

podis[®] system manual

Part 1: **podis[®]** CON - Energy bus

Part 2: **podis[®]** DRIVE – Distributed motor control units

Ref. no: 00.000.0059.0
Version: 1.03
Issue date: 08.01.2001
Last modified: 28.03.2001

I About this manual

Who is the manual intended for? This system manual is directed at qualified staff with training in PLC programming, electrical engineers or staff instructed by electrical engineers who are authorised to commission, earth and label devices, systems and circuits according to safety standards.

What is the scope of the manual? This system manual describes the components, installation, commissioning and maintenance of the **podis®** system. The total system is composed of the energy bus **podis® CON** and the motor control units **podis® DRIVE**. As an energy bus system, **podis® CON** is an independent system which supplies all types of installations with both primary and control voltage.

The motor control units **podis® DRIVE** require the use of **podis® CON** components. They are specially geared to the properties of **podis® CON** components and enable the control of connected loads via the field bus coupler which is integrated in the motor control units.

The two parts of the **podis®** system are described separately in this manual. If you have purchased **podis® CON** components, you will receive the first section of the manual. You require both sections of the manual to operate **podis® DRIVE**.

User-friendly At WIELAND ELECTRIC GmbH, your satisfaction with our products is of primary importance. If you have any ideas or suggested improvements for this manual, we would be happy to receive them.

Contact address If you have any queries about the manual or parts of the **podis®** system, please direct your questions to the following address:

Wieland Electric GmbH
Brennerstraße 10-14
96052 Bamberg
Tel.: 0951 9324 0
Fax : 0951 9324 198
Email: info@wieland-electric.com

Hotline If you have any technical queries, please contact our **hotline** on **0951 9324 358**.

II Using this manual

Before reading the manual, please familiarise yourself with the table of contents. This will provide you with an immediate overview of the manual.

Please note the warnings and safety notes in particular. These are denoted by the following symbols.


DANGER Means that death, serious risk to health or considerable damage to property will occur if the appropriate warning is disregarded or not sufficiently heeded.


WARNING Means that risk to health or considerable damage to property will occur if the appropriate warning is disregarded or not sufficiently heeded.


CARE Means that damage to property will occur if the appropriate warning is disregarded or not sufficiently heeded.


CAUTION Means that death, risk to health or damage to property *may* occur if the appropriate warning is disregarded or not sufficiently heeded.

i
NOTE Emphasises an important piece of information which affects the handling of the devices or the respective section of the manual.

Part 1:
podis® CON – Energy bus

Proofing status of **podis®** system manual, part 1

Date	Publication	Version	Proofing status	Proofing status (old)	Edited (new)
08.01.2001	podis manual part 1	1 (draft)	00	-	TK
18.01.2001	podis manual part 1	1 (draft)	01	00	TK
12.03.2001	podis manual part 1	1 (draft)	02	01	TK
28.03.2001	podis manual part 1	1	03	02	TK

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Part 2: ***podis*® DRIVE** motor control units

1 Structure and use of the energy bus system

This chapter describes the general structure of the **podis**® system. It includes the electrical configuration of **podis**® and the factors that must be considered when designing a **podis**® installation. You can find an overview of the system components and their technical data in the appendix under "**podis**® components" and "Technical data".

1.1 General structure

The **podis**® system has a distributed configuration. This applies to the distribution of energy, automation and the inputs/outputs. The basic framework of **podis**® is composed of a flexible flat cable. It contains five high-capacity cores ($\varnothing 2.5 \text{ mm}^2$) as the main circuit and two cores for the 24 V control electronics. Energy can be supplied and drawn via supply terminals at any point on the flat cable (three-phase asynchronous motors). This system also enables the installation to be retrofitted according to the user's requirements.

Since the energy and the control voltage are drawn at the point of the flat cable which is nearest to the load, the electromagnetic susceptibility of the installation and the applications is considerably reduced. The complete installation thus has a clearer overview for both planning and maintenance.

Distributed configuration

Programmable controllers

PLC
RC
NC
IPC

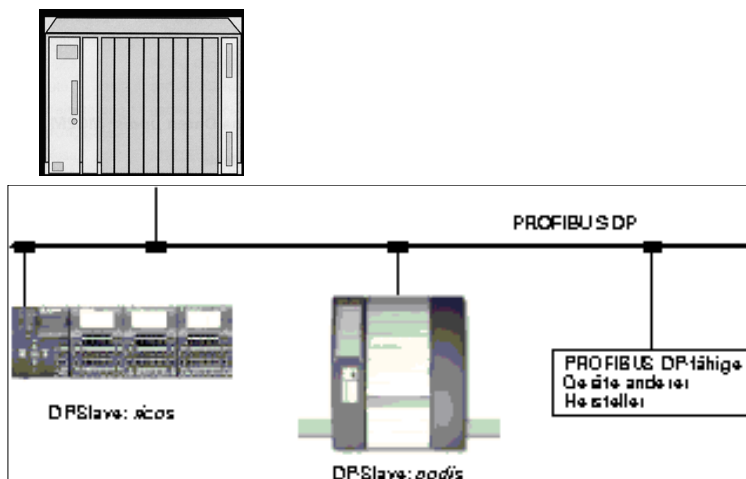
PROFIBUS DP

Devices from other manufacturers with PROFIBUS DP capability

DP slave: **ricos**

DP slave: **podis**

The general field bus configuration of the **podis**® CON system with connected loads



1.2 Areas of application

Intended use

The **podis**[®] system can be used in all installations where three-phase asynchronous motors must be supplied with energy and control voltage e.g. for conveyor belts. A prerequisite for the operation of **podis**[®] **CON** is the availability of a three-phase system with an earthed infeed and separate N and PE conductor (TN-S system).

1.3 Performance data for flat cable

podis® CON is connected to an earthed infeed.

General data	
Rated voltage	VDE 450/750 V AC UL 600 V AC
Nominal frequency	50 Hz
Rated current (at 50°C)	16 A
Rated voltage of auxiliary circuit (L+)	50 V DC
Sheath	PVC according to CENELEC HD 21.1 S3, TM5, oil-resistant, LBS-free, silicone-free
Dimensions mm (H x W)	35 x 6.1 with single-sided coding lug
Cu number (kg/km)	168
Cable weight (kg/km)	402
Ambient temperature (operating)	-15°C to +50°C
Connection temperature (piercing contact)	+10°C to +50°C
Behaviour in the event of a fire	Self-extinguishing according to DIN VDE 0472 section 804 B, IEC 60332-1
Approval (in preparation)	VDE, SEV and UL
Main circuit (colour coding: yellow/green, blue, brown, black)	
Fuse	16 A with tripping characteristic C
Number of cores x cross section	5 x 2.5 mm ² based on HD 359 and DIN VDE 0281 section 404
Conductor	Bare copper, highly flexible according to DIN VDE 0295 class 6, corresponds to CENELEC HD 383 S2 class 6
Conductor insulation	PVC according to CENELEC HD 21.1 S3, TI2, silicone-free
Auxiliary circuit (colour coding: red, white)	
Fuse	16 A with tripping characteristic C
Number of cores x cross section	2 x 2.5 mm ² based on HD 359 and DIN VDE 0281 section 404
Conductor	Bare copper, highly flexible according to DIN VDE 0295 class 6, corresponds to CENELEC HD 383 S2 class 6
Conductor insulation	PVC according to CENELEC HD 21.1 S3, TI2

Specification of the flat cable

Cross section with colour coding

0V		Weiß
+24V		Rot
PE		Gelb-grün
N		Blau
L3		Schwarz
L2		Braun
L1		Schwarz

M	White
L+	Red
PE	Yellow/green
N	Blue
L3	Black
L2	Brown
L1	Black

1.4 Permitted use

podis® CON may only be operated in networks with an earthed infeed (TN-S system). A non-earthed configuration of **podis®** systems is not permitted.

The sheath of the flat cable should not show any signs of damage. Any holes left by the piercing contact should be sealed. An approved sealing strip (Scotch VM from 3M) may be used for this purpose.



WARNING

It is not permitted to operate **podis® CON with open flat cable outlets.**

The flat cable must be de-energized at the relevant outlets during installation and maintenance.

During operation, unused flat cable outlets should either be sealed using a cover (order no. 07.409.7256.0 for connectors) or using a cover and a dummy screwed gland at the round cable outlet.

When laying the flat cable in cable trunking, you must take the derating into consideration according to VDE 0660 section 507 as well as the ambient temperature of 50°C.

1.5 Additional devices

This section describes devices which can or must be operated in connection with **podis® CON** but which are not part of the **podis® CON** system.

1.5.1 Monitoring and protective devices

Depending on the application, various components and protective measures are stipulated for the installation of a complete system. The type of components and the level of protective measures required is dependent on the VDE regulations that apply to your installation. Please also read section 1.8.

Fuse

The allocation of protective equipment for the short-circuit protection of cables and lines in main or auxiliary circuits outside switchgear assembly must be carried out under consideration of the loop impedance. DIN VDE 0100 section 430 should be applied.

Tripping characteristic C for 100/400 V supply

The 2.5 mm² flat cable must be fused to prevent overload and short circuits using a three-phase miniature circuit-breaker 16 A (I_{nom}) with tripping characteristic C. The tripping current is 8 to 10 I_{nom} (EN 60898, DIN VDE 0641 section 11 and IEC 898).

Tripping characteristic C for auxiliary circuit

You must fuse the auxiliary circuit with a single-phase miniature circuit-breaker 16 A (I_{nom}) with tripping characteristic C.

Emergency stop devices

Emergency stop devices (according to IEC 204, corresponds to DIN VDE 113) must be present. Their function may not be limited in any way.

Earthing

The infeed must be earthed (TN-S system). The installation in which **podis®** systems are integrated should have a connection to protective earth (neutral point of the network transformer). If this is not the case, you must link each of the loads connected to **podis® CON** separately to the neutral point of the network transformer via a PE conductor. The minimum diameter of the PE conductor must be 4 mm². The PE conductor may not be looped through via the loads.

Effective lightning protection measures must be provided in the installation to prevent damage to electronic devices.

Electrical separation

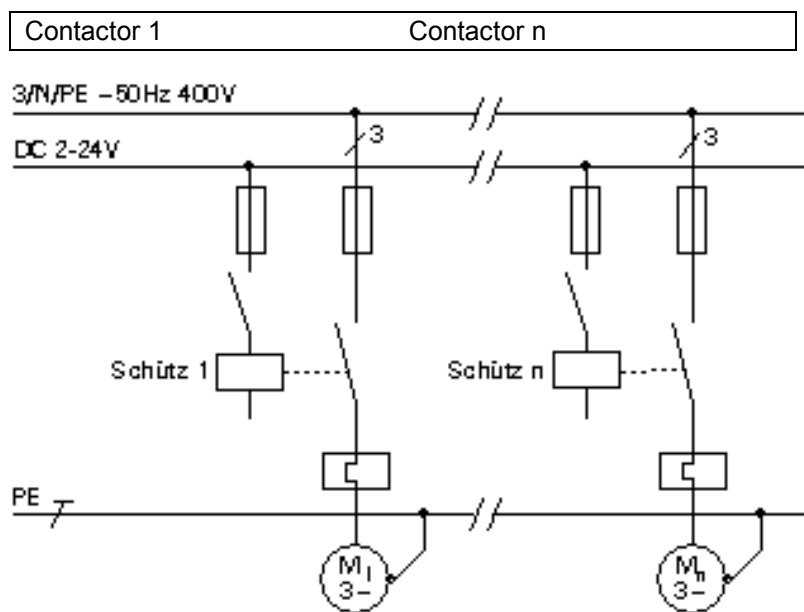
Safety separation between main and auxiliary circuits is required for the motor starters.

The main and auxiliary circuits in the **podis®** system are designed to be electrically isolated. When connecting motor contactor combinations from third parties, ensure that they are electrically separated (min. isolation voltage 2.5 k V AC).

1.5.2 Loads (three-phase asynchronous motors)

In principle, all three-phase asynchronous motors can be used as loads. Please read section 2.4 when designing the system (number of loads, power consumption etc.).

Wieland supplies **podis® DRIVE** motor control units which are specially tailored to **podis® CON**. Further information about **podis® DRIVE** can be found in part 2 of the manual.



Example of motor contactor connections

1.6 Flat cable outlet

Current supplied via flat cable outlets

The flat cable is supplied with primary and auxiliary voltage via flat cable outlets. A branch circuit for loads can also be created via these outlets.



Current may only be supplied via the flat cable outlets for round cables.

Piercing contact

The flat cable outlets make contact at any point on the flat cable without needing to remove the sheath or strip the insulation from the cable. The current transfer from the flat cable to the outlet is produced by piercing contacts. These are special screws (contact screws) which penetrate the sheath once the cable outlet has been installed and are pushed forwards until the core is reached.

The energy supply for the connected loads must likewise be carried out via the flat cable outlets provided.

Specifications

	Variants	
	For round cable	For connectors
		
Corresponds to	IEC 999	VDE 0600 T1535
Piercing contact according to	IEC 998-3	
Mechanical endurance	Vibration test IEC 68 section 2-6	
Types of round cable	Impulse voltage test IEC 68 section 2-27	
	Oil-resistant, mechanical endurance similar to H05W5-F, alternatively halogen-free	
Type of protection	IP 65	
Rated voltage	5 x 480/277 V AC, 2 x 50 V DC	
Rated current	16 A	
Operating temperature	0 - 50°C	
Installation temperature (for piercing contact)	+10 ...+50°C	
Relative humidity	Stress level 2 (IEC 1131-2)	
Degree of pollution	II (for surface)	
Screwed gland	Metric M25x1.5	
	For conductor cross sections 9-16 mm and 13-18 mm	
Opening in terminal compartment	Test with gauge plug according to IEC 947-1, insulated wire ends	
Nominal cross section	2.5 mm ²	
Mounting position	As required	
Approvals (in preparation)	UL, CSA, VDE, SEV	

There are two variants of **podis® CON** flat cable outlets:

- for round cables (with screw connection)
- for connectors

The terminal assignment/polarity can be found in section 2.3.
The notes regarding sealing in section 1.4 should also be taken into account.

1.7 Sealing ends

The sealing ends (order no. 05.562.7450.0) are used for the reliable termination and sealing of open cable ends according to IP 65.



WARNING

Due to the required creepage distances and clearances, *podis®* flat cables must always be terminated at both ends with sealing ends.

2 Fixing and exchange

2.1 Wiring instructions

Installation	
Bend radius	> 100 m
Processing temperature	+10°C ... +50°C
Type of installation	Cable trunking, rack, with cable clip (see section "Cable clips")
Fuse	
380 V supply	3-phase miniature circuit-breaker 16 A, tripping characteristic C
24 V supply	3-phase miniature circuit-breaker 16 A, tripping characteristic C

Data for the installation of flat cable

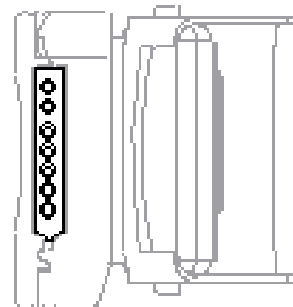


CAUTION

The flat cable is not suitable for retraction.

The flat cable is protected against polarity reversal using coding. One edge of the flat cable is wedge-shaped. The cable locator in all **podis**® components (flat cable outlets, motor starter) is shaped accordingly. You must insert the flat cable so that the wedge-shaped side lies opposite the hinge of the opened cable locator.

Flat cable with coding

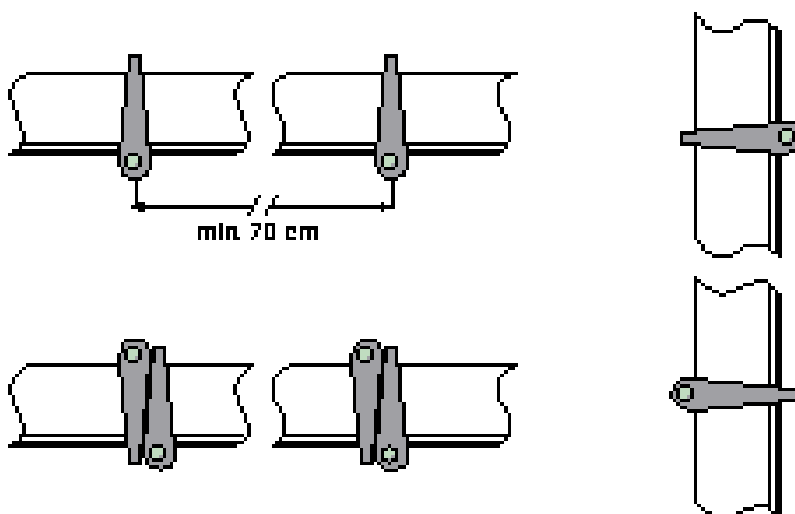


2.2 Cable clips

The cable clips are attached to fixed sub-floors with a screwed connection. The flat cable is suspended in the mounted cable clips (see sketch below, variant A).

If you wish to prevent the flat cable from being removed, you should install two cable clips right next to each other so that they are attached to opposite sides of the flat cable (see sketch, variant B).

Securing against removal



Vertical installation

This type of fixing can also be selected when the flat cable is laid vertically. In this case, it is however also sufficient to attach the cable via staggered cable clips with a two-way end stop.

2.3 Flat cable outlets

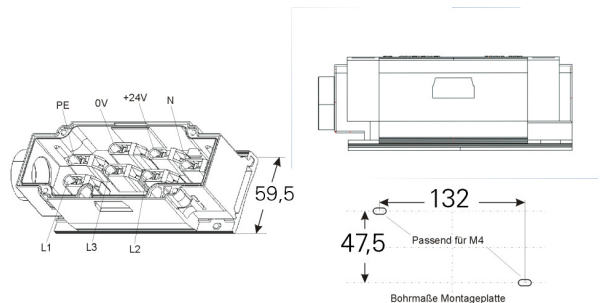


DANGER

It is not permitted to carry out any mounting or dismantling procedures when the flat cable is live.

2.3.1 Round cable outlet

Please also note the specification of the flat cable outlet in section 1.7.

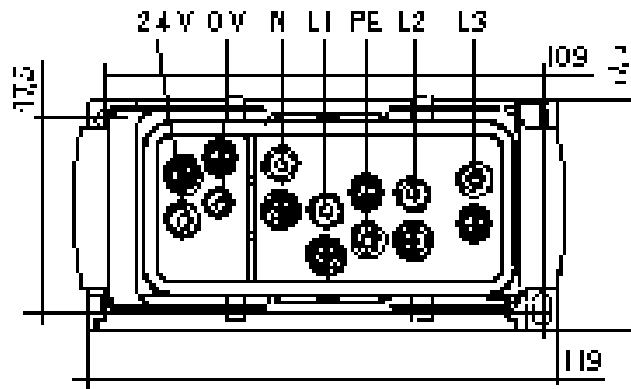


Dimensions and polarity

Dimensions and polarity

2.3.2 Outlet for connectors

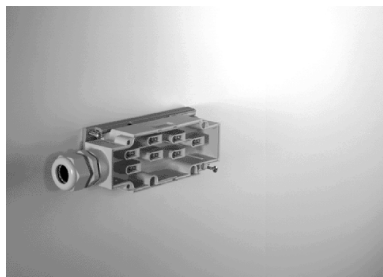
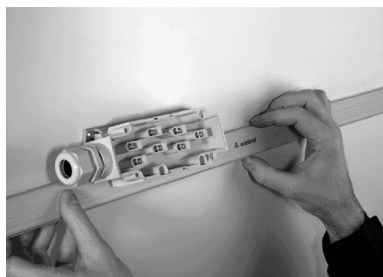
Please also note the specification of the flat cable outlet in section 1.7.



2.3.3 Attachment and connection

The attachment is demonstrated using the flat cable outlet for round cables. The installation of the outlet for connectors is carried out in the same way.

- 1 Screw the module in position on the sub-floor using suitable screws. Only use the slots provided.
- 2 Open up the top and insert the flat cable.



- 3 Close the top again and screw shut. The top is thus sealed in accordance with IP 65.
- 4 Turn the contact screws. The conductors of the flat cable are thus bonded.



WARNING

The contact screws must be turned until they reach the stop.



CARE

The maximum tightening torque may not exceed 1 Nm.



NOTE

We recommend the use of a torque screwdriver. Note the permitted torque.

You have now completed the installation of the flat cable outlet for connectors. You only need to attach the integrally moulded plug or a cover and secure in position with the clips.



WARNING

The plug may never be inserted or removed under load.

- 5 You can now connect the cables for the flat cable outlet for round cables. The connection is carried out via screw terminals. In accordance with VDE 0611, all types of conductors (finely stranded, stranded or single-core) can be connected.



NOTE

If you are using finely stranded conductors, we recommend the attachment of connector sleeves.

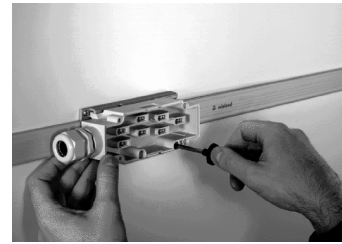
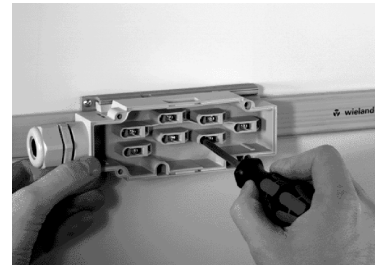
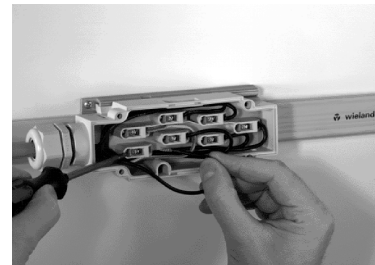
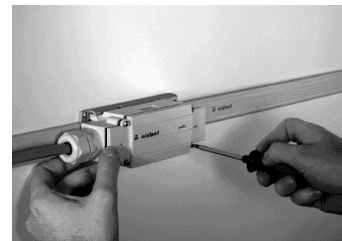
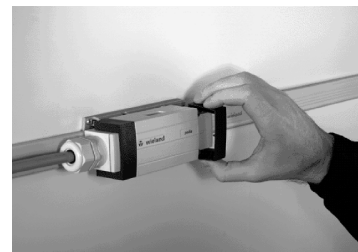
- 6 Screw down the cap plug.



CARE

If you are not connecting a round cable, you must seal the round cable outlet for operation with a blanking plug.

- 7 You can then clip on the trimming strip to cover the screws.



i
NOTE If a contact screw arcs, you must replace the flat cable outlet with a new one and reinstall it at least 200 mm away from the original position. Seal the damaged section of the flat cable with an approved sealing strip (Scotch VM from 3M).

2.3.4 Dismantling

To dismantle the outlets, carry out the same procedure as described under section 2.2.2 but in the reverse order. The appropriate safety instructions should be taken into account.

Note in particular that work cannot be carried out with live voltage.

2.4 Loads

The basic conditions for the number of motors that can be connected to a flat cable for operation are the current carrying capacity of 16 A (at 50°C) of the flat cable as well as characteristic C of the characteristic curve for the fuse. With the help of these parameters, you can determine the permitted start-up configuration and operating methods.

i
NOTE This also applies to the connection of **podis®** motor control units. Further information can be found in part 2 of this manual.

