

# NBC-FRD-R4AC SCO-PN/.../... - Network cable



1408613

<https://www.phoenixcontact.com/us/products/1408613>

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Network cable, PROFINET CAT5 (100 Mbps), EtherCAT® CAT5 (100 Mbps), 4-position, Variable cable type, shielded, Socket angled M12, coding: D SPEEDCON / IP67, on Plug straight RJ45 / IP20, cable length: Free input (0.2 ... 40.0 m)

## Commercial data

Item number	1408613
Packing unit	1 pc
Minimum order quantity	1 pc
Note	Made to order (non-returnable)
Sales key	BF17
Product key	BF1CJN
Catalog page	Page 397 (C-2-2019)
Customs tariff number	85444290
Country of origin	PL

## Technical data

### Notes

General	This product corresponds to the PROFINET Cabling and Interconnection Technology Guideline for PROFINET regulations, version 2.00, order no: 2.252, Chapter 8.2 Connectors for Outside Environment (Balanced cabling)
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### Product properties

Product type	Data cable preassembled
Sensor type	PROFINET
Number of positions	4
Application	Standard Robots and drag chains
Shielded	yes
Coding	D

### Interfaces

Bus system	PROFINET
Signal type/category	PROFINET CAT5 (IEC 11801), 100 Mbps EtherCAT <sup>®</sup> CAT5 (IEC 11801), 100 Mbps

### Signaling

Status display	No
Status display present	No

### Electrical properties

Nominal voltage $U_N$	48 V AC 60 V DC
Nominal current $I_N$	1 A
Transmission medium	Copper
Transmission characteristics (category)	CAT5 (IEC 11801:2002)

### Material specifications

Seal material	NBR
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### Connector

#### Connection 1

Type	Socket angled M12 SPEEDCON / IP67
Number of positions	4
Coding type	D (Data)
Handle color	black
Material	CuSn (Contact) Ni/Au (Contact surface)

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	TPU GF (Contact carriers)
	TPU, hardly inflammable, self-extinguishing (Grip)
	Zinc die-cast, nickel-plated (Screw connection)
Insertion/withdrawal cycles	≥ 100
Contact resistance	≤ 5 mΩ
Insulation resistance	≥ 100 MΩ
Tightening torque	0.4 Nm
Degree of protection	IP67
Ambient temperature (operation)	-25 °C ... 90 °C
Number of positions	4
Insertion/withdrawal cycles	100
Locking type	SPEEDCON

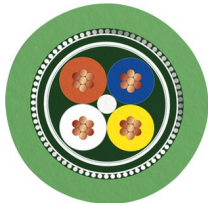
## Connection 2

Type	Plug straight RJ45 / IP20
Number of positions	4 (8)
Handle color	black
Material	CuSn (Contact)
	Ni/Au (Contact surface)
	PA (Contact carriers)
	PA (Housing)
Insertion/withdrawal cycles	≥ 750
Ambient temperature (operation)	-25 °C ... 80 °C
Number of positions	4
Degree of protection	IP20

## Cable/line

Cable length	Free input (0.2 ... 40.0 m)
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## PROFINET PVC stranded CAT5 [93B]

Dimensional drawing	
Shielded	yes
UL AWM Style	21694
Cable weight	67 kg/km
Cable type	PROFINET PVC stranded CAT5
Short symbol	2YY(ST)CY
Cable type (abbreviation)	93B
Signal type/category	PROFINET CAT5 (IEC 11801), 100 Mbps

