads with very high tensile strength

4. Outer sheath

PCP, rubber compound
5GM5 refer to
DIN VDE 0207 part 21,
heavy duty abrasion and notch-resistant
Colour: orange



Marking

RHEYCORD-OFE SR
Number of fibers - Diameter
NEXANS - year

Fibers Identification

DIN VDE 0888

Standards

In line with
DIN VDE 0888
DIN VDE 0168

RHEYCORD®-OFE SR

Cable Characteristics

Mechanical properties

Torsional stress	≤ 120 °/m
Bending radii	see construction characteristics page 3.1 E
Tests	alternating/reversed and roller bending test, torsional resistance test
Reeling speed	up to 240 m/min (for higher speed contact us)

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Optical and Thermal properties

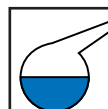
Optical properties	see general characteristics page 3.3 B
Max. surface temperature:	
- fixed installation	-40 °C up to +80 °C
- mobile operation	-30 °C up to +60 °C



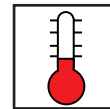
Flexible



Good



Oil resistant



-30 + 80 °C

RHEYCORD®-OFE SR

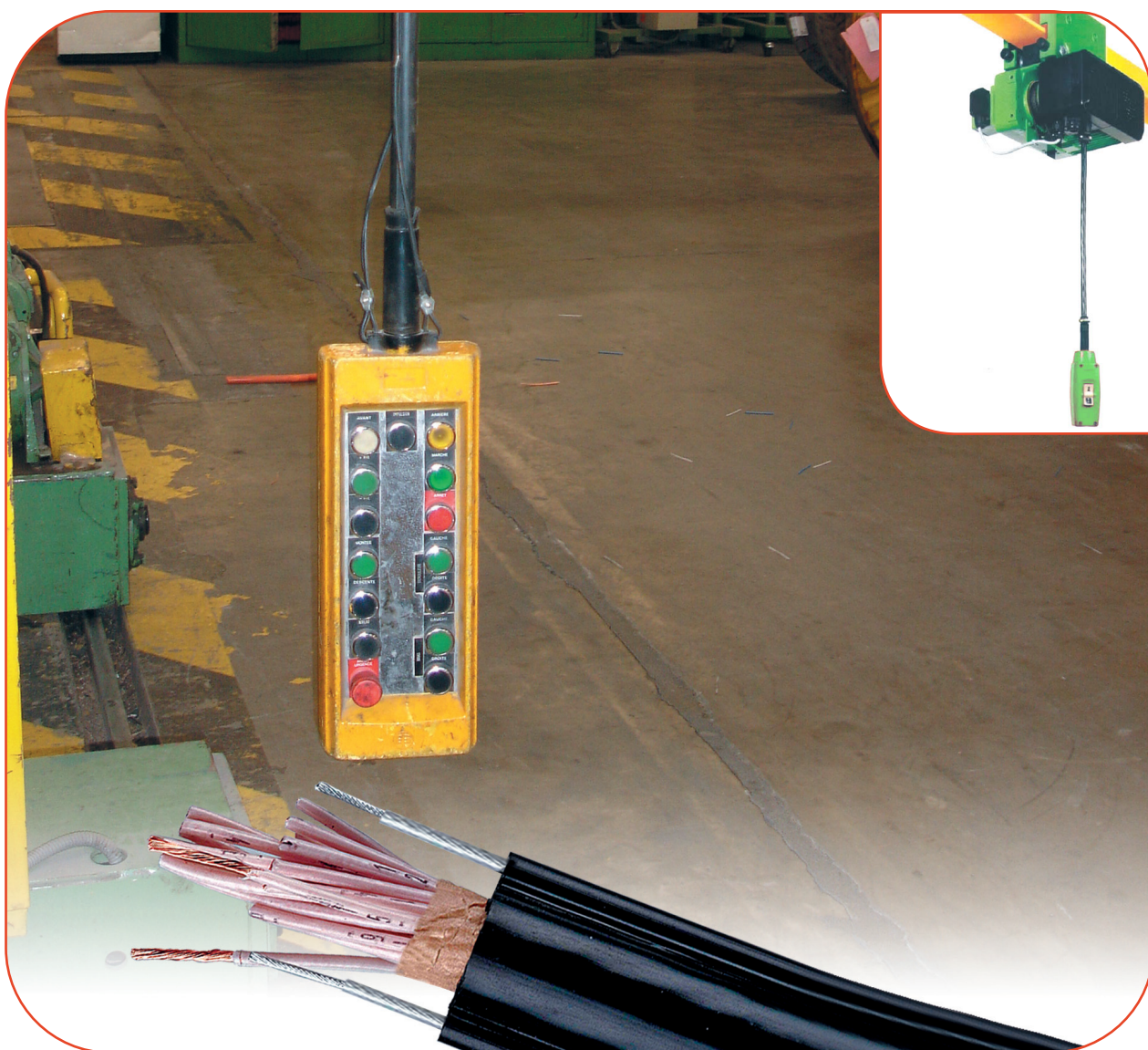
	Types	Outer diameter		Weight approx. (kg/km)	Max. tensile load. (N)
		Min. (mm)	Max. (mm)		
MULTI-MODE/ GRADED INDEX	6 G 50/ 125	17	19	350	4,000
	12 G 50 / 125				
	18 G 50/ 125				
	24 G 50 / 125				
	6 G 62.5 / 125				
	12 G 62.5 / 125				
	18 G 62.5 / 125				
	24 G 62.5 / 125*				
MONO-MODE/ SINGLE MODE	6 E 9 / 125	17	19	350	4,000
	12 E 9 / 125				
	18 E 9 / 125				
	24 E 9 / 125				

*Stocked products

Options

- Pre-assembled with plugs

BOITALYON® **PVC Pendant Overhead Crane Cables**



BOITALYON®R

PVC Pendant Overhead Crane Cables

Applications

300/500 V

Special cable with lateral suspension strands used to remote control overhead cranes from pushbutton boxes. It can be used for installations where the hanging length of cable does not exceed 50 m.

Design

1. Conductor

Flexible, plain copper
class 5
IEC 60228

2. Insulation

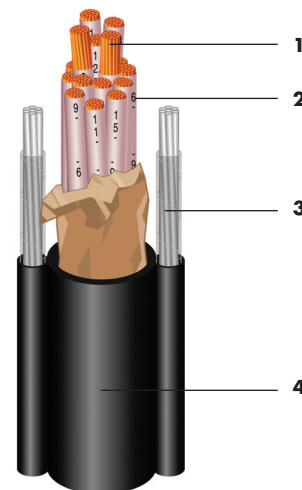
XLPE

3. Lateral suspension members

Sheathed stranded steel wires

4. Twin "figure 8" outer sheath

PVC
Colour: black



Marking

BOITALYON - 300/500 V
Number of cores - cross-section
NEXANS - year - week

Cores Identification

White printed numbers
with or without earth core
(green-yellow)

Standards

Nexans specification

BOITALYON® R

Cable Characteristics

Mechanical properties

Max. tensile load of the two steel supports	1,000 N
Bending radii	10 x D (cable diameter)
Tests	alternating/reversed bending test, torsional resistance test

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	300/500 V
Maximum operating voltage in AC systems	U _m	500 V
Test voltage	2.5 kV in AC	
Current rating (A)	see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 90 °C	
- in short circuit	+ 250 °C	
Max. surface temperature:		
- mobile operation	- 25 °C up to + 60 °C	



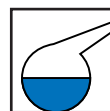
Flexible



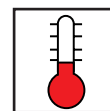
Good



Good



Good



-25 + 60 °C

BOITALYON® R

Number of cores and nominal cross-section (mm ²)	Outer dimensions approx. (mm)	Weight approx. (kg/km)
5 x 1.5*	20.0 x 9.5	210
8 x 1.5*	24.0 x 12.5	300
12 x 1.5*	24.0 x 12.5	350
12 G 1.5*	24.0 x 12.5	350
16 x 1.5*	25.5 x 14.5	440
20 x 1.5*	27.0 x 15.5	520
20 G 1.5*	27.0 x 15.5	520
30 x 1.5*	30.0 x 19.0	700

*Stocked products

Options

- Other cross-sections on request

RHEYFLEX®-PN Rubber Pendant Overhead Crane Cables



RHEYFLEX®-PN

Rubber Pendant Overhead Crane Cables

450/750 V

Applications

Rubber cable with a central strength member used for control, measurement and signalling in the steel, mining and chemical industries. In addition as cantilevered control cable for cranes

(e.g. to remote control on overhead cranes with push-button boxes), wind turbines, conveyor and storage systems.

Design

1. Central strength member

2. Conductor

Flexible, plain copper, according to IEC 60228/ DIN VDE 0295 class 6

3. Insulation

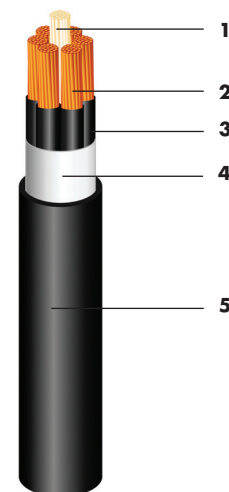
EPR, rubber compound refer to IEC 60502-1

4. Separator

Nonwoven tape over each layer

5. Outer sheath

EM2, rubber compound refer to DIN VDE 0207 part 21, heavy duty abrasion and notch-resistant
Colour: black



Marking

RHEYFLEX-PN
Number of cores - cross-section
NEXANS

Cores Identification

DIN VDE 0293 part 308
HD 308 S2
black with white printed numbers
+ green/yellow core (in the outer layer).

Standards

Nexans specification

RHEYFLEX®-PN

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298, see construction characteristics page 3.1 E	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	450/750 V
Maximum operating voltage in AC systems	U _m	825 V
Maximum operating voltage in DC systems	V _m	1,238 V
Test voltage (according to DIN VDE 0250 part 809)	2.5 kV in AC	
Current rating (A)	according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor :		
- in service	+ 90 °C	
- under short-circuit conditions	+ 250 °C	
Max. surface temperature :		
- fixed installation	- 40 °C up to + 80 °C	
- mobile operation	- 25 °C up to + 60 °C	



Flexible



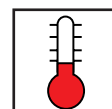
Good



Good



Oil resistant



-25 + 60 °C

RHEYFLEX®-PN

Number of cores and nominal cross-section (mm ²)	Outer diameter		Weight approx. (kg/km)	Breaking load of the strength member (N)
	Min. (mm)	Max. (mm)		
3 x 1	8	10	110	1,600
7 x 1*	12	14	220	4,000
12 x 1*	17	19	430	4,000
18 x 1*	17	19	510	4,000
24 x 1*	21	23	670	4,000
36 x 1*	24	26	900	4,000
48 x 1	27	30	1,220	4,000
54 x 1	30	33	1,320	4,000
3 x 1.5*	9	11	120	1,600
4 x 1.5*	10	12	180	1,000
5 x 1.5*	11	13	200	1,400
7 x 1.5*	13	15	280	4,000
9 x 1.5*	16	18	400	4,000
12 x 1.5	19	21	540	4,000
18 x 1.5*	19	21	600	4,000
24 x 1.5*	23	25	840	4,000
4 x 2.5*	12	14	250	1,350
5 x 2.5*	13	15	280	1,670

* Stocked products

Options

- With one common shield
- With individually screened cores
- Special cold resistant compound

RHEYCORD®(BS) YSLZ3SOE-J **Basket Spreader Cables**



RHEYCORD®(BS) YSLZ3SOE-J Basket Spreader Cables

Applications

300/500 V

Special control cable for basket spreader applications, e.g. in Ship to Shore (STS) cranes, Rail Mounted Gantry cranes (RMG) and Rubber Tired Gantry cranes (RTG).

