Operating instructions

MSK200ia-E
MSK200ib-E

WINSMART support
MODBUS-RTU communication

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Operating instructions for MSK200ia-TE-SIL, MSK200ib-TE-SIL

WINSMART support from MTP200 version 4.0
MODBUS-RTU communication

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Disclaimer

We have checked the contents of this publication for conformity with the hardware and software described. However, deviations cannot be ruled out, so that we cannot guarantee complete conformity. The information in this publication is checked regularly. Corrections and additions will be made in the following version. We are grateful for any suggestions for improvement.

Subject to technical changes

Table of contents

Safety regulations and instructions

Follow the instructions for installation:

Note: Installation, operation and maintenance may only be carried out by qualified personnel.

The applicable safety guidelines (including the national safety guidelines), accident prevention regulations and general technical regulations must be observed when installing and operating the appliance.

Note: The circuits in the appliance must not be accessed.

Do not repair the appliance yourself, but replace it with an equivalent appliance. Repairs may only be carried out by the manufacturer.

Note: The device is suitable for protection class IP20 if:

- It is installed outside potentially explosive atmospheres
- The environment is clean and dry

Install the device in a suitable housing with a suitable degree of protection in accordance with IEC/EN 60079-0 to protect it from mechanical and electrical damage.
The safety-relevant data can be found in the operating instructions and in the ATEX certificate (EU type examination certificate or other certificates, if necessary).

Safety regulations for installation in potentially explosive atmospheres and Regulations for intrinsically safe circuits:

Warning: Explosion hazard
When carrying out measurements on the intrinsically safe side, the relevant regulations regarding the connection of intrinsically safe electrical equipment must be observed.
Only use approved devices for use in intrinsically safe circuits.

Warning: Explosion hazard
If the device has previously been used in non-intrinsically safe circuits, it must not be used for intrinsically safe circuits may no longer be used.
Clearly mark the device as no longer intrinsically safe.

Installation in areas with a risk of dust explosions:

Warning: Explosion hazard
The appliance is not approved for installation in areas where there is a risk of dust explosions.

Only interconnect intrinsically safe circuits in potentially explosive dust atmospheres in zones 20, 21 or 22 if the equipment connected to these circuits is approved for this zone (e.g. category 1D, 2D or 3D).

Classification of the instructions

This manual contains instructions that you must observe for your personal safety and to prevent damage to property. The instructions are highlighted by a warning triangle and shown as follows, depending on the degree of danger.

DANGER

means that death or serious bodily injury will occur,
if the appropriate precautions are not taken.

WARNING

means that death or serious bodily injury may occur,
if the appropriate precautions are not taken.

CAUTION

with a warning triangle means that minor bodily injury may occur,
if the appropriate precautions are not taken.

CAUTION

without a warning triangle means that material damage may occur,
if the appropriate precautions are not taken.

ATTENTION

means that an undesirable result or condition may occur,
if the corresponding notice is not observed.

NOTE

is important information about the product, the handling of the product
or the part of the documentation to which particular attention is drawn.
and compliance with which is recommended.

In addition to these instructions in this publication, the generally applicable safety and accident prevention regulations must be observed.
If the information contained in this brochure is not sufficient in any case, our telephone service is at your disposal for further information.
Please read this document carefully before installation and commissioning.

CE mark

This product complies with the specifications of the EMC Directive 2004/108/EC and the Low Voltage Directive 2006/95/EC.

General information

This appliance has left the factory in a technically safe condition. In order to maintain this condition and to ensure safe operation of the appliance, the instructions and warnings given in these operating instructions must be observed by the user.

NOTE

For reasons of clarity, these instructions do not contain all detailed information on all types of the product and cannot take into account every conceivable case of installation, operation or maintenance.
Should you require further information, or should particular problems arise that are not covered in sufficient detail in the instructions, you can request the necessary information by telephone.
Furthermore, we would like to point out that the contents of the instructions are not part of a previous or existing agreement, promise or legal relationship or are intended to change these. All obligations of Mütec Instruments GmbH arise from the respective purchase contract, which also contains the complete and solely valid warranty provisions. These contractual warranty provisions are neither extended nor limited by the explanations in the instructions.
The content reflects the technical status at the time of printing. We reserve the right to make technical changes in the course of further development.

WARNING

Devices with "intrinsic safety" type of protection lose their approval as soon as they have been operated on circuits that do not comply with the values specified in the test certificate. The correct and safe operation of this appliance requires proper transportation, storage, installation and assembly as well as careful operation and maintenance. The appliance may only be used for the purposes specified in these operating instructions.

DISCLAIMER

All modifications to the appliance, unless expressly mentioned in the operating instructions, are the responsibility of the user.

Qualified PERSONNEL

are persons who are familiar with the installation, assembly, commissioning and operation of the product and who have the appropriate qualifications for their work, e.g:

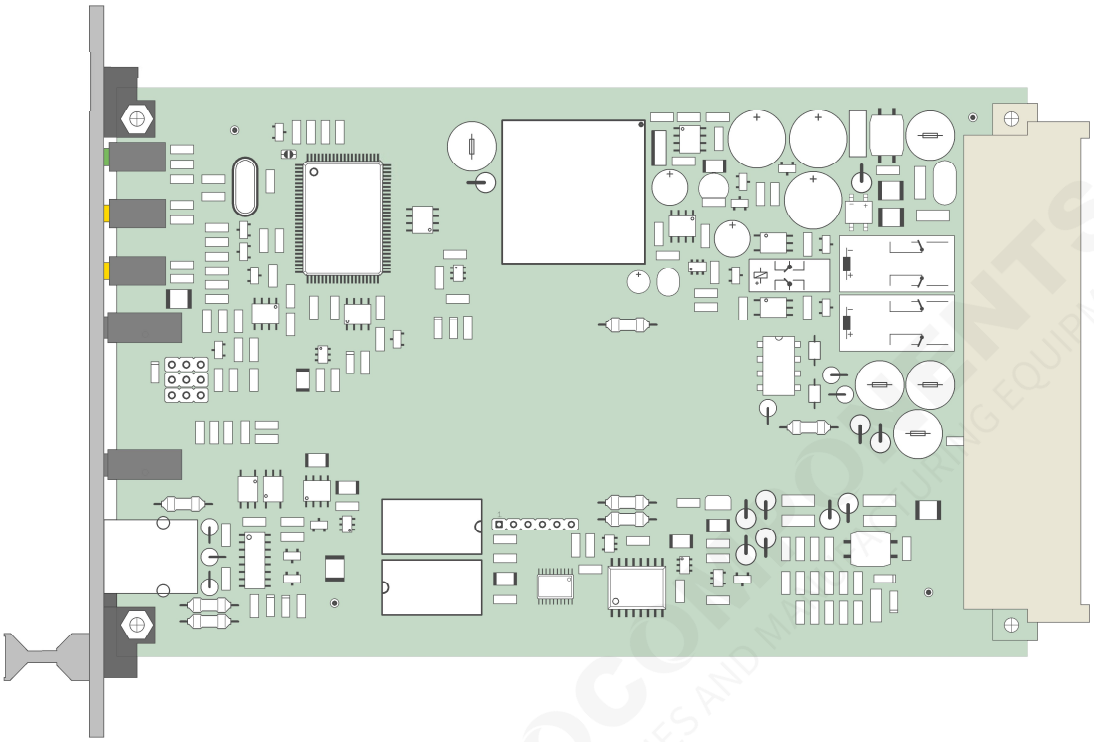
- Training or instruction or authorization to operate and maintain devices/systems in accordance with the safety engineering standard for electrical circuits, high pressures and aggressive and hazardous media.
- For devices with explosion protection: training or instruction or authorization to carry out work on electrical circuits for potentially explosive systems.
- Training or instruction according to the standard of safety engineering in the care and use of appropriate safety equipment.

CAUTION

Electrostatic sensitive modules can be destroyed by voltages that are far below the threshold of human perception. These voltages already occur when you touch a component or electrical connections of an assembly without being electrostatically discharged. The damage that occurs to a module due to an overvoltage cannot usually be detected immediately, but only becomes noticeable after a long period of operation

Introduction

MSK200ia-E, MSK200ib-E
Transmitter supply unit

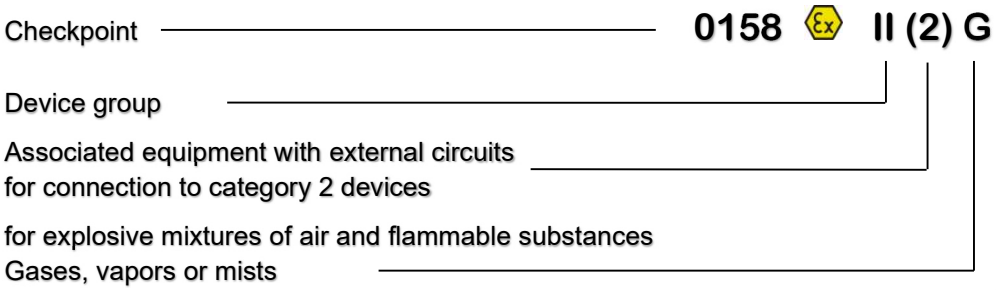


Performance features:

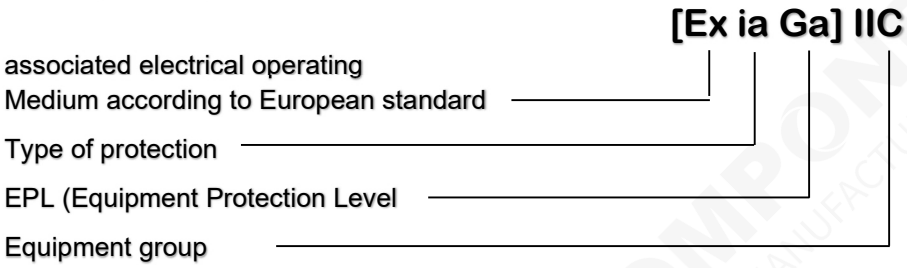
- DuoTec® system (2 controllers with mutual monitoring)
- Failsafe technology for self-monitoring
- HART signal connection to the supply circuit
- 4 A/D converters (24-bit, 12-bit and 10-bit)
- 1 D/A converter (15-bit)
- 5 Self-monitoring circuits
- 4 galvanically isolated alarm outputs (3x relay contact, 2x transistor)
- 1 intrinsically safe transmitter supply circuit[Ex ia/ib] IIC
- 1 intrinsically safe mA input[Ex ia/ib] IIC
- 1 analog output for constant current or voltage
- 1 galvanically isolated RS232 interface
- 1 galvanically isolated RS485 interface
- 24V AC/DC Power

1.0 General information for installation and operation

Labeling according to Directive 2014/34/EU:



Marking of the type of protection:



Safety instructions

The appliance must be taken out of operation and secured against unintentional operation if it must be assumed that safe operation is no longer possible. Reasons for this assumption may be

- Visible damage to the device
- Failure of the electrical function
- Longer storage at temperatures above 85 °C
- Heavy transportation stress

Before the appliance is put back into operation, a professional routine test must be carried out in accordance with DIN EN 61010, Part 1. This test should always be carried out by the manufacturer. Repair work on Ex devices may only be carried out in accordance with §9 of the Ex Ordinance (Elex V).
Devices with intrinsically safe circuits must never be operated on non-intrinsically safe circuits. If Ex devices are to be operated on non-intrinsically safe circuits, they must be specially labeled and the Ex markings must be removed so that these devices are not used for intrinsically safe circuits at a later date. Subsequent testing of the devices for compliance with the conditions for explosion protection is only possible at a disproportionately high cost, even for the manufacturer, and is therefore generally rejected.

