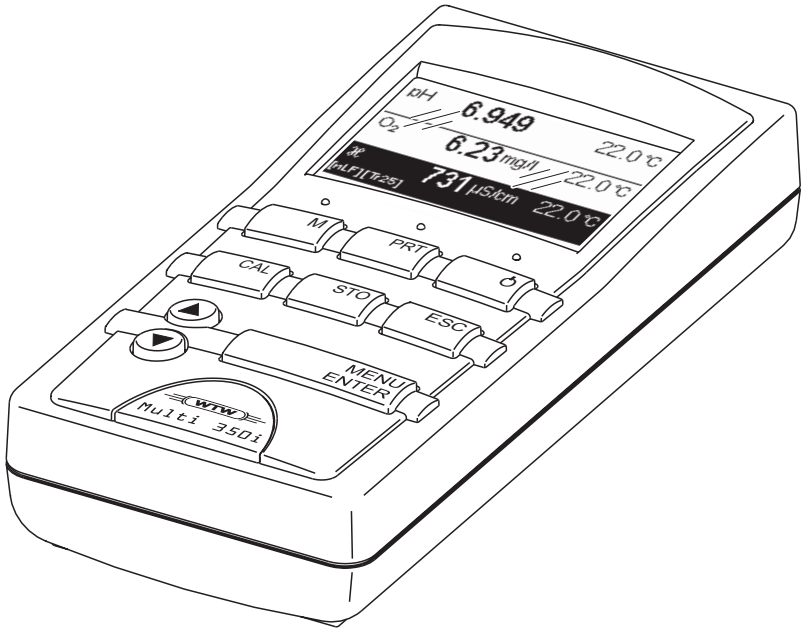
Bedienungsanleitung
Operating manual
Mode d'emploi
Instrucciones de operación

ba75421defs

Multi 350i



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Note
The process of consistently improving our products includes the continuous further development of instrument firmware. The current Multi 350i firmware is available on the Internet. It can easily be downloaded on your meter using the enclosed AK 340/B cable and a PC.
For more detailed information, refer to the appendix of the detailed operating manual or to the Internet under http://www.WTW.com.

Safety

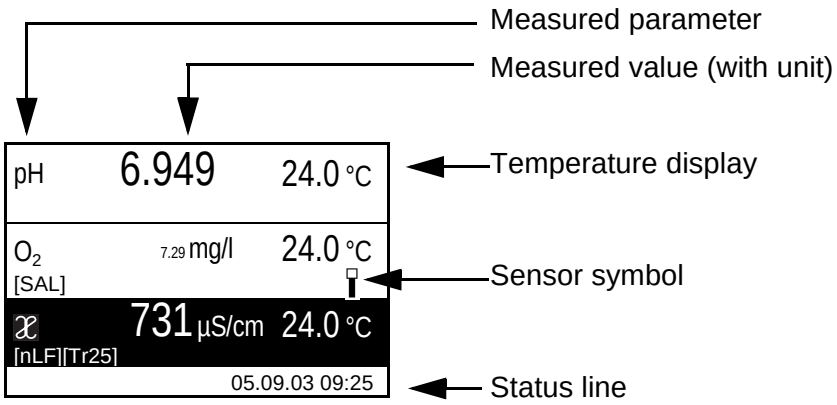
Safety instructions

The individual chapters of this operating manual use safety instructions such as the label shown below to indicate various hazards or dangers:

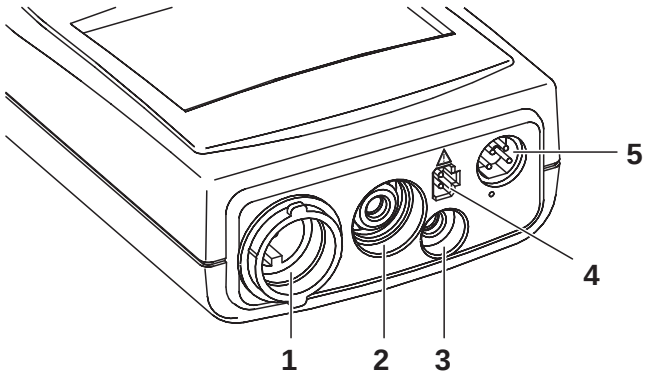
Caution
indicates instructions that must be followed precisely in order to avoid the possibility of slight injuries or damage to the instrument or the environment.

