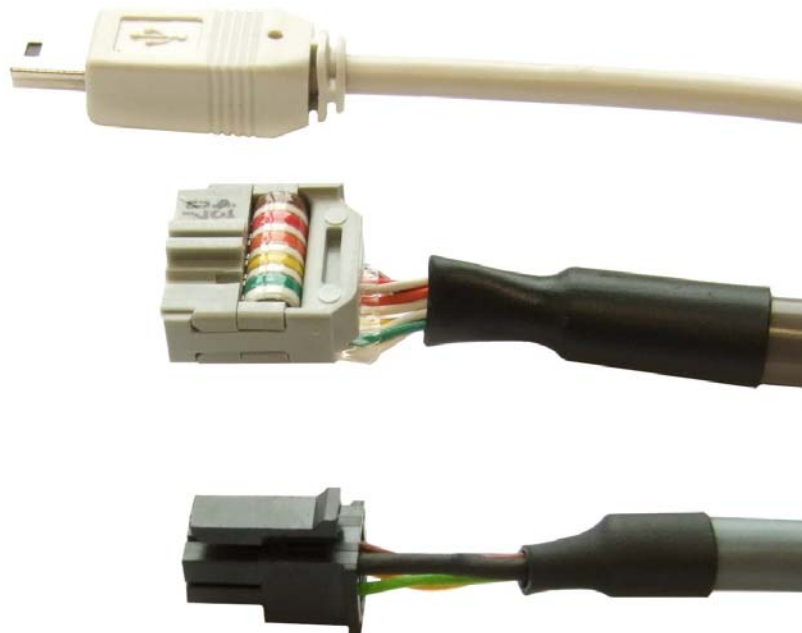


EPOS2 P 24/5

Programmable Positioning Controller

Cable Starting Set



Document ID: rel4271

PLEASE READ THIS FIRST



These instructions are intended for qualified technical personnel. Prior to commencing with any activities ...

- *you must carefully read and understand this manual and*
- *you must follow the instructions given therein.*

We have tried to provide you with all information necessary to install and commission the equipment in a **secure, safe and time-saving** manner. Our main focus is ...

- to familiarize you with all relevant technical aspects,
- to let you know the easiest way of doing,
- to alert you of any possibly dangerous situation you might encounter or that you might cause if you do not follow the description,
- to **write as little** and to **say as much** as possible and
- not to bore you with things you already know.

Likewise, we tried to skip repetitive information! Thus, you will find things **mentioned just once**. If, for example, an earlier mentioned action fits other occasions you then will be directed to that text passage with a respective reference.



Follow any stated reference – observe respective information – then go back and continue with the task!

PREREQUISITES FOR PERMISSION TO COMMENCE INSTALLATION

The **EPOS2 P 24/5** is considered as partly completed machinery according to EU's directive 2006/42/EC, Article 2, Clause (g) and therefore **is intended to be incorporated into or assembled with other machinery or other partly completed machinery or equipment**.



You must not put the device into service, ...

- *unless you have made completely sure that the other machinery – the surrounding system the device is intended to be incorporated to – fully complies with the requirements stated in the EU directive 2006/42/EC!*
- *unless the surrounding system fulfills all relevant health and safety aspects!*
- *unless all respective interfaces have been established and fulfill the stated requirements!*

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1 About this Document

1.1 Intended Purpose

The purpose of the present document is to familiarize you with the described equipment and the tasks on safe and adequate installation and/or commissioning.

Observing the described instructions in this document will help you ...

- to avoid dangerous situations,
- to keep installation and/or commissioning time at a minimum and
- to increase reliability and service life of the described equipment.

Use for other and/or additional purposes is not permitted. maxon motor, the manufacturer of the equipment described, does not assume any liability for loss or damage that may arise from any other and/or additional use than the intended purpose.

1.2 Target Audience

This document is meant for trained and skilled personnel working with the equipment described. It conveys information on how to understand and fulfill the respective work and duties.

This document is a reference book. It does require particular knowledge and expertise specific to the equipment described.

1.3 How to use

Take note of the following notations and codes which will be used throughout the document.

| Notation | Explanation |
|----------|--|
| (n) | referring to an item (such as order number, list item, etc.) |
| → | denotes "see", "see also", "take note of" or "go to" |

Table 1-1 Notations used in this Document

1.4 Symbols and Signs

1.4.1 Safety Alerts



Take note of when and why the alerts will be used and what the consequences are if you should fail to observe them!

