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OPERATING MANUAL

Analog Transmitter device

MAT 4111/4221/4241

- Analog evaluation signal
- Display of %-/ mA-/ Pulses
- 1 or 2 Measuring
- Analog output 4–20 mA
- Limit value with relay output

- MAT-Version V1.1x
- Technical specifications
- Operating
- Commissioning
- Installation

mipromex®

for monitoring product measurement values

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Dear Customer

Congratulations! With this system you have chosen a high performance unit of the famous **mipromex**® line from **Aquasant Messtechnik AG**. The analog transmitter **MAT** for one or two measuring circuits changes the normed impedance measuring signal of a pipe- or bar-probe into a 4 - 20 mA signal.

Reading and carefully following the operating instructions, assures a perfect functioning of your **MAT** system.

There's something else which is important for you to know: If any troubles should appear (opposite all our expectations), then our **Aquasant Messtechnik AG** service department will assist you even long time after you purchased your **MAT Analog transmitter.**

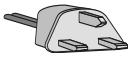
Using this manual

Symbols and conventions

- In this document the following conventions are used at formatting to differentiate text elements.
- The names of equipment pieces are written in BOLD.
  Example: **mipromex®**

In this document the following terms and symbols are used for special program messages:

Emphasized symbols and notices and their meaning:

	Mortal Danger: the non-observance can lead to injuries or death.		Step by step: Text enhanced/marked this way, contains detailed instructions and comments
	Caution: the non-observance can lead to equipment damages or loss of information.		Actions to be carried out by user.
	Information / Notice: describes equipment characteristic features.		Read and follow instruction steps.
	A waiting time is required during which the equipment does recalibrate itself.	*mipromex® display*	Compare with the **mipromex®** display.
	Adjustment of the measuring electronic MTI (visualized by red and green LED's).		Plug in mains 230/115 V (24 V AC/DC).
	Observe and control equipment display.		Send equipment back to manufacturer.
▲▼	Button on **mipromex®** front panel		**mipromex®** Error message on display with Time/Date
▲▼	Function: change value according to displayed character set	◀▶	Button on **mipromex®** front panel
▲▼	Change line without store	◀▶	Function: select number or character
C	Button on **mipromex®** front panel, Function: back	ok	Button on **mipromex®** front panel, Functions: menu, select, next, store (press more than 2s)
"next step" in navigation bar	press **ok b**utton on **mipromex®**. Press less than 2 seconds to advance to the next parameter	"store" in navigation bar	press **ok b**utton on **mipromex®**. Press more than 2 s to store

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1. Security and precautions

The following points must be considered at installation and setting up of microprocessor units 24 V AC/DC of Treina Electronics AG:

1.1. Installation

- The units are IP20 according to EN 60529 and must be protected against e.g. splash water or pollution exceeding the degree of pollution 2.
- The units must be installed outside the hazardous area.
  Maximum 7 units can be installed into a 19"-Rack. Multipoint connector type: FI32 must only be equipped with d- and z – contacts. Solder connections are to be isolated with heat shrinkable sleeves (see chapter 7.2)
- Single units installed with Monorack Type: MRM 2 (see chapter 7.4)
  Housings or switch cabinets must be ventilated (dissipation of heat built-up)
- Hazardous area blue line to lead separately (cable channel or joined to loom of cables)
  Equipotential bond must be installed; Hazardous area protection
  Outside installations: a corresponding lightning protection of the probe supply cables is recommended.
- Installation instructions for impedance probes I must be observed

1.2. Setup

- Verify wiring and power supply tension (chapter 7.2)
- Perform probe and system specific parameterization in the menu (chapter 5)
- Check max. load of the opto-electronic coupling transistor outputs (NPN) according to datasheet (chapter 7.6)
- Adjustments under tension are only allowed to be carried out by manufacturer
  Handling by user is performed only via protected film keypad
  Repair of unit only by trained personnel with manufacturer certificate

1.3. Hazardous Area protection

The EC-type examination certificate has to be respected. It is specially important to respect the contained "special conditions". Ex certification according to Directive 94/9/CE (ATEX 100 A).

Confidential test certificate no. 08-IK-0396.01 CE **1254**
EC-type examination certificate SEV09 ATEX 0132

Notification no.:	**QS 11 ATEX 2081**
Ex classification:	**II (2)G [Ex ia] IIC**
	II (2)D [Ex iaD]
	II (2)GD

Please pay attention to the following documents:

- ***VEZ-SEV-ATEX-09-ISO_Certifcat-Doc.pdf*** (actually valid certificats)
- ***VED-TSS**...***probe data sheet with specific (X) Ex-relevant coat thicknesses and information regarding the application in which zone
- ***08-IK-0396.01*** the test certificate with the characteristics is submitted in strict confidence.

1.3.1. Following notices must be observed:

1. The microprocessor control unit **mipromex**® as per EN *60079-0:2006* can only be used outside of the hazardous area.
2. The highest allowed ambient temperature is 60°C (also inside a protective housing)
3. The microprocessor unit **mipromex**® is to install in a manner that at least the protection standard IP 20 as per Standard IEC 529 resp. EN 60529 is fulfilled. By corresponding mount into rack unit this condition is fulfilled.
4. At installation of the microprocessor control unit **mipromex**® a minimum distance of 50mm must be created by insertion of a separation wall between the intrinsic safe and non intrinsic safe wiring circuit or the connecting parts must be insulated (i.e. with a heat-shrinkable sleeve). The input lines are secured to the rack or the monorack with a strain relief.
5. The intrinsic safe signal wiring circuits are safe galvanic separated from the remaining wiring circuits up to a peak value of 375 V of the nominal voltage

1.4. SIL Safety Integrity Level

The microprocessor unit **mipromex**® is produced as per the SIL standards Norm IEC 61508/61511.

1.5. Cleaning of units

The microprocessor unit **mipromex**® and the measuring electronic **MTI** built-in on the probe head are not allowed to be cleaned with water.
The cleaning of the front panel is to be done with a slightly damped, clean cloth. The printed circuit boards, to remove the dust, shall only be slightly blown-out with compressed air (low pressure 4 bar).
The bar probes must be cleaned with alcohol or a corresponding solvent.
Probes with stainless steel electrodes (SRK or SRM or probes made to measure powders/solids) are not allowed to be cleaned with water or liquids.

1.6. Maintenance

The data transmission of the microprocessor units remains stable, even over a long period of time. Therefore, a periodic adjustment or similar, is not necessary.

1.7. Warranty claims

Your measuring system had to undergo a precise final inspection at the factory. Interventions are only allowed to be carried out by a competent person. Warranty according to Aquasant Messtechnik AG warranty.

1.8. Waste disposal of electrical and mechanical components

The disposal of the components must be carried out in compliance with the country valid regulations.

2. mipromex® type description

Pic. 1 **mipromex®**

2.1. MAT-Hardware types

MAT 411* 1 measuring circuit with 1 analog output and 1 limit value output OC

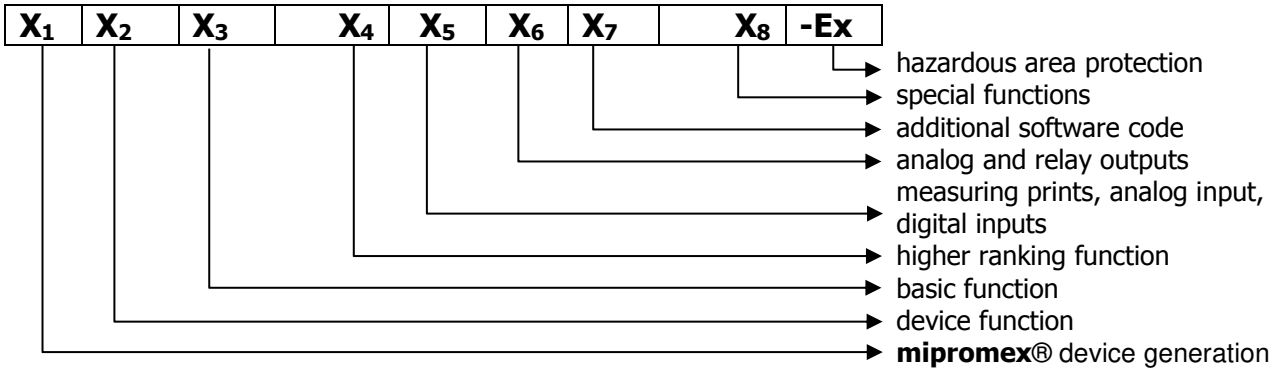
MAT 411*/22* 2 measuring circuits with 1 analog outputs each (not potentially separated against each other) and 1 limit value output OC each. The second measuring circuit can be activated with an activation code subject to costs.

MAT 422* 2 measuring circuits with 1 analog output each (not potentially separated against each other)*

MAT 424* 2 measuring circuits with 1 analog output each (potentially separated against each other)*

*) no change in software except type code)

2.1.1. mipromex® type code:



X1 M = **mipromex®**

X2
A = Analog
I = Interface
L = Level
P = Product

X3
L = Limit/Level
M = Monitoring
T = Transmitter
R = Recognition
Q = Quality
S = Switch
L = Level
U = Universal

X4
1 = Limit switch
4 = Analog output
7 =
2 = Level switch empty
5 = Universal new
8 = Interfacial layer
3 = Level switch full
6 = Filling level
9 = Product (quality, type, concentration)

X5	Meas. print	MeV of 2nd. unit	analog input	digital input
1	1			3
2	2			3
3	2	1 MeV ex Rackbus		3
4	2	2 MeV ex Rackbus		3
5	1		1	3
6	2		1	3

X6	relay	OC	analog output	DC-converter
0	2			
1		1	1	1
2		2	2	1
3	2		1	1
4		2	2	2
5	2		1	1
6	2		2	1
7		2		
8	2 intern		1	1
9	1		1	1

One DC-converter, with potential separation, analog output toward power supply
Two DC-converter, additional potential separation, analog outputs toward each other

X7
0 = standard - software
1 = first expansion of a standard - software

X8
- = without
C = controller (device with control function) e.g. **MIL** 8110 **C** interfacial layer level controller
P = product compensation
S = Segment

Ex
Ex = with hazardous area protection according to ATEX II(2)G [Ex ia] IIC // II(2)D [Ex iaD]
Exd = with hazardous area protection according to ATEX II(2)GD [Ex d ia] IIC
NEx = without hazardous area protection on measuring print

2.2. Software Versions

2.2.1. Basic

The standard operating software is used for all basic hardware units. The basic functions are identical for all software versions; you can use them on all the units. Software versions are marked according to NAMUR EN53.

Example:

MAT 411*	V1.1x	1 measuring circuit with one analog output and one limit value
MAT 411*/22*	V1.1x	2 measuring circuits with 1 analog outputs each (not potentially separated against each other) and 1 limit value output OC each. The second measuring circuit can be activated with an activation code subject to costs.
MAT 4220	V1.1x	2 measuring circuits with one analog output each and one limit value each*
MAT 4240	V1.1x	2 measuring circuits with one analog output each (potentially separated against each other) and one limit value each*

(* no change in software except type code)

Within each software type, at cost, additional functions can be activated.
For each additional function a separate activation code is generated for each measuring circuit. The activation code is serial number depending.

Examples for additional functions:

- Second measuring circuit for **MAT** 411*/422*

The simple menu navigation (language selectable) assures a fast and accurate operation.
Input can be made via buttons and display of the device or via connection to a laptop or the process control system.

2.3. Basic functions

The **mipromex® MAT** has one or two separated and independent measuring circuits. Depending on the device type, one or two measured signal processing can be activated.
The pulse signal transmitted by the measuring electronic MTI is transformed into an offset compensated and filtrated pulse value and converted into a 4 – 20 mA signal in function of the selected measuring span.
The output signal is displayed as pulses value, % value or as mA value.
The offset range can be set between 10 and 2000 pulses.
The measuring signal offset (zero point) can be picked up automatically and/or the stored value can be modified via the keypad buttons. The measuring span is product dependent determined and automatically stored and/or the stored value can also be modified manually via the keypad buttons.
The pulses signal is converted into a 0 – 100 %-value.
The 4 - 20 mA analog output can be spread via programmable start and end values.
Parameter input is menu-driven and device-type based. Inactive positions are hidden.
The parameters can be stored and reloaded.
For each measuring circuit, an opto-electronic coupler transistor output (OC) with Low and Hi function as well as an adjustable time delay for drop and activation is at disposal. Fault messages are visualized with time and date of the error.

2.4. Measuring circuit

One or two probes with the measuring electronic MTI in the connecting head are connected to the **mipromex® MAT** using a shielded two core cable. Between field and control room an equipotential bond must be installed.

2.5. Function

A product surrounding or filling an Aquasant-mt impedance pipe or bar probe you varied the impedance in function of the dielectrical constant and/or conductivity characteristics of organic products or aqueous solutions as, well as the immersion depth of the active part of the bar probe .
The measured impedance sum signal is converted directly by the measuring electronic MTI into a normed signal and is transmitted as pulse packages to the analog transmitter **mipromex® MAT**.
The measured values within the normed signal range are product specific and characteristic for the different products and changing in accordance with product mixtures or immersion depth - This product specific measured value correspond to a value in the range of 0 – 3700. The physical impedance measured value of a product is registered in digits, designed as pulses value.

In a measuring electronic range (e.g. MTI 100) the dielectrical value of 100 pF is converted into a range of 0 – 3500 pulses.

A modern and menu driven operation and calibration concept enables a time saving commissioning of the analog transmitter. The frontal key pad with function and graphic display assure a user friendly operation and reliable working.

