



SIEMENS

Flexible cables

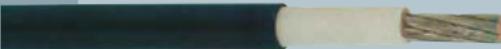
Australian catalogue

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APPLICATION SELECTION GUIDE

Construction	Designation
 <ul style="list-style-type: none">1. PCP elastomer sheath2. Protolon R-EP-110 insulation3. Tinned copper conductor, highly flexible	3.3KV 110° FLEX 5DF2
 <ul style="list-style-type: none">1. CSP elastomer sheath2. Elastomer inner sheath3. EPR insulation4. Copper conductors, flexible	OZOFLEX 5DH2
 <ul style="list-style-type: none">1. Special CPE elastomer sheath2. Elastomer inner sheath3. EPR insulation4. Copper conductors, flexible	OZOFLEX (PLUS) 5DH10

Rated voltage	Application and design	Page
0.6/1kV to 1.9/3.3kV	<p>Single core highly flexible cable for switchboard cabling; submains, machine and equipment cabling.</p> <p>Suitable for high and sub-zero temperatures with a high short circuit strength.</p>	34
0.6/1kV	<p>Heavy duty EPR/CSP flexible for power and control supply.</p> <p>Suitable as flexible leads in mining, industry and agriculture.</p> <p>Suitable for hazardous locations</p>	40
0.6/1kV	<p>Especially suitable for submersion in sewage and effluent, waste water, polluted liquids containing oils, fats, solvents and chemicals etc.</p> <p>For pumps and aerators.</p> <p>Suitable for hazardous locations</p>	52

APPLICATION SELECTION GUIDE

Construction	Designation
 <ul style="list-style-type: none">1. CPE elastomer outer sheath2. Copper braid screen3. Elastomer inner sheath4. EPR insulation5. Copper conductor, flexible	OZOFLEX (PLUS) SCREENED (FC+) 5DH5
 <ul style="list-style-type: none">1. Special EPR sheath2. Watertight bond between insulation and sheath3. EPR insulation4. Copper conductors, flexible	HYDROFIRM (T) 5DH1
 <ul style="list-style-type: none">1. EPR outer elastomer sheath2. Copper braid screen3. Elastomer inner sheath4. EPR insulation5. Copper conductor, flexible	HYDROFIRM (T) SCREENED 5DH5

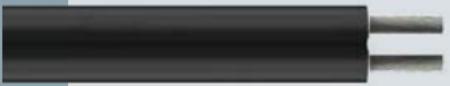
Rated voltage	Application and design	Page
0.6/1kV to 1.9/3.3kV	<p>Screened cable suitable for VSD's submersion in sewage and effluent, waste water, polluted liquids containing oils, fats, solvents and chemicals, etc.</p> <p>For pumps and aerators requiring control cores. Suitable for hazardous locations.</p>	60
0.6/1kV	<p>Circular and flat flexible cable especially developed for continuous submersion in fresh, salt and bore water as a power supply to pumps and underwater electrical equipment.</p>	66
0.6/1kV	<p>Screened flexible cable especially developed for continuous submersion in fresh, salt and bore water as a power supply with control cores to pumps and underwater electrical equipment.</p>	76

APPLICATION SELECTION GUIDE

Construction	Designation
 <ol style="list-style-type: none">1. PCP elastomer sheath2. Elastomer inner sheath3. PROTOLON EPR insulation4. Copper conductors, flexible	PROTOMONT HD 5DL1
 <ol style="list-style-type: none">1. PCP elastomer sheath2. Copper braid screen3. Elastomer inner sheath4. EPR insulation5. Copper conductor, flexible	PROTOMONT SCREENED 5DL2
 <ol style="list-style-type: none">1. Silicone rubber insulation2. Copper conductors, flexible	SINOTherm 180°C 5DR3 5DR4 5DR5

Rated voltage	Application and design	Page
0.6/1kV	<p>Extra heavy duty flexible cable for mining, construction, industry and harsh environments.</p> <p>Designs suitable for submersion in aggressive liquids.</p> <p>Suitable for hazardous locations.</p>	80
0.6/1kV	<p>Heavy duty overall screened EPR/PCP flexible in 4 and 5 core constructions.</p> <p>Submersible pumps, mining where earth screen protection is required.</p> <p>Suitable for hazardous locations.</p>	88
380/660V 0.6/1kV	<p>High temperature silicone cables up to 180°C. Suitable for motor rewinds, heating appliances, steelwork, floodlights, etc. Available with glass braid and in flexible multicore constructions.</p>	96

APPLICATION SELECTION GUIDE

Construction	Designation
 <ul style="list-style-type: none">1. Heat resistant, cross-linked elasto meric special compound2. Copper conductors, flexible	SINOTHERM 110°C 5DR7
 <ul style="list-style-type: none">1. EVA Elastomer insulation2. Copper conductors, flexible	EVA 125 FLEX 5DR7
  <ul style="list-style-type: none">1. EVA Elastomer insulation2. Multi stranded tinned copper4. Cross-linked polyolefine	TECSUN (PV) 5DH9 TECSUN TWIN (PV) 5DH

Rated voltage	Application and design	Page
0.6/1kV	These cables are intended for use as fixed wiring, or wiring where limited flexing in operation is encountered.	104
0.6/1kV	High temperature EVA flexible cables for 125°C application. Increased mechanical strength with low smoke, and a non toxic gas emission and halogen free sheath in the event of fire. For switchboard wiring and coils.	110
0.9/1.8kV DC	Tecsun (PV) 120 C (degrees) solar cables are designed for use in photovoltaic power supply systems.	114

APPLICATION SELECTION GUIDE

Construction	Designation
 <p>1. PVC sheath 2. Copper conductors, flexible</p>	PROTOFLEX 5DE7
 <p>1. UV-stabilised PVC orange transparent outer sheath 2. Tinned copper braid screen 3. Cross linked poly ethylene (XLPE) insulation</p>	PROTOFLEX EMV-FC UV stabilized 90° rating 5DE6
 <p>1. Clear PVC outersheath. 2. Tinned copper braided screen</p>	PROTOFLEX EMC 5EMC PROTOFLEX EMC-FC 5EMV

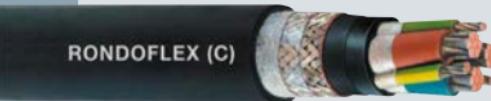
Rated voltage	Application and design	Page
300/500V	<p>Light duty flexible PVC control cable for machine tools, process automation and control devices.</p> <p>Flexible overall screened PVC control cable for EMI and RFI interference suppression in industrial electronics, switchboards, PLC connections, etc.</p>	120 129
0.6/1kV	Flexible tinned copper braid screened XLPE power cable for variable speed drive to motor connections.	132
0.6/1kV	<p>Very flexible screened cable for variable speed drive to motor connections.</p> <p>UV-stabilised</p>	136

APPLICATION SELECTION GUIDE

Construction	Designation
	EMC cable glands
<ul style="list-style-type: none">1. Highest protection IP68 & 15 bar2. One gland body for several cable O.D.'s3. Highest strain relief	
	CORDAFLEX (SMK) 5DH3
<ul style="list-style-type: none">1. PCP elastomer sheath2. Anti torsion textile braid3. Elastomer inner sheath4. Protolon EPR insulation5. Copper conductors, highly flexible	
	RONDOFLEX 5DG6
<ul style="list-style-type: none">1. PCP elastomer sheath2. Protolon insulation3. Tinned finely stranded conductors4. Braid screen available	

Rated voltage	Application and design	Page
	EMC metric glands are IP68, brass, galv nickel plated. Designed for EMC environments, ensuring positive contact with the cable.	138
0.6/1kV	<p>Crane, reeling and festoons cable designed to withstand tensile and torsional stresses. Suitable for all types of mobile equipment e.g., stackers, reclaimers, hoists, cranes, ship loaders, trippers etc. Screened data cores for PLC and communications are standard. Integrated fibre optics available.</p> <p>Suitable for hazardous locations</p>	144
0.6/1kV	<p>Flexible power and control cable, for use on festoon systems and for connecting moving parts of machine tools, material handling equipment, etc, associated with high mechanical stresses and frequent bending operation.</p> <p>Suitable for simple reeling.</p>	156

APPLICATION SELECTION GUIDE

Construction	Designation
 <p>RONDOFLEX (C)</p> <ul style="list-style-type: none">1. PCP elastomer sheath2. Protolon R-EP-110 insulation3. Tinned copper conductor, highly flexible	RONDOFLEX (C)-FC 5DG6
 <p>RONDOFLEX (CHAIN)</p> <ul style="list-style-type: none">1. PCP elastomer sheath2. Protolon EPR insulation3. Tinned copper conductors, extremely flexible4. Individual copper braid screens	RONDOFLEX (CHAIN) 5DG4

Rated voltage	Application and design	Page
0.6/1kV	Shielded EMC festoon power cable used for applications where there is a danger of interference to data transmission systems from power cables. This cable is suitable for festoon systems.	162
0.6/1kV	Specially designed for outdoor applications with long travel distances at high speeds. Including drag chain systems on container stacking cranes. Key benefits are reliability, abrasion resistance and long life time.	168

APPLICATION SELECTION GUIDE

Construction	Designation
 	PLANOFLEX 5DG5
<ol style="list-style-type: none">1. PCP elastomer sheath2. PROTOLON EPR insulation3. Copper conductors, extremely flexible4. Individual copper braid screens	 OPTOFLEX (M) 5DG8

Rated voltage	Application and design	Page
380/660V 0.6/1kV	Flat form elastomer cable for gantry and festoon installations in mining, marine and sub zero environments. Screened cores, pairs and integrated fibre optics available for data transmission.	180
	Optical signal and data transmission cable for fixed installations for material handling and mining equipment and in open pits on conveyors.	192

APPLICATION SELECTION GUIDE

Construction	Designation
 <p>OPTOFLEX (F.O)</p> <ol style="list-style-type: none"> 1. Black PCP outer sheath 2. Kevlar braided coverage of core assembly 3. 50/125; 62.5/125 micron graded index and E9 mono mode fibres 	OPTOFLEX (F.O) 5DG8
 <ol style="list-style-type: none"> 1. Polyurethane sheath 2. Lead beaded core elements 3. Kevlar rope strength support 4. PROTODUR PVC insulation 5. Copper conductors, highly flexible 	SPREADERFLEX 5DE5
 <p>PROTOMONT</p> <ol style="list-style-type: none"> 1. PCP heavy duty sheath 2. Elastomer inner sheath 3. Individual copper core screens 4. PROTOLON EPR insulation 5. Copper conductors, flexible 	PROTOMONT XHD 5DL/5DM

Rated voltage	Application and design	Page
	Flexible fibre optic cable suitable for cable handling systems, cable tenders on cranes and material handling systems. Key benefits are high data rates, large bandwidth and absolute immunity to EMI.	196
300/500V	Dedicated flexible cable for free fall coiling in spreader crane applications. Kevlar reinforced with lead bead weights to improve performance in high speed, high wind environments.	200
0.6/1kV	Extra heavy duty mining cable with screened power cores and separate control cores. Abrasion and tear resistant, suitable for all above ground mining installations and industry e.g., drills, pumps, conveyors and 400 Hz installations.	206

APPLICATION SELECTION GUIDE

Construction	Designation
 <ul style="list-style-type: none">1. CPE Sheath2. Exceptional flexibility3. Robust construction4. EPR insulation5. Copper conductors, highly flexible	PROTOMONT 241.1
 <ul style="list-style-type: none">1. CPE sheath2. Overall copper braid screen3. Elastomer inner sheath4. Polyethylene insulation5. Copper conductors, flexible, screened pairs	MINING MSR 5DM4
 <ul style="list-style-type: none">1. Protofirm PCP sheath2. Elastomer inner sheath3. Protolon EPR insulation4. Semiconductive core screens5. Copper conductors, flexible	PROTOLON (N) 5DK8

Rated voltage	Application and design	Page
1.1/1.1kV	Extra heavy duty semi conductive screened cable for mining applications including supply cable for underground cutting machines and pumping.	214
250/250V	Twisted pair screened elastomer cable for mining installations. Heavy duty and flexible, resistant to UV with excellent transmission characteristics for PLC's, instrumentation and control signals.	220
3.3/3.3kV to 33/33kV	High voltage flexible reeling cable specifically designed to withstand torsional and tensile forces of medium duty reeling. Suitable for all mobile equipment in mining, marine and materials handling facilities.	226

APPLICATION SELECTION GUIDE

Construction	Designation
 <p>1. Protofirm PCP HD 2. Anti torsion textile braid 3. Elastomer inner sheath 4. Protolon EPR insulation 5. Semiconductive core screens 6. Copper conductors, highly flexible</p>	PROTOLON (SMK) 5DK8
	PROTOLON (SM-R) FO FIBRE OPTICS 5DK8

Rated voltage	Application and design	Page
3.3/3.3kV to 33/33kV	High voltage, heavy duty reeling cable specifically designed for extreme dynamic applications eg., high mount reelers, high speed cranes, multiple deflection guidance systems.	226
3.3/3.3kV to 33/33kV	High voltage reeling cable with integrated fibre optics for transmission of voice, video and data signals thereby eliminating the need for a separate control reeler.	226

APPLICATION SELECTION GUIDE

Construction	Designation
 <p>1. Protofirm PCP heavy duty sheath 2. Anti torsion textile braid 3. Elastomer inner sheath 4. Protolon EPR insulation 5. Semiconductive core screens 6. Copper conductors, highly flexible</p>	PROTOLON (SB) 5DK8
 <p>1. Protofirm PCP sheath 2. Elastomer inner sheath 3. Protolon EPR insulation 4. Semiconductive core screens 5. Copper conductors, flexible</p>	PROTOLON (Single core) 5DK8

Rated voltage	Application and design	Page
3.3/3.3kV to 33/33kV	Designed as a power supply or connection cable for large material handling machines in open cut mines where they are subject to extremely high mechanical stresses due to abrasion and trailing. Also available with screened power cores.	226
3.3/3.3kV to 22/22kV	Designed for voltages up to 22kV for power supply interconnections, transformer drop cable, mobile sustations, over head service line connections and H.V. switchboards.	234

FLEXIBLE CABLE DESIGN AND ELECTRICAL CRITERIA

The design and proper selection of a cable should take into account environmental conditions, electrical, thermal and mechanical stresses that can be expected as these all have a bearing on its operating life. All Siemens flexible cables are designed to suit their application perfectly, thereby ensuring a long trouble free service life even under the harshest conditions.

CONDUCTORS

Siemens flexible cables utilise high conductivity copper in accordance with the Australian Standard AS 1125 either finely or extra finely stranded, depending on its intended application, and these are bunched or rope laid to provide a flexible conductor assembly with increased mechanical strength. All values for strandings are given as approximate due to final conductance values of the copper used in production. The Australian Standard AS1125 now nominates for flexible cables a maximum DC resistance value for a given conductor cross section. In this way the cross-sectional area of the conductor is stated not as the geometrical, but as the electrically effective cross-sectional area determined by the resistance measurement. Thereby, all cables will have equivalent electrical characteristics irrespective of the manufacturer or the origin of the base copper used.

INSULATION

Insulation materials covered within this catalogue are of basically two types. Thermoplastic polyvinyl chloride (PVC) and cross linked compounded elastomers such as Ethylene Propylene Rubber (EPR), Ethyl Vinyl Acetate (EVA) and Silicone rubber. The Silicone and EVA compounds permit higher operating temperatures, and accordingly higher current capacities, whilst EPR exhibits excellent dielectric properties, low temperature flexibility and resistance to ozone, ionization and weather.

SHEATH MATERIALS

Likewise sheath materials are either thermoplastic or elastomeric compounds such as Chlorosulphonated Polyethylene (CSP), Polychloroprene (PCP), Chlorinated Polyethylene (CPE), Silicone (SR), Ethylene Propylene Rubber (EPR), or Polyurethane (PU). CSP is often known by the DuPont trade name Hypalon and PCP as Neoprene.

Each particular sheath material is selected or specially compounded for its specific characteristics. eg. EPR (HYDROFIRM) compounded with additives to achieve total water resistance. PCP (CORDFLEX) for a high mechanical strength and abrasion resistance. Although the base polymer name is used eg. CSP, up to 14 additives may be compounded to achieve the desired characteristics based on years of research, field service and customer's requirements.

INSULATION AND SHEATH THICKNESSES

All Siemens elastomer (synthetic rubber) cables meet or exceed the values laid down in AS/NZS 5000-1 and AS 3191 (flexible cords).

Voltage ratings based on the insulation electrical, thermal and mechanical characteristics for each cable are given.

AMBIENT AND CONDUCTOR OPERATING TEMPERATURE

Ambient temperature is that surrounding the cable. All values stated in this catalogue are based on an ambient of 40°C which is generally considered the norm for Australian conditions when averaged annually. Surface temperature is the maximum permissible temperature onto which the cable can be laid upon without damage to the sheath. Conductor temperature is the temperature the conductor will maintain when loaded fully in accordance with its rated current carrying capacity. The maximum permissible conductor temperature is also the temperature rating of the insulation which it can withstand indefinitely without effect on its properties. The difference between the ambient temperature and the maximum conductor temperature is the window of thermal heat rise generated when current is passed. Basically the heat generated by current flow must be equalised by convection and thermal radiation so that an equilibrium is maintained at the maximum insulation temperature. For this reason the derating factors are applicable when higher or lower ambients are present.

HIGH AND LOW TEMPERATURES

Siemens elastomer cables utilise insulation and sheathing compounds which provide excellent performance in extremes in ambient temperatures. In sub zero environments the catalogue lists the absolute minimum that the cable can withstand and additionally the minimum for fully flexible operation in its intended application.

Elastomer insulated conductors operate continuously at 90.5°C with an emergency overload up to 130°C and short circuit temperature withstand of up to 250.5°C. Experience has shown that flexible reeling cables with tinned conductors should be limited to a short circuit temperature of 200.5°C. Exposure to higher temperatures than the cables are rated will lead to degradation over a period of time of the compounds based on the rate of exposure and intensity. Fig. 1 shows the service life characteristic for EPR insulation. The temperature index criteria was 113.5°C, ie., the compound will remain serviceable for 20,000hrs at 113.5°C in accordance with IEC 216. This table is purely indicative as many variables can effect the result.

GRAPH RANGE/TEMPERATURE

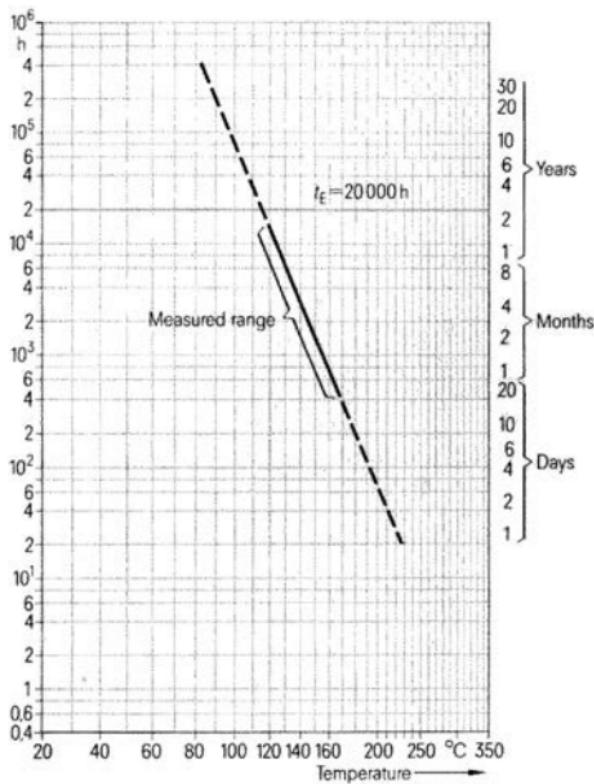


Fig. 1

VOLTAGE RATINGS

Voltage values are usually expressed in the form U_0/U and U_m . U_0 is the rms power frequency voltage between phase and earth. U is the rms power frequency voltage between phases. U_m is the maximum continuous rms power frequency voltage between any two phases and excludes fault conditions or sudden disconnection of large loads.

CURRENT CARRYING CAPACITY

Current ratings are dependant on the method of installation, the insulation material affecting the maximum conductor temperature, internal thermal resistance and external ambient conditions. Unless otherwise indicated the ratings stated within are for cables touching a surface and unenclosed, based on a 50Hz system either single phase or balanced three phase. For all intents and purposes current ratings for DC are equivalent to AC values.

VOLTAGE DROP

Volt drop is dependant on the impedance of the conductor, the load current, power factor and route length. In accordance with AS/NZS 3008.1.1:2017 the milli-volts per ampere meter (mV/A.m) are listed on Page 251 / 252, Table 40/42 together with the formula to satisfy the voltage drop limitations. AS 3000 generally limits the allowable voltage drop to 5% of the system Voltage, however some mining installations may nominate a lower value. It is important where practicable in the case of single core cables they are run in trefoil arrangement to minimise impedance.

SHORT CIRCUIT

Symmetrical short circuit calculations are given on page 244/245, table 6.2 and are based on the maximum operating temperature of the insulation and the maximum final safe short circuit temperature of the insulated conductor.

AUSTRALIAN STANDARDS

The following Australian Standards relate to cables, their design and application.

AS 1125	Conductors in Flexible Cables and Cords
AS 3191	Electric Flexible Cords 250V, 440V and 0.6/1kV
AS/NZ 3008.1.1:2017	Cable Selection 0.6/1kV
AS 1802	Cables for Underground Mining (Reeling)
AS 5000	Electric cables – polymeric insulation 0.6/1 (1-2kV)
AS 2802	Cables for Above Ground (open cut) Mining

AS 1660 Test Methods for Cables

AS 1429 Electric cables – polymeric insulation working voltages 3.3/33kV

Generally all Australian Standards are aligned with the relevant IEC Standards to enable them to conform internationally.

IEC 227 Flexible PVC Cables and Cords

IEC 245 Flexible Elastomer Cables and Cords

VDE 0250 Cables, Wires and Flexible Cords for Power Installations

VDE 0282 Elastomer Cables and Flexible Cords for Power Installations

CABLE REPAIR

In the event of damage to either the insulation or sheath or where two cables must be spliced together, the use of commercially available repair materials are suitable for use with Siemens flexible cable compounds. Various methods and types are available from cast kits which offer a simple, effective, however non-flexible joint to electrical repair and self-fusing tapes which when applied build up the insulation and sheath to their specified dimensions and provide a flexible, weatherproof repair equal to the original cable. It is most important that the repair tapes and kit compounds match those of the cables and this should be confirmed with the supplier prior to use. R-EP-90 (EPR) tape must be used on all Siemens elastomer insulated cables and HD-85-PCP and HD-90-CSP tapes should be used on their appropriate sheath types. Other repair materials from Calico and polyester tapes, semi conductive screen tape, silicone, vinyl/mastic and glass cloth tapes to tinned copper wire braid screen tapes are available from various manufacturers and include all instructions on preparation and installation.

QUALITY ASSURANCE

We, at Siemens, have a deep commitment to quality assurance at all levels of our organisation. In fact, this catalogue represents one step in the quality effort by presenting complete product and applications information in such a way that leads to optimum product selection to satisfy the customer's needs. Our internal quality assurance programme includes quality audits, the maintenance of a quality assurance manual and many other procedures designed to optimise quality.

SECTION 1

A large, stylized illustration of a hand holding a cable, set against a background of blue and white abstract shapes.

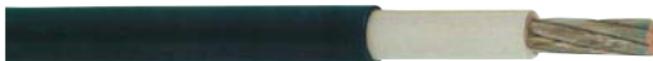
GENERAL FLEXIBLE ELASTOMER CABLES

SINGLE CORE – SDI 110° FLEX	5DF2	PAGE 34
<hr/>		
OZOFLEX	5DH2	PAGE 40
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OZOFLEX (PLUS)	5DH1	PAGE 52
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OZOFLEX (PLUS) SCREENED (FC+)	5DH5	PAGE 60
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HYDROFIRM (T)	5DH1	PAGE 66
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HYDROFIRM (T) SCREENED	5DH5	PAGE 76
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PROTOMONT HD	5DL1	PAGE 80
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PROTOMONT SCREENED	5DL2	PAGE 88

15059

SINGLE CORE – SDI 110⁰ FLEX 3.3KV

Highly flexible, single core rubber cables



APPLICATION

- Internal switchboard cabling
- Sub-mains
- Electrical traction vehicles
- Battery bank connections
- Machine & equipment cabling
- Steelworks, cranes & hoists
- Stacker & reclaimer cabling
- DC wiring
- Submersible to 100 meters + then depending on application to IEC 60332-1-2
- For fixed installation indoor and outdoor
- Installed in electrical conduit, on surface and flush-mounted, in closed electrical installation ducts and in equipment.
- In switchgear and distribution boards up to 1000 V.

Special-purpose rubber insulated single-core cabled with a rated voltage of at least U_0/U 1,8/3.3kV may be used here. Because of their increased mechanical strength due to the greater insulation thickness as compared with LV single-core cables, they are classified as short-circuit-proof and earth-fault-proof. The short-circuit withstand capability, on the other hand, must be assured by specifying a conductor cross-section suitable for the short-circuit currents concerned. Please see under "Short-Circuit" for the permissible short-circuit currents.

SINGLE CORE – SDI 110° FLEX 3.3KV

DESIGN

Single core flex cables consist of extra finely stranded tinned copper conductors laid up to provide an extremely flexible design. The Protolon R-E-110 elastomer insulation is rated at 3.3kV with an oil resistant, flame retardant PCP sheath completing the construction.

Designed in accordance with AS1125, AS/NZS 3008.1.1:2017, and VDE0250 part 602. for NSGAFoeu.

Permissible thermal short-circuit currents for 1 s duration (conductor temperature at start of short-circuit: 110°C):

[mm ²]	4	6	10	16	25	35	50	70	95	120	150	185	240
[kA]	0.488	0.732	1.22	1.95	3.05	4.27	6.10	8.54	11.6	14.6	18.3	22.6	29.3

The thermal as well as the dynamic short-circuit strength must be taken into account. The cables must in particular be firmly fixed to protect them from the effects of peak short-circuit currents.

Special-purpose rubber insulated single-core cables have a sheath over the insulation to serve as mechanical protection while cable laying is in progress, but are without electrical touch protection. Care should therefore be taken to ensure that cables generally cannot be touched during operation.

SINGLE CORE – SDI 110⁰ FLEX 3.3KV

OPERATING TEMPERATURE

■ Minimum permissible ambient temperature	-40°C
■ Maximum permissible conductor temperature	110°C
■ Maximum permissible short circuit temperature	250°C
■ Minimum ambient temperature for optimum fully flexible operation	-25°C

MINIMUM BENDING RADII

The following minimum bending radii should be observed to ensure operating reliability.

For fixed installation 6 x cable diameter

When freely flexing 8 x cable diameter

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

The values are valid for permanent operation with DC or AC with 50 up to 60 Hz at 40°C ambient temperature.

TENSILE STRENGTH

The maximum allowable tensile stress is 15N/mm².

This ensures no conductor damage will occur in operation.

SINGLE CORE – SDI 110⁰ FLEX 3.3KV

VOLTAGE RATING

- Rated voltage: $U_o/U = 0.6/1\text{kV}$ to 3.3kV AC
- Maximum operating voltages in:
 - 3 phase AC operation $U_o/U = 2.1/3.6\text{kV}$
 - DC operation $U_o/U = 2.7/5.4\text{kV}$
- AC test voltage $= 6\text{kV (5min)}$
- Also used on $0.6/1\text{kV Systems}$

CORE COLOUR IDENTIFICATION

The core insulation is white.

SINGLE CORE – SDI 110⁰ FLEX

Selection and ordering data

No. of cores x conductor size	Part No.	Nominal diameter of bare
mm ²		mm
1 x 1.5	5DF2 043	1.5
1 x 2.5	5DF2 053	1.9
1 x 4	5DF2 063	2.5
1 x 6	5DF2 073	3.2
1 x 10	5DF2 103	4.1
1 x 16	5DF2 123	6.5
1 x 25	5DF2 133	6.8
1 x 35	5DF2 143	8.1
1 x 50	5DF2 153	9.6
1 x 70	5DF2 163	11.2
1 x 95	5DF2 173	13.2
1 x 120	5DF2 183	14.9
1 x 150	5DF2 203	16.6
1 x 185	5DF2 213	18.0
1 x 240	5DF2 223	21.2
1 x 300	5DF2 233	23.6
1 x 400	5DF2 243	26.5
1 x 500	5DF2 244	30.1
1 x 630	5DF2 254	34.3

SINGLE CORE – SDI 110⁰ FLEX

Current ratings are based on AS/NZS 3008.1.1:2017.