Display and socket field

Display



Socket field



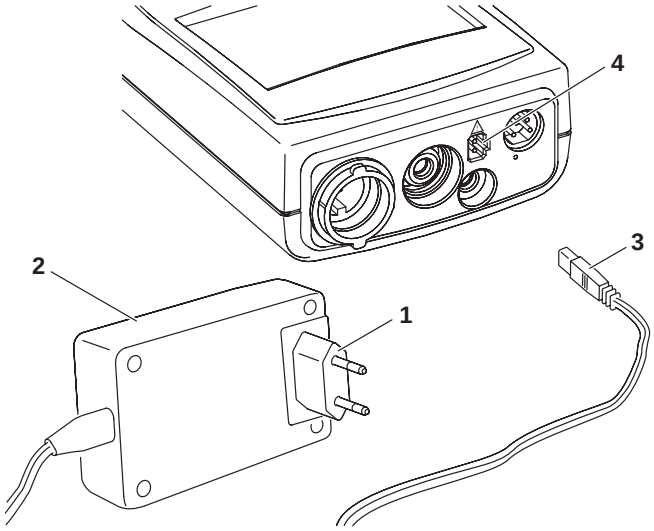
1	DO sensor or conductivity measuring cell or combined conductivity / DO sensor
2	pH electrode, ISE electrode or ISE combination electrode
3	pH temperature sensor, reference electrode
4	Power pack
5	RS232 serial interface

Line power

The power pack supplies the measuring instrument with low voltage (9 V DC). At the same time, the rechargeable batteries are charged (approx. 36 hours). The *LoBat* display indicator appears if the batteries are nearly empty.

Caution
The line voltage at the operating site must lie within the input voltage range of the original power pack (see TECHNICAL DATA).

Caution
Only use original power packs (see TECHNICAL DATA).

