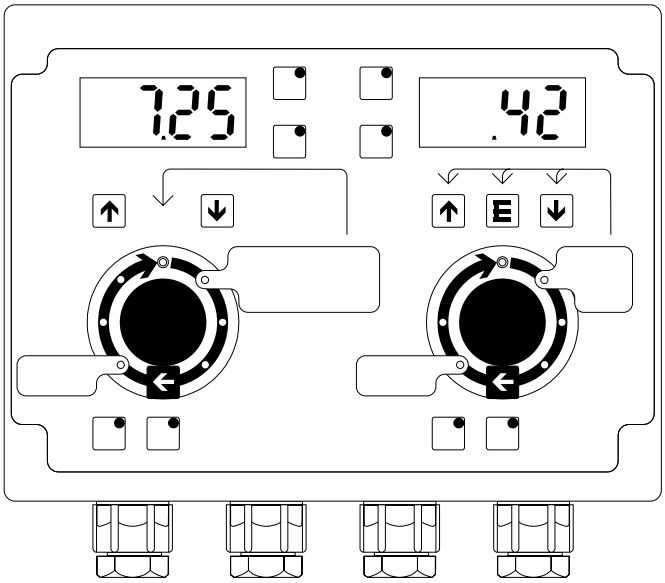
BA 060e00/11.99
No. 51503318
Software Version from 11.99 or higher

OCM 360
Chlorine, pH, Redox and Temperature Measuring Transmitter, Controller

Operating Instructions



Contents

1 General Information

1.1 Symbols used

Warning:

This symbol alerts you to hazards which could cause serious injuries as well as damage to the instrument if ignored.

Note:

This symbol indicates important items of information which could cause faults if ignored.

1.2 Storage and transportation

Pack the instrument in shock-proof packaging for storage and transportation. The original packaging offers the best protection.

Comply with the permitted ambient conditions (see »Technical Data«).

1.3 Unpacking

Make sure that the packaging and the contents are undamaged! If you find any damage, inform your postal service, freight handler, forwarding agent, etc. Keep any damaged goods until matters have been clarified.

Inspect the delivery for completeness and quantity according to the delivery papers, and the instrument type and version as shown on the nameplate.

The scope of supply comprises
- 1 measuring and control instrument OCM 360
- 5 pcs cable glands Pg 11
- 5 pcs cable glands Pg 9
- 6 pc blank threaded plugs
- 1 equivalent resistor 10 kΩ
- 1 set of operating instructions
- 1 short operating instructions.

Retain the original packaging in case the instrument must be stored or dispatched at a later date. If you have any queries, please contact your suppliers.

1.4 Dismantling, packing, and disposal

Pack the instrument in protective packaging for later repacking. The original packaging offers the best protection.

If you dispose of the instrument later, please observe the regulations of your country.

1.5 Instrument variants

Depending on the intended purpose, there are a number of matching expansion stages from the OCM 360 available (see Table 1.1). **These Operating Instructions describe the maximum expansion stage OCM 360-2x1 and instrument variant OCM 360-363.** (x = placeholder for various instrument variants in acc. with Product Structure, see Chapter 1.6.) Input and output terminals of stages that are not fitted have no function.

Type designation	Existing parameters	of which meas. and control parameters	of which / no control parameters
OCM 360-0x8xxxx	Cl_2, °C	Cl_2	°C
OCM 360-1x0xxxx	Cl_2, pH, °C	Cl_2, pH	°C
OCM 360-2x1xxxx	Cl_2, pH, mV, °C	Cl_2, pH	mV, °C
OCM 360-363xxxx	pH, mV	pH, mV	—

Tab. 1.1 Expansion stages of OCM 360

1.6 Product structure

The instrument variant is recognisable from the order code on the nameplate.

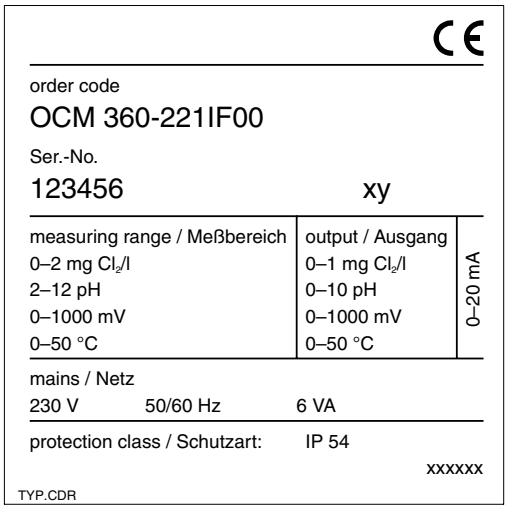


Fig. 1.1 Nameplate of OCM 360

Combination measuring instruments OCM 360

Measuring ranges

00	0 ... 1.0 mg Cl_2/l / 0 ... 50 °C
01	0 ... 0.5 mg Cl_2/l / 0 ... 50 °C
02	0 ... 2.0 mg Cl_2/l / 0 ... 50 °C
03	0 ... 5 mg Cl_2/l / 0 ... 50 °C
04	0 ... 10 mg Cl_2/l / 0 ... 50 °C
10	0 ... 1.0 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH
11	0 ... 0.5 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH
12	0 ... 2.0 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH
13	0 ... 5 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH
14	0 ... 10 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH
20	0 ... 1.0 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH / 0 ... 1000 mV
21	0 ... 0.5 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH / 0 ... 1000 mV
22	0 ... 2.0 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH / 0 ... 1000 mV
23	0 ... 5 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH / 0 ... 1000 mV
24	0 ... 10 mg Cl_2/l / 0 ... 50 °C / 5 ... 10 pH / 0 ... 1000 mV
36	1 ... 13 pH / 0 ... 1000 mV (for redox / pH)

pH/redox measuring range

0	display 2 ... 12 pH; signal output 5 ... 10 pH and Cl_2
1	display 2 ... 12 pH; signal output 5 ... 10 pH and 0 ... 1000 mV and Cl_2
3	display range and signal output 1 ... 13 pH and 0 ... 1000 mV without Cl_2
8	without pH/redox measurement

Controller

IF	pulse length/pulse frequency controller for chlorine / pH
RA	pulse length/pulse frequency controller for redox / pH
RD	three-point step controller for chlorine, pulse length/pulse frequency controller for pH
RE	three-step controller for chlorine

Mains supply

0	230 V AC, 50 / 60 Hz
1	110 V AC, 50 / 60 Hz
6	127 V AC, 50 / 60 Hz
7	240 V AC, 50 / 60 Hz

Instrument output

0	0 ... 20 mA
2	4 ... 20 mA

OCM 360- [ ][ ][ ][ ][ ] **complete order code**

2 Safety

2.1 Intended purpose

OCM 360 is a family of instruments for measuring and controlling auxiliary hygiene parameters such as pH value, redox potential, free chlorine and temperature for treating swimming pool and bathing pool water.

Depending on the instrument variants, there are a number of different expansion stages available.

2.2 Analysing the conditions of use

The trouble-free function of the measuring and control instrument depends on its compliance with various conditions of use.

Please check your pool against the information in the table below. Tick off the boxes that apply ☒.

① **Chlorination agent, just in use or used previously**

☐ Chlorine gas from bottles	☐ Stabilised chlorination agent, pH-neutral
☐ Sodium hypochlorite (»chlorine bleaching lye«)	☐ Sodium hypochlorite
☐ Calcium hypochlorite	☐ Trichlorisocyanuric acid
☐ Chlorine from common salt electrolysis	☐ Others: .....

② **pH value**

☐ pH value ≤ 8	☐ pH value > 8
☐ Constant, fluctuation range does not exceed ±0.1 pH	☐ Fluctuation range drastically exceeds ±0.1 pH

③ **Temperature**

☐ When chlorine measuring cell OCS 140-A is used: fluctuation range does not exceed ±2 °C	☐ When chlorine measuring cell OCS 140-A is used: fluctuation range exceeds ±2 °C
☐ When chlorine measuring cell OCS 140-N is used with integrated temperature sensor	

④ **Chemicals for chlorine reference measurement**

☐ DPD 1 (or DPD-A) used before expiry date	☐ Ortho-Tolidin

⑤ **Sampling for chlorine reference measurement**

☐ From measuring water supply line direct to flow assembly OCA 250 via sampling cock	☐ From measuring water supply line upstream of prefilter
	☐ From pool

⑥ **Measuring water return**

☐ Return to main pipe downstream of filter or heat exchanger	☐ Return to recirculation pump intake side
☐ No return due to free discharge	

☑ **Cross in left-hand column:**
Compliance with conditions of use.

Cross in right-hand column:
No or incomplete compliance with conditions of use.
Implement the correct conditions or consult your supplier.

2.3 Declaration of conformity

All measuring and control instruments of the OCM 360 family have been designed and manufactured in conformity with the prevailing European standards and directives.

Note:

You can request a Declaration of Conformity from your suppliers.

2.4 General safety notes

Instruments in the OCM 360 family have been designed for operational safety according to the latest state of the art and conform with the prevailing regulations and European standards (see »Technical Data«). They have been built as per EN 61010-1 and left our factory in perfect condition with regard to safety.
However, if they are used improperly or other than for their intended purpose, they may pose a hazard, e. g. due to improper connection.

Warning:

- If the instrument is used for any application other than those described in these operating instructions, it may lead to unsafe and incorrect functioning and is therefore not permitted.
- Make sure you strictly adhere to the warnings and notes in these operating instructions.

2.5 Installation, start-up, operation

Warning:

- Installation, electrical connection, start-up, operation and maintenance of the measuring instrument must be carried out exclusively by trained specialists authorised by the system operator.
- Technical personnel must be familiar with the instructions in these operating instructions and must adhere to them.
- Before connecting the instrument ensure that the power supply complies with the ratings specified on the nameplate.
- Before switching on the system check all the connections once again for correctness.
- No not start the instrument if no protective conductor is connected!
- Do not operate damaged instruments which could pose a danger, and mark them as defective.
- Measuring point faults may only be repaired by authorised and trained personnel.
- If faults cannot be repaired, the instrument must be taken out of service and secured against unintentional start-up.
- Repairs may only be carried out by the manufacturer.

3 Installation

3.1 Measuring equipment

Table 3.1 shows the set-up of a fully functional measuring point (x = variant placeholder):

Type designation	Sensors	Assembly	Connecting cable
OCM 360-0x8	Cl_2: OCS 140-A/-N	OCA 250	perm. connected
OCM 360-1x0	Cl_2: OCS 140-A/-N pH: HGK2 gel	OCA 250	perm. connected 1 pc OPK 1-xx0A
OCM 360-2x1	Cl_2: OCS 140-A/-N pH: HGK2 gel mV: PFGK2 gel	OCA 250	perm. connected 2 pcs OPK 1-xx0A
OCM 360-363	pH: HGK2 gel mV: PFGK2 gel	OCA 250	2 pcs OPK 1-xx0A

Tab. 3.1 Instrument variants and complete measuring points

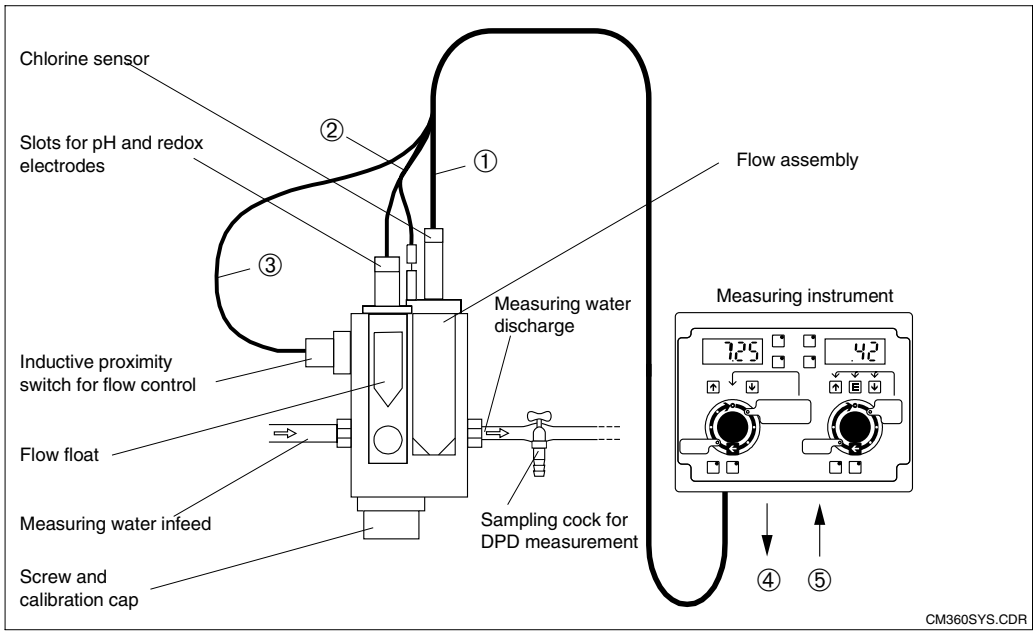
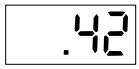
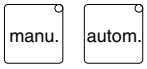
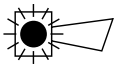
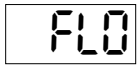
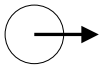


Fig. 3.1 Complete measuring point, e.g. comprising measuring instrument OCM 360, assembly OCA 250, pH, redox and chlorine sensor, and proximity switch INS

① Connecting cable CMK
② Connecting cable OPK 1 with PM connection
③ Connecting cable for INS
④ Signal output for chlorine, pH, mV or temperature (0 / 4 ... 20 mA)
⑤ Power supply

3.2 Function

Instruments in the OCM 360 family have the following main functions:

	Simultaneous measurement of parameters pH, mV, Cl_2 and °C
	Controlled add. dosing of chlorine and acid/alkaline in automatic mode or dosing in manual mode
	Parameter monitoring and alarm output
	Automatic flow monitoring and dosing switch-off if flow rate drops below threshold or fails
	Current output 0 / 4 ... 20 mA for each existing parameter

Tab. 3.2 Main functions of instrument family OCM 360

3.3 Integration in the water circuit

A measuring system as described in Chapter 3.1 can be integrated in the swimming pool or bathing pool water circuit in a number of different ways (see Fig. 3.2).