Normal overall cable conductor	Net cable weight diameter	Unenclosed Spaced
mm	kg/km	A
5.8	47	31
6.3	59	42
6.8	77	55
7.3	97	70
8.8	153	99
10.2	214	130
12.2	324	173
13.3	421	214
14.7	564	270
16.6	758	340
18.9	995	410
21.0	1253	487
23.0	1540	562
25.0	1862	644
28.3	2428	775
31.3	3006	995
35.3	3898	1079
39.5	5016	1260
43.7	6450	1498

OZOFLEX – Flexible cables with cross linked elastomeric insulation

Heavy duty EPR/CSP rubber flexible cables

Marking <VDE><HAR>OZOFLEX H07RN-F 4G35



APPLICATION

The cables are suitable for:

- Heavy duty construction site leads for drills, pumps, saws, kangoes
- Cranes, hoists & festoon systems
- Stage & theatre power & lighting
- Portable motors, generators & power supplies
- Submersible to 100 metres plus
- Suitable for hazardous locations
- Use in dry, humid or moist rooms and outdoors:
transportable motors or machines on building sites or in agricultural workings, etc.:
- medium mechanical stresses, e.g. for industrial and agricultural workshop appliances, large boiling installations, heating plates, inspection lamps, electric tools such as drills, circular saws, domestic electric tools:
- Use in workshops having an explosive atmosphere.
- When a cable is to be used in the presence of explosive or flammable atmospheres, guidance should be sought by reference to specifications and guidance should be sought in selecting suitable cables.
- Fixed installations e.g. on rough-cast in temporary buildings and huts for accommodation purposes:
- Wiring of constructional components in lifting appliances, machinery, etc.

OZOFLEX – Flexible cables with cross linked elastomeric insulation

DESIGN

OZOFLEX is designed as a heavy duty flexible for dry, damp and wet environments, areas of stress caused by vibration or impact and is resistant to abrasion, exposure to radiated heat and chemical contamination.

OZOFLEX cables consist of finely stranded copper conductors laid up to provide a flexible design. Vulcanized rubber compound, basis EPR compound, insulation (E14) provides improved current capacities.

Cables above 16mm² and all control cables have an elastomer inner sheath. The CSP elastomer sheath (Hypalon) is oil resistant and flame retardant in accordance with VDE 0472, IEC 6032-1.

Designed in accordance with the Australian Standards AS 1125, AS 3191, AS/NZS 5000-1 & AS/NZS 3008.1.1:2017.

OZOFLEX – Flexible cables with cross linked elastomeric insulation

OPERATING TEMPERATURE

- Maximum permissible operating temperature at conductor 90°C
- Minimum permissible ambient temperature – when stationary -40°C
- Maximum permissible short circuit temperature 250°C
(max 5sec)
- Minimum ambient temperature for optimum fully flexible operation – when in motion -25°C

MINIMUM BENDING RADII

The following minimum bending radii should be observed to ensure operating reliability.

- For fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

The values are valid for permanent operation with DC or AC with 50 up to 60 Hz at 40°C ambient temperature.

AS PER AS/NZS 3008.1.1:2013 – 3.5.2.8

Where layers of flexible cables are wound on a cylindrical-type drum or reel, the current-carrying capacity of the cable shall be derated by the appropriate factor, as follows:

Number of layers:	1	2	3	4
Derating factor:	0.85	0.65	0.45	0.32

OZOFLEX – Flexible cables with cross linked elastomeric insulation

VOLTAGE RATING

- Rated voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 0.7/1.15kV
 - DC operation U_o/U = 0.9/1.73kV
- AC test voltage = 2.5kV for 15min

*The cable is designated with EI4 insulation compound in accordance with VDE/IEC and is in accordance with Australian Standard AS/NZS 5000-1 for the voltage rating of 0.6/1kV.

OZOFLEX – Flexible cables with cross linked elastomeric insulation

CORE COLOUR IDENTIFICATION

Single Core	black
3 Core	blue, brown, green/yellow
4 Core	brown, black, grey, green/yellow
5 Core	blue, brown, black, grey, green/yellow
Multi core	black insulation white cores sequentially numbered including a green/yellow earth core.
Australian core colours red, white, blue, black, green/yellow	

Selection and ordering data

	No. of cores x conductor size	Part No.	Nominal No. of strands x and strand diameter
OZOFLEX with black insulation and sheath	mm²		mm
	1 x 1.5	5DH2 104-5	30x0.25
	1 x 2.5	5DH2 105-5	50x0.25
	1 x 4	5DH2 106-5	56x0.30
	1 x 6	5DH2 107-5	84x0.30
	1 x 10	5DH2 110-5	80 x 0.40
	1 x 16	5DH2 112-5	126 x 0.40
	1 x 25	5DH2 113-5	196 x 0.40
	1 x 35	5DH2 114-5	276 x 0.40
	1 x 50	5DH2 115-5	396 x 0.40
	1 x 70	5DH2 116-5	546 x 0.40
	1 x 95	5DH2 117-5	724 x 0.40
	1 x 120	5DH2 118-5	926 x 0.40
	1 x 150	5DH2 120-5	1156 x 0.40
	1 x 185	5DH2 121-5	1406 x 0.40
	1 x 240	5DH2 122-5	1862 x 0.40
	1 x 300	5DH2 123-5	1456 x 0.50

OZOFLEX – Flexible cables with cross linked elastomeric insulation

TENSILE STRENGTH

The maximum allowable tensile stress is 15N/mm².

This ensures no conductor damage will occur in operation.

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal diameter of bare conductor	Nominal cable overall diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
1.6	6.2	49	25
2.1	6.8	64	33
2.6	7.7	89	45
3.2	8.4	114	57
4.2	10.0	180	80
5.3	11.2	253	106
6.6	13.1	354	142
70.8	14.5	465	177
9.3	16.7	642	223
10.9	18.9	864	283
12.6	21.4	1117	341
14.2	23.7	1399	406
15.9	26.1	1729	470
17.5	27.5	2095	540
20.2	31.8	2624	651
22.3	35.9	3315	752

OZOFLEX – Flexible cables with cross linked elastomeric insulation

Selection and ordering data

	No. of cores x conductor size	Part No.	Nominal No. of strands x and strand diameter
without a green/yellow earth	mm ²		mm
	2 x 1	5DH2 203-5	32 x 0.20
	2 x 1.5	5DH2 204-5	30 x 0.25
	2 x 2.5	5DH2 205-5	50 x 0.25
	2 x 4	5DH2 206-5	56 x 0.30
	2 x 6	5DH2 207-5	84 x 0.30
	3 x 0.75	5DH2 995-6	24 x 0.20
	3 x 1.0	5DH2 997-6	32 x 0.20
	3 x 1.5	5DH2 855-4	30 x 0.25
OZOFLEX including a green/yellow earth core			
	3G1	5DH2 303-5	32 x 0.22
	3G1.5	5DH2 304-5	30 x 0.25
	3G2.5	5DH2 305-5	50 x 0.25
	3G4	5DH2 306-5	56 x 0.30
	3G6	5DH2 307-5	84 x 0.30
	3G10	5DH2 310-5	80 x 0.40
	3G16	5DH2 312-5	126 x 0.40
	4G1	5DH2 403-5	32 x 0.20
	4G1.5	5DH2 404-5	30 x 0.25
	4G2.5	5DH2 405-5	50 x 0.25
	4G4	5DH2 406-5	56 x 0.30
	4G6	5DH2 901-5	84 x 0.30
	4G10	5DH2 410-5	80 x 0.40
	4G16	5DH2 412-5	126 x 0.40
	4G25	5DH2 413-5	196 x 0.40
	4G35	5DH2 414-5	276 x 0.40

OZOFLEX – Flexible cables with cross linked elastomeric insulation

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal diameter of bare conductor	Nominal cable overall diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
1.3	8.1	83	19
1.6	9.1	106	24
2.1	10.4	152	32
2.6	12.0	213	43
3.2	13.7	278	55
1.2	7.7	95	13
1.3	9.3	101	16
1.6	10.2	135	20
1.3	8.8	102	19
1.6	9.5	131	24
2.1	11.2	189	32
2.6	12.9	264	43
3.2	14.1	344	55
4.2	19.7	644	78
5.3	24.5	903	103
1.3	9.3	125	16
1.6	10.5	159	20
2.1	12.2	231	27
2.6	14.1	329	36
3.2	15.7	440	46
4.2	21.4	799	66
5.3	23.9	1096	87
6.6	29.3	1627	116
7.8	32.5	2108	144

OZOFLEX – Flexible cables with cross linked elastomeric insulation

Selection and ordering data

	No. of cores x conductor size	Part No.	Nominal No. of strands x and strand diameter
	mm ²		mm
OZOFLEX	4G50	5DH2 415-5	396 x 0.40
including a	4G70	5DH2 416-5	546 x 0.40
green/yellow	4G95	5DH2 417-5	724 x 0.40
earth core	4G120	5DH2 418-5	926 x 0.40
	5G1	5DH2 503-5	32 x .20
	5G1.5	5DH2 504-5	30 x 0.25
	5G2.5	5DH2 505-5	50 x 0.25
Aust. Core	5G2.5 – Australian	5DH2 958-6	50 x 0.25
Colours	5G4 – Australian	5DH2 961-6	56 x 0.30
R,W,B,B,	5G6 – Australian	5DH2 907-6	84 x 0.30
green/yellow	5G10	5DH2 510-5	80 x 0.40
earth core	5G10 – Australian	5DH2 941-6	80 x 0.40
	5G16- Australian	5DH2 939-6	126 x 0.40
	5G25	5DH2 513-5	196 x 0.40
	5G25 – Australian	5DH2 942-6	196 x 0.40
	5G35 – Australian	5DH2 965-5	276 x 0.40
	5G50	5DH2 515-5	396 x 0.40
	5G70	5DH2 516-5	546 x 0.40
	5G95	5DH2 517-5	274 x 0.40

OZOFLEX – Flexible cables with cross linked elastomeric insulation

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal Diameter of bare conductor	Nominal cable overall diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
9.3	38.5	2908	182
10.9	43.4	3856	230
12.6	49.1	5062	275
14.2	54.5	6262	327
1.3	10.3	157	16
1.6	11.6	194	20
2.1	13.6	280	27
2.1	13.6	280	27
2.6	15.6	407	36
3.2	17.5	542	46
4.2	23.7	972	66
4.2	23.7	972	66
5.3	26.9	1352	87
6.6	32.5	1999	116
6.6	32.5	1999	116
7.8	36.4	2554	144
9.3	42.2	3515	182
10.9	48.4	4831	230
12.6	54.8	6262	275

OZOFLEX – Flexible cables with cross linked elastomeric insulation

Selection and ordering data

	No. of cores x conductor size	Part No.	Nominal No. of strands x and strand diameter
	mm ²		mm
OZOFLEX (Control) including a green/yellow earth core	3G1.5	5DH2 844-5	30 x 0.25
	7G1.5	5DH2 580-5	30 x 0.25
	8G1.5	5DH2 940-5	30 x 0.25
	12G1.5	5DH2 583-5	30 x 0.25
	18G1.5	5DH2 258-5	30 x 0.25
	24G1.5	5DH2 943-5	30 x 0.25
	7G2.5	5DH2 590-5	50 x 0.25
	8G2.5	5DH2 591-5	50 x 0.25
	10G2.5	5DH2 592-5	50 x 0.25
	12G2.5	5DH2 593-5	50 x 0.25
	18G2.5	5DH2 595-5	50 x 0.25
	24G2.5	5DH2 596-5	50 x 0.25

OZOFLEX – Flexible cables with cross linked elastomeric insulation

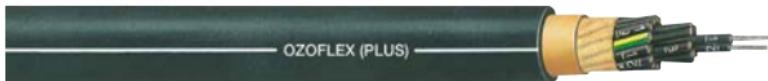
Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal Diameter of bare conductor	Nominal cable overall diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
1.9	10	165	20
1.6	14.7	323	20
1.6	18.5	450	20
1.6	18.2	482	20
1.6	21.0	689	20
1.6	24.5	919	20
2.1	17.2	456	27
2.1	18.3	519	27
2.1	21.1	692	27
2.1	24.7	993	27
2.1	28.7	1331	27
2.1	20.7	647	27

OZOFLEX (PLUS)

Flexible cables for submersion in polluted liquids

Flexible cables for submersion in polluted liquids



APPLICATION

OZOFLEX(PLUS) rubber-sheathed cables are intended for connection of electrical equipment in contaminated water and for medium mechanical stresses. Owing to the various (and frequently changing) substances of which the contaminated water is made up, the cables may be used only in easily accessible areas that can be inspected (installation depth of approximately 10 m, as customarily encountered in sewage water tanks).

These cables are also suitable for use in process water, cooling water, mine surface water, rainwater and combined waste water. They also can be used in groundwater and seawater; it is possible to impose less stringent specifications in terms of accessibility and inspection. In such cases the cables can be used at depths up to 500 m.

If the water concerned is aggressive or composed of special substances, the cable's resistance properties should be examined. These cables can be used indoors, outdoors, in explosion-hazard areas, in fire-hazard locations, on construction sites, in open-cast mining and in quarries, in industry and in agriculture. They can also be permanently installed, e.g. on plaster, on excavators or on hoisting gear.

The permissible AC test voltage in connection with motor tests is 3 kV, the maximum test duration is 3 minutes.

The insulating and sheath materials used allow a maximum temperature at the conductor of 90 °C.

Typical uses include:

- Sewage treatment plants
- Waste water pumps – effluent aerators
- Abattoirs (high temp chemical cleaning)
- Dairy industry
- Mining – de-watering
- Chemical plants & steelworks
- Hygenic cleaning in breweries, food processing plants etc.
- Water depth approx. 10m in waste water, up to 500m in all other types
- Suitable in seawater

DESIGN

OZOFLEX (PLUS) cables consist of finely stranded copper conductors laid up to provide a flexible design. R-EP-90 elastomer insulation provides improved current capacities. Cables above 16mm² and all control cables include an additional elastomer inner sheath and all cables up to 6mm² have tinned conductors. The specially compounded heavy duty CPE Elastomer sheath (Hypalon) is oil resistant and flame retardant and resists the effects of water absorption.

The construction is in accordance with the Australian Standards AS 1125, AS 3191, AS/NZS 5000-1.

THERMAL CHARACTERISTICS

■ Maximum permissible operating temperature at conductor	90 °C
■ Maximum permissible short circuit temperature at conductor	250 °C (max. 5 s)
■ Maximum permissible water temperature (At higher water temperatures, a shortened cable service life is to be expected)	40 °C
■ Minimum permissible temperatures when in motion	-25 °C
when stationary	-40 °C

OZOFLEX (PLUS)

Flexible cables for submersion in polluted liquids

MINIMUM BENDING RADII

The following minimum bending radii should be observed to ensure operating reliability.

- For fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

The values are valid for permanent operation with DC or AC with 50 up to 60 Hz at 40°C ambient temperature. Touching a surface, two or three cores loaded, multi-core cables all cores loaded.

VOLTAGE RATING

- Rated voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 0.7/1.15kV
 - DC operation U_o/U = 0.9/1.73kV
- AC test voltage (test duration) = 2.5 kV (15 min)

* The cable is designated with EI4 insulation compound in accordance with VDE/IEC and is in accordance with Australian Standard AS/NZS 5000-1 for the voltage rating of 0.6/1kV.

CORE COLOUR IDENTIFICATION

Single Core	black
3 Core	blue, brown, green/yellow
4 Core	brown, black, grey, green/yellow
5 Core	blue, brown, black, grey, green/yellow
Multi core	black insulation sequentially numbered including a green/yellow earth core.

TENSILE STRENGTH

The maximum allowable tensile stress is 15N/mm².

This ensures no conductor damage will occur in operation.

OZOFLEX (PLUS)

Flexible cables for submersion in polluted liquids

Selection and ordering data

No. of cores x conductor size	Part No.	Nominal No. of strands x and strand diameter
OZOFLEX H0RN-F 1X ...		
	mm ²	mm
OZOFLEX (PLUS) including a green/yellow earth	3G1	5DH1 014 29 x 0.20
	3G1.5	5DH1 015 27 x 0.25
	3G2.5	5DH1 016 45 x 0.25
	3G4	5DH1 017 50 x 0.30
	3G6	5DH1 018 75 x 0.30
	3G10	5DH1 020 78 x 0.30

OZOFLEX (PLUS)

Flexible cables for submersion in polluted liquids

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal Diameter of bare conductor	Nominal cable overall diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
1.5	9.6	122	19
1.8	10.6	154	24
2.6	12.8	229	32
3.2	14.8	319	43
3.9	16.9	420	55
5.1	22.4	780	78

OZOFLEX (PLUS)

Flexible cables for submersion in polluted liquids

Selection and ordering data

	No. of cores x conductor size	Part No.	Nominal No. of strands x and strand diameter
"Brown, black, grey, green/yellow"			
	mm ²		mm
OZOFLEX (PLUS) including a green/yellow earth	4G1 4G1.5 4G2.5 4G4 4G10 4G16 4G25 4G35 4G50 4G70 4G95 4G120 7G1.5	5DH1 245 5DH1 021 5DH1 022 5DH1 023 5DH1 025 5DH1 026 5DH1 027 5DH1 028 5DH1 030 5DH1 031 5DH1 032 5DH1 033 5DH1 241	29 x 0.21 27 x 0.26 45 x 0.26 50 x 0.31 78 x 0.41 124 x 0.41 192 x 0.41 271 x 0.41 388 x 0.41 551 x 0.41 733 x 0.41 938 x 0.41 30 x 0.26
OZOFLEX (PLUS) with pilots	4G1.5 + 2 x 1.5 4G2.5 + 2 x 1.5 4G4 + 2 x 1.5 4G6 + 2 x 1.5 4G10 + 2 x 1.5 4G10 + 4 x 1.5 4G16 + 2 x 1.5 4G25 + 2 x 1.5 4G35 + 2 x 1.5	5DH1 069 5DH1 070 5DH1 071 5DH1 072 5DH1 073 5DH1 276 5DH1 275 5DH1 282 5DH1 076	27 x 0.26 45 x 0.26 50 x 0.31 75 x 0.31 78 x 0.41 78 x 0.41 124 x 0.41 192 x 0.41 271 x 0.41

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal Diameter of bare conductor	Nominal cable overall diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
1.2	9.8	139	16
1.5	11.0	177	20
1.9	12.8	251	27
2.4	14.6	344	36
3.9	22.2	841	66
5.7	26.8	1256	87
6.8	31.4	1812	116
8.0	35.2	2312	144
9.4	40.1	3011	182
11.0	45.2	4230	230
12.8	52.3	5536	275
14.5	56.6	6724	327
1.5	15.75	362	20
1.5	12.5	187	20
1.9	14.3	261	27
2.4	16.1	354	36
2.9	18.6	491	46
3.9	23.7	851	66
3.9	23.7	851	66
5.7	28.3	1266	87
6.8	32.9	1822	116
8.0	36.70	2322	144

OZOFLEX (PLUS) SCREENED (FC+)

Submersible overall screened cable (emc compliant)

Flexible cables with cross linked elastomeric insulation:



APPLICATION

For making connections to electrical equipment used in a waste-water environment and subject to medium mechanical stress. Especially for frequency converter controlled AC drives and if considerable demands in respect of electromagnetic compatibility (EMC) according to the EMC directive imposes.

For an effective shielding both ends of cable must have a good shield contact to ground. For connection with 1-level frequency converter, rated output voltage max. 690 V.

Owing to the various (and frequently changing) substances of which the contaminated water is made up, the cables may be used only in easily accessible areas that can be inspected (installation depth of approximately 10 m, as customarily encountered in sewage water tanks).

These cables are also suitable for use in process water, cooling water, mine surface water, rainwater and combined waste water. Under certain circumstances they can be suitable for groundwater and seawater; it is possible to impose less stringent specifications in terms of accessibility and inspection. In such cases the cables can be used at depths up to 500 m.

If the water concerned is aggressive or composed of special substances, the cable's resistance properties should be examined.

These cables can be used indoors, outdoors, in explosion-hazard areas, in fire-hazard locations, on construction sites, in open-cut mining and in quarries.

In industry and in agriculture. They can also be permanently installed, e.g. on plaster, on excavators or on hoisting gear. If they are permanently

OZOFLEX (PLUS) SCREENED (FC+)

installed in protective conduits or equipment, or e.g. in well installations or are used as rotor circuit cables for motors.

The permissible AC test voltage in connection with motor tests is 3 kV, the maximum test duration is 3 minutes.

Specifically designed for pumps in waste-water under medium mechanical stress.

Typical uses include:

- Sewage treatment plants
- Waste water pumps, effluent aerators
- For pumps requiring control cores
- Electromagnetic compatibility (EMC)
- Abattoirs (high temp chemical cleaning)
- Dairy industry
- Mining – de-watering
- Chemical plants & steelworks
- Hygenic cleaning in breweries, food processing plants etc.
- Water depth approx. 10m in waste water, as customarily Encountered in sewerage tanks
- Suitable in seawater under certain circumstances
- Suitable for hazardous locations

DESIGN

OZOFLEX (PLUS) SCREENED cables consist of finely stranded copper conductors laid up to provide a flexible design. R-EP-90 elastomer insulation provides improved current capacities. All cables up to 6mm² have tinned conductors. Between the elastomer inner and outer sheaths there is an overall tinned copper screen. The specially compounded heavy duty CSP Elastomer sheath (Hypalon) is oil resistant and flame retardant and resists the effects of water absorption.

Designed in accordance with the Australian Standards AS 1125, AS 3191, AS/NZS 5000-1.

OZOFLEX (PLUS) SCREENED (FC+)

THERMAL CHARACTERISTICS

- Maximum permissible operating temperature at conductor 90 °C
- Maximum permissible short circuit temperature at conductor 250 °C (max. 5 s)
- Maximum permissible water temperature (At higher water temperatures, a shortened cable service life is to be expected) 40 °C
- Minimum permissible temperatures when in motion -25 °C when stationary -40 °C

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

The values are valid for permanent operation with DC or AC with 50 up to 60 Hz at 40°C ambient temperature. Touching a surface, two or three cores loaded, multi-core cables all cores loaded.

OZOFLEX (PLUS) SCREENED (FC+)

VOLTAGE RATING

- Rated voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 0.7/1.15kV
 - DC operation U_o/U = 0.9/1.73kV
- AC test voltage = 2.5kV

*The cable is designated with EI4 insulation compound in accordance with VDE/IEC and is in accordance with Australian Standard AS/NZS 5000-1 for the voltage rating of 0.6/1kV..

CORE COLOUR IDENTIFICATION

Single Core	black
3 Core	blue, brown, green/yellow
4 Core	brown, black, green/yellow , grey
Multi core	black insulation sequentially numbered including a green/yellow earth core.

TENSILE STRENGTH

The maximum allowable tensile stress is 15N/mm².

This ensures no conductor damage will occur in operation.

OZOFLEX (PLUS) SCREENED (FC+)

Selection and ordering data

No. of cores x conductor size	Part No.	Nominal No. of strands x and strand diameter
mm ²		mm
3 G 1.5	5DH5 305	30 x 0.25
3 G 2.5	5DH5 306	50 x 0.25
4 G 1.5	5DH5 312	30 x 0.25
4 G 2.5	5DH5 313	50 x 0.25
4 G 4	5DH5 314	56 x 0.30
4 G 6	5DH5 315	84 x 0.30
4 G 10	5DH5 316	80 x 0.40
4 G 16	5DH5 317	126 x 0.40
4 G 25	5DH5 160	196 x 0.40
4 G 35	5DH5 320	276 x 0.40
4 G 50	5DH5 321	396 x 0.40
4 G 70	5DH5 322	546 x 0.40
4 G 95	5DH5 323	724 x 0.40
4 G 120	5DH5 324	926 x 0.40

OZOFLEX (PLUS) screened with pilots

4 G 2.5 + 4 x 1.5	5DH5 146	50 x 0.25
4 G 4 + 4 x 1.5	5DH5 147	56 x 0.30
4 G 6 + 4 x 1.5	5DH5 148	84 x 0.30
4 G 10 + 4 x 1.5	5DH5 149	80 x 0.40
4 G 16 + 4 x 1.5	5DH5 150	126 x 0.40
4 G 25 + 4 x 2.5	5DH5 152	196 x 0.40
4 G 35 + 4 x 2.5	5DH5 151	276 x 0.40
4 G 50 + 4 x 2.5	5DH5 154	396 x 0.40
4 G 70 + 4 x 2.5	5DH5 153	546 x 0.40
4 G 95 + 4 x 2.5	5DH5 155	724 x 0.40
4 G 120 + 4 x 2.5	5DH5 158	926 x 0.40
4 G 185 + 4 x 2.5	5DH5 157	1406 x 0.40

OZOFLEX (PLUS) SCREENED (FC+)

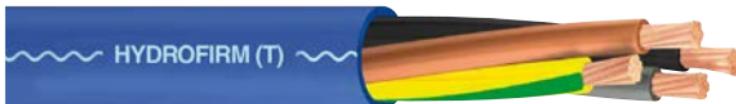
Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal cable overall diameter	Approx. net cable weight	Unenclosed Spaced
mm	kg/km	A
13	230	24
15	300	32
14	266	20
16.8	388	27
18.5	516	36
20.8	630	46
24.8	972	66
29.3	1447	87
34.3	2015	116
37.8	2539	144
43.8	3458	182
48.3	4800	230
55.8	6280	275
59.8	7520	327
21.7	630	27
24.0	905	36
26.0	930	46
26.7	1133	66
28.4	1363	87
34.0	2022	116
36.4	2550	144
42.50	3600	182
48.20	4800	230
52.00	5450	275
61.00	6900	327
72.00	10200	428

HYDROFIRM (T)

Round and Flat Cables for Drinking Water Application

Flexible cables for use underwater and for
submersible pumps



APPLICATION

- Submersible pumps in boreholes, mining, irrigation dams, reticulation systems
- Ponds and fountains
- For fresh, salt & lightly polluted water (60°C)
- Underwater and marine installations
- Sub zero installations (-50°C)
- De-watering & drainage systems
- For pumps with thermistors
- Water authorities
- Flexible marina power supplies
- Round version suitable for depths up to 2000mts

For making connections to electrical equipment used in water and subjected to medium mechanical stress. The cables can also be used in drinking water, industrial water, cooling water, surface water, rainwater, ground water and sea water (salt water).

When corrosive water is involved, or water of some other special compositions must be investigated in each individual case. They may not be used in water containing more than 0,5 mg/l of chlorine These cables can be used indoors, outdoors, in industrial and agricultural plant, but not in explosion-hazard areas.

For protected, fixed installation within equipment, pipes or wells, as well as for rotor connections, these cables may be operated with an AC voltage to 1000 V or a DC voltage to 750 V with respect to earth. The permissible AC voltage for motor tests is 3 kV for a maximum duration of 3 minutes.

DESIGN

HYDROFIRM (T) cables consist of finely stranded copper conductors laid up to provide a flexible design. R-EP-90 elastomer insulation enables improved current capacities and a specially compounded EPR sheath inhibits water absorption. A hand strippable bond between insulation and sheath stops any moisture migration along the insulated conductors should the sheath be damaged. HYDROFIRM (T) is suitable for water temperatures up to 60°C and is designed and approved for use in drinking water eg., mineral spring and spa pumps. For particularly aggressive liquids refer to OZOFLEX (PLUS) and PROTOMONT HD. The sheath colour is blue for identification. Designed in accordance with the Australian Standard, AS/NZS 5000-1, AS/NZS 3191 and DIN VDE 0282 pt 810.

OPERATING TEMPERATURE

■ Minimum permissible ambient temperature	-40°C
■ Maximum permissible conductor temperature	90°C
■ Maximum permissible short circuit temperature	250°C (max 5sec)
■ Minimum ambient temperature for optimum fully flexible operation	-25°C

HYDROFIRM (T)

Round and Flat Cables for Drinking Water Application

MINIMUM BENDING RADII

The following minimum bending radii should be observed to ensure operating reliability.

- For fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following factors. For HYDROFIRM (T) the water temperature should be considered as the ambient depending on the % of cable submerged.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

The values are valid for permanent operation with DC or AC with 50 up to 60 Hz at 40°C ambient temperature. Touching a surface, two or three cores loaded, multi-core cables all cores loaded.

TENSILE STRENGTH

The maximum allowable tensile stress is 15N/mm². This ensures no conductor damage will occur in operation.

VOLTAGE RATING

- Rated voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - DC operation U_o/U = 0.9/1.73kV
 - AC test voltage = 3kV

*The cable is designated with EI4 insulation compound in accordance with VDE/IEC and is in accordance with Australian Standard AS/NZS 5000-1 for the voltage rating of 0.6/1kV.

CORE COLOUR IDENTIFICATION

Single core	-	black
3 core	-	blue, brown and green/yellow
4 core	-	brown, black, grey and green/yellow
5 core	-	brown, black, grey, blue, green/yellow
Multi core	-	black insulation, sequentially numbered, including a green/yellow earth core

THERMAL CHARACTERISTICS

Maximum permissible water temperature.

