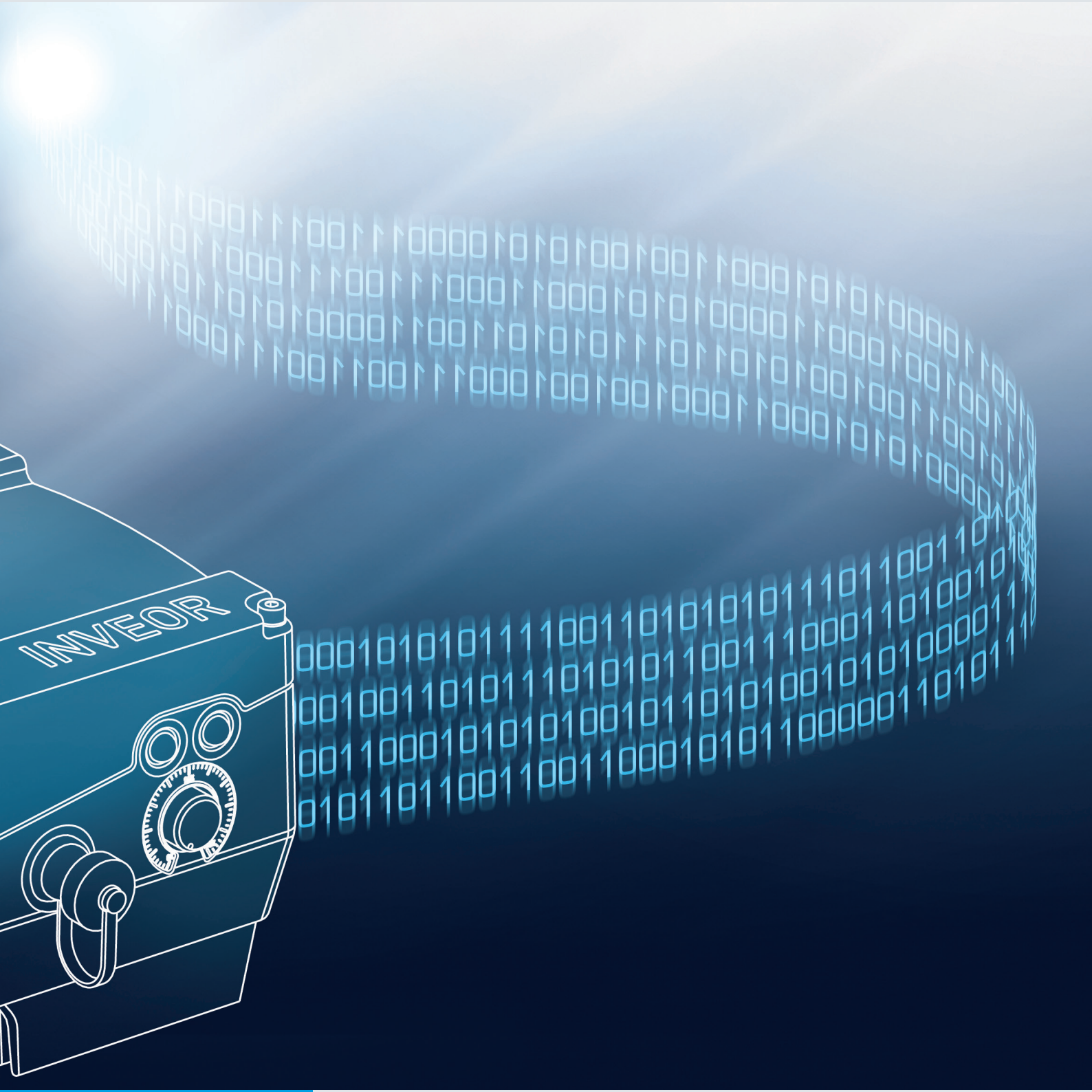
INDUSTRIE ELEKTRIK

KOSTAL



Smart connections.

Operating manual

Fieldbus MODBUS

Legal notice

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Exclusion of liability

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The illustrations and texts have been compiled with great care. However, the possibility of errors cannot be ruled out. The compilation is made without any guarantee.

General note on gender equality

KOSTAL is aware of how language impacts on gender equality and always makes an effort to reflect this in documentation. Nevertheless, for the sake of readability we are unable to use non-gender-specific terms throughout and use the masculine form instead.

Contents

1. General information

Thank you for choosing an INVEOR drive controller with Modbus from KOSTAL Industrie Elektrik GmbH & Co KG! Our INVEOR line of drive controllers is designed to be universally usable with all common motor types and bus systems.

If you have any technical questions, please call our central service hotline:

Tel.: +49 (0)2331 80 40-848

Monday to Friday: 7 am to 5 pm (UTC/GMT +1)

Fax: +49 (0)2331 80 40-602

E-mail: INVEOR-service@kostal.com

Website

www.kostal-industrie-elektrik.com

1.1 Information about documentation

This documentation is a supplementary operating manual for the INVEOR drive controller with the Modbus bus system. It contains all the important information you need to install and operate the bus system.

Please read the operating manuals for the drive controller and bus system through carefully. They contain important information for operating the INVEOR with fieldbus.

We assume no liability for any damage resulting from non-observance of this manual.

This manual is an integral part of the product and applies exclusively to the INVEOR with Modbus from KOSTAL Industrie Elektrik GmbH & Co KG.

Provide the operator of the system with this manual so it is available when needed.

1.1.1 Other applicable documents

This refers to all manuals that describe how to operate the drive controller system and any other manuals for the equipment used. Download the 3D files (.stp) for INVEOR and adapter plates from https://www.kostal-drives-technology.com/download

A description of parameters is available for download (https://www.kostal-drives-technology.com/download) for parametrising the drive controller.

In the download, you will find all the information required for correct parameterisation.

1.1.2 Storing the documentation

Store this operating manual and all other applicable documents carefully so they are available when needed.

1.2 Notes in this manual

1.2.1 Warnings

The warnings refer to life-threatening dangers. Serious injuries possibly resulting in death may occur.

Each warning consists of the following elements:

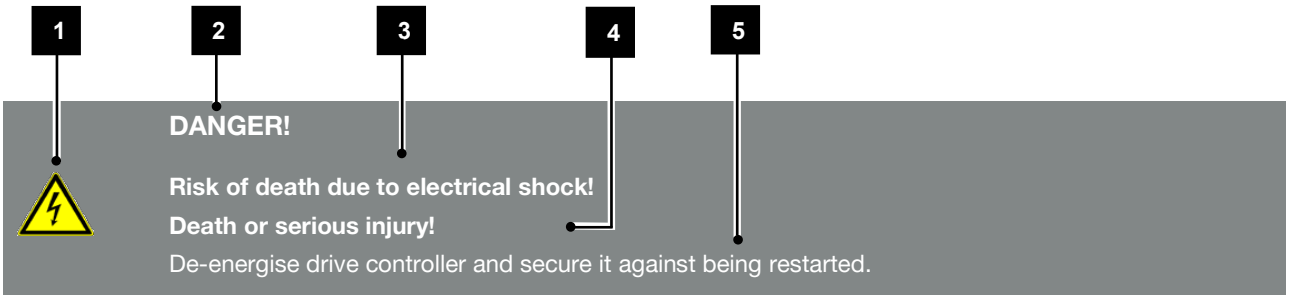


Fig. 1: Structure of the warnings

1 Warning symbol

2 Signal word

3 Type of danger and its source

4 Possible consequence(s) of failure to comply

5 Corrective actions

1.2.2 Warning symbols used

Symbol	Meaning
	Danger
	Danger due to electrical shock and discharge
	Danger due to burns
	Danger due to electromagnetic fields

1.2.3 Signal words

Signal words are used to identify the severity of the danger.

DANGER

Indicates a direct hazard with a high level of risk, which, if not avoided, will result in death or serious injury.

WARNING

Indicates a hazard with a moderate level of risk, which, if not avoided, will result in death or serious injury.

CAUTION

Indicates a hazard with a low level of risk, which, if not avoided, may result in minor or slight injury or property damage.

1.2.4 Information notes

Information notes contain important instructions for the installation and problem-free operation of the drive controller. These must be followed at all times. The information notes also point out that failure to observe instructions may result in damage to property or financial damages.

IMPORTANT INFORMATION

The drive controller may only be assembled, operated, maintained and installed by trained and qualified staff.

Fig. 2: Example of an information note

Symbols within the information notes

Symbol	Meaning
	Important information
	Damage to property possible

Other notes

Symbol	Meaning
	INFORMATION
	Enlarged view

1.3 Symbols used in this manual

Symbol	Meaning
1., 1., 3. …	Consecutive steps in a handling instruction
➔	Effect of a handling instruction
✓	Final result of a handling instruction
■	List

Fig. 3: Symbols and icons used

Abbreviations used

Abbreviation	Explanation
Tab.	Table
Fig.	Figure
It.	Item
Ch.	Chapter

1.4 Qualified staff

You will find the "Qualified staff" chapter in the operating manual for the INVEOR.

1.5 Proper use

You will find the "Proper use" chapter in the operating manual for the INVEOR.

1.6 Responsibility

You will find the "Responsibility" chapter in the operating manual for the INVEOR.

1.7 Safety notice

You will find the "Safety instructions" chapter in the operating manual for the INVEOR.

1.8 Contacts for information

More information is available from:

Central service hotline

Tel.: +49 2331 8040-848
Monday to Friday: 7 am to 5 pm (UTC/GMT +1)

Fax: +49 2331 8040-602

E-mail: INVEOR-service@kostal.com

Website address

Customers can find technical and general information on the following website:

https://www.kostal-drives-technology.com/download

2. Device and system description

This chapter contains information on the scope of delivery for the drive controller and the function description.

2.1 Modbus

The Modbus bus system is part of the fieldbus family.
The network is generally linear in structure. The maximum data transfer rate to a Modbus bus may be up to 115.2 kbit/s. The fieldbus cable is only connected via the M12 connector socket on the front of the device.
If the fieldbus cable is to be routed to another participant, an M12 T-splitter (order no. 10272829) should be used. The bus must be terminated with a terminating resistor (order no. 10343387).

