



# Limit value switch

MLS 11x0/12x0 mipromex<sup>®</sup>



- Limit value detection for various applications
- Dynamic measured value processing
- Evaluation for impedance probes
- For up to two measuring points
- Menu guidance in 3 languages
- DIN rail or wall mounting

## Use

The aquasant<sup>®</sup> evaluation device is used for varied limit value detections with bar probes in reactors or pipe probes in pipelines for detecting all kinds of foam, liquid and powder. Up to two freely definable limit values can be parameterized as fail-safe level switches.

Dynamic limit value control allows for a safe level switch measurement even with contaminated probes.



## Overview

- ▼ MLS 11x0: 1 measuring circuit with two limit value outputs (2 relays)
  - ▼ MLS 12x0: 2 measuring circuits with one limit value output each (one relay each per measuring circuit)
- Dynamic limit value detection with compensation for contamination
  - Parameterisation in languages: D / F / E
  - Device data and item no. storage
  - Film keypad with graphic display
  - 19" plug-in cartridge 3 HE/12 TE (European format)
  - Supply: 24 V AC 50/60 Hz / DC; independent of polarity
  - Fault message can be parameterised on 2nd relay contact
  - Fault indication Time/Date
  - 2 LV relay outputs max. 2A/30VDC
  - Limit value simulation
  - 1 or 2 measurement inputs for transmitter modules, max. cable length approx. 200 m (<120 nF)
  - 256 kB Flash Firmware V1.17
- Ex version:            Gas II (2) G [Ex ia Gb] IIC  
                              Dust II (2) D [Ex ia Db] IIIC;  
SEV 09 ATEX 0132; EMC STS 024 CE 1254

## Basic function

Mipromex® MLS can be designed with one or two measuring circuits that are independent of each other.

The pulse signal transmitted from the aquasant® transmitter module is converted into an offset-compensated filtered pulse value and processed in function of the entered limit value. The indication on the graphic display visualises the actual pulse value and the limit pulse value. The offset range can be set between 10 and 2000 pulses (due to respective zero adjustment of probe). The measurement signal offset (zero point) can be accepted with the press of a key or changed manually using the keypad.

The measured value in the range normed by Aquasant Messtechnik AG (0–3700 pulses) is product-specific and varies in function of immersion depth or product mixes. The pulse signal is converted into a 0 – 100% value in function of a measuring span. The limit values can be set as a pulse or %.

As well as standard static limit value entry, dynamic measured value monitoring is also possible. If the

adjustable hysteresis is exceeded or undershot, the corresponding digital output switches off according to fail-safe setting. For security, a maximum limit value can be set. The outputs can be parameterized with on/off time delay. In the event of a failure, the relay or optocoupler transistor output, as High or Low alarm depending on FSH or FSL setting, switches off (NO). For models 1100/1170, the second digital output can be parameterised as a limit value contact or fault indication contact.

## Measuring circuit

A measuring probe with MTI transmitter module in the probe head is connected to the mipromex® MIQ by means of a shielded 2-core cable. A potential equalisation line must be installed between the earthing of the plant room and the control room.

## Measuring principle

Impedance measurement; dependent on electrical conductivity and dielectric constant.

## Wiring

2-core cable 0.75 mm<sup>2</sup> twisted CY/EIG cable length up to 200 m or max. C= 120 nF / R = 30 Ohm line impedance

## Connection

All aquasant® on-site electronic units for impedance measurement can be connected.

# Function

The electrode system of a probe, surrounded by product, changes the impedance in function of the dielectric properties and conductivity of organic products and aqueous solutions.

The measured impedance sum signal is converted directly by the aquasant® transmitter module into a normed signal and is transmitted as pulse packages to the analogue transmitter mipromex® MLS.

The measured value in the range normed by Aquasant Messtechnik AG (0–3700 pulses) is product-specific and varies in function of interfacial layer height, product mixes or immersion depth. The physical measured impedance value of a product at a given interfacial layer height or immersion depth is thus displayed as a numeric value, which is designated as a pulse count.

