

- Introduction
- For Your Safety
- Description
- Installation
- Startup
- Configuration
- Run Mode
- Maintenance and Cleaning

MANUAL ENGLISH

for the Devices of the MVK-MPNIO Safety Series

MVK-MPNIO F DI16/8 Art. No. 55560 and

MVK-MPNIO F DI8/4 F DO4 Art. No. 55561



3 Description

3.1 Module

Features

The MVK-MPNIO Safety Module is a fully encapsulated field bus module in a metal case. It is particularly robust and designed for use in rough environments.

Feature	Description
Robust	Versatile applications under very high loads due to: <ul style="list-style-type: none">• rugged metal casing;• no condensate formation due to fully encapsulated case;• resistant to weld spatter in combination with rugged metal case;
Vibration-proof	Safety function also guaranteed when subjected to continuous vibration.
Resistant	Long service life despite exposure to aggressive media due to high-quality surface finish.
Tight	Tight to IP67 Protection Class (EN60529)

3.1.1 Technical Data

Safety codes
EN ISO 13849-1,
IEC 61508 and IEC 62061

Description	Art. No. 55560	Art. No. 55561
PL	up to e	
Category	up to 4	
PFH	1,70E-9	1,653E-9
MTTFd	148 Jahre	157 Jahre
DC	98%	
SIL	up to 3	
SIL CL	up to 3	
Service life	20 years	

Ambient conditions

Operating temperature range	-20°C to +55°C
Storage temperature range	-40°C to +70°C
Protection Class to EN 60529	IP67

Bus

Fieldbus protocols	PROFINET IO / PROFIsafe
Transfer rate	100 Mbit/s
PROFINET addressing	Via DCP

Power supply

Operating voltage and sensor power supply (US)	24 VDC	
Actuator power supply (UA)	24 VDC	
Voltage range US/UA	18 to 30 VDC	
Max. current at 7/8" socket/plug	9 A	
Power consumption (without inputs)	≤0.16 A	
Line cross-section 7/8" plug	max. 1.5 mm ²	
Reverse-connection protection for US and UA	Only US (UA not used)	Yes

Inputs

Description	Art. No. 55560	Art. No. 55561
Delay time	1, 3, 10, or 15 ms	
Input characteristic	DIN EN 61131-2 (IEC 61131-2), Type 1	
Sensor power supply		
<ul style="list-style-type: none"> When Pin 1 and Pin 5 are used. 	0.2 A per pin	
<ul style="list-style-type: none"> When Pin 1 or Pin 5 is used. 	max. 0.7 A	
Short-circuit protection for sensor power supply	High Side Switch with overload protection	
Line length (0.34 mm ² and 0.75 mm ²)	-	max. 30 m
Line cross-section	-	max. 0.75 mm ²

Outputs (Art. No. 55561)

Output current	-	max. 2 A per pin, Σ 8 A
Line length (0.34 mm ² and 0.75 mm ²)	-	max. 30 m
Line cross-section	-	max. 0.75 mm ²
Frequency	-	max. 1 Hz

3.1.2 PROFINET IO Communication

IEC 61784-2	PROFINET IO is an open communication protocol that complies with IEC 61784-2. The communication protocol is based on Ethernet.
Data transfer:	Data is exchanged between the control unit, referred to as the PROFINET IO Controller, and connected users, which are called PROFINET IO devices.
M12 connectors (IP67)	M12 connectors link the MVK-MPNIO Safety Module to the PROFINET IO network.
Communication	<p>Communication is based on a full-duplex Ethernet network running at 100 Mbit/s. IO controllers and IO devices communicate by means of Ethernet telegrams. Devices exchange data cyclically based on the provider-consumer principle. Devices function simultaneously as receiver (consumer) and transmitter (provider).</p> <p>The IO controller sends output data to the IO devices and receives input data from the IO devices. The IO devices send input data and receive output data.</p> <p>Other components of the communication protocol include telegrams in the form of acyclical communication to transfer parameters and for read/write access to I&M data or manufacturer-specific features IundM.</p>