Safety alerts are composed of...

- a signal word,
- a description of type and/or source of the danger,
- the consequence if the alert is being ignored, and
- explanations on how to avoid the hazard.

Following types will be used:

1) **DANGER**

Indicates an **imminently hazardous situation**. If not avoided, the situation will result in death or serious injury.

2) WARNING

Indicates a **potentially hazardous situation**. If not avoided, the situation **can** result in death or serious injury.

3) CAUTION

Indicates a **probable hazardous situation** and is also used to alert against unsafe practices. If not avoided, the situation **may** result in minor or moderate injury.

Example:



DANGER

High Voltage and/or Electrical Shock

Touching live wires causes death or serious injuries!

- Make sure that neither end of cable is connected to live power!
- Make sure that power source cannot be engaged while work is in process!
- Obey lock-out/tag-out procedures!
- Make sure to securely lock any power engaging equipment against unintentional engagement and tag with your name!

1.4.2 Prohibited Actions and Mandatory Actions

The signs define prohibitive actions. So, you **must not**!

Examples:



Do not touch!



Do not operate!

The signs point out actions to avoid a hazard. So, you **must**!

Examples:



Unplug!



Tag before work!

1.4.3 Informatory Signs



Requirement / Note / Remark

Indicates an action you must perform prior continuing or refers to information on a particular item.



Best Practice

Gives advice on the easiest and best way to proceed.



Material Damage

Points out information particular to potential damage of equipment.



Reference

Refers to particular information provided by other parties.

1.5 Trademarks and Brand Names

For easier legibility, registered brand names are listed below and will not be further tagged with their respective trademark. It must be understood that the brands (the below list is not necessarily concluding) are protected by copyright and/or other intellectual property rights even if their legal trademarks are omitted in the later course of this document.

| Brand Name | Trademark Owner |
|-----------------------------|---|
| CANopen® CiA® | © CiA CAN in Automation e.V, DE-Nuremberg |
| Micro-Fit™ Mini-Fit Jr.™ | © Molex, USA-Lisle, IL |

Table 1-2 Brand Names and Trademark Owners

1.6 Copyright

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2 Introduction

The present document provides you with information on the wiring details for each cable which will be used with the EPOS2 P 24/5 hardware. It contains pictures, drawings, cable specification, pin assignment and detailed connector information. The included «Cable Selector» will help you to choose the correct cable for the setup you are using.

Find the latest edition of the present document, as well as additional documentation and software to the EPOS2 P 24/5 Programmable Positioning Controller also on the Internet: → www.maxonmotor.com

2.1 Documentation Structure

The present document is part of a documentation set. Please find below an overview on the documentation hierarchy and the interrelationship of its individual parts:

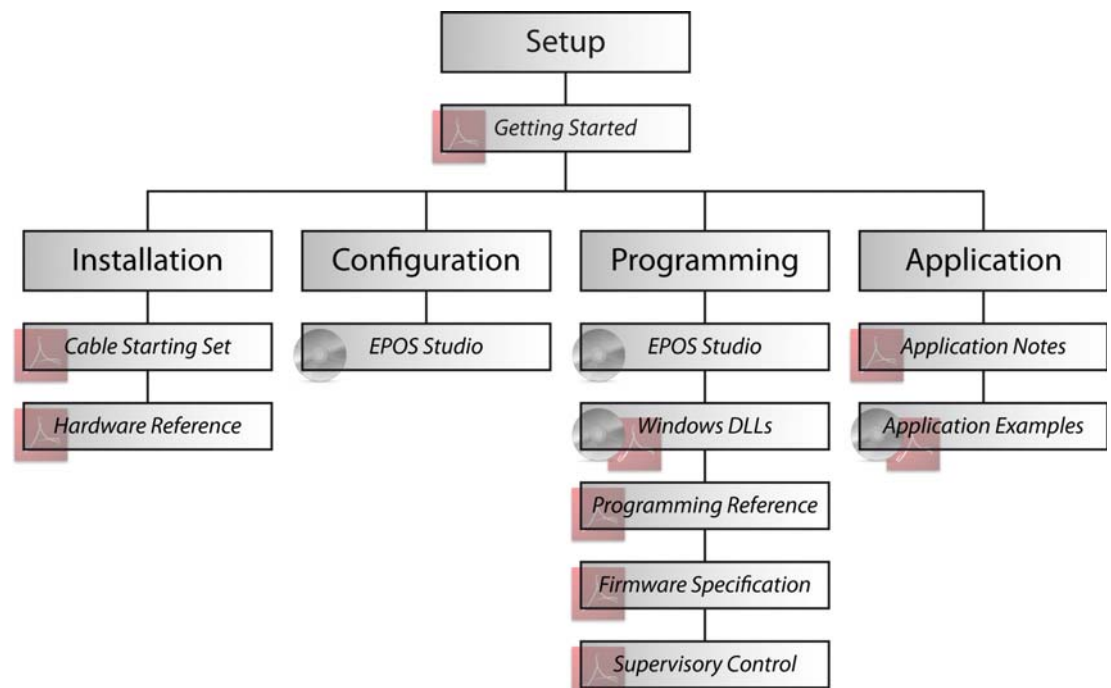


Figure 2-1 Documentation Structure

2.2 Safety Precautions

Prior continuing ...

- make sure you have read and understood chapter “PLEASE READ THIS FIRST” on page A-2,
- do not engage with any work unless you possess the stated skills (→ chapter “1.2 Target Audience” on page 1-4),
- refer to chapter “1.4 Symbols and Signs” on page 1-4 to understand the subsequently used indicators,
- you must observe any regulation applicable in the country and/or at the site of implementation with regard to health and safety/accident prevention and/or environmental protection,
- take note of the subsequently used indicators and follow them at all times.



DANGER

High Voltage and/or Electrical Shock

Touching live wires causes death or serious injuries!

- Consider any power cable as connected to life power, unless having proven the opposite!
- Make sure that neither end of cable is connected to life power!
- Make sure that power source cannot be engaged while work is in process!
- Obey lock-out/tag-out procedures!
- Make sure to securely lock any power engaging equipment against unintentional engagement and tag with your name!



Requirements

- Make sure that all associated devices and components are installed according to local regulations.
- Be aware that, by principle, an electronic apparatus can not be considered fail-safe. Therefore, you must make sure that any machine/apparatus has been fitted with independent monitoring and safety equipment. If the machine/apparatus should break down, if it is operated incorrectly, if the control unit breaks down or if the cables break or get disconnected, etc., the complete drive system must return – and be kept – in a safe operating mode.
- Be aware that you are not entitled to perform any repair on components supplied by maxon motor.



Electrostatic Sensitive Device (ESD)

- Make sure to wear working cloth in compliance with ESD.
- Handle device with extra care.

3 Cables

3.1 Important Notice: Prerequisites for Permission to commence Installation

The **EPOS2 P 24/5** is considered as partly completed machinery according to EU's directive 2006/42/EC, Article 2, Clause (g) and therefore **is only intended to be incorporated into or assembled with other machinery or other partly completed machinery or equipment.**



WARNING

Risk of Injury

Operating the device without the full compliance of the surrounding system with the EU directive 2006/42/EC may cause serious injuries!

- *Do not operate the device, unless you have made sure that the other machinery fulfills the requirements stated in EU's directive!*
- *Do not operate the device, unless the surrounding system fulfills all relevant health and safety aspects!*
- *Do not operate the device, unless all respective interfaces have been established and fulfill the stated requirements!*

3.2 Tools

If you should decide not to use the ready-made cable assemblies, we strongly recommend to employ the following hand tools.

| Tools | |
|---------|---------------------------------|
| Crimper | Molex hand crimper (63819-0000) |
| | Molex hand crimper (63819-0900) |

Table 3-3 Recommended Tools

3.3 Cable Selector

Use the following table to find the matching cables for the maxon motor variant and type of equipment you will be using:

| Cable | | | Motor | | | Communication | | |
|--|---------|-----------|---|---|---|---------------|-------|-----|
| Designation | Order # | Connector | DC motor with separated motor/encoder cable | DC motor with integrated motor/encoder ribbon cable | EC motor with separated motor/encoder cable | USB | RS232 | CAN |
| Power Cable | 275829 | J1 | X | X | X | | | |
| Motor Cable | 275851 | J2 | X | | X | | | |
| Hall Sensor Cable | 275878 | J3 | | | X | | | |
| Encoder Cable | 275934 | J4 | X | X | X | | | |
| Signal Cable 16core | 275932 | J5 | O | O | O | | | |
| RS232-COM Cable | 275900 | J6 | | | | | X | |
| USB Type A - mini B Cable | 370513 | J9 | | | | X | | |
| CAN-COM Cable | 275908 | J7 or J8 | | | | | | X |
| CAN-CAN Cable | 275926 | J7 or J8 | | | | | | O |
| CAN-Y Cable | 319471 | J7 or J8 | | | | | | O |
| Legend: X = use / O = optionally | | | | | | | | |

