Bedienungsanleitung
Instruction Manual
Notice d'utilisation

Transmitter Cond Ind 7100 PA

69954

METTLER TOLEDO

Mettler-Toledo GmbH
Process Analytics
Im Hackacker 15, P.O. Box
CH-8902 Urdorf
Switzerland
Phone: +41-1-736 22 11
Fax: +41-1-736 26 36
www.mtpro.com

TA-194.360-MTX02

Gewährleistung

Innerhalb von 1 Jahr ab Lieferung auftretende Mängel werden bei freier Anlieferung im Werk kostenlos behoben.

Softwareversion: 2.x

Stand Bedienungsanleitung: 06.06.2005

Warranty

Defects occurring within 1 year from delivery date shall be remedied free of charge at our plant (carriage and insurance paid by sender).

Software release: 2.x

Date of issue: June 6, 2005

Garantie

Tout défaut constaté dans les 1 an à dater de la livraison sera réparé gratuitement dans notre usine à réception franco de l'appareil.

Version logiciel : 2.x

Version du mode d'emploi : 06.06.2005

FM

CE

Contents

English

1 Information on this instruction manual

1.1 Markings

The warning symbol means that the instructions given must always be followed for your own safety.

Failure to follow these instructions may result in injuries

Notes provide important information that should be strictly followed when using the device.

When a key is shown, its function is explained.

When a display is shown, the corresponding information or operating instructions are provided.

Operating instructions

- Each operating instruction is preceded by a dot.

Enumerations

- Each enumeration is preceded by a dash.

Model designation

For practical purposes, the Transmitter Cond Inc 7100 PA is simply referred to as Transmitter in this instruction manual.

Trademarks

The following names are registered trademarks. For practical reasons they are shown without trademark symbol in this manual.

- Registered trademarks
  - Sensocheck®
  - Sensoface®
  - GainCheck®
  - InPro®

English

2 Safety information

2.1 Be sure to read and observe the following instructions!

The device has been designed in accordance with the state of the art and complying with the applicable safety regulations.

When operating the device, certain conditions may nevertheless be dangerous for the operator or cause damage to the device.

Whenever it is likely that protection has been impaired, the device shall be made inoperative and secured against unintended operation.

The protection is likely to be impaired if, for example:

- the device shows visible damage
- the device fails to perform the intended measurements
- after prolonged storage at temperatures above 70 °C
- after severe transport stress

Before recommissioning the device, a professional routine test in accordance with EN 61010-1 must be performed. This test should be carried out by the manufacturer.

The Transmitter is approved for installation in ATEX, FM Zone 1 with measurement in Zone 0, and FM Class I Div 1.

The electrodeless conductivity sensors of the InPro 7250 series are approved for operation in hazardous locations.

Before commissioning it must be proved that the intrinsic safety is maintained when connecting the device to other equipment, such as segment coupler and cable.

For hazardous-area applications, the Transmitter may only be connected to explosion-proof segment couplers, power supplies, ...

The Transmitter may be operated in accordance with the FISCO model.

The stipulations of EN 60079-10: 1996 and the following must be observed for the installation.

In hazardous locations the Transmitter may only be cleaned with a damp cloth to prevent electrostatic discharge.

3 PROFIBUS technology

3.1 General

PROFIBUS is a digital communication system that connects different field devices over a common cable and integrates them into a control system. In the long term, PROFIBUS will replace the 4-20 mA technology, which only supplies pure measured values.

Advantages of the PROFIBUS technology are:

- easy and cost-saving cabling
- convenient operation over a central control station
- transmission, evaluation and control of high amounts of data from field device to control station.
- devices installed in hazardous locations are configured and maintained from the control station

PROFIBUS is the leading open fieldbus system in Europe. Its application range covers manufacturing, process and building automation. As open fieldbus standard to EN 50170, PROFIBUS ensures communication of different devices over one bus.

The PROFIBUS User Organization provides for further development and maintenance of the PROFIBUS technology. It combines the interests of users and manufacturers.

3.2 Variants and basic characteristics

PROFIBUS determines the technical and functional characteristics of a serial bus system.

There are three PROFIBUS variants:

- PROFIBUS-FMS (FMS protocol)
  - is particularly suited for exchanging large amounts of data between control devices. It operates according to the RS 485 standard with transmission rates up to 12 MBits/sec.
- PROFIBUS-DP (decentralized peripherals)
  - is tailored for communication of automation systems and distributed peripherals. It operates according to the RS 485 standard with transmission rates up to 12 MBits/sec.
- PROFIBUS-PA (process automation)
  - is dedicated to the process industry. It permits connection of sensors and actuators to a common bus even in hazardous locations. PROFIBUS-PA has a transmission rate of 31.25 kBits/sec.

PROFIBUS distinguishes between two types of devices:

- Masters
  - control the data traffic on the bus. They send messages without external request.
- Slaves
  - are peripheral devices such as valves, drives, transmitters and analyzers. They can react acyclically to servicing, configuration and diagnostic tasks of the master. The central controller cyclically reads the measurement data with status.

3.3 Definitions for PROFIBUS-PA

The bus protocol defines type and speed of the data exchange between master and slave devices and determines the transmission protocol of the respective PROFIBUS system.

PROFIBUS-PA permits cyclic and acyclic services.

- Cyclic services are used for transmission of measurement data and actuating commands with status information.
- Acyclic services are used for device configuration, maintenance and diagnostics during operation.

The device profile defines the device class and typical functionalities with parameters, ranges and limit values.

The FISCO model developed by the German PTB for hazardous locations permits connection of several devices to one common bus and defines permissible limits for device and cable parameters.

3.4 PROFIBUS-PA with the Transmitter

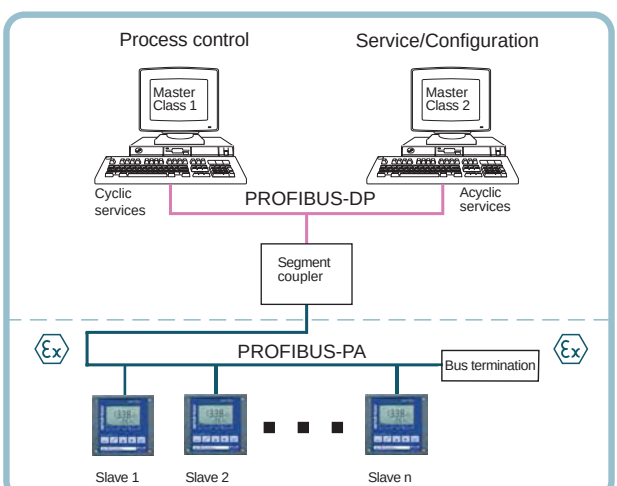


Fig. 3.1 Typical configuration of a PROFIBUS system with the Transmitter

4 Description

4.1 Intended use

The Transmitter is a PROFIBUS-PA analyzer. It is used for conductivity measurement with electrodeless sensor in the field of water/waste-water treatment, electroplating, biotechnology, food processing, pharmaceutical, chemical and paper industry.

The rugged molded enclosure can be wall mounted or fixed into a control panel. It can also be mounted at a post or pipe.

The protective hood provides additional protection against direct weather exposure and mechanical damage.

The device can be easily replaced since the terminals are of a plug-in design.

The device is designed for concentration determination of NaCl, HCl, NaOH, H_2SO_4, HNO_3.

4.2 Technical features

Communication between measuring point and control room is via PROFIBUS-PA. The data exchange (cyclic and acyclic) is performed in accordance with the PROFIBUS-DP/V1 protocol.

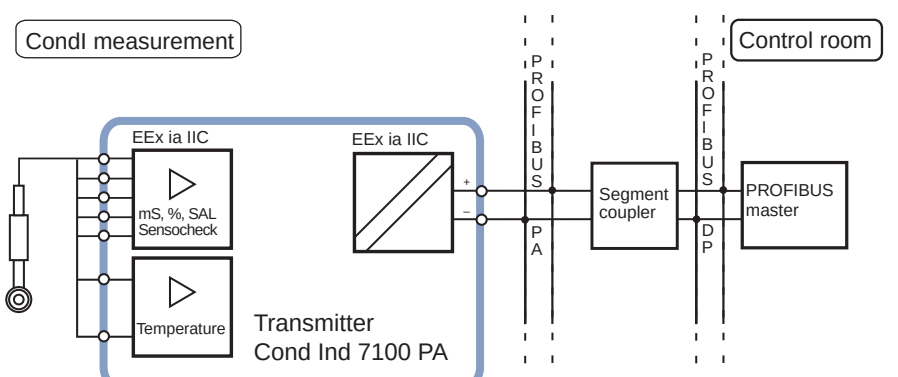


Fig. 4.1 System functions (hardware)

4.3 Communication model

The device performance is described by function blocks according to the PNO profile for Process Control Devices.

The respective blocks contain different parameters and functions.

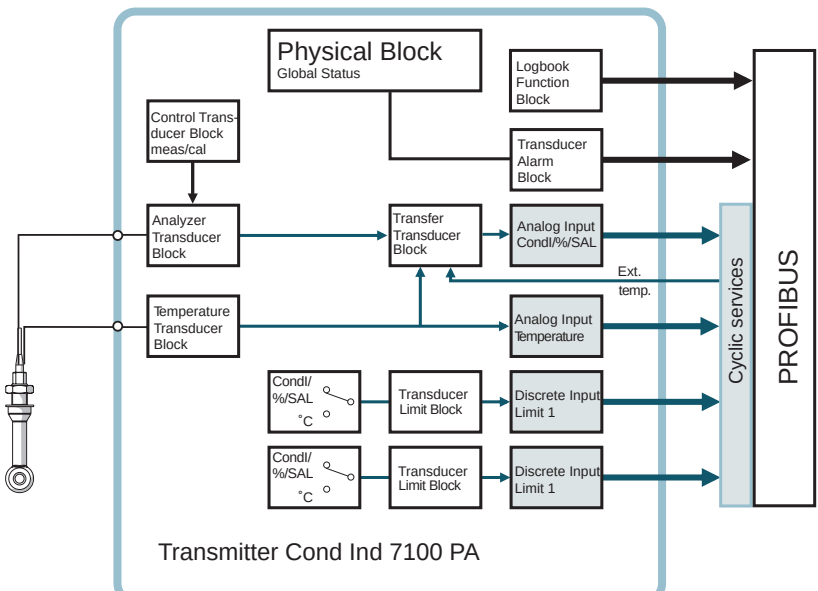


Fig. 4.2 Communication model Transmitter Cond Ind 7100 PA according to the PNO Profile

4.4 Profile for Process Control Devices (extract)

Type of block	Block contents (general)	Block contents (detailed)
Physical Block (PB)	Description of device	Measurement procedure, device configuration Serial number, manufacturer name Operating state (run, maintenance, ...) Global status, diagnostics information
Transducer Block (TB)	Measurement procedure with interpretation	Process variable (plain text and unit) Number of measurement ranges (MR), start and end value of MR, active MR Autorange function On/Off Sampling rate of measured values Uncorrected measured value with status
Control Transducer Block	Control of device functions	Status of function execution of respective Transducer Blocks Slope of sensor characteristic (cell factor)
Transfer Transducer Block	Pre-processing of a measured value	Measured value pre-processing Temperature compensation Selection of pre-processing function
Transducer Limit Block	Limit monitoring	Block (TB) for limit setting (select input variable) Threshold, effective direction, hysteresis On-delay, off-delay Reset behavior, reset confirmation Limit status (active, not active)

Type of block	Block contents (general)	Block contents (detailed)
Analog Input (AI) Function Block	Measured value	Currently measured value with status and scale Rise time, hysteresis of AI limits Upper/lower alarm limit Upper/lower warning limit Switchover manual/automatic operation, measured value simulation Fail-safe behavior
Discrete Input (DI) Function Block	Digital input	Switchover manual/automatic operation Signal inversion Fail-safe behavior Limit value message/status
Transducer Alarm Block	Signaling of states and events	Required maintenance, function check, errors, limit values incl. summing Binary messages (error messages)
Logbook Function Block	Registration of states and events	Power on, power off, reset State of execution (Logbook status) Number of entries Navigation through entries

Tab. 4.1: Profile for Process Control Devices (function contents)

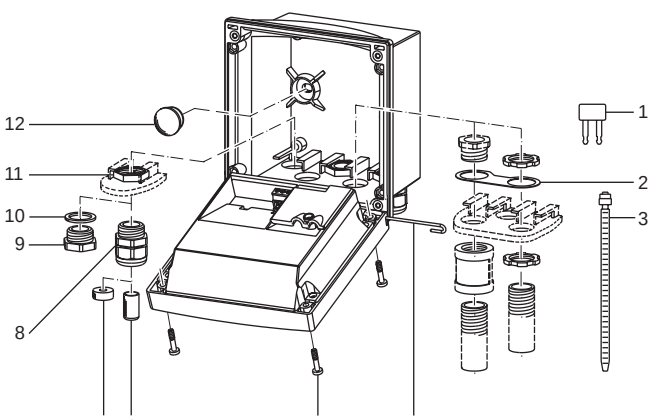
5 Assembly

5.1 Package contents and unpacking

Unpack the device carefully. Check the shipment for transport damage and completeness.