3.1.3 PROFIsafe Communication

Safe communication	PROFIsafe is a functionally safe expansion of standard communication via PROFINET or PROFIBUS. Communication based on PROFIsafe is secured against alteration, transmission errors, changes to the telegram sequence, etc.
MVK-MPNIO Safety Module	<p>The MVK-MPNIO Safety Module is a PROFIsafe module and complies with "PROFIsafe – Profile for Safety Technology on PROFIBUS DP and PROFINET IO" Version 2.4 of March 2007.</p> <p>The module is based on safe communication with a PROFIsafe Master.</p>

3.1.4 Device Design

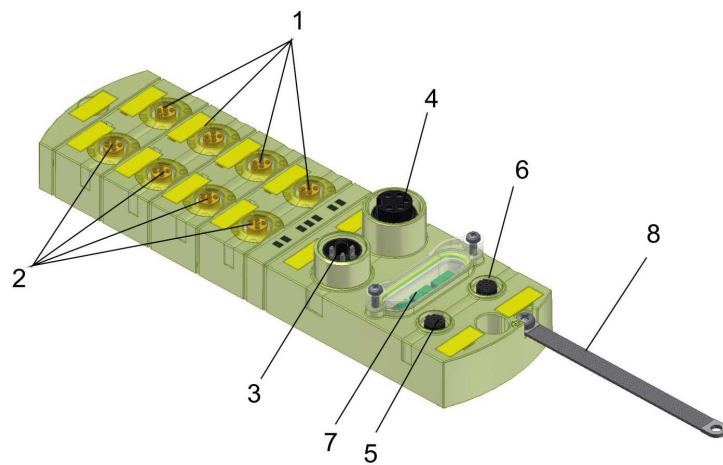


Fig. 1: Device design of Art. No. 55560 and Art. No. 55561

Legend

- 1 DI, digital inputs, M12 sockets
- 2 Art. No. 55560: DI, digital inputs, M12 sockets
Art. No. 55561: DO, digital outputs, M12 sockets
- 3 Power supply POWER IN
- 4 Power supply POWER OUT
- 5 Port 1 PROFINET
- 6 Port 2 PROFINET
- 7 F addressing
- 8 Grounding strap for functional ground

3.1.5 Displays

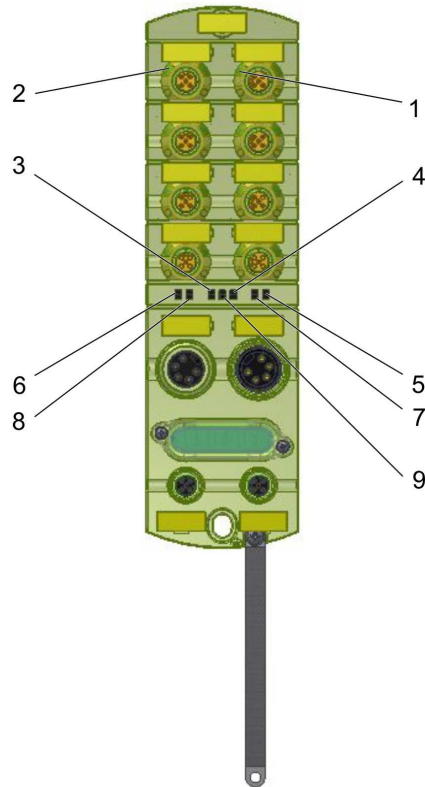
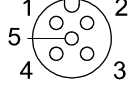
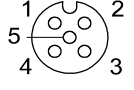

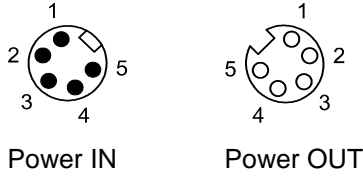

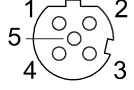


Fig. 2: Displays on Art. No. 55560 and Art. No. 55561

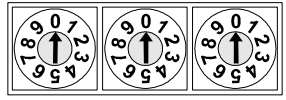
Legend

- | | |
|---|---|
| 1 | Digital input display |
| 2 | Art. No. 55560: Digital input display
Art. No. 55561: Digital output display |
| 3 | LNK1/ACT1 LED |
| 4 | LNK2/ACT2 LED |
| 5 | Power LED US |
| 6 | BUS RUN LED |
| 7 | Power LED U _A |
| 8 | CfgF LED |
| 9 | F_Err LED |

