User manual

Ultrasonic sound transmitter

UST 200

Version 2.1.1

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

Inhalt

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

1. General

The ultrasonic transmitters of the UST 200 series from promesstec are excellent devices for continuous, non-contact level measurement of liquid media.

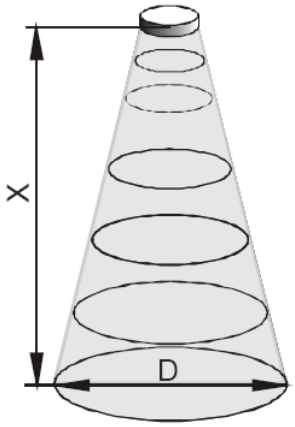
1.1 Description measuring principle

The ultrasonic level metering technology is based on the principle of measuring the time required for the ultrasound pulses to make a round trip from the sensor to the level to be measured and back. The sensor emits an ultrasonic pulse train and receives the echoes reflected. The intelligent electronic device processes the received signal by selecting the echo reflected by the surface and calculates from the time of flight the distance between the sensor and the surface which constitutes the basis of all output signals of the UST 200.

Minimum measuring distance (Xm): Is the smallest measurable distance, depending on the device version. Measurements below the blocking distance are not possible, but a larger value can be set in parameter P05 as the start of the measuring range.

Maximum measuring distance (XM): Is the largest measurable distance, depending on the device version. Measurements (H) greater than XM are not possible.

A Total beam angle: of 5°-7° at –3 dB as is featured by most of promesstec's transducers ensuring a reliable measurement in narrow silos with uneven side walls as well as in process tanks with various protruding objects. Furthermore, as a result of the narrow beam angle - the emitted ultrasonic signals have an outstanding focusing - deep penetration through gases, vapour and foam is ensured.



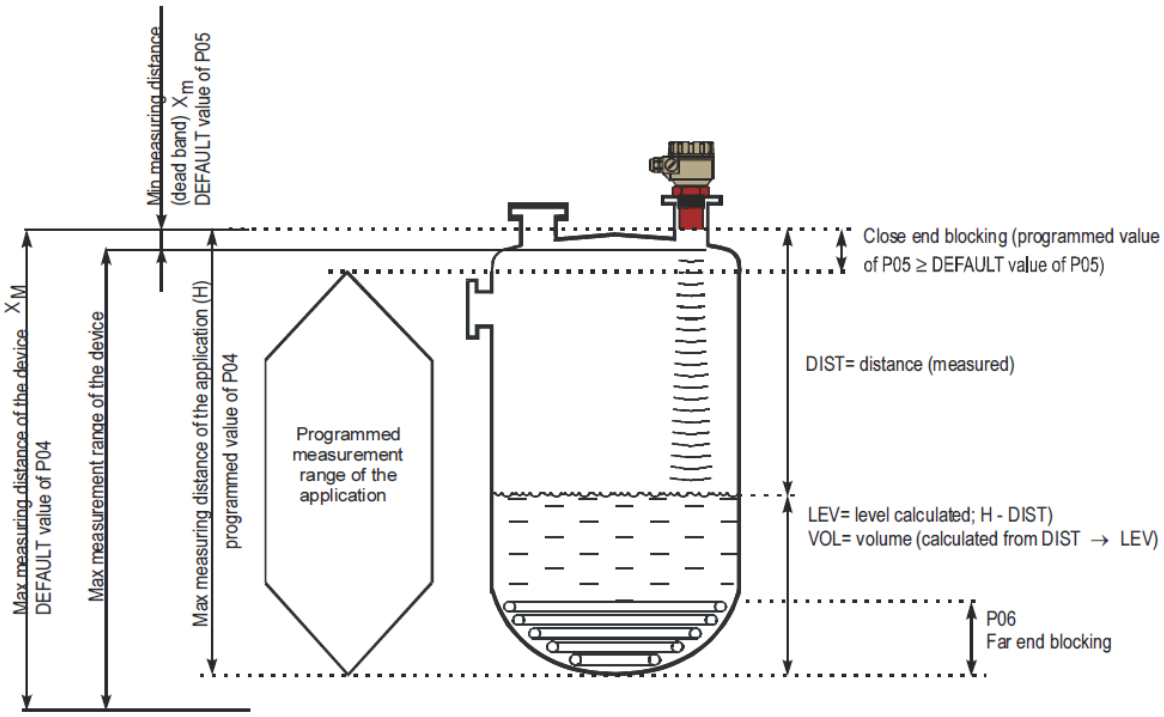
X	D
1 m	0,21 m
2 m	0,30 m
5 m	0,56 m
10 m	1,00 m
15 m	1,45 m

Diameters corresponding to 5° beam angle.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

Blocking distance: is a feature common to all ultrasonic level meters.
It is specified as “Minimum measuring distance” in the Technical Data Table.
Measurement within this range can not be interpreted.

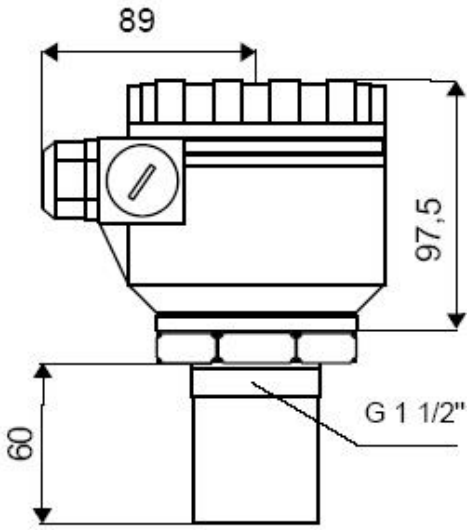
1.2 Basic concept and elements of ultrasonic level measurement

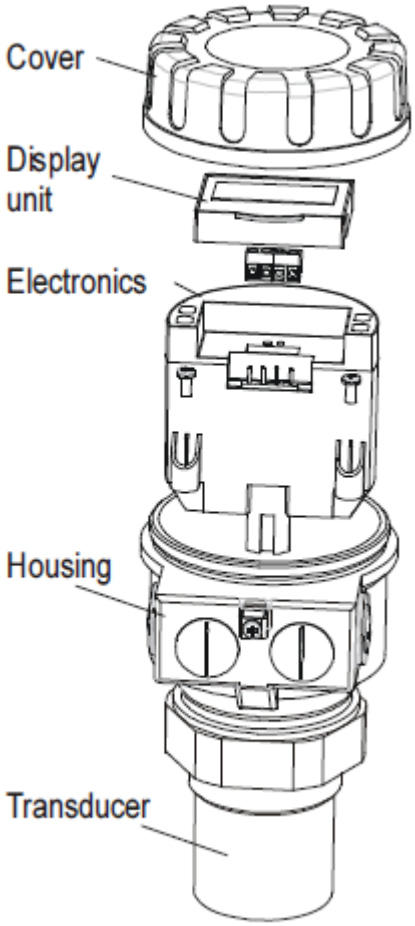


promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

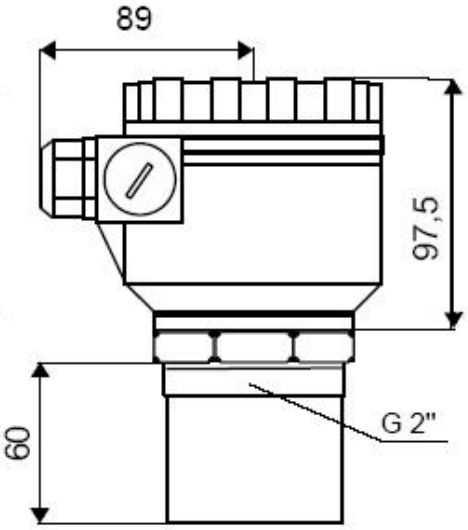
1.3 Dimensions / Structure

Version with G1½" process connection





Version with G2" process connection



promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

1.4 Drawings and shortcut

Warning!
A non-observance can cause injuries to persons and/or the demolition of the device. There can be a dangerous to life.

Attention!
A non-observance can cause a faulty operation of the device or lead to property damage.

Information!
A non-observance can have influence on the operation of the device or cause unintentional reactions of the device.

Danger!
When not observing the safety instructions, there is a risk of serious or fatal injuries caused by electrical power.

Warning!
Possibly a dangerous situation can occur, which results in burns because of hot surfaces or liquids, if not avoided.

2. Transport, Packaging, Storage

2.1 Transport

Check the instrument for any damage that may have been caused during transportation. If, report them immediately. The temperature during transportation and storage of the meter must be within the range of -10 °C to 50 °C.

2.2 Packaging

Do not remove packaging until just before mounting. Keep the packaging as it will provide optimum protection during transport (e.g. change in installation site, sending back).

2.3 Storage

For longer term storage avoid the following influences:

1. Direct sunlight or proximity to hot objects
2. Mechanical vibration, mechanical shock (putting it hard down)
3. Soot, vapour, dust and corrosive gases

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

The transport and storage temperature must be between -10 °C and +50 °C. If possible, store the device in the original packaging or equivalent packaging.

3. Safety instructions

More important safety instructions can be found in the individual chapters.

3.1 Intended use of the product

The UST 200 is a compact measuring device for continuous, non-contact level measurement. Depending on the sensor, the measuring range is up to 8 m for liquids.

The sensor has been designed and built solely for the intended use described here and may only be used accordingly. The technical specifications contained in these operating instructions must be observed.

Improper handling or operation of the instrument outside of its technical specifications requires the instrument to be taken out of service immediately and an inspection by the manufacturer. When the instrument is transported from a cold into a warm environment, the formation of condensation may result in the instrument malfunctioning. Before putting it back into operation, wait for the instrument temperature and the room temperature to equalise. The manufacturer shall not be liable for claims of any type based on operation contrary to the intended use.