For a MTI 50 transmitter module, a purely dielectric measured value of 1 pF is converted into a pulse value of 65 pulses.

A modern, menu-guided operating and parameter concept allows for extremely time-saving commissioning of the limit value switch. The film keypad with function and graphic displays makes operation safe and user-friendly.

Use: as limit value switch for liquids, foam and powder in function of the fill level or the product type.

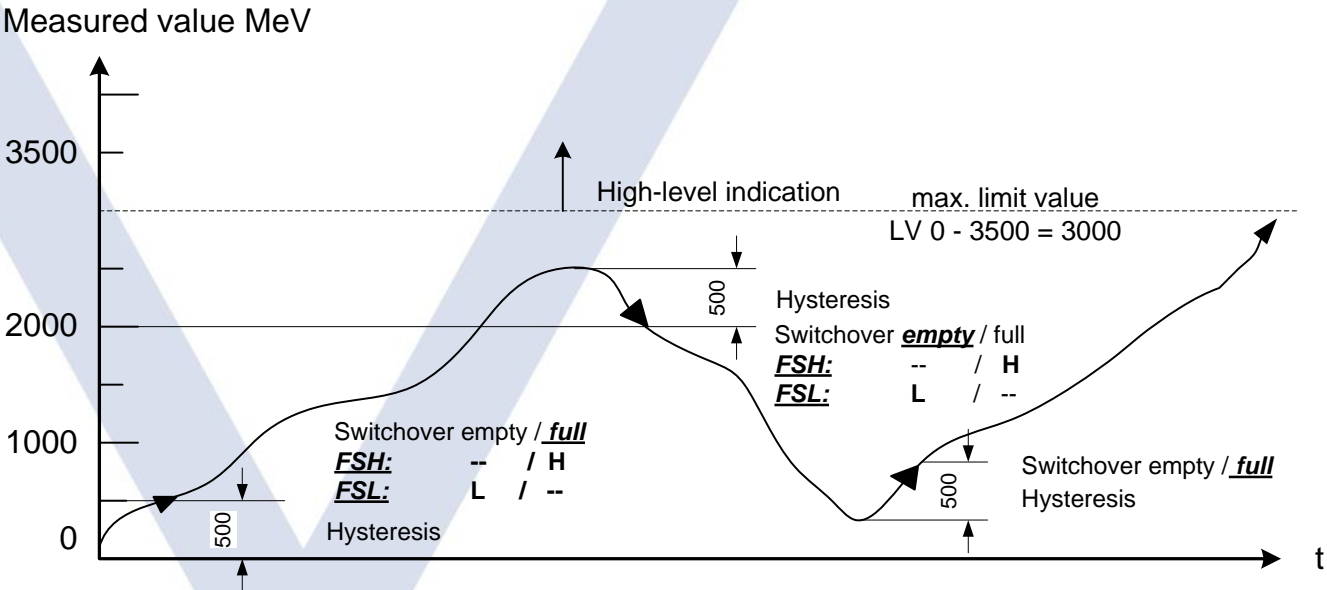
# Dynamic measured value

Dynamic measured value monitoring reliably and automatically detects product changes by means of freely parameterizable hysteresis – even with contaminated probes.

The mipromex® MLS automatic-dynamic interfacial detection works independent of the product-specific signal progression, rising or falling. The limit value is detected via the measured value change in function of the product.

The limit values are freely parameterizable. On/off time delays and fail-safe setting can be selected depending on the requirements.

Dynamic limit value measurement (image below):  
Measured value progression with active hysteresis switch



# Connection circuit board for 19" rack, Monorack

Cage Clamp® terminals for 0.08–2.5 mm<sup>2</sup> cable cross section, stripping length 5–6 mm / 0.22 in (without cable end sleeve), are mounted using a special tensioning tool.