3.1.6 Connections

<p>DI M12 sockets A-coded</p>		<p>Pin 1 UT 0x Pin 2 IN 1x Pin 3 0 V Pin 4 IN 0x Pin 5 UT 1x</p>
<p>DO M12 sockets (only Art. No. 55561) A-coded</p>		<p>Pin 1 n. c. Pin 2 n. c. Pin 3 Mx Pin 4 Px Pin 5 </p>
<p>POWER IN, POWER OUT 7/8" connector</p>		<p>Pin 1 0 V_{UA} Pin 2 0 V_{US} Pin 3  Pin 4 +24 V US / 9 A Pin 5 +24 V UA / 9 A</p>
<p>Port 1, Port 2 M12 sockets D-coded</p>		<p>Pin 1 TD + Pin 2 RD + Pin 3 TD- Pin 4 RD- Pin 5 n.c.</p>

3.1.7 F Addressing

<p>F address range 1 to 999</p>	<p>x 100 x 10 x 1</p> 	<p>x1 rotary dip switch (ones) x10 rotary dip switch (tens) x100 rotary dip switch (hundreds)</p>
<p>As-delivered state: switch positions to "0"</p>	<p>Settings</p> <p>0</p> <p>1 to 999</p>	<p>Description</p> <p>Not permitted</p> <p>Possible address range</p>

3.2 Configurable Functions

3.2.1 Safe Output Parameters

A description of safe output parameters is contained in Section 3.2.2.

Parameters	Possible Selections	Presetting
Output enable	enabled	X
	disabled	
Wire break detection at currents > 60 mA	enabled	X
	disabled	
Readback time for max. period of switch-off test pulse	4-6-8-10-20-30-40-50-75-100-150-200-250-300-400-500 ms	4 ms

Tab. 1: Safe output parameters

3.2.2 Description of Safe Output Parameters

Output enable	When an output is disabled, the related ground and positive pins are not supplied with power, even if they are controlled by the PLC.
Wire break detection	When wire break detection is enabled, a current of > 60 mA must flow via the enabled output. If a current of < 60 mA flows, the "Wire break" alarm is signaled for the affected output.



NOTE

Actuators with a current value of <60 mA:

→ You can avoid false alarms by disabling the wire break detection feature.

The "Wire break detection" parameter has no impact on safety codes.

Readback time	<p>Readback time defines the maximum period of a switch-off pulse.</p> <p>The module uses switch-off pulses to test the switch-off capability of the P and M branches in a connected output. The connected actuator may delay execution of the switch-off pulse due to energy stored in the form of a capacitance or inductance. The readback time must be adapted to prevent the delayed execution of the switch-off pulse from generating an alarm. A connected actuator must possess a certain "electrical or mechanical inertia" to be able to bridge the duration of the switch-off pulse.</p>
----------------------	---

3.2.3 Safe Input Parameters

A description of safe input parameters is contained in Section 3.2.4.

Parameters	Possible Selections	Presetting
Enable input channel Pin 2	enabled	X
	disabled	
Enable input channel Pin 4	enabled	X
	disabled	
Enable test signal to detect cross-circuit shorts between Pin 5 and Pin 2	enabled	X
	disabled	
Enable test signal to detect cross-circuit shorts between Pin 1 and Pin 4	enabled	X
	disabled	
Sensor analysis	1oo1	
	1oo2	X
Sensor valence	1 channel	
	2 channels equivalent	X
	2 channels antivalent	
Discrepancy error behavior	Supply 0 value	X
	Supply last valid value	
Discrepancy time	10-20-30-40-50-75-100-200- 400 -750-1000-2500-5000-10000-15000-30000 ms	400 ms
Discrepancy error correction	Test 0 signal required	
	Test 0 Signal not required	X
Input delay (input filter)	1-3-10-15 ms	1 ms
Monitoring time	enabled	
	disabled	X
Stable time filter ¹		
Check time	10-11-12-13-14- 15 -16-17-18-19-20 s	15 s
Stabilization time	0.6-0.7- 0.8 -0.9-1.0-1.1-1.2-1.3-1.4-1.5 s	0.8

Tab. 2: Safe input parameters

¹ The stable time filter, comprising the check time and stabilization time parameters, is enabled when the monitoring time is enabled.