The package should contain:

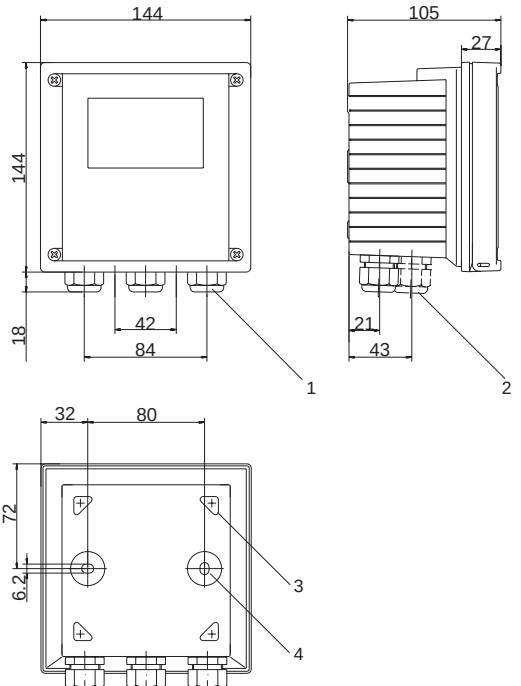
- Front unit of Transmitter
- Lower case
- This instruction manual
- Short instruction sheet
- Floppy disk with GSD file Mett7533.GSD
- Bag containing small parts:



1 Jumper (1 piece)
2 Washer (1 piece): for conduit mounting: Place washer between enclosure and nut
3 Cable ties (3 pieces)
4 Hinge pin (1 piece): insertable from either side
5 Enclosure screws (4 pieces)
6 Sealing inserts (3 pieces)
7 Rubber reducer (1 piece)
8 Cable glands (3 pieces)
9 Filler plugs (3 pieces)
10 Gaskets (3 pieces)
11 Hexagon nuts (3 pieces)
12 Sealing plugs (2 pieces): for sealing in case of wall mounting

Fig. 5.1 Assembling the enclosure

5.2 Mounting plan



1 Cable glands (3 pieces)

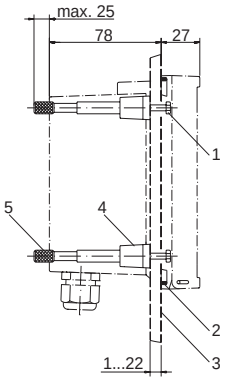
2 Breakthroughs for cable gland or conduit 1/2", ø = 21.5 mm (2 breakthroughs)

Conduits not included!

3 Breakthroughs for pipe mounting (4 breakthroughs)

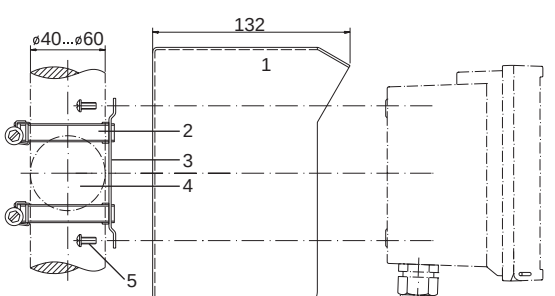
4 Breakthroughs for wall mounting (2 breakthroughs)

Fig. 5.2 Mounting plan



1 Screws (4 pieces)
2 Gasket (1 piece)
3 Panel
4 Span pieces (4 pieces)
5 Threaded sleeves (4 pieces)

Fig. 5.3 ZU 0275 panel-mount kit, panel cutout 138 x 138 mm (DIN 43700)



1 ZU 0276 protective hood (if required)
2 Hose clamps with worm gear drive to DIN 3017 (2 pieces)
3 Pipe-mount plate (1 piece)
4 For vertical or horizontal posts or pipes
5 Self-tapping screws (4 pieces)

Fig. 5.4 ZU 0274 pipe-mount kit

1 Protective hood

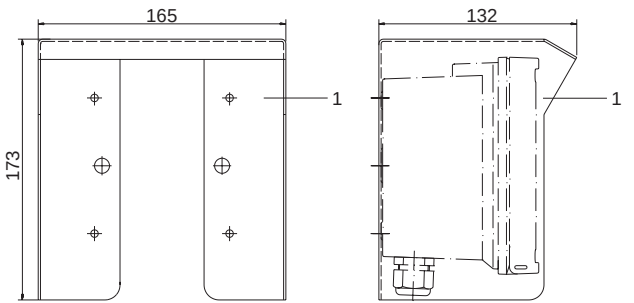


Fig. 5.5 ZU 0276 protective hood for wall and pipe mounting

6 Installation and connection

6.1 Information on installation

Installation may only be carried out by trained experts in accordance with this instruction manual and as per applicable local and national codes.

Be sure to observe the technical specifica - tions and input ratings.

According to the PTB FISCO model, the limits of the permissible parameter range must be observed for connection in a hazardous location.

See PROFIBUS Technical Guidelines PNO Order No.: 2.091

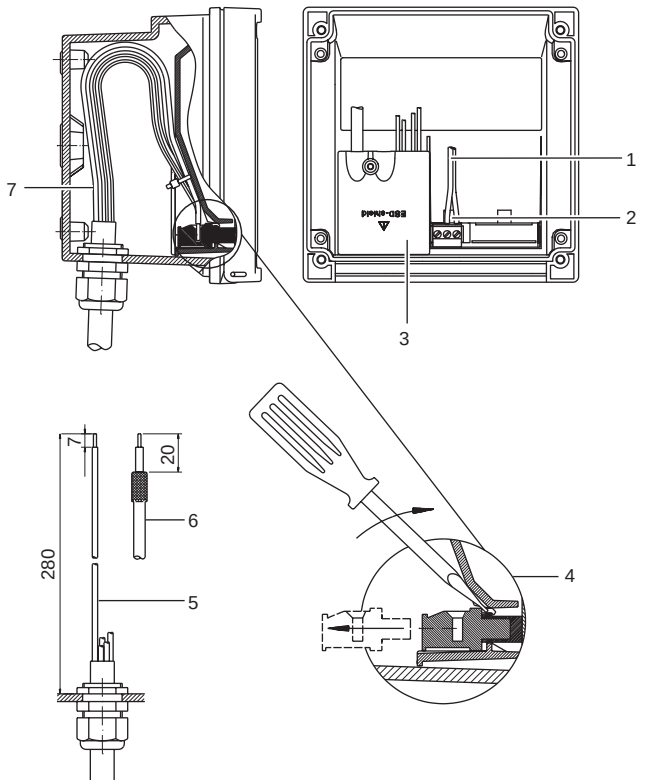
Be sure not to notch the conductor when stripping the insulation.

For easier installation, the terminal strips are of a plug-in design. The terminals are suitable for single wires and flexible leads up to 2.5 mm^2 (AWG 14).

A special twisted and shielded two-wire cable (e.g. Siemens) is used as bus cable.

Division 2 wiring

The connections to the Transmitter must be installed in accordance with the National Electric Code (ANSI-NFPA 70) Division 2 hazardous (classified) location non-incendive wiring techniques.



1 Connection leads PROFIBUS-PA
2 Area for placing the screwdriver to pull out the terminals
3 Cover for sensor and temperature probe terminals
4 Pulling out the terminal blocks using a screwdriver
5 Recommended stripping lengths for multi-core cables
6 Recommended stripping lengths for coaxial cables
7 Cable laying in the device

Fig. 6.1 Information on installation

6.2 Terminal assignments

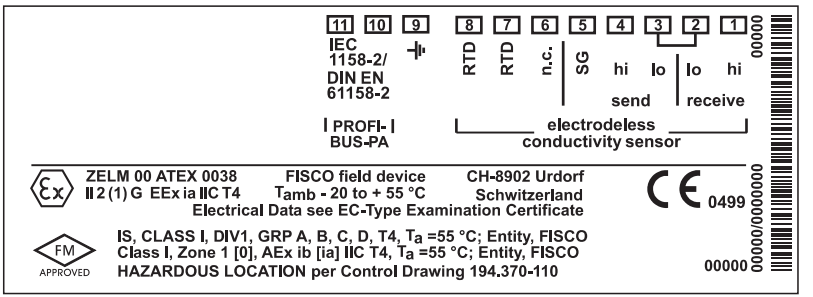
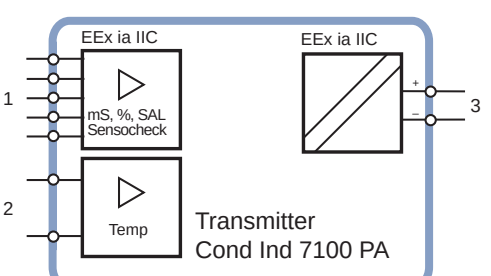


Fig. 6.2 Terminal assignments of Transmitter

6.3 Overview of the Transmitter



1 Input for electrodeless conductivity sensor
2 Input for temperature probe
3 Bus connection

Fig. 6.3 Inputs and outputs

Conductivity measurement with the InPro 7250 ST electrodeless conductivity sensor

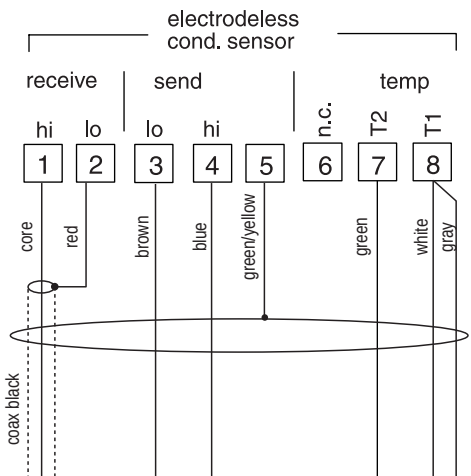


Fig. 6.4 Conductivity measurement with the InPro 7250 ST electrodeless conductivity sensor

The electrodeless conductivity sensor is used to measure low to highest conductivity values.