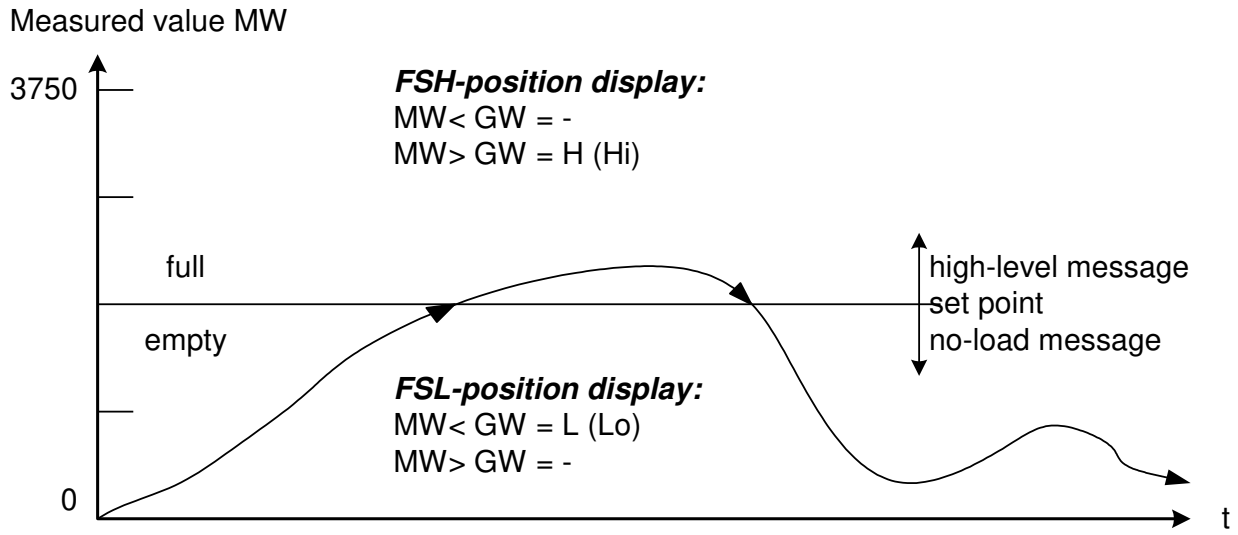
Use for foam and powder surveillance, recognition of water in petrochemical products or organic products in water or surveillance of surface oil layers with floater probes

2.1. Measured values processing

The safety level switch MLS is equipped with 2 different measured values processing modes: **stat** and **dyn.** The factory setting at delivery or after initialization is the **stat** (static) process mode.

Pos.-Nr.	settings	description
6.1.2	**stat**/dyn	Static measure processing mode
6.1.7	FSL/**FSH**	Safety level (full) switch

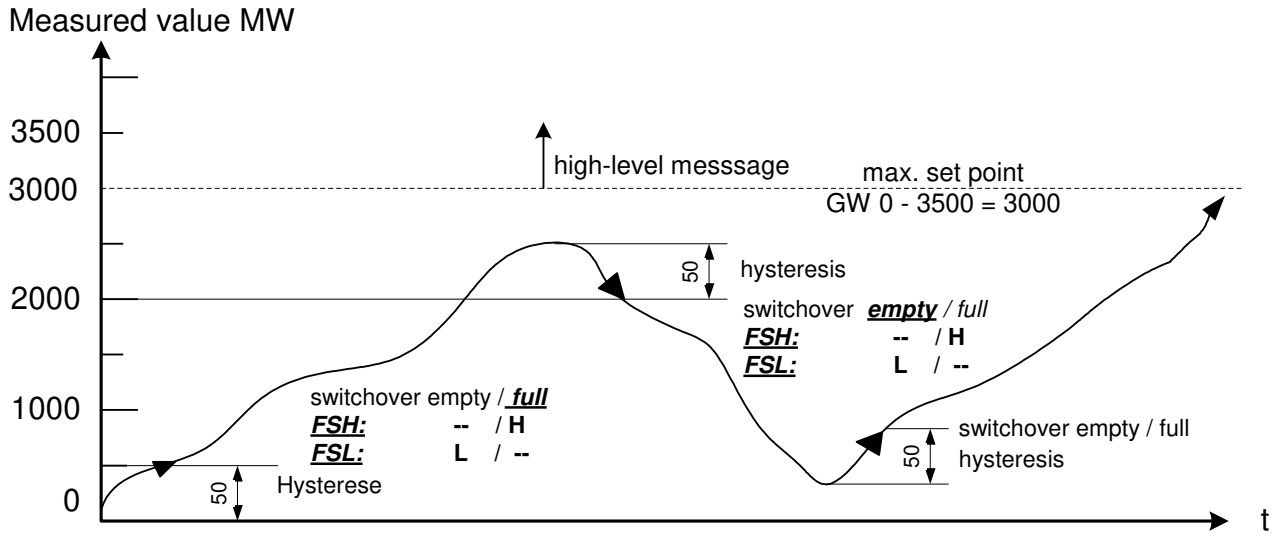
2.1.1. Static measure processing mode



Pic. 2 static measure processing mode

2.1.2. Dynamic measure processing mode

Nr.	settings	description
6.1.2.	stat/**dyn**	Dynamic measure processing mode
6.1.3.	3000 Imp	Max. limit value (as example below)
6.1.4.	50 Imp	Hysteresis (as example below)
6.1.5.	00.02 mm.ss	Relay Time delay, drop
6.1.6.	00.00 mm.ss	Relay Time delay, tension
6.1.7.	FSL/**FSH**	Safety level (full) switch



Pic. 3 dynamic processing mode

3. Structure of data input (parameterization)

3.1. General

To select a menu point or to go forward/ "next" step in the menu, use the **OK** button.
The function of the **OK** button is shown in the inversed bar at the bottom of the display.
The position number of the actual menu item is displayed at bottom left.
To select the desired menu item use the ▲ ▼ buttons. The selected menu item is shown inversed. To execute the shown function use the **ok** button, to delete a value or go back to the previous menu, use the **C** button.

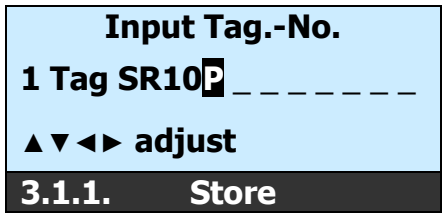
3.2. Key functions

Key	description	measured value	in main menu	menu line	Data input
▲	up	Advancing display	"next" menu item	1 step up	0 – 9 / A - Z
▼	down	next dysplai	"next" menu item	1 step down	0 - 9 / A - Z
►	right	-	no function	no function	input right
◄	left	-	no function	no function	input left
OK	"next" / menu / select / store	(>2 s) Confirmation error	select	confirm	forward or (>2 s) store and forward
C	back	retour	back	back	back

Chart 2 Key functions

3.2.1. Input / changing of characters

Every parameter has its own input field.
The input and change of parameter values can be done using the **mipromex**® menu or via PC-Software.
For several menu configuration text input is required. Text input is done the same way in all functions.
Input via buttons on the **mipromex**® key pad is done as follows:
The first position, beginning on the left, is inverted. To change the character use the ▲ ▼ buttons.
To select the next position use the ◄ ► buttons.
With the **ok** button (press >2 sec) the new value is stored and the display changes to the next parameter.
You can reactivate the old value using the **C** button. If no input is made during an adjustable amount of time, the display changes back to measured value.



Define your position, instrument or tag-number, 11 characters max.

active key-navigation

Menu-Pos.-Nr.-Code /**ok** button function

Change and input

1. position character input using ▲▼buttons alpha-numerical

active button function

press **ok** key more than 2s; store and advance to the next Menu item

Chart 3 Display

3.2.2. Select language

The languages Deutsch/English/Français are available and selectable in the **mipromex**® menu. A fourth language can be programmed. The parameter text field is loaded according to language code via PC-Software. Changes of the text can not be done using only the microprocessor unit **mipromex**®!

3.3. Graphic display

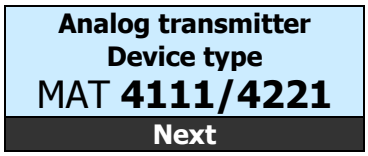
The format of the display is as follows:
Every menu position, parameter and device unit can be set active or inactive (not visible) according to the function of the device. The display is also adjusted to the function of the device.

3.3.1. Display at switch-on of mipromex®

Vendor
Name of device generation
ok button function

ok: forward to device type

Unit description
Device type and hardware model
MAT 4110, 4110/220, 4220, 4240
ok button function

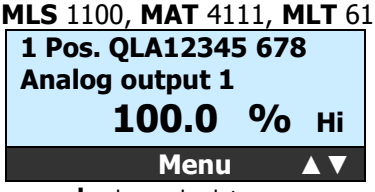


ok: forward to meas.value display

3.3.2. Measured value display

Unit type (with 1 measuring circuit) **MLS** 1100, **MAT** 4111, **MLT** 6130, **MIQ** 8130, **MIL** 8110

Description of the 1. measuring position
Description of the (1st) measured value
Actual calibrated meas.value display in %
Change and input in Menu 5.1.2
ok button function / active keys



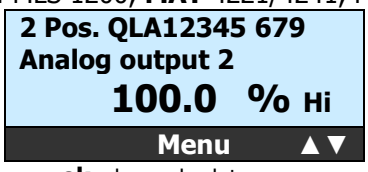
Change and input in measuring circuit 1, Menu 3.1.1.
Limit value "Hi" (high) is reached
Change and input in measuring circuit 1, Menu 6.1.2

ok: change back to menu ▲▼: circulate (loop) in display mode

Pos. no. can be entered in the menu

Unit types with 2 measuring circuits: MLS 1200, **MAT** 4221/4241, MLT 6250, MIL 8240

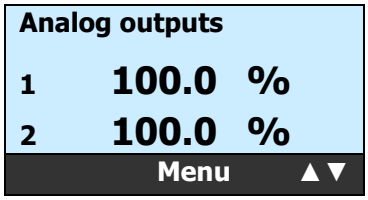
Description of the 2nd measuring position
Description of the 2nd measured value
Actual calibrated meas.value display in %
Change and input in Menu 5.1.2.
ok button function / active keys



Change and input in measuring circuit 2, Menu 3.1.1.
Limit value "Hi" (high) is reached
Change and input in measuring circuit 2, Menu 6.1.2

ok: change back to menu ▲▼: circulate (loop) in display mode

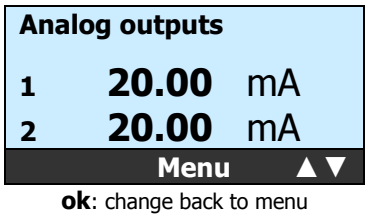
Description of the outputs
Display of the 1st and 2nd measured value
Actual calibrated meas. value display in %
Change and input in Menu 5.1.2.
ok button function / active keys



ok: change back to menu ▲▼: circulate (loop) in display mode

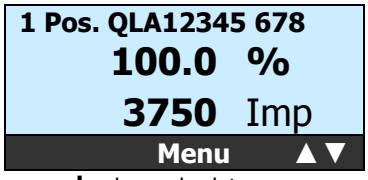
In case of alarm sign **Δ,** "Lo" or "Hi" : no display of impulse or % values/digits

Description of the outputs
Display of the 1st and 2nd measured value
Display of actual current output values
ok button function / active keys



ok: change back to menu ▲▼: circulate (loop) in display mode (loop)

Description of the 1st measuring position
Display of the measured value
Actual calibrated meas.value display in %
measured value display in pulses
ok button function / active keys

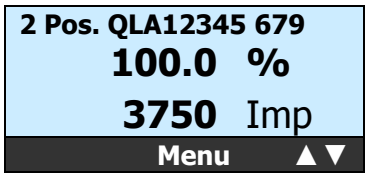


Change and input in Menu 3.1.1.

ok: change back to menu

▲▼: circulate (loop) in display mode

Description of the 2nd measuring position
Display of the measured value
Actual calibrated meas.value display in %
measured value display in pulses
ok button function / active keys



Change and input in Menu 3.1.1.

ok: change back to menu

▲▼: circulate (loop) in display mode

3.3.3. Menu parameter settings

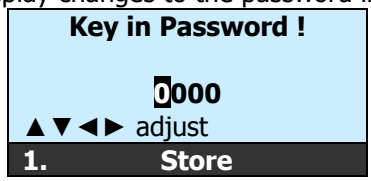
After pressing the OK button the display changes to the info menu.

Menu-Information
Both functions of the **ok** button
store or
next
Menu Pos. No. / **ok** button function

ok: change to password input

After pressing the OK button the display changes to the password input.

selected character is inverted
Menu Pos. No. / **ok** button function

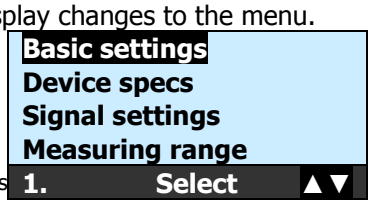


1. key-in the numerical password using the ▲▼◄►-buttons
2. press **ok** button more than 2 seconds
Standard factory password 0000
Display changes to the menu
Parameters can be changed

ok: change to the menu

After pressing the OK button the display changes to the menu.

selected menu item is inverted
Menu Pos. No./**ok** function/active keys



ok: change to the selected menu item

▲▼: circulate (loop) menu items

4. Program structure with parameters of the analog transmitter

Legend: ☜ = Select / ✍ = Input / 〰 = Display / ⌨ = only available with activation code **Menu-Code Parameter**	**Type:**	**MAT 4111**	**MAT 4111/221**	**MAT 4221**	**MAT 4241**	**Change**
1. Basic settings		☑	☑	☑	☑	☜
1.1. Language		☑	☑	☑	☑	☜
1.1.1. Deutsch		☑	☑	☑	☑	☜
1.1.2. English		☑	☑	☑	☑	☜
1.1.3. Français		☑	☑	☑	☑	☜
1.1.4. Free language / text		-	-	-	-	✍
1.2. Time/Date		☑	☑	☑	☑	☜
1.2.1. Time, input/correction		☑	☑	☑	☑	✍
1.2.2. Date, input/correction		☑	☑	☑	☑	✍
1.3. Modify Password		☑	☑	☑	☑	☜
1.3.1. Password input		☑	☑	☑	☑	✍
1.3.2. Modify password		☑	☑	☑	☑	✍
1.4. *Lighting*		☑	☑	☑	☑	✍
1.4.1. Lighting on/off		☑	☑	☑	☑	☜
1.4.2. Duration of lighting in min. / 0 = continuous ON		☑	☑	☑	☑	☜
1.5. Contact information		☑	☑	☑	☑	☜
1.5.1. Contact address		☑	☑	☑	☑	〰
1.5.2. Contact Tel./E-Mail		☑	☑	☑	☑	〰
1.5.3. Contact Web		☑	☑	☑	☑	〰
1.6. Factory settings		☑	☑	☑	☑	〰
1.6.1. Store parameter set		☑	☑	☑	☑	☜
1.6.2. Load parameter set		☑	☑	☑	☑	☜
1.6.3. Initialize device no/yes		☑	☑	☑	☑	☜
1.7. Activation code		⌨	⌨	⌨	⌨	〰
1.7.1. Activation of 2nd measuring circuit, Code: **********		-	☑	-	-	✍
2. Device specs		☑	☑	☑	☑	☜
2.1. Device type: **MAT** 4110 or 4110/220 or 4220 or 4240 Software: Version V….		☑	☑	☑	☑	〰
2.2. S/N and system verification date		☑	☑	☑	☑	〰
2.3. Quantity of measuring circuits (1 measuring circuit: skips 2.4.0/3.1.0/4.1.0) Battery type: CR2032		☑	☑	☑	☑	〰
2.4. Select measuring circuit 1 or 2		-	-	☑	☑	☜
2.4.1. Type code probe 1 / 2		☑	☑	☑	☑	✍
2.4.2. S/N 1 / 2		☑	☑	☑	☑	✍
3. Signal settings		☑	☑	☑	☑	☜
3.1 Select measuring circuit 1 or 2		-	-	☑	☑	☜
3.1.1. Input position number / TAG number		☑	☑	☑	☑	✍
3.1.2. Probe factor		☑	☑	☑	☑	✍
3.1.3. Zero point input (Offset), accept at press of OK button, store		☑	☑	☑	☑	✍

