MOTION-CONNECT connection systems
Overview

Power cables

Cable	For motor	MOTION-CONNECT 500	MOTION-CONNECT 800PLUS	Page
Dynamic requirements	SIMOTICS	Medium	High	
Environmental requirements		Medium	High	
UL/CSA		✔	✔	
Halogen-free		–	✔	
RoHS		✔	✔	
Power cables with SPEED-CONNECT connector				
	S-1FT7	✔	✔	**12/9, 12/10**
	S-1FK7	✔	✔	**12/11**
	M-1PH808 M-1PH810	✔	✔	**12/9**
Power cables with full-thread connector				
	S-1FT7	✔	✔	**12/12 ... 12/14**
	S-1FK7	✔	✔	**12/14**
	M-1PH808 M-1PH810 M-1PH813	✔	✔	**12/12, 12/14**
	L-1FN3	–	✔	**12/19**
	T-1FW6	–	✔	**12/21**
Extensions for power cables with SPEED-CONNECT or full-thread connector				
	S-1FT7	✔	✔	**12/15**
	S-1FK7	✔	✔	**12/15**
	M-1PH808 M-1PH810 M-1PH813	✔	✔	**12/15**
	L-1FN3	–	✔	**12/19**
	T-1FW6	–	✔	**12/21**
Power cables for motors with terminal box				
	M-1PH8	✔ from 35 mm^2	✔ up to 16 mm^2	**12/16, 12/17**
	T-1FW3	✔	✔ up to 16 mm^2	**12/20**

Hybrid cables for SINAMICS S120M distributed servo drive

Cable	For distributed servo drive	MOTION-CONNECT 800PLUS	Page
Dynamic requirements	SINAMICS S120M	High	
Environmental requirements		High	
UL/CSA		✔	
Halogen-free		✔	
RoHS		✔	
Hybrid cables			
	6FX8002-7HY	✔	**12/22**

✔ = Possible
– = Not possible

General information

Overview

MOTION-CONNECT cables are suitable for use with many different types of machine tools and production machinery.

The following variants of MOTION-CONNECT cable are available as fully-assembled power and signal cables or sold by the meter:

- **MOTION-CONNECT 500**
  - Cost-effective solution for predominantly fixed installation
  - Suitable for low mechanical loading
  - Tested for travel distances up to 5 m (16.4 ft)
- **MOTION-CONNECT 800PLUS**
  - Meets requirements for use in cable carriers
  - Suitable for high mechanical loading
  - Oil resistance
  - Tested for travel distances of up to 50 m (164 ft)

Benefits

Pre-assembled MOTION-CONNECT cables provide high quality and perfect, system-tested functionality.

SPEED-CONNECT

Fast, stable and reliable connections can be made with the new, pre-assembled cables with SPEED-CONNECT connectors. With a short rotation as far as the stop, the cap nut of the connector secures the connection.

The cables with SPEED-CONNECT connectors supplement the previous offering of MOTION-CONNECT cables with full-thread connectors.

Application

MOTION-CONNECT cables are intended for use in machines. They are not suitable for building technology applications or outdoor installation.

MOTION-CONNECT cables have been tested in a cable carrier with horizontal travel distance and have also been designed for this type of application. They are not self-supporting.

The pre-assembled cables can be ordered in length units of 10 cm (3.94 in) and can be extended, if necessary.

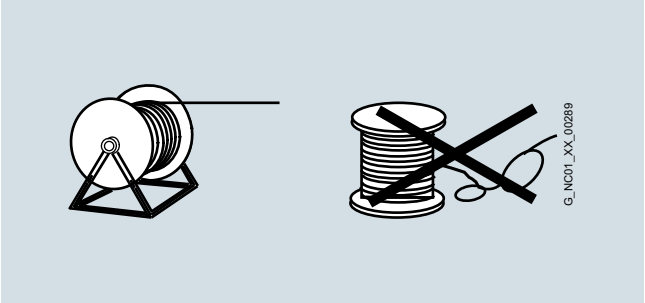
When cable lengths (basic cables and extensions) are determined for the systems and applications described in this catalog, the technically permissible maximum cable lengths (e.g., 25 m (82 ft)) specified in the catalog must be observed. Malfunctions can occur if longer cables are used.

Siemens assumes no liability for correct transmission of signals or power in this case.

