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# *Cables* Manual

**ver.1 rev.12/'08**

## Enclosures to Service Manuals of:

- **McbNET Digital™**
- **Magnum400™**
- **MiniMagnum400™**

# Summary


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| Release | Notes |
|---|---|
| ver.1 rev.06/'07 | Preliminary first edition. |
| ver.1 rev.12/'08 | Correction pag.9 - McbNET Digital RS232 communication cable |




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**THIS MANUAL IS EXCLUSIVELY ADDRESSED TO TECHNICAL PERSONNEL WITH AN APPROPRIATE TECHNICAL KNOWLEDGE ON SERVODRIVE.**
**BEFORE USING THIS MANUAL READ DRIVE'S SERVICE MANUAL.**

# 1 Cables

The following table illustrates the technical characteristics of all cables:

| Cables (norm EN60204) | | |
|---|---|---|
| **Type** | **Section** | **Notes** |
| **Main supply cable** | **1,5**mm²/15AWG | • **Always insert a power relay or a thermal magnet on every phase of the products power supply.**<br>• Insert a protective fuse. |
| | **2,5**mm²/13-14AWG (only Magnum400 size: 10/20, 14/28, 20/40) | |
| **Auxiliary supply (+24VDC) cable** | **1,5**mm²/15AWG | Connect the 0V of the auxiliary supply to the ground bar. |
| **Motor power cable** | **1,5**mm²/15AWG | • It must be shielded.<br>• It must have a capacity ≤150pF/m.<br>• If the length exceeds 20/25m, insert an Axor **3x1.2mH** filter. |
| | **2,5**mm²/11AWG (only Magnum400 size: 10/20, 14/28, 20/40) | |
| **Motor's brake cables** | min. **0,75**mm²/15AWG | They must be shielded. |
| **Motor signal cable (encoder)** | **0,25**-**0,35** mm²/ 24-22AWG | • It must be shielded.<br>• It must have a capacity less than 120pF/m (up to 25m max).<br>• See paragraph 3 and 4 for more information. |
| **Motor signal cable (resolver)** | **0,25**-**0,35** mm²/ 24-22AWG | |
| **External regen resistance cable** | **1,5**mm²/15AWG | The cable must be as short as possible.<br>If the cable is length more then 20/30cm, it must be twisted and shielded. The shield must be connected to ground, on both ends, utilising u clamps to the zinced panel of the electrical box. |
| **Control signal cable** | **0,5**mm²/20AWG | • Cables for *analogic signals* must be braided and shielded.<br>• Cables for *digital signals* can be individual ones. |
| **RS232 communication cable** | **0,22**mm²/24AWG or **0,34**mm²/22AWG. | • Cable length should be equal or less than 2,5m.<br>• It must be shielded (only for Magnum400 and MiniMagnum400).<br>• It must be connected when the main supply and the auxiliary supply are both powered off.<br>• It must have a capacity less than 160pF/m. |
| **CanBus communication cable** | **0,25**mm²/**0,34**mm² | • Cable capacitance: max 60 nF/km.<br>• Characteristic impedance: 100...120Ω.<br>• Load resistance (loop): 159,8 Ω/km<br>• The length depends by the transmission speed:<br>• 1000kbit/s ⇨20m max;<br>• 500kbit/s ⇨70m max;<br>• 250kbit/s ⇨115m max. |
| **Note:** Avoid crossing, overlapping and twisted cables together. If it is absolutely necessary to cross them, do so at 90°. | | |

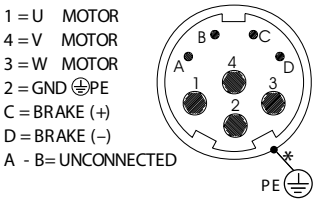
**On request Axor provides:**

- ***motor signal cables series encoder or resolver* for *SuperSAX* motors;**
- ***motor power cables* for *SuperSAX*motors;**
- ***RS232* communication cable;**
- ***CanBus* communication cable.**