Conductivity measurement with the InPro 7250 HT electrodeless conductivity sensor

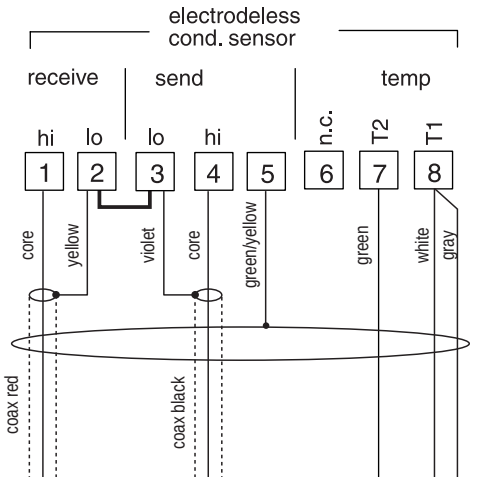


Abb. 6.5 Conductivity measurement with the InPro 7250 HT electrodeless conductivity sensor

The electrodeless conductivity sensor is used to measure low to highest conductivity values.

7 Commissioning

7.1 Checklist

Commissioning may only be carried out by trained experts.

Before commissioning the Transmitter, the following requirements must be met:

- The device must not show any damage.
- When recommissioning the device after a repair, a professional routine test in accordance with EN 61010-1 must be performed.
- It must be proved that the intrinsic safety is maintained when connecting the device to other equipment.
- It must be ensured that the device is configured in accordance with the connected peripherals.
- All connected voltage and current sources must correspond to the technical data of the device.
- The device must only be connected to explosion-proof segment couplers, power supplies, ...

8 Operation

8.1 Operation possibilities

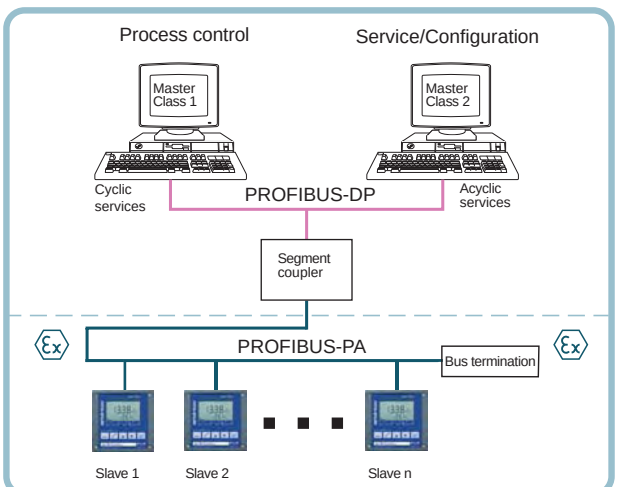
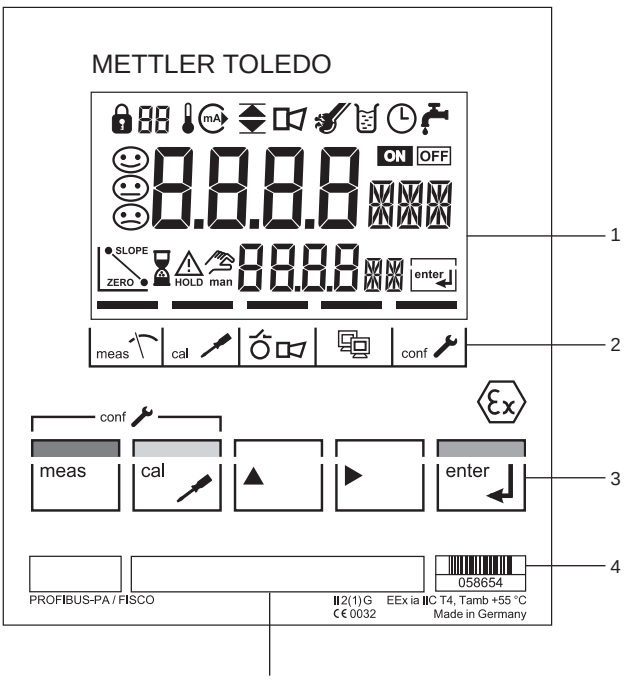


Fig. 8.1 System configuration

The device can be operated as follows:

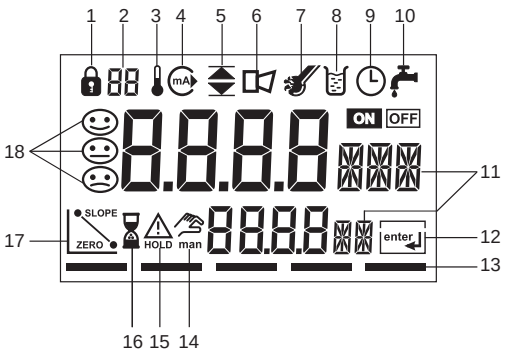
- using the keypad on the device
- using an operating tool in the service station



1 Display
2 Mode indicators
   - Measuring mode
   - Calibration mode
   - Alarm
   - PROFIBUS-PA communication
   - Configuration mode
3 Keypad
4 Coding
5 Rating plate

Fig. 8.2 Front view of Transmitter

Display



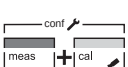
1	Mode code entry	10	Not connected
2	Display of measured variable	11	Unit symbol
3	Temperature	12	Proceed with enter
4	Not connected	13	Bar for device status
5	Limit values	14	Manual temp indicator
6	Alarm	15	Hold state active
7	Sensocheck	16	Wait
8	Calibration	17	Sensor data
9	Interval/response time	18	Sensoface

Fig. 8.3 Display of Transmitter

Keypad functions

Measurement

Calibration



Configuration

Select digit position
Selected position flashes

Change digit

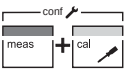
Prompt in display:
Continue in program sequence

Calibration/configuration: Confirm entries, next configuration step

Further key combinations are explained in the respective function descriptions.

8.3 Mode code

After pressing meas and/or cal you can enter one of the following mode codes to access the designated mode:



conf, 0000	Error Info
conf, 1200	Configuration mode

cal, 0000	Cal Info
cal, 1001	Zero point calibration
cal, 1015	Adjusting temp probe
cal, 1100	Calibration mode
cal, 1125	Input/adjustment of transfer ratio
cal, 2222	Test mode

8.4 Safety functions

Sensocheck, Sensoface sensor monitoring

Sensocheck continuously monitors the sensor.

Sensocheck can be switched off.

Sensoface provides information on the conductivity sensor condition.

The primary coil and its lines are checked for short circuits, the secondary coil and its lines are checked for open circuits.

GainCheck manual device self-test

A display test is carried out, the software version is displayed and the memory and measured value transfer are checked. The GainCheck function ensures device operability.

Start GainCheck manual device self-test

Automatic device self-test

The automatic device self-test checks the memory and measured-value transfer. It runs automatically in the background at fixed intervals.

Hold state

The Hold state is a safety state that is activated in the case of interventions such as configuration and calibration. The Transmitter freezes the last valid measured value and sends a status message to the control system.

This symbol indicates that the device is in the "Hold" state.

The Hold state is activated by the following mode codes:

- Calibration
  - Mode code 1001
  - Mode code 1015
  - Mode code 1100
  - Mode code 1125
  - Mode code 2222
- Configuration
  - Mode code 1200

The measured value and Hold are displayed alternately

- Check whether the measured value is plausible

- End the Hold state

After 20 sec (for measured value stabilization) the device returns to measuring mode.

8.5 Mode indicators

Measuring mode

The Transmitter is in measuring mode.

Calibration mode

Calibration mode is active.

Alarm

During an error message the red alarm LED beneath the display flashes.

The alarm response time is permanently set to 10 sec.

PROFIBUS-PA communication

The Transmitter communicates via PROFIBUS-PA and can be configured from the service station. Measured values, messages and device identification can be downloaded at any time. This allows integration in fully automatic process cycles.

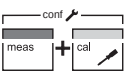
Configuration mode

The Transmitter is in configuration mode.

8.6 Configuration

In the configuration mode the device parameters are set.

The following steps must be executed:



- Activate configuration

- Enter mode code ”1200”

- Confirm entry

Welcome text 3 sec

During configuration the Transmitter remains in the Hold state for reasons of safety.

- Select or edit parameter

- Confirm entries

All configurable parameters are shown in the "Configuration parameters" table (See Page 28).

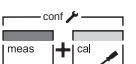
The configuration parameters are checked during the input.

In the case of an incorrect input ”Err” is displayed for 3 sec. The incorrect parameters cannot be stored. Input must be repeated.

- End configuration

The measured value and Hold are displayed alternately

- End the Hold state / accept configuration or



- Repeat configuration

- End the Hold state

The menus are cyclically displayed.

English

Pictograph/display	Parameter	Selection/input	Comment	Factory setting
88	Process variable	00.00 mS / 000.0 mS / 0000 mS 000.0 % 000.0 SAL	The selected process variable is shown in the display.	000.0 mS
	Concentration	-01- NaCl -02- HCl -03- NaOH -04- H_2SO_4 (0 to 35 % by wt) -05- HNO_3 -06- H_2SO_4 (95 to 99 % by wt)	With % only	-01-
	Temperature	°C °F	Temperature display selection	°C
	Temperature probe	Pt 100 Pt 1000 NTC 30 NTC 100	Selection of temperature probe	Pt 1000
		BUS EXT	External temperature detection Temperature value is transmitted to the device via PROFIBUS.	
	Temperature compensation (Step omitted for % and SAL.)	OFF LIN NLF	Temperature compensation selection: Linear Nonlinear, natural waters	OFF

Pictograph/display	Parameter	Selection/input	Comment	Factory setting
	Temperature coefficient	xx.xx %/K	Input of temperature coefficient Only with temperature compensation LIN	02.00 %/K
	Sensocheck	ON OFF	Sensor monitoring on or off	OFF
	PROFIBUS device address	0001 ... 0126	Input of PROFIBUS device address Not possible if device is communicating via PROFIBUS.	0126

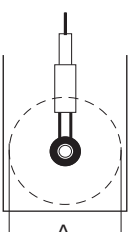
Tab. 8.1: Configuration parameters

8.7 Calibration

Calibration procedures (configurable)

- Calibration by specifying the cell factor of the sensor used (See Page 31)
- Zero point calibration in air (See Page 32)
- Calibration with calibration solution (See Page 33)
- Input and adjustment of transfer ratio (See Page 34)
- Adjustment of temperature probe (See Page 35)

Information on calibration



Calibration is performed by entering the cell factor or by determining the cell factor with a known calibration solution under consideration of the temperature.

If the sensor is used for measurements with a wall distance A < 110 mm, it must be calibrated with a similar wall distance.

All calibration procedures must be performed by trained personnel.

When another sensor is used, its transfer ratio must be entered before calibration (see “Input and adjustment of transfer ratio” Pg. 34).

Incorrectly set parameters may go unnoticed, but change the measuring properties.

The calibration is directly conducted on the device.

Calibration via PROFIBUS-PA is not provided.

HOLD

During calibration the Transmitter remains in the Hold state for reasons of safety.

Err

In the case of an incorrect input ”Err” is displayed for approx. 3 sec. The incorrect parameters cannot be stored. Input must be repeated.

For keypad functions see Pg. 24.

Calibration by input of cell factor

The following steps must be executed:

- Activate calibration

- Enter mode code ”1100”

- Confirm entry

Welcome text 3 sec

- Enter cell factor

The lower display shows the conductivity value.

A change in the cell factor also changes the conductivity value.

When there has not been an entry for 6 sec, the lower display alternately shows the conductivity and temperature value.

- Confirm cell factor

- End the Hold state

After 20 sec (for measured value stabilization) the device returns to measuring mode.

English

Zero point calibration in air

Zero point calibration is required when low conductivity values are to be measured.

Before you start calibration, remove the sensor from the process, clean it and dry it up.

The following steps must be executed:

- Activate calibration

- Enter mode code ”1001”

- Confirm entry

Welcome text 3 sec

- Modify the zero point until the lower display reads 0 µS.

If required, change the sign of the zero point.

When there has not been an entry for 6 sec, the lower display alternately shows the zero-corrected conductivity value and the temperature value.

- Confirm zero point

- End the Hold state

After 20 sec (for measured value stabilization) the device returns to measuring mode.