Table 3-4 Cable Selector

3.4 Cable Assemblies

3.4.1 Power Cable (275829) – Connector J1

Head A

Head B



Figure 3-2 Power Cable

| Technical Data | |
|---------------------|---|
| Cable cross-section | 2 x 0.75 mm ² |
| Length | 3 m |
| Head A | Molex Mini-Fit Jr. 2 poles (39-01-2020) Molex Mini-Fit Jr. female crimp terminals (44476-xxxx) |
| Head B | Cable end sleeves 0.75 mm ² |

Table 3-5 Power Cable – Technical Data

| Wire | Head A Pin | Head B Pin | Twisted Pair | Signal | Description |
|-------|------------|------------|--------------|------------------|------------------------------|
| black | 1 | - | – | Power_Gnd | Ground of supply voltage |
| black | 2 | + | – | +V _{CC} | Supply voltage +11...+24 VDC |

Table 3-6 Power Cable – Pin Assignment, J1

3.4.2 Motor Cable (275851) – Connector J2

Head A

Head B

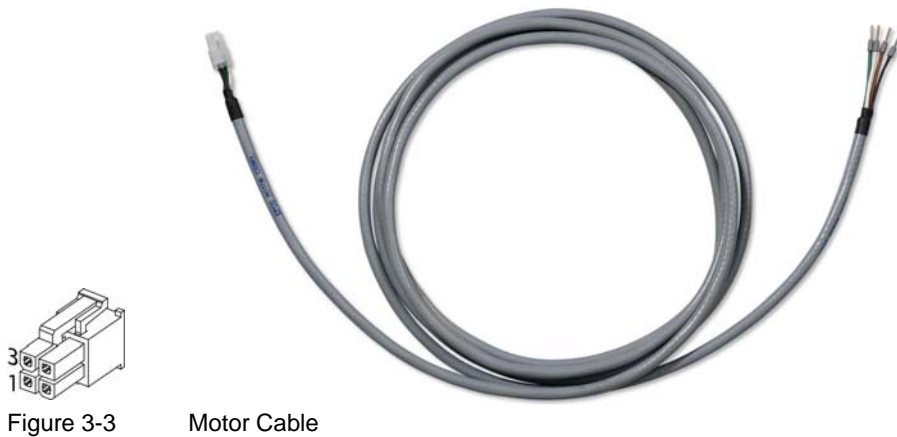


Figure 3-3 Motor Cable

| Technical Data | |
|---------------------|---|
| Cable cross-section | 3 x 0.75 mm ² shielded |
| Length | 3 m |
| Head A | Molex Mini-Fit Jr. 4 poles (39-01-2040) Molex Mini-Fit Jr. female crimp terminals (44476-xxxx) |
| Head B | Cable end sleeves 0.75 mm ² |

Table 3-7 Motor Cable – Technical Data

| Wire | Head A Pin | Head B Pin | Twisted Pair | Signal | Description |
|-------|------------|------------|--------------|----------------------|--|
| white | 1 | | – | Motor winding 1 (+M) | EC motor: Winding 1 DC motor: Motor + |
| brown | 2 | | – | Motor winding 2 (-M) | EC motor: Winding 2 DC motor: Motor - |
| green | 3 | | – | Motor winding 3 | EC motor: Winding 3 |
| black | 4 | | – | Motor shield | Cable shield |

Table 3-8 Motor Cable – Pin Assignment, J2



Note

For EMC-compliant installation, the cable shield should be connected to the motor housing.