# 2 Motor power cable

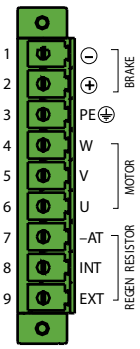
**For the motor power connection use a globally shielded 3P+T cable.**
**It must have a capacity less than 100pF/m.**
**If the length exceeds 20/25m, insert an Axor 3x1.2mH filter.**
**If necessary insert two conductors, separately shielded, for motor's brake.**

| Motor power connector 8 pole | Function | Axor's cable Colour/mark | Axor power connector |
|---|---|---|---|
| 1 | Motor lead U | Black 1/U | U |
| 4 | Motor lead V | Black 3 /V | V |
| 3 | Motor lead W | Black 2/W | W |
| 2 | GND, PE | Yellow/Green | PE |
| C | Brake (+) | Black 6/BR+ | + |
| D | Brake (-) | Black 5/BR- | - |
| A | Not connected | /- | / |
| B | Not connected | /- | / |
| Connector's metal ring | Brake internal shield | - | |
| Connector's metal ring | Brake external shield | - | |

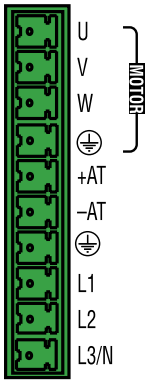



**Motor power connector 8 pole**

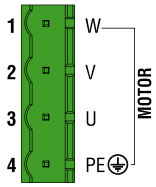
**MAGNUM400™ motor power connector:**




**McbNET Digital™ motor power connector:**




**MiniMagnum™ motor power connector:**

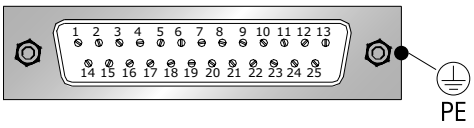


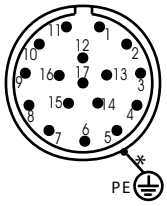

**Note: We suggest to use *pre-set Axor motor power cables*.**

# 3 Motor signal cable - encoder

| Sub-D 25 pole | Function | Description | 17 pole connector (Encoder) | Color Axor's cable |
|---|---|---|---|---|
| 1 | Hall U- | Negative hall signal. | 12 | White Yellow |
| 2 | Hall V- | Negative hall signal. | 13 | White Black |
| 3 | Hall W- | Negative hall signal. | 16 | Brown Yellow |
| 4 | T.SW/PTC | Motor thermal protection. | 17 | Blue |
| 5 | CHA+ | Encoder channel A+. | 5 | Yellow |
| 6 | CHB+ | Encoder channel B+. | 7 | Red |
| 7 | CHZ+ | Encoder channel Z+. | 9 | Black |
| 8 | PE | Cable's external shield.<br>Remove part of the outer insulation and connect it to the cabinet metal back plane and to the pin 8. | Connector metal ring | - |
| 10 | Hall U+ | Positive hall signal. | 11 | Green Black |
| 11 | Hall V+ | Positive hall signal. | 14 | Green Red |
| 12 | Hall W+ | Positive hall signal. | 15 | Brown Grey |
| 13 | 0V | Encoder power supply, +0V. | 4 | Brown Blue |
| 13 | AGND | Cable's internal shields. | Connector metal ring | - |
| 17 | T.SW/PTC | Motor thermal protection. | 2 | Grey |
| 18 | CHA- | Encoder channel A-. | 6 | Green |
| 19 | CHB- | Encoder channel B-. | 8 | Orange |
| 20 | CHZ- | Encoder channel Z-. | 10 | Brown |
| 21 | +5V | Encoder power supply, +5V.<br>Max load 220mA.<br>Protected from the short circuits, not protected from negative or alternate voltages. | 3 | Brown Red |
| 9-14-15-16-22-23-24-25 | - | Not connected. | - | - |
| **Note: It must have a capacity less than 120pF/m.** | | | | |