Calibration with calibration solution

Be sure to use known calibration solutions and the respective temperature-corrected conductivity values (see “Calibration solutions” Pg. 61).

During the calibration procedure the temperature must be kept constant.

Observe the response time of the temperature probe.

The following steps must be executed:

- Activate calibration

- Enter mode code ”1100”

- Confirm entry

Welcome text 3 sec

- Immerse sensor in calibration solution

When there has not been an entry for 6 sec, the lower display alternately shows the conductivity and temperature value.

- Read the conductivity value corresponding to the displayed temperature from the table of the calibration solution used (see “Calibration solutions” Pg. 61)

- Change cell factor until the display shows the conductivity value from the table

- Confirm cell factor

- End the Hold state

After 20 sec (for measured value stabilization) the device returns to measuring mode.

Input and adjustment of transfer ratio

The Transmitter comes with a preset transfer ratio.

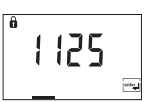
If another sensor is used, you must enter a different transfer ratio.

If you do not know the transfer ratio, it must be determined in the test mode using a comparison resistor (see “Test mode” Pg. 44).

If the transfer ratio has been changed after a cell factor calibration, this calibration must be repeated.

The following steps must be executed:

- Activate calibration

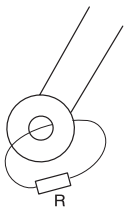


- Enter mode code ”1125”

- Confirm entry

Welcome text 3 sec

- Enter transfer ratio of the sensor or



- loop conductivity comparison resistor (simulator) through the sensor bore
- Adjust transfer ratio of sensor

Recommended resistance value for adjustment: R = 100 Ω.

- Modify the transfer ratio until the lower display shows the corresponding resistance value (without considering the cell factor)

- Confirm transfer ratio

- End the Hold state

After 20 sec (for measured value stabilization) the device returns to measuring mode.

Adjustment of temperature probe

Especially for Pt 100 temperature probes, it is advisable to perform an adjustment.

The following steps must be executed:

- Activate calibration

- Enter mode code ”1015”

- Confirm entry

Welcome text 3 sec

- Measure the temperature of the process medium using an external thermometer
- Enter the determined temperature value in the main display

The lower display shows the measured temperature without adjustment. If this value is taken over for the upper display, the adjustment is without effect.

- Confirm the temperature value

- End the Hold state

After 20 sec (for measured value stabilization) the device returns to measuring mode.

English

8.8 Operating tool

For parameter setting, commissioning and diagnostics of the Transmitter, we recommend operating tools such as SIMATIC-PDM Version 5 or higher.

The current device description is included.
DTM for tools with FDT interface on request.

8.9 Measurement

Measuring mode

In the measuring mode the main display shows the configured process variable and the lower display the temperature.

The Transmitter returns to measuring mode, also from configuration or calibration mode (after a relax time for measured-value stabilization, if required).

Cal Info

The "Cal info" shows the current cell factor and the zero point.

- Activate "Cal Info" function

- Mode code

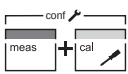
- Confirm

The current cell factor and the zero point are shown for approx. 20 sec.

- End "Cal Info"

Error Info

"Error Info" shows the most recent error message.



- Activate "Error Info" function

- Mode code

- Confirm

The last error message is displayed for approx. 20 sec.
After that the message will be deleted.

- End "Error Info"

9 Diagnostics

9.1 Sensoface, Sensocheck

Sensocheck continuously monitors the sensor.

Sensocheck can be switched off.

Sensoface provides information on the conductivity sensor condition.

The primary coil and its lines are checked for short circuits, the secondary coil and its lines are checked for open circuits.

A friendly Smiley can only be displayed when Sensocheck has been activated.

The Sensoface status does not influence the measured value display.

9.2 PROFIBUS-PA limit monitoring

The Transmitter is equipped with two limit blocks that can be separately configured for the process variables conductivity, resistivity, salinity or temperature.

Configuration is only performed via the bus.

The limit conditions are transmitted cyclically.

Hysteresis, effective direction, on and off delay can be configured.

Limit value setting and output of limit messages is via the PROFIBUS-PA.

When this symbol is displayed, limit block 1 is active.

When this symbol is displayed, limit block 2 is active.

9.3 Error message

When one of the following error messages is displayed, the device can no longer determine the measured variable correctly.

During an error message the red alarm LED beneath the display flashes.

The alarm response time is permanently set to 10 sec.

The error messages in the display are sorted according to their priority. A higher-priority message overlays a lower-priority message.

Error No.	Display (flashing)	Problem	Possible causes
Err 01	1179 mS	Sensor	- Wrong cell factor - Measurement range exceeded - SAL > 45 ‰ - Sensor connection or cable defective
Err 02	Measured value	Sensor	- Unsuitable sensor
Err 03		Temperature probe	- Outside temp range - Outside temp range for TC - Outside temp range for TC - Outside temp range for concentration
Err 33		Sensocheck primary coil	- Short circuit in primary coil - Short circuit of lines
Err 34		Sensocheck secondary coil	- Open circuit in secondary coil - Lines interrupted
Err 98	ConF	System error	- Memory error in device program - Measured value transmission defective - Configuration or calibration data defective • Completely reconfigure and calibrate the device

Error No.	Display (flashing)	Problem	Possible causes
Err 99	FAIL	Factory settings	- EEPROM or RAM defective - Error in factory settings This error message normally should not occur as the data are protected from loss by multiple safety functions. • Send in the device for repair and recalibration.

Tab. 9.1: Error messages

9.4 Display messages and PROFIBUS communication

User interface / display of device				Cause	Communication via PROFIBUS				
Display pictograph	Display message	Sensoface	LED	For comments see Pg. 38	No. of binary message (logbook)	Analog input status	Physical Block (PB) Global status	Text of binary message (factory setting)	Logbook entry (factory setting)
FAIL	Err 99		X	Factory settings defective	1	0000 11xx	Failure	ERR SYSTEM	X
ConF	Err 98		X	Configuration data defective, Gaincheck	2	0000 11xx	Failure	ERR PARAMETERS	X
ConF	Err 98		X	Memory error (RAM, ROM, EPROM)	3	0000 11xx	Failure	ERR MEMORY	X
1179 mS	Err 01		X	Cond, conc, sal range violation	4	0101 01xx	Failure	ERR MEAS VALUE	X
1179 mS	Err 02		X	Measurement range Conductance range violation	5	0100 0111 0100 1111	Failure	ERR COND VALUE	X
	Err 03		X	Temp range violation Temperature probe	6	0100 0111 0100 1111	Failure	ERR TEMP VALUE	X
	Err 33		X	Sensocheck Primary coil	7	0100 0111 0100 1111	Failure	CHK SENSOR	X

User interface / display of device				Cause	Communication via PROFIBUS				
Display pictograph	Display message	Sensoface	LED	For comments see Pg. 38	No. of binary message (logbook)	Analog input status	Physical Block (PB) Global status	Text of binary message (factory setting)	Logbook entry (factory setting)
	Err 34		X	Sensocheck Secondary coil	8	0100 0111 0100 1111	Failure	CHK SENSOR	X
				Zero point	9	1010 01xx	Maintenance req.	CHK ZERO	X
				Cell factor	10	1010 01xx	Maintenance req.	CHK SLOPE	X
				Calibration	11	0100 0111 0100 1111	Function check	CAL RUNNING	X
				Configuration	12	0100 0111 0100 1111	Function check	CONF RUNNING	X
				HOLD (Device state = Maintenance)	13	0100 0111 0100 1111	Function check	HOLD	X
				HI_HI_LIM FB analysis Cond/Conc/SAL	14	1000 1110	Limit 1 Bit 1	HI_HI_LIMIT COND HI_HI_LIMIT CONC HI_HI_LIMIT SAL	
				HI_LIM FB analysis Cond/Conc/SAL	15	1000 1010	Limit 1 Bit 2	HI_LIMIT COND HI_LIMIT CONC HI_LIMIT SAL	

User interface / display of device				Cause	Communication via PROFIBUS				
Display pictograph	Display message	Sensoface	LED	For comments see Pg. 38	No. of binary message (logbook)	Analog input status	Physical Block (PB) Global status	Text of binary message (factory setting)	Logbook entry (factory setting)
				LO_LIM FB analysis Cond/Conc/SAL	16	1000 1001	Limit 1 Bit 3	LO_LIMIT COND LO_LIMIT CONC LO_LIMIT SAL	
				LO_LO_LIM FB analysis Cond/Conc/SAL	17	1000 1101	Limit 1 Bit 4	LO_LO_LIMIT COND LO_LO_LIMIT CONC LO_LO_LIMIT SAL	
				HI_HI_LIM FB temperature	18	1000 1110	Limit 2 Bit 1	HI_HI_LIMIT TEMP	
				HI_LIM FB temperature	19	1000 1010	Limit 2 Bit 2	HI_LIMIT TEMP	
				LO_LIM FB temperature	20	1000 1001	Limit 2 Bit 3	LO_LIMIT TEMP	
				LO_LO_LIM FB temperature	21	1000 1101	Limit 2 Bit 4	LO_LO_LIMIT TEMP	
				Logbook empty	22		Function check	EMPTY LOGBOOK	

9.5 Diagnostics functions

Cal Info

The "Cal info" shows the current cell factor and the zero point.

- Activate "Cal Info" function

- Mode code

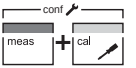
- Confirm

The current cell factor and the zero point are shown for approx. 20 sec.

- End "Cal Info"

Error Info

"Error Info" shows the most recent error message.



- Activate "Error Info" function

- Mode code

- Confirm

The error message is displayed for approx. 20 sec. After that the message will be deleted.

- End "Error Info"

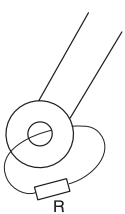
Test mode

In the test mode you can check the measuring equipment with a resistor.

- Activate "Test Mode" function

- Enter mode code

- Confirm entry



- loop conductivity comparison resistor (simulator) through the sensor bore

The conductivity comparison resistance is indicated in Ω

- without consideration of the cell factor (c = 1) and
- without temperature compensation

in the main display.

The basis for accurate resistance measurement is a correctly specified transfer ratio (see "Input and adjustment of transfer ratio" Pg. 34).

- End Test Mode

The device is in Hold state.

GainCheck manual device self-test

A display test is carried out, the software version is displayed and the memory and measured value transfer are checked.

Start GainCheck
manual device self-test

Automatic device self-test

The automatic device self-test checks the memory and measured-value transfer. It runs automatically in the background at fixed intervals.

10 Maintenance and Cleaning

10.1 Maintenance

The Transmitter contains no user repairable components.

10.2 Cleaning

To remove dust, dirt and spots, the external surfaces of the Transmitter may be wiped with a soft cloth moistened with water.

A mild household cleaner may also be used if necessary.