Legend: ☜ = Select / ✍ = Input / 🖋 = Display / ⌨ = only available with activation code **Menu-Code Parameter**	**Type:**	**MAT 4111**	**MAT 4111/221**	**MAT 4221**	**MAT 4241**	**Change**
3.1.4. Manual input of the zero point (Offset)		☑	☑	☑	☑	✍
3.1.5. Measuring span, accept at press button		☑	☑	☑	☑	☜
3.1.6. Height in percent at auto measuring span		-	-	-	-	✍
3.1.7. Measuring span input / correction manual		☑	☑	☑	☑	✍
3.1.8. Signal filter		☑	☑	☑	☑	✍
4. Commissioning according to device type		-	-	-	-	☜
4.1 Select measuring circuit 1 or 2		-	-	☑	☑	☜
5. Measuring range		☑	☑	☑	☑	☜
5.1 Select measuring circuit 1 or 2		-	-	☑	☑	☜
5.1.2. Measuring range starting point		☑	☑	☑	☑	✍
5.1.3. Measuring range end point		☑	☑	☑	☑	✍
6. Limit values		☑	☑	☑	☑	☜
6.1 Select measuring circuit 1 or 2		-	-	☑	☑	☜
6.1.1. static/dynamic		-	-	-	-	☜
6.1.2. Limit value(s)		☑	☑	☑	☑	✍
6.1.3. Hysteresis /max. measured value		-	-	-	-	✍
6.1.4. Time delay, drop 1		☑	☑	☑	☑	✍
6.1.5. Time delay, tension 1		☑	☑	☑	☑	✍
6.1.6. FSL/FSH position		☑	☑	☑	☑	✍
7. Test functions		☑	☑	☑	☑	☜
7.1. Select measuring circuit 1 or 2		-	-	☑	☑	☜
7.1.1. mA- output simulation (0.1 mA steps) beginning at 0.5 mA		☑	☑	☑	☑	✍
8. Error message mA output		☑	☑	☑	☑	☜
8.1. Data error, measured value underflow, <0010 pulses		☑	☑	☑	☑	✍
8.2. Data error, measured value overflow, >3750 pulses		☑	☑	☑	☑	✍
8.3. Technical error		☑	☑	☑	☑	🖋
Display actual error with time/date		☑	☑	☑	☑	🖋
9. Controller function		-	-	-	-	☜
10. Protocol of active data set		⌨	⌨	⌨	⌨	☜
11. Service parameter basic settings		-	-	-	-	☜
11.1. Service parameter list (encoded)		-	-	-	-	PC
11.2. Parameter list for different device types		⌨	⌨	⌨	⌨	
12. Calculation parameters		☑	☑	☑	☑	☜
12.1. Select measuring circuit 1 or 2		-	-	☑	☑	☜
12.1.1 Drift memory		☑	☑	☑	☑	✍
12.1.2 Drift gradient		☑	☑	☑	☑	✍
13. Archive		⌨	⌨	⌨	⌨	☜
13.1. Operation parameter sets (last set of parameters)		☑	☑	☑	☑	🖋

Legend: ☜ = Select / ✍ = Input / 🖋 = Display / ⌨ = only available with activation code **Menu-Code Parameter**	**Type:**	**MAT 4111**	**MAT 4111/221**	**MAT 4221**	**MAT 4241**	**Change**
Display modes						
Analog output 1 in %		☑	☑	☑	☑	🖋
Analog output 2 in %		-	-	☑	☑	🖋
Analog output 1 in mA		☑	☑	-	-	🖋
Analog output 1/2 in %		-	-	☑	☑	🖋
Analog output 1/2 in mA		-	-	☑	☑	🖋
1. Pos. Number analog output 1 in % and measured value in pulses		☑	☑	☑	☑	🖋
2. Pos. Number analog output 2 in % and measured value in pulses		-	-	☑	☑	🖋
Display actual error with time /date		☑	☑	☑	☑	🖋

Chart 4 Program structure

4.1. Description of the menu, program structure General, for all mipromex® units

mipromex® display

Your TAG or Position number
Measuring position, number
Display measured value in %
Hi = High Alarm
ok button function / active keys

1 Pos. QLA12345678
Analog output 1
100.0 % Hi
Menu ▲▼

After pressing the **ok** button the display changes to the info menu.

Information about storing or next

=> Menu-Info <=
Press OK button
>2s store !
< 2s next !
Info 01 Next

After pressing the **ok** button, the display changes to password input.

Password

The password protects the programming level of the **mipromex®**. If you start up for the first time, the standard password is ***0000*** and is displayed. If you change the password (under point 1.3.) every user has to log-in using the new password!

Note: If you loose the new password, contact aquasant-mt to obtain an override password.
After the input password and leave the parameter that remains one hours use.

Key in your new password or accept the standard password
selected digit is inverted

Key in Password !
0000
1. Store

1. Key-in the numerical password using the ▲▼◀▶ buttons
2. Press **ok** button more than 2 seconds

Display changes to the menu
Parameters can be changed

4.1.1. [1.] Basic settings

You can set the device specific parameters in the basic settings menu. Please note that you first have to activate the password before you can make any changes.

Main menu
selected menu item is inverted

Basic settings
Device specs
Signal settings
Measuring range
1. Select ▲▼

After pressing the **ok** button the display changes to the sub menu basic settings

Sub menu
Selected sub menu item is inverted

Language / Sprache
Time/Date
Modify password
Lighting settings
1.1. Select ▲▼

After pressing the **ok** button the display changes to the sub menu Language / Sprache

[1.1.] Language/Sprache

Select the desired language. After you selected the language and stored your choice, the new language will be activated immediately. On the internet homepage www.aquasant-mt.com / Downloads, you can download an Excel-file. The three languages Deutsch, English and Français are listed. Replenish all text blocks in your language (max 16-characters), send it to us and we will be glad to implement your language.

selected menu item is inverted

Deutsch
English
Français
1.1.1 Store ▲▼

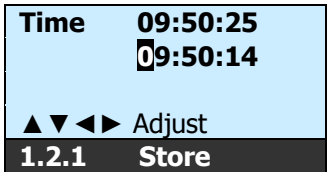
1. select language with the ▲▼-buttons
2. press **ok** button more than 2 seconds

The selected language is immediately activated
Display changes back to menu item 1.1.

[1.2.] Time/Date

Correction of device time and date. The time is displayed in hours, minutes and seconds. Daylight saving time is not adjusted automatically! The date is displayed in day, month and year. The device time is used for the protocol logger.

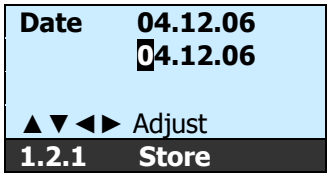
current time
selected character is inverted
active key-navigation



1. use ▲▼◄►-buttons to change the time
2. press **ok** button more than 2 seconds

Time is stored
Display changes to date 1.2.1.

current date
selected character is inverted
active key-navigation



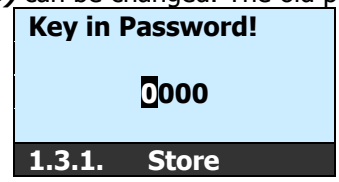
1. use ▲▼◄►-buttons to change the date
2. press **ok button** more than 2 seconds

Date is stored
Display changes back to menu item 1.2.

[1.3.1.] Key-in and change password

The ***standard password (0000)*** can be changed. The old password has to be confirmed first.

selected character is inverted



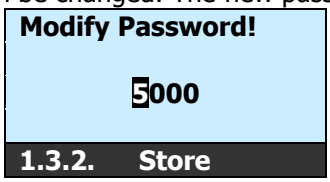
1. use ▲▼◄►-buttons to input the numerical password
2. press **ok button** more than 2 seconds

Password is stored
Display changes to modify password 1.3.2.

[1.3.2.] Modify password

The standard password (0000) can be changed. The new password has not to be confirmed.

selected character is inverted



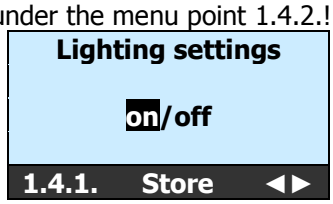
1. use ▲▼◄►-buttons to input the numerical password
2. press **ok button** more than 2 seconds

New password is stored
Display changes back to menu item 1.3.

[1.4.1.] *Lighting*

The display lighting can be switched on or off. The duration of the lighting can be set in minute-steps; for continuously on choose time 00, under the menu point 1.4.2.!

selected character is inverted



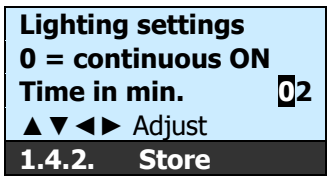
1. use ◄►-buttons to switch the lighting on or off
2. press **ok button** more than 2 seconds

Selection is stored
Display changes to sub menu lighting duration 1.4.2.

[1.4.2.] *Lighting settings*

The display lighting can be switched on or off. The duration of the lighting can be set in minute-steps; for continuously on choose 00!

selected character is inverted
active key-navigation

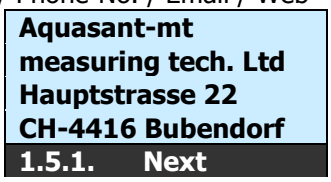


1. use ▲▼◄►-buttons to select the lighting duration
2. press **ok button** more than 2 seconds

Lighting duration is immediately activated
Display changes back to menu item 1.4.

[1.5.] Contact

Our contact information: Address / Phone-No. / Email / Web



After pressing the **ok b**utton the display changes to the next menu item.

/ Switzerland

After pressing the **ok b**utton the display changes to the next menu item.

/ info@aquasant-mt.com

After pressing the **ok b**utton the display changes back to the sub menu Contact 1.5

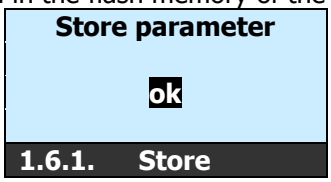
/ www.aquasant-mt.com

[1.6.] Factory settings

Under the ***Factory settings*** Menu Level, the programmed device parameters can also be stored, reloaded or deleted. All parameters are set back to factory settings at initialization of the device.

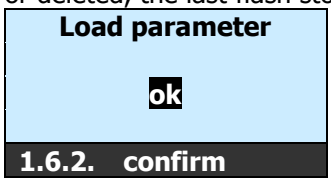
[1.6.1.] Store Parameter set

All keyed-in parameters are stored in the flash memory of the unit. The parameters can be reloaded afterwards.



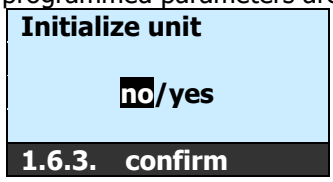
[1.6.2.] Load Parameter set

If parameters have been changed or deleted, the last flash stored parameter set can be reloaded into the RAM.



[1.6.3.] Initialize unit no/yes

If the device is initialized, all user-programmed parameters are deleted and set back to factory settings.



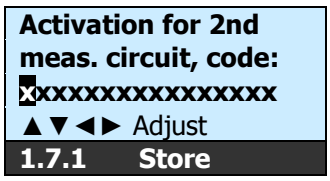
[1.7.] Activation code

With the activation code, several optional dutiable ***software packages/functions*** can be activated. You can obtain the activation code by ordering the optional packages/functions (e.g. ***MK 220*** Article-No.: 02.05.03.0019*)*. The activation code is *depending on the serial-number* and can not be used for other devices.

[1.7.1.] Activation of/for 2nd measuring circuit

On the Hardware type **MAT 411*/22*** with one active measuring circuit, the second measuring circuit can be activated. If the code is entered incorrectly the menu jumps back to menu item 1.7. The code can be entered again! Once the second measuring circuit is activated, it can not be deactivated. At start-up the new hardware type **MAT 4221** will be displayed.

Description
Code input
active key-navigation



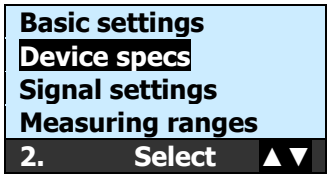
1. use ▲▼◄►-buttons to input the alpha-numerical Code
2. press **ok b**utton more than 2 seconds

Input is stored
Display changes back to menu 1.

4.1.2. [2.] Device specs

In the device specs you will find specific information about the **mipromex®**.

Main menu
selected menu item is inverted



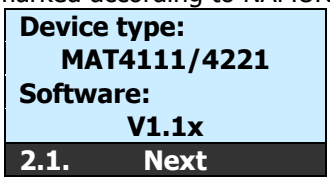
After pressing the **ok b**utton the display changes to the sub menu Device specs

[2.1.] Device type MAT 4111 or 4111/221 or 4221 or 4241

In the device type menu the hardware type and the software-release are displayed. Example:

MAT 4111	with 1 measuring circuit (activation code 1.7.1. inactive)
MAT 4111/221	with 2 measuring circuits, but only one is activated (activation code 1.7.1.)
MAT 4221	with 2 active measuring circuits
MAT 4241	with 2 active measuring circuits, plus analog outputs galvanically separated against each other

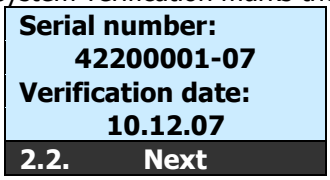
Software versions are marked according to NAMUR EN53. (V 1.00)



After pressing the **ok b**utton the display changes to the next menu item 2.2.

[2.2.] Serial number and date of the system verification

The serial number is fix stored in the **mipromex®** and can not be changed. The serial number is linked to the activation codes. The date of the system verification marks the QS-function control during the final function test.



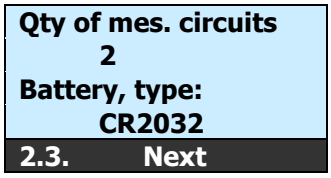
After pressing the **ok b**utton the display changes to the next menu item 2.3.

[2.3.] Number of measuring circuits (1. measuring circuit, skip 3.1/4.1)

Here is displayed if there is one or two measuring circuits activated.

Battery type

The inserted battery type is displayed. The battery has not to be charged before using the **mipromex®**. The battery lifetime of 10 years guarantees that no data loss will occur.

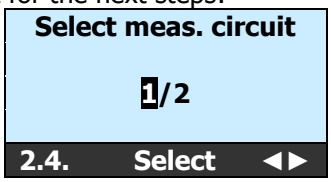


After pressing the **ok b**utton the display changes to the next menu item 2.4.