**J1 connector**
**Sub-D 25 pole**

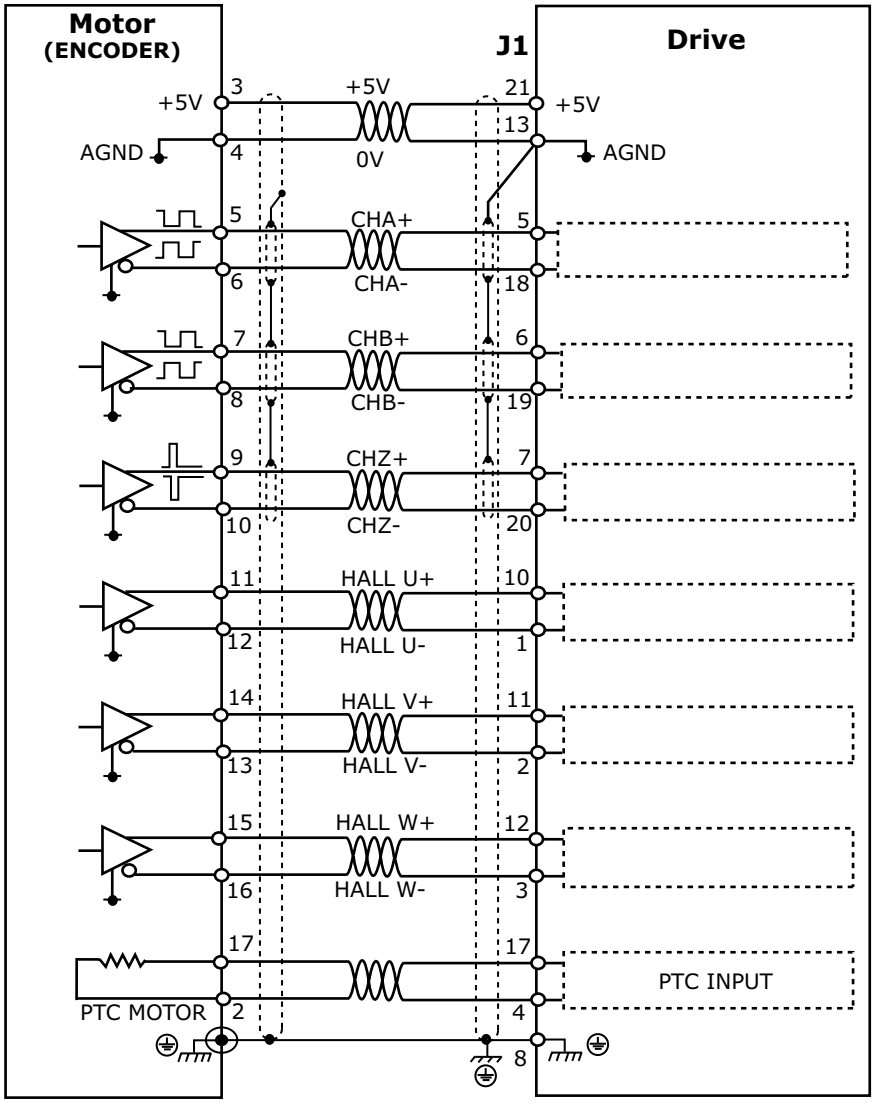



**17 pole connector**
**(Encoder)**

**Cable realisation:**

It must have *8 twisted pairs*: one for the supply, three for the encoder signal, three for the hall signal and one for the thermal protection; additionally it must be *externally shielded*.
Motor side three pairs (the encoder signal's ones) must be shielded and connected together and with the external shield; while drive side they must be connected together and with pin 8 of the J1 connector (not with the external shield).
Motor side the external shield must be connected to ground through the connector's ring; drive side the shield must be connected to ground utilising pressed cable on the zinced panel of the electrical box.




**Notes:**

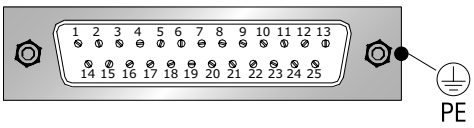
✓ **If the motor has not the thermal protection (PTC MOTOR) you should bridge the 4 and 17 pins on the "J1, Sub-D 25 pole" connector of the drive.**

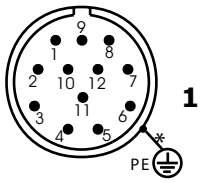
✓ **We suggest to use *pre-set Axor motor signal cables*.**

