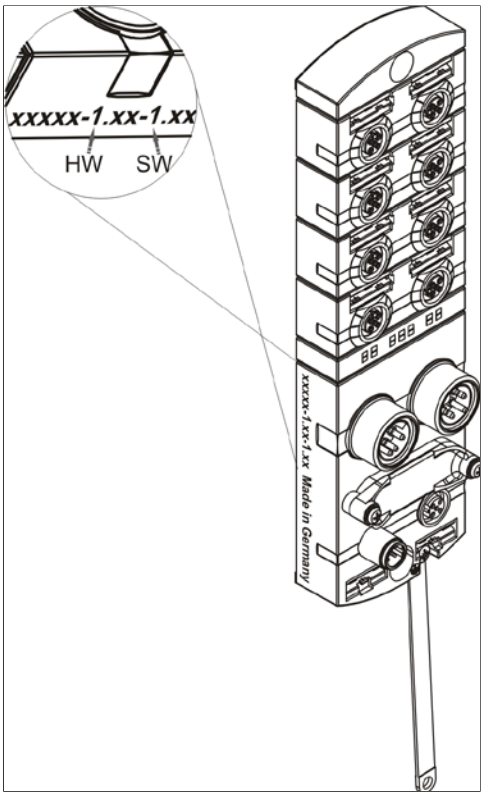
Manual for MVK-MP Modules

For Use with GSD Version 1 and HW/SW Version 1



Art.-No. 55274, MVK-MP DO4 (DO4) DI4 (DI4)
Art.-No. 55290, MVK-MP DO8 (DO8)
Art.-No. 55291, MVK-MP K3 DO4 (DO4) / DIO4 (DIO4)
Art.-No. 55292, MVK-MP AO4 (I) DIO4 (DIO4)
Art.-No. 55293, MVK-MP AI4 (U) DIO4 (DIO4)
Art.-No. 55307, MVK-MP DI8 (DI8)
Art.-No. 55308, MVK-MP DIO8 (DI8)
Art.-No. 55309, MVK-MP DIO8 (DIO8)

Imprint

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Content

1. Important Information

Explanation of Symbols

This manual contains important information that has to be observed in order to guarantee safety and avoid material damage. This information is specially marked and illustrated as follows:

This symbol refers to important information.

CAUTION!

The hazard warning symbol refers to instructions that if not observed, may cause damage to equipment and other objects or, if appropriate precautions are not taken, may result in danger to the user's health or life.

Info texts refer to accessories.

Action

- ➔ An arrow indicates action to be taken.
- ➔ Read and follow the action to be taken.

Designated Use

Read this manual carefully before starting the equipment and keep it in a place that is accessible at any time for all users.

The products described in this manual were developed, manufactured, tested, and documented under strict compliance with safety standards. The equipment poses no danger to operating personnel or material if the handling instructions are complied with. The products meet the requirements of the EMC directive (89/336/EEC) and the machine directive (98/37/EEC) "Safety component".

The products are designed for use in industrial environments. A characteristic of the industrial environment is that the consumers are not directly connected to the public low voltage system. Additional precautions are required for use in residentail, business, and commercial applications.

Troublefree and safe functioning of the product can only be assured through proper transportation, storage, installation, assembly, and operation with proper care and attention.

The designated operation of the equipment is only guaranteed with complete installation of the housing.

Good chemical and oil resistance.

When using aggressive mediums, material resistance based on application must be checked.

The power supply must meet the SELV[1] or PELV[2] standards. Power supplies according to EN 61558-2-6 (transformer) or EN 60950-1 (switch mode power supply) meet these requirements.

System configuration, installation, startup, maintenance, and testing of devices may only be performed by an accredited, trained electrician familiar with automation technology safety standards.

Current safety and accident prevention laws valid for a specific application must be observed in the configuration, installation, setup, maintenance and testing of the equipment.

Only cables and accessories are allowed that meet the requirements and regulations for safety, electromagnetic compatibility and, where applicable, telecommunication transmission equipment and specifications.

Information regarding which cables and accessories are approved for the installation can be obtained from your local Murrelektronik branch office, and may also be found in this manual.

Foreseeable misuse

- Do **not** alter the design, engineering, or electrical features of the device.
- Do **not** take out of operation emergency-off functions or equipment. Refer to the relevant standards, for example, DIN EN ISO 13850 Safety of Machinery - Emergency Stop - Design Guidelines.
- Do **not** use the device outside of the application fields described in this manual, the Technical Data, or the Operating Instructions.
- Do **not** use the device outdoors, or in continuous operation in liquids.
- Do **not** clean the device using high-pressure tools.
- Do **not** use the module for climbing.

Qualified Personnel

Requirements to be met by qualified personnel are based on qualification profiles described in ZVEI and VDM guidelines.

Only qualified electricians that are familiar with the contents of this manual may install and service the products described: "Weiterbildung in der Automatisierungstechnik" (Further Training in Automation Engineering), published by ZVEI and VDMA in the Maschinenbau-Verlag, P.O.Box 710864 in D-60498 Frankfurt, Germany.

These are specialists who are capable of assessing the work to be done and the possible dangers on account of their technical training, knowledge, experience, and konwledge of the relevant standards; or who have an identical level of knowledge equivalent to technical training since they have worked in the same area for many years.

Interventions in the hardware and software of our products, if not described in this manual, may only be carried out by Murrelektronik specialists.

[1] SELV:Separated or safety extra-low voltage
[2] PELV: Protected extra-low voltage

Unqualified alteration of hardware or software, or disregard of the warnings given in this manual, may result in personal injury or serious damage to property.

Safety-requirements for module 55291 are to be find in manual „Safety Category Instructions 3 PL d nach EN ISO 13849-1“ Art-No. 55499.

2. Configuration

2.1 Power Supply

Bus modules require a direct-voltage power supply of typically 24 VDC (SELV/PELV) which must comply with the regulations of conventional industrial power-utility companies.

In order to optimize interference immunity, we advise you to power sensors, bus, and actuators from different sources. The power supply should be primary switched-mode or regulated power supplies.

The output of the power supply units depends on the number of connected electrical consumers and their output.

In any case, it must be ensured that the system voltage does not drop below 18 V DC viewed from the system power supplies and measured at the remotest slave. System response becomes unspecific if sensor and bus power supply drop below 18 V DC.

Primary switched-mode power supply units normally permit an increase in output voltage to the amount of the rated voltage in order to compensate for any power losses.

Modules with digital inputs support the direct connection of commercially available sensors. A separate power supply may be necessary for the sensors if the total power required is high due to the number of slaves or a high power draw of the sensors.

2.1.1 Recommended Power Supply Units

Primary switched-mode power supply units from Murrelektronik are specially designed to power automation systems. For this reason, we recommend them to power the modules.

Please refer to our catalog or to: **www.murrelektronik.com**

2.1.2 Cable Cross Sections

The max. cable cross section is 1.5 mm². It is limited to this max. diameter by the 7/8" plug.

2.2 Electromagnetic Compatibility (EMC)

This device meets the requirements of EC Directive 2004/108/EEC "Electromagnetic Compatibility".

The device is Class A equipment. It may cause radio-frequency interferences in residential areas. In this case, the operator may be required to implement adequate countermeasures.

The devices described in this manual each meet the relefant standards for electromagnetic compatibility. However, this does not mean that their electromagnetic compatibility is still guaranteed when installed in a plant or machine.
For this reason, we urgently advise you to comply with the instructions on installation in accordance with EMC requirements below. Only then can you assume that the overall system complies with EMC requirements, provided CE-marked components are used exclusively.

2.2.1 Protection against Electrostatic Discharge

The products described in this manual contain complex semiconductor components which may be destroyed or damaged by electrostatic discharge (ESD).
Damage does not necessarily lead to immediate, detectable failure, or malfunction. These states may be even delayed, or occur sporadically.
The generally accepted safety precautions for ESD sensitive devices must be observed when handling the devices. The following precautions must be taken:

Never plug or unplug connectors while the equipment is under power.

If you are an operator, discharge any static charge you may be carrying just before you touch the equipment. For example, you can touch a grounded part of the machine, or wear an ESD discharge strap that is permanently connected to ground.

2.2.2 Grounding

A short low-impedance connection (max. 10 cm) between the grounding point and the reference ground is essential to divert interference voltages running between the device and reference ground.
The inductivity of standard FE conductors is a high impedance for high-frequency interference voltages. For this reason, the use of grounding straps is advisable. If this is not possible, a fine-wire FE conductor should be selected with the largest possible cross section, and the connection to ground should be kept as short as possible.

2.2.3 Cable Routing

You can avoid EMC problems by observing elementary basic rules of cable routing:

- Route data lines as far as possible away from power lines.
- Route data lines and power lines at least 10 cm apart.
- Intersect data and power lines at right angles only.
- Route data and power lines in separate, shielded compartments.
- Remember the interference potential of other devices or lines when routing the cables.
- Place frequency converters, motor lines, and other devices and lines that emit high-frequency intereference at the greatest possible distance.

2.2.4 Voltage Drops

Short-term voltage drops normally do not pose operational problems as the electronics are protected by capacitors integrated in the power circuits. This does not apply to the power supply of the sensors and actuators connected to the module. Their high power requirement cannot be covered by the capacitors integrated in the device. For this reason, even transient interruptions of the actuator supply can result in undesirable switching operations.

Due to the integrated input filter, a change in the input signal of less than 1 ms does not cause a change of the input state signaled to the Master. Longer interruptions of the sensor supply may cause changes of the input signal.

2.2.5 Separate Power Supplies

Sensors or actuators can be powered by a common power supply unit. However, it is preferable to use separate power supplies in order to maximize the electromagnetic compatibility of the overall system.

2.2.6 Interference Suppression of Inductive Loads

The outputs of the devices described in this manual have an integrated protective circuit that provides safety against high-energy interference voltages, such as those that occur when inductive consumers are switched.

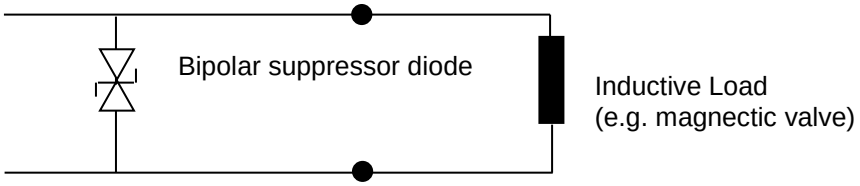

Fig. 1: Interference Suppression of Inductive Loads

A suppressor diode helps to quickly reduce the energy stored in the inductive load of a magnetic field. Contrary to varistors, suppression with suppressor diodes offer two important advantages:

- No aging
- Very fast response

The high voltages that occur when inductive loads are shut down result in strong fields in the cables with consequential faults in adYescent circuits or devices. Therefore we recommend for large distances between module output and load or for possible other reasons, an additional suppression of the inductive load. This causes the voltage spike generated by the inductive load to be short-circuited at the source.

Murrelektronik offers a wide selection of interference suppression components.

Please refer to our catalog or to: **www.murrelektronik.com**

2.2.7 Other Measures and Limits

In some system configurations, the requirements for interference emission and immunity from interference can only be met with additional measures, or even not at all. In these cases, the EMC within the system is also dependent on the signle components of other manufacturers.

- Mains filters are a suitable means of reducing line-conducted interference.
- Various manufacturers offer optical-fiber converters. This data transmission technology is basically immune to EMC interferences. However, this does not apply to the electronic conversion circuits. For this reason, the use of optical fibers does not solve all EMC problems.

Our certified test center will answer your questions regarding EMC. They will give advice on guaranteeing compliance with the EMC directive for the system you produce.

Murrelektronik Test Center

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71570 Oppenweiler

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Fon 07191 47-4000

Fax 07191 47-494001

pruefzentrum@murrelektronik.com

2.3 Replaceability

Some modules of the MVK-MP family are downward compatible. Single modules can be replaced according to the hierarchy shown in the illustration. This reduces inventory: A module does not have to be replaced by a device of identical design, but can also be replaced by other modules that offer at least the same functionality. The adaptive software architecture of future products will also feature downward compatibility, thereby assuring psare parts supply.

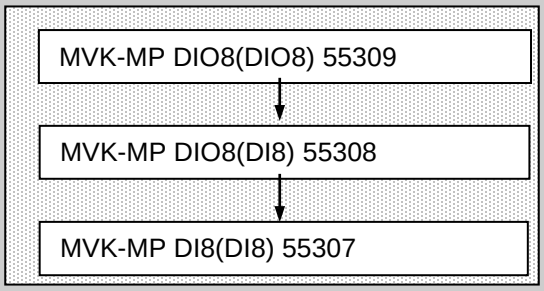
Replaceability	Modules that cannot be replaced:
	55292, 55293, 55274, 55290, 55291
MVK-MP DIO8 (DIO8), Art.No: 55309 can directly replace all digital MVK-MP. This makes it suitable as universal module for service works.	

Fig. 2: MVK-MP Compatibility Hierarchy

3. Installation

3.1 Assembly

The MVK-MP modules can be directly mounted to a mounting wall or to a machine. The module features two fixing holes for this purpose.
Before attaching the module, it must be assured that the mounting surface is smooth and flat to prevent mechanical stress in the module housing.
Two screws with M6 thread and two U washers DIN 433 are required for assembly. The tightening torque is 8 Nm.

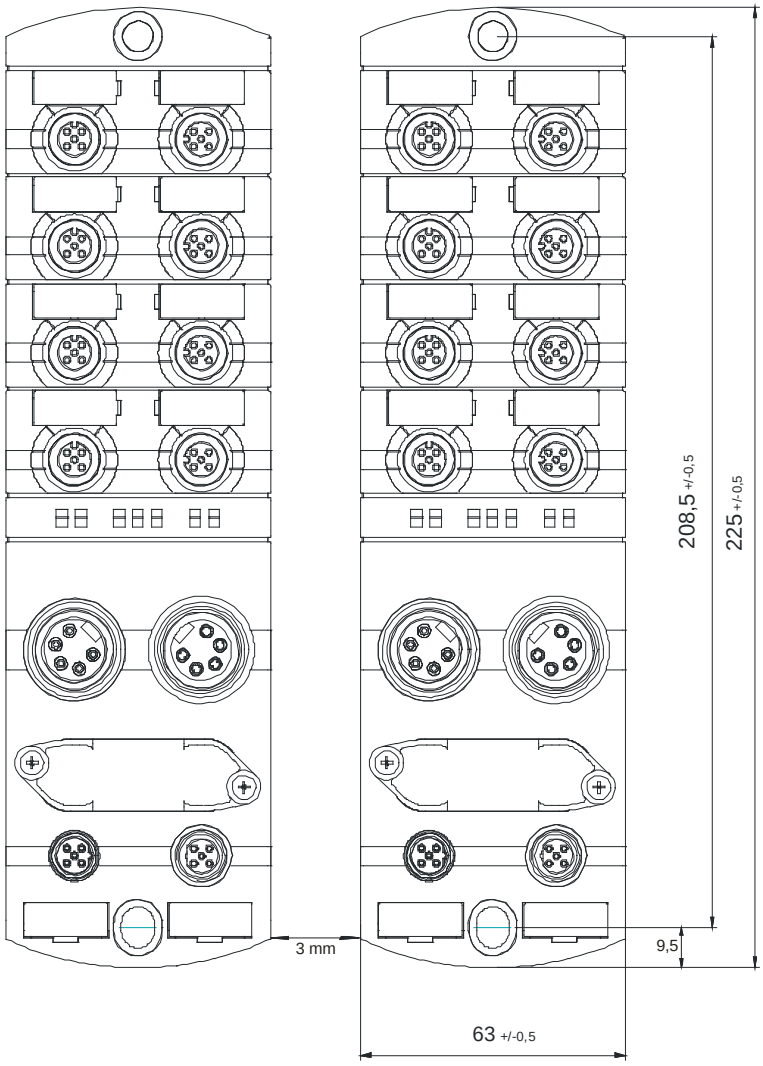


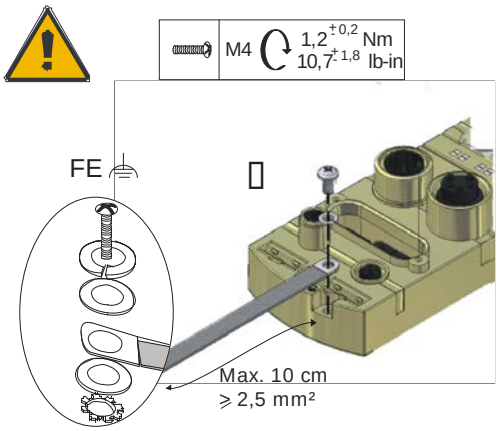
Fig. 3: Fixing Centers, Mounting pitch

To ensure correct installation and improved heat dissipation we recommend observing minimum spacing of 3 mm when assembling the modules.

For angled connectors minimum spacing of 50 mm is required.

3.1.1 Functional Earth

The FE connection is located at the bottom of the module. The ground strap is pre-installed.



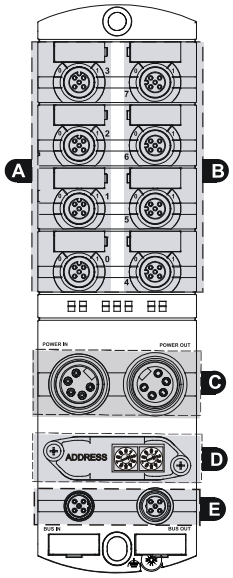
❶ FE connection (ground strap already connected)

Fig. 4: Functional Earth

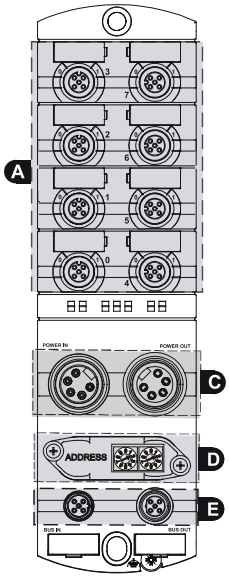
Ensure a low impedance connection between the FE connection at the housing and functional earth (see the information regarding EMC).