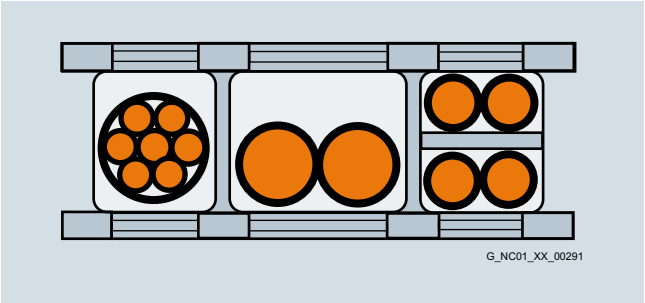
Compatibility between SPEED-CONNECT and full-thread connectors:

Connector on motor with external thread	Connector with cap nut on cable	Compatibility
SPEED-CONNECT	SPEED-CONNECT	✔
SPEED-CONNECT	Full-thread	✔
Full-thread	Full-thread	✔
Full-thread	SPEED-CONNECT	–

Function



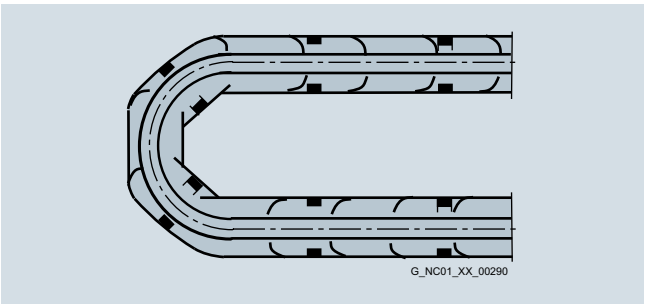
The cables must be removed from the drum without twisting, i.e., the cables must be unwound and must never be lifted over the drum flange in loops.



To maximize the service life of the cable carrier and cables, cables in the carrier made from different materials must be separated by spacers in the cable carrier. The spacers must be filled evenly to ensure that the position of the cables does not change during operation. The cables should be distributed as symmetrically as possible according to their weights and dimensions. Cables with very different outer diameters should also be separated by spacers.

When inserting pre-assembled cables into the cable carrier, do **not** pull at the connector, as this may damage the strain relief or cable clamping.

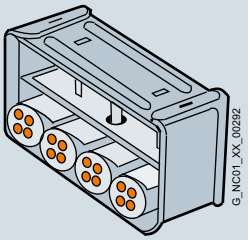
The cables must not be fixed in the cable carrier. They must be freely movable.



The cables must be able to be moved without applying force in particular in the bending radii of the carrier. The specified minimum bending radii must be adhered to.

The cable fixings must be attached at both ends at an appropriate distance away from the end points of the moving parts in a dead zone.

Function (continued)



MOTION-CONNECT cables are tested in a cable carrier. The cables are attached at one end by means of strain relief to the moving ends of the cable carrier. Strain relief is applied over a wide area of the cable jacket surface without crimping the cable.

Cables must be installed in accordance with the instructions supplied by the cable carrier manufacturer.

Note:

If, for example, pre-assembled cables are installed in a cable carrier in such a way that the connector would inhibit assembly, pre-assembled cables without assembled connectors can also be supplied (power and signal cables [1]). In this case, the contacts of the cables are crimped and the connector is supplied separately. After installing the cables, the customer assembles the connector.

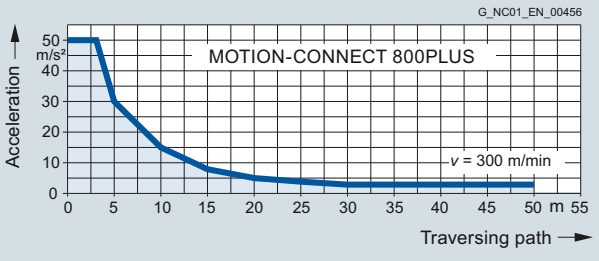
In case of vibration load and with horizontal or vertical cable entries, we recommend that the cable is additionally fixed if between the cable strain relief on the cable carrier and the terminal at the motor part of the cable is hanging loose or is not routed. To prevent machine vibrations being transmitted to the connectors, the cable should be fixed at the moving part where the motor is mounted.

