

dTRANS pH 01 µP transmitter / controller for pH value or redox voltage



Type 202530 / ...

Type 202530 Panel-mounting housing to DIN 43 700

Brief description

This instrument, with a 96mm x 48mm bezel size and a plug-in controller module, measures and controls (depending on the configuration) the pH value or redox voltage of aqueous solutions.

The transmitter has two analog and two logic inputs. The first analog input is suitable for connecting a pH combination electrode, or a glass and reference electrode (also antimony), or a redox combination electrode, or a metal and reference electrode. The second analog input can be used to connect Pt100 or Pt1000 resistance thermometers. The instrument features two 4-digit 7-segment displays for indicating the pH or redox voltage process value (red) and the temperature (green). During programming, the displays provide comments on the inputs.

A great variety of control tasks can be handled by the various output options (relay contacts and/or analog outputs). The two relay "make" contacts that are provided on the instrument as standard can be configured as a limit controller and/or pulse width or pulse frequency controllers, or as a modulating controller. To obtain analog (continuous) controller outputs, the optional analog outputs must be configured accordingly.

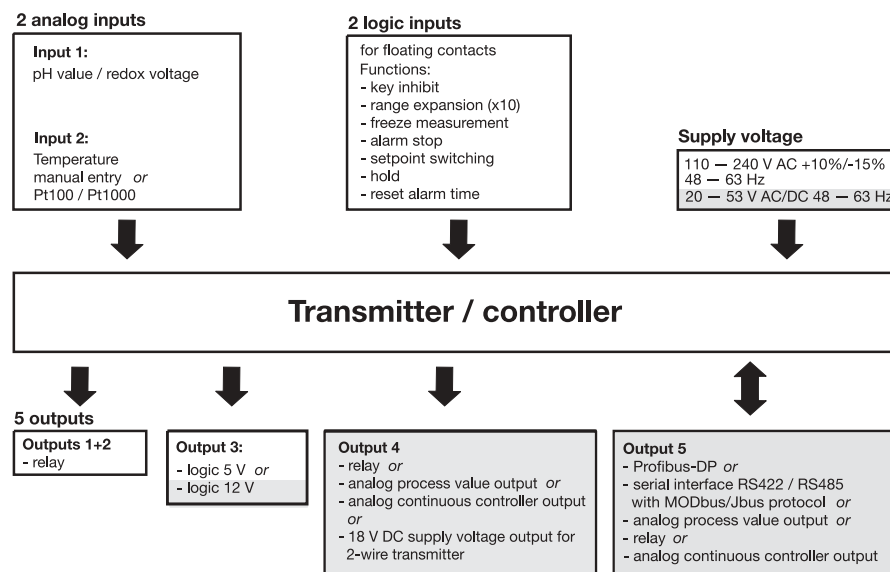
All controller outputs can be configured for a P, PI, PD or PID control action.

In the basic version, the instrument provides two relay "make" contacts and one logic output (0/5V). Two additional outputs can, according to choice, be fitted as relay changeover contacts and/or analog outputs (process value output or analog controller output) or as a serial interface (Profibus-DP or MODbus/Jbus protocol).

Special features

- Compact design, only 96 x 48 x 110 mm.
- switchable from pH to mV/ORP (redox voltage).
- display of pH or mV/ORP (redox voltage) and temperature.
- Simple, step-by-step calibration procedure.
- Monitoring of the medium temperature is possible.
- 2 electrically isolated analog outputs 0(4) — 20 mA / 0(2) — 10 V, freely configurable as process value output for pH, redox or temperature, or for proportional controllers (option).
- 2 relays as standard, freely programmable as limit controller or P, PI, PID, PD controller with pulse width, pulse frequency output or modulating controller.
- 2 logic inputs
- 1 logic output (alarm contact or temperature limit contact).
- OPTION: Profibus-DP or serial interface RS485/422 with MODbus/Jbus protocol.
- Complies with the most stringent CE standard.
- Front protection IP65.
- IP65 surface mounting or site housing on request.