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	EtherCAT® CAT5 (IEC 11801), 100 Mbps
Cable structure	1x4xAWG22/7, SF/TQ
External cable diameter	6.5 mm ±0.2 mm
Outer sheath, material	PVC
External sheath, color	green RAL 6018
Thickness, outer sheath	approx. 0.9 mm
Material, inner sheath	PVC
Conductor material	Tin-plated Cu litz wires
Conductor structure signal line	7x 0.25 mm
AWG signal line	22
Conductor cross section	4x 0.34 mm²
Material wire insulation	PE
Wire diameter incl. insulation	1.55 mm
Single wire, color	white, yellow, blue, orange
Overall twist	Star quad
Shielding	Aluminum-coated foil, tinned copper braided shield
Optical shield covering	85 %
Nominal voltage, cable	600 V
Test voltage Core/Core	2000 V (50 Hz, 1 min.)
Test voltage Core/Shield	2000 V (50 Hz, 1 min.)
Cable insulation resistance	≥ 500 MΩ*km
Coupling resistance	≤ 20.00 mΩ/m (at 10 MHz)
Wave impedance	100 Ω ±15 Ω (at 100 MHz)
Loop resistance	≤ 120.00 Ω/km
Signal runtime	5.3 ns/m
Signal speed	0.66 c
Minimum bending radius, fixed installation	3 x D
Minimum bending radius, flexible installation	7 x D
Damping	2.1 dB (with 1 MHz)
	4 dB (at 4 MHz)
	6.3 dB (at 10 MHz)
	8 dB (at 16 MHz)
	9 dB (at 20 MHz)
	11.4 dB (at 31.25 MHz)
	16.5 dB (at 62.5 MHz)
	21.3 dB (at 100 MHz)
Near end crosstalk attenuation (NEXT)	80 dB (with 1 MHz)
	76 dB (at 4 MHz)
	70 dB (at 10 MHz)
	65 dB (at 16 MHz)
	63 dB (at 20 MHz)
	60 dB (at 31.25 MHz)
	55 dB (at 62.5 MHz)
	50 dB (at 100 MHz)

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Resistance to oil	Resistant to oil to a limited extent
Flame resistance	according to UL 1685 (CSA FT 4)
Other resistance	UV resistant According to UL 1581, Section 1200
Ambient temperature (operation)	-40 °C ... 70 °C (Cable, flexible installation)
	-40 °C ... 70 °C (cable, fixed installation)

## PROFINET drag chain CAT5 [93C]

Dimensional drawing	
Shielded	yes
Cable weight	61 kg/km
Cable type	PROFINET drag chain CAT5
Short symbol	2YH(ST)C11Y
Cable type (abbreviation)	93C
Signal type/category	PROFINET CAT5 (IEC 11801), 100 Mbps
	EtherCAT® CAT5 (IEC 11801), 100 Mbps
Cable structure	1x4xAWG22/7, SF/TQ
External cable diameter	6.5 mm ±0.2 mm
Outer sheath, material	PUR
External sheath, color	green RAL 6018
Thickness, outer sheath	approx. 0.9 mm
Material, inner sheath	FRNC
Conductor material	Tin-plated Cu litz wires
Conductor structure signal line	7x 0.25 mm
AWG signal line	22
Conductor cross section	4x 0.34 mm²
Material wire insulation	PE
Wire diameter incl. insulation	1.5 mm
Single wire, color	white, yellow, blue, orange
Overall twist	Star quad
Shielding	Aluminum-coated foil, tinned copper braided shield
Optical shield covering	85 %
Nominal voltage, cable	600 V (UL rating)
Test voltage Core/Core	2000 V (50 Hz, 1 min.)
Test voltage Core/Shield	2000 V (50 Hz, 1 min.)
Cable insulation resistance	≥ 500 MΩ*km
Coupling resistance	≤ 20.00 mΩ/m (at 10 MHz)
Wave impedance	100 Ω ±15 Ω (at 1 ... 100 MHz)