Representation in connection overviews

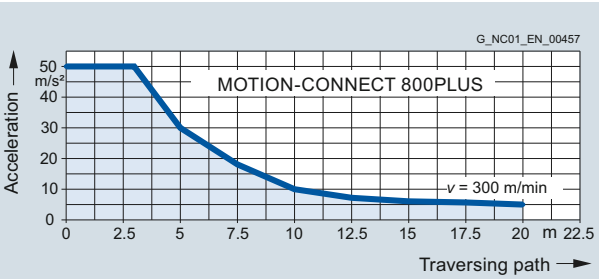
Symbol	Explanation
	Connector with pin contacts
	Connector with socket contacts
	Exposed core ends
	Cable must be supplied by the customer

Characteristic curves

The shaded area beneath the characteristic represents the potential range of use for the cables. The characteristics represent the tested operating points.



Acceleration for MOTION-CONNECT 800PLUS signal and power cables up to 16 mm^2



Permissible acceleration for MOTION-CONNECT 800PLUS cables of 25 mm^2, 35 mm^2, and 50 mm^2

[1] Not applicable to DRIVE-CLiQ signal cables.

More information

Current carrying capacity for power and signal cables

The current carrying capacity of PVC/PUR-insulated copper cables is specified for installation types B1, B2, C, and E under continuous operating conditions in the table with reference to an ambient air temperature of 40 °C (104 °F). For other ambient temperatures, the values must be corrected by the derating factors from the table.

Cross-section	**Current carrying capacity** rms AC 50/60 Hz or DC in amps for installation type			
	B1 Single-core cables in conduits or installation ducts	**B2** Multi-core cables in conduits or cable ducts	**C** Multi-core cables, vertically or horizontally on walls/open, without conduits and installation ducts/with contact	**E** Multi-core cables, horizontally or vertically on perforated cable racks/ open, without conduits and installation ducts/with contact
mm²				
Electronics [1]				
0.20	–	4.3	4.4	4.4
0.50	–	7.5	7.5	7.8
0.75	–	9	9.5	10
Power [2]				
0.75	8.6	8.5	9.8	10.4
1.00	10.3	10.1	11.7	12.4
1.50	13.5	13.1	15.2	16.1
2.50	18.3	17.4	21	22
4	24	23	28	30
6	31	30	36	37
10	44	40	50	52
16	59	54	66	70
25	77	70	84	88
35	96	86	104	110
50	117	103	125	133
70	149	130	160	171
95	180	165	194	207
120	208	179	225	240

Derating factors for power and signal cables

Ambient air temperature °C (°F)	**Derating factor** according to EN 60204-1, Table D.1
30 (86)	1.15
35 (95)	1.08
40 (104)	1.00
45 (113)	0.91
50 (122)	0.82
55 (131)	0.71
60 (140)	0.58

[1] One control circuit pair.
[2] One symmetrically loaded three-phase AC cable.

Overview

MOTION-CONNECT DRIVE-CLiQ signal cable with IP20/IP67 connector

Signal cables are pre-assembled and are sold by the meter for connecting a variety of components.

The following different types of cable are available:

- DRIVE-CLiQ signal cables
- MOTION-CONNECT DRIVE-CLiQ signal cables
- MOTION-CONNECT pre-assembled signal cables

Type of delivery for pre-assembled signal cables

Pre-assembled signal cables are available in units of 10 cm (3.94 in).

The cables are supplied on reels up to 30 kg or 100 m (66.2 lb or 328 ft). Above 30 kg or 100 m (66.2 lb or 328 ft), cable drums are used instead of reels.

Application

DRIVE-CLiQ signal cables without 24 V DC cores

are used to connect components with DRIVE-CLiQ connections which have a separate or external 24 V DC power supply.

MOTION-CONNECT DRIVE-CLiQ signal cables with 24 V DC cores

are used whenever components with DRIVE-CLiQ connections must meet high requirements such as mechanical stress and oil resistance, e.g., where a connection is made outside the cabinet between Power Modules, Motor Modules, and SIMOTICS S-1FK7/SIMOTICS M-1PH8 motors with DRIVE-CLiQ interface.

MOTION-CONNECT pre-assembled signal cables

are used whenever motor encoders on motors without DRIVE-CLiQ interface need to be connected to Sensor Modules.

Design

If pre-assembled signal cables are to be installed in a cable carrier in such a way that the connector would inhibit assembly, pre-assembled cables without assembled connector can also be supplied. In this case, the contacts of the cables are crimped and the connector enclosure is supplied separately. After installing the cables, the customer assembles the connector enclosure.

The 6FX.002-2....-.... signal cables are available with crimped contacts and with the connector enclosure supplied separately (not in the case of DRIVE-CLiQ signal cables and signal cables with exposed core ends).