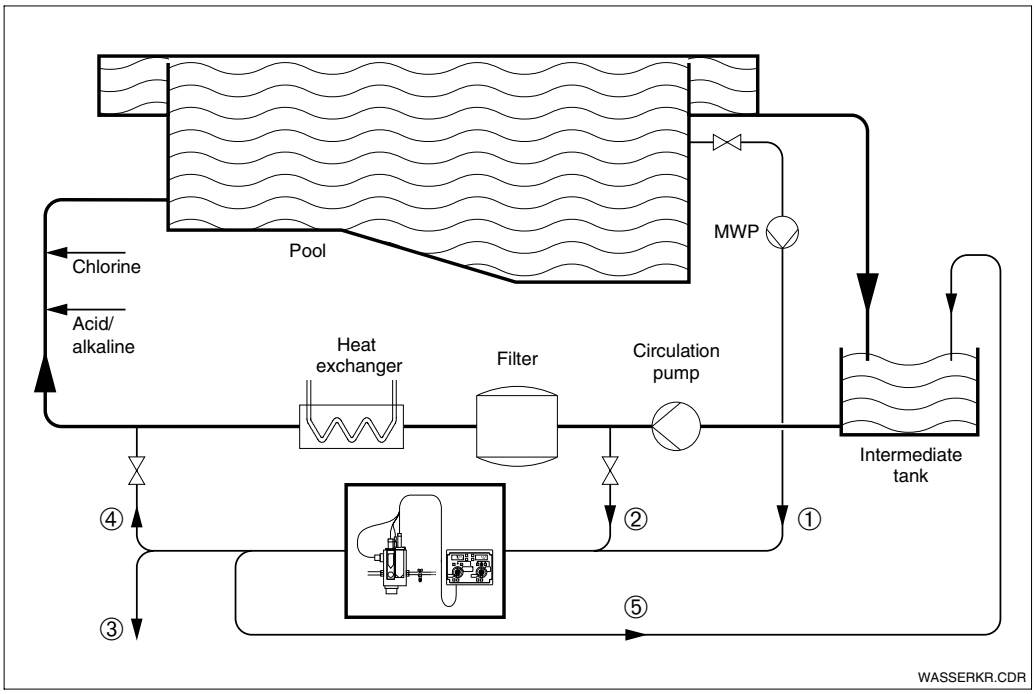


Fig. 3.2 Swimming or bathing pool water circuit

Measuring water supply	Measuring water discharge	Measuring water pump (MWP)
① Direct pool sampling	③ Free discharge	n.a.
	④ Return to main line	required
	⑤ Return to intermediate tank	required, if height difference of water level between pool and intermediate tank < approx. 2 m
② Circulation pump pressure side	③ Free discharge	n.a.
	④ Return to main line	n.a.
	⑤ Return to intermediate tank	n.a.

Tab. 3.3 Explanation of Fig. 3.2

3.4 Dimensions

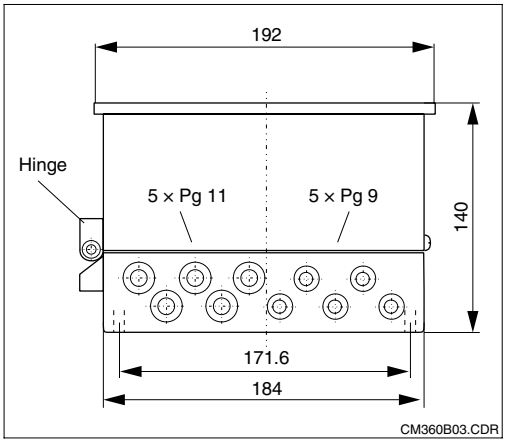


Fig. 3.3 OCM 360, instrument dimensions and view from below

The OCM 360 measuring instrument is designed for two installation methods:
- Wall mounting
- Panel mounting

The instrument's dimensions and fitting with cable glands are depicted in Fig. 3.3. Blank threaded plugs are provided for cable entries that are not required.

3.5 Wall mounting

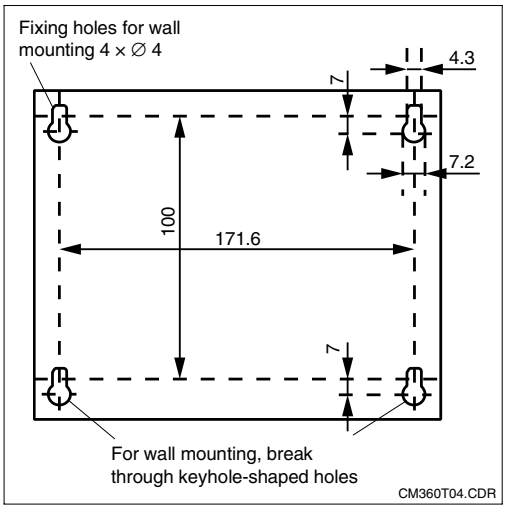


Fig. 3.4 OCM 360, Screw locations for wall mounting

- Open screw plug, remove screw and store in safe place.
- Open instrument, break open four keyhole-shaped openings in housing base with screwdriver from inside.
- Hold instrument against wall and draw screw positions or define as described in Fig. 3.4.
- Tighten fixing screws until heads still project about 10 mm from wall
- Place instrument over screws, press down to stop and then tighten screws.
- Mount cable glands or blank threaded plugs as required.

3.6 Panel mounting

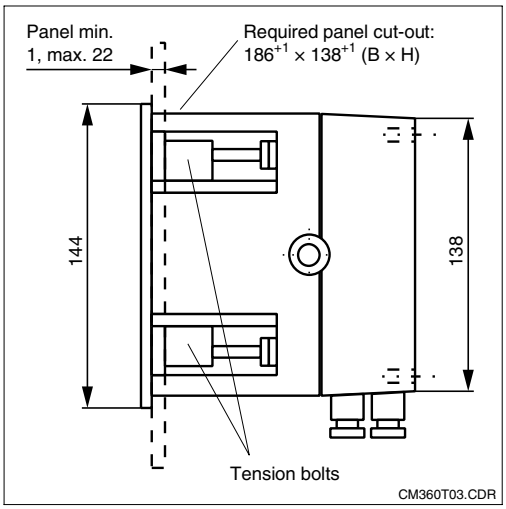


Fig. 3.5 OCM 360, side view with panel cut-out

- Make cut-out in panel as depicted in Fig. 3. 5.
- Install premounted Pg cable glands.
- Fold out tension bolts with the housing section open and tighten.
- Mount cable and blank threaded plugs as required.

3.7 Installation accessories

In addition to the direct connection of sensors and proximity switches to the measuring instrument, you can install a cable extension by means of a VBC junction box and extension cable.

Note:

Junction box for connecting cable lengths of max. 30 m between chlorine sensor and instrument.

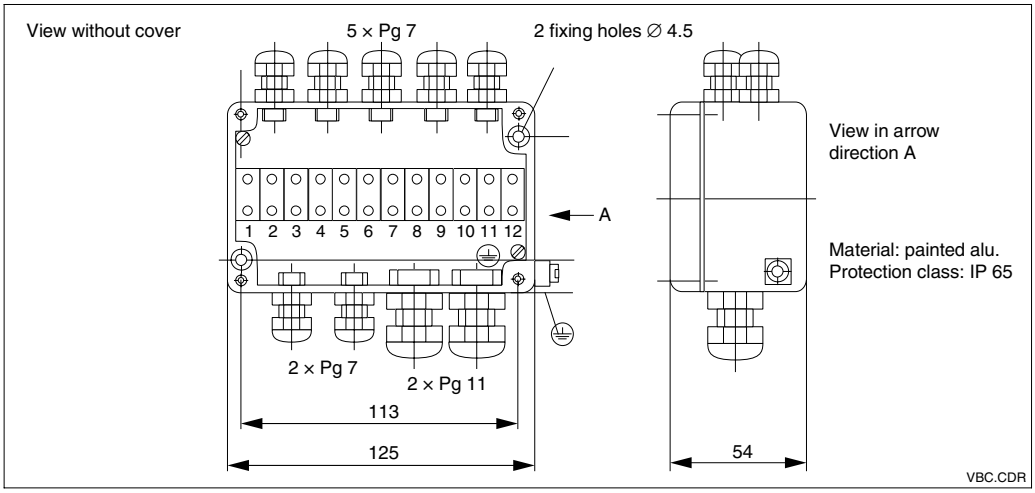


Fig. 3.6 Junction box VBC dimensions (w × h × d): 125 × 80 × 54 mm with earth

Input side:
5 pcs Pg 7 glands
Output side:
2 pcs Pg 11, 2 pcs Pg 7 with blind plugs

3.8 Electrical connection

3.8.1 Connectivity basics

Warning:

- Only trained specialists should be permitted to work on the instrument when it is live or connected to the mains.
- A mains breaker must be installed close to the OCM 360 and marked as the mains breaker for the OCM 360 (see EN 61010-1).
- Do not start the instrument if no protective conductor is connected!
- Before connecting the instrument ensure that the power supply complies with the ratings specified on the nameplate.

Note:

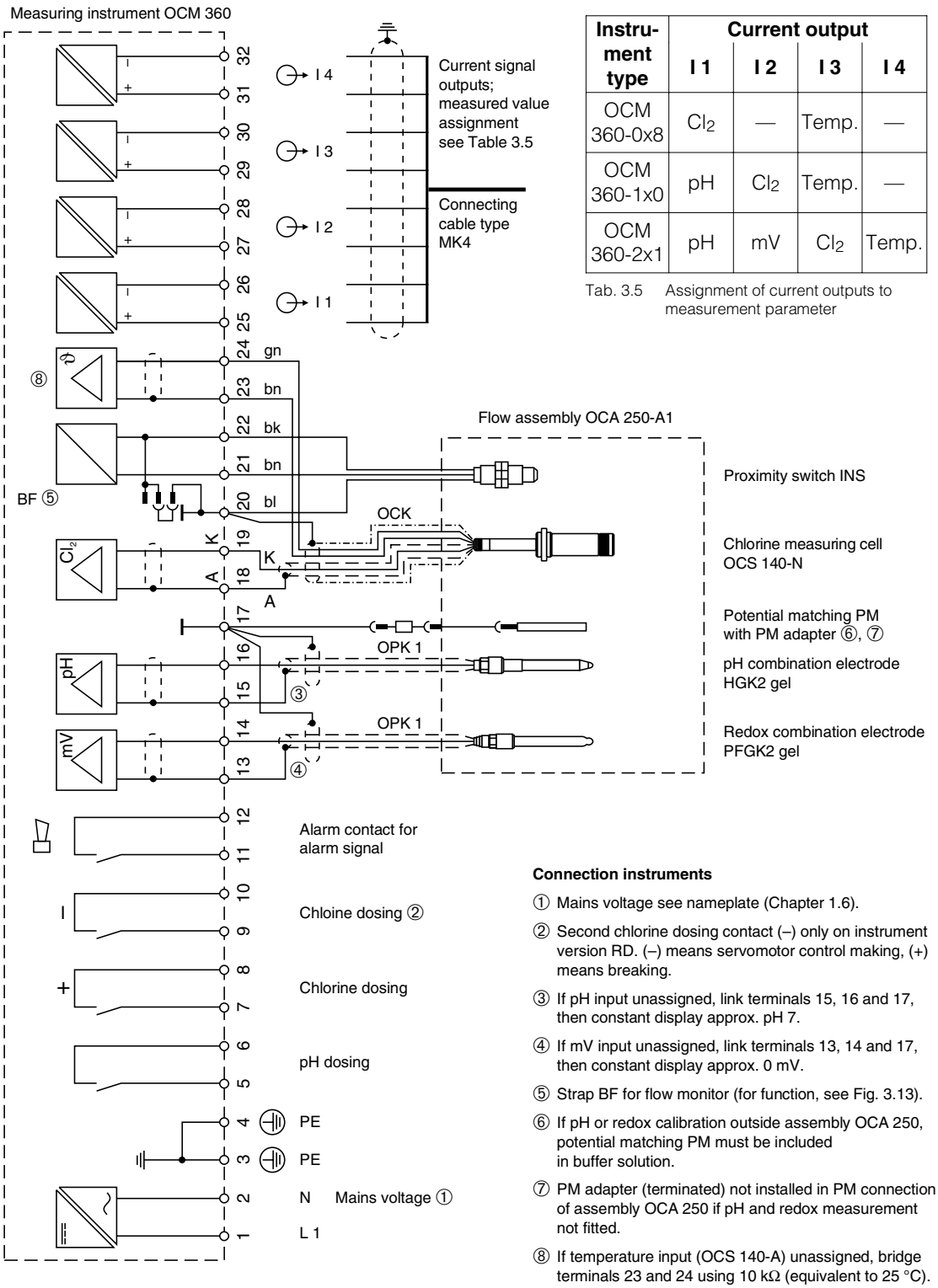
- Screen all signal-carrying lines and route them separately to the other lines.
- Immunity to interference can only be ensured if the screen earth is kept as short as possible. Do not install a soldered screen extension!