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Loop resistance	≤ 120.00 Ω/km
Signal runtime	5.3 ns/m
Signal speed	0.66 c
Tensile strength	≤ 150 N
Minimum bending radius, fixed installation	5 x D
Minimum bending radius, flexible installation	7.5 x D
Number of bending cycles	3000000
Bending radius	100 mm
Traversing path	10 m
Traversing rate	4 m/s
Acceleration	4 m/s <sup>2</sup>
Torsion force	± 30 °/m
Damping	2.1 dB (with 1 MHz)
	4 dB (at 4 MHz)
	6.3 dB (at 10 MHz)
	8 dB (at 16 MHz)
	9 dB (at 20 MHz)
	11.4 dB (at 31.25 MHz)
	16.5 dB (at 62.5 MHz)
	21.3 dB (at 100 MHz)
Near end crosstalk attenuation (NEXT)	80 dB (with 1 MHz)
	76 dB (at 4 MHz)
	70 dB (at 10 MHz)
	65 dB (at 16 MHz)
	63 dB (at 20 MHz)
	60 dB (at 31.25 MHz)
	55 dB (at 62.5 MHz)
	50 dB (at 100 MHz)
Halogen-free	yes
Resistance to oil	in accordance with DIN EN 60811-2-1
Flame resistance	according to IEC 60332-1-2
Other resistance	UV resistant
Special properties	Electrical properties in accordance with EN 50288-2-2
Ambient temperature (operation)	-40 °C ... 70 °C (Cable, flexible installation)
	-40 °C ... 70 °C (cable, fixed installation)

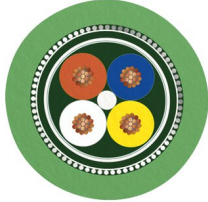
PROFINET robot CAT5 [93R]

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Dimensional drawing	
Shielded	yes
UL AWM Style	20233 (80°C/300 V)
Cable weight	55 kg/km
Cable type	PROFINET robot CAT5
Short symbol	02YSC11Y
Cable type (abbreviation)	93R
Signal type/category	PROFINET CAT5 (IEC 11801), 100 Mbps EtherCAT <sup>®</sup> CAT5 (IEC 11801), 100 Mbps
Cable structure	1x4xAWG22/19, S/TQ
External cable diameter	6.5 mm ±0.2 mm
Outer sheath, material	PUR
External sheath, color	green RAL 6018
Thickness, outer sheath	approx. 1 mm
Conductor material	Tin-plated Cu litz wires
Conductor structure signal line	19x 0.15 mm
AWG signal line	22
Conductor cross section	4x 0.34 mm <sup>2</sup>
Material wire insulation	Foamed PE
Wire diameter incl. insulation	1.5 mm
Single wire, color	white, yellow, blue, orange
Overall twist	Star quad
Shielding	Tinned copper braided shield
Optical shield covering	85 %
Nominal voltage, cable	300 V
Test voltage Core/Core	2000 V (50 Hz, 1 min.)
Test voltage Core/Shield	2000 V (50 Hz, 1 min.)
Cable insulation resistance	≥ 500 MΩ*km
Wave impedance	100 Ω ±5 Ω (at 100 MHz)
Loop resistance	≤ 120.00 Ω/km
Signal runtime	4.8 ns/m
Minimum bending radius, fixed installation	5 x D
Torsion force	± 180 °/m
Torsion cycles	1000000
Damping	2.9 dB (with 1 MHz) 5 dB (at 4 MHz) 8.1 dB (at 10 MHz)

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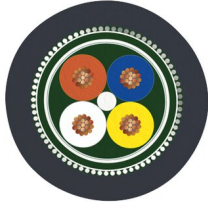


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	10.4 dB (at 16 MHz)
	11.9 dB (at 20 MHz)
	15.5 dB (at 31.25 MHz)
	26.5 dB (at 62.5 MHz)
	41 dB (at 100 MHz)
Halogen-free	according to IEC 60754-1
Resistance to oil	in accordance with DIN EN 60811-2-1
Flame resistance	according to IEC 60332-1-2
Other resistance	UV resistant According to UL 1581, Section 1200
Ambient temperature (operation)	-40 °C ... 80 °C
	-40 °C ... 80 °C