3.2 Stuff qualification

Improper handling can result in considerable injury and damage to equipment. The activities described in these operating instructions may only be carried out by skilled stuff who have the qualifications described below. Keep unqualified stuff away from hazardous areas.

For installation and starting of the flow-meter the stuff has to be familiar with the relevant regulations and directives of the country and must have the qualification required. They must have knowledge on measurement and control technology, have to be acquainted with electric circuits, are capable of carrying out the work described and can independently recognize potential hazards. Depending on the

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

operation conditions of the application they have to have the corresponding knowledge, e.g. of aggressive media.

3.3 Special hazards

For hazardous media such as oxygen, acetylene, flammable or toxic gases or liquids, refrigeration plants, compressors, etc., in addition to all standard regulations, the appropriate existing codes or regulations must also be followed. If you do not observe the appropriate regulation, serious injuries and/or damage can occur

A protection from electrostatic discharge (ESD) is required. The proper use of grounded work surfaces and personal wrist straps is required when working with exposed circuitry (PCB, printed circuit boards), in order to prevent static discharge from damaging sensitive electronic components.

There is a danger of death caused by electric current. Upon contact with life parts, there is a direct danger of death. Electrical instruments may only be installed and connected by skilled electrical personnel. Operation using a defective power supply unit (e.g. short circuit from the mains voltage to the voltage output) can result in life-threatening voltages at the instrument.

Residual media in dismounted instruments can result in a risk to personnel, the environment and equipment. Take sufficient precautionary measures. Do not use this instrument in safety or Emergency Stop devices. Incorrect use of the instrument can result in injury. Should a failure occur, aggressive media with extremely high temperature and under high pressure or vacuum may be present at the instrument.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

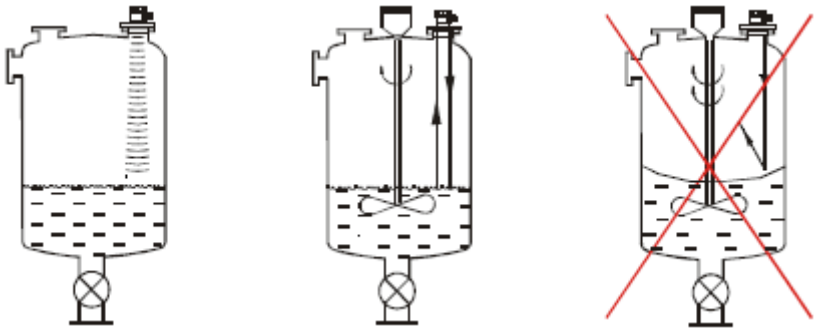
4. Installation

4.1 Installation

4.1.1 Level measurement in liquid media

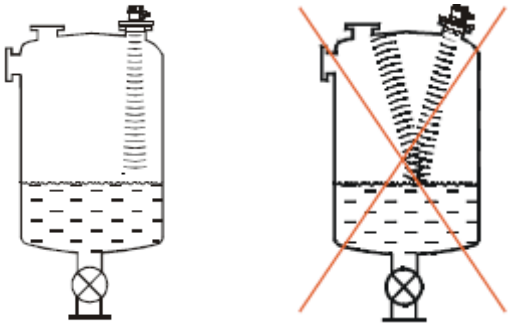
Mounting location:

The optimal position of the UST 200 is on the radius
r = (0.3 … 0.5) R of the (cylindrical) tank / silo.



Mounting angle:

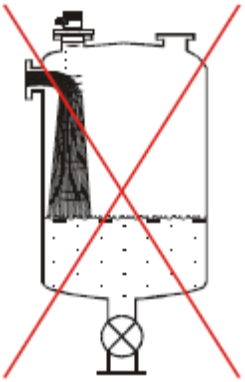
The sensor head must be parallel to the medium, tolerance ± 2-3°



! Make sure the meter is protected from overheating, avoid direct sunlight.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

Obstacles / fixtures
Make sure that there are no inlets or other installations such as cooling lines, temperature sensors, ladders, reinforcements, etc. in the measuring cone. A fixed obstacle in the measuring range can be masked out by appropriate device settings.

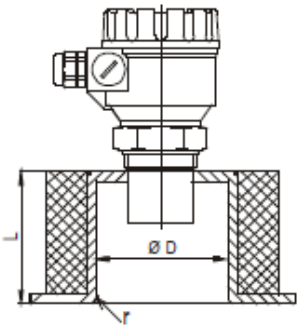


Foam
Foaming of the liquid surface may render ultrasonic level metering impossible. If possible, a location should be found, where foaming is the least (device should be located as far as possible from liquid inflow) or a stilling pipe or well should be used.

Wind
Intensive air (gas) movements in the vicinity of the ultrasonic cone is to be avoided. A strong draft of wind may "blow away" the ultrasound. Devices with lower measuring frequency (40, 20 kHz) are recommended.

FUMES / VAPOURS
For closed tanks containing chemicals or other liquids, which creats fume/gases above the liquid surface especially for outdoor tanks exposed to the sun, a strong reduction of the nominal measuring range of the ultrasonic device is to be considered during device selection.
Devices with lower measuring frequency (40, 20 kHz) are recommended in these cases units.

Spacer tube
When installing with a spacer tube, please note that the tube is very strong, the length and diameter match the device and the tube edge is rounded to the container. Please refer to the following table for the length/diameter values.



L	D_{min}		
	UST200-X-X-A-1-X-X	UST200-X-X-B-2-X-X	UST200-X-X-C-2-X-X
150	50	60	60
200	50	60	75
250	65	65	90
300	80	75	105
350	95	85	120

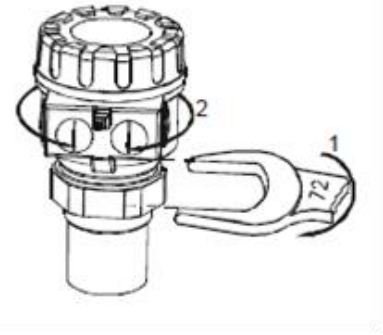
4.2 Open channel flow measurement

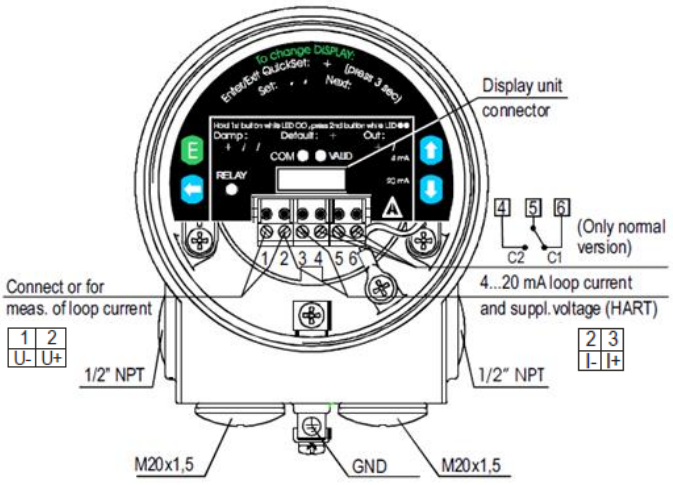
promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

- For ultimate accuracy, install the sensor as close as possible above the expected maximum water level (see minimum measuring range).
- Install the device in a place defined by the characteristics of the metering channel along the longitudinal axis of the flume or weir. In case of Parshall flumes supplied by promesstec the location of the sensor is marked.
- In some cases foam may develop on the surface. Make sure that the surface, opposite to the sensor remain free of foam for proper sound reflection.
- From the point of view of measurement accuracy the length of the channel sections preceding and following the measuring flume and their method of joining to the measuring channel section are of critical importance.
- Despite of the most careful installation, the accuracy of flow metering will be lower than that of specified for the distance measurement. It will be determined by the features of the flume or weir applied.

4.3 Installation and electrical connection

- Screw the unit in to its place. Use open wrench for tightening; max torque is 20Nm
- After tightening the enclosure can be rotated to the proper position. (Safety bolt prevents rotation more than 350°)
- The unit may be damaged by electrostatic discharge (EDS) via its terminal, thus apply the precautions commonly used to avoid electrostatic discharge e.g. by touching a properly grounded point before removing the cover of the enclosure.
- Ensure that the power supply is turned off at the source.
- With removal of the cover of the housing and taking out the display module (if any), the screw terminals can be accessed. Suggested cable core cross section: 0.5 ... 1.5 mm2. Arrange grounding by the inner or outer grounding screw first.
- Switch on the unit and make necessary programming.
- After programming ensure proper sealing and closing of the cover.





promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

4.4 Loop current checking

After removing the cover (and the Display Module if there is any) the actual loop current can be measured with an accuracy of 0.5% by connecting an voltmeter (in the range of 200 mV) to the points indicated on the drawing above).

5. Programming

! Before switching on the device, it should be checked whether the sensor has been correctly installed and wired.

The UST 200 can be programmed by the following two ways:

- **Programming without display module 5.1**
  Assignment of the levels to the 4 and 20 mA current output, error indication by the analogue signal and damping can be set.

- **Programming with display module 5.2**
  All features of the unit can be set, such as measurement configuration and optimisation, 32-point linearisation, dimensions for 11 tanks with different shape and for 21 different open channels (flume, weir, etc).

Devices with the type code UST 200-X-1-X-X-X-X include a display.
All device functions are also available without a display, but the display is required for programming.

The unit will measure during programming in accordance with the previous parameters. The new, modified parameters will only be effective after returning to the Measurement Mode.

If the transmitter is left in Programming Mode by mistake, it will automatically return to Measurement Mode after 30 minutes and will operate with the parameters entered during the last completed programming.