Intended use

The MSK200ia/ib-E transmitter supply unit is used to supply an intrinsically safe 2-wire transmitter or as an isolation amplifier for a 0/4 - 20 mA signal. The transmitter supply circuit at contacts d/z28 + d/z30 and the mA input circuit at contacts d/z30 + d/z32 comply with the "intrinsically safe" type of protection of category "ia" or "ib".
For operation, the 19" card must be installed in a subrack or housing so that at least the required degree of protection IP20 in accordance with IEC publication 144 is achieved.

A "HART" socket is available on the front panel for connecting an intrinsically safe HART terminal for parameterization or for testing a connected 2-Lt. transmitter.

The maximum permissible ambient temperature range of -20 °C to +70 °C must not be exceeded or undershot.
The MSK200i..-E transmitter supply unit is an associated electrical device with type of protection [Ex ia] IIC or [Ex ib] IIC and must always be operated outside potentially explosive atmospheres. Only the intrinsically safe supply or input circuit listed above may be routed into the potentially explosive area and connected to a certified intrinsically safe circuit. Before commissioning, proof of intrinsic safety must be provided for the correct interconnection of an MSK200i..-E circuit with the circuit of the connected equipment, including the cables.
The EC type examination certificate and the provisions of EN 60079-14:2014 must be observed.

Installation and commissioning

The MSK200i..-E transmitter power supply unit must be installed in such a way that the clearances from bare parts of intrinsically safe circuits to the metallic housing parts are at least 3 mm and to the bare parts of non-intrinsically safe circuits at least 6 mm.
Connecting parts for the external intrinsically safe circuits must be arranged in such a way that the bare parts are at least 50 mm away from connecting parts or bare conductors of non-intrinsically safe circuits in accordance with EN 60079-11.
The terminal assignments of the DIN rail housing with the intrinsically safe circuits and the non-intrinsically safe circuits are clearly marked on the rating plate.
Assembly/disassembly, installation, operation and maintenance may only be carried out by qualified personnel as defined by the automation industry in compliance with the relevant regulations and the MSK200i..-E operating instructions. The technical data and connected loads must be observed during installation.

For safe operation, a protective conductor connection must be established with the 19" rack to establish a fixed connection via the front panel of the MSK200*.
Integration into the equipotential bonding must be ensured.

2.0 Technical features

Equipped with two mutually monitoring 16-bit controllers (DuoTec® system), the transmitter meets all safety requirements with additional measures (failsafe technology). Configuration, parameterization and calibration can be carried out easily, clearly and quickly via the RS232/RS485 interface using the WINSMART® PC program. As proof of the selected device parameters, these can be documented using the WinSmart program under *Save/print configuration*.
A HART terminal can be briefly connected to the intrinsically safe supply circuit via the front socket.
Alarm monitoring is carried out with 2 relay contact and 2 transistor outputs. In addition, a further relay contact output is available for signaling the safety function. All output circuits are galvanically isolated from each other and from the auxiliary power.
The analog output is designed for a constant current of 0/4-20 mA. By connecting a shunt resistor of 500 Ω with the jumpers JP1-JP3, a voltage of 0/2-10 V can be supplied at the output.

- Master/slave controller according to the DuoTec technology®
- Intrinsically safe supply circuit of protection class[Ex ia] IIC or[Ex ib] IIC
- Intrinsically safe current measurement input of protection class[Ex ia] IIC or[Ex ib] IIC
- Analog output for 0/4-20 mA or 0/2-10 V
- Output signal monitoring by reading back the mA value
- 2 relay outputs for limit value monitoring and/or maintenance requirement message

- 1 passive short-circuit-proof 50mA transistor output
- 1 relay output for the maintenance requirement signal
- COM interface connection on the front for online access
- Galvanically isolated RS232 and RS485 interface
- 24V AC/DC supply with undervoltage cut-off

3.0 ATEX relevant data

Ex certificate		BVS 08 ATEX E 124 II (1) G [Ex ia] IIC for MSK200ia-E II (2) G [Ex ib] IIC for MSK200ib-E		
Conformity		EN IEC 60079-0:2018 EN 60079-11:2012	General requirements Intrinsic safety "i"	
Supply circuit (contacts d/z2 and d/z4)				
Rated voltage			DC 19 ... 30	V
Rated voltage			AC 18 ... 28	V
max. voltage		To	AC/DC 250	V
Non-intrinsically safe RS485 interface circuit (contacts b16 and b18)				
Non-intrinsically safe RS232 interface circuit (front socket connection)				
Rated voltage			DC 6	V
Rated current			100	mA
max. voltage		To	AC/DC 48	V
Non-intrinsically safe relay contact circuits (contacts d8, d10 and z8/10, Contacts d12, d14 and z12/14, contacts d6 and z6)				
Switching voltage			DC 30	V
Switching current			1	A
Or				
Switching voltage			AC 125	V
Switching current			0,5	A
max. voltage		To	AC/DC 125	V
Non-intrinsically safe digital output circuit (contacts d16 and z16, Contacts d18 and z18)				
Rated voltage			DC 28	V
Rated current			50	mA
max. voltage		To	AC/DC 125	V
Non-intrinsically safe analog output circuit (contacts d20 and z20)				
Rated voltage			DC 20	V
Rated current			50	mA
max. voltage		To	AC/DC 125	V
Intrinsically safe supply circuit (contacts d/z28 and d/z30)				
Tension		Uo	DC 25,8	V
Amperage		Io	65 mA	
Performance		Po	420 mW	
max. external capacity		Co	83 nF	
max. external inductance		Lo	4 mH	
Intrinsically safe HART circuit (at the front socket)				
Tension		Ui	DC 2 V	
Amperage		Ii	30	mA
Performance		Pi	21 mW	
max. external capacity		Ci	10 µF	
max. external inductance		Li	1 µH	