3.2 Connection Overview
3.2.1 DO4 (DO4) DI4 (DI4) Art.-No. 55274
3.2.2 DO8 (DO8) Art.-No. 55290

MVK-MP DO4(DO4)DI4(DI4)



MVK-MP DO8(DO8)



A

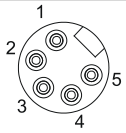
Pin 1	n.c.
Pin 2	DO
Pin 3	0V
Pin 4	DO
Pin 5	FE

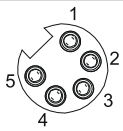
DO : U_A / 1,6 A

B

Pin 1	+24V U / 0,2A
Pin 2	DI / Diag
Pin 3	0V
Pin 4	DI
Pin 5	FE

C

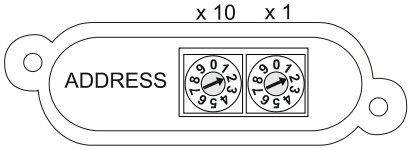




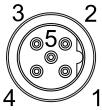
POWER IN

Pin 1	0V	**POWER OUT**
Pin 2	0V	
Pin 3	FE	
Pin 4	+24V U_S / 9 A	
Pin 5	+24V U_A / 9 A	

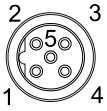
D **Adressierung / Adressage / Addressing / Direccionamiento / Indirizzamento / Endereçamento : 0 ... 99**



E



BUS IN

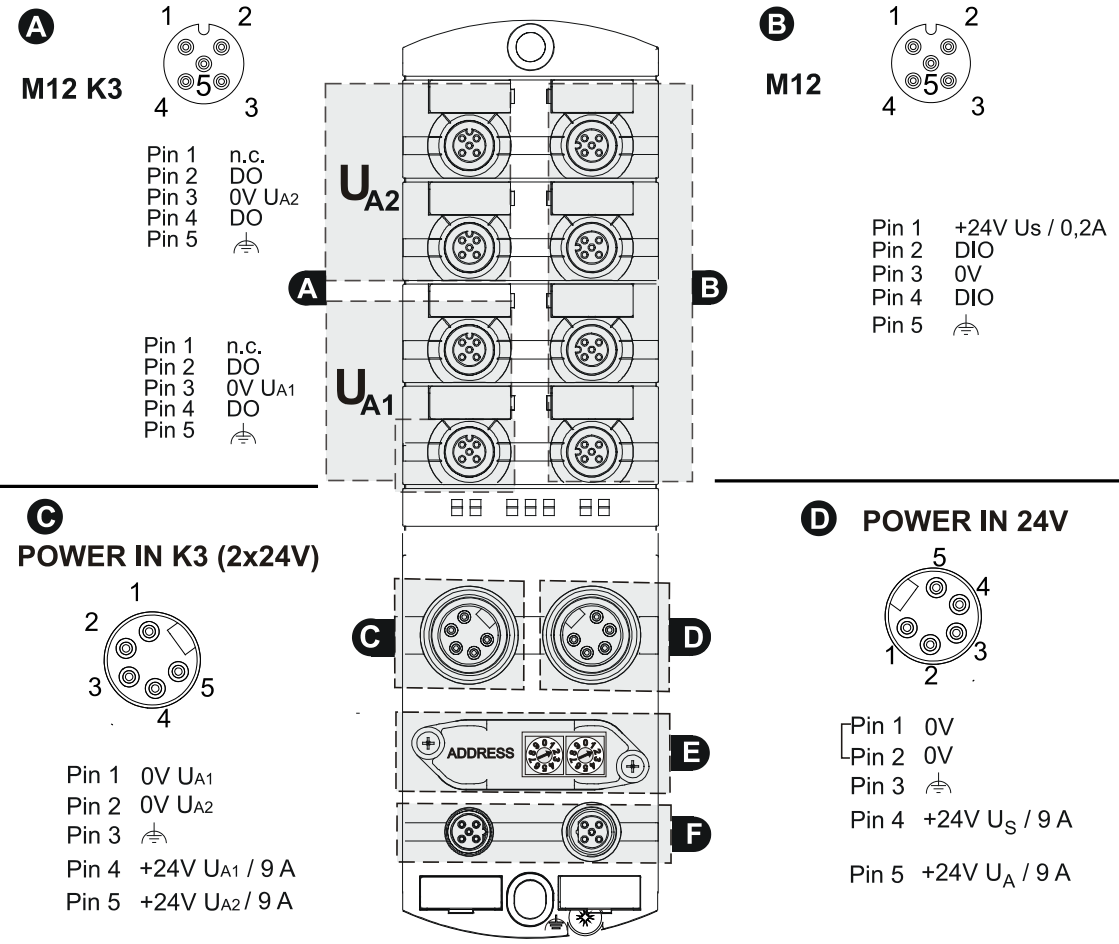


BUS OUT

n.c.	**Pin 1**	+5V2
A grün / green / vert / verde / verde / verde	**Pin 2**	A grün / green / vert / verde / verde / verde
n.c.	**Pin 3**	0V2
B rot / red / rouge/ rosso / vermelho / rojo	**Pin 4**	B rot / red / rouge/ rosso / vermelho / rojo
n.c.	**Pin 5**	n.c.
Schirmung / Blindage / Screening / Blindaje / Schermatura / Blindagem	Gewinde Thread Filet Rosca Filetto Rosca	Schirmung / Blindage / Screening / Blindaje / Schermatura / Blindagem

Fig. 5: Pin Assignment and Overview Connections

3.2.3 K3 DO4(DO4) / DIO4(DIO4) Art.-No. 55291



E

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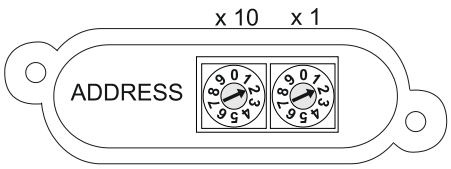
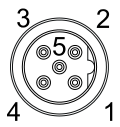
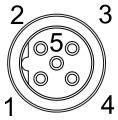


0 ... 99

F



BUS IN

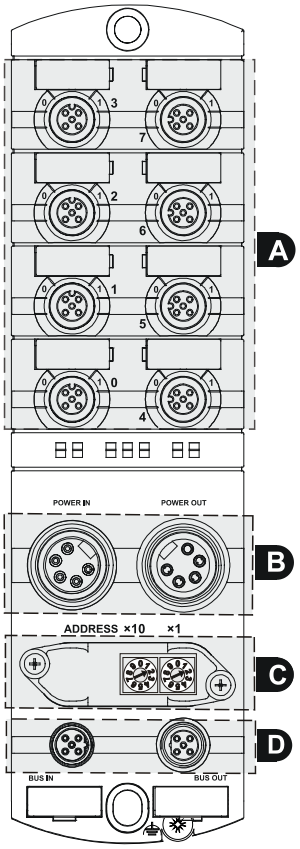


BUS OUT

n.c.	**Pin 1**	+5V2
A grün / green / vert / verde / verde / verde	**Pin 2**	A grün / green / vert / verde / verde / verde
n.c.	**Pin 3**	0V2
B rot / red / rouge/ rosso / vermelho / rojo	**Pin 4**	B rot / red / rouge/ rosso / vermelho / rojo
Schirmung / Blindage / Screening / Blindaje / Schermatura / Blindagem	**Pin 5** Gewinde Thread Filet Rosca Filetto Rosca	Schirmung / Blindage / Screening / Blindaje / Schermatura / Blindagem

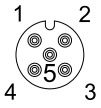
Fig. 6: Pin Assignment and Overview Connections

3.2.4 DI8(DI8) Art.-No. 55307
3.2.5 DIO8(DI8) Art.-No. 55308
3.2.6 DIO8(DIO8) Art.-No. 55309



A

MVK-MP DI8(DI8)
MVK-MP DIO8(DI8)
MVK-MP DIO8(DIO8)

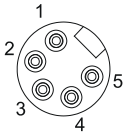


Pin 1	+24V U_S / 0,2A
Pin 2	DI / DO / Diag
Pin 3	0V
Pin 4	DI / DO
Pin 5	FE

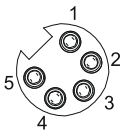
DO : U_A / 1,6 A

B

POWER IN



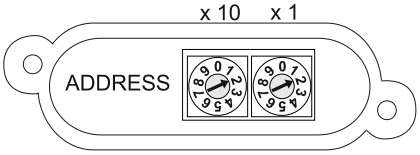
POWER OUT



Pin 1	0V
Pin 2	0V
Pin 3	FE
Pin 4	+24V U_S / 9 A
Pin 5	+24V U_A / 9 A

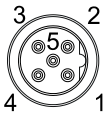
C

Adressierung / Adressage / Addressing / Direccionamiento / Indirizzamento / Endereçamento :

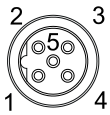


0 ... 99

D



BUS IN

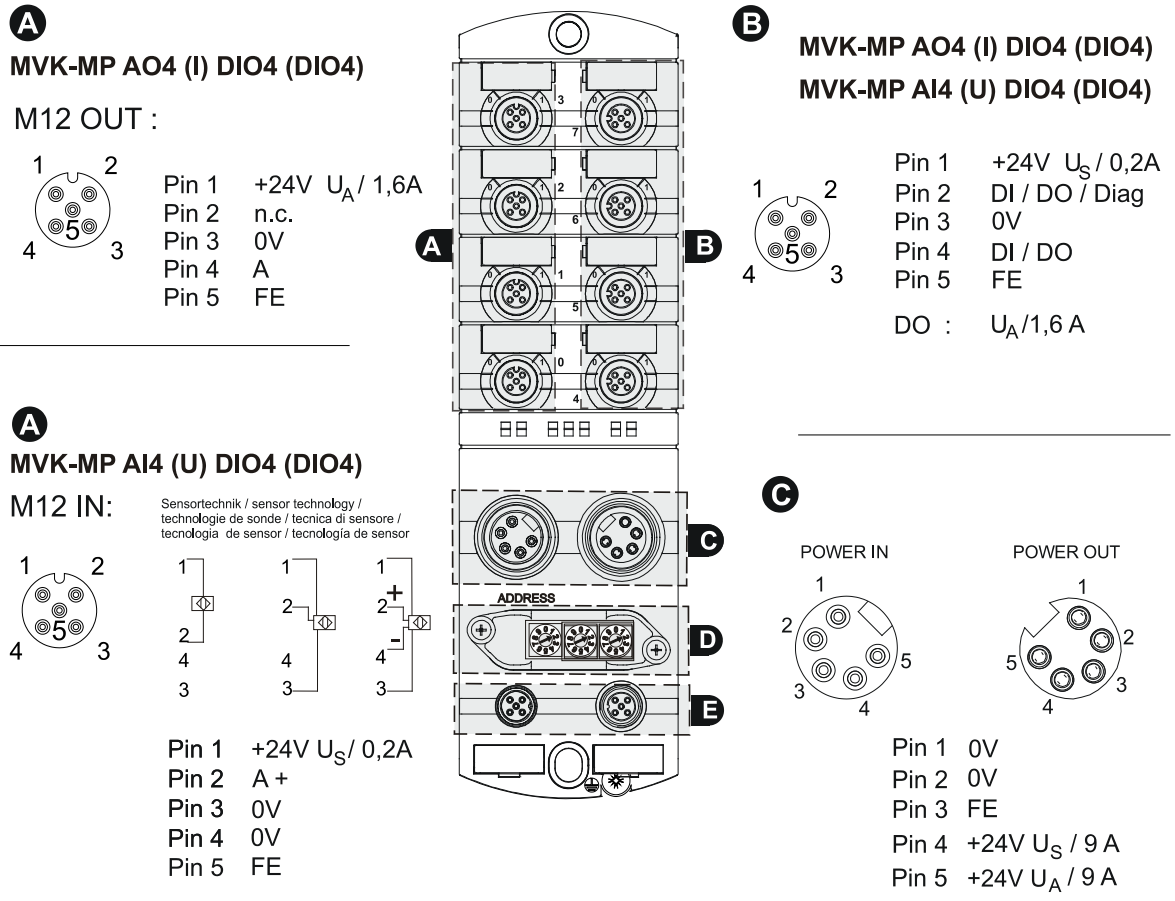


BUS OUT

n.c.	**Pin 1**	+5V2
A grün / green / vert / verde / verde / verde	**Pin 2**	A grün / green / vert / verde / verde / verde
n.c.	**Pin 3**	0V2
B rot / red / rouge/ rosso / vermelho / rojo	**Pin 4**	B rot / red / rouge/ rosso / vermelho / rojo
n.c.	**Pin 5**	n.c.
Schirmung / Blindage / Screening / Blindaje / Schermatura / Blindagem	Gewinde Thread Filet Rosca Filetto Rosca	Schirmung / Blindage / Screening / Blindaje / Schermatura / Blindagem

Fig. 7: Pin Assignment and Overview Connections

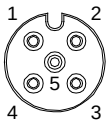
3.2.7 AO4 (I) DIO4 (DIO4) Art.-No. 55292
3.2.8 AI4 (U) DIO4 (DIO4) Art.-No. 55293



n.c.	**Pin 1**	+5V2
A grün / green / vert / verde / verde / verde	**Pin 2**	A grün / green / vert / verde / verde / verde
n.c.	**Pin 3**	0V2
B rot / red / rouge/ rosso / vermelho / rojo	**Pin 4**	B rot / red / rouge/ rosso / vermelho / rojo
n.c.	**Pin 5**	n.c.
Schirmung / Blindage / Screening / Blindaje / Schermatura / Blindagem	Gewinde Thread Filet Rosca Filetto Rosca	Schirmung / Blindage / Screening / Blindaje / Schermatura / Blindagem

Fig. 8: Pin Assignment and Overview Connections

3.2.9 Connection of Digital Sensors and Actuators



Pin 1	+ 24 V	Sensor supply
Pin 2	Function channel 1x	Parameterizable channel or input or output
Pin 3	0 V	Refernce potential
Pin 4	Function channel 0x	Parameterizable channel or input or output
Pin 5	FE	Ground

Fig. 9: Configuration of the M12 port

Modules with sockets that are only output (55274 socket 0-3 and 55290 socket 0-7) do not supply +24 Volt on Pin 1. Pin 2 and Pin 4 are digital outputs that cannot be parameterized as input.

Unused sockets have to be fitted with blind caps in order to ensure IP67 protection.

3.2.10 Sensor Supply

Sensors can be supplied via pin 1 (+24 V) and pin 3 (0 V) of the M12 sockets. The sensor supply of each M12 socket is secured. This fuse automatically resets under 100mA. If the current is > 100mA, a reset has to be done via the sensor supply. The max. current draw for the sensor supply is 200 mA for each M12 socket. Please see the following derating diagram:

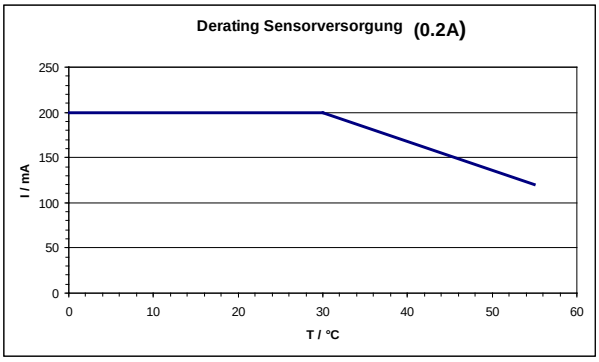


Fig. 10: Derating Sensor Supply

We recommend observing a cable diameter of min. 0.34mm² in order to ensure fast switching off in case of short-circuit.

3.2.11 Actuators

Each output can be loaded to a maximum of 1.6 A.

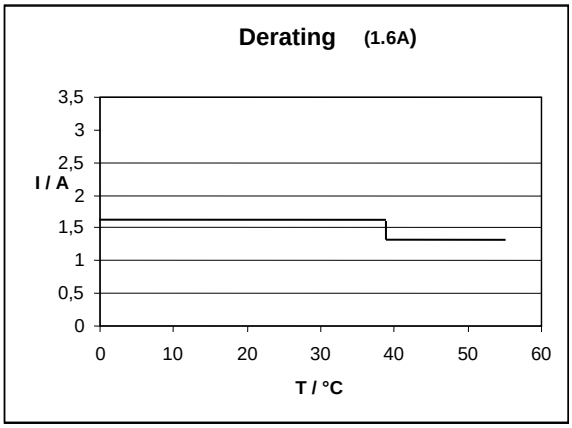


Fig. 11: Derating actuators

The total current may not exceed 9 A dur to the maximum current carrying capacity of the power plug.

When looping through the actuator supply make sure that the total current of all modules does not exceed 9 A.

Reverse polarity of the actuator voltage can damage the module.

The module may heat, depending on the load.

If an output is overloaded or short-circuited it is disabled. This output will remain disabled even when the error was corrected. In order to reset the short-circuit memory, the output must be switched off via the control.

We recommend not to exceed the following cable lengths in order to ensure fast switching off in case of short-circuit.

max. 15m incoming cable 1.5mm² and max. 1.5m actuator cable 0.75 mm²
max. 10m incoming cable 1.5mm² and max. 3m actuator cable 0.75 mm²

3.2.12 Diagnostic Input at Input Sockets

Pin 2 of the M12 socket with digital signal can be parameterized as diagnostic input. If the signal 0V is present at a diagnostic input, it will be inversely displayed in the process map. At the same time, a channel-related diagnostic message "External Error" is generated via the DP diagnostic. The corresponding LED lights up red. This makes it possible to display errors of external equipment at the MVK-MP. Some suggestions are given in the following.

3.2.13 Connection of Sensors/Actuators with Diagnostic Output

When sensors or actuators with diagnostic output are used (e.g. accoring to Desina standard), you can also evaluate this diagnostic signal, and process and represent it in the controller or visualization unit using a conventional I/O system.

In this case there will be no visual error display close to the defective sensor, which might also be installed in a place not visible. The visual signal at the M12 socket of the MVK-MP facilitates thus on-site troubleshooting.

This helps to detect:

- Front surface damage
- defective electronics and
- wire break.

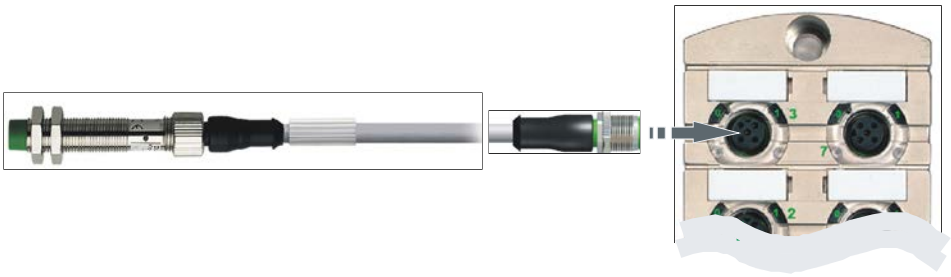


Fig. 12: Connection of Sensors/Actuators with Diagnostic Output

3.2.14 Cable Break Monitoring

With the M12 diagnostic adapter; Murrelektronik offers a simple tool for monitoring the M12 cables to the sensors and actuators regarding cable breaks on the wires 1 and 2, in case you do not use Desina sensors or actuators.

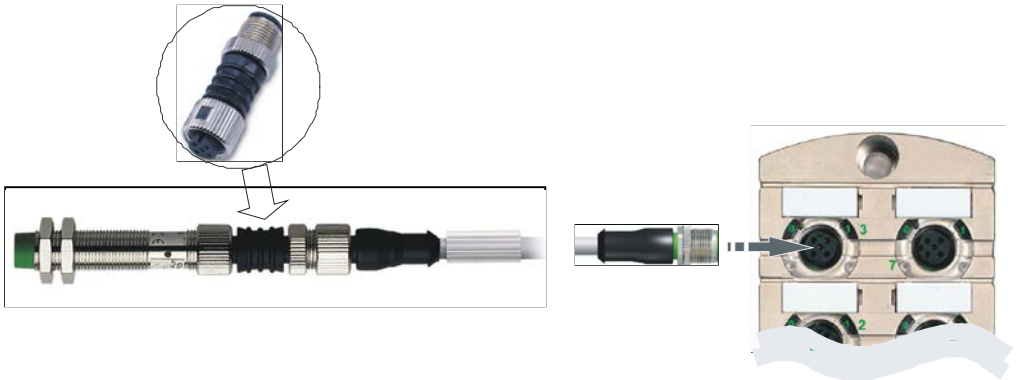
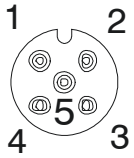


Fig. 13: Cable Break Monitoring

3.2.15 Connection of Analog Sensors

The sensor supply is identical to the supply of digital modules.