Block structure



extra codes / options

Standard accessories

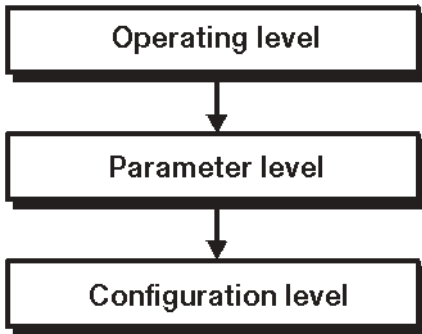
- 2 mounting brackets
- 1 BNC plug
- 1 seal for panel mounting
- 1 Operating Instructions B 20.2530.0.1
- 1 Operating Instructions B 20.2535.0.1

Optional accessories

- housing, no door at front
- housing with door at front
- Interface Description B 20.2530.2

Operation

For easy programming and operation, the controller parameter and configuration data are assigned to various levels.



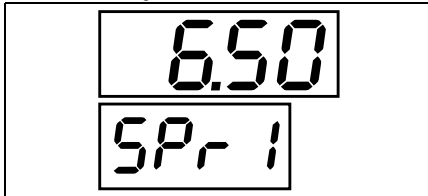
Code words protect the levels from unauthorized access.

Membrane keys ensure simple and user-friendly operation.

The two LED displays show the parameter symbols and the corresponding values.

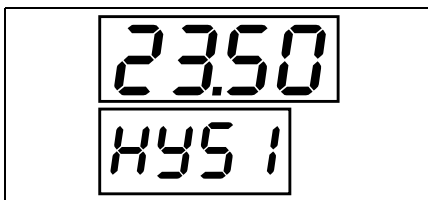
Operating level

The lower display, for example, shows the symbol, the upper display the corresponding value. Setpoints SP1 and SP2 can be altered by using the membrane keys.



Parameter level

The controller is adapted to the control loop at this level. The appropriate parameters appear here, with symbol and value. Only those parameters will be indicated which correspond to the configuration of the controller (configuration level).

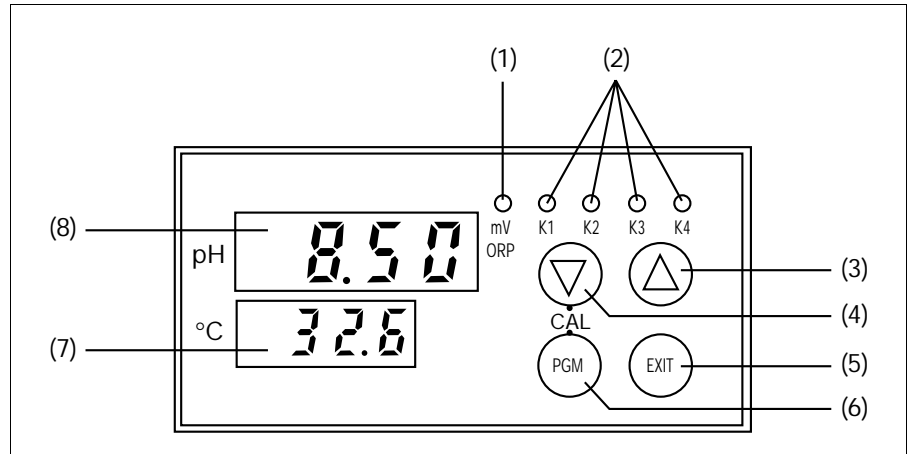


Configuration level

This level is used to adapt the controller to the control task, or for adaptation of the inputs and outputs.



Indications / controls



(1) Display: The instrument has been reconfigured from "pH" to "redox"	(6) PGM key for selection of parameters and confirmation of entries
(2) Status indicators (yellow) for outputs 1 to 4	(7) 4-digit temperature display (LED, green, 8mm high)
(3) Increment key for altering parameters or manual operation of relay K2	(8) 4-digit process value indication (LED, red, 13mm high)
(4) Decrement key for altering parameters or manual operation of relay K1	(4) "CAL": Initiating electrode calibration + (1-point or 2-point calibration)
(5) EXIT key to leave the levels	(6)
	(3) + (5) Initiate manual operation or hold

Calibration options

The electrode parameters of a pH or redox combination electrode are subject to manufacturing tolerances and variations depending on usage. To compensate for these changing electrode parameters, the transmitter offers two calibration procedures:

1) 2-point calibration (standard)
2-point calibration makes a fresh determination of the **electrode zero and slope** using two liquids with known pH values (e.g. buffer solutions).

This method should be given preference!

2) 1-point calibration
In 1-point calibration, **only the electrode zero** is freshly determined using a buffer solution (solution with a known pH value).

Problems arising from an incorrect electrode slope cannot be detected by the user!

This method should only be adopted in cases where the electrode is not subject to significant chemical or mechanical influences.