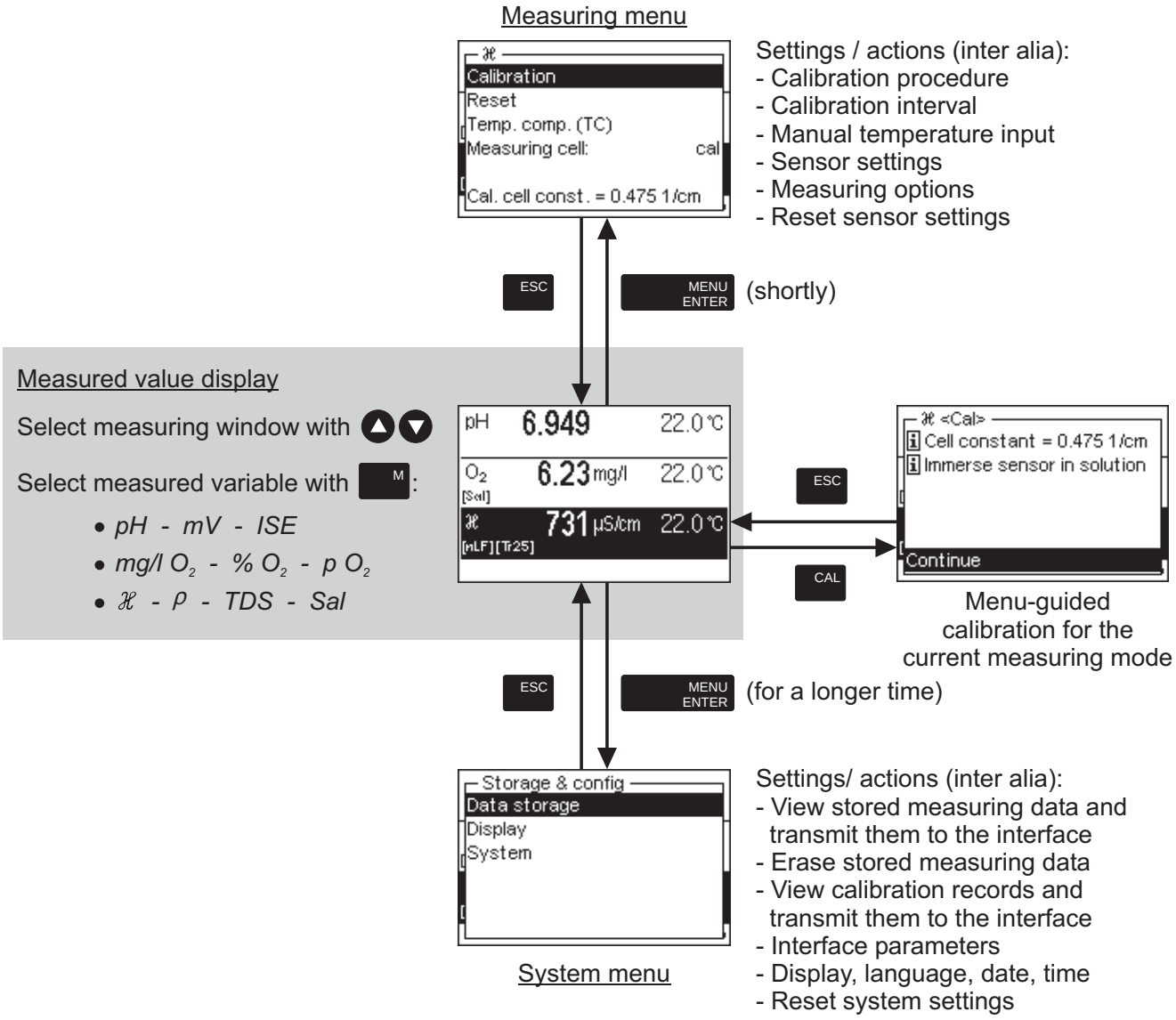


- If necessary, replace the Euro plug (1) on the power pack (2) by the country-specific plug suitable for your country.
- Connect the plug (3) to the socket (4) of the meter.
- Connect the power pack (2) to an easily accessible power socket.

Switching on the meter

- Press the **<** ⏻ **>** key.
  An opening screen with instrument identification data appears on the screen for a short time. Subsequently, the measured value display appears. The meter displays the measuring windows of all connected sensors.

Overview of the functions



Data storage and print functions:

PRT

Press shortly:
– Transmit current measuring data to the interface.
– Transmit the displayed calibration record to the interface

Press for a long time:
– Configure the automatic download at intervals to the interface

STO

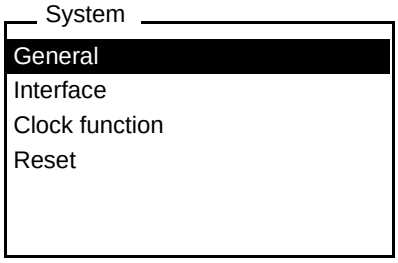
Press shortly:
– Transmit current measuring data to the data storage and interface

Press for a long time:
– Configure the automatic download at intervals to the data storage and interface

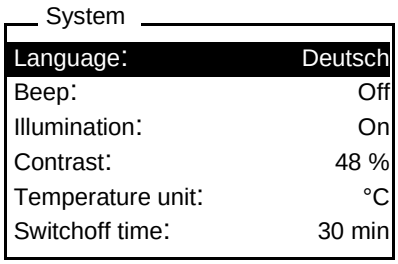
Navigation in menus

The menus for settings and dialogs in courses contain further submenus. The selection is made with the **<▲> <▼>** keys. The current selection is displayed in reverse video.

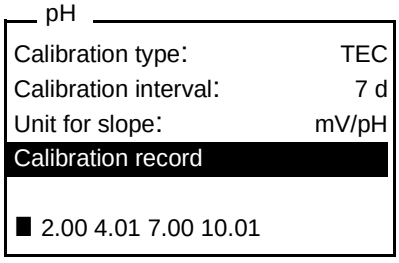
- Submenus
  The name of the submenu is displayed at the upper edge of the frame. Submenus are opened by confirming with **<MENU/ENTER>**.
  Example:



- Settings
  Settings are indicated by a colon. The current setting is displayed on the right-hand side. The setting mode is opened with **<MENU/ENTER>**. Subsequently, the setting can be changed with **<▲> <▼>** and **<MENU/ENTER>**.
  Example:



- Functions
  Functions are designated by the name of the function. They are immediately carried out by confirming with **<MENU/ENTER>**.
  Example: Display the *Calibration record* function.



Messages (■) Information or operating instructions are designated by the ■ symbol. They cannot be selected.

Measuring functions

AutoRead (drift control)

The AutoRead function indicates the stability of the measurement signal. It is active during all measurements. The display of the measured parameter flashes as long as the specified stability of the measured value is not kept.

Temperature measurement in pH and ISE measurements

When using electrodes without an integrated temperature sensor you can use the temperature sensor of a DO sensor or a conductivity measuring cell. The meter recognizes suitable sensors and switches on the temperature measurement. If the instrument measures the temperature, it is displayed with a high resolution (0.1 °C); if the temperature is entered manually, it is displayed with a low resolution (1 °C). The temperature is entered manually in the measuring menu.