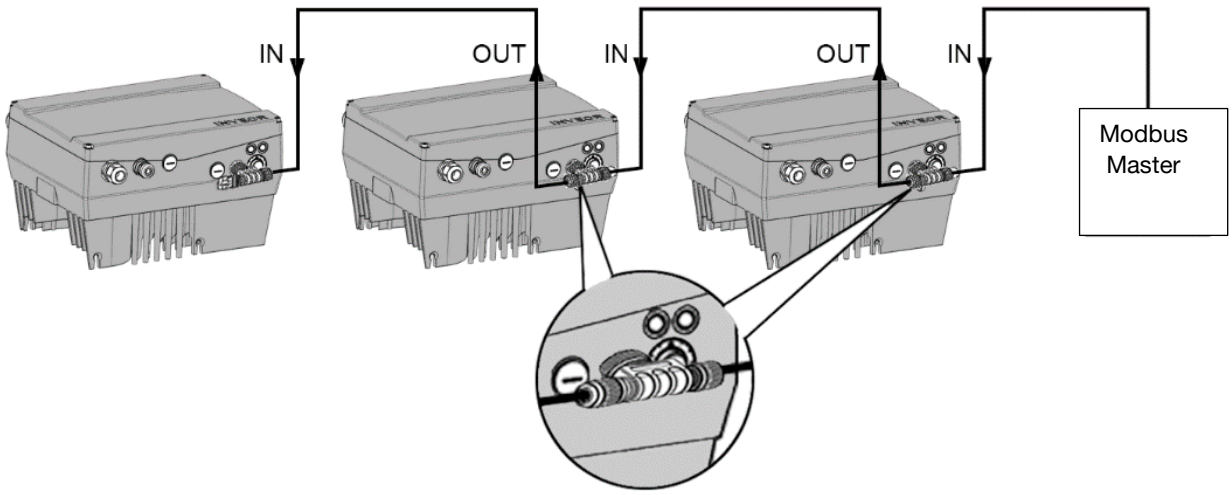


Fig.: 1 Wiring and bus connection

INFORMATION

A repeater must be used when more than 32 devices (e.g. INVEOR) are operated on one Modbus string.

2.1.1 Master/slave operation

The INVEOR should only be operated as a Modbus slave.

2.2 Scope of delivery

The scope of delivery is described in the INVEOR basic documentation.
The Modbus interface card forms part of the INVEOR.

2.3 Item description

The Modbus function is supported by all INVEOR drive controllers (except INVEOR drive controllers with MMI option [DKx5])

2.4 Hardware components

The following hardware components are available for connecting the INVEOR to a Modbus bus system:

Description	Article number
M12 connecting cable 2 m M12 plug on M12 coupling / RS485 / 4-pin / 2 m / A-coded	10272382
M12 connecting cable 5 m M12 plug on M12 coupling / RS485 / 4-pin / 5 m / A-coded	10272793
M12 connection cable open 2 m M12 plug / open / RS485 / 4-pin / 2 m / A-coded	10272795
M12 connection cable open 10 m M12 plug / open / RS485 / 4-pin / 10 m / A-coded	10272794
M12 T distributor (without pin 1) M12 plug on plug and socket / RS485 / 4-pin / A-coded	10272829
M12 plug can be self-assembled M12 plug / RS485 / 4-pin / A-coded	10137294
M12 coupling can be self-assembled M12 coupling / RS485 / 4-pin / A-coded	10272796
M12 terminating resistor 120 ohm M12 plug / RS485 / 5-pin / A-coded	10343387

2.4.1 Interfaces on the drive controller

The following connections can be found on the INVEOR with Modbus interface card:

Size Alpha:

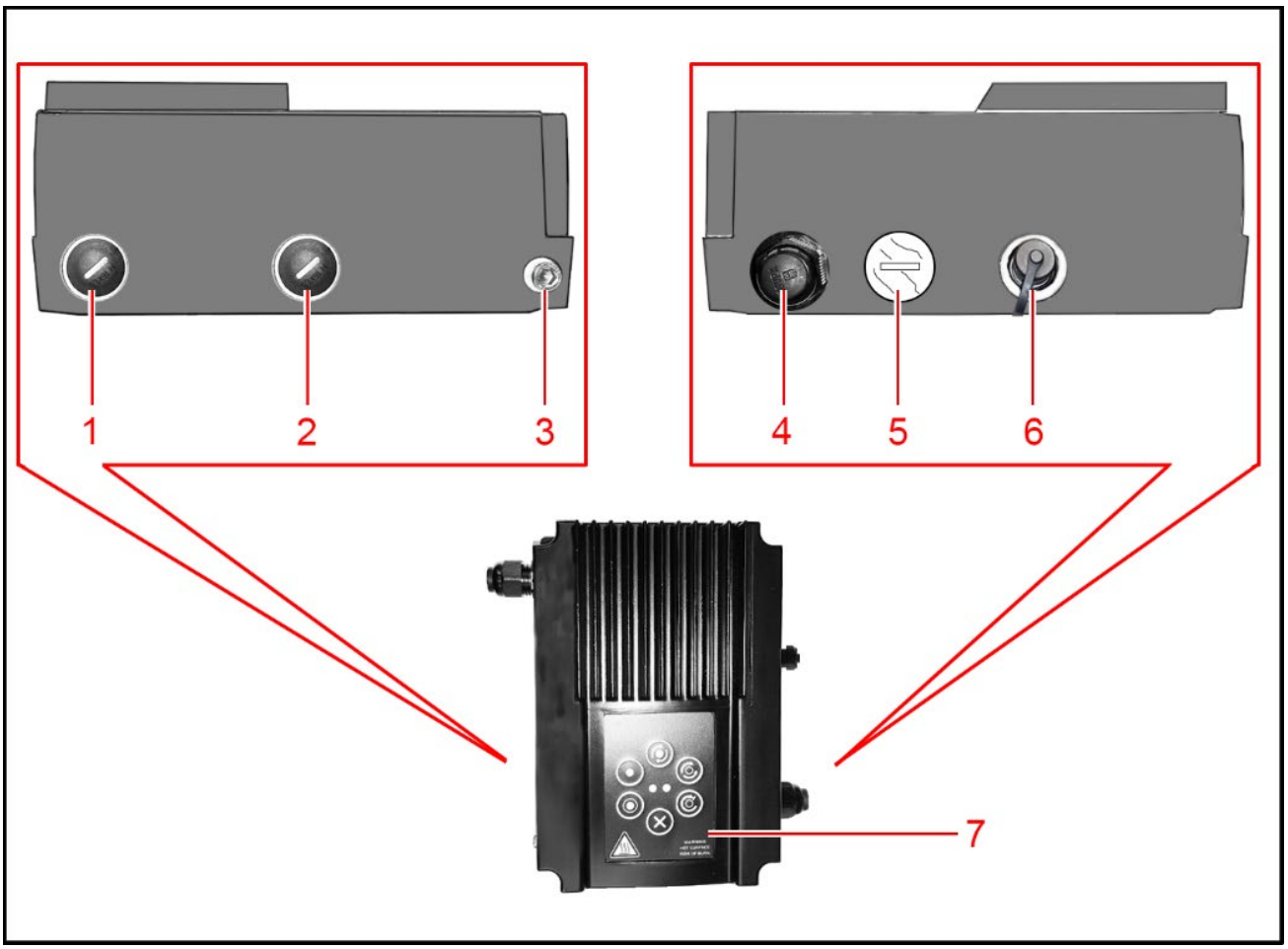


Fig.: 2 Size Alpha "Modbus" connections

Size Alpha "Modbus" connections	
1	Blind plug (optional motor connection with wall mounting)
2	Control cable blind plug
3	Ground screw
4	Grid connection
5	Transparent plug
6	MMI / Modbus
7	Foil keypad (optional)

1	2	3	4	5

Size A:

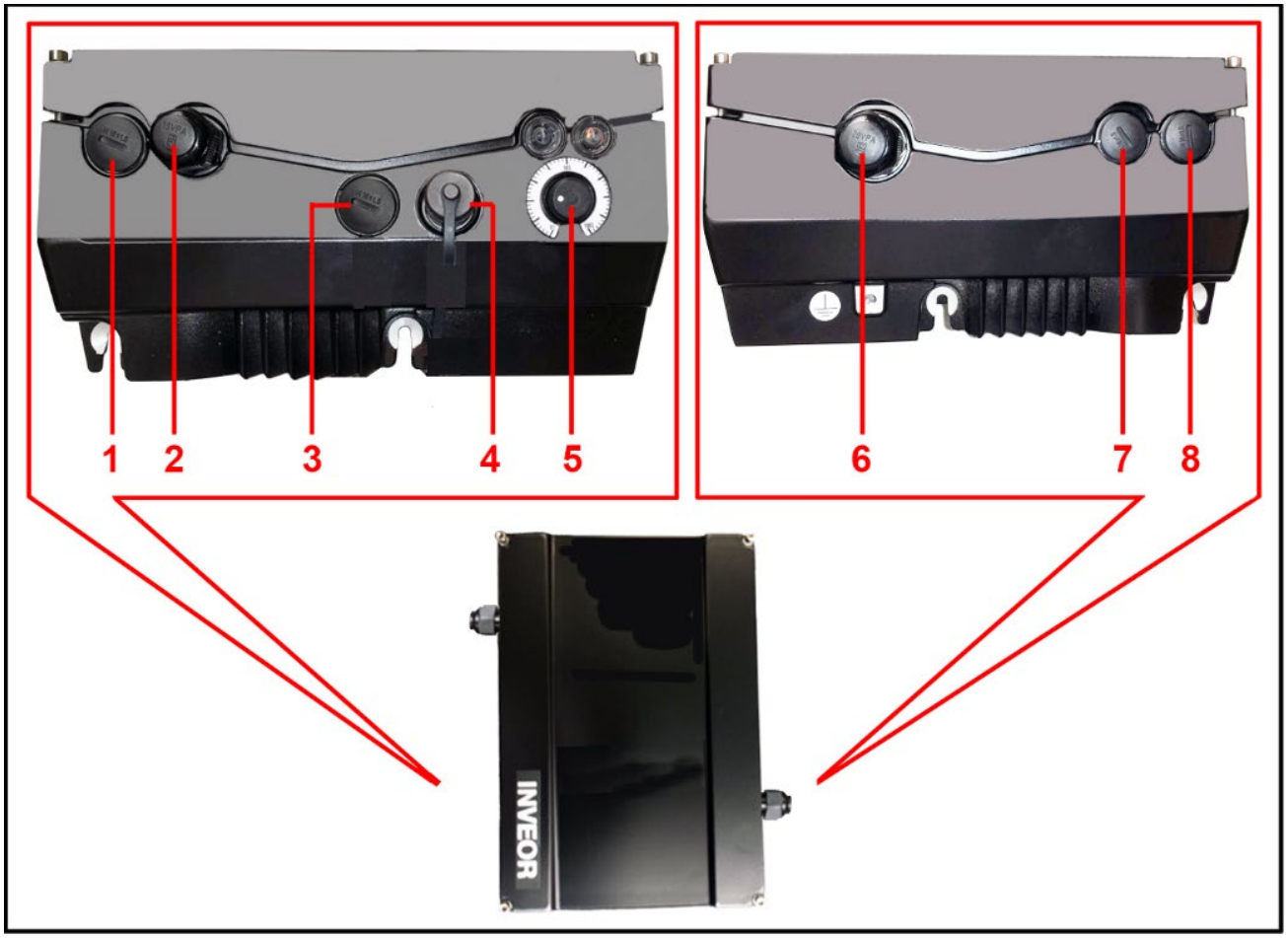


Fig.: 3 Size A "Modbus" connections

Size A "Modbus" connections	
1	Blind plug
2	Control line
3	Blind plug
4	MMI / Modbus
5	Potentiometer
6	Grid connection
7	Blind plug STO (install EMC screw connection supplied in the package)
8	Blind plug STO (install EMC screw connection supplied in the package)

1	2	3	4	5

Sizes B - C

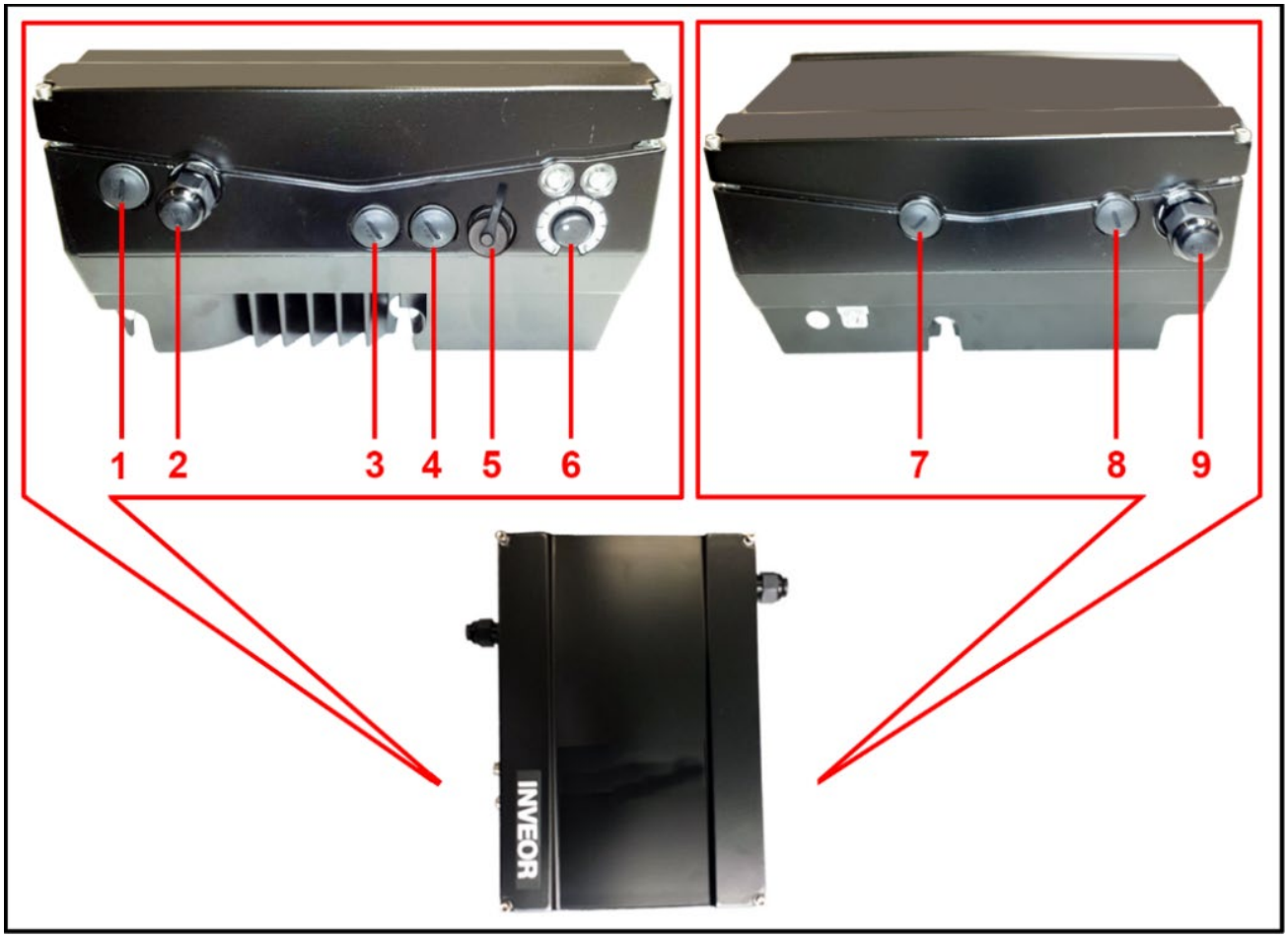


Fig.: 4 Sizes B - C "Modbus" connections

Sizes B - C "Modbus" connections	
1	Blind plug STO (install EMC screw connection supplied in the package)
2	Control line
3	Blind plug
4	Blind plug
5	MMI / Modbus
6	Potentiometer
7	Blind plug STO (install EMC screw connection supplied in the package)
8	Blind plug STO (install EMC screw connection supplied in the package)
9	Grid connection

1	2	3	4	5

Size D

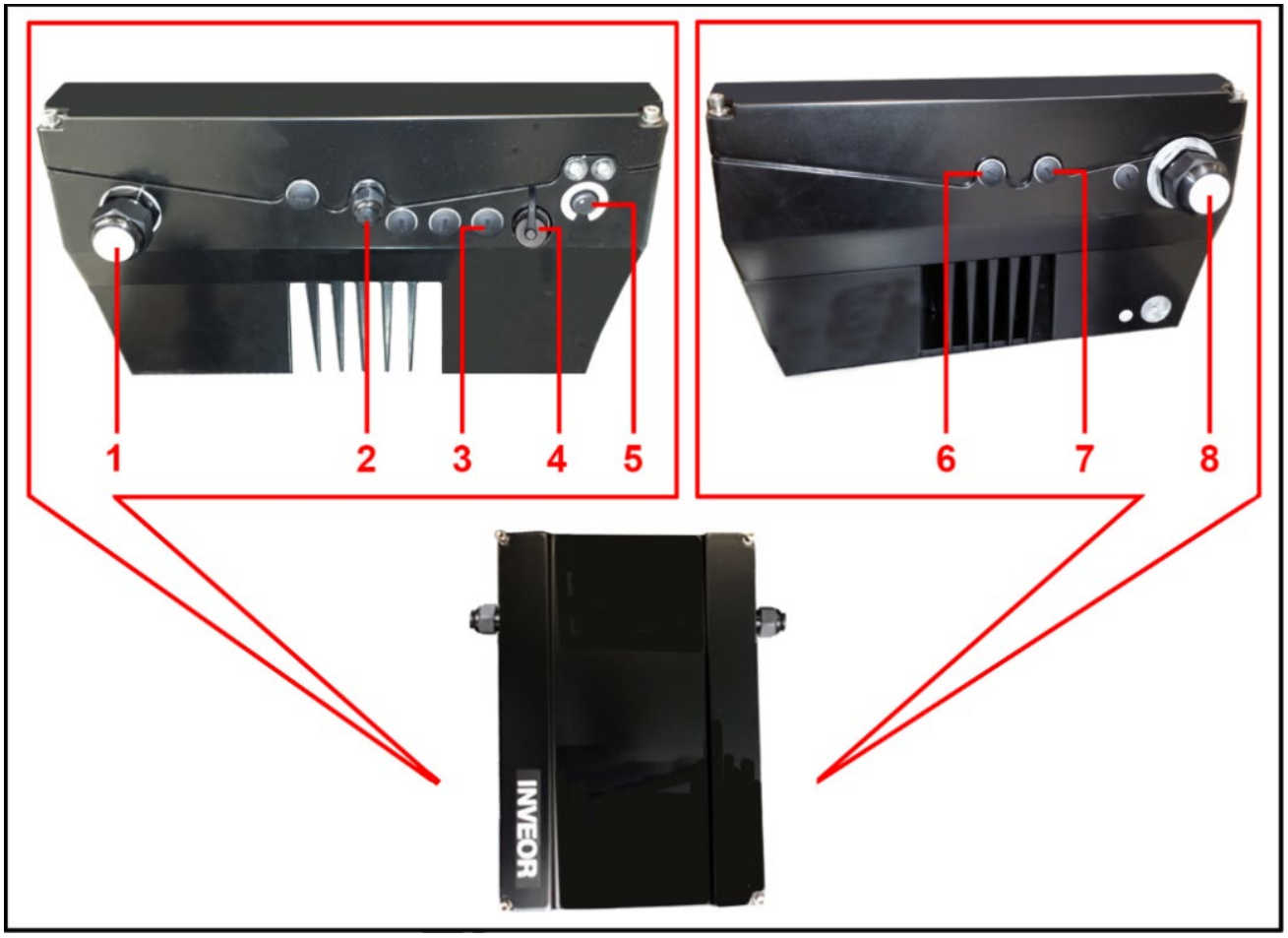


Fig.: 5 Size D "Modbus" connections

Size D "Modbus" connections	
1	Cable screw connection with blind plug
2	Control line
3	Blind plug
4	MMI / Modbus
5	Potentiometer
6	Blind plug STO (install EMC screw connection supplied in the package)
7	Blind plug STO (install EMC screw connection supplied in the package)
8	Grid connection

2.4.2 Pin assignment for interfaces

Pin assignment on device side of M12 socket for Modbus:

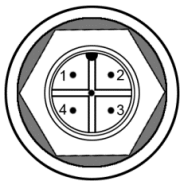
Pin no.	Assignment	Socket
1	24 V	
2	RS 485 - A	
3	GND	
4	RS 485 - B	
Housing	Shielding	

Fig. 6: Round plug connector, 4-pin, M12, A-coded for Modbus fieldbus

IMPORTANT INFORMATION

The 24 V on pin 1 is output by the INVEOR, to supply the MMI handheld controller, for example.