[2.4.] Select measuring circuit 1 or 2

Select the active measuring circuit for the next steps.

selected menu item is inverted



After pressing the **ok b**utton the display changes to the menu of the selected measuring circuit (1). 2.4.1.

[2.4.1.] Probe Type 1 / 2

This is an input field. If the system is delivered with a probe, the probe type is stored here.

selected character is inversed 16-char. max

1. use ▲▼◄►-buttons to input the alpha-numerical type code of the probe
2. press **ok b**utton more than 2 seconds

Type code is stored
Display changes to the next menu item 2.4.2.

[2.4.2.] Serial No. 1 / 2

This is an input field. If the system is delivered with a probe, the serial no. of the probe is stored here.

selected character is inversed 16-char. max

1. use ▲▼◄►-buttons to input the alpha-numerical serial number of the probe
2. press **ok b**utton more than 2 seconds

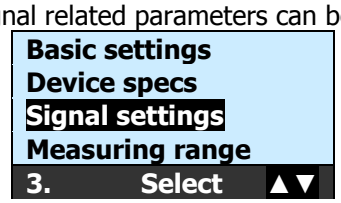
Serial number is stored
Display changes back to menu 2.4.

4.1.3. [3.] Signal settings

In the signal settings menu all signal related parameters can be set.

Main menu

selected menu item is inverted

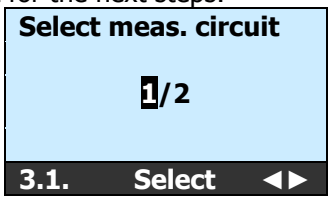


After pressing the **ok b**utton the display changes to the sub menu signal settings

[3.1.] Select measuring circuit 1 or 2

Select the active measuring circuit for the next steps.

selected menu item is inverted



After pressing the **ok b**utton the display changes to the menu of the selected measuring circuit (1). 3.1.1.

[3.1.1.] Input Pos. No.

You have the possibility to store a Tag No. for the probe in the **mipromex®**. The field is alphanumerical.

define your position-
or Tag-number, 11-characters max.
selected character is inverted

1. use ▲▼◄►-buttons to input the alpha-numerical position number
2. press **ok b**utton more than2 seconds

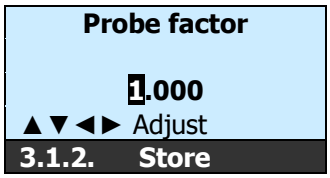
Pos.-No. is stored
Display changes to menu item 3.1.2.

[3.1.2.] Probe factor

The probe factor is a probe specific number which indicates the correlation to the standard probe (factor 1.00). If you replace the probe you will get a reproducible measurement with the same measured values. The probe factor has only to be changed when using a replacement probe. By changing the factor, you will get with the replacement probe, the same pulses value at 100 %

e. g. MeV old probe 2600 / 2955 MeV new probe = f 0.879

The probe factor has only to be changed
when using a replacement probe
selected character is inverted



1. use ▲▼◄►-buttons to define the probe factor
2. press **ok b**utton more than 2 seconds

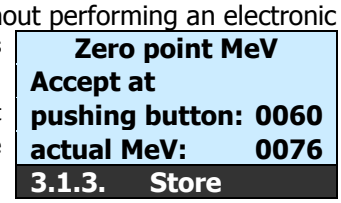
Probe factor is stored
Display changes to the next menu item 3.1.3. After changing the probe factor the zero point must be actualized and stored 3.1.3.

[3.1.3.] Zero point acceptance at push button (Offset) OK store

The probe electronic is calibrated in the factory to 60 ±2 pulses. If the probe is installed, this value can be higher due to the environment. If the probe is installed; empty and dry, the zero point can be checked and/or manually corrected. Attention: switch-on the unit 30 minutes before the zero adjust. A measured value between 10 and 2000 pulses can be adjusted without performing an electronic calibration. ***Attention;*** *Probe must be dry and clean!*

MeV = normed measured value in pulses

actual stored zero point offset
actual raw measured value, empty probe



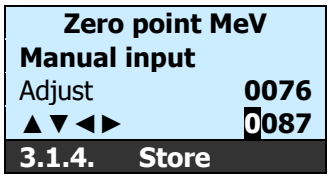
1. press **ok b**utton more than 2 seconds

The new zero point is immediately activated
Display changes to the next menu item 3.1.4.

[3.1.4.] Manual zero point input (offset)

The programmable probe zero point can be changed or corrected manually.
If the installation cannot be emptied for the zero point of the probe, then the zero point is manually keyed-in from the protocol

You can manually correct the
zero point of the probe
actual raw measured value of the probe
adjust zero point



1. use ▲▼◄►-buttons to define the zero point
2. press **ok b**utton more than 2 seconds

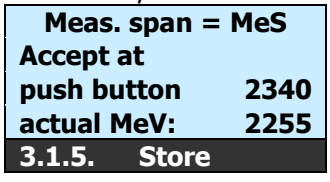
The new zero point is immediately activated
Display changes to the next menu item 3.1.5.

[3.1.5.] Measuring span acceptance at push button

The measuring span for the calculation of the 100 % point is product depending. This pulses value is obtained by fully immersing the measuring electrode into the product and by saving "at push button" the measured value.
Attention: this procedure is in dependence of point 3.1.6.

MS = normed measuring span in pulses

actual stored measuring span
(raw measured value – zero point offset)



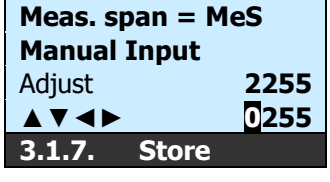
1. press **ok b**utton more than 2 seconds

The new measuring span is immediately activated
Display changes to the next menu item 3.1.7.

[3.1.7.] Measuring span

The measuring span (point 3.1.5) can be changed or corrected here manually.

You can manually correct the
Measuring span of the probe
actual measured value of the probe
Adjust measuring span



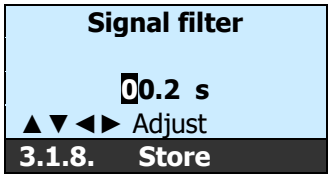
1. use ▲▼◄►-buttons to define the measuring span
2. press **ok b**utton more than 2 seconds

The new measuring span is immediately activated
Display changes to the next menu item 3.1.8.

[3.1.8.] Signal filter

With the free selectable filter time constant (max 30 seconds) you can attenuate the raw measuring signal. A way to center the displayed and power output values

Input the filter constant
filter of the first order
actual stored filter constant



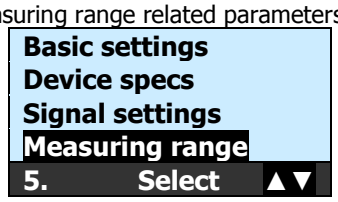
1. use ▲▼◄►-buttons to define the signal filter time
2. press **ok b**utton more than 2 seconds

The new time is immediately activated
Display changes back to menu 3.1.

4.1.4. [5.] Measuring range

In the measuring range menu all measuring range related parameters can be set.

Main menu
selected menu item is inverted

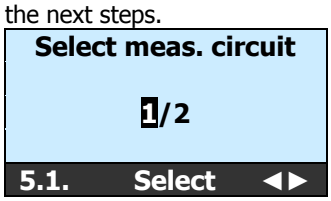


After pressing the **ok b**utton the display changes to the sub menu measuring range 5.1.

[5.1.] Select measuring circuit 1 or 2

Select the active measuring circuit for the next steps.

selected menu item is inverted

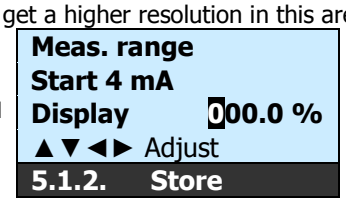


After pressing the **ok b**utton the display changes to the selected measuring circuit menu (1). 5.1.2

[5.1.2.] Measuring range starting point

Set the start point of the selected measuring range (e.g. **20.0** – 60.0 %). By defining the start and the end point you can ***spread*** the mA signal and therefore get a higher resolution in this area.

selected character is inverted



1. use ▲▼◄►-buttons to define the start point
2. press **ok b**utton more than 2 seconds

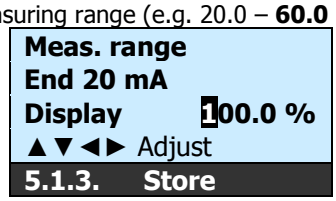
The new spreading is immediately activated

Display changes to the next menu item 5.1.3.

[5.1.3.] Measuring range end point

Set the end point of the selected measuring range (e.g. 20.0 – **60.0** %)

selected character is inverted



1. use ▲▼◄►-buttons to define the end point
2. press **ok b**utton more than 2 seconds

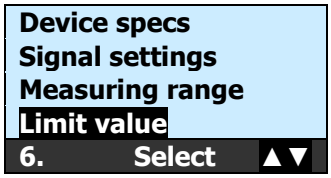
The new spreading is immediately activated

Display changes back to menu 5.1.

4.1.5. [6.] Limit value

In the limit value menu all limit values related parameters can be set.

Main menu
selected menu item is inverted

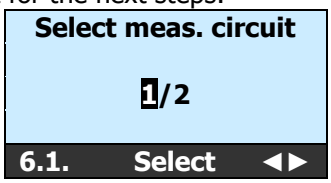


After pressing the **ok b**utton the display changes to the sub menu measuring ranges 6.1. select measuring circuit.

[6.1.] Select measuring circuit 1 or 2

Select the active measuring circuit for the next steps.

selected menu item is inverted



After pressing the **ok b**utton the display changes to the selected measuring circuit menu (1). 6.1.2

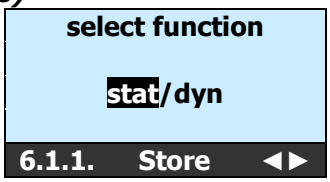
[6.1.1.] Select static or dynamic

With the static limit value you can:
- obtain a precise and reproducible limit value for a given measuring range corresponding to 100 %
- read a chosen limit value as a percentage and programme it as a limit value
- enter very small limit values, starting at 1.1 %, thanks to the high performance measuring circuit and the precise and reproducible processing of the measurement values

With the dynamic limit value you can:
- detect the limit value inside the length of the active measuring electrode independently of the product's properties and its adherence to the measuring electrode
- only one dynamic limit value should be set for each measuring circuit.
- see diagram for the processing of the measurement value

Diagramm (look on Capitel 2.6)

selected character is inverted



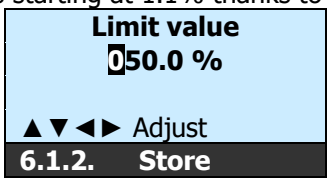
1 Use ▲▼◄►-buttons to define the function
2. Press **ok** button more than 2 seconds

After pressing the **ok** button, the display changes to the menu Enter limit value or max limit value and hysteresis

[6.1.2.] Limit value

With the static limit value you:
- get an exact and reproducible limit value for a defined measuring span corresponding to 100 %
- can display read a desired percentage at the desired limit value and program it/store it, as limit value
- can enter exact limit values starting at 1.1% thanks to the precise and reproducible measuring values.

selected character is inverted



1. use ▲▼◄►-buttons to define the limit value
2. press **ok b**utton more than 2 seconds

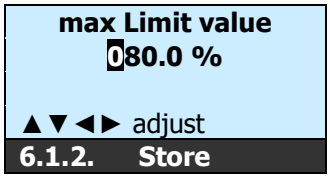
The selected limit value is immediately activated
Display changes to the next menu item 6.1.4.

Or wen your select dyn...

[6.1.2.] max. Limit value

After entering Dynamic

selected character is inverted



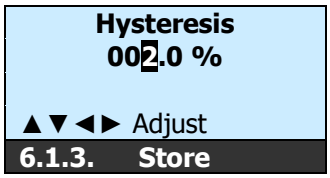
1. Use ▲▼◄►-buttons to define the limit value
2. press **ok b**utton more than 2 seconds

The selected limit value is immediately activated
Display changes to the next menu item 6.1.4.

[6.1.3.] Hysteresis

After entering Dynamic

selected character is inverted



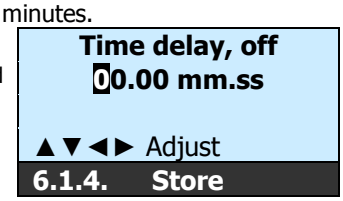
1. Use ▲▼◄►-buttons to define the hysterese
2. Press **ok** button more than 2 seconds

After pressing the **ok**-button display changes to the next menu item 6.1.4.

[6.1.4.] Time, drop down delay, 1

The relay- or opto-electronic coupler- transistor- output can be activated with a drop down time delay. Input of the time delay drop, in 1 second steps from 0 - 30 minutes.

selected character is inverted



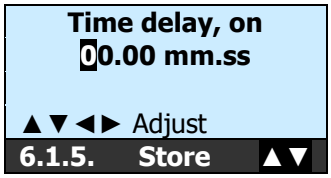
1. use ▲▼◄►-buttons to define the time delay off, drop
2. press **ok b**utton more than 2 seconds

The selected time delay is immediately activated
Display changes to the next menu item 6.1.5.

[6.1.5.] Time, on delay, 1

The relay- or opto-electronic coupler- transistor- output can be activated with an on/raise time delay. Input of the time delay, of raise, in 1 second-steps from 0 - 30 minutes.

selected character is inverted



1. use ▲▼◄►-buttons to define the time delay on, raise
2. press **ok b**utton more than 2 seconds

The selected time delay is immediately activated
Display changes to the next menu item 6.1.6.

[6.1.6.] FSL/FSH Position

Define the security settings of the Relay- or opto-electronic-coupler- transistor- outputs, ...

Active position		Measured value	Display	opto-electronic coupler
Fail Safe Low	***FSL***	is **lower** than limit value	**Lo**	de-energized
Lo-Alarm		is **higher** than limit value	**none**	switched on
Fail Safe High	***FSH***	is **lower** than limit value	**none**	switched on
Hi-Alarm		is **higher** than limit value	**Hi**	de-energized

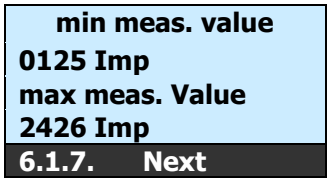
Chart 5 Fail Safe settings

selected menu item is inverted

1. use ◄►-buttons to define the opto-electronic coupler-output
2. press **ok b**utton more than 2 seconds

The selected definition is immediately activated
Display changes back to menu item 6.

[6.1.7.] min/max Measurement value



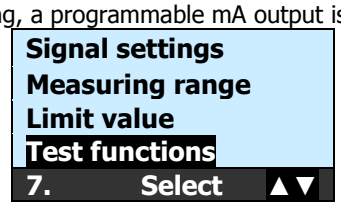
After pressing the **ok b**utton the display changes to the sub menu test functions 6.1. select measuring circuit

4.1.1. [7.] Test functions

To test the functions at commissioning, a programmable mA output is available.