Intrinsically safe supply circuit (contacts d/z28 and d/z30) with HART terminal
Connection (at the front socket)

Trapezoidal characteristic curve

Tension	Uo	DC	25,8 V
Amperage	Io		95 mA
Performance	Po		441 mW
max. external capacity	Co		73 nF
max. external inductance	Lo		4 mH

Intrinsically safe mA input circuit (contacts d/z30 and d/z32)

Protection level Ex ia IIC for MSK200ia-E or Ex ib IIC for MSK200ib-E
for connecting an intrinsically safe circuit with the following maximum values:

Tension	Ui	DC	30 V
Amperage	Ii		110 mA
Performance	Pi		700 mW
Effective internal capacity	Ci	negligible	
Effective internal inductance	Li	negligible	

Ambient temperature range	T_{amb}	-20 °C to +70 °C

4.0 Error states and error signaling

No.	Source of error/ Cause of error	Alarm LED	Analog output in case of error (programmable)	Alarms (programmizable)	Recommissioning after troubleshooting	Remarks
1	EEPROM: Checksum faulty	Permanent light	Alarm value or Instantaneous value	lim-prio, to, from limit	MSK200 must be reconfigured, parametrized and calibrated	Parameter table in RAM is loaded with default values
2	Master controller: Error in the RAM/EPROM Memory	Permanent light	Alarm value or frozen Value	lim-prio, on from limit	automatically (after system reset)	Parameter set or program damaged
3	Slave controller: Communication, RAM or CPU Defective	Permanent light	Alarm value or Frozen value	lim-prio, on from limit	automatically	
4	Slave controller: 5V supply faulty	Permanent light	Alarm value or Instantaneous value	lim-prio, on from limit	automatically	at≥ 4 % off softening from the Reference value
5	Master controller: 3V3 supply faulty	Permanent light	Alarm value or Instantaneous value	lim-prio, on from limit	automatically	at≥ 4 % off softening from the Reference value
6	Analog output: Signal deviation	Permanent light	Alarm value or Instantaneous value	lim-prio, on from limit	automatically	parameterizable: from≥ 0.2 %
7	A/D converter: Signal deviation	Permanent light	Alarm value or Instantaneous value	lim-prio, on from limit	automatically	parameterizable: from≥ 0.2 %
8	mA/supply current circuit: MIN signal under-transgression	Permanent light	Alarm value or frozen Value	lim-prio, on from limit	automatically	parameterizable: from 0 mA

9	mA/supply current circuit: MAX signal over-transgression	Permanent light	Alarm value or Frozen value	lim-prio, on from limit	automatically	parameterizable: up to 22 mA
10	Transmitter-Power supply circuit faulty	Permanent light	Alarm value or Instantaneous value	lim-prio, on from limit	automatically	with ≥ 20 % deviation from the reference value!
11	Alarm outputs Relay contact Rel1, Rel2 or Rel3 defective	Permanent light	Alarm value or Instantaneous value	lim-prio, on from limit	automatically	Parallel contact of the relay serves for reference!

In general, the alarm for maintenance requirements, signaled by the alarm LED and relay 3, remains permanently on in the event of an existing fault. The source of the fault is displayed in the diagnostics manager as the current fault and in the fault memory.
A temporary error that is no longer present is signaled by a flashing alarm LED on the front of the device and in the error memory in the diagnostics manager.
Each fault is recorded in the diagnostic manager and a distinction can be made between a current fault and a fault that no longer exists.

5.0 Technical data

ANALOG INPUT (AE)

A 1st order filter of (0.1 - 99.9)s can be parameterized for the measurement input!

mA measurement input AE

Measuring span:	0 .... 22 mADC, freely configurable	
Input resistance:	51Ω + 2x U_D	U_D = max. 700 mV

Power supply circuit (SP)

A 1st order filter of (0.1 - 99.9)s can be parameterized for the measurement input!

Supply circuit SP

Umax:	22.4 V at 4 mA load current
Umin:	17.3 V at 20 mA load current
Imax:	24 mA
Pmax:	360 mW

ANALOG OUTPUT (AA)

Parameterizable 1st order filter from (0.1 - 9.9)s!
Galvanic isolation between input, analog output and power supply!

	Constant current	Voltage
Max. Range:	0...22 or 22...0 mA	0...11 or 11...0 V
Standard range:	0/4-20 mA	0/2-10 V
Load:	max. 500 Ω at 20 mA	min. 50 kOhm
Accuracy:	0.02 % of the final value	0.02 % of the final value
Load influence:	< 0,005 %	0.5 % with R_L=100 kΩ
Rise time:	< 150 ms	< 150 ms

CONTACT OUTPUTS (REL1, REL2), TRANSISTOR OUTPUTS (DA1, DA2)

For devices with intrinsically safe circuits, the contact and transistor outputs may only be used for devices with operating voltages below 250 V!

The alarm statuses are indicated by yellow LEDs!