Pin 1	+ 24 V / 0,2 A	Sensor supply
Pin 2	A+	Signal input
Pin 3	0 V	Reference potential
Pin 4	0 V	Reference potential
Pin 5	FE	

Fig. 14: M12 Socket Assignment

Unused sockets have to be fitted with blind caps in order to ensure IP67 protection.

3.2.16 Using Analog Sensors 0 to 10 V

Sensors with signal 0 to 10 V can be directly connected to the analog voltage input.

Fig. 15: Using Analog Sensors 0 to 10 V

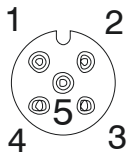
3.2.17 Using Analog Sensors 0 to 20 mA or 4 to 20 mA

Sensors with signals 0 to 20 mA or 4 to 20 mA have to be connected to the analog voltage input via an M12 adapter (on the module) (Art.-No. 7000-42251-0000000).

Fig. 16: Using Analog Sensors 0 to 20 mA or 4 to 20 mA

3.2.18 Connection of Analog Actuators

Actuators can be supplied via pin 1 (+24V) and pin 3 (0V) of the M12 sockets. A FET per M12 socket protects the actuator supply. The maximum current for the actuator supply is 1.6 A per M12 socket.



Pin 1	+ 24 V / 1,6 A	Actuator supply
Pin 2	not connected	-
Pin 3	0 V	Reference potential
Pin 4	A +	Analog output
Pin 5	FE	

Fig. 17: M12 Socket Assignment

Unused sockets have to be fitted with blind caps in order to ensure IP67 protection.

3.2.19 Using Analog Actuators 0 to 10 V or 2 to 10 V

Actuators with signals 0 to 10 V or 2 to 10 V have to be connected to the analog voltage output via an M12 adapter (on the actuator) (Art.-No. 7000-42252-0000000).

Fig. 18: Using Analog Actuators 0 to 10 V or 2 to 10 V

3.2.20 Using Analog Actuators 0 to 20 mA or 4 to 20 mA

Actuators with signal 0 to 20 mA or 4 to 20 mA can be directly connected to the analog voltage output.

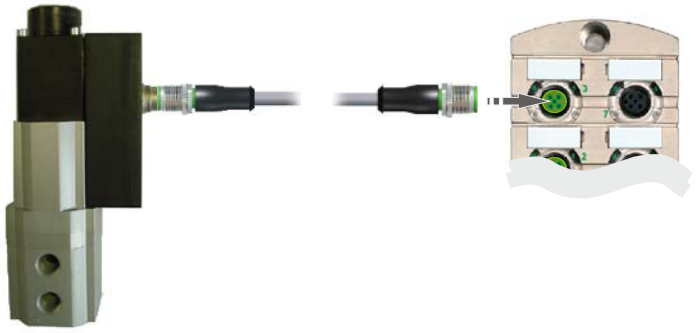


Fig. 19: Using Analog Actuators 0 to 20 mA or 4 to 20 mA

3.3 Connection

3.3.1 Connection of the Profibus

Cables

The bus cable has to meet the EN 50170 Part 2 (Cable type A) standard. With multi-wired cables, ferrule ends have to be applied. We recommend our pre-wired Profibus cables in order to ensure simple and reliable wiring.

Please refer to information on accessories in chapter Accessories
Connection to MVK-MP

① Connect functional earth to the FE connection at the housing
② Connect incoming Profibus cable to the incoming bus connection ❼
③ Connect the next Profibus cable to the continuing bus connection ❽
④ or screw terminator onto the bus connection ❽.

Both ends of a Profibus segment must be fitted with a terminal resistor.

Please refer to information on accessories in chapter *Accessories*.

3.3.2 Connection of Supply Voltage

Reverse polarity of the power supply can damage the module. Therefore, we recommend using pre-wired connectors from Murrelektronik.

Connecting Supply Voltage on the Module

The supply of actuators and sensors requires auxiliary power. The electronics of the MVK-MP are supplied via the sensor supply.

The sensor supply voltage must not be deactivatable. It supplies the power for the electronics.

The 7/8" plug is designed for a max. current of 9 A per pin. This has to be considered when looping through the supply voltage.

4. Setup

4.1 Assigning and Setting the Profibus Address

The Profibus address is set by means of two BCD switches directly on the MVK-MP. Allowable values are between 0 and 99. Usually, the addresses 0 to 2 are assigned to the DP master. Therefore, we recommend setting the addresses for the MVK-MP starting with address 3.

The preset address will be read in after the supply voltage is connected. Therefore, a change of the address will only become effective after a voltage reset of the module.

When assigning the address it must be ensured that each Profibus device gets a clear and individual address.

4.2 GSD File

The operation of the equipment described in this manual requires a GSD file

MURR064A.* for digital modules

MURR09AD.* for analog modules

MURR09EB.* for safety module

The suffix of the file indicates the language version. The GSD files are available in six languages.

Language	Suffix
*.gsd	Default = English
*.gse	English
*.gsg	German
*.gss	Spanish
*.gsf	French
*.gsi	Italian
*.gsp	Portuguese

Tab. 1: GSD Files

The GSD file can be downloaded from the Murrelektronik homepage:
www.murrelektronik.com

4.3 Configuration

The configuration of a Profibus DP slave is required for defining the quantity of I/O data and for reserving the addresses in the control.

The MVK-MP is a compact device in the physical sense. In the DP system, however, it is considered a modular system. This modular system consists of a "vitual" head module, which is followed by "virtual" user data and "virtual" diagnostic modules.

First the head module is included in the configuration, same as in a modular set. Head modules always have data length zero and are used to identify and parameterize the module. They are related to the part no. of the corresponding MVK-MP. Please note that you can only add one head module, which has always to be the first element in the configuration.

Now the user data modules can be connected to the head module in any required order. Each user data module has a spefic data length (one or two bytes). To each of the user data module an individual address can be assigned in the PLC's process image.

MVK-MP does not only offer the possibility of transferring diagnostic information in a DP diagnostic telegram, it can also include this information into the cyclic data exchange same as the user data. This is done via the diagnostic modules.

The advantages are:

- Access to the diagnostic information is given the same way, independently of the DP master used.
- The diagnostic information is available in the process image and can quickly and easily be evaluated.
- No inconvenient operation with special diagnostic function blocks required.
- In the process image of the control only as much memory in the I/O range is used as necessary.

The MVK-MP uses the ID format described in IEC 61158.

4.3.1 Relation between Channel Number and Pin/Socket

By means of the channel number you can define the socket and the associated pin. Example: The channel number is 12, this corresponds to Pin 2 (X=1) of socket no. 2 (Y=2).

Channel number = XY	X	Y
X = 0	Pin 4	
X = 1	Pin 2	
Y = 0 to (No. of sockets)		Number of socket

Tab. 2: Relation between Channel Number and Pin/Socket

4.3.2 Structure of Virtual Data Modules

Same as for the MVK-MP, the I/O data are compiled from a list of virtual data modules. Depending on the type of MVP, not all data modules may be available.

Virtual head modules	Data width	Bit assignment	Identification
MVK-MP DO4 (DO4) DI4 (DI4) 55274	0	-	01_{hex} 56_{hex}
MVK-MP DO8(DO8) 55290	0	-	01_{hex} 55_{hex}
MVK-MP DI8(DI8) 55307	0	-	01_{hex} 50_{hex}
MVK-MP DIO8(DI8) 55308	0	-	01_{hex} 51_{hex}
MVK-MP DIO8(DIO8) 55309	0	-	01_{hex} 52_{hex}
MVK-MP AI4 (U) DIO4 (DIO4) 55293	0	-	01_{hex} 70_{hex}
MVK-MP AO4 (I) DIO4 (DIO4) 55292	0	-	01_{hex} 71_{hex}
MVK-MP K3 DO4 (DO4) / DIO4 (DIO4) 55291	0	-	01_{hex} 53_{hex}
Virtual user data modules	**Data width**	**Bit assignment**	**Identification**
Inputs Pin 4	1 Byte	❶	41_{hex} 00_{hex} 02_{hex}
Inputs/Diagnostics Pin 2	1 Byte	❷	41_{hex} 00_{hex} 01_{hex}
Outputs Pin 4	1 Byte	❶	81_{hex} 00_{hex} 03_{hex}
Outputs Pin 2	1 Byte	❷	81_{hex} 00_{hex} 09_{hex}
Analog input 0	2 Bytes	❺	41_{hex} 01_{hex} $0C_{hex}$
Analog input 1	2 Bytes	❺	41_{hex} 01_{hex} $0D_{hex}$
Analog input 2	2 Bytes	❺	41_{hex} 01_{hex} $0E_{hex}$
Analog input 3	2 Bytes	❺	41_{hex} 01_{hex} $0F_{hex}$
Analog output 0	2 Bytes	❻	81_{hex} 01_{hex} 12_{hex}
Analog output 1	2 Bytes	❻	81_{hex} 01_{hex} 13_{hex}
Analog output 2	2 Bytes	❻	81_{hex} 01_{hex} 14_{hex}
Analog output 3	2 Bytes	❻	81_{hex} 01_{hex} 15_{hex}
Virtual diagnostic modules	**Data width**	**Bit assignment**	**Identification**
Station diagnostics	1 Byte	❸	41_{hex} 00_{hex} 04_{hex}
Peripheral fault socket	1 Byte	❹	41_{hex} 00_{hex} 05_{hex}
Sensor supply short-circuit	1 Byte	❹	41_{hex} 00_{hex} 06_{hex}
Actuator shutdown Pin 4	1 Byte	❶	41_{hex} 00_{hex} 07_{hex}
Actuator shutdown Pin 2	1 Byte	❷	41_{hex} 00_{hex} $0A_{hex}$
Actuator warning Pin 4	1 Byte	❶	41_{hex} 00_{hex} 08_{hex}
Actuator warning Pin 2	1 Byte	❷	41_{hex} 00_{hex} $0B_{hex}$
Overvoltage	1 Byte	❼	41_{hex} 00_{hex} 10_{hex}
Cable break	1 Byte	❼	41_{hex} 00_{hex} 11_{hex}

Tab. 3: Structure of Virtual Data Modules

Bit Assignment ❶

Fig. 20: Bit Assignment (1)

Bit Assignment ❷

Fig. 21: Bit Assignment (2)

Bit Assignment ❸ Station Diagnostics

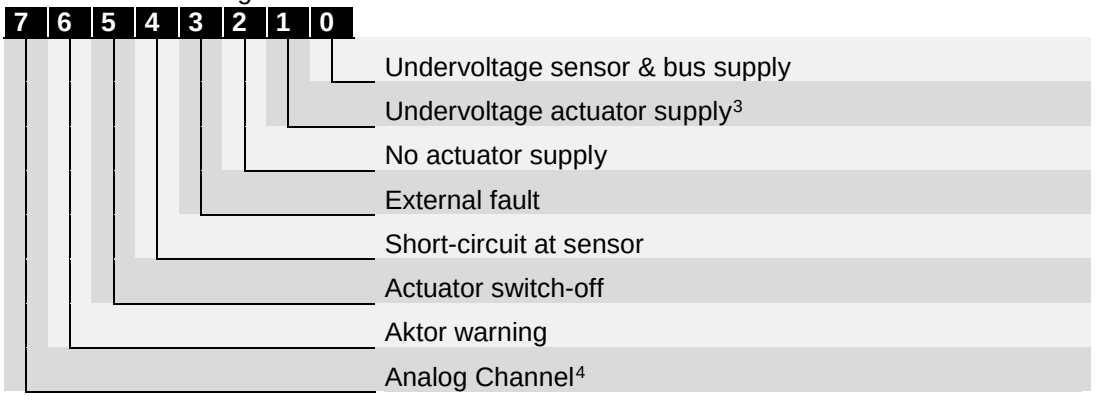


Fig. 22: Bit Assignment (3)

[3] Input module MVK-MP DI8 (DI8) Art. No. 55307 does not feature these diagnostics.
[4] The different analog channel diagnostics (e.g. wire break) are combined in this bit and are only available with analog modules.

Bit Assignment ❹ Periphal Fault Socket and Sensor Supply

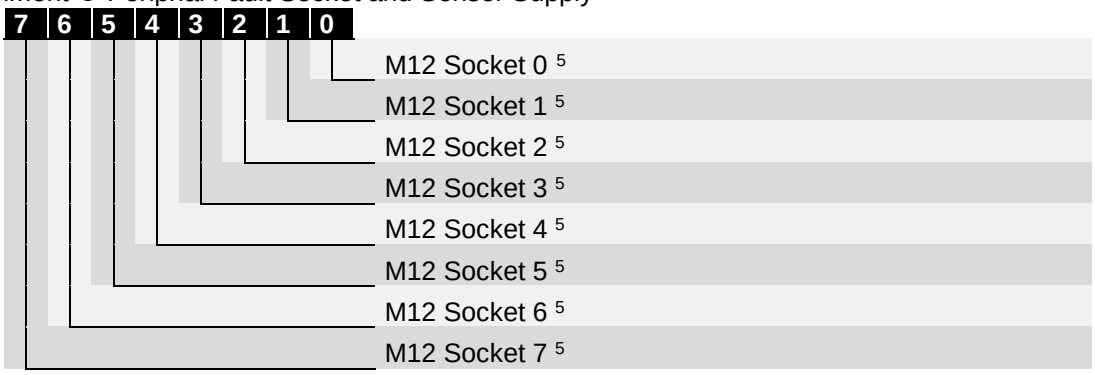


Fig. 23: Bit Assignment (4)

Bit Assignment ❺ Analog Input 0 to 3

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	VZ	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

Fig. 24: Bit Assignment (5)

Bit Assignment ❻ Analog Output 0 to 3

Byte	Byte 0 (High-Byte)								Byte 1 (Low-Byte)							
Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	0	0	0	0	0	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}

Fig. 25: Bit Assignment (6)

Bit Assignment ❼ Wire Break and Over Voltage

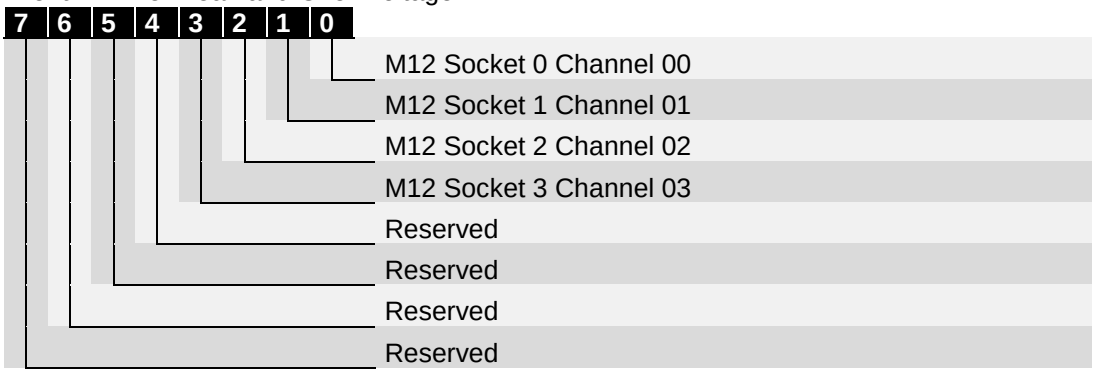


Fig. 26: Bit Assignment (7)

[5] Module art. no. 55290 does not feature the diagnosis sensor supply, as it is only an output module.

4.3.3 Example

The configuration software usually supports a visual configuration, so you don't have to assemble the configuration string yourself.

This configuration consists of an MVK-MP DIO8(DI8) 55308. The output data for pin 4, the station diagnostics and diagnostic information for actuator disabling and actuator warning at pin 4 are to be transferred to the process map in the cyclical data exchange.

① Head module selection.

MVK-MP DIO8(DI8) 55308	01_{hex} 51_{hex}

② Selection of the virtual modules in the required order.

Outputs Pin 4	81_{hex} 00_{hex} 03_{hex}
Station diagnostics	41_{hex} 00_{hex} 04_{hex}
Actuator switch-off Pin 4	41_{hex} 00_{hex} 07_{hex}
Actuator warning Pin 4	41_{hex} 00_{hex} 08_{hex}

③ The configuration string looks like this (hexadecimal values):

01 51	81 00 03	41 00 04	41 00 07	41 00 08

4.3.4 Structure of the I/O data MVK AO4 (I) Art.-No. 55292

The module has 11 Bit.

4.3.4.1. Binary Representation of Analog Data

Bit assignment I/O Data (Intel format)

I/O Data																
Word / Channel	3				2				1				0			
Byte	7		6		5		4		3		2		1		0	
Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Va-lue	-	-	-	-	-	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
Byte	1								0							

Tab. 4: Bit assignment analog I/O data in Intel format

Bit assignment I/O data (Motorola format)

I/O Data																
Word / Channel	3				2				1				0			
Byte	7		6		5		4		3		2		1		0	
Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Va-lue	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	-	-	-	-	-	2^{10}	2^{9}	2^{8}
Byte	1								0							

Tab. 5: Bit assignment analog I/O data in Motorola format

4.3.4.2. Data Format MVK AO4(I) Art.-No. 55292

Representation of analog values of input data 11 Bit.

Measuring range 0..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA 10 mA 4 mA 0 mA	0xxx x111 1111 1111 0xxx x011 1111 1111 0xxx x001 1001 1001 0xxx x000 0000 0000	07FF 03FF 0199 0000	2047 1023 409 0	Nominal Range

Tab. 6: Analog values MVK AO4(I) Art.-No. 55292 in the range of 0 ... 20 mA

Representation of analog values of output data 11 Bit.

Measuring range 4..20 mA	Measuring value			Range
	binary	hexadecimal	decimal	
20 mA 10 mA 4 mA	0xxx x111 1111 1111 0xxx x010 1111 1111 0xxx x000 0000 0000	07FF 02FF 0000	2047 767 0	Nominal Range

Tab. 7: Analog values MVK AO4(I) Art.-No. 55292 in the range of 4...20 mA

4.3.5 Structure of the I/O Data MVK AI4(U) Art.-No. 55293

The module has 15 Bit.

4.3.5.1. Binary Representation of Analog Data

Bit assignment I/O Data (Intel format)

I/O Data																
Word / Channel	3				2				1				0			
Byte	7		6		5		4		3		2		1		0	
Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	Sign	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}
Byte	1								0							

Tab. 8: Bit assignment analog I/O data in Intel format

Bit assignment I/O data (Motorola format)

I/O Data																
Word / Channel	3				2				1				0			
Byte	7		6		5		4		3		2		1		0	
Bit	MSB							LSB	MSB							LSB
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Value	2^{7}	2^{6}	2^{5}	2^{4}	2^{3}	2^{2}	2^{1}	2^{0}	Sign	2^{14}	2^{13}	2^{12}	2^{11}	2^{10}	2^{9}	2^{8}
Byte	1								0							

Tab. 9: Bit assignment analog I/O data in Motorola format

4.3.5.2. Data Format MVK AI4(U) Art.-No. 55293

Representation of analog values of input data 15 Bit.