Design

1. Conductor

Extra flexible, plain copper, according to IEC 60228
DIN VDE 0295 class 6

2. Insulation

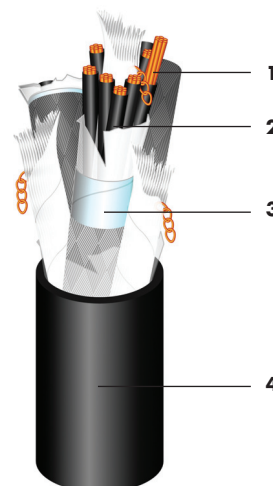
PVC compound TI4 refer to
DIN VDE 0281 part 1

3. Core assembling

Bundle stranding with/without
EMC screen and heavy weight
chain unleaded elements

4. Outer sheath

Elastomere compound,
heavy duty abrasion
and notch-resistant
Colour: black



Marking

RHEYCORD(BS) YSLZ3SOE
Number of cores - cross-section
300/500 V - NEXANS - year

Cores Identification

DIN VDE 0293 part 308
black with white printed numbers
+ green/yellow cores.

Standards

Nexans specification

RHEYCORD®(BS) YSLZ3SOE

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298, see construction characteristics page 3.1 E	
Tests	alternating/reversed bending test, torsional resistance test	
Travelling speed	up to 160 m/min	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	300/500 V
Maximum operating voltage in AC systems	U _m	550 V
Maximum operating voltage in DC systems	V _m	825 V
Test voltage (according to DIN VDE 0250 part 809)	2.0 kV in AC	
Current rating (A)	according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor:		
- in service	+ 70 °C	
- under short-circuit conditions	+ 150 °C	
Max. surface temperature:		
- fixed installation	- 35 °C up to + 70 °C	
- mobile operation	- 25 °C up to + 60 °C	



Flexible



lead free



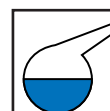
Good



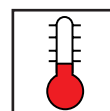
Good



Good



Oil resistant



-25 + 60 °C

RHEYCORD®(BS) YSLZ3SOE

	Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)
		Min. (mm)	Max. (mm)	
CONTROL	48 x 1	32	35	2,100
	30 x 2.5	32	35	2,200
	36 x 2.5*	35	38	2,600
	44 x 2.5*	37	40	3,250
	20 x 3.5	30	33	1,850
	24 x 3.5*	32	35	2,350
	30 x 3.5*	35	38	2,800
	36 x 3.5*	39	42	3,700
	42 x 3.5*	43	46	4,700
CONTROL WITH OPTICAL FIBER ELEMENT	32 x 3.5 + OFE*	39	42	3,550
CONTROL WITH CONCENTRIC SCREEN	48 x 1	38	41	2,400
	30 x 2.5	38	41	2,550
	36 x 2.5*	41	44	2,950
	42 x 2.5	43	46	3,700
	20 x 3.5	36	39	2,100
	24 x 3.5	38	41	2,600
	30 x 3.5	41	44	3,150
	36 x 3.5	45	48	4,150
	42 x 3.5	49	52	5,250

* Stocked products

Options

- Further numbers of cores upon request
- Integrated Optical Fiber Elements

RHEYFIRM®(SI) NTMCGCWOEUS

Flexible Single-Core Connection Cables



RHEYFIRM®(SI) NTMCGCWOEUS

Flexible Single-Core Connection Cables

Applications

Flexible high voltage cable
used normally in short lengths,
e.g. between short-circuit
breaker and mobile transformer

6/10 kV
12/20 kV

Design

1. Conductor

Flexible, tinned copper,
IEC 60228 class 5

2. Insulation

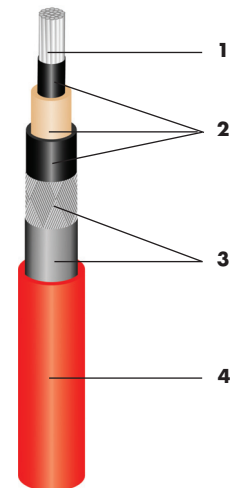
- Inner semi-conductive layer
- New special insulation compound "RHEYCLEAN" based on EPDM, better than DIN VDE 207 part 20.
- Outer semi-conductive layer, "RHEYSTRIP", easy strip design

3. Screen

Close spinning of
tinned copper wires/
tinned stranded wires

4. Outer sheath

PCP, rubber compound
5GM5 refer to
DIN VDE 0207 part 21,
heavy duty abrasion and
notch-resistant
Colour: red



Marking

RHEYFIRM(SI) NTMCGCWOEUS
1 x cross-section - Voltage
NEXANS <VDE> - year

Core Identification

Single core design

Standards

DIN VDE 0250 part 813
DIN VDE 0298
DIN VDE 0298 part 4

Cable Characteristics

Mechanical properties

Tensile stress of the conductor	static	15 N/mm ²
	dynamic	30 N/mm ²
Bending radii	according to DIN VDE 298, see construction characteristics page 3.1 E	
Tests	alternating/reversed bending test	

Chemical properties

Oil resistant.
For indoor and outdoor applications. Moisture, UV and ozone resistance.
Flame-retardant according to IEC 60 332 part 1.

Electrical and Thermal properties

Nominal voltage	U ₀ /U	6/10 kV to 12/20 kV
Test voltage (according to DIN VDE 0250 part 809) Current rating (A)	17 to 29 kV in AC according to DIN VDE 0298 part 4, see electrical characteristics page 3.2 B	
Max. temperature at the conductor: - in service - under short-circuit conditions	+ 90 °C + 200 °C	
Max. surface temperature: - fixed installation	- 35 °C up to + 80 °C	



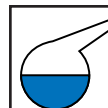
Flexible



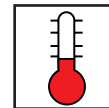
Excellent



Good



Oil resistant



-35 + 80 °C

RHEYFIRM®(SI) NTMCGCWOEUS

Number of cores and nominal cross-section (mm²)	Outer diameter		Weight approx. (kg/km)
	Min. (mm)	Max. (mm)	
6/10 kV			
1 x 16/16	20	23	690
1 x 25/16	21	24	800
1 x 35/16*	22	25	920
1 x 50/16*	24	27	1,100
1 x 70/16*	26	29	1,360
1 x 95/16*	28	31	1,610
1 x 120/16*	29	32	1,870
1 x 150/25	32	35	2,320
1 x 185/25	34	37	2,650
1 x 240/25	38	41	3,320
12/20 kV			
1 x 16/16	24	27	870
1 x 25/16*	26	29	1,030
1 x 35/16*	27	30	1,150
1 x 50/16*	29	32	1,340
1 x 70/16*	30	33	1,580
1 x 95/16*	33	36	1,920
1 x 120/16*	35	38	2,190
1 x 150/25*	36	39	2,610
1 x 185/25*	39	42	3,040
1 x 240/25*	42	45	3,660

*Stocked products

Options

- Pre-assembled with sealing ends upon request
- Other voltages on request

1. Generalities

Copper conductors for flexible handling cables are manufactured in accordance with IEC 60228 DIN VDE 0295 / CENELEC HD 383 and prEN 60228.

Nexans uses class 5 and /or class 6 design.

2. Conductor material


Copper (Cu), a nonferrous metal with a density of 8.945 kg/dm³ and a melting point of 1,083 °C is characterized by a high degree of chemical stability and excellent thermal and electrical conductivity.

Mechanical and electrical properties :

- tensile strength 210 to 230 N/mm²
- elongation at break > 40 %
- electrical conductivity > 58.0 m/Ω mm²


(the indicated values are non binding average values)

Class 5 flexible copper conductor for single-core and multi-core cables

Nominal cross-section area (mm ²)	Maximum diameter of wires in conductor		Maximum resistance of conductors at 20 °C	
	 FSC* (mm)	IEC 60228 (mm)	Plain wires (Ω/km)	Metal-coated wires (Ω/km)
0.5	0.191	0.21	39.0	40.1
0.75	0.191	0.21	26.0	26.7
1	0.191	0.21	19.5	20.0
1.5	0.251	0.26	13.3	13.7
2.5	0.251	0.26	7.98	8.21
4	0.301	0.31	4.95	5.09
6	0.301	0.31	3.30	3.39
10	0.396	0.41	1.91	1.95
16	0.396	0.41	1.21	1.24
25	0.396	0.41	0.780	0.795
35	0.396	0.41	0.554	0.565
50	0.396	0.41	0.386	0.393
70	0.396	0.51	0.272	0.277
95	0.396	0.51	0.206	0.210
120	0.396	0.51	0.206	0.210
150	0.396	0.51	0.129	0.132
185	0.396	0.51	0.106	0.108
240	0.396	0.51	0.0801	0.0817
300	0.396	0.51	0.0641	0.0654

*FSC: Flexible Stranded Conductor with optimized length of lay

Class 6 flexible copper conductor for single-core and multi-core cables

Nominal cross-sectional area (mm ²)	Maximum diameter of wires in conductor		Maximum resistance of conductors at 20 °C	
	 exans FSC* (mm)	IEC 60228 (mm)	Plain wires (Ω/km)	Metal-coated wires (Ω/km)
0.5	0.148	0.16	39.0	40.1
0.75	0.148	0.16	26.0	26.7
1	0.148	0.16	19.5	20.0
1.5	0.148	0.16	13.3	13.7
2.5	0.148	0.16	7.98	8.21
4	0.148	0.16	4.95	5.09
6	0.191	0.21	3.30	3.39
10		0.21	1.91	1.95
16		0.21	1.21	1.24
25		0.21	0.780	0.795
35		0.21	0.554	0.565
50		0.31	0.386	0.393
70		0.31	0.272	0.277
95		0.31	0.206	0.210
120		0.31	0.206	0.210
150		0.31	0.129	0.132
185		0.41	0.106	0.108
240		0.41	0.0801	0.0817
300		0.41	0.0641	0.0654

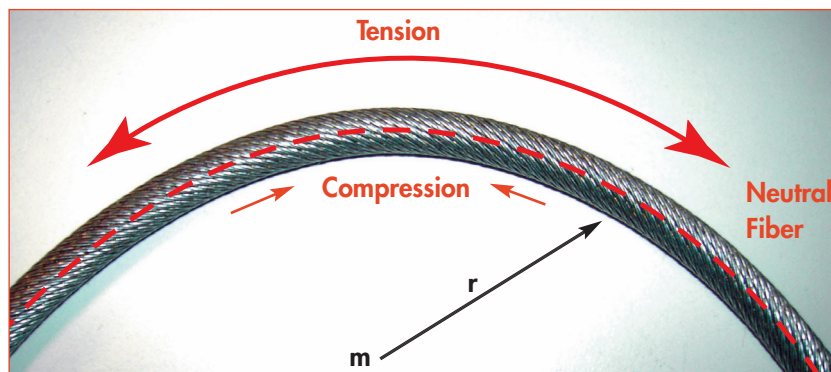
*FSC: Flexible Stranded Conductor with optimized length of lay

3. Design and function of stranded flexible conductors

To ensure optimum service life in crane applications, the conductor must be flexible including high bending qualities.