11 Appendix

11.1 Product line

Devices

Model designation	Ref. No.
Transmitter CondI 7100 PA for hazard-ous- and safe-area applications	52121273

Mounting accessories

Accessories	Ref. No.
ZU 0274 pipe-mount kit	52120741
ZU 0275 panel-mount kit	52120740

Accessories	Ref. No.
ZU 0276 protective hood	52120739

Sensors

Mettler-Toledo GmbH, Process Analytics offers a wide range of electrodeless sensors for the following fields of applications:
- Chemical process industry
- Pharmaceutical industry
- Food and beverage industry
- Pulp and paper industry
- Water/waste-water treatment

For more information concerning our sensors and housings program, please refer to our website:

http://www.mtpro.com

11.2 Specifications

General

Manufacturer	Mettler-Toledo GmbH / METT
Model designation/ID	Transmitter Cond Ind 7100 PA / 7533

Applications

Conductivity and temperature measurement

Input

Process variable	Cond Ind input	Display/measurement range	Conductivity	00.00 to 99.99 µS/cm
				000.0 to 999.9 µS/cm
				0000 to 1999 mS/cm
			Concentration	0.0 to 100.0 % by wt
			Salinity	0.0 to 45.0 ‰ (0 to 35 °C)
	Temperature input	Temperature sensor[a]	Pt100 / Pt1000 / NTC 30 kΩ / NTC 100 kΩ (2-wire connection, adjustable)	
		Measurement range	Pt100 / Pt1000	-20.0 to +150.0 °C / -4 to +302 °F
			NTC 30 kΩ / NTC 100 kΩ	-20.0 to +130.0 °C / -4 to +266 °F
		Resolution	0,1 °C / 1 °F	
		Temperature compensation[a] (ref. temperature 25 °C)	Linear characteristic (LIN)	00.00 to 19.99 %/K
			Nonlinear temperature compensation (NLF) for natural waters to EN 27888 (0 to 36 °C)	

a) Configurable

Accuracy (± 1 count)

Conductivity value	< 1 % of meas. value + 0.02 mS/cm
Temperature	< 0.5 K (for Pt 100 ± 1 K, for NTC: Temp. > 100 °C < 1 K)

Monitoring function

Sensor	Sensocheck (can be disabled)	Monitoring of primary and lines for short circuit Monitoring of secondary and lines for open circuit

Concentration determination

Operating modes	Concentration determination	-01- NaCl	0 to 26 % by wt (0 ˚C)	0 to 28 % by wt (100 ˚C)
		-02- HCl	0 to 18 % by wt (-20 ˚C)	0 to 18 % by wt (50 ˚C)
		-03- NaOH	0 to 13 % by wt (0 ˚C)	0 to 24 % by wt (100 ˚C)
		-04- H_2SO_4	0 to 26 % by wt (-17 ˚C)	0 to 37 % by wt (110 ˚C)
		-05- HNO_3	0 to 30 % by wt (-20 ˚C)	0 to 30 % by wt (50 ˚C)
		-06- H_2SO_4	94 to 99 % by wt (-17 ˚C)	89 to 99 % by wt (115 ˚C)
Standardization	Sensor standardization	Permissible cell factor	00.100 to 19.999	
		Permissible transfer ratio	01.00 to 99.99	
		Permissible offset	± 0.5 mS/cm	

Conditions for use

Temperature	Operation / environment	-20 to +55 ˚C	
	Transport / storage	-20 to +70 ˚C	
Electromagnetic compatibility	RFI suppression	EN 50 081-1, EN 61 326-1	
	Immunity to interference	EN 50 082-2, EN 61 326-1	
Ingress protection	Enclosure	IP65	
Explosion protection	ATEX	II 2(1) G EEx ia IIC T4, FISCO	
	FM	IS, Class I Div1, Group A, B, C, D T4 FISCO I / 1[0] / AEx ib [ia] / IIC / T4 FISCO NI, Class I Div2, Group A, B, C, D T4 NIFW	
Data retention	Parameters and calibration data	> 10 years	EEPROM

Construction

Dimensions	Height	144 mm	
	Width	144 mm	
	Depth	105 mm	
Weight		Approx. 1 kg	
Material		PBT (polybutylene terephtalate)	
Color	Bluish gray	RAL 7031	
Assembly	Wall mounting		
	Post/pipe mounting	On pipe with 40 to 60 mm diameter On square post with 30 to 45 mm edge length	
	Panel mounting	Cutout to DIN 43 700	
		Sealed against panel	
Electrical connection	Cable glands	3 breakthroughs	for included cable glands
		2 breakthroughs	for NPT 1/2" or Rigid Metallic Conduit or cable glands

Display and user interface

Display	LC display, 7-segment	Measured value display	Conductivity value, temperature
		3 Sensoface states	Good / average / poor
		5 mode indicators	meas / cal / alarm / online / conf
	Alarm LED	Error message	
Operation	5 keys	meas / cal / up / right / enter	
Operating tool		Device description (DD) implemented in SIMATIC PDM	

PROFIBUS-PA communication	Digital communication by current modulation of supply current Reading of device identification, measured values, status and message Reading and writing of parameter and configuration data	
	Protocol	PROFIBUS-PA (DPV 1)
	Connection	Via segment coupler to SPC, PC, PCS
	Profile	PNO directive: PROFIBUS-PA, Profile for Process Control Devices, Version 3.0
	Physical interface	To IEC 1158-2
	Address range	1 to 126, default: 126
	Supply voltage	FISCO bus supply: 9 to 17.5 V Linear barrier: 9 to 24 V
	Current consumption	< 16.1 mA
	Max. current in case of fault (FDE)	≤ 21.8 mA

Prüf- und Zertifizierungsstelle

ZELM Ex

(1) **EC-TYPE-EXAMINATION CERTIFICATE**
(Translation)

(2) Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres - **Directive 94/9/EC**

(3) EC-TYPE-EXAMINATION CERTIFICATE Number:

ZELM 00 ATEX 0038

(4) Equipment: **Conductivity Transmitter type Cond I 7100 PA**

(5) Manufacturer: **Mettler Toledo GmbH**

(6) Address: **CH – 8902 Urdorf**

(7) This equipment and any acceptable variation thereto are specified in the schedule to this certificate and the documents therein referred to.

(8) The Prüf- und Zertifizierungsstelle ZELM Ex, notified body No. 0820 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment and protective systems intended for use in potentially explosive atmospheres, given in Annex II to the Directive.
The examination and test results are recorded in the confidential report ZELM Ex 0130019048.

(9) Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

EN 50 014: 1997 **EN 50 020: 1994**

(10) If the sign "X" is placed after the certificate number, it indicates that the equipment is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This EC-type-examination Certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.

(12) The marking of the equipment shall include the following:

Ex II 2 (1) G EEx ia IIC T4

Zertifizierungsstelle **ZELM Ex** Braunschweig, June 26, 2000

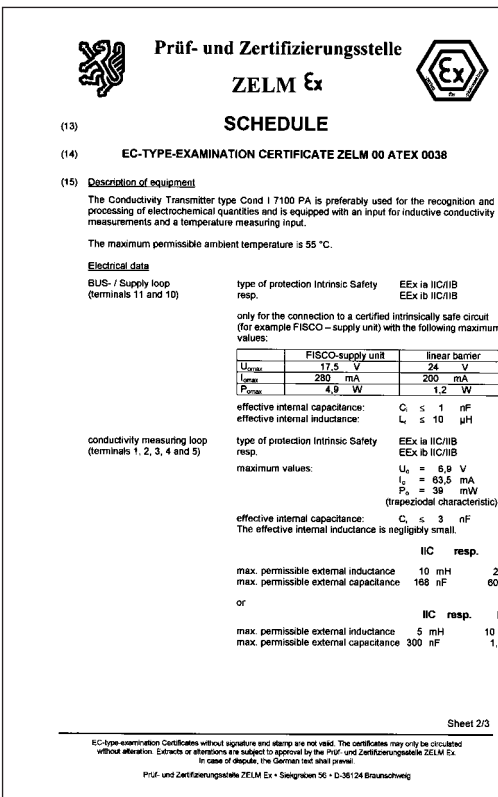
Dipl.-Ing. Harald Zelm

Zertifizierungs ZELM Ex

Sheet 1/3

EC-type-examination Certificates without signature and stamp are not valid. The certificates may only be circulated without alteration. Extracts or alterations are subject to approval by the Prüf- und Zertifizierungsstelle ZELM Ex.
In case of dispute, the German text shall prevail.

Prüf- und Zertifizierungsstelle ZELM Ex • Sieggraben 56 • D-38124 Braunschweig



Prüf- und Zertifizierungsstelle

ZELM Ex

(13) SCHEDULE

(14) EC-TYPE-EXAMINATION CERTIFICATE ZELM 00 ATEX 0038

(15) Description of equipment

The Conductivity Transmitter type Cond I 7100 PA is preferably used for the recognition and processing of electrochemical quantities and is equipped with an input for inductive conductivity measurements and a temperature measuring input.

The maximum permissible ambient temperature is 55 °C.

Electrical data

BUS- / Supply loop (terminals 11 and 10)

type of protection Intrinsic Safety resp. EEx ia IIC/IIB EEx ib IIC/IIB

only for the connection to a certified intrinsically safe circuit (for example FISCO – supply unit) with the following maximum values:

	FISCO-supply unit	linear barrier
$U_{o/max}$	17,5 V	24 V
$I_{o/max}$	280 mA	200 mA
$P_{o/max}$	4,9 W	1,2 W

effective internal capacitance: $C_i \leq 1$ nF
effective internal inductance: $L_i \leq 10$ µH

conductivity measuring loop (terminals 1, 2, 3, 4 and 5)

type of protection Intrinsic Safety resp. EEx ia IIC/IIB EEx ib IIC/IIB

maximum values: $U_o = 6{,}9$ V, $I_o = 63{,}5$ mA, $P_o = 39$ mW (trapeziodal characteristic)

effective internal capacitance: $C_i \leq 3$ nF
The effective internal inductance is negligibly small.

	IIC	resp.	IIB
max. permissible external inductance	10 mH		25 mH
max. permissible external capacitance	168 nF		600 nF

or

	IIC	resp.	IIB
max. permissible external inductance	5 mH		10 mH
max. permissible external capacitance	300 nF		1,5 µF

Sheet 2/3

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Prüf- und Zertifizierungsstelle

ZELM Ex

SCHEDULE TO EC-TYPE-EXAMINATION CERTIFICATE ZELM 00 ATEX 0038

Temperature measuring loop (terminals 7 and 8)	type of protection Intrinsic Safety resp.	EEx ia IIC/IIB EEx ib IIC/IIB
	maximum values:	U_o = 5,9 V I_o = 3,71 mA P_o = 5,5 mW (linear characteristic)
	effective internal capacitance:	C_i ≤ 250 nF

The effective internal inductance is negligibly small.

	IIC	resp.	IIB
max. permissible external inductance	1000 mH		1000 mH
max. permissible external capacitance	42,7 µF		1000 µF

(only valid if external inductance and external capacitance do not exist in concentrated form at the same time)

	IIC	resp.	IIB
max. permissible external inductance	1 mH		5 mH
max. permissible external capacitance	1,65 µF		6,85 µF

(also valid if external inductance and external capacitance exist in concentrated form at the same time)

EP (terminal 9)	for the connection to the equipotential bonding system

References:

Connecting the equipotential bonding is absolutely required to guarantee electrostatical leakage.

The BUS- / Supply loop is safely electrically isolated from the other loops up to a voltage of 60 V.

The operation manual has to be considered.

(16) Report No.
ZELM Ex 0130019048

(17) Special conditions for safe use
not applicable

(18) Essential Health and Safety Requirements
met by standards

Zertifizierungsstelle **ZELM Ex**

Braunschweig, June 26, 2000

Dipl.-Ing. Harald Zelm

Sheet 3/3

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In case of dispute, the German text shall prevail.