(At higher water temperatures, a shortened
cable service life is to be expected)

60 °C

HYDROFIRM (T)

Round and Flat Cables for Drinking Water Application

Selection and ordering data

HYDROFIRM (T) with black core insulation	No. of cores x conductor size	Part No.	Nominal. No. of strands and strand diameter
	mm ²		mm
	1 x 1.5	5DH1 302	30 x 0.25
	1 x 2.5	5DH1 602	50 x 0.25
	1 x 4	5DH1 603	56 x 0.30
	1 x 6	5DH1 305	84 x 0.30
	1 x 10	5DH1 306	80 x 0.40
	1 x 16	5DH1 307	126 x 0.40
	1 x 25	5DH1 308	196 x 0.40
	1 x 35	5DH1 310	276 x 0.40
	1 x 50	5DH1 311	396 x 0.40
	1 x 70	5DH1 312	546 x 0.40
	1 x 95	5DH1 313	724 x 0.40
	1 x 120	5DH1 314	926 x 0.40
	1 x 150	5DH1 315	1156 x 0.40
	1 x 185	5DH1 316	1406 x 0.40
	1 x 240	5DH1 317	1862 x 0.40
	1 x 300	5DH1 318	1995 x 0.40

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal diameter of conductor mm	Nominal cable diameter mm	Approx. net cable weight kg/km	Unenclosed Spaced A
1.6	6.3	50	25
2.1	6.9	62	33
2.6	7.9	86	45
3.2	8.3	120	57
4.2	10.3	180	80
5.3	12.5	265	106
6.6	14.5	380	142
7.8	16.5	500	177
9.3	18.8	690	223
10.9	21.3	920	283
12.5	23.8	1180	341
14.2	25.3	1470	406
15.9	27.5	1777	470
17.5	29.7	2100	540
20.2	33.0	2708	651
26.3	35.9	3371	752

HYDROFIRM (T)

Round and Flat Cables for Drinking Water Application

Selection and ordering data

No. of cores x conductor size	Part No.	Nominal. No. of strands and strand	
		diameter	
		mm	
HYDROFIRM (T) including a green/yellow earth core	3G1.5	5DH1 352	30 x 0.25
	3G2.5	5DH1 353	50 x 0.25
	3G4	5DH1 354	56 x 0.30
	3G6	5DH1 644	84 x 0.30
	3G10	5DH1 645	80 x 0.40
		mm ²	
	4G1.5	5DH1 362	30 x 0.25
	4G2.5	5DH1 363	50 x 0.25
	4G4	5DH1 364	56 x 0.30
	4G6	5DH1 365	84 x 0.30
	4G10	5DH1 366	80 x 0.40
	4G16	5DH1 367	126 x 0.40
	4G25	5DH1 368	196 x 0.40
	4G35	5DH1 370	276 x 0.40
	4G50	5DH1 371	396 x 0.40
	4G70	5DH1 372	546 x 0.40
	4G95	5DH1 373	724 x 0.40
	4G120	5DH1 374	926 x 0.40
		mm	
	7 G 1.5	5DH1 402	30 x 0.25
	7 G 2.5	5DH1 412	50 x 0.25
	7 G 4	5DH1 422	56 x 0.30

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal diameter of conductor mm	Nominal cable diameter mm	Approx. net cable weight kg/km	Unenclosed Spaced 
A			
1.6	10.1	140	24
2.1	12.0	200	32
2.6	13.9	285	43
3.2	15.3	370	55
4.2	20.4	655	78
1.6	11.0	175	20
2.1	13.0	250	27
2.6	15.0	355	36
3.2	16.8	475	46
4.2	22.3	825	66
5.3	27.3	1250	87
6.6	32.5	1800	116
7.8	37.0	2360	144
9.3	43.0	3250	182
10.9	48.3	4300	230
12.6	52.6	3250	275
14.2	57.1	4300	327
1.6	15.2	353	20
1.9	17.2	494	27
2.5	20.7	714	36

HYDROFIRM (T)

Round and Flat Cables for Drinking Water Application

Selection and ordering data

HYRDOFIRM (T), four-core design, with earth conductor, FLAT

No. of cores x conductor size	Part No.	Nominal. No. of strands and strand
		diameter
mm ²		mm
HYDROFIRM (T)	4 G 1.5	5DH1 522
FLAT including a green/yellow earth core	4 G 2.5	5DH1 523
	4 G 4	5DH1 524
	4 G 6	5DH1 525
	4 G 10	5DH1 526
	4 G 16	5DH1 527
	4 G 25	5DH1 528
	4 G 35	5DH1 530
	4 G 50	5DH1 531
	4 G 70	5DH1 532
	4 G 95	5DH1 533
	4 G 120	5DH1 534

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal diameter of conductor	Nominal cable diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
1.6	6.8 x 17.3	167	20
2.1	7.8 x 20.1	240	27
2.6	8.8 x 24.0	337	36
3.2	10.0 x 27.3	448	46
4.2	13.5 x 34.8	791	66
5.3	15.8 x 42.8	1162	87
6.6	18.8 x 51.3	1698	116
7.8	20.8 x 50.8	2293	144
9.3	23.8 x 68.0	3054	182
10.9	26.5 x 75.3	4200	230
12.6	28.5 x 80.0	5260	275
14.3	30.6 x 85.9	6291	327

HYDROFIRM (T) SCREENED

Flexible cables for use underwater and for submersible pumps



APPLICATION

- Submersible pumps in boreholes, mining, irrigation dams, reticulation systems
- Ponds and fountains
- For fresh, salt & lightly polluted water (60°C)
- Underwater and marine installations
- Sub zero installations (-50°C)
- De-watering & drainage systems
- Pumps with thermistors
- Flexible marina power supplies
- Suitable for depths up to 500 mts

DESIGN

HYDROFIRM (T) screened cables consist of finely stranded copper conductors laid up to provide a flexible design. R-EP-90 elastomer insulation enables improved current capacities and a specially compounded EPR sheath inhibits water absorption.

A hand stripable bond between insulation and inner sheath stops any moisture migration along the insulated conductors should the sheath be damaged. Between the inner and outer EPR sheaths there is an overall copper screen. HYDROFIRM (T) is suitable for water temperatures up to 60°C and is designed and approved for use in drinking water eg., mineral spring and spa pumps. For particularly aggressive liquids refer to OZOFLEX (PLUS) and PROTOMONT HD. The sheath colour is blue for identification. Designed in accordance with the Australian Standard AS/NZS 5000-1, AS/NZS 3191 and AS/NZS 3008.1.1:2017.

HYDROFIRM (T) SCREENED

OPERATING TEMPERATURE

- Minimum permissible ambient temperature -50°C
- Maximum permissible conductor temperature 90°C
- Maximum permissible short circuit temperature 250°C
(max 5sec)
- Minimum ambient temperature for optimum fully flexible operation -50°C

MINIMUM BENDING RADII

The following minimum bending radii should be observed to ensure operating reliability.

- For fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following factors. For HYDROFIRM (T) the water temperature should be considered as the ambient depending on the % of cable submerged.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

TENSILE STRENGTH

The maximum allowable tensile stress is 15 N/mm².

This ensures no conductor damage will occur in operation.

VOLTAGE RATING

- Rated voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 0.7/1.2kV
 - DC operation U_o/U = 0.9/1.8kV
- AC test voltage = 2kV

HYDROFIRM (T) SCREENED

CORE COLOUR IDENTIFICATION

4 core	-	brown, black, grey and green/yellow earth
Pilot core	-	black

Selection and ordering data

Number of cores and conductor size	Part No.	Nominal number and strand diameter	Nominal diameter of bare conductor
mm ²		mm	mm
4G1.5	5DH5 631	30 x 0.25	1.6
4G2.5	5DH5 632	50 x 0.25	2.1
4G4	5DH5 633	56 x 0.30	2.6
4G6	5DH5 634	84 x 0.30	3.2
4G10	5DH5 635	80 x 0.40	4.2
4G16	5DH5 636	126 x 0.40	5.3
4G25	5DH5 637	196 x 0.40	6.6
4G35	5DH5 638	276 x 0.40	7.8
4G50	5DH5 640	396 x 0.40	9.3
4G70	5DH5 641	546 x 0.40	10.9
4G95	5DH5 642	724 x 0.40	12.2
4G120	5DH5 643	926 x 0.40	13.2

HYDROFIRM (T) SCREENED

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal diameter of cable	Approx. net cable weight	Unenclosed Spaced
mm	kg/km	A
14.0	260	20
16.8	396	27
18.8	525	36
20.8	665	46
24.8	970	66
29.3	1400	87
34.3	2030	116
37.8	2610	144
43.8	3610	182
48.3	4710	230
55.8	6340	275
59.8	7470	327

PROTOMONT HD

Heavy duty flexible for aggressive environments

HD Rubber Flexible Cables for use in Mining and Industry



APPLICATION

- Extra heavy duty flexible
- Stackers & reclaimer cabling
- Draglines, shovels & hoists
- Conveyors
- Open cut mine trailing cable
- Heavy industry & construction sites
- Submersion in polluted liquids
- Single core for festoon cranes
- Suitable for hazardous locations

DESIGN

PROTOMONT HD heavy duty elastomer flexible cables are designed for aggressive environments in open cut mining and quarries, industry and construction sites as well as agricultural use where heavy mechanical stresses occur.

PROTOMONT HD cables consist of finely stranded tinned copper conductors laid up to provide a flexible design.

R-EP-90 elastomer insulation enables improved current capacities and a specially compounded XHD-PCP-90 outer sheath resists hard and abrasive surfaces. Designed in accordance with the Australian Standard AS 1125, AS/NZS 5000-1, AS 3191 and DIN VDE 0250 pt 812 for NSSHoeu. Flame retardant to VDE and MSHA.

OPERATING TEMPERATURE

- Minimum permissible ambient temperature -40°C
- Maximum permissible conductor temperature 90°C
- Maximum permissible short circuit temperature 250°C
- Minimum ambient temperature for optimum fully flexible operation -25°C

MINIMUM BENDING RADII

The following minimum bending radii should be observed to ensure operating reliability.

- For fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

CURRENT CARRYING CAPACITY

Current ratings are based on a continuous operating ambient temperature of 40°C. At other temperatures, these values must be converted using the following table

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

The values are valid for permanent operation with DC or AC with 50 up to 60 Hz. Touching a surface, two or three cores loaded, multi-core cables all cores loaded.

TENSILE STRENGTH

The maximum allowable tensile stress is 15 N/mm².

This ensures no conductor damage will occur in operation.

PROTOMONT HD

VOLTAGE RATING

- Rated voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 0.7/1.2kV
 - DC operation U_o/U = 0.9/1.8kV
- AC test voltage = 3kV

Selection and Ordering Data

	No. of cores x conductor size	Part No.	Nominal of strands and strand diameter
PROTOMONT	mm ²		mm
with black core insulation	1 x 16	5DL1 112	126 x 0.40
	1 x 25	5DL1 113	196 x 0.40
	1 x 35	5DL1 114	276 x 0.40
	1 x 50	5DL1 115	396 x 0.40
	1 x 70	5DL1 116	546 x 0.40
	1 x 95	5DL1 117	724 x 0.40
	1 x 120	5DL1 118	926 x 0.40
	1 x 150	5DL1 120	1156 x 0.40
	1 x 185	5DL1 121	1406 x 0.40
	1 x 240	5DL1 122	1862 x 0.40
	1 x 300	5DL1 123	1456 x 0.50
PROTOMONT	3 x 1.5*	5DL1 304	30 x 0.25
including green/ yellow earth core	3 x 2.5*	5DL1 305	50 x 0.25
	3 x 4*	5DL1 306	56 x 0.30
	3 x 6*	5DL1 307	84 x 0.30

CORE COLOUR IDENTIFICATION

Single core:	-	black
3 core	-	blue, brown and green/yellow
4 core	-	blue, brown, black and green/yellow
5 core	-	blue, brown, black, green/yellow and black
Multi core:	-	black insulation sequentially numbered including a green/yellow earth core

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal of diameter conductor	Nominal cable diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
5.3	11.2	231	106
6.6	13.4	349	142
7.8	14.5	443	177
9.3	16.4	601	223
10.9	18.5	814	283
12.6	20.5	1041	341
14.2	23.0	1325	406
15.9	25.2	1615	470
17.5	28.3	1997	540
20.2	31.5	2575	651
22.3	35.7	3244	752
1.6	11.9	185	24
2.1	13.0	235	32
2.6	16.2	380	43
3.2	17.6	447	55

PROTOMONT HD

Selection and ordering data

	No. of cores x conductor size	Part No.	Nominal of strands and strand diameter
	mm ²		mm
PROTOMONT	4 x 1.5*	5DL1 404	30 x 0.25
including green/yellow earth core	4 x 2.5*	5DL1 405	50 x 0.25
	4 x 4*	5DL1 406	56 x 0.30
	4 x 6*	5DL1 407	84 x 0.30
	4 x 10*	5DL1 410	80 x 0.40
	4 x 16*	5DL1 412	126 x 0.40
	4 x 25*	5DL1 413	196 x 0.40
	4 x 35*	5DL1 414	276 x 0.40
	4 x 50*	5DL1 415	396 x 0.40
	4 x 70*	5DL1 416	546 x 0.40
	4 x 95*	5DL1 417	724 x 0.40
	4 x 120*	5DL1 418	926 x 0.40
	4 x 150*	5DL1 420	1156 x 0.40
	4 x 185*	5DL1 421	1406 x 0.40
	4 x 240*	5DL1 422	1862 x 0.40
	3 x 50/25*	5DL1 715	396 x 0.40
	3 x 70/35*	5DL1 716	546 x 0.40
	3 x 95/50*	5DL1 717	724 x 0.40
	3 x 120/95*	5DL1 718	926 x 0.40
	3 x 150/70*	5DL1 722	1156 x 0.40
	3 x 185/95*	5DL1 721	1406 x 0.40

*This construction can be used for submersion in aggressive liquids

PROTOMONT HD

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal of diameter conductor	Nominal cable diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
1.6	12.6	215	20
2.1	15.1	319	27
2.6	16.7	411	36
3.2	17.9	508	46
4.2	22.1	803	66
5.3	26.7	1181	87
6.6	31.3	1721	116
7.8	34.2	2176	144
9.3	39.6	3022	182
10.9	43.6	3939	230
12.6	50.2	5335	275
14.2	56.6	6758	327
15.9	62.8	8021	375
17.5	69.3	10154	428
20.2	75.7	10621	511
9.3	39.9	2874	182
10.9	43.8	3714	230
12.6	50.1	4899	275
14.2	56.6	6482	327
15.9	62.0	7568	375
17.5	69.3	9328	428

PROTOMONT HD

Selection and ordering data

	No. of cores x conductor size	Part No.	Nominal of strands and strand diameter
	mm ²		mm
PROTOMONT	5 x 1.5	5DL1 504	30 x 0.25
including	5 x 2.5	5DL1 505	50 x 0.25
green/yellow	5 x 4	5DL1 506	56 x 0.30
earth core	5 x 6	5DL1 507	84 x 0.30
	5 x 10	5DL1 510	80 x 0.40
	5 x 16	5DL1 512	126 x 0.40
	5 x 25	5DL1 513	196 x 0.40
	5 x 35	5DL1 514	276 x 0.40
	6 x 1.5*	5DL1 982	30 x 0.25
	7 x 1.5*	5DL1 933	30 x 0.25
	8 x 1.5*	5DL1 931	30 x 0.25
	10 x 1.5*	5DL1 878	30 x 0.25
	11 x 1.5*	5DL1 903	30 x 0.25
	7 x 2.5	5DL1 911	50 x 0.25
	10 x 2.5*	5DL1 748	50 x 0.25
	12 x 2.5	5DL1 755	50 x 0.25
	12 x 2.5*	5DL1 923	50 x 0.25
	18 x 2.5	5DL1 937	50 x 0.25
	24 x 2.5	5DL1 842	50 x 0.25
	7 x 4	5DL1 750	56 x 0.30
	12 x 4	5DL1 957	56 x 0.30
	14 x 4	5DL1 892	56 x 0.30

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal of diameter conductor	Nominal cable diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
1.6	13.5	250	20
2.1	16.2	363	27
2.6	28.0	482	36
3.2	20.1	633	46
4.2	24.0	956	66
5.3	28.9	1396	87
6.6	33.9	2051	116
7.8	38.4	2743	144
1.6	14.5	315	20
1.6	16.2	364	20
1.6	17.6	419	20
1.6	18.7	476	20
1.6	20.0	516	20
2.1	18.4	497	27
2.1	22.0	671	27
2.1	22.2	735	27
2.1	22.2	765	27
2.1	26.0	1034	27
2.1	29.8	1300	27
2.6	21.5	698	36
2.6	27.1	1070	36
2.6	27.2	1130	36

PROTOMONT SCREENED

Heavy duty / extra heavy duty flexible cables



APPLICATION

- Flexible pump cable
- Heavy duty construction site leads
- Oil rigs
- Generator supply cables
- Suitable for submersible application
- Suitable for hazardous locations

For flexible use and fixed installation in underground mining applications, tunnel building applications, open-cast mining applications, in quarries, on construction sites and similar applications, with heavy mechanical stresses. The cables can be used indoors as well as outdoors, in explosion-hazard areas, in industry and in agriculture.

They can be used permanently in waste water up to 40 °C. Owing to the various (and frequently changing) substances of which the contaminated water is made up, the cables may be used only in easily accessible areas that can be inspected (installation depth of approximately 10 m, as customarily encountered in sewage water tanks).

The cables can also be used in industrial water, cooling water, surface water, rainwater and mixed water – and in groundwater and seawater to a more limited extent. The requirements for accessibility and inspection are less stringent in such cases at depths greater than 10 m up to 500 m.

If the water concerned is aggressive or composed of special substances, the cable's resistance properties should be examined.

PROTOMONT SCREENED

DESIGN

PROTOMONT heavy duty elastomer flexible cables are designed for aggressive environments in open cut mining and quarries, industry and construction sites as well as agricultural use where heavy mechanical stresses occur.

PROTOMONT cables consist of finely stranded tinned copper conductors laid up to provide a flexible design. Between the elastomer inner and outer sheaths there is an overall tinned copper screen.

R-EP-90 elastomer insulation enables improved current carrying capacities and a specially compounded CPE outer sheath resists hard and abrasive surfaces. Designed in accordance with the Australian Standard, AS/NZS 5000-1, AS 3191.

OPERATING TEMPERATURE

■ Maximum permissible operating temperature at conductor	90 °C
■ Maximum permissible short circuit temperature at conductor	250 °C (max. 5 s)
■ Minimum permissible temperatures	
when in motion	-25 °C
when stationary	-40 °C
■ Maximum permissible water temperature	40 °C

PROTOMONT SCREENED

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

The values are valid for permanent operation with DC or AC with 50 up to 60 Hz. Touching a surface, two or three cores loaded, multi-core cables all cores loaded.

VOLTAGE RATING

- Rated voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 0.7/1.15kV
 - DC operation U_o/U = 0.9/1.73kV
- AC test voltage = 3kV

* The cable is designed in accordance with VDE/IEC and meets or exceeds the Australian Standard AS 5000.1 for the voltage rating of 0.6/1kV.

MINIMUM BENDING RADII

The following minimum bending radii should be observed to ensure operating reliability.

- For fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

Note: For force guided and reeling applications please refer to Siemens CORDAFLEX (K) information.

PROTOMONT SCREENED

TENSILE STRENGTH

The maximum allowable tensile stress is 15N/mm². This ensures no conductor damage will occur in operation.

CORE COLOUR IDENTIFICATION

4 core	blue, brown, black, green/yellow
5 core	red, white, blue, black, green/yellow

PROTOMONT SCREENED

Selection and ordering data

5 CORE OVERALL PROTOMONT SCREENED (F)

	Number of cores x conductor size	Part No.	Nominal strands and strand diameter
	mm ²		mm
PROTOMONT	5 x 2.5/2.5	5DL2 710	50 x 0.25
Screened	5 x 4/4	5DL2 811	56 x 0.30
	5 x 6/6	5DL2 712	84 x 0.30
	5 x 10/10	5DL2 713	80 x 0.40
	5 x 16/16	5DL2 714	126 x 0.40

PROTOMONT SCREENED

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal of diameter conductor	Nominal cable diameter	Approx net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
2.1	15.8	540	27
2.6	18.8	680	36
3.2	20.4	910	46
4.2	24.6	1320	66
5.3	30.0	1955	87

SECTION 2



HIGH TEMPERATURE CABLES

SINOTHERM 180°C 5DR3 PAGE 96

SINOTHERM Multicore 5DR5 PAGE 102

SINOTHERM Glass Fibre Braid 5DR4 PAGE 103

SINOTHERM 110°C 5DR7 PAGE 104

EVA 125 FLEX 5DR7 PAGE 110

TECSUN (PV) 5DH9 PAGE 114

SINOTHERM 180°C

High temperature 180°C silicone flexible cables



APPLICATION

- Switchboard & cubical wiring
- Transformer and capacitor cabling
- High output floodlights
- Chemical & ceramic industry
- Injection moulding & extruders
- Steelworks / hot strip rolling mills
- Foundries & cooking plants
- Heating appliances
- Motor rewinders
- For internal wiring in switchgear, distribution boards, electric cookers, electrical machines, heating appliances and luminaries.
- In conduits which are either surface mounted, embedded on or in or under plaster, or enclosed within electrical installation ducts or within equipment housings.
- By virtue of their increased heat resistance, these cables are particularly suitable for use in ambient temperatures of over 55 °C.
- Since silicone rubber is malleable and less durable than other insulating materials, these cables are not suitable for high mechanical stress, e.g. when cables laid across sharp edges.

DESIGN

SINOTHERM cables consist of fine stranded copper conductors laid up to provide a flexible design.

Silicone insulation offers high resistance to increased ambient temperatures, however with a low mechanical resistance to cuts and tearing.

OPERATING TEMPERATURE

- Minimum and maximum permissible ambient temperature -55°C +180°C
- Maximum permissible conductor temperature 180°C
- Maximum permissible short circuit temperature 350°C (max. 5 s)
- Minimum ambient temperature for optimum fully flexible operation -40°C

RESISTANCE TO CHEMICALS

Occasional slight exposure to oil and grease is permitted but the cables must not lie continually in oil or grease. They must be protected against fuels and solvents by suitable insulation. Designed in accordance with ASNZS/5000.1 the single core 0.6/1kV SINOTHERM.

MINIMUM BENDING RADII

The following minimum bending radii must be observed to ensure operating reliability.

These are applicable for both sub-zero and elevated temperatures.

- Fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

SINOTHERM 180°C

CURRENT CARRYING CAPACITY

The values are valid for a cable in permanent operation with DC or AC with 50 up to 60 Hz at 150 °C ambient temperature, free in air.

Current ratings are based on continuous operation at an ambient temperature of 150°C per the following table when installed unenclosed and touching.

Conductor Size	0.75	1.0	1.5	2.5	4	6	10	16	25	35	50	70	95
Amps	15	19	24	32	42	54	73	98	129	158	198	245	292

At other temperatures these values must be converted using the following table.

Ambient temp. up to °C	150	155	160	165	170	175	180
Current capacity as a % of values above	100	91	82	71	58	41	23

Current ratings are based on continuous operation at an ambient temperature of 40°C per the following table when installed unenclosed and touching.

Conductor Size	0.75	1.0	1.5	2.5	4	6	10	16	25	35	50	70	95
Amps	18	21	27	38	51	65	92	123	163	202	294	364	433

At other temperatures these values must be converted using the following table.

°C	40	45	50	55	60	65	70	75
Factor	1.0	0.98	0.95	0.93	0.90	0.88	0.85	0.83

VOLTAGE RATING

- Rated voltage:
 - Single core U_o/U = 0.6/1kV
 - Multi core & glass braided U_o/U = 300/500V

CORE COLOUR IDENTIFICATION

2 core - blue, brown

3 core - blue, brown, green/yellow

4 core - blue, brown, black, green/yellow

5 core - blue, brown, black, green/yellow, black

A single core 660V is available in a range of colours for control wiring in black, red, pink, green/yellow, blue, orange, brown, white and grey.

Coloured Sinotherm Conductors tinned to AS/NZS 1125.

SINO THERM 180°C



Selection and ordering data

No. of cores x conductor size	Part No.	Nominal No. of strands and strand diameter
mm ²		mm
1 x 1.5	5DR3 514	30 x 0.25
1 x 2.5	5DR3 515	50 x 0.25
1 x 4	5DR3 516	56 x 0.30
1 x 6	5DR3 517	84 x 0.30
1 x 10	5DR3 518	80 x 0.40
1 x 16	5DR3 520	126 x 0.40
1 x 25	5DR3 521	196 x 0.40
1 x 35	5DR3 522	276 x 0.40
1 x 50	5DR3 523	396 x 0.40
1 x 70	5DR3 524	360 x 0.50
1 x 95	5DR3 525	475 x 0.50

Nominal diameter conductor mm	Nominal cable diameter mm	Approx. net cable weight kg/km
1.6	3.4	20
2.1	4.1	30
2.6	4.7	50
3.2	5.8	65
4.2	7.1	115
5.3	8.3	180
6.6	10.1	275
7.8	11.7	365
9.3	13.6	520
10.9	15.7	710
14.5	17.7	930

MULTICORE SINO THERM FLEXIBLE CABLES



Selection and ordering data

No. of cores x conductor size	Part No.	Nominal No. of strands and strand	Nominal conductor diameter	Nominal cable diameter	Approx. net cable weight
mm ²		mm	mm	mm	kg/km
2 x 0.75	5DR5 228-4	24 x 0.20	1.2	6.6	52
2 x 1	5DR5 238-4	32 x 0.20	1.3	7.1	59
2 x 1.5	5DR5 248-4	30 x 0.25	1.6	8.3	81
2 x 2.5	5DR5 258-4	50 x 0.25	2.1	9.8	125
2 x 4	5DR5 268-4	56 x 0.30	2.6	11.0	180
3 x 0.75	5DR5 328-4	24 x 0.20	1.2	7.2	62
3 x 1	5DR5 338-4	32 x 0.20	1.3	7.5	77
3 x 1.5	5DR5 348-4	30 x 0.25	1.6	8.8	98
3 x 2.5	5DR5 358-4	50 x 0.25	2.1	10.6	150
3 x 4*	5DR5 368-4	56 x 0.30	2.6	12.0	225
4 x 0.75	5DR5 428-4	24 x 0.20	1.2	7.8	80
4 x 1*	5DR5 438-4	32 x 0.20	1.3	8.2	94
4 x 1.5	5DR5 448-4	30 x 0.25	1.6	9.8	125
4 x 2.5	5DR5 458-4	50 x 0.25	2.1	11.5	185
4 x 4	5DR5 468-4	56 x 0.30	2.6	13.0	290
5 x 1.5	5DR5 548-4	30 x 0.25	1.6	10.7	155
7 x 1.5	5DR5 793-4	30 x 0.25	1.6	11.6	195
12 x 1.5*	5DR5 794-4	30 x 0.25	1.6	14.5	315

SINGLE CORE SINOTHERM WITH GLASS FIBRE BRAID (500V)



Selection and ordering data

No. of cores x conductor size	Part No.	Nominal No. of strands and strand	Nominal conductor diameter	Nominal cable diameter	Approx. net cable weight
mm ²		mm	mm	mm	kg/km
1 x 0.75	5DR4 021-5	24 x 0.20	1.2	3.1	17
1 x 1	5DR4 031-5	32 x 0.20	1.3	3.3	20
1 x 1.5	5DR4 041-5	30 x 0.25	1.6	3.8	27
1 x 2.5	5DR4 051-5	50 x 0.25	2.1	4.4	39
1 x 4	5DR4 061-5	56 x 0.30	2.6	5.0	54
1 x 6	5DR4 071-5	84 x 0.30	3.2	5.5	75
1 x 10	5DR4 101-5	80 x 0.40	4.2	7.1	130
1 x 16	5DR4 121-5	126 x 0.40	5.3	8.9	200
1 x 25	5DR4 131-4	196 x 0.40	6.6	10.9	305
1 x 35	5DR4 141-4	276 x 0.40	7.8	12.3	420
1 x 50	5DR4 151-4	396 x 0.40	9.3	14.8	595
1 x 70	5DR4 161-4	360 x 0.50	10.9	16.8	825
1 x 95*	5DR4 171-4	475 x 0.50	14.3	19.4	1075

SINOTHERM 110°C

High temperature 110°C silicone flexible cables



APPLICATION

These cables are intended for use as fixed wiring, or wiring where limited flexing in operation is encountered.

- For internal wiring in switchgear, distribution boards, electric cookers, electrical machines, heating appliances and luminaires
- In conduits which are either surface mounted, embedded on or in or under plaster, or enclosed within electrical installation ducts or within equipment housings
- By virtue of their increased heat resistance, these cables are particularly suitable for use in ambient temperatures of over 55°C
- Suitable for protected installation in, or on, lightning or controlgear for voltages up to 1000 V a.c. or, up to 750 V d.c. to earth.

INSULATION

Heat resistant, cross-linked elastomeric special compound

DESIGN

SINOTHERM cables consist of fine stranded copper conductors laid up to provide a flexible design.

Silicone insulation offers high resistance to increased ambient temperatures, however with a low mechanical resistance to cuts and tearing.

OPERATING TEMPERATURE

■ Maximum permissible operating temperature at conductor	110°C
■ Maximum permissible short-circuit temperature at conductor	250°C (max. 5 s)
■ Minimum permissible temperatures	
when in motion	-25°C
when stationary	-40°C

MECHANICAL CHARACTERISTICS

Permissible pulling force	max 15 N/mm ²
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RESISTANCE TO CHEMICALS

Occasional slight exposure to oil and grease is permitted but the cables must not lie continually in oil or grease. They must be protected against fuels and solvents by suitable insulation.

MINIMUM BENDING RADII

The following minimum bending radii must be observed to ensure operating reliability.

These are applicable for both sub-zero and elevated temperatures.

- Fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

SINOTHERM 110°C

CURRENT CARRYING CAPACITY

The values are valid for a cable in permanent operation with DC or AC with 50 up to 60 Hz at 80 °C ambient temperature, free in air.

Current ratings are based on continuous operation at an ambient temperature of 150°C per the following table when installed unenclosed and touching.

Conductor Size	0.75	1.0	1.5	2.5	4	6	10	16	25	35	50	70	95
Amps	15	19	24	32	42	54	73	98	129	158	198	245	292

Current ratings are based on continuous operation at an ambient temperature of 40°C per the following table when installed unenclosed and touching.