Flexibility is defined as the force required to bend the conductor. The best results can be achieved by subdividing the conductor diameter into several individual strands. Smaller the diameter of the individual wires, higher the flexibility of the conductor.

Individual strands are twisted together to ensure the necessary cohesion within the conductor. When a conductor is bent with a radius r , tensile and compression stresses are created within the conductor, the extent of which depend on r . The tensile forces are most pronounced in the outer margins of the conductor farthest away from the bending center m , whereas the compression stress is highest in the marginal area closer to the bending center m .



r = bending radius
 m = bending center

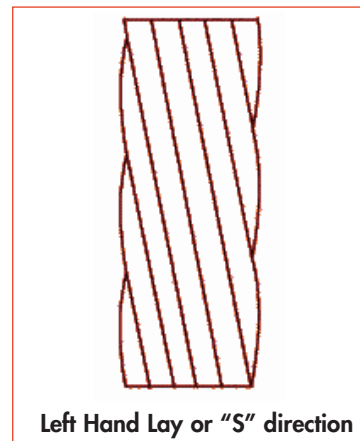
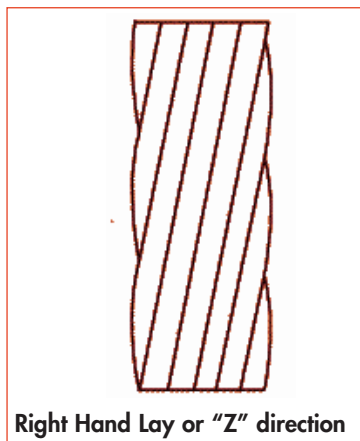
A conductor consists of several twisted strands, the individual wires change their position with varying degrees of frequency between bending and compression areas, so that the tensile and compression stress virtually offset each other.

Consequently, such offsetting processes can take place more frequently if the length of lay is shortened. By this way, all handling cables from NEXANS are optimized regarding the best bending qualities and flexibility for reeling and festoon applications.

Direction of lay

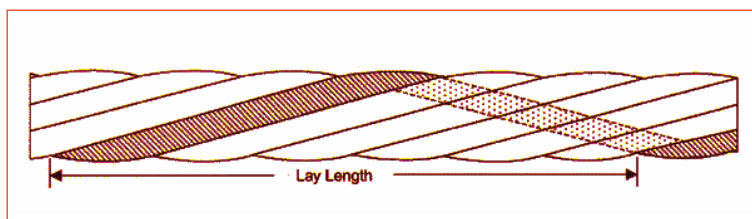
The stranding of a conductor is clearly defined when the twisting direction of the strand is also defined.

The two possible twist directions are usually indicated with the letters S and Z, respectively (regardless of the observer's position).



Length of lay

The length of lay is defined as the quantifiable twist completed by a strand around the conductor axle, as measured in the axial direction. Frequently, the length of lay is also measured as a multiple of the conductor diameter: e.g. $10 \times D$.



Frequently used strands and ropes

Bunched wires

This type of conductor is characterized by the fact that the position of individual wires is not clearly defined. Any number of wires can be bundled and twisted – they are bunched.

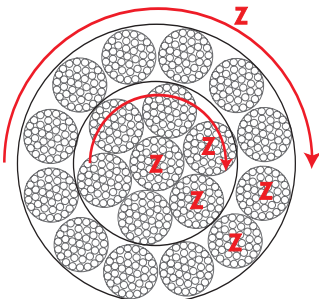
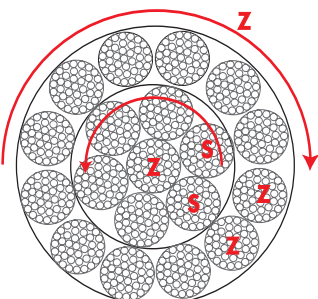
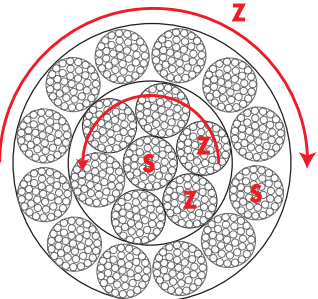
Nexans uses this conductor type in their flexible handling cables only for $\leq 10 \text{ mm}^2$.

Concentric rope lay conductors

Rope-lay conductors consist of a number of rope-lay elements characterized by regular concentric stranding layers. Within the stranded conductor, the position of each member in relation to its neighbouring members is clearly defined. Rope-lay conductors are characterized by uniform surface and almost roundness.

Its bending stability is high; its shape stays round and circular.

For the different applications we find following various rope-lays:

Rope-lay type	Equal-lay	Reversed-lay	Cross-lay																																				
Definition	All lay directions in the strand and rope lays are uniform	The lay directions of the individual layers in the rope-lay conductor alternate. However, the lay direction in the rope lay still corresponds to that of the respective strand layer	Alternate lay directions in successive layers of the strand and opposite lay direction of rope-lays and stranded layers.																																				
																																							
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Characteristics	- High flexibility	<ul style="list-style-type: none"> - Good flexibility - Resistant referring to torsional stress - Good axial compression and bending strength 	<ul style="list-style-type: none"> - Very resistant referring to torsional stress - Very good axial compression and bending strength 																																				

In the case of a 3 layer design, the 3rd layer is Z stranded.

The inner layers are in the same direction as shown in the drawings.

Compounds for Nexans handling cables

1. Generalities

The selection of the correct compound assume the detailed analysis of the application where the cable is used.

In the case of flexible, movable applications such as in cranes the compounds for insulation, semi-conductive layer, outer and inner sheaths are chosen by Nexans for several factors as high mechanical properties, chemical resistance and thermal requirements.

Nexans is familiar with the high performance requirements in flexible applications combined with high mechanical stress. Due to this, Nexans especially uses in our RHEYFIRM®(RTS) only high-grade rubber insulation such as RHEYCLEAN®-HV.

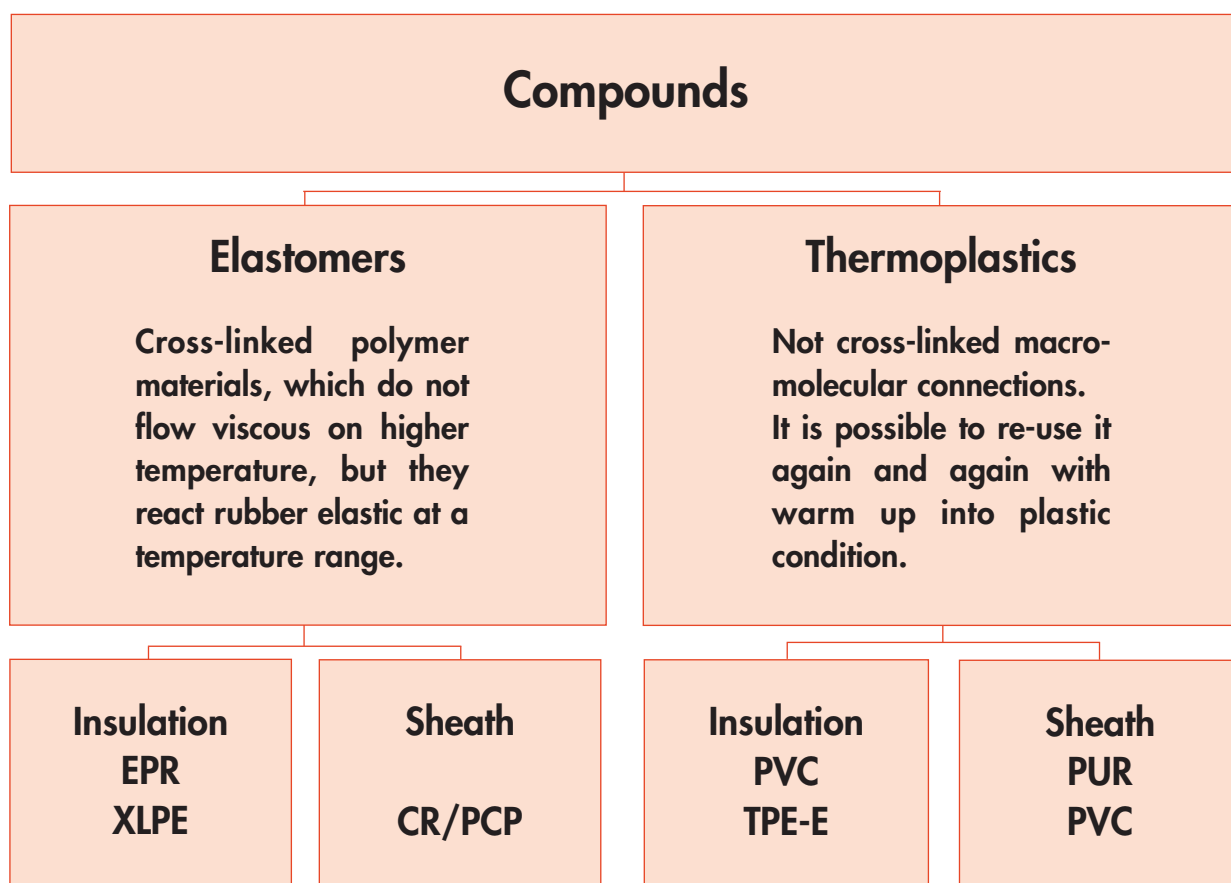
This special compound, manufactured in several versions allows to reduce wall-thickness for the different voltage rates from 6 to 30 kV. We generally use compounds that exceed required standards like VDE.

In our product range RHEYFIRM®(RTS) and RHEYCORD®(RTS) we only use the compound **5GM5** instead of 5GM3. This high grade compound has a much higher tensile strength, tear resistance and abrasion resistance than the more commonly used compound 5GM3.

Additional advantages of this special outer sheath compound are high flame retardancy properties, ozone, weather and ageing resistance. Furthermore it has excellent elastic behaviour even in low temperatures.

NEXANS distinguish compounds between **Thermoplastics** and **Elastomers**.

Both compounds are used for insulation, inner and outer sheaths. The graph and table on the following pages give a short introduction to compound and explain the typical and most important characteristics from several materials used in Nexans handling cables.