# 4 Motor signal cable - resolver

| Sub-D 25 pole | Function | Description | 12 pole connector (Resolver) | Color Axor's cable |
|---|---|---|---|---|
| 1-2-3-5-6-7-9-10-11-12-18-19-20-21-22 | - | Not connected. | 1-10-11-12 | |
| 4 | T.SW/PTC | Motor thermal protection. | 2 | Green |
| 8 | PE | External shield. | - | |
| 13 | AGND | Global internal schield. | Connector metal ring | Connected with the White cable (Exc(-)) |
| 14 | Sen - | Negative resolver signal. | 7 | White |
| 15 | Cos - | Negative resolver signal. | 8 | White |
| 16 | Exc - | Negative resolver signal. | 9 | White |
| 17 | T.SW/PTC | Motor thermal protection. | 6 | White |
| 23 | Sen + | Positive resolver signal. | 3 | Yellow |
| 24 | Cos + | Positive resolver signal. | 4 | Blue |
| 25 | Exc + | Positive resolver signal. | 5 | Red |
| **Note: It must be made by using four couples of conductors. Each couple must have the conductors twisted and shielded. It must be externally shielded. It must have a capacity less than 120pF/m.** | | | | |

**J1 connector**
**Sub-D 25 pole**

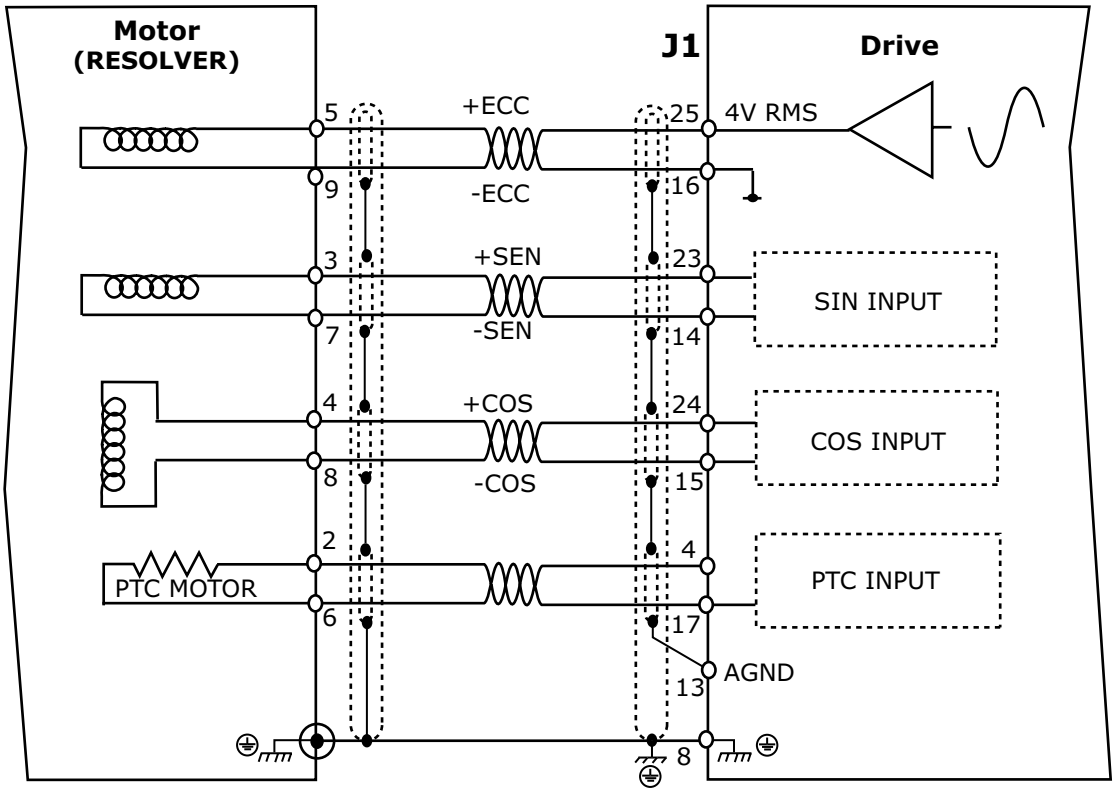



**12 pole connector (Resolver)**

**Cable realisation:**

It must be made by using *four twisted and shielded pairs*: one for the supply, two for the resolver signal and one for thermal protection; additionally it must be *externally shielded*.
Motor side the internal shields must be connected together and with the external shield through the connector's ring.
Drive side the internal shields must be connected together and to pin 13 of the J1 connector; while the external shield must be connected to ground utilising u clamps to the zinced panel of the electrical box, and to pin 8.