Measuring range 0..10 V	Measuring value			**Rang**	Diagnostics
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Over range	yes
10 V 5V 0,0003mV 0	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
< 0V	0000 0000 0000 0000	0000	0	Under range	-

Tab. 10: Analog values MVK AI4(U) Art.-No. 55293 in the range of 0...10 V

Representation of analog values of input data 15 Bit.

Measuring range 2..10 V	Measuring value			**Range**	Diagnostics
	binary	hexadecimal	decimal		
>10 V	0111 1111 1111 1111	7FFF	32767	Over range	yes
10 V 6V 2,0002V 2V	0111 1111 1111 1111 0011 1111 1111 1111 0000 0000 0000 0001 0000 0000 0000 0000	7FFF 3FFF 0001 0000	32767 16383 1 0	Nominal range	-
< 0V	0000 0000 0000 0000	0000	0	Under range	-

Tab. 11: Analog values MVK AI4(U) Art.-No. 55293 in the range of 2...10 V

4.4 Parameterization

The MVK-MP parameter message comprises 19 Bytes. The first 7 bytes are defined by Profibus standard IEC 50170. The following 12 bytes are user parameter.

The majority of configuration tools divide user parameters into module-related and station-related parameters that, as a general rule, appear in various dialogs in the user interface of the configuration tool.

The reserved bytes 0 to 2 of the user parameters are station related parameters on the MVK-MP.

All necessary settings are made via the module-related parameter starting from byte 3 of the user parameters. These parameters are always assigned to the virtual head module.

4.4.1 How to code functions with more than two options

For several parameters, more than two options are possible. Each of these parameters is coded with two bits. Values from 0_{dez} to 3_{dez} are therefore possible. Please note that the coding of the functions of Pin 2 and Pin 4 is not identical.

4.4.2 Parameterization of the General Diagnostic Messages

Modules	Description	Decimal	Bit 0
AO4 (I) DIO4 (DIO4) Art.-No. 55292 AI4 (U) DIO4 (DIO4) Art.-No. 55293	Diagnostic messages	Release global diagnostic	0
		Do not release global diagnostic	1
	Channel diagnostic	Report	0
		Do not report	1
	Under voltage bus / sensor supply	Report	0
		Do not report	1
	Under voltage aktuator supply	Report	0
		Do not report	1
	No Aktuator supply	Report	0
		Do not report	1

Tab. 12: Parameterization of the general diagnostic messages

4.4.3 Parameterization of the Data Format

Modules	Description	Decimal	Bit 0
AO4 (I) DIO4 (DIO4) Art.-No. 55292 AI4 (U) DIO4 (DIO4) Art.-No. 55293	Data format	byte sequence high/low (Motorola)	0
		byte sequence low/high (Intel)	1

Tab. 13: Parameterization of the Data Format

4.4.4 Parameterization of Smoothing (AI4 (U) DIO4 (DIO4) Art.-No. 55293)

Module	Description	Value	Bit 0	Bit 1
AI4 (U) DIO4 (DIO4) Art.-No. 55293	Smoothing	none	0	0
		weak	0	1
		moderate	1	0
		strong	1	1

Tab. 14: Parameterization of Smoothing

4.4.5 Parameterization Functionality of Channels 00 to 07 (Pin 4)

Modules	Description	Decimal	Bit 1	Bit 0
DO4(DO4) DI4(DI4) Art.-No. 55274 only channels 4 to 7	Normally open input	0	0	0
	Normally closed input	1	0	1

Modules	Description	Decimal	Bit 1	Bit 0
DI8(DI8) Art.-No. 55307	Normally open input	0	0	0
	Normally closed input	1	0	1
DIO8(DI8) Art.-No. 55308	Normally open input	0	0	0
	Normally closed input	1	0	1
	Output	2	1	0
DIO8(DIO8) Art.-No. 55309	Normally open input	0	0	0
	Normally closed input	1	0	1
	Output	2	1	0
AO4(I) DIO4 (DIO4) Art.-No. 55292 only channels 4 to 7	Normally open input	0	0	0
	Normally closed input	1	0	1
	Output	2	1	0
AI4(U) DIO4 (DIO4) Art.-No. 55293 only channels 4 to 7	Normally open input	0	0	0
	Normally closed input	1	0	1
	Output	2	1	0
K3 DO4 (DO4) / DIO4 (DIO4) Art.-No. 55291 only channels 4 to 7	Normally open input	0	0	0
	Normally closed input	1	0	1
	Output	2	1	0

Tab. 15: Parameterization Functionality of Channels 00 to 07 (Pin 4)

4.4.6 Parameterization Functionality of Channels 10 to 17 (Pin 2)

		Decimal	Bit 1	Bit 0
DO4(DO4) DI4(DI4) Art.-No. 55274 only channels 14 - 17	Normally open input	0	0	0
	Normally closed input	1	0	1
	Diagnostics input	2	1	0
DI8(DI8) Art.-No. 55307	Normally open input	0	0	0
	Normally closed input	1	0	1
	Diagnostics input	2	1	0
DIO8(DI8) Art.-No. 55308	Normally open input	0	0	0
	Normally closed input	1	0	1
	Diagnostics input	2	1	0
DIO8(DIO8) Art.-No. 55309	Normally open input	0	0	0
	Normally closed input	1	0	1
	Diagnostics input	2	1	0
	Output	3	1	1
AO4(I) DIO4 (DIO4) Art.-No. 55292 only channels 14 to 17	Normally open input	0	0	0
	Normally closed input	1	0	1
	Diagnostics input	2	1	0
	Output	3	1	1
AI4(U) DIO4 (DIO4) Art.-No. 55293 only channels 14 to 17	Normally open input	0	0	0
	Normally closed input	1	0	1
	Diagnostics input	2	1	0
	Output	3	1	1
K3 DO4 (DO4) / DIO4 (DIO4) Art.-No. 55291 only channels 14 to 17	Normally open input	0	0	0
	Normally closed input	1	0	1
	Diagnostics input	2	1	0
	Output	3	1	1

Tab. 16: Parameterization Functionality of Channels 10 to 17 (Pin 2)

4.4.7 Parameterization Functionality of Analog Channels 00 … 03

		Decimal	Bit 1	Bit 0
AO4 (I) DIO4 (DIO4) Art.-No. 55292	Inactive	0	0	0
	0 … 20 mA	1	0	1
	4 … 20 mA	2	1	0
AI4 (U) DIO4 (DIO4) Art.-No. 55293	Inactive	3	1	1
	0 … 10 V	1	0	1
	2 … 10 V	2	1	0

Tab. 17: Parameterization Functionality of Analog Channels 00 … 03

4.4.8 Parameterization Safe States of the Digital Outputs

Signification	Decimal	Bit 1	Bit 0
„0“ Output will be disabled (0 V)	0	0	0
„1“ Output will be enabled (24 V)	1	0	1
„last state“ Last state of output is remained.	2	1	0
Reserved	3	1	1

Tab. 18: Parameterization Safe States of the Digital Outputs

4.4.9 Structure of standard-specific parameters (Byte 0 … 6)

Byte	Bit n								Selection
	7	6	5	4	3	2	1	0	
0	Lock Req	Unlock Req	Sync Req	Free Req	WD On	res	res	res	Station status
1									WD_Fact_1
2									WD_Fact_2
3									MinTSDR
4									Ident_Number_High
5									Ident_Number_Low
6									Group_Ident

Fig. 27: Structure of standard-specific parameters (Byte 0 … 6)

TWD (s) = 10ms · WD_Fact_1 · WD_FACT_2. Time until response monitoring in the DP slave expires. Time in Tbit: This time must elapse before the slave can respond. The standard requires at least value 11. This value must always be smaller than maxTSDR

4.4.10 Structure of User Parameters

The user parameters for all devices described in this manual are structured the same way. The modules differ in their setting options, therefore, non-supported parameters are marked as reserved. Reserved bytes must be written with zero.

In chapter *user parameters* you will find a table with all user parameters.

4.4.11 Example: Configuration of the MVK-MP with the S7 Hardware Manager

① You will find MVK-MP in the hardware catalog of the Simatic manager under "Additional Field Devices" and "I/O".

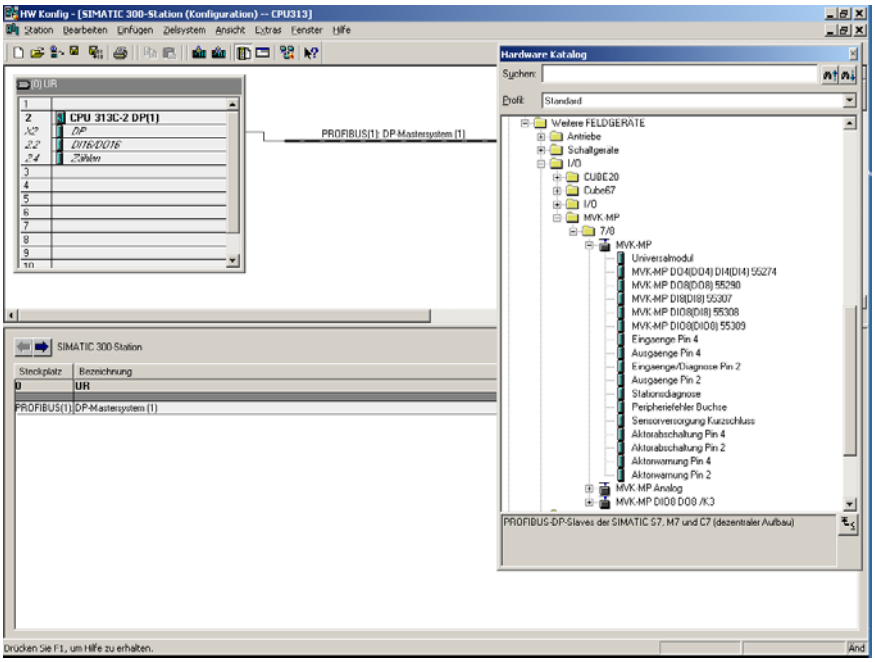


Fig. 28: Configuration of the MVK-MP with the S7 Hardware Manager

② Mark "MVK-MP" and drag the entry to the Profibus string while keeping the left mouse button depressed or by double clicking the Profibus string.

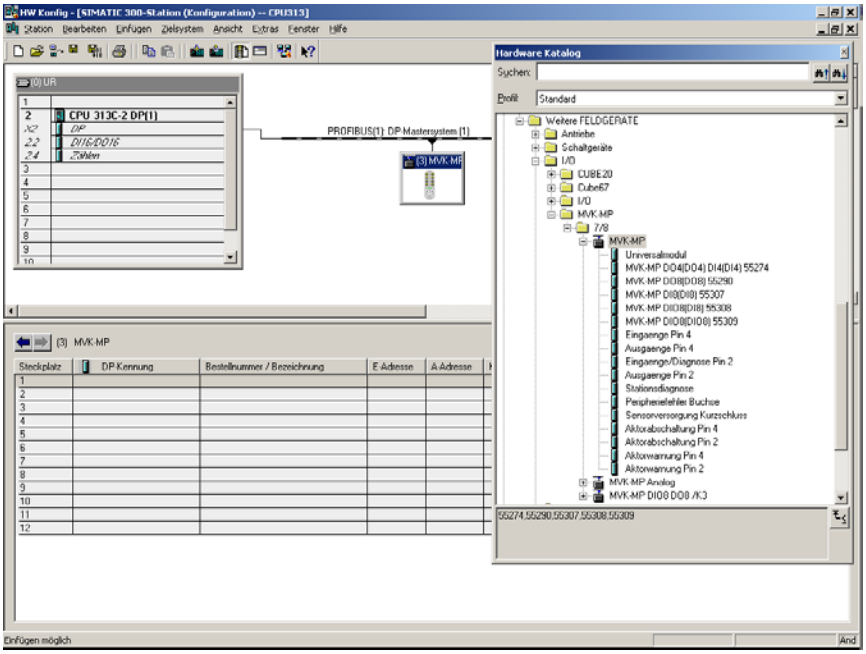


Fig. 29: Drag "MVK-MP" to the Profibus string

③ Select the appropriate head module (here: „MVK-MP DIO8(DI8) 55308“) from the hardware catalog and always insert this head module in port 0 in the table.

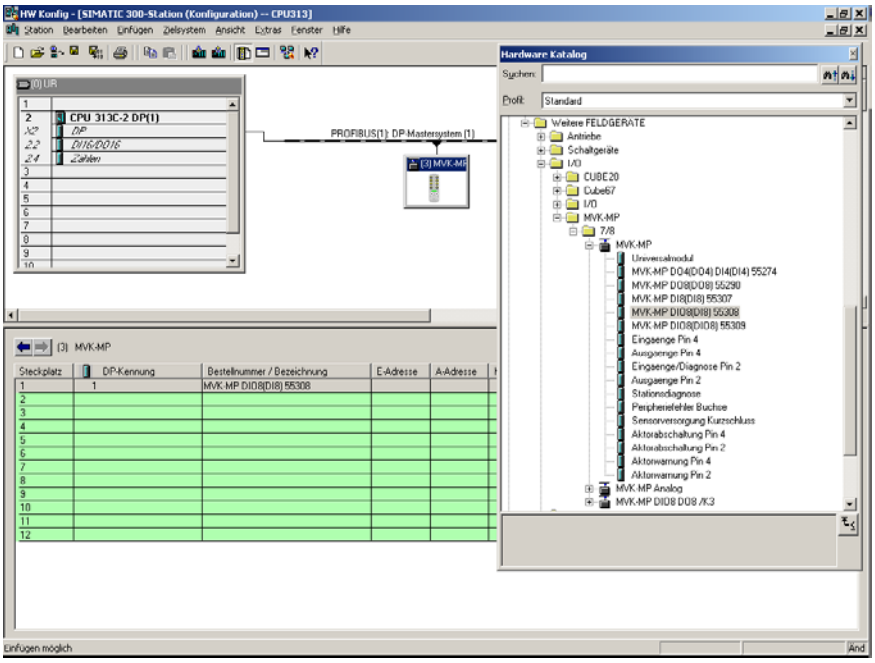


Fig. 30: Select the appropriate head module

④ The so-called "virtual modules" are listed under the head modules in the hardware catalog. Each of these modules occupies one or two bytes input or output data. Insert the required data in the table following the head module. Please note that, in addition to the user data, the diagnostic information can also be entered in the process map in this manner.

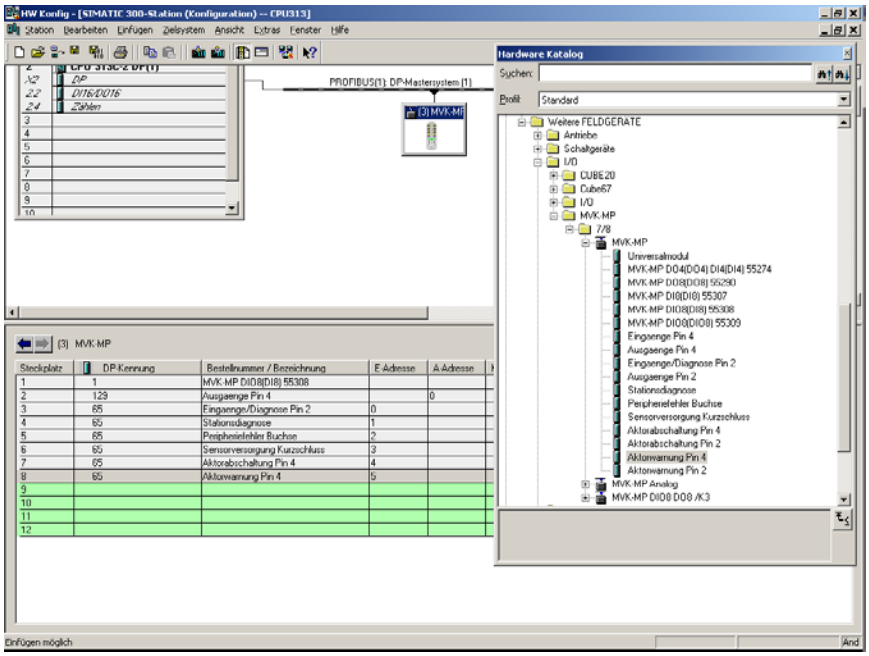


Fig. 31: Insert the required data in the table

⑤ By double clicking the head module you a list box of all available parameters. Select the required settings.

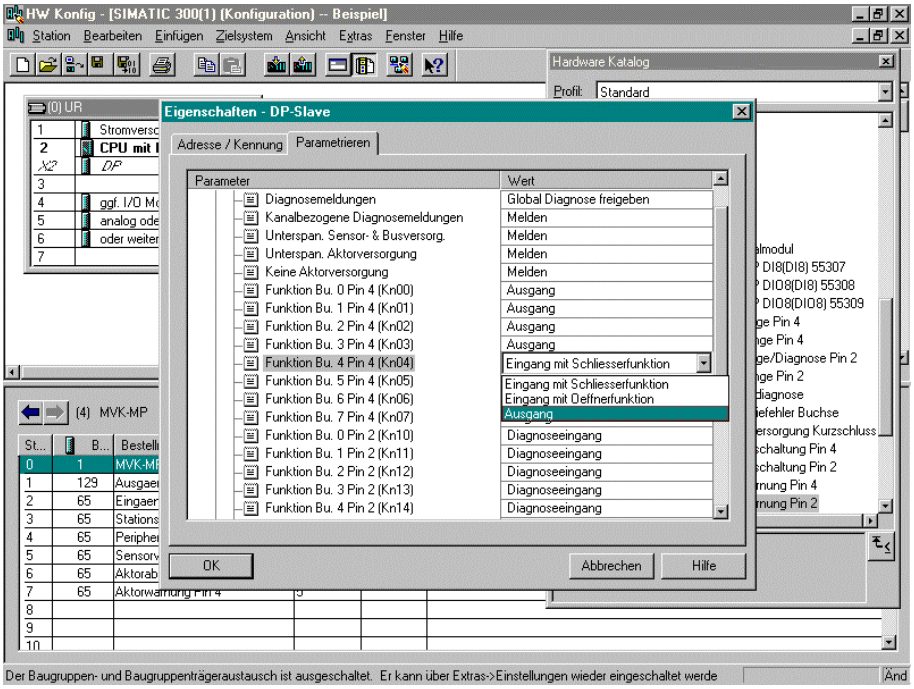


Fig. 32: List box of all available parameters by double clicking

5. Diagnostic

5.1 LED General Information

Signification for Bus Run LED		Remedy
green	Profibus - DP data exchange	-
flashing green	No DP data exchange Possible cause	
	Segment without supply.	Supply segment.
	No address or invalid address set.	Set correct address.
	The address set is already used.	Every Profibus segment must have an explicit and unique address
	Terminating resistor between master and segment is switched on.	When the terminal resistor of a Profibus plug is switched on, the following segment is usually separated from the Profibus. Check whether only the terminal resistors at the end of the Profibus segment are switched on.
	Wrong termination of the Profibus segment	Both ends of a Profibus segment must be fitted with a terminal resistor. With low baud rates the network can apparently be operated despite wrong termination. This may cause sporadic faults during operation.
	Stub Lines Baud rates up to 1.5 Mbit/s max. 6.6m With higher baud rates, stub lines are not admissible.	If stub lines cannot be avoided, preferably use specific “active” stub lines or repeaters. Please note that the number of repeaters used in a segment is limited. Please refer to the relevant documentation of the repeater.
	Extension of the Profibus segment is too large. For addmissible cable lengths see table.	Use repeaters for dividing large segments into several segments.
Off	Profibus firmware not yet initialized	Initializing the bus node may take some seconds

Tab. 19: LED General Information

Baud rate in kBit/s	9.6	19.2	45.45	93.75	187.5
Cable length in m	1200	1200	1200	1200	1000
Baud rate in kBit/s	500	1500	3000	6000	12000
Cable length in m	400	200	100	100	100

Tab. 20: Baud rates

5.2 LED Display

Channel-related diagnostics are displayed at the M12 socket via the LED assigned to this particular channel. Four LEDs, located beside the BUS LED, display the state of the supply voltage. The following tables show the relationship between cause of error and LED display. Please note the difference between MVK-MP with parameterizable outputs and the MVK-MP DI8 (DI8) with no outputs and the MVK-MP DO8 (DO8) with no inputs.