Basic RAW Materials used in Nexans Handling Cables

TERMS			THERMAL PROPERTIES				CHEMICAL PROPERTIES			MECHANICAL PROPERTIES				COMPOUNDS
Abreviation	VDE Designation	Chemical Designation	Ambient Temperature (mobile operation) (°C)	Weather Resistant	Flame Retardant	Behaviour in case of fire	Chemical Resistance (oil, grease, fuel, solvent)	Halogen Free	Water Absorption (%)	Flexibility	Abrasion	Tensile Strength (N/mm²)	Elongation at break (%)	
PUR	11Y	Polyurethane	-55 +80	+++	-	flammable	+++	Yes	0.5	++	+++	35-50	550-650	80
TPE-E	13Y	Polyester	-100 +130	used only for insulation	-	flammable	++	Yes	0.5	++	used only for insulation	12.5-25	130-150	70-95
PVC	Y	Polyvinyl chloride	-25 +70	++	++	self extinguish	++	No	0.4	+++				
XLPE		cross-linked polyethylene	-50 +90	used only for insulation	-	flammable	+	Yes	0.7	+ -	+	15-18	300-450	+
CR/PCP	5G	Polychloroprene	-40 +100	+++	+++	self extinguish	+++	No	1.0	+++	++	19	550-750	70
EPR	3G	Ethylene - Propylene Rubber	-30 +90	used only for insulation	+ -	flammable	+	Yes	0.1	+++	used only for insulation			
EVA	4G	Ethylene - vinylacetate	-30 +125	used only for semi-conductive layer										
ELASTOMERS														

+++ excellent ++ very good + good + - medim - low

Strength Member

Strength members in flexible cables could be placed in different arrangements:

- outside the cable
- elements (e.g. braid) between inner and outer sheaths
- in flat cables besides the cores
- in the center of cable.

The effects of a strength member are:

- to take over a part of the pulling force to reduce the mechanical stress from the copper conductor.

It ensures compliance with VDE 0298 standard part 3 of 15 N/mm² (referring to the copper cross-section of the main cores).

- to reduce the risk of a corkscrew-effect. That would be caused by turning off the stranding from the cores and simultaneous turning on in an other part of the cable length.
- to reduce the risk of torsion in a cable by a reduction of the tensile force of the stranding conductor.

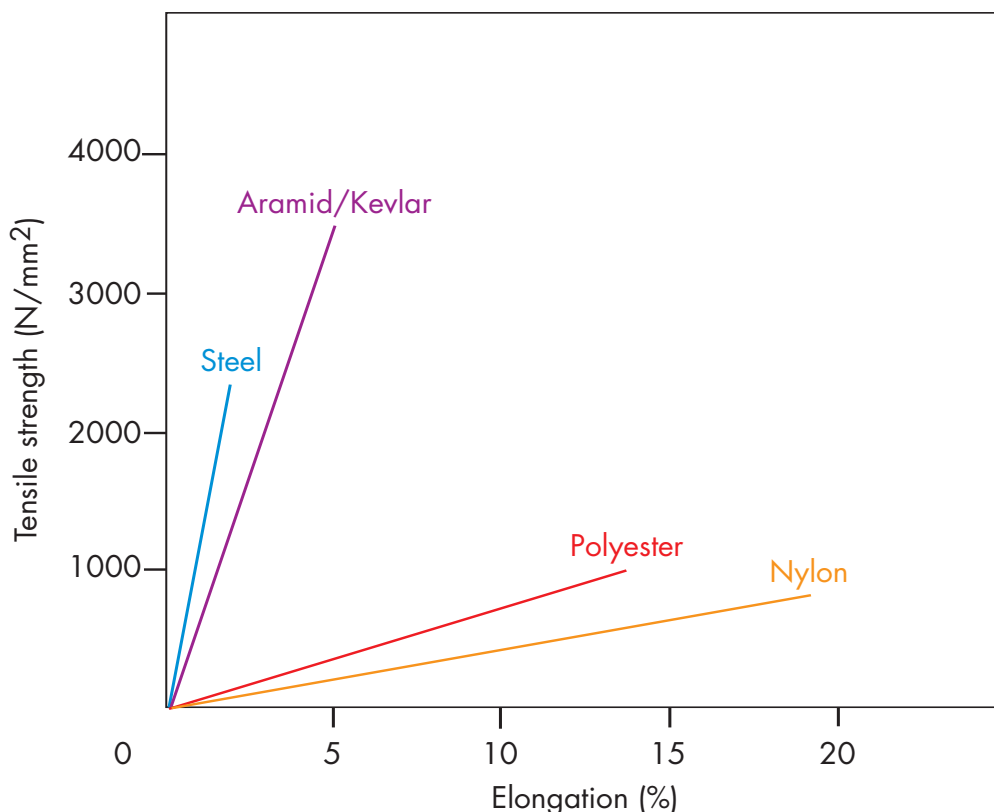
The most common strength members are:

- Steel rope
- Polyamid/ polyester ropes
- Aramid/ kevlar yarns
- Natural fiber e.g. sash line
- Coated E-glass

Depending on the detailed application of the flexible handling cable, physical characteristics like elongation [%], elastic stability (N/mm²), breaking load (kN), laying types and reversed bending properties of the different strength members must be analysed.

Other integrated elements like reinforcement braids used as strength member, relieve the conductor *after* stress application. The strength members used by Nexans relieve the conductor *instantaneously* with stress application.

Stress-strain curves

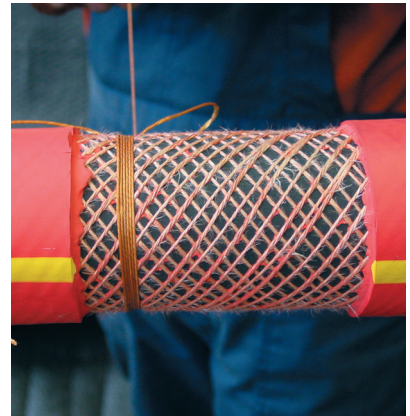


Anti-Torsion Braid

In most flexible handling cables, we use an anti-torsion braid. The anti-torsion braid consist of synthetic threads with a very high tensile strength. It is embedded between inner and outer sheath to prevent twisting, loops, push off the outer sheath and "corkscrew-effects".

I Torsional stresses is caused by different conditions:

- Changes of direction into different planes
- Non aligned guide pulley
- Sloping cable guide into the deflection pulley
- High dynamic stress
- High tensile load of the cable



Anti-torsion braid in a RHEYFIRM® (RTS)

I Criterias to build up a heavy duty reinforcement:

- A good chemical bonding between synthetic threads and sheath compound
- Braid angle
- Braid coverage pourcentage
- Material of reinforcement
- Shear resistance of the reinforcement element



Cork screw-effect

Bending Radius

To ensure a long life term for flexible cables in handling applications it is important to considerate the following table which is based on the VDE standard and our additional experience. If the bending radius is reduced, simultaneous stresses on all components of the cable increase and damages could appear.

Cable Type	cable outer diameter (mm)	APPLICATIONS						s-shape deflection
		entry bell	festoon application	e-chain	reeling operation	cable tender	deflection pulleys	
RHEYCORD(BS) RHEYCORD RHEYCORD (RTS) RHEYFESTOON	up to 8 mm	3 x d	3 x d	4 x d	5 x d	7.5 x d	7.5 x d	20 x d
	9 - 12 mm	4 x d	4 x d	4 x d				
	13 - 20 mm	5 x d	5 x d	5 x d	5 x d	6 x d		
		above 20 mm	5 x d	5 x d				
RHEYFIRM (RTS) RHEYFIRM (SI)		10 x d	10 x d	10 x d	12 x d	15 x d	15 x d	
BUFLEX DGR		6 x d	6 x d	6 x d	8 x d	8 x d	8 x d	20 x d
BUFLEX SEM BUFLEX SC		10 x d	10 x d	10 x d	10 x d	15 x d	15 x d	20 x d
RHEYCORD-PUR R	up to 8 mm			6 x d	6 x d		7.5 x d	
	9 - 12 mm							
	13 - 20 mm							
		above 20 mm			8 x d	8 x d		
H07VVH6-F PVC-Flat			10 x t					
RHEYFLAT-N			10 x t					
RHEYCORD-OFE R	14 - 16 mm	200 mm	125 mm	125 mm	125 mm	200 mm	200 mm	500 mm
RHEYCORD-OFE SR	17 - 19 mm	200 mm	125 mm	125 mm	125 mm	200 mm	200 mm	500 mm
RHEYCORD-OFE M	9 - 11 mm		125 mm	125 mm				

d = outer diameter

t = thickness

Low voltage: Flexible Cable Types

H	N	(N)	N	(N)	(N)	(N)	harmonized type
	S	S					standard type according to VDE
	H	H					in line with VDE
07							tough flexible cable
							heavy duty cable
V V			G	G	3G	3G	nominal voltage 450/750 V
							rubber (EPR) insulation
					RD	RD	PVC insulation and PVC sheath
H6			FL	FL			flexible round cable
-F							flexible flat cable
	T	T					harmonized flat cable
				C			conductor class, fine stranded class 5
			G	G			anti-torsion element
					G		metallic screen over cores
					C		rubber sheath
	OE	OE			5G	5G	screen between inner and outer sheath
	U	U					outer sheath, rubber type 5GM5 according to DIN VDE 0207 part 21
	-J	-J					oil resistant
							flame-retardant
							with green/yellow core
							without green/yellow core
							Reduced Torsion Special
							RHEYFESTOON®(N)3GRD5G Flexible Round Festoon Cables
							RHEYFESTOON®(N)3GRDGC5G Flexible Screened Round Festoon Cables
							RHEYFLAT®-N (N)GFLCGOEU-J Screened Rubber Flat Cables
							RHEYFLAT®-N NGFLFOEU-J Rubber Flat Cables
							RHEYCORD®(RTS) (N)SHTOEU-J Extra Heavy Duty Reeling Cables
							RHEYCORD® NSHTOEU-J Reeling Cables
							H07VVH6-F PVC Flat Cables

High voltage: Flexible Cable Types

(N)	(N)	(N)	in line with VDE
T	T	T	trailing
S		S	heavy duty
	M		single sheath type
		FL	flexible flat cable
CGE			conducting non metallic screen
	CGC	CGC	conducting metallic screen
W	W	W	heat-resistant EPR insulation
T			anti-torsion element
OE	OE	OE	oil resistant
U	U	U	flame-retardant
S	S	S	PCP outer sheath type 5GM5 according to DIN VDE 0207 part 21
OFE		OFE	Optical Fiber Element
(RTS)			Reduced Torsion Special
(RS)			Reduced Special
			RHEYFIRM® (N)TSFLCGCWOEUS Flexible Flat Reeling Cables
			RHEYFIRM® (N)TMCGCWOEUS Flexible Screened Single Core Cables
			RHEYFIRM® (N)TSCGEWTOEUS Reeling Cables

Units of Measurement

Equivalence between metric size and AWG-kcmil

The US American standardization extracts several standardized sections from 0.324 to 253 mm².

Sections are designed by a gauge-number AWG or a section in MCM (Mil Circular Mil).

AWG numbers are identical with the British Brown and Sharpe (B&S) numbers.