The 24 V must not be connected to the other 24 V bus participants in a Modbus network.

When using the KOSTAL M12 T-splitter, pin 1 is not connected.

2.4.3 Cable

The following points should be observed when wiring:

- Lay bus and power cables as far apart as possible (min. 30 cm),
- If cables do cross, an angle of 90° should be observed if possible.
- Depending on how cables are laid, cable length, set baud rate and ambient conditions, shielded cables may have to be used.

2.5 Software components

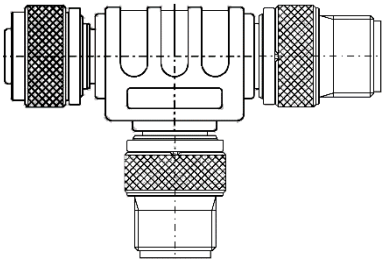
The INVEOR drive controller can be parameterised using the INVERTERpc tool and MMI (see operating manual) as well as using the Modbus master.

3. Installation

The fieldbus line is exclusively connected via an M12 T-splitter found on the front of the M12 connection socket.

The following Modbus M12 T-splitter can be used:

- M12 T-splitter
  M12 plug on plug and socket / RS485 / 4-pin / A-coded



M12 T-splitter

Article no.
10272829

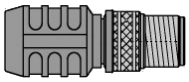
IMPORTANT INFORMATION

The 24 V on pin 1 is output by the INVEOR, to supply the MMI handheld controller, for example.
The 24 V must not be connected to the other 24 V bus participants in a Modbus network.
When using the KOSTAL M12 T-splitter, pin 1 is not connected.

A terminating resistor must be installed at both ends of the Modbus.

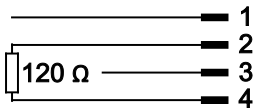
The following Modbus M12 terminating resistor can be used:

- M12 terminating resistor 120 Ohm
  M12 plug / RS485 / 5-pin / A-coded



Terminating resistor

Article no.
10343387



Terminating resistor plug assignment

3.1 Configuration of the drive controller for Modbus

In order for the drive controller to be controlled by Modbus, the following basic parameters must be set using the INVERTERpc tool:

- Set parameter 6.050 MODBUS address
- Set parameter 6.064 RS485 type (RS485 bus type) to Modbus "1" (only for INVEOR M)
- Set parameter 6.065 MODBUS configuration (we recommend the 32 bit communication)
- Set parameter 1.130 (target value source) to Modbus "4"
- Set parameter 1.131 (target value approval) to Modbus "7"
- Perform device restart

The user must choose the set of parameters appropriate to him.

IMPORTANT INFORMATION

Switching to Modbus RTU requires a few initial telegrams. As soon as the INVEOR responds correctly to the telegrams, assurance is given that the switchover has taken place properly.

1	2	3	4	5

6.051	Modbus baud rate	Unit:	
Relationship to parameter	Transfer status: 2	min. 0 max.: 8 def.: 2	own value (to be entered)
	Configuration of the Modbus baud rate: 0 = 9600 1 = 19200 2 = 38400 3 = 57600 4 = 115200 5 = 600 6 = 1200 7 = 2400 8 = 4800		

6.065	Modbus configuration	Unit:	
Relationship to parameter	Transfer status: 0	min. 0 max.: 7 def.: 0/4	own value (to be entered)
	Configuration of the Modbus bus: 0 = 8 Bits, Even Parity, 1 Stoppbit, 16 Bit, Big Endian 1 = 8 Bits, No Parity, 2 Stoppbit, 16 Bit, Big Endian 2 = 8 Bits, No Parity, 1 Stoppbit, 16 Bit, Big Endian 3 = 8 Bits, Odd Parity, 1 Stoppbit, 16 Bit, Big Endian 4 = 8 Bits, Even Parity, 1 Stoppbit, 32 Bit, Big Endian 5 = 8 Bits, No Parity, 2 Stoppbit, 32 Bit, Big Endian 6 = 8 Bits, No Parity, 1 Stoppbit, 32 Bit, Big Endian 7 = 8 Bits, Odd Parity, 1 Stoppbit 32 Bit, Big Endian } recommended setting **IMPORTANT INFORMATION** To accept the parameter, the unit must be restarted.		

IMPORTANT INFORMATION

Switching to Modbus RTU requires a few initial telegrams. As soon as the INVEOR responds correctly to the telegrams, assurance is given that the switchover has taken place properly.

3.2 INVEOR bus address

In order for an INVEOR to be clearly recognised in a Modbus system, it must be assigned an address.

The assignment can take place by setting parameter 6.050 "Modbus address".

Use INVERTERpc for the parameterisation.

6.050	Modbus address	Unit:	
Relationship to parameter	Transfer status: 0	min. 0 max.: 247 def.: 0	own value (to be entered)
	Selection of the Modbus address **IMPORTANT INFORMATION** To accept the parameter, the unit must be restarted.		

IMPORTANT INFORMATION

The address of an INVEOR must lie within the range from 1 to 247.

4. Accessing data via Modbus

Accessing data via Modbus is purely acyclic and can be undertaken with 16-bit / 32-bit access.

The 16-bit or 32-bit data width can be set via parameter 6.065 "Modbus configuration".

A typical MODBUS telegram is structured as follows:

Slave address	Function code	Data	Checksum CRC	
1 Byte	1 Byte	0 bis 252 Byte(s)	CRC Low	CRC High

We usually use the function codes 0x03 (read) and 0x10 (write).

HINWEIS

The function codes of the Modbus master are often set automatically!

In the INVEOR a distinction is made between In/Out process data and parameters.

The process data sent from the Modbus master to the INVEOR drive controller is known as "Process data In".

The process data sent from the INVEOR drive controller to the Modbus master is known as "Process data Out".

IMPORTANT INFORMATION

Switching to Modbus RTU requires a few initial telegrams. As soon as the INVEOR responds correctly to the telegrams, assurance is given that the switchover has taken place properly.

4.1 Process data

4.1.1 Process data Out: Status word / actual frequency

The status word and actual frequency can be read by the Modbus master.
Both values can be read individually and together.

Example 1:

16-bit data width, read the actual frequency:
Read at address 2000, 1 register (1 x 16-bit)

01 03 07 D0 00 01 84 87

Example 2:

16-bit data width, read the status word and actual frequency:
Read at address 1999, 2 register (2 x 16-bit)

01 03 07 CF 00 02 F5 40

Example 3:

32-bit data width, read the status word and actual frequency:
Read at address 3999, 4 register (4 x 16-bit)

01 03 0F 9F 00 04 77 33

16-bit access:

Address	Data type	Designation	Unit	Description
1999	WORD*	Status word	-	See structure of status word 4.1.2
2000	WORD	Actual frequency	Hz	Signed 16-bit standardised to 0.1 Hz/digit

Tab.: 1 Addresses of process values Out 16-bit

32-bit access:

Address	Data type	Designation	Unit	Description
3999	DWORD*	Status word	-	See structure of status word 4.1.2
4001	REAL***	Actual frequency	Hz	

Tab.: 2 Addresses of process values Out 32-bit

* WORD data type corresponds to INT16 = 2 bytes
** DWORD data type corresponds to UINT32 = 4 bytes
***REAL data type corresponds to = 4 bytes

IMPORTANT INFORMATION

The REAL depiction is the standard IEEE format
(Help: 50 % target value = 0X42480000)

The endianness of the fieldbus should be observed for all data types.

1	2	3	4	5

4.1.2 Structure of INVEOR status word

The meanings of the individual bits of the INVEOR status word are described in the following table.

Bit	Value	Meaning	Description
0	**1**	Ready for engagement	Grid voltage present, no fault
	0	Not ready for engagement	
1	1	Ready for operation	No fault / HW enable set
	0	Not ready for operation	
2	1	Operation	Motor is energised
	0	Operation blocked	
3	1	Error active	A fault is present
	0	Free from faults	
4	1	No OFF 2	On 2 off / STW bit 1 set [3](logic can be inverted with parameter 6.066.)
	0	Electr. stop active (OFF 2)	
5	1	No OFF 3	On 3 off / STW bit 2 set [3](logic can be inverted with parameter 6.066)
	0	Rapid stop active (OFF 3)	
6	1	Engagement inhibit active	[1] PWM blocked
	0	No engagement inhibit	[1] PWM enabled
7	1	Warning active	[2] A warning is present
	0	No warning	
8	1	Nominal/actual value deviation in tolerance range	Actual value within a tolerance band Parameter 6.070 / 6.071
	0	Nominal/actual value deviation outside tolerance range	
9	1	Control from AG	INVEOR is parameterised for activation via fieldbus
	0	No control from AG	
10	1	Target frequency reached	Actual frequency > = reference value (Parameter 6.072)
	0	Target frequency fallen below	Actual frequency < reference value
11	1	-	-
	0	-	
12	1	-	-
	0	-	
13	1	-	-
	0	-	
14	1	-	
	0	-	-
15	1	-	
	0		

Tab.: 3 INVEOR status word

AG: Automation device
1 Deviation from standard

1	2	3	4	5

4.1.3 Further process data Out

Further "Process data Out" is available as of start address 999 (16-bit access) and/or as of address 1999 (32-bit access).

The following tables contain the process data Out available.

Please note that 1 register must be read for the 16-bit data width and 2 registers for the 32-bit data width!