When connecting third party devices, you should note all the instructions in their respective device descriptions.

The loads should be earthed. The earthed cable may not be looped through to other loads on the same circuit.

2.5 Sealing ends

If the flat cable has been laid, all the free cable ends must be reliably terminated and sealed in accordance with IP 65. The sealing ends can be used for this. They consist of a shorter lower section and a longer upper section which contains the seal and the insulation ducts. Both the following diagrams indicate the termination of the flat cable.

1 Cut the cable to the required length.



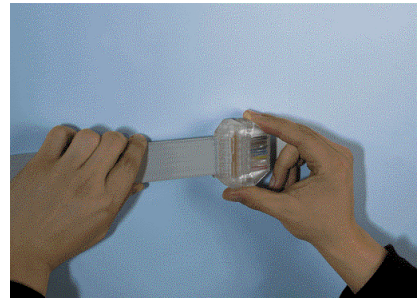
2 Remove approx. 19 mm of the sheath from the flat cable.

i
NOTE We recommend the Wieland flat cable stripper for removing the sheath (further information can be found in the appendix under "Components"). It has an end stop that has been specially designed for Wieland flat cable and enables the process to be carried out cleanly.



i
NOTE If you do not wish to remove the sheath using the Wieland flat cable stripper, you must ensure that the insulation of the individual conductors is not damaged.

3 Slide the lower (shorter) section of the sealing end onto the prepared flat cable. Push the individual conductors until they reach the stop in the insulation ducts of the sealing end. Finally, screw the top and base together. The flat cable is thus sealed according to IP 65.



3 Commissioning and maintenance

3.1 Safety notes and measures

3.1.1 Staff selection and qualification



WARNING

All project design, programming, installation, commissioning, operational and maintenance tasks connected with the automation system should only be carried out by trained personnel (e.g. electrical engineers).

The project design and programming staff must be familiar with the safety concepts of automation technology.

The operational staff must be instructed in the control system and know the operating instructions.

The installation, commissioning and maintenance staff must have the necessary training to access the automation system.

Use of specialist staff is required

3.1.2 Conditions for operation

The energy bus systems have been designed according to the latest technology and the recognised safety regulations. However, risk of death or personal injury to the user or a third party or damage to machines, installations or other property may occur during usage.

The implementation of the energy bus systems must be technically correct according to the stipulated conditions. The operating instructions must be followed with awareness of the safety issues and risk factors. The correct and safe operation of the control system requires proper transport, storage and installation as well as careful operation and maintenance. Any faults that can interfere with safety must be rectified immediately.

Prerequisites for proper use

The energy bus systems are only intended for the supply of control systems, machines and installations. If they are used for any other purpose, they do not meet the specified conditions. In this case, the manufacturer is not liable for any resulting damages.

In order to use the energy bus system as stipulated, please observe the instructions regarding the mechanical and electrical configuration, commissioning and operation as described in this manual.

3.1.3 General notes

If the systems form part of the electrical equipment of a machine, they must be included by the machine manufacturer in the procedure to assess conformity. The norm DIN EN 60204-1 should be observed (machine safety, general requirements for the electrical equipment of machines).

Possible risks

If the energy bus systems themselves are used and maintained correctly, there is normally no risk as regards property or health. Danger may arise however if actuators such as motors, hydraulic mechanisms etc. are connected; if the project design, installation, maintenance and operation of the complete installation or the machine is not carried out properly; if the instructions in this manual are not observed and if personnel without sufficient training operate the system.

3.1.4 Specific notes

During the project design, installation and commissioning of energy bus systems in connection with the supply of machines and their controllers, the safety conditions stipulated in the machine guideline 89/392/EEC must be observed by the manufacturer and user of the machine. In specific cases, national accident regulations apply such as VBG 4.0.

The relevant safety and accident regulations that apply to the respective application e.g. machine protection guidelines must be taken into account.

All safety-related devices of the controlled machine should be designed so that they can function independently of the control system. Emergency stop devices must remain effective according to IEC 204 (corresponds to DIN VDE 113) in all operating modes of the system. In an emergency, the supply voltage of all the controlled switching elements must be disconnected.

Uncontrolled and undefined initialisation processes such as:

- start-up after deactivation of the emergency stop device
- start-up of the control system without the DP slave being addressed by the DP master

may not occur.

In fixed installations or systems without an all-pole mains isolating switch, an isolating switch or a back-up fuse must be present in the building installation.

Mains isolating switch

The set nominal voltage range must correspond to the local mains voltage in the case of load power supply and power supply modules.

As regards the 24 V supply, you should ensure that

- lightning protection measures are provided
- the 24 V extra-low voltage has been electrically isolated.

3.1.5 Disconnection and emergency stop

An emergency stop should be enforced if hazardous operating conditions occur, in particular

- during start-up after a voltage dip or failure
- during start-up of control systems after disruption of the bus communication.

3.1.6 Maintenance and service

If measuring or testing procedures are required on the active device, the definitions and instructions for implementation of the accident prevention regulation VBG 4.0 should be observed. A suitable electronic tool should be used.

Before opening a device, the connection to the power supply system should always be isolated (withdraw the mains plug or open the isolating switch).

When replacing fuses, only the types that are specified in the technical data may be used.

Appendix

podis® CON components

Flat cables 2.5 mm² and accessories (VDE, SEV, UL, CSA in preparation)		
	<i>Order no.</i>	<i>Box quantity</i>
Flat cable PVC 7Gx2.5 mm ² , AC 500 V, 16 A at 50°C, light grey sheath RAL 7035, profile section, overall dimensions approx. 35 x 6 mm, weight approx. 1.3 kg/m, resistant to oil and acids, extra finely stranded	00.705.0503.3	Cut to length on customer request
Sealing end Terminating end for flat cable 00.705.0503.3, for locating the individual conductors, AC 500 V, 50°C	05.562.7453.0	10
Cable clip, plastic hook Grey RAL 7035, for wall-mounted assembly of 00.705.0503.3	05.562.3000.0	100
Sheath stripping tool Manual tool for removing the sheath at the end of the cable, for flat cable 00.705.0503.3	95.350.0300.0	1
Cable cutters Manual tool for cutting flat cables 00.705.0503.3 to length	95.300.0300.0	1
Outgoing units and accessories (VDE, SEV, UL, CSA in preparation)		
	<i>Order no.</i>	<i>Box quantity</i>
Flat cable outlet for round cable (screw connection) AC 500 V, 16 A at 50°C, 7 pole outlet box for round cables, flat cable contact with pointed screws M3 (tightening torque 0.8-1 Nm), for wire ranges 1.5-2.5 mm ² at screw terminals with Philips bi-directional screws Gr1 (tightening torque 0.5-0.7 Nm); for screwed gland M25 x 1.5	75.016.0053.2	5
Flat cable outlet (plug-in) AC 500 V, 16 A at 50°C, connector (socket, 7 pole) for wall-mounted installation or insertion in devices, for insulated flat cable 7 x 2.5 mm ² , flat cable contact with pointed screws M3 (tightening torque 0.8-1 Nm) including 2 interlocking clips and 1 cover for screws	75.015.5053.0	5
Cover Protective cover for 75.015.5053.0, lockable	07.409.7256.0	10
Integral plug for round cables AC 500 V, 16 A at 50°C connector (male connector, 7 pole), suitable for 75.015.5053.0, for wire ranges 1.5-2.5 mm ² , at screw terminals with slotted screws (tightening torque 0.5-0.7 Nm), for screwed gland M25 x 1.5	75.015.0053.2	5
Accessories for cable connections		
	<i>Order no.</i>	<i>Box quantity</i>
Screwed gland M25 x 1.5 Suitable for 75.016.0053.2 and 75.016.0053.2, for one cable with overall dimensions 9-16 mm	Z5.507.1453.0	10
Screwed gland M25 x 1.5 Suitable for 75.016.0053.2 and 75.016.0053.2, for one cable with overall dimensions 13-18 mm	Z5.507.14553.0	10

Part 2:
podis® DRIVE - Motor control units

Domain of **podis®** system manual, part 2

Item	Description	Hardware (version)	Firmware (version)
83.104.0010.0	Base plate MC2M	1.0	-
83.104.0010.0	Base plate MRC	1.0	-
83.104.0010.0	Base plate MFI	1.0	-
83.104.0020.0	Motor starter MC2M	1.2	1.1
83.104.0020.0	Motor starter MRC	1.2	1.1
83.104.0020.0	Motor starter MFI	1.2	1.2
83.104.0430.0	DP bus coupler	1.1	1.0
83.104.0130.0	Extension bus coupler	1.1	1.0

Proofing status of **podis®** system manual, part 2

Date	Publication	Version	Proofing status	Proofing status (old)	Edited (new)
08.01.2001	podis manual part 2	1 (draft)	00	-	TK
18.01.2001	podis manual part 2	1 (draft)	01	00	TK
12.03.2001	podis manual part 2	1 (draft)	02	01	TK
28.03.2001	podis manual part 2	1	03	02	TK

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Appendix: *podis*® DRIVE components

4 Structure and use of the motor control units

4.1 Areas of application

The **podis**[®] motor control units switch and protect three-phase asynchronous motors with a maximum capacity of 1.1 kW (frequency inverter up to 0.75 kW). The distributed control is carried out via integrated PROFIBUS couplers.

The motor control units are available in the following versions:

- 1) MC2M (Motor Contactors for 2 Motors) for switching 2 x three-phase asynchronous motors separately with one direction of travel.
- 2) MRC (Motor Reverse Contactor) for clockwise and anti-clockwise rotation of the motors.
- 3) MFI (Motor Frequency Inverter) with frequency inverter for operation of three-phase asynchronous motors with variable speed.

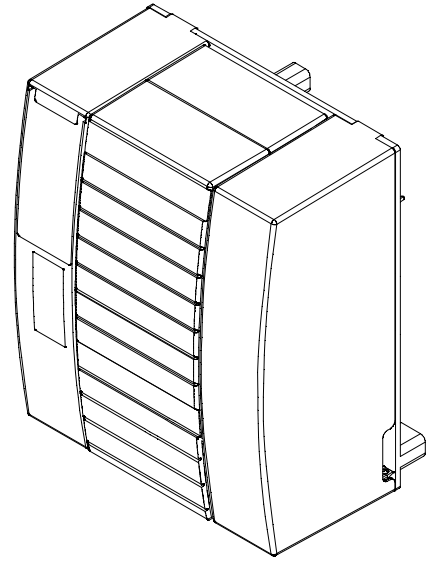
The motor control units consist of the following components:

- 1) Base plate
- 2) Motor starter and
- 3) Bus coupler.

All motor control units also have 8 digital channels and a connection option for the bus system.

Sockets for rapid connection are available for the motor feeders. The power electronics (motor starter) as well as the bus interface electronics (bus coupler) can likewise be plugged in.

The setting of the motor parameters is described in section 6.6 "Parameterisation".

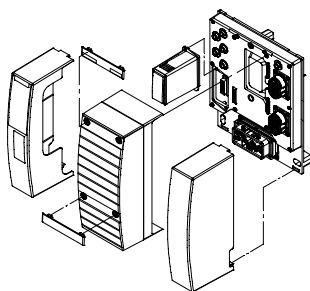


4.2 Performance data

The following sections contain general data and characteristics for the motor control units.

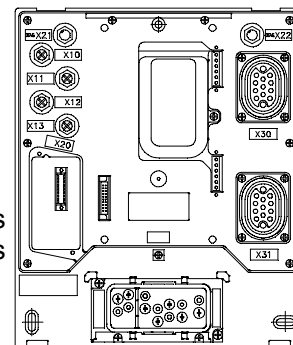
4.2.1 Motor control unit *podis*® MC2M

The type MC2M enables the simultaneous operation of two asynchronous motors. An integrated motor contactor is available for each motor. The motors are protected against short circuits by an overload monitoring function. The motor starter itself is protected by internal fuses that cannot be replaced.

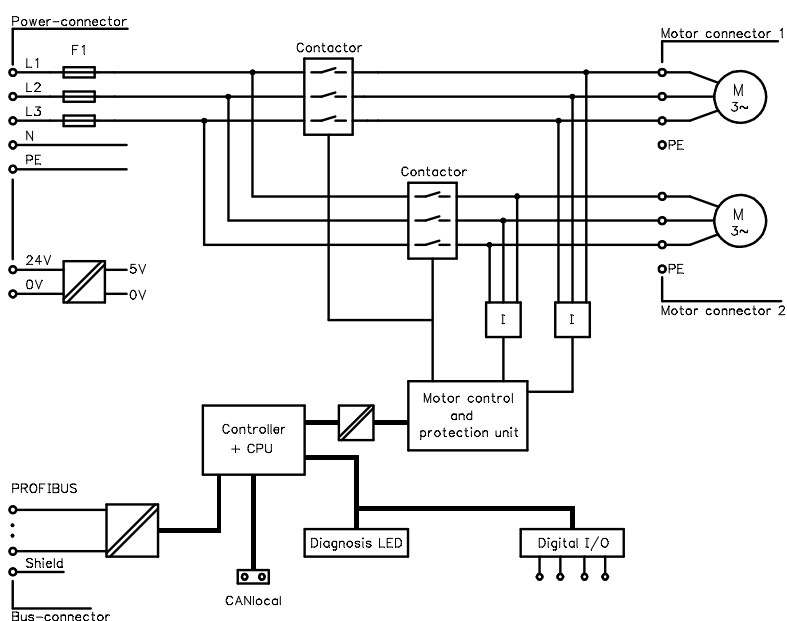


Designation of the terminals

- X10 Digital input/output
- X11 Digital input/output
- X12 Digital inputs
- X13 Digital inputs
- X20 Bus coupler
- X21 Diagnostic and extension bus
- X22 Diagnostic and extension bus
- X30 Motor feeder socket M1
- X31 Motor feeder socket M2



Circuit diagram Motor control unit MC2M

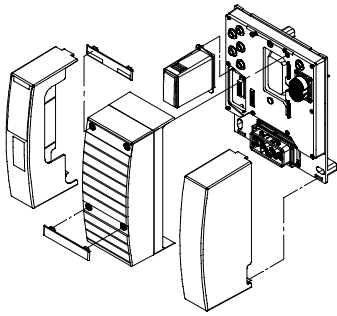


Motor Contactor, 2 Motors MC2M

Supply load	
Rated operating voltage	400 V 3~AC $\pm 10\%$
Rated operating current I_c (50°C)	4.5 A
Switching capacity AC~3	3.3 A per motor
System frequency of input	47 ... 63 Hz
Supply electronics	
Input voltage	24 V DC $\pm 20\%$
Residual ripple	max. 5%
Input current	< 2 A
Nominal consumption	approx. 5 W + max. 12 W per digital output (max. 24 W)
Motor feeder connector	
Nominal capacity per motor	max. 1100 W
Total nominal capacity	1.5 kW
Rated load voltage (phase voltage)	400 V 3~AC
Input current	max. 4.5 A
Residual current (M1 + M2)	max. 4.5 A
Overload protection	Current monitoring
Field bus connection	
Field bus system	PROFIBUS DP / CANLOCAL
Bus connection – PROFIBUS DP	M12 circular connector with metal housing (socket contact on bus coupler)
Insulation voltage	
Field bus / electronics	500 V DC (by DC/DC converter and optocoupler)
Electronics / motor starter	2.5 kV AC (by optocoupler in motor starter)
Diagnostic and extension bus	
Number of extension modules	max. 4
Type of connection	M12 circular connector (plug-in contacts on device)
Digital I/Os	
Connections of initiators/actuators	M12 circular connector (4 sockets, each with 5 contacts on device)
Number of inputs and outputs	6 x IN and 2 x IN/OUT
Inputs	
Nominal voltage U_H	24 V DC $\pm 20\%$
Residual ripple	max. 5%
Voltage level "1"	+15 V ... +28.8 V DC
Voltage level "0"	0 V ... +5 V DC
Power consumption at HIGH level	typ. 6 mA per digital input
Concurrence	50%
Signal delay	< 100 μ s
Outputs	
Rated output voltage	24 V $\pm 20\%$
Output current	max. 0.5 A per output (short-circuit-proof)
General data	
Ambient temperature	0° ... +40°C (50°C)
Storage temperature	-25° ... +55°C
Connection type of input (flat cable)	podis CON
Connection type of output (motor connector)	podis CON
Wire range	2.5 mm ² (flat cable)
Mounting location	As required
Type of protection	IP 65
Relative humidity (Class F according to DIN 40040)	10 ... 95% (no moisture condensation)
Air pressure during operation	680 ... 1060 hPa
CE mark	Yes
Approvals (in preparation)	UL, CSA, VDE
Norms	UL 508; VDE 0660
Weight	approx. 9.2 kg
EMC	
Emission	EN 55011:1998/A1 1999 Class A Group 1
Immission	EN 50082-2/03.95 Industry EN 61000-4-2:1995 (ESD) EN 61000-4-4:1995 (Burst) EN 61000-4-5:1995 (Surge) EN 61000-4-6:1996 (incl. HF fields, mains-borne) EN 61000-4-11:1994 (voltage dips)

Technical data

Motor control unit MC2M

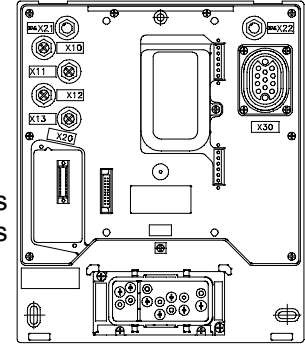


4.2.2 Motor control unit *podis*® MRC

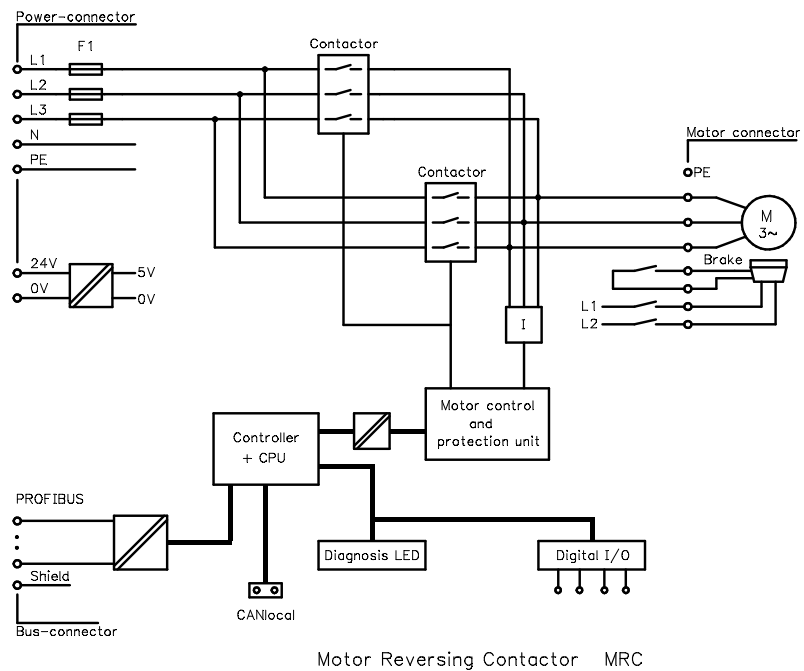
The MRC reverse starter enables the operation of asynchronous motors with a reverse function. A mechanically locked reversing contactor as well as a braking contactor are integrated in the device. The motors are protected against short circuits by an overload monitoring function. The motor starter itself is protected by internal fuses that cannot be replaced.

Designation of the terminals

- X10 Digital input/output
- X11 Digital input/output
- X12 Digital inputs
- X13 Digital inputs
- X20 Bus coupler
- X21 Diagnostic and extension bus
- X22 Diagnostic and extension bus
- X30 Motor feeder socket



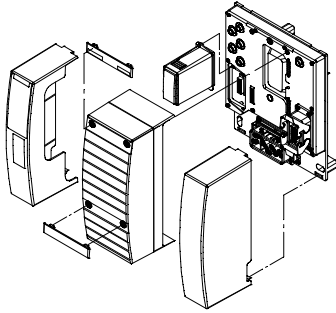
Circuit diagram Motor control unit MRC



Supply load	
Rated operating voltage	400 V 3~AC $\pm 10\%$
Rated operating current I_c (50°C, switching capacity AC~3)	3.3 A
System frequency of input	47 ... 63 Hz
Supply electronics	
Input voltage	24 V DC $\pm 20\%$
Residual ripple	max. 5% residual ripple
Input current	< 2 A
Nominal consumption	approx. 5 W + max. 12 W per digital output (max. 24 W)
Motor feeder connector	
Nominal capacity per motor	max. 1100 W
Rated load voltage (phase voltage)	400 V 3~AC
Min./max. load current	0.5 A / 3.3 A
Overload protection	Current monitoring
Braking contactor	400 V AC, max. 1 A
High-speed contact	400 V AC, 1 A (normally open contact, closes when the brake is released, opens when the brake is disconnected)
Field bus connection	
Field bus system	PROFIBUS DP / CANLOCAL
Bus connection – PROFIBUS DP	M12 circular connector with metal housing (socket contact on bus coupler)
Insulation voltage	
Field bus / electronics	500 V DC (by DC/DC converter and optocoupler)
Electronics / motor starter	2.5 kV AC (by optocoupler in motor starter)
Diagnostic and extension bus	
Number of extension modules	max. 4
Type of connection	M12 circular connector
Digital I/Os	
Connections of initiators/actuators	M12 circular connector (4 sockets, each with 5 contacts on device)
Number of inputs and outputs	6 x IN and 2 x IN/OUT
Inputs	
Nominal voltage U_H	24 V DC $\pm 20\%$
Residual ripple	max. 5%
Voltage level "1"	+15 V ... +28.8 V DC
Voltage level "0"	0 V ... + 5 V DC
Power consumption at HIGH level	typ. 6 mA per digital input
Concurrence	50%
Signal delay	< 100 μ s
Outputs	
Rated output voltage	24 V $\pm 20\%$
Output current	max. 0.5 A per output (short-circuit-proof)
General data	
Ambient temperature	0° ... +40°C (50°C derating)
Storage temperature	-25° ... +55°C
Connection type of input (flat cable)	podis CON
Connection type of output (motor connector)	podis CON
Wire range	2.5 mm ² (flat cable)
Mounting location	As required
Type of protection	IP 65
Relative humidity (Class F according to DIN 40040)	10 ... 95% (no moisture condensation)
Air pressure during operation	680 ... 1060 hPa
CE mark	Yes
Approvals (in preparation)	UL, CSA, VDE
Norms	UL 508; VDE 0660
Weight	approx. 9.2 kg
EMC	
Emission	EN 55011:1998/A1 1999 Class A Group 1
Immission	EN 50082-2/03.95 Industry EN 61000-4-2:1995 (ESD) EN 61000-4-4:1995 (Burst) EN 61000-4-5:1995 (Surge) EN 61000-4-6:1996 (incl. HF fields, mains-borne) EN 61000-4-11:1994 (voltage dips)

Technical data

Motor control unit MRC



4.2.3 Motor control unit *podis*® MFI

The MFI frequency inverters continuously control the speed of asynchronous motors. This is carried out by converting the a.c. supply voltage and frequency into variable voltage and frequency values. The control unit has a braking relay and enables clockwise and anti-clockwise rotation with variable speed.