Main menu

selected menu item is inverted

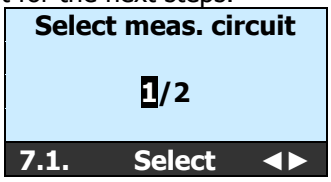


After pressing the **ok b**utton the display changes to the sub menu test functions 7.1. select measuring circuit

[7.1.] Select measuring circuit 1 or 2

Select the active measuring circuit for the next steps.

selected menu item is inverted

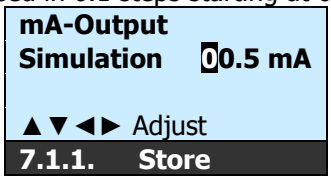


After pressing the **ok b**utton the display changes to the selected measuring circuit menu (1). 7.1.1

[7.1.1.] Simulation of mA- output (in 0.1 mA steps, starting at 0.5 mA)

With this function the active current output (burden 750 Ω) can be tested.
The current output can be increased in 0.1 steps starting at 0.5 mA and ending at max. 22.0 mA.

selected character is inverted



1. use ▲▼◄►-buttons to define the current output
2. press **ok b**utton more than 2 seconds

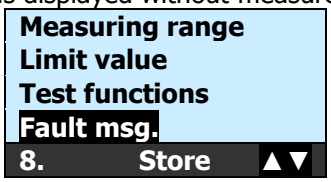
Current output is immediately activated
Display changes back to 7.1.

4.1.2. [8.] Programmable mA output

All **mipromex**® microprocessor units are equipped with a diagnostic system, which makes fault-finding easier and facilitates quicker correction in case of malfunction occurrence. The error levels can be set in 0.1 mA-steps between 0.5 - 4.0 and 20.0 - 22.0 mA. Error messages are set at factory to automatically acknowledge the fault. The fault-type is displayed with time and date. By pressing > 2 seconds the **ok** button, the display changes back to the measured value. The error is displayed without measured value ---.- and an arrow up ⬆ or down ⬇ .

Main menu

selected menu item is inverted

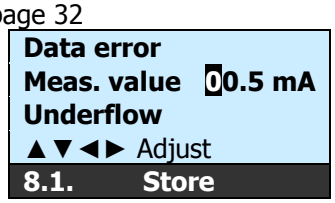


After pressing the **ok b**utton the display changes to the sub menu fault messages 8.1.

[8.1.] Data error measuring value underflow MeV <0010

The data transmission of the measured value, between measuring electronic MTI and the control unit **mipromex**® is faulty. The control unit **mipromex**® is unable to process the measured data.
Error level 1 see fault finding on page 32

selected character is inverted



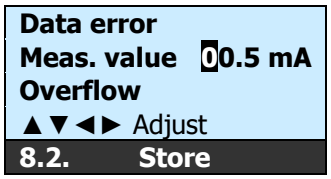
1. use ▲▼◄►-buttons to define the current output
2. press **ok b**utton more than 2 seconds

Current output is immediately activated
Display changes to the next menu item 8.2.

[8.2.] Data error measuring value overflow MeV >3750

The measured value of the measuring electronic MTI is higher than the allowed range of pulses. The control unit **mipromex**® is unable to process the measured data. Error level 2 see fault finding on page 32

selected character is inverted



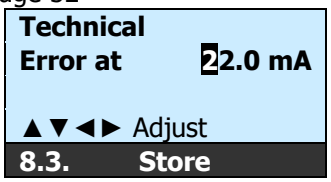
1. use ▲▼◄►-buttons to define the current output
2. press **ok b**utton more than 2 seconds

Current output is immediately activated
Display changes to the next menu item 8.3.

[8.3.] Technical Error

The control unit **mipromex**® generates a periodic checksum test. If it is faulty, an error message is displayed.
Error level 3 see fault finding on page 32

selected character is inverted



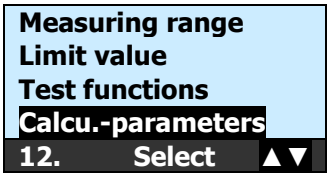
1. use ▲▼◄►-buttons to define the current output
2. press **ok b**utton more than 2 seconds

Current output is immediately activated
Display changes back to menu 8.

4.1.1. [12.] Calculation parameters

Main menu

selected menu item is inverted



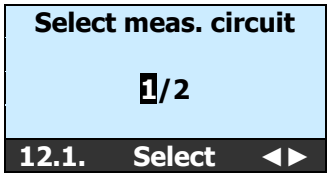
After pressing the **ok b**utton the display changes to the sub menu 12.1. select measuring circuit

[12.1.] Select measuring circuit 1 or 2 (MLS 1200/1270)

With the drift compensation small measurement modifications like temperature drift are compensated for by HF wire or probes. ± 1-3 impulses per minute correspond to normal drift compensation. With the drift compensation the measurement has left constantly if the drift is smaller than the drift gradient. This means the measurement corrects itself the max. drift in impulses is fixed in the drift memory within a minute (adjusting drift time 60 s). The sum of the individual drift compensations becomes e.g. 30 (impulses) to change the measurement more greatly than 30 impulses begin itself into function of the drift. At a zero comparison [3.1.3.] the drift loft is put on 0000. Around min. 40 impulses, the zero comparison must always be GREATER than Max Driftspeicher. The measurement otherwise sinks at a negative drift under the zero. Consequence is: Technical disturbance measurement underrun!

At the measuring of at times slow modifications like filling level measuring the drift compensation must get prepared for 0 Imp, i.e. turned off.
Caution: With the drift compensation no probe pollutions can be compensated for.
Select the measuring circle for the further action.

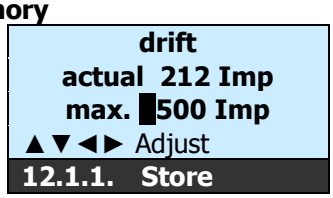
selected menu item is inverted



After pressing the **ok** button, display changes to the menu for the measuring circuit selected (1). 12.1.1.

[12.1.1.] Drift memory

selected menu item is inverted

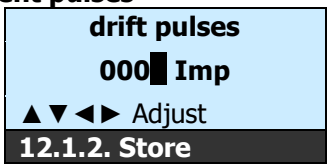


1. use ▲▼◄►-buttons to define max. drift
2. press **ok** button more than 2 seconds
+- drift

If the max. drift is exceeded, no more drift compensation is possible

[12.1.2.] Driftgradient pulses

selected menu item is inverted



1. use ▲▼◄►-buttons to define max. drift pluses
2. press **ok** button more than 2 seconds
+- drift

If the max. drift is exceeded, no more drift compensation is possible

[12.1.3.] Driftgradient time

selected menu item is inverted

1. use ▲▼◄►-buttons to define max. drift time
2. press **ok** button more than 2 seconds
+- drift time

If the max. drift is exceeded, no more drift compensation is possible

5. Commissioning example

Make sure the connections in the Monorack or 19"-Rack are wired correctly and the probe is connected.
The control unit **mipromex®** is installed in the Rack and under tension.
The green or red LED inside the MTI (measuring electronic) of the probe is lit.
The vessel is empty; the probe is dry and clean.
Follow the steps of the commissioning:

5.1. Commissioning the mipromex® with a pipe probe

5.1.1. Detection of water in petrochemical products

The pipe probe is installed in the pipeline. The pipeline must be empty!

Menu-Code	Description	Example		Input
2.4.1	Check the probe type	TSS90 DN50		
2.4.2	Check the serial no. of the probe	1050066-06		
3.1.1.	Enter your TAG-, position- or measuring site- number	LS1200		
3.1.2.	Check the probe factor Only to be changed when using a replacement probe	1.000		
3.1.3.	Accept the actual zero point Important: the pipeline must be empty, Important: the pipe probe must be dry and clean Pipe probes are calibrated in the factory to 60 pulses **If the probe is already product, please keep the factory settings**	ideal between 60 – 80		
3.1.5.	Accept measuring span MS: Fill the pipeline with your petrochemical product with the highest water content The MS is product and nominal diameter depending	5 % water in paraffin oil MS 860 Imp = 100 %	paraffin oil 110 Imp = 12.5 %	
5.1.2.	Define the start point of the signal spread at 4 mA	instead of 0.0 %	new at 10.0 %	
5.1.3.	Define the end point of the signal spread at 20 mA	instead 100.0 %	new at 80.0 % = 4 % water	

Chart 6 Commissioning of water detection

5.1.2. Oil detection in process- or rain-water

The pipe probe is installed in the pipeline. The pipeline must be empty!

Menu-Code	Description	Example		Input
2.4.1	Check the probe type	TSS90 DN50		
2.4.2	Check the serial no. of the probe	1050066-06		
3.1.1.	Enter your TAG-, position- or measuring site- number	LS1200		
3.1.2.	Check the probe factor Only to be changed when using a replacement probe	1.000		
3.1.3.	Accept the actual zero point Important: the pipeline must be empty Important: the pipe probe must be and clean Pipe probes are calibrated in the factory to 60 pulses **If the probe is already soiled with product, please keep the factory settings**	ideal between 60 – 80		
3.1.5.	Accept measuring span MS: Fill the pipe with your process water The MS depends on the product and the nominal diameter	water MS 2570 Imp	5 % oil in water 2050 Imp	
5.1.2.	Define the start point of the signal spread at 4 mA	instead of 0.0 %	new at 80.0 %	
5.1.3.	Define the end point of the signal spread at 20 mA	instead 100.0 %	remains at 100.0 %	

Chart 7 Commissioning of oil detection

5.2. Commissioning the mipromex® with a bar probe

5.2.1. Oil detection in process- or rain-water with float

Bar probe is installed and adjusted in the float. The bar probe must be dry and clean!

Menu-Code	Description	Example		Input
2.4.1	Check the probe type	STM 180/100 SB R TN ES SW V		
2.4.2	Check the serial no. of the probe	1050066-06		
3.1.1.	Enter your TAG-, position- or measuring site- number	LS1200		
3.1.2.	Check the probe factor Only to be changed when using a replacement probe	1.000		
3.1.3.	Accept the actual zero point Important: the bar probe must be dry and clean **If the probe is already soiled with product please keep the factory settings**	ideal between 60 – 80		
3.1.5.	Accept measuring span MS: Bar probe is 100 % immersed in your process water Accept the measured value as measuring span Probe 100 mm in water = 100% Probe 80 mm in water and 20 mm in oil	100 mm water 2700 Imp = MS =100%	80 mm water 20 mm oil 2200 Imp = 81 %	
5.1.2.	Define the start point of the signal spread at 4 mA	instead of 0.0 %	new at 80.0 %	
5.1.3.	Define the end point of the signal spread at 20 mA	100.0 %	remains at 100.0 %	

Without an oil layer at surface of water, the display shows 100% = 20.0 mA
Chart 8 Commissioning of oil layer detection

5.2.2. Foam detection

Attention: A limit switch detection of the top of the foam is a relative measurement. Due to varying structure and consistence, and foam plus product variations, the measurement can not be considered as a filling level measure.

Bar probe is installed in the vessel. The bar probe must be dry and clean!

Code	Description	Example		Input
2.4.1	Check the probe type	ST2M 500/300 SB T2R GS DN50 C		
2.4.2	Check the serial no. of the probe	1050066-06		
3.1.1.	Enter your tag-, position- or measuring site-number	LS1200		
3.1.2.	Check the probe factor Only to be changed when using a replacement probe	1.000		
3.1.3.	Accept the actual zero point Important: the bar probe must be dry and clean **If the probe is already soiled with product, please keep the factory settings**	ideal between 60 – 80		
	If the measured value shows > 400 an electronic calibration is recommended ***Point 5.3 page 29*** Otherwise the measuring span MS is limited			
3.1.5.	Accept measuring span MS: Immerse the probe 100 % in your foam and accept the measuring span If the probe is not fully immersed, the measuring span must be calculated to 100 % and keyed-in at menu item 3.1.7.	Full range 1270 Imp	50 % 635 Imp	
5.1.2.	Define the start point of the signal spread at 4 mA	0.0 %	remains at 0.0 %	
5.1.3.	Define the end point of the signal spread at 20 mA	100.0 %	remains at 100.0 %	
6.1.2.	max. Limit value	80 %		
6.1.3.	Limit switch detectionby hysteresis	10 %		
6.1.4	Time, drop down delay, 1	00.02		

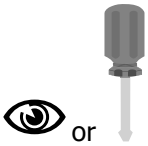
Chart 9 Commissioning of foam detection

5.3. Electronic calibration MTI, basic equalization

An electronic calibration has only to be done at following occurrences:

- ☑ Probes without reference electrode, flexible- or flat-probes where the ***measured value*** inside the ***empty*** vessel is smaller than 10 or bigger than 200
- ☑ After exchange of the measuring electronic MTI, or of the coax cable, or of the probe, or after repair of the probe
- ☑ If the zero adjust is not possible: displayed measured value >2000 or <10

Tip:	Adjust the measuring electronic MTI between 60 and 80 pulses This allows the biggest possible measuring span of up to max. 3750 pulses. **Soiled or uncleaned probes should not be adjusted with an MTI calibration.**

	Probe dry and clean, built in the vessel	Go to the menu point 3.1.3.
 or	*Calibration of MTI as follows:* Using a screwdriver size No. 1, fine adjust to switch point of the LED from red to green (red will flicker). Display between 60 and 80	

The 0-point has been stored at the system test. If the probe is built in, dry and empty the 0-point can be checked and corrected.

Menu position Number-Code

Zero point MeV	
Accept at	
push button	**0060**
actual MeV	**0085**
3.1.3.	**Store**

change to the next menu item by pressing the **Ok b**utton

1. press **ok b**utton more than 2 seconds:

actual MeV is stored
Display changes to the next parameter input

Chart 10 Electronic calibration operating sequences

5.4. Inspection release of the parameters

Operating parameters (Settings at commissioning)
Chart 11 2-2 Commissioning protocol – page 2 of 2

Company						Order	
Building						PO no.	
Plant						Project no.	
mipromex®	**MLS**	V1.12	Ex ia ☐	Exd ☐	Non-ex ☐	Serial no.	
Measuring circuit 1						Pos./Tag no.	
Probe type						Serial no.	
Coax cable		Serial no.		MTI		Serial no.	
Measuring circuit 2						Pos./Tag no.	
Probe type						Serial no.	
Coax cable		Serial no.		MTI		Serial no.	

