

# SAC-4P-FR SCO RAIL/.../... - Sensor/actuator cable



1412168

<https://www.phoenixcontact.com/us/products/1412168>

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Sensor/actuator cable, 4-position, shielded, free cable end, on Socket angled M12 SPEEDCON, coding: A, cable length: Free input (0.2 ... 40.0 m), For railway applications

## Your advantages

- Easy and safe: 100 % electrically tested plug-in components
- Securely locked by special vibration brake
- Resistant to temperature influences – tested for an extended temperature range and for resistance to temperature shocks
- Reliable signal transmission – 360° shielding in environments with electromagnetic interference

## Commercial data

|                        |                                |
|------------------------|--------------------------------|
| Item number            | 1412168                        |
| Packing unit           | 1 pc                           |
| Minimum order quantity | 1 pc                           |
| Note                   | Made to order (non-returnable) |
| Product key            | AF1CJA                         |
| GTIN                   | 4046356993661                  |
| Country of origin      | PL                             |

## Technical data

### Notes

|         |                                                                                  |
|---------|----------------------------------------------------------------------------------|
| General | Further products with fixed cable length can be found in the accessories section |
|---------|----------------------------------------------------------------------------------|

### Product properties

|                      |                       |
|----------------------|-----------------------|
| Product type         | Sensor/actuator cable |
| Application          | Railway applications  |
| Number of positions  | 4                     |
| No. of cable outlets | 1                     |
| Shielded             | yes                   |
| Coding               | A                     |

### Insulation characteristics

|                      |    |
|----------------------|----|
| Overvoltage category | II |
| Degree of pollution  | 3  |

### Material specifications

|                                        |                              |
|----------------------------------------|------------------------------|
| Flammability rating according to UL 94 | V0                           |
| Seal material                          | NBR                          |
| Material of grip body                  | PA 6.6                       |
| Contact material                       | CuSn                         |
| Contact surface material               | Ni/Au                        |
| Contact carrier material               | PA 6.6                       |
| Material for screw connection          | Zinc die-cast, nickel-plated |
| Standards/regulations                  | PA 6.6                       |

### Electrical properties

|                       |          |
|-----------------------|----------|
| Insulation resistance | ≥ 100 MΩ |
| Nominal voltage $U_N$ | 250 V AC |
|                       | 250 V DC |
| Nominal current $I_N$ | 4 A      |

### Mechanical properties

#### Mechanical data

|                             |       |
|-----------------------------|-------|
| Insertion/withdrawal cycles | ≥ 100 |
|-----------------------------|-------|

### Signaling

|                        |    |
|------------------------|----|
| Status display         | no |
| Status display present | no |

### Connection data

#### Conductor connection

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|                   |                        |
|-------------------|------------------------|
| Tightening torque | 0.4 Nm (M12 connector) |
|-------------------|------------------------|

## Connector

### Connection 1

|      |                |
|------|----------------|
| Type | free cable end |
|------|----------------|

### Connection 2

|                     |                            |
|---------------------|----------------------------|
| Type                | Socket angled M12 SPEEDCON |
| Number of positions | 4                          |
| Locking type        | SPEEDCON                   |
| Coding type         | A                          |

## Cable/line

|              |                             |
|--------------|-----------------------------|
| Cable length | Free input (0.2 ... 40.0 m) |
|--------------|-----------------------------|