1 Mil = 0.0254 mm = 1/100 inch

1 MCM = 0.5067 mm²

AWG/kcmil	mm ²	AWG/kcmil	mm ²	MCM	mm ²
18	0.823	7	10.55	250	127
17	1.04	6	13.3	300	152
16	1.31	5	16.77	350	177
15	1.65	4	21.15	400	203
14	2.08	3	26.67	450	228
13	2.63	2	33.62	500	253
12	3.31	1	42.41	550	279
11	4.17	1/0	53.49	600	304
10	5.261	2/0	67.43		
9	6.631	3/0	85.01		
8	8.361	4/0	107.2		

Conversion from non-metric systems - Measures of length

Unit	mils	inch	foot	yard	cm	m
1 mils	1	0.001	0.0000833	0.0000278	0.00254	0.0000254
1 inch	1,000	1	0.0833	0.02278	2.54	0.0254
1 foot	12,000	12	1	0.3333	30.48	0.3048
1 yard	36,000	36	3	1	91.44	0.9144
1 cm	393.7	0.3937	0.0328	0.01094	1	0.01
1 m	39,370	39.37	3,281	1,094	100	1

Voltage Definition

Definition

Nominal Voltage: voltage between phases for which the system is designated.

Operating Voltage: electrical potential difference between 2 conductors in normal conditions.

The cable voltage (U_0/U) is designed by 2 values:

- U_0 is voltage between phase and neutral
- U is voltage between phases

For alternative current system having a nominal voltage between 100 V and 1000 V

Operating Nominal Voltage		Cable Voltage
50 Hz	60 Hz	
230/400 V (+ or - 10%)	277/480 V	300/500 V
400/630 V (+ or - 10%)	480 V	450/750 V
1000 V	600 V	0.6/1 kV

For alternative current system having a nominal voltage above 1 kV and less than 35 kV (3 phases)

50 Hz		Cable Voltage
Highest voltage of equipment	Operating Nominal Voltage	
3.6 kV 7.2 kV 12 kV 17.5 kV 24 kV 36 kV	3 kV or 3.3 kV 6 kV or 6.6 kV 10 kV or 11 kV 15 kV 20 kV or 22 kV 33 kV	1.8/3 (3.6) kV 3.6/6 (7.2) kV 6/10 (12) kV 8.7/15 (17.5) kV 12/20 (24) kV 18/30 (36) kV
60 Hz		Cable Voltage
Highest voltage of equipment	Operating Nominal Voltage	
4.4 kV 14.5 kV 26.4 kV	4.16 kV 13.8 kV 24.94 kV	3.6/6 (7.2) kV 8.7/15 (17.5) kV 18/30 (36) kV

Current Carrying Capacity

Correction factors

Short-circuit capacity

1. Current Carrying Capacity

Nominal cross section of conductor (mm ²)	XLPE or EPR	PVC	XLPE or EPR	XLPE or EPR
	Single-core cable free in air in acc. with EN 50 355 (A)	Multi-cores cable three loaded cores free in air type E in acc. with IEC 60 364-5-52-12 (A)	Multi-cores cable three loaded cores free in air in acc. with IEC 60 364-5-52-12 (A)	Multi-cores cable three loaded cores on ground in acc. with IEC 60 364-5-52-12 (A)
1.5	29	19	23	22
2.5	38	25	31	29
4	53	34	42	40
6	69	43	54	51
10	98	60	75	71
16	127	80	100	95
25	173	101	127	121
35	219	126	158	150
50	276	153	192	182
70	345	196	246	234
95	414	238	298	283
120	489	276	346	329
150	564	318	395	375
185	644	362	450	428
240	776	424	538	511
XLPE or EPR Conductor temperature: 90 °C/ Reference ambient temperature of 30 °C PVC Conductor temperature: 70 °C/ Reference ambient temperature of 30 °C				

2.1 Correction factors for ambient air temperature

Ambient Temperature (°C)	PVC Insulation Temperature: 70 °C	XLPE or EPR Insulation Temperature: 90 °C
10	1.22	1.15
15	1.17	1.12
20	1.12	1.08
25	1.06	1.04
30	1.00	1.00
35	0.94	0.96
40	0.87	0.91
45	0.79	0.87
50	0.71	0.82
55	0.61	0.76
60	0.50	0.71
65		0.65
70		0.58
75		0.50
80		0.41

2.2 Correction factors for reeling cables

Basis in free air (in line with EN 60204-11)

	Multilayer Reel				Monospiral Reel		
Number of layers	1	2	3	4	round cable ventilated	round cable non-ventilated	flat cable ventilated
	0.85	0.65	0.45	0.35	0.85	0.75	0.65

2.3 Reduction factors for groups of several circuits or several multicore cables

	Number of 3 cores circuits							
Arrangement	1	2	4	6	9	12	16	20
Bunched in air, on a surface, embedded or enclosed	1.00	0.80	0.65	0.55	0.50	0.45	0.40	0.40

3 Short-circuit current density in A/mm² for 1 second

	Number of 3 cores circuits								
Insulating material	Permissible operating temperature	Permissible short-circuit temperature	90 °C	80 °C	70 °C	60 °C	50 °C	40 °C	30 °C
plain copper conductor + PVC	70 °C	150 °C			109	117	124	131	138
tinned copper conductor + EPR	90 °C	200 °C	122	128	135	141	147	153	159
plain copper conductor + EPR	90 °C	250 °C	143	149	154	159	165	170	176
plain copper conductor + XLPE	90 °C	250 °C	143	149	154	159	165	170	176
plain copper conductor + TPE	90 °C	250 °C	143	149	154	159	165	170	176

For other short-circuit times (lower than 5 seconds), the short-circuit current density has to be calculated with the following formula:

$$d_t = d \times 1/\sqrt{t}$$

Voltage Drop

Voltage drops are determined by using the following formula:

$$\Delta u = b \times l \times i_b (R \cos \varphi + \lambda \sin \varphi)$$

With:

Δu	voltage drop (in Volts)
b	coefficient equal to $\sqrt{3}$ for three-phases circuits, or 2 for single-phase circuits
R	electrical resistance of conductors in normal service (in Ω/km)
l	straight length of the wiring systems (in km)
$\cos \varphi$	power factor, if no precise details, the power factor is taken equal to 0.8 ($\sin \varphi = 0.6$)
λ	reactance per unit length of conductors (in Ω/km)
i_b	current value (in Ampere)

For the application of the formula it is necessary to know the exact cable specification.

For a fast calculation of the section it is recommended to use the following tables which give the value of the voltage drop, available for most of the low voltage cables and for different values of $\cos \varphi$.

Voltage drops are calculated for a three-phases circuit:

- 3 or 4 copper cores cables
- 3 single cores cables

Low voltage cables with PVC insulation (max. temperature: 70 °C) 3 or 4 copper cores

Cross-section area (mm ²)	Voltage drop (V/ A x km)			
	cos φ = 1	cos φ = 0.9	cos φ = 0.8	cos φ = 0.6
1.5	25.10	22.70	20.20	15.30
2.5	15.20	13.70	12.30	9.30
4	9.50	8.60	7.80	5.80
5	6.40	5.80	5.30	4.00
10	3.80	3.50	3.20	2.40
16	2.40	2.20	2.00	1.60
25	1.50	1.40	1.30	1.04
35	1.10	1.06	0.97	0.80
50	0.80	0.80	0.74	0.62
70	0.56	0.57	0.55	0.46
95	0.40	0.43	0.42	0.37
120	0.33	0.37	0.36	0.32
150	0.26	0.30	0.30	0.28
185	0.21	0.26	0.27	0.25
240	0.17	0.22	0.23	0.22
300	0.13	0.19	0.20	0.21

Low voltage cables with EPR or XLPE insulation (max. temperature: 90 °C) 3 or 4 copper cores

Cross-section area (mm ²)	Voltage drop (V/ A x km)			
	cos φ = 1	cos φ = 0.9	cos φ = 0.8	cos φ = 0.6
1.5	26.00	24.20	21.50	16.20
2.5	15.50	14.40	12.80	9.60
4	10.00	9.00	8.00	6.10
5	6.60	6.10	5.40	4.20
10	3.90	3.60	3.20	2.50
16	2.50	2.30	2.10	1.50
25	1.60	1.50	1.35	1.10
35	1.15	1.10	1.00	0.85
50	0.85	0.80	0.75	0.65
70	0.57	0.60	0.55	0.50
95	0.42	0.45	0.42	0.40
120	0.33	0.35	0.35	0.34
150	0.27	0.30	0.30	0.31
185	0.22	0.25	0.22	0.24
240	0.17	0.20	0.21	0.23
300	0.14	0.17	0.20	0.21

BUS System Data transmission

BUS Systems are used as a communication medium for sectorized actuators, sensors and steering in the automation industry and where electronic modules

have to be connected easily. Only one cable connects all components.

Field bus is the generic name for all bus systems which are used for the metrology, steering and controlling engineering.

These are:

- CAN
- ProfiBUS
- InterBUS
- ASI BUS

According to DIN (German Institute for Standardization) standard a field bus in general should transmit a small volume of data in fast time series on a digital compare between sensors, actuators and steering. as the requirements to the bus system depends on the level of automation, there is

no field bus which can solve all tasks optimal together.

Following table shows a short overview of the most important features of the three most popular BUS systems:

BUS systems	Highest BPSe	Biggest dimensions	Maximal number of participants	Standardization
CAN BUS	1 Mbit/s to 40 m	1 km at 50 Kbit/s	64(128)	ISO 11898
ProfiBUS	500 Kbit/s to 200 m	1200 m at 93 Kbit/s	256	ISO 19245
InterBUS	500 Kbit/ s to 40 m	12,8 km at 400 m Segments	256	ISO 19258

Profi-BUS Family

EN 50170 Volume 2 and DIN 19245 Part 1 to 4			
Device profiles Application profiles	Automation for General Purposes PROFIBUS-FMS Universal <ul style="list-style-type: none"> • Large variety of applications • Multi-Master communication 	Factory Automation PROFIBUS-DP Fast <ul style="list-style-type: none"> • Plug and Play • Efficient and cost effective 	Process Automation PROFIBUS-PA Application oriented <ul style="list-style-type: none"> • Powering over the BUS • Intrinsic Safety

Optical Fibers

I General Overview

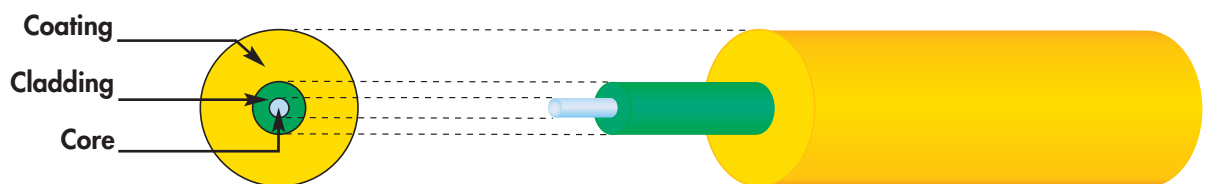
Optical fibers are mainly used to transmit information over long distances and with high bit rates. Their benefits are numerous: the signal transmitted on the fiber is not disturbed by any electromagnetic wave created by power cables or electric machines. It also provides more security, as these cables can be fully dielectric. Besides, they provide a weight and space saving due to their small diameter, only 250 μm .

An optical fiber is made up of three main parts: the core, the cladding and the coating.

In the center, the "core" is made of doped silica and is surrounded by the "cladding", made of natural silica.