## PROFINET RADOX<sup>®</sup> railway application CAT5 [937]

Dimensional drawing	
Shielded	yes
Cable weight	70 kg/km
Cable type	PROFINET RADOX <sup>®</sup> railway application CAT5
Cable type (abbreviation)	937
Signal type/category	PROFINET CAT5 (IEC 11801), 100 Mbps EtherCAT <sup>®</sup> CAT5 (IEC 11801), 100 Mbps
Cable structure	1x4xAWG22/7, SF/TQ
External cable diameter	6.6 mm ±0.4 mm
Outer sheath, material	PE-X
External sheath, color	black RAL 9005
Thickness, outer sheath	approx. 1 mm
Conductor material	silver-plated Cu litz wires
Conductor structure signal line	7x 0.25 mm
AWG signal line	22
Conductor cross section	4x 0.34 mm <sup>2</sup>
Material wire insulation	Foamed PE
Wire diameter incl. insulation	approx. 1.5 mm
Single wire, color	white-blue, orange-yellow
Overall twist	Star quad
Shielding	Plastic-coated aluminum foil, tinned copper braided shield
Nominal voltage, cable	300 V AC
Test voltage, cable	2000 V AC (50 Hz, 5 minutes)
Cable resistance	≤ 54.4 Ω/km



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Coupling resistance	200.00 mΩ/m (f ≤ 30 MHz)
Wave impedance	100 Ω ±5 Ω (f = 100 MHz)
Working capacitance	≤ 65 pF (Line-line)
	≤ 100 pF (Line-shield)
Signal speed	75 c
Minimum bending radius, fixed installation	6 x D
Damping	2 dB (with 1 MHz)
	4.4 dB (at 4 MHz)
	7.4 dB (at 10 MHz)
	14 dB (at 31.5 MHz)
	20 dB (at 62.5 MHz)
	26 dB (at 100 MHz)
Remote crosstalk attenuation (FEXT)	78 dB (with 1 MHz)
	77 dB (at 4 MHz)
	70 dB (at 10 MHz)
	65 dB (at 31.5 MHz)
	56 dB (at 62.5 MHz)
	48 dB (at 100 MHz)
Near end crosstalk attenuation (NEXT)	73 dB (with 1 MHz)
	70 dB (at 4 MHz)
	65 dB (at 10 MHz)
	57 dB (at 31.5 MHz)
	52 dB (at 62.5 MHz)
	48 dB (at 100 MHz)
Return loss (RL)	25 dB (at 4 MHz)
	30 dB (at 10 MHz)
	30 dB (at 31.5 MHz)
	30 dB (at 62.5 MHz)
	28 dB (at 100 MHz)
Shield attenuation	40 dB (30 MHz ≤ f ≤ 100 MHz)
Fire protection in rail vehicles	BS 6853 (Category Ia, Ib, II)
	GM/RT 2130 (Category Ia, Ib, II)
	EN 45545 (Risk level HL1 - HL3)
	DIN 5510 (Fire protection level 1, 2, 3, 4)
	NF F16-101 (Category A1, A2, B)
	NF F16-101 (Class C/F0)
	NFPA 130
	UNI CEI 11170 (Risk level LR1 - LR4)
Halogen-free	in accordance with EN 50267-2-1
Resistance to oil	according to IIR 902, 72 h at 100 °C
Concentration of fumes	BS 6853 D.8.7
	EN 61034-2
	UL 1685, 12 (FT4)
Fume toxicity	BS 6853 B.1

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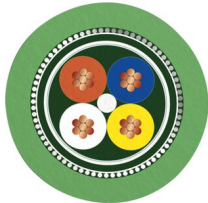


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	EN 50305, 9.2
Fume corrosiveness	EN 50267-2-2
Flame resistance	EN 60332-1-2
	EN 50266
	EN 60332-3-25
	NF C32-070, 2.1
	NF C32-070, 2.2
	UL 1685, 12 (FT4)
	in accordance with ISO 6722-1 5.22 (UN ECE-R 118.01)
Other resistance	Resistance to fuels according to IRM 903, 168 h at 70 °C
Ambient temperature (operation)	-40 °C ... 90 °C (Cable, flexible installation)
	-50 °C ... 90 °C (cable, fixed installation)