Chart for operating settings

Menu	item	Meas. circuit	Description	Final inspection	Commissioning
	1.		***Basic settings***		
	1.1.		Language Deutsch/Français/English	English	
	1.2.1.		Time	Local time	Local time
	1.2.2.		Date	Local date	Local date
	1.3.1		Password	0000	
	1.4.1.		Lighting	on	
	1.4.2.		Lighting time in minutes	1	
	1.6.1.		Store the parameters	OK ☐	OK ☐
	1.6.2.		Load the parameters	press **OK** button >2s	
	1.6.3.		Initialize the device		Yes ☐
	1.7.1.		Activation for the 2nd measuring circuit		
	2.		***Device data***		
	2.1.		Device type Software version	MLS V1.12	MLS V
	2.2.		Serial no. Testing date		
	2.3.		Number of measuring circuits / Battery type: CR2032		
	2.4.1.	**MC1**	Probe type		
	2.4.2.	**MC1**	Probe serial no.		
	2.4.1.	**MC2**	Probe type		
	2.4.2.	**MC2**	Probe serial no.		
	3.		***Signal settings***		
	3.1.1.	**MC1**	Entry of position/TAG no.		
	3.1.2.	**MC1**	Probe factor	1.000	
			Zero adjustment for tube/bar probe *empty/clean*		
	3.1.3./4.	**MC1**	Zero point importing on keystroke / manual entry Imp		
	3.1.5./7.	**MC1**	Measuring span importing on keystroke / manual entry / adjustment Imp		
	3.1.8.	**MC1**	Signal filter s	00.1	
	3.1.1.	**MC2**	Entry of position/TAG no.		
	3.1.2.	**MC2**	Probe factor	1.000	
			Zero adjustment for tube/bar probe *empty/clean*		
	3.1.3./4.	**MC2**	Zero point importing on keystroke / manual entry Imp		
	3.1.5./7.	**MC2**	Measuring span importing on keystroke / manual entry / adjustment Imp		
	3.1.8.	**MC2**	Signal filter s	00.1	

	5.		***Measuring ranges***			
	5.1.1.	**MC/DO1**	Measuring range unit			
	5.1.1.	**MC/DO2**	Measuring range unit			
	6.		***Limit values***			
	6.1.2.	**MC1/DO1**	Selection: stat / dyn			
	6.1.3.	**MC1/DO1**	Set limit value 1 / *(max. limit value → dyn)*	%		
	6.1.4.	**MC1/DO1**	Hysteresis *(→ dyn)*	Imp		
	6.1.5.	**MC1/DO1**	Time delay, off	mm.ss	00.00	
	6.1.6.	**MC1/DO1**	Time delay, on	mm.ss	00.00	
	6.1.7.	**MC1/DO1**	FSL / FSH position		FSL	
	6.1.8.	**MC1/DO1**	min/max limit value display *(→ dyn)*			
	6.1.1.	**MC1/DO2**	Selection: Limit value / Fault message *→ MLS 1100 / 1101 / 1170 only*			
	6.1.2.	**MC2/DO2**	Selection stat / dyn			
	6.1.3.	**MC2/DO2**	Set limit value 1 / *(max. limit value → dyn)*	%		
	6.1.4.	**MC2/DO2**	Hysteresis *(→ dyn)*	Imp		
	6.1.5.	**MC2/DO2**	Time delay, off	mm.ss	00.00	
	6.1.6.	**MC2/DO2**	Time delay, on	mm.ss	00.00	
	6.1.7.	**MC2/DO2**	FSL / FSH position		FSH	
	6.1.8.	**MC2/DO2**	min/max limit value display *(→ dyn)*			
	7.		***Test functions***			
	7.1.3.	**MC1/DO1**	Limit value 1 simulation OFF/ON		☐ i.O.	☐ i.O.
	7.1.4.	**MC2/DO2**	Limit value 2 simulation OFF/ON		☐ i.O.	☐ i.O.
	8.		***Fault messages***			
	8.1.		Actual fault with time/date			
	12.		***Calculation parameters***			
	12.1.1.	**MC1**	Maximal drift storage in pulses	Imp	0100	
	12.1.2.	**MC1**	Drift pulses per time unit	Imp	0	
	12.1.3.	**MC1**	Drift time	s	0060	
	12.1.1.	**MC2**	Maximal drift storage in pulses	Imp	0100	
	12.1.2.	**MC2**	Drift pulses per time unit	Imp	0	
	12.1.3.	**MC2**	Drift time	s	0060	
	1.6.1.		Storing the parameters		OK ☐	OK ☐

Final inspection carried out by:

Aquasant Messtechnik AG / Bubendorf /

Commissioning carried out by:

Product	**MAT-Display [%]**	**measured value MeV /measuring span MS** **measuring circuit 1**	**MAT-Display [%]**	**measured value MeV /measuring span MS** **measuring circuit 2**
		/		/
		/		/
		/		/
		/		/
		/		/

Commissioning by:

Company / location:

Date, signature:

6. Fault finding

All **mipromex** –microprocessor units are equipped with a diagnostic system, which makes fault finding easier and facilitates quicker correction in case of malfunction occurrence.

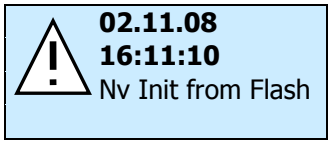
6.1. After power on

7.1.1. Technical error; All oder Nv Init from Flash oder low Battery

The error message can have different origin.

1. RAM memory check has failed

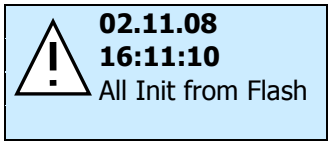
Date of error
Time of error
Error description



1. press **ok b**utton more than 2 seconds, the error is confirmed and the display changes back to last active menu point

2. Flash memory check has failed

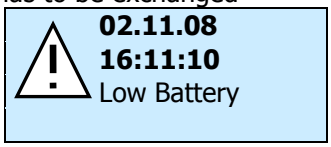
Date of error
Time of error
Error description



1. press **ok b**utton more than 2 seconds, the error is confirmed and the display changes back to last active menu point

3. Battery is discharged and has to be exchanged

Date of error
Time of error
Error description



1. press **ok b**utton more than 2 seconds, the error is confirmed and the display changes back to last active menu point

Switch OFF and then switch ON the unit. If error reoccurs then:

∫ **Send unit back for repair!**

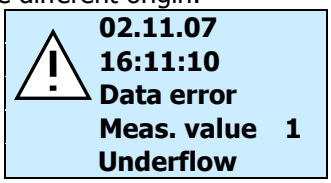
6.2. During operation

6.2.1. Data error

7.1.1. Technical error; Measured value 1 underflow

The error message can have different origin.

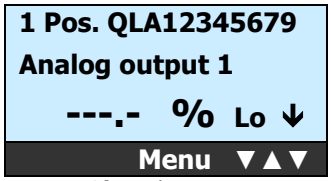
Date of error
Time of error
Measuring circuit 1 or 2
Error description



1. press **ok b**utton more than 2 seconds, the error is confirmed and the display changes back to last active menu point

The mA output falls to the value programmed under menu point 8.3!

Description of 1st meas. circuit position
Description of 1st meas. value
Non display of meas. value
Error display
ok button-functions / active keys

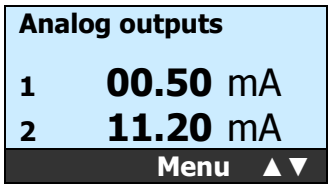


Press **Ok** to change to menu

Limit value low alarm is reached
Arrow down ↓ signalizes : Meas. range underflow

use the ▲▼ buttons to scroll within display mode

Description of the outputs
Description of 1. and 2, meas. value
Display of actual value of current outputs
ok button-functions / active keys



Press **Ok** to change to menu

use the ▲▼ buttons to scroll within display mode

⚠ **LEDs on measuring electronic MTI are dark/OFF**

1. Short circuit or circuit break. Change connection wires on clamp 1 / 2 of probe electronic.

∫ **Check connections of measuring electronic MTI**

2. Hazardous area output microprocessor unit **mipromex®** or measuring electronic MTI defective

∫ **Send unit back for repair!** .

The electronic insert MTI is plugged in the blue protection housing. Loosen the two outer M4-screws and remove the electronic insert MTI laterally towards the cable gland.

LED's on measuring electronic MTI are ON

3. Range monitoring did respond, measured value <10

∫ **Check with 0-point-function at menu item 5.3. , perform a new zero adjust**

4. Coax cable or probe defective (circuit break)

∫ **Send coax cable and probe back for repair!**

Calibration of MTI was possible, microprocessor unit mipromex® showing fault or after power cut showing measured value underflow (no measure):

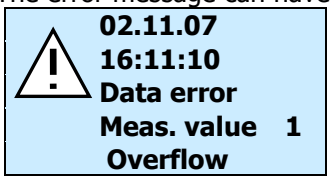
5. Hazardous area data input of **mipromex®** defective;

∫ **Send mipromex® unit back for repair!**

7.1.1. Technical error; Measured value 1 overflow

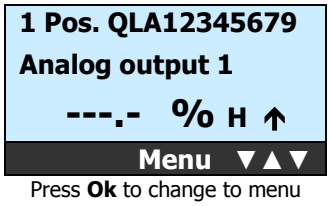
The error message can have different origin.

Date of error
Time of error
Measuring circuit 1 or 2
Error description



1. press **ok b**utton more than 2 seconds, the error is confirmed and the display changes back to last active menu point

Description of 1st meas. circuit position
Description of 1st meas. value
Non display of meas. value
Error display
ok button-functions / active keys

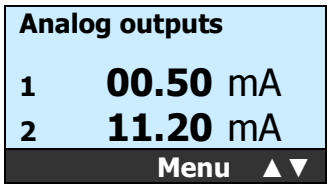


Press **Ok** to change to menu

Limit value high alarm is reached
Arrow up ⬆ signalizes : Meas. range overflow

use the ▲▼ buttons to scroll within display mode

Description of the outputs
Description of 1. and 2, meas. value
Display of actual value of current outputs
ok button-functions / active keys



Press **Ok** to change to menu

use the ▲▼ buttons to scroll within display mode

∫ **Check probe, product intrusion**

LEDs on MTI measuring electronic are ON

6. Range control active, measured value >3750

∫ **Scheck with 0-point function under Menu 5.3, perform new basic calibration**

∫ Probe not covered (empty), coax cable or probe defective (coax plug wet)

∫ Fault occurs only when probe covered (full): Impedance in function of product too high:

∫ **Send probe back for repair!**

6.2.2. Display error

Faulty or no display on the LCD display

1. Restart the program after 5 seconds of mains interruption.

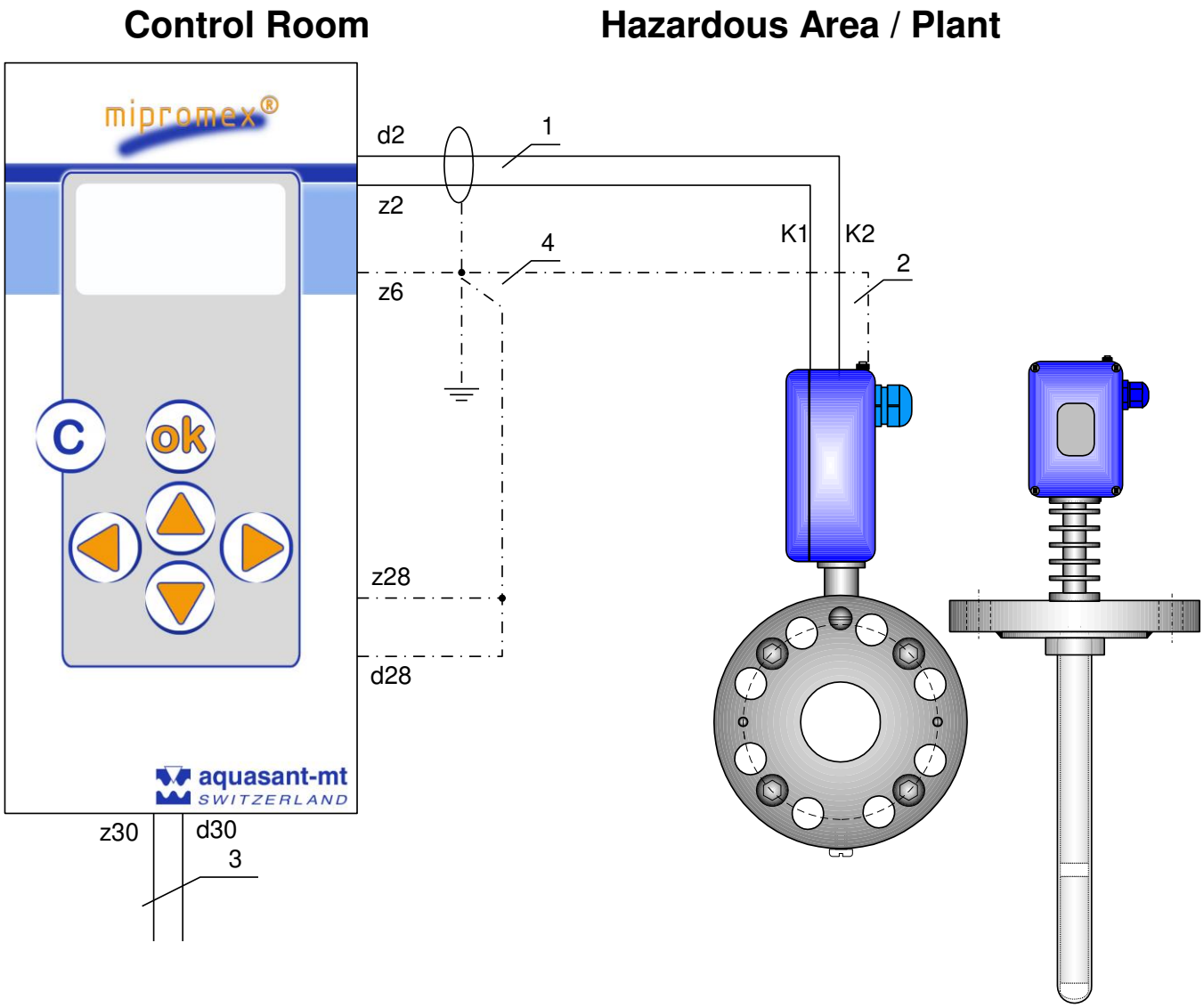
6.2.3. Radio equipment

∫ Radio/wireless equipment should not be operated in the immediate vicinity of the microprocessor unit **mipromex®**, of an open MTI measuring electronic or of the bar probe (measurements can be affected)