### Shielded black RADOX® [28R]

|                                               |                                                                                                                                                                                                                         |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cable weight                                  | 56 kg/km                                                                                                                                                                                                                |
| Number of positions                           | 4                                                                                                                                                                                                                       |
| Shielded                                      | yes                                                                                                                                                                                                                     |
| Cable type                                    | Shielded black RADOX® [28R]<br>Shielded black RADOX® 28R                                                                                                                                                                |
| Conductor structure signal line               | 19x 0.18 mm                                                                                                                                                                                                             |
| AWG signal line                               | 20                                                                                                                                                                                                                      |
| Conductor cross section                       | 4x 0.5 mm²                                                                                                                                                                                                              |
| Wire diameter incl. insulation                | 1.43 mm                                                                                                                                                                                                                 |
| External cable diameter                       | 5.40 mm ±0.3 mm                                                                                                                                                                                                         |
| Outer sheath, material                        | PE-X                                                                                                                                                                                                                    |
| External sheath, color                        | black RAL 9005                                                                                                                                                                                                          |
| Conductor material                            | Tin-plated Cu litz wires                                                                                                                                                                                                |
| Material wire insulation                      | PE-X                                                                                                                                                                                                                    |
| Single wire, color                            | white 1, white 2, white 3, white 4                                                                                                                                                                                      |
| Overall twist                                 | 4 wires, twisted                                                                                                                                                                                                        |
| Shielding                                     | Tinned copper braided shield                                                                                                                                                                                            |
| Optical shield covering                       | 85 %                                                                                                                                                                                                                    |
| Max. conductor resistance                     | ≤ 40.1 Ω/km                                                                                                                                                                                                             |
| Nominal voltage, cable                        | 600 V AC (Core-ground, U <sub>0</sub> )<br>1000 V AC (Core-ground, U)<br>≤ 720 V AC (core-ground)<br>≤ 1200 V AC (Core-ground, U <sub>m</sub> )<br>≤ 900 V DC (Core-ground, V <sub>0</sub> )<br>≤ 1500 V DC (Line-line) |
| Test voltage                                  | 3500 V AC (50 Hz, 5 min.)<br>8400 V DC (50 Hz, 5 min.)                                                                                                                                                                  |
| Minimum bending radius, fixed installation    | 3 x D                                                                                                                                                                                                                   |
| Minimum bending radius, flexible installation | 4 x D                                                                                                                                                                                                                   |

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|                                               |                                                            |
|-----------------------------------------------|------------------------------------------------------------|
| Smallest bending radius, fixed installation   | 17 mm                                                      |
| Smallest bending radius, movable installation | 22 mm                                                      |
| Halogen-free                                  | in accordance with EN 50267-2-1                            |
| Flame resistance                              | IEC 60332-1-2                                              |
|                                               | EN 50266                                                   |
|                                               | EN 50305, 9.1.2                                            |
|                                               | 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)       |
| Fume corrosiveness                            | EN 50267-2-2                                               |
| Fume toxicity                                 | BS 6853 B.1                                                |
|                                               | EN 50305, 9.2                                              |
| Concentration of fumes                        | BS 6853 D.8.7                                              |
|                                               | EN 61034-2                                                 |
|                                               | UL 1685, 12 (FT4)                                          |
| Resistance to oil                             | according to IRM 902, 72 h at 100 °C                       |
| 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)                       |
| Other resistance                              | Resistance to fuels (according to IRM 903, 168 h at 70 °C) |
| Ambient temperature (operation)               | -50 °C ... 120 °C (cable, fixed installation)              |
|                                               | -25 °C ... 90 °C (Cable, flexible installation)            |

## RADOX® black Twisted-Pair [28T]

|                                 |                                 |
|---------------------------------|---------------------------------|
| Cable weight                    | 80 kg/km                        |
| Number of positions             | 4                               |
| Shielded                        | yes                             |
| Cable type                      | RADOX® black Twisted-Pair [28T] |
|                                 | RADOX® black Twisted-Pair 28T   |
| Conductor structure signal line | 19x 0.18 mm                     |
| AWG signal line                 | 20                              |
| Conductor cross section         | 2x 2x 0.5 mm <sup>2</sup>       |
| Wire diameter incl. insulation  | 1.4 mm                          |
| External cable diameter         | 7.20 mm ±0.3 mm                 |
| Outer sheath, material          | PE-X                            |
| External sheath, color          | black                           |
| Conductor material              | Tin-plated Cu litz wires        |
| Material wire insulation        | PE-X                            |