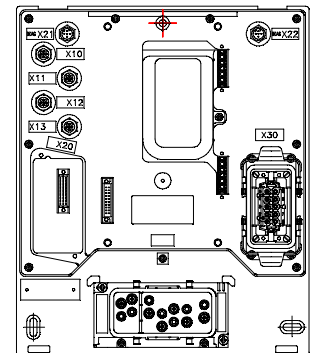
CAUTION

To protect the motor, a thermal resistor must be inserted in the motor and connected to the motor control unit.

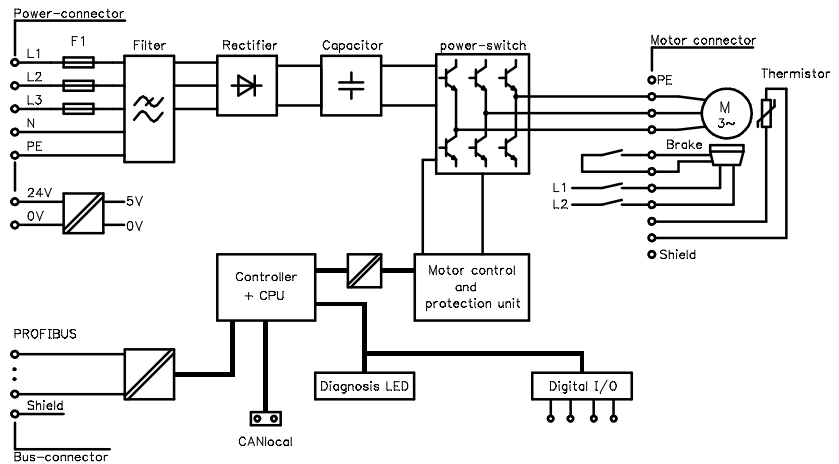
In addition, the motors are protected against short circuits by an overload monitoring function. The motor starter itself is protected by internal fuses that cannot be replaced.

Designation of the terminals

- X10 Digital input/output
- X11 Digital input/output
- X12 Digital inputs
- X13 Digital inputs
- X20 Bus coupler
- X21 Diagnostic and extension bus
- X22 Diagnostic and extension bus
- X30 Motor feeder socket



Circuit diagram Motor control unit MFI

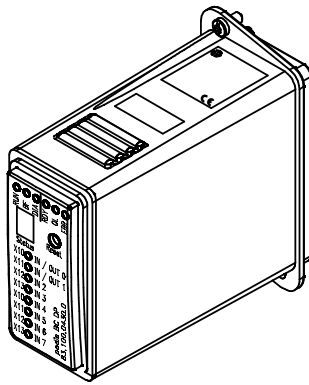


Motor Frequency Inverter MFI

Supply load	
Rated operating voltage (U_{mains})	400 V 3~AC $\pm 10\%$
Rated operating current I_c	3 A
System frequency of input	47 ... 63 Hz
Supply electronics	
Input voltage	24 V DC $\pm 20\%$
Residual ripple	max. 5% residual ripple
Input current	< 2 A
Nominal consumption	approx. 5 W + max. 12 W per digital output (max. 24 W)
Motor feeder connector	
Nominal capacity	0.75 kW
$\cos \varphi$	min. 0.7
Rated load voltage (phase voltage)	400 V 3~AC
Max. load current	2.3 A (note derating)
Output frequency	0 ... 63 Hz (resolution 0.25 Hz)
Pulse frequency	4/8/12/16/20 kHz (adjustable)
Overload protection	via thermistor
Braking relay contact	400 V AC, max. 1 A
High-speed contact	400 V AC, 1 A (normally open contact, closes when the brake is released, opens when the brake is disconnected)
Operating range of thermistor	approx. 1.8 – 2.5 kOhm
Field bus connection	
Field bus system	PROFIBUS DP / CANLOCAL
Bus connection – PROFIBUS DP	M12 circular connector with metal housing (socket contact on bus coupler)
Insulation voltage	
Field bus / electronics	500 V DC (DC/DC converter + optocoupler)
Electronics / motor starter	2.5 kV AC (optocoupler in motor starter)
Diagnostic and extension bus	
Number of extension modules	max. 4
Type of connection	M12 circular connector
Digital I/Os	
Connections of initiators/actuators	M12 circular connector (4 sockets, each with 5 contacts on device)
Number of inputs and outputs	6 x IN and 2 x IN/OUT
Inputs	
Nominal voltage U_H	24 V DC $\pm 20\%$
Residual ripple	max. 5%
Voltage level "1"	+15 V ... +28.8 V DC
Voltage level "0"	0 V ... + 5 V DC
Power consumption at HIGH level	typ. 6 mA per digital input
Concurrence	50%
Signal delay	< 100 μ s
Outputs	
Rated output voltage	24 V $\pm 20\%$
Output current	max. 0.5 A per output (short-circuit-proof)
General data	
Ambient temperature	0° ... +40°C (50°C derating)
Storage temperature	-25° ... +55°C
Connection type of input (flat cable)	podis CON
Connection type of output (motor connector)	podis CON
Wire range	2.5 mm ² (flat cable)
Mounting location	As required
Type of protection	IP 65
Relative humidity (Class F according to DIN 40040)	10 ... 95% (no moisture condensation)
Air pressure during operation	680 ... 1060 hPa
CE mark	Yes
Approvals (in preparation)	UL, CSA, VDE
Norms	UL 508; VDE 0660
Weight	approx. 9.2 kg
EMC	
Emission	EN 55011:1998/A1 1999 Class A Group 1
Immission	EN 50082-2/03.95 Industry EN 61000-4-2:1995 (ESD) EN 61000-4-4:1995 (Burst) EN 61000-4-5:1995 (Surge) EN 61000-4-6:1996 (incl. HF fields, mains-borne) EN 61000-4-11:1994 (voltage dips)

Technical data

Motor control unit MFI



4.2.4 PROFIBUS DP bus coupler

The communication link to the PROFIBUS DP is created via a bus coupler. Apart from the field bus interface, the bus coupler has 8 binary inputs and outputs which are led externally via M12 sockets.

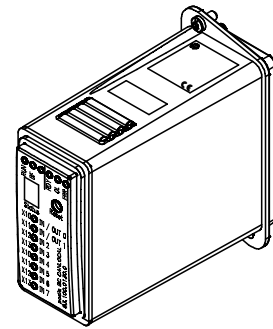
The bus coupler modules as well as the binary inputs and outputs are supplied **solely via the 24 V auxiliary circuit from the flat cable**. Polarity reversal protection and a self-sealing, thermal semiconductor fuse (multifuse) are integrated into the device for protection against short circuits.

Technical data PROFIBUS DP bus coupler

General data for bus coupler	
Connection type	30 pole strip
Rated operating voltage U_B	24 V DC $\pm$ 20% (via base)
Residual ripple	max. 5%
Power consumption	< 5 W during operation + max. 12 W per digital output (max. 24 W)
Insulation voltage	
PROFIBUS / electronics	500 V DC (by DC/DC converter and optocoupler)
Electronics / motor starter	2.5 kV AC (by optocoupler in motor starter)
Bus connection (according to PROFIBUS norm)	
Connection type	M12 circular connector with metal housing (socket contact on bus coupler)
Transmission type	RS485 (according to PROFIBUS norm)
Baud rate	9.6 kBaud ... 1.5 MBaud
Addresses	0 ... 126, set via 8 pole DIP switch
Matching resistor	External
Extension bus	
Cable length	1 m between the individual modules
Matching resistor for CANLOCAL	Integrated in PROFIBUS field bus coupler (jumper in extension module)
Digital I/Os	
Number of inputs and outputs	6 x IN and 2 x IN/OUT
Inputs	
Rated voltage	24 V DC $\pm$ 20%
Residual ripple	max. 5%
Voltage level "1"	+15 V ... +28.8 V DC
Voltage level "0"	0 V ... + 5 V DC
Power consumption at HIGH level	typ. 6 mA per digital input
Concurrence	50%
Signal delay	< 100 μ s
Outputs	
Output voltage	$U_B - 0.5$ V DC
Output current	0.5 A, short-circuit-proof
Residual current of outputs	1 A DC
Concurrence	100%
Signal delay	< 100 μ s
General data	
Housing material	GD-ALSI 9 Cu 3
Storage temperature	-25° ... +55°C
Relative humidity (Class F according to DIN 40040)	10 ... 95% (no moisture condensation)
Weight	approx. 0.4 kg

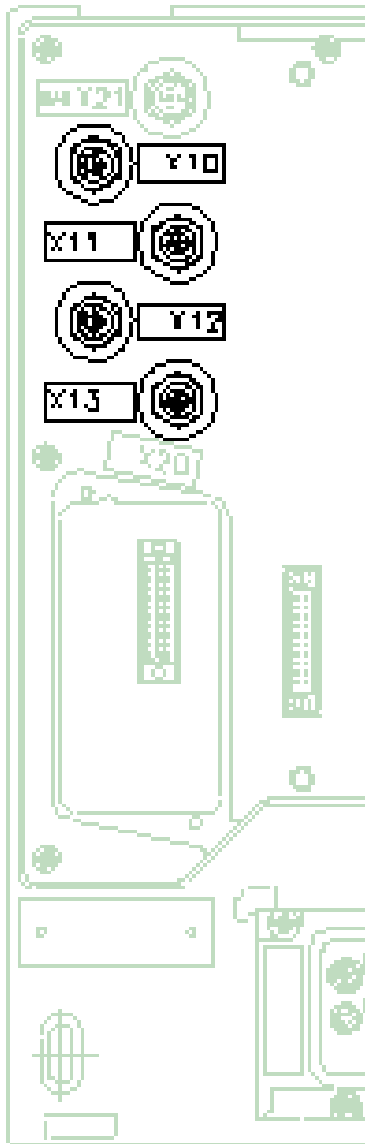
4.2.5 Extension bus coupler

The bus coupler can address up to four additional motor control units via the extension bus. The extension modules are interfaced via extension bus couplers on the field bus coupler (see top of page 6-7, sample configuration).



Module supply	
Rated operating voltage U_B	24 V DC $\pm$ 20% (via base)
Residual ripple	max. 5%
Power consumption	< 5 W during operation + max. 12 W per digital output (max. 24 W)
Insulation voltage	
Expansion bus / electronics	500 V DC (by DC/DC converter and optocoupler)
Electronics / motor starter	2.5 kV AC (by optocoupler in motor starter)
Reverse polarity protection	Diode
Protection against short circuits	Multifuse 2 A
Filter	
Surges	Suppressor diode 1.5 kW 33 V
Low frequency interference voltage	Choke with current transformation 2 x 4.7 mH
High frequency interference voltage	Inductance 2 x 100 mH
Supply electronics	
Input voltage U_H	24 V DC $\pm$ 20% (via base)
Extension bus	
Connection type	3 x 10 pole DIN plug connector RM 2.54 mm
Cable length of extension bus	Max. 4 m (total via all modules of a node)
Digital I/Os	
Number of inputs and outputs	6 x IN and 2 x IN/OUT
Inputs	
Rated voltage	U_B
Residual ripple	max. 5%
Voltage level "1"	+15 V ... +28.8 V DC
Voltage level "0"	0 V ... +5 V DC
Power consumption at HIGH level	typ. 6 mA per digital input
Concurrence	50%
Signal delay	< 100 μ s
Outputs	
Output voltage	$U_B - 0.5$ V DC
Output current	0.5 A, short-circuit-proof
Residual current of outputs	1 A DC
Concurrence	100%
Signal delay	< 100 μ s
General data	
Housing material	GD-ALSI 9 Cu 3
Storage temperature	-25° ... +55°C
Relative humidity (Class F according to DIN 40040)	10 ... 95% (no moisture condensation)
Weight	approx. 0.3 kg

Technical data Extension bus coupler



4.2.6 Digital I/Os

Apart from the bus interface and the power control, there are a total of 8 binary channels in the bus coupler. 6 binary inputs and 2 binary inputs/outputs are available.

Four M12 terminals, each with 2 channels are installed on the base plate as an interface. All the channels are designed for a nominal operating voltage of 24 V DC.



The inputs may only be provided via the 24 V supply that is applied internally at X10...X13 (an external supply is not permitted).

The behaviour of the inputs is specified according to the PLC norm EN 61131 type 1.

The binary outputs are implemented via semiconductors and provided with a current limiter and thermal protection.

Binary inputs	
Switching state "0"	0 ... +5 V DC
Switching state "1"	+ 15 ... +28.8 V DC
Nominal operating current	typ. 6 mA
Switching delay	< 100 µs
Binary outputs	
Nominal operating voltage	24 V DC
Output voltage	Input voltage – 0.5 V DC
Nominal current	max. 0.5 A per output (short-circuit-proof)
Residual current	1 A

4.3 Permitted use

podis[®] motor control units may only be used in connected with **podis**[®] CON flat cables. Any other type of energy supply is not permitted. You can find notes about flat cables in part 1 of the manual.

4.4 Additional devices

4.4.1 PROFIBUS DP field bus system

The motor control units are integrated via their bus coupler into an existing PROFIBUS DP system and controlled.

PROFIBUS DP is an open bus system according to the norm EN 50170, volume 2, PROFIBUS with the transmission protocol "DP" (DP stands for a distributed interface system).

Physically, PROFIBUS DP is either an electrical power system based on a shielded twin-core cable or an optical system based on an optical fibre.

The transmission protocol "DP" enables a fast, cyclical data exchange between the control CPU and the distributed peripheral devices.

Structure of a PROFIBUS DP network

A PROFIBUS DP network is generally composed of a master group, programmable controllers and field bus couplers (slaves).

The programmable controllers displayed (PLC, PC) either contain the respective master interface directly (e.g. Simatic S7-315-2-DP) or in the form of an interface module (e.g. Simatic S5-115U uses the interface module IM 308C as the master). The DP slaves are the peripheral devices such as **podis**[®] DRIVE or distributed I/O systems.

Distributed peripheral devices

When configuring an installation, the process inputs and outputs are frequently inserted in a central position in the automation system.

If the I/Os are placed at greater distances from the automation system, the installation can become very extensive and confusing. Increased electromagnetic interference also effects the reliability of the application.

The use of distributed peripheral devices that communicate via field bus is suited to this type of installation. These devices control and switch the connected processes both directly and locally.

Master and slave

The DP master is the connecting element between the central control CPU and distributed peripheral devices such as **podis® DRIVE** motor starters. The DP master changes and monitors the data exchange between the CPU and the distributed devices.

As it is an open bus system, all the devices from the manufacturer which fulfil the norm EN 50170, volume 2, PROFIBUS can be inserted. The record is kept by the PNO (PROFIBUS user organisation).

To enable a connection between the programmable controller and the distributed devices, the DP master must be configured with the individual device data.

For the formal description of **podis® DRIVE** motor control units, a so-called GSD file is required.

GSD files

Under PROFIBUS DP, the performance characteristics of the devices are documented by the manufacturers in the form of a GSD file and then made available to the user.

The structure, content and coding of this master device data are standardised so that it is possible to configure any DP slaves using project design devices from various manufacturers.

The PNO supplies information about the GSD file of all listed manufacturers.

The GSD data is read by the respective configuration software and the corresponding settings are transferred. Any required operating steps can be taken from the relevant manuals.

Structure of the GSD file for *podis®*

Wieland has a GSD file available for all types of **podis®** devices.

The GSD file describes a modular system with a maximum of 5 modules (1 PROFIBUS slave module and 4 extension modules).

The following I/O byte structure is produced for each of the three device types:

- Reverse contactor (MRC): 4 byte inputs; 2 byte outputs
- Direct starter, 2 motors: 7 byte inputs; 2 byte outputs
- Frequency inverter: 4 byte inputs; 4 byte outputs

All the necessary parameterisation for the basic device as well as the extension devices can be carried out via the configuration software (e.g. Step 7). The inputs are carried out via the menu item "Parameterisation". More detailed information about the parameter settings can be found in section 6.6 "Parameterisation".

The item number for ordering the GSD file can be found in the appendix.

4.4.2 Monitoring and protective devices

All the monitoring and protective devices required for the connected loads are integrated in the motor control units (further explanations can be found in the performance data of the respective type of motor control unit). Additional devices are not required.

Technical data
Motor control unit MFI

4.5 Supply terminals

The energy supply for both the connected loads and the control system is carried out solely via the energy bus **podis® CON**. All the relevant data can be found in part 1 of the manual.

4.6 Safety measures

The usual measures for operating installations apply. The **podis® CON** cable must be de-energised before working on the motor control units.



DANGER

When the power has been switched off or a module has been disconnected, the input connector should not be touched for at least 2 minutes. Live voltage could still be present at the connector during this period.



DANGER

Never touch any live components when the module is connected.

- Even if the motor is not being driven, it remains electrically connected to the power supply (400 V AC).
- The full voltage value can be present at frequency inverters even when the motor is stationary.



DANGER

Never carry out any wiring or manipulation at the motor when the module is connected. If a short circuit occurs, uncontrolled energy can be released in spite of a suppressor circuit.



CAUTION

The protective conductor should not be looped through between the loads.

5 Fixing and exchange

Bild: 0010160

5.1 Base plate

The motor control units are attached to the sub-floor via their respective basic modules. The following section describes how you attach these basic modules and establish a connection with the flat cable.

The diagrams only show one type of basic module. The other types are installed in the same way.

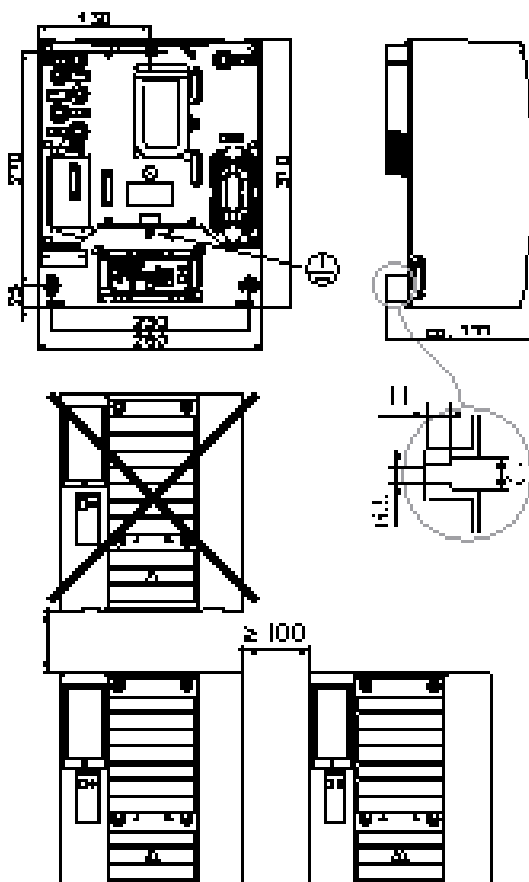
The terminal assignment of the plugs, the connection of the loads and the energy supply or signal routing can be found in the descriptions of the individual types of motor control units.



All the electrical installations and connections may only be carried out by qualified personnel. The appropriate safety and accident regulations must be observed.

Dimensions and sketch of the installation

The sketch below indicates the relevant dimensions in mm for the installation (the example shows the **podis**® MFI base plate, the dimensions of the other variants are identical).



The sub-floor must be flat and portable. It must also be prepared if necessary for attaching the motor starter.

Installation layout and clearances for *podis*® MFI frequency inverter

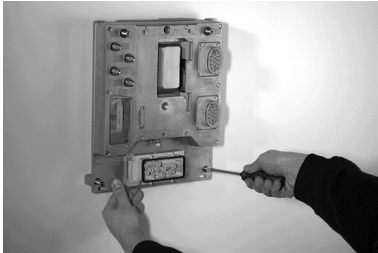
Bild: 0010128b



Only the bore holes provided in the base plate can be used for installing the device onto the sub-floor. Additional bore holes in another location are not permitted.

The base plates for the MFI motor starters may only be mounted vertically. Note the installation clearances in the sketch opposite.

The basic modules may only be installed on stationary sub-floors.



Examples of fixing screws

- slotted cylinder screw DIN EN ISO 1207 M6x20 (previously DIN 74)
- Allen® screw DIN 912 M6x20
- Allen® screw DIN 9784 M6x20
- Philips® screw DIN 7985 M6x20

Attaching the base plate

The series of diagrams opposite show you how to attach the base plate and connect the flat cable.

1. Screw the base plate onto the sub-floor using the fixing screws.
2. Attach the PE conductor with the screw in the space provided.



The connecting cable to the protective earth must have a minimum conductor cross section of 4 mm². Always ensure that the connection to the protective earth has a low resistance.

3. Open the locator for the flat cable and insert the flat cable.



The *podis*® flat cable is coded. It must be inserted in the cable locator so that the wedge-shaped edge is at the bottom.

Close the locator again.

4. Tighten the contact screws.



The contact screws must be turned until they reach the stop.

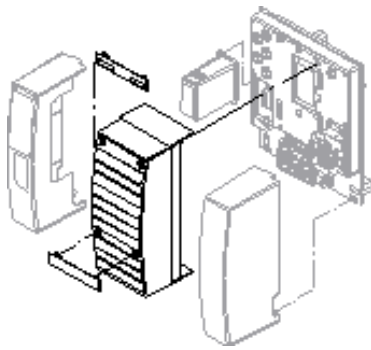
The maximum torque of 1 Nm may not be exceeded.

It is not permitted to use a screw that has snapped off.

i Use a pneumatic or electric screwdriver. Note the
NOTE permitted torque value.

If a contact screw should snap off due to mishandling, the following steps should be carried out:

- (A) If the motor control unit can be mounted in another location
1. Dismantle the base plate.
 2. Seal the damaged area of the flat cable with an approved sealing strip (Scotch VM from 3M).
 3. Replace the flat cable connection of the base plate (order no. Z1.458.2953.0). Mount the base plate at least 200 mm from the original installation position.
- (B) If it is not possible to move the motor control unit
1. Dismantle the base plate.
 2. Replace the damaged flat cable with a new one.
 3. Replace the flat cable connection of the base plate (order no. Z1.458.2953.0) and reinstall the base plate.

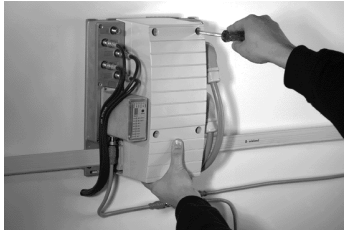


5.2 Motor starter

5.2.1 Installation

Tools: Allen® key, width 5, screw length at least 100 mm.

The motor starters of the various **podis®** types have a uniform housing which is attached in the same way for all the variants. Place the motor starter on the base plate and screw in position using the four captive screws (see diagram). The torque may not exceed 4 Nm.



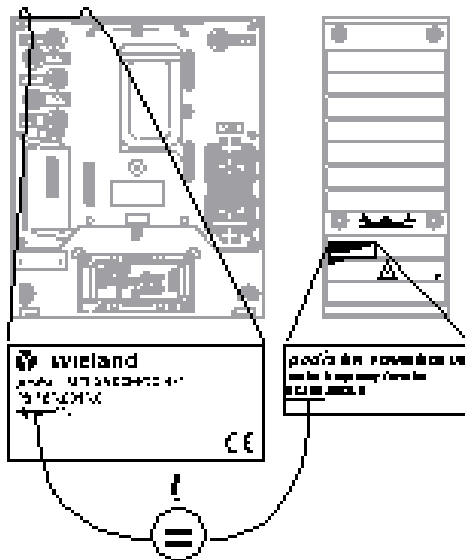
The motor starter may only be placed onto the base plate if it has already been installed.