∫ Minimum distance 1 to 2 m

7. Wiring diagram

7.1. Measuring electronic/probe with fix connection

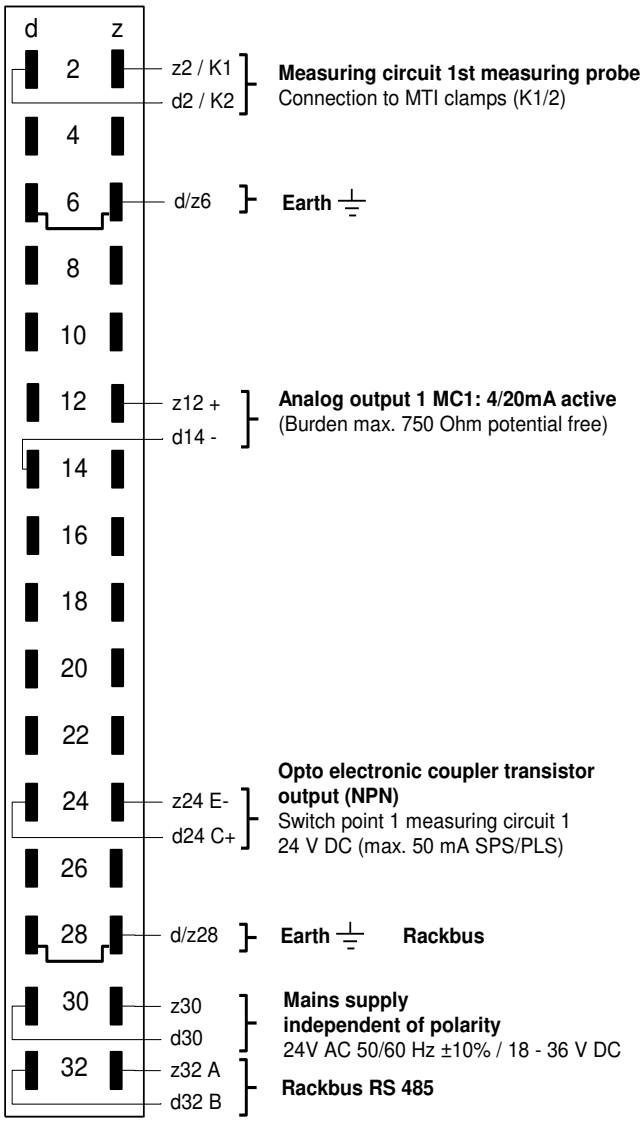


Pic. 4 Wiring diagram

1. 2 x 0.75 mm^2 shielded (both sides earthed in switch room and probe head)
2. MTI housing and probe are connected to the (factory/plant) equipment earths
3. Mains 24 V AC 50/60 Hz /DC ±10 % control voltage, polarity independent, without inductive load
4. Equipotential bond
   An equipotential bond must be fitted between the control room earth and the equipment earth (condition of hazardous area protection and for accurate data transmission)

7.2. Connections to female multipoint connector with 32 poles, type: MAT 411*

Microprocessor units with one measuring circuit input
Connections to female multipoint connector FI 32

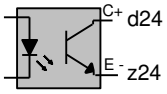


ELECTRICAL DATA
Euro plug-in card pin assignment

24 V-Version

Error message programmable in
0.1 mA-steps;
0.5 – 3.9 / 20.1 – 22 mA

Optokoppler
NPN



Pic. 5 FI 32 female multipoint connector to MAT 4110

Switch point 1 for measuring circuit 1 ***FSL*** (Fail Safe Low) ***Lo-Alarm***
Opto-electronic coupler transistor output NPN 1 disabled (measured value < limit switch value)

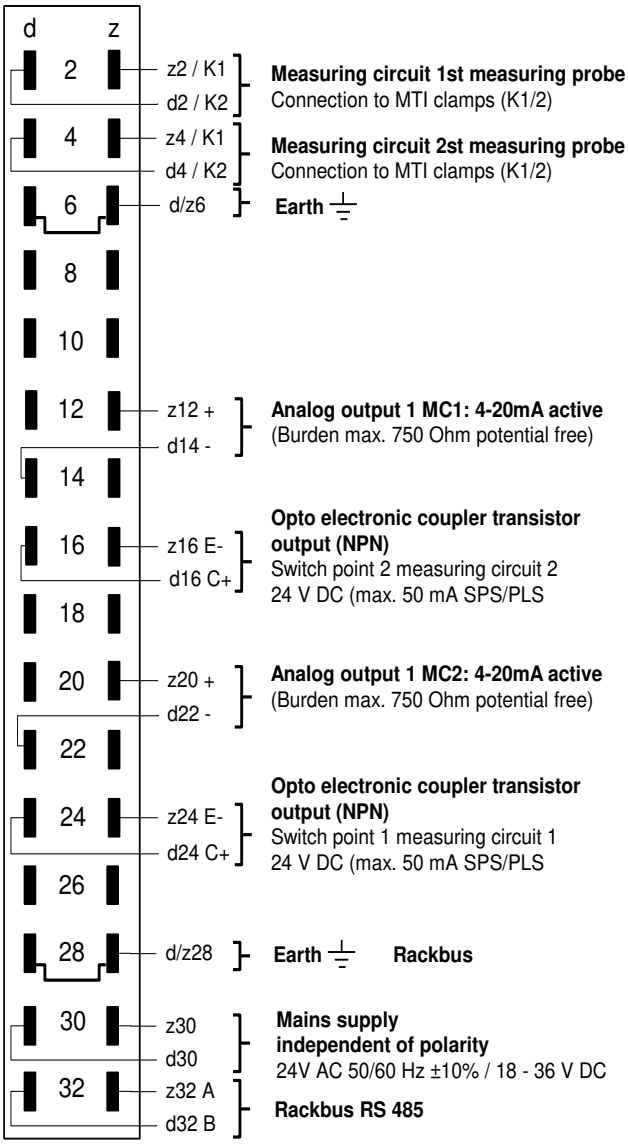
Switch point 1 for measuring circuit 1 ***FSH*** (Fail Safe High) ***Hi-Alarm***
Opto-electronic coupler transistor output NPN 1 disabled (measured value > limit switch value)

Switch point 2 not activated

Technical error level of analog output according to parameterization
Opto-electronic coupler transistor output NPN 1 disabled

7.3. Connections to female multipoint connector with 32 poles, type: MAT 422*/424*

Microprocessor units with two measuring circuit inputs
Connections to female multipoint connector FI 32



Pic. 6 FI 32 female multipoint connector to MAT 4220

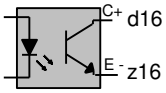
ELECTRICAL DATA

Euro plug-in card pin assignment

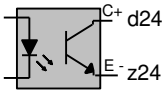
24 V-Version

Error message programmable in
0.1 mA-steps;
0.5 – 3.9 / 20.1 – 22 mA

Optokoppler
NPN



Optokoppler
NPN



Switch point 1 for measuring circuit 1 or 2 ***FSL*** (Fail Safe Low) ***Lo-Alarm***
Opto-electronic coupler transistor output NPN 1 disabled (measured value < limit switch value)

Switch point 1 for measuring circuit 1 or 2 ***FSH*** (Fail Safe High) ***Hi-Alarm***
Opto-electronic coupler transistor output NPN 1 disabled (measured value > limit switch value)

Switch point 2 not activated

Technical error level of analog output according to parameterization
Opto-electronic coupler transistor output NPN 1 disabled

7.4. Printed circuit board for 19"-Rack, Monorack, Wall- and Table Top housing

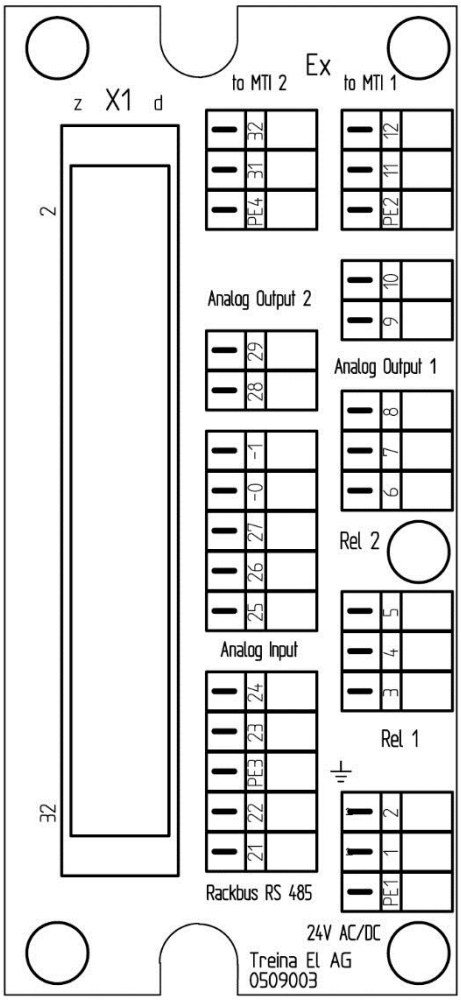
The Cage Clamp® connection clamps for cable diameter 0.08 – 2.5 mm² bared length 5 – 6 mm /0.22 in (without cable cover) are mounted with a special pre spanning tool.
Color coding:

- To the **blue** clamps: connection of the intrinsically safe field circuit. This one being allowed, with connection lines in accordance to DIN EN 60079-14, to be routed into the hazardous area.
- The **black/orange**- clamps are polarity independent current- inputs or -outputs

Dimension: *H x B x T 137 x 77 x 210 mm /* for 19"-plug in module Euro 3 HE/12TE pr*ofundity 160 mm*

Anschluss an: *Microprocessor unit mipromex®*

Artikel-Nr.: *02.03.18.011*



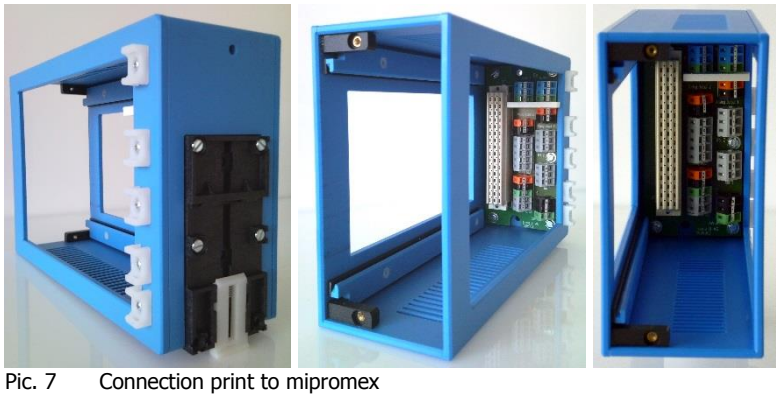
PE1 Earthing FI32: d/z6
1. Mains 24 V AC/DC 50/60 Hz (polarity independent) FI32: z30
2. Mains 24 V AC/DC 50/60 Hz (polarity independent) FI32: d30

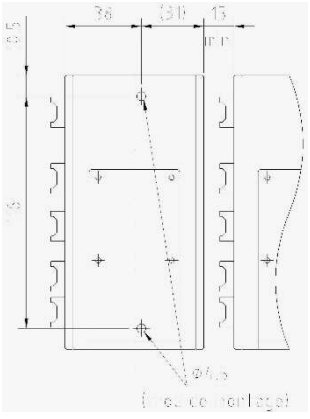
	Relay	Opto-e. coupler	
3.	1 NO	output E-	FI32: z24
4.	1 COM	output C+	FI32: d24
5.	1 NC	-	FI32: z22
6.	2 NO	output E-	FI32: z16
7.	2 COM	output C+	FI32: d16
8.	2 NC	-	FI32: z14

9. MC1 analog output 1 - FI32: d14
10. MC1 analog output 1 + FI32: z12
11. MC1 MTI 1 K1 FI32: z2
12. MC1 MTI 1 K2 FI32: d2

21. Rackbus RS 485 A FI32: z32
22. Rackbus RS 485 B FI32: d32
23. Analog input - FI32: d18
24. Analog input + FI32: d12
25. Digital input 1 (+24 V) FI32: d10
26. Digital input 2 (+24 V) FI32: z10
27. Digital input 3 (+24 V) FI32: d8
-0 Digital input D1-3 (0 V) FI32: z8
-1 Digital input D1-3 (0 V) FI32: z8
28. MC2 Analog output 2 - FI32: d22
29 MC2 Analog output 2 + FI32: z20

31. MC2 MTI 2 K1 FI32: z4
32. MC2 MTI 2 K2 FI32: d4

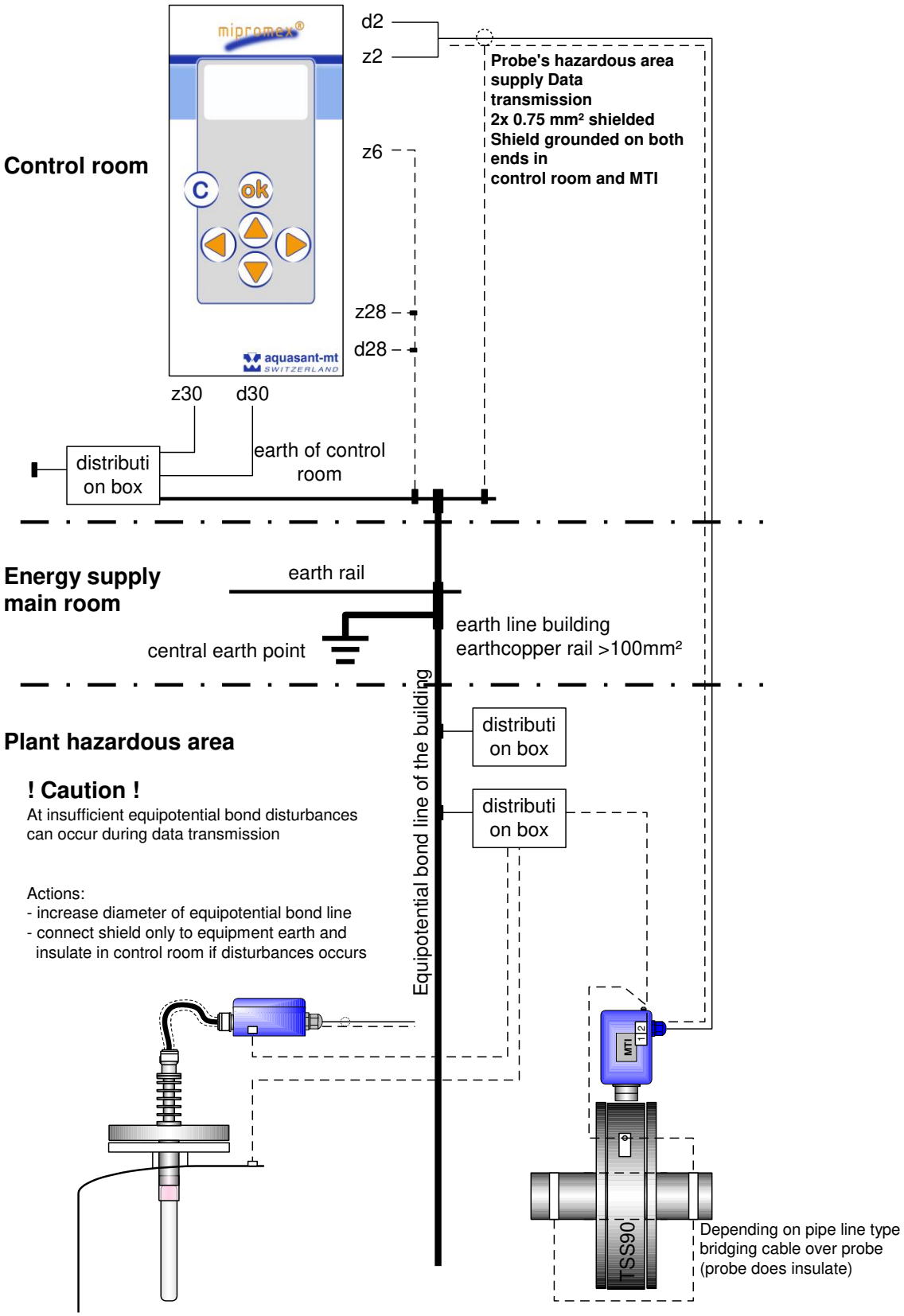




Pic. 7 Connection print to mipromex

7.5. Earthing of microprocessor units and probes

Equipotential bond and correct earthing for the hazardous area protection and against disturbances of the data transmission