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|                                               |                                                            |
|-----------------------------------------------|------------------------------------------------------------|
| Single wire, color                            | white 1-white 2, white 3-white 4                           |
| Twisted pairs                                 | 2 cores to the pair                                        |
| Overall twist                                 | Two pairs with two fillers to the core                     |
| Shielding                                     | Tinned copper braided shield                               |
| Max. conductor resistance                     | $\leq 40.1 \Omega/\text{km}$                               |
| Nominal voltage, cable                        | 600 V AC (Core-ground, $U_0$ )                             |
|                                               | 1000 V AC (Core-ground, U)                                 |
|                                               | $\leq 720 \text{ V AC (core-ground)}$                      |
|                                               | $\leq 1200 \text{ V AC (Core-ground, } U_m)$               |
|                                               | $\leq 900 \text{ V DC (Core-ground, } V_0)$                |
| Test voltage                                  | $\leq 1500 \text{ V DC (Line-line)}$                       |
|                                               | 3500 V AC (50 Hz, 5 min.)                                  |
|                                               | 8400 V DC (50 Hz, 5 min.)                                  |
| Minimum bending radius, fixed installation    | 3 x D                                                      |
| Minimum bending radius, flexible installation | 4 x D                                                      |
| Smallest bending radius, fixed installation   | 22 mm                                                      |
| Smallest bending radius, movable installation | 29 mm                                                      |
| Halogen-free                                  | in accordance with EN 50267-2-1                            |
| Flame resistance                              | IEC 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)       |
| Fume corrosiveness                            | EN 50267-2-2                                               |
| Fume toxicity                                 | BS 6853 B.1                                                |
|                                               | EN 50305, 9.2                                              |
| Concentration of fumes                        | BS 6853 D.8.7                                              |
|                                               | EN 61034-2                                                 |
|                                               | UL 1685, 12 (FT4)                                          |
| Resistance to oil                             | according to IRM 902, 72 h at 100 °C                       |
| 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)                       |
| Other resistance                              | Resistance to fuels (according to IRM 903, 168 h at 70 °C) |
| Ambient temperature (operation)               | -50 °C ... 120 °C (cable, fixed installation)              |
|                                               | -25 °C ... 90 °C (Cable, flexible installation)            |

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RADOX® black shielded 0.75 mm² [29R]

|                                               |                                                                                                                                                                                                                         |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cable weight                                  | 72 kg/km                                                                                                                                                                                                                |
| Number of positions                           | 4                                                                                                                                                                                                                       |
| Shielded                                      | yes                                                                                                                                                                                                                     |
| Cable type                                    | RADOX® black shielded 0.75 mm² [29R]<br>RADOX® black shielded 0.75 mm² 29R                                                                                                                                              |
| Conductor structure signal line               | 19x 0.22 mm                                                                                                                                                                                                             |
| AWG signal line                               | 18                                                                                                                                                                                                                      |
| Conductor cross section                       | 4x 0.75 mm²                                                                                                                                                                                                             |
| Wire diameter incl. insulation                | 1.63 mm                                                                                                                                                                                                                 |
| External cable diameter                       | 6.00 mm ±0.3 mm                                                                                                                                                                                                         |
| Outer sheath, material                        | PE-X                                                                                                                                                                                                                    |
| External sheath, color                        | black                                                                                                                                                                                                                   |
| Conductor material                            | Tin-plated Cu litz wires                                                                                                                                                                                                |
| Material wire insulation                      | PE-X                                                                                                                                                                                                                    |
| Single wire, color                            | white 1, white 2, white 3, white 4                                                                                                                                                                                      |
| Overall twist                                 | 4 wires, twisted                                                                                                                                                                                                        |
| Shielding                                     | Tinned copper braided shield                                                                                                                                                                                            |
| Max. conductor resistance                     | ≤ 26.7 Ω/km                                                                                                                                                                                                             |
| Nominal voltage, cable                        | 600 V AC (Core-ground, U <sub>0</sub> )<br>1000 V AC (Core-ground, U)<br>≤ 720 V AC (core-ground)<br>≤ 1200 V AC (Core-ground, U <sub>m</sub> )<br>≤ 900 V DC (Core-ground, V <sub>0</sub> )<br>≤ 1500 V DC (Line-line) |
| Test voltage                                  | 3500 V AC (50 Hz, 5 min.)<br>8400 V DC (50 Hz, 5 min.)                                                                                                                                                                  |
| Minimum bending radius, fixed installation    | 3 x D                                                                                                                                                                                                                   |
| Minimum bending radius, flexible installation | 4 x D                                                                                                                                                                                                                   |
| Smallest bending radius, fixed installation   | 18 mm                                                                                                                                                                                                                   |
| Smallest bending radius, movable installation | 24 mm                                                                                                                                                                                                                   |
| Halogen-free                                  | in accordance with EN 50267-2-1                                                                                                                                                                                         |
| Flame resistance                              | IEC 60332-1-2<br>EN 50266<br>EN 50305, 9.1.2<br>NF C32-070, 2.1<br>NF C32-070, 2.2<br>UL 1685, 12 (FT4)<br>in accordance with ISO 6722-1 5.22 (UN ECE-R 118.01)                                                         |
| Fume corrosiveness                            | EN 50267-2-2                                                                                                                                                                                                            |
| Fume toxicity                                 | BS 6853 B.1<br>EN 50305, 9.2<br>BS 6853 D.8.7                                                                                                                                                                           |