Conductor Size	0.75	1.0	1.5	2.5	4	6	10	16	25	35	50	70	95
Amps	18	21	27	38	51	65	92	123	163	202	294	364	433

At other temperatures these values must be converted using the following table.

°C	40	45	50	55	60	65	70	75
Factor	1.0	0.98	0.95	0.93	0.90	0.88	0.85	0.83

For other ambient temperatures, the current-carrying capacities must be converted with the following factors:

°C	55	60	65	70	75	80	85	90	95	100	105
f	1.35	1.29	1.22	1.15	1.08	1.00	0.91	0.82	0.71	0.58	0.41

VOLTAGE RATING

- Rated AC voltage U_o/U = 0.6/1kV
 - AC test voltage (test duration) U_o/U = 2.5kV (15min)

SINOTHERM 110°C

Selection and ordering data

No. of cores x conductor size	Insulation colour	Part No.	Nominal strands and strand diameter
mm²			mm
1 x 0.50	black	5DR7 050-5	16 x 0.20
1 x 0.75	black	5DR7 051-5	24 x 0.20
1 x 1	black	5DR7 052-5	32 x 0.20
1 x 1.5	black	5DR7 053-5	30 x 0.25
1 x 2.5	black	5DR7 054-5	50 x 0.25
1 x 4	black	5DR7 055-5	56 x 0.30
1 x 6	black	5DR7 056-5	84 x 0.30
1 x 10	black	5DR7 057-5	80 x 0.40
1 x 16	black	5DR7 060-5	126 x 0.40
1 x 25	black	5DR7 061-5	196 x 0.40
1 x 35	black	5DR7 062-5	276 x 0.40
1 x 50	black	5DR7 063-5	396 x 0.40
1 x 70	black	5DR7 064-5	546 x 0.40
1 x 95	black	5DR7 065-5	724 x 0.40
1 x 120	black	5DR7 066-5	926 x 0.40
1 x 150	black	5DR7 067-5	1156 x 0.40
1 x 185	black	5DR7 068-5	1406 x 0.40
1 x 240	black	5DR7 070-5	1862 x 0.40

SINOTHERM 110°C

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal diameter of conductor mm	Nominal cable diameter mm	Approx. net cable weight kg/km	Unenclosed Spaced
0.94	2.2	8	12
1.2	2.4	11	15
1.3	2.5	13	25
1.6	3.3	21	31
2.1	3.8	30	42
2.6	4.5	47	55
3.2	5.0	64	70
4.2	6.5	110	99
5.3	7.9	164	130
6.6	9.3	256	173
7.8	10.5	339	214
9.3	12.3	489	270
10.9	14.1	663	340
14.2	16.1	869	410
15.9	18.8	1165	487
17.5	20.7	1435	562
20.2	22.6	1754	644
24.6	26.3	2306	775

EVA 125 FLEX

High temperature 125°C flame retardant



APPLICATION

- Switchboard cabling
- Coil & transformer wiring
- High thermal stress resistant
- Chemical & ceramic industry
- Steelworks

DESIGN

EVA 125 is a flexible elastomer insulated cable with improved thermal characteristics due to special cross linking together with an excellent resistance to oils, chemicals, abrasion and mechanical damage.

EVA 125 Flex cables consist of finely stranded tinned copper conductors laid up to provide a flexible design with a specially compounded R-EVA-125 synthetic rubber insulation for operation in elevated ambient temperatures. Designed in accordance with the Australian Standards AS 1125, AS/NZS 5000-1. The special Ethylene Vinyl Acetate compound is halogen free and exhibits low smoke generation in the event of fire and has a high resistance to absorption of oils and grease.

TEMPERATURE

- | | |
|---|-----------------|
| ■ Minimum and maximum permissible ambient temperature | -40°C to +110°C |
| ■ Maximum permissible conductor temperature | 125°C |
| ■ Maximum permissible short circuit temperature | 250°C |

MINIMUM BENDING RADII

The following minimum recommended bending radii should be observed to ensure operating reliability.

- For fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

CURRENT CARRYING CAPACITY

Current ratings are based on a continuous operating ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

TENSILE STRENGTH

The maximum allowable tensile stress on the conductors is 15N/mm². This ensures no conductor damage will occur in operation.

VOLTAGE RATING

- Rated voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 0.7/1.15kV
 - DC operation U_o/U = 0.9/1.73kV
- AC test voltage = 2.5kV

The cable is designated 450/750V in accordance with VDE/IEC and designed to the Australian Standard AS/NZS 5000.1 for the voltage rating 0.6/1kV

CORE COLOUR IDENTIFICATION

The cable is available in either black or orange as standard. Variations are available subject to manufacture length.

EVA 125 FLEX

Selection and ordering data

No. of cores conductor size	Part No.	Nominal strands and strand diameter
mm ²		mm
1 x 4	5DR7 490-5	56 x 0.3
1 x 10	5DR7 493-5	80 x 0.4
1x 16	5DR7 492-5	126 x 0.4
1 x 50	5DR7 491-5	396 x 0.4

EVA 125 FLEX

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal diameter of conductor	Nominal cable diameter	Approx. net cable weight	Unenclosed Spaced
mm	mm	kg/km	A
2.6	4.9	60	55
4.2	7.0	130	99
5.3	8.1	210	130
9.3	13.6	595	270

TECSUN (PV)

SOLAR 120°C Single and twin cables



APPLICATION

TECSUN (PV) Solar cables are intended for use in photovoltaic power supply systems and are suitable in applications where the cable will be free moving, hanging, fixed installation or buried underground.

PV-Wires TECSUN DUO (PV) PV1-F and TECSUN DUO (PV) S are intended for use in Photovoltaic Power Supply Systems: Indoor and/or outdoor, in explosion hazard areas, in industrial and agriculture fields. They are suitable for applications in/at equipment with protective insulation (Protecting Class II).

Installation in cable trays, conduits, on and in walls is available.

DESIGN

The cables can be used indoor, outdoor and in explosion hazardous areas and is suitable for applications in/at equipment with protective insulation (protecting class II).

The special EVA sheath (Ethylene Vinyl Acetate) is halogen free and exhibits low smoke generation in the event of fire and has high resistance to absorption of oils and grease.

Tecsun cables consist of multi-stranded tinned copper conductors that are designed to resist corrosion and reduce annealing of the conductors due to the constant current in DC systems.

Tecsun Cables meet and exceed IEC 61215 and 61646, IEC64/1123/CD and AS4777.1.2.3:2005.

Approvals: DKE/VDE AK 411.2.3, VDE-Reg. No. 7985, TUV 2 PFG 1169/08.2007, Cert. – No. R 60013989

THERMAL PARAMETERS

- Minimum permissible temperature -40°
(stationary and in motion)
- Maximum permissible operating temperature of the conductor +120°C;
Interpretation according to IEC 60216
- Short-circuit temperature +250°C
(at the conductor max .5 sec.)

TENSILE STRENGTH

The maximum allowable tensile stress on the conductors is 15N/mm², and 50N/mm² during insulation.

ELECTRICAL PARAMETERS

- Rated voltage AC 0.6/1kV
 - TECSUN DUO (PV)* Power Cable 600/1000V
 - TECSUN DUO (PV) S Signal Cable 300/500V
- Maximum PV-System voltage DC up to 2.0 kV possible
- Maximum AC operating voltage 0.7/1.2kV
- Maximum DC operating voltage 0.9/1.8kV

COLOUR IDENTIFICATION

Single Core Sheath	Black, Blue, Red
Twin Sheath	Black
Twin Cores	Black, Red

TECSUN (PV)

No. of cores x conductor size	Insulation colour	Part No.	Nominal conductor diameter	Nominal cable diameter
mm²				
1 x 1.5	Black	5DH9 3011	1.6	4.6
1 x 2.5	Black	5DH9 3021	2.1	4.9
1 x 4	Black	5DH9 3031	2.6	5.4
1 x 6	Black	5DH9 3041	3.2	5.9
1 x 10	Black	5DH9 3051	4.2	7.0
1 x 16	Black	5DH9 3061	5.3	8.7
1 x 1.5	Blue	5DH9 3012	1.6	4.6
1 x 2.5	Blue	5DH9 3022	2.1	4.9
1 x 4	Blue	5DH9 3032	2.6	5.4
1 x 6	Blue	5DH9 3042	3.2	5.9
1 x 1.5	Red	5DH9 3013	1.6	4.6
1 x 2.5	Red	5DH9 3023	2.1	4.9
1 x 4	Red	5DH9 3033	2.6	5.4
1 x 6	Red	5DH9 3043	3.2	5.9
Nominal cross-section and colour	Order No.	Nominal conductor diameter	Nominal cable diameter	
Tecsun Duo (PV)			mm	mm
2 x 4 Black	5DH9 903	2.6	5.4	
2 x 6 Black	5DH9 904	3.2	5.9	

TECSUN (PV)

Approx. net cable weight	Min bending radius	Max permissible tensile load	Current carrying capacity at 60°C	Permissible short circuit current
kg/km	mm	N m	A	kA
29	13.8	23	29	0.19
43	14.7	38	41	0.32
58	16.2	60	55	0.50
76	17.7	90	70	0.76
120	21.0	150	98	1.26
178	34.8	240	132	2.01
29	13.8	23	29	0.19
43	14.7	38	41	0.32
58	16.2	60	55	0.50
76	17.7	90	70	0.76
29	13.8	23	29	0.19
43	14.7	38	41	0.32
58	16.2	60	55	0.50
76	17.7	90	70	0.76
Approx. net weight Twin Cable	Min bending radius	Max permissible tensile load	Current carrying capacity at 60°C ambient temperature (free in air)	Permissible short circuit current (1s)
kg/km	mm	N m	A	kA
116	16.2	120	44	0.50
152	17.7	180	56	0.76

SECTION 3



PVC DATA AND CONTROL CABLES

PROTOFLEX PVC Unscreened 5DE7 PAGE 120

PROTOFLEX PVC Screened 5DE7 PAGE 129

PROTOFLEX-EMV-FC 5DE6 PAGE 132

PROTOFLEX EMC 5EMC PAGE 136

EMC CABLE GLANDS PAGE 138

PROTOFLEX PVC

PVC control cables



APPLICATION

PROTOFLEX® PVC control cables are specifically suitable for use as flexible control cables.

- Fans and air-conditioning systems
- Machine tools
- Production and processing machines
- Industrial robots

DESIGN

PROTOFLEX® PVC control cables consist of finely stranded copper conductors with V75 PVC insulation. The high grade PVC sheath is resistant to oil, grease and chemicals.

PROTOFLEX® PVC screened control cables have a PVC inner and outer sheath with a copper braided shield between the sheaths which serves to avoid electromagnetic interference (EMC) in building systems and where equipment is in environments where Electromagnetic interference would be unacceptable.

Designed for moderate mechanical loading, in dry, damp and wet areas and in hazardous areas. Outdoor use is possible, provided that the cables are protected from direct sunlight and are permanently installed.

SPECIAL FEATURES

Suitable for use in hazardous areas	Burning behavior in accordance with DIN VDE 0472 Part 804, Test B (IEC 660332-1-2) and AS 5000
Low transfer impedance	The cable has a concentric copper braided shield to restrict electromagnetic interference (max 250 Ω /km at 30 MHz).
Voltages	300/500 V Rated voltage <ul style="list-style-type: none">– 3 phase and single phase operation– in DC operation
Certification Standards	2 kV Test voltage VDE Reg. No. 7042 Based on DIN VDE 0281-13

PROTOFLEX PVC

SHIELD CONNECTION

In order to obtain optimum shielding quality, the shield must be connected around its entire circumference and over an ample surface area at both ends of the cable.

Twisting the shielding strands together into a pigtail or exclusive use of a sheath wire is not sufficient.

TECHNICAL INFORMATION

Cable construction is based on DIN VDE 0281-13

- Finely-stranded bare copper conductors according to VDE 0295 Class 5
- Insulation of special polyvinyl chloride (PVC)
- PVC inner sheath over laid-up cores in shielded versions
- Braided shield of tinned copper wires over inner sheath
- Grey PVC outer sheath, largely resistant to oil and chemicals

CONTINUOUS TENSILE LOAD

The maximum allowable tensile stress for operation of cables with mobile equipment is 15 N per mm².

The maximum allowable tensile stress is 50 N mm² for fixed installations.

PERMISSIBLE TEMPERATURE

At conductor:	free-flexing	-5°C to + 70°C
	fixed	- 40°C to + 70°C
Bending radii:	fixed	4 d
	free-flexing	7.5 d

d= outer diameter of cable

CURRENT CARRYING CAPACITY

The current carrying capacities are based on a continuous operating temperature of 40°C. At other temperatures these values must be converted using the following factors

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

VOLTAGE RATINGS

- Rated voltage: U_o/U = 300/500V
- AC test voltage = 2kV

*The cable is designated 300/500V in accordance with VDE/IEC.

CORE COLOUR IDENTIFICATION

All control cores are black, sequentially numbered and include a **green/yellow** earth core.

PROTOFLEX PVC

PVC control cables, unscreened

Selection and ordering data

No. of cores \times conductor cross-section	Part No.	Nominal No. of strands and strand diameter	Approx. cable diameter	Unenclosed Touching
mm ²		mm	mm	A
2 x 0.5	5DE7 026	16 x 0.20	4.8	8
3 x 0.5	5DE7 001	16 x 0.20	5.1	8
4 x 0.5	5DE7 002	16 x 0.20	5.6	8
5 x 0.5	5DE7 003	16 x 0.20	6.2	8
7 x 0.5	5DE7 004	16 x 0.20	6.8	8
12 x 0.5	5DE7 005	16 x 0.20	9.2	8
18 x 0.5	5DE7 010	16 x 0.20	10.8	8
25 x 0.5	5DE7 012	16 x 0.20	13.1	8
32 x 0.5	5DE7 014	16 x 0.20	14.2	8
40 x 0.5	5DE7 016	16 x 0.20	16.1	8
52 x 0.5	5DE7 027	16 x 0.20	17.7	8



PVC control cables, unscreened Selection and ordering data

Current ratings are based on AS/NZS 3008.1.1:2017.

No. of cores x conductor cross-section	Part No.	Nominal No. of strands and strand diameter	Approx. cable diameter	Unenclosed Touching
mm ²		mm	mm	A
2 x 0.75	5DE7 040	24 x 0.20	5.2	10
3 x 0.75	5DE7 041	24 x 0.20	5.6	10
4 x 0.75	5DE7 042	24 x 0.20	6.2	10
5 x 0.75	5DE7 043	24 x 0.20	6.8	10
7 x 0.75	5DE7 044	24 x 0.20	7.5	10
12 x 0.75	5DE7 045	24 x 0.20	10.0	10
18 x 0.75	5DE7 050	24 x 0.20	12.0	10
25 x 0.75	5DE7 052	24 x 0.20	14.5	10
34 x 0.75	5DE7 055	24 x 0.20	16.5	10
42 x 0.75	5DE7 057	24 x 0.20	17.9	10
50 x 0.75	5DE7 058	24 x 0.20	19.6	10



PROTOFLEX PVC

PVC control cables, unscreened

Selection and ordering data

No. of cores \times conductor cross-section	Part No.	Nominal No. of strands and strand diameter	Approx. cable diameter	Unenclosed Spaced
mm ²		mm	mm	A
2 x 1.0	5DE7 080	32 x 0.20	5.7	13
3 x 1.0	5DE7 081	32 x 0.20	6.1	13
4 x 1.0	5DE7 082	32 x 0.20	6.7	13
5 x 1.0	5DE7 083	32 x 0.20	7.4	13
7 x 1.0	5DE7 084	32 x 0.20	8.3	13
12 x 1.0	5DE7 085	32 x 0.20	10.9	13
18 x 1.0	5DE7 090	32 x 0.20	13.1	13
25 x 1.0	5DE7 093	32 x 0.20	15.9	13
34 x 1.0	5DE7 096	32 x 0.20	18.1	13
41 x 1.0	5DE7 098	32 x 0.20	19.6	13
50 x 1.0	5DE7 102	32 x 0.20	21.5	13



PVC control cables, unscreened Selection and ordering data

Current ratings are based on AS/NZS 3008.1.1:2017.

No. of cores x conductor cross-section	Part No.	Nominal No. of strands and strand diameter	Approx. cable diameter	Unenclosed Spaced
mm ²		mm	mm	A
2 x 1.5	5DE7 120	30 x 0.25	6.3	17
3 x 1.5	5DE7 121	30 x 0.25	6.7	17
4 x 1.5	5DE7 122	30 x 0.25	7.4	17
5 x 1.5	5DE7 123	30 x 0.25	8.3	17
7 x 1.5	5DE7 124	30 x 0.25	9.1	17
12 x 1.5	5DE7 125	30 x 0.25	12.1	17
18 x 1.5	5DE7 128	30 x 0.25	14.5	17
25 x 1.5	5DE7 133	30 x 0.25	17.7	17
34 x 1.5	5DE7 135	30 x 0.25	19.9	17
42 x 1.5	5DE7 136	30 x 0.25	21.6	17
50 x 1.5	5DE7 137	30 x 0.25	23.8	17

PROTOFLEX PVC

PVC control cables, unscreened

Selection and ordering data

No. of cores \times conductor cross-section	Part No.	Nominal No. of strands and strand diameter	Approx. cable diameter	Unenclosed Spaced
mm ²		mm	mm	A
2 x 2.5	5DE7 160	50 x 0.25	7.7	22
3 x 2.5	5DE7 161	50 x 0.25	8.3	22
4 x 2.5	5DE7 162	50 x 0.25	9.2	22
5 x 2.5	5DE7 163	50 x 0.25	10.1	22
7 x 2.5	5DE7 164	50 x 0.25	11.2	22
12 x 2.5	5DE7 165	50 x 0.25	15.2	22
18 x 2.5	5DE7 170	50 x 0.25	18.1	22
25 x 2.5	5DE7 172	50 x 0.25	22.1	22
34 x 2.5	5DE7 175	50 x 0.25	25.0	22
50 x 2.5	5DE7 178	50 x 0.25	30.0	22

PVC control cables, screened Selection and ordering data

Current ratings are based on AS/NZS 3008.1.1:2017.

No. of cores x conductor cross-section	Part No.	Nominal No. of strands and strand diameter	Approx. cable diameter	Unenclosed Spaced
mm ²		mm	mm	A
2 x 0.5	5DE7 626	16 x 0.20	6.8	8
3 x 0.5	5DE7 601	16 x 0.20	7.0	8
4 x 0.5	5DE7 602	16 x 0.20	7.5	8
5 x 0.5	5DE7 603	16 x 0.20	8.2	8
7 x 0.5	5DE7 604	16 x 0.20	8.7	8
12 x 0.5	5DE7 605	16 x 0.20	10.9	8
18 x 0.5	5DE7 610	16 x 0.20	12.8	8
25 x 0.5	5DE7 612	16 x 0.20	15.4	8
32 x 0.5	5DE7 614	16 x 0.20	16.7	8
40 x 0.5	5DE7 616	16 x 0.20	18.3	8

PROTOFLEX PVC

PVC control cables, screened

Selection and ordering data

No. of cores \times conductor cross-section	Part No.	Nominal No. of strands and strand diameter	Approx. cable diameter	Unenclosed Touching
mm ²		mm	mm	A
2 x 0.75	5DE7 640	24 x 0.20	7.4	10
3 x 0.75	5DE7 641	24 x 0.20	7.7	10
4 x 0.75	5DE7 642	24 x 0.20	8.2	10
5 x 0.75	5DE7 643	24 x 0.20	9.0	10
7 x 0.75	5DE7 644	24 x 0.20	9.5	10
12 x 0.75	5DE7 645	24 x 0.20	12.0	10
18 x 0.75	5DE7 650	24 x 0.20	14.2	10
25 x 0.75	5DE7 652	24 x 0.20	17.0	10
34 x 0.75	5DE7 655	24 x 0.20	19.0	10
42 x 0.75	5DE7 657	24 x 0.20	20.3	10



PVC control cables, screened Selection and ordering data

Current ratings are based on AS/NZS 3008.1.1:2017.

No. of cores x conductor cross-section	Part No.	Nominal No. of strands and strand diameter	Approx. cable diameter	Unenclosed Spaced
mm ²		mm	mm	A
2 x 1.0	5DE7 680	32 x 0.20	7.8	13
3 x 1.0	5DE7 681	32 x 0.20	8.1	13
4 x 1.0	5DE7 682	32 x 0.20	8.9	13
5 x 1.0	5DE7 683	32 x 0.20	9.5	13
7 x 1.0	5DE7 684	32 x 0.20	10.3	13
12 x 1.0	5DE7 685	32 x 0.20	13.3	13
18 x 1.0	5DE7 690	32 x 0.20	15.6	13
25 x 1.0	5DE7 693	32 x 0.20	18.4	13
34 x 1.0	5DE7 696	32 x 0.20	20.8	13
41 x 1.0	5DE7 698	32 x 0.20	22.3	13

PROTOFLEX-EMV-FC – UV Stabilised

UV Stabilised



APPLICATION

Specifically designed low capacitance screened cable for connection between AC variable speed drives and motors. Suitable for fixed installation and occasional freely flexing applications in dry damp and wet conditions.

U.V stabilised for indoor/outdoor use.

Especially for frequency converter controlled AC drives. As well as outdoors, for medium mechanical stress.

Not suitable for direct installation into the ground or submersion in water. Suitable for hazardous locations.

DESIGN

Electromagnetic compatibility (EMC) is the ability of electrical or electronic equipment to function normally in an environment without being effected by (EMI) electromagnetic and (RFI) radio frequency interferences or in turn disturbing the environment by transmitting EMI or RFI.

The Siemens PROTOFLEX -EMV screened power cable consists of finely stranded copper conductors with Cross Linked Poly Ethylene (XLPE) insulation covered with a tinned copper braided screen and a PVC orange, transparent sheath.

For cable cross sections 16mm² or greater the earth conductor is divided evenly into 3 seperate cores and uniformly located in the interstitial gaps around the power cores. This achieves a truly concentric design in accordance with the EMC standards.

The overall tinned copper braid screen is specifically designed for optimum Electromagnetic Compatibility (EMC) by taking into account the percentage coverage, braid fan angle, and wire gauge which all results in a very low transfer resistance. The screen offers a low DC resistance affording protection from low frequency interference such as AC harmonics.

PROTOFLEX-EMV-FC – UV Stabilised

Design in accordance with AS 1125 for the conductors and AS/NZS 5000.1 for the sheath. Fire performance is according to IEC 60332- 1

■ Minimum permissible ambient temperature	-40°C
■ Maximum permissible conductor temperature	90°C
■ Maximum permissible short circuit temperature	250°C
■ Minimum permissible temperature when in motion	(max. 5 s) -5°C
when stationary	-40°C

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

The current-carrying capacity values in the selection table are valid for one cable, installed on a surface, ambient temperature 40 °C.

MINIMUM BENDING RADII.

For recommended bending radii refer to the selection and ordering data tables.

CORE COLOUR IDENTIFICATION

4 core – brown, black, grey, **green/yellow earth** (could be multiple earth)

VOLTAGE RATING

■ Rated AC voltage:	U_o/U	= 0.6kV/1kV
■ AC test voltage:		= 5kV
■ Max. permissible peak AC voltage		= 2.4kV
■ For connection on frequency converter		U max. 690 V

PROTOFLEX-EMV-FC – UV Stabilised

UV stabilised

Selection and ordering data

No. of cores and conductor cross-section	Part No.	Nominal No. of strands and strand diameter	Operating capacitance	Nominal diameter over screen
mm ²		mm	nF/Km	mm
4 x 1.5	5DE6 600	30 x 0.25	130	8.4
4 x 2.5	5DE6 601	50 x 0.25	145	9.4
4 x 4	5DE6 602	56 x 0.30	145	11.6
4 x 6	5DE6 603	84 x 0.30	160	12.8
4 x 10	5DE6 604	80 x 0.40	185	15.3
3 x 16 + 3 x 2.5	5DE6 605	126 x 0.40	235	16.2
3 x 25 + 3 x 4	5DE6 606	196 x 0.40	245	19.8
3 x 35 + 3 x 16/3	5DE6 607	276 x 0.40	270	22.5
3 x 50 + 3 x 25/3	5DE6 608	396 x 0.40	270	26.7
3 x 70 + 3 x 35/3	5DE6 610	546 x 0.40	295	30.6
3 x 95 + 3 x 50/3	5DE6 611	724 x 0.40	300	35.1
3 x 120 + 3 x 50/3	5DE6 612	926 x 0.40	315	39.6
3 x 150 + 3 x 70/3	5DE6 613	1156 x 0.40	315	44.3
3 x 185 + 3 x 95/3	5DE6 614	1406 x 0.40	315	48.9
3 x 240 + 3 x 120/3	5DE6 615	1862 x 0.40	320	55.8
3 x 300 + 3 x 150/3	5DE6 616	1456 x 0.50	330	62.9

PROTOFLEX-EMV-FC – UV Stabilised

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal cable diameter	Min bending radii when STATIONARY	Min bending radii when IN MOTION	Approx. net cable weight	Unenclosed Spaced
mm	mm	mm	kg/km	A
11.5	69	92	150	20
13.0	100	125	205	27
15.5	124	155	320	36
17.0	136	170	410	46
19.5	156	195	600	66
21.0	168	210	770	87
24.5	196	245	1110	116
28.0	224	280	1510	144
33.0	264	330	2140	182
37.0	296	370	2860	230
42.0	336	420	3740	275
46.5	372	465	4810	327
51.5	412	515	5850	375
57.0	456	570	7100	428
64.5	516	645	9500	511
72.0	576	720	11680	584

PROTOFLEX EMC - UV Stabilised



APPLICATION

Specifically designed low capacitance screened cable for connection between AC variable speed drives and motors. Suitable for fixed installation and occasional freely flexing applications in dry damp and wet conditions.

No. of cores x conductor size	Part No.	Nominal No. of strands and strand diameter	Nominal diameter over screen
mm ²		mm	mm
3 x 1.5	5EM 3015	30 x 0.25	8.4
3 x 2.5	5EMV 3025	50 x 0.25	9.9
4 x 1.5	5EMV 4015	30 x 0.25	9.7
4 x 2.5	5EMV 4025	50 x 0.25	10.9
4 x 4	5EMV 4040	56 x 0.30	12.25
3 x 6 + 3 x 1.5	5EMV 4060	84 x 0.30	14.00
3 x 10 + 3 x 1.5	5EMV 4100	80 x 0.40	15.80
3 x 16 + 3 x 2.5	5EMV 4160	126 x 0.40	18.80
3 x 25 + 3 x 4	5EMV 4250	196 x 0.40	22.00
3 x 35 + 3 x 6	5EMV 4350	276 x 0.40	28.40
3 x 50 + 3 x 10	5EMV 4550	396 x 0.40	32.20

DESIGN

Electromagnetic compatibility (EMC) is the ability of electrical or electronic equipment to function normally in an environment without being affected by electromagnetic (EMI) and radio frequency interferences (RFI) or in turn disturbing the environment by transmitting EMI or RFI.

VOLTAGE RATING

- Rated AC voltage: U_o/U = 0.6kV/1kV

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal cable diameter	Min bending radii when STATIONARY	Min bending radii when IN MOTION	Approx. net cable weight kg/km	Unenclosed Spaced A
mm	mm	mm	kg/km	A
10.5	54.0	105	173	20
12.0	62.5	120	240	22
10.5	69.0	90	203	20
12.6	100.0	126	289	22
14.7	110.0	147	373	30
16.8	140.0	166	532	38
19.0	158.0	186	720	54
23.00	184.0	207	1006	83
26.00	208.0	247	1454	110
33.00	264.0	313	2085	137
37.00	296.0	350	2980	171

EMC CABLE GLANDS



EMC Cable Glands from Siemens are the perfect complement to PROTOFLEX-EMV screen cables providing an efficient shield connection that meets the requirements of both AS/NZS CISPR-11 and EN 55011.

Consisting of a few components they are quick and easy to install. Tightening the pressure nut causes the insert to press against two taper rings which, in turn, press on an endless spring washer, making its diameter taper, thus permanently bonding the screen braid of the threaded cable. The result is a low resistance connection between the cable screen and the housing of the electrical equipment via the gland body.

In order to conform with the radio interference suppression requirements set forth in EN 55011, the shield must be connected around its entire circumference and over an ample surface area at both ends of the cable.

ADVANTAGES

- Easily assembled
- 360° bonding on screen
- Large sealing ranges
- IP68
- High attenuation
- Sheath can still be continued on into the equipment housing

EMC CABLE GLANDS

THE EARTHING PROBLEM

The paint on cubicles and equipment housings has to be removed so the metal gland body is in direct contact with the bare metal of the equipment to ensure the earth bonding circuit is compliant.

THE SOLUTION

The 6 teeth of the lock nut are for equipotential bonding and scrape into the insulating layers of paint or powder to create a vibration-resistant contact.