**Colour coding:**

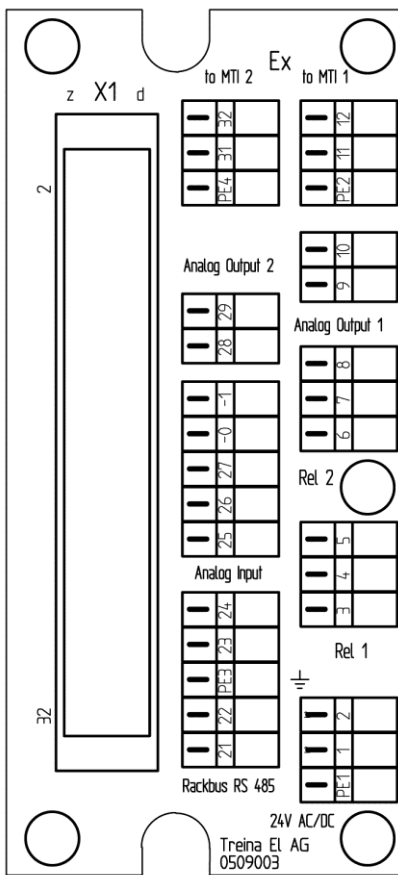
The fail-safe field circuit is connected to the **blue** terminals. It may be guided into the hazardous area with connecting cables as per DIN EN 60079-14.

The **black/orange** terminals are polarity-dependent current inputs and outputs.

**Dimensions:** H x W x D 137 x 77 x 210 mm / for Eurocard 3 HE/12TE Depth 60 mm

**Connection to:** mipromex® microprocessor device

**Article no.:** 02.03.18.011



- |   |            |
|---|------------|
| PE1 Erdung  | FI32: d/z6 |
| 1. Speisung 24 V AC/DC 50/60 Hz (polungsunabhängig) | FI32: z30  |
| 2. Speisung 24 V AC/DC 50/60 Hz (polungsunabhängig) | FI32: d30  |

Relais	Optokoppler	FI32
3. 1 NO	Ausgang E-	FI32: z24
4. 1 COM	Ausgang C+	FI32: d24
5. 1 NC	-	FI32: z22
6. 2 NO	Ausgang E-	FI32: z16
7. 2 COM	Ausgang C+	FI32: d16
8. 2 NC	-	FI32: z14

- |                               |           |
|-------------------------------|-----------|
| 9. MK1 Analogausgang 1 -      | FI32: d14 |
| 10. MK1 Analogausgang 1 +     | FI32: z12 |
| 11. MK1 MTI 1 K1              | FI32: z2  |
| 12. MK1 MTI 1 K2              | FI32: d2  |
| 21. Rackbus RS 485 A          | FI32: z32 |
| 22. Rackbus RS 485 B          | FI32: d32 |
| 23. Analog-Eingang -          | FI32: d18 |
| 24. Analog-Eingang +          | FI32: d12 |
| 25. Digital-Eingang 3 (+24 V) | FI32: d10 |
| 26. Digital-Eingang 2 (+24 V) | FI32: z10 |
| 27. Digital-Eingang 1 (+24 V) | FI32: d8  |
| -0 Digital input D1-3 (0 V)   | FI32: z8  |
| -1 Digital input D1-3 (0 V)   | FI32: z8  |
| 28. MK2 Analogausgang 2 -     | FI32: d22 |
| 29. MK2 Analogausgang 2 +     | FI32: z20 |
| 31. MK2 MTI 2 K1              | FI32: z4  |
| 32. MK2 MTI 2 K2              | FI32: d4  |

## Mounting/Installation:

The 19" cartridge is used in a MRM Monorack for DIN rail or wall mounting.

The connection board with FI32 female multi-point connector can also be installed in table-tops or 19" racks. For Ex applications, the connection boards are different (female multi-point connectors are coded).