The UST 200 will be delivered with the following factory default:

- Current output, display and bargraph: LEVEL
- Current output and bargraph proportional to the level
- 4 mA: assigned to the minimum level 0%
- 20 mA: assigned to the maximum level 100%
- Error indication by the current output: hold last value
- Damping: 60 sec.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

5.1 Programming without display module

Programming is only possible when the UST 200 is in measurement mode and is receiving a valid echo (the "VALID" LED lights up).

The following can be programmed without display module:

- Assignment of the 4 mA to a required e.g. min. level / max. distance
- Assignment of the 20 mA to a required e.g. max. level / min. distance
- Error indication by the current output (Hold, 3.6 mA or 22 mA)
- Damping (10, 30 or 60 sec)
- Reset to the factory default

Note: Current output can also be assigned in inverted mode: 4 mA = 100% (Full), 20 mA = 0% (Empty)

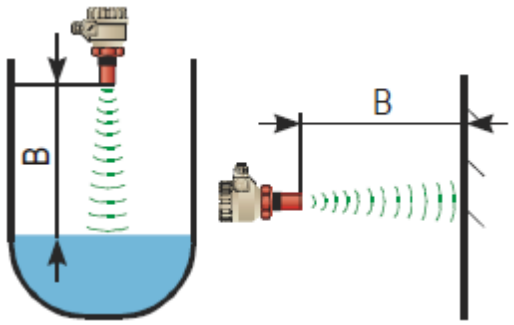
Procedure of programming: press button in the relevant sequence and check the state of the LED-s. Symbols for the states of the LED-s:

○	LED is off
◐	LED is blinking
●	LED is on
◐ ◑	LED´s are blinking alternatively
⊗	Dont care

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

Minimum level, (0%, empty tank) assignment to 4 mA

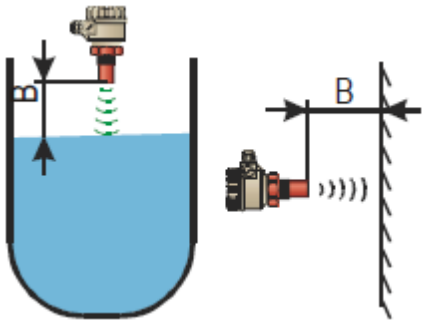
Action	LED-state following the action
1. Check for a valid ECHO	⊗● = Valid ECHO, transmitter pro-grammable
2. Press NEXT ⊕ button steadily	○○ = UST200 in pro-gramming mode
3. Press UP ⊕ but-ton steadily	●● = 4mA assigned to the distance (see picture)
4. Release buttons	○○ = programming completed



Use level in tank or a fix target e.g. the wall

Maximum level (100%, full tank) assignment to 20 mA

Action	LED- state following the action
1. Check for a valid ECHO	⊗● = Valid ECHO, transmitter pro-grammable
2. Press NEXT ⊕ button steadily	○○ = UST200 in pro-gramming mode
3. Press DOWN ⊕ button steadily	●● = 20mA as sig-ned to the distance (see picture)
4. Release buttons	○○ = programming completed



Use level in tank or a fix target e.g. the wall

Error behavior / error signaling of the current output

Action	LED- state following the action
1. Check for a valid ECHO	⊗● = Valid ECHO, transmitter programmable
2. Press UP ⊕ button steadily	○○ = UST200 in programming mode
3. Press any of the DOWN ⊕ ENTER Ⓔ NEXT ⊕ buttons steadily	- hold last value ●● = - 3,6mA - 22mA
4. Release buttons	○○ = Programming completed

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

Damping time setting (Check for a valid echo as above)

Action	LED- state following the action
1. Check for a valid ECHO	⊗● = Valid ECHO, transmitter programmable
2. Press ENTER Ⓔ button steadily	○○ = UST200 in programming mode
3. Press any of the NEXT ⊕ UP ⊕ DOWN ⊕ buttons steadily	- 10 sec. ●● = - 30 sec. - 60 sec.
4. Release buttons	○○ = Programming completed

RESET: Returning to the default (Check for a valid echo as above)

Action	LED-state following the action
1. Check for a valid ECHO	⊗● = Valid ECHO, transmitter programmable
2. Press NEXT ⊕ button steadily	○○ = UST200 in programming mode
3. Press ENTER Ⓔ button steadily	●● = Default loaded
4. Release buttons	○○ = Programming completed

Indication of mistakes (by LEDs) made during programming

Action	LED- state following the action	Possible correc-tion
Attempted program-ming	◐◐ = blinking twice = no Echo	Find a valid Echo
Attempted program-ming	◐◐ = blinking three times = no ac-cess possible	Only with display (5.2 / P99)
Attempted program-ming	◐◐ = blinking four times = UST 200 not in Level Measurement Mode	Only with display (5.2 / P01)

5.2 Programming with display module

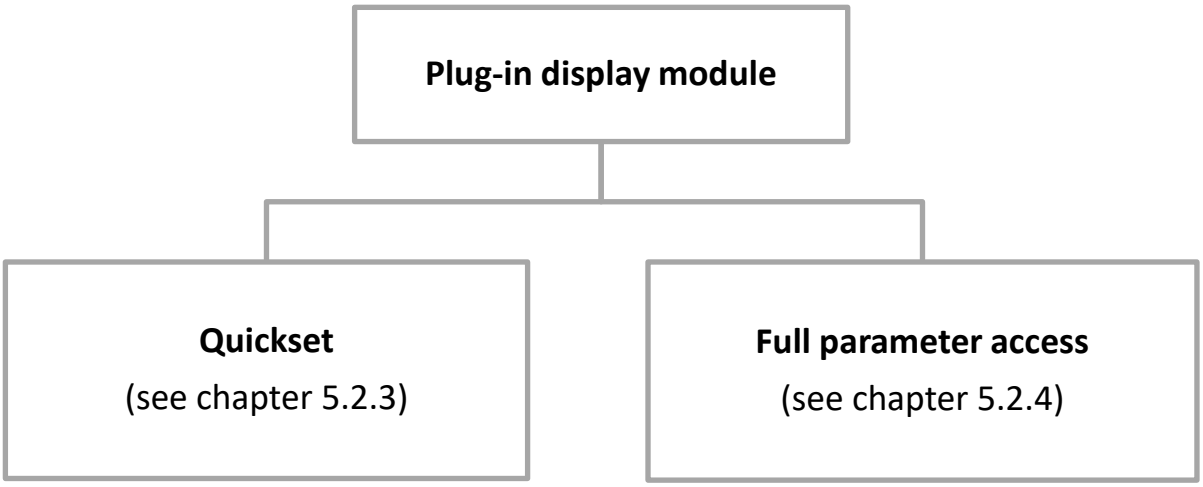
The UST 200 should be adjusted to the process by programming the parameters. The Display Module can be used to display the parameters during programming and measurement values during measurement.

The display module supports two programming modes:

1. The quick configuration

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

2. Full parameter access



Quickset (see chapter 5.2.3)

The quick configuration includes the following 6 basic parameters:

- Engineering unit for the display (Metric or US)
- Maximum measuring distance (H)
- Assignment of min level to 4 mA
- Assignment of max level to 20 mA
- Error indication by the current output
- Damping time

Full parameter access (see chapter 5.2.4)

With full parameter access, all functions of the device are available, e.g.

- Measurement configuration
- Outputs
- Measurement optimisation
- 11 pre-programmed tank shapes for volume calculation
- 21 pre-programmed formula for flow metering
- 32-point linearisation

5.2.1 Display module

Symbols used on the LCD:

- **DIST** – Distance (measuring) mode
- **LEV** – Level (measuring) mode
- **VOL** – Volume (measuring) mode
- **FLOW** – Open channel (flow metering) mode

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

- **PROG**- Programming mode (device under programming)
- **T1** – TOT1 volume flow totaliser
- (resetable aggregate)
- **T2** – TOT2 volume flow totaliser (aggregate)
- **FAIL** – Measurement / device error
- ↑ ↓ - Level changing direction
- **Bargraph**, assigned to the current output or echo strength

Symbols in the frame:

- **M** – Metric system
- **US** – US calculation system

LEDs lit:

- **COM** – digital (Hart) communication
- **VALID** – presence of valid echo

IrDA – Infrared communication port for logger readout, diagnostics and software upgrade

5.2.2 Steps of the display module

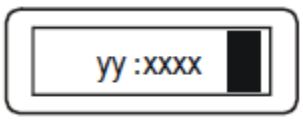
Programming will be performed by the pressing and releasing the relevant one or two keys (simultaneously).

Single key pressing

ENTER	Ⓔ	to select parameter address and go to parameter value
	◯	to save parameter value and return to parameter address
NEXT	⊕	to move the blinking (sign of change) of the digit to the left
UP	⊕	to increase value of the blinking digit
DOWN	⊕	to decrease value of the blinking digit

Double key pressing

Press the two keys simultaneously for desired programming step



yy parameter address (P01, P02 … P99)

xxxx parameter value (dcba)

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

bargraph

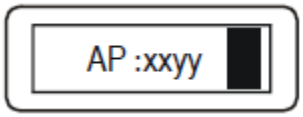
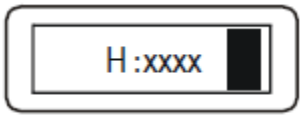
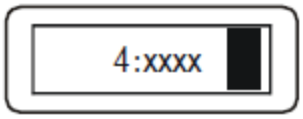
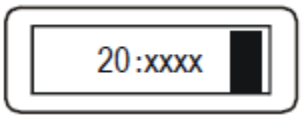
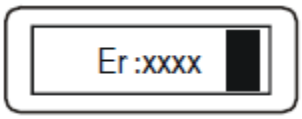
5.2.3 Quickset

Recommended as a simple and fast way to start up UST 200.
QUICKSET programming (aided by 6 screens) is used in uncomplicated level metering applications to set the 6 basic parameters.