## PROFINET stranded CAT5 [93M]

Dimensional drawing	
Shielded	yes
UL AWM Style	20236 (80°C/30 V)
Cable weight	65 kg/km
Cable type	PROFINET stranded CAT5
Cable type (abbreviation)	93M
Signal type/category	PROFINET CAT5 (IEC 11801), 100 Mbps
	EtherCAT® CAT5 (IEC 11801), 100 Mbps
Cable structure	1x4xAWG22/7, SF/TQ
External cable diameter	6.5 mm ±0.2 mm
Outer sheath, material	PUR
External sheath, color	green RAL 6018
Thickness, outer sheath	approx. 0.9 mm
Material, inner sheath	PVC
Conductor material	Tin-plated Cu litz wires
Conductor structure signal line	7x 0.25 mm
AWG signal line	22
Conductor cross section	4x 0.34 mm²
Material wire insulation	PE
Wire diameter incl. insulation	approx. 1.5 mm
Single wire, color	white, yellow, blue, orange
Overall twist	Star quad
Shielding	Aluminum-coated foil, tinned copper braided shield

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Nominal voltage, cable	600 V
Test voltage Core/Core	2000 V (50 Hz, 1 min.)
Test voltage Core/Shield	2000 V (50 Hz, 1 min.)
Cable insulation resistance	$\geq 500 \text{ M}\Omega \cdot \text{km}$
Coupling resistance	$\leq 20.00 \text{ m}\Omega/\text{m}$ (at 10 MHz)
Wave impedance	$100 \Omega \pm 15 \Omega$ (at 100 MHz)
Loop resistance	$\leq 120.00 \Omega/\text{km}$
Working capacitance	52 pF
Signal runtime	5.3 ns/m
Minimum bending radius, fixed installation	4 x D
Minimum bending radius, flexible installation	8 x D
Damping	2.1 dB (with 1 MHz)
	4 dB (at 4 MHz)
	6.3 dB (at 10 MHz)
	8 dB (at 16 MHz)
	9 dB (at 20 MHz)
	11.4 dB (at 31.25 MHz)
	16.5 dB (at 62.5 MHz)
Near end crosstalk attenuation (NEXT)	21.3 dB (at 100 MHz)
	80 dB (with 1 MHz)
	76 dB (at 4 MHz)
	70 dB (at 10 MHz)
	65 dB (at 16 MHz)
	63 dB (at 20 MHz)
	60 dB (at 31.25 MHz)
Ambient temperature (operation)	55 dB (at 62.5 MHz)
	50 dB (at 100 MHz)
Ambient temperature (operation)	-40 °C ... 80 °C (Cable, flexible installation)
	-40 °C ... 80 °C

## Environmental and real-life conditions

### Ambient conditions

Degree of protection	IP65 (M12 connector)
	IP67 (M12 connector)
	IP20 (RJ45 connector)
Ambient temperature (operation)	-25 °C ... 85 °C (M12 connector)
	-25 °C ... 60 °C (RJ45 connector)