3.4.3 Hall Sensor Cable (275878) – Connector J3

Head A

Head B



Figure 3-4 Hall Sensor Cable

| Technical Data | |
|---------------------|--|
| Cable cross-section | 5 x 0.14 mm ² shielded |
| Length | 3 m |
| Head A | Molex Micro-Fit 3.0 6 poles (430-25-0600) Molex Micro-Fit 3.0 female crimp terminals (43030-xxxx) |
| Head B | Cable end sleeves 0.14 mm ² |

Table 3-9 Hall Sensor Cable – Technical Data

| Wire | Head A Pin | Head B Pin | Twisted Pair | Signal | Description |
|--------|------------|------------|--------------|--------------------|--|
| green | 1 | | – | Hall sensor 1 | Hall sensor 1 Input |
| brown | 2 | | – | Hall sensor 2 | Hall sensor 2 Input |
| white | 3 | | – | Hall sensor 3 | Hall sensor 3 Input |
| yellow | 4 | | – | GND | Ground of Hall sensor supply |
| grey | 5 | | | +V _{Hall} | Hall sensor supply voltage +5 VDC / 30 mA |
| black | 6 | | | Hall shield | Cable shield |

Table 3-10 Hall Sensor Cable – Pin Assignment, J3



Note

For EMC-compliant installation, the cable shield should be connected to the motor housing.

3.4.4 Encoder Cable (275934) – Connector J4

Head A

Head B



Figure 3-5 Encoder Cable

| Technical Data | |
|---------------------|---|
| Cable cross-section | 10 x AWG28, round-jacket, twisted pair flat cable, pitch 1.27 mm |
| Length | 3.20 m |
| Head A | DIN 41651 female connector, pitch 2.54 mm, 10 poles, plug strain relief |
| Head B | DIN 41651 Plug, pitch 2.54 mm, 10 poles, plug strain relief |

Table 3-11 Encoder Cable – Technical Data

| Wire | Head A Pin | Head B Pin | Twisted Pair | Signal | Description |
|--|------------|------------|--------------|-----------------|------------------------|
| brown | 1 | 1 | 1 | Motor + | DC motor: Motor + *1) |
| white | 2 | 2 | | +5 VDC / 100 mA | Encoder supply voltage |
| red | 3 | 3 | 2 | GND | Ground |
| white | 4 | 4 | | Motor - | DC motor: Motor - *1) |
| orange | 5 | 5 | 3 | Channel A\ | Channel A complement |
| white | 6 | 6 | | Channel A | Channel A |
| yellow | 7 | 7 | 4 | Channel B\ | Channel B complement |
| white | 8 | 8 | | Channel B | Channel B |
| green | 9 | 9 | 5 | Channel I\ | Index complement |
| white | 10 | 10 | | Channel I | Index |
| Remark *1) only with maxon DC motors with digital MR encoder with Line Driver type S and M | | | | | |

Table 3-12 Encoder Cable – Pin Assignment, J4


Note

Encoder Cable head B. The pin out suits, for example:

- maxon digital MR Encoder type S, M, ML, L all with Line Driver
- maxon digital encoder HEDL 55_ with Line Driver RS 422

3.4.5 Signal Cable 16core (275932) – Connector J5

Head A

Head B



Figure 3-6 Signal Cable 16core

| Technical Data | |
|---------------------|---|
| Cable cross-section | 16 x 0.14 mm ² |
| Length | 3 m |
| Head A | Molex Micro-Fit 3.0 16 poles (430-25-1600) Molex Micro-Fit 3.0 female crimp terminals (43030-xxxx) |
| Head B | Cable end sleeves 0.14 mm ² |