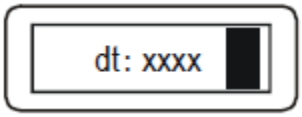
The instructions of this programming mode are also to be found on the front panel above the display module socket.

Buttons	Function
ENTER Ⓔ + DOWN ⓓ (press for min 3 secs!)	Enter or exit QUICKSET programming mode
UP ⓤ, DOWN ⓓ, NEXT ⓛ	Increase/decrease and move left the blinking digit
UP ⓤ + DOWN ⓓ	“GET LEVEL" - display actual level measured
ENTER Ⓔ	Save readout and step to the next screen
NEXT ⓛ + UP ⓤ	Quit current output scaling without saving the modifications (CANCEL)
NEXT ⓛ + DOWN ⓓ	Display of the DEFAULT value.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

Display	Actions
	**AP*plikation*** xx = select “EU” (European) for metric or “US” for US engineering units (use UP ⊕ / DOWN ⊖) yy = „Li“ for liquids DEFAULT: EU
	**H = xxxx maximum measuring distance** (Distance between transducer face and tank bottom) **Manual:** set value UP ⊕, DOWN ⊖, NEXT ⊜ **Automatic:** use the „GET LEVEL” function (UP ⊕ + DOWN ⊖) to obtain actual measured value with level in tank or a fixed target, i.e. wall. (“GET LEVEL” functions only if ECHO LED is lit) and save it as above. **Save** it with ENTER Ⓔ DEFAULT: maximum measuring distance [m], see technical data table
	4mA xxxx – **level value** assigned to 4 mA current output **Manual:** set level value UP ⊕, DOWN ⊖, NEXT ⊜ buttons, **Automatic:** use the “GET LEVEL” function (UP ⊕ + DOWN ⊖) to display the actual measured value with level in tank or a fixed target, i.e. wall, **Save** it with ENTER Ⓔ DEFAULT: 0 m (0%, Empty tank)
	20mA xxxx – **level value** assigned to 20 mA current output **Manual:** set level value use UP ⊕, DOWN ⊖, NEXT ⊜ buttons, **Automatic:** use the “GET LEVEL” function (UP ⊕ + DOWN ⊖) to obtain actual measured value with level in tank or a fixed target, i.e. wall. (“GET LEVEL” functions only if ECHO LED is lit) **Save** it with ENTER Ⓔ DEFAULT: max. level = max. measuring distance – dead band [m] (100%, Full tank) (See Technical Data Table
	**Error indication** by the current output – select “Hold”, 3.8 mA or 22 mA **(**by UP ⊕ / DOWN ⊖) **Save** it with ENTER Ⓔ DEFAULT: hold last value

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

	**damping time** wählen select required damping time (by UP ⊕ / DOWN ⊖ button) **Save** it with ENTER Ⓔ DEFAULT: 60 sec for liquids, 300 sec for solids.

Note: Current output can also be programmed for inverted operation: 4 mA= 100% (Full), 20 mA= 0% (Empty)
Description of failures can be found under the chapter 6

5.2.4 Full parameter access

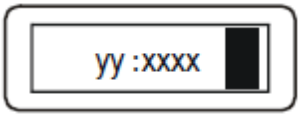
Full parameter access is the highest programming level to access all features provided by the UST 200.

Description of all parameters can be found under the chapter “Parameter” 5.

You can access the full range of parameters as follows:

Button	Function
ENTER Ⓔ + NEXT ⊖ (press for 3 seconds)	Enter or exit full parameter access programming mode.

In this programming mode, the display will indicate:



yy Parameter address (P01, P02 … P99)
xxxx Parameter value (dcba)
≡ Bargraph

Measuring is going on during programming in accordance with the old parameter set. New parameter set will be valid after returning to the measurement to the programming mode.
Steps and indications of the full parameter access programming mode.

Button	while Parameter Address is blinking	while Parameter Value is blinking
ENTER Ⓔ	Go to the parameter value	Save the modification of the parameter value and return to the parameter address

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

NEXT ⊖ + UP ⊕	Cancel all modifications of the actual programming phase.pressing for 3 sec is required while CANCEL will be displayed for warning	Neglect the modification of the parameter value. and return to the parameter address without saving the modifications
NEXT ⊖ + DOWN ⊗	Reset entire device to factory default. Since this action will reset all parameters, "LOAD" will appear on the display: - to confirm, press - to escape, press any other key - Exception: clearing TOT 1 (See at P77)	Display default of the Parameter Values (it can be saved by pressing ENTER Ⓔ)
NEXT ⊖	Move blinking (changeability) of the digit to the left	
UP ⊕ / DOWN ⊗	Modify the blinking digit (increase, decrease) or scroll up/down	

6. Parameters – descriptions and programming

6.1 Measurement configuration

P00: -cba Application/Engineering Units

Note: Programming of this parameter will result in loading the factory default with the corresponding engineering units.

a	**Operating (measurement) mode**
0	Liquid level measurement

b	**Engineering units (according to „c“)**	
	metric	**US**
0	m	ft
1	cm	inch

c	**Calculation system**

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

0	metric
1	US

FACTORY DEFAULT: -000

P01: --ba Measurement mode – Bargraph

Attention: mind the sequence! when programming this parameter the right value “a” will be blinking first.

a	**Measurement mode**	**Display symbol**	**Displayed values**
0	Distance	**DIST**	Distance
1	Level	**LEV**	Level, distance
2	Level in %	**LEV%**	Level %, level, distance
3	Volume	**VOL**	Volume, level, distance
4	Volume in %	**VOL%**	Volume %, volume, level, distance
5	Flow	**FLOW**	Flow, TOT1, TOT2, level, distance

Parameter value “b” will determine that the height of the bargraph will be proportional to the current output or to the Echo strength

b	**Bargraph indikator**
0	ECHO strength
1	Current output

FACTORY DEFAULT: 11

P02: -cba Calculation units

a	**Temperature**
0	°C
1	°F

This table is interpreted according to P00(c), P01(a) and P02(c) and is irrelevant in case of percentage measurement (P01(a)= 2 or 4)

b	**Volume**		**Weight (set also P32)**		**Flow**	
	metric	**US**	**metric**	**US**	**metric**	**US**
0	m^3	ft^3	-	lb (pound)	m^3/time	ft^3/time
1	liter	gallons	tons	tons	liter/time	gal./time

c	**time**
0	sec.
1	min.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

2	hour
3	day

FACTORY DEFAULT: 000

03: ---a Values displayed- rounding

It is important to keep in mind that the instrument is measuring distance as basic quantity.

Measured distance	**Resolution**
Xmin – 2 m	1 mm
2 m – 5 m	2 mm
5 m – 10 m	5 mm

The resolution depending on the distance can be considered as a kind of rounding that will be contained in all further value (of level, volume or volume flow) calculated. Therefore if programmed for DIST or LEV measurement the setting of P03 is irrelevant.

Display (VOL or FLOW)

Displayed Value	**Display Format**
0,000 – 9,999	x,xxx
10,000 – 99,999	xx,xx
100,000 – 999,999	xxx,x
1000,000 – 9999,999	xxxxx
100000,000 – 99999,999	xxxxxx
1 Million – $9{,}99999*10^{9}$	x,xxxx :e
over$1*10^{10}$	overflow (Err4)

Obviously the decimal position will be shifted with increasing value displayed. (See table at the left). Values over one million will be displayed in exponential format whereas the value (e) represents the exponent. Over the value of 1x1010 Err4 (overflow) will be displayed.

Rounding

a	**Steps in the displayed value**
0	1 (no rounding)
1	2
2	5
3	10
4	20
5	50

A couple of millimetres of fluctuation of the basic DIST value (e.g. due to waves) will be enlarged by the mathematical operations. This enlarged fluctuation in displaying VOL or FLOW can (if disturbing) be avoided by rounding to be set in P03. Rounding

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

value 2, 5, 10 etc represents the steps by which the calculated value will be changed in its (one or two) last digit(s).

Examples:
P03=1 steps by 2: 1,000; 1,002; 1,004
P03=5 steps by 50: 1,000; 1,050; 1,100 or 10,00; 10,05(0); 10,10(0); 10,15(0)
(the 0 from the steps 50, 100, 150 etc will not be displayed).

FACTORY DEFAULT: 0

P04: xxxx Maximum distance to be measured (H)

The maximum distance to be measured is the greatest distance between the surface of the transducer and the level to be measured.
This is the only parameter that has to be programmed for each application other than distance (however to avoid disturbing effect of possible multiple echos it is suggested to do this in distance measurement applications too).

Values of the maximum measuring distance will be displayed as below**.**

Engineering unit	Display format
m	x,xxx or xx,xx
cm	xxx,x
ft	xx,xx or xxx,x
inch	xxx,x

Enter the distance between the sensor and the bottom of the tank in the set unit using the UP ⊕, DOWN ⊖, NEXT ⊙ keys, or use the "TEACH IN LEVEL" function (UP ⊕ + DOWN ⊖) to learn the current level.
Save the settings with: ENTER Ⓔ

FACTORY DEFAULT: Depending on type (see technical data).

P05: Minimum measuring distance (dead zone- close-end blocking)

Automatic setting
By using the factory default value, the unit will automatically set the smallest possible close-end-blocking distance i.e. the dead band.