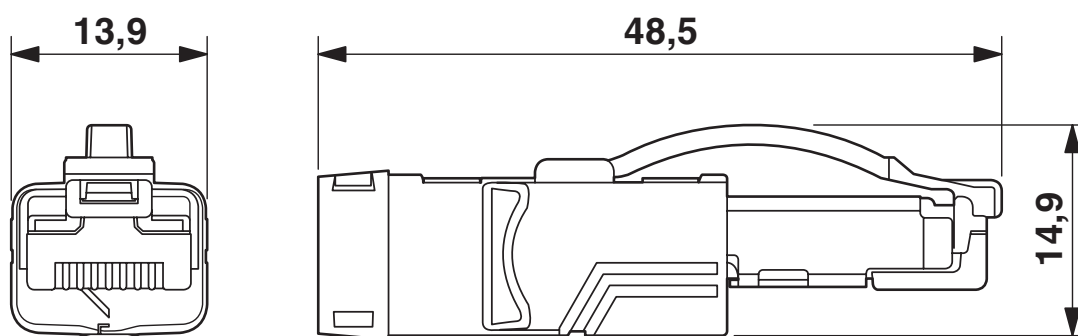
## Standards and regulations

### M12

Standard designation	M12 connector
Standards/specifications	IEC 61076-2-101

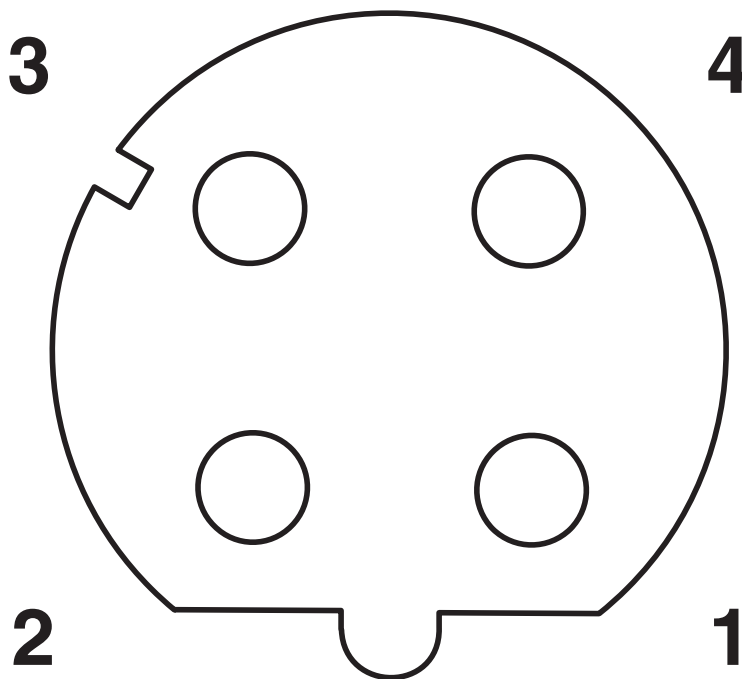
## Drawings

Dimensional drawing



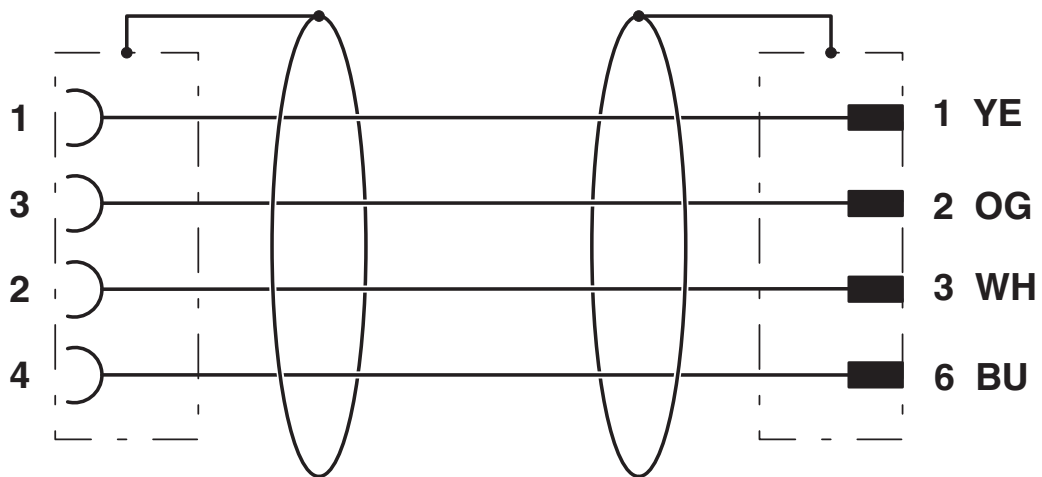
RJ45 connector, IP20

Schematic diagram

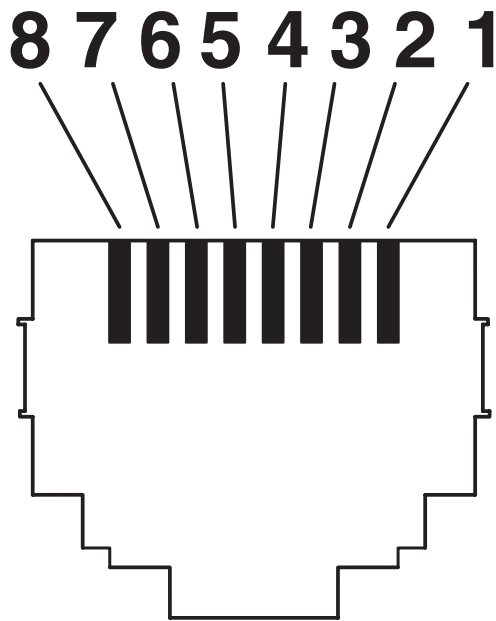


Pin assignment M12 socket, 4-pos., D-coded, female side

Circuit diagram



Schematic diagram



Connector pin assignment plug RJ45

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## Approvals

To download certificates, visit the product detail page: <https://www.phoenixcontact.com/us/products/1408613>



### UL Listed

Approval ID: FILE E 335024

	Nominal voltage $U_N$	Nominal current $I_N$	Cross section AWG	Cross section $\text{mm}^2$
	30 V	4 A	-	-



### cUL Listed

Approval ID: FILE E 335024

	Nominal voltage $U_N$	Nominal current $I_N$	Cross section AWG	Cross section $\text{mm}^2$
	60 V	0.5 A	-	-



### EAC-RoHS

Approval ID: RU D-DE.HB35.B.00387

### cULus Listed

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## Classifications

### ECLASS

ECLASS-11.0	27060307
ECLASS-12.0	27060307
ECLASS-13.0	27060307

### ETIM

ETIM 8.0	EC001855
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### UNSPSC

UNSPSC 21.0	26121600
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Environmental product compliance

China RoHS	Environmentally friendly use period: unlimited = EFUP-e
	No hazardous substances above threshold values

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## Accessories

### TSD 04 SAC - Torque screwdriver

1208429