# Connections to FI32 female multi-point connector MLS 1100

Microprocessor device with one measuring circuit input | Connections to FI32 female multi-point connector

## Electrical data

Euro plug-in print pin assignment 24 V version

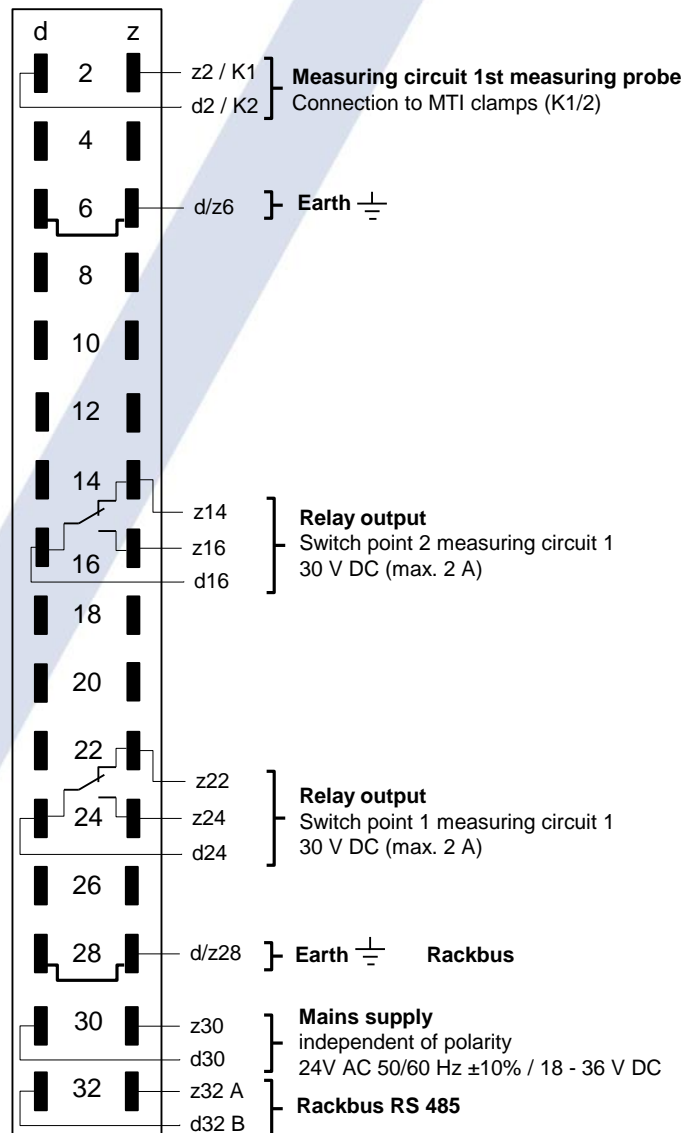
Switchpoint 1 for measuring circuit 1 FSL (Fail Safe Lo) L Alarm

Relay de-energised (Measured value < Limit value)

Switchpoint 2 for measuring circuit 1 FSH (Fail Safe Hi) H Alarm

Relay de-energised (Measured value > Limit value)

Technical error: Relay de-energised



# Connections to FI32 female multi-point connector MLS1200

Microprocessor device with two measuring circuit inputs | Connections to FI32 female multi-point connector