It is not permitted to insert and remove the motor starters when the load is connected.

Ensure that the motor starter is mounted on the correct type of base plate. The first five digits in the order numbers of the base plate and motor starter must match (see diagram, the base plate and motor starter **podis®** MFI were selected in the example).

Assignment

Motor starter – base plate



5.2.2 General notes for connecting motors



WARNING

Please note the chapter about electrical safety and earthing described in part 1 of the system manual.

The motor feeder connectors may only be inserted and removed in the de-energised state.

Note the warning information about the respective types of motor starter.

If a brake is present on the motor, it must be rated for 400 V AC.

The core cross section of the motor connecting cables must be adapted to the respective environmental conditions. The decisive factors for the cross section are the

- nominal current of the motor
- type of wiring
- ambient temperature
- material type of the connecting cable (PVC, rubber)

The current norms (VDE 0100) etc. should be observed.

The control units are described in detail in the following sections. Please take the relevant advice into account.

Core cross section for motor connecting cable

5.2.3 *podis*® MC2M

You require 1.5 mm² or 2.5 mm² round cables for the motor control unit MC2M. The required number of cores can vary between 3 cores + PE and 7 cores + PE, depending on the motor that is used. Prefabricated cables with **revos MOT** plugs can be used. Ordering details can be found in the appendix.

The following sketch indicates the connector pin assignment of the motor feeder sockets. The upper socket (X30) is assigned to motor 1, the lower socket (X31) is assigned to motor 2. The connector pin assignment is identical for both sockets.

podis® MC2M Connector pin assignment of motor feeder sockets X30, X31



Pin	Brief description	Comment
1	L1 (U)	Motor phase voltage
2	L2 (V)	Motor phase voltage
3	L3 (W)	Motor phase voltage
4	n.c.	Unassigned
...	n.c.	Unassigned
10	n.c.	Unassigned
PE	PE	PE connection



CARE

If a brake is present in the motor, a drive circuit with 400 V AC must be designed. If one of the two motors is not to be used, the outgoing feeder should be sealed appropriately. This can be carried out with a corresponding sealed connector of the **revos MOT** range.

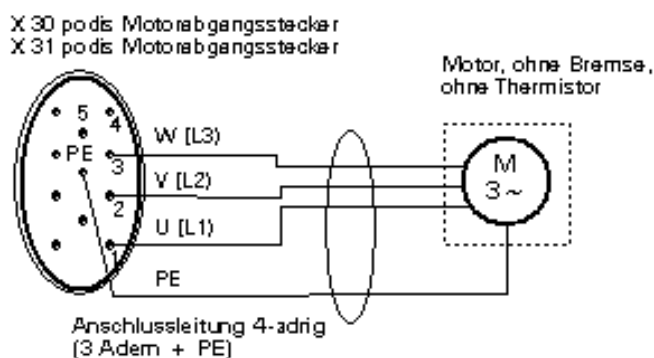
Motor connection examples for *podis*® MC2M

podis® MC2M Asynchronous motor without brake, without thermistor

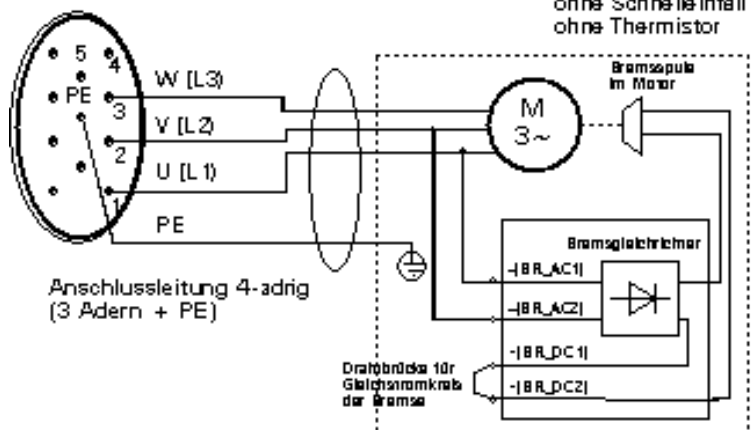
X30 *podis* motor feeder connector
X31 *podis* motor feeder connector

Motor, without brake
without thermistor

**4-core connecting cable
(3 cores + PE)**



X 30 podis Motorausgangsstecker
X 31 podis Motorausgangsstecker



podis® MC2M
**Asynchronous motor with
brake, without thermistor**

X30 podis motor feeder connector
X31 podis motor feeder connector

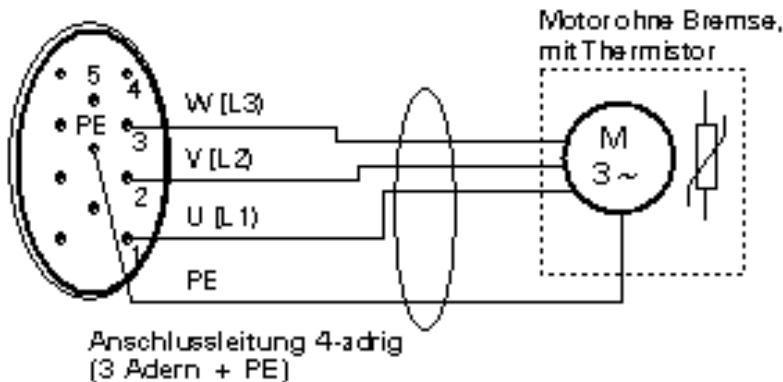
Motor, with brake, without high-speed contact,
without thermistor

Brake coil in motor
Brake rectifier

Wiring jumper for d.c. brake circuit

4-core connecting cable (3 cores + PE)

X 30 podis Motorausgangsstecker
X 31 podis Motorausgangsstecker



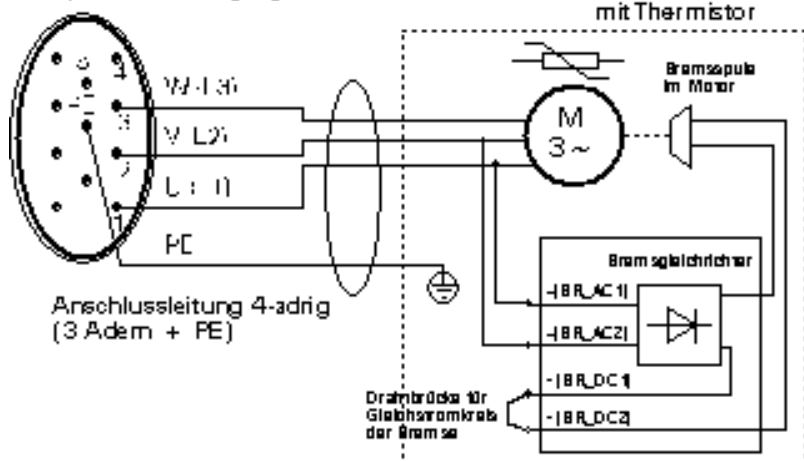
podis® MC2M
**Asynchronous motor
without brake, with
thermistor**

X30 podis motor feeder connector
X31 podis motor feeder connector

Motor, without brake,
with thermistor

4-core connecting cable (3 cores + PE)

X 30 podis Motorausgangsstecker
X 31 podis Motorausgangsstecker



podis® MC2M
**Asynchronous motor with
brake, with thermistor**

X30 podis motor feeder connector
X31 podis motor feeder connector

Motor, with brake, without high-speed
contact, with thermistor

Brake coil in motor
Brake rectifier

Wiring jumper for d.c. brake circuit

4-core connecting cable (3 cores + PE)

5.2.4 *podis*® MRC

You require 1.5 mm² or 2.5 mm² round cables for the motor control unit MRC. The required number of cores can vary between 3 cores + PE and 7 cores + PE, depending on the motor that is used. Prefabricated cables with **revos MOT** plugs can be used. Ordering details can be found in the appendix.

***podis*® MRC**
Connector pin assignment
of motor feeder sockets



Pin	Brief description	Comment
1	L1 (U)	Motor phase voltage U
2	L2 (V)	Motor phase voltage V
3	L3 (W)	Motor phase voltage W
4	n.c.	Unassigned
5	n.c.	Unassigned
6	BR_AC1	Brake drive circuit AC
7	BR_AC2	Brake drive circuit AC
8	BR_DC1	Brake DC (high-speed contact)
9	BR_DC2	Brake DC (high-speed contact)
10	n.c.	Unassigned



DANGER

In this variant, the brake can be applied independently of the motor. Hazardous voltage can thus also be present at the terminals of the brake even when the motor is stationary.



CARE

If a brake is present in the motor, a drive circuit with 400 V AC must be provided. The brakes can be electrically ventilated. It is possible to apply the brake quickly via the motor starter.



WARNING

The high-speed contact of the motor starter may only be used in combination with the drive circuit of the brake. It is not permitted to connect the brake via the motor terminals together with the high-speed contact of the motor starter (see sketch below).

***podis*® MRC**
This type of connection is
not permitted

Bild: Nicht zulässige
Anschlußart

X30 *podis* motor feeder connector

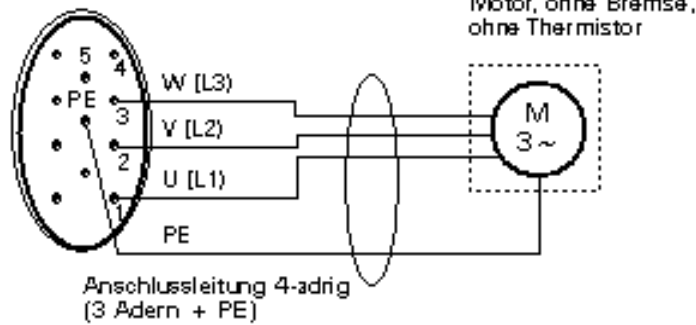
Motor with brake

Brake coil in motor

Brake rectifier

Motor connection examples for *podis*® MRC

X 30 *podis* Motorebgangsstecker



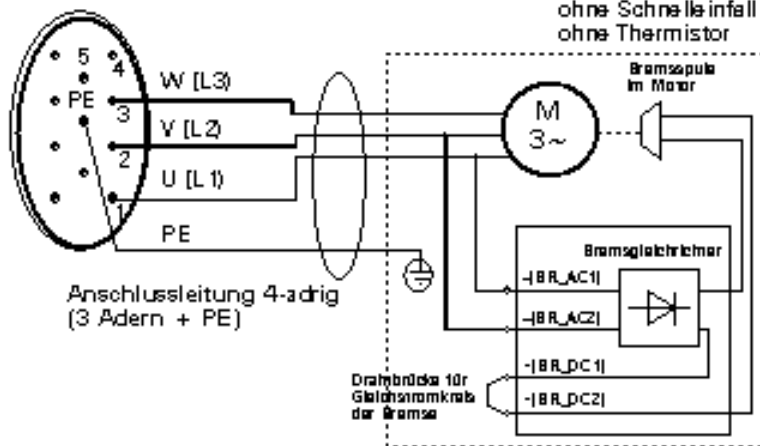
***podis*® MRC**
Asynchronous motor
without brake, without
thermistor

X30 *podis* motor feeder connector

Motor, without brake,
without thermistor

4-core connecting cable (3 cores + PE)

X 30 *podis* Motorebgangsstecker



***podis*® MRC**
Asynchronous motor with
brake (via motor power
supply), without thermistor

X30 *podis* motor feeder connector

Motor with brake, without high-speed contact,
without thermistor

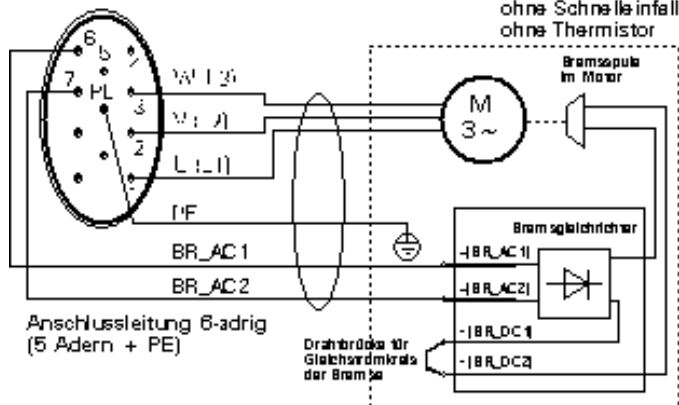
Brake coil in motor
Brake rectifier

Wiring jumper for d.c. brake circuit

4-core connecting cable (3 cores + PE)

Note: The brake cannot be electrically ventilated in this configuration.

X 30 *podis* Motorebgangsstecker



***podis*® MRC**
Asynchronous motor with
brake (separate), without
thermistor

X30 *podis* motor feeder connector

Motor, with brake, without high-speed contact,
without thermistor

Brake coil in motor
Brake rectifier

Wiring jumper for d.c. brake circuit

4-core connecting cable (3 cores + PE)

Note: The brake cannot be electrically ventilated in this configuration.

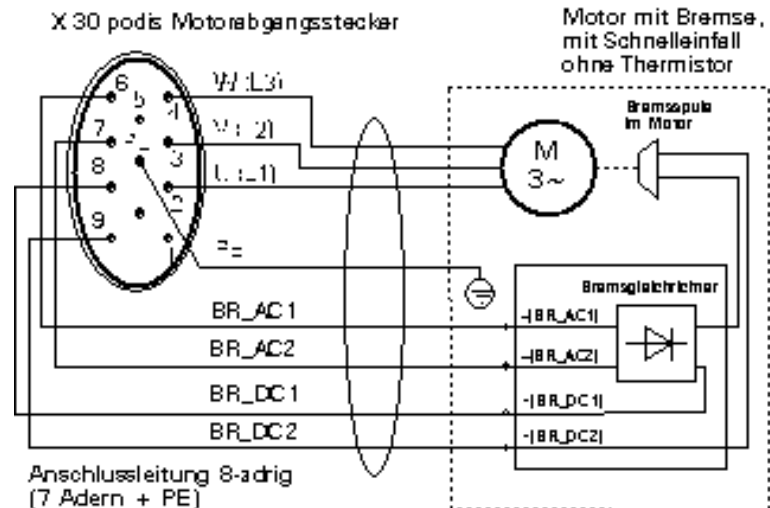
podis® MRC
Asynchronous motor with
brake (separate), with
high-speed contact,
without thermistor

X30 podis motor feeder connector

Motor, with brake, with high-speed contact,
without thermistor

Brake coil in motor
Brake rectifier

8-core connecting cable (7 cores + PE)

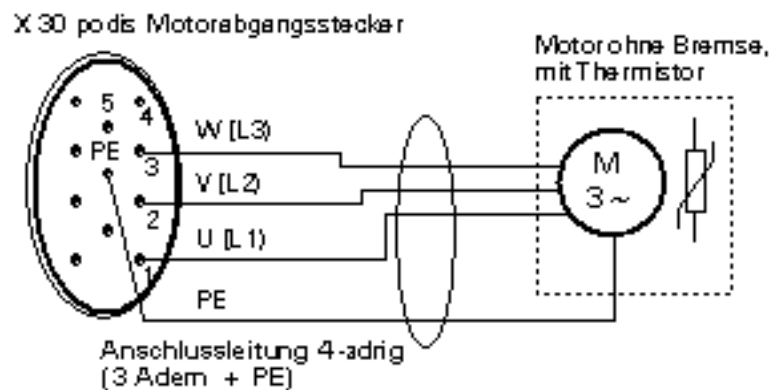


podis® MRC
Asynchronous motor
without brake, with
thermistor

X30 podis motor feeder connector

Motor, without brake,
with thermistor

4-core connecting cable (3 cores + PE)



podis® MRC
Asynchronous motor with
brake (via motor power
supply), with thermistor

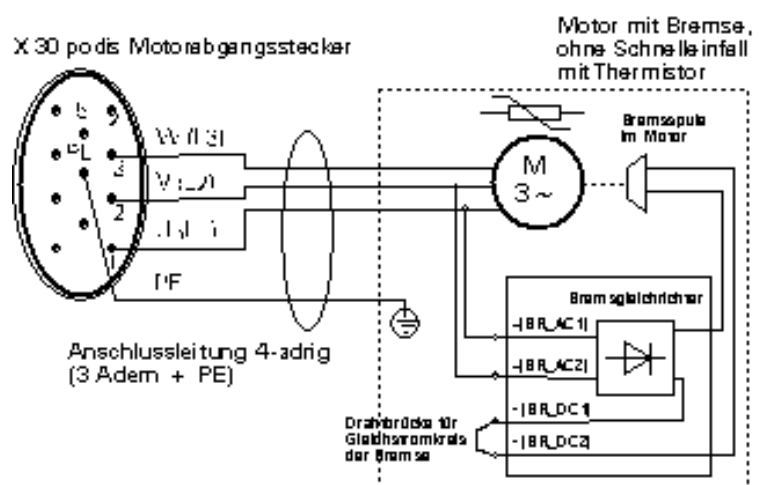
X30 podis motor feeder connector

Motor, with brake, without high-speed contact,
with thermistor

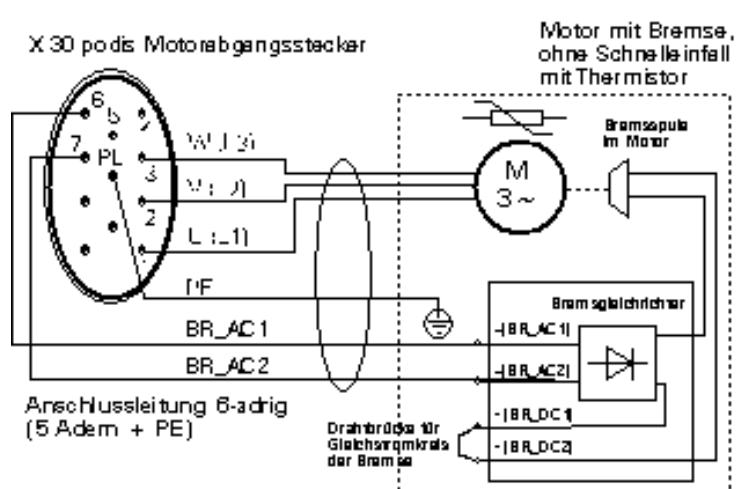
Brake coil in motor
Brake rectifier

Wiring jumper for d.c. brake circuit

4-core connecting cable (3 cores + PE)



Note: The brake cannot be electrically ventilated in this configuration. The thermistor is not evaluated.



podis® MRC
Asynchronous motor with
brake (separate), with
thermistor

X30 podis motor feeder connector

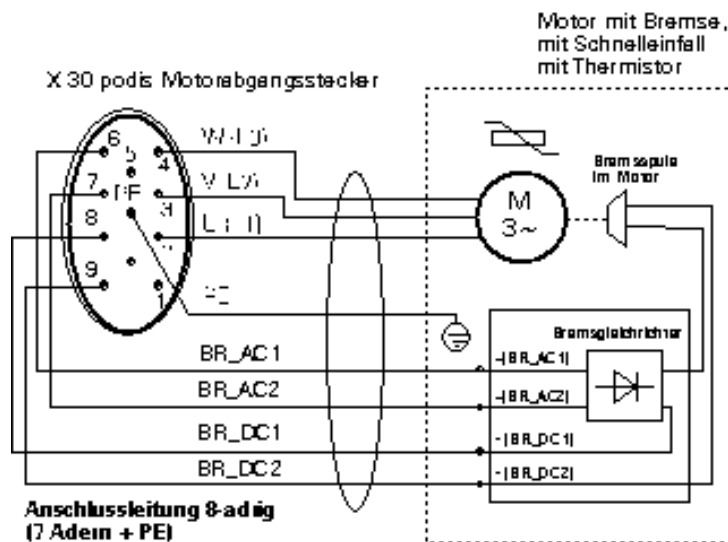
Motor with brake, without high-speed contact, with thermistor

Brake coil in motor
 Brake rectifier

Wiring jumper for d.c. brake circuit

6-core connecting cable (5 cores + PE)

Note: The brake cannot be electrically ventilated in this configuration. The thermistor is not evaluated.



podis® MRC
Asynchronous motor with
brake (separate), with
high-speed contact, with
thermistor

X30 podis motor feeder connector

Motor with brake, with high-speed contact, with thermistor

Brake coil in motor
 Brake rectifier

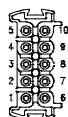
8-core connecting cable (7 cores + PE)

5.2.5 *podis*® MFI (frequency inverter)

A shielded cable should be used for the motor control unit MFI for EMC reasons. The shield of this cable should be laid at the motor feeder connector and at the motor.

The required number of cores can vary between 5 cores + PE (for motors with thermistor, without brake) and 9 cores + PE (for motors with thermistor, brake and high-speed contact), depending on the motor that is used. The cable length may not exceed 5 m.

***podis*® MFI**
Connector pin assignment
of motor feeder sockets



Pin	Brief description	Comment
1	L1 (U)	Phase voltage U
2	L2 (V)	Phase voltage V
3	L3 (W)	Phase voltage W
4	TU1	Temperature monitoring (thermistor)
5	TU2	Temperature monitoring (thermistor)
6	BR_AC1	Brake drive circuit AC
7	BR_AC2	Brake drive circuit AC
8	BR_DC1	Brake DC (high-speed contact)
9	BR_DC2	Brake DC (high-speed contact)
10	n.c.	Unassigned



DANGER

In this variant, the brake can be applied independently of the motor. Hazardous voltage can thus also be present at the terminals of the brake even when the motor is stationary.

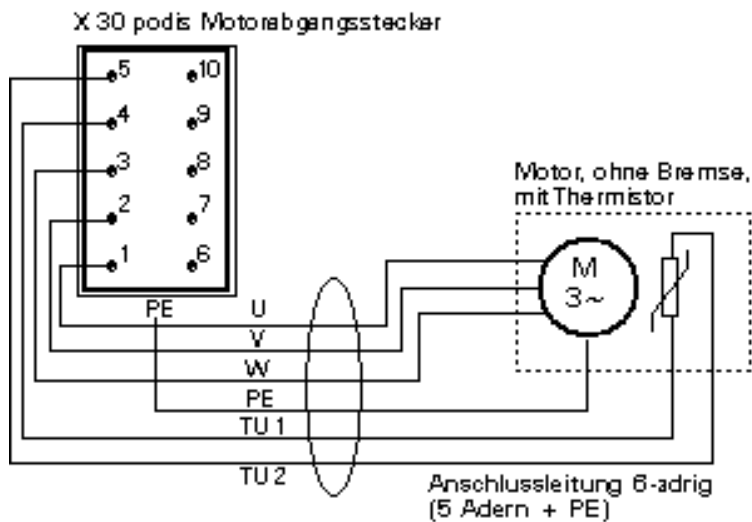


CARE

The brake must be connected via the separate supply cables for the brake. Depending on the speed, the brake does not receive the nominal voltage via the motor supply cables. Damage to the motor or brake cannot be excluded.

Further information should be taken from the description for your motor.