**Notes:**

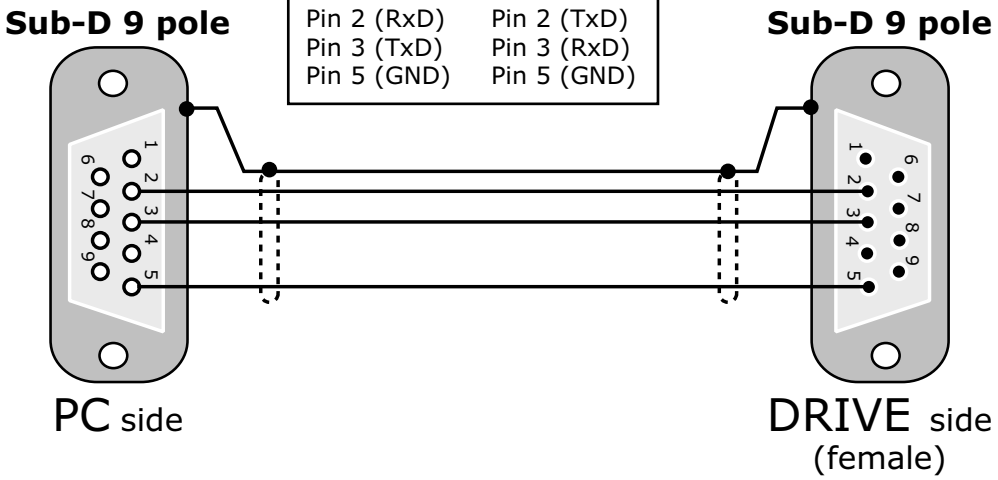
✓ **If the motor has not the thermal protection (PTC MOTOR) you should bridge the 4 and 17 pins on the "J1, Sub-D 25 pole" connector of the drive.**

✓ **We suggest to use *pre-set Axor motor signal cables*.**

# 5 RS232 communication cable

**Magnum400™ and MiniMagnum™:**

| Sub-D | MAGNUM |
|---|---|
| Pin 2 (RxD) | Pin 2 (TxD) |
| Pin 3 (TxD) | Pin 3 (RxD) |
| Pin 5 (GND) | Pin 5 (GND) |

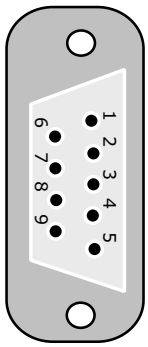



**Note: It can be pin to pin.**

**McbNET Digital™** ( **RJ11 - 6 pole**):

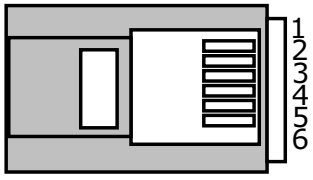
**Sub-D 9 pole**

| Sub-D | MCBNETD |
|---|---|
| n.c. | Pin 1 - |
| n.c. | Pin 2 - |
| Pin 2 (RxD) | Pin 3 (TxD) |
| Pin 3 (TxD) | Pin 4 (RxD) |
| Pin 5 (GND) | Pin 5 (GND) |
| n.c. | Pin 6 - |




PC side

**RJ11**
**6 pole**

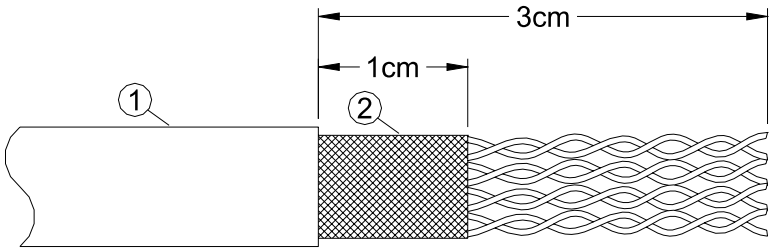



DRIVE side

# 6 CanBus communication cable

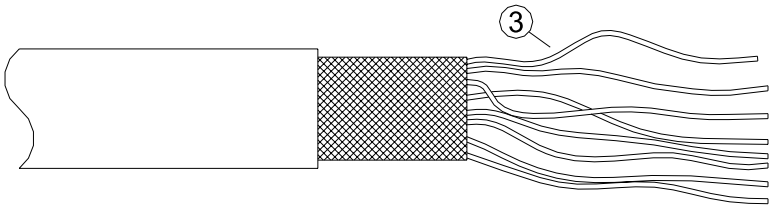
For assembling this cable take a **network cable**, **two RJ45 shielded connectors** and **appropriate nippers**, then follow this procedure:

1



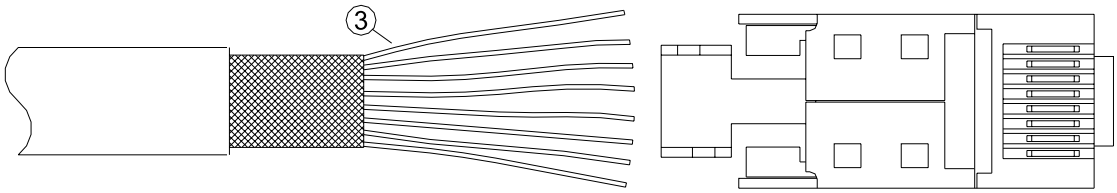

Remove the outer covering of the cable over a length of about 3cm (1).
Pay attention to not cut or incise the insulation of the conductors inside the sheath.
Leave the shield (2) of the cable over a length of about 1cm.

2




Uncurl the four couples of wires in order to obtain eight separated wires, but pay attention to distinguish them if they don't have different colours .

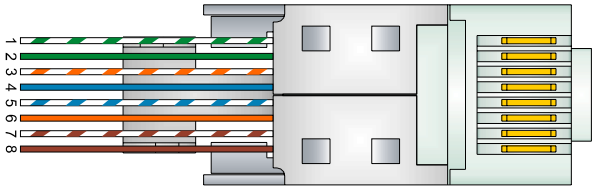
3



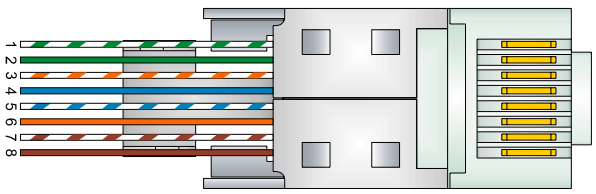

Open as a fan the wires (3) in the order of you will have to connect them, from left to right.
For the configuration of the cable see the following table.

| N° | 1 and 2 connectors | Function |
|---|---|---|
| 1 | White/Green | CAN H |
| 2 | Green | CAN L |
| 3 | White/Orange | PGND |
| 4 | Blue | N.C. |
| 5 | White/Blue | N.C. |
| 6 | Orange | N.C. |
| 7 | White/Brown | PGND |
| 8 | Brown | N.C. |
| **NB**: If the colours of the cables are different, it is sufficient to maintain the correct correspondence. | | |

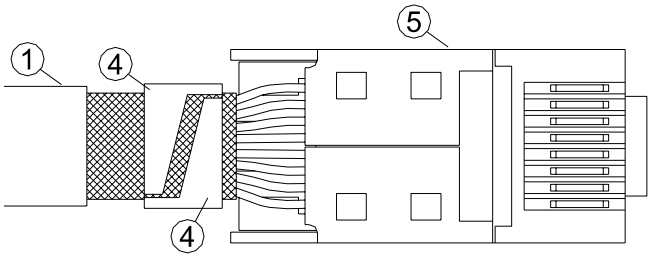
**Connector 1:**




**Connector 2:**



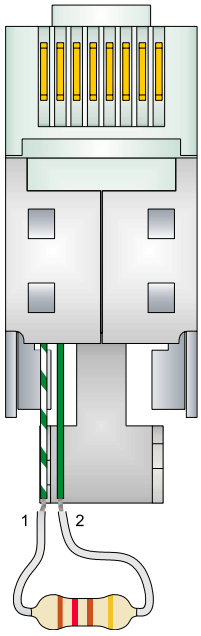
4

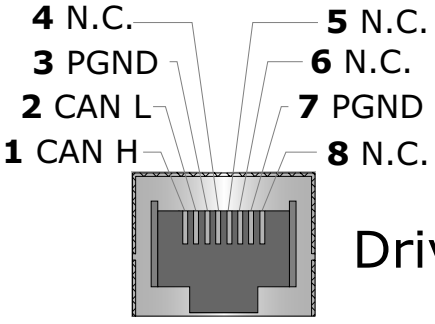



After you have connected the wires by using the correct tackle, block the cable (1) by using the two tangs (4) of the RJ45 connector.

5

If necessary, connect the resistor of about 120 Ohm 1/4W between the pins 1 and 2 of the connector. Then insulate and cover by using a thermo-shrinked tube.



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