## Electrical data

Euro plug-in print pin assignment 24 V version

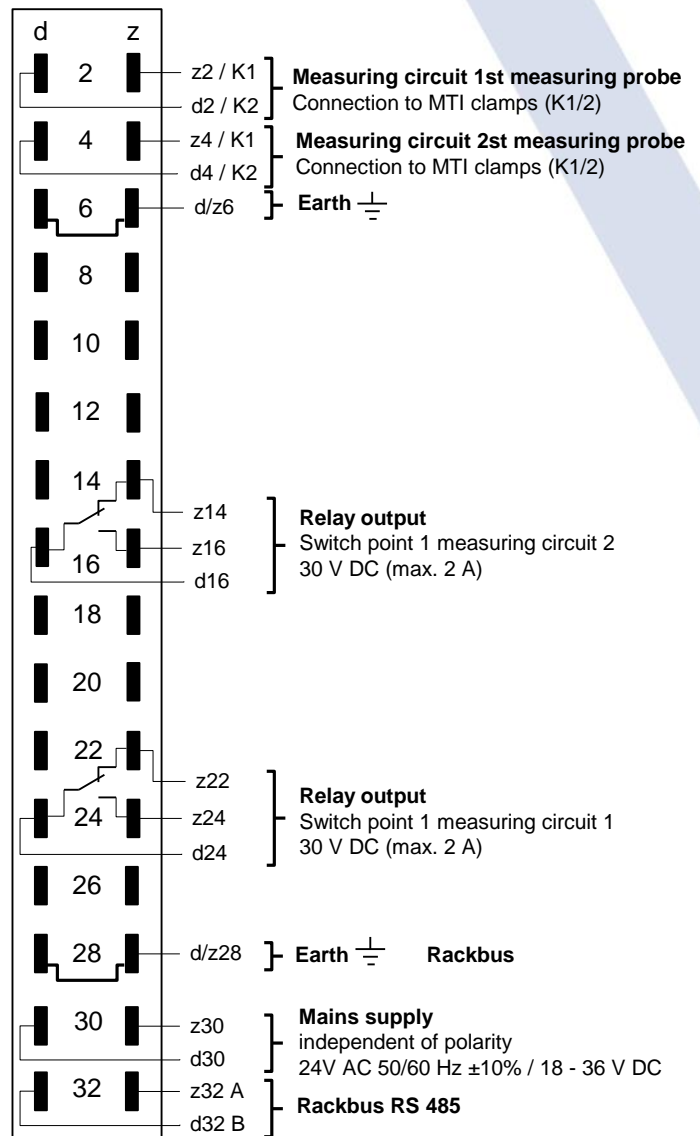
Switchpoint 1 for measuring circuit 1 FSL (Fail Safe Lo) L Alarm

Relay de-energised (Measured value < Limit value)

Switchpoint 2 for measuring circuit 1 FSH (Fail Safe Hi) H Alarm

Relay de-energised (Measured value > Limit value)