INFORMATION

With the 32-bit data width, all process data Out is of the "REAL" data type.

With the 16-bit data width, all process data Out is of the "INT16" data type (values standardised to the maximum value)

e.g. reading the supply voltage (address 1005)

Maximum 1000 V
Read 14261

$$\frac{14261}{2^{15}} \text{ x } 1000 \text{ V} = 435{,}2 \text{ V}$$

e.g. reading out a negative actual frequency (address 999)

Maximum 400 Hz
read -2458

$$\frac{-2458}{2^{15}} \text{ x } 400 \text{ Hz} = -30 \text{ Hz}$$

16-bit access:

Address	Data type	Designation	Unit	Maximum	Description
999	WORD	Actual frequency	Hz	400 Hz	
1000	WORD	Output voltage	V	1000 V	Motor voltage
1001	WORD	Motor current	A	100 A	
1002	WORD	IGBT temperature	° C	200°C	
1003	WORD	Intermediate circuit voltage	V	1000 V	
1004	WORD	Target frequency value	Hz	400 Hz	
1005	WORD	Supply voltage	V	1000 V	Input voltage
1006	WORD	Intermediate circuit current	A	100 A	
1007	WORD	Inner temperature	° C	200°C	FC inner temperature
1008	WORD	Incremental encoder speed	Hz	400 Hz	only with encoder option
1009	t.b.d.	Incremental encoder position			only with encoder option
1010	WORD	Application error, low word	1		Bit-coded
1011	WORD	Application error, high word	1		Bit-coded
1012	WORD	Power error, low word	1		Bit-coded
1013	WORD	Power error, high word	1		Bit-coded
1014	WORD	Digital inputs	1		Bit 0 = Dig. In 1 Bit 1 = Dig. In 2 Bit 2 = Dig. In 3 Bit 3 = Dig. In 4 Bit 4 = EN-HW / STO
1015	WORD	Analogue In 1	V	10.0	Analogue input 1 application
1016	WORD	Analogue In 2	V	10.0	Analogue input 2 application
1017	WORD	F_target ramp	Hz		Frequency target value behind ramp
1018	WORD	F_target	Hz		Frequency target value of target value source
1019	WORD	PID actual value	%	100.0	Actual value of PID process controller
1020	WORD	PID target value	%	100.0	Target value of PID process controller
1021	WORD	Analogue Out 1	V	10.0	Analogue Out 1

1	2	3	4	5

Address	Data type	Designation	Unit	Maximum	Description
1022	WORD	Intermediate circuit power	W	50000.0	Intermediate circuit power
1023	REAL	Analogue In 3	V	10.0	Analogue input 3 Application
1024	REAL	PT 1000	° C	4095	PT 1000 input Application
1025	WORD	Reserved	-	-	Reserved
1026	WORD	Reserved	-	-	Reserved
1027	WORD	Reserved	-	-	Reserved
1028	WORD	BUS/Soft PLC status word	1	-	BUS/Soft PLC status word
1029	WORD	Speed	rpm	20000	Motor shaft speed
1030	WORD	Torque	Nm	200.0	Torque
1031	WORD	Shaft power	W	25000.0	Mechanical shaft power
1032	WORD	Customised output variable 1, low word	1	-	Virtual DigOuts of the soft PLC
1033	WORD	Customised output variable 1, high word	1	-	Virtual DigOuts of the soft PLC
1034	WORD	Customer-specific output variable 2	1	10000	Customer-specific soft PLC output variable
1035	WORD	Customer-specific output variable 3	1	10000	Customer-specific soft PLC output variable
1036	WORD	Customer-specific output variable 4	1	10000	Customer-specific soft PLC output variable
1037	WORD	Operating time in hours	1	-	Operating time in hours
1038	WORD	Power On cycles	1	-	Power On cycles
1039	WORD	Electric energy kWh	kWh	32767	Total electric energy
1040	WORD	Status of outputs (DigOut 1 + 2, relays 1 + 2)		-	Status of outputs: Bit 0 = Dig Out 1 Bit 1 = Dig Out 2 Bit 2 = Relay 1 Bit 3 = Relay 2 Bit 4 = Virt Out 1
1041	WORD	Appl. (current) error, low word	1	-	Bit-coded
1042	WORD	Appl. (current) error, high word	1	-	Bit-coded
1043	WORD	Power (current) error, low word	1	-	Bit-coded
1044	WORD	Power (current) error, high word	1	-	Bit-coded
1045	UDINT	Active parameter set	1	-	Active parameter set
1046	REAL	Position	1	-	Current position with consideration of factor and offset
1047	UDINT	pwm_freq_idx	1	-	Index of the active switching frequency 0 = 2 kHz 1 = 4 kHz 2 = 6 kHz 3 = 8 kHz 4 = 12 kHz 5 = 16 kHz 6 = Auto
1060	REAL	Vibration X-axis RMS	g	-	Vibration value of the X-axis
1061	REAL	Vibration Y-axis RMS	g	-	Vibration value of the Y-axis
1062	REAL	Vibration Z-axis RMS	g	-	Vibration value of the Z-axis

Tab.: 4 Process data Out 16-bit

*Data type WORD corresponds to INT16

1	2	3	4	5

32-bit access:

Address	Data type	Designation	Unit	Maximum	Description
1999	REAL	Actual frequency	Hz	-	
2001	REAL	Output voltage	V	-	Motor voltage
2003	REAL	Motor current	A	-	
2005	REAL	IGBT temperature	° C	-	
2007	REAL	Intermediate circuit voltage	V		
2009	REAL	Target frequency value	Hz	-	
2011	REAL	Supply voltage	V	-	Input voltage
2013	REAL	Intermediate circuit current	A	-	
2015	REAL	Inner temperature	° C	-	FC inner temperature
2017	REAL	Incremental encoder speed	Hz	-	only with encoder option
2019	t.b.d.	Incremental encoder position		-	only with encoder option
2021	DWORD*	Application error	1	-	Bit-coded
2023	REAL	Reserved	-	-	Reserved
2024	REAL	Reserved	-	-	Reserved
2025	DWORD	Power error	1	-	Bit-coded
2029	DWORD	Digital inputs	1	-	Bit 0 = Dig. In 1 Bit 1 = Dig. In 2 Bit 2 = Dig. In 3 Bit 3 = Dig. In 4 Bit 4 = EN-HW / STO
2031	REAL	Analogue In 1	V	-	Analogue input 1 application
2033	REAL	Analogue In 2	V	-	Analogue input 2 application
2035	REAL	F_target ramp	Hz	-	Frequency target value behind ramp
2037	REAL	F_target	Hz	-	Frequency target value of target value source
2039	REAL	PID actual value	%	-	Actual value of PID process controller
2041	REAL	PID target value	%	-	Target value of PID process controller
2043	REAL	Analogue Out 1	V	-	Analogue Out 1
2045	REAL	Intermediate circuit power	W	-	Intermediate circuit power
2046	REAL	Reserved	-	-	Reserved
2047	REAL	Analogue In 3	V	10.0	Analogue input 1 application
2049	REAL	PT 1000	° C	4095	PT 1000 input application
2051	REAL	Reserved	-	-	Reserved
2053	REAL	Reserved	-	-	Reserved
2055	REAL	Reserved	-	-	Reserved
2057	DWORD	BUS/Soft PLC status word	1	-	BUS/Soft PLC status word
2058	REAL	Reserved	-	-	Reserved
2059	REAL	Speed	g	-	Motor shaft speed
2060	REAL	Reserved	-	-	Reserved
2061	REAL	Reserved	-	-	Reserved

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Address	Data type	Designation	Unit	Maximum	Description
2063	REAL	Electric motor rating	W	-	Electric motor rating
2067	WORD	Customer-specific output variable 1	1	-	Customer-specific soft PLC output variable
2069	REAL	Customer-specific output variable 2	1	-	Customer-specific soft PLC output variable
2071	REAL	Customer-specific output variable 3	1	-	Customer-specific soft PLC output variable
2073	REAL	Customer-specific output variable 4	1	-	Customer-specific soft PLC output variable
2075	DWORD	Operating time in seconds	1	-	Operating time in seconds
2077	DWORD	Power On cycles	1	-	Power On cycles
2079	REAL	Electric energy Wh	Wh	-	Total electric energy
2081	DWORD	Status of outputs (DigOut 1 + 2, relay 1 + 2)		-	Status of outputs: Bit 0 = Dig Out 1 Bit 1 = Dig Out 2 Bit 2 = Relay 1 Bit 3 = Relay 2 Bit 4 = Virt Out 1
2083	DWORD*	Application error (at present)	1	-	Bit-coded
2087	DWORD	Power error (at present)	1		Bit-coded
2091	WORD	Active parameter set	1	-	Active parameter set
2093	REAL	Position	1	-	Current position with consideration of factor and offset
2095	WORD	Pwm_freq_idx	1	-	Index of the active switching frequency
2121	REAL	Vibration X-axis RMS	g	-	Vibration value of the X-axis
2123	REAL	Vibration Y-axis RMS		-	Vibration value of the Y-axis
2125	REAL	Vibration Z-axis RMS	g	-	Vibration value of the Z-axis

Tab.: 5 Process data Out 32-bit

4.2 Process data In control word / nominal frequency

The control word and nominal frequency can be transferred by the Modbus master.
The two values can be written individually and together.

Example 1:
16-bit data width, write the nominal frequency:
Write at address 2002, 1 register (1 x 16-bit)

Example 2:
16-bit data width, write the control word and nominal frequency:
Write at address 2001, 2 register (2 x 16-bit)

Example 3:
32-bit data width, write the control word and nominal frequency:
Write at address 4003, 4 register (4 x 16-bit)

16-bit access:

Address	Data type	Designation	Unit	Description
2001	WORD*	Control word	-	See structure of control word 4.2.1
2002	WORD	Nominal frequency	Hz	Signed 16-bit standardised to 0.1 Hz/digit e.g. 15 Hz = value 150

Tab.: 6 Addresses of process values In 16-bit

IMPORTANT INFORMATION

With PID control

PID target value % = $\frac{Value\ x\ F_{Max}}{10}$

IMPORTANT INFORMATION

The target value is only accepted if bit 6 (target value enabled) and bit 10 (control from automation device) is set.
Otherwise the target value is rejected.