Number of alarms:	4 independently adjustable limit values
Setting:	Physical value in the WINSMART program®
Accuracy:	like accuracy of measured values
Alarm type:	configurable as desired
Alarm output:	2 relay contacts and 1 transistor output
Alarm delay:	freely configurable from 0 ... 9,9 s
Switching hysteresis:	freely configurable from 0 ... 99,9 %
Operating mode:	Open-circuit or closed-circuit principle
Alarm function:	Input signal monitoring and maintenance requirement message
Contact outputs REL1/REL2	
Contact:	Normally closed or normally open contact (according to jumper position)
Switching capacity:	max. 62.5 VA or max. 30 W
Switching voltage:	max. 125 V AC or 110 V DC
Switching current:	max. 1 A
Minimum contact voltage:	10 mVDC
Minimum contact current:	10 µA
Contact material:	AG Pd + 10 µAu
Relay type:	according to IEC 947-5-1 or EN60947
Transistor output DA	
Switching power:	< 1,4 W
Switching voltage:	< 28 VDC
Switching current:	< 50 mA

CONTACT OUTPUT (REL3) for MAINTENANCE REPORTING

In the case of devices with intrinsically safe circuits, only devices with operating voltages below 250 V must be connected!

The alarm status is indicated by a red LED!

Operating mode:	closed-circuit current principle
Contact:	closed in good condition
Alarm function:	Maintenance requirement message
Contact position:	closed in good condition
Switching capacity:	max. 62.5 VA or max. 30 W
Switching voltage:	max. 125 V AC or 110 V DC
Switching current:	max. 1 A
Minimum contact voltage:	10 mVDC
Minimum contact current:	10 µA
Contact material:	AG Pd + 10 µAu
Relay type:	according to IEC 947-5-1 or EN60947

INTERFACES (COM, RS485, HARD)

Galvanic isolation of the COM and RS485 from the power supply and all other circuit components!

RS232/COM:	via front socket with Mütec interface cable
RS485:	Half-duplex, without termination
Baud rate:	9600 bps
Device address:	1-248
HART signal:	on the supply circuit (max. 3 kHz bandwidth)

SUPPLY VOLTAGE

Supply voltage display:	green LED signals good status
Supply voltage range:	19 ... 30 VDC or 18 ... 28 VAC

Power consumption

Power supply isolator:	1.6 W (at 24VDC and 4 mA in the analog output) 2.1 W (at 24VDC and 20 mA in the analog output)
mA isolating amplifier:	1.1 W (at 24VDC and 4 mA in the analog output) 1.4 W (at 24VDC and 20 mA in the analog output)

GENERAL DATA

Measurement accuracy

Maximum:	< 0.05 % of the final value
Typical:	< 0.025 % of the final value

Temperature coefficient

Maximum:	< 0,01 %/K
Typical:	< 0,005 %/K

Galvanic isolation

Input/output/supply:	300 Vrms (rated insulation voltage, overvoltage category II, Pollution degree 2, safe isolation according to EN 61010, EN 50178); 2.5 kV AC test voltage (50 Hz, 1 min.);
Input/output:	375 V (peak value according to EN 60079-11)
Input/supply:	375 V (peak value according to EN 60079-11)

Ambient conditions

Permissible temperature:	-20 °C ... +70 °C
Storage/transport:	-30 °C ... +80 °C
Perm. humidity (during operation):	10 % ... 95 % r.h. without condensation

Electrical connection

Female connector:	48-pole to DIN 41612 - type F

Measures for self-monitoring

mA measurement input:	1 monitoring measuring circuit with adjustable tolerance
Power supply circuit:	1 monitoring measuring circuit with adjustable tolerance
Analog output :	1 monitoring measuring circuit with adjustable tolerance
Supply voltages:	2 monitoring measuring circuits
Relay (REL1 ... REL3):	indirect contact monitoring
Maintenance required:	Continuous light of the red LED and REL3 contact open

A maintenance requirement signal is always issued by the REL3 relay, which is operated according to the closed-circuit principle.The relay contact, which is closed in the good state, offers the option of series connection with other contacts of other devices and thus collective alarm monitoring. In addition the relays REL1 and REL2 as well as the transistor outputs DA1 and DA2 on the alarm signaling can be involved.

CONFORMITY

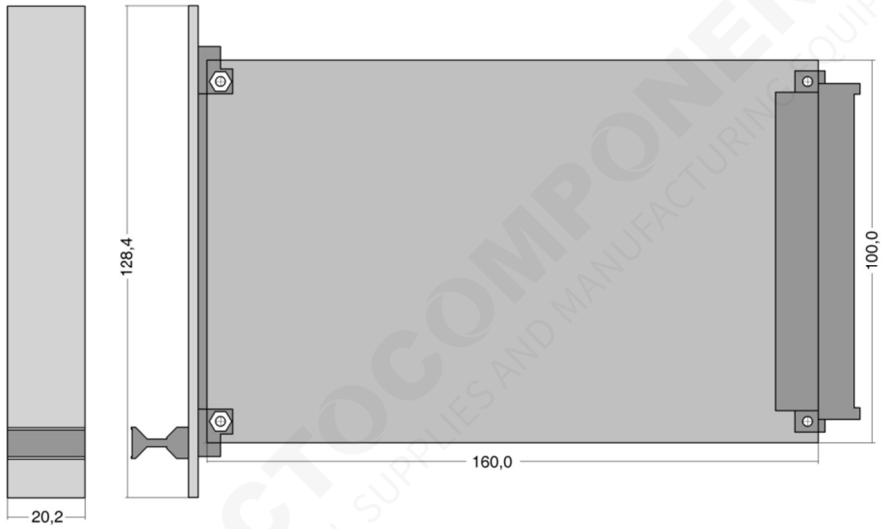
Ex Directive (ATEX):	EN 60079-0, EN 60079-11, EN 60079-26
EMC Directive 2004/108/EC:	EN 61000-6-2, EN 61000-6-4, EN 61326-1