- No surface corrosion
- Very low-ohm transition; gland/housing
- No need to clean contact surface
- Increases the installed vibration-resistance through frictional connection

EMC CABLE GLANDS

Cable cross section	Cable part No.	Nominal cable diameter	Approx. diameter over screen	Glands part No.
mm²		mm	mm	
4 x 1.5	5EMC 4015	11.20	9.70	100210999
4 x 2.5	5EMC 4025	13.30	10.90	100210999
4 x 4	5EMC 4040	15.50	12.25	100210738
3 x 6 + 3 x 1.5	5EMC 4060	17.50	14.00	100206872
3 x 10 + 3 x 1.5	5EMC 4100	19.60	15.80	100206872
3 x 16 + 3 x 2.5	5EMC 4160	23.00	18.80	100206246
3 x 25 + 3 x 4	5EMC 4250	26.00	22.00	100207312
4 x 1.5	5DE6 600	11.00	8.40	100210368
4 x 2.5	5DE6 601	12.50	9.40	100210999
4 x 4	5DE6 602	15.50	11.60	100210738
4 x 6	5DE6 603	17.50	12.80	100210738
4 x 10	5DE6 604	19.50	15.30	100206872
3 x 16 + 3 x 2.5	5DE6 605	21.00	16.20	100206246
3 x 25 + 3 x 4	5DE6 606	24.50	19.80	100207312
3 x 35 + 3 x 6	5DE6 607	28.00	22.50	100208193
3 x 50 + 3 x 10	5DE6 608	33.00	26.70	100208574
3 x 70 + 3 x 10	5DE6 610	37.00	30.60	100209510
3 x 95 + 3 x 16	5DE6 611	42.00	35.10	100209202
3 x 120 + 3 x 16	5DE6 612	46.50	39.60	100209598
3 x 150 + 3 x 25	5DE6 613	51.50	44.30	100209276
3 x 185 + 3 x 35	5DE6 614	57.00	48.90	100210042
3 x 240 + 3 x 42.5	5DE6 615	64.50	55.80	100200893

EMC CABLE GLANDS

Connection thread / length	Sealing range		Screen diameter range		Lock nut part No.
	mm	Max	Min	Max	
M 25 x 1.5	14.00	10.00	13.50	8.00	100204211
M 25 x 1.5	14.00	10.00	13.50	8.00	100204211
M 25 x 1.5	18.00	14.00	16.50	9.50	100204211
M 25 x 1.5	20.00	17.00	17.50	12.50	100204211
M 25 x 1.5	20.00	17.00	17.50	12.50	100204211
M 32 x 1.5	23.00	19.00	21.00	15.00	100206391
M 32 x 1.5	26.00	22.00	21.00	15.00	100206391
M 20 x 1.5	11.00	8.00	8.50	4.00	100203808
M 25 x 1.5	14.00	10.00	11.50	6.50	100204211
M 25 x 1.5	18.00	14.00	16.50	9.50	100204211
M 25 x 1.5	18.00	14.00	16.50	9.50	100204211
M 25 x 1.5	20.00	17.00	17.50	12.50	100204211
M 32 x 1.5	23.00	19.00	21.00	15.00	100206391
M 32 x 1.5	26.00	22.00	21.00	15.00	100206391
M 40 x 1.5	29.00	25.00	25.00	22.00	100207739
M 40 x 1.5	35.00	30.00	30.50	24.00	100207739
M 50 x 1.5	41.00	37.00	33.00	29.00	100209917
M 63 x 1.5	45.00	40.00	42.00	34.00	100210718
M 63 x 1.5	51.00	45.00	48.00	40.00	100210718
M 75 x 1.5	55.00	51.00	48.00	42.00	100210735
M 75 x 1.5	58.00	54.00	54.00	47.00	100211073
M 80 x 2.0	70.00	63.00	56.00	47.00	100200894

SECTION 4



CRANE, REELING AND HOIST CABLES

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CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

Flexible reeling and crane cables



APPLICATIONS

CORDAFLEX (SMK) cables are specifically designed to withstand high and very high mechanical stresses associated with cable reelers, festoon systems and force guided applications where high dynamic and static forces are induced into the cable.

CORDAFLEX (SMK) is designed for all types of mobile equipment such as ship loaders, gantry cranes, stackers and reclaimers, inclinators, hoists, spreader and magnet cranes, in steelworks, smelters and sub-zero environments.

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE



CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

- selection table -

Cable Type	Application					
Festoon System	Spring reeler without guides	Motor driven reeler without cable guide	Mono-spiral with multiroller guides	Drum reeler with multiroller force guided guides	Reeler for vertical cable run	
						

CORDAFLEX SMK

max = 30 N/mm²

M

M

M

M

M

M

M = Main field of application

DESIGN

CORDAFLEX (SMK) cables consist of extra finely stranded tinned copper conductors with a short length of lay to provide an extremely flexible conductor assembly with greater mechanical strength.

Designed in accordance with the Australian Standards, AS/NZS 5000-1, AS 3191 and AS/NZS 3008.1.1.2017.

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

Type	CORDAFLEX (SMK)
Conductor (refer also to DIN VDE 0295	Electrolytic copper tinned, very finely stranded class "F"
Conductor (refer also to DIN VDE 0207, Part 20)	PROTOLON MS Newly developed special compound based on high-quality EPR (at least 3GI3); improved mechanical and electrical characteristics
Shield for individually shielded cores and twisted and shielded	Braid screen made of tinned copper wires. Transfer impedance optimized at 30 MHz Surface covered: at least 60% for shielded cores at least 80% for twisted and shielded pairs
Core identification	Optimal identification as a result of light insulation with numbers printed in black for power and control cables, protective-earth conductor green-yellow
Core arrangement	Laid-up in a maximum of 3 layers, Length of lay 5 x D (core diameter)
Support element	Central aramide support element to increase the loading capability for special designs; the kN value designates the breaking load of the support element.
Sheath System	PROTOFIRM special: First sheath Newly developed special compound based on PCP, colour: yellow Anti-torsion braid Reinforced braid made of polyester threads, in a vulcanized bond between the sheaths. Resulting in a high strength of the sheath system. PROTOFIRM: Third sheath A sheath system with a unique combination of flexibility and robustness has been achieved through the use of a new structure. Abrasion and tear-proof special rubber compound based on PCP, colour: yellow. PROTOFIRM sandwich construction (2 sheaths) for wall thickness 3mm and more. Refer also to PROTOLON (SMK)
Marking	CORDAFLEX (SMK) (N)SHTÖU-JI-O (number of cores) x (cross section)

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

THERMAL PARAMETERS

■ Ambient temperature	
Fully flexible operation	-35°C to +80°C
Fixed installation	-50°C to +80°C
■ Maximum permissible operating temperature of the conductor	90°C
■ Short-circuit temperature of the conductor	250°C SMK
■ Short-circuit temperature of the conductor	200°C SMK-V

MECHANICAL PARAMETERS

In all cases, the cable reeler manufacturer should be consulted.

■ Tensile load:	Up to 30 N/mm ²
■ Torsional stresses:	± 50°/m
■ Min. distance with S-type directional changes:	20 x D

MINIMUM BENDING RADII

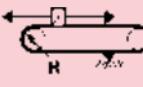
If the bending radii are smaller than those permitted, a reduced service life can be expected depending on the stress conditions. The values given in the following table should be taken as a basis.

The minimum bending radii are shown as the product of the overall diameter of the cable and a factor, which is dependent on the diameter of the cable (e.g. 3x d).

The minimum permissible bending radii are valid within the specified ambient temperature range (see thermal parameters subject to the provision that the permissible tensile loads are not exceeded).

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

Minimum bending radii

Flexible Cables	CORDAFLEX, PLANOFLEX, RONDOFLEX, SPREADERFLEX, Lift control cable				
Rated voltage U_0/U	Up to 0.6/1 kV				
Maximum overall diameter of the cable or maximum thickness of the flat cable (mm)	Up to 8	Above 8 to 12	Above 12 to 20	Above 20	
	Fixed installation	3 x d	3 x d	4 x d	4 x d
	Fully flexible operation	3 x d	4 x d	5 x d	5 x d
	For the entry, e.g. at a centre feed point	3 x d	4 x d	5 x d	5 x d
	For forced guidance with reeling operation	5 x d	5 x d	5 x d	6 x d
	For forced guidance with festoon operation	4 x d	4 x d	5 x d	5 x d
	For forced guidance with power tracks	4 x d	4 x d	5 x d	5 x d
	For forced guidance with sheaves	7.5 x d	7.5 x d	7.5 x d	7.5 x d
	For forced guidance with cable tenders	7.5 x d	7.5 x d	7.5 x d	7.5 x d
	Minimum distance with double or S-type directional changes	20 x d	20 x d	20 x d	20 x d

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

CHEMICAL PARAMETERS

Weather resistance	Unrestricted use outdoors and indoors, resistant to ozone, UV and moisture
Water compatibility and resistance to oil	Given and verified in long-term tests

CURRENT CARRYING CAPACITY

If, after all selection criteria have been taken into account, the type of flexible electric cable to be used for cranes and material handling equipment has been decided on, the necessary cross-section of the conductor can be determined either from the current to be transmitted or from the power. Installation conditions (stretched laying, suspended freely in the air, reeled), variations in ambient temperature, grouping, type of operation (continuous duty, intermittent periodic duty) and the use of multi-core cables are to be taken into account.

De-rating factors for varying ambient temperatures

Ambient temperature °C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

AS PER AS/NZS 3008.1.1:2017

Where layers of flexible cables are wound on a cylindrical-type drum or reel, the current-carrying capacity of the cable shall be derated by the appropriate factor, as follows:

Number of layers:	1	2	3	4
Derating factor:	0.85	0.65	0.45	0.32

TENSILE STRENGTH

CORDAFLEX has a maximum safe reeling tensile strength of 30N/mm². This ensures that no conductor deformation will occur in operation. Dynamic tensile stresses such as start-up, braking and centre feed pass-over should be taken into account.

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

VOLTAGE RATING

- Rated voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 0.7/1.2kV
 - DC operation U_o/U = 0.9/1.8kV
- AC test voltage
 - Power cores 3.5kv 5min
 - Control cores 3.5kv 5min

TRAVEL SPEED

At high speeds close attention to other parameters eg bending radii, cable tension and temperature must be adhered to.

- Gantry (reeling operation) No restriction. It is recommended to consult the manufacturer for speeds beyond 240m/min
- Trolley (festoon operation) Trolley (festoon operation)
Up to 240 m/min

VERTICAL SUSPENSION

When CORDAFLEX cables are vertically suspended care must be taken to terminate the cable at the point of suspension. This can be done by either stress relief drums with 2-1/2 turns of cable around the drum, cable stockings correctly sized for the diameter and weight or cable clamps. CORDAFLEX (SMK) control cables for vertical reeling operations with 20 kN support element.

For CORDAFLEX steel core hangers or rope thimbles should be employed to ensure correct tensile load bearing on the steel support rope. If the cable is to pass or be guided over a roller sheave then this shall be specifically dimensioned for the cable and shall have a minimum bending radius of 18 x cable diameter to distribute the tensile stress and compressive forces over as wide a surface area as possible. The support element must be terminated at the reeler.

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

Selection and ordering data

Part No.	Number of cores and nominal cross-section mm ²	Nominal main conductor diameter mm
Power Cables, Four-core Design		
5DH3 132	4 x 4	3.0
5DH3 133	4 x 6	3.6
5DH3 134	4 x 10	4.6
5DH3 135	4 x 16	5.6
5DH3 136	4 x 25	7.3
Power Cables, Five-core Design		
5DH3 151	5 x 4	3.0
5DH3 152	5 x 6	3.6
5DH3 153	5 x 10	4.6
5DH3 154	5 x 16	5.6
5DH3 155	5 x 25	7.3
5DH3 156	5 x 35	8.4
Power Cables, Three-core Design with Protective-earth Conductor split into 3		
5DH3 121	3 x 35 + 3 x 16/3	8.4/3.5
5DH3 122	3 x 50 + 3 x 25/3	10.3/4.2
5DH3 123	3 x 70 + 3 x 35/3	12.0/5.0
5DH3 124	3 x 95 + 3 x 50/3	14.0/6.0
5DH3 125	3 x 120 + 3 x 70/3	15.8/7.2
5DH3 126	3 x 150 + 3 x 70/3	17.5/7.2
5DH3 127	3 x 185 + 3 x 95/3	19.4/8.1
5DH3 128	3 x 240 + 3 x 120/3	22.5/9.3
Control Cables for Vertical Reeling Operation, with 20 kN Support Element (SMK-V CONTROL CABLES)		
5DH3 291	49 x 1.0 (20 kN)	1.3
5DH3 295	24 x 2.5 (20 kN)	2.0
5DH3 296	30 x 2.5 (20 kN)	2.0
5DH3 298	44 x 2.5 (20 kN)	2.0
5DH3 290	56 x 2.5 (20 kN)	2.0

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

Nominal diameter of cable mm	Approx. net cable weight kg/km	Maximum permissible tensile force N
17.0	455	480
18.4	575	720
22.6	905	1200
25.2	1240	1920
30.0	1850	3000
18.4	430	600
20.0	690	900
24.4	1080	1500
27.6	1500	2400
35.1	2350	3750
39.1	3000	5250
30.0	2160	3150
36.0	2850	4500
41.2	3920	6300
45.8	4960	8550
53.0	6630	10800
55.9	7560	13500
60.9	9310	16650
69.4	12200	21600
28.0	1260	3200
27.7	1340	3600
30.9	1680	4100
35.6	2280	5100
41.6	3030	6000

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

Selection and ordering data

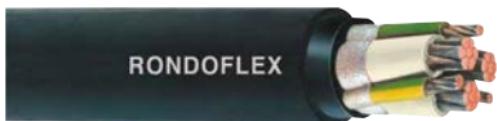
Part No.	Number of cores and nominal cross-section mm ²	Nominal main conductor diameter mm
Control Cables		
5DH3 130	4 x 1.5	1.6
5DH3 140	5 x 1.5	1.6
5DH3 142	7 x 1.5	1.6
5DH3 161	12 x 1.5	1.6
5DH3 162	18 x 1.5	1.6
5DH3 163	24 x 1.5	1.6
5DH3 164	30 x 1.5	1.6
5DH3 165	36 x 1.5	1.6
5DH3 166	44 x 1.5	1.6
5DH3 167	56 x 1.5	1.6
5DH3 111	3 x 2.5	2.0
5DH3 131	4 x 2.5	2.0
5DH3 141	5 x 2.5	2.0
5DH3 143	7 x 2.5	2.0
5DH3 171	12 x 2.5	2.0
5DH3 172	18 x 2.5	2.0
5DH3 173	24 x 2.5	2.0
5DH3 174	30 x 2.5	2.0
5DH3 175	36 x 2.5	2.0
5DH3 176	44 x 2.5	2.0
5DH3 177	56 x 2.5	2.0
Bus Cables		
5DH3 186	3 x (2 x 1)C	1.3
5DH3 187	6 x (2 x 0.5)C	0.9
5DH3 188	6 x (2 x 1)C	1.3
5DH3 206	12 x (2 x 1)C	1.3
5DH3 183	12 x 1(C)	1.3
Combined Control Cables		
5DH3 184	12 x 2.5 + 12 x 1 (C)	2.0/1.3
5DH3 180	19 x 2.5 + 5 x 1 (C)	2.0/1.3
5DH3 181	25 x 2.5 + 5 x 1 (C)	2.0/1.3

CORDAFLEX (SMK) – LOW VOLTAGE REELING CABLE

Nominal diameter of cable mm	Approx. net cable weight kg/km	Maximum permissible tensile force N
13.0	240	180
13.8	280	225
16.2	385	315
22.4	710	540
22.3	760	810
25.3	990	1080
28.1	1220	1350
28.0	1260	1620
31.0	1530	1980
36.4	2050	2520
13.5	280	225
14.0	305	300
15.0	355	375
17.6	510	525
21.4	920	900
24.3	1005	1350
27.7	1320	1800
30.9	1660	2250
31.8	1720	2700
35.6	2230	3300
41.6	2940	4200
23.0	755	180
24.1	885	360
30.4	1330	360
39.1	2170	720
24.4	865	360
27.7	1230	900
27.7	1290	1575
30.9	1620	2025

RONDOFLEX – Round festoon cable

Rubber sheathed festoon cable



APPLICATION

Flexible power and control cable, for use on festoon systems machine tools, material handling equipment, associated with high mechanical stresses and frequent bending during operation, also suitable for light duty reeling applications.

DESIGN

RONDOFLEX cables consist of electrolytic copper, tinned finely stranded conductors. The insulation is a PROTOLON MS which is a newly developed special compound based on high quality EPR which provides improved mechanical and electrical characteristics. For individually shielded cores and twisted and shielded pairs the overall braided screen consists of tinned copper wires. The transfer impedance is optimised at 30 MHz and the surface area covered is approx 60% for shielded cores and 80% for twisted and shielded pairs. The inner sheath is EPR, the outer sheath is PCP. RONDOFLEX remains flexible at sub zero temperatures and high ambient temperatures. The construction is in accordance with the Australian Standards AS/NZS 1125, AS/NZS 5000.1, AS/NZS 3191.

CHEMICAL PARAMETERS

Weather resistance

Unrestricted use outdoors
and indoors, resistant to
ozone, UV and moisture

Water compatibility
and resistance to oil

Given and verified in long-term tests

RONDOFLEX – Round festoon cable

ELECTRICAL PARAMETERS

■ Rated voltage	U_o/U	= 0.6/1kV
■ Max permissible operating voltage in AC systems	U_o/U	= 0.7/1.2kV
voltage in DC systems	U_o/U	= 0.9/1.8kV
■ AC test voltage		2.5 kV over 5 min

THERMAL PARAMETERS

■ Ambient temperature		
Fully flexible operation		-35°C to +80°C
Fixed installation		-50°C to +80°C
■ Max permissible operating temperature of the conductor		90°C
■ Short-circuit temperature of the conductor		250°C

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

De-rating factors for varying ambient temperatures

Ambient temperature °C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

MECHANICAL PARAMETERS

Tensile load	Up to 15 N/mm ²
Torsional stresses	± 25°/m
Minimum bending radii	See min bending radii at start of Corda flex SMK chapter
Minimum distance for S-type directional changes	20 X D
Travel speed	
■ Gantry (reeling operation)	60 m/min
■ Trolley (festoon system)	up to 240 m/min
■ For speeds above 240m/min consult the manufacturer	

RONDOFLEX – Round festoon cable

CORE COLOUR IDENTIFICATION

Control and power conductors are light coloured with numbers printed in black for easy identification and include a **green/yellow** earth conductor.

Selection and ordering data

	Number of cores & nominal area	Part No.
Power cables	mm²	
SINGLE-CORE DESIGN	1 x 25	5DG6 610
	1 x 35	5DG6 611
	1 x 50	5DG6 612
	1 x 70	5DG6 613
	1 x 95	5DG6 614
	1 x 120	5DG6 615
	1 x 150	5DG6 616
	1 x 185	5DG6 617
Power cables	mm²	
FOUR AND FIVE-CORE DESIGN	4 x 2.5	5DG6 641
	4 x 4	5DG6 642
	4 x 6	5DG6 643
	4 x 10	5DG6 644
	4 x 16	5DG6 645
	4 x 25	5DG6 646
	4 x 35	5DG6 647
	4 x 50	5DG6 648
	5 x 4	5DG6 652
	5 x 6	5DG6 653
	5 x 10	5DG6 654
	5 x 16	5DG6 655
	5 x 25	5DG6 656

RONDOFLEX – Round festoon cable

CORE ARRANGEMENT

Laid-up in a maximum of 3 layers.

Length of lay 10 x D.

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal conductor diameter	Nominal cable diameter	Approx. net cable weight	Maximum permissible tensile force	Unenclosed Spaced
mm	mm	kg/km	N m	A
6.8	12.0	330	375	142
8.1	13.1	430	525	177
9.6	15.8	625	750	223
11.2	17.5	835	1050	283
13.2	19.9	1070	1425	341
14.9	21.8	1340	1800	406
16.6	23.9	1650	2250	470
18.0	26.3	2010	2775	540
2.0	13.5	300	150	27
3.0	14.7	350	240	36
3.2	16.9	475	360	46
4.2	19.2	680	600	66
5.7	23.9	1070	960	87
6.8	28.4	1600	1500	116
8.1	31.6	2090	2100	144
9.6	37.2	2970	3000	182
3.0	16.7	450	300	36
3.2	18.5	575	450	46
4.2	21.8	865	750	66
5.7	26.1	1300	1200	87
6.8	31.0	1940	1875	116

RONDOFLEX – Round festoon cable

Selection and ordering data

	Number of cores & nominal area	Part No.
	mm ²	
Power cables	3 x 35 + 3 x 16/3	5DG6 631
Three-core design with protective-earth conductor split into 3	3 x 50 + 3 x 25/3	5DG6 632
	3 x 70 + 3 x 35/3	5DG6 633
Control cables	12 x 1.5	5DG6 662
	18 x 1.5	5DG6 663
	24 x 1.5	5DG6 664
	30 x 1.5	5DG6 665
	36 x 1.5	5DG6 666
	12 x 2.5	5DG6 672
	18 x 2.5	5DG6 673
	24 x 2.5	5DG6 674
	30 x 2.5	5DG6 675
	36 x 2.5	5DG6 676
Bus cables	3 x (2 x 1) C	5DG6 891
	6 x (2 x 0.5)	5DG6 693
	6 x (2 x 1) C	5DG6 694
	9 x (2 x 0.5) C	5DG6 691
	9 x (2 x 1) C	5DG6 692
	12 x 1(C)	5DG6 681
	12 x (2 x 0.5) C	5DG6 521
	3 x (2 x 2.5) C	5DG6 637

RONDOFLEX – Round festoon cable

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal conductor diameter	Nominal cable diameter	Approx. net cable weight	Maximum permissible tensile force	Unenclosed Spaced
mm	mm	kg/km	N m	A
8.1	29.2	1800	1575	144
9.7	34.0	2540	2250	182
11.2	40.6	3570	3150	230
1.6	17.2	440	270	20
1.6	19.7	615	405	20
1.6	23.1	805	540	20
1.6	24.3	930	675	20
1.6	26.1	1090	810	20
2.0	18.9	580	450	27
2.0	22.5	865	675	27
2.0	25.5	1110	900	27
2.0	27.9	1330	1125	27
2.0	29.9	1550	1350	27
1.3	21.8	685	90	16
0.9	23.6	850	90	12
1.3	29.6	1250	80	16
0.9	29.8	1340	135	12
1.3	37.4	2010	270	16
1.3	19.0	590	180	16
0.9	31.6	1540	360	12
2.0				

RONDOFLEX (C) – FC OVERALL SCREENED

Shielded EMC Festoon Power Cables



APPLICATION

For use on festoon systems, eg, on gantry cranes, hall gantry cranes, rack material handling equipment, transportation systems or machine tools, in particular for applications where there is a danger of interference to data transmission systems from power cables. The cables are used for high mechanical stresses and frequent bending, also suitable for use as a flexible motor power supply cable.

DESIGN

The RONDOFLEX (C) – FC cable consists of electrolytic copper, thinned finely stranded conductors. The insulation is a PROTOLON MS which is a newly developed special compound based on high quality EPR providing improved mechanical and electrical characteristics. The overall braid screen is made of tinned copper wires with a surface coverage of greater than 80%. The inner sheath is SBR, the black outer sheath is PCP allowing it to remain flexible at sub zero temperatures and also withstand extremely high ambients. The construction is in accordance with the Australian Standards AS/NZS 5000-1, AS3191 and VDE certificate with VDE Reg No. 9809.

CHEMICAL PARAMETERS

Weather resistance

Unrestricted use outdoors and indoors, resistant to ozone, UV and moisture

Water compatibility and resistance to oil

Given and verified in long-term tests

RONDOFLEX (C) – FC OVERALL SCREENED

ELECTRICAL PARAMETERS

- | | | |
|--|---------|----------------|
| ■ Rated voltage | U_o/U | = 0.6/1kV |
| ■ Max permissible operating voltage in AC systems | U_o/U | = 0.7/1.2kV |
| voltage in DC systems | U_o/U | = 0.9/1.8kV |
| ■ AC test voltage | | 5kV over 5 min |
| ■ For connection on frequency converters U_{max} | | 690V |

THERMAL PARAMETERS

- | | |
|--|----------------|
| ■ Ambient temperature | |
| Fully flexible operation | -35°C to +80°C |
| Fixed installation | -50°C to +80°C |
| ■ Max permissible operating temperature of the conductor | 90°C |
| ■ Short-circuit temperature of the conductor | 250°C |

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

MECHANICAL PARAMETERS

Tensile load	Up to 15 N/mm ²
Torsional stresses	No application
Minimum bending radii	See min bending radii at start of Corda flex SMK chapter Travel speed

- Gantry (reeling operation) 60 m/min
- Trolley (festoon system) – up to 240 m/min, the travel speed is determined by a number of factors and can thus not be precisely defined. Influence factors are, eg, space requirement, cable weight, loop sag, number of the festoon systems etc.
- For speeds above 240 m/min consult the manufacturer.

RONDOFLEX (C) – FC OVERALL SCREENED

CORE COLOUR IDENTIFICATION

Black, blue, brown with green/yellow earth conductor.

Selection and ordering data

Number of cores & nominal cross-section	Part No.	Shield cross-section diameter	Nominal conductor of cable
mm ²	mm ²	mm	
4x4	5DG6 682	8.0	2.45
4x6	5DG6 683	10.7	2.93
4x10	5DG6 684	12.7	3.90
3x16+3x2,5	5DG6 685	13.3	5.72
3x25+3x4	5DG6 686	15.9	6.75
3x35+3x6	5DG6 687	21.4	8.05
3x50+3x10	5DG6 688	24.9	9.60
3x70+3x10	5DG6 690	29.8	11.50
3x95+3x16	5DG6 679	36.9	14.00
3x120+3x16	5DG6 680	45.9	15.80
3x150+3x25	5DG6 650	53.3	17.80

RONDOFLEX (C) – FC OVERALL SCREENED

CORE ARRANGEMENT

Three main conductors laid-up (10 x D) with protective-earth conductor split into 3 in the outer filler

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal diameter mm	Approx. net weight kg/km	Maximum permissible tensile force N	Unenclosed Spaced A
16.3	485	240	36
18.7	700	300	46
21.2	925	600	66
23.7	1150	720	87
26.8	1610	1125	116
30.8	2160	1575	144
36.5	3090	2250	182
42.4	4100	3150	230
45.7	5040	4275	275
50.2	5900	5400	327
56.1	7620	6750	375

RONDOFLEX (C) – FC OVERALL SCREENED

Selection and ordering data

Number of cores & nominal cross-section mm ²	Part No.	Conductor resistor at 20°C	Inductance (core/core) at 10 kHz µ Henry/km
		Ω/km	
4x4	5DG6 682	4.95	550
4x6	5DG6 683	3.30	530
4x10	5DG6 684	1.91	510
3x16+3x2,5	5DG6 685	1.21	480
3x25+3x4	5DG6 686	0.78	450
3x35+3x6	5DG6 687	0.55	430
3x50+3x10	5DG6 688	0.39	410
3x70+3x10	5DG6 690	0.27	390
3x95+3x16	5DG6 679	0.21	375
3X120+3X16	5DG6 680	0.16	360

RONDOFLEX (C) – FC OVERALL SCREENED

Current ratings are based on AS/NZS 3008.1.1:2017.

Capacitance (core/shield) at 1 kHz n Farrads/km	Transfer impedance		
	at 1 MHz mΩ/m	at 10 MHz mΩ/m	at 30 MHz mΩ/m
180	follows	follows	follows
190	follows	follows	follows
230	0.4	1.3	3.5
225	0.2	0.6	1.5
275	0.2	0.4	1.3
325	0.1	0.4	0.9
400	0.1	0.2	0.7
475	0.1	0.2	0.5
600	0.1	0.2	0.4
700	0.1	0.1	0.3

RONDOFLEX-CHAIN

High Flexible Cable for Energy Chain Systems



APPLICATION

All chain systems (e.g. container cranes, stacking cranes, indoor cranes, material-handling equipment). Specifically designed for outdoor energy chain applications with long travel distances at high travel speeds. Key benefits are reliability, abrasion resistance and a long lifetime.

DESIGN

The power and control conductors in RONDOFLEX (CHAIN) cables consist of Class 5 finely stranded electrolytic copper. The earth conductors consist of very finely stranded electrolytic copper exceeding Class 5. The insulation compound is Protolon MS (refer also DIN VDE 0207) which is a high grade insulation compound based on EPR (at least 3GI3) with improved mechanical and electrical performance; alternative for control cables: ETFE. The inner sheath is a black special compound based on EPR GM1b. The overall shield consists of a tinned copper wire braided screen with greater than 80% coverage. The outer sheath is a high grade compound based on EVA with excellent abrasion and aging characteristics. Core identification is a light coloured compound with black number prints, yellow-green earth.

CHEMICAL PARAMETERS

Weather resistance

Unrestricted use indoors and outdoors, resistant to ozone, UV and moisture.

Water compatibility and resistance to oil

Given and verified in long-term tests

ELECTRICAL PARAMETERS

■ Rated voltage	U_o/U	= 0.6/1kV
■ Max permissible operating voltage in AC systems	U_o/U	= 0.7/1.2kV
voltage in DC systems	U_o/U	= 0.9/1.8kV

THERMAL PARAMETERS

Ambient temperature

■ Fully flexible operation	-35°C to +80°C
■ Fixed installation	-50°C to +80°C

Max permissible operating temperature of the conductor

90°C

Short-circuit temperature of the conductor

250°C

MECHANICAL PARAMETERS

Tensile load	Up to 15 N/mm ²
Torsional stresses	No application
Minimum bending radii	See min bending radii at start of Corda flex SMK chapter
Travel speed	Travel speed
■ Trolley	As a guide up to 300 m/min as tested on factory test rig
■ Other	As per all other recommended chain application speeds

TRAVEL SPEED

Trolley As a guide up to 300 m/min as tested on factory test rig.