Manual close-end-blocking
Manual close-end-blocking should be used for example to block out the echo originating from the bottom rim of a stand-off pipe or from any object protruding into the ultrasonic cone near to the transmitter.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

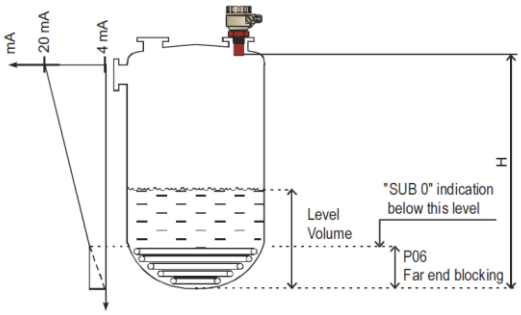
By entering a value, higher than the factory default, the minimum measuring range will be extended and fixed to the specified value.

To return to the factoryprogrammed (DEFAULT value) of the minimum measuring distance press NEXT + DOWN .

FACTORY DEFAULT: Depending on type (see technical data).

P06: Far end blocking

Far end blocking is used to neglect incorrect level/volume readings and output actions below a pre-set level programmed in P06.



Level measurement

The far-end blocking can be used to avoid disturbing effect of stirrer or heaters at the bottom of the tanks.
If the level of the medium sinks below the blocked out range:

- ”Sub 0” will be indicated for the level and volume
- Distance value is not interpretable
- Current output will hold the value corresponding to the far end blocking level

If the medium level is above the blocked out range:
The calculation of level and volume will be based on the programmed tank dimensions, therefore the measured or calculated process values will not be influenced in any way, by the far end blocking value.

Open channel flow metering

Remote blanking is used to suppress false flow readings and output actions below a specified level where an accurate flow rate calculation is no longer possible.

If the liquid level in the flume/weir falls below the blocked out range:
The UST 200 will act as follows:

- - Indicate ”No Flow” on the display
- - Hold last valid data on the current output.

If the level in the flume/weir is above the blocked out range:
The calculation of volume flow will be based on the programmed flume/weir data; therefore the measurement values will not be influenced in any way, by the far end blocking value.

FACTORY DEFAULT: 0

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

6.2 Current output

P10: Value (of distance, level, volume or flow) assigned to 4 mA current output

P11: Value (of distance, level, volume or flow) assigned to 20 mA current output

Values are interpreted according to P01(a). Please note that in case of programming for (LEV or VOL) % measurement the min and max value has to be entered in the relevant engineering units of LEV (m, ft) or VOL (m3, ft3).
Assignment can be made so that the proportion between the change of the (measured or calculated) process value and the change of the current output be either direct or inverse. E.g. lev 1 m assigned to 4mA and lev 10 m assigned to 20 mA represents direct proportion and lev 1 m assigned to 20 mA and lev 10 m assigned to 4 mA represents the inverse proportion.

WERKSEINSTELLUNG
P10 0 level (max distance)
P11 max level (min distance) H

P12: ---a Error indication by the current output

In case of error the UST 200 will provide one of the current outputs below. (For errors and their interpretation see chapter 7).

a	Error indication
0	Hold last value
1	3,8 mA
2	22 mA

FACTORY DEFAULT: 0

P13 – P16: NOT required (reserved for future devices with relay output)

6.3 Measurement optimisation

P20: ---a Damping

This parameter can be used to reduce unwanted fluctuation of the display and output

a	Damping time (sec.)	Liquids	
		none / moderate	heavy / dense fume or tur-

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

		fume / waves	bulent waves
0	No filter		
1	3	applicable	not recommended
2	6	recommended	applicable
3	10	recommended	recommended
4	30	recommended	recommended
5	60	recommended	recommended

FACTORY DEFAULT: 60 sec.

P22: ---a Dome top tank compensation

This parameter can be used to reduce disturbing effect of possible multiple echos.

a	Compensation	Applied
0	OFF	In case the UST 200 is not mounted in the centre of the top and the top is flat
1	ON	In case the UST 200 is mounted in the centre of a tank with dome-shaped top

WERKSEINSTELLUNG: ---0

P24: ---a Target tracking speed

In this parameter evaluation can be speed up at the expense of the accuracy

a	Tracking speed	Remark
0	Standard	For most applications
1	Fast	For fast changing level
2	Special	Only for special applications (measuring range is reduced to 50% of the nominal value) The measuring window is inactive and the UST 200 will respond practically instantly to any target. Recommended to fast target tracking, but usually not applicable for level metering..

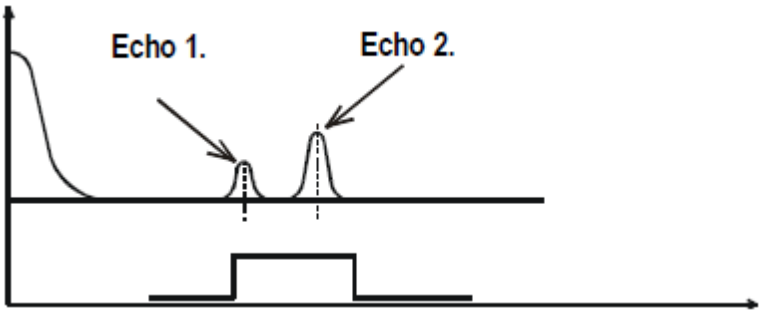
FACTORY DEFAULT: ---0

P25: ---a Selection of echo within the measuring window

A so-called measuring window is formed around the echo signal. The position of this measuring window determines the flight time for calculation of the distance to the target. (the picture below can be seen on the test oscilloscope).

Received signal amplitude:

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com



"t" ultrasonic transit time

This parameter only influences the echo selection within the measuring window.

a	Echo in the window to be selected	Remark
0	With the highest amplitude	For most applications (both with liquids and solids)
1	Erstes Echo	For liquids applications with multiple echoes within the measuring window

FACTORY DEFAULT: ---0

P26: Level elevation rate (filling speed) (m/h)

P27: Level descent rate (emptying speed) (m/h)

These parameters provide additional protection against echo loss in applications involving very heavy fuming.
The parameters must not be smaller than the fastest possible filling/emptying rate of the actual technology.
For all other applications, use the factory default setting.

FACTORY DEFAULT: 2000 for both P26 and P27

P28: ---a Echo loss indication

a	Signalling	Remark
0	Delayed indication	During echo-loss, display and analogue output will hold last value. If the echo-loss prevails for 10 sec plus the time period set in P20 (damping time), the reading on the display will change to "no Echo" and the outputs will change according to the "Error Indication Mode" pre-set in P12
1	No indication	For the time of echo-loss, display and analogue output will hold last value.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

2	Advance to full	During echo-loss in case of filling, the reading on the display and analogue output will shift towards the "full" tank state with a level elevation rate (filling speed) pre-set in P26.
3	Immediate indication	In case of echo-loss, the display will immediately change to “no echo”, and the outputs will change according to the "error indication mode" pre-set in P12.
4	Empty tank indication	Echo-loss may occur in completely empty tanks with a spherical bottom due to deflection of the ultrasonic beam, or in case of silos with an open outlet. If the echo is lost when the tank is completely empty, the indication will correspond to empty tank, in all other cases echo-loss indication will function according to the “Delayed”.

FACTORY DEFAULT: ---0

P29: Blocking out of disturbing object

One fixed object in the tank, disturbing the measurement, can be blocked out.
Enter distance of the object from the transducer. Use the echo map (P70) to read out the precise distance of disturbing objects.

FACTORY DEFAULT: ---0

P31: Sound velocity at 20°C (m/sec or ft/sec depending on P00(c))

Use this parameter if the sound velocity in the gases above the measured surface differs largely from that of in air.
Recommended for applications where the gas is more or less homogeneous. If it is not, the accuracy of the measurement can be improved using 32-point linearisation (P48, P49).
For sound velocities in various gases see section “Sound Velocities”.

FACTORY DEFAULT: Metric (P00: “EU”): 343.8 m/s, US (P00: “US”): 1128 ft/s

P32: Specific gravity

If you enter a value (other than “0”) of specific gravity in this parameter, the weight will be displayed instead of VOL.
FACTORY DEFAULT: 0 [kg/dm3] or [lb/ft3] depending on P00 (c)

P34 – P39: NOT required (reserved for future devices with data logging)

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

6.4 Volume measurement

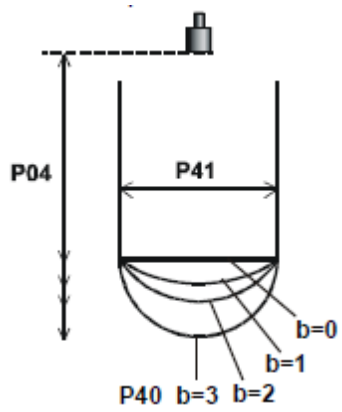
P40: --ba Tank shape

ba	Tank shape	Other parameters
b0	Standing cylindrical tank shape (value of “b” as below)	P40(b), P41
01	Standing cylindrical tank with conical bottom	P41, P43, P44
02	Standing rectangular tank (with chute)	P41,P42, (P43, P44, P45)
b3	Lying cylindrical tank shape (value of “b” as bellow)	P40(b), P41, P42
04	Spherical tank	P41

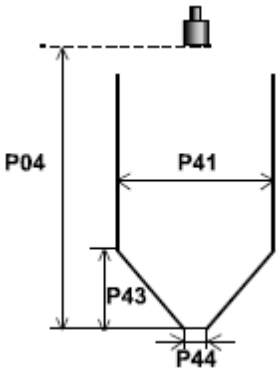
FACTORY DEFAULT: --00

P41-45: Tank dimensions

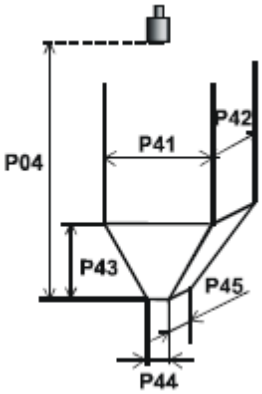
Standing cylindrical tank with hemispherical bottom