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|                                  |                                                            |
|----------------------------------|------------------------------------------------------------|
| Concentration of fumes           | EN 61034-2                                                 |
|                                  | UL 1685, 12 (FT4)                                          |
| Resistance to oil                | according to IRM 902, 72 h at 100 °C                       |
| 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                                                   |
| Other resistance                 | UNI CEI 11170 (Risk level LR1 - LR4)                       |
|                                  | Resistance to fuels (according to IRM 903, 168 h at 70 °C) |
| Ambient temperature (operation)  | -50 °C ... 120 °C (cable, fixed installation)              |
|                                  | -25 °C ... 90 °C (Cable, flexible installation)            |

## Environmental and real-life conditions

### Ambient conditions

|                                                                   |                                  |
|-------------------------------------------------------------------|----------------------------------|
| Degree of protection                                              | IP65                             |
| Ambient temperature (operation) (male connector/female connector) | -40 °C ... 85 °C (Plug / socket) |

## Standards and regulations

### M12

|                          |                  |
|--------------------------|------------------|
| Standard designation     | M12 connector    |
| Standards/specifications | IEC 61076-2-101  |
| Standard designation     | Shock, vibration |
| Standards/specifications | EN 50155         |

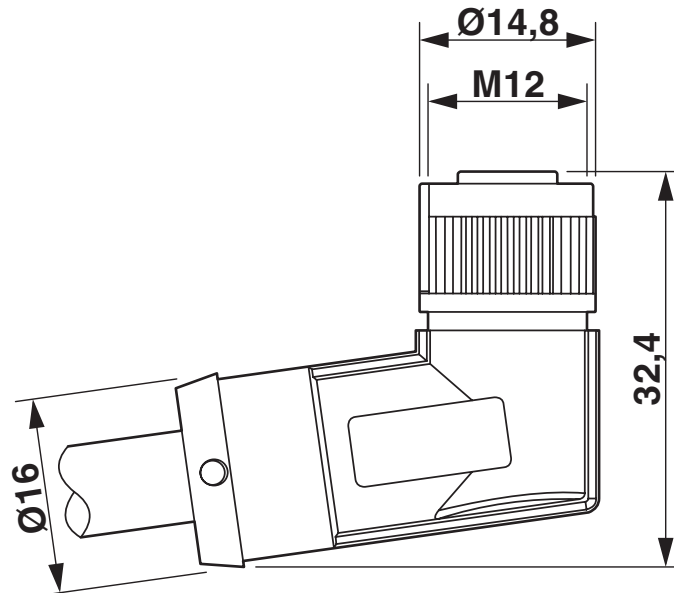
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## Drawings