Other As per all other recommended chain application speeds.

RONDOFLEX-CHAIN

CORE COLOUR IDENTIFICATION

Control and power conductors are light coloured with numbers printed in black for easy identification and include a **green/yellow** earth conductor.

Selection and ordering data

	Number of cores & nominal cross-section	Part No.	Nominal conductor diameter
	mm ²		mm
Power cable single core design	1x16	5DG4 011	5.7
	1x25	5DG4 012	7.1
	1x35	5DG4 013	8.3
	1x50	5DG4 014	9.8
	1x70	5DG4 015	11.6
	1x95	5DG4 016	13.8
	1x120	5DG4 017	14.9
	1x150	5DG4 018	17.2
	1x185	5DG4 019	18.0
	1x240	5DG4 020	22.5

RONDOFLEX-CHAIN

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal cable diameter	Approx. net cable weight	Maximum permissible tensile force	Unenclosed Spaced
mm	kg/km	N	A
8.7	210	240	106
11.6	325	375	142
13.1	445	525	177
14.9	605	750	223
16.9	830	1050	283
20.1	1120	1425	341
21.8	1390	1800	406
24.5	1740	2250	470
27.3	2130	2775	540
31.4	2830	3600	651

RONDOFLEX-CHAIN

Selection and ordering data

Number of cores & nominal cross-section	Part No.	Nominal conductor diameter
mm ²		mm
Power cable, single core design, screened	1x16C	5DG4 211
	1x25C	5DG4 212
	1x35C	5DG4 213
	1x50C	5DG4 214
	1x70C	5DG4 215
	1x95C	5DG4 216
	1x120C	5DG4 217
	1x150C	5DG4 218
	1x185C	5DG4 219
	1x240C	5DG4 220
Power cable, 3/4 – core design	4x4	5DG4 111
	4x6	5DG4 112
	4x10	5DG4 113
	4x16	5DG4 114
	4x25	5DG4 115
	3x35+3x16/3	5DG4 116
	3x50+3x25/3	5DG4 117
		10.0

RONDOFLEX-CHAIN

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal cable diameter	Approx. net cable weight	Maximum permissible tensile force	Unenclosed Spaced
mm	kg/km	N	A
11.0	320	240	106
13.8	450	375	142
14.9	555	525	177
16.7	745	750	223
19.7	1090	1050	283
21.8	1330	1425	341
23.8	1580	1800	406
27.1	2000	2250	470
29.3	2330	2775	540
33.4	3130	3600	651
13.7	325	240	36
15.2	435	360	46
17.6	650	600	66
21.0	960	960	87
27.4	1580	1500	116
28.2	1770	1575	144
33.0	2510	2250	182

RONDOFLEX-CHAIN

Selection and ordering data

Number of cores & nominal cross-section	mm ²	Part No.	Nominal conductor diameter
			mm
Power cable, 3/4/5 – core design overall screened	4x2,5C	5DG4 240	1.9
	4x4C	5DG4 241	2.9
	4x6C	5DG4 242	3.6
	4x10C	5DG4 243	4.6
	3x16+3x2,5C	5DG4 254	5.9
	3x25+3x4C	5DG4 255	7.2
	3x35+3x6C	5DG4 256	8.1
	3x50+3x10C	5DG4 257	10.0
	3x70+3x10C	5DG4 258	11.8
	5x16C	5DG4 264	5.9
Power cable, 5/7 – core design	7x4	5DG4 171	2.9
	5x6	5DG4 122	3.6
	5x10	5DG4 123	4.6
	5x16	5DG4 124	5.9

RONDOFLEX-CHAIN

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal cable diameter	Approx. net cable weight	Maximum permissible tensile force	Unenclosed Spaced
mm	kg/km	N	A
12.3	390	150	27
16.7	505	240	36
18.0	650	360	46
20.7	930	600	66
21.4	1070	720	87
27.3	1810	1125	116
30.1	2220	1575	144
36.5	3090	2250	182
41.3	4100	3150	230
26.7	1610	1200	87
17.7	535	420	36
16.8	535	450	46
20.7	850	750	66
23.8	1220	1200	87

RONDOFLEX-CHAIN

Selection and ordering data

	Number of cores & nominal cross-section	Part No.	Nominal conductor diameter
	mm ²		mm
Control cable, overall screened	12x1.5C	5DG4 252	1.5
	5x2.5C	5DG4 260	1.9
Control cable	12x1.5	5DG4 152	1.5
	24x1.5	5DG4 154	1.5
	7x2.5	5DG4 141	1.9
	12x2.5	5DG4 190	1.9
	18x2.5	5DG4 191	1.9
	24x2.5	5DG4 192	1.9

RONDOFLEX-CHAIN

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal cable diameter	Approx. net cable weight	Maximum permissible tensile force	Unenclosed Spaced
mm	kg/km	N	A
15.7	440	270	20
13.7	435	188	27
12.7	305	270	20
18.1	705	540	20
12.3	290	263	27
14.6	485	450	27
17.9	760	675	27
23.5	1010	900	27

RONDOFLEX-CHAIN

Selection and ordering data

	Number of cores & nominal cross-section	Part No.
Fibre optic cable	6xG62,5/125µ	5DG4 290
	12xG62,5/125µ	5DG4 291
	6xE9/125µ	5DG4 292
Bus cable	1x(2x0.5)C	5DG4 ---
	4x(2x0.5)C	5DG4 280
	(4x2x0.5)C	5DG4 279
	6x(2x0.5)C	5DG4 281
	6x(2x1)C	5DG4 259

RONDOFLEX-CHAIN

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal Conductor diameter	Nominal diameter cable	Approx. net cable weight	Maximum permissible tensile force
mm	mm	kg/km	N
NA	15	260	500
NA	15	260	500
NA	15	260	500
0.9	9.0	135	15
0.9	20.0	625	60
0.9	20.2	605	60
0.9	21.2	730	90
1.3	27.8	1120	180

PLANOFLEX

Flat festoon crane cables



APPLICATION

- Festoon gantry cranes
- Wharf & port facilities
- Mine sites & cold stores
- Container cranes
- Timber & refuse cranes
- Rubber tyred gantries
- Trippers
- Steelworks & ladle cranes
- Suitable for submersible application

Flexible power and control cable, for use on festoon systems and for connecting moveable parts of machine tools, material handling equipment, etc., associated with high mechanical stresses and frequent bending during operation and for bending in one plane only.

DESIGN

PLANOFLEX cables consist of extra finely stranded copper conductors with a short length of lay to provide a high degree of flexibility.

Up to 25mm² class 6 conductors greater than 25mm², class 5 conductor.

PROTOLON elastomer R-EP-90 insulation provides improved current carrying capacities and the cable is sheathed overall with HD-PCP-90 Polychloroprene which is oil resistant and flame retardant, remaining flexible at sub-zero temperatures, and withstands high ambient temperatures. Designed in accordance with the Australian Standards AS 5000.1, AS/NZS 5000-1, AS/NZS 3191 and AS/NZS 3008.1.1:2017.

OPERATING TEMPERATURE

■ Ambient temperature	
Fully flexible operation	35°C to +80°C
Fixed installation	50°C to +80°C
■ Maximum permissible conductor temperature	90°C
■ Maximum permissible short circuit temperature	250°C
■ Minimum ambient temperature for optimum fully flexible operation	-35°C

MINIMUM BENDING RADII

The recommended minimum bending radii is dependent on the cable thickness and should be observed to ensure operating reliability.

Cables up to **8mm** diameter thickness **MIN 3 x cable diameter**

Cables up to **12mm** diameter thickness **MIN 4 x cable diameter**

Cables greater than **12mm** diameter thickness **MIN 5 x cable diameters**

PLANOFLEX

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

De-rating factors for varying ambient temperatures

Ambient temperature °C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

TENSILE STRENGTH

The maximum allowable tensile stress is 15N/mm².

This ensures no conductor damage will occur in operation.

VOLTAGE RATING

- Rated voltage:

(multicore control)	U_o/U	= 380/660V
(power)	U_o/U	= 0.6/1kV
- AC test voltage = 2.5kV, 5 min

* The cable is designated 300/500V in accordance with VDE/IEC, and compliant to the Australian Standard AS/NZS 5000-1 for the stated voltage ratings.

SCREENED CONTROL/DATA CORES

Individually screened and twisted screened pair constructions have been developed to enable interference free data/PLC transmission. Screens consist of tinned copper wire braid with 95% coverage with an extruded polymer skin to bond the screen to the insulation and enable greater internal screen protection. Attenuation data for these screened cores at various transmission rates is listed in tables 6.8 and 6.9 at the end of the catalogue.

CORE COLOUR IDENTIFICATION

Control cables (up to incl. 2.5mm ²)	-	black cores sequentially numbered, including a green/yellow earth
4 Core	-	blue, brown, black and green/yellow
7 Core	-	black cores sequentially numbered, including a green/yellow earth core

NOTES

The 7 core design permits two three phase supplies to be incorporated within a single cable, each circuit sharing the full size earth.

For the system design the length of cable required for a festoon is approximately +10% on the total trolley length.

For large or fast moving systems the stronger power cables should have a shorter loop depth than the lighter control cables. These types of festoons must always be fitted with tow ropes to limit whiplash and conductor stress on acceleration and braking.

PLANOFLEX

Selection and ordering data

	Number of cores x conductor size	Part No.	Nominal diameter of conductor
	mm ²		mm
PLANOFLEX	3 x 1.5	5DG5 751	1.5
Control Cable	4 x 1.5	5DG5 711	1.5
	5 x 1.5	5DG5 712	1.5
	7 x 1.5	5DG5 714	1.5
	8 x 1.5	5DG5 715	1.5
	10 x 1.5	5DG5 717	1.5
	12 x 1.5	5DG5 718	1.5
	24 x 1.5	5DG5 720	1.5
	4 x 2.5	5DG5 721	2.0
	5 x 2.5	5DG5 722	2.0
	7 x 2.5	5DG5 724	2.0
	8 x 2.5	5DG5 725	2.0
	10 x 2.5	5DG5 727	2.0
	12 x 2.5	5DG5 728	2.0
	24 x 2.5	5DG5 730	2.0

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal overall cable dimension Thickness x Width	Approx. net cable weight	Max permissible tensile force	Unenclosed Spaced
mm	kg/km	N	A
6.2 x 17.0	126	68	20
5.7 x 15.8	171	90	20
6.2 x 17.0	214	113	20
5.7 x 25.8	292	158	20
5.7 x 29.0	325	180	20
6.4 x 37.0	455	225	20
6.4 x 43.0	550	270	20
12.5 x 53.0	1050	540	20
7.2 x 20.3	257	150	27
7.8 x 21.5	332	188	27
7.2 x 33.8	454	263	27
7.2 x 37.5	510	300	27
7.8 x 39.5	660	375	27
7.8 x 56.0	810	450	27
16.0 x 69.0	1730	900	27

PLANOFLEX

Selection and ordering data

	Number of cores x conductor size	Part No.	Nominal diameter of conductor
	mm ²		mm
PLANOFLEX Power Cable	4 x 4	5DG5 731	2.8
	4 x 6	5DG5 741	3.5
	4 x 10	5DG5 765	4.5
	4 x 16	5DG5 766	5.6
	4 x 25	5DG5 767	6.6
	4 x 35	5DG5 768	8.1
	4 x 50	5DG5 770	9.7
	4 x 70	5DG5 771	11.2
	4 x 95	5DG5 772	13.1
	4 x 120	5DG5 773	15.0
	5 x 4	5DG5 732	2.8
	5 x 6	5DG5 742	3.5
	5 x 10	5DG5 687	4.5
	5 x 16	5DG5 776	5.6

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal overall cable dimension Thickness x Width	Approx. net cable weight	Max permissible tensile force	Unenclosed Spaced
mm	kg/km	N	A
8.7 x 24.5	402	240	36
9.4 x 27.0	510	360	46
11.0 x 38.3	770	600	66
13.0 x 39.0	1160	960	87
14.8 x 46.8	1560	1500	116
17.0 x 54.0	2100	2100	144
19.8 x 62.8	2930	3000	182
22.3 x 72.0	3910	4020	230
25.0 x 81.8	5120	5700	275
25.6 x 81.2	6110	7200	327
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8.8 x 30.0	510	300	36
9.4 x 35.5	640	450	46
10.9 x 40.2	960	750	66
12.4 x 46.4	1370	1200	87

PLANOFLEX

Selection and ordering data

	Number of cores x conductor size	Part No.	Nominal diameter of conductor
	mm ²		mm
			
PLANOFLEX 7 Core Cable	7 x 4	5DG5 734	2.8
	7 x 6	5DG5 744	3.5
	7 x 10	5DG5 865	4.5
	7 x 16	5DG5 866	5.6
	7 x 25	5DG5 867	6.6
	7 x 35	5DG5 868	8.1
			
Controlled Cables with individually shielded cores	4 x 1 (c)	5DG5 673	1.3
	12 x 1 (c)	5DG5 670	1.3
	4 x 1.5 (c)	5DG5 880	1.5
	8 x 1.5 (c)	5DG5 884	1.5
	12 x 1.5 (c)	5DG5 888	1.5

(c) indicates individually screened cores or twisted screened pairs

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal overall cable dimension Thickness x Width	Approx. net cable weight	Max permissible tensile force	Unenclosed Spaced
mm	kg/km	N	A
8.7 x 40.0	720	420	36
9.4 x 44.8	910	630	46
11.5 x 56.3	1370	1050	66
13.5 x 67.6	1990	1680	87
16.0 x 80.5	2730	2625	116
17.5 x 91.8	3820	3675	144
5.7 x 16.8	150	120	16
6.9 x 49.9	653	180	16
7.2 x 19.0	250	90	20
7.2 x 36.5	510	180	20
7.8 x 54.0	820	270	20

PLANOFLEX

Selection and ordering data

	Number of cores x conductor size	Part No.	Nominal diameter of conductor
	mm ²		mm
Bus cables	4 x (2x1) (c)	5DG5 890	1.3
	6 x (2x2.5) (c)	5DG5 898	2.0
	7 x (2x1) (c)	5DG5 893	1.3
Power cables with individual screens	4 x 1.5 (c)	5DG5 880	1.5
	4 x 4 (c)	5DG5 484	2.8
	4 x 6 (c)	5DG5 485	3.5
	4 x 10 (c)	5DG5 486	4.5
	4 x 16 (c)	5DG5 487	5.6
	4 x 25 (c)	5DG5 488	6.6
	4 x 35 (c)	5DG5 489	8.1
	4 x 50 (c)	5DG5 490	9.7
	4 x 70 (c)	5DG5 491	11.2
	4 x 95 (c)	5DG5 492	13.1

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal overall cable dimension Thickness x Width	Approx. net cable weight	Max permissible tensile force	Unenclosed Spaced
mm	kg/km	N	A
12.0 x 35.1	663	120	16
15.6 x 65.0	1800	450	27
11.4 x 56.0	1100	210	16
7.5 x 19.0	250	90	20
9.7 x 27.8	550	240	36
10.3 x 30.3	665	360	46
12.5 x 37.5	1060	600	66
13.6 x 41.7	1360	960	87
15.8 x 48.6	1980	1500	116
17.9 x 55.4	2590	2100	144
20.5 x 64.0	3590	3000	182
22.9 x 71.8	4630	4200	230
25.6 x 81.4	5950	5700	275

OPTOFLEX (M)

Flexible rubber sheathed fibre optic cable



APPLICATION

For optical signal and data transmission in open-pit mining applications, for use on material handling equipment and for fixed installation alongside conveyor belts (including mobile conveyor belts).

DESIGN

The fibres are enclosed in buffering tube filled with an EFTE natural coloured compound type: 7YI1. The fibres and buffering tube are colour coded for identification of the fibre type. Core arrangement of the six buffering tubes is one layer, specially laid-up around a GFK supporting element (GFK = Glass fibre reinforced plastic). The core arrangement is covered by a special braid consisting of Kevlar threads in a longitudinal lay to increase tensile-strength covering approx. 80% of the surface. The orange outer sheath consists of a 5GM5 PCP compound.

FIBRE-OPTICS

The fibre elements are available in the following constructions –

50/125 Micron – Graded index fibre

62.5/125 Micron – Graded index fibre

E9/125 Micron – Mono mode fibre

The inner core diameter of the fibres: 50 μm , 62.5 μm or 9 μm ,

Diameter over cladding: 125 μm . Diameter over coating: 250 μm .

CHEMICAL PARAMETERS

Weather resistance – Unrestricted use indoors and outdoors, resistant to ozone, UV and moisture.

ATTENUATION DATA

Type	OPTOFLEX(M) LWL
Type designation	6 x ... x ... /125 Micron
Approvals/ standards	Based on DIN VDE 0888, MSHASC 1891, FDDI, ...
Application (refer also to DIN VDE 0298 Part 3)	For optical signal and data transmission in opencast mining applications, for use on material handling equipment and for laying alongside conveyor belts (including shiftable conveyor belts)

Transmission data of the fibre	Gradedindex	Gradedindex	Monomode
Fibre	50/125 62,	5/125	E9/125
Attenuation at wavelength 850 nm	2,8 dB/km	3,3 dB/km	–
Attenuation at wavelength 1310 nm	0,8dB/km	0,9 dB/km	0,4 dB/km
Attenuation at wavelength 1550 nm	–	–	0,3 dB/km
Bandwidth at 850 nm	>=400 MHz	>=400 MHz	–
Bandwidth at 1300 nm	>1200 MHz	>600 MHz	–
Numerical aperture	0,200 +/-0,02	0,275 +/-0,02	0,14 +/-0,02
Dispersion value at 1300 nm	–	–	<3,5 ps/nm km
Dispersion value at 1550 nm	–	–	<18 ps/nm km

OPTOFLEX (M)

THERMAL PARAMETERS

Ambient temperature

- Fully flexible operation -30°C to +60°C
- Fixed installation -40°C to +80°C

MECHANICAL PARAMETERS

Tensile load	Max. 2000 N
Torsional stresses	Max. 100°/m
Minimum bending radius	50mm

Selection and ordering data

Number of fibres & fibre type	Part No.	Maximum overall diameter	Bending radius for fixed installation	Fibre attenuation on at 850nm	Fibre attenuation on at 1300nm
		mm	mm	dBb/km	dB/km
Multi Mode					
6x G50/125	5DG8 028	10	50	2.8	0.8
12x G50/125	5DG8 030	10	50	2.8	0.8
18x G50/125	5DG8 027	10	50	2.8	0.8
6x G62,5/125	5DG8 021	10	50	3.3	0.9
12x G62,5/125	5DG8 022	10	50	3.3	0.9
18x G62,5/125	5DG8 024	10	50	3.3	0.9
Mono Mode					
6x E9/125	5DG8 031	10	50	-	0.4
12x E9/125	5DG8 032	10	50	-	0.4
18x E9/125	5DG8 033	10	50	-	0.4
24x E9/125	5DG8 034	10	50	-	0.4

APPROVALS/ STANDARDS

Based on DIN VDE 0888, MSHA-SC 189-1, FDDI, (refer also to DIN VDE 0298, Part 3). Additional mechanical tests – Tensile load test, transverse pressure test, reversed bending test, roller bending test, torsional stress test, water compatibility according to HD 22.16

Fibre attenuation at 1550nm	Numerical aperature	Band width at 1300nm	Approx. net weight	Maximum permissible tensile force
dB/km		MHz	kg/km	N
-	0,2 +/- 0,02	>1200	100	2000
-	0,2 +/- 0,02	>1200	100	2000
-	0,2 +/- 0,02	>1200	100	2000
-	0,275 +/- 0,02	>600	100	2000
-	0,275 +/- 0,02	>600	100	2000
-	0,275 +/- 0,02	>600	100	2000
0.3	-	-	100	2000
0.3	-	-	100	2000
0.3	-	-	100	2000
0.3	-	-	100	2000

OPTOFLEX (F.O)

Fibre optic reeling and festoon cable

OPTOFLEX (F0)



APPLICATION

Flexible fibre optic cable for signal and data transmission on cranes and material handling equipment; suitable for cable handling systems, such as reels, festoon systems, cable tenders, etc. High data rates at a large bandwidth have absolute immunity to electromagnetic interference.

DESIGN

The fibres are enclosed in a buffering tube filled with an EFTE natural coloured compound type: 7Y11. For identification the fibres and buffering tube are colour coded for identification of the fibre type. The six buffering tubes are specially laid-up in one layer around a GFK supporting element (GFK = Glass fibre reinforced plastic). The core arrangement is covered by a special braid consisting of polyester threads covering approx. 80% of the surface. The black outer sheath consists of a 5GM5 PCP compound with a wall thickness of 2.6 mm.

FIBRE-OPTICS

The fibre elements are available in the following constructions –

50/125 Micron – Graded index fibre

62.5/125 Micron – Graded index fibre

E9/125 Micron – Mono mode fibre

The inner core diameter of the fibres: 50 μ m, 62.5 μ m or 9 μ m,

Diameter over cladding: 125 μ m. Diameter over coating: 250 μ m.

CHEMICAL PARAMETERS

Resistance to oil – Given to DIN VDE 0473, Part 811-2-1 Para.10

Weather resistance – Unrestricted use indoors and outdoors, resistant to ozone, UV and moisture.

OPTOFLEX (F.O)

ATTENUATION DATA

Transmission data of the fiberoptics	Gradedindex fibre	Gradedindex fibre	Monomode fibre
	50/125	62.5/125	E9/125
Max. attenuation at wavelength 850 nm	2.8 dB/km	3.3 dB/km	–
Max. attenuation at wavelength 1300 nm	0.8 dB/km	0.9 dB/km	0.4 dB/km
Max. attenuation at wavelength 1550 nm	–	–	0.3dB/km
Bandwidth at 850 nm	> 400 MHz	> 400 MHz	–
Bandwidth at 1300 nm	> 1200 MHz	> 600 MHz	–
Numerical aperture	0.200 +/-0.200	0.275+/0.02	0.14+/0.02
Chromatic dispersion at 1300 nm	–	–	<3.5 ps/nm km
Chromatic dispersion at 1550 nm	–	–	<3.5 ps/nm km

THERMAL PARAMETERS

Ambient temperature

- Fully flexible operation -20°C to +80°C
- Fixed installation -40°C to +80°C

MECHANICAL PARAMETERS

Tensile load	Max. 500 N
Torsional stresses	Max. 50°/m
Minimum bending radius fixed installation and festoon system.	125 mm
On reels and cable tenders.	250 mm
Minimum distance with S-type directional changes (D=cable diameter)	20 x D

OPTOFLEX (F.O)

TRAVEL SPEED

Gantry (reeling operation)	Up to 120 m/min (no random wound reel, cylindrical reel)
Trolley (festoon systems)	Up to 240 m/min (festoon, cable tender)
Hoist	No application.

Selection and ordering data

Number of fibres & fibre type	Part No.
Multi Mode	
6G50/125 micron	5DG8 004
6G62.5/125 micron	5DG8 002
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12G50/125 micron	5DG8 036
12G62.5/125 micron	5DG8 035
<hr/>	
18G50/125 micron	5DG8 014
18G62.5/125 micron	5DG8 012
<hr/>	
Mono Mode	
6E9/125 micron	5DG8 023
12E9/125 micron	5DG8 037
18E9/125 micron	5DG8 010

OPTOFLEX (F.O)

APPROVALS/ STANDARDS

Based on FDDI, ISO/IEC 9314 Part 3, DIN VDE 0888, MSHA-SC 189-1

Additional tests – Bending and reversed bending test.

SPREADERFLEX – Spreader Basket Cable

Container crane spreader cables



APPLICATION

- Container crane spreaders
- Timber cranes
- Mobile booms

Feeder cable for loadlifting equipment, e.g. spreader with high mechanical stress in gravityfed collector basket operation.

Cable must be laid into the basket in a counterclockwise direction. Detailed installation instructions available upon request.

DESIGN

This advanced cable design is used for vertical free-fall operation in outdoor marine environments that require cable self coiling and uncoiling in a collector basket. This design allows for a heavy construction which greatly improves the coiling performance while giving a small cable diameter, reducing the wind effect on the cable.

Extra finely stranded copper conductors are insulated with special EPR compound. Conductors are grouped in bundles around lead beaded weight element cords. The bundles are textile taped and laid up around the central supporting element that consists of multiple lead beaded cords with a KEVLAR reinforcing braid. Additional lead beaded weight element cords and textile fillers complete the conductor assembly. A black polyurethane sheath which is resistant to oil, grease, abrasion, and cold temperature is extruded overall.

The cable should not be used for applications employing force guiding devices such as reeler, guide rollers or sheaves.

Optimal identification as a result of black insulation with light-printed numbers, protective earth conductor **green/ yellow**.

SPREADERFLEX – Spreader Basket Cable

OPERATING TEMPERATURE

- Ambient temperature
 - Fully flexible operation -40°C to + 80°C
 - Fixed installation -50°C to + 80°C
- Maximum permissible conductor temperature 90°C
- Maximum permissible short circuit temperature 250°C

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

VOLTAGE RATING

The cable is designated 600/1000V in accordance with VDE/IEC.

- Rated Voltage: U_o/U = 0.6/1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 0.7/1.2kV
 - DC operation U_o/U = 0.9/1.8kV
- AC test voltage = 3.5kV (5 min)

OPERATING SPEEDS

SPREADERFLEX is suitable for hoist speeds up to 160 m/per minute.

SUSPENSION LENGTH

The KEVLAR braided reinforcement messenger is rated to provide a safety factor of five when the cable is suspended vertically for 50 metres.

Note: Installation instructions are available on request

CORE COLOUR IDENTIFICATION

All control cores are black, sequentially numbered and include a **green/yellow** earth core.

SPREADERFLEX – Spreader Basket Cable

Selection and ordering data

	No. of cores x conductor size	Part No.	Conductor diameter
	mm ²		mm
Control cables with integrated fibre optics	30 x 2.5+6x1 LWL	5DE5 675	2.0
	32 x 2.5+4x3 LWL	5DE5 756	2.0
	36 x 2.5+6x1 LWL	5DE5 658	2.0
	42 x 2.5+6x1 LWL	5DE5 648	2.4
	52 x 2.5+2x3 LWL	5DE5 767	2.0
Control cables	48 x 1.0	5DE5 697	1.5
	24 x 2.5	5DE5 625	2.0
	30 x 2.5	5DE5 698	2.0
	36 x 2.5	5DE5 688	2.0
	42 x 2.5	5DE5 690	2.0
	48 x 2.5	5DE5 660	2.0
	54 x 2.5	5DE5 667	2.0
	7 x 4.0	5DE5 668	2.5
Control cables with bus element	24 x 2.5+1x(2x1) (c)	5DE5 654	2.0
	24 x 2.5+4x(2x1) (c)	5DE5 661	2.0
	36 x 2.5+2x(2x1) (c)	5DE5 657	2.0

SPREADERFLEX – Spreader Basket Cable

Nominal cable diameter	Approx. net weight	Exposed to Sun
mm	kg/km	A
37.1	2300	22
36.5	2360	22
39.0	3060	22
49.6	4150	22
48.2	3460	22
32.4	1860	13
29.6	1600	22
32.8	2010	22
35.8	2330	22
38.2	3020	22
42.8	3420	22
47.2	3460	22
19.2	750	29
33.1	2090	22
43.6	3100	22
43.8	3700	22



SECTION 5



MINING AND HIGH VOLTAGE REELING CABLES

PROTOMONT XHD 5DM4 PAGE 206

PROTOMONT 241.1 5DM6 PAGE 214

MINING MSR 5DM4 PAGE 220

PROTOLON 5DK8 PAGE 224

PROTOLON (SB) TYPE 450 5DK8 PAGE 228

SINGLE CORE HIGH VOLTAGE FLEX 5DK4 PAGE 234
 5DK5
 5DK8

PROTOMONT XHD – Rubber-Sheathed Flexible Cable

Extra heavy duty flexible mining cables



APPLICATION

- Above ground mining of coal, iron ore and uranium
- Quarries
- Construction & heavy industry
- Drills, pumps & cutters
- Conveyors
- Suitable for submersible application

The cables are suitable for fixed installation and flexible operation as power supply cables to motors, distribution boards, etc., for underground mining applications, for tunnel building applications, for opencast mining applications, for use in quarries and similar applications.

DESIGN

PROTOMONT heavy duty cables combine flexibility with toughness to provide long service life in aggressive operating conditions.

Finely stranded tinned copper conductors are rope laid to form a flexible construction. R-EP-90 elastomer insulation offers a high insulation resistance and excellent current carrying capacity. Each power core has a concentric screen of tinned copper wires and the entire conductor assembly is bound together with a textile tape. Both the elastomer inner sheath and heavy duty PCP outer sheath protect the cable from mechanical damage. Control cores, when required, are laid up in the three interstices outside the screens.

PROTOMONT XHD – Rubber-Sheathed Flexible Cable

OPERATING TEMPERATURES

■ Ambient temperature	
Fully flexible operation	25°C to +80°C
Fixed installation	40°C to +80°C
■ Maximum permissible conductor temperature	90°C
■ Maximum permissible short circuit temperature	250°C

MINIMUM BENDING RADII

The following minimum recommended bending radii should be observed to ensure operating reliability.