Motor connection examples for *podis*® MFI

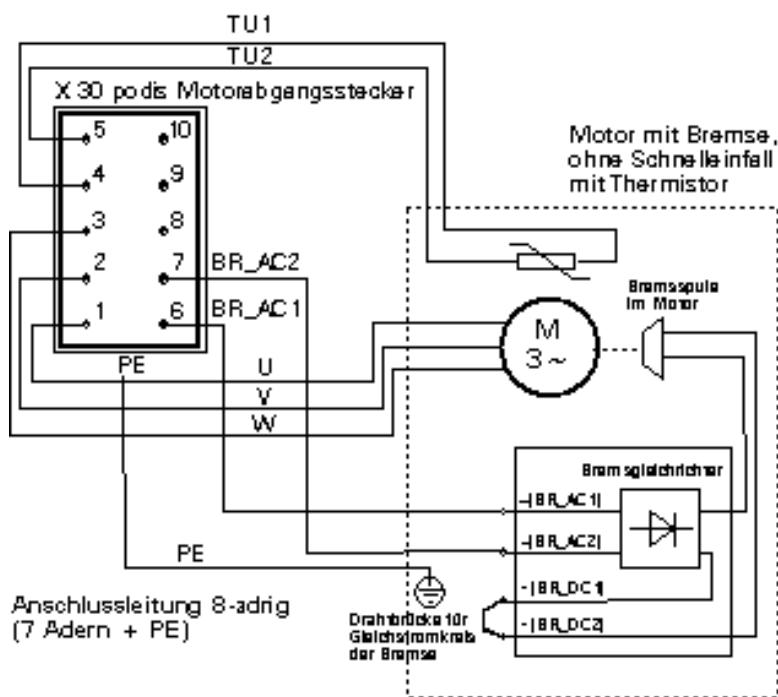


***podis*® MFI**
Asynchronous motor
without brake, with
thermistor

X30 *podis* motor feeder connector

Motor without brake,
with thermistor

6-core connecting cable (5 cores + PE)



***podis*® MFI**
Asynchronous motor with
brake, with thermistor

X30 *podis* motor feeder connector

Motor with brake, without high-speed contact,
with thermistor

Brake coil in motor
Brake rectifier

Wiring jumper for d.c. brake circuit

8-core connecting cable (7 cores + PE)

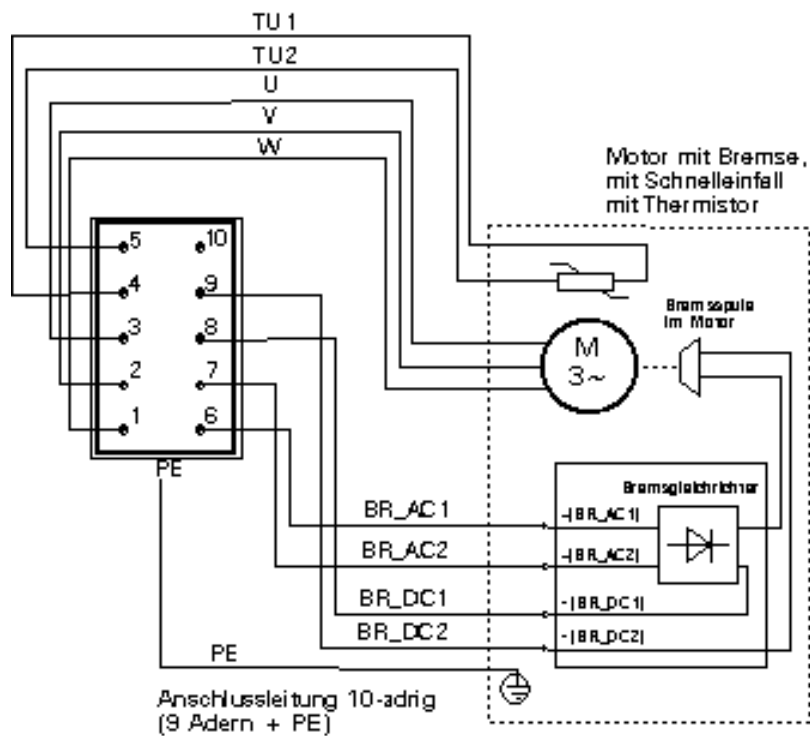
podis® MFI
Asynchronous motor with
brake, with high-speed
contact, with thermistor

X30 podis motor feeder connector

Motor with brake, with high-speed
 contact,
 with thermistor

Brake coil in motor
 Brake rectifier

10-core connecting cable
(9 cores + PE)



5.3 Bus coupler

5.3.1 PROFIBUS DP

You must assign a unique station address ADR to each network device in the PROFIBUS system. The station address is set with the aid of the 8 pole DIP switch which is attached to the rear of the bus coupler (outlined in the sketch below). The address must be set before inserting the bus coupler on the base plate.

You can assign addresses in the value range 0-126. Switch 8 is unassigned. The switch position "ON" corresponds to binary "1", while "OFF" corresponds to binary "0".

The address is set as follows:

Switches S1 to S8 are assigned values as in the sketch (switch S8 is reserved).

Schalterwert	1	2	4	8	16	32	64	res.
Switch value	☒	☒	☒	☒	☒	☒	☒	☐
Switch number	1	2	3	4	5	6	7	8

OFF (= 0)

ON (= 1)

You are looking for the position of the DIP switch for the address ADR. The value X_1 that is greater or smaller than ADR is derived from ADR:

$$\text{ADR} - X_1 = \text{Rest}_1$$

Now extract the largest switch value X_2 from the received remainder Rest_1 , which is greater or smaller than Rest_1 :

$$\text{Rest}_1 - X_2 = \text{Rest}_2$$

Continue in this way until the remainder disappears. You then have determined all X_i switches which you must set to "ON".

Example: You are looking for the switch positions for the address 113.

ADR = 113

The next smallest value on the DIP switch is 64 ($=2^6$, corresponds to switch 7).

$X_1 = 64$ and thus

$$113 - 64 = 49$$

$X_2 = 32$

$$49 - 32 = 17$$

$X_3 = 16$

$$17 - 16 = 1$$

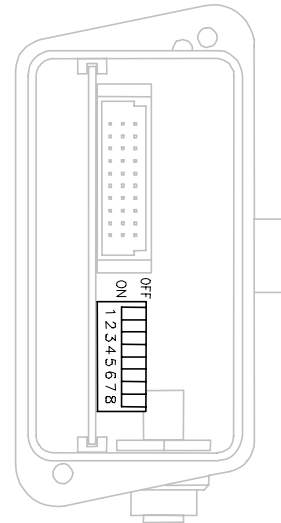
$X_4 = 1$

$$1 - 1 = 0$$

You must therefore set switches S7, S6, S5 and S1 to "ON".

res.	1	2	3	4	5	6	7	8
☐	☒	☒	☒	☒	☒	☒	☒	☐
OFF	ON	ON	ON	ON	ON	ON	ON	ON

Setting the station address

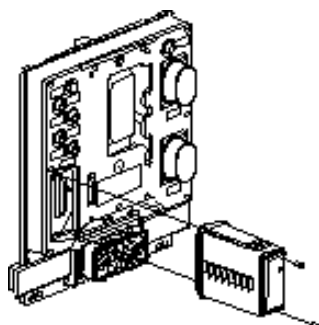


In order to implement the universal protection level IP 65, the PROFIBUS interface should be designed by default as an M12 connection. The physical basis corresponds to the US standard for mains-borne transmission.

Specifications for PROFIBUS operation

- 2-wire bus
- Spur line at 1.5 MBaud up to a length of 6.6 m
- Max. 32 slaves per bus segment (incl. repeater)

Attaching the bus coupler



Installation

Tool: Slotted screwdriver or torque screwdriver, size 15.

1. Place the bus coupler in the opening provided in the base plate and ensure that the seal is applied cleanly (see sketch on the left-hand side).
2. Screw the bus coupler onto the base plate with the two captive screws.
The torque may not exceed 1.2 Nm.



The bus coupler can be damaged if it is inserted or removed while connected to the supply. Disconnect the 24 V power supply before you install or remove the bus coupler.



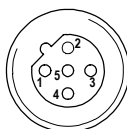
NOTE

Check the behaviour of your PLC once you have replaced a bus coupler. Carry out a reset of the bus coupler.

PROFIBUS connection

The assignment of the M12 socket at the bus interface is carried out according to the following table:

Contact pin assignment of the PROFIBUS connection



Pin	Signal	Description
1	Vcc	Supply voltage
2	RxDT (TxD)-P	Send signal (receive)
3	GND	Supply reference potential
4	RxDT (TxD)-N	Send signal (receive)
5	Shield	



NOTE

Only use plugs with metal housing in accordance with the PROFIBUS norm. The shield is laid on the housing.

The bus cable must be terminated at the cable ends to guarantee error-free data transmission in accordance with the PROFIBUS norm.

The following sketch indicates which accessories should be used to integrate the motor control units in a PROFIBUS DP network.

Bild: 0010176_

To PLC		
2-core	2-core	4-core

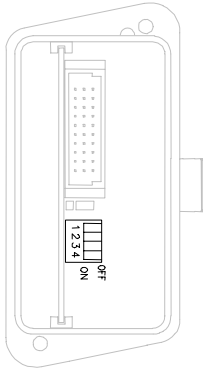
No.	Brief description	Manufacturer	Unit	Order no.
1	T connector	Wieland		08.000.0226.2
2	Bus terminating resistor	Wieland		08.000.0230.0
3	Connecting cable for PROFIBUS, prefabricated	Turck		RSSW-RKSW 456-XXM (XX = length e.g. 2.5 m)
4	Connecting cable for extension bus	Wieland	0.3 m	08.000.0226.4
	Connecting cable for extension bus		1.0 m	08.000.0226.5
5	Connecting cable from bus coupler to T connector, 2 pole	Wieland	0.3 m	08.000.0229.8
6	Connecting cable from bus coupler to T connector, 4 pole	Wieland	0.3 m	08.000.0229.9

Accessories for PROFIBUS connection

Please note the following:

- Each bus coupler (with the exception of the final coupler) in a PROFIBUS DP line is linked to the T connector with a 2 pole connecting cable.
- The last bus coupler in a PROFIBUS DP line must be connected with a 4 pole connector to the T connector. This should be provided with a terminating resistor as indicated in the diagram.
- If you prepare the cable yourself, you must ensure that
 - a) The shield runs on the metal part of the plug or socket.
 - b) Cables, sockets and plugs correspond to the PROFIBUS norm.
 - c) The connecting cables to the extension modules have a max. length of 1 m.

Setting the device address



ID =
DIP switch
(black = switch position)

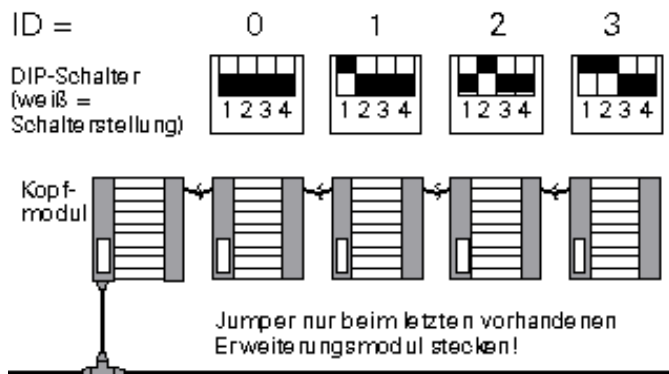
Header module

Only insert the jumper at the last extension module

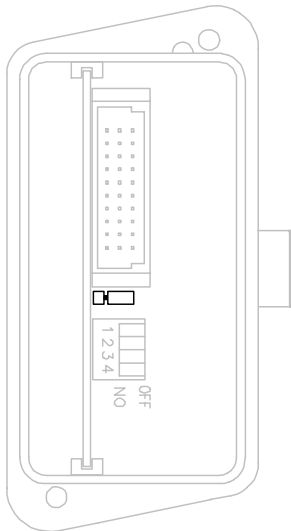
5.3.2 Extension bus

If you are operating motor control units as an extension at the head-end (the PROFIBUS bus coupler), you must allocate extension device addresses. The extension modules are addressed by the PROFIBUS coupler via these addresses.

The addresses are assigned via switches 1 to 2 of the 4 pole DIP switch at the rear of the extension bus coupler (shown in the sketch opposite). Start with the address "0" for the first extension module. Additional modules then have the next highest address (see sketch below). The switch position "ON" corresponds to binary "1" while "OFF" corresponds to binary "0". Switches 3 and 4 are not occupied.



Terminating resistor



The extension bus couplers have a matching resistor which can be activated via a jumper.

Jumper inserted = matching resistor activated
Jumper removed = matching resistor deactivated

The jumper is already inserted before it is delivered (shown in the sketch opposite). This matching resistor always remains connected in the last element of an extended chain. The jumper is removed from all other extension modules.

Installation

The installation of the extension bus coupler is carried out as described under 5.3.1 "Installation". Please note the instructions in this section.

Connection to the header or extension module

Connect the extension modules together with the relevant connecting cables via the extension plugs X21 or X22 or connect them with the header module.

Plug M12 with metal housing, shield on the housing.

The PIN assignment on the extension plugs X21, X22 is as follows:

Pin	Signal	Description
1	Free	
2	CHIN	
3	ED-GND	
4	ED-HIGH	
5	ED-LOW	

Bild:
Pin-Belegung

PIN assignment
Extension plugs X21, X22

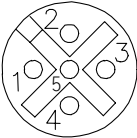


Any unused extension plugs must be covered with protective caps. These caps are supplied with the base plate.

5.4 Sensor technology (connections X10 ... X13)

Socket contacts are located on the device which are assigned as shown in the following table.

Pin	Signal	Description
1	+24 V	
2	IN-B	
3	0 V	
4	IN-A or OUT-A	
5	Shield	



Terminal assignment

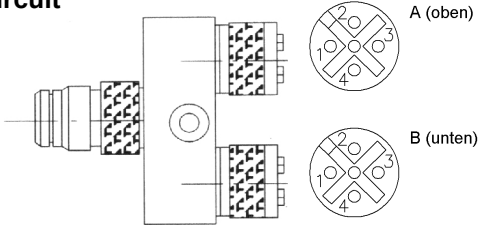
Pin / socket	Name	Input / output
X10 – Pin 4	IN/OUT_0	Input or output
X10 – Pin 2	IN_4	Input only
X11 – Pin 4	IN/OUT_1	Input or output
X11 – Pin 2	IN_5	Input only
X12 – Pin 4	IN_2	Input only
X12 – Pin 2	IN_6	Input only
X13 – Pin 4	IN_3	Input only
X13 – Pin 2	IN_7	Input only

Connector pin assignment

Branching the I/O terminals

If you wish to use both channels of a terminal, you must run the supply cables together via a Y connector (see appendix for ordering information). This connector is then linked with the M12 socket of the base plate.

Terminal assignment for branch circuit



Pin	Assignment	Coupler plug
	A	B
1	24 V supply for sensor technology	
2	n.b.	n.b.
3	Reference potential of supply (GND)	
4	E1 / A1	E2
5	PE	PE
	Connecting plug Base plate	Connecting sockets of I/Os



The inputs should only be connected via the internal 24 V DC supply applied at X10 ... X13. The inputs and outputs may not be supplied externally.



To ensure compliance with the protection type IP 65, you must mount protective caps on all unoccupied inputs or outputs. These protective caps are supplied for all I/O sockets and for the extension plugs on the base plate.

6 Commissioning and maintenance

6.1 Safety notes and measures

6.1.1 Staff selection and qualification



WARNING

All project design, programming, installation, commissioning, operational and maintenance tasks connected with the automation system should only be carried out by trained personnel (e.g. electrical engineers).

The project design and programming staff must be familiar with the safety concepts of automation technology.

The operational staff must be instructed in the control system and know the operating instructions.

The installation, commissioning and maintenance staff must have the necessary training to access the automation system.

6.1.2 Conditions for operation

The **podis® DRIVE** motor control units have been designed according to the latest technology and the recognised safety regulations. However, risk of death or personal injury of the user or a third party or damage to machines, installations or other property may occur during usage.

The implementation of the **podis® DRIVE** motor control units must be technically correct according to the stipulated conditions. The operating instructions must be followed with awareness of the safety issues and risk factors. The correct and safe operation of the control system requires the proper transport, storage and installation as well as careful operation and maintenance. Any faults that can interfere with safety must be rectified immediately.

The **podis® DRIVE** motor control units are only intended for the control of three-phase asynchronous motors. If they are used for any other purpose, they do not meet the specified conditions. In this case, the manufacturer is not liable for any resulting damages.

In order to use the **podis® DRIVE** motor control units as stipulated, please observe the instructions regarding the mechanical and electrical configuration, commissioning and operation as described in this manual.

6.1.3 General notes

The term "motor control unit" as used in the following section incorporates bus couplers, extension modules, other components (such as mounting racks, connecting cable), operator panels and software which is used for the programming, commissioning and operation of the controllers.

The technical design of the **podis® DRIVE** motor control units is based on the product norm EN 61131-2 (IEC 61131-2) for stored-program controllers. The CE mark applies for the systems and devices according to the EMC guideline 89/336/EEC and the low voltage guideline 73/23/EEC where appropriate.

podis® DRIVE motor control units form part of the electrical equipment of a machine. They must therefore be included by the machine manufacturer in the procedure to assess conformity. The norm DIN EN 60204-1 should be observed (machine safety, general requirements for the electrical equipment of machines).

If the **podis® DRIVE** motor control units themselves are used and maintained correctly, there is normally no risk as regards property or health. Danger may arise however if actuators such as motors, hydraulic mechanisms etc. are connected; if the project design, installation, maintenance and operation of the complete installation or the machine is not carried out properly; if the instructions in this manual are not observed and if personnel without sufficient training operate the system.

6.1.4 Specific notes

During the project design, installation and commissioning of **podis® DRIVE** motor control units in connection with the control of machines, the safety conditions stipulated in the machine guideline 89/392/EEC must be observed by the manufacturer and user of the machine. In specific cases, national accident regulations apply such as VBG 4.0.

The relevant safety and accident regulations that apply to the respective application e.g. machine protection guidelines must be taken into account.

Precautions should be taken to ensure that a control program that has been interrupted due to voltage dips and failures can be restarted correctly. Any hazardous, transient operating states should also be avoided. An emergency stop device should be enforced if necessary.

To prevent a wire breakage on the signal end from causing undefined states in the controller, appropriate safety measures should be taken for the I/O interface as regards the hardware and software. Control engineering equipment and operating elements should be installed in a position that protects them sufficiently against accidental operation.

All safety-related devices of the controlled machine should be designed so that they can function independently of the control system. Emergency stop devices must remain effective according to IEC 204 (corresponds to DIN VDE 113) in all operating modes of the system. In an emergency, the supply voltage of all the controlled switching elements must be disconnected.

Uncontrolled and undefined initialisation processes such as:

- start-up after deactivation of the emergency stop device
- start-up of **podis® DRIVE** without the **podis® DRIVE** bus coupler being addressed by the DP master

may not occur.

You should ensure that the deviations of the mains voltage from the nominal value are within the permitted tolerance in all the circuits of the **podis® DRIVE** motor control unit.

6.1.5 Disconnection and emergency stop

An emergency stop should be enforced if hazardous operating conditions occur, in particular

- during start-up after a voltage dip or failure
- during start-up of **podis® DRIVE** after disruption of the bus communication.

6.1.6 Maintenance and service

If measuring or testing procedures are required on the active device, the definitions and instructions for implementation of the accident prevention regulation VBG 4.0 should be observed. A suitable electronic tool should be used.

Repairs to controller components may only be carried out by authorised Wieland workshops. Unauthorised opening and improper operation or repairs can lead to personal injury or damage to the device.

Before opening a device, the connection to the power supply system should always be isolated (withdraw the mains plug or open the isolating switch).

Motor starters may never be installed or removed under load. Bus couplers may only be changed when the power is disconnected. Dismantling and installation should be carried out according to the mechanical guidelines.

6.2 Switching on

The system is activated by switching on

1. the auxiliary supply for the electronics and
2. the main supply for the load (400 V).

The connected motor control units are only then ready for parameterisation or signal exchange with the DP master.

For information on switching on or starting up the individual motor starters, please refer to the section "Start-up and operation".

6.3 Integration of the motor control units into the automation system

The PROFIBUS configuration tools require device-specific information to enable the master and the PLC system to exchange data with the slave. This information is stored in the so-called master device file (GSD file) and can be read by the configuration tool.

A GSD file is used for the formal description of a PROFIBUS DP slave. In addition, it contains references to graphics files (bitmaps) for the symbolic representation of the DP slave in normal and diagnostics modes.

The GSD file contains standard error text for the extended PROFIBUS diagnostics. The configuration tool displays this diagnostics text automatically in the event of a fault. The user can thus detect the reason for a fault without needing to carry out the error coding via the PLC.

The GSD file for **podis® DRIVE** is called Podis.GSD. The current version can be found on the internet under

<http://www.wieland-electric.com>

The integration of the GSD file is indicated in the following sections using the example of the SIMATIC Step7 software.

Example: Import of the GSD file into SIMATIC Step7

i NOTE The process described here and the screenshots refer to SIMATIC Step7 version 5.1. The current documentation for the Step7 configuration software is valid.

The GSD file can be easily installed in the SIMATIC Manager.

1. Selection of the installation menu



2. Selection of the GSD file



3. Copying of the graphics file
Copy the graphics file `PODIS_N.bmp` from the diskette into the directory:
`\SIEMENS\STEP7\S7DATA\NSBMP\`
3. Update of the hardware catalog



i
NOTE

For versions of the SIMATIC Manager that do not include the function "Install new GSD file", the following process should be carried out:

Copy the GSD file into the directory:
`\SIEMENS\STEP7\S7DATA\GSD\`

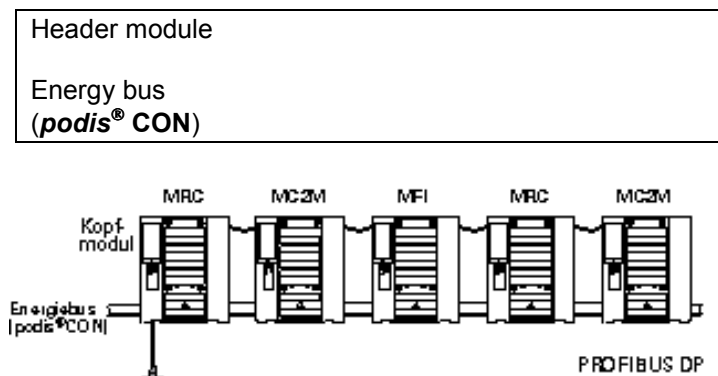
Select the menu item "Extras\Update GSD files" in the "Extras" menu.

4. The **podis**® components are now included in the hardware catalog and are available for the configuration tool.

6.4 Configuration

The configuration process involves the systematic allocation of **podis**® DRIVE devices with the aid of a hardware configuration tool. This process is indicated in the following section using the example of the SIMATIC Step7 software.