The connection drawings for the OCM 360 instruments are on the following pages. They depict direct connection or connection with line extension.

Instrument version	Direct connection	Connection with cable extension
OCM 360-0x8 OCM 360-1x0 OCM 360-2x1	see page 10	see page 11
OCM 360-363	see page 13	see page 14

Tab. 3.4 Connections for instrument versions OCM 360

3.8.2 Direct connection of OCM 360-0x8/1x0/2x1



Instrument type	Current output I 1	I 2	I 3	I 4
OCM 360-0x8	Cl_2	—	Temp.	—
OCM 360-1x0	pH	Cl_2	Temp.	—
OCM 360-2x1	pH	mV	Cl_2	Temp.

Tab. 3.5 Assignment of current outputs to measurement parameter

Connection instruments

① Mains voltage see nameplate (Chapter 1.6).

② Second chlorine dosing contact (–) only on instrument version RD. (–) means servomotor control making, (+) means breaking.

③ If pH input unassigned, link terminals 15, 16 and 17, then constant display approx. pH 7.

④ If mV input unassigned, link terminals 13, 14 and 17, then constant display approx. 0 mV.

⑤ Strap BF for flow monitor (for function, see Fig. 3.13).

⑥ If pH or redox calibration outside assembly OCA 250, potential matching PM must be included in buffer solution.

⑦ PM adapter (terminated) not installed in PM connection of assembly OCA 250 if pH and redox measurement not fitted.

⑧ If temperature input (OCS 140-A) unassigned, bridge terminals 23 and 24 using 10 kΩ (equivalent to 25 °C).

Fig. 3.7 Connection drawing of OCM 360-2x1 with flow assembly OCA 250-A1 (with proximity switch INS)

3.8.3 Connection with line extension of OCM 360-0x8/1x0/2x1

Note:

Maximum line length of OCK cable
for chlorine measuring cell
OCS 140-A or OCS 140-N: 30 m.

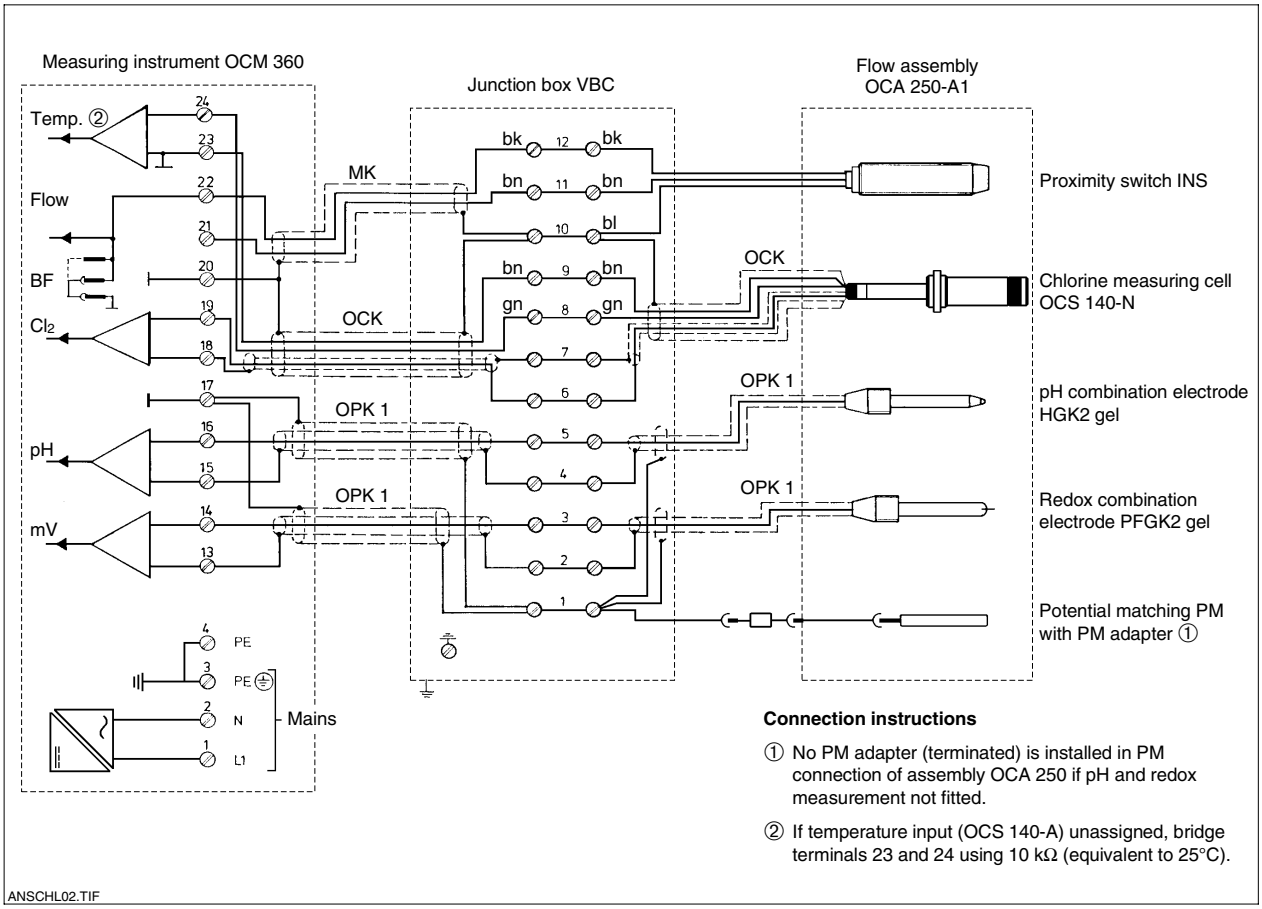


Fig. 3.8 Connection drawing of OCM 360-2x1 with flow assembly OCA 250-A1 (with proximity switch INS) and junction box VBC

3.8.4 Instrument setting of OCM 360-0x8/1x0/2x1

Measuring ranges and controller functions ex factory are equivalent to the order code on the nameplate (see Chapter 1.6). Changes to the settings are possible, as described below.

Note:

Settings must always be carried out when the instrument is de-energised. The selected setting is adopted whenthe instrument is switched on.

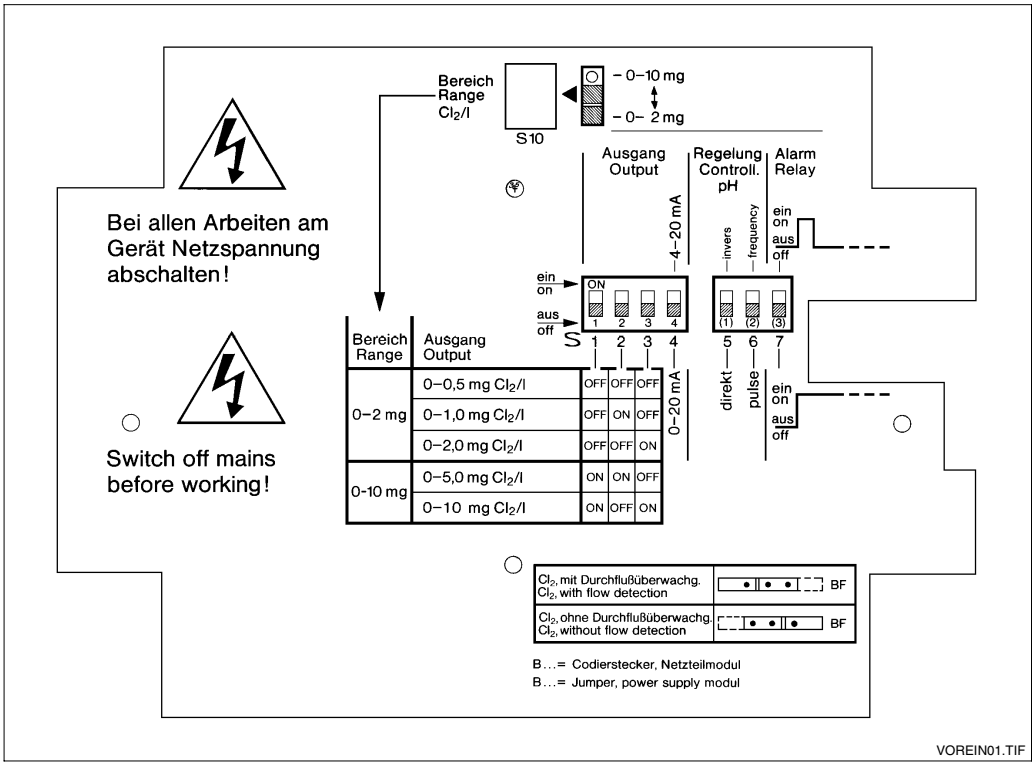


Fig. 3.9 Internal view of housing front section, switches S1 to S10 for setting instrument

Chlorine display range and current output assignment

(switches S10 and S1 to S3)

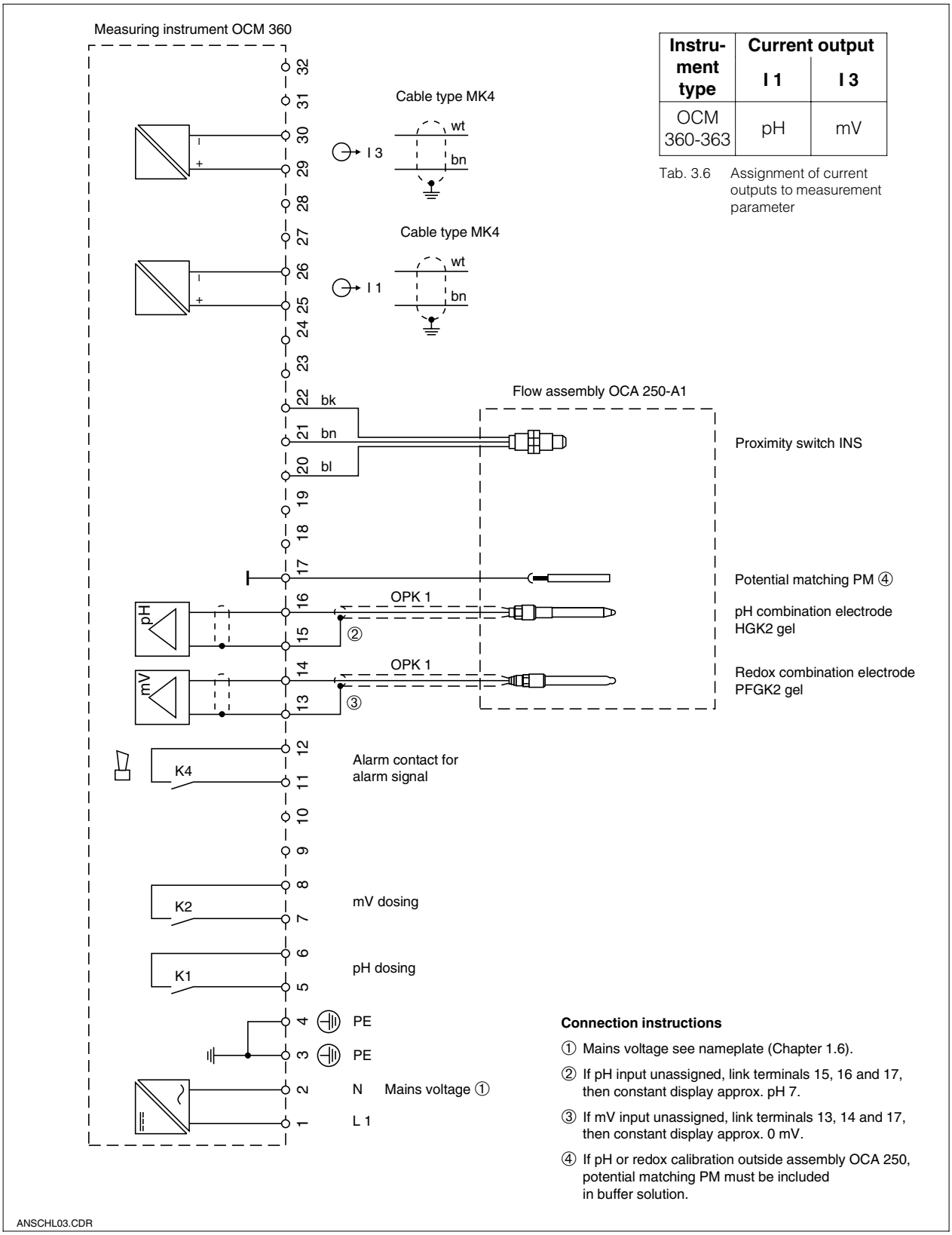
S10 Display range of chlorine	Assignment of current output 0 / 4 ... 20 mA	Set S1 to S3
Switch down 0 ... 2 mg	0 ... 0.5 mg/l	S1 = OFF S2 = OFF S3 = OFF
	0 ... 1 mg/l	S1 = OFF S2 = ON S3 = OFF
	0 ... 2 mg/l	S1 = OFF S2 = OFF S3 = ON
Switch up 0 ... 10 mg	0 ... 5 mg/l	S1 = ON S2 = ON S3 = OFF
	0 ... 10 mg/l	S1 = ON S2 = OFF S3 = ON

Current output, controller function pH, alarm function

(switches S4 to S7)

Function	Set S4 to S7	Remarks
Current output 0 ... 20 mA 4 ... 20 mA	 S4 = OFF S4 = ON	applies to all current outputs
pH controller direct inverted	 S5 = OFF S5 = ON	controller dosed: above setpoint under setpoint
pH controller pulse frequency	 S6 = OFF S6 = ON	controller type: pulse length controller pulse frequency controller
Alarm output (T. 11–12) steady contact fleeting contact	 S7 = OFF S7 = ON	contact 11–12 closed: as long as alarm is at alarm start

3.8.5 Direct connection of OCM 360-363



Instrument type	Current output I 1	Current output I 3
OCM 360-363	pH	mV

Tab. 3.6 Assignment of current outputs to measurement parameter

Fig. 3.10 Connection drawing of OCM 360-363 with flow assembly OCA 250-A1 (with proximity switch INS)

3.8.6 Connection with cable extension OCM 360-363

Note:

Max. cable length for pH/redox sensors: 100 m.