Salt content correction in DO measurements

When measuring the concentration of solutions with a salt content of more than 1 g/l, a salt content correction is required. When using the ConOx double sensor, you can measure the salinity in the solution simultaneously and include it in the DO measurement automatically. When the salt content correction is switched on, the [SAL] indicator appears in the measuring window. The salt content correction is set in the DO measuring menu.

Temperature compensation and reference temperature of conductivity measurements

You can select from the following settings:

- **Nonlinear temperature compensation** [nLF] according to EN 27 888
- **Linear temperature compensation** [lin] with selectable coefficients of 0.000 ... 3.000 %/K
- **No temperature compensation**

The setting of the temperature compensation and entry of the reference temperature are carried out in the conductivity measuring menu.

Calibration

Procedure

Select the required measured parameter with **<▲> <▼>** and **<M>**. Ensure that the correct calibration procedure is set in the relevant measuring menu (e.g. buffer sets for pH calibration). Then switch to the measured value display and press **<CAL>**. The Multi 350i guides you through the course of the calibration step by step.

AutoRead (drift control)

With automatic calibration, the measured value is only accepted when the stability criterion is met. This can be terminated prematurely and the current measured value taken over with **<MENU/ENTER>** at any time.

Calibration result

When a calibration is finished, the new calibration values are displayed as an informative message (■ symbol) first. Then you can decide whether you want to take over these values of the new calibration or whether you want to continue measuring with the old calibration data. After accepting the new calibration values the calibration record is displayed.

Measuring menus

Measuring menu: pH/ORP

Menu item	Possible setting	Description
Calibration / *Calibration interval*	*1 ... 999 d*	*Calibration interval* for the pH electrode (in days). The meter reminds you to calibrate regularly by the flashing sensor symbol.
Calibration / *Calibration type*	*TEC* *NIST/DIN* *ConCal*	Buffer sets for pH calibration: *TEC:* 2.00 / 4.01 / 7.00 / 10.01 *NIST/DIN:* 1.679 / 4.006 / 6.865 / 9.180 / 12.454 *ConCal:* pH 7.0 ± 0.5 and any other buffer solution
Calibration / *Unit for slope*	*mV/pH* *%*	Unit of the slope. The % display refers to the Nernst slope of -59.16 mV/pH (100 x determined slope/Nernst slope).
Calibration / *Calibration record*	-	Displays the calibration record of the last calibration.
Man. temperature	*-20 ... +130 °C*	Entry of the manually determined temperature. For measurements without temperature sensor only.
Reset	-	Resets all sensor settings to the delivery condition.
High resolution	*On* *Off*	Resolution of the pH display: *On* = 0.001 *Off* = 0.01

Measuring menu: ISE

Menu item	Possible setting	Description
Calibration / *Calibration record*	-	Displays the calibration record of the last calibration.
Man. temperature	*-20 ... +130 °C*	Entry of the manually determined temperature. For measurements without temperature sensor only.

Measuring menu: DO

Menu item	Possible setting	Description
Calibration / *Calibration interval*	*1 ... 999 d*	*Calibration interval* for the DO sensor (in days). The meter reminds you to calibrate regularly by the flashing sensor symbol.
Calibration / *Comparison meas.*	*On* *Off*	Enables to adjust the measured value with the aid of a comparison measurement, e.g. Winkler titration.
Calibration / *Calibration record*	-	Displays the calibration record of the last calibration.
Reset	-	Resets all sensor settings to the delivery condition.
Sal automatic	*On* *Off*	Automatic salt content correction for concentration measurements. **Note:** This function is available with the ConOx double sensor only.
Sal correction	*On* *Off*	Manual salt content correction for concentration measurements.
Salinity	*0.0 ... 70.0*	Salinity or salinity equivalent for the salt content correction. This function is only available if the manual salt content correction is switched on.