4.1.2 Dimensions

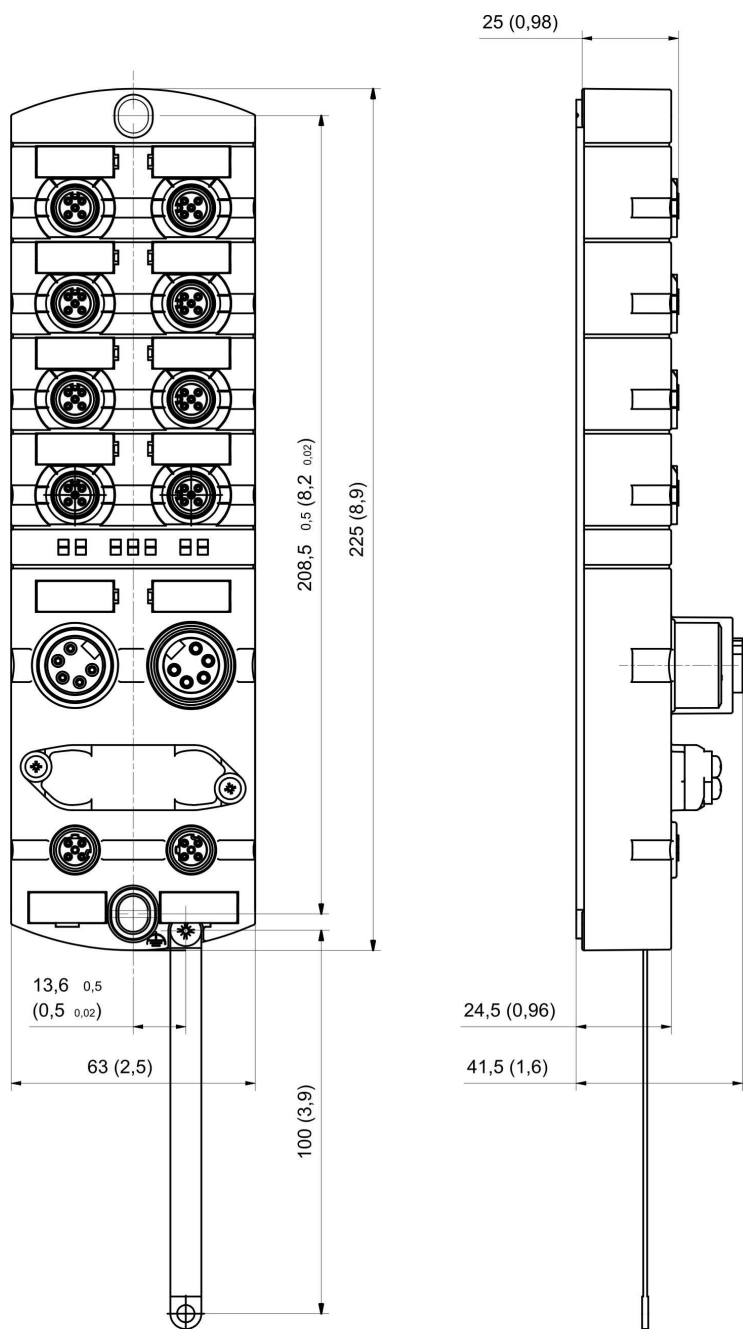


Fig. 6: Dimensions

4.1.3 Fitting the Device

CAUTION**Risk of material damage**

The fixing screws are dependent on the substrate at the place of installation.

→ Use the right screws suitable for the type of substrate.