Switching to Modbus RTU requires a few initial telegrams. As soon as the INVEOR responds correctly to the telegrams, assurance is given that the switchover has taken place properly.

32-bit access:

Address	Data type	Designation	Unit	Description
4003	DWORD*	Control word	-	See structure of control word 4.2.1
4005	REAL***	Nominal frequency	%	100 % = maximum frequency

Tab.: 7 Addresses of process values In 32-bit

IMPORTANT INFORMATION

The target value is only accepted if bit 6 (target value enabled) and bit 10 (control from automation device) is set.
Otherwise the target value is rejected.

Switching to Modbus RTU requires a few initial telegrams. As soon as the INVEOR responds correctly to the telegrams, assurance is given that the switchover has taken place properly.

* WORD data type corresponds to INT16 = 2 bytes
** DWORD data type corresponds to UINT32 = 4 bytes
*** REAL data type corresponds to = 4 bytes

4.2.1 Structure of INVEOR control word

The meanings of the individual bits of the INVEOR control word are described in the following table.

IMPORTANT INFORMATION

The control word is only accepted if bit 10 (control from AG) is set, otherwise the sent control word is rejected.

IMPORTANT INFORMATION

The target value is only accepted if bit 6 (target value enabled) and bit 10 (control from automation device) is set.
Otherwise the target value is rejected.

Bit	Value	Meaning	Description
0	1*	ON 1	Engagement condition 1
	0	OFF 1	Shut down via ramp
1	1*	ON 2	Engagement condition 2
	0	Electr. stop (OFF 2)	Switch off PWM, free shutdown
2	1*	EIN 3	Engagement condition 3
	0	Rapid stop (OFF 3)	Shut down via fastest possible ramp
3	1*	Operating condition 1	Operating condition 1
	0		Switch off PWM, free shutdown
4	1*	Operating condition 2	Operating condition 2
	0		Shut down via fastest possible ramp
5	1	-	-
	0	-	-
6	1*	Enable target value	Adopt target value
	0	Block target value	Reject target value
7	1	Error acknowledgement (0-> 1)	Collective acknowledgement on pos. flank
	0*	---	---
8	1	-	-
	0	-	-
9	1	-	-
	0	-	-
10	1*	Control from AG	Management via interface, control word valid
	0		Control word is rejected
11	1	Motor identification	Start of motor identification via fieldbus (bits 0 - 9 must be 0)
	0		
12	1	-	-
	0		
13	1	-	-
	0		
14	1	-	-
	0		
15	1	-	-
	0		

Tab.: 8 Control word

*** Operating condition**

IMPORTANT INFORMATION

An example of a control word with which the start-up works is 0x45F.

The endianness of the fieldbus should be observed for all data types.

4.2.2 Further process data IN

Further process data In is available as of start address 1049 (16-bit access) and/or as of address 2099 (32-bit access).

The following tables contain the process data In available.

Please note that 1 register must be written for the 16-bit data width and 2 registers for the 32-bit data width!

INFORMATION

With the 32-bit data width, all process data In is of the "REAL" data type.

With the 16-bit data width, all process data In is of the "INT16" data type (values standardised to the maximum value)

e.g. adaptation of customised input variable 2 (address 1053) to 800

Maximum 10000 $\frac{800}{10000} x\ 2^{15} = 2621$

16-bit access:

Address	Data type	Designation	Unit	Maximum	Description
1049	WORD*	Digital relay outputs	1	-	Control of outputs: Bit 0 = Dig Out 1 (Parameter 4.150 = 25) Bit 1 = Dig Out 2 (Parameter 4.170 = 25) Bit 2 = Relay 1 (Parameter 4.190 = 25) Bit 3 = Relay 2 (Parameter 4.210 = 25) Bit 4 = Virt Out 1 (Parameter 4.230 = 25)
1050	WORD	Analogue Out 1	V	10.0	Control of analogue output
1051	WORD	Customised input variable 1, low word	1	-	Customised input variable soft PLC (32 bit)
1052	WORD	Customised input variable 1, high word	1	-	Customised input variable soft PLC (32 bit)
1053	WORD	Customised input variable 2 / PID actual value	-	1	Customised input variable soft PLC
1054	WORD	Customised input variable 3	-	1	Customised input variable soft PLC
1055	WORD	Customised input variable 4	-	1	Customised input variable soft PLC
1058	REAL	Position setpoint	1	-	Position setpoint (Parameter 9.015 = 3: Fieldbus)

32-bit access:

Address	Data type	Designation	Unit	Description
2099	DWORD*	Digital relay outputs	1	Control of outputs: Bit 0 = Dig Out 1 (Parameter 4.150 = 25) Bit 1 = Dig Out 2 (Parameter 4.170 = 25) Bit 2 = Relay 1 (Parameter 4.190 = 25) Bit 3 = Relay 2 (Parameter 4.210 = 25) Bit 4 = Virt Out 1 (Parameter 4.230 = 25)
2101	REAL	Analogue Out 1	V	Control of analogue output
2103	DWORD	Customised input variable 1	1	Customised input variable soft PLC (32 bit)
2107	REAL	Customised input variable 2 / PID actual value	-	Customised input variable soft PLC
2109	REAL	Customised input variable 3	-	Customised input variable soft PLC
2111	REAL	Customised input variable 4	-	Customised input variable soft PLC
2117	REAL	Position setpoint	1	Position setpoint (Parameter 9.015 = 3: Fieldbus)

Tab.: 9 Addresses of process data In 32-bit

* DWORD data type corresponds to UINT32 = 4 bytes

4.3 Parameter

IMPORTANT INFORMATION

Only parameters with an access level of 2 or less can be accessed
(see list of parameters in operating manual).

Access for both reading and writing is possible.

IMPORTANT INFORMATION

You will find detailed information about the parameters in the "Parameters" chapter of the "INVEOR drive controller" operating manual.

4.3.1 Parameter

The following parameters can be accessed for reading and writing.

IMPORTANT INFORMATION

Changing a parameter value via the fieldbus includes direct EEPROM write access.

Writing cyclically to the EEPROM can lead to destruction!
(Maximum 1,000,000 write cycles permitted**)**

INFORMATION

With the 32-bit data width, all parameters are of the "REAL" data type.

With the 16-bit data width, all parameters In are of the "INT16" data type (values standardised to the maximum value)

e.g. adaptation of maximum frequency (address 3000) to 75 Hz

Maximum 400 Hz $\frac{75\ \mathrm{Hz}}{400\ Hz}\ x\ 2^{15}$ = 6144

IMPORTANT INFORMATION

The data below is listed sorted in ascending order by "Number*".

The data listed here represent all available parameters for the INVEOR M, MP, MPP and MP Modular series. Please refer to the respective operating instructions for the product variants to find out which parameters are relevant for the individual variants.

The standardisation of the individual parameters required for 16-bit communication can also be found in the respective operating instructions for the product variants.

These can be downloaded from the KOSTAL homepage under the following link:

M	https://kostal-drives-technology.com/betriebsanleitung_en
MP	https://kostal-drives-technology.com/betriebsanleitung_mp_en
MPP	https://kostal-drives-technology.com/betriebsanleitung_mpp_en
MP Modular	https://kostal-drives-technology.com/betriebsanleitung_mp_mod_en

Modbus		INVEOR parameter			
16-bit	32-bit	Number*	Accepted	Name	Unit
2999	5999	1.020	2: Always	minimum speed	Hz
3000	6001	1.021	2: Always	maximum speed	Hz
3002	6005	1.050	2: Always	deceleration 1	s
3003	6007	1.051	2: Always	acceleration 1	s
3047	6095	1.052	2: Always	deceleration 2	s
3048	6097	1.053	2: Always	acceleration 2	s
3049	6099	1.054	2: Always	ramp selection	int
3207	6415	1.060	1: Ready	S Curve	s
3171	6343	1.088	2: Always	quick stop	s
3007	6015	1.100	2: Always	control mode	int
3004	6009	1.130	2: Always	ref.channel	int
3006	6013	1.131	2: Always	software enable	int
3080	6161	1.132	2: Always	start protect	int
3200	6401	1.133	2: Always	Free run-out	int
3040	6081	1.150	2: Always	rot.direction	int
3052	6105	1.180	2: Always	err. acknowledge	int
3053	6107	1.181	2: Always	auto acknowlege	s
3108	6217	1.182	2: Always	number auto ack	int
3054	6109	2.050	2: Always	pres.speed mode	int
3008	6017	2.051	2: Always	preset speed 1	Hz
3009	6019	2.052	2: Always	preset speed 2	Hz
3010	6021	2.053	2: Always	preset speed 3	Hz

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Modbus		INVEOR parameter			
16-bit	32-bit	Number*	Accepted	Name	Unit
3011	6023	2.054	2: Always	preset speed 4	Hz
3012	6025	2.055	2: Always	preset speed 5	Hz
3013	6027	2.056	2: Always	preset speed 6	Hz
3014	6029	2.057	2: Always	preset speed 7	Hz
3138	6277	2.150	2: Always	MOP digital in.	int
3050	6101	2.151	2: Always	MOP step range	%
3140	6281	2.152	2: Always	MOP step time	s
3139	6279	2.153	2: Always	MOP resp.time	s
3141	6283	2.154	2: Always	MOP memory	int
3036	6073	3.050	2: Always	PID prop.gain	
3037	6075	3.051	2: Always	PID integr.gain	1/s
3038	6077	3.052	2: Always	PID deriv.gain	s
3185	6371	3.055	2: Always	PID Modus	int
3005	6011	3.060	2: Always	PID feedback	int
3081	6163	3.061	2: Always	PID inverted	int
3082	6165	3.062	2: Always	PID preset ref.1	%
3126	6253	3.063	2: Always	PID preset ref.2	%
3127	6255	3.064	2: Always	PID preset ref.3	%
3128	6257	3.065	2: Always	PID preset ref.4	%
3129	6259	3.066	2: Always	PID preset ref.5	%
3130	6261	3.067	2: Always	PID preset ref.6	%
3131	6263	3.068	2: Always	PID preset ref.7	%
3132	6265	3.069	2: Always	PID pre.ref.mode	int
3083	6167	3.070	2: Always	PID standby time	s
3084	6169	3.071	2: Always	PID standby hyst	%
3165	6331	3.072	2: Always	PID dry run time	s
3168	6337	3.073	2: Always	PID ref.min	%
3169	6339	3.074	2: Always	PID ref.max	%
3184	6369	3.080	2: Always	PID Min.freq.2	Hz
3024	6049	4.020	2: Always	AI1 ref.type	int
3025	6051	4.021	2: Always	AI1-Norm. Low	%
3026	6053	4.022	2: Always	AI1-Norm. High	%
3022	6045	4.023	2: Always	AI1 dead time	%
3021	6043	4.024	2: Always	AI1 filter time	s
3018	6037	4.030	2: Always	AI1 function	int