Measuring menu: conductivity

Menu item	Possible setting	Description
Calibration / *Calibration interval*	*1 ... 999 d*	*Calibration interval* for the measuring cell (in days). The meter reminds you to calibrate regularly by the flashing sensor symbol.
Calibration / *Calibration record*	-	Displays the calibration record of the last calibration.
Reset	-	Resets all sensor settings to the delivery condition.
Temp. comp. (TC) / *Reference temp.*	*20 °C* *25 °C*	Reference temperature. This setting is only available when the conductivity or specific resistance display is set.
Temp. comp. (TC) / *Compensation*	*nLF* *lin* *Off*	Procedure for temperature compensation. This setting is only available when the conductivity or specific resistance display is set.
Temp. comp. (TC) / *Linear coeff.*	*0.000 ...* *3.000 %/K*	Coefficient of the linear temperature compensation. This setting is only available when the linear temperature compensation is set.
Measuring cell		*Measuring cell* used
	Cal	Measuring cells the cell constant of which is determined by calibration in the KCL control standard solution. Calibration ranges: 0.450 to 0.500 cm^{-1} and 0.800 to 1.200 cm^{-1} The currently valid cell constant is displayed in the status line.
	LR325/001	*LR 325/001* measuring cell, nominal cell constant 0.010 cm^{-1}. The cell constant is permanently set.

Measuring menu: conductivity (continued)

Menu item	Possible Setting	Description
Measuring cell		*Measuring cell* used
	LR325/01	LR 325/01 measuring cell, nominal cell constant 0.100 cm^{-1}. The cell constant can be adjusted in the range from 0.090 to 0.110 cm^{-1}.
	man	Any measuring cells with freely adjustable cell constants in the range from 0.250 to 25.000 cm^{-1}.
Cell constant	*0.090 to 0.110 cm^{-1}*	Display and setting option of the cell constant of the *LR 325/01* measuring cell.
Man. cell const.	*0.250 to 25.000 cm^{-1}*	Display and setting option of the cell constant of any measuring cells (*man*).

System menu

The following settings and functions are available in the system menu and its submenus:

- Viewing, transmitting and erasing stored measuring data
- Viewing and transmitting calibration records
- Display illumination and contrast
- Changing the unit of the temperature display (°C <-> °F)
- Setting the automatic switchoff
- Configuring the data interface
- Setting the menu language, date and time
- Resetting all sensor-independent system settings to the default condition

Technical data

General data

Dimensions	approx. 172 x 80 x 37 mm	
Weight	approx. 0.3 kg (without power pack)	
Mechanical structure	Type of protection	IP 66
Electrical safety	Protective class	III
Test certificates	cETLus, CE	

Ambient conditions	Storage	- 25 °C ... + 65 °C
	Operation	-10 °C ... + 55 °C
	Climatic class	2
Power supply	Rechargeable batteries	4 x 1.2 V nickel metal hydride (NiMH), type AA
	Operational life	up to 500 h with one battery charging
	Power pack (charging device)	FRIWO FW7555M/09, 15.1432.500-00 Friwo Part. No. 1883259 Input: 100 ... 240 V ~ / 50 ... 60 Hz / 400 mA Output: 9 V = / 1,5 A Connection max. overvoltage category II Primary plugs contained in the scope of delivery: Euro, US, UK and Australian.
Serial interface	Connection of the cable AK 340/B or AK 325/S	
	Baud rate	Adjustable: 1200, 2400, 4800, 9600, 19200 baud
	Type	RS232, data output
	Data bits	8
	Stop bits	2
	Parity	None
	Handshake	RTS/CTS
	Cable length	Max. 15m
Guidelines and norms used	EMC	EC guideline 89/336/EEC EN 61326-1:1998 EN 61000-3-2 A14:2000 EN 61000-3-3:1995 FCC Class A
	Instrument safety	E.C. guideline 73/23/EEC EN 61010-1 A2:1995
	Climatic class	VDI/VDE 3540
	IP protection	EN 60529:1991

Measuring ranges, resolution, accuracy

pH/ORP

Measuring ranges, resolution

Variable	Measuring range	Resolution
pH	- 2.000 ... + 20.000 - 2.00 ... + 20.00	0.001 0.01
U [mV]	- 999.9 ... + 999.9 - 2000 ... + 2000	0.1 1
T [°C]	- 5.0 ... + 105.0	0.1

Manual temperature input

Variable	Range	Increment
T_{manual} [°C]	- 20 ... + 130	1

Accuracy (± 1 digit)

Variable	Accuracy	Temperature of sample
pH *	± 0.004	+ 15 °C ... + 35 °C
U [mV] */ range*		
- 999.9 ... + 999.9	± 0.2	+ 15 °C ... + 35 °C
- 2000 ... + 2000	± 1	+ 15 °C ... + 35 °C
T [°C] */ temperature sensor*		
NTC 30	± 0.2	0 °C ... + 55 °C
PT 1000	± 0.3	0 °C ... + 55 °C