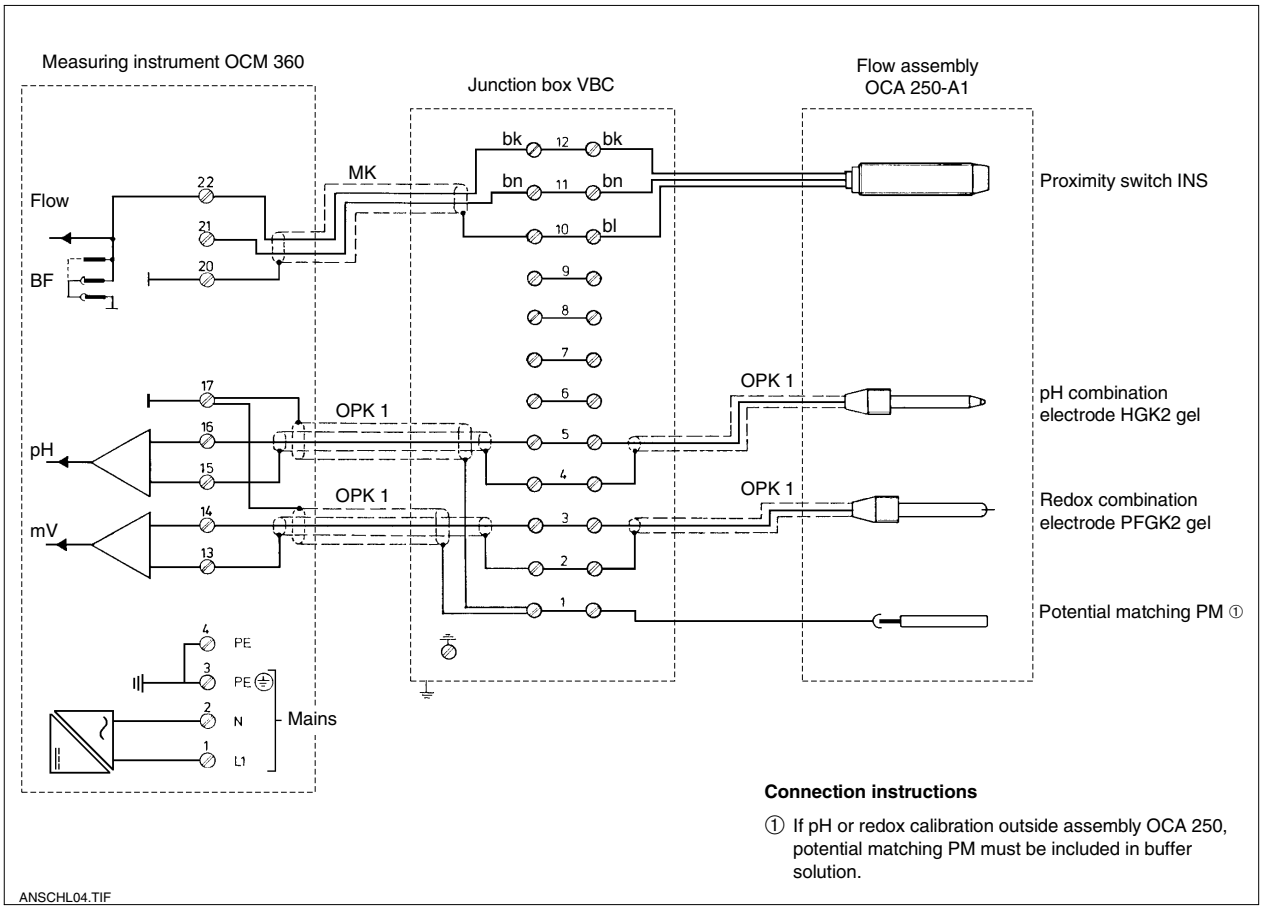


Fig. 3.11 Connection drawing of OCM 360-363 with flow assembly OCA 250-A1 and junction box VBC

3.8.7 Setting the OCM 360-363 instrument

Measuring ranges and controller functions correspond ex factory to the order code on the nameplate (see Chapter 1.6). Changes in settings are possible as described below.

Note:

Always carry out the setting when the instrument is de-energised. The selected setting is adopted when the instrument is switched on.

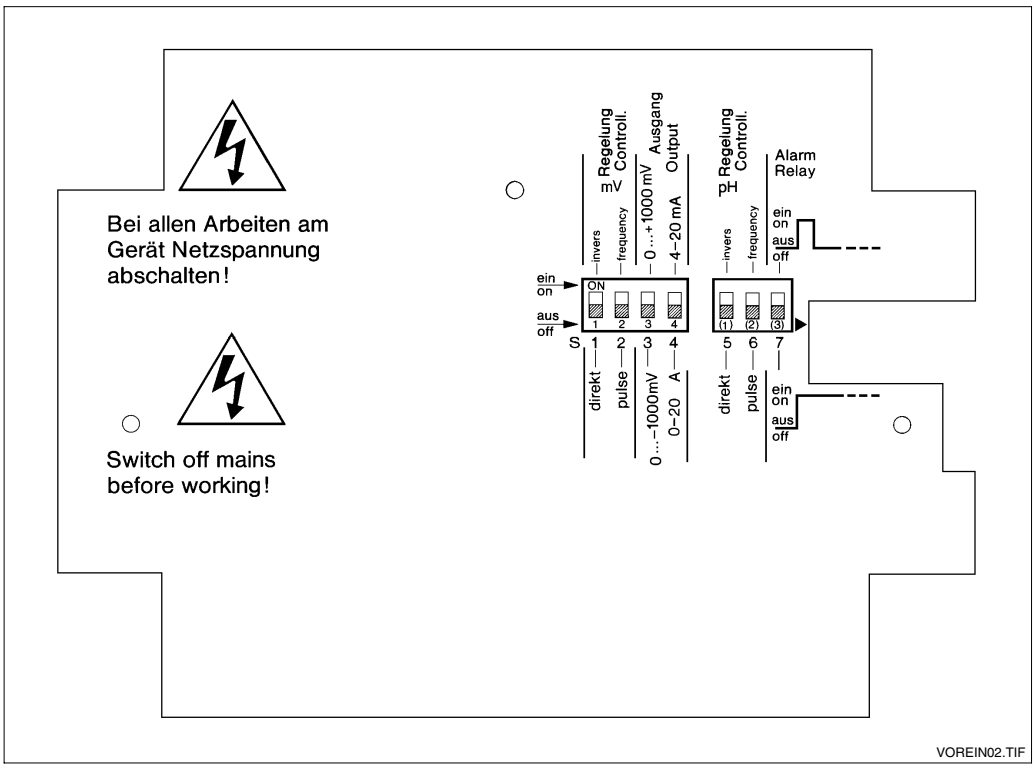


Fig. 3.12 Internal view of housing front section, switches S1 to S7 for setting instrument

Current output, controller function for pH and mV, alarm function (Switches S1 to S7)

Function	Set S1 to S7	Remarks
mV controller direct inverted	 S1 = OFF S1 = ON	controller dosing above setpoint under setpoint
mV controller pulse frequency	S2 = OFF S2 = ON	controller type pulse length controller pulse frequency controller
Current output mV 0 ... –1000 mV 0 ... +1000 mV	S3 = OFF S3 = ON	assigned to 0 / 4 ... 20 mA
Current output 0 ... 20 mA 4 ... 20 mA	S4 = OFF S4 = ON	applies to the two current outputs

Function	Set S5 to S7	Remarks
pH controller direct inverted	 S5 = OFF S5 = ON	controller dosing: above setpoint under setpoint
pH controller pulse frequency	S6 = OFF S6 = ON	controller type: Pulse frequency controller Pulse frequency controller
Alarm output (T. 11–12) steady contact fleeting contact	S7 = OFF S7 = ON	contact 11–12 closed: as long as alarm is at alarm start

3.8.8 Flow monitor presetting

The strap BF on the PCB of the housing rear selects whether the instrument operates with or without flowmonitor. To use a flow monitor, an inductive proximity switch INS must be connected.

Note:

If strap BF is in position »with flow monitor« but no inductive proximity switch INS is connected, a permanent FLOW alarm is generated.

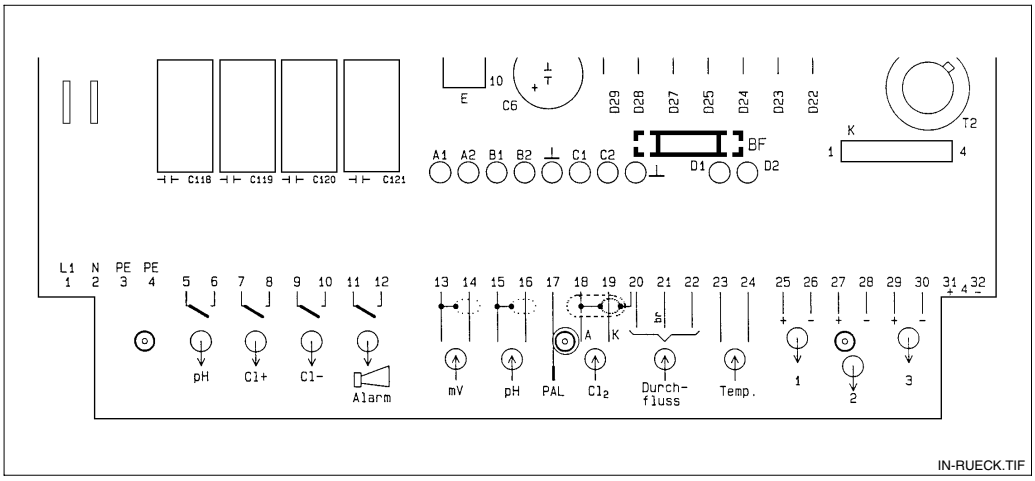


Fig. 3.13 Internal view of housing rear section (instrument example: full configuration); connection section with strap BF

BF strap position		Function
	left	with flow monitor
	right	without flow monitor

For a functional description of the flow monitor, see Chapter 5 (Safety functions in »Measurement mode«).