Table 3-13 Signal Cable 16core – Technical Data

| Wire | Head A Pin | Head B Pin | Twisted Pair | Signal | Description |
|---|------------|------------|--------------|-------------------|--|
| white | 1 | | – | D_Gnd | Digital signal ground |
| brown | 2 | | – | D_Gnd | Digital signal ground |
| green | 3 | | – | DigIN6 | Digital Input 6 “Negative Limit Switch” |
| yellow | 4 | | – | DigIN5 | Digital Input 5 “Positive Limit Switch” |
| grey | 5 | | – | DigIN4 | Digital Input 4 “Home Switch” |
| pink | 6 | | – | DigIN3 | Digital Input 3 “General Purpose” |
| blue | 7 | | – | DigIN2 | Digital Input 2 “General Purpose” |
| red | 8 | | – | DigIN1 | Digital Input 1 “General Purpose” |
| black | 9 *1) | | – | +V _{out} | Auxiliary supply voltage output (+11...+24 VDC) |
| | 9 *2) | | | +V _C | Logic supply voltage input (+11...+24 VDC) |
| violet | 10 | | – | DigOUT4 | Digital Output 4 “Brake” |
| grey/ pink | 11 | | – | DigOUT3 | Digital Output 3 “General Purpose” |
| red/blue | 12 | | – | DigOUT2 | Digital Output 2 “General Purpose” |
| white/ green | 13 | | – | DigOUT1 | Digital Output 1 “General Purpose” |
| brown/ green | 14 | | – | A_Gnd | Analog signal ground |
| white/ yellow | 15 | | – | AnIN 2 | Analog Input 2 |
| yellow/ brown | 16 | | – | AnIN 1 | Analog Input 1 |
| Remarks: *1) jumper JP4 is set (initial setting) *2) if jumper JP4 is open, a separate logic supply voltage may be applied | | | | | |

Table 3-14 Signal Cable 16core – Pin Assignment, J5

3.4.6 RS232-COM Cable (275900) – Connector J6

Head A

Head B



Figure 3-7 RS232-COM Cable

| Technical Data | |
|---------------------|--|
| Cable cross-section | 2 x 2 x 0.14 mm ² , twisted pair, shielded |
| Length | 3 m |
| Head A | Molex Micro-Fit 3.0 6 poles (430-25-0600) Molex Micro-Fit 3.0 female crimp terminals (43030-xxxx) |
| Head B | Female D-Sub connector DIN 41652, 9 poles, with mounting screws |

Table 3-15 RS232-COM Cable – Technical Data

| Wire | Head A Pin | Head B Pin | Twisted Pair | Signal | Description |
|---|------------|------------|--------------|----------|---|
| yellow | 1 | 3 | 1 | EPOS RxD | EPOS RS232 receive |
| white | 2 | 2 | 2 | EPOS TxD | EPOS RS232 transmit |
| green | 4 | 5 | 1 | GND | RS232 ground |
| brown | 5 | 5 | 2 | GND | RS232 ground |
| black | 6 | – | – | Shield | Cable shield |
| – | – | Housing | – | Shield | Cable shield, soldered to connector housing |
| Remark pin assignment according to RS232 Standard | | | | | |

Table 3-16 RS232-COM Cable – Pin Assignment, J6

3.4.7 USB Type A - mini B Cable (370513) – Connector J9

Head A

Head B



Figure 3-8 USB Type A - mini B Cable

| Technical Data | |
|---------------------|---|
| Cable cross-section | 1 x 28 AWG non-twisted power pair / 1 x 28 AWG twisted data pair, aluminum-metallized polyester inner shield, 28 AWG stranded tinned copper drain wire, > 65%, tinned copper wire interwoven (braided) outer shield, PVC jacket |
| Length | 3 m |
| Head A | USB Type mini B, male |
| Head B | USB Type A, male |

Table 3-17 USB Type A - mini B Cable – Technical Data

| Wire | Head A Pin | Head B Pin | Twisted Pair | Signal | Description |
|--|------------|------------|--------------|--------------|---|
| red | 1 | 1 | – | V_{BUS} | USB BUS supply voltage input +5 VDC |
| white | 2 | 2 | 1 | D- | USB Data- |
| green | 3 | 3 | | D+ | USB Data+ |
| – | 4 | – | – | ID | not connected |
| black | 5 | 4 | – | GND | USB_Ground |
| Shell | Shield | Shield | – | Cable shield | Cable shield, soldered to connector housing |
| Remark: pin assignment according to USB 2.0 standard | | | | | |

Table 3-18 USB Type A - mini B Cable – Pin Assignment, J9

3.4.8 CAN-COM Cable (275908) – Connector J7 or J8

Head A

Head B



Figure 3-9

CAN-COM Cable

| Technical Data | |
|---------------------|--|
| Cable cross-section | 2 x 2 x 0.14 mm ² , twisted pair, shielded |
| Length | 3 m |
| Head A | Molex Micro-Fit 3.0 4 poles (430-25-0400) Molex Micro-Fit 3.0 female crimp terminals (43030-xxxx) |
| Head B | Female D-Sub connector DIN 41652, 9 poles, with mounting screws |