** when measuring in a range of ± 2 pH around a calibration point*

ISE

Measuring ranges, resolution

Variable	Measuring range	Resolution
ISE [mg/l]	0.000 ... 10.000 0.00 ... 100.00 0.0 ... 100.0 0 ... 2000	0.001 0.01 0.1 1

Manual temperature input

Variable	Range	Increment
T_{manual} [°C]	- 20 ... + 130	1

Dissolved oxygen

Measuring ranges, resolution

Note: The values quoted in brackets apply especially for the DurOx 325 sensor.

Variable	Measuring range	Resolution
DO concentration [mg/l]	0 ... 20.00 (0 ... 20.0) 0 ... 90.0 (0 ... 90)	0.01 (0.1) 0.1 (1)

Measuring ranges, resolution (continued)

Variable	Measuring range	Resolution
DO saturation [%]	0 ... 200.0 (0 ... 200) 0 ... 600	0.1 (1) 1
DO partial pressure [mbar]	0 ... 200.0 (0 ... 200) 0 ... 1250	0.1 (1) 1
T [°C]	0 ... 50.0	0.1

Accuracy (± 1 digit)

Variable	Accuracy
DO concentration [mg/l]	± 0.5 % of measured value at ambient temperature + 5 °C ... + 30 °C
DO saturation [%]	± 0.5% of measured value when measuring in the range of ± 10 K around the calibration temperature
DO partial pressure [mbar]	± 0.5 % of measured value at ambient temperature + 5 °C ... + 30 °C

Correction functions

Temperature compensation	Accuracy better than 2 % at 0 ... + 40 °C
Salinity correction	0 ... 70.0 SAL
Air pressure correction	Automatic through integrated pressure sensor in the range of 500 ... 1100 mbar

Conductivity

Measuring ranges, resolution

Variable	Measuring range	Resolution
$\mathscr{K}$ [µS/cm]	0.000 ... 2.000* 0.00 ... 20.00** 0.0 ... 200.0 0 ... 2000	0.001 0.01 0.1 1
$\mathscr{K}$ [mS/cm]	0.00 ... 20.00 0.0 ... 200.0 0 ... 2000	0.01 0.1 1
Specific resistance [kOhm*cm]	0.000 ... 2.000 0.00 ... 20.00 0.0 ... 200.0 0 ... 2000	0.001 0.01 0.1 1
Specific resistance [MOhm*cm]	0.00 ... 20.00 0.0 ... 200.0 0 ... 2000	0.01 0.1 1
SAL	0.0 ... 70.0 according to the IOT table	0.1

Measuring ranges, resolution (continued)

Variable	Measuring range	Resolution
TDS [mg/l]	0 ... 2000 Factor can be set between 0.40 and 1.00	1
T [°C]	- 5.0 ... + 105.0	0.1

** only possible with cells of the cell constant, 0.010 cm^{-1}*
*** only possible with cells of the cell constant, 0.010 cm^{-1}* or *0.090 ... 0.110 cm^{-1}*

Cell constants

Cell constant C	Values
Can be calibrated in the ranges	0.450 ... 0.500 cm^{-1} 0.800 ... 1.200 cm^{-1}
Adjustable	0.010 cm^{-1} (fixed) 0.090 ... 0.110 cm^{-1} 0.250 ... 25.000 cm^{-1}

Reference temperature

Reference temperature	Values
Adjustable	20 °C (Tr20) 25 °C (Tr25)

Accuracy (± 1 digit)

Variable	Accuracy	Temperature of sample
$\mathcal{K}$ / Temperature compensation		
None (Off)	± 0.5 %	
Nonlinear (nLF)	± 0.5 %	0 °C ... + 35 °C according to EN 27 888
	± 0.5 %	+ 35 °C ... + 50 °C Extended nLF function according to WTW measurements
Linear (lin)	± 0.5 %	+ 10 °C ... + 75 °C
***SAL** / range*		
0.0 ... 42.0	± 0.1	+ 5 °C ... + 25 °C
	± 0.2	+ 25 °C ... + 30 °C
TDS [mg/l]		
	± 1	
***T [°C]** / temperature sensor*		
NTC 30	± 0.2	0 °C ... + 55 °C
PT 1000	± 0.3	0 °C ... + 55 °C