4 Operation

4.1 Operation basics

4.1.1 User interface of OCM 360-0x8/1x0/2x1

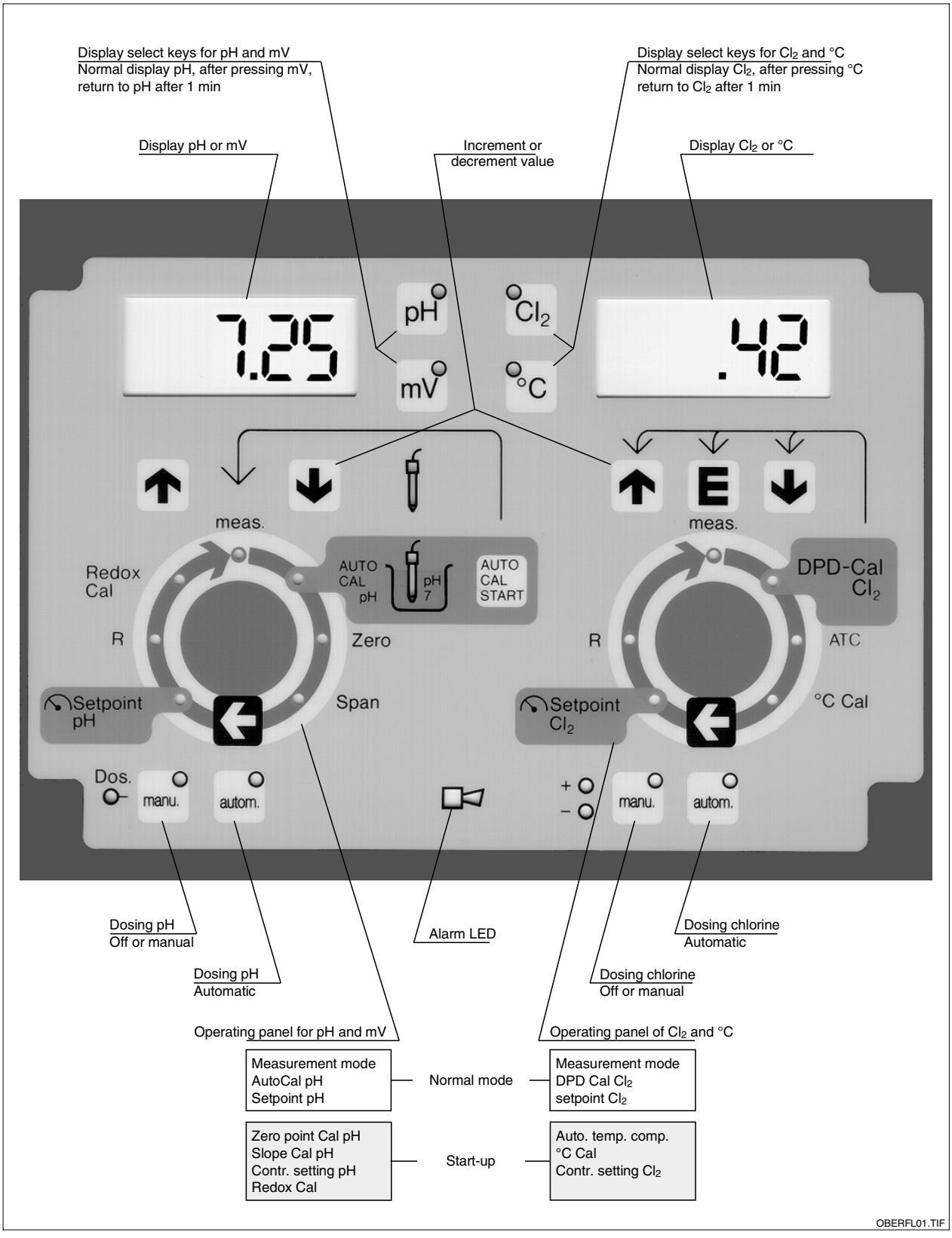


Fig. 4.1 User interface of OCM 360-0x8/1x0/2x1

4.1.2 User interface of OCM 360-363

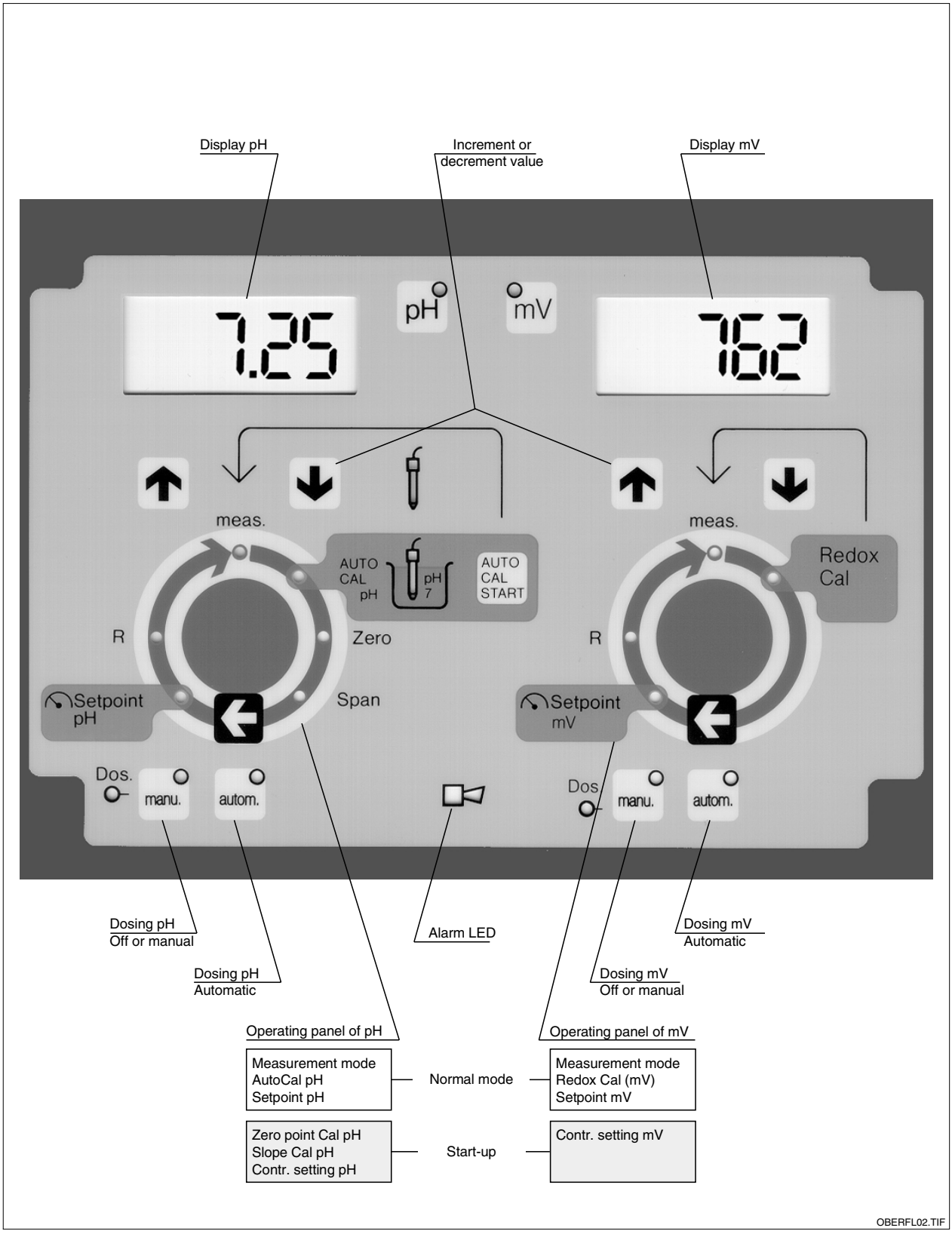


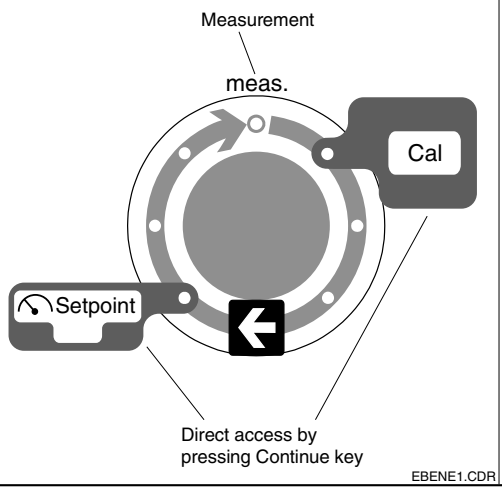
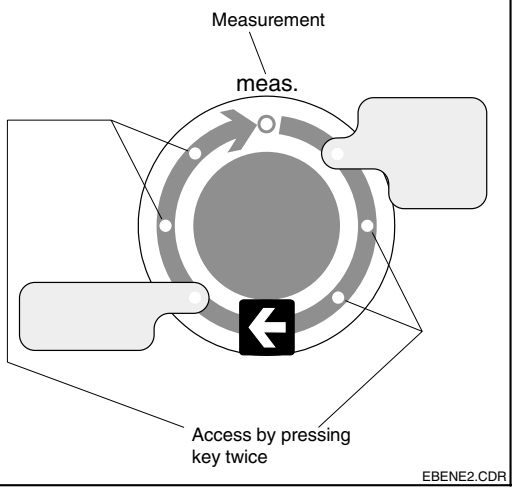
Fig. 4.2 User interface of OCM 360-363

4.1.3 Operating levels

Select a function in both the left-hand and the right-hand operating panels by pressing the function's

Continue key .

A distinction is made between two operating levels:

Normal mode	Start-up
Operating level for pool operator	Operating level for start-up or service
Accessible **directly** by pressing Continue key	Access **protected** by pressing key twice
	

When you exit Measurement mode to enter at least one measurement parameter, all the existing current outputs are frozen in their previous values. Control and dosing functions in manual or automatic mode are interrupted.

4.2 Measured value display in »Measurement mode«

The instrument has two symmetrical displays. The current measurement parameter display is recognizable by a red LED lit in the associated display select key.

Display	OCM 360-0x8/1x0/2x1		OCM 360-363	
Normal permanent display	pH	Cl_2	pH	mV
Optional display of	mV	°C	—	—

Return to the normal permanent display is either automatic after 1 min or by pressing the display select key pH or Cl_2.

4.3 Calibrating

Calibration matches the measuring instrument to the parameters of the sensors used. **What is absolutely necessary is a calibration on start-up for the measurement parameters pH and chlorine.** Normally, the measurement parameter for redox potential seldom requires calibration. A temperature calibration is not normally required, but here, too, fine tuning is possible when you use a precision thermometer.

Note:

Please refer especially to the chapters related to calibration in the Operating Instructions of the flow assembly OCA 250, the chlorine sensor OCS 140 (for instrument versions OCM 360-0x8/1x0/2x1) and the DPD measuring instrument used for chlorine calibration.

4.3.1 Automatic pH calibration using AUTOCAL

Carry out a single-point calibration with buffer solution pH 7. This is suitable for operating the instrument in the pH range 6.5 ... 7.5.

Press key	Action	Display
←	From **meas.** to **AUTOCAL pH**	Electrode icons blink alternately: »Immerse«
	Fill calibration vessel with buffer 7 and immerse electrode	
AUTO CAL START	Start of automatic calibration	Lower electrode icon permanently lit
		Eletrode icons blink alternately: »Sampling«
		or warning message (then continue as below)
←	From **AUTOCAL pH** to **meas.** End of calibration	Measurement mode (pH recalibrated)
	Empty calibration vessel and restore measuring water flow	
	Warning message if pH value not stable after 5 min	Alternating display »Err« / pH value and LEDs blink alternately »AUTOCAL pH« / lower electrode icon
	then **either:**	
AUTO CAL START	Repeat automatic calibration	Lower electrode icon permanently lit
	or:	
←	Abort calibration without accepting measured value	Measurement mode (pH **not** recalibrated)

4.3.2 Manual pH calibration using zero/span

The extended measurement mode outside the pH range of 6.5 ... 7.5 requires two-point calibration. We recommend the use of buffer solutions pH 7 and pH 4.

During calibration, electrode parameters can be requested. However, this is not absolutely necessary and can be skipped.

Press key	Action	Display
←	From **meas.** to **AUTOCAL pH**	
pH then in addition ←	From **AUTOCAL pH** to **Zero**	
only if required pH	Request previous zero value	Electrode parameter »Asymmetry potential« in pH units
	Fill calibration vessel with buffer 7 (possible: 5.5 ... 8.5) and immerse electrode. Wait until display is stable.	
↑ or ↓	Set buffer value	pH value setting or warning message (then continue as below)
pH then in addition ←	From **Zero** to **Span**	
only if required pH	Request previous slope value	Electrode parameter »Slope« in % (100 % ≙ 59.16 mV at 25°C)
	Fill calibration vessel with buffer 4 and immerse electrode. Wait until display is stable.	
↑ or ↓	Set buffer value	pH value setting or warning message (then continue as below)
←	From **Span** to **meas.**	Measurement mode (pH recalibrated)
	Empty calibration vessel and restore measuring water flow	
	Warning message if setting is outside pH 5.5 ... 8.5	Alternating display »Err« and pH value
	Warning message if slope is outside 48 ... 65 mV/pH	Alternating display »Err« and pH value
←	Abort calibration without accepting measured value	Measurement mode (pH **not** recalibrated)
	Check/clean/replace pH electrode. Check whether correct buffer solution used.	

4.3.3 Chlorine calibration

The amount of free chlorine for calibrating the measuring instrument is determined using the DPD method by means of a measuring set or a photometer. Diethyl-p-phenylenediamine reacts and forms a red dye. The intensity of the red dye rises proportionally with the chlorine content.

Warning:

In order to measure the actual amount of free chlorine, an anorganic chlorination agent is required (see Chapter 2.2, left column). If anorganic chlorination agent is **or was** used in the bathing pool water (see Chapter 2.2, right-hand column), do not use the DPD method. It would result in a higher measured value compared with the actual value of free chlorine (compare note in DIN 38408, Part 4, Section 5).

For reasons of measurement precision, it is **not** recommended to calibrate the measuring instrument at a current DPD measured value of **below 0.2 mg/l**.

To avoid incorrect calibration, the instrument conducts a plausibility check by comparing the difference between the current and the previous DPD measured value and the maximum permitted difference setting in the chlorine R menu, Parameter 8 (see Chapter 4.5). Ifi there is an overshoot, a warning message is displayed during the calibration. The maximum permitted difference can be set to the range 0.01 ... 0.99 mg/l.

Maximum permitted DPD difference	**Cl_2 [mg/l]**
Factory setting	0.99
User setting	

Press key	**Action**	**Display**
	Read current chlorine reading and note down	Current chlorine reading
	Take measuring water sample from sampling cock and carry out DPD measurement	
←	From **meas.** to **DPD-Cal Cl_2**	Current chlorine reading
↑ or ↓	Press **once** on one of the two keys	DPD calibration value of **previous** calibration
↑ or ↓	Set DPD measured value	**Current** DPD measured value setting
E	Accept value and return to **meas.**	Measurement mode (chlorine recalibrated)
		or warning message (then continue as below)
	Warning message if maximum permitted difference exceeded	LEDs blink **»DPD Cal Cl_2«** and display of difference between current and previous DPD measured value
	then **either:**	
E	Accept value anyway	Measurement mode (chlorine recalibrated)
	or:	
twice ←	Abort calibration without accepting measured value	Measurement mode (chlorine **not** recalibrated)

4.3.4 Redox calibration (mV)

Carry out a single-point calibration using redox buffer solution, e.g. 470 mV. Calibration takes place on instrument variants OCM 360-0x8/1x0/2x1 in the pH and mV operating panel (on the left); on the instrument variants OCM 360-363 calibration takes place in the mV operating panel (on the right).