<https://www.phoenixcontact.com/us/products/1208429>



Torque screwdriver, with preset torque of 0.4 Nm and 4 mm hexagonal drive for M12 connectors

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### TSD-M 1,2NM - Torque screwdriver

1212224

<https://www.phoenixcontact.com/us/products/1212224>



Torque screw driver, accuracy as per EN ISO 6789 standard, adjustable from 0.3 - 1.2 Nm

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## TSD-M SAC-BIT ADAPTER - Adapter insert

1212600

<https://www.phoenixcontact.com/us/products/1212600>



Adapter bit for TSD-M...torque tools, E6.3-1/4" drive with 4 mm hexagon to accommodate SAC bits

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## SAC BIT M12-D15 - Tool

1208432

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Nut for assembling sensor/actuator cables with M12 connector and M12 connectors for assembly, with a knurl diameter of 15 mm, for 4 mm hexagonal drive

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## PROT-M12 MS-PA-CHAIN - Screw plug

1430899

<https://www.phoenixcontact.com/us/products/1430899>

M12 sealing cap with fixing band, for sensor cables, for free M12 sockets



## SAC-M12-EXCLIP-F - Locking clip

1558991

<https://www.phoenixcontact.com/us/products/1558991>

Locking clip for the socket side of sensor/actuator cables with M12 connector and M12 connectors for assembly, for knurl diameter: 15 mm or for Allen key with a wrench size of 14 mm, prevents the disconnection of plug-in connections without tools



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