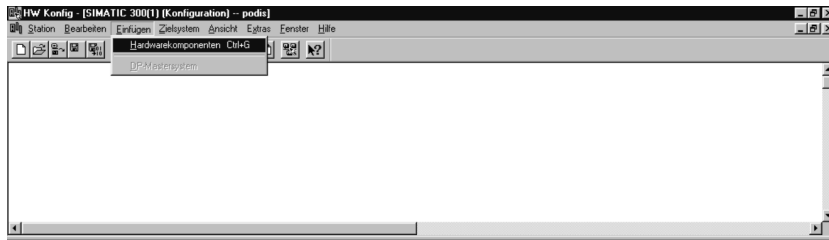
The following installation configuration serves as an example:



6.4.1 Creating the hardware configuration

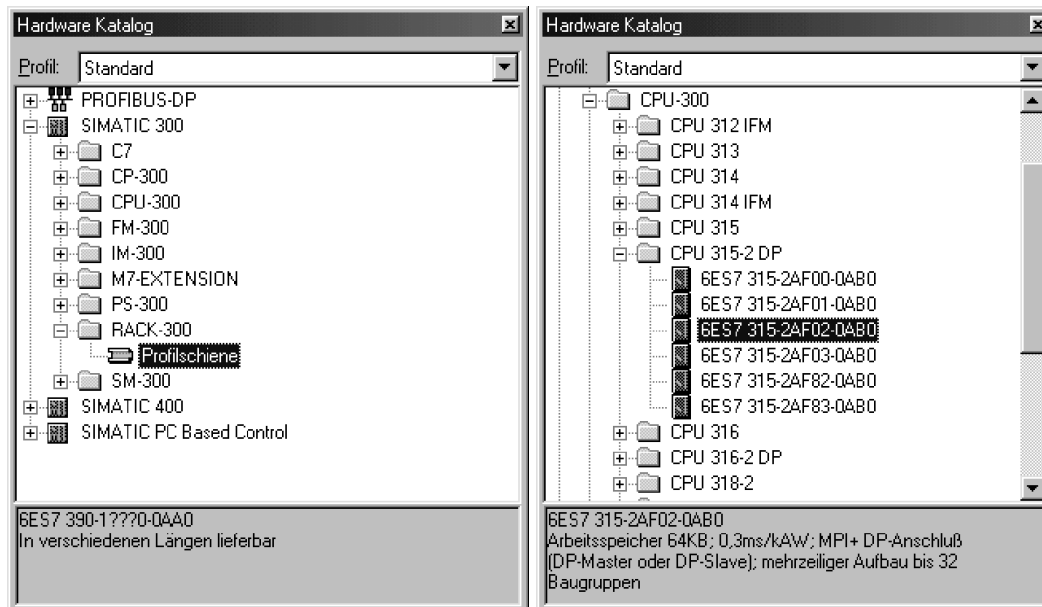
Create the graphic representation of your automation system.

Example: Controller from the S7-300 range: CPU 315-2 DP



The hardware catalog appears from which you select components in order to assemble the S7 controller.

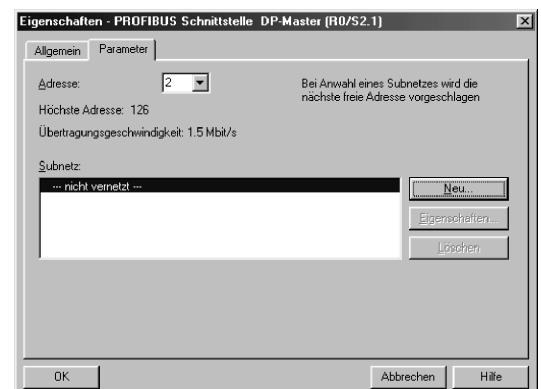
Select a DIN rail (RACK-300) and a power supply unit (PS-300).
Select the controller S7-CPU (CPU 315-2 DP).



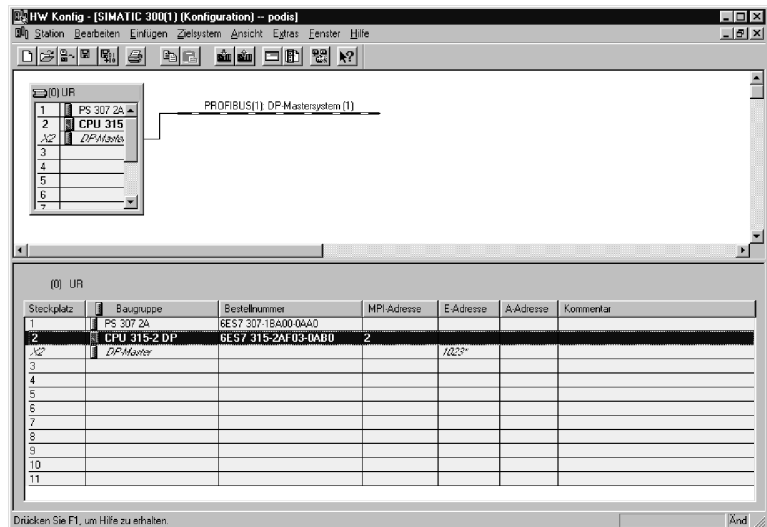
When this CPU is selected, a dialog box appears in which you must specify a PROFIBUS network (see diagram on right-hand side).

Enter the bus address of the DP master. The DP master is already integrated in the PLC that you have selected and requires an address as do all the other devices.

In the "Subsystem" dialog, you define the basic physical data of the PROFIBUS DP network as you wish to use it. Press the "New" button and select the baud rate that is to be used. A subsystem is defined when you exit this dialog.



Once you have carried out this configuration step, you project screen appears as follows:



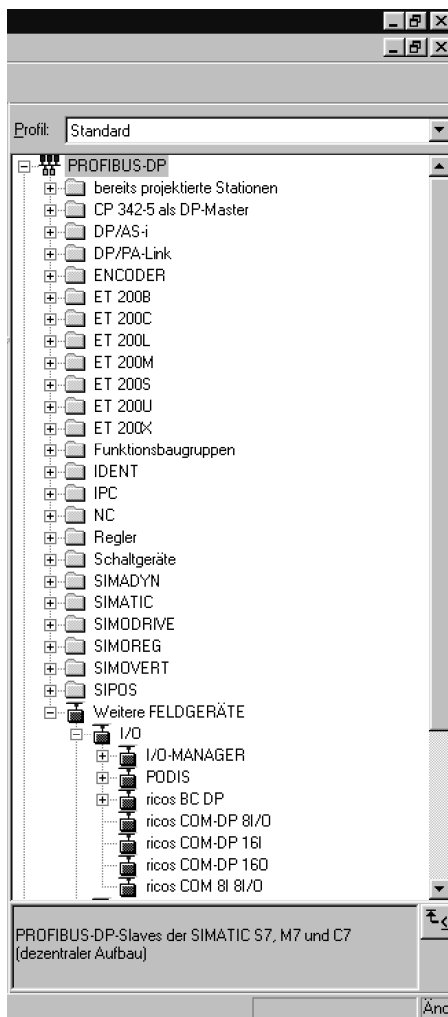
You have now configured the PROFIBUS DP network and the DP master. The next step is to integrate the **podis® DRIVE** devices.

To do this, click once on the DP master system (thick black/white line). This line then becomes a thick transparent black line.

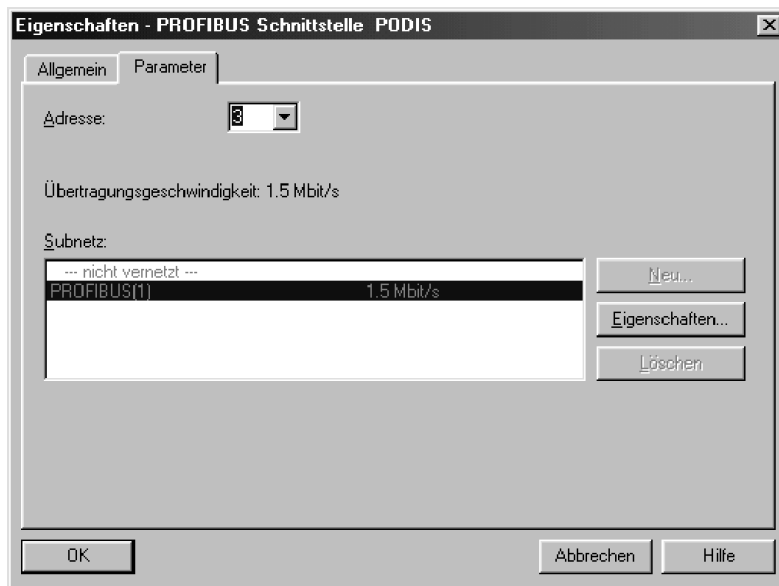
6.4.2 Inserting the **podis® DRIVE** devices into the PROFIBUS system

Select "Further FIELD DEVICES" from the hardware catalog under "PROFIBUS-DP" and then select "PROFIBUS interface" from the submenu "I/O" (see screenshot on left-hand side).

You insert a **podis® DRIVE** bus coupler into the PROFIBUS system by double clicking on the PODIS components.



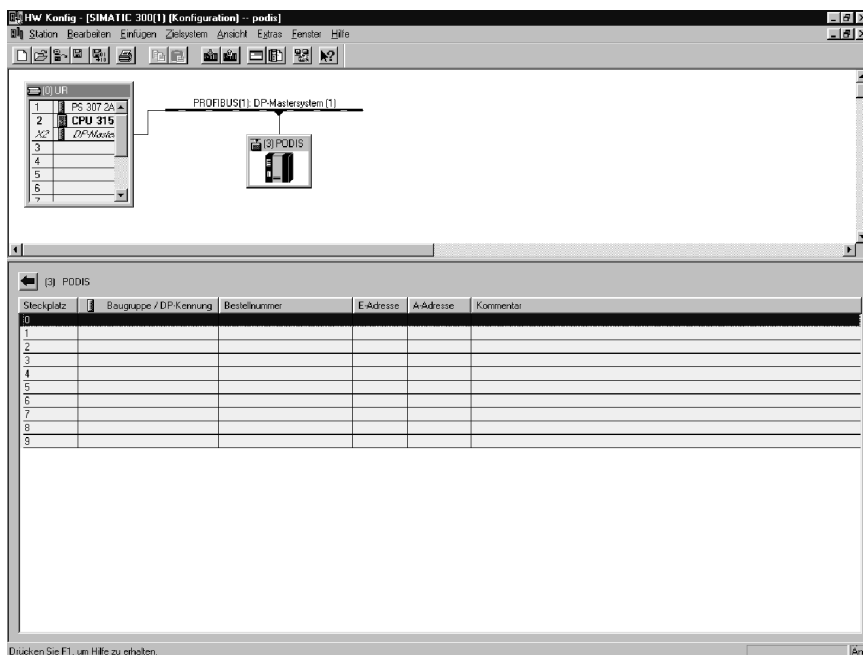
The address of the PROFIBUS DP slave should be assigned next:



NOTE

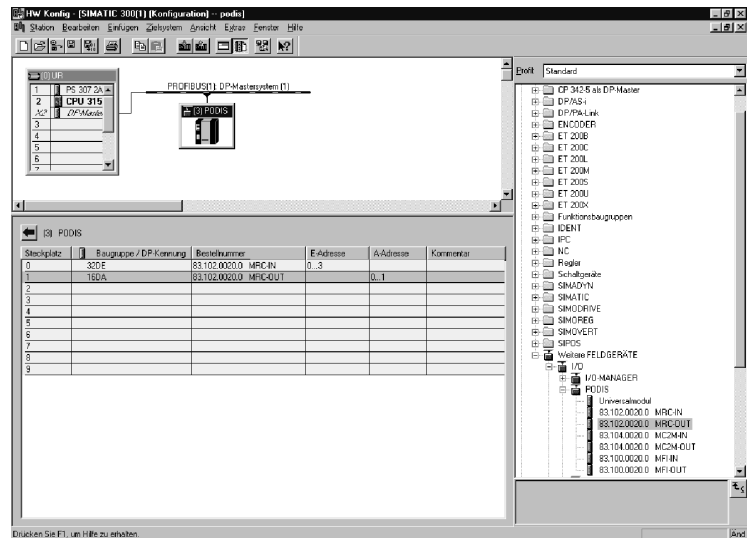
The PROFIBUS DP slave address must be set at the bus coupler and must match the address configured here.

After confirming with "OK", a **podis® DRIVE** DP slave is displayed with 10 empty module locations.

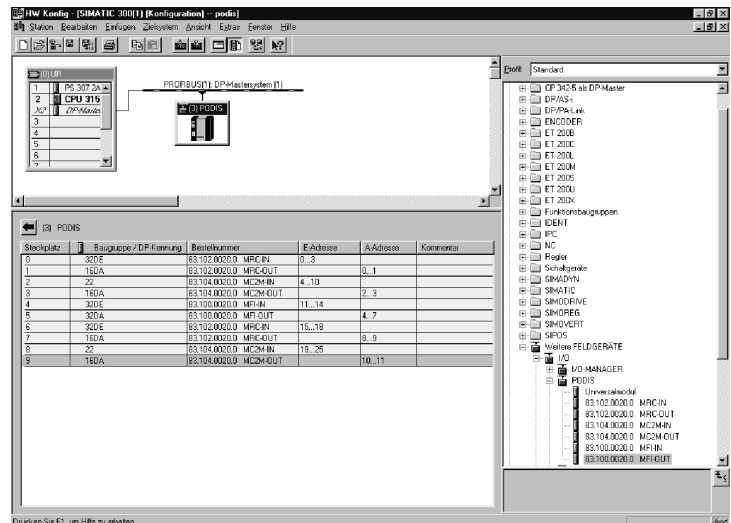


The individual **podis® DRIVE** motor control units are now inserted. The device with the PROFIBUS interface, the MRC, is the first device to be inserted.

The input range (MRC-IN) is configured first followed by the output range (MRC-OUT):



The remaining extension devices that are connected to the PROFIBUS slave via the local bus are inserted in the same way.



The configuration menu has automatically assigned input and output addresses for the configured **podis® DRIVE** devices.

In the example:

<i>Module location</i>	<i>Device</i>	<i>Input addresses</i>	<i>Output addresses</i>
0/1	MRC	E 0.0 .. E 3.7	A 0.0 .. A 1.7
2/3	MC2M	E 4.0 .. E 10.7	A 2.0 .. A 3.7
4/5	MFI	E 11.0 .. E 14.7	A 4.0 .. A 7.7
6/7	MRC	E 15.0 .. E 18.7	A 8.0 .. A 9.7
8/9	MC2M	E 19.0 .. E 25.7	A 10.0 .. A 11.7

The individual devices can be controlled and monitored by the application program via these addresses.

After clicking on the **podis**® bitmap, a hardware list appears at the bottom on the left where the existing motor control units are now entered. 5 module locations (0 to 4) are defined. The module location 0 always represents the motor control unit that is switched directly on the PROFIBUS. Module locations 1 to 4 are the motor control units that run via the internal subsystem bus.

Entry of the motor control units

Once you have entered all the relevant devices for the application, you must define the input and output addresses in the appropriate column as well as the required parameterisation. You access the corresponding menu by double clicking on the motor control units in the list.

The start address must be defined. The end address is produced from the control functionality used (MFI, MRC, MC2M) and its specified I/O byte size. The respective sizes are listed and explained in section 6.6.

The parameterisation is carried out accordingly. After selecting the button "Parameterisation", the relevant parameters appear for the selected control unit:

Type	Parameter data	Value range	Value	Default
MFI	PWM frequency	4, 8, 12, 16, 20	kHz	4 kHz
	Motor thermistor	ON/OFF		Enable PTC
	Max. speed	0...255	63.75 Hz	255
	Boost factor	1...64		10
	Stalling current	0...255		50
	Mains frequency	50 Hz / 60 Hz	Hz	50
	Mains voltage	400 V / 500 V	V	400
MRC	Minimum current	0...180	Max. 3.6 A	0
	Nominal current	0...180	Max. 3.6 A	50
	Asymmetry	0...100	In %	1
	Operating time	I^2t	1...255	10
MC2M	Motor 1: Minimum current	0...180	Max. 3.6 A	0
	Motor 1: Nominal current	0...180	Max. 3.6 A	50
	Motor 1: Asymmetry	0...100	In %	1
	Motor 1: Operating time	I^2t	1...255	10
	Motor 2: Minimum current	0...180	Max. 3.6 A	0
	Motor 2: Nominal current	0...180	Max. 3.6 A	50
	Motor 2: Asymmetry	0...100	In %	1
	Motor 2: Operating time	I^2t	1...255	10

The adjustable ramp time and further data for the frequency inverter MFI are written directly into the corresponding output bytes via the application program. Once all the data has been entered, the network configuration and parameterisation is complete. Store all the data and return to the project menu.

6.5 Allocating the input and output bytes

The motor starters are assigned parameters via the menu item "Edit/Object properties". The assignment of input and output bytes for each motor control unit can be found on the following pages.

6.5.1 MC2M

6.5.1.1 Input bytes

Byte	Bit	Short code	Description
0	0	E0	Binary input E0
	1	E1	Binary input E1
	2	E2	Binary input E2
	3	E3	Binary input E3
	4	E4	Binary input E4
	5	E5	Binary input E5
	6	E6	Binary input E6
	7	E7	Binary input E7
1	0	ERRPHASE_1	Phase failure or unbalance. The bit is set if the difference between two currents exceeds the phase unbalance value. If the bit is set, the motor is disconnected and the brake is applied
	1	WARNCRRNT_1	Transient occurrence of excess current. If the "Starting current" value during start-up exceeds the "Max. current" value during operation, the bit is set to 1. The bit is automatically deleted if the event no longer exists
	2	ERRCRRNT_1	Overcurrent disconnection. If the energy level specified by "Max. current" and "Max. time" is exceeded, the motor is disconnected and the brake is applied
	3	MINCRRNT_1	Value is below minimum current. The bit is set if there is an underflow in the "Min. current" when the motor is started. This bit can be used to display the failure of all 3 phases or to indicate that no loads are connected to the motor starter. It is automatically reset if the event no longer exists
	4	COMERR_1	Communication error. The bit is set if invalid commands are generated due to false inputs or synchronisation errors. It is automatically reset if the event no longer exists
	5	ENDSTUFE_1	Indicates the status of the control bit "Output module ON"
	6		Not used, always 0
2	7	RUN	Bus coupler is running
		Reserved	
3		ACTUAL_CURRENT_1	Actual current of motor 1, range 0 mA – 5.1 A in units of 20 mA (250 => 5.0 A)
4	0	ERRPHASE_2	Phase failure or unbalance. The bit is set if the difference between two currents exceeds the phase unbalance value. If the bit is set, the motor is disconnected and the brake is applied
	1	WARNCRRNT_2	Transient occurrence of excess current. If the "Starting current" value during start-up exceeds the "Max. current" value during operation, the bit is set to 1. The bit is automatically deleted if the event no longer exists
	2	ERRCRRNT_2	Overcurrent disconnection. If the energy level specified by "Max. current" and "Max. time" is exceeded, the motor is disconnected and the brake is applied

Byte	Bit	Short code	Description
4	3	MINCRRNT_2	Value is below minimum current. The bit is set if there is an underflow in the "Min. current" when the motor is started. This bit can be used to display the failure of all 3 phases or to indicate that no loads are connected to the motor starter. It is automatically reset if the event no longer exists
	4	COMERR_2	Communication error. The bit is set if invalid commands are generated due to false inputs or synchronisation errors. It is automatically reset if the event no longer exists
	5	ENDSTUFE_2	Indicates the status of the control bit "Output module ON"
	6		Not used, always 0
5	7	Reserved	Not used, always 0
6		ACTUAL_CURRENT_2	Actual current of motor 2, range 0 mA – 5.1 A in units of 20 mA (250 => 5.0 A)

6.5.1.2 Output bytes

Byte	Bit	Short code	Description
0	0	A0	Binary output A0
	1	A1	Binary output A1
	2		Not used, always 0
	3		Not used, always 0
	4		Not used, always 0
	5		Not used, always 0
	6		Not used, always 0
1	7		Not used, always 0
	0	ENABLE_1	Enable / Delete error, motor 1
	1	MOT_EIN_1	Motor 1 ON (direction dependent on phase of supply)
	2		Not used, always 0
	3		Not used, always 0
	4	ENABLE_2	Enable / delete error, motor 2
	5	MOT_EIN_2	Motor 2 ON (direction dependent on phase of supply)
	6		Not used, always 0
	7	ERR_QUITT	Acknowledge error

6.5.2 MRC

6.5.2.1 Input bytes

Byte	Bit	Short code	Description
0	0	E0	Binary input E0
	1	E1	Binary input E1
	2	E2	Binary input E2
	3	E3	Binary input E3
	4	E4	Binary input E4
	5	E5	Binary input E5
	6	E6	Binary input E6
	7	E7	Binary input E7
1	0	ERRPHASE	Phase failure or unbalance. The bit is set if the difference between two currents exceeds the phase unbalance value. If the bit is set, the motor is disconnected and the brake is applied
	1	WARNCRRNT	Transient occurrence of excess current. If the "Starting current" value during start-up exceeds the "Max. current" value during operation, the bit is set to 1. The bit is automatically deleted if the event no longer exists
	2	ERRCRRNT	Overcurrent disconnection. If the energy level specified by "Max. current" and "Max. time" is exceeded, the motor is disconnected and the brake is applied
	3	-	Not used, always 0
	4	COMERR	Communication error. The bit is set if invalid commands are generated due to false inputs or synchronisation errors. It is automatically reset if the event no longer exists
	5	ENDSTUFE	Indicates the status of the control bit "Output module ON"
	6		Not used, always 0
2	7	RUN	Bus coupler is running
			Reserved
3		ACTUAL_CURRENT	Actual current of motor, range 0 mA – 5.1 A in units of 20 mA (250 => 5.0 A)

6.5.2.2 Output bytes

Byte	Bit	Short code	Description
0	0	A0	Binary output A0
	1	A1	Binary output A1
	2		Not used, always 0
	3		Not used, always 0
	4		Not used, always 0
	5		Not used, always 0
	6		Not used, always 0
1	7		Not used, always 0
	0	ENABLE	Enable / Delete error
	1	RIGHT	Clockwise rotation (direction dependent on phase of supply)
	2	LEFT	Anti-clockwise rotation (direction dependent on phase of supply)
	3		Not used, always 0
	4	BRAKE	Ventilate brake
	5		Not used, always 0
2	6		Not used, always 0
	7	ERR_QUITT	Acknowledge error

6.5.3 MFI

6.5.3.1 Input bytes

Byte	Bit	Short code	Description
0	0	E0	Binary input E0
	1	E1	Binary input E1
	2	E2	Binary input E2
	3	E3	Binary input E3
	4	E4	Binary input E4
	5	E5	Binary input E5
	6	E6	Binary input E6
	7	E7	Binary input E7
1	0	ERRPHASE	Phase failure or unbalance. The bit is set if the difference between two currents exceeds the phase unbalance value. If the bit is set, the motor is disconnected and the brake is applied
	1	WARNCRRNT	Transient occurrence of excess current. If the "Starting current" value during start-up exceeds the "Max. current" value during operation, the bit is set to 1. The bit is automatically deleted if the event no longer exists
	2	BKROVR_CRRNT	Stalling current is exceeded
	3		Not used, always 0
	4	COMERR	Communication error. The bit is set if invalid commands are generated due to false inputs or synchronisation errors. It is automatically reset if the event no longer exists
	5	ENDSTUFE	Indicates the status of the control bit "Output module ON"
	6	LADERELAIS	Indicates the status of the control bit "Charging relay", 1 = OK
	7	RUN	Bus coupler is running
2	0	WARN_TEMP	Temperature warning
	1	ERR_TEMP	Excess temperature disconnection
	2	ERR_TEMP_MOT	Excess temperature of motor (thermistor)
	3		
	4		
	5		
	6	ERR_RELAIS	Error with charging relay
	7	ERR_BRAKE	Error with braking relay
3		ACTUAL_CURRENT	Actual current of motor, range 0 mA – 5.1 A in units of 20 mA (250 => 5.0 A)

6.5.3.2 Output bytes

Byte	Bit	Short code	Description
0	0	A0	Binary output A0
	1	A1	Binary output A1
	2		Not used, always 0
	3		Not used, always 0
	4		Not used, always 0
	5		Not used, always 0
	6		Not used, always 0
	7		Not used, always 0
1	0	ENABLE	Enable / Delete error
	1	RIGHT	Clockwise rotation (direction dependent on phase of supply)
	2	LEFT	Anti-clockwise rotation (direction dependent on phase of supply)
	3		Not used, always 0
	4	BRAKE	Ventilate brake
	5		Not used, always 0
	6		Not used, always 0
	7	ERR_QUITT	Acknowledge error
2		N_SOLL	Frequency setting in 1/4 Hz increments, range 0-255 => 0 Hz – 63.75 Hz (e.g. 240 => 60 Hz)
3		T_RAMPE	Setting for ramp time in s, range 0-255 => factor (1 bit = 0.552 s e.g. 240 => 132.48 s)

Explanations and examples of setpoint speed

Setpoint speed

Input of setpoint speed in 0.25 Hz increments.
Range: 0 Hz – 63.75 Hz

Example 1: Acceleration and retention at one speed, clockwise and anti-clockwise rotation, ramp unchanged

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Clockwise speed

Anti-clockwise speed

Explanation of example 1

Range	Control bits			Ramp	Speed	Motor	Explanation
	Enable	Right	Left				
[A]	1	1	0	5	0	Stationary	Enable and clockwise rotation HIGH, ramp preset: motor is stationary as a speed has not yet been indicated
[B]	1	1	0	5	200	Accelerates right	Motor accelerates with preset ramp until it reaches indicated speed (in this case 200dec = 50 Hz)
[C]	1	1	0	5	200	Rotates clockwise at a constant speed	Speed is reached, motor speed remains unchanged
[D]	1	1	0	5	0	Gradually slows down until it stops	Motor brakes with preset ramp until it reaches a standstill (same ramp as for acceleration)
[E]	1	0	1	5	0	Stationary	Enable and anti-clockwise rotation HIGH, ramp preset: motor is stationary as speed 0 has been reached and no new speed has been indicated
[F]	1	0	1	5	200	Accelerates left	Motor runs with preset ramp until it reaches indicated speed
[G]	1	0	1	5	200	Rotates clockwise at a constant speed	Speed is reached, motor speed remains unchanged
[H]	1	0	1	5	0	Gradually slows down until it stops	Motor slows down with preset ramp until it reaches a standstill (same ramp as for acceleration)

Notes regarding example 1

- Braking with the set ramp until the motor reaches a standstill is only possible if the speed value 0 (zero) is preset while the motor is in motion (ranges [D] or [H]).
- If the enable or direction of rotation is set to LOW, the motor stalls abruptly – regardless of the ramp.
- The ramp can be modified during operation. It is therefore possible to set different acceleration and braking times (e.g. acceleration in 6 seconds, braking in 3 seconds).