Press key			Action	Display
mV	then in addition	←	**OCM 360-0x8/1x0/2x1:** From **meas.** to **Redox Cal**	
		←	**OCM 360-363:** Von **meas.** to **Redox Cal**	
			Fill calibration vessel with redox buffer 470 mV and immerse electrode. Wait until reading is stable.	
↑	or	↓	Press **once** on one of the two keys for min. 5 s	Redox calibration value of **previous** calibration
↑	or	↓	Set buffer value	Redox value setting
		←	From **Redox Cal** to **meas.**	Measurement mode (redox recalibrated)
			Empty calibration vessel and restore measuring water flow	

4.3.5 Temperature calibration

Carry out a single-point calibration at the current bathing pool water temperature. To measure the temperature, use a precision thermometer. When taking the reading the chlorine measuring cell and the thermometer must be in the same water flow and must be in steady state.

Press key			Action	Display
			Read thermometer value	
°C	then in addition	←	From **meas.** to **°C Cal**	Current temperature measured value
↑	or	↓	Set thermometer value starting from 250°C	Temperature value setting
		E	Accept value and return to **meas.**	Measurement mode (temperature recalibrated)
			or	
		←	Abort calibration without accepting measured value	Measurement mode (temperature **not** recalibrated)

4.4 Setting the setpoint

Entering the setpoint specifies the target values to be reached in the »Automatic dosing« mode. The setpoint is entered for all control parameters using the same procedure depending on the instrument variant (see Table 1.1, page 2).

Press key	Action	Display
twice	From **meas.** to **Setpoint**	Current setpoint
or	Set required setpoint	New setpoint
	From **Setpoint** to **meas.**	Measurement mode

Setpoint	pH	Cl_2 [mg/l]	redox [mV]
Factory setting	7.20	0.5 (MR = 0 ... 2) 5.0 (MR = 0 ... 10)	600
User setting			

Table 4.1 is a setting aid and contains the guideline values contained in German DIN 19643 / Edition April 1997 (»Treatment of swimming pool and bathing pool water«) for public bathing. The compliance values may differ depending on the country.

No.	Parameter	Unit	Pure water		Pool water	
			Lower value	Upper value	Lower value	Upper value
5.3.2	Physical and chemical requirements					
5.3.2.4	**pH value** a) Freshwater b) Seawater	 — —	 6.5 6.5	 7.6 7.8	 **6.5** 6.5	 **7.6** 7.8
5.3.2.7	**Redox voltage** to Ag/AgCl 3.5 m KCl					
5.3.2.7.1	For freshwater a) 6.5 ≤ pH value ≤ 7.3 b) 7.3 < pH value ≤ 7.6	 mV mV	 — —	 — —	 **750** 770	 — —
5.3.2.7.2	For seawater a) 6.5 ≤ pH value ≤ 7.3 b) 7.3 < pH value ≤ 7.8	 mV mV	 — —	 — —	 700 720	 — —
5.3.2.9	**Free chlorine** Combination or processes: adsorption – flocculation– filtration – chlorination a) General b) Hot whirlpool	 mg/l mg/l	 0.3 0.7	 as required	 **0.3** 0.7	 **0.6** 1.0
	Free chlorine Combination or processes: flocculation – filtration – chlorination – ozonisation – sorption filtration – chlorination a) General b) Hot whirlpool	 mg/l mg/l	 0.2 0.7	 as required	 **0.2** 0.7	 **0.5** 1.0

Tab. 4.1 Extract from DIN 19463 / April 1997 (»Treatment of swimming and bathing pool water«) Part 1 / Section 5.3 / Table 2

4.5 Setting the controller

The various conntroller parameters are set in the R menu to match the controller to the control process (also see Appendix).

At the start, set the controller type to match the installed actuator and control device **(bold: factory setting):**

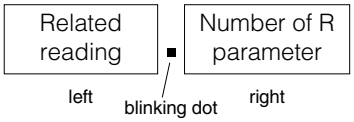
Controller type	**Actuator**	**pH***	**Cl_2**	**mV****
Pulse frequency	Magnetic dosing pump	**S6 = ON**	**R param. 11 = »1«**	**S2 = ON**
Pulse length	Solenoid valve	S6 = OFF	R param. 11 = »0«	S2 = OFF
Black/white (limit contactor)	Hose pump Centrifugal pump	S6 = OFF, then R param. 1 = »0«	R param. 11 = »0«, then R param. 1 = »0«	S2 = OFF, then R param. 1 = »0«
Three-point step controller	Motor valve servomotor	—	Order variants -RD / -RE	—
Control direction		**pH***	**Cl_2**	**mV****
direct		**S5 = OFF, dosed over setpoint**	always dosed under setpoint	S1 = OFF, dosed over setpoint
inverted		S5 = ON, dosed under setpoint		**S1 = ON, dosed under setpoint**

*see page 12/15 **see page 15

Starting the controller setting menu:

Press key			**Action**	**Display**
	twice	←	From **meas.** to **Setpoint**	
pH Cl_2 mV	then in addition	←	From **Setpoint** to **R**	left: Reading right: R parameter no. 1
↑	or	↓	Set value	left: Value setting right: R parameter no. 1
		manu.	to next R parameter	left: Reading right: R parameter no. 2
	etc.		etc.	etc.
		←	From **R** to **meas.**	Measurement mode (controller re-adjusted)

All the R parameters are identified by a consecutive number (1 to max. 14). Depending on the controller type selected, some of the fields can be skipped (highlighted dark). The related reading and the number of the R parameter are displayed in the following format:



4.5.1 Pulse frequency controller

No.	R parameter	Input/ display range on instrument	pH		
			Input / display same as instrument setting	Factory setting	User setting
1	Proportional range X_p	1 ... 50	10 ... 500 % of MR* 1 ... 50 % of MR* (see parameter 13)	100 %	
2	Integral action time T_n for I component	1 ... 99	1 ... 99 min	99 min	
3	Control function P or PI	0 or 1	1: PI function 0: P function	1: PI	
4	Maximum pulse frequency f_{max}	60 ...120	60 ... 120 p/min	80 p/min	
5					
6	Basic chlorine load dosage	0 ... 80			
7	Alarm delay time t_{AS}	0 ... 99	0 ... 99 min	60 min	
8	Maximum permitted DPD difference	1 ... 99			
9	Display of chlorine sensor signal	0 ... 199			
10	Flow rate alarm delay time t_{AF}	_. 1 ... 19			
11	Controller type pulse frequency	1			
12	Alarm trip threshold X_{AS} (both side of setpoint)	_. 1 ... 5	5 % of setpoint 10 ... 50 % of setpoint	5 %	
		_. 1 ... 19			
13	Switchover to proportional range	_. or 1	_.: 10 ... 500 % 1: 1 ... 50 %	10 ... 500 %	
14	pH dosing priority	_. or 1	_.: off 1: on	off	
	Display of software version	xx.yy	Month.Year		

*MR = measurement range pH 2 ... 12 ≙ 10 units

Cl_2 (OCM 360-0x8/1x0/2x1)			mV (OCM 360-363)		
Input / reading same as instrument setting	**Factory setting**	**User setting**	**Input / reading same as instrument setting**	**Factory setting**	**User setting**
10 ... 500 % of MR*	100 %		10 ... 500 % of MR* 1 ... 50 % of MR* (see Parameter 13)	100 %	
1 ... 99 min	99 min		1 ... 99 min	99 min	
1: PI function 0: P function	1: PI		1: PI function 0: P function	1: PI	
60 ... 120 p/min	80 p/min		60 ... 120 p/min	80 p/min	
0 ... 80 % of setpoint	0 %				
0 ... 99 min	60 min		0 ... 99 min	60 min	
0.01 ... 0.99 mg/l	0.99 mg/l				
MR 0 ...2 mg/l: Current [nA] = value · 0,2 MR 0 ... 10 mg/l: Current [nA] = value					
0 s 10 ...190 s	0 s		0 s 10 ...190 s	0 s	
Pulse frequency	1	1			
5 % of setpoint 10 ... 50 % of setpoint	40 %				
			5 mV 10 ... 190 mV	100 mV	
			_.: 10 ... 500 % 1: 1 ... 50 %	10 ... 500 %	
Month.Year			Month.Year		

*MR = measurement range 0 ... 2 / 0 ... 10 mg/l (see page 12)

*MR = measurement range 0 ... +1000 mV / 0 ... –1000 mV = 1000 mV

4.5.2 Pulse-length controller

No.	R parameter	Input-/ display range on instrument	pH		
			Input / reading same as instrument setting	Factory setting	User setting
1	Proportional range X_p	1 ... 50	10 ... 500 % of MR* 1 ... 50 % of MR* (see Parameter 13)	100 %	
2	Integral action time T_n for I component	1 ... 99	1 ... 99 min	99 min	
3	Control function P or PI	0 or 1	1: PI function 0: P function	1: PI	
4	Period T	1 ... 99	1 ... 99 s	99 s	
5	Minimum switch-on time t_{emin}	3 ... 150	0.3 ... 15 s	0,3 s	
6	Basic chlorine load dosage	0 ... 80			
7	Alarm delay time t_{AS}	0 ... 99	0 ... 99 min	60 min	
8	Maximum permitted DPD difference	1 ... 99			
9	Display of chlorine sensor signal	0 ... 199			
10	Flow rate alarm delay time t_{AF}	_. 1 ... 19			
11	Controller type pulse length	_.			
12	Alarm trip threshold X_{AS} (on both sides of setpoint)	_. 1 ... 5	5 % of setpoint 10 ... 50 % of setpoint	5 %	
		_. 1 ... 19			
13	Switchover to proportional range	_. or 1	_.: 10 ... 500 % 1: 1 ... 50 %	10 ... 500 %	
14	pH dosing priority	_. or 1	_.: off 1: on	off	
	Display of software version	xx.yy	Month.Year		

*MR = measurement range pH 2 ... 12 ≙ 10 units

Cl_2 (OCM 360-0x8/1x0/2x1)			mV (OCM 360-363)		
Input / reading same as instrument setting	**Factory setting**	**User setting**	**Input / reading same as instrument setting**	**Factory setting**	**User setting**
10 ... 500 % of MR*	100 %		10 ... 500 % of MR* 1 ... 50 % of MR* (see Parameter 13)	100 %	
1 ... 99 min	99 min		1 ... 99 min	99 min	
1: PI function 0: P function	1: PI		1: PI function 0: P function	1: PI	
1 ... 99 s	99 s		1 ... 99 s	99 s	
0.3 ... 15 s	0.3 s		0.3 ... 15 s	0.3 s	
0 ... 80 % of setpoint	0 %				
0 ... 99 min	60 min		0 ... 99 min	60 min	
0.01 ... 0.99 mg/l	0.99 mg/l				
MR 0 ...2 mg/l: Current [nA] = value · 0.2 MR 0 ... 10 mg/l: Current [nA] = value					
0 s 10 ...190 s	0 s		0 s 10 ...190 s	0 s	
Pulse length	_.	_.			
5 % of setpoint 10 ... 50 % of setpoint	40 %				
			5 mV 10 ... 190 mV	100 mV	
			_.: 10 ... 500 % 1: 1 ... 50 %	10 ... 500 %	
Month.Year			Month.Year		

*MR = measurement range 0 ... 2 / 0 ... 10 mg/l (see page 12)

*MR = measurement range 0 ... +1000 mV / 0 ... –1000 mV = 1000 mV

4.5.3 Black-white controller

No.	R parameter	Input/ display range on instrument	pH		
			Input / reading same as instrument setting	Factory setting	User setting
1	Proportional range X_p	0	Controller type black/white	0 %	0 %
2	Hysteresis for black/white controller	1 ... 19	0.1 ... 1.9 % of setpoint	0.5 %	
		1 ... 199			
3					
4					
5					
6					
7	Alarm delay time t_{AS}	0 ... 99	0 ... 99 min	60 min	
8	Maximum permitted DPD difference	1 ... 99			
9	Display of chlorine sensor signal	0 ... 199			
10	Flow rate alarm delay time t_{AF}	–. 1 ... 19			
11					
12	Alarm trip threshold X_{AS} (on both sides of setpoint)	–. 1 ... 5	5 % of setpoint 10 ... 50 % of setpoint	5 %	
		–. 1 ... 19			
13					
14	pH dosing priority	–. or 1	–.: off 1: on	off	
	Display of software version	xx.yy	Month.Year		