Standing cylindrical tank with conical bottom

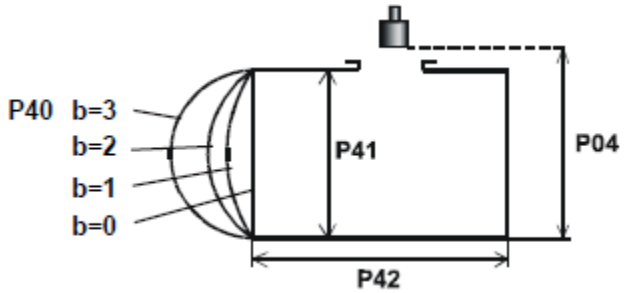


Standing rectangular tank with or without chute

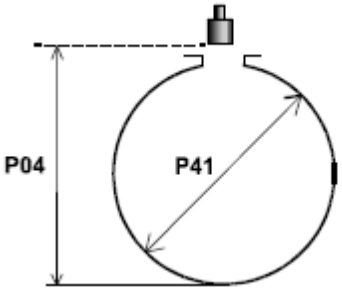


Ohne Rutsche
P43, P44 und P45 = 0

Lying cylindrical tank



Spherical tank



promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

6.5 Volume flow measuring

P40: --ba Devices, formula, data

--ba	Devices, formula, data						more parameters
	Typ		Berechnungsformel	Qmin [l/s]	Qmax [l/s]	„P“ cm	
00	promesstec Parshall flume	GPA-1P1	Q[l/s]= 60.87*h$^{1.552}$	0,26	5,38	30	P46
01		GPA-1P2	Q[l/s]= 119.7*h$^{1.553}$	0,52	13,3	34	P46
02		GPA-1P3	Q[l/s]= 178.4*h$^{1.555}$	0,78	49	39	P46
03		GPA-1P4	Q[l/s]= 353.9*h$^{1.558}$	1,52	164	53	P46
04		GPA-1P5	Q[l/s]= 521.4*h$^{1.558}$	2,25	360	75	P46
05		GPA-1P6	Q[l/s]= 674.6*h$^{1.556}$	2,91	570	120	P46
06		GPA-1P7	Q[l/s]= 1014.9*h$^{1.556}$	4,4	890	130	P46
07		GPA-1P8	Q[l/s]= 1368*h$^{1.5638}$	5,8	1208	135	P46
08		GPA-1P9	Q[l/s]= 2080.5*h$^{1.5689}$	8,7	1850	150	P46
09	General PARSHALL flume						P46, P42
10	PALMER-BOWLUS (D/2)						P46, P41
11	PALMER-BOWLUS (D/3)						P46, P41
12	PALMER-BOWLUS (rechteckig)						P46, P41, P42
13	Khafagi Venturi						P46, P42
14	Bottom-step weir						P46, P42
15	Suppressed rectangular or BAZIN weir						P46, P41, P42
16	Trapezoidal weir						P46, P41, P42
17	Special trapezoidal (4:1) weir						P46, P42
18	V- notch weir						P46, P42
19	THOMSON (90°-notch) weir						P46
20	Circular weir						P46, P41
21	General flow formula: Q[l/s]= 1000*P41*hP42, h [m]						P46, P41, P42

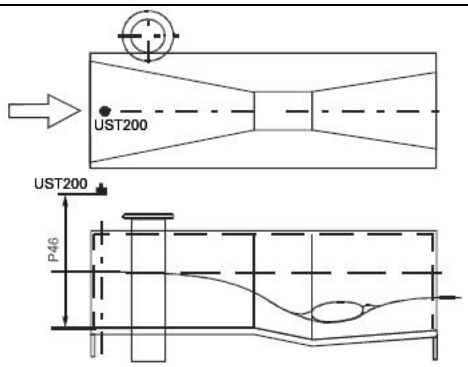
* See parameters P41-P46 on the following pages

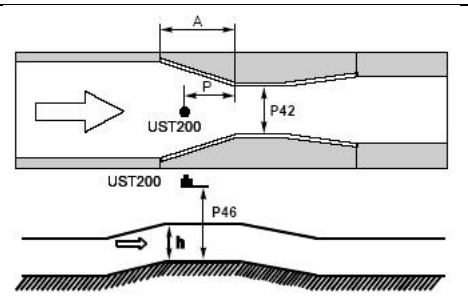
FACTORY DEFAULT: --00

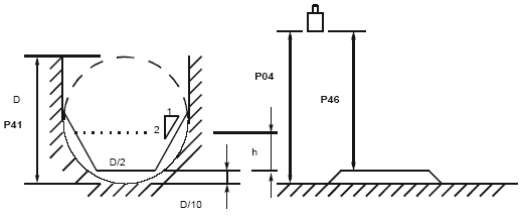
P41-P45: Flume/weir dimensions

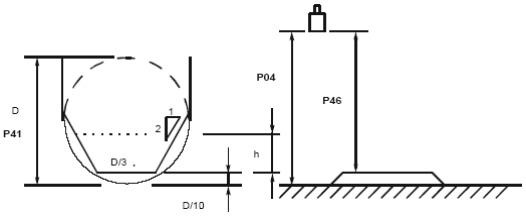
See following pages
FACTORY DEFAULT: --00

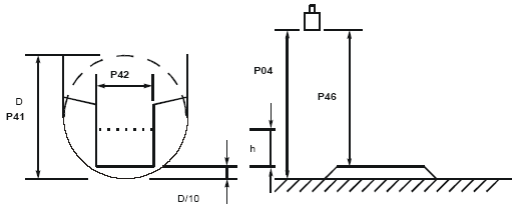
promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

<table>
<tr>
<td>P40 = 00
.
.
.
08</td>
<td>Promesstec Parshall flumes
(GPA1P1 … GPA-1P9)
For further details see the Manual of the Parshall flume</td>
<td> 
</td>
</tr>
<tr>
<td>P40 = 09</td>
<td>General Parshall flume
0.305 < P42(Breite) <2.44
$Q[m^3/s]= 372*P42*(h/0.305)^{1.569*P42^{0.026}}$

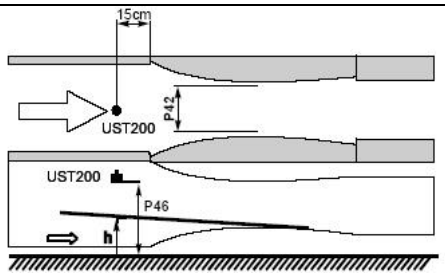
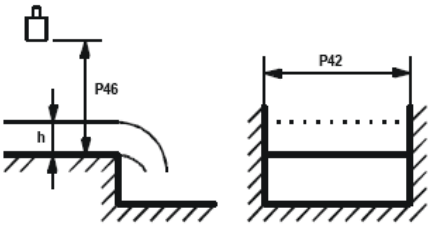
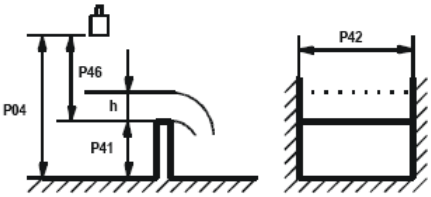
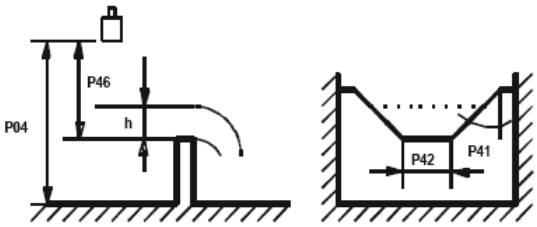
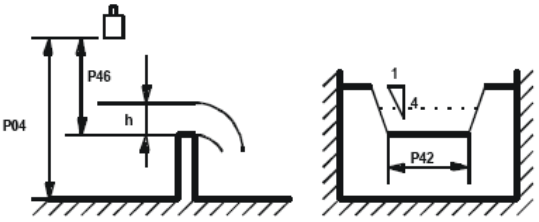
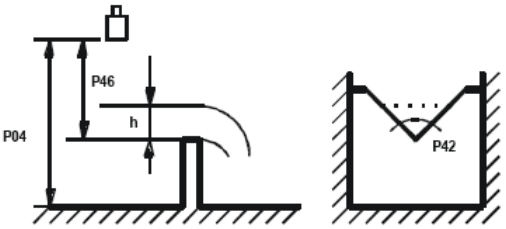
2.5 < P42
$Q[m3/s]= K*P42*h^{1.6}$
P= 2/3*A
<table><tr><th>P42[m]</th><th>K</th></tr><tr><td>3.05</td><td>2.450</td></tr><tr><td>4.57</td><td>2.400</td></tr><tr><td>6.10</td><td>2.370</td></tr><tr><td>7.62</td><td>2.350</td></tr><tr><td>9.14</td><td>2.340</td></tr><tr><td>15.24</td><td>2.320</td></tr></table></td>
<td> 
</td>
</tr>
<tr>
<td>P40 = 10</td>
<td>Palmer-Bowlus (D/2) flume

$Q[m^3/s]= f(h1/P41)*P41^{2,5}$,
bei h1[m]= h+(P41/10)</td>
<td> 
</td>
</tr>
<tr>
<td>P40 = 11</td>
<td>Palmer-Bowlus (D/3) flume