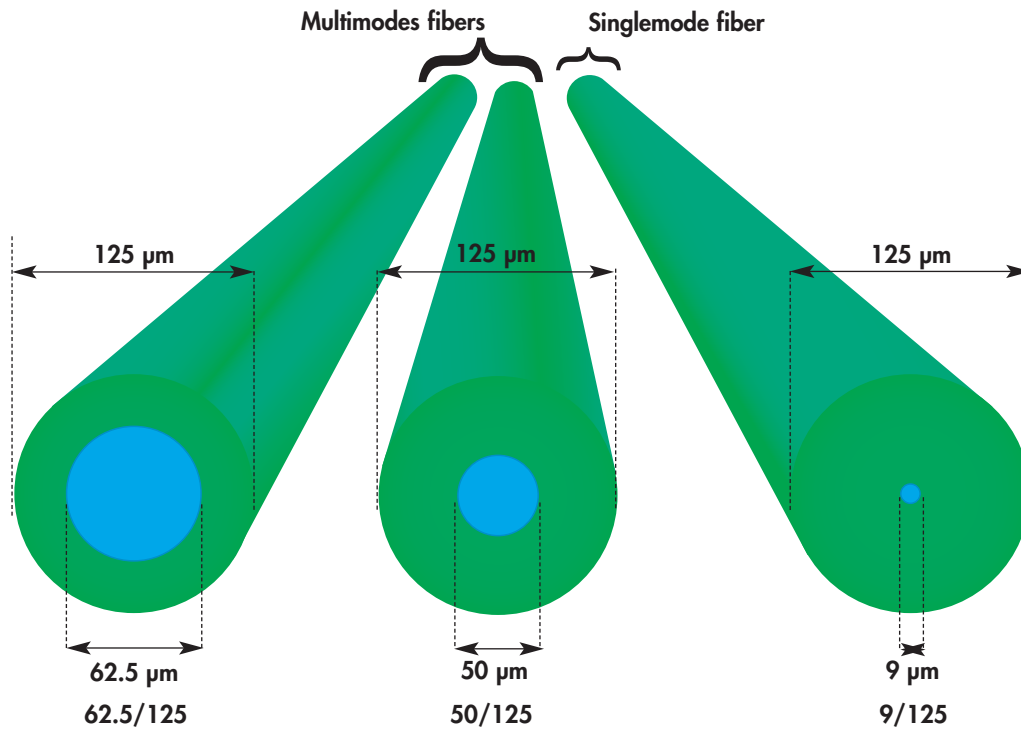
The light signal propagates along the core and the signal is reflected on the surface between the core and the cladding.

An acrylic "coating", generally made of two layers, is protecting the silica part against abrasion during installation.



Different fiber types are available:

- Multimode fibers are used for Local Area Networks (LAN) where the network links can be up to 2,000 meters. Two standard sizes of core are offered: 62.5 μm and 50 μm (with better performances). Multimode fibers have a graded index profile to reduce the dispersion of the signal during the transmission. The high size of the core is interesting for easy connection and does not require high cost test equipment.
- Singlemode fibers are able to transmit over longer distances. The installation is more delicate as they have a smaller core of 9 μm . This implies more precise connectors and test equipment.



On a global network point of view, although the cost of multimode fiber is more important than the singlemode's, the complete system is more economic. Indeed Multimode fibers are used with cheap transmission components LED⁽¹⁾ or VCSEL⁽²⁾ whilst Singlemode fiber operates with more expensive LASER.

⁽¹⁾ LED: Light Emitting Diode

⁽²⁾ VCSEL: Vertical Cavity Surface Emitting Laser

Optical fibers are used at specific wavelength. Multimodes fibers are mainly used at 850 nm and 1,300 nm and Singlemode are used at 1,310 nm and 1,550 nm. The attenuation performances are better at the higher bandwidth with consequently improved transmission performances.

Optical fiber can be provided with different characteristics. Indeed the performance need for fiber in patch cord or fiber over one kilometer link are obviously different. The fiber choice is based on optical parameters such as attenuation, bandwidth performances and chromatic dispersion.

Different international standards are available to describe the optical fiber characteristics: ITU G652 for Singlemode fiber and IEC 60793-2-10 for Multimode fibers are worldwide references.

Optical fiber properties

	G 50/125	G 62.5/125	E 9/125
Attenuation coefficient at 850 nm	2.8 dB/km	3.3 dB/km	
Attenuation coefficient at 1,300 nm	0.8 dB/km	0.9 dB/km	0.4 dB/km
Attenuation coefficient at 1,550 nm			0.3 dB/km
Minimum modal band with at 850 nm	> 200 MHz.km	> 200 MHz.km	
Minimum modal band with at 1,300 nm	> 200 MHz.km	> 200 MHz.km	
Numerical aperture	0.200 ± 0.02	0.275 ± 0.02	
Dispersion at 1,285 - 1,330 nm			≤ 3.5 ps/nm.km
Dispersion at 1,550 nm			≤ 18 ps/nm.km

Optical fiber connectors

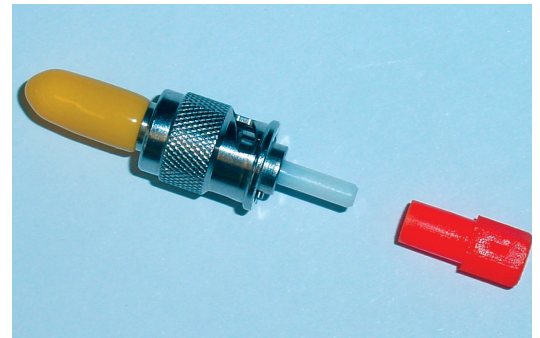
Nexans are able to preassemble optical fibers with plugs, we can provide this service in our factory or on site. A fiber optic connector is a non permanent join between two fibers.

In the optic connector systems gives a plurality to connector, they are not compatible among on another. It is recommendable to use ST connector or E2000 connector for reel and flexible cables with integrated fiber optics.

A high quality connetor is required to achieve the best possible transfer of light signal between fibers.

ST Connector (standard)

This type of connector is suitable for both multimode fiber and singlemode fiber. The ST connector and the bajonet-holder is the most popular used connector worldwide.

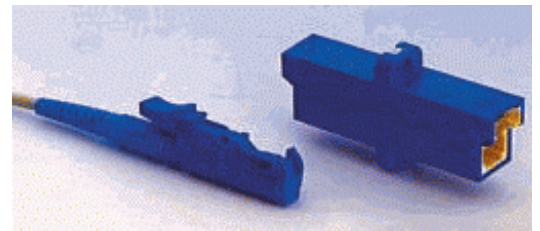


E2000 Connector

An E2000 connector is a special connector with high level attenuation coefficient. This connector is suitable for multimode fiber and singlemode fiber.

Due to the code system, this connector is very user friendly and can also be fit as a single connector or duplex connector

The built-in filler cap protects the ferrule against contamination. The filler cap open/close during the connector plug in/out.



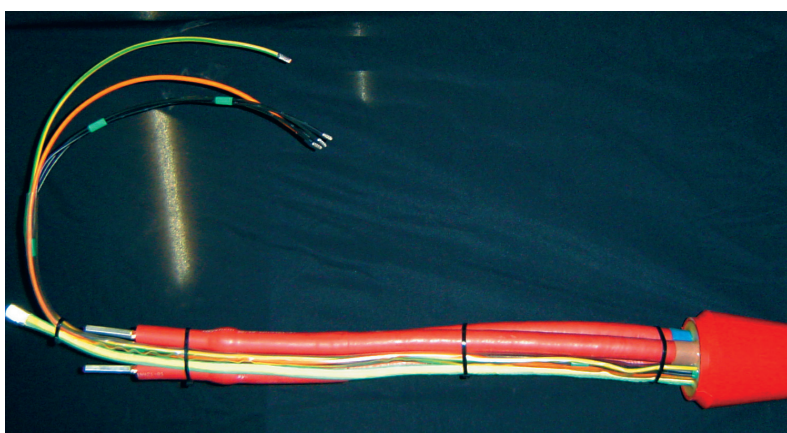
Sealing Ends

Generalities

Besides cables, Nexans group manufactures sealing ends and plugs for high voltage cables up to 30 kV. We are able to offer preassemblies of outdoor and indoor sealing ends. We can provide this service in our factory or on site.

Indoor Sealing Ends

Used for high voltage cables from 6 up to 30 kV for transformers, substations, terminal boxes and motor connections boxes.



Outdoor Sealing Ends

Used for high voltage cables from 6 up to 30 kV for connections to overhead lines, in dirty environments and emergency power supplies.



High Voltage Plugs

Inner or outer cone plugs and three-phases open pit plugs.



I Generalities

From an economical point of view it only makes sense to repair or splice handling cables having a large conductor size. For implementation of splices well-founded knowledge of the fitter is needed. Furthermore for a bunched conductor splice a vulcanizing machine for the vulcanisation of elastomeric compounds is required.

First step is to strip-off the outer and inner sheaths. Further the bunched conductor has to be welded strand by strand, and layer by layer.

By using different material tapes, we rebuild the triple extrusion:

- semi-conducting inner layer
- insulation
- semi conducting outer layer

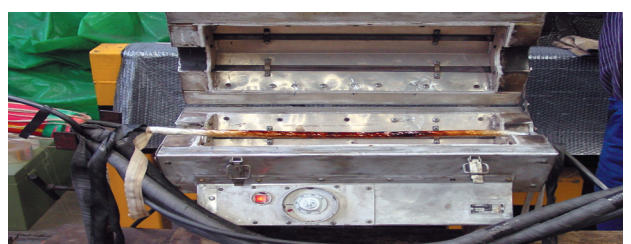
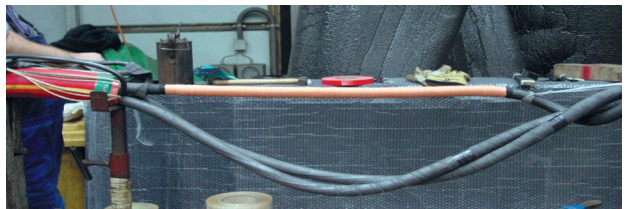
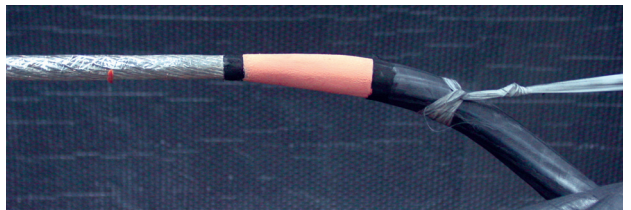
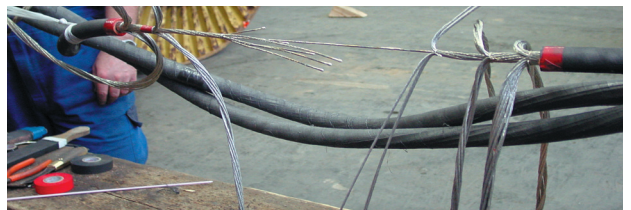
After applying and vulcanization of the inner sheath the reinforcement will be wrapped.