In addition to the calibration procedure described above, the transmitter offers the facility of manually entering or adjusting the zero point and slope (as determined by a laboratory, for example),

Additional functions of the dTRANS pH 01

□ Programmable response of the process value output to underrange/overrange

On underrange or overrange, the process value output can move to the following operational states:

-4%, 0%, 100% or 110% freely selectable

Example: The instrument is programmed to 4 — 20 mA corresponding to 2 — 12 pH

The instrument can be set up so that, on falling below pH 2, the output signal is either held at 4 mA (0%) or drops to 3.84 mA (-4%). The 3.84 mA value can then be recognized as "irregular" by a connected PLC.

□ The response of the controller relays to "Hold" can be defined

"Hold" is initiated either manually, using the keys, by a logic input, or by an alarm event. The outputs of the relays K1 and K2 can move to the following (programmable) states on "Hold":

0%	Relay de-energized
50% output	For dynamic controllers, 50% of the maximum pulse width or frequency is produced.

100% output	Relay is energized, or maximum pulse width/frequency
Output accepted	The present output continues to be produced

- ❑ **In "Manual" mode, the relays K1 and K2 are operated manually, by using the keys.** Either key or switch operation can be selected, by a setting at the parameter level.

Key operation: The relay is switched as long as the key is pressed (e.g. for manual dosing).

Switch operation: The first key stroke switches the relay on – the second switches it off again (toggle action), e.g. for emptying large tanks.

- ❑ **Simulation of the analog process value output**

In the manual mode, the process value output (0/2 — 10 V or 0/4 — 20 mA, depending on the setting) can be switched in 10% steps from 0 — 100%.

Application: "Dry-run" commissioning of the plant (without electrodes), fault-finding, servicing.

- ❑ **Controller output functions**

Output 1 (relay): Switching, with pulse frequency or pulse width action / limit monitoring / switched off. Switching function can be reversed. MAX/MIN limit comparator.

Output 2, relay: Switching, with pulse frequency or pulse width action / limit monitoring / MAX limit comparator for temperature input / MIN limit comparator for temperature input / switched off. Switching function can be reversed. MAX/MIN limit comparator.

Output 3, relay or analog process value output: "Hold" / alarm pulse contact; alarm steady contact / MAX limit comparator / MIN limit comparator / output of pH or redox process value (only for analog process value output) / output of temperature process value (only for analog process value output) / analog controller output (only for analog process value output) / no function.

Output 4, logic output: "Hold" / alarm pulse contact / alarm steady contact / MAX limit comparator / MIN limit comparator / no function.

Output 5, relay or analog process value output: "Hold" / alarm pulse contact; alarm steady contact / MAX limit comparator / MIN limit comparator / output of pH or redox process value (only for analog process value output) / output of temperature process value (only for analog process value output) / analog controller output (only for analog process value output) / no function.

Limit comparator (limit monitor)

Controller outputs 1 to 5 (depending on the instrument version) can be assigned to a limit-monitoring function.

For each one, the direction of switching (pulled in going above, or going below a limit), pull-in and/or drop-out delay, and a hysteresis can all be defined.

Interface

The microprocessor transmitter/controller can be optionally fitted with an RS422/RS485 interface. This is used for communication with higher-level systems and integration into a data network. The transmission protocol can be either Profibus-DP or MODbus/Jbus.

Technical data

Inputs

Analog input 1

Input resistance $\geq 10^{12} \Omega$
Insulation resistance of the reference system connection to ground $> 10^7 \Omega$ according to DIN 19 265

For all the usual pH electrodes, pH antimony electrodes, metal electrodes, reference electrodes or combination electrodes.

Analog input 2

Resistance thermometer Pt100 or Pt1000, in 2- or 3-wire circuit
-50 to +250°C
Measurement display in °C (option °F)

Lead compensation, analog input 2

The lead resistance can be compensated in software by a correction of the process value.

This is not required if the resistance thermometer is connected in a 3-wire circuit.

When a resistance thermometer is connected in a 2-wire circuit, lead compensation can be provided by using an external compensation resistor.

Functional description of logic inputs 1 and 2

The two standard logic inputs can be operated by floating contacts (relays) from a PLC, or by switches. The following functions can be selected and assigned:

Key inhibit: The PLC or a key switch can be used to lock the keys on the transmitter, to prevent unauthorized entries being made.