ASSEMBLY

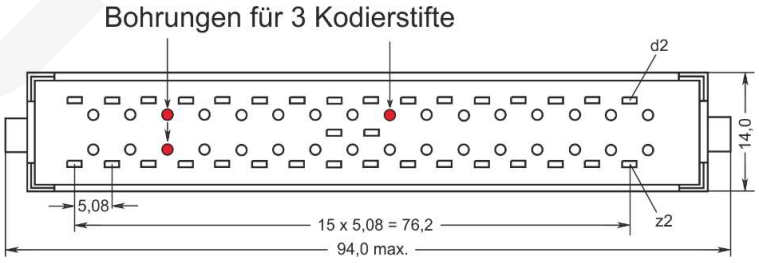
The appliance may only be installed outside a potentially explosive atmosphere!

Design:	19" Eurocard with 4 HP front panel
Protection class:	IP20 is prescribed
Installation:	For the required degree of protection, the device must be installed in an assembly group carrier or an appropriate housing;
Installation position:	any
Weight:	220 g

DIMENSIONS



CODING OF THE SPRING LINE



TYPE SHIELD

CE 0158 Ex II (1) G [Ex ia] IIC BVS 08 ATEX E 124		
Mütec Instruments GmbH Bei den Kämpen 26 D-21220 Seevetal	MSK 200ia-E	Firmware: 4.05 $T_{amb.}$: -20 bis +70°C
Eingangsstromkreise: Ex ia IIC d/z32 d/z30 d/z28	S. Nr. : 2099 Date Code: 2350	Hilfsenergie: 19-30VDC / 18-28VAC

5.1 Configuration protocol

The WINSMART® command "Export configuration" can be used to create a log (xxx.csv) with all device parameters for each device. The specific identifiers are the device address, the tag no., the serial no. and the version no. of the software. All parameters for input, mA output and the relay/transistor outputs are documented. The desired behavior of the analog output, the two relays and the transistor outputs in the event of an error are also logged.

Gerätetyp	MSK200i-E		
Firmwareversion	Apr 18		
Parameter CRC	7002		
Seriennummer	TEC2022-0012		
Geräte-TAG	12345678		
Modbusadresse	1		
Messeingang			
Messwert			
Sensor/Signal	mV-Signal (-35mV/70mV)		
Messbereichsanfang	-30	mV	
Messbereichsende	70	mV	
Filterzeit	0	s	
Physikalische Darstellung des Messwertes			
Bereichsanfang	-30	mV	
Bereichsende	70	mV	
Bereichsgrenze MIN	-31	mV	
Bereichsgrenze MAX	71	mV	
Messbereichsabbildung			
Bereichsanfang	4	mA	
Bereichsende	20	mA	
Filterzeit	0	s	
Ausgangssignal radizieren	Nein		
Begrenzung			
MIN-Begrenzung	3,6	mA	
MAX-Begrenzung	21	mA	
Alarmwert	22	mA	
Alarm 1 (Relais 1)			
Alarmwert	50	mV	
Alarmtyp	MAX-Alarm		
Funktion	Arbeitsstrom		
Hysterese	1	%	
Verzögerung	0,5	s	
Alarm 2 (Relais 2)			
Alarmwert	30	mV	
Alarmtyp	MAX-Alarm		
Funktion	Arbeitsstrom		
Hysterese	1	%	
Verzögerung	0,5	s	
Alarm 3 (Transistorausgang 1)			
Alarmwert	20	mV	
Alarmtyp	MAX-Alarm		
Funktion	Arbeitsstrom		
Hysterese	0,5	%	
Verzögerung	0,5	s	
Gradientenalarm - Zeitfenster	4	s	

Überwachungsmesskreis für maximale Toleranz:				
Analogeingang	5	% vom Nominalwert (=20mA/10V)		
Analogausgang	5	% vom Nominalwert (=20mA/10V)		
Analogausgangs- und Alarmausgangs-Steuerung im Fehlerfall:				
Fehlerquellen	Analogausgang	Relais 1	Relais 2	Logik 1
mV-Messkreisüberwachung	Alarmwert	limit	limit	an
Widerstandsmesskreis	Alarmwert	limit	limit	an
Ausgangssignal	Alarmwert	aus	aus	aus
Sensor-/Leitungsbruch	Alarmwert	limit	limit	an
Relais 1, Relais 2, Relais 3	Alarmwert	limit	limit	an
Transistor-Output 1	Alarmwert	limit	limit	an
Interner Gerätefehler	Alarmwert	limit	limit	an

5.2 Calculation of the max. line resistance for the analog output

Data of the analog output (AA) for constant current:

Max. Range:	0...22 mA
Standard range:	0/4-20 mA
Load:	max. 500 Ohm at 20 mA
Accuracy:	0.02 % of the final value
Burden influence:	<0,005 %

The maximum load for the analog output is the sum of the resistances of the forward and return lines and the input resistance (shunt) of the downstream module:

$$R_{load} = 2x\ R_L + R_{(shunt)} \leq\ 500\ \Omega$$

The following applies to the line resistance:

$$R_L = l \times \varrho \times A^{-1}\ [\Omega]$$

$\varrho = 0.0178 \quad [\Omega\ mm^{(2)}\ m^{(-1)}]$
$A = 0.25 \times d^2 \times \pi\ [mm^2]$