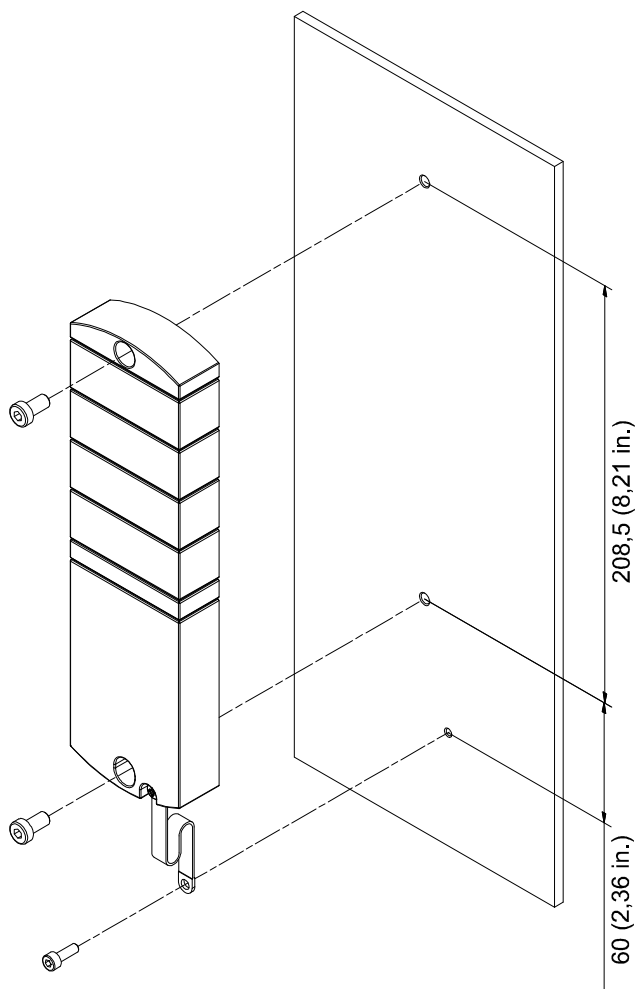


Fig. 7: Place of installation

**INFORMATION**

The screws illustrated are not part of the scope of supply.

**Fitting
(keep to the
sequence indi-
cated)**

- Fit the upper screw M6 to tightening torque of $8^{\pm 0.1}$ Nm ($70.8^{\pm 0.9}$ lbf-in.)
- Align the case.
- Fit the lower screw M6 to tightening torque of $8^{\pm 0.1}$ Nm ($70.8^{\pm 0.9}$ lbf-in.)

**Attach ground-
ing strap**

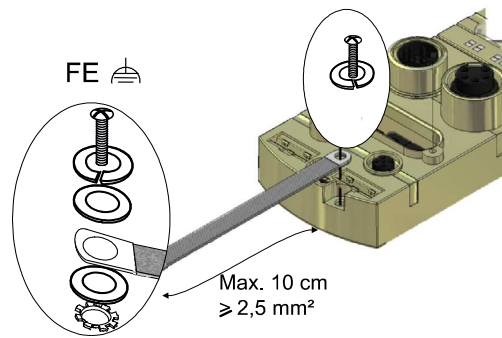


Fig. 8: Attach grounding strap

- Tighten the ground strap using a conductive screw M4 and washers (see Figure) to a tightening torque of $1.2^{\pm 0.2}$ Nm ($10.6^{\pm 1.2}$ lbf-in.)

4.2 Installing the Module Electrically



WARNING

Danger from electric voltage in machine.

The result may be death or fatal injuries.

1. Observe the five safety rules.
2. Connect the device to the electrical system.



WARNING

Fire risk from short-circuits

Power supply lines and/or modules damaged by short-circuits may cause overheating and fires.

- Provide an intelligent power monitoring system or fuse.

Fuse protection

The fuse must be designed for max. 9 A. Typically, an 8 A fuse is used.

Representante oficial de:



[Argentina – Uruguay – Paraguay – Bolivia – Colombia – y Perú.]



Calle 49 N° 5764 - Villa Ballester (B1653AOX) - Prov. de Buenos Aires - ARGENTINA
Tel: (+54 11) 4768-4242 / Fax: (+54 11) 4849-1212
Mail: ventas@nakase.com.ar / Web: www.nakase.com.ar