- For fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

CURRENT CARRYING CAPACITY

Current ratings are based on a continuous operating ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

Accordance with AS/NZS 3008.1.1.2017.

TENSILE STRENGTH

The maximum allowable tensile stress on the conductors is 15N/mm². This ensures no conductor damage will occur in operation.

VOLTAGE RATING

■ Rated Voltage:	U_o/U	= 0.6/1kV
■ Maximum operating voltages in:		
3 phase AC operation	U_o/U	= 0.7/1.2kV
DC operation	U_o/U	= 0.9/1.8kV
■ AC test voltage		= 3kV (5 min)

PROTOMONT XHD – Rubber-Sheathed Flexible Cable

CORE COLOUR IDENTIFICATION

- 3 core : blue, brown & black
Pilots : blue, brown & black
5 core : black, blue, black, brown, black

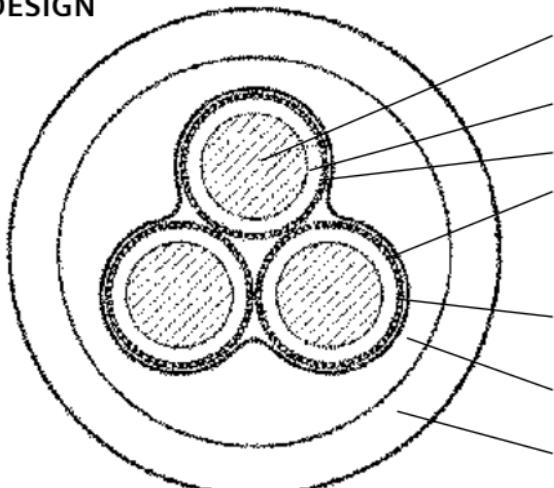
CABLE DESCRIPTION

Protomont has a particular description to detail its construction fully.
eg., 3 x 25 + 3 x 16/3E indicates 3 power cores each
25 mm² and 3 split earth screens (one over each power core)
totaling 16 mm².
+ 3 x 2.5 indicates 3 insulated control cores.

Conductor size	Reactance at 50Hz	Impedance at 90°C	Inductance	Capacitance
mm ²	Ω/km	Ω/km	mH/km	μF/km
4	0.1080	6.310	0.290	0.380
6	0.1030	4.310	0.270	0.440
10	0.0936	2.440	0.370	0.480
16	0.0887	1.540	0.250	0.570
25	0.0871	0.995	0.250	0.600
35	0.0839	0.707	0.240	0.690
50	0.0832	0.493	0.240	0.720
70	0.0800	0.348	0.230	0.840
95	0.0796	0.264	0.230	0.860
120	0.0774	0.207	0.230	0.960
150	0.0775	0.167	0.230	1.110
185	0.0771	0.138	0.230	1.190
240	0.0764	0.106	0.225	1.33
300	0.0761	0.086	0.223	1.44

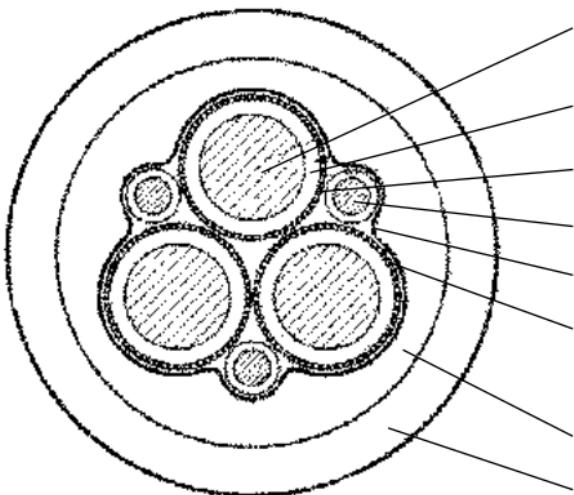
PROTOMONT XHD – Rubber-Sheathed Flexible Cable

DESIGN



- Finely stranded tinned copper conductor
- PROTOLON insulation
- Textile tape and con-centric protective earth conductor
- Textile tape
- Inner sheath
- PROTFIRM outer sheath

5DM4 – Protomont 3 screened Power Cores



- Finely stranded tinned copper conductor
- PROTOLON insulation
- Textile serving
- Control conductor
- Textile tape
- Distributed con-centric protective earth conductor
- Inner sheath
- PROTFIRM outer sheath

5DM4 – Protomont 3 screened Power Cores
including 3 control cores

PROTOMONT XHD – Rubber-Sheathed Flexible Cable

Selection and ordering data

No. of cores conductor size	Part No.	
mm^2		
PROTOMONT	3 x 1.5 + 3 x 1.5/3E	5DM4 604
Untinned	3 x 2.5 + 3 x 2.5/3E	5DM4 605
3 Screened	3 x 4 + 3 x 4/3E	5DM4 606
Power Cores	3 x 6 + 3 x 6/3E	5DM4 607
	3 x 10 + 3 x 10/3E	5DM4 610
	3 x 16 + 3 x 16/3E	5DM4 612
	3 x 25 + 3 x 16/3E	5DM4 613
	3 x 35 + 3 x 16/3E	5DM4 614
	3 x 50 + 3 x 25/3E	5DM4 615
	3 x 70 + 3 x 35/3E	5DM4 616
	3 x 95 + 3 x 50/3E	5DM4 617
	3 x 120 + 3 x 70/3E	5DM4 618
	3 x 150 + 3 x 70/3E	5DM4 620
	3 x 185 + 3 x 95/3E	5DM4 627
PROTOMONT	1 x (2 x 1.5)C	5DL4 052
Control Cores		
Overall Screened		

PROTOMONT XHD – Rubber-Sheathed Flexible Cable

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal No. of strands and strand diameter	Nominal conductor diameter	Nominal cable diameter	Approx. cable weight	Current carrying capacity Unenclosed Spaced
mm	mm	mm	kg/km	A
30 x 0.25	1.6	13.3	250	20
50 x 0.25	2.1	14.4	345	27
56 x 0.30	2.6	17.1	466	36
84 x 0.30	3.2	18.4	560	46
80 x 0.40	4.2	21.3	751	66
126 x 0.40	5.3	24.9	1100	87
196 x 0.40	6.6	29.2	1565	116
276 x 0.40	7.8	31.6	1935	144
396 x 0.40	9.3	38.0	2725	182
546 x 0.40	10.9	42.1	3725	230
724 x 0.40	12.6	47.0	4725	275
926 x 0.40	14.2	53.9	5905	327
1156 x 0.40	15.9	58.2	7275	375
1406 x 0.40	17.5	64.8	9025	428
30 x 0.25	1.6	12.3	166	20



PROTOMONT XHD – Rubber-Sheathed Flexible Cable

Selection and ordering data

	No. of cores conductor size	Part No.
	mm ²	
PROTOMONT	3 x 2.5 + 3 x 2.5/3E + 3 x 1.5 ST	5DM4 624
Untinned	3 x 4 + 3 x 4/3E + 3 x 1.5 ST	5DM4 626
3 Screened	3 x 6 + 3 x 6/3E + 3 x 1.5 ST	5DM4 630
Power Cores	3 x 10 + 3 x 10/3E + 3 x 2.5 ST	5DM4 631
including 3	3 x 16 + 3 x 16/3E + 3 x 2.5 ST	5DM4 632
Control Cores	3 x 25 + 3 x 16/3E + 3 x 2.5 ST	5DM4 633
	3 x 35 + 3 x 16/3E + 3 x 2.5 ST	5DM4 634
	3 x 50 + 3 x 25/3E + 3 x 2.5 ST	5DM4 635
	3 x 70 + 3 x 35/3E + 3 x 2.5 ST	5DM4 636
	3 x 95 + 3 x 50/3E + 3 x 2.5 ST	5DM4 637
	3 x 120 + 3 x 70/3E + 3 x 2.5 ST	5DM4 638
	3 x 150 + 3 x 70/3E + 3 x 2.5 ST	5DM4 642
	3 x 185 + 3 x 95/3E + 3 x 2.5 ST	5DM4 644
PROTOMONT	3 x 2.5 + 3 x 2.5/3E + 3 x 1.5 ST	5DM4 724
Tinned	3 x 4 + 3 x 4/3E + 3 x 1.5 ST	5DM4 726
3 Screened	3 x 6 + 3 x 6/3E + 3 x 1.5 ST	5DM4 730
Power Cores	3 x 10 + 3 x 10/3E + 3 x 2.5 ST	5DM4 731
including 3	3 x 16 + 3 x 16/3E + 3 x 2.5 ST	5DM4 732
Control Cores	3 x 25 + 3 x 16/3E + 3 x 2.5 ST	5DM4 733
	3 x 35 + 3 x 16/3E + 3 x 2.5 ST	5DM4 734
	3 x 50 + 3 x 25/3E + 3 x 2.5 ST	5DM4 735
	3 x 70 + 3 x 35/3E + 3 x 2.5 ST	5DM4 736
	3 x 95 + 3 x 50/3E + 3 x 2.5 ST	5DM4 737
	3 x 120 + 3 x 70/3E + 3 x 2.5 ST	5DM4 738
	3 x 150 + 3 x 70/3E + 3 x 2.5 ST	5DM4 742
	3 x 185 + 3 x 95/3E + 3 x 2.5 ST	5DM4 744

PROTOMONT XHD – Rubber-Sheathed Flexible Cable

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal No. of strands and strand diameter	Conductor diameter guidance (max value)	Nominal cable diameter	Approx. cable weight	Current carrying capacity Unenclosed Spaced
mm	mm	mm	kg/km	A
50 x 0.25	2.1	18.1	510	27
56 x 0.30	2.6	18.8	552	36
84 x 0.30	3.2	19.4	628	46
80 x 0.40	4.2	23.1	934	66
126 x 0.40	5.3	24.9	1175	87
196 x 0.40	6.6	29.2	1640	116
273 x 0.40	7.8	31.6	2010	144
396 x 0.40	9.3	38.0	2800	182
546 x 0.40	10.9	42.1	3800	230
724 x 0.40	12.6	47.0	4800	275
926 x 0.40	14.2	53.9	5980	327
1156 x 0.40	15.9	58.2	7350	375
1406 x 0.40	17.5	64.8	9100	428
50 x 0.25	2.1	19.0	520	27
56 x 0.30	2.6	19.8	600	36
84 x 0.30	3.2	20.5	670	46
80 x 0.40	4.2	24.5	1010	66
126 x 0.40	5.3	28.0	1290	87
196 x 0.40	6.6	32.0	1780	116
273 x 0.40	7.8	36.0	2300	144
396 x 0.40	9.3	42.0	3200	182
546 x 0.40	10.9	45.5	4010	230
724 x 0.40	12.6	52.0	5100	275
926 x 0.40	14.2	57.5	6510	327
1156 x 0.40	15.9	63.5	7600	375
1406 x 0.40	17.5	68.5	9400	428

PROTOMONT 241.1

**Extra heavy duty semi conductive screened cable
for mining applications including supply cable for
underground cutting machines and pumping.**



PROTOMONT 241.1

APPLICATION

The 241.1 cable is specifically engineered for the Australian mining industry and manufactured in accordance with AS 1802. It is an extra heavy duty semi conductive screened cable for mining applications including supply cable for underground cutting machines and pumping

DESIGN

The Protomont 241.1 cable is for aggressive environments in mining where high mechanical stresses occur from reeling and trailing. A semi conductive cradle separator encapsulates the central pilot core and interstitial earth conductors. The semi conductive layer ensuring a high conductivity low resistance earth circuit. The conductors consist of very finely stranded tinned copper wires, rope laid to maximise flexibility.

The power cores have an inner semi-conductive layer around their conductors. A reinforced polyester braid is embedded between the inner and outer sheaths forming a vulcanised bond protecting against the effects of torsional forces during operation. The specially compounded CPE outer sheath resists damage from hard and abrasive surfaces protecting the cable from mechanical damage.

OPERATING TEMPERATURE

- Maximum permissible operating temperature at conductor 90 °C
- Maximum permissible short circuit temperature at conductor 250 °C (max. 5 s)
- Minimum permissible temperatures when in motion -25 °C
when stationary -40 °C
- Maximum permissible water temperature 40 °C

PROTOMONT 241.1

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

The values are valid for permanent operation with DC or AC with 50 up to 60 Hz. Touching a surface, two or three cores loaded, multi-core cables all cores loaded.

VOLTAGE RATING

- Rated voltage: U_o/U = 1.1kV
- Maximum operating voltages in:
 - 3 phase AC operation U_o/U = 1.1/1.1kV
 - DC operation U_o/U = 0.9/1.8kV
- AC test voltage = 3kV

MINIMUM BENDING RADII

The following minimum bending radii should be observed to ensure operating reliability.

- For fixed installation 4 x cable diameter
- When freely flexing 5 x cable diameter

TENSILE STRENGTH

The maximum allowable tensile stress is 15N/mm². This ensures no conductor damage will occur in operation.

CORE COLOUR IDENTIFICATION

Power core	Red, White & Blue
Central pilot	Grey
Semi conductive earth	Black

KEY FEATURES AND BENEFITS

- **Designed for Australia's extreme mining conditions**

Specifically engineered product derived from extensive research and development to maximise the installations performance and reliability.

- **Extensive Industry Knowledge**

Experience & knowledge derived from decades of heavy involvement in the Global and Australian mining markets. Our factory specialises in both underground and open cut cables

- **Quality Control**

Exceptional quality is achieved through stringent quality control and continuous improvement processes.

- **Exceptional Flexibility**

Constructed with premium grade very finely stranded copper wire. Short length of lay to maximise flexibility ensuring a user friendly product.

- **Compact Robust Construction**

Exceptionally tough. Our specifically designed CPE outer sheath resists damage from tearing, notching & abrasion yet provides extreme flexibility. Reinforced polyester braid embedded between the inner and outer CPE sheaths protects against the effects of torsional forces during operation.

- **Return on Investment**

Don't risk expensive cable downtime.

Specify reliability. Specify Siemens 241.1

PROTOMONT 241.1

Selection and ordering data

	No. of cores and nominal conductor size	Part No.
		mm ²
PROTOMONT	3 x 6 + 3 x 3 /3E + pilot	5DM6 209
241.1	3 x 10 + 3 x 5 /3E + pilot	5DM6 212
	3 x 16 + 3 x 8 /3E + pilot	5DM6 213
	3 x 25 + 3 x 13/3E + pilot	5DM6 214
	3 x 35 + 3 x 18/3E + pilot	5DM6 201
	3 x 50 + 3 x 25 /3E + pilot	5DM6 215
	3 x 70 + 3 x 35/3E + pilot	5DM6 208
	3 x 95 + 3 x 50 /3E + pilot	5DM6 216
	3 x 120 + 3 x 70 /3E + pilot	5DM6 217
	3 x 150 +3 x 70 / 3E +pilot	5DM6 218
	3 x 185 + 3 x 95 / 3E + pilot	5DM6 219
	3 x 240 + 3 x 120 / 3E + pilot	5DM6 ***
	3 x 300 + 3 x 150/ 3E + pilot	5DM6 ***

PROTOMONT 241.1

Current ratings are based on AS/NZS 3008.1.1:2017.

Nominal No. of strands and strand diameter	Nominal cable diameter	Approx. cable weight	Unenclosed Spaced
mm	mm	kg/km	A
84 x 0.30	29	1030	46
80 x 0.40	32	1260	66
126 x 0.40	35	1630	87
196 x 0.40	38	2190	116
304 x 0.30	40	2660	144
396 x 0.40	47	3530	182
546 x 0.40	52	4500	230
724 x 0.40	57	5600	275
926 x 0.40	63	7000	327
1156 x 0.40	69	8150	375
1406 x 0.40	74	9770	428
1862 x 0.40	82	12750	511
1456 x 0.50	89	15870	584

MINING MSR

Twisted pair data signal and control cables for mining installations



APPLICATION

- Along conveyor routes
- On board data cabling
- Stackers & reclaimers
- Freely flexing (non reeling) conditions
- PLC, data & still video transmission

Control, signalling and bus cables with the necessary transmission characteristics used for electric and electronic equipment, such as for measured value and process data processing and automation units in opencast mining applications. Suitable for laying alongside conveyor belts and on material handling equipment.

DESIGN

MINING MSR cables consist of finely stranded copper conductors laid up to provide a flexible design. High grade Polyethylene insulation offers improved capacitance values. The cores are twisted in pairs with alternate length of lay to minimise cross talk, they exhibit excellent transmission characteristics even at high data transmission rates.

An overall copper braid screen between the inner and outer sheath provides protection against the external interferences of EMI, RFI and high voltage fields.

The elastomer inner and outer sheath offers high mechanical strength, is UV stabilised and moisture resistant.

OPERATING TEMPERATURES

- Ambient temperature
 - Fully flexible operation -25°C to +60°C
 - Fixed installation -40°C to +60°C
- Maximum permissible conductor temperature 60°C
- Maximum permissible short circuit temperature 150°C

MINIMUM BENDING RADII

The following minimum recommended bending radii should be observed to ensure operating reliability

- For fixed installations 4 x cable diameter
- When freely flexing 5 x cable diameter

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following factors.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

TENSILE STRENGTH

The maximum allowable tensile stress is 15N/mm².

This ensures no conductor damage will occur in operation.

VOLTAGE RATING

- Rated voltage: = 250/250V
- Maximum operating voltages: = 350V (Peak)
- AC test voltage = 1.5kV (3 min)

TRANSMISSION DATA

Attenuation: 1dB/km at 800 Hz

3dB/km at 100kHz

Capacitance: 65 nF/km (max) at 800 Hz

MINING MSR

CORE COLOUR IDENTIFICATION

All cores are black and sequentially numbered.

NOTE: Mining MSR is also available with twisted pairs and quads with a flexible steel wire armour. PE insulated with a PVC inner and outer sheath, this design is subject to manufacture.

Selection and ordering data

No. of pairs x Conductor size	Part No.	Nominal No. of strands and strand diameter	Nominal conductor diameter
mm ²	mm	mm	mm
2 x (2 x 1.0)	5DM4 995	32 x 0.20	1.5
5 x (2 x 1.0)	5DM4 996	32 x 0.20	1.5
10 x (2 x 1.0)	5DM4 997	32 x 0.20	1.5
20 x (2 x 1.0)	5DM4 998	32 x 0.20	1.5

Other conductor sizes and core numbers are available subject to manufacture.



Nominal cable diameter	Approx. cable net weight	Unenclosed Spaced
mm	kg/km	A
12.0	245	16
17.3	420	16
21.4	660	16
26.6	1030	16

Current ratings are based on AS/NZS 3008.1.1:2017.

PROTOLON

High voltage reeling and trailing cables



	Reeler without guides	Reeler with roller guides	Reeler with plane angle deflection
PROTOLON	M	M	+
PROTOLON (SM)-R	+	M	M
PROTOLON (SB)	-	-	-
PROTOLON (SMK)	+	M	M
PROTOLON (ST)	-	-	-

M

+

-

Main field of application Suitable

Not designed for this application

APPLICATION

PROTOLON reeling and trailing cables are available in various types of constructions are specifically designed to withstand the forces of reeling and forced guidance systems on today's mobile equipment.

A range of designs are available to suit all applications including stackers, reclaimers, shiploders, cranes, shovels, dredges, electric drills and draglines.

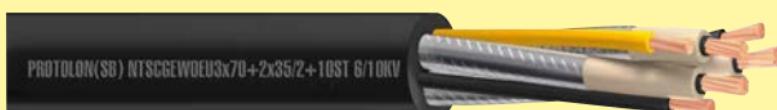
DESIGN

Protolon cables are suitable for voltages 3.3/3.3kV to 33/33kV and are designed in accordance with the Australian Mining Standard AS/NZS 2802.

A complete catalogue on Siemens Protolon is available detailing all constructions, their application and design.

Trailing and draglines	Fixed installation	Festoon Systems
-	M	M
-	-	+
M	+	-
-	-	+
-	-	-

PROTOLON



PROTOLON (N) for stackers and reclaimers, shiploaders, tripper cars, stockpilers and festoons for medium mechanical stresses.

PROTOLON (SMK) for high speed,tensile stress applications characterised by dynamic load peaks eg., braided screen high mount container cranes, hoisting equipment, mining machines.

Note: Latest generation compounds allowing for reduced OD.

PROTOLON (SM-R) incorporating integrated fibre optics for high speed, high volume data transfer, voice video and digital drive control. This eliminates the need for a separate control reeler.

PROTOLON Single Core designed for voltages up to 22kV for power supply interconnections, transformer drop cable, mobile sustations, over head service line connections and H.V switchboards.

PROTOLON (SB) dragline cable with extra heavy duty sheath and copper wire core screens to withstand the agressive operating conditions of open cut mining.

Protolon (SB) Type 450 Trailing Cable

High voltage trailing cable

APPLICATION

PROTOLON (SB) Type 450 high voltage trailing cable is designed for power supply to large mining machines operating at voltages up to 33/33kV. The cable is constructed to withstand the harsh operating conditions of open-cut mining of coal and iron ore, quarries and tunnel boring such as rough terrain, tensile stresses associated with draglines, rock falls and compressive forces from trucks etc. Typical applications include draglines, jumbo drills, excavators and electric shovels.

DESIGN

The Protolon insulation provides high electrical characteristics. The Semi Conductive Insulation together with the braided screen controls the Electric Field and helps to prevent 'partial discharge', improving the longevity of the cable. This in turn maintains the High Electrical insulation characteristics of this cable.

The Open Mesh Tape surrounding the cable; together with the outer Extra Heavy Duty XHD-90-PCP provides the Necessary Reinforcement of which Siemens cables' are renowned for.

The Copper wire Screens are in accordance with AS2802:2000 with the Mechanical Electrical properties in which abrasion and chaffing stresses are to be expected in the trailing operation.

The cables has been tested over and above the requirements under Australian standards with the test results recorded well above the minimum in order to prove the cable's resistance to high mechanical requirements extending the longevity of the cable. It's characteristics remain even after extremely high mechanical stresses when other cable designs have already failed.

Protolon (SB) Type 450 Trailing Cable



Protolon (SB) Type 450 Trailing Cable

OPERATING TEMPERATURE

- Maximum permissible operating temperature at conductor 90 °C
- Maximum permissible short circuit temperature at conductor 250 °C (max. 5 s)
- Minimum permissible temperatures when in motion -20 °C
when stationary -40 °C
- Minimum permissible ambient -45 °C



Protolon (SB) Type 450 Trailing Cable

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34



Protolon (SB) Type 450 Trailing Cables

Selection and ordering data

No of cores and nominal cross section	Earth core (total size) split into 2	Pilot core
mm ²	mm ²	mm ²

PROTOLON (SB) Symmetric 6.6/6.6 kV

3x25 + 3x(8/3+16/3KON)	16	8/3
3x35 + 3x(8/3+16/3KON)	16	8/3
3x50 + 3x(12/3+25/3KON)	25	12
3x70 + 3x(18/3+35/3KON)	35	18
3x95 + 3x(25/3+50/3KON)	50	25
3x120 + 3x(35/3+70/3KON)	70	35
3x150 + 3x(35/3+70/3KON)	70	35
3x185 + 3x(50/3+95/3KON)	95	50
3x240 + 3x(60/3+120/3KON)	120	60
3x300 + 3x(75/3+150/3KON)	150	75

PROTOLON (SB) 6.6/6.6 kV

3x25 + 2x25/2 + 1x10ST	25	10
3x35 + 2x25/2 + 1x10ST	25	10
3x50 + 2x25/2 + 1x10ST	25	10
3x70 + 2x35/2 + 1x16ST	35	16
3x95 + 2x50/2 + 1x25ST	50	25
3x120 + 2x70/2 + 1x35ST	70	35
3x150 + 2x70/2 + 1x35ST	70	35
3x185 + 2x95/2 + 1x50ST	95	50
3x240 + 2x120/2 + 1x60ST	120	60

Current ratings are based on AS/NZS 3008.1.1:2009.

NOTE: For other cable sizes please discuss with Siemens.

Protolon (SB) Type 450 Trailing Cable

Selection and ordering data

No of cores and nominal cross section	Earth core (total size) split into 2	Pilot core
mm ²	mm ²	mm ²

PROTOLON (SB) 11/11 kV

3x25 + 2x25/2 + 1x10ST	25	10
3x35 + 2x25/2 + 1x10ST	25	10
3x50 + 2x25/2 + 1x10ST	25	10
3x70 + 2x35/2 + 1x16ST	35	16
3x95 + 2x50/2 + 1x25ST	50	25
3x120 + 2x70/2 + 1x35ST	70	35
3x150 + 2x70/2 + 1x35ST	70	35
3x185 + 2x95/2 + 1x50ST	95	50
3x240 + 2x120/2 + 1x60ST	120	60

PROTOLON (SB) 22/22 kV

3x25 + 2x25/2 + 1x10ST	25	10
3x35 + 2x25/2 + 1x10ST	25	10
3x50 + 2x25/2 + 1x10ST	25	10
3x70 + 2x35/2 + 1x16ST	35	16
3x95 + 2x50/2 + 1x25ST	50	25
3x120 + 2x70/2 + 1x35ST	70	35
3x150 + 2x70/2 + 1x35ST	70	35
3x185 + 2x95/2 + 1x50ST	95	50
3x240 + 2x120/2 + 1x60ST	120	60

Current ratings are based on AS/NZS 3008.1.1:2017.
NOTE: For other cable sizes please discuss with Siemens.

Protolon Lumen – The Illuminating Mining Cable

A luminescent mining cable



Protolon-LUMEN

Application

The Protolon-LUMEN is intended as trailing cable for the power supply to large mobile equipment in mines, such as shovels and draglines. Especially intended for application where, to guarantee the safety of personnel and equipment, the cable must be visible in the dark.

The transparent polyurethane outer sheath, combined with the use of active illuminating element, allows the cable illumination also when not energized.

The extremely robust sheath has excellent resistance against impact, abrasion and tearing, and also suitable for fully flexible operation down to -50 °C.

MAIN FEATURES

- Brightly self-luminous in dark areas
- Exceptional cold resistance down to -50°C
- Excellent impact and abrasion resistant
- Resistant to oil, ozone and moisture



Protolon Lumen – The Illuminating Mining Cable

Global data		Usage characteristics	
Brand	(N)TSCGEH35	Lead free	Yes
Type designation	(N)TSCGEH35	Oil resistance	Yes
Standard	Based on DIN VDE 0250-813	Chemical resistance	Yes
Construction characteristics		Ozone resistance	
Conductor	Tinned copper, finely stranded class 5	UV resistance	
Insulation	German made special cross-linked EPR	Reaction to fire	
Electrical field control	Inner and outer layer of semi-conductive rubber compound	EN 60322-1-2; IEC 60322-1-2	
Core identification	Main cores and earth cores: black Pilot core: blue	Weather resistance	
Illuminating element	Special electroluminescent string designed for high visibility and low power consumption	Unrestricted use outdoors and indoors, resistant to ozone and moisture	
Core arrangement	Three main cores, split earth and pilot laid up around semiconductive central filler with aramid yarns. Electroluminescent string in the interstices	Thermal parameters	
Outer sheath	German made special PUR compound. Abrasion and tear-proof, cold-resistant to -50 °C	Max. permissible temperature at conductor	90 °C
Outer sheath color	Light orange/Transparent	Max. short circuit temperature	250 °C
Mechanical characteristics		Ambient temp. in flexible application (min. - max.)	-50 °C - +60 °C
Resistance to impact	Excellent	Ambient temp. in fixed installation (min. - max.)	-50 °C - +80 °C
Abrasion resistance	Excellent	Electrical parameters	
Cable flexibility	Excellent, also at very low temp.	Rated voltage	3.6/6 kV 6/10 kV
Cable handling	Excellent	Max. permissible operating voltage AC	4.2/7.2 kV 6.9/12 kV
Cable visibility in the dark	Excellent, thanks to active illuminating strings visible through transparent sheath	Max. permissible operating voltage DC	5.4/10.8 kV 9/18 kV
Bending radius	6 x D in fixed installation 10 x D in flexible operation	AC test voltage	11 kV 17 kV
Max. tensile load on the conductor	25 N/mm ²	Electroluminescent string parameters	
		Max. voltage	125 Vac
		Max. frequency	2.000 Hz
		Current absorption	ca. 15 A /km
		Heat development	none
		Light homogeneity	> 95 %
		Irradiation	360 °

SINGLE CORE HIGH VOLTAGE FLEX

Flexible high voltage cable for high mechanical stresses



APPLICATION

- Power supply cubicle interconnections
- Transformer dropper cable
- Mobile substations
- Pumps and motors
- Overhead line connections
- High voltage switchboards
- Suitable for 6.6kV, 11kV and 22kV applications

DESIGN

Finely stranded tinned copper conductors laid up with a short length of lay to provide a flexible and robust conductor assembly. The PROTOLOM R-EP-90 insulation provides high electrical characteristics and is manufactured using a triple extrusion process together with the semi-conductive EPR conductor and insulation screen. The semi-conductive screening combined with the overall braided copper wire screen controls the electric field and prevents partial discharge. The overall copper wire braid screen is in accordance with AS 2802. The flame retardant heavy duty XHD-90-PCP sheath has a high resistance to abrasion, tearing, lubricants, chemicals and weathering. The PROTOLOM sheath is coloured red for high voltage designation.