Example 2: Stepwise acceleration with retention at one speed, only clockwise rotation, ramp unchanged

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Clockwise speed

Anti-clockwise speed

Explanation of example 2

Range [K]	Control bits			Ramp 5	Speed 0	Motor Stationary	Explanation
	Enable 1	Right 1	Left 0				
[L]	1	1	0	5	50	Accelerates right	Enable and clockwise rotation HIGH, ramp preset: motor is stationary as a speed has not yet been indicated Motor accelerates with preset ramp until it reaches indicated speed (in this case 50dec = 12.5 Hz)
[M]	1	1	0	5	50	Rotates clockwise at a constant speed	Speed is reached, motor speed remains unchanged
[N]	1	1	0	5	200	Further accelerates right	Motor accelerates further with preset ramp until it reaches indicated speed (in this case 200dec = 50 Hz, same ramp as for acceleration)
[O]	1	0	0	5	200	Rotates clockwise at a constant speed	Speed is reached, motor speed remains unchanged
[P]	1	0	0	5	150	Gradually slows down until it reaches given speed	Motor brakes with preset ramp until it reaches a standstill (in this case 150dec = 37.5 Hz, same ramp as for acceleration)
[Q]	1	1	0	5	150	Rotates clockwise at a constant speed	Speed is reached, motor speed remains unchanged
[R]	1	1	0	5	0	Slows down	Motor brakes with preset ramp until it reaches a standstill (same ramp as for acceleration)
[S]	1	1	0	5	0	Stationary	Enable and clockwise rotation HIGH, ramp preset: motor is stationary as no speed has been indicated

Notes regarding example 2

- Braking with the set ramp until the motor reaches a standstill is only possible if the speed value 0 (zero) is preset while the motor is in motion (range [R]).
- If the enable or direction of rotation is set to LOW, the motor stalls abruptly – regardless of the ramp.
- The ramp can be modified during operation. It is therefore possible to set different acceleration and braking times (e.g. acceleration in 6 seconds, braking in 3 seconds).

Explanations and examples of ramp time

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Kennlin_MFI_rampenzeit_vs
Dezimalwert_rampe 01

Ramp time

The value used to select the ramp time is determined with the following characteristic curve:

Acceleration ramp as function of the set value

Period until final speed (s)

Parameter value "Ramp" (decimal)

Line equation:

$$t = 0.4653 \times \text{dec} + 0.6741$$

(t = time in seconds; dec = parameter value, decimal)

i The ramp time applies both to the
NOTE acceleration and deceleration ramp.

The decimal parameter value is calculated as follows:

$$\text{dec} = (t - 0.674) / 0.465$$

(t = time in seconds, dec = parameter value, decimal)

Example 1

The motor should reach its nominal speed after 70 seconds.

$$\text{Parameter value dec} = (70 - 0.674) / 0.465 = 149$$

Further parameters such as the boost factor, load and nominal current do not play a role in the ramp time. It should be noted that the ramp time cannot be maintained if the setting for the nominal current is too low.

If the nominal current is exceeded, it is reset and the speed is not reached.

Example 2

Which ramp value X must be set so that a motor rotates with a nominal speed (idling) of 1850 U/min (63 Hz) after 50 sec with 925 U/min (25 Hz)?

Parameter value

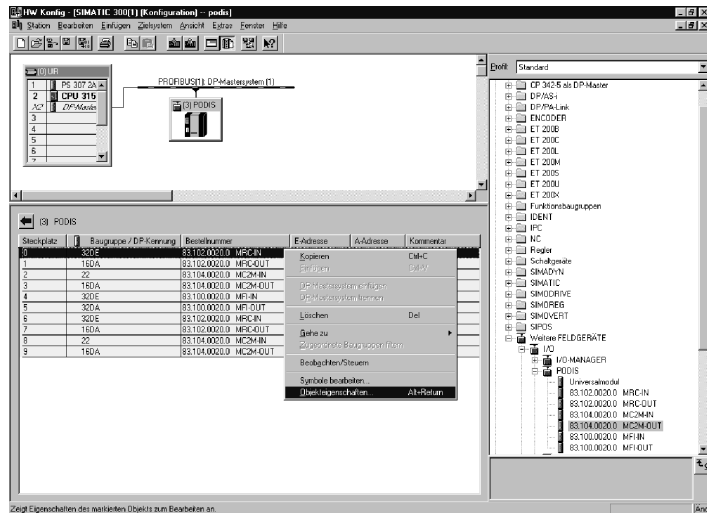
$$\text{dec} = (50 - 0.674) / 0.465 \times 1850/925 = 212.15$$

This figure is rounded up to 212 and becomes the ramp value.

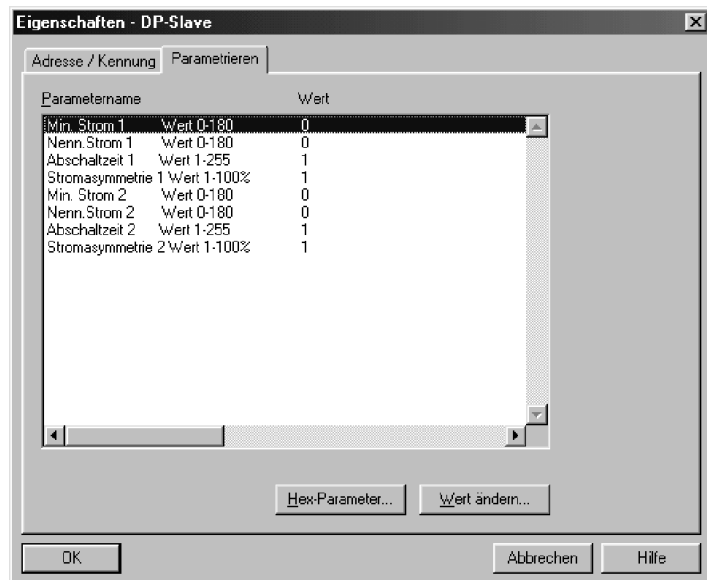
6.6 Parameterisation

The parameters of the **podis® DRIVE** devices are defined on the following pages using the configuration software.

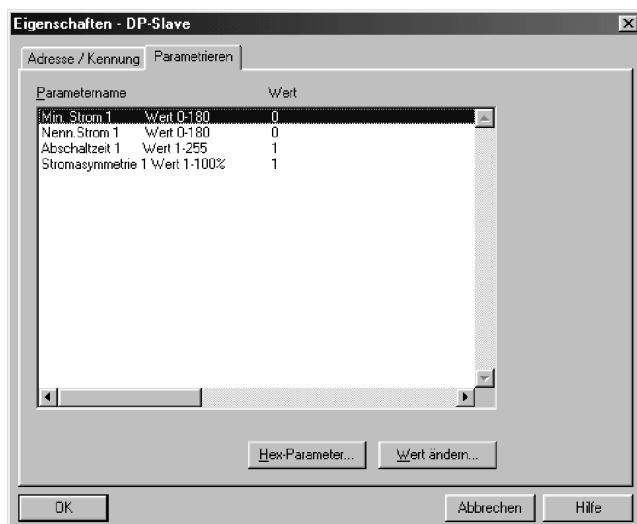
The parameterisation is carried out via the input ranges of the **podis® DRIVE** devices (MRC-IN, MC2M-IN, MFI-IN).



6.6.1 Parameter description for MRC and MC2M



Screenshot of default parameters for **podis® MC2M**



Screenshot of default parameters for **podis®** MC2M

Current characteristic curve

The current characteristic curve is used to convert a current value in the range 0 to 3.5 A into a decimal value in the range 0 to 180. It is required to preset the minimum current and nominal current for the types MRC and MC2M.

Current as a function of the set digital value (MRC, MC2M)

Load current in A/AC

Digital value Dec

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Kennlin_MRC_MC2M_Dezimal
wert_vs_Lastrom_01

Line equation:

$$I = 0.0186 \times \text{dec} + 0.267$$

$$\text{dec} = (I - 0.267) / 0.0186$$

(I = nominal current of motor, dec = decimal value)

Example

The nominal motor current is 2 A according to the nameplate. The associated decimal parameter is 94.

Min. current 1 / Min. current 2

Adjustable value range (decimal) 0...180

Value range (physical variable) 0 A...3.5 A

Factory setting 0

The parameter "Min. current 1" or "Min. current 2" determines the minimum setting for the motor current if a **podis®DRIVE** device is switched on. This is used to monitor the motor connecting cable (wire breakage, loose connecting plug).

A preset value > 0 activates this monitoring function. If the **podis®DRIVE** device is triggered by the motor connecting cable being removed, the error bit "MINCRRNT" is set in the input range.

If the values are left at "Min. current 1 = 0" or "Min. current 2 = 0", no error message appears in the display or in the status byte if the cable is removed or the motor is not connected when it is switched on.

Nom. current 1 / Nom. current 2

Adjustable value range (decimal) 0...180

Value range (physical variable) 0 A...3.5 A

Factory setting 50

Recommended values:

Current value from nameplate of motor, conversion according to diagram "Current as function of set digital value" or relevant line equation

This parameter is used to monitor the motor current.

Disconnection time 1 / Disconnection time 2

Adjustable value range 1...255

Value range (physical variable) 1...255

Factory setting 10

Recommended values:

Motors up to 0.37 kW: 10...150

Motors up to 0.75 kW: 30...100

Motors > 0.75 kW: 30...50

Factor for the overcurrent protection is required to calculate the I^2t characteristic curve and the maximum current.

The trigger time for the protective device is influenced via the parameter "Disconnection time" according to the diagram.

Trigger time as a function of the excess current

Trigger time in sec

Time parameter 30 dec

I/I_e motor current/nominal current

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Kennlinie_MRC-
MC2M_Abschaltzeit_Überstrom

Example

If the motor current reaches twice the nominal current (motor current/nominal current = 2), the protective device should be tripped after 4 seconds.

As indicated in the characteristic curve, this behaviour is reached with the parameter value 50 dec.

Current asymmetry 1 / Current asymmetry 2

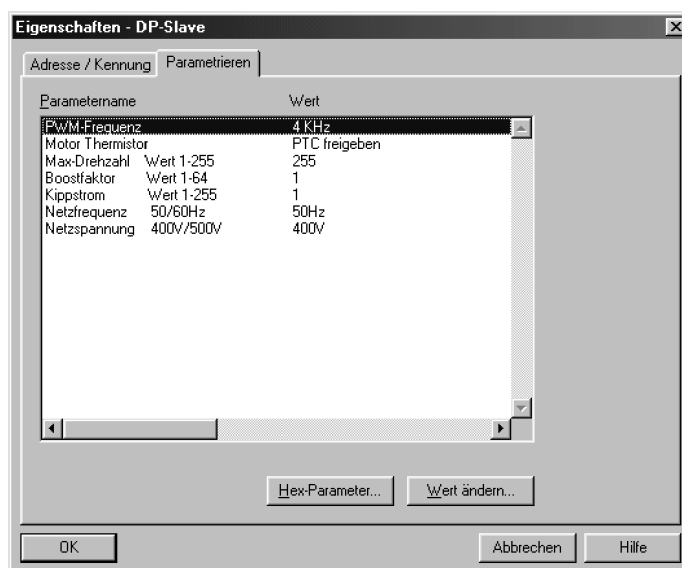
Adjustable value	1...100
Value range (physical variable)	100%...1%
Factory setting	1
Recommended values	1

Percentage value by which the motor current can deviate in the individual phases.

When connecting a brake with its own power supply, you must adapt the asymmetric limit value as the brake voltage is derived asymmetrically from a phase.

If the current deviates by more than the given percentage value, the error bit "ERRPHASE" (phase failure) is set in the input range.

6.6.2 Parameter description for MFI



Screenshot of default parameters for *podis*® MFI

PWM frequency

Adjustable value range (decimal) 4 kHz, 8 kHz, 12 kHz, 16 kHz, 20 kHz

Value range (physical variable) 4 kHz, 8 kHz, 12 kHz, 16 kHz, 20 kHz

Factory setting: 4 kHz

Recommended value: application-dependent

A variation in the PWM frequency is used to change either the power or noise generation. Lower frequencies enable a higher temperature-limited output power in connection with greater noise generation (see "Derating").



Motor thermistor

Adjustable value range Enable/disable PTC

Value range Enable/disable PTC

Factory setting Enable PTC

Recommended values:

For motor protection: Enable PTC

A connected thermistor (PTC) is evaluated depending on this setting.



CAUTION

To guarantee motor protection, a thermistor must be connected and this parameter must be set to "Enable PTC".

Max. speed

Adjustable value range (decimal)	1...255
Value range (physical variable)	0.25 Hz ... 63.7 Hz
Factory setting	255
Recommended values	120 to 255

**CAUTION**

In the case of speeds below the nominal speed, ensure that the motor is cooled sufficiently.

This parameter should for example be set to 200 if the connected drive is to be operated with a maximum of 50 Hz. The frequency can be increased and decreased in increments of 0.25 Hz. The motor speed is then adjusted according to the number of poles and slip frequency.

Boost factor

Adjustable value range (decimal)	1...64
Value range (physical variable)	0%...25%
Factory setting	10
Recommended values	5...64

Used to increase the rotational torque (by increasing the voltage) at low speeds.

U/f characteristic curve for podis MFI U/U_{nom} **Boost factor (0...25% of nominal voltage)**

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Kennlin_MFI_U_vs_f_boost_01

At a nominal voltage of 400 V, the boost factor would be max. 100 V. The U/f line starts with 100 V at 0 Hz and rises to 50 Hz at 400 V (see U/f characteristic curve).

The voltage increase can be max. 25% of the nominal voltage e.g. at a nominal voltage of 400 V, it would be 100 V. This leads to a better torque curve in the lower speeds – the motor can accelerate at a faster rate.

The boost factor influences the U/f characteristic curve of the frequency inverter. When the motor is started, the motor voltage is increased until the motor current exceeds the nominal motor current by the figure indicated here.

The motor is however placed under a greater load than permitted. The boost factor must therefore be set carefully (see flow chart on page 6-27).

Nominal current

Recommended values for nominal current for standard three-phase asynchronous motors up to 0.75 kW

Nominal motor power (kW)	Nominal current value (decimal)
0.11	39
0.15	45
0.18	50
0.25	61
0.37	80
0.55	109
0.75	140

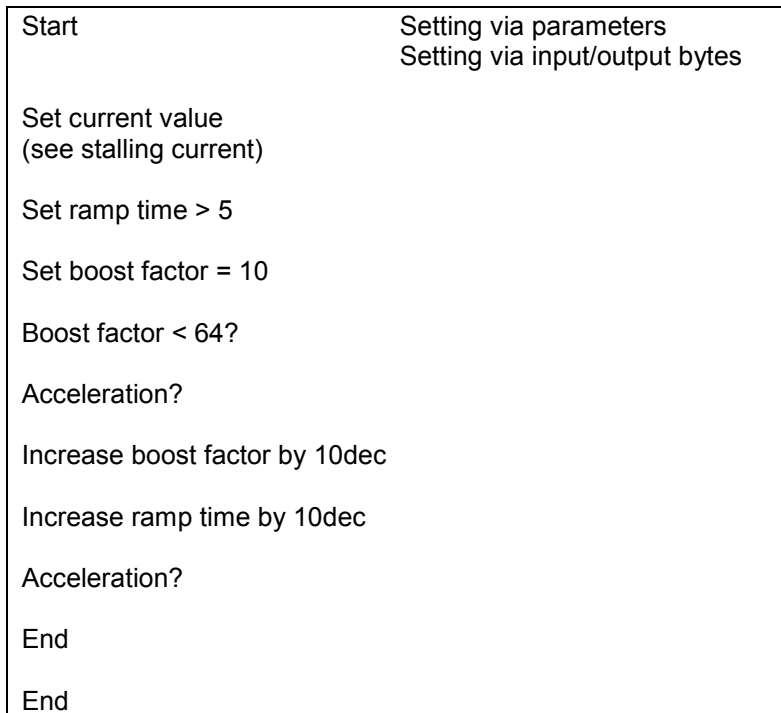
Adjustable value range (decimal)	1...255
Value range (physical variable)	internal variable
Recommended values	see table

Used to protect the motor by setting the maximum current.

Mains frequency

Adjustable value range (decimal)	50 Hz or 60 Hz
Value range (physical variable)	50 Hz or 60 Hz
Recommended values	Europe: 50 Hz (default) USA: 60 Hz

The setting of the mains frequency is used for adaptation to country-specific conditions.



**Flow chart for configuring
and assigning parameters
to *podis*® MFI**

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Possible causes if the motor does not start up:

- Motor current has been set too low
- Motor load is too high
- Boost value is too high, motor is saturated
- Electrical wiring is incorrect

Error displays in the status byte and LED display on the bus coupler

- Error flag "Overcurrent" is set during the start-up
 - ➔ increase boost
 - ➔ increase ramp time
- Overcurrent disconnection set
 - ➔ motor saturated, disconnection due to overcurrent
 - ➔ motor stalled (load is too high)

The configuration and parameterisation is complete once all the data has been entered. The project design should be transferred as usual into the controller. After the transfer to the CPU, the bus operation is immediately started, provided that the ***podis*® DRIVE** devices have been connected properly. The fault LEDs on the bus coupler and CPU are extinguished.

6.7 Derating

The maximum output power of the MFI is dependent on the ambient temperature. The following derating curve shows this dependency factor.

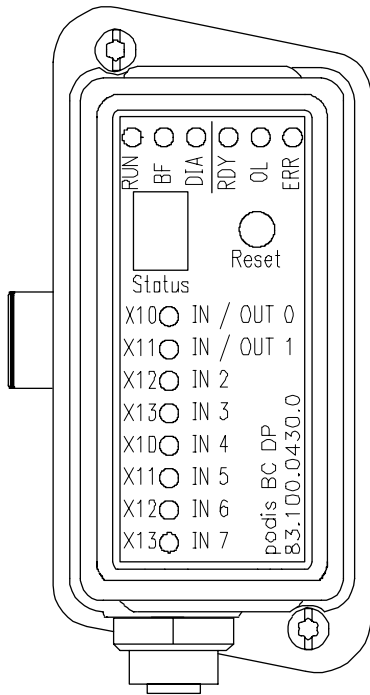
Derating curve for frequency inverter *podis*® MFI

Shaft output in kW

Ambient temperature in °C

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Kennlinie_MFI_Derating_PWM



6.8Diagnostics

6.8.1 Diagnostics on the bus coupler

After the configuration of the master interface and the electrical installation of the **podis**® control unit, the system can be put into operation.

After switching on the operating voltage, the bus coupler checks all the connected functions and the communication interface using a self-test. The existing configuration is then examined. An internal list is created which contains an input and output range, which is shown on the field bus RAM of the protocol chip. During the acceleration phase, the "RUN" LED flashes. After an error-free acceleration, the control unit is set to START mode. The green "RUN" LED signals this state.