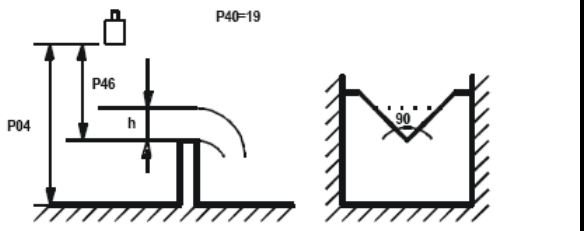
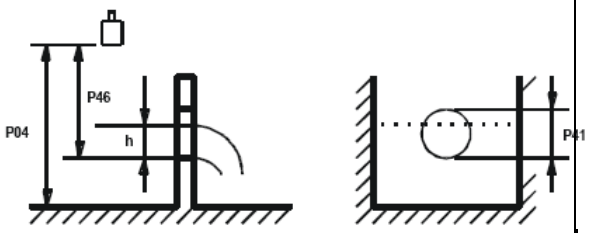
$Q[m^3/s]= f(h1/P41)*P41^{2,5}$,
bei h1[m]= h+(P41/10)</td>
<td> 
</td>
</tr>
<tr>
<td>P40 = 12</td>
<td>Palmer-Bowlus (rectangular) flume

$Q[m^3/s]= C*P42*h^{1,5}$,
bei C= f(P41/P42)</td>
<td> 
</td>
</tr>
</table>

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

P40 = 13	Khafagi Venturi flume Q[m³/s]= P42*1.744*h^{1,5} + 0.091*h^{2,5}	
P40 = 14	Bottom step weir 0.0005 < Q[m³/s] < 1 0.3 < P42[m] < 15 0.1 < h[m] < 10 Q[m3/s]= 5.073*P42*h^{1,5} Genauigkeit: ±10%	
P40 = 15	Suppressed rectangular or BAZIN weir 0.001 < Q[m³/s] < 5 0.15 < P41[m] < 0.8 0.15 < P42[m] < 3 0.015 < h[m] < 0.8 Q[m³/s]= 1.7599*[1+(0.1534/P41)] *P42*(h+0.001)$^{1,.5}$ Accuracy: ±1%	
P40 = 16	Trapezoidal weir 0.0032 < Q[m³/s] < 82 20 < P41[°] < 100 0.5 < P42[m] < 15 0.1 < h[m] < 2 Q[m3/s]= 1.772*P42*h1.5 +1.320*tg(P41/2)*h^{2,47} Accuracy: ±5%	
P40 = 17	Special Trapezoidal (4:1) weir 0.0018 < Q[m³/s] < 50 0.3 < P42[m] < 10 0.1 < h[m] < 2 Q[m3/s]= 1.866*P42*h^{1,5} Accuracy: ±3%	
P40 = 18	V-notch weir 0.0002 < Q[m³/s] < 1 20 < P42[°] < 100 0.05 < h[m] < 1 Q[m³/s]= 1.320*tg(P42/2)*h^{2,47} Accuracy: ±3%	

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

P40 = 19	THOMSON (90°-notch) weir 0.0002 < Q[m^3/s] < 1 0.05 < h[m] < 1 Q[m3/s]= 1.320*$h^{2,47}$ Accuracy: ±3%	
P40 = 20	Circular weir 0.0003 < Q[m^3/s] < 25 0.02 < h[m] < 2 Q[m^3/s]= m*b*$D^{2,5}$ m= 0.555+0.418h/P41+(P41/(0.11*h)) Accuracy: ±5%	

P46: Distance between transducer face and level of Q=0

P46 is always the distance between the transducer face and the level, where the volume flow is 0.

FACTORY DEFAULT: --00

6.6 32- Point linearisation

P47: ---a Linearisation

Linearisation is the method of assigning requested (calibrated or calculated) level, volume or flow to values measured by the transmitter.
It can be used for instance if the sound velocity is not known (LEVEL⇒LEVEL) or in the case of tank with other shape than under 6.4 or open channel other than under 6.5 (LEVEL ⇒ VOLUME or LEVEL ⇒ FLOW)..

a	**Linearisation**
0	OFF
1	ON

WERKSEINSTELLUNG: ---0 = AUS

P48: Linearisierungstabelle

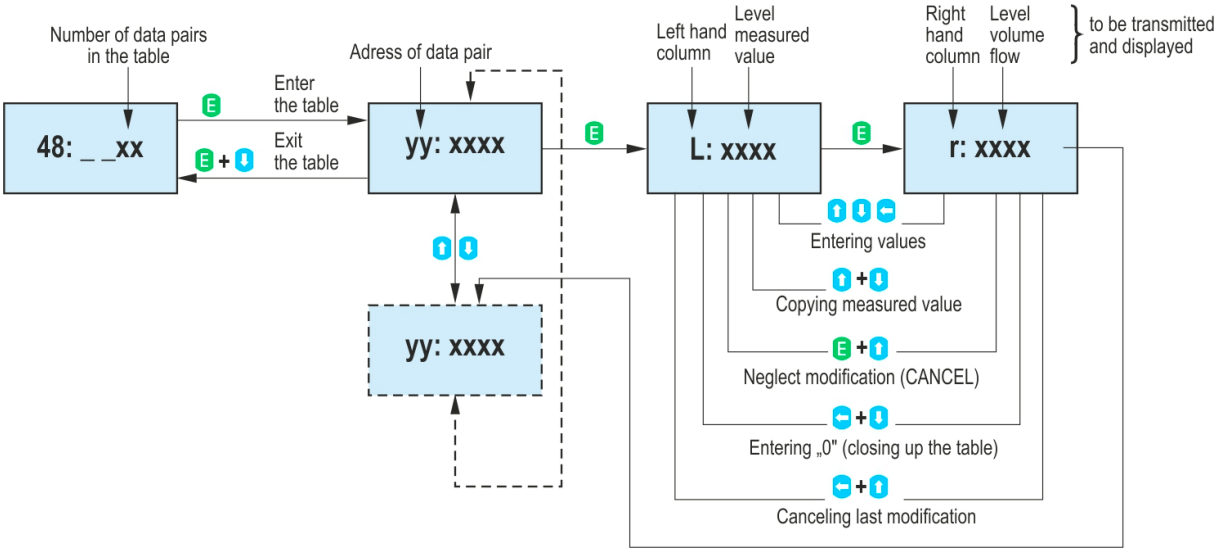
Datenpaare der Linearisierungstabelle werden als 2x32-Matrix behandelt, bestehend aus zwei Spalten.

Left column "L"	**Right column "r"**
LEVEL measured	LEVEL or VOLUME or FLOW to be

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

	transmitted and displayed

The left column values (indicated on the display as “L”) contain the measured LEVEL values.
The right column values (indicated on the display as “r”) contain the calibrated values and are interpreted according to the selected measurement
value in P01(a).



Conditions of correct programming of the data pairs

Left column “L”	**Right column “r”**
L(1)=0	r(1)
L(i)	r(i)
:	:
L(j)	r(j)

- The table must always start with: L(1)= 0 and r(1)= value (assigned to 0 level)
- The table must be ended either with the 32nd data pair i.e. j=32 or if the linearization table contains less than 32 data-pairs j < 32, the table must be closed by a level value “0” e.g. **L**(j<32)= 0.
- The UST 200 will ignore data after recognizing level value ‘0’ with serial number other than ‘1’.
- If the above conditions are not met, error codes will be displayed (see chapter: Error Codes).

6.7 Informational parameters (read out parameters)

P60: Overall operating hours of the unit (h)

Indication varies according to the elapsed time:

Operating hours	**Indication form**

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

0 bis 999,9 Std.	xxx,x
1000 to 9999 Std.	xxxx
over 9999 Std.	x,xx: e meaning x,xx 10^e

P61: (h) Time elapsed after last switch-on (h)

P62 – P63: NOT needed (reserved for future devices with relay output)

P64: (°C/°F) Current temperature of the sensor

P65: (°C/°F) Max. temperature of the sensor

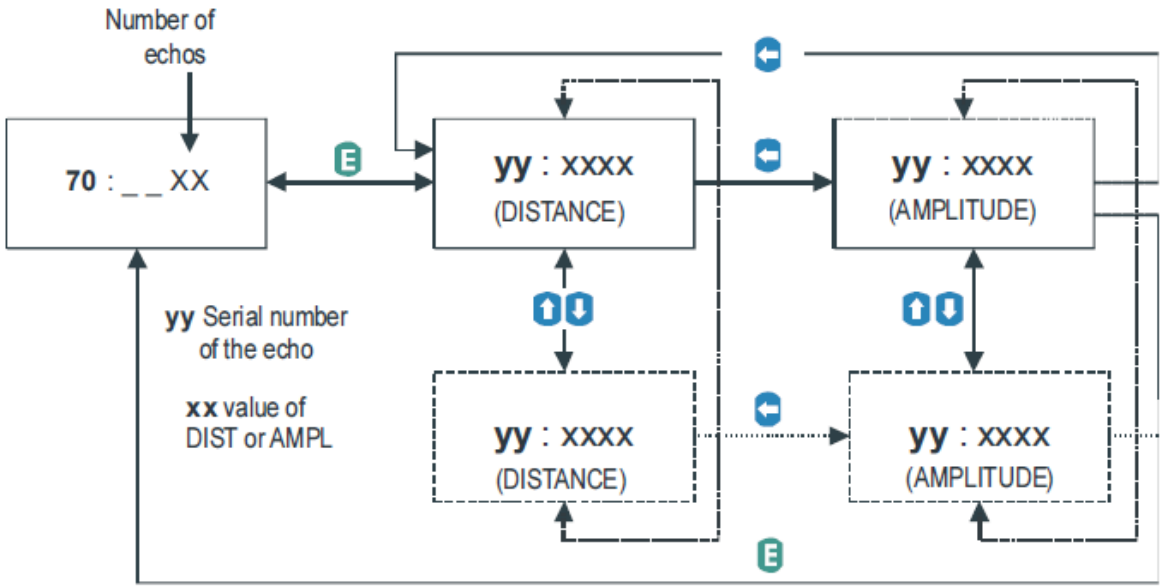
P66: (°C/°F) Min. temperature of the sensor

”Pt Error” is displayed when the temperature circuit is defective. The transmitter will then provide a temperature correction equal to 20ºC.