Finally the outer sheath will be taped till the equal diameter of the original cable.

Vulcanizing machine

The fundamental principle of splicing is to build an exact reproduction of the handling cable design (including the outer diameter) and the flexibility.

Pictured below, for a HV reeling cable, a short introduction shows the different phases of a repair.



Mechanical Tests for flexible handling cables

I Generalities

In Nexans factories, strict quality control is one of the most important tasks to ensure a long-life term of our products.

Due to the high mechanical, torsion and tensile stresses appeared in handling applications, Nexans carry out extreme mechanical type tests before a new product range is introduced into the market. The test conditions are much more harder then the reality in the application.

Climate-tests, continous-tests for artificial ageing, mechanical and chemical compound properties (e.g. tensile strength, elongation, density, tear resistance and abrasion, oil, ozone, UV resistance) serve to increase the operating period of our products. All these tests are the basis for Nexans to improve the high quality level and cable performance.

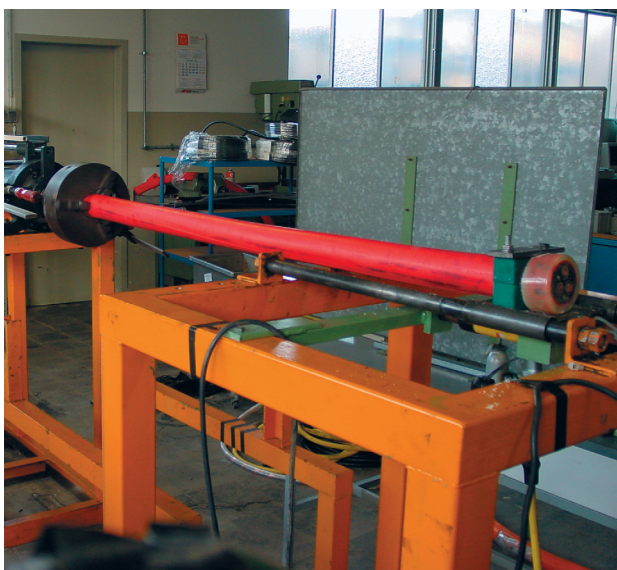
I Torsional Resistance Test / Anti twisting test

The torsional resistance test is carried out to evaluate the mechanical behaviour of cable with respect to, it's twisting properties at simultaneous tensile load, different torsional angle and twisting speed.

Operating conditions:

- tensile force: up to 4,000 N
(depending on cross-section)
- torsional force: 200 Nm
(depending on cable length and cross-section)
- torsional angle: $\pm 100^\circ$
(depending on clamping length)

The anti twisting test is carried out to evaluate the resistance of the cable regarding of twisting force.

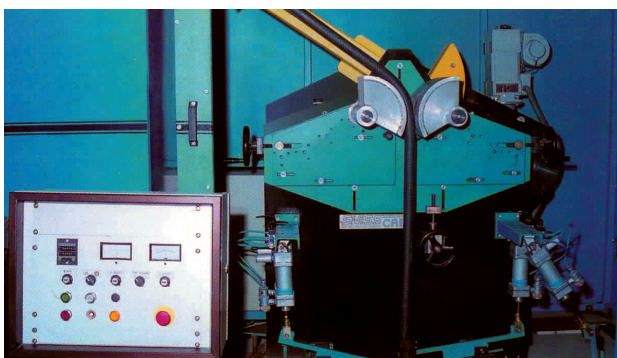


I Alternating/Reversed Bending Test

In line with the VDE 0472 standard part 603. To show the operating conditions under enhanced bending stress. This test permits us to develop better conductor design.

Operating conditions:

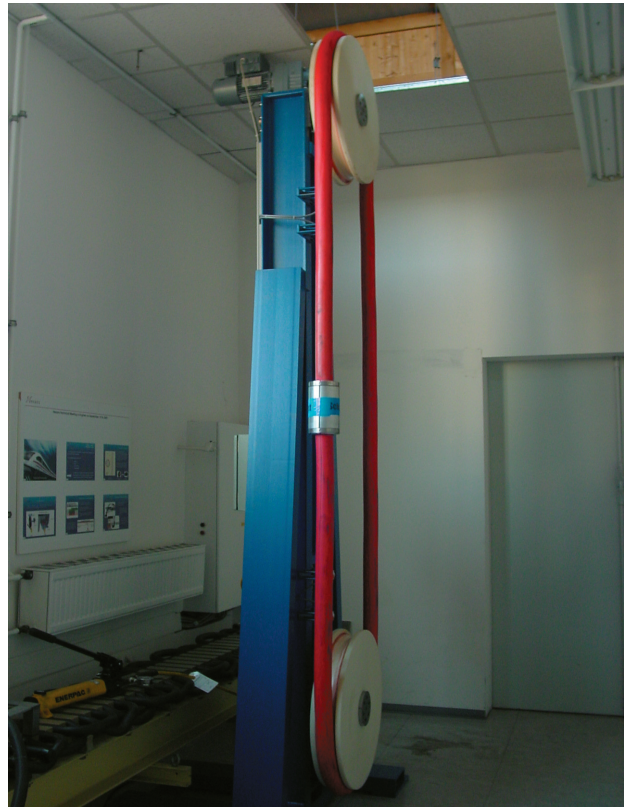
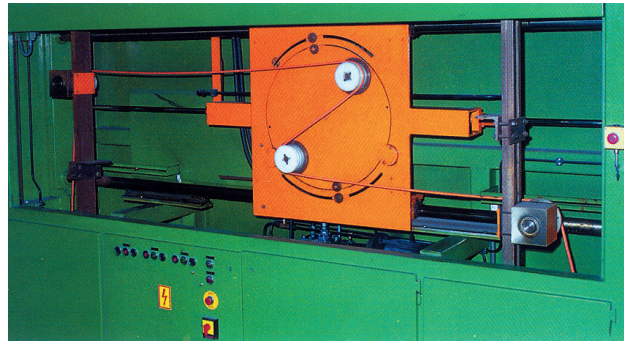
- cycle movement: max 180°
- tensile load: max 3,000 N
(depending on cross-section)



Roller Bending Test

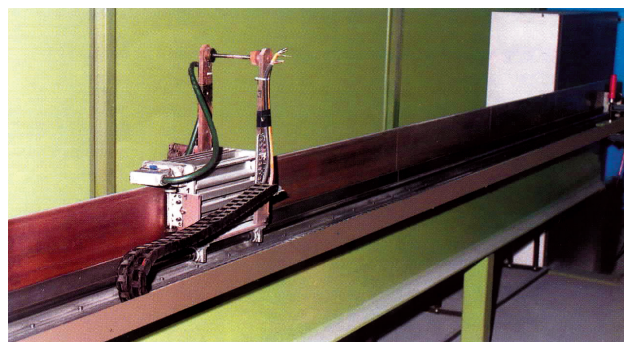
The bending test is used for operating time-lapse evaluation of flexible cables for middle and heavy duty service with regard to:

- travelling behaviour over pulleys under simultaneous pulling force
- determination of broken wires under service
- quality of repairing points



Drag Chain Test

This test facility permits the combination of small bending radius, with high acceleration and high speed movement.

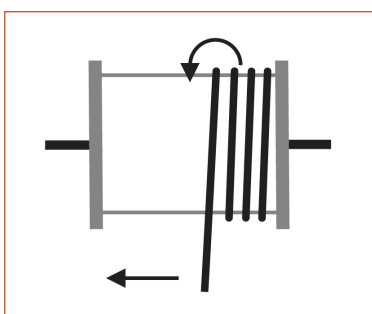
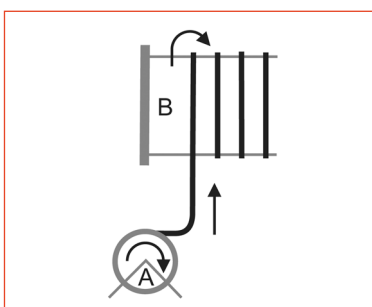
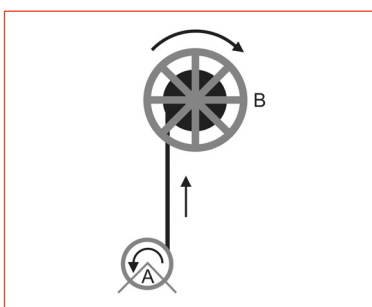


Installation and Laying Instructions

Long-life terms of flexible reeling cables in cranes and other handling systems depend on cables installation and laying in a professional way. To ensure that, you have to respect the following rules:

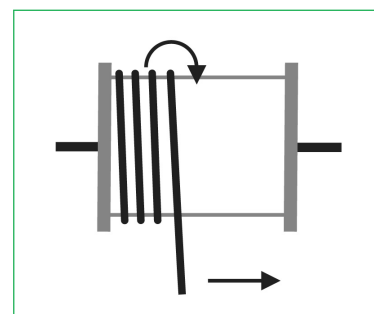
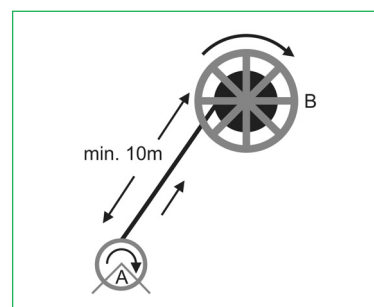
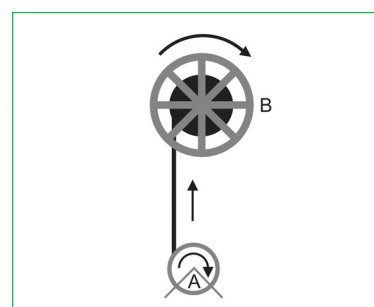
The most professional and safety way to avoid torsion stress is to lay the complete cable length from the supply drum over support rollers on the ground with unfixed ends. If this is not possible, in case of less space, lay up the cable like in the below mentioned ways.

WRONG



Changes in directions must be avoided.

RIGHT



To traverse a Nexans flexible cable length (left hand laid) on a cylindrical reel, you must start on the **left** side of the reel for winding up as shown on the picture.

Feeding / Anchoring Systems for reeling cables

Generalities

To ensure an optimum result regarding the service life of reeling cables, some important instructions must be noticed in the various methods of feeding/anchoring systems.

Center feeding

In many installations the anchoring device is located at the center of the guideway. Flexible reeling cables are normally connected over the entry bell through the underground center point. To guaranty an effective strain-bearing, the flexible handling cable must be turned at least 2 1/2 times around the stress-bearing drum.

The advantage of the two-way center point anchoring is the short cable length in comparison to an end anchoring device. Critical points in center feeding system are the dynamic load peaks due to the change of direction.

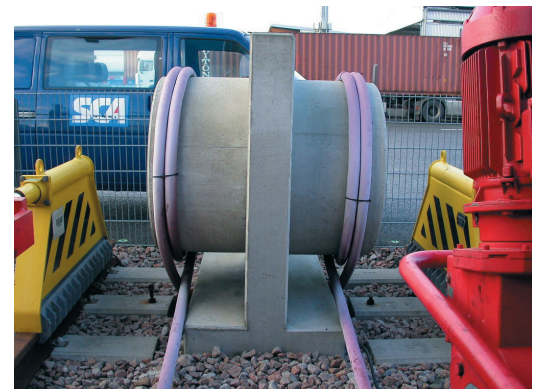


End anchoring device

In opposite to the center feeding system, the complete installation including e.g. guideway, device and power supply is appropriate overground.