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Mettler-Toledo GmbH
Process Analytics

Adresse | Im Hackacker 15 (Industrie Nord), CH-8902 Urdorf, Schweiz
Briefadresse | Postfach, CH-8902 Urdorf
Telefon | 01-736 22 11
Telefax | 01-736 26 36
Internet | www.mt.com
Bank | Credit Suisse First Boston, Zurich (Acc. 0835-370503-21-90)

Declaration of conformity
Konformitätserklärung
Déclaration de conformité

CE 0820

We/Wir/Nous	**Mettler-Toledo GmbH, Process Analytics** Im Hackacker 15 8902 Urdorf Switzerland declare under our sole responsibility that the product, erklären in alleiniger Verantwortung, dass dieses Produkt, déclarons sous notre seule responsabilité que le produit,
Description **Beschreibung/Description**	**Condi 7100 PA** to which this declaration relates is in conformity with the following standard(s) or other normative document(s). auf welches sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder Richtlinie(n) übereinstimmt. auquel se réfère cette déclaration est conforme à la (aux) norme(s) ou au(x) document(s) normatif(s).
Explosionsschutzrichtlinie **Explosion Protection / Protection contre les explosions**	**94/9/EG** **Prüf- und Zertifizierungsstelle ZELM** **ZELM 00 ATEX 0038** **D-38124 Braunschweig, ZELM 0820**
EMC Directive/EMV-Richtlinie **Directive concernant la CEM**	**89/336/EWG** **SR 734.5, VEMV**
Low-voltage directve/Niederspannungs-Richtlinie/ **Directive basse tension**	**73/23/EWG** **SR 734.26, NEV**
Norm/Standard/Standard	**EN 50 014: 1997 + A1 + A2** **EN 50 020: 1994** **EN 50284: 1999** **DIN EN 61326 / VDE 0843 Teil 20: 1998-01** **DIN EN 61326 / A1 / VDE 0843 Teil 20 / A1: 1999-05** **EN 61010 Teil 1 / 03.93 / VDE 0411 Teil 1: 1994-03** **EN 61010-1/ A2 / 07.95 / VDE 0411 Teil 1 / A1: 1996-05**
Place and Date of issue **Ausstellungsort / - Datum** **Lieu et date d'émission**	**Urdorf, August 3, 2004**

Mettler-Toledo GmbH, Process Analytics

Waldemar Rauch
General Manager PO Urdorf

Christian Zwicky
Head of Marketing

METTLER TOLEDO

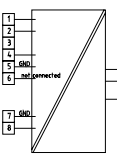
Artikel Nr.: 52960174 KE 52960174KE-I7100-PA-Internet-2.doc

Conductivity Transmitter
Cond Ind 7100 PA
Cond Ind 7100e FF

IS/I/1/ABCD/T4, Ta=55°C, Entity; FISCO
I/1 [0]/AEx ib [ia]/IIC/T4, Ta=55°C; Entity; FISCO
NI/I/2/ABCD/T4, Ta=55°C; NIFW

Entity Parameters:

Terminals 1, 2, 3, 4, 5 and 6
V_t = 6.9 V C_a = 590 nF
I_t = 98.5 mA L_a = 2 mH
P_{max} = 73 mW



Terminals 7 and 8
V_{oc} = 6 V C_a = 40 µF
I_{sc} = 3.71 mA L_a = 1 H
P_{max} = 5.5 mW

The intrinsically safe equipment connecting to 1, 2, 3, 4, 5, 6 and 7, 8 must be FM Approved or be simple apparatus, a device which will neither generate nor store more than 1.5 V, 0.1 A, 25 mW.

table 1

Concept	Groups	V_{max} (V)	I_{max} (mA)	P_{max} (W)	C_i (nF)	L_i (µH)
Entity	IIC/ABCD	24	200	1.2	1.2	7
FISCO	IIC/ABCD	17.5	380	4.9		

Any FM Approved Associated Apparatus

Any FM Approved Terminator (May not be necessary for Entity Installations)

Unclassified Locations

Hazardous (Classified) Locations
Class I, Zone 1, Group IIC
Class I, Division I, Groups A, B, C and D

Conductivity Transmitter Cond Ind 7100 PA
Conductivity Transmitter Cond Ind 7100e FF

Any FM Approved Intrinsically Safe Apparatus

Any FM Approved Terminator (May not be necessary for Entity Installations)

FISCO rules
The FISCO Concept allows the interconnection of intrinsically safe apparatus to associated apparatus not specifically examined in such combination. The criterion for such interconnection is that the voltage (V_{max}), the current (I_{max}) and the power (P_i) which intrinsically safe apparatus can receive and remain intrinsically safe, considering faults, must be equal or greater than the voltage (U_o, V_{oc}, V_t), the current (I_o, I_{sc}, I_t) and the power (P_o) which can be provided by the associated apparatus (supply unit).
In addition, the maximum unprotected residual capacitance (C_i) and inductance (L_i) of each apparatus (other than the terminators) connected to the Fieldbus must be less than or equal to 5 nF and 10 µH respectively.
In each I.S. Fieldbus segment only one active source, normally the associated apparatus, is allowed to provide the necessary power for the Fieldbus system. The allowed voltage (U_o, V_{oc}, V_t) of the associated apparatus used to supply the bus must be limited to the range of 14 V d.c. to 24 V d.c. All other equipment connected to the bus cable has to be passive, meaning that the apparatus is not allowed to provide energy to the system, except to a leakage current of 50 µA for each connected device. Separately powered equipment needs a galvanic isolation to insure that the intrinsically safe Fieldbus circuit remains passive.
The cable used to interconnect the devices needs to comply with the following parameters:
Loop resistance R': 15 ... 150 Ω/km
Inductance per unit length L': 0.4 ... 1 mH/km

Capacitance per unit length C': 80 ... 200 nF/km
C' = C' line/line + 0.5 C' line/screen, if both lines are floating
or
C' = C' line/line + C' line/screen, if the screen is connected to one line
Length of spur Cable: max. 30 m
Length of trunk cable: max. 1 km
Length of splice: max. 1 m
Termination:
At each end of the trunk cable an approved line terminator with the following parameters is suitable:
R = 90 ... 100 Ω
C = 0 ... 2.2 µF
System evaluation
The number of passive devices like transmitters, actuators, connected to a single bus segment is not limited due to I.S. reasons. Furthermore, if the above rules are respected, the inductance and capacitance of the cable need not to be considered and will not impair the intrinsic safety of the installation.

Installation Notes For FISCO and Entity Concepts
1. The Intrinsic Safety Entity concept allows the interconnection of FM Approved Intrinsically safe devices with entity parameters not specifically examined in combination as a systems when: U_o or V_{oc} or $V_t \leq V_{max}$, I_o or I_{sc} or $I_t \leq I_{max}$, $P_o \leq P_i$, C_a or $C_e \geq \sum C_i + \sum C_{cable}$, L_a or $L_e \geq \sum L_i + \sum L_{cable}$.
   For inductance use either L_a or L_e ($L_a \geq \sum L_i + \sum L_{cable}$ or $L_e \geq L_i + L_{cable}$).
2. The Intrinsic Safety FISCO concept allows the interconnection of FM approved Intrinsically safe devices with FISCO parameters not specifically examined in combination as a system when: U_o or V_{oc} or $V_t \leq V_{max}$, I_o or I_{sc} or $I_t \leq I_{max}$, $P_o \leq P_i$.
3. Dust-tight conduit seals must be used when installed in Class II and Class III environments.
4. Control equipment connected to the Associated Apparatus must not use or generate more than 250 V_{rms} or V_{dc}.
5. Installation should be in accordance with ANSI/ISA RP12.06.01 (except chapter 5 for FISCO Installations). "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the National Electrical Code® (ANSI/NFPA 70) Sections 504 and 505.
6. The configuration of associated Apparatus must be FM Approved under the associated concept.
7. Associated Apparatus manufacturer's installation drawing must be followed when installing this equipment.
8. Cond Ind 7100 PA, Cond Ind 7100e FF Series are Approved for Class 1, Zone 0, applications. If connecting AEx [ib] associated Apparatus or AEx ib I.S. Apparatus to the Cond Ind 7100 PA, Cond Ind 7100e FF Series the I.S. circuit is only suitable for Class 1, Zone 1, or Class 1, Zone 2, and is not suitable for Class 1, Zone 0 or Class 1, Division 1, Hazardous (Classified) Locations.
9. No revision to drawing without prior FM Approvals authorisation.
10. Simple Apparatus is defined as a device that does not generates more than 1.5 V, 0.1 A or 25 mW.

Verteiler: FGL (Ze)				Zul. Abweichungen für Maße ohne Toleranzangabe	Oberfläche	Maßstab
						Maßstab
				ISO 2768 - m		
					Datum	Name
				Bearb.	15.01.05	dorn
				Gepr.(KON)		
				Freigabe(FGL)		
				Schutzvermerk nach DIN 34 beachten		
Nr.	Änderung	Datum	Bearbeiter	FGL	KON	

Benennung: control drawing DIV 1
Cond Ind 7100 PA, Cond Ind 7100e FF

Zeichnungsnummer: 194.370-110

Ungültig als: | Ersetzt durch:

Specifications

InPro 7250
electrodeless conductivity sensors

Conductivity	Meas. range	0 to 2000 mS/cm
	Resolution	0.01 mS/cm
	Meas. error InPro 7250 ST	± (0.5 % of meas. value, + 25 µS)
	Meas. error InPro 7250 HT	± (0.5 % of meas. value, + 1 µS)
Temperature InPro 7250 ST	Temp probe	Pt 1000
	Process temp	-20 to +100 °C (-4 to +212 °F)
Temperature InPro 7250 HT	Temp probe	Pt 1000
	Process temp	-20 to +180 °C (-4 to 356 °F)
	Process temp (within Ex range)	-20 to +130 °C (-4 to +266 °F)
Pressure[a)]	Process pressure InPro 7250 ST	max. 8 bars
	Process pressure InPro 7250 HT	max. 20 bars
Basic settings	Cell factor	2.175[b)]
	Transfer ratio	120[c)]

a) Depending on the installation.
b) Typical value, may differ for each individual sensor and depends on the installation conditions. The exact value must be determined with a calbration.
c) Typical value, may differ for each individual sensor. The exact value must be determined with a calbration.

Construction

Dimensions	Total length	185.5 mm (incl. fixing thread)
	Body length	125.5 mm
	Diameter	ø = 47 mm
	Sensor bore	ø = 15 mm
Mounting		G 3/4"
Material	Sensor (medium wetted)[a)]	Glass-filled PEEK (GF30)
	Sensor mounting thread (G 3/4")	stainless steel (1.4435)
	O-ring	Viton®
Cable	Type InPro 7250 ST	single coaxial cable
	Type InPro 7250 HT	double coaxial cable
	Available cable lengths	3, 5 and 10 m (9.80, 16.40 and 32.80 ft)
Explosion protection InPro 7250 HT	ATEX	SEV 05 ATEX 016 X II 1/2G EEx ia IIC T6/T5/T4/T3
	FM	I.S. Cl 1, Div 1, GR ABCD / T6

a) This material is not FDA listed.