Signal cables with separately supplied **module-end** connector: in this case, the 6th position of the Article No. must be changed from **0** to **1**:
6FX.0**1**2-2C...-.... (not for signal cables for connecting via terminals or 6FX.002-2AH00-...., 6FX.002-2CA12-....).

Signal cables with separately supplied **motor-end** connector: in this case, the 6th position of the Article No. must be changed from **0** to **4**:
6FX.0**4**2-2C...-.... (not for signal cables for connecting via terminals or 6FX8002-2BA20-...., 6FX8002-2BA21-....).

Note:

Once the contacts have latched into the insulator, they can no longer be removed.

Technical specifications (continued)

Signal cables	MOTION-CONNECT 500 6FX50..-.....-....	MOTION-CONNECT 800PLUS 6FX80..-.....-....
Certificate of suitability		
• cURus or UR/CSA	UL758-CSA-C22.2-N.210.2-M90	UL758-CSA-C22.2-N.210.2-M90
• UR-CSA File No. [1]	Yes	Yes
• RoHS conformity	Yes	Yes
Rated voltage according to EN 50395	30 V	30 V
Test voltage, rms	500 V	500 V
Operating temperature on the surface		
• Fixed installation	-20 … +80 °C (-4 ... +176 °F)	-50 … +80 °C (-58 ... +176 °F)
• Flexible installation	0 … 60 °C (32 ... 140 °F)	-20 … +60 °C (-4 ... +140 °F)
Tensile stress, max.		
• Fixed installation	50 N/mm^2 (7252 lb/in^2)	50 N/mm^2 (7252 lb/in^2)
• Flexible installation	20 N/mm^2 (2901 lb/in^2)	20 N/mm^2 (2901 lb/in^2)
Smallest bending radius		
• Fixed installation	60 mm (2.36 in)	4 × D_{max}
• Flexible installation	100 mm (3.94 in)	70 mm [2] (2.75 in)
Torsional stress	Absolute 30°/m	Absolute 30°/m
Bending	2 million	10 million
Traversing velocity	180 m/min (591 ft/min)	Up to 300 m/min (984 ft/min)
Acceleration	5 m/s^2 (16.41 ft/s^2)	Up to 50 m/s^2 (164 ft/s^2), see characteristics on page 12/5
Insulation material, incl. jacket	CFC/silicone-free	CFC/halogen-free/silicon-free IEC 60754-1/DIN VDE 0472-815
Oil resistance	EN 60811-2-1 (mineral oil only)	EN 60811-2-1
Outer jacket	PVC DESINA color green RAL 6018	PUR, HD22.10 S2 (VDE 0282, Part 10) DESINA color green RAL 6018
Flame-retardant	EN 60332-1-1 to 1-3	EN 60332-1-1 to 1-3

Degree of protection of the pre-assembled signal cables and their extensions when closed and inserted: IP67.

[1] The File No. is printed on the cable jacket.

[2] Exception: 6FX8002-2SL..-....; smallest bending radius (flexible): 85 mm (3.35 in).

Selection and ordering data

Signal cables for temperature sensors with full-thread connector

Temperature sensor	Motor	Connection via	Length, max.	D_{max}	Degree of protection Connector [1]	**Basic cable/ extension** [2]	**Adapter cable** [2]
	SIMOTICS	SINAMICS	m (ft)	mm (in)		Article No.	Article No.
Temperature sensor	L-1FN3100/L-1FN3150 [3]	SME120/SME125	10 (32.8)	11.0 (0.43)	IP67/IP67	**6FX8002-2SL10-....**	**6FX8002-2SL01-....**
Temperature sensor	L-1FN3300 ... L-1FN3900 [3]	SME120/SME125	10 (32.8)	11.0 (0.43)	IP67/IP67	**6FX8002-2SL10-....**	**6FX8002-2SL02-....**
Temperature sensor	T-1FW6	SME120/SME125	10 (32.8)	11.0 (0.43)	IP67/IP67	**6FX8002-2SL10-....**	**–**
Temperature sensor	L-1FN3100/L-1FN3150 [3]	TM120	100 (328)	11.0 (0.43)	–/IP67	**6FX8002-2SL20-....**	**6FX8002-2SL01-....**
Temperature sensor	L-1FN3300 ... L-1FN3900 [3]	TM120	100 (328)	11.0 (0.43)	–/IP67	**6FX8002-2SL20-....**	**6FX8002-2SL02-....**
Temperature sensor	T-1FW6	TM120	100 (328)	11.0 (0.43)	–/IP67	**6FX8002-2SL20-....**	**–**
MOTION-CONNECT 800PLUS						**8**	**8**
Length code						**....**	**....**

The combinations of signal cable extensions shown are only provided by way of example.