Calculation of the maximum cable length (distance):

$$l = 0.5\ (500\ \Omega - R_{(shunt))} \times \varrho^{(-1)} \times A\ [m]$$

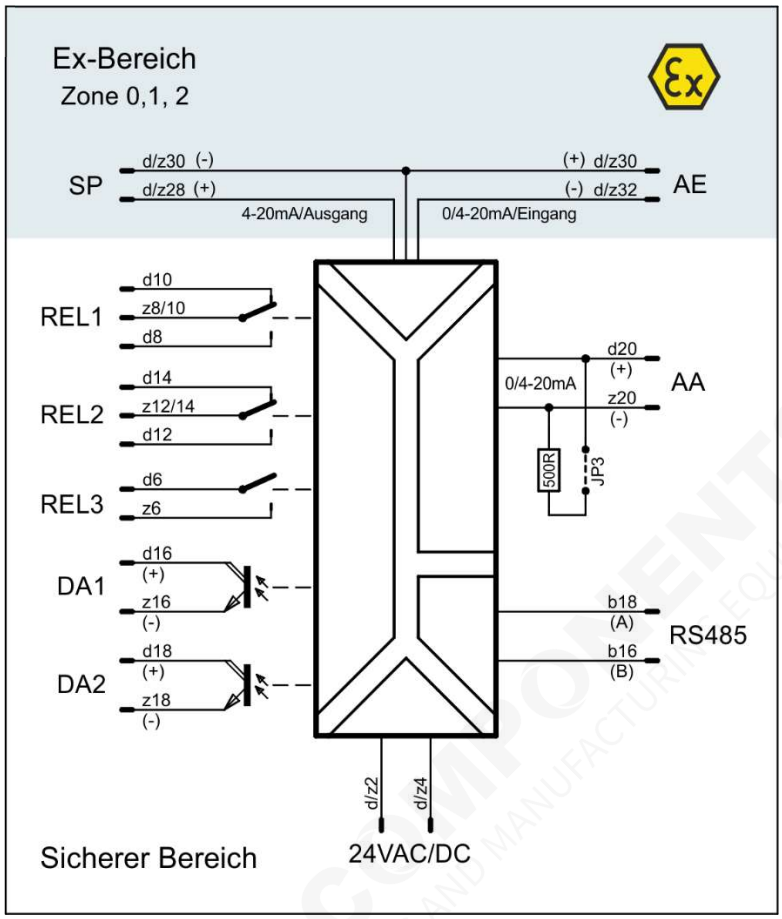
Cable lengths as a function of diameter and input resistance:

$R_{(shunt}$ [Ω]	$L_{(diameter}$ [mm]	$L_{cross\ section}$ [mm²]	L_{length} [m]	L_{length} [km]
100	0,6	0,283	3179	3,18
	0,7	0,385	4325	4,33
	0,8	0,502	5640	5,64
	0,9	0,636	7146	7,15
	1,0	0,785	8820	8,82

$R_{(shunt}$ [Ω]	$L_{(diameter}$ [mm]	$L_{cross\ section}$ [mm²]	L_{length} [m]	L_{length} [km]
200	0,6	0,283	2385	2,39
	0,7	0,385	3244	3,24
	0,8	0,502	4230	4,23
	0,9	0,636	5360	5,36
	1,0	0,785	6615	6,62

$R_{(shunt}$ [Ω]	$L_{(diameter}$ [mm]	$L_{cross\ section}$ [mm²]	L_{length} [m]	L_{length} [km]
300	0,6	0,283	1590	1,59
	0,7	0,385	2163	2,16
	0,8	0,502	2820	2,82
	0,9	0,636	3573	3,57
	1,0	0,785	4410	4,41