Dimension drawing

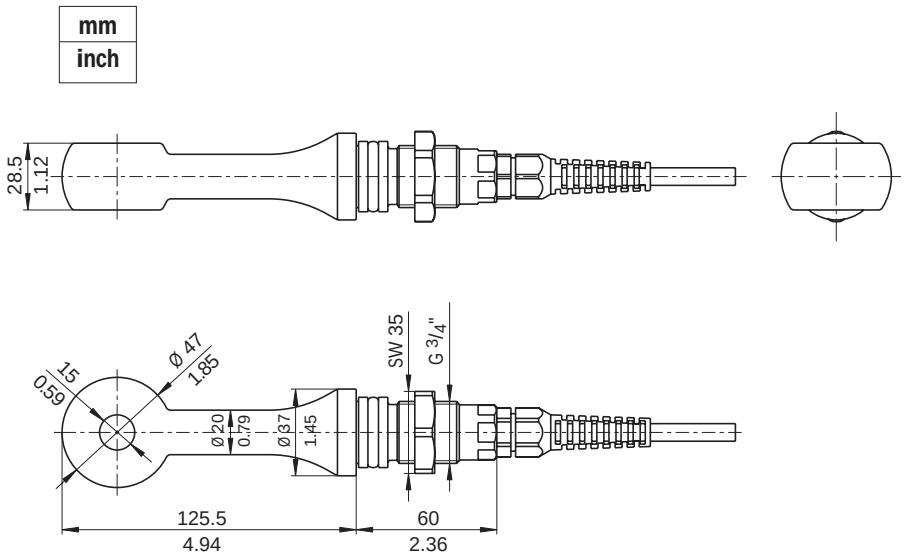


Fig. 11.1 Dimension drawing InPro 7250 electrodeless conductivity sensors

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SEV Association pour l'électrotechnique, les technologies de l'énergie et de l'information
SEV Associazione per l'elettrotecnica, la tecnica energetica e l'informatica
SEV Association for Electrical Engineering, Power and Information Technologies

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(1) **EC-Type Examination Certificate**

(2) Equipment or protective system intended for use in potentially explosive atmospheres **- Directive 94/9/EC**

(3) Examination Certificate Number **SEV 05 ATEX 0106 X**

(4) Equipment: Conductivity sensor; InPro725X /*/*/*

(5) Manufacturer: Mettler-Toledo GmbH, Process Analytics

(6) Address: Im Hackacker 15, CH-8902 Urdorf

(7) The equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

(8) SEV as notified body No. 1258 in accordance with article 9 of the Council Directive of the European Communities of 23 March 1994 (94/9/EC), certifies that this equipment has been found to comply with the essential health and safety requirements relating to the design and construction of equipment or protective systems intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The results of the examination are recorded in confidential report No. 04-IK-0212.01

(9) Compliance with the essential health and safety requirements has been assured by compliance with:
EN 1127-1:1997 EN 50014:1997 + A1 ... A2 EN 50020:2002 EN 50284:1999

(10) If the sign «X» is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.

(11) This examination certificate relates only to design and construction of the specified equipment in accordance to the directive 94/9/EC. Further requirements of this directive apply to the manufacturing process and the placing on the market of the equipment.

(12) The marking of the equipment shall include the following:
Ex II 1/2G EEx ia IIC T6 / T5 / T4 / T3

Electrosuisse
Certification Body ATEX

Fehraltorf, 2005-04-15

Jürg Rellstab
Manager Product Certification

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Luppmenstrasse 1 Tel. +41 (0) 1 956 11 11
CH-8320 Fehraltorf Fax +41 (0) 1 956 11 22
info@electrosuisse.ch
www.electrosuisse.ch

SEV Verband für Elektro-, Energie- und Informationstechnik
SEV Association pour l'électrotechnique, les technologies de l'énergie et de l'information
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(13) **Annex**

(14) **EC-Type Examination Certificate SEV 05 ATEX 0106 X**

(15) Description of the equipment

The InPro725X /*/*/* conductivity sensor with integrated temperature sensor and data chip is used for the measurement of conductivities and substance concentrations in solutions. The sensors are designed for the measurement of medium and high conductivities.

The principle function of the sensors is based on inductive conductivity measurement. These sensors contain out of two toroidal coils which are totally encapsulated in a plastic material. When a current passes through the sensor transmitter coil, a voltage is induced in the measuring solution. This causes a flow of current in the measuring solution, which induces a voltage in the receiver coil. The current is directly proportional to the conductivity of the measuring solution.

The sensors can be installed with different process adapters (flanges, threaded bushes) permanently in pipes or tanks.

Also installed in the housing is a separately tested calibration and life data chip, type Maxim Dallas DS 2433 with a capacitance of 100 pF parallel to the data circuit.

Ratings:

Conductivity measuring circuit, temperature measuring circuit and data chip circuit	With type of protection intrinsic safety EEx ia IIC only for connection to a certified intrinsically safe circuit.
	Maximum values:
	$U_i \leq$ 16 V
	$I_i \leq$ 150 mA
	$P_i \leq$ 155 mW
	L_i = 0 (the internal inductance is ineffective towards the outside)
	C_i = 900 pF (effective internal capacitance)

The above values are each the total of all individual circuits of the associated intrinsically safe power supply and transmitter.

Notes:

1. According to RL 94/9/EG (ATEX 95) Appendix I, InPro725X /*/*/* conductivity sensors are devices group II, category 1/2G and according to RL 99/92/EG (ATEX 137) may be used in zones 0/1 or 0/2 and gas groups IIA, IIB and IIC that are potentially explosive due to flammable substances in the temperatures classes T1 to T6.

   For use/installation, the requirements of EN 60079-14 must be observed.

2. The conductivity measuring circuit, temperature measuring circuit and data chip circuit are part of a common intrinsically safe system and are for operation connected to a separately certified transmitter.

3. The conductivity measuring circuit, temperature measuring circuit and data chip circuit as part of an intrinsically safe system are isolated from conductive housing parts up to a maximum rated voltage of 30 V.

Lupsingenstrasse 1 Tel. +41 (0) 1 956 11 11
CH-8320 Fehraltorf Fax +41 (0) 1 956 11 22
info@electrosuisse.ch
www.electrosuisse.ch

SEV Verband für Elektro-, Energie- und Informationstechnik
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Annex to EC-Type Examination Certificate SEV 05 ATEX 0106 X

(16) Test Report 04-IK-0212.01

(17) Special requirements

1. The maximum permissible process temperatures are in accordance with the temperature classes shown in the table below:

Temperature class	Maximum permissible process temperature
T6	68 °C
T5	80 °C
T4	108 °C
T3	130 °C

2. The InPro725X /*/*/* conductivity sensors may only be used in suitable process terminals of METTLER TOLEDO or other manufacturers in potentially explosive atmospheres.
3. The capacitance and inductance of the connecting cable must be taken into account in the design.
4. The independent process terminal used for installation of the conductivity sensors must be connected to the equipotential bonding system of the installation.
5. The independent process terminal used for installation of the conductivity sensors must be included in the recurring pressure test of the installation if necessary.
6. The minimum conductivity of the media for safe working in potentially explosive atmospheres must be higher than 1 nS/cm.

(18) Fundamental essential health and safety requirements
Fulfilled by the standards applied

Electrosuisse
Certification Body ATEX

Fehraltorf, 2005-04-15

Jürg Rellstab
Manager Product Certification

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Lupfenstrasse 1 Tel. +41 (0) 1 956 11 11
CH-8320 Fehraltorf Fax +41 (0) 1 956 11 22
info@electrosuisse.ch
www.electrosuisse.ch

11.8 Calibration solutions

Temperature [°C]	Concentration [a] 0.01 mol/l	0.1 mol/l	1 mol/l
0	0.776	7.15	65.41
5	0.896	8.22	74.14
10	1.020	9.33	83.19
15	1.147	10.48	92.52
16	1.173	10.72	94.41
17	1.199	10.95	96.31
18	1.225	11.19	98.22
19	1.251	11.43	100.14
20	1.278	11.67	102.07
21	1.305	11.91	104.00
22	1.332	12.15	105.94
23	1.359	12.39	107.89
24	1.386	12.64	109.84
25	1.413	12.88	111.80
26	1.441	13.13	113.77
27	1.468	13.37	115.74
28	1.496	13.62	
29	1.524	13.87	
30	1.552	14.12	
31	1.581	14.37	
32	1.609	14.62	
33	1.638	14.88	
34	1.667	15.13	
35	1.696	15.39	
36		15.64	

a) Data source: K. H. Hellwege (Editor), H. Landolt, R. Börnstein: Zahlenwerte und Funktionen ..., Volume 2, Part. Volume 6

Tab. 11.1: Potassium chloride solutions, conductivity in mS/cm

Temperature [°C]	Concentration Saturated [a]	0.1 mol/l [b]	0.01 mol/l [b]
0	134.5	5.786	0.631
1	138.6	5.965	0.651
2	142.7	6.145	0.671
3	146.9	6.327	0.692
4	151.2	6.510	0.712
5	155.5	6.695	0.733
6	159.9	6.881	0.754
7	164.3	7.068	0.775
8	168.8	7.257	0.796
9	173.4	7.447	0.818
10	177.9	7.638	0.839
11	182.6	7.831	0.861
12	187.2	8.025	0.883
13	191.9	8.221	0.905
14	196.7	8.418	0.927
15	201.5	8.617	0.950
16	206.3	8.816	0.972
17	211.2	9.018	0.995
18	216.1	9.221	1.018
19	221.0	9.425	1.041
20	226.0	9.631	1.064
21	231.0	9.838	1.087
22	236.1	10.047	1.111
23	241.1	10.258	1.135
24	246.2	10.469	1.159
25	251.3	10.683	1.183
26	256.5	10.898	1.207
27	261.6	11.114	1.232
28	266.9	11.332	1.256
29	272.1	11.552	1.281
30	277.4	11.773	1.306
31	282.7	11.995	1.331
32	288.0	12.220	1.357
33	293.3	12.445	1.382
34	298.7	12.673	1.408
35	304.1	12.902	1.434
36	309.5	13.132	1.460

a) Data source: K. H. Hellwege (Editor), H. Landolt, R. Börnstein: Zahlenwerte und Funktionen ..., Volume 2, Part. Volume 6

b) Data source: Test solutions calculated according to DIN IEC 746-3

Tab. 11.2: Sodium chloride solutions, conductivity in mS/cm

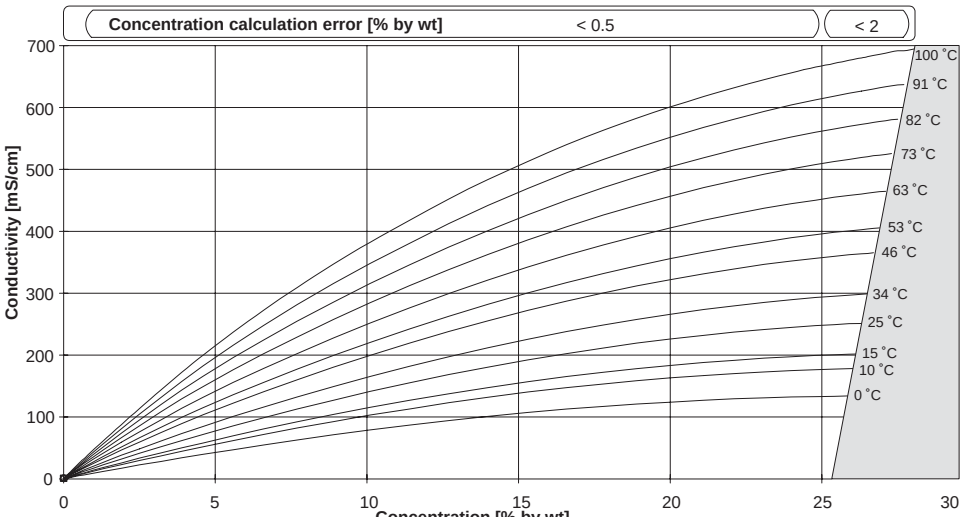


Fig. 11.2 Concentration curves NaCl (configuration: concentration -01-)

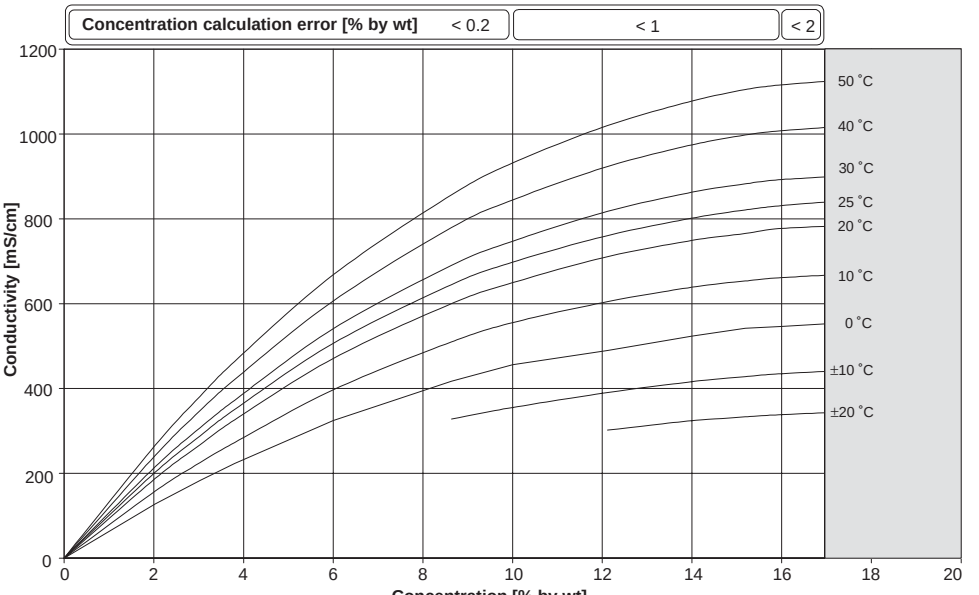


Fig. 11.3 Concentration curves HCl (configuration: concentration -02-)