5.2.1 MVK-MP DO4 (DO4) DI4 (DI4) Art.-No. 55274

Error	LED on M12 socket No. x		Error		Power	
	Channel 0x	Channel 1x	U_A	U_S	U_A	U_S
Undervoltage bus & sensor supply				Red		
Undervoltage actuator supply			Red			
Bus&sensor supply ≤12V				Red		Off
No actuator supply			Red		Off	
External fault (socket 4 … 7)		Red				
Short-circuit (socket 4 … 7)	Red					
Actuator shutdown (socket 0…3)	Red	Red				
Actuator warning (socket 0 … 3)	Red	Red				

Tab. 21: Error displays MVK-MP DO4 (DO4) DI4 (DI4) Art.-No. 55274

5.2.2 MVK-MP DO8 (DO8) Art.-No. 55290

Error	LED on M12 socket No. x		Error		Power	
	Channel 0x	Channel 1x	U_A	U_S	U_A	U_S
Undervoltage bus supply				Red		
Undervoltage actuator supply			Red			
Bus supply ≤12V				Red		Off
No actuator supply			Red		Off	
Actuator shutdown	Red	Red				
Actuator warning	Red	Red				

Tab. 22: Error displays MVK-MP DO8 (DO8) Art.-No. 55290

5.2.3 MVK-MP K3 DO4 (DO4) / DIO4 (DIO4) Art.-No. 55291

Status	Power		Error		Power	
	U_{A1}	U_{A2}	U_S	U_A	U_S	U_A
Bus & sensor supply OK (≥18V)					Green	
UA actuator supply OK (≥18V)						Green
Bus & sensor supply ≤18V			Red			
UA actuator supply ≤18V				Red		
Bus & sensor supply ≤12V			Red		Off	
No UA actuator supply (≤12V)						Off
UA1 actuator supply OK (≥18V)	Green					
UA2 actuator supply OK (≥18V)		Green				
No UA1 actuator supply (≤12V)	Off					
No UA2 actuator supply (≤12V)		Off				

Tab. 23: Status displays MVK-MP K3 DO4 (DO4) / DIO4 (DIO4) Art.-No. 55291

Error	LED on M12 socket No. x					
	Channel 0x	Channel 1x				
External fault		Red				
Short-circuit (sensor supply)	Red					
Actuator shutdown	Red	Red				
Actuator warning	Red	Red				

Tab. 24: Error displays MVK-MP K3 DO4 (DO4) / DIO4 (DIO4) Art.-No. 55291

5.2.4 MVK-MP AO4 (I) DIO4 (DIO4) Art.-No. 55292

Error	LED on M12 socket No. x		Error		Power	
	Channel 0x	Channel 1x	U_A	U_S	U_A	U_S
Undervoltage bus & sensor supply				Red		
Undervoltage actuator supply			Red			
Bus&sensor supply ≤12V				Red		Off
No actuator supply			Red		Off	
External fault		Red				
Short-circuit (sensor supply)	Red					
Actuator shutdown	Red	Red				
Actuator warning	Red	Red				
Wire break	Red					

Tab. 25: Error displays MVK-MP AO4 (I) DIO4 (DIO4) Art.-No. 55292

5.2.5 MVK-MP AI4 (U) DIO4 (DIO4) Art.-No. 55293

Error	LED on M12 socket No. x		Error		Power	
	Channel 0x	Channel 1x	U_A	U_S	U_A	U_S
Undervoltage bus & sensor supply				Red		
Undervoltage actuator supply			Red			
Bus&sensor supply ≤12V				Red		Off
No actuator supply			Red		Off	
External fault		Red				
Short-circuit (sensor supply)	Red					
Actuator shutdown	Red	Red				
Actuator warning	Red	Red				
Over voltage	Red					
Wire break[6]	Red					

Tab. 26: Error displays MVK-MP AI4 (U) DIO4 (DIO4) Art.-No. 55293

[6] Only measuring range 2 to 10V

5.2.6 MVK-MP DI8 (DI8) Art.-No. 55307

Error	LED on M12 socket No. x		Error		Power	
	Channel 0x	Channel 1x	U_A	U_S	U_A	U_S
Undervoltage bus & sensor supply				Red		
Bus&sensor supply ≤12V				Red		Off
No actuator supply					Off	
External fault		Red				
Short-circuit (sensor supply)	Red	Red				

Tab. 27: Error displays MVK-MP DI8 (DI8) Art.-No. 55307

5.2.7 MVK-MP DIO8 (DI8) Art.-No. 55308
5.2.8 MVK-MP DIO8 (DIO8) Art.-No. 55309

Error	LED on M12 socket No. x		Error		Power	
	Channel 0x	Channel 1x	U_A	U_S	U_A	U_S
Undervoltage bus & sensor supply				Red		
Undervoltage actuator supply			Red			
Bus&sensor supply ≤12V				Red		Off
No actuator supply			Red		Off	
External fault		Red				
Short-circuit (sensor supply)	Red					
Actuator shutdown	Red	Red				
Actuator warning	Red	Red				

Tab. 28: Error display MVK-MP DIO8 (DI8) Art.-No. 55308 / MVK-MP DIO8 (DIO8) Art.-No. 55309

5.3 Structure of a Diagnostic Message

Diagnostic information comprises standard diagnostic information (6 bytes) and manufacturer-specific diagnostic information.

5.3.1 Byte 0 … 5: Standard Diagnostic Information

Byte 0

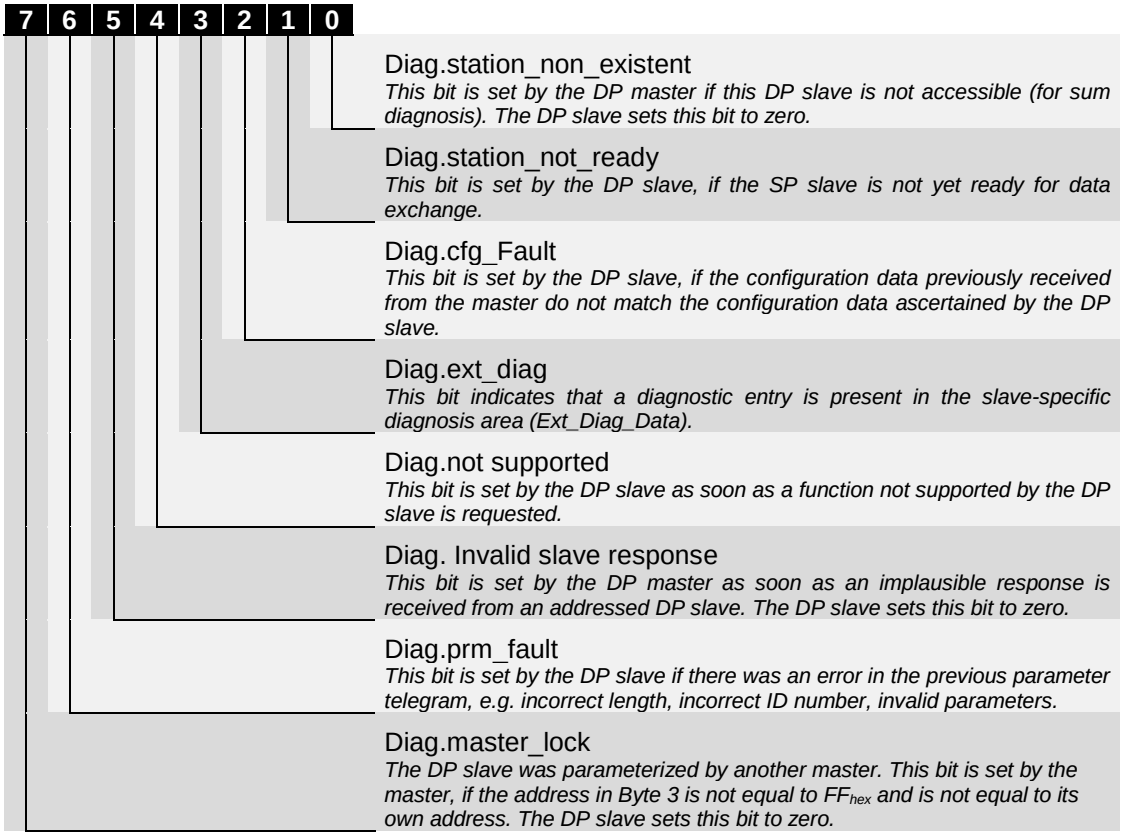


Fig. 33: Byte 0 Standard Diagnostic Information

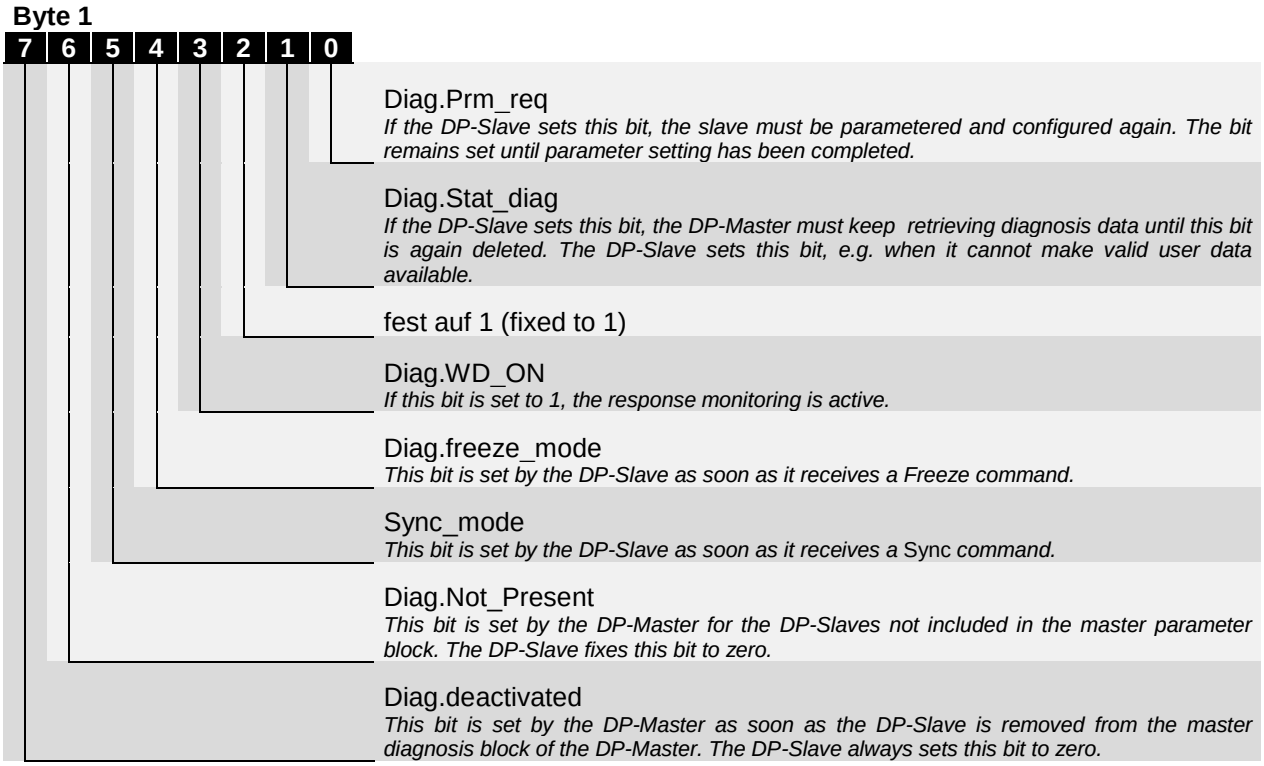


Fig. 34: Byte 1 Standard Diagnostic Information

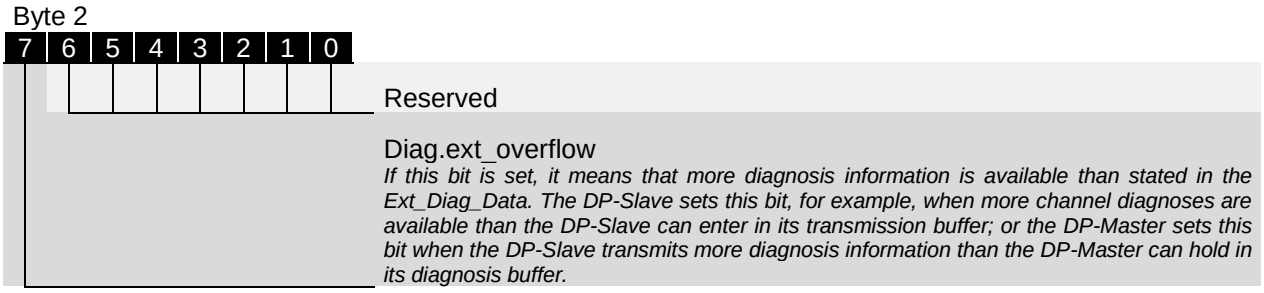


Fig. 35: Byte 2 Standard Diagnostic Information

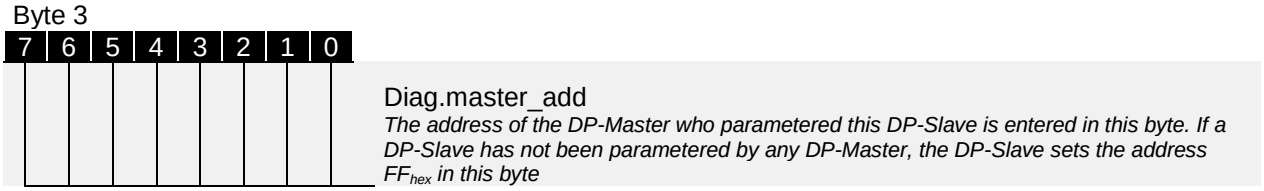


Fig. 36: Byte 3 Standard Diagnostic Information

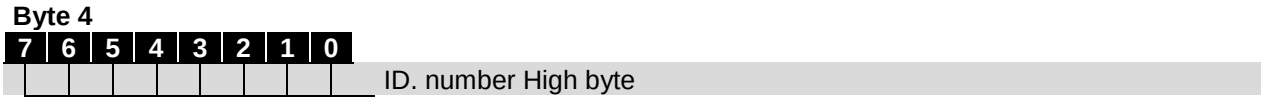


Fig. 37: Byte 4 Standard Diagnostic Information

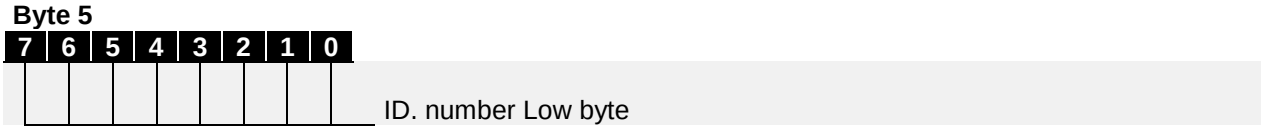


Fig. 38: Byte 5 Standard Diagnostic Information

5.3.2 Device-related Diagnostics Bytes 6 to 7

Byte 6 Device-related diagnostic – Header byte

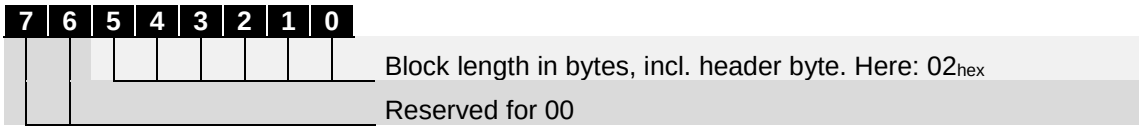


Fig. 39: Byte 6 Device-related diagnostic – Header byte

Byte 7 Device-related diagnostic

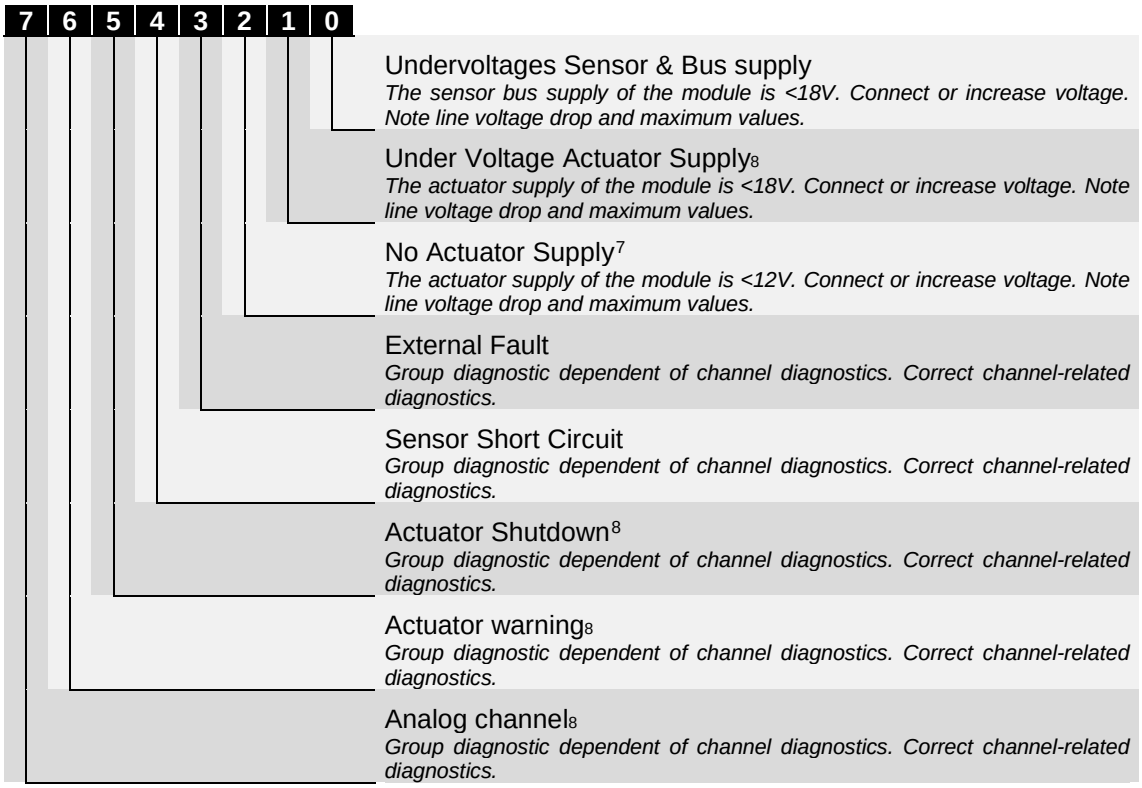


Fig. 40: Byte 7 Device-related diagnostic

[7] These diagnostics do not exist for input module MVK-MP DI8 (DI8) Art.-No. 55307.
[8] The different analog channel diagnostics (e.g. line breaks) are combined in this bit.