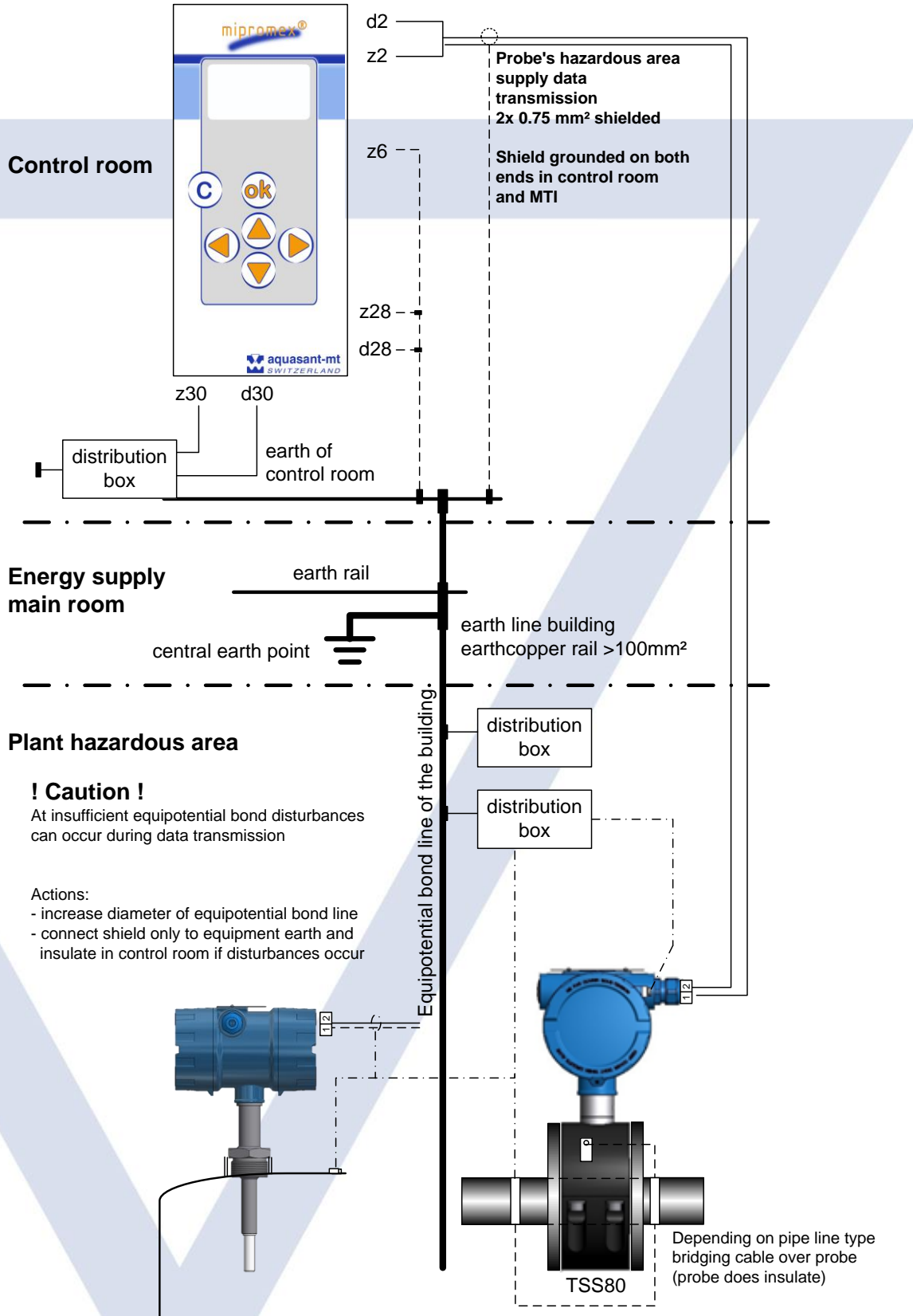
Technical error: relay de-energised





# Earthing for microprocessor devices and probes

Earth-related measuring must be earthed in accordance with Ex regulations.



## Technical data

### Design type

Plug-in electronics with square stainless cover in protective housing, with HF connection

19" plug-in module with aluminium-steel housing; IP 20

### Mounting

MR 7 19" rack; 3 HE (European format)

MRM II monorack; plastic housing for DIN rail or wall mounting. Front panel mounting with BOPLA housing.

Compact or table-top for laboratory

### Function

Limit value switch with fail-safe supply for one MTI xx measurement transducer.

- Static and/or dynamic limit value transmitter
- Drift compensation programmable
- Menu-guided multilingual device communication
- 2 relay outputs

### Operation/Display

Front panel with film keypad with graphic LCD display, backlit, 6 push buttons for entering calibration data and parameters

### Data backup in case of mains failure

Battery buffer max. 10 years. Parameter storage in case of battery failure

### Dimensions

Heights 3 HE; width 12 TE

Front panel: Height x Width 128 x 61 mm

Plug-in module: Height x Width x Depth 100 x 60 x 160 mm

7 plug-in modules can be mounted per 19" rack

### Weight

MLS 1100: 690 g / MLS 1200: 705 g

### Supply voltage

24 V DC/AC 50/60 Hz (22-26 VAC) / (18-36 VDC), independent of polarity

### Start-up current

Short-time (1 ms) approx. 1 A

### Power consumption

MLS 1100: approx. 3.4 VA (I = 140 mA) / MLS 1200: approx. 4 VA (I = 200 mA)