Cl_2 (OCM 360-0x8/1x0/2x1)			mV (OCM 360-363)		
Input / reading same as instrument setting	**Factory setting**	**User setting**	**Input / reading same as instrument setting**	**Factory setting**	**User setting**
Controller type black/white	0 %	0 %	Controller type black/white	0 %	0 %
1 ... 19 % of setpoint	5 %				
			1 ... 199 mV	5 mV	
0 ... 99 min	60 min		0 ... 99 min	60 min	
0.01 ... 0.99 mg/l	0.99 mg/l				
MR 0 ...2 mg/l: Current [nA] = value·0.2 MR 0 ... 10 mg/l: Current [nA] = value					
0 s 10 ...190 s	0 s		0 s 10 ...190 s	0 s	
5 % of setpoint 10 ... 50 % of setpoint	40 %				
			5 mV 10 ... 190 mV	100 mV	
Month.Year			Month.Year		

4.5.4 Three-point step controller

No.	R parameter	Input-/ display range on instrument	Cl_2 (OCM 360-0x8/1x0/2x1)		
			Input / reading same as instrument setting	Factory setting	User setting
1	Proportional range X_p	1 ... 50	10 ... 500 % of MR*	100 %	
2	Integral action time T_n for I component	1 ... 99	1 ... 99 min	99 min	
3					
4	Servomotor run time T_M	1 ... 99	10 ... 990 s	60 s	
5	Minimum switch-on time t_{emin}	3 ... 150	0,3 ... 15 s	0,3 s	
6	Neutral zone in % of setpoint	0 ... 10	0 ... ±10 %	0 %	
7	Alarm delay time t_{AS}	0 ... 99	0 ... 99 min	60 min	
8	Maximum permitted DPD difference	1 ... 99	0.01 ... 0.99 mg/l	0.99 mg/l	
9	Display of chlorine sensor signal	0 ... 199	MR 0 ...2 mg/l: Current [nA] = value · 0.2 MR 0 ... 10 mg/l: Current [nA] = value		
10	Flow rate alarm delay time t_{AF}	–. 1 ... 19	0 s 10 ...190 s	0 s	
11					
12	Alarm trip threshold X_{AS} (on both sides of setpoint)	–. 1 ... 5	5 % of setpoint 10 ... 50 % of setpoint	40 %	
13					
14					
	Display of software version	xx.yy	Month.Year		

*MR = measurement range 0 ... 2 / 0 ... 10 mg/l (see page 12)

4.6 Temperature compensation for chlorine (ATC)

The measuring instrument is designed to use **a chlorine measuring cell OCS 140-N and an integrated temperature sensor** at the factory. The integrated automatic temperature compensation (ATC) function corrects the temperature influence on the measuring instrument irrespective of the actual chlorine content. **The measuring signal is then equivalent to the DPD measured value even if the temperature changes.**

If a **chlorine measuring cell OCS 140-A is used without an integrated temperature sensor**, no measured value correction function is fitted. **If the temperature deviates from the chlorine calibration, there will be a difference to the DPD measured value.** The increase in the measured value when the temperature rises by 1°C is approx. 3.5 %. To employ this chorine measuring cell, the ATC function can be switched off (when the temperature input is bridged, terminals 23/24, by means of 10 kΩ not absolutely required).

Press key		Action	Display
Cl_2	then in addition →	From **meas.** to**ATC**	01 ATC on (00 ATC off)
	↓	Switch off ATC	00 ATC off
	(↑)	Switch on ATC	01 ATC on
	→	From **ATC** to**meas.**	Measurement mode
		Carry out chlorine calibration acc. to Chapter 4.3.3	

The ATC function can always be switched off at the instrument service level (not accessible to the user). Access to the »ATC« in the right-hand operating panel is then disabled.

4.7 Dosing

4.7.1 Assigning chemicals/control direction

To ensure trouble-free operation of the instrumentation and control systems, the chemicals used for disinfection and for setting the pH value must match as well as the control direction of the controller.

Chemicals used	Control direction pH	Control direction Cl_2	Control direction mV
Sodium hypochlorite or calcium hypochlorite and acid (»pH minus«)	direct	dosing always under setpoint	inverted
Chlorine gas and alkaline (»pH plus«)	inverted	dosing always under setpoint	inverted

Warning:

- Make absolutely sure you check that the chemicals and control directions match before you start the dosing mode, otherwise the result could be severe damage to the instrument!
- After a power failure or interruption, the instrument resets itself to the operating mode »meas.« (Measurement mode) **with automatic control** on power restoration, **i.e. also on start-up**!

4.7.2 Note on dosing redox (mV)

The concentration of disinfection agent in the water obtained at a specific redox potential depends on several influencing parameters and on the conditions of use. This includes the composition of the filling water, substances added during water treatment, pH value and temperature.

At the start of automatic control, we therefore recommend you carry out a **multi-step strategy**. Due to the possible inertia of the redox measurement at the start and the specific conditions of use, specify a lower setpoint compared with the setpoint achieved later (e.g. see Table 4.1) (e.g. factory setting 600 mV). After the setpoint is reached, carry out a DPD check measurement. The final setpoint is reached by alternately raising the setpoint and carrying out DPD check measurements.

4.7.3 Automatic or manual dosing

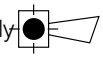
Press key	Action	Display
[autom.]	Switch on automatic control	Dos. comes on **while** actuator doses or + (with controller types: pulse frequency pulse length black/white)
		+ or − only comes on **when** set value changes (with controller type: three-point step controller)
First press [manu.]	Switch off automatic control Only if required: Manual dosing (then continue as below), or	
[autom.]	Return to automatic control	
Second press [manu.]	Manual dosing Auto. stop after 1 min	Dos. comes on **while** actuator doses or + (with controller type: pulse frequency pulse length black/white)
Next press [manu.]	Repeat if necessary Auto. stop after 1 min	
etc.	etc.	
Only with three-point step controller in addition after [manu.]:		+ or − comes on **if set value** changes (with controller type: three-point step controller)
[↑] or [↓]	actuator on or actuator off	
[manu.]	During dosing time 1 min: stop manual dosing	
[autom.]	At any time: return to automatic control	

5 Safety functions in »Measurement mode«

5.1 Alarm messages: flow alarm / pH, Cl_2, mV

Alarm message	Cause	Alarm relay contact 11-12
FLO blinks alternately with 	Flow rate longer than alarm delay time t_{AF} **under 30 l/h or total failure**	makes
pH blinks alternately with 	Actual value longer than alarm delay time t_{AS} **small setpoint minus alarm threshold X_{AS}**	makes
Cl_2 blinks alternately with 	or	
mV blinks alternately with 	Actual value longer than alarm delay time t_{AS} **large setpoint plus alarm threshold X_{AS}**	makes

5.2 Cancelling and acknowledging alarms

Press key	Action	Alarm relay contact 11-12
automatic	Alarm cancelled when alarm criterion no longer exists	breaks
right 	Alarm acknowledgement **Flow:** FLO stops blinking  blinks slowly	breaks
pH: left Cl_2/mV: right 	Alarm acknowledgement after **undershooting/exceeding alarm threshold X_{AS}:** pH stops blinking Cl_2 stops blinking mV stops blinking  blinks alternately with 	breaks

5.3 Dosing switch-off on flow alarm

If the flow rate drops below 30 l/h or there is a total flow failure, a proximity siwtch INS, if fitted, causes a flow alarm. It becomes active on expiry of a flow delay time of t_{AF} (chlorine R menu, Parameter 10). As soon as the required flow rate is restored, the flow alarm is cancelled after a fixed delay time of 2 min.

While the flow alarm is active, the instrument automatically stops the dosing of chemicals for chlorinating the pool water and setting the pH value (relay contacts switch off on pulse frequency / pulse length controller or relay contacts Cl^- make on three-point step controller).

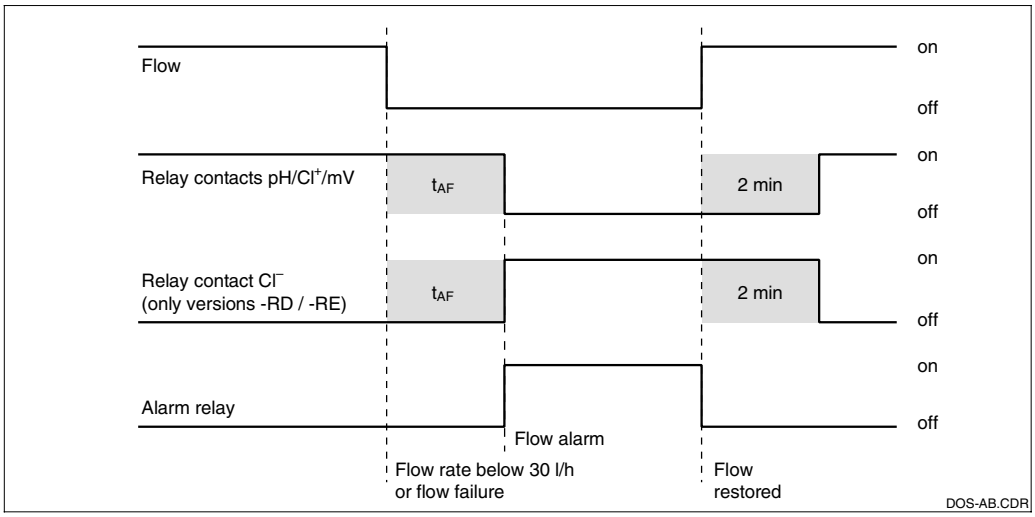


Fig. 5.1 Dosing switch-off on receipt of flow alarm

5.4 Safety switch-off to prevent overdosage

When the control is in automatic mode with the PI controller switched on, the occurrence of a strong I component may cause a limited (in time) dosage of chemicals, even if the setpoint is undershot. This is a normal control function. To prevent any impermissible overdosage, a safety switch-off function is coupled to the dosing function **on one side** to the alarm threshold XAS (pH/Cl2/mV control parameter 12). Switch-off takes place independently for pH and Cl_2 or mV and is only cancelled when the setpoint is undershot. The position of the relay contacts corresponds to switch-off in the event of a flow alarm (see Fig. 5.2).

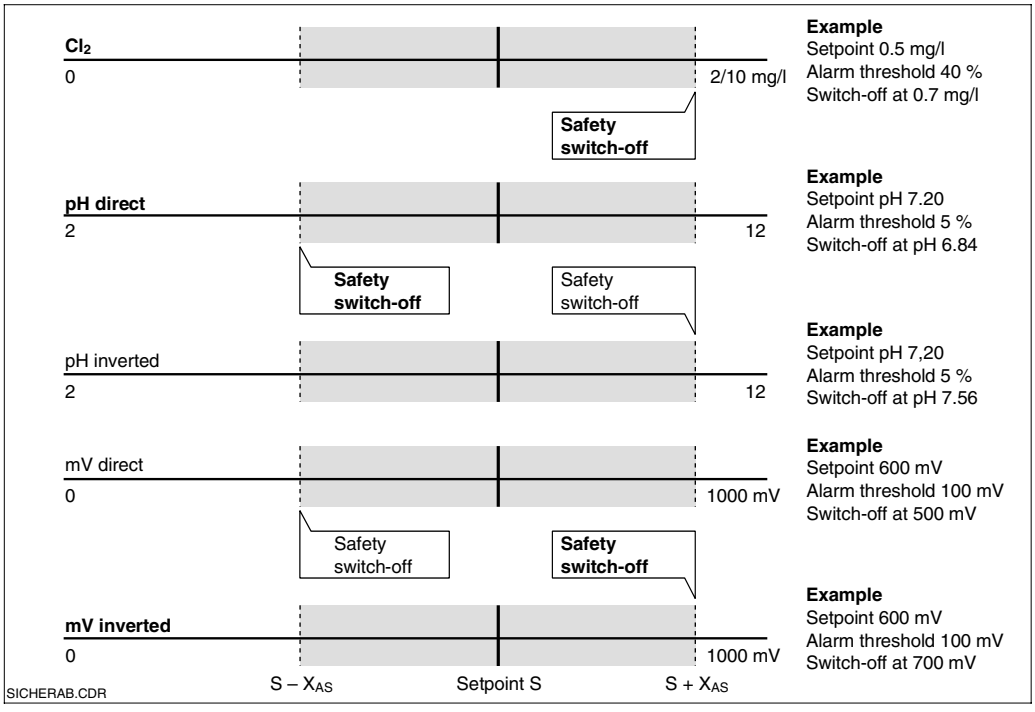


Fig. 5.2 Safety shut-off only active on one side for chlorine, pH and mV
(in bold: factory setting)

6 Troubleshooting

Errors can basically only occur in three areas of the measuring instrument:

- Measuring transmitter
- Supply lines and connections
- Chlorine measuring cell and measuring water

Before starting troubleshooting, check whether the conditions for use listed in Chapter 2.2 have been maintained. If this is not the case, restore the necessary conditions for use. If troubleshooting is still unsuccessful, the search lists below will provide help.