P70: Number of echoes / echo map

The UST 200 monitors the echo characteristics.

When called up, the current echo map is saved.
When called up, it outputs the range and amplitude of these echoes in sequence.



P71: Distance of the of measuring window

P72: Amplitude of the echo in the measuring

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

P73: (msec) Echo Position (time)

P74: Signal to noise ratio

Ratio	Measurement conditions
over 70	excellent
between 70 - 30	good
under 30	unreliable

P75: Blocking distance

The actual close-end blocking distance will be displayed (provided automatic blocking was selected in P05).

6.8 Additional parameters for flow measurement in open channels

P76: LEV Head of flow

The Headwater value can be checked here. This is the “h” value in the formula for flow calculation.

P77: TOT1 volume flow totaliser (resetable)

Resetting TOT1 totaliser:

1). Go to the parameter P77.
2). Press NEXT+ DOWN simultaneously.
3). Display will indicate: “t1 Clr”.
4). Press ENTER E to delete.

P78: TOT2 volume flow totaliser (non-resetable)

6.9 Test parameters

P80: (mA) Current output test (mA)

Going to this parameter, the actual current output (corresponding to the measured process value) will be displayed. By pressing ENTER E the (now blinking) current value can be set for any value between 3,9 and 20.5 mA. The current output has to show the same value which can be checked by an ampere meter, according to the description under 4.4. Press ENTER E to quit test mode and return the parameter address.

P81: NOT needed (reserved for future devices with relay output)

P97: b:a.aa Software code

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

a.aa: Number of the software version
b: Code of the special version

6.10 Simulation

P84: ---x Selection of the simulation

This function enables the user to test the settings of the outputs. The UST 200 can simulate the static or continuous change of level according to the simulation cycle time, high level and low level set in P85, P86 and P87. (The simulation levels must be within the programmed measuring range set in P04 and P05.
After selecting simulation type in P85 and setting simulation values Measurement Mode has to be re-entered. While the UST 200 is in simulation mode the DIST, LEV or VOL symbol will be blinking. To quit Simulation Mode P84= 0 should be set.

x	Simulation type
0	No simulation
1	The level changes continuously up and down between the level values set in P86 and P87 with a cycle time set in P85
2	Static level simulation on the level entered under P86

FACTORY DEFAULT: ---0

P85: (sec) Cycle time for simulation

P86: (m) Simulated low level value (m)

P87: (m) Simulated high level value (m)

6.11 Access lock

P99: dcba Access lock by password

The purpose of this feature is to provide protection against accidental (or intentional) re-programming of parameters.
The password can be any value other than 0000. Setting a password will automatically be activated when the UST 200 is returned to the measurement mode. If the password is activated, the parameters can only be viewed, this is indicated by the a flashing colon ":" between the parameter address and the parameter value.
In order to program the device locked by a secret code, first enter the password in P99. The password is re-activated each time the UST 200 is returned to measurement mode.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

To delete the password, enter the password in P99. After confirming it with [E] re-enter the parameter P99 and enter 0000.

[dcba (password)] → [E] → [E] → [0000] → [E] ⇒ password deleted

7. Error codes

Error code	Error description	Causes and solutions
1	Memory error	Contact Fa. promesstec
No echo	Echo loss	Sensor does not receive an echo (no reflection)
3	Hardware error	Contact Fa. promesstec
4	Display overflow	Check settings
5	Sensor error or improper installation/mounting, level in the dead band	Verify sensor for correct operation and check for correct mounting according to the user's manual
7	No signal received within the measuring range specified in P04 and P05.	Review programming, also look for installation mistake
12	Linearisation table error: both L(1) and L(2) are zero (no valid data-pairs)	See the section "Linearisation"
13	Linearisation table error: there are two same L(i) data in the table	See the section "Linearisation"
14	Fehler in der Linearisierungstabelle: die r(i)-Werte steigen nicht kontinuierlich an	See the section "Linearisation"
15	Linearisation table error: measured Level is higher than the last Volume or Flow data-pair	See the section "Linearisation"
16	The check sum of the program in the EEPROM is wrong	Contact Fa. promesstec
17	Parameter consistency failure	Check programming
18	Hardware failure	Contact Fa. promesstec
PtErr	Break in temperature sensor circuit	Contact Fa. promesstec

8. Sound velocity in gases (reference values)

The table below contains the propagation velocities of various gases at a temperature of 20°C.

Gas		Velocity (m/s)

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

Acetaldehyd	C_2H_4O	252,8
Acetylene	C_2H_2	340,8
Ammonia	NH_3	429,9
Argon	Ar	319,1
Benzene	C_6H_6	183,4
Carbon dioxide	CO_2	268,3
Carbon monoxide	CO	349,2
Carbon tetrachloride	CCl_4	150,2
Chlorine	Cl2	212,7
Dimethyl ether	CH_3OCH_3	213,4
Ethane	C_2H_6	327,4
Ethanol	C_2H_3OH	267,3
Ethylene	C_2H_4	329,4
Helium	He	994,5
Hydrogen sulfide	H_2S	312,1
ethane	CH_4	445,5
Methanol	CH_3OH	347
Neon	Ne	449,6
Nitrogen	N_2	349,1
Nitric oxide	NO	346
Oxygen	O_2	328,6
Propane	C_3H_8	246,5
Hexafluorosulfur	SF_6	137,8

9. Parameter table

Par.	Description	Value			
		d	c	b	a
P00	Units				
P01	Measurement mode				
P02	Calculation units				
P03	Rounding				
P04	Maximum measuring distance				
P05	Minimum measuring distance				
P06	Far end blocking				
P07	N.A.				
P08	N.A.				

Par.	Description	Value			
		d	c	b	a
P51	N.A.				
P52	N.A.				
P53	N.A.				
P54	N.A.				
P55	N.A.				
P56	N.A.				
P57	N.A.				
P58	N.A.				
P59	N.A.				

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

P09	N.A.				
P10	Value assigned to „4 mA”				
P11	Value assigned to „20 mA”				
P12	“Error” indication by the current output				
P13	N.A.				
P14	N.A.				
P15	N.A.				
P16	N.A.				
P17	N.A.				
P18	N.A.				
P19	N.A.				
P20	Damping				
P21	N.A.				
P22	Dome top tank compensation				
P23	N.A.				
P24	Target tracking speed				
P25	Selection of Echo in the measuring window				
P26	Level elevation rate				
P27	Level descent rate				
P28	Echo loss indication				
P29	Blocking out of disturbing object				
P30	N.A.				
P31	Sound velocity in different gases				

P60	Overall operating hours of the unit				
P61	Time elapsed after last switch-on				
P62	N.A.				
P63	N.A.				
P64	Actual temperature of the transducer				
P65	Maximum temperature of the transducer				
P66	Minimum temperature of the transducer				
P67	N.A.				
P68	N.A.				
P69	N.A.				
P70	Echo map				
P71	Distance of the measuring window				
P72	Amplitude of the in the measuring window				
P73	Distance of the in the measuring window				
P74	Signal / noise ratio				
P75	Blocking Distance				
P76	Waterhead of the flow				
P77	TOT1				
P78	TOT2				
P79	N.A.				
P80	Current generator test				
P81	N.A.				
P82	N.A.				

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

P32	Specific gravity					P83	N.A.				
P33	N.A.					P84	Simulation mode				
P34	N.A.					P85	Simulation cycle time				
P35	N.A.					P86	Simulation low level				
P36	N.A.					P87	Simulation high level				
P37	N.A.					P88	N.A.				
P38	N.A.					P89	N.A.				
P39	N.A.					P90	N.A.				
P40	Selection of tank shape/ open channel					P91	N.A.				
P41	Dimensions of tank / Open Channel					P92	N.A.				
P42	Dimensions of tank / Open Channel					P93	N.A.				
P43	Dimensions of tank / Open Channel					P94	N.A.				
P44	Dimensions of tank / Open Channel					P95	N.A.				
P45	Dimensions of tank / Open Channel					P96	N.A.				
P46	Dist. Btw. Transducer face and level of Q=0					P97	Software code				
P47	Linearisation					P98	N.A.				
P48	Linearisation table					P99	Access lock				
P49	N.A.										
P50	N.A.										

10. Dismounting, Return, Cleaning, Disposal

10.1 Dismounting

Residual media in dismounted instruments can result in a risk of personnel, the environment and equipment. Take sufficient precautionary measures.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com

10.2 Return

When returning the instrument, use the original packaging or a suitable package.
To avoid a damage, use for example antistatic plastic film, shock-absorbent material, a marking as highly sensitive measuring instrument.

.

10.3 Cleaning

Before cleaning the instrument disconnect the electrical connection. Clean the instrument with a moist cloth. Electrical connections must not come into contact with moisture. Wash or clean the dismounted instrument before returning it in order to protect personnel and the environment from exposure to residual media.

Residual media in dismounted instruments can result in a risk to persons, the environment and equipment. Take sufficient precautionary measures.

10.4 Disposal

Dispose instrument components and packaging materials in accordance with the respective waste treatment and disposal regulations of the region or country to which the sensor is supplied.

promesstec GmbH I Niedersachsenstraße 4 I D-Schüttorf I Tel.:+49 (0)5923/ 90 229 0 I Fax:+49 (0)5923/ 90 229 29
E-Mail: office@promesstec.com I Internet: www.promesstec.com