The maximum specified cable length (basic cable and extensions) must not be exceeded.
The total maximum length is reduced by 2 m (6.56 ft) for each interruption point.

[1] The specification for the degree of protection refers to the basic cable.

[2] The smallest bending radius (flexible) for signal cables 6FX8002-2SL..-.... is 85 mm (3.35 in).

[3] Continuous load version.

Overview

Data position in Article No.	1	2	3	4	5	6	7		8	9	10	11	12		13	14	15	16
MOTION-CONNECT 500	**6**	**F**	**X**	**5**	**0**	■	**2**	**–**	**2**	■	■	■	■	**–**	.	.	.	.
MOTION-CONNECT 800PLUS	**6**	**F**	**X**	**8**	**0**	■	**2**	**–**	**2**	■	■	■	■	**–**	.	.	.	.
6FX2 cables	**6**	**F**	**X**	**2**	**0**	**0**	**2**	**–**	**1**	**D**	**C**	■	**0**	**–**	.	.	.	.

Pre-assembled at motor and module ends	**0**
Pre-assembled at motor end, connector at module end supplied separately	**1**
Connector at motor end supplied separately, pre-assembled at module end	**4**

Variant: Signal cables for integrated encoder

DRIVE-CLiQ cables between	and				
Power Module/Motor Module/SMC with IP20 connector	Power Module/Motor Module/SMC with IP20 connector	**D**	**C**	**0**	**0**
Power Module/Motor Module/SMC with IP20 connector	Motor/encoder/SME IP67 connector	**D**	**C**	**1**	**0**
DME20/cabinet bushing/coupler	Motor/encoder/SME IP67 connector	**D**	**C**	**2**	**0**
Basic cable between	**and motor with**				
SMC20	Incremental encoder (sin/cos 1 V_{pp}), full-thread connector, M23	**C**	**A**	**3**	**1**
SMC30	Incremental encoder (HTL), full-thread connector, M23	**A**	**H**	**0**	**0**
CU310-2	Incremental encoder (HTL), full-thread connector, M23	**A**	**H**	**1**	**1**
SMC20	Absolute encoder, full-thread connector, M23	**E**	**Q**	**1**	**0**
SMC10	Resolver, full-thread connector, M23	**C**	**F**	**0**	**2**
SMC20	Incremental encoder (sin/cos 1 V_{pp}), SPEED-CONNECT connector, M23	**C**	**Q**	**3**	**1**
SMC20	Incremental encoder, SPEED-CONNECT connector, M17	**C**	**N**	**2**	**0**
SMC20	Absolute encoder, SPEED-CONNECT connector, M23	**E**	**Q**	**3**	**1**
SMC20	Absolute encoder, SPEED-CONNECT connector, M17	**E**	**N**	**2**	**0**
SMC10	Resolver, SPEED-CONNECT connector, M17	**F**	**N**	**2**	**0**
Extension between basic cable with connector	**and motor connector**				
Full-thread or SPEED-CONNECT	Full-thread or SPEED-CONNECT				**4**

Variant: Signal cables for external encoder

Basic cable between	and				
SMC30	Incremental encoder 6FX2001-2 (TTL/supply 5 V), full-thread connector	**C**	**R**	**0**	**0**
SMC30	Incremental encoder 1XP8012-2./1XP8032-2. (TTL/supply 24 V), full-thread connector	**C**	**D**	**2**	**4**
SMC20	Incremental encoder 6FX2001-3 (sin/cos 1 V_{pp}), full-thread connector	**C**	**G**	**0**	**0**
SMC30	Incremental encoder 6FX2001-4 (HTL), full-thread connector	**C**	**A**	**1**	**2**
SMC30	Incremental encoder 1XP8012-1./1XP8032-1. (HTL), full-thread connector	**C**	**A**	**1**	**2**
SMC30	Absolute encoder with SSI 1XP8014-2./1XP8024-2., full-thread connector	**C**	**C**	**0**	**6**
SMC30	Absolute encoder 6FX2001-5.S (SSI), full-thread connector	**C**	**C**	**1**	**1**
SMC20	Absolute encoder 6FX2001-5.E (EnDat 2.1), full-thread connector	**C**	**H**	**0**	**0**
SMC20	Absolute encoder 1XP8014-10/1XP8024-10 (EnDat 2.1), full-thread connector	**C**	**H**	**0**	**0**
SMC10	Resolver 1XP8013-1./1XP8023-1., full-thread connector	**C**	**F**	**0**	**6**
Extension between basic cable with connector	**and motor connector**				
Full-thread	Full-thread				**4**