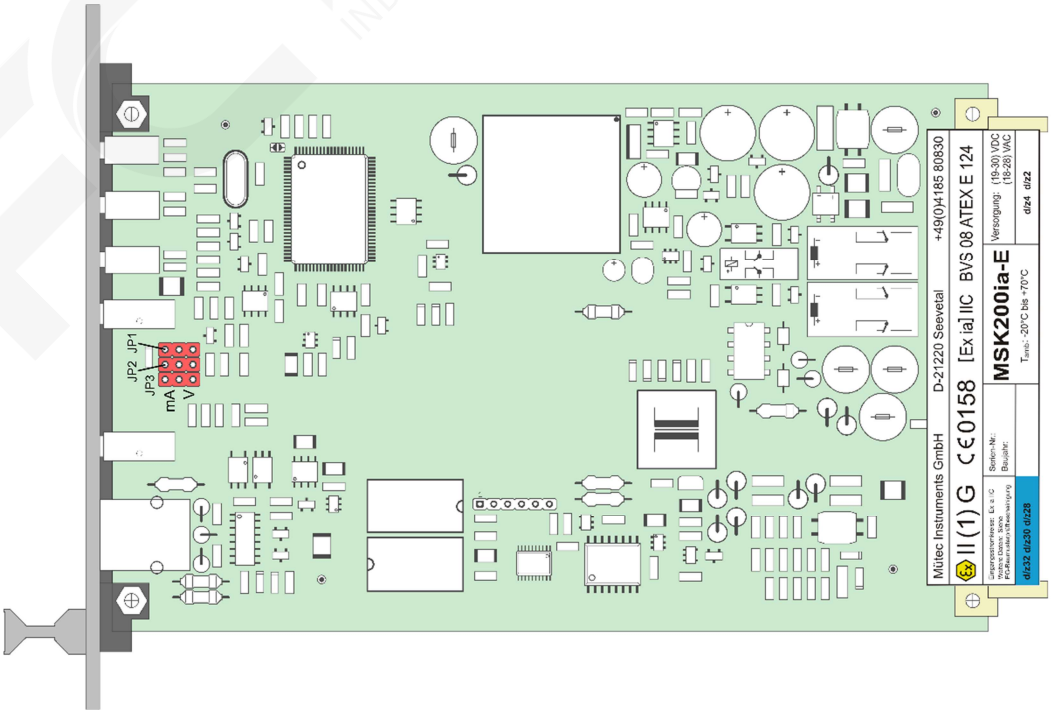
5.3 Block diagram



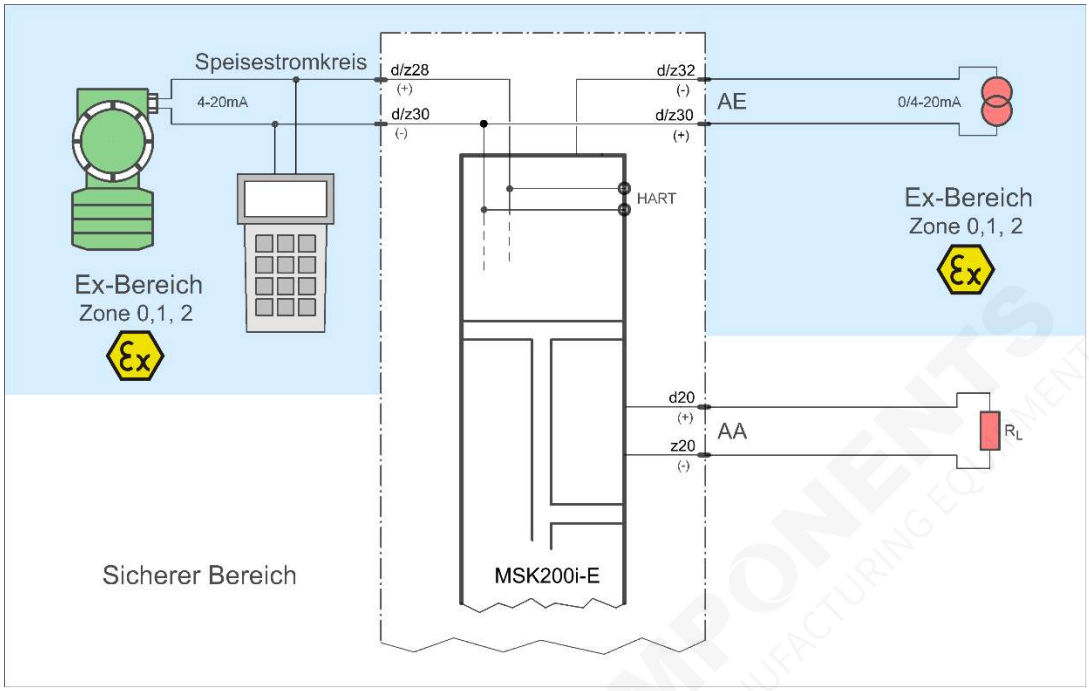
5.4 Jumper settings

Jumper JP1 - JP3:

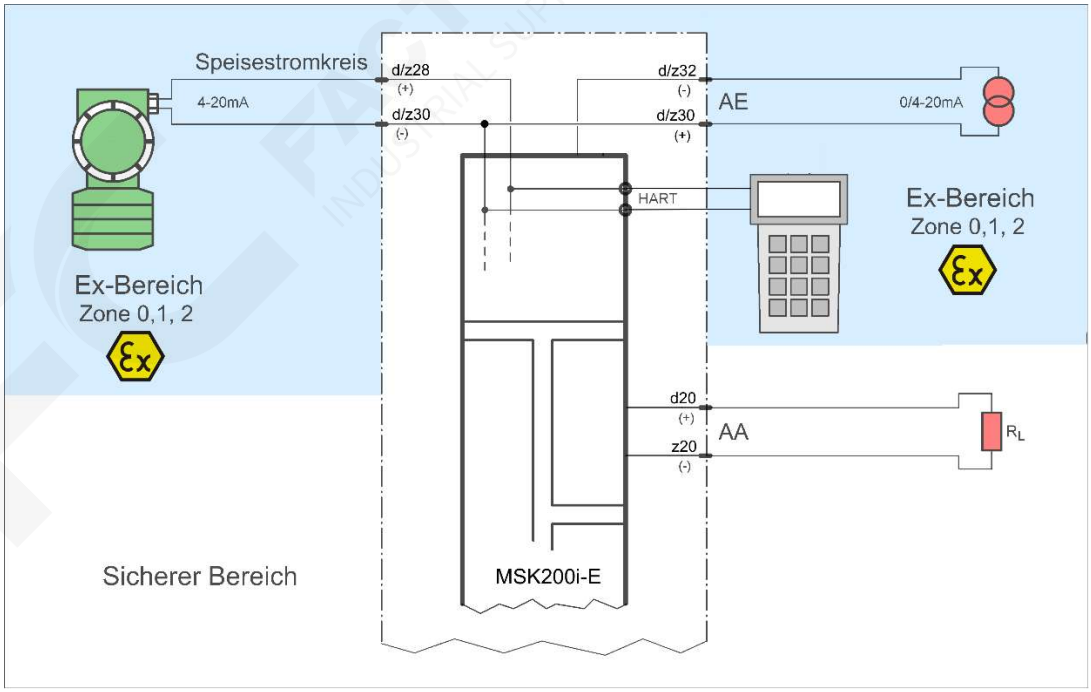
These jumpers can be used to switch the analog output from constant current (mA) to voltage (V).



5.5 HART terminal connection



HART terminal connection on the supply circuit



HART terminal connection at the HART socket