1	2	3	4	5

Modbus		INVEOR parameter			
16-bit	32-bit	Number*	Accepted	Name	Unit
3102	6205	4.033	2: Always	AI1 phy.unit	int
3103	6207	4.034	2: Always	AI1 phy.unit min	
3104	6209	4.035	2: Always	AI1 phy.unit max	
3166	6333	4.036	2: Always	AI1 br.wir.det.t	s
3176	6353	4.037	2: Always	AI1 inverted	int
3033	6067	4.050	2: Always	AI2 ref.type	int
3034	6069	4.051	2: Always	AI2-Norm. Low	%
3035	6071	4.052	2: Always	AI2-Norm. High	%
3031	6063	4.053	2: Always	AI2 dead time	%
3030	6061	4.054	2: Always	AI2 filter time	s
3027	6055	4.060	2: Always	AI2 function	int
3105	6211	4.063	2: Always	AI2 phy.unit	int
3106	6213	4.064	2: Always	AI2 phy.unit min	
3107	6215	4.065	2: Always	AI2 phy.unit max	
3167	6335	4.066	2: Always	AI2 br.wir.det.t	s
3177	6355	4.067	2: Always	AI2 inverted	int
3230	6461	4.070	2: Always	AI3 ref.type	int
3231	6463	4.071	2: Always	AI3-Norm. Low	%
3232	6465	4.072	2: Always	AI3-Norm. High	%
3233	6467	4.073	2: Always	AI3 filter time	s
3234	6469	4.074	2: Always	AI3 br.wir.det.t	s
3235	6471	4.075	2: Always	AI3 inverted	int
3244	6489	4.076	2: Always	AI3 phy.unit	int
3245	6491	4.077	2: Always	AI3 phy.unit min	
3246	6493	4.078	2: Always	AI3 phy.unit max	
3238	6477	4.080	2: Always	DI5/DO2 select	int
3239	6479	4.081	2: Always	DI6/DO3 select	int
3240	6481	4.082	2: Always	AI3/AO1 select	int
3041	6083	4.100	2: Always	AO1 function	int
3042	6085	4.101	2: Always	AO1-Norm. Low	
3079	6159	4.102	2: Always	AO1-Norm.-High	
3119	6239	4.110	2: Always	DI1 inverted	int
3120	6241	4.111	2: Always	DI2 inverted	int
3121	6243	4.112	2: Always	DI3 inverted	int
3122	6245	4.113	2: Always	DI4 inverted	int
3236	6473	4.114	2: Always	DI5 inverted	int
3237	6475	4.115	2: Always	DI6 inverted	int

1	2	3	4	5

Modbus		INVEOR parameter			
16-bit	32-bit	Number*	Accepted	Name	Unit
3055	6111	4.150	2: Always	DO1 function	int
3056	6113	4.151	2: Always	DO1 on	
3057	6115	4.152	2: Always	DO1 off	
3058	6117	4.170	2: Always	DO2 function	int
3059	6119	4.171	2: Always	DO2 on	
3060	6121	4.172	2: Always	DO2 off	
3241	6483	4.180	2: Always	DO3 function	int
3242	6485	4.181	2: Always	DO3 on	
3243	6487	4.182	2: Always	DO3 off	
3061	6123	4.190	2: Always	relay1 function	int
3062	6125	4.191	2: Always	relay1 on	
3063	6127	4.192	2: Always	relay1 off	
3093	6187	4.193	2: Always	relay1 on delay	s
3094	6189	4.194	2: Always	relay1 off delay	s
3064	6129	4.210	2: Always	relay2 function	int
3065	6131	4.211	2: Always	relay2 on	
3066	6133	4.212	2: Always	relay2 off	
3095	6191	4.213	2: Always	relay2 on delay	s
3096	6193	4.214	2: Always	relay2 off delay	s
3159	6319	4.230	2: Always	VO function	int
3160	6321	4.231	2: Always	VO on	
3161	6323	4.232	2: Always	VO off	
3162	6325	4.233	2: Always	VO on delay	s
3163	6327	4.234	2: Always	VO off delay	s
3192	6385	4.235	2: Always	VO-inverted	int
3123	6247	5.010	2: Always	external fault1	int
3124	6249	5.011	2: Always	external fault2	int
3201	6403	5.069	2: Always	curr.limit.fix	%
3085	6171	5.070	2: Always	curr.limit.[%]	%
3086	6173	5.071	2: Always	curr.limit.[s]	s
3155	6311	5.075	2: Always	gear factor	
3110	6221	5.080	2: Always	stall detection	int
3153	6307	5.081	2: Always	stall time	s
3170	6341	5.082	2: Always	startup error	int
3182	6365	5.083	2: Always	deact.Errorlog11	int
3193	6387	5.085	2: Always	f min monitoring	s
3194	6389	5.086	2: Always	f max monitoring	s

1	2	3	4	5

Modbus		INVEOR parameter			
16-bit	32-bit	Number*	Accepted	Name	Unit
3137	6275	5.090	2: Always	para.set change	int
3069	6139	5.100	2: Always	tech.parameter 1	
3070	6141	5.101	2: Always	tech.parameter 2	
3071	6143	5.102	2: Always	tech.parameter 3	
3072	6145	5.103	2: Always	tech.parameter 4	
3073	6147	5.104	2: Always	tech.parameter 5	
3074	6149	5.105	2: Always	tech.parameter 6	
3075	6151	5.106	2: Always	tech.parameter 7	
3076	6153	5.107	2: Always	tech.parameter 8	
3077	6155	5.108	2: Always	tech.parameter 9	
3078	6157	5.109	2: Always	tech.parameter 10	
3143	6287	5.110	2: Always	tech.parameter 11	
3144	6289	5.111	2: Always	tech.parameter 12	
3145	6291	5.112	2: Always	tech.parameter 13	
3146	6293	5.113	2: Always	tech.parameter 14	
3147	6295	5.114	2: Always	tech.parameter 15	
3148	6297	5.115	2: Always	tech.parameter 16	
3149	6299	5.116	2: Always	tech.parameter 17	
3150	6301	5.117	2: Always	tech.parameter 18	
3151	6303	5.118	2: Always	tech.parameter 19	
3152	6305	5.119	2: Always	tech.parameter 20	
3483	6967	5.120	2: Always	tech.parameter 21	
3484	6969	5.121	2: Always	tech.parameter 22	
3485	6971	5.122	2: Always	tech.parameter 23	
3486	6973	5.123	2: Always	tech.parameter 24	
3487	6975	5.124	2: Always	tech.parameter 25	
3488	6977	5.125	2: Always	tech.parameter 26	
3489	6979	5.126	2: Always	tech.parameter 27	
3490	6981	5.127	2: Always	tech.parameter 28	
3491	6983	5.128	2: Always	tech.parameter 29	
3492	6985	5.129	2: Always	tech.parameter 30	
3493	6987	5.130	2: Always	tech.parameter 31	
3494	6989	5.131	2: Always	tech.parameter 32	
3495	6991	5.132	2: Always	tech.parameter 33	
3496	6993	5.133	2: Always	tech.parameter 34	
3497	6995	5.134	2: Always	tech.parameter 35	
3498	6997	5.135	2: Always	tech.parameter 36	
3499	6999	5.136	2: Always	tech.parameter 37	
3.500	7001	5.137	2: Always	tech.parameter 38	
3.501	7003	5.138	2: Always	tech.parameter 39	
3.502	7005	5.139	2: Always	tech.parameter 40	

1	2	3	4	5

Modbus		INVEOR parameter			
16-bit	32-bit	Number*	Accepted	Name	Unit
3449	6899	5.140	2: Always	tech.parameter 41	
3450	6901	5.141	2: Always	tech.parameter 42	
3451	6903	5.142	2: Always	tech.parameter 43	
3452	6905	5.143	2: Always	tech.parameter 44	
3453	6907	5.144	2: Always	tech.parameter 45	
3454	6909	5.145	2: Always	tech.parameter 46	
3459	6919	5.146	2: Always	tech.parameter 47	
3461	6923	5.147	2: Always	tech.parameter 48	
3462	6925	5.148	2: Always	tech.parameter 49	
3463	6927	5.149	2: Always	tech.parameter 50	
3464	6929	5.150	2: Always	tech.parameter 51	
3465	6931	5.151	2: Always	tech.parameter 52	
3466	6933	5.152	2: Always	tech.parameter 53	
3467	6935	5.153	2: Always	tech.parameter 54	
3468	6937	5.154	2: Always	tech.parameter 55	
3469	6939	5.155	2: Always	tech.parameter 56	
3470	6941	5.156	2: Always	tech.parameter 57	
3471	6943	5.157	2: Always	tech.parameter 58	
3472	6945	5.158	2: Always	tech.parameter 59	
3473	6947	5.159	2: Always	tech.parameter 60	
3474	6949	5.160	2: Always	tech.parameter 61	
3475	6951	5.161	2: Always	tech.parameter 62	
3476	6953	5.162	2: Always	tech.parameter 63	
3477	6955	5.163	2: Always	tech.parameter 64	
3478	6957	5.164	2: Always	tech.parameter 65	
3178	6357	5.200	2: Always	Rot.MMI display	int
3183	6367	5.201	2: Always	mem.MMI screen	int
3186	6373	5.202	2: Always	MMI Password	int
3187	6375	5.210	2: Always	MMI Opt language	int
3195	6391	6.010	0: Setup	Ethern.Fieldbus	int
3199	6399	6.040	0: Setup	CAN active	int
3097	6195	6.050	2: Always	MODBUS addr	int
3109	6219	6.051	2: Always	MODBUS baudr	int
3098	6197	6.060	0: Setup	field.address	int
3099	6199	6.061	0: Setup	field.baud rate	int
3101	6203	6.062	2: Always	field.timeout	s
3174	6349	6.065	0: Setup	MODBUS Config	int
3175	6351	6.066	2: Always	Statusw.Bits4/5	int
3179	6359	6.067	0: Setup	IP Address	ipv4
3180	6361	6.068	0: Setup	subnet Mask	ipv4
3181	6363	6.069	0: Setup	Gateway	ipv4