5.3.3 ID-related diagnostic bytes 8 to 9

Byte 8 ID-related diagnostic - header byte

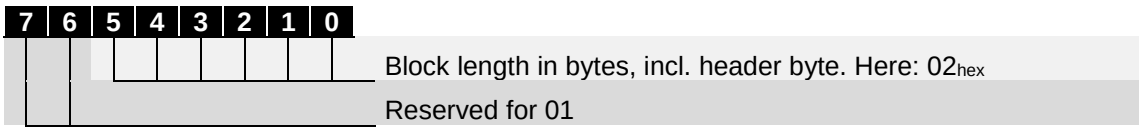


Fig. 41: Byte 8 ID-related diagnostic - header byte

Byte 9 ID-related diagnostic – ID Number

Fig. 42: Byte 9 ID-related diagnostic – ID Number

5.3.4 Byte 10 to 12 and following: Channel-related diagnostic

Three bytes are assigned in the diagnostic message for each channel-related diagnostic. If, for example, 5 channel-related diagnostics are available, a total of 5 x 3 = 15 bytes channel-related diagnostic information.

Byte 10 ID number

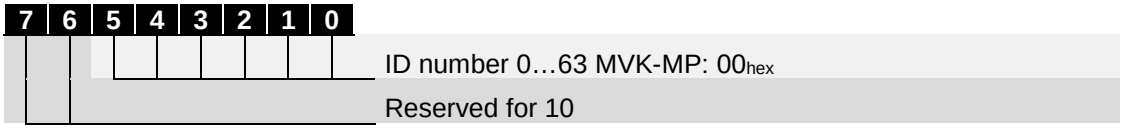


Fig. 43: Byte 10 ID number

Byte 11 Channel number

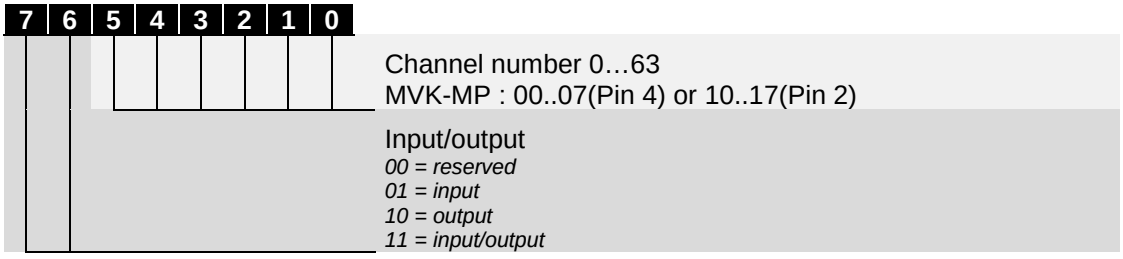


Fig. 44: Byte 11 Channel number

Byte 12 Error type

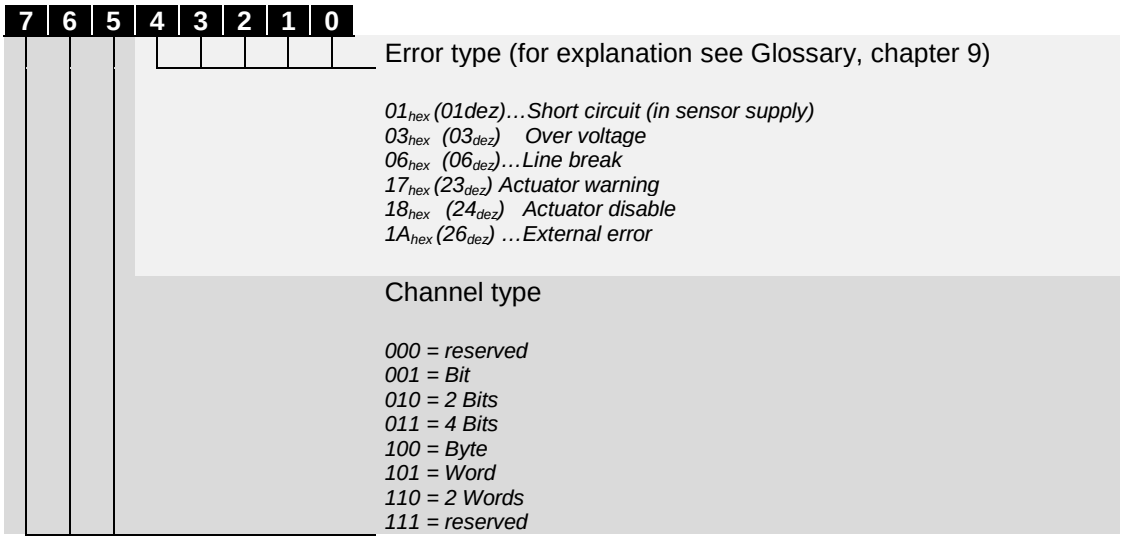


Fig. 45: Byte 12 Error type

Diagnostic message		Possible cause	Remedy
Channel	Short circuit (of sensor supply)	Overload or short circuit of sensor supply to 0V.	Check sensor cable or check sensor regarding short circuit, if necessary replacement.
	Over voltage	Measuring range of analog input overshot	Check sensor or connection to sensor
	Line break	Defective cable. Only analog inputs	Check sensor or connection to sensor
	Actuator warning	Short circuit of output signal to 24V.	Check wiring. Possibly sensor plugged in actuator socket
	Actuator disable	Overload or short circuit of output signal to 0V.	Check wiring or actuator.
	External Error	Diagnostic acc. DESINA specification. 24V at Pin2 missing.	Check DESINA sensor and DESINA cable, if necessary, replace.

Tab. 29: Diagnostic messages

5.3.5 Possible channel-related diagnostics

Sensor supply short circuit			
Channel	1. Byte	2. Byte	3. Byte
00 – Pin 4 So. 0	80_{hex}	40_{hex}	21_{hex}
01 – Pin 4 So. 1	80_{hex}	41_{hex}	21_{hex}
02 – Pin 4 So. 2	80_{hex}	42_{hex}	21_{hex}
03 – Pin 4 So. 3	80_{hex}	43_{hex}	21_{hex}
04 – Pin 4 So. 4	80_{hex}	44_{hex}	21_{hex}
05 – Pin 4 So. 5	80_{hex}	45_{hex}	21_{hex}
06 – Pin 4 So. 6	80_{hex}	46_{hex}	21_{hex}
07 – Pin 4 So. 7	80_{hex}	47_{hex}	21_{hex}
10 – Pin 2 So. 0	80_{hex}	$4A_{hex}$	21_{hex}
11 – Pin 2 So. 1	80_{hex}	$4B_{hex}$	21_{hex}
12 – Pin 2 So. 2	80_{hex}	$4C_{hex}$	21_{hex}
13 – Pin 2 So. 3	80_{hex}	$4D_{hex}$	21_{hex}
14 – Pin 2 So. 4	80_{hex}	$4E_{hex}$	21_{hex}
15 – Pin 2 So. 5	80_{hex}	$4F_{hex}$	21_{hex}
16 – Pin 2 So. 6	80_{hex}	50_{hex}	21_{hex}
17 – Pin 2 So. 7	80_{hex}	51_{hex}	21_{hex}

Actuator disable			
Channel	1. Byte	2. Byte	3. Byte
00 – Pin 4 So. 0	80_{hex}	80_{hex}	38_{hex}
01 – Pin 4 So. 1	80_{hex}	81_{hex}	38_{hex}
02 – Pin 4 So. 2	80_{hex}	82_{hex}	38_{hex}
03 – Pin 4 So. 3	80_{hex}	83_{hex}	38_{hex}
04 – Pin 4 So. 4	80_{hex}	84_{hex}	38_{hex}
05 – Pin 4 So. 5	80_{hex}	85_{hex}	38_{hex}
06 – Pin 4 So. 6	80_{hex}	86_{hex}	38_{hex}
07 – Pin 4 So. 7	80_{hex}	87_{hex}	38_{hex}
10 – Pin 2 So. 0	80_{hex}	$8A_{hex}$	38_{hex}
11 – Pin 2 So. 1	80_{hex}	$8B_{hex}$	38_{hex}
12 – Pin 2 So. 2	80_{hex}	$8C_{hex}$	38_{hex}
13 – Pin 2 So. 3	80_{hex}	$8D_{hex}$	38_{hex}
14 – Pin 2 So. 4	80_{hex}	$8E_{hex}$	38_{hex}
15 – Pin 2 So. 5	80_{hex}	$8F_{hex}$	38_{hex}
16 – Pin 2 So. 6	80_{hex}	90_{hex}	38_{hex}
17 – Pin 2 So. 7	80_{hex}	91_{hex}	38_{hex}

External error			
Channel	1. Byte	2. Byte	3. Byte
10 – Pin 2 So. 0	80_{hex}	$4A_{hex}$	$3A_{hex}$
11 – Pin 2 So. 1	80_{hex}	$4B_{hex}$	$3A_{hex}$
12 – Pin 2 So. 2	80_{hex}	$4C_{hex}$	$3A_{hex}$
13 – Pin 2 So. 3	80_{hex}	$4D_{hex}$	$3A_{hex}$
14 – Pin 2 So. 4	80_{hex}	$4E_{hex}$	$3A_{hex}$
15 – Pin 2 So. 5	80_{hex}	$4F_{hex}$	$3A_{hex}$
16 – Pin 2 So. 6	80_{hex}	50_{hex}	$3A_{hex}$
17 – Pin 2 So. 7	80_{hex}	51_{hex}	$3A_{hex}$

Actuator warning			
Channel	1. Byte	2. Byte	3. Byte
00 – Pin 4 So. 0	80_{hex}	80_{hex}	37_{hex}
01 – Pin 4 So. 1	80_{hex}	81_{hex}	37_{hex}
02 – Pin 4 So. 2	80_{hex}	82_{hex}	37_{hex}
03 – Pin 4 So. 3	80_{hex}	83_{hex}	37_{hex}
04 – Pin 4 So. 4	80_{hex}	84_{hex}	37_{hex}
05 – Pin 4 So. 5	80_{hex}	85_{hex}	37_{hex}
06 – Pin 4 So. 6	80_{hex}	86_{hex}	37_{hex}
07 – Pin 4 So. 7	80_{hex}	87_{hex}	37_{hex}
10 – Pin 2 So. 0	80_{hex}	$8A_{hex}$	37_{hex}
11 – Pin 2 So. 1	80_{hex}	$8B_{hex}$	37_{hex}
12 – Pin 2 So. 2	80_{hex}	$8C_{hex}$	37_{hex}
13 – Pin 2 So. 3	80_{hex}	$8D_{hex}$	37_{hex}
14 – Pin 2 So. 4	80_{hex}	$8E_{hex}$	37_{hex}
15 – Pin 2 So. 5	80_{hex}	$8F_{hex}$	37_{hex}
16 – Pin 2 So. 6	80_{hex}	90_{hex}	37_{hex}
17 – Pin 2 So. 7	80_{hex}	91_{hex}	37_{hex}

Overvoltage			
Channel	1. Byte	2. Byte	3. Byte
00 –So. 0	80_{hex}	80_{hex}	03_{hex}
01 –So. 1	80_{hex}	81_{hex}	03_{hex}
02 –So. 2	80_{hex}	82_{hex}	03_{hex}
03 –So. 3	80_{hex}	83_{hex}	03_{hex}

Line break			
Channel	1. Byte	2. Byte	3. Byte
00 – So. 0	80_{hex}	80_{hex}	06_{hex}
01 – So. 1	80_{hex}	81_{hex}	06_{hex}
02 – So. 2	80_{hex}	82_{hex}	06_{hex}
03 – So. 3	80_{hex}	83_{hex}	06_{hex}

* - Nur Art.-No.: 55292, 55293

Tab. 30: Possible channel-related diagnostics

6. Technical Data

6.1 Data sheet

6.1.1 Mechanical data

6.1.1.1. DO4 (DO4) DI4(DI4) Art.-No. 55274

6.1.1.2. DO8(DO8) Art.-No. 55290

6.1.1.3. DI8(DI8) Art.-No. 55307

6.1.1.4. DIO8(DI8) Art.-No. 55308

6.1.1.5. DIO8(DIO8) Art.-No. 55309

6.1.1.6. AO4 (I) DIO4 (DIO4) Art.-No. 55292

6.1.1.7. AI4 (U) DIO4 (DIO4) Art.-No. 55293

EMC

EN 61131-2

EN 61000-4-2 ESD	Contact ±4 kV, Air ±8 kV
E EN 61000-4-3 RF-Field + GSM	10 V/m
EN 61000-4-4 Burst	±2 kV
EN 61000-4-5 Surge	asym./symm. ±500 V (DC power input)
	asym. ±1 kV (signal connections)
EN 61000-4-6 HF-asymmetrical	10 V
EN 61000-4-8 magnet field 50 Hz	30 A/m
EN 50081-1 interference strength	QP 40 dBµV/m (30 … 230 MHz)
	QP 47 dBµV/m (230 … 1000 MHz) Class A

Ambient conditions

Operating temperature	0°C ... +55°C
Storage temperature	-25°C ... +70°C
Protection acc. EN 60529	IP 67

Materials

Housing	zinc die cast, matt nickel coated
Addressing cap	PA 6-3-T
O-Ring cap	Viton, green
O-Ring M12	Viton, green
O-Ring 7/8“	NBR, black
Light comb + ring	PC

Mechanical Environment

Vibration acc. to EN 60068 Part 2-6	5 … 58 Hz; const. Amplitude 1.5 mm
	58 … 500 Hz; const. acceleration 20 g
	Rate of frequency change: 1 Oct/min.
	Number of cycles: 10
	Function test during testing
Shock acc. to EN 60068 Part 2-27	Shock shape: Half sinus
	Shock acceleration: 50g
	Shock duration: 11ms
	Directions 6 (positive and negative)
	Number of shocks per direction: 3
	Function test during testing

Connections

Supply cable	2 x Connector 7/8" female, male
Data cable	2 x M12 connector 5 pole
	(female, male, B-coded)
Outputs, inputs, and diagnostic inputs	8 x 5 pole M12 connector (A coded)

Torques

Addressing cap M3	0.3 Nm
M12 Round Plug Connectors	0.6 Nm
M6 fixing screw	8 Nm
7/8" round plug connector	1.5 Nm

Other

Dimensions (LxWxH)	225 x 63 x 39 mm
Mounting clearance	208.5 ±0.5 mm
Weight	760 g

6.1.2 Mechanical data

6.1.2.1 K3 DO4(DO4)/DIO4(DIO4) Art.-No. 55291

EMC

EN 61131-2

EN 61000-4-2 ESD	Contact ±4 kV, Air ±8 kV
E EN 61000-4-3 RF-Field + GSM	10 V/m
EN 61000-4-4 Burst	±2 kV
EN 61000-4-5 Surge	asym./symm. ±500 V (DC power input)
	asym. ±1 kV (signal connections)
EN 61000-4-6 HF-asymmetrical	10 V
EN 61000-4-8 magnet field 50 Hz	30 A/m
EN 50081-1 interference strength	QP 40 dBµV/m (30 … 230 MHz)
	QP 47 dBµV/m (230 … 1000 MHz) Class A

Ambient conditions

Operating temperature	0°C ... +55°C
Storage temperature	-25°C ... +70°C
Protection acc. EN 60529	IP 67

Materials

Housing	zinc die cast, matt nickel coated
Addressing cap	PA 6-3-T
O-Ring cap	Viton, green
O-Ring M12	Viton, green
O-Ring 7/8“	NBR, black
Light comb + ring	PC

Mechanical Environment

Vibration acc. to EN 60068 Part 2-6	5 … 58 Hz; const. Amplitude 1.5 mm
	58 … 500 Hz; const. acceleration 20 g
	Rate of frequency change: 1 Oct/min.
	Number of cycles: 10
	Function test during testing
Shock acc. to EN 60068 Part 2-27	Shock shape: Half sinus
	Shock acceleration: 50g
	Shock duration: 11ms
	Directions 6 (positive and negative)
	Number of shocks per direction: 3
	Function test during testing

Connections

Supply cable	2 x Connector 7/8" female, male
Data cable	2 x M12 connector 5 pole
	(female, male, B-coded)
Outputs, inputs, and diagnostic inputs	8 x 5 pole M12 connector (A coded)

Torques

Addressing cap M3	0.3 Nm
M12 Round Plug Connectors	0.6 Nm
M6 fixing screw	8 Nm
7/8'' round plug connector	1.5 Nm

Other

Dimensions (LxWxH)	225 x 63 x 39 mm
Mounting clearance	208.5 ±0.5 mm
Weight	780 g

6.1.3 Electrical data

6.1.3.1. DO4 (DO4) DI4 (DI4) Art.-No. 55274

Bus data

Transfer protocol	Profibus-DP acc. to DIN 19245
Transfer rates	9,6/19,2/45,45/93,75/187,5/500/
	1500/3000/6000/12000 kBaud
Baud rate detection	automatically
Operating modes	Sync- and freeze mode are supported
Addressing	1 … 99 via BCD rotary switch
ID number	0x064A hex

Supply

Operating voltage U_B	24 V ⎓
Supply voltage range	18 ... 30 V ⎓
Current consumption (without inputs)	≤150 mA
Sensor supply	≤200 mA per sensor
Short-circuit protection for sensors	Multifuse,
	up to 100 mA load automatic start
	from 100 mA load reset required
Tripping time multifuse	1s at I_K ≥1 A and 23°C
Reverse polarity protection inputs	yes

Inputs / diagnostics

Max. no. of inputs	8
Delay time with signal change	2 … 5 ms
Input characteristic	EN 61131-2, type 2
Input filter	approx. 1 ms
Over voltage protection	Yes (suppressor diode)