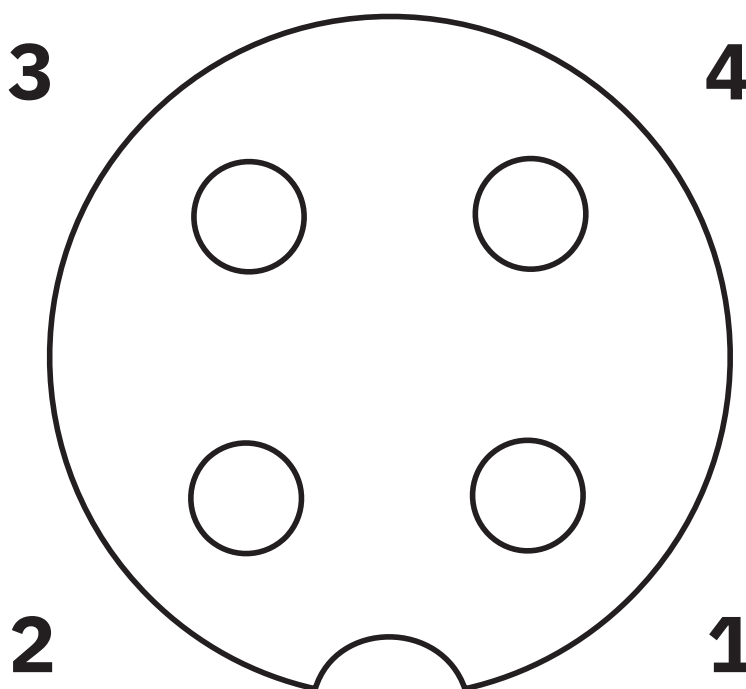
Dimensional drawing



Socket M12-SPEEDCON, angled, shielded

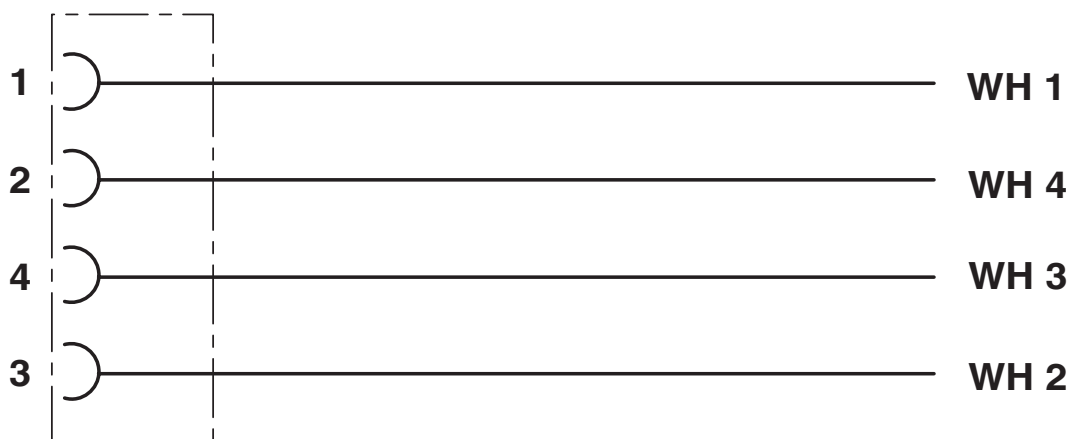


Schematic diagram



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

Circuit diagram



Contact assignment of the M12 socket

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## Approvals

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**EAC-RoHS**

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

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## Classifications

### ECLASS

|             |          |
|-------------|----------|
| ECLASS-13.0 | 27060311 |
| ECLASS-15.0 | 27060311 |

### ETIM

|          |          |
|----------|----------|
| ETIM 9.0 | EC001855 |
|----------|----------|

### UNSPSC

|             |          |
|-------------|----------|
| UNSPSC 21.0 | 26121600 |
|-------------|----------|

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## Environmental product compliance

|                                         |                                                             |
|-----------------------------------------|-------------------------------------------------------------|
| EU RoHS                                 |                                                             |
| Fulfills EU RoHS substance requirements | Yes, No exemptions                                          |
| China RoHS                              |                                                             |
| Environment friendly use period (EFUP)  | EFUP-E                                                      |
|                                         | No hazardous substances above the limits                    |
| EU REACH SVHC                           |                                                             |
| REACH candidate substance (CAS No.)     | 6,6'-di-tert-butyl-2,2'-methylenedi-p-cresol(CAS: 119-47-1) |

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