OPERATING TEMPERATURE

- | | |
|---|-------|
| ■ Minimum permissible ambient temperature fixed | -25°C |
| ■ Minimum permissible ambient temperature flexing | -40°C |
| ■ Maximum permissible conductor temperature | 90°C |
| ■ Maximum permissible short circuit temperature | 250°C |

SINGLE CORE HIGH VOLTAGE FLEX

CURRENT CARRYING CAPACITY

Current ratings are based on continuous operation at an ambient temperature of 40°C. At other temperatures these values must be converted using the following table.

°C	15	20	25	30	35	40	45	50	55	60	65	70	75	80
Factor	1.26	1.20	1.15	1.10	1.05	1.00	0.94	0.88	0.81	0.73	0.65	0.57	0.47	0.34

VOLTAGE RATINGS

Rated voltage	6/10kV	$U_o/U = 6.9/12 \text{ kV}$
AC test voltage		17 kV
Rated voltage	12/20kV	$U_o/U = 13.9/24 \text{ kV}$
AC test voltage		29 kV

MINIMUM BENDING RADII

The following minimum bending radii should be observed to ensure operating reliability where d = cable O.D.

- For fixed installation 6 x cable O.D.
 - When freely flexing 10 x cable O.D.

SINGLE CORE HIGH VOLTAGE FLEX

Number of cores and conductor cross-section	Part No.	Nominal diameter conductor
mm ²		mm

Selection and ordering data – 6/10kV flex

1 x 25/25 KON	5DK4 113	6.6
1 x 35/16 KON	5DK4 114	7.8
1 x 50/16 KON	5DK4 115	9.3
1 x 70/16 KON	5DK4 116	10.9
1 x 95/16 KON	5DK4 117	12.6
1 x 120/16 KON	5DK4 118	14.2
1 x 150/25 KON	5DK4 120	15.9
1 x 185/25 KON	5DK4 121	17.5
1 x 240/25 KON	5DK4 122	20.2

Selection and ordering data – 12/20kV flex

1 x 25/16 KON	5DK5 562	6.6
1 x 35/16 KON	5DK5 564	7.8
1 x 50/16 KON	5DK5 566	9.3
1 x 70/16 KON	5DK5 568	10.9
1 x 95/16 KON	5DK5 571	12.6
1 x 120/16 KON	5DK5 573	14.2
1 x 150/25 KON	5DK5 575	15.9
1 x 185/25 KON	5DK5 577	17.5
1 x 240/25 KON	5DK5 580	20.2
1 x 300/25 KON	5DK5 581	22.3
1 x 400/25 KON	5DK5 582	25.7

SINGLE CORE HIGH VOLTAGE FLEX

Nominal outer diameter mm	Approx. Net weight kg/km	Maximum permissible tensile force N	Unenclosed Spaced A
22.4	860	375	142
23.1	960	525	177
24.6	1140	750	223
27.1	1410	1050	283
28.9	1660	1425	341
31.5	2010	1800	406
33.3	2400	2250	470
36.6	2840	2775	540
38.9	3420	3600	651
<hr/>			
26.9	1100	375	142
28.0	1230	525	177
29.1	1430	750	223
32.3	1760	1050	283
34.0	2030	1425	341
35.7	2320	1800	406
38.5	2830	2250	470
40.1	3170	2770	540
43.1	3810	3600	651
46.9	4730	4500	752
50.1	5620	6000	909

Current ratings are based on AS/NZS 3008.1.1:2017.

SINGLE CORE HIGH VOLTAGE FLEX

Number of cores and conductor cross-section	Part No.	Nominal diameter conductor
mm ²		mm

Selection and ordering data – 11/11kV flex

1 x 16/16 KON	5DK8 542	5.3
1 x 25/16 KON	5DK8 543	6.6
1 x 35/16 KON	5DK8 544	7.8
1 x 50/16 KON	5DK8 545	9.3
1 x 70/16 KON	5DK8 546	10.9
1 x 95/16 KON	5DK8 547	12.6
1 x 120/16 KON	5DK8 548	14.2

Selection and ordering data – 22/22kV flex

1 x 185/25 KON	5DK8 555	17.5
1 x 300/25 KON	5DK8 557	22.3

Selection and ordering data – FELTOFLEX 6/10KV

1 x 50/16 KON	20074726	9.3
1 x 70/16 KON	20074263	11.2

Selection and ordering data – FELTOFLEX 12/20KV

1 x 35/16 KON	20074729	7.7
1 x 70/16 KON	20074256	11.2
1 x 95/16 KON	20074253	12.9

SINGLE CORE HIGH VOLTAGE FLEX

Nominal outer diameter mm	Approx. Net weight kg/km	Maximum permissible tensile force N	Unenclosed Spaced 
24.0	900	240	106
25.5	1040	375	142
26.6	1170	525	177
28.1	1360	750	223
29.9	1620	1050	283
32.7	1960	1425	341
34.3	2240	1800	406
<hr/>			
43.9	3440	2775	540
50.1	4780	4500	752
<hr/>			
18.7	1260	750	223
20.5	1530	1050	283
<hr/>			
21.3	1320	525	177
24.7	1920	1050	283
26.5	2190	1425	341

Current ratings are based on AS/NZS 3008.1.1:2017.

SECTION 6



TECHNICAL TABLES AND FORMULAE

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TECHNICAL TABLES AND FORMULAE

MOTOR CURRENTS

The Line Amps per phase are approximate and for standard AC induction motors assuming a Power Factor of 0.8 and Efficiency of 0.9.

Power kW	Horse power HP	Full load current Line Amps
0.75	1.0	1.8
1.1	1.5	2.6
1.5	2.0	3.4
2.2	2.9	5.0
3.0	4.0	6.5
4.0	5.3	8.0
5.5	7.3	11
7.5	10	15
11	15	22
15	20	28
18.5	25	36
22	29	39
30	40	52
37	49	69
45	60	79
55	73	96
75	100	125
90	120	156
110	147	189
132	176	255
150	200	285
160	213	275
185	247	310
200	267	325
220	293	360
250	333	410
315	420	520
355	473	580
400	533	650
450	600	730
500	667	800

TECHNICAL TABLES AND FORMULAE

THREE PHASE FORMULAE

kW	= $\frac{\text{Line Amps} \times \text{Line Volts} \times 1.732 \times \text{P.F}}{1000}$
kVA	= $\frac{\text{Line Amps} \times \text{Line Volts} \times 1.732}{1000}$
kW	= kVA x P.F (Power Factor)

ELECTRIC MOTORS

Power Output	= Power Input x Efficiency
kW Output	= kW Input x Efficiency
kW Output	= $\frac{1.732 \times \text{Line Volts} \times \text{Line Amps} \times \text{P.F} \times \text{Efficiency}}{1000}$
kVA Input	= $\frac{1.732 \times \text{Line Volts} \times \text{Line Amps}}{1000}$
Line Current (Input)	= $\frac{1000 \times \text{kW Output}}{\text{Line Volts} \times 1.732 \times \text{P.F} \times \text{Efficiency}}$
Line Current (Input)	= $\frac{1000 \times \text{kVA Input}}{\text{Line Volts} \times 1.732}$

TECHNICAL TABLES AND FORMULAE

Permissible short circuit temperature and the prospective fault level for cables and their insulation

Based on the final (permissible) short circuit temperature of a fault duration of 1 sec, the values for calculating the prospective fault are listed below.

Insulation	Permissible rated operating temperature °C	Permissible short circuit temperature °C
Silicone	180	350
PVC	75	160
EPR Untinned conductor	90	250
Tinned conductor	90	200
EVA	125	250
Tinned conductor	-	200
Soldered joint	-	160

Table 6.2

TECHNICAL TABLES AND FORMULAE

Conductor temperature at the beginning of the short circuit in °C

180	165	150	135	120	105	90	80	70	60	50	40	30
-----	-----	-----	-----	-----	-----	----	----	----	----	----	----	----

J_{thr} for 1 sec in A/mm²

132	139	146	153	160	166	173	178	182	187	191	196	201
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----

-	-	-	-	-	-	-	-	-	109	117	124	131	138
---	---	---	---	---	---	---	---	---	-----	-----	-----	-----	-----

-	-	-	-	-	-	-	143	148	154	159	165	170	176
---	---	---	---	---	---	---	-----	-----	-----	-----	-----	-----	-----

122	128	135	141	147	153	159
-----	-----	-----	-----	-----	-----	-----

-	-	-	-	126	135	143	148	154	159	165	170	176
---	---	---	---	-----	-----	-----	-----	-----	-----	-----	-----	-----

49	65	79	91	102	112	122	128	136	141	147	153	159
----	----	----	----	-----	-----	-----	-----	-----	-----	-----	-----	-----

-	-	36	58	74	87	100	107	115	122	129	136	143
---	---	----	----	----	----	-----	-----	-----	-----	-----	-----	-----

FORMULA

For fault level I_{thr} of a cable

$$I_{\text{thr}} = J_{\text{thr}} \times \text{conductor size in mm}^2$$

Example: A 4 x 25mm² EPR/CSP fully loaded UNTINNED and therefore having a continuous conductor operating temperature of 90°C

$$I_{\text{thr}} = 143 \times 25$$

$$= 3.58 \text{ kA (1 second)}$$

For fault durations up to 5 sec or below 1 sec the following equation is applicable (example is for 0.2 sec fault).

$$I_{\text{thz}} = I_{(1s)} \times \frac{1 \text{ sec}}{\sqrt{0.2 \text{ sec}}} \quad (3.58)$$

CABLE SUSPENSION

The maximum free suspension height in metres for reeling cables that must be vertically suspended shall be calculated utilising the following. This formula protects the copper conductors from deformation past their elastic limit. Conductor deformation leads to cork screws and possible core breakages.

$$\text{Height} = \frac{C \times \text{CSA} \times N}{W \times 9.81}$$

C = Number of Conductors in the cable

CSA = Conductor Cross Section in mm²

N = Max. Tensile limit in N/mm² of the cable

i.e. Cordaflex (SMK) Page 24 Mechanical Parameters

Tensile load: up to 30N/mm²

W = Cable Weight in kg/mtr

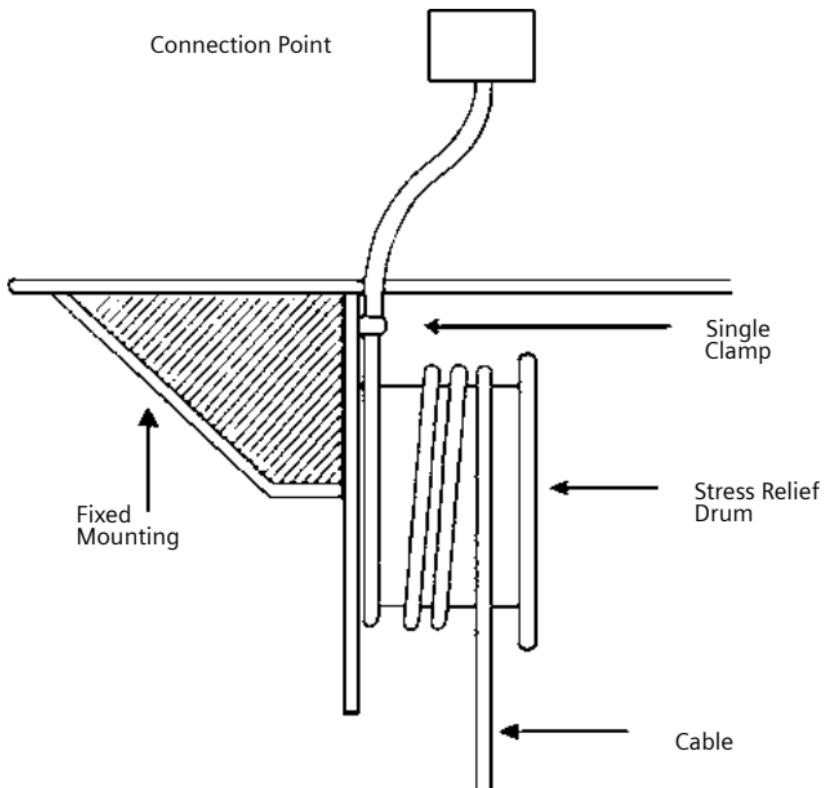
Example: Cordaflex (SMK) 5DH3 121 (3x35+3x16/3)

$$= \frac{3 \times 35 \times 30}{2.16 \times 9.81} = \frac{3150}{21.19}$$

SUPPORT FOR VERTICALLY SUSPENDED CABLES

The anchoring of cables is best achieved with a stress relief drum. The open ended construction facilitates installation and replacement while affording better stress relief and jacket protection than cable grips. At least $2\frac{1}{2}$ cable turns should be wound around the drum. Refer to the minimum Bending Radii data for each cable type to determine the stress relief drum diameter.

Suggested stress relief drum design



CHEMICAL RESISTANCE OF DIFFERENT CABLES

Chemical	PCP	PCP	CSP/CPE	CPE
	3.3kV Flex	Planoflex	Ozoflex	Mining MSR
	Protolon (SM)			
	Cordaflex (SMK)			
	Protomont			
	Neoprene 1	Neoprene 2	Hypalon	Chlorinated Polyethylene
Acetic acid	P	P	F	F
Benzene	F	F	F	F
Bituminous tar	G	G	G	G
Bleach (NaCLO2)	VG	VG	VG	VG
Coke oven gas	VG	VG	VG	VG
Diesel oil	F	F	VG	VG
Ethylene glycol	VG	VG	VG	VG
Gasoline	G	G	G	G
Hydraulic oil	VG	VG	VG	VG
Hydrochloric acid (21%)	E	E	E	E
Hydrogen sulphide	E	E	VG	E
Kerosene	G	G	G	G
Methanol	E	E	E	E
Methyl ethyl keton	G	G	G	G
Nitric acid (10%)	G	G	E	E
Phosphoric acid (60%)	VG	VG	E	E
Picric acid (10%)	E	E	E	E
Potassium chloride	E	E	E	E
Sodium hydroxide (25%)	E	E	E	E
Sulphuric acid (50%)	E	E	E	E
Transformer oil	G	VG	G	VG
Trichlorethylene	P	P	P	P
Vegetable oils & fats	VG	VG	VG	VG
UV resistance	E	E	E	E
Ozone resistance	VG	VG	VG	VG
Water resistance	E	E	E	VG
Tear & notch resistance	VG	E	G	VG
Low temp. flexibility	E	VG	VG	G
Abrasion resistance	VG	VG-E	VG	G-VG

Table 6.3

E = Excellent

VG = Very Good

G = Good

The results tabled are generic for each particular sheath compound and should be used as such. For a more exact evaluation, the chemical concentration, duration of attack, temperature and contact contamination should be known.

SHEATH MATERIALS

PU Spreaderflex	EPR Hydrofirm	EVA EVA125	SI Sinotherm	PVCPU EPR Protoflex Pendantflex
Polyurethane	Ethylene Propylene	Ethylvinyl Acetate	Silicone	Polyvinyl Chloride
F	P	F	VG	P
P	P	P	P	F
G-VG	P	P	F	G
F	E	P	VG	VG
VG	VG	G	F	VG
VG	F	G	P	VG
F	E	F	E	G
E	F	G	P	F
E	P	VG	E	VG
F	P	F	P	VG
P	E	G	P	VG
VG	F	G	P	F
F	E	P	E	G
G	E	P	P	P
F	E	P	P	VG
G	E	P	E	E
F	VG	F	P	E
E	E	E	E	E
P	E	P	P	G
P	E	P	P	VG
E	F	G	P	VG
F-P	P	P	P	P
E	VG	G	E	VG
E	E	VG	VG	G
E	E	E	VG	E
F	E	G	E	G
E	F-G	F	P	VG
E	E	G	E	G
E	G	VG	P	VG

F = Fair

P = Poor

PCP Polychloroprene (Neoprene) CSP Chlorosulphonated Polyethylene (Hypalon)
 CPE Chlorinated Polyethylene EPR Ethylene Propylene Rubber EVA Ethyl vinyl Acetate
 PVC Polyvinyl Chloride

FORMULA

FORMULA 1 ACTUAL VOLTS

$$Vd = \frac{L \times I \times mV/Am}{1000}$$

where

Vd = volt drop in volts

L = route length of cable in metres

I = current to be carried in Amps

mV/Am = millivolt per ampere metre

- * With this method the drop in voltage (in volts) is given and shall not exceed 5% of the supply voltage, i.e., 5% of 415V = 20.75V.

FORMULA 2

$$mV/A.m \text{ value } Vc = \frac{1000 \times Vd}{L \times I}$$

where

Vc = millivolts per Ampere metre

Vd = volt drop in volts

L = route length of cable in metres

I = current to be carried in Amps

- * With this method the millivolts per ampere metre is given and the appropriate conductor size shall be selected from Three Phase Voltage Drop (multicore cables and single core) in the following pages (Table 40 and 42). The conductor size selected shall be nearest to, but not exceed the formula result,

e.g., 415V, 3 phase installation,
load demand is 55A,
100m length: OZOFLEX

Result: 3.77mV/A.m 4 x 10mm²

- * To convert single-phase voltage drop (V/A.m) values to three-phase values, multiply the single-phase values by 0.866. To convert three-phase voltage drop (V/A.m) values to single-phase values, multiply the three-phase values by 1.155

VOLT DROP

In accordance with AS 3000 the permissible volt drop from the point of the connection is 5% of the supply voltage. The following tables and formula should be used to satisfy volt drop limitations.

Three Phase Voltage Drop – Single Core Cables in Trefoil

Conductor size mm ²	Three phase voltage drop at 50Hz, mV/Am							
	45°C Max. 0.8pf		60°C Max. 0.8pf		75°C Max. 0.8pf		90°C Max. 0.8pf	
1.0	40.3		42.5		44.7		46.8	
1.5	25.9		27.3		28.6		30.0	
2.5	14.1		14.9		15.6		16.4	
4	8.77		9.24		9.71		10.2	
6	5.86		6.18		6.49		6.81	
10	3.49		3.67		3.86		4.05	
16	2.20		2.31		2.43		2.55	
25	1.40		1.47		1.54		1.62	
35	1.01		1.07		1.12		1.17	
50	0.757		0.795		0.834		0.872	
70	0.537		0.563		0.589		0.615	
95	0.402		0.420		0.439		0.457	
120	0.332		0.345		0.359		0.373	
150	0.284		0.295		0.305		0.316	
185	0.245	0.245	0.253	0.253	0.261		0.269	
240	0.211	0.208	0.216	0.214	0.221	0.220	0.227	0.226
300	0.191	0.185	0.195	0.190	0.198	0.195	0.202	0.199
400	0.175	0.166	0.178	0.169	0.181	0.173	0.183	0.176
500	0.165	0.150	0.166	0.153	0.168	0.156	0.170	0.158
630	0.155	0.138	0.156	0.140	0.157	0.142	0.159	0.144

Table 40 AS/NZS 3008.1.1:2017

Three phase voltage drop – multicore cables

Conductor size mm ²	Three phase voltage drop at 50Hz, mV/Am								
	Conductor temperature °C				75°C				
	45°C		60°C		Max.		0.8pf	90°C	
	Max.	0.8pf	Max.	0.8pf	Max.	0.8pf	0.8pf	Max.	0.8pf
1.0	40.3		42.5		44.7			46.8	
1.5	25.9		27.3		28.6			30.0	
2.5	14.1		14.9		15.6			16.4	
4	8.77		9.24		9.71			10.2	
6	5.86		6.18		6.49			6.80	
10	3.49		3.67		3.86			4.05	
16	2.19		2.31		2.43			2.55	
25	1.39		1.47		1.54			1.61	
35	1.01		1.06		1.11			1.17	
50	0.751		0.790		0.829			0.868	
70	0.530		0.556		0.583			0.609	
95	0.394		0.413		0.431			0.450	
120	0.323		0.337		0.351			0.366	
150	0.274		0.285		0.296			0.307	
185	0.234		0.242		0.251			0.259	
240	0.198	0.198	0.204	0.201	0.210	0.210		0.216	0.216
300	0.178	0.175	0.180	0.178	0.186	0.185		0.190	0.189
400	0.162	0.157	0.165	0.158	0.168	0.164		0.171	0.167
500	0.152	0.143	0.154	0.139	0.156	0.148		0.158	0.151

Table 42 AS/NZS 3008.1.1:2017

NOTE: The values in the tables are taken from AS/NZS 3008.1.1:2017 and based on cables operating at maximum conductor temperature. For lightly loaded cables the standard also permits determination of the appropriate Vd in such cases and therefore the tables list reduced conductor temperatures.

NON-INTRINSICALLY SAFE WIRING SYSTEMS IN HAZARDOUS AREAS

(Not applicable to coal mining areas)

x Denotes acceptable use

Type of wiring system	Zone 0	Zone 1	Zone 2
Cables in metallic conduit and fittings complying with AS/NZS 2053.1 and AS/NZS 2053.7 and the appropriate protection technique for the area in which they are to be installed	X	X	X
Served MIMS	*	X	X
Thermoplastic, thermosetting or elastomeric sheathed unarmoured			X
Thermoplastic, thermosetting or elastomeric sheathed with armouring or braiding designed for mechanical protection	*	X	X
Cables in rigid and corrugated, non-metallic conduit, minimum light duty, complying with AS/NZS 2053.1, AS/NZS 2053.2 and AS/NZS 2053.5			X
Metal sheathed, served and armoured	*	X	X
Flexible cords and cables in accordance with Clause 3.11.1	*	X	X
Metal sheathed, served and unarmoured			X
Flexible steel conduit with non-metallic serving to AS/NZS 2053.1 and AS/NZS 2053.8			X
Trunking, ducts, pipes or trenches installed to meet the requirements of Clause 3.8.5	X	X	
Flexible conduit assemblies complying with the relevant requirements of AS 2380.2 or AS/NZS 60079.1	X	X	

*This wiring system may be installed in a Zone 0 area, if provided with additional protection to counter the harmful environmental effects detailed in clause 3.8.4. This table, extracted from the Hazardous Location Standard AS2381.1, nominates the allowable cable types for each zone classification.

DE-RATING FOR PARALLEL CONNECTION

The following factors should be applied to conductors connected in parallel for the various methods of installation.

Table taken from AS 3008.1.2017

Arrangement of cables

		1	2	3	4	5	
1.	Bunched in air	1.00	0.87	0.75	0.72	0.70	
2.	Bunched on a surface or enclosed in conduit or ducting	1.00	0.80	0.70	0.65	0.60	
3.	Single layer on wall or floor	Touching	1.00	0.85	0.79	0.75	0.73
4.		Spaced*	1.00	0.94	0.90	0.90	0.90
5.	Single layer under ceiling	Touching	0.95	0.81	0.72	0.68	0.66
6.		Spaced*	0.95	0.85	0.85	0.85	0.85

AS/NZS 3008.1.1:2017

De-rating factors for bunched circuits

NOTE: De-rating is necessary for the purpose of thermal dissipation. If sufficient clearance from adjacent conductors/cables is allowed for then no de-rating is necessary. To avoid de-rating a minimum clearance of 2 x cable O.D for horizontal, and 4 x cable O.D for vertical installation in air are given in AS/NZS 3008.1.1:2017.

De-rating factors										
No. of circuits/cables in parallel										
6	7	8	9	10	12	14	16	18	20+	
0.67	-	-	-	-	-	-	-	-	-	-
0.57	0.54	0.52	0.50	0.48	0.45	0.43	0.41	0.39	0.38	
0.72	0.72	0.71	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
0.64	0.63	0.62	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85

* Spaced in the above table indicates a clearance of 1 x cable O.D between adjacent cables.

* Where cables concerned are not the same size, the spacing will be based on the largest cable diameter in the adjacent groups.

ATTENUATION DATA FOR CORDAFLEX AND

Individually screened conductors

	Frequency Hz	Line attenuation dB/km	Impedance Z
Attenuation data for individually screened conductors	300	0.85	200
	600	1.2	150
	1200	1.7	110
	2400	2.3	90
	4800	3.2	60
	9600	4.2	50
	19200	5.0	40
	38400	6.0	38
	48000	6.3	35
	57600	6.5	35
	115200	8.0	35
	153600	8.5	35

Twisted screened pairs

	Frequency Hz	Line attenuation dB/km	Impedance Z
Attenuation data for twisted screened pair conductors	300	0.42	250
	600	0.60	200
	1200	0.80	150
	2400	1.0	130
	4800	1.3	100
	9600	1.5	90
	19200	2.0	85
	38400	2.8	80
	48000	3.3	78
	57600	3.5	75
	115200	5.5	70
	153600	5.7	70

PLANOFLEX SCREENED CORES

Capacitance nF/km	Inductance mH/km	Resistance Ω/km
200.2	0.256	50
200.0	0.256	50
200.0	0.256	50
199.9	0.256	50
199.6	0.256	50
199.0	0.256	50
198.6	0.256	50
198.0	0.251	52
197.9	0.249	54
197.8	0.248	55
197.4	0.238	63
197.2	0.235	67

Capacitance nF/km	Inductance mH/km	Resistance Ω/km
102.6	0.69	26
101.4	0.69	26
100.2	0.69	26
99.2	0.67	26
98.6	0.66	26
98.1	0.65	30
97.6	0.61	36
97.2	0.56	48
97.0	0.54	52
96.9	0.52	56
96.4	0.47	78
95.9	0.46	88

AC RESISTANCE OF FLEXIBLE CABLES AND

Conductor size	Single core		
	Conductor temperature °C		
	AC resistance at 50 Hz, Ω/km		
mm ²	60°C	75°C	90°C
0.5	45.1	47.4	49.7
0.75	30.1	31.6	33.2
1.0	22.6	23.7	24.9
1.5	15.4	16.2	17.0
2.5	9.23	9.70	10.2
4	5.73	6.02	6.31
6	3.82	4.01	4.21
10	2.21	2.32	2.44
16	1.40	1.47	1.54
25	0.903	0.949	0.995
35	0.641	0.674	0.707
50	0.447	0.470	0.493
70	0.316	0.332	0.348
95	0.240	0.252	0.264
120	0.188	0.197	0.207
150	0.151	0.159	0.166
185	0.125	0.131	0.137
240	0.0958	0.100	0.105
300	0.0780	0.0817	0.0853
400	0.0613	0.0640	0.0666
500	0.0507	0.0527	0.0548

*For the AC resistance of tinned copper conductors,
multiply copper value by 1.02.

The table above lists measured values that conform to AS/NZS 3008.1.1:2017 for rope laid flexible cables. For cables with an alternate core length of lay (e.g., CORDAFLEX) the values will alter slightly.

CORDS WITH COPPER CONDUCTORS

Conductor Size	Multicore		
	Conductor temperature °C	AC resistance at 50 Hz, Ω/km	
mm ²	60°C	75°C	90°C
0.5	45.1	47.4	49.7
0.75	30.1	31.6	33.2
1.0	22.6	23.7	24.9
1.5	15.4	16.2	17.0
2.5	9.23	9.70	10.2
4	5.73	6.02	6.31
6	3.82	4.01	4.21
10	2.21	2.32	2.44
16	1.40	1.47	1.54
25	0.903	0.949	0.995
35	0.642	0.674	0.707
50	0.447	0.470	0.493
70	0.316	0.332	0.348
95	0.240	0.252	0.264
120	0.188	0.198	0.207
150	0.152	0.159	0.167
185	0.126	0.132	0.138
240	0.0965	0.101	0.106
300	0.0789	0.0825	0.0860
400	0.0623	0.0649	0.0675
500	0.0518	0.0538	0.0558

AVAILABILITY

Generally the cables listed within this catalogue are available as either stock items in Australia or available on indent from Germany.

Some of the designs listed in our programme, may be subject to manufacture or factory scheduling and availability.

STANDARDS AND APPROVALS

Siemens cable products are manufactured and tested to VDE Specifications established by the Association of German Electrical Engineers. The specifications are restricted to each particular cable design and also consider the application of the cables.

Siemens wire and cable products are used throughout the world. Consequently, many have been tested, approved, or manufactured to the standards of the following organisations:

British Standards	BS
Standards Association of Australia	SAA
Underwriters Laboratories	UL
Canadian Standards Association	CSA
National Electrical Manufacturers Association	NEMA
American Bureau of Shipping	ABS
Lloyds Register of Shipping	LRS
Association of German Electrical Engineers	VDE
German Lloyds	GL
European Committee on Electrotechnical Standardisation	CENELEC
International Electrotechnical Commission	IEC
Mine Safety & Health Administration	MSHA

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GLOSSARY

PVC	Thermoplastic polyvinylchloride
EPR	Ethylen propylene rubber
Eva	Ethyl vinyl acetate
XLPE	Cross linked polyethlene
PCP	Polychloroprene
CPE	Chlorinated polyethylene (Hypalon)
SR	Silicone
PU	Polyurethane
EMI	Electromagnetic interference
RFI	Radio frequency interference
GFK	Glass fibre reinforced plastic
EMC	Electromagnetic compatibility
KW	Kilowatt
kV	Kilovolt
AS	Australian standards
V-75	75°C rated PVC
MM	Multi mode (Fibre)
mm	millimetre
PE	Polyethylene
OD	Outside diametre
R-CPE-90	Rubber – chlorinated polythylene-90°C
R-ER-90	Rubber – ethylene polythylene-90°C
R-E-110	Rubber – ethylene polythylene-110°C
Cu	Copper conductor
Tcu	Tinned copper conductor
SDI	Single double insulated
LV	Low voltage
HV	High voltage

NOTES

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The information in this document contains general descriptions of the technical options available, which do not always have to be present in individual cases. The required features should therefore be specified in each individual case at the time of closing the contract.



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