Reverse polarity protection

Module electronics	Yes
Sensors	No
Actuators	No

Outputs

Max. no. of outputs	8
Nominal current	1.6 A
Max. total current	9 A
Over voltage protection	Yes (suppressor diode)
Cable length	0.75 mm² ≤10 m
	0.34 mm² ≤5 m
Cable diameter	≤1.5 mm²
Signal delay	2 … 5 ms
Max. switching frequency at resistive load	20 Hz
Max. lamp load	10 W

6.1.3.2. DO8(DO8) Art.-No. 55290

Bus data

Transfer protocol	Profibus-DP acc. to DIN 19245
Transfer rates	9,6/19,2/45,45/93,75/187,5/500/
	1500/3000/6000/12000 kBaud
Baud rate detection	automatically
Operating modes	Sync- and freeze mode are supported
Addressing	1 … 99 via BCD rotary switch
ID number	0x064A hex

Supply

Operating voltage U_B	24 V ⎓
Supply voltage range	18 ... 30 V ⎓
Current consumption (without inputs)	≤150 mA

Reverse polarity protection

Module electronics	Yes
Actuators	No

Outputs

Max. no. of outputs	16
Nominal current	1.6 A
Max. total current	9 A
Over voltage protection	Yes (suppressor diode)
Cable length	0.75 mm² ≤10 m
	0.34 mm² ≤5 m
Cable diameter	≤1.5 mm²
Signal delay	2 … 5 ms
Max. switching frequency at resistive load	20 Hz
Max. lamp load	10 W

6.1.3.3. K3 DO4(DO4)/DIO4(DIO4) 55291

Bus data

Transfer protocol	Profibus-DP acc. to DIN 19245
Transfer rates	9,6/19,2/45,45/93,75/187,5/500/
	1500/3000/6000/12000 kBaud
Baud rate detection	automatically
Operating modes	Sync- and freeze mode are supported
Addressing	1 … 99 via BCD rotary switch
ID number	0x09EB hex

Supply

Operating voltage U_B	24 V ⎓
Supply voltage range	18 ... 30 V ⎓
Current consumption (without inputs)	≤150 mA
Sensor supply	≤200 mA per sensor
Short-circuit protection for sensors	Multifuse,
	up to 100 mA load automatic start
	from 100 mA load reset required
Tripping time multifuse	1s at I_K ≥1 A and 23°C
Reverse polarity protection inputs	Yes

Inputs / diagnostics

Max. no. of inputs	8
Delay time with signal change	2 … 5 ms
Input characteristic	EN 61131-2, type 2
Input filter	approx. 1 ms
Over voltage protection	Yes (suppressor diode)

Reverse polarity protection

Module electronics	Yes
Sensors	No
Actuators	No

Outputs

Max. no. of outputs	8 safe outputs / 8 standard outputs
Nominal current	≤3,2 A per socket, ≤2 A per pin
Max. total current	9 A
Over voltage protection	Yes (suppressor diode)
Cable length	0.75 mm² ≤10 m
	0.34 mm² ≤5 m
Cable diameter	≤1.5 mm²
Signal delay	2 … 5 ms
Max. switching frequency at resistive load	20 Hz
Max. lamp load	10 W

6.1.3.4. AO4 (I) DIO4 (DIO4) Art.-No. 55292

Bus data

Transfer protocol	Profibus-DP acc. to DIN 19245
Transfer rates	9,6/19,2/45,45/93,75/187,5/500/
	1500/3000/6000/12000 kBaud
Baud rate detection	automatically
Operating modes	Sync- and freeze mode are supported
Addressing	1 … 99 via BCD rotary switch
ID number	09AD hex

Supply

Operating voltage U_B	24 V ⎓
Supply voltage range	18 ... 30 V ⎓
Current consumption (without inputs)	≤150 mA
Sensor supply	≤200 mA per sensor
Short-circuit protection for sensors	Multifuse,
	up to 100 mA load automatic start
	from 100 mA load reset required
Tripping time multifuse	1s at I_K ≥1 A and 23°C
Reverse polarity protection inputs	Yes

Inputs / diagnostics

Max. no. of inputs	8
Delay time with signal change	2 … 5 ms
Input characteristic	EN 61131-2, type 2
Input filter	approx. 1 ms
Over voltage protection	Yes (suppressor diode)

Reverse polarity protection

Module electronics	Yes
Sensors	No
Actuators	No

Outputs

Max. no. of outputs	8
Nominal current	1.6 A
Max. total current	9 A
Over voltage protection	Yes (suppressor diode)
Cable length	0.75 mm² ≤10 m
	0.34 mm² ≤5 m
Cable diameter	≤1.5 mm²
Signal delay	2 … 5 ms
Max. switching frequency at resistive load	20 Hz
Max. lamp load	10 W

Analog outputs

Conversion time	approx. 1 ms
Signal delay	approx. 5 ms
Pin 4	analog current output
Pin 2	not used
Current range	0 … 20 mA or 4 … 20 mA
	(11 Bits)
max. analog output current	20 mA
Data format	11 bits, Motorola or optionally Intel format
relative error of output value	±0.6 % of end-scale value
relative error of output value at 55°C	±0.8 % of end-scale value
relative error of output value with EMC conditions	±1 % of end-scale value
Load resistance	500 Ω
max. capacitive load	1 µF

6.1.3.5. AI4 (U) DIO4 (DIO4) Art.-No. 55293

Bus data

Transfer protocol	Profibus-DP acc. to DIN 19245
Transfer rates	9,6/19,2/45,45/93,75/187,5/500/
	1500/3000/6000/12000 kBaud
Baud rate detection	automatically
Operating modes	Sync- and freeze mode are supported
Addressing	1 … 99 via BCD rotary switch
ID number	09AD hex

Supply

Operating voltage U_B	24 V ⎓
Supply voltage range	18 ... 30 V ⎓
Current consumption (without inputs)	≤150 mA
Sensor supply	≤200 mA per sensor
Short-circuit protection for sensors	Multifuse,
	up to 100 mA load automatic start
	from 100 mA load reset required
Tripping time multifuse	1s at I_K ≥1 A and 23°C
Reverse polarity protection inputs	Yes

Inputs / diagnostics

Max. no. of inputs	8
Delay time with signal change	2 … 5 ms
Input characteristic	EN 61131-2, type 2
Input filter	approx. 1 ms
Over voltage protection	Yes (suppressor diode)

Analog inputs

Conversion time	7 ms
Conversion type	successive approximation
Signal delay	35 ms
Pin 2	positive differential voltage input
PIN 4	negative differential voltage input
Measuring range	0 … 10 V (15 Bits)
	2 … 10 V (15 Bits)
max. analog input voltage	12 V
Input resistor	approx. 1 MΩ
Data format	16 bits, Motorola or optionally Intel format
relative measuring error	±0.3 % of end-scale value
relative measuring error at 55°C	±0.5 % of end-scale value
relative measuring error under EMC conditions	±1 % of end-scale value
Repetition accuracy	±0.03 % relative to the absolute value
Calibration	self-calibrating
Cable length	≤30 m

Reverse polarity protection

Module electronics	Yes
Sensors	No
Actuators	No

Outputs

Max. no. of outputs	8
Nominal current	1.6 A
Max. total current	9 A
Over voltage protection	Yes (suppressor diode)
Cable length	0.75 mm² ≤10 m
	0.34 mm² ≤5 m
Cable diameter	≤1.5 mm²
Signal delay	2 … 5 ms
Max. switching frequency at resistive load	20 Hz
Max. lamp load	10 W

6.1.3.6. DI8(DI8) Art.-No. 55307

Bus data

Transfer protocol	Profibus-DP acc. to DIN 19245
Transfer rates	9,6/19,2/45,45/93,75/187,5/500/
	1500/3000/6000/12000 kBaud
Baud rate detection	automatically
Operating modes	Sync- and freeze mode are supported
Addressing	1 … 99 via BCD rotary switch
ID number	0x064A hex

Supply

Operating voltage U_B	24 V ⎓
Supply voltage range	18 ... 30 V ⎓
Current consumption (without inputs)	≤150 mA
Sensor supply	≤200 mA per sensor
Short-circuit protection for sensors	Multifuse,
	up to 100 mA load automatic start
	from 100 mA load reset required
Tripping time multifuse	1s at I_K ≥1 A and 23°C
Reverse polarity protection inputs	yes

Inputs / diagnostics

Max. no. of inputs	16
Delay time with signal change	2 … 5 ms
Input characteristic	EN 61131-2, type 2
Input filter	approx. 1 ms
Over voltage protection	Yes (suppressor diode)

Reverse polarity protection

Module electronics	Yes
Sensors	No
Actuators	No

6.1.3.7. DIO8(DI8) Art.-No. 55308

Bus data

Transfer protocol	Profibus-DP acc. to DIN 19245
Transfer rates	9,6/19,2/45,45/93,75/187,5/500/
	1500/3000/6000/12000 kBaud
Baud rate detection	automatically
Operating modes	Sync- and freeze mode are supported
Addressing	1 … 99 via BCD rotary switch
ID number	0x064A hex

Supply

Operating voltage U_B	24 V ⎓
Supply voltage range	18 ... 30 V ⎓
Current consumption (without inputs)	≤150 mA
Sensor supply	≤200 mA per sensor
Short-circuit protection for sensors	Multifuse,
	up to 100 mA load automatic start
	from 100 mA load reset required
Tripping time multifuse	1s at I_K ≥1 A and 23°C
Reverse polarity protection inputs	Yes

Inputs / diagnostics

Max. no. of inputs	16
Delay time with signal change	2 … 5 ms
Input characteristic	EN 61131-2, type 2
Input filter	approx. 1 ms
Over voltage protection	Yes (suppressor diode)

Reverse polarity protection

Module electronics	Yes
Sensors	No
Actuators	No

Outputs

Max. no. of outputs	8
Nominal current	1.6 A
Max. total current	9 A
Over voltage protection	Yes (suppressor diode)
Cable length	0.75 mm² ≤10 m
	0.34 mm² ≤5 m
Cable diameter	≤1.5 mm²
Signal delay	2 … 5 ms
Max. switching frequency at resistive load	20 Hz
Max. lamp load	10 W

6.1.3.8. DIO8(DIO8) Art.-No. 55309

Bus data

Transfer protocol	Profibus-DP acc. to DIN 19245
Transfer rates	9,6/19,2/45,45/93,75/187,5/500/
	1500/3000/6000/12000 kBaud
Baud rate detection	automatically
Operating modes	Sync- and freeze mode are supported
Addressing	1 … 99 via BCD rotary switch
ID number	0x064A hex

Supply

Operating voltage U_B	24 V ⎓
Supply voltage range	18 ... 30 V ⎓
Current consumption (without inputs)	≤150 mA
Sensor supply	≤200 mA per sensor
Short-circuit protection for sensors	Multifuse,
	up to 100 mA load automatic start
	from 100 mA load reset required
Tripping time multifuse	1s at I_K ≥1 A and 23°C
Reverse polarity protection inputs	Yes

Inputs / diagnostics

Max. no. of inputs	16
Delay time with signal change	2 … 5 ms
Input characteristic	EN 61131-2, type 2
Input filter	approx. 1 ms
Over voltage protection	Yes (suppressor diode)

Reverse polarity protection

Module electronics	Yes
Sensors	No
Actuators	No

Outputs

Max. no. of outputs	16
Nominal current	1.6 A
Max. total current	9 A
Over voltage protection	Yes (suppressor diode)
Cable length	0.75 mm² ≤10 m
	0.34 mm² ≤5 m
Cable diameter	≤1.5 mm²
Signal delay	2 … 5 ms
Max. switching frequency at resistive load	20 Hz
Max. lamp load	10 W

Accessories

Art.-No.	Description
926029	Adapter plate for MVK Metal
7000-14001-0000000	M12 male, B-coded straight (shielded)
7000-14021-0000000	M12 female, B-coded straight (shielded)
7000-78081-0000000	7/8“ male straight
7000-78201-0000000	7/8“ female straight
7000-14041-0000000	Terminating resistor Profibus
7000-41241-0000000	M12 diagnostic adapter (for cable monitoring)
55468	M12 blind plug black (4 pcs.)
338155	Blind plug diagnostic M12x1
55390	Blind plug 7/8" (outer thread)
55317	Addressing cap metal (zinc die-cast matt nickel plated)
55318	Label plates 20x8
55770	Profibus bus cable (by the meter), massive cable
55777	Profibus bus cable (by the meter), flexible, suitable for C-tracks
7000-44001-8400030	Pre-wired bus connector straight length 0.3m (PUR)
7000-44001-8400060	Pre-wired bus connector straight length 0.6m (PUR)
7000-44001-8400100	Pre-wired bus connector straight length 1.0m (PUR)
7000-44001-8400200	Pre-wired bus connector straight length 2.0m (PUR)
7000-44001-8400300	Pre-wired bus connector straight length 3.0m (PUR)
7000-44001-8400500	Pre-wired bus connector straight length 5.0m (PUR)
7000-44021-8400030	Pre-wired bus connector 90° length 0.3m (PUR)
7000-44021-8400060	Pre-wired bus connector 90° length 0.6m (PUR)
7000-44021-8400100	Pre-wired bus connector 90° length 1.0m (PUR)
7000-44021-8400200	Pre-wired bus connector 90° length 2.0m (PUR)
7000-44021-8400300	Pre-wired bus connector 90° length 3.0m (PUR)
7000-44021-8400500	Pre-wired bus connector 90° length 5.0m (PUR)
7000-50021-9610030	Pre-wired power connector straight length 0.3m (PUR)
7000-50021-9610060	Pre-wired power connector straight length 0.6m (PUR)
7000-50021-9610100	Pre-wired power connector straight length 1.0m (PUR)
7000-50021-9610200	Pre-wired power connector straight length 2.0m (PUR)
7000-78021-9610300	Pre-wired power connector female straight one side open length 3.0m (PUR)
7000-78021-9610500	Pre-wired power connector female straight one side open length 5.0m (PUR)
7000-78021-9611000	Pre-wired power connector female straight one side open length 10.0m (PUR)
7000-50061-0000000	T-coupler male-female-male 5 pole (shielded)

More information on system accessories available upon request. Please refer to our catalogs or visit: www.murrelektronik.com.