Variant: Signal cables for temperature sensor	**6**	**F**	**X**	**8**	**0**	**0**	**2**	**–**	**2**	**S**	**L**	■	■	**–**	.	.	.	.
Adapter cable with M17 socket on SIMOTICS T-1FW6 terminals												**0**	**0**					
Adapter cable with M17 socket on SIMOTICS L-1FN3100/L-1FN3150												**0**	**1**					
Adapter cable with M17 socket on SIMOTICS L-1FN3300 ... L-1FN3900												**0**	**2**					
Extension to basic cable between SME12x and SIMOTICS L-1FN3/SIMOTICS T-1FW6												**1**	**0**					
Basic cable between TM120 and SIMOTICS L-1FN3/SIMOTICS T-1FW6												**2**	**0**					

Length code				
Units of 10 cm (3.94 in) or 1 meter (3.28 ft) or in fixed lengths	.	.	.	.

Length code

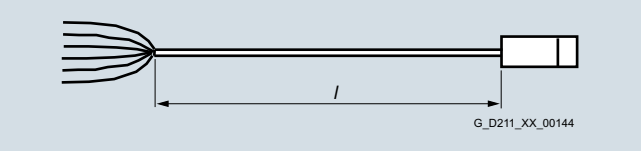
Overview

Description	Article No. supplement				
Length code for pre-assembled cables					
	6FX.0.2-.....-	■	■	■	■
0 m 100 m (328 ft) 200 m (656 ft)		**1** **2** **3**			
0 m 10 m (32.8 ft) 20 m (65.6 ft) 30 m (98.4 ft) 40 m (131 ft) 50 m (164 ft) 60 m (197 ft) 70 m (230 ft) 80 m (262 ft) 90 m (295 ft)			**A** **B** **C** **D** **E** **F** **G** **H** **J** **K**		
0 m 1 m (3.28 ft) 2 m (6.56 ft) 3 m (9.84 ft) 4 m (13.1 ft) 5 m (16.4 ft) 6 m (19.7 ft) 7 m (23.0 ft) 8 m (26.2 ft) 9 m (29.5 ft)				**A** **B** **C** **D** **E** **F** **G** **H** **J** **K**	
0 m 0.1 m (3.94 in) 0.2 m (7.87 in) 0.3 m (11.81 in) 0.4 m (15.75 in) 0.5 m (19.96 in) 0.6 m (23.62 in) 0.7 m (27.56 in) 0.8 m (31.5 in)					**0** **1** **2** **3** **4** **5** **6** **7** **8**
Examples:	1.0 m (3.28 ft):	1	A	B	0
	2.2 m (7.22 ft):	1	A	C	2
	8.0 m (26.3 ft):	1	A	J	0
	299.0 m (981 ft):	3	K	K	0

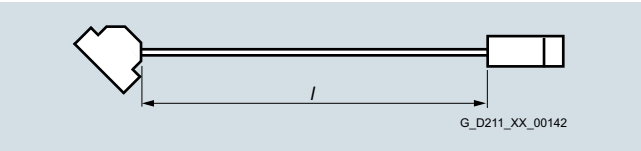
Description	Article No. supplement				
Length code for power and signal cables, sold by the meter [1]					
	6FX.008-.....-	■	■	**A**	**0**
50 m (164 ft)		**1**	**F**		
100 m (328 ft)		**2**	**A**		
200 m (656 ft)		**3**	**A**		
500 m (1641 ft)		**6**	**A**		

More information

Definition of lengths for pre-assembled cables



Cable with exposed core ends and pre-assembled connector



Cable with pre-assembled connectors at both ends

Tolerance:

- Cable lengths up to 10 m (32.8 ft): ± 2%
- Cable lengths of 10 m (32.8 ft) and longer: ± 1%

[1] Note type of delivery. Cables with core cross-section 4 × 4 mm^2 or 4 × 4 mm^2 with brake cores can be delivered in units of 1 m (3.28 ft).