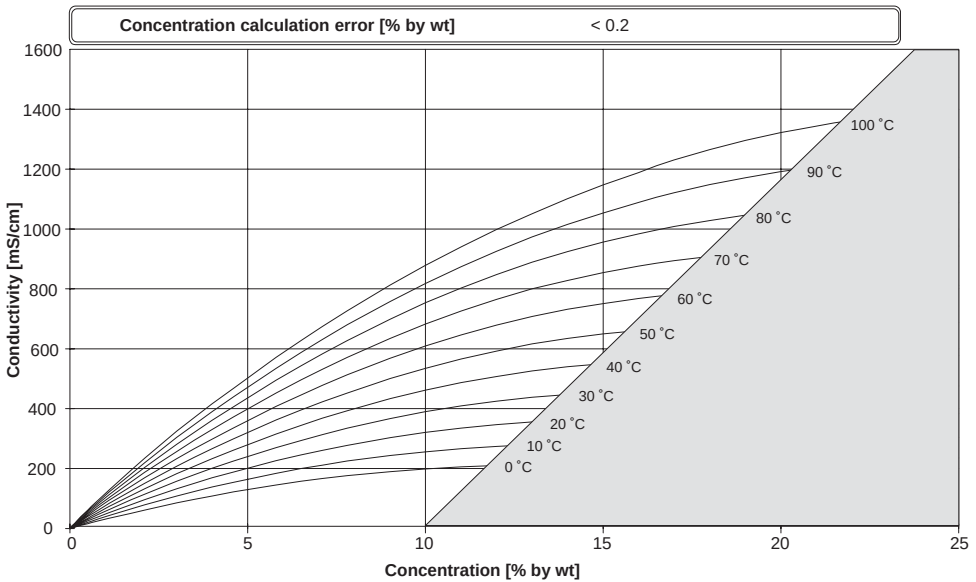


Fig. 11.4 Concentration curves NaOH (configuration: concentration -03-)

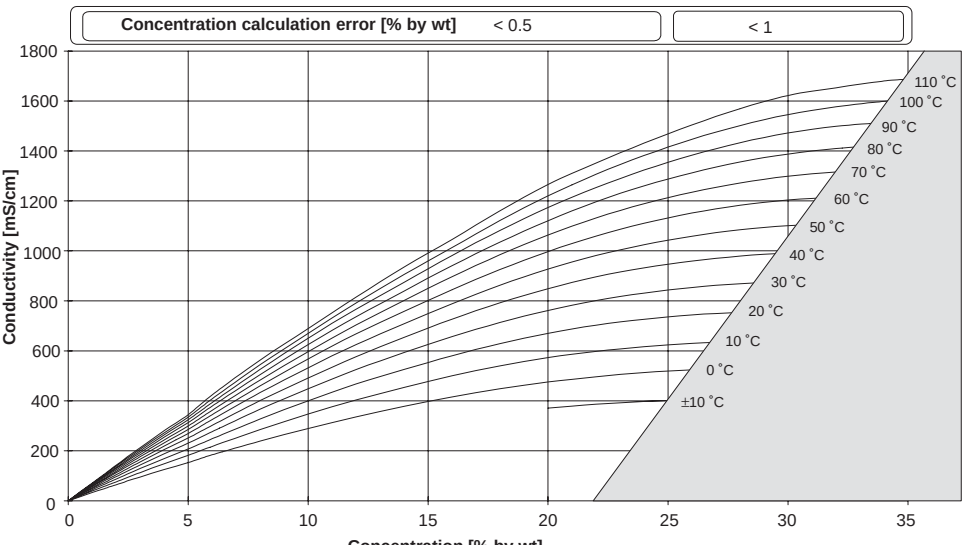


Fig. 11.5 Concentration curves H_2SO_4 (configuration: concentration -04-)

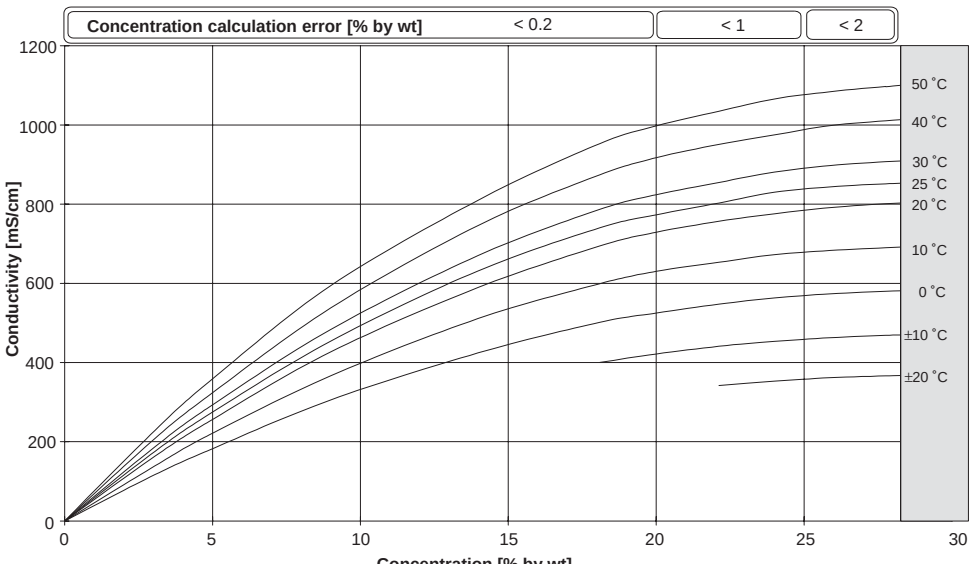


Fig. 11.6 Concentration curves HNO_3 (configuration: concentration -05-)

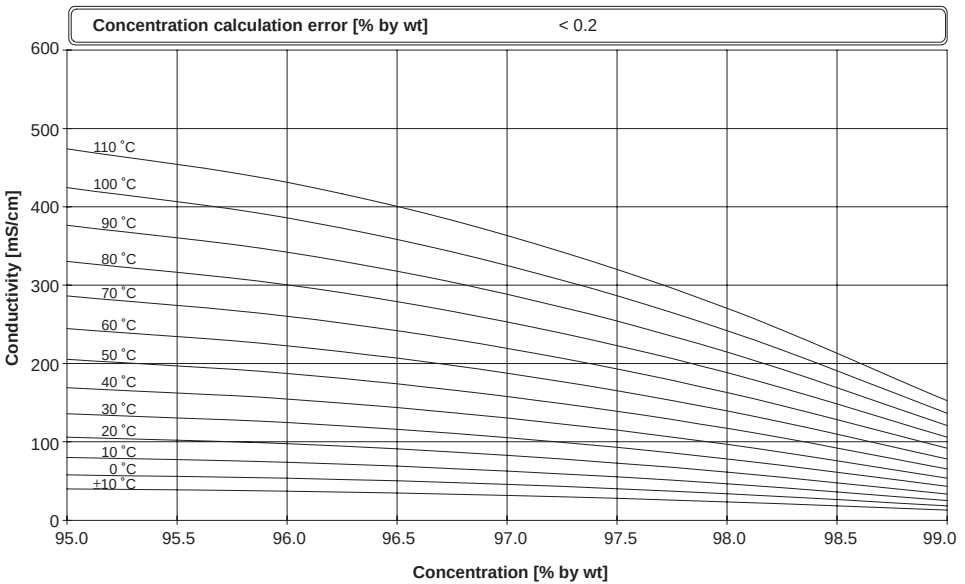


Fig. 11.7 Concentration curves H_2SO_4 (range 95 to 99 % by wt), (configuration: concentration -06-)

Conductance

Conductance G [S] =1 / R [Ω]

Conductivity

Conductivity κ [S/cm] = G [S] · c [1/cm]

DTM (Device Type Manager)

Permits access to field device (acyclic services) via system with FDT interface.

FDT (Field Device Tool)

Standardized interface for data exchange with field devices, among others.

FISCO Model (Fieldbus Intrinsically Safe Concept)

Permits connection of several devices to a common bus line and defines limit values for device and cable parameters. This model developed by the German PTB assumes that only one "active" device, i.e. the bus supply, is connected to the field bus. All other devices are "passive" with regard to the power supply into the bus. Within the defined limits, the line characteristics have no influence on the intrinsic safety.

GSD file (device database file)

Contains the communication features of slave devices. During commissioning it is loaded in the process control system.

PROFIBUS-DP (decentralized peripherals)

Standardized specification (EN 50 170) of an open fieldbus system for binary and analog signals of sensors and actuators. It has been designed for high-speed data exchange at the device level.

PROFIBUS-PA (process automation)

Open fieldbus standard for process automation. It makes use of the transmission technology to IEC 1158-2 approved for operation in hazardous locations, which at the same time allows the field devices to be powered over the bus.

SIMATIC-PDM

Tool developed by Siemens for projecting, configuring, commissioning and diagnostic of smart process analyzers. The Transmitter device description (DD) is implemented in the SIMATIC-PDM.

Temperature coefficient

With temperature compensation activated, the measured value is calculated to the value at the reference temperature using the temperature coefficient.

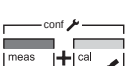
Temperature compensation

Calculates the measured conductivity value for a reference temperature.

12 Index

English

Mode codes



conf, 0000	Error Info
conf, 1200	Configuration mode

cal, 0000	Cal Info
cal, 1001	Zero point calibration
cal, 1015	Temp probe adjustment
cal, 1100	Calibration mode
cal, 1125	Input/adjustment of transfer ratio
cal, 2222	Test mode

BR **Mettler-Toledo Ind. e Com. Ltda.,**
Alameda Araguaia, 451 - Alphaville
BR - 06455-000 Barueri / SP, Brazil
Phone +55 11 4166 74 00
Fax +55 11 4166 74 01

CH **Mettler-Toledo (Schweiz) AG,**
Im Langacher,
CH - 8606 Greifensee, Switzerland
Phone +41 44 944 45 45
Fax +41 44 944 45 10

D **Mettler-Toledo GmbH,** Prozeßanalytik,
Ockerweg 3,
D - 35396 Gießen, Germany
Phone +49 641 507-333
Fax +49 641 507-397

F **Mettler-Toledo Analyse Industrielle Sàrl,**
30 Bld. de Douaumont, BP 949,
F - 75829 Paris Cedex 17, France
Phone +33 1 47 37 06 00
Fax +33 1 47 37 46 26

USA **Mettler-Toledo Ingold, Inc.,**
36 Middlesex Turnpike,
USA - Bedford, MA 01730, USA
Phone +1 781 301-88 00
Fax +1 781 271-06 81

Management-System zertifiziert nach ISO 9001 / ISO 14001

Mettler-Toledo GmbH, Process Analytics
Industrie Nord, CH-8902 Urdorf, Switzerland
Phone + 41 44 736 22 11, Fax +41 44 736 26 36

www.mtpro.com