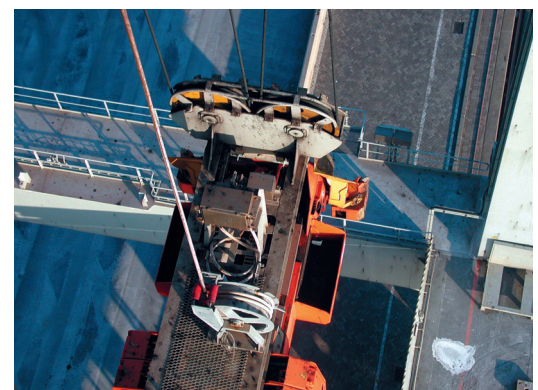
To avoid dynamic stress due to tensile load in the cable. Nexans recommends to use:

- stress bearing drums,
- and / or
- cables with integrated strength member



Anchoring vertical drum spreader cable

In the case of anchoring vertical spreader cable, the stress bearing drum is placed on the top of the spreader. Nexans recommends in this application, stress bearing drums instead of cable grips or other cable anchoring system. For a perfect operation it is important to turn the cable at least 2 1/2 times around the stress bearing drum.



Repair and Emergency Service

Flexible cables used in cranes and other handling systems are exposed to extreme mechanical conditions during their operations. Due to this, it isn't possible to prevent damages.

In order to avoid high cost during stand still of the crane and high detention charges of the vessel, it is necessary to carry out immediate, professional and reliable repairs in case of damage of the power cable.

There for, Nexans provides an extensive repair and emergency service including:

Repairs of

- insulation
- inner and outer sheath
- splicing of cables without increasing diameter
- splicing/ repair of optical fiber elements

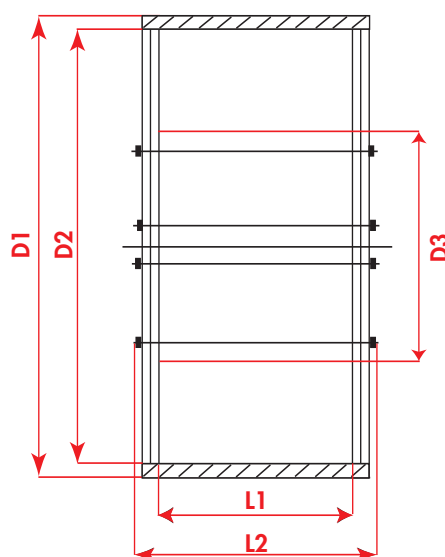


Worldwide 24h emergency call:
+49 (0)2166 27 2176

Drum Dimensions

Export Drums (one-way)

Drum Type	Lagging-diameter D1 (mm)	Flange-diameter D2 (mm)	Barrel diameter D3 (mm)	Winding width L1 (mm)	Overall width L2 (mm)	Maximum carrying capacity (kg)	Drum weight (kg)	Drum volume (D1) ² x L2 (m ³)
E45	504	450	150	300	353	130	14	0.081
E60	664	610	300	330	383	175	25	0.163
E70	754	700	250	385	438	200	27	0.249
E75	804	750	350	385	444	300	33	0.287
E90	954	900	450	475	550	600	72	0.501
E95 A	1054	950	350	475	550	550	72	0.583
E105 A	1,104	1,050	500	500	583	600	75	0.711
E115	1,204	1,150	600	650	734	800	110	1.064
E120	1,254	1,200	600	670	754	950	120	1.186
E130	1,354	1,300	700	650	734	1,100	140	1.346
E153	1,584	1,530	800	650	754	1,700	180	1.892
E165 A	1,730	1,650	900	820	951	2,200	310	2.846
E165 B	1,730	1,650	750	1,000	1,147	2,100	370	3.431
E190	1,980	1,900	1,000	1,000	1,147	2,700	490	4.497
E210	2,180	2,100	1,100	1,000	1,187	4,500	700	5.510
E245	2,530	2,450	1,300	1,000	1,187	4,800	930	7.598
E260	2,680	2,600	1,600	1,000	1,187	6,700	1,100	8.526

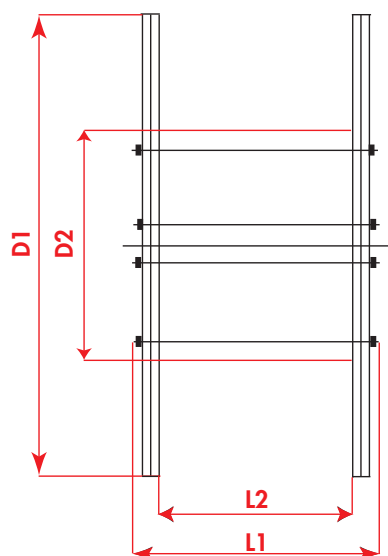


KTG Plastic drums

Drum Type	Flange-diameter D1 (mm)	Barrel-diameter D2 (mm)	Overall width L1 (mm)	Winding width L2 (mm)	Maximum carrying capacity (kg)	Drum weight (kg)
050/7	500	150	456	404	100	4
070	710	355	510	400	250	11
080	800	400	510	400	350	16
090	900	450	680	560	400	23
050/7	1000	500	704	560	500	32

KTG Standard wooden/ Steel-tyred wooden drums

Drum Type	Flange-diameter D1 (mm)	Barrel-diameter D2 (mm)	Overall width L1 (mm)	Winding width L2 (mm)	Maximum carrying capacity (kg)	Standard wooden drum weight (kg)	Steel-tyred wooden drum weight (kg)
071	710	355	520	400	250	25	28
081	800	400	520	400	400	31	35
091	900	450	690	560	750	47	51
101	1000	500	710	560	900	71	78
121	1250	630	890	670	1700	144	165
141	1400	710	890	670	2000	175	199
161	1600	800	1100	850	3000	280	309
181	1800	1000	1100	840	4000	380	413
201	2000	1250	1350	1045	5000	550	600
221	2240	1400	1450	1140	6000	710	753
250	2500	1400	1450	1140	7500	875	923
251	2500	1600	1450	1130	7500	900	925
281	2800	1800	1635	1280	10000	1175	1240



Drum capacity and cable lengths (only KTG drums for round cables)

cable diameter mm	Drum size and drum type															cable diameter mm
	051	061	071	081	091	101	121	141	161	181	201	221	250	251	281	
6	1130	1110	2024	2755												6
7	815	840	1480	2340												7
8	630	640	1064	1463	2730											8
9	460	470	890	1152	2202	2866										9
10	390	388	680	980	1768	2349										10
11	320	315	564	760	1404	1910										11
12	260	254	470	643	1206	1540										12
13	220	238	385	542	1032	1339	2727									13
14	190	190	360	454	880	1159	2265	2967								14
15	170	180	300	430	749	1000	1990	2480								15
16	150	140	239	358	632	860	1756	2205								16
17	130	134	228	294	603	736	1545	1960								17
18	110	102	218	280	505	705	1355	1737								18
19	105	96	172	228	485	599	1184	1535	2722							19
20	100	92	165	220	402	576	1139	1352	2435	2830						20
21	80	90	159	210	387	485	990	1304	2172	2527						21
22		65	122	167	315	468	856	1145	1930	2248						22
23		62	117	160	304	389	827	999	1870	2172	2954					23
24		60	113	156	294	377	709	967	1657	1927	2608					24
25		58	110	150	285	365	688	839	1608	1867	2522					25
26		56	80	116	226	299	668	814	1420	1650	2218					26
27			78	113	220	290	567	700	1244	1450	2150	2860				27
28			76	109	215	282	550	680	1210	1410	1880	2777				28
29			73	106	209	226	462	663	1180	1370	1826	2450		2976		29
30			70	103	165	220	450	564	1028	1200	1583	2383		2893		30
31				76	157	214	438	550	1003	1166	1540	2089		2558		31
32				74	153	209	428	537	866	1009	1500	2035	2978	2490		32
33				72	150	204	352	450	846	985	1289	1984	2908	2428		33
34					146	158	344	440	828	962	1257	1726	2605	2134		34
35					108	154	336	430	710	824	1227	1685	2547	2083	2890	35
36					105	150	329	422	692	806	1040	1646	2270	2035	2820	36
37					103	148	265	348	678	788	1017	1418	223	1174	2760	37
38						144	259	340	664	772	994	1386	1969	1735	2432	38
39						110	254	334	560	653	972	1356	1930	1697	2380	39
40						105	249	327	549	640	812	1328	1892	1486	2330	40
41						102	244	264	539	627	795	1130	1664	1435	2036	41
42						100	190	259	529	615	779	1107	1633	1406	1995	42
43							187	254	437	510	763	1085	1603	1199	1956	43
44							183	249	430	502	750	1065	1574	1175	1692	44
45							180	245	422	492	610	890	1373	1153	1660	45
46							177	240	415	484	600	874	1349	1130	1630	46
47							174	187	408	475	589	858	1326	1110	1600	47
48							130	184	330	386	578	842	1144	930	1366	48
49							127	180	325	380	568	828	1125	914	1342	49
50							125	178	319	373	558	878	1107	898	1320	50
51							123	175	314	367	442	666	1089	883	1298	51
52							120	172	310	360	435	655	1072	869	1276	52
53								170	305	356	428	644	912	715	1072	53
54								126	230	280	420	634	898	700	1056	54
55								124	235	276	414	624	885	690	1040	55
56								122	232	270	408	614	872	680	1022	56
57								121	228	267	400	488	860	668	1006	57
58								119	225	263	304	480	720	658	990	58
59								117	222	260	300	473	710	649	815	59
60									220	256	295	466	700	640	803	60
61									216	252	290	460	690	610	790	61
62									160	190	287	453	680	500	780	62
63									158	187	282	448	670	494	770	63
64									156	184	280	440	662	487	760	64
65									154	182	275	335	640	480	748	65
66									152	180	270	330	534	474	738	66
67									178	266	326	528	468	468	588	67
68									174	264	320	520	462	462	580	68
69									172	186	317	515	456	456	574	69
70									170	184	313	510	450	450	566	70
71									168	182	310	502	342	342	558	71
72									166	180	305	498	338	338	552	72
73									164	177	300	190	334	334	545	73
74									162	175	297	486	330	330	540	74
75									160	173	294	480	326	326	532	75
76									112	170	291	380	322	322	526	76
77									110	168	287	375	318	318	520	77
78									109	166	284	370	314	314	514	78
79									108	164	281	367	310	310	508	79
80									107	163	278	363	306	306	502	80

approx. drum barrel $\varnothing \leq 40 \times D$
 approx. drum barrel $\varnothing \leq 25 \times D$
 approx. drum barrel $\varnothing \leq 15 \times D$

approx. drum barrel $\varnothing \leq 15 \times D$
 approx. drum barrel $\varnothing \leq 50 \times D$

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