Pic. 8 Earthing principle

8. Technical Data

8.1. mipromex® Analog transmitter type: MAT 411x

Construction
19"-plug in module, with aluminum-steel housing; IP 20

Assembly
19"-Rack type MR 7; 3 HE (Europ.sizes)
Monorack type MRM2; plastic housing for DIN-rail- or wall mounting.
Front plate fitting with Bopla housing.
Compact or table top housing

Purpose
- analog transmitter with intrinsically safe supply for one measuring electronic MTI xx. Transformation of a digital measuring signal into an analog signal with measuring range spread
- analog output 4 – 20 mA
- menu driven, multi language unit
- hazardous area (Ex) supply for one measuring electronic MTI xx
- shielded 19" plug in module
- one open collector outputs NPN

Operation/Display
Film keypad-front plate with graphical LCD-display, backlit, 6 buttons for data and parameter input

Data saving during power cuts
Battery buffer max. 10 years. Parameter storage into flash at battery failure

Dimensions
Height 3 HE; Width 12 TE
Front plate: Height x width 128 x 61 mm
Plug in module: Height x width x depth 100 x 60 x 160 mm
7 units can be inserted on a 19"-rack

Weight
690 g

Mains supply
24 VDC 50/60 Hz / 24 VDC Range 20 – 39 VDC
independent of polarity

Switch on current
momentary (1ms) approx. 1A

Power input t
ca. 3.4 VA (I = 140 mA)

Fuses
8.5 x 8.5 mm miniature fuse MST 400 mA

Hazardous area supply and signal transmission
[**Ex ia] IIC** Pulse modulated supply signal
open circuit voltage max. 18.9 V; typically 17 V
short circuit current max. 49 mA; typically 40 mA

[Ex d ia], Pulse modulated supply signal
open circuit voltage max. U ≤19.3 V; typ. 17 V
short circuit current max. I ≤75 mA; typ. 70 mA

Signal transmission
1 measuring circuit, pulse modulated supply signal

Signal line short circuit
power input max. MAT 4110: 160 mA

Ambient temperature
0 °C ... 45 °C

Storage temperature
–20 °C ...+45 °C, ideally 20 °C

Measurement range
0 – 3700 pulses

Data display
MeV 0 – 3700

Switching hysteresis
1 pulse = 0.028 pF for the 100 pF measuring range

Connection
32 pole FI connector, coding facility

Open collector NPN output
1 potential free NPN transistor output
Limit switch min./max.
Security min. or max. selectable

Rupturing tension NPN output
30 V DC

Continuous current NPN output
50 mA

Rupturing capacity NPN output
150 mW

Analog output
one active 4 – 20 mA output, max.working resistance/burden 750 Ω, not for hazardous area, with potential separation, tech. fault 0.5 – 4 / 20 - 22 mA adjustable

Interface
RS 232 / RS 485

Monitoring
Self-monitoring detection system for: defective probe; short circuit/interruption signal supply to hazardous area (cable break security); measurement range; main power interruption
mipromex® -error messages

Test and certification
II (2) G [Ex ia] IIC
II (2) D [Ex iaD]
II (2) GD

RL 94/9/EG SEV 09 ATEX 0132

Confidential test report No.: 08-IK-0396.01 with amendment 1
Unit also available without hazardous area protection

The **mipromex**® must be installed outside of the Ex-Zone
Ex-connection:

Measuring electronic MTI ... in protection housing or bar probe type S**; K**; F*

EMC-tested, STS 024 report NR. 990102WS corresponds to

EN 1127-1:2007	
EN 61241-0:2006	EN 61241-11 :2006
EN 60079-0:2006	EN 60079-11 :2007

CE

8.2. mipromex® Analog transmitter type: MAT 422x/424x

Construction
19"-plug in module, with aluminum-steel housing; IP 20

Assembly
19"-Rack type MR 7; 3 HE (Euro)
Monorack type MRM2; plastic housing for DIN-rail- or wall mounting.
Front plate fitting with Bopla housing.
Compact or table top housing

Purpose
- analog transmitter with intrinsically safe supply for two measuring electronics MTI xx. Transformation of the digital measuring signals into analog signals with measuring range spread
- analog outputs 4 – 20 mA
- menu driven, multi language unit
- Ex supply for two measuring electronics MTI xx
- shielded 19" plug in module
- one each open collector outputs NPN

Operation/Display
Film keypad-front plate with graphical LCD-display, backlit, 6 buttons for data and parameter input

Data saving during power cuts
Battery buffer max. 10 years. Parameter storage into flash at battery failure

Dimensions
Height 3 HE; Width 12 TE
Front plate: Height x width 128 x 61 mm
Plug in module: Height x width x depth 100 x 60 x 160 mm
7 units can be inserted on a 19"-rack

Weight
705 g

Mains supply
24 VAC ± 10 % 50/60 Hz / 24 VDC Range 18 – 36 VDC
independent of polarity

Switch on current
momentary (1ms) ca. 1A

Power input
ca. 4 VA (I = 200 mA)

Fuses
8.5 x 8.5 mm miniature fuse MST 400 mA

Hazardous area supply and signal transmission
[Ex ia] IIC Pulse modulated supply signal
open circuit voltage max. 18.9 V; typically 17 V
short circuit current max. 49 mA; typically 40 mA

[Ex d ia], Pulse modulated supply signal
open circuit voltage max. U ≤19.3 V; typ. 17 V
short circuit current max. I ≤75 mA; typ. 70 mA

Signal transmission
2 measuring circuits, pulse modulated supply signal

Signal line short circuit
power input max. MAT 4220/4240: 280 mA

Ambient temperature
0 °C ... 45 °C

Storage temperature
–20 °C ...+45 °C, ideally 20 °C

Measurement range
0 – 3700 pulses

Data display
MeV 0 – 3700

Switching hysteresis
1 pulse = 0.028 pF for the 100 pF measuring range

Connection
32 pole FI connector, coding facility

Open collector NPN output
one each potential free NPN transistor output for each measuring circuit Limit switch min./max.
Security min. or max. selectable

Rupturing tension NPN output
30 V DC

Continuous current NPN output
50 mA

Rupturing capacity NPN output
150 mW

Analog output
one each, active 4 – 20 mA output each, max. working resistance/burden 750 Ω, not for hazardous area, with potential separation, tech. fault 0.5 – 4 / 20 - 22 mA adjustable

Interface
RS 232 / RS 485

Monitoring
Self-monitoring detection system for: defective probe; short circuit/interruption signal supply to hazardous area (cable break security); measurement range; main power interruption **mipromex**® -error messages

Test and certification
II (2) G [Ex ia] IIC
II (2) D [Ex iaD]
II (2) GD

RL 94/9/EG SEV 09 ATEX 0132

Confidential test report No.: 08-IK-0396.01 with amendment 1
Unit also available without hazardous area protection

The **mipromex**® must be installed outside of the Ex-Zone
Ex-connection:

Measuring electronic MTI ... in protection housing or bar probe type S**; K**; F*

EMC-tested, STS 024 report NR. 990102WS corresponds to

EN 1127-1:2007	
EN 61241-0:2006	EN 61241-11 :2006
EN 60079-0:2006	EN 60079-11 :2007

CE

8.3. Measuring electronic MTI for measuring probes

Probes with separate or integrated measuring electronic MTI

Hotspots

- *MTI – measuring electronic in protection housing*
- *for bare-, strip- and pipe probes with and without measuring electronic in the connection head*
- *Measuring electronic slot*
- *Ex-version ATEX ExG / ExD*

MTI structure:

- Aluminium gush, Inox or Polyester-protection housing IP 65
- Cover and screw are saved
- Viton cover joint
- screwed cable gland M16 x 1.5 or M20 x 1.5

Dimension:

Aluminium gush-housing: H x B x L = 57 x 80 x 125 mm
Inox-housing: H x B x L = 85 x 82 x 142 mm
Polyester-housing: H x B x L = 55 x 80 x 110 mm

Definition:

Under value -10/+0 pF // upper value -0/+10 pF

Temperature range:

–40 bis +60 °C ambient air temperature

Connection:

For all S*K ** bar- and TSS pipe probes with HF-connection

Article-N°.: *02.24.06.0000*

Example: MTI in housing	MTI	50/2	A	Gv	L	-	2		K	H
Example: MTI slot	MTI	50/2	A	E	-	E	2		K	H
Your version:	MTI									

Pic. 9 Measuring electronic

MTI	= measuring electronic slot	MTI

Measuring range:

10	= 3000 Imp/10 pF	
15	= 2400 Imp/10 pF	
20	= 1600 Imp/10 pF	
50	= 650 Imp/10 pF	50
100	= 350 Imp/10 pF	
200	= 180 Imp/10 pF	
300	= 120 Imp/10 pF	
400	= 90 Imp/10 pF	
600	= 60 Imp/10 pF	
...	= Special range	

Base calibration range:

0	= calibration range in pF of measuring	
1...	= calibration range in pF of measuring	

Measuring technology:

A	= Analog measuring technics for interface	A

Form or housing version

E	= Slot	E
G	= Protection housing IP 65 blue powder coated angled	
Gd	= Protection housing IP 68 blue powder coated	
Gv	= Protection housing IP 68 stainless steel	Gv
Gk	= Protection housing IP 65 Polyester conductive	

Connection to the probe:

K	= UHF-connection	
L	= Lemo-connection	
S	= dual HF-connection SMA	

Slot-version:

E	= measuring electronic slot angled	E
R	= measuring electronic slot round (old)	
O	= measuring electronic slot round for ExD-head	
K	= measuring electronic slot angled for plastics-head	

Ex-version: SEV 09 ATEX 0133 X / CE 0036/049

0	= without protection for hazardous area CE	
2	= protection for hazardous area II 2G Ex ia IIC T6 / II 2D	2

Differential measuring:

2	= 2. Measuring input for compensation (Antistatic protection	

Trimmer:

K	= 20 pF Ceramic trimmer (vibrationsfest) (all MTI from 10 to 50)	K

Version:

H	= increased ESD (electrostatic) protection	H

8.3.1. Technical Data MTI . . . / .

Construction/design type
Plug-in measuring electronic with stainless steel cover in protection housing, with coax connection

Installation
Protection housing with mounting holes, plug-in electronic insert, mounting with 2 screws

Function
Linear conversion of an impedance range into a digital measuring norm signal

Operation/display
One time only calibration of the coax cable and the (dry, clean, empty) probe. LED display for quick setting

Housing
Cast aluminum housing, powder coated, solvent resistant, cover and screws secured; IP 65; coax probe connector and cable gland M16, IP 65; blue color coded

Dimensions
Height x width x length 57 x 80 x 175 mm

Weight of electronic
140 g

Weight of housing
740 g incl. MTI and transmitter

Supply/connection hazardous area
Shielded 2 core cable 0.75 mm² to all TREINA microprocessor measuring and control units types VTI, LTI, FTI, QTI ... K/S and mipromex®; cable length up to (100m) or max. C= 120 nF / R = 30 Ohm line impedance.

Transmission signal
Pulse packages, superimposed to the power supply

Measuring circuit voltage/current
V ~ 11 V I ~ 13,5 mA

Nominal data of supply voltage
$U_N \leq 18{,}9$ V $I_N \leq 49$ mA
Ci_{max} 60 nF $Li_{max} \leq 0$ mH
$P_0 \leq 231$ mW

Ambient temperature
–20 . . . +60 °C

Storage temperature
–30 up to +80 °C, ideally +20 °C

Measurement range
10 / 20 / 50 / 100 / 200 / 300 corresponding to 0 to 3500 pulses, special ranges can be supplied, max. pulse range 3700 pulses

Resolution
Max. 0.003 pF/pulse

Standard measuring range for bar probes
Type STK .../100/200/300
55 pF, Type MTI 50/(0 - 16) basic calibration range (0 – 16) depending on coax cable and probe length, is determined by manufacturer

Basic calibration range
MTI .../. 0 up to 16, 0 to 500 pF

Monitoring frequency
~ 500 kHz

Linearity
Deviation < 0,1 % (without probe)

Hysteresis
1 monitoring pulse

Influence of temperature 5 – 45 °C
Type MTI .../.D digital: < ± 10 measurement pulses
Type MTI .../.A analog: < ± 3 measurement pulses

Test and certification
II 2 G Ex ia IIC
II 2 D Ex iaD
II 2 GD

RL 94/9/EG SEV 09 ATEX 0133 X

confidential test report N° : 08-IK-0396-01

EN 1127-1:2007	EN 60079-26 :2007
EN 61241-0:2004	EN 61241-11 :2006
EN 60079-0:2006	EN 60079-11 :2007

CE 1254

Unit also available without (Ex-Zone) hazardous area protection

Only for connection to microprocessor unit .TI.... K/S and mipromex®

SEV 09 ATEX 0132 II (2)G [Ex ia] IIC
EMC-tested, STS 024 test report N° : 990102WS corresponds to directive 94/9/EG CENELEC Norms
EN 50081-2: 1993
\+ EN 50082-2: 1995
+pr EN 50082-2: 1996

Feed line to probe

Version
- MTI fix mounted onto probe

- Coax cable with UHF plug on both ends

Mounting
Screw in UHF plugs and shrink heat-shrinkable sleeves

Length
0.3 m, 1 m, 2 m and 3 m

Code color brown
High temperature resistant up to 200 °C, Teflon coated, only suitable for permanent installations

Code color blue
Highly flexible, temperature resistant up to max. 80 °C
Deviation at cable move ±2 measuring pulse

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