Setpoint changeover: For comfortable process control. As long as the logic input is not operated, setpoint pair SP_{r1} and

SP_{r2} is active. If the appropriately configured logic input is operated, then the second setpoint pair is activated. Application: If, for instance, the medium is to be first acidified to pH 4 and then neutralized to pH 7 (2 process steps).

Freeze measurement: The indicated measurement and the process value output no longer change.

"Hold": This function can be used (for instance, by a supervisory PLC) to put the instrument into the secure "Hold" state. The response of the controller to "Hold" is as previously defined.

HOLD reversed: The same function as HOLD, but when the logic input is open.

Alarm stop: The alarm generation via the configured output is prevented. The alarm LED (e.g. K4) continues to blink as a warning.

Reset alarm time: The alarm generation via the configured output is prevented. The alarm delay time is set to zero, but is restarted when the logic input becomes inactive and the start conditions are fulfilled once more. The alarm LED (e.g. K4) continues to blink as a warning.

Range expansion (x10): If only a small portion of the measurement range is used, it may be advantageous for the transmitter to react to 0 — 10% of the process value by producing 0 — 100% of the output signal.

Measurement and control range

-1.00 to 14.00 pH or
-1999 to +1999 mV (redox)

Deviation from characteristic
 $\leq 0.25\%$ of measurement range

Ambient temperature error
 $\leq 0.15\%$ per 10 °C

Reference temperature
25°C

Temperature display
-50 to +250°C (option °F)

Deviation from characteristic
 $\leq 0.25\%$ of measurement range

Ambient temperature error
 $\leq 0.1\%$ per 10 °C

Temperature compensation (pH measurement)

by resistance thermometer on analog input 2
Configurable:

automatic temperature compensation with a Pt100 or Pt1000, or manual temperature compensation.

Compensation range
-20 to +150°C

Outputs

2 relay outputs, 1 logic output, 1 analog process value output or 1 additional relay, and 1 serial interface are available.

1. **Relay, output 1 / 2 (standard)**
Make contact (n.o., can also be configured as n.c. break contact)
contact rating: 3A, 250V AC
with resistive load
contact life:
> 5×10^5 operations at rated load
2. **Logic output, output 4**
0/5V $R_{load} \geq 250\Omega$ (standard)
or
0/12V $R_{load} \geq 650\Omega$ (option)
3. **Process value output, output 3 or 5 (option)**
freely configurable:
0(2) — 10V $R_{load} \geq 500\Omega$ or
0(4) — 20mA $R_{load} \geq 500\Omega$
electrically isolated from the inputs:
 $\Delta U \leq 30V$ AC or
 $\Delta U \leq 50V$ AC

Deviation from characteristic of the output signal
 $\leq 0.25\% \pm 50$ ppm per °C
4. **Relay, output 3 or 5 (option)**
(only for instruments without a process value output)
changeover contact
contact rating: 3A, 250V AC
with resistive load
contact life:
> 5×10^5 operations at rated load
5. **Interface RS422 / RS485, output 5 (option)**
electrically isolated

Baud rate
4800 / 9600bps

Protocol
MODbus/Jbus or
Profibus-DP

General controller data

A/D converter

resolution > 15 bit

Controller type

Outputs 1 and 2

limit controller, pulse width or pulse frequency controller, modulating controller. Freely configurable and mixable

K3 / K5:

proportional controller

Control action

configurable as P, PI, PID or PD.

Sampling time

210msec

Measurement circuit monitoring

Input 1:

out-of-range, sensor monitoring

Input 2:

out-of-range, probe short-circuit, probe break

The outputs move to a defined (configurable) status.

Data backup

EEPROM

Supply voltage

110 — 240 V AC +10%/-15%,

48 — 63 Hz or

20 — 53 V AC/DC, 48 — 63/0 Hz

Power consumption

approx. 8V A

Electrical connection

via gold-plated faston connectors

to DIN 46 244/A; 4.8mm x 0.8mm

pH glass electrode or combination

electrode or metal electrode via BNC socket.

Permissible ambient temperature

0 to +50°C

Permissible ambient temperature limits

-10 to +55°C

Permissible storage temperature

-40 to +70°C

Climatic conditions

rel. humidity $\leq 75\%$, no condensation

Enclosure protection

to EN 60 529

front IP65 / rear IP20

Electrical safety

to EN 61 010

clearance and creepage distances for

- overvoltage category II

- pollution degree 2

Electromagnetic compatibility

to EN 61 326

interference emission: Class B

interference immunity: to industrial requirements

Housing

Panel-mounting housing in conductive plastic to DIN 43 700