Table 3-19

CAN-COM Cable – Technical Data

| Wire | Head A Pin | Head B Pin | Twisted Pair | Signal | Description |
|--|------------|------------|--------------|------------|-------------------|
| yellow | 1 | 7 | 1 | CAN high | CAN high bus line |
| green | 2 | 2 | | CAN low | CAN low bus line |
| brown | 3 | 3 | – | CAN GND | CAN ground |
| black | 4 | 5 | – | CAN shield | Cable shield |
| Remark pin assignment according to CiA DS102 | | | | | |

Table 3-20

CAN-COM Cable – Pin Assignment, J7/8

3.4.9 CAN-CAN Cable (275926) – Connector J7 or J8

Head A

Head B



Figure 3-10 CAN-CAN Cable

| Technical Data | |
|---------------------|--|
| Cable cross-section | 2 x 2 x 0.14 mm ² , twisted pair, shielded |
| Length | 3 m |
| Head A / Head B | Molex Micro-Fit 3.0 4 poles (430-25-0400) Molex Micro-Fit 3.0 female crimp terminals (43030-xxxx) |

Table 3-21 CAN-CAN Cable – Technical Data

| Wire | Head A Pin | Head B Pin | Twisted Pair | Signal | Description |
|--------|------------|------------|--------------|------------|-------------------|
| yellow | 1 | 1 | 1 | CAN high | CAN high bus line |
| green | 2 | 2 | | CAN low | CAN low bus line |
| brown | 3 | 3 | – | CAN GND | CAN ground |
| black | 4 | 4 | – | CAN shield | Cable shield |

Table 3-22 CAN-CAN Cable – Pin Assignment, J7/8

3.4.10 CAN-Y Cable (319471) – Connector J7 or J8

Head A
Head B

Head C

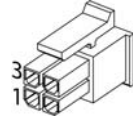
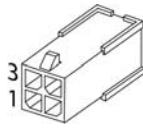


Figure 3-11 CAN-Y Cable

| Technical Data | |
|---------------------|--|
| Cable cross-section | 2 x 4 x 0.14 mm ² , single wires |
| Length | 0.05 m |
| Head A / Head B | Molex Micro-Fit 3.0 4 poles (430-25-0401) Molex Micro-Fit 3.0 male crimp terminals (43031-xxxx) |
| Head C | Molex Micro-Fit 3.0 4 poles (430-25-0400) Molex Micro-Fit 3.0 female crimp terminals (43030-xxxx) |

Table 3-23 CAN-Y Cable – Technical Data

| Wire | Head A Pin | Head B Pin | Head C Pin | Twisted Pair | Signal | Description |
|--------|------------|------------|------------|--------------|------------|-------------------|
| yellow | 2 | 2 | 1 | – | CAN high | CAN high bus line |
| green | 1 | 1 | 2 | – | CAN low | CAN low bus line |
| brown | 4 | 4 | 3 | – | CAN GND | CAN ground |
| black | 3 | 3 | 4 | – | CAN shield | Cable shield |

Table 3-24 CAN-Y Cable – Pin Assignment, J7/8



Note

The CAN-Y Cable fits the other CAN cables.

3.5 EPOS2 24/5 Connector Set (384915)

If you decide not to use the ready-made cable assemblies, you can take advantage of a prepackaged set containing all required connectors. The set contains following items:

| Connector | Specification | Quantity |
|-----------|--|----------|
| J1 | Molex Mini-Fit Jr. 2 poles (39-01-2020) | 1 |
| J2 | Molex Mini-Fit Jr. 4 poles (39-01-2040) | 1 |
| J3 / J6 | Molex Micro-Fit 3.0 6 poles (430-25-0600) | 2 |
| J5 | Molex Micro-Fit 3.0 16 poles (430-25-1600) | 1 |
| J7 / J8 | Molex Micro-Fit 3.0 4 poles (430-25-0400) | 2 |
| | Molex Mini-Fit Jr. female crimp terminal (44476-1111) | 8 |
| | Molex Micro-Fit 3.0 female crimp terminal (43030-0010) | 38 |
| | Tyco C42334-A421-C42 (right), encoder clip right | 1 |
| | Tyco C42334-A421-C52 (left), encoder clip left | 1 |

Table 3-25 EPOS2 24/5 Connector Set – Content



Best Practice

For best results use original manufacturer's tools (➔chapter "3.2 Tools" on page 3-9).

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