### Fuses

8.5 x 8.5 mm miniature fuse MST 400 mA

### Hazardous area supply/Signal transmission

[Ex ia] IIC, modulated pulse supply signal

Open circuit voltage  $U_o \leq 18.9$  V

Short-circuit current  $I_o \leq 49$  mA

Power  $P_o \leq 231$  mW output characteristic linear

Ex d ia, modulated pulse supply signal

Open circuit voltage  $U \leq 19.3$  V

Short-circuit current  $I \leq 75$  mA

### Signal wiring circuit Ex ia IIC

Max. external inductance  $L_o \leq 10$  mH

Max outer capacity  $C_o \leq 180$  nF

### Signal transmission

1 or 2 measuring circuits, modulated pulse supply signal

### Signal line short-circuit

max. current consumption MLS 1100: 160 mA / MLS 1200 : 280 mA

### Ambient temperature

0 °C ... +45 °C

### Storage temperature

-20 °C ... +45 °C, ideally +20 °C

### Measuring range / Data display, processing

0 – 3700 pulses / Transmission from MTI: 400 ms, internal processing mipromex® 20 ms, approx. 3 measurements/second

### Switching hysteresis

1 pulse corresponds to 0.028 pF for measuring range 100 pF

### Connection

FI male plug 32 poles, coding possible (Ex version)

### Relay output

2 relays of 1st Measuring point with one switchover contact for the limit value, example: Min./max. deviation, min. or max. safety selectable. Switching voltage 30 Vdc /2 A, I/O=2kV, -40 to +85 °C

MLS 1200 one relay per measuring point

### Switching voltage relay – output

30 V DC

### Continuous current relay – output

2 A

### Breaking capacity relay – output

60 W

### Interface

RS 232 / RS 485 (only for firmware update)

### Monitoring

Self-monitoring measuring system: defective probe; short-circuit/interrupted Ex supply (wire break protection); measuring range; mains failure and mipromex malfunctions

### Testi

Gas II (2) G [Ex ia Gb] IIC

Staub II (2) D [Ex ia Db] IIIC

II (2) G / II (2) D (Probe [Ex d ia] IIC)

RL 2014/34/EU

Test report no.: 08-IK-0396.01 with extension 1

Device also available without hazardous area protection mipromex® must be installed outside the hazardous area.

### Fail-safe hazardous area connection:

MTI transmitter module ... In protective housing or S\*\*; K\*\*; F\*\* bar probes

EMC-tested, STS 024 Report No. 990102WS

complies with EN 1127-1 : 20011

EN 61000-6-2 2005 EN 6100-6-4 : 2007

EN 60079-0 : 2012 EN 60079-11 : 2012





# Fault messages

Error messages are visualised on the display with time, date and error type.

Fault messages can be programmed on the analogue signal in the ranges of 0.5 – 4.0 mA and 20.0 – 22.0 mA, in increments of 0.1 mA.

In the event of a fault, the limit value outputs are de-energised.

## Technical error:

All mipromex® microprocessor devices are equipped with a diagnostic system, which facilitates the error search and helps to rectify faults more quickly.

mipromex® technical errors which require the device to be sent to aquasant® for repair:

- ▼ Flash memory checksum verification failed

**In the case of repeated errors, send device in for repair!**

- ▼ Flash memory failed

**Flash is defective; send device in for repair!**

- ▼ Low battery: Battery is drained and must be replaced

**Battery change; send device in for repair!**

- ▼ Program memory check failed

**Microprocessor card is defective; send device in for repair!**

## Data error:

- ▼ Measured value undershot: mA output changes to the value programmed in menu item 8.3! Relays drop out.

Possible cause: Cable break, misaligned on-site MTI electronic unit

- ▼ Measured value exceeded: mA output changes to the value programmed in menu item 8.3! Relays drop out.

Possible cause: Measured value is greater than 3750 pulses, misaligned on-site MTI electronic unit