Error	Possible cause	Remedial action
No display, no measuring cell current	No mains voltage to measuring transmitter	Plug in mains plug
	Connecting line between measuring cell and measuring transmitter interrupted	Connect cable
	No electrolyte in measuring chamber	Fill measuring chamber
	No measuring water flow	Restore flow, clean filter
Reading too high	pH value dropped since calibration	Raise pH value or recalibrate
	Temperature risen since calibration (if no temperature compensation fitted)	Lower temperature or recalibrate
	Polarisation of measuring cell not yet terminated	Wait for end of polarisation
	Diaphragm defective	Replace diaphragm cap
	Shunt resistor (e.g. humidity bridge) in measuring cell, connections or connecting line	Open measuring chamber, wipe gold cathode dry. If reading on measuring transmitter does not reset to zero, there is a shunt.
	Fault in measuring cell due to external oxidant	Analyse measuring water, check chemicals

Error	Possible cause	Remedial action
Reading too low	pH value risen since calibration	Lower pH value or recalibrate
	Temperature dropped since calibration (if no temperature compensation fitted)	Raise temperature or recalibrate
	Measuring chamber not fully tightened	Tighten screws or screw cap on measuring chamber
	Diaphragm dirty	Clean diaphragm
	Air bubble upstream on outside of diaphragm	Remove air bubble
	Air bubble inside between cathode and diaphragm	Open measuring chamber, top up with electrolyte, tap
	Measuring water incoming flow too low	Restore correct incoming flow
	External oxidant interfering with DPD reference measurement	Analyse measuring water, check chemicals
	Use of organic chlorination agent	Use agent as per DIN 19643 (possibly replace water first)
Reading fluctuates strongly	Hole in diaphragm	Replace diaphragm cap
	External voltage in measuring medium	Remove connection on PM pin of assembly OCA 250. Measure voltage between PM pin and protective earth of measuring instrument (measure both AC and DC). With values greater than approx. 0.5 V, search external cause and remedy
Temperature reading **– too low** **– too high**	Supply line to NTC thermal sensor – interrupted – short-circuited	Inspect line (green/brown) and carry out resistance measurement (NTC), if nec. replace measuring cell

7 Technical Data

pH measurement

Measuring range = display range	2 ... 12 pH
Signal output range	5 ... 10 pH
Adjustment range of measuring chain zero point	5 ... 9 pH
Slope adjustment range	48 ... 65 mV/pH
Reference value for slope (25°C)	59.16 mV/pH
Zero adjustment range	±1.5 pH
Input impedance for measuring and reference electrode connection (acc. to DIN 19265)	$> 0.5 \times 10^{12}\ \Omega$
Input circuit	Balanced, high impedance
Measured error (acc. to IEC 746)	±0.5 % of measuring range

mV measurement

Measuring range = display range	0 ... 1000 mV
Signal output range OCM 360-0x8/1x0/2x1	0 ... 1000 mV
Signal output range OCM 360-363	0 ... +1000 mV / 0 ... –1000 mV, switchable
Zero adjustment range (redox Cal)	±100 mV
Slope adjustment	±10 %, only at factory
Input impedance	$> 0.5 \times 10^{12}\ \Omega$
Input circuit	Balanced, high impedance
Measured error	±0.5 % of measuring range

Chlorine measurement

Sensor	Type OCS 140-A or Type OCS 140-N
Measuring range = display range	Range 1: 0 ... 2.0 mg Cl_2/l Range 2: 0 ... 10.0 mg Cl_2/l
Possible signal output range	In Range 1: 0 ... 0.5 / 0 ... 1.0 / 0 ... 2.0 mg Cl_2/l In Range 2: 0 ... 5.0 / 0 ... 10.0 mg Cl_2/l
Automatic temperature compensation (ATC)	Switchable on/off
Cl_2-ATC range	10 ... 45 °C
Reference temperature	25°C
pH reference value	7.2
Measured error (at temperature of chlorine calibration)	±0.5 % of measuring range

Temperature measurement

Sensor	NTC sensor, 10 kΩ at 25°C
Measuring range	0 ... 50 °C
Signal output range	0 ... 50 °C
Slope adjustment	±20 % of final value
Measured error	±0.5 % of measuring range

Flow monitoring

Sensor	Inductive proximity switch Type INS
Measuring function	Monitoring the minimum position of a float flowmeter
Fault signal	With group alarm contact

pH value of mV control

Control function	Optionally P/PI controller
Setpoint adjustment of pH	In Range 2 ... 12 pH possible
Setpoint adjustment of mV	In range of –1000 ... +1000 mV possible
Proportional range X_p	10 ... 500 % in 10% steps or 1 ... 50 % in 1% steps X_p = 0 %: → Black/white controller
Integral action time T_n	1 ... 99 min
Control characteristic	Direct = dosing above setpoint Inverted = dosing below setpoint
Manipulated variable output	Quasi-steady as floating relay contact (NO contact)
Manipulated variable function	Optional: – Pulse frequency proportional-action controller, f = 60 ... 120 p/min – Pulse length proportional-action controller, T = 1 ... 99 s – Black/white controller (limit switch)
Hysteresis with black/white controller pH	0.1 ... 1.9 % of setpoint
Hysteresis with black/white controller mV	1 ... 199 mV

Chlorine control

Control function	Optionally P/PI controller, three-point step controller (PID) as option -RD / -RE
Setpoint adjustment (setpoint)	In full chlorine measuring range possible
Proportional range X_p	10 ... 500 % adjustable in 10% steps
Integral action time T_n	1 ... 99 min
Basic load dosing	0 ... 80 % of setpoint
Manipulated variable function	With P/PI controller and with pH. With three-point step controller servomotor with 2 relay contacts Actuator run time T_n for 100 % adjustable from 10 ... 990 s
Hysteresis with black/white controller	1 ... 19 % of setpoint
Neutral zone X_{Sh}	0 ... ±10 % of setpoint (with options -RD / -RE)

Alarm function

Function	Group alarm setpoint pH and Cl_2 or pH and mV and flow rate
Alarm trip threshold X_{AS} at pH, Cl_2	±5 %, ±10 ... ±50 % of setpoint adjustable in 10% steps
Alarm trip threshold X_{AS} at mV	5 mV, 10 ... 190 mV adjustable in 10% steps
Max. permissible difference with DPD Cal Cl_2	0.01 ... 0.99 mg/l adjustable
Alarm time delay of setpoint t_{AS}	0 ... 99 min adjustable
Alarm time delay of flow rate t_{AF}	0 ... 190 s adjustable in steps of 10 s
Contact function	Steady contact switchable to fleeting contact
Contact status in case of alarm	Closed (standard) Open (only selectable via instrument service level)
Alarm blink frequency	Approx. 1 Hz Approx. 0.5 Hz after alarm acknowledgement

Signal outputs

Output range	0 ... 20 mA or 4 ... 20 mA, also switchable for all signal outputs
Measuring range assignment to 0 / 4 ... 20 mA	Fixed for pH, mV and temperature, adjustable for Cl_2
Max. load	500 Ω
Max. permitted separation voltage	650 V_{rms}

Display

Displays	2 LC displays, 3½ digits, 13 mm digit height
Status indicators	LEDs red

Contact outputs

Quantity	Max. 4
Functions	K1: pH dosing K2: chlorine dosing (+) or mV dosing K3: chlorine dosing (–) (only with Rd controller) K4: group alarm
Contact load carrying capacity	Max. 250 V AC, max. 3 A AC, max. 500 VA
Potential matching	Floating
Measures for spark quenching	Integrated

Power supply

Power supply	110 / 127 / 230 / 240 V (recodable internally) –15 ... +10 %, 48 ... 62 Hz
Power consumption	Approx. 2 VA as well as max. 1 VA per signal output (min. approx. 3 VA, max. approx. 6 VA)

Data security

Program memory	EPROM
Memory for variable parameters	EEPROM

Mechanical data

Dimensions (w × h × d)	192 × 144 × 140 mm
Housing material	ABS
Connections	Screw terminals, max. 2,5 mm^2
Cable entry	Pg glands
Front panel	PC film with integrated keys and LED indicators
Protection class	IP 54
Nominal operating temperature	–10 ... +55 °C
Storage and transportation temperature	–25 ... +70 °C
Weight	Approx. 1.6 kg

Subject to modifications.

8 Appendix

Instructions on setting P(I) controllers

P controller: This is used for simple linear control with minor control deviations. Harmonics may result when you try to compensate for strong fluctuations. You may also have to expect a permanent control deviation.

PI controller: Used in processes where harmonics must be avoided and no permanent control deviation may occur.

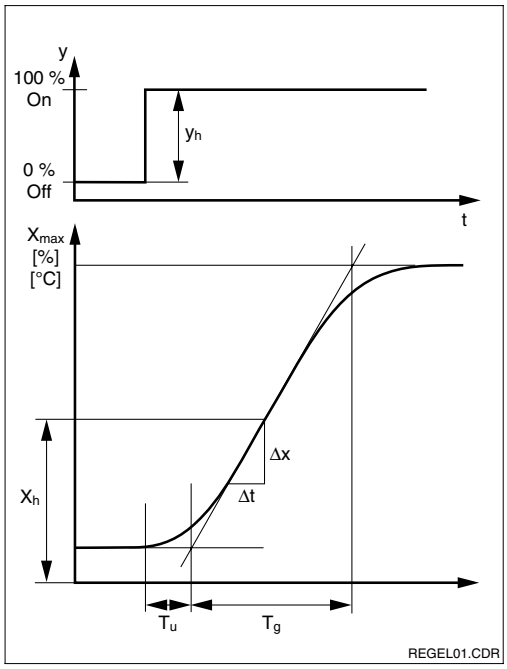


Fig. 8.1 Control characteristic

Setting options of P(ID) controller

There are three setting options for a PID controller:

- Change proportional band X_p (P action)
- Set integral action time T_n (I impact)

Step response of process control loop

y = set value
y_h = control range
T_u = delay time [s]
T_g = recovery time [s]

$$V_{max} = \frac{X_{max}}{T_g} = \frac{\Delta x}{\Delta t}$$

= rise time of control parameter
X_{max} = maximum process value
x_h = controller adjustment range

Controller characteristics

$$K = \frac{V_{max}}{x_h} \cdot T_u \cdot 100\,\%$$

Recommended settings for all versions

Controller reponse	X_p [%]	T_n [s]
P	K	—
PI	2,6 K	6 T_u

Start-up

If there are no empirical values available for setting the control parameters, use values that provide the greatest possible stability of the control loop (see Table on left).
When performing optimisation, reduce the proportional band X_p until the control parameter is just affected by harmonics. Raise X_p slightly, then change the T_n setting at short time intervals to obtain the shortest possible correction time without any harmonics.

Control and fine-optimisation of set parameters

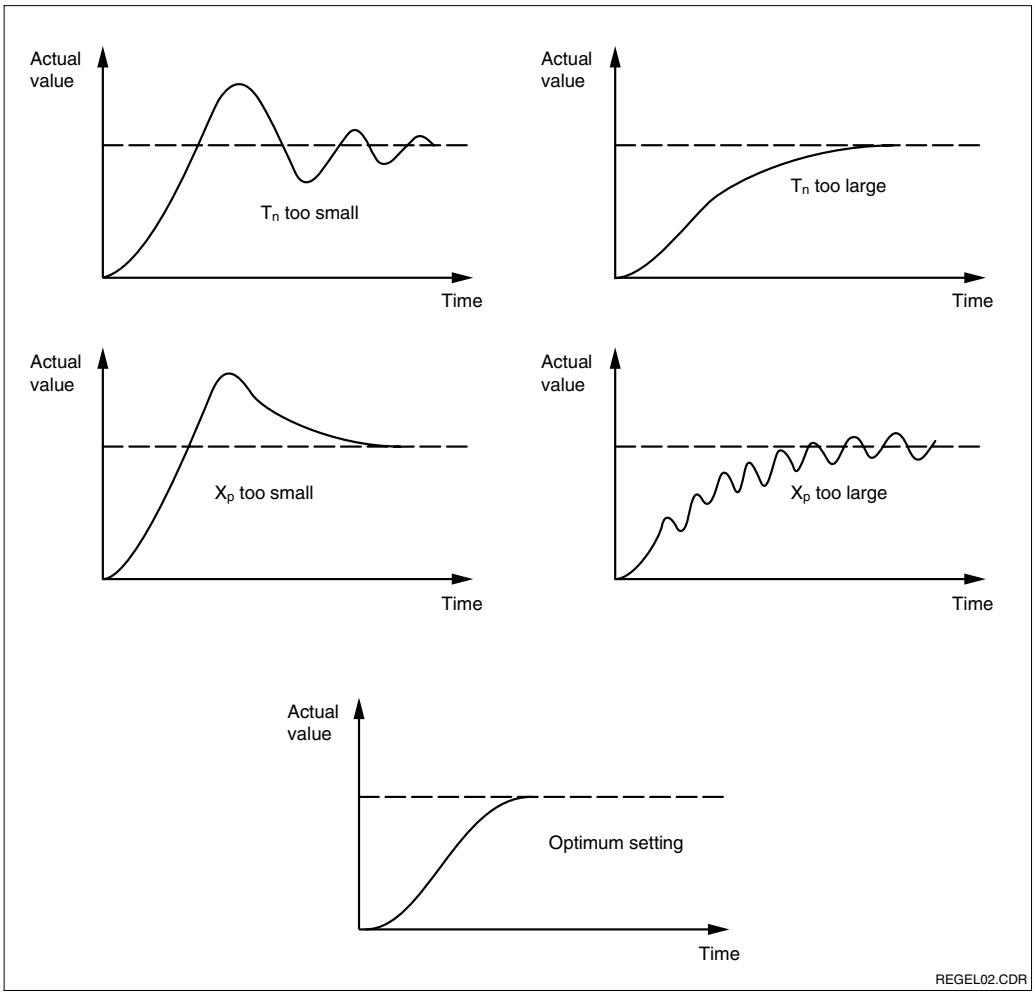


Fig. 8.2 Setting optimisation T_n and X_p