User Parameter

Byte	Byte in telegram	Bit	MVK-MP DI8(DI8)	MVK-MP DIO8(DI8)	MVK-MP DIO8(DIO8)	MVK-MP AO4 (I) DIO4 (DIO4)	MVK-MP AI4 (U) DIO4(DIO4)
			Article number 55307	Article number 55308	Article number 55309	Article number 55292	Article number 55293
	0		Standard IEC 61158	Standard IEC 61158	Standard IEC 61158	Standard IEC 61158	Standard IEC 61158
	1						
	2						
	3						
	4						
	5						
	6						
0	7		Reserved	Reserved	Reserved	Reserved	Reserved
1	8		Reserved	Reserved	Reserved	Reserved	Reserved
2	9		Reserved	Reserved	Reserved	Reserved	Reserved
			Global settings	**Global settings**	**Global settings**	**Global settings**	**Global settings**
3	10	0	Diagnostic messages (enable/disable global diagnostics)	Diagnostic messages (enable/disable global diagnostics)	Diagnostic messages (enable/disable global diagnostics)	Diagnostic messages (enable/disable global diagnostics)	Diagnostic messages (enable/disable global diagnostics)
		1	Channel-related diagnostic messages	Channel-related diagnostic messages	Channel-related diagnostic messages	Channel-related diagnostic messages	Channel-related diagnostic messages
		2	Undervoltages sensor and bus supply	Undervoltages sensor and bus supply	Undervoltages sensor and bus supply	Undervoltages sensor and bus supply	Undervoltages sensor and bus supply
		3	Reserved	Undervoltage actuator supply	Undervoltage actuator supply	Undervoltage actuator supply	Undervoltage actuator supply
		4	Reserved	No Actuator Supply	No Actuator Supply	No Actuator Supply	No Actuator Supply
		5	Reserved	Reserved	Reserved	Reserved	Reserved
		6	Reserved	Reserved	Reserved	Reserved	Reserved
		7	Reserved	Reserved	Reserved	Byte sequence Motorola/Intel (default: 0 = motorola)	Byte sequence Motorola/Intel (default: 0 = motorola)
			Function Socket 0..3 Pin 4 (Channel 00..03)	**Function Socket 0..3 Pin 4 (Channel 00..03)**	**Function Socket 0..3 Pin 4 (Channel 00..03)**	**Function Socket 0..3 Analog Output (Channel 00..03)**	**Function Socket 0..3 Analog Output (Channel 00..03)**
4	11	0 1	Function Socket 0 Pin 4 (Channel 00)	Function Socket 0 Pin 4 (Channel 00)	Function Socket 0 Pin 4 (Channel 00)	Function Socket 0 Analog Output (Channel 00)	Function Socket 0 Analog Output (Channel 00)
		2 3	Function Socket 1 Pin 4 (Channel 01)	Function Socket 1 Pin 4 (Channel 01)	Function Socket 1 Pin 4 (Channel 01)	Function Socket 1 Analog Output (Channel 01)	Function Socket 1 Analog Output (Channel 01)
		4 5	Function Socket 2 Pin 4 (Channel 02)	Function Socket 2 Pin 4 (Channel 02)	Function Socket 2 Pin 4 (Channel 02)	Function Socket 2 Analog Output (Channel 02)	Function Socket 2 Analog Output (Channel 02)
		6 7	Function Socket 3 Pin 4 (Channel 03)	Function Socket 3 Pin 4 (Channel 03)	Function Socket 3 Pin 4 (Channel 03)	Function Socket 3 Analog Output (Channel 03)	Function Socket 3 Analog Output (Channel 03)
			Function Socket 4..7 Pin 4 (Channel 04..07)	**Function Socket 4..7 Pin 4 (Channel 04..07)**	**Function Socket 4..7 Pin 4 (Channel 04..07)**	**Function Socket 4..7 Pin 4 (Channel 04..07)**	**Function Socket 4..7 Pin 4 (Channel 04..07)**
5	12	0 1	Function Socket 4 Pin 4 (Channel 04)	Function Socket 4 Pin 4 (Channel 04)	Function Socket 4 Pin 4 (Channel 04)	Function Socket 4 Pin 4 (Channel 04)	Function Socket 4 Pin 4 (Channel 04)
		2 3	Function Socket 5 Pin 4 (Channel 05)	Function Socket 5 Pin 4 (Channel 05)	Function Socket 5 Pin 4 (Channel 05)	Function Socket 5 Pin 4 (Channel 05)	Function Socket 5 Pin 4 (Channel 05)
		4 5	Function Socket 6 Pin 4 (Channel 06)	Function Socket 6 Pin 4 (Channel 06)	Function Socket 6 Pin 4 (Channel 06)	Function Socket 6 Pin 4 (Channel 06)	Function Socket 6 Pin 4 (Channel 06)
		6 7	Function Socket 7 Pin 4 (Channel 07)	Function Socket 7 Pin 4 (Channel 07)	Function Socket 7 Pin 4 (Channel 07)	Function Socket 7 Pin 4 (Channel 07)	Function Socket 7 Pin 4 (Channel 07)
			Function Socket 0..3 Pin 2 (Channel 10..13)	**Function Socket 0..3 Pin 2 (Channel 10..13)**	**Function Socket 0..3 Pin 2 (Channel 10..13)**		**Smoothing Socket 0..3 Analog Input (Channel 00..03)**
6	13	0 1	Function Socket 0 Pin 2 (Channel 10)	Function Socket 0 Pin 2 (Channel 10)	Function Socket 0 Pin 2 (Channel 10)	Reserved	Smoothing Socket 0 Analog Input (Channel 00)
		2 3	Function Socket 1 Pin 2 (Channel 11)	Function Socket 1 Pin 2 (Channel 11)	Function Socket 1 Pin 2 (Channel 11)		Smoothing Socket 1 Analog Input (Channel 01)
		4 5	Function Socket 2 Pin 2 (Channel 12)	Function Socket 2 Pin 2 (Channel 12)	Function Socket 2 Pin 2 (Channel 12)		Smoothing Socket 2 Analog Input (Channel 02)
		6 7	Function Socket 3 Pin 2 (Channel 13)	Function Socket 3 Pin 2 (Channel 13)	Function Socket 3 Pin 2 (Channel 13)		Smoothing Socket 3 Analog Input (Channel 03)
			Function Socket 4..7 Pin 2 (Channel 14..17)	**Function Socket 4..7 Pin 2 (Channel 14..17)**	**Function Socket 4..7 Pin 2 (Channel 14..17)**	**Function Socket 4..7 Pin 2 (Channel 14..17)**	**Function Socket 4..7 Pin 2 (Channel 14..17)**
7	14	0 1	Function Socket 4 Pin 2 (Channel 14)	Function Socket 4 Pin 2 (Channel 14)	Function Socket 4 Pin 2 (Channel 14)	Function Socket 4 Pin 2 (Channel 14)	Function Socket 4 Pin 2 (Channel 14)
		2 3	Function Socket 5 Pin 2 (Channel 15)	Function Socket 5 Pin 2 (Channel 15)	Function Socket 5 Pin 2 (Channel 15)	Function Socket 5 Pin 2 (Channel 15)	Function Socket 5 Pin 2 (Channel 15)
		4 5	Function Socket 6 Pin 2 (Channel 16)	Function Socket 6 Pin 2 (Channel 16)	Function Socket 6 Pin 2 (Channel 16)	Function Socket 6 Pin 2 (Channel 16)	Function Socket 6 Pin 2 (Channel 16)
		6 7	Function Socket 7 Pin 2 (Channel 17)	Function Socket 7 Pin 2 (Channel 17)	Function Socket 7 Pin 2 (Channel 17)	Function Socket 7 Pin 2 (Channel 17)	Function Socket 7 Pin 2 (Channel 17)
				Safe State Socket 0..3 Pin 4 (Channel 00..03)	**Safe State Socket 0..3 Pin 4 (Channel 00..03)**	**Safe State Socket 0..3 Analog Output (Channel 00..03)**	
8	15	0 1	Reserved	Safe State Socket 0 Pin 4 (Channel 00)	Safe State Socket 0 Pin 4 (Channel 00)	Safe State Socket 0 Analog Output (Channel 00)	Reserved
		2 3		Safe State Socket 1 Pin 4 (Channel 01)	Safe State Socket 1 Pin 4 (Channel 01)	Safe State Socket 1 Analog Output (Channel 01)	
		4 5		Safe State Socket 2 Pin 4 (Channel 02)	Safe State Socket 2 Pin 4 (Channel 02)	Safe State Socket 2 Analog Output (Channel 02)	
		6 7		Safe State Socket 3 Pin 4 (Channel 03)	Safe State Socket 3 Pin 4 (Channel 03)	Safe State Socket 3 Analog Output (Channel 03)	
				Safe State Socket 4..7 Pin 4 (Channel 04..07)	**Safe State Socket 4..7 Pin 4 (Channel 04..07)**	**Safe State Socket 4..7 Pin 4 (Channel 04..07)**	**Safe State Socket 4..7 Pin 4 (Channel 04..07)**
9	16	0 1	Reserved	Safe State Socket 4 Pin 4 (Channel 04)	Safe State Socket 4 Pin 4 (Channel 04)	Safe State Socket 4 Pin 4 (Channel 04)	Safe State Socket 4 Pin 4 (Channel 04)
		2 3		Safe State Socket 5 Pin 4 (Channel 05)	Safe State Socket 5 Pin 4 (Channel 05)	Safe State Socket 5 Pin 4 (Channel 05)	Safe State Socket 5 Pin 4 (Channel 05)
		4 5		Safe State Socket 6 Pin 4 (Channel 06)	Safe State Socket 6 Pin 4 (Channel 06)	Safe State Socket 6 Pin 4 (Channel 06)	Safe State Socket 6 Pin 4 (Channel 06)
		6 7		Safe State Socket 7 Pin 4 (Channel 07)	Safe State Socket 7 Pin 4 (Channel 07)	Safe State Socket 7 Pin 4 (Channel 07)	Safe State Socket 7 Pin 4 (Channel 07)
					Safe State Socket 0..3 Pin 2 (Channel 10..13)		
10	17	0 1	Reserved	Reserved	Safe State Socket 0 Pin 2 (Channel 10)	Reserved	Reserved
		2 3			Safe State Socket 1 Pin 2 (Channel 11)		
		4 5			Safe State Socket 2 Pin 2 (Channel 12)		
		6 7			Safe State Socket 3 Pin 2 (Channel 13)		
					Safe State Socket 4..7 Pin 2 (Channel 14..17)	**Safe State Socket 4..7 Pin 2 (Channel 14..17)**	**Safe State Socket 4..7 Pin 2 (Channel 14..17)**
11	18	0 1	Reserved	Reserved	Safe State Socket 4 Pin 2 (Channel 14)	Safe State Socket 4 Pin 2 (Channel 14)	Safe State Socket 4 Pin 2 (Channel 14)
		2 3			Safe State Socket 5 Pin 2 (Channel 15)	Safe State Socket 5 Pin 2 (Channel 15)	Safe State Socket 5 Pin 2 (Channel 15)
		4 5			Safe State Socket 6 Pin 2 (Channel 16)	Safe State Socket 6 Pin 2 (Channel 16)	Safe State Socket 6 Pin 2 (Channel 16)
		6 7			Safe State Socket 7 Pin 2 (Channel 17)	Safe State Socket 7 Pin 2 (Channel 17)	Safe State Socket 7 Pin 2 (Channel 17)

Byte	Byte in telegram		MVK-MP DO4(DO4) DI4 DI4 Article number 55274	MVK-MP DO8(DO8) Article number 55290
	0		Standard IEC 61158	Standard IEC 61158
	1			
	2			
	3			
	4			
	5			
	6			
0	7		Reserved	Reserved
1	8		Reserved	Reserved
2	9		Reserved	Reserved
			Global settings	**Global settings**
3	10	0	Diagnostic messages (enable/disable global diagnostics)	Diagnostic messages (enable/disable global diagnostics)
		1	Channel-related diagnostic messages	Channel-related diagnostic messages
		2	Undervoltages sensor and bus supply	Undervoltage bus supply
		3	Undervoltage actuator supply	Undervoltage actuator supply
		4	No Actuator Supply	No Actuator Supply
		5	Reserved	Reserved
		6	Reserved	Reserved
		7	Reserved	Reserved
			Function Socket 0..3 Pin 4 (Channel 00..03)	**Function Socket 0..3 Pin 4 (Channel 00..03)**
4	11		Reserved	Reserved
			Function Socket 4..7 Pin 4 (Channel 04..07)	**Function Socket 4..7 Pin 4 (Channel 04..07)**
5	12	0 1	Function Socket 4 Pin 4 (Channel 04)	Reserved
		2 3	Function Socket 5 Pin 4 (Channel 05)	
		4 5	Function Socket 6 Pin 4 (Channel 06)	
		6 7	Function Socket 7 Pin 4 (Channel 07)	
			Function Socket 0..3 Pin 2 (Channel 10..13)	**Function Socket 0..3 Pin 2 (Channel 10..13)**
6	13		Reserved	Reserved
			Function Socket 4..7 Pin 2 (Channel 14..17)	**Function Socket 4..7 Pin 2 (Channel 14..17)**
7	14	0 1	Function Socket 4 Pin 2 (Channel 14)	Reserved
		2 3	Function Socket 5 Pin 2 (Channel 15)	
		4 5	Function Socket 6 Pin 2 (Channel 16)	
		6 7	Function Socket 7 Pin 2 (Channel 17)	
			Safe State Socket 0..3 Pin 4 (Channel 00..03)	**Safe State Socket 0..3 Pin 4 (Channel 00..03)**
8	15	0 1	Safe State Socket 0 Pin 4 (Channel 00)	Safe State Socket 0 Pin 4 (Channel 00)
		2 3	Safe State Socket 1 Pin 4 (Channel 01)	Safe State Socket 1 Pin 4 (Channel 01)
		4 5	Safe State Socket 2 Pin 4 (Channel 02)	Safe State Socket 2 Pin 4 (Channel 02)
		6 7	Safe State Socket 3 Pin 4 (Channel 03)	Safe State Socket 3 Pin 4 (Channel 03)
			Safe State Socket 4..7 Pin 4 (Channel 04..07)	**Safe State Socket 4..7 Pin 4 (Channel 04..07)**
9	16		Reserved	Safe State Socket 4 Pin 4 (Channel 04)
				Safe State Socket 5 Pin 4 (Channel 05)
				Safe State Socket 6 Pin 4 (Channel 06)
				Safe State Socket 7 Pin 4 (Channel 07)
			Safe State Socket 0..3 Pin 2 (Channel 10..13)	**Safe State Socket 0..3 Pin 2 (Channel 10..13)**
10	17	0 1	Safe State Socket 0 Pin 2 (Channel 10)	Safe State Socket 0 Pin 2 (Channel 10)
		2 3	Safe State Socket 1 Pin 2 (Channel 11)	Safe State Socket 1 Pin 2 (Channel 11)
		4 5	Safe State Socket 2 Pin 2 (Channel 12)	Safe State Socket 2 Pin 2 (Channel 12)
		6 7	Safe State Socket 3 Pin 2 (Channel 13)	Safe State Socket 3 Pin 2 (Channel 13)
			Safe State Socket 4..7 Pin 2 (Channel 14..17)	**Safe State Socket 4..7 Pin 2 (Channel 14..17)**
11	18	0 1	Reserved	Safe State Socket 4 Pin 2 (Channel 14)
		2 3		Safe State Socket 5 Pin 2 (Channel 15)
		4 5		Safe State Socket 6 Pin 2 (Channel 16)
		6 7		Safe State Socket 7 Pin 2 (Channel 17)

Byte	Byte in telegram		MVK-MP K3 DO4 (DO4) DIO4 (DIO4) Article number 55291	MVK-MP K3 DO4 (DO4) DI4 (DI4) Article number 5529100
	0		Standard IEC 61158	Standard IEC 61158
	1			
	2			
	3			
	4			
	5			
	6			
0	7		reserved	reserved
1	8		reserved	reserved
2	9		reserved	reserved
			Global settings	**Global settings**
3	10	0	Diagnostic messages (enable/disable global diagnostics)	Diagnostic messages (enable/disable global diagnostics)
		1	Channel-related diagnostic messages	Channel-related diagnostic messages
		2	Undervoltages sensor and bus supply	Undervoltages sensor and bus supply
		3	Undervoltage actuator supply	reserved
		4	No Actuator Supply	No Actuator Supply
		5	reserved	reserved
		6	reserved	reserved
		7	reserved	reserved
			Function Socket 0..3 Pin 4 (Channel 00..03)	**Function Socket 0..3 Pin 4 (Channel 00..03)**
4	11		reserved	reserved
			Function Socket 4..7 Pin 4 (Channel 04..07)	**Function Socket 4..7 Pin 4 (Channel 04..07)**
5	12	0	Function Socket 4 Pin 4 (Channel 04)	Function Socket 4 Pin 4 (Channel 04)
		1		
		2	Function Socket 5 Pin 4 (Channel 05)	Function Socket 5 Pin 4 (Channel 05)
		3		
		4	Function Socket 6 Pin 4 (Channel 06)	Function Socket 6 Pin 4 (Channel 06)
		5		
		6	Function Socket 7 Pin 4 (Channel 07)	Function Socket 7 Pin 4 (Channel 07)
		7		
			Function Socket 0..3 Pin 2 (Channel 10..13)	**Function Socket 0..3 Pin 2 (Channel 10..13)**
6	13		reserved	reserved
			Function Socket 4..7 Pin 2 (Channel 14..17)	**Function Socket 4..7 Pin 2 (Channel 14..17)**
7	14	0	Function Socket 4 Pin 2 (Channel 14)	Function Socket 4 Pin 2 (Channel 14)
		1		
		2	Function Socket 5 Pin 2 (Channel 15)	Function Socket 5 Pin 2 (Channel 15)
		3		
		4	Function Socket 6 Pin 2 (Channel 16)	Function Socket 6 Pin 2 (Channel 16)
		5		
		6	Function Socket 7 Pin 2 (Channel 17)	Function Socket 7 Pin 2 (Channel 17)
		7		
			Safe State Socket 0..3 Pin 4 (Channel 00..03)	**Safe State Socket 0..3 Pin 4 (Channel 00..03)**
8	15	0	Safe State Socket 0 Pin 4 (Channel 00)	Safe State Socket 0 Pin 4 (Channel 00)
		1		
		2	Safe State Socket 1 Pin 4 (Channel 01)	Safe State Socket 1 Pin 4 (Channel 01)
		3		
		4	Safe State Socket 2 Pin 4 (Channel 02)	Safe State Socket 2 Pin 4 (Channel 02)
		5		
		6	Safe State Socket 3 Pin 4 (Channel 03)	Safe State Socket 3 Pin 4 (Channel 03)
		7		
			Safe State Socket 4..7 Pin 4 (Channel 04..07)	**Safe State Socket 4..7 Pin 4 (Channel 04..07)**
9	16	0	Safe State Socket 4 Pin 4 (Channel 04)	reserved
		1		
		2	Safe State Socket 5 Pin 4 (Channel 05)	
		3		
		4	Safe State Socket 6 Pin 4 (Channel 06)	
		5		
		6	Safe State Socket 7 Pin 4 (Channel 07)	
		7		
			Safe State Socket 0..3 Pin 2 (Channel 10..13)	**Safe State Socket 0..3 Pin 2 (Channel 10..13)**
10	17	0	Safe State Socket 0 Pin 2 (Channel 10)	Safe State Socket 0 Pin 2 (Channel 10)
		1		
		2	Safe State Socket 1 Pin 2 (Channel 11)	Safe State Socket 1 Pin 2 (Channel 11)
		3		
		4	Safe State Socket 2 Pin 2 (Channel 12)	Safe State Socket 2 Pin 2 (Channel 12)
		5		
		6	Safe State Socket 3 Pin 2 (Channel 13)	Safe State Socket 3 Pin 2 (Channel 13)
		7		
			Safe State Socket 4..7 Pin 2 (Channel 14..17)	**Safe State Socket 4..7 Pin 2 (Channel 14..17)**
11	18	0	Safe State Socket 4 Pin 2 (Channel 14)	reserved
		1		
		2	Safe State Socket 5 Pin 2 (Channel 15)	
		3		
		4	Safe State Socket 6 Pin 2 (Channel 16)	
		5		
		6	Safe State Socket 7 Pin 2 (Channel 17)	
		7		

Glossary

General Information about Profibus

Bus segment	The electrical specification of the RS-485 interface limits the number of devices in an RS485 network to 32. If more than 32 Profibus devices have to be used, the network must be segmented by means of repeaters.
DP	**D**ecentralized **P**eripherals. Profibus protocol for high-speed cyclic data exchange.
Freeze-Mode	The input data of the slave are "frozen".
GAP factor	The number of bus cycles after which a DP master searches for new active devices in order to include them into the token ring. This factor can be modified in order to optimize the speed of a DP network.
GAP range	The address range, in which an active device searches for other new active devices. This range is always between the own address and the address of the next active device that is already in the token ring. The range from the highest address up to 127 does not belong to the GAP range.
GSD	The GSD file (electronic data sheet) describes the technical features of a Profibus product. This file is required for the Profibus system configuration and is provided by the device manufacturer.
ID number	A 16-bit number which positively identifies a Profibus product. It is a reference to the GSD file. More than one device can have the same ID number, provided that the numbers can be written to a common GDS file. This number is allocated by the "Profibus Nutzerorganisation e.V." (Profibus Users Organization).
IEC 61158	Globally recognized standard for Profibus DP and FMS which supersedes the international standard EN 50170 Volume 2.
Master Class 1	The master that performs user data transfer.
Master Class 2	Master for control, startup, and configuration tasks.
Byte	Term from IEC 61158. Equals 1 byte or 8 bits.
PNO	**P**rofibus **N**utzer**o**rganisation e.V. (Profibus Users Organization).
Repeater	Coupler element for signal processing between Profibus segments.
PLC	Programmable Logic Controller
Sync-mode	The output data of the slave are "frozen".
Token	The active device (master) in possession of the token can carry out data exchange with the slaves that were parameterized and configured by this master. On completion of the data cycle, the active device passes the token over to the next active device.

MVK-MP Specific

Sensor Short Circuit	Short-circuit or overload at Pin 1 of the M12 socket causes the self-setting fuse to be tripped. Every M12 socket is separately protected. A red LED indicates the error at the respective M12 socket. This error is reported via the DP diagnosis and possibly in the user data to the DP master. After the error has been corrected, the sensor supply is automatically restarted.
Actuator disable	Short circuit or overload at an output causes the output to be disabled. This error is reported via the DP diagnosis and possibly in the user data to the DP master. A red LED indicates the error at the respective M12 socket. The output is not automatically re-enabled. The output must be disabled via the control after the error cause has been removed. This deletes the short circuit memory.
Actuator warning	When an output is disabled, the presence of 24V at the associated Pin of the M12 socket is detected. This suggests a +24 "short-circuit". A red LED indicates the error at the respective M12 socket. This error is reported via the DP diagnosis and possibly in the user data to the DP master. This error does not affect output control. It is not possible to detect an actuator warning when the output is enabled.
Undervoltage	Sensor supply and actuator voltages are registered separately. If power drops below 18 V DC, this error is reported to the DP master via the DP diagnosis. If the sensor supply voltage is low, the "U_S Error" LED lights up red. If the actuator supply voltage is low, the "U_A Error" LED lights up red.
External Error	This diagnosis can only be generated by an input parameterized as a diagnostic input. External error is reported when 0 V is present at this input. Sensors and actuators meeting the DESINA specification are supported in this manner. Alternatively, the line can be monitored for breakage by using a diagnosis adapter.
Peripheral error	A summary of individual errors that may occur at the M12 sockets. This includes diagnostic reports, external errors, sensor short-circuit, actuator shutdown, and actuator warning.
Virtual modules	A configuration concept that describes a compact device as modular system. This allows free assignment of individual data groups in the process map.
Line break	In the ranges of 4 to 20 mA and 2 to 10 V, falling below 4 mA and/or 2 V is considered an open circuit.
Over voltage	If the measuring range is exceeded, diagnosis is generated.

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