1	2	3	4	5

Modbus		INVEOR parameter			
16-bit	32-bit	Number*	Accepted	Name	Unit
3156	6313	6.070	2: Always	ref-feed.diff.	%
3157	6315	6.071	2: Always	tolerance range	s
3158	6317	6.072	2: Always	reference value	Hz
3228	6457	6.073	0: Setup	DNS Server 1	ipv4
3229	6459	6.074	0: Setup	DNS Server 2	ipv4
3111	6223	6.080	2: Always	processdat.out3	int
3112	6225	6.081	2: Always	processdat.out4	int
3113	6227	6.082	2: Always	processdat.out5	int
3114	6229	6.083	2: Always	processdat.out6	int
3115	6231	6.084	2: Always	processdat.out7	int
3116	6233	6.085	2: Always	processdat.out8	int
3117	6235	6.086	2: Always	processdat.out9	int
3118	6237	6.087	2: Always	processdat.out10	int
3133	6267	6.110	2: Always	processdat.in3	int
3134	6269	6.111	2: Always	processdat.in4	int
3135	6271	6.112	2: Always	processdat.in5	int
3136	6273	6.113	2: Always	processdat.in6	int
3217	6435	6.150	2: Always	MQTT active	int
3218	6437	6.151	0: Setup	MQTT broker adr.	ipv4
3189	6379	6.201	0: Setup	BT Password	int
3190	6381	6.202	0: Setup	BT strength	int
3202	6405	7.010	2: Always	Torque Ref.Cha.	int
3203	6407	7.030	2: Always	Torque limit low	Nm
3204	6409	7.031	2: Always	Torq. limit high	Nm
3205	6411	7.040	2: Always	Torque fix Ref	Nm
3206	6413	7.050	2: Always	Torque delay	s
3216	6433	8.010	0: Setup	Multipump mode	int
3212	6425	8.020	0: Setup	number of pumps	int
3209	6419	8.040	2: Always	startfreq.Apump	Hz
3210	6421	8.041	2: Always	stopfreq.Apump	Hz
3211	6423	8.042	2: Always	settling time	s
3208	6417	8.050	2: Always	pump change time	h
3213	6427	8.060	2: Always	Pumphrs.Correct	h
3222	6445	9.010	1: Ready	position mode	int
3220	6441	9.015	1: Ready	position ref.	int
3221	6443	9.020	1: Ready	position ctrwrd	int
3226	6453	9.050	2: Always	pos.value unit	int

1	2	3	4	5

Modbus		INVEOR parameter			
16-bit	32-bit	Number*	Accepted	Name	Unit
3225	6451	9.051	2: Always	pos.value offset	
3224	6449	9.052	2: Always	pos.value factor	
3223	6447	9.100	2: Always	Pos.control gain	1/s
3367	6735	33.001	1: Ready	Type of motor	
3355	6711	33.010	2: Always	I²T fact. motor	%
3365	6731	33.010	1: Ready	drive type	int
3339	6679	33.011	1: Ready	i2t time	s
3336	6673	33.012	1: Ready	I2T threshold 1	%
3337	6675	33.013	1: Ready	I2T threshold 2	%
3338	6677	33.014	1: Ready	I2T threshold 3	%
3335	6671	33.015	1: Ready	I2T function	
3402	6805	33.016	1: Ready	motorPhasMonitor	int
3387	6775	33.020	1: Ready	R-optimisation	%
3325	6651	33.031	1: Ready	motor current	A
3326	6653	33.032	1: Ready	motor power	W
3328	6657	33.034	1: Ready	motor speed	rpm
3329	6659	33.035	1: Ready	motor frequency	Hz
3370	6741	33.050	1: Ready	stator resist.	Ohm
3372	6745	33.105	1: Ready	leakage induct.	H
3323	6647	33.110	1: Ready	motor voltage	V
3327	6655	33.111	1: Ready	motor cosphi	
3281	6563	33.112	1: Ready	boost volt. uf	V
3371	6743	33.200	1: Ready	Stator induc.	H
3384	6769	33.201	1: Ready	nominal flux	Vs
3270	6541	33.248	1: Ready	d inductance	H
3271	6543	33.249	1: Ready	q inductance	H
3366	6733	34.010	1: Ready	Control method	
3255	6511	34.015	1: Ready	ramp corr.active	int
3386	6773	34.020	2: Always	flystart	int
3385	6771	34.021	2: Always	flystart time	ms
3262	6525	34.030	2: Always	PWM frequency	int
3263	6527	34.030	2: Always	Switching frequency	
3264	6529	34.031	1: Ready	auto PWMfreq.min	int
3265	6531	34.032	1: Ready	auto PWMfreq.max	int
3376	6753	34.090	2: Always	speed control Kp	mNms/rad
3377	6755	34.091	2: Always	speed control Tn	s
3295	6591	34.092	1: Ready	act.speed filter	s
3368	6737	34.110	2: Always	slip trimmer	
3393	6787	34.120	2: Always	squared charac.	int
3394	6789	34.121	2: Always	flux reduction	%
3417	6835	34.122	2: Always	max. flux red.	%

1	2	3	4	5

Modbus		INVEOR parameter			
16-bit	32-bit	Number*	Accepted	Name	Unit
3369	6739	34.130	2: Always	volt.utilisation	
3380	6761	34.138	2: Always	hold.curr.time	s
3401	6803	34.193	1: Ready	start frequency	%
3391	6783	34.226	2: Always	startup current	%
3398	6797	34.227	1: Ready	PMSM init. time	s
3395	6791	34.228	1: Ready	startup method	int
3396	6793	34.229	1: Ready	startup ramptime	s
3397	6795	34.230	1: Ready	startup frequenz	Hz
3285	6571	34.249	1: Ready	fieldweak_filter	s
3375	6751	35.080	2: Always	Brake chopper	
3407	6815	36.020	2: Always	disabMainsMonitr	int
3347	6695	37.010	1: Ready	Brakectrl manual	int
3346	6693	37.020	1: Ready	brakectrl auto	int
3343	6687	37.030	1: Ready	br. low freq.	Hz
3344	6689	37.040	1: Ready	br.releasetime	s
3345	6691	37.050	1: Ready	br.off delay	s
3348	6697	37.060	1: Ready	brakectrl invert	int
3298	6597	61.001	1: Ready	init pulse	Vs
3302	6605	61.003	2: Always	OverModMaxBoost	%
3303	6607	61.004	2: Always	OverMod Prio	%
3305	6611	61.006	1: Ready	Init Pulse Logic	
3306	6613	61.007	1: Ready	RsIdentOnEnable	
3266	6533	61.010	1: Ready	motor ident mode	
3340	6681	61.011	1: Ready	encoder type	
3341	6683	61.012	1: Ready	enc.line count	
3342	6685	61.013	2: Always	encoder offset	°
3282	6565	61.020	1: Ready	DCctrl bandwidth	s
3296	6593	61.030	1: Ready	position filter	
3316	6633	61.040	1: Ready	PresatCurrent	A
3317	6635	61.041	1: Ready	TempTrackRange	A
3362	6725	61.050	1: Ready	injection amplit	V
3361	6723	61.051	1: Ready	injection freq	Hz
3333	6667	61.120	1: Ready	motor efficiency	%
3324	6649	61.200	1: Ready	Rs Tracking Rng	%
3299	6599	61.210	0: Setup	OverCurrentTrip	A
3398	6797	61.227	1: Ready	pulse interval	s

5. Error detection and troubleshooting

The errors from the application and power side can be issued in the Process data Out (see Chapter 4.1.1).

5.1 Application side error word

The following section contains a list of possible error messages of the application. *

Bit.	Error number	Description
0	1	Undervoltage 24 V application
1	2	Overvoltage 24 V application
3	4	Warning: Customer PLC runtime environment
5	6	Customer PLC version error
7	8	Communication application<>power
8	9	Warning: Multi-pump error
9	10	Parameter distributor
10	11	Power time out
12	13	Cable break at analogue in 1 (4–20 mA / 2– 10 V)
13	14	Cable break at analogue in 2 (4–20 mA / 2– 10 V)
14	15	Blocking detection
15	16	PID dry run
16	17	Start-up error
17	18	Excess temperature for frequency converter application
18	19	Firmware update error
20	21	Bus time-out
21	22	Acknowledgement error
22	23	External error 1
23	24	External error 2
24	25	Motor detection
25	26	STO inputs plausibility
26	27	Bus address invalid
27	28	Limit frequency exceeded / not met

Tab.: 10 Application error word

*** Maximum number of error messages.**
The number may vary depending on the series!

5.2 Power side error word

The following section contains a list of possible power side error messages. *

Bit.	Error number	Description
0	32	Trip IGBT
1	33	Overvoltage of intermediate circuit
2	34	Undervoltage of intermediate circuit
3	35	Excess motor temperature
4	36	Power failure
6	38	Excess IGBT module temperature
7	39	Overcurrent
8	40	Excess frequency converter temperature
10	42	I^2t motor protection shut-off
11	43	Ground leak
13	45	Motor connection disrupted
14	46	Motor parameters
15	47	Drive controller parameters
16	48	Type plate data
17	49	Power class restriction
21	53	Motor tipped
23	55	Speed limit
24	56	Grid overvoltage
25	57	Warning: Switching frequency reduction active
26	58	IGBT module overheating
27	59	Encoderausfall
28	60	Warning Encoder

Tab.: 11 Power error word

*** Maximum number of error messages.**
The number may vary depending on the series!

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