In the event of an error, the corresponding LEDs "ERR" or "OL" light up. Using these LEDs, the operating and fault diagnostics of the connected devices can be represented visually. The respective meaning of the symbols can be found in the following table:

6.8.1.1 LED displays on the bus coupler

General bus coupler			
LED	Status	Cause	Corrective measures
RUN	OFF	Bus coupler is not supplied with voltage	Check the power supply for the bus coupler
	Flashing	Bus coupler is in initialisation mode	Change the bus coupler
	ON	Bus coupler OK	
PROFIBUS			
LED	Status	Cause	Corrective measures
BF	OFF	Bus connection OK	
	ON	1. The bus coupler has left the initialisation mode and is ready for parameterisation and configuration by the master. 2. Parameterisation/configuration via the master is faulty. 3. Station address has been set incorrectly. 4. Connection to the master has been physically interrupted (short circuit, wire breakage).	1. Start the PROFIBUS master 2. Check the parameterisation/configuration 3. Check the address setting 4. Check the bus cable
DIA	OFF	No diagnostics have been assigned	
	ON	Diagnostics data is being transferred	

Extension bus			
LED	Status	Cause	Corrective measures
RDY	OFF	No further devices connected to the PROFIBUS slave module	
	ON	Extension modules are connected to the PROFIBUS slave module	
	Flashing (+BF ON)	1. Station address has been set incorrectly on the extension module. 2. The connection between the PROFIBUS slave module and the extension modules has been physically interrupted (wire breakage, short circuit). 3. An extension module or several modules have stopped.	1. Check the address setting 2. Check the bus cable 3. Check and change the bus coupler
Device function			
LED	Status	Cause	Corrective measures
OL	OFF	No overload	
	Flashing	Overload warning	Check motor/configuration
	ON	Overload tripping; for MFI: thermistor (or motor) is not connected	Check motor/configuration
ERR	OFF	Motor starter OK	
	ON	See additional fault information of the 7-segment display (following table)	Rectify error and press reset button, change motor starter if necessary
X10 to X13	ON/OFF	Status of the binary inputs/ outputs	

6.8.1.2 7-segment display on the bus coupler

Display	Motor starter	Cause
	MC2M	Motor 1 ON
	MRC, MFI	Motor – clockwise rotation
	MC2M	Motor 2 ON
	MRC, MFI	Motor – anti-clockwise rotation
	MC2M	Both motors ON
1 + LED "ERR"	MC2M, MRC, MFI	Fault fuse, phase failure, phase unbalance
2 + LED "ERR"	MC2M, MRC, MFI	Output A0/A1 has short circuit, overload, defect
3 + LED "ERR"	MFI	Device disconnected due to excessive temperature
4 + LED "ERR"	MFI	Mains voltage failure (direct voltage in intermediate circuit)
5 + LED "ERR"	MFI	Fault with braking relay (welded together or not inserted)
6 + LED "ERR"	MC2M, MRC	Reserved
7 + LED "ERR"	MC2M, MRC	Overcurrent monitoring has been triggered
Flashing	MC2M, MRC, MFI	Address ZERO (0) has been set on the PROFIBUS bus coupler (invalid address). Set address > 0

Bilder:
00101460-
001014669

6.8.2 RESET button

The RESET button is located on the front of the bus coupler next to the 7-segment display. If you press it, a RESET is triggered which resets the bus interface and reinitialises the motor starter and any further **podis**® motor control units that are connected via the extension bus.

6.8.3 Diagnostics under PROFIBUS DP

The **podis**® DRIVE PROFIBUS interfaces support extended diagnostics information in addition to the standard 6 byte diagnostics information specified in the norm. This data is in the form of device-related diagnostics signals.

The bus coupler makes the PROFIBUS DP standard diagnostics data available after a request from the master or in the event of an error.

Standard diagnostics data

Byte	Bit	Short code	Description
0	0	non_exist	Slave does not exist (sets master)
	1	station_not_ready	Slave is not ready for data exchange
	2	cfg_fault	Configuration data between master and slave does not match
	3	ext_diag	Extended diagnostics bytes exist
	4		
	5	invalid_slave_response	Always set to 0 by slave
	6	prm_fault	Fault in parameterisation
	7	master_lock	Slave has been parameterised by a master
1	0	prm_req	Slave must be reassigned parameters
	1	stat_diag	Static diagnostics
	2		Always 1
	3	wd_on	Response monitoring active
	4	freeze_mode	Freeze command active
	5	sync_mode	Sync command active
	6		Reserved
	7	slave_deactivated	1 if slave is deactivated by master
2	0...6	Reserved	
	7	ext_diag_overflow	Master or slave has too much diagnostics data
Byte	Description		
3	Master address according to parameterisation		
4	ID number High Byte		
5	ID number Low Byte		

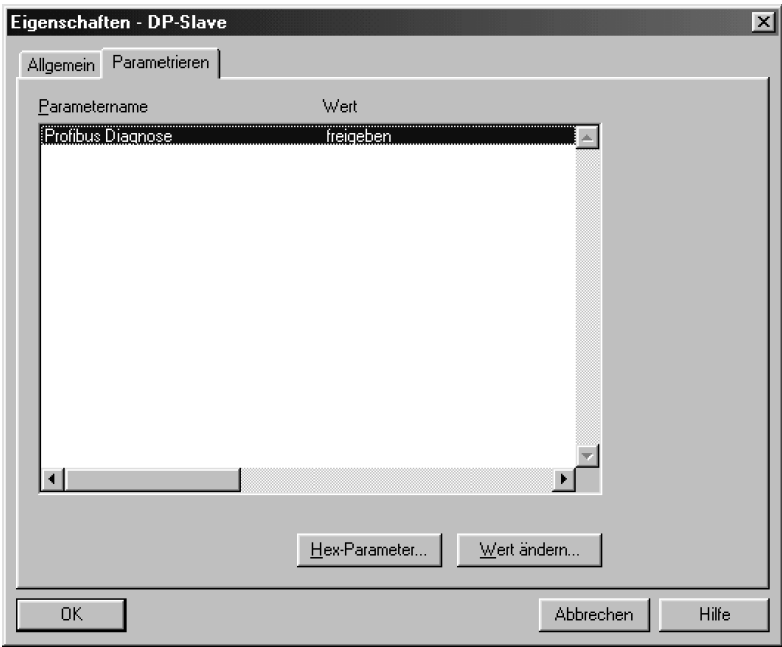
In addition, the **podis® DRIVE** bus coupler can send extended diagnostics data to the master. The extended data has the following structure:

Byte	Bit	Description
6		Length of the identification-related diagnostics
7		Slot location for identification-related diagnostics
8		Length of the device-related diagnostics
9		Status of module slot location 0 Basic module
10		Status of module slot location 0
11		Status of module slot location 1 Extension module 1
12		Status of module slot location 1
13		Status of module slot location 2 Extension module 2
14		Status of module slot location 2
15		Status of module slot location 3 Extension module 3
16		Status of module slot location 3
17		Status of module slot location 4 Extension module 4
18		Status of module slot location 4

Extended diagnostics data

The extended diagnostics function is activated via the menu item "Edit/Object properties":

Activation of the extended diagnostics function



6.9 Start-up and operation

This section describes the start-up of the entire system as well as the points that must be noted when switching on the individual motor starters.

Before you boot up the system, check that the system is ready using the following checklist:

Requirements for start-up

- Are the PROFIBUS/CANLOCAL address settings correct?
- Are all the matching resistors (PROFIBUS and CANLOCAL) installed correctly?
- Has the wiring been looped through correctly?
- Are the motors suitable for the application?
- Are the power supply units suitable?
- Is the phase sequence of the supply connected correctly in the flat cable outlet?
- Have the nominal current values been set?

6.9.1 Complete system start-up

After the configuration of the master interface and the electrical installation of the **podis**® motor control unit, the system can be put into operation.

After switching on the operating voltage, the bus coupler checks all the connected functions and the communication interface using a self-test. The existing configuration is then examined. An internal list is created which contains an input and output range, which is shown on the field bus RAM of the protocol chip. During the start-up phase, the "RUN" LED flashes. After an error-free start-up, the control unit is set to START mode. The green "RUN" LED signals this state.

In the event of an error, the corresponding LEDs "ERR" or "OL" light up. Using these LEDs, the operating and fault diagnostics of the connected devices can be represented visually. The respective meaning of the symbols can be found in the following table.

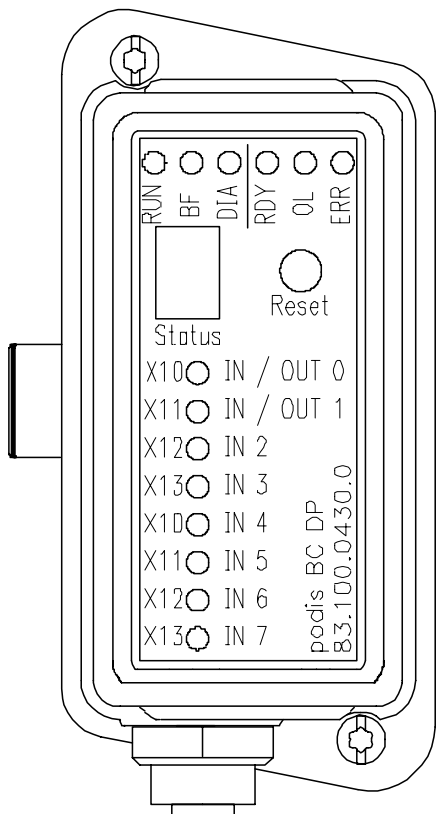
Caution: The start-up time (from when the 24 V power supply is switched on) of the respective bus coupler is approx. 16 seconds.

Displays on the bus coupler

During a normal and error-free start-up of the bus coupler, the following displays are activated once the power supply has been switched on or the RESET button has been pressed (in time sequence):

PROFIBUS	Extension bus	Activity / result
"A", point flashing rapidly ("A" = character in 7-segment display) "P", point flashing slowly	"A", point flashing rapidly ("A" = character in 7-segment display) "P", point flashing slowly	Self-test
Test of all LEDs and the 7-segment display RUN flashing, DIA on H, RUN + DIA on	Test of all LEDs and the 7-segment display RUN flashing, DIA on H, RUN + DIA on	Reading out the programming data from the flash memory Test of the display elements
1[2]3, RUN + DIA on	1[2]3, RUN + DIA on	Conclusion of the self-test Hardware detection of the motor starter is running Hardware detection successfully completed 1 = MFI 2 = MRC 3 = MC2M
RUN + BF + RDY on	RUN + BF + RDY on	Communication test: PROFIBUS and CANLOCAL
RUN on (+ RDY on if one or several CANLOCAL extension modules are present)	RUN + RDY on	Communication with PROFIBUS master or header module established

See chapter 6.8 "Diagnostics" for possible error messages and corrective measures.



6.9.2 Switching on MRC

Prerequisite: A suitable nominal current (> 0) must be set (see chapter 6.6.1 "Parameter description for MRC and MC2M").

Sequence for switching on (operating sequence):

- (1) Enable
- (2) Release brake (brake must be released before [or at the same time as] the direction information is given)
- (3) Right/left (when the three phases have been connected correctly)



CAUTION

When switching directly between right and left, an internal lock-out time in the motor starter of approx. 100 ms should be observed.

Brake	Left	Right	Enable	What is happening	Display	Status byte
0	0	0	0	Motor OFF	OFF	1000 0000
0	0	0	1	Motor OFF – output module is enabled	OFF	1000 0000
1	0	0	0	Motor OFF – brake is ventilated	OFF	
1	0	0	1	Motor OFF, output module is free, brake is ventilated	OFF	1000 0000
1	0	1	1	Motor ON – clockwise rotation	d	1010 0000
1	1	0	1	Motor ON – anti-clockwise rotation	d	1010 0000
1	1	1	1	Invalid state: Motor stalls	OFF	1000 0000

Error	Display	LEDs	Status byte	Diagnostics	Measures
Errvolt	1	ERR	1000 0001	Error in power supply 400 V - mains voltage is missing - phase failure or unbalance Caution after restart: If the 400 V supply is still not present, the error code "1" is also displayed. After switching on the 400 V supply voltage however, the error is automatically acknowledged	Check mains voltage Possible internal fuse defect Reset error with control byte (value 80hex)
Warnccrnt (transient overcurrent)	-	OL	1000 0010	Warning: the motor is experiencing overcurrent - incorrect nominal current set - high-inertia starting of motor - transient overload of the motor	Correct nominal current setting Reset error with control byte (value 80hex)
Errccrnt (overcurrent disconnection)	7	ERR	1000 0100	Motor disconnected due to overcurrent - incorrect nominal current set - motor is blocked	Correct nominal current setting Reset error with control byte (value 80hex)
Comerr (Communication error)	-	-	1001 0000	Display: if faulty communication to the motor starter occurs (due to faulty telegrams or incorrect operator inputs e.g. excessive speed if a low maximum speed has been set)	Error display is automatically reset once the fault has been rectified
Digital output has short circuit	2	ERR	-	Digital output has a short circuit	Remove short circuit Error display is automatically reset once the fault has been rectified

6.9.3 Switching on MC2M

Sequence for switching on (operating sequence):

- (1) Enable
- (2) Motor 1 ON / Motor 2 ON (if the three phases have been connected correctly)

Enable M1 Bit 0	M1 ON Bit 1	Enable M2 Bit 4	M2 ON Bit 5	What is happening	Display	Status byte 1/4
0	0	0	0	Motor M1/M2 OFF	OFF	1000 0000 0000 0000
1	0	0	1	Motor M1/M2 OFF – output module M1 is enabled	OFF	1000 0000 0000 0000
1	1	0	0	Motor M1 ON, M2 is OFF	d	1010 0000 0000 0000
1	1	0	1	Motor M1 ON, output module M2 is enabled	b	1010 0000 0000 0000
1	1	1	1	Motor M1/M2 ON	o	1010 0000 0000 0000

Error	Display	LEDs	Status byte	Diagnostics	Measures
Errvolt M1	1	ERR	1000 0001 0000 0000	Error in power supply 400 V - mains voltage is missing - phase failure or unbalance Caution after restart: If the 400 V supply is still not present, the error code "1" is also displayed. After switching on the 400 V supply voltage however, the error is automatically acknowledged	Check mains voltage Possible internal fuse defect Reset error with control byte (value 80hex)
Warnccrnt M1 (transient overcurrent)	-	OL	1000 0010 0000 0000	Warning: the motor is experiencing overcurrent - incorrect nominal current set - high-inertia starting of motor - transient overload of the motor	Correct nominal current setting Reset error with control byte (value 80hex)
Errccrnt M1 (overcurrent disconnection)	7	ERR	1000 0100 0000 0000	Motor disconnected due to overcurrent - incorrect nominal current set - motor is blocked	Correct nominal current setting Reset error with control byte (value 80hex)
Comerr M1 (Communication error)	-	-	1001 0000 0000 0000	Display: if faulty communication to the motor starter occurs (due to faulty telegrams or incorrect operator inputs e.g. excessive speed if a low maximum speed has been set)	Error display is automatically reset once the fault has been rectified
Errvolt M2	1	ERR	1000 0000 0000 0001	Error in power supply 400 V - mains voltage is missing - phase failure or unbalance Caution after restart: If the 400 V supply is still not present, the error code "1" is also displayed. After switching on the 400 V supply voltage however, the error is automatically acknowledged	Check mains voltage Possible internal fuse defect Reset error with control byte (value 80hex)
Warnccrnt M2 (transient overcurrent)	-	OL	1000 0000 0000 0010	Warning: the motor is experiencing overcurrent - incorrect nominal current set - high-inertia starting of motor - transient overload of the motor	Correct nominal current setting Reset error with control byte (value 80hex)
Errccrnt M2 (overcurrent disconnection)	7	ERR	1000 0000 0000 0100	Motor disconnected due to overcurrent - incorrect nominal current set - motor is blocked	Correct nominal current setting Reset error with control byte (value 80hex)
Comerr M2 (Communication error)	-	-	1000 0000 0001 0000	Display: if faulty communication to the motor starter occurs (due to faulty telegrams or incorrect operator inputs e.g. excessive speed if a low maximum speed has been set)	Error display is automatically reset once the fault has been rectified
Digital output has short circuit	2	ERR	-	Digital output has a short circuit	Remove short circuit Error display is automatically reset once the fault has been rectified

6.9.4 Switching on MFI

Sequence for switching on (operating sequence):

- (1) Enable
- (2) Release brake (brake must be released before the direction information is given)
- (3) Ramps, speed
- (4) Right/left

Brake	Left	Right	Enable	Speed	Ramp	What is happening	Display	Status byte
0	0	0	0	0	0	Motor OFF	OFF	1100 0000
0	0	0	1	0	0	Motor OFF – output module is enabled	OFF	1100 0000
1	0	0	0	0	0	Motor OFF – brake is ventilated	OFF	
1	0	0	1	0	0	Motor OFF – output module is free, brake is ventilated	OFF	1100 0000
1		1	1	0	0	Motor OFF – speed data is missing	d	1110 0000
1	0	1	1	200	0	Motor ON – clockwise rotation with a ramp time of 0 (characteristic curve)	d	1110 0000
1	0	1	1	200	5	Motor ON – clockwise rotation with a ramp time of 5 (characteristic curve)	d	1110 0000
1	1	0	1	200	5	Motor ON – anti-clockwise rotation with a ramp time of 5 (characteristic curve)	b	1110 0000
1	1	1	1	200	5	Invalid state, motor stalls	OFF	1100 0000

Error	Display	LEDs	Status byte	Diagnostics	Measures
Errvolt	1	ERR	11X0 0001 0000 0000	Error in power supply 400 V - mains voltage is missing - phase failure or unbalance Caution after restart: If the 400 V supply is still not present, the error code "1" is also displayed. After switching on the 400 V supply voltage however, the error is automatically acknowledged	Check mains voltage Possible internal fuse defect Reset error with control byte (value 80hex)
Warnccrnt (transient overcurrent)	-	OL	11X0 0010 0000 0000	Warning: the motor is experiencing overcurrent - incorrect nominal current set - high-inertia starting of motor - transient overload of the motor	Correct nominal current setting Reset error with control byte (value 80hex)
Errccrnt (overcurrent disconnection)	7	ERR	11X0 0100 0000 0000	Motor disconnected due to overcurrent - incorrect nominal current set - motor is blocked	Correct nominal current setting Reset error with control byte (value 80hex)
Comerr (Communication error)	-	-	11X1 0000 0000 0000	Display: if faulty communication to the motor starter occurs (due to faulty telegrams or incorrect operator inputs e.g. excessive speed if a low maximum speed has been set)	Error display is automatically reset once the fault has been rectified
Digital output has short circuit	2	ERR	-	Digital output has a short circuit	Remove short circuit Error display is automatically reset once the fault has been rectified
Braking relay error	5	ERR	11X0 0000 1000 0000	Error with braking relay	Check motor connection/cable

Appendix

podis® DRIVE components

Motor control units for PROFIBUS DP (UL, CSA in preparation)			
	Order no.	Box quantity	
2 x direct starter, 400 V AC, total capacity up to 1.5 kW	83.104.0400.0	1	
1 x reverse starter, 400 V AC, up to 1.1 kW	83.102.0400.0	1	
1 x frequency inverter, 400 V AC, up to 0.75 kW	83.100.0400.0	1	
Motor control units for extension bus (UL, CSA in preparation)			
	Order no.	Box quantity	
2 x direct starter, 400 V AC, total capacity up to 1.5 kW	83.104.0100.0	1	
1 x reverse starter, 400 V AC, up to 1.1 kW	83.102.0100.0	1	
1 x frequency inverter, 400 V AC, up to 0.75 kW	83.100.0100.0	1	
IP 65 connector for the motor connection			
	Order no.	Box quantity	
Motor connector for MC2M and MRC	75.011.0053.0	10	
Plastic, light grey, AC 500 V, 16 A			
Scope of supply (components are not preassembled)			
- 1 plug			
- 1 x 11 pole plug insert			
- 11 crimp contacts for wire range 1.5 mm ²			
- 1 screwed gland M25 x 1.5 with NPR sealing insert for cable diameters 9-16 mm			
- 1 NPR sealing insert for cable diameters 13-18 mm			
Motor connector for MFI	75.011.0128.0	10	
Aluminium, AC 500 V, 16 A			
Scope of supply (components are not preassembled)			
- 1 plug with screwed gland PG21, EMC protected, with NPR sealing insert for cable diameters 13-18 mm			
- 1 x 10 pole plug insert, with spring-loaded contacts and PE screw connection for wire ranges of 0.5-2.5 mm ² , single-core to finely stranded, with connector sleeve			
IP 65 prefabricated cables for the motor connection			
	Order no.	Box quantity	
Motor connector for MC2M and MRC			
with PVC cable attached, unshielded			
- 4 x 1.5 mm ² finely stranded ÖLFLEX	5 m	75.011.1405.0	1
- 4 x 1.5 mm ² finely stranded ÖLFLEX	10 m	75.011.1410.0	1
- 8 x 1.5 mm ² finely stranded ÖLFLEX	5 m	75.011.1805.0	1
- 8 x 1.5 mm ² finely stranded ÖLFLEX	10 m	75.011.1810.0	1
Motor connector for MFI			
with PVC cable attached, unshielded			
- 8 x 1.5 mm ² finely stranded ÖLFLEX	5 m	75.011.6803.0	1
- 8 x 1.5 mm ² finely stranded ÖLFLEX	10 m	75.011.6805.0	1

IP 65 connector and prefabricated cables for the bus connection and I/Os		
PROFIBUS connection set, for one control unit	Order no. 83.195.0490.0	Box quantity 1
Consisting of		
- 1 x bus T connector M12, 5 pole plug, coding B		
- 1 x connecting cable PUR 0.3 m, M12, 2 pole, shielded between bus coupler and T connector		
PROFIBUS connection set (bus terminal), for one control unit	83.195.0491.0	1
Consisting of		
- 1 x bus T connector M12, 5 pole plug, coding B		
- 1 x connecting cable PUR 0.3 m, M12, 4 pole, shielded between bus coupler and T connector with a terminating resistor connector		
- 1 x bus terminating resistor connector M12		
Bus T connector	08.000.0226.2	1
M12, 5 pole plug, B coding for PROFIBUS DP		
Bus matching resistor M12	08.000.0230.0	1
Connecting cable PUR 0.3 m	08.000.0229.8	1
From bus coupler to bus T connector		
M12, 2 pole, shielded, for PROFIBUS up to 1.5 Mbaud		
Y connector for digital I/Os	Acquired from Turck or Lumberg	
Connecting cable PUR 0.3 m	08.000.0229.9	1
From bus coupler to bus T connector with a terminating resistor connector		
M12, 4 pole, shielded, for PROFIBUS up to 1.5 Mbaud		
Connecting cable PUR 0.3 m for extension bus	08.000.0226.4	1
2 x M12 socket connectors, 5 pole, shielded		
Connecting cable PUR 1.0 m for extension bus	08.000.0226.5	1
2 x M12 socket connectors, 5 pole, shielded		
Accessories for commissioning and service		
GSD file for PROFIBUS DP	Order no. 00.000.0058.2	Box quantity 1
On 3.5" diskette		
revos MOT working set, in plastic case	95.400.0100.0	1 set
Crimping tool for revos MOT plug-in contacts		
Contents:		
- Basic crimping tool		
- Crimping jaws "B"		
- Contact locator "3"		
- Extracting tool for crimp contacts		
- 200 replacement crimp contacts for 1.5 mm ²		
Crimping tool for revos MOT plug-in contacts, individual		
- Basic crimping tool	95.101.0800.0	1
- Crimping jaws "B"	05.502.2100.0	1
- Contact locator "3"	05.502.3300.0	1
- Extracting tool for crimp contacts	05.502.3500.0	1
- Replacement crimp contacts for 1.5 mm ²	05.543.7221.0	200
Spare parts for motor control units		
Base plate for MC2M	Order no. 83.104.0010.0	Box quantity 1
Base plate for MRC	83.102.0010.0	1
Base plate for MFI	83.100.0010.0	1
Motor starter MC2M, 400 V AC, total capacity up to 1.5 kW	83.104.0020.0	1
Motor starter MRC, 400 V AC, up to 1.1 kW	83.102.0020.0	1
Motor starter MFI, 400 V AC, up to 0.75 kW	83.100.0020.0	1
PROFIBUS DP bus coupler	83.100.0430.0	1
Extension bus coupler	83.100.0130.0	1
Left and right covers	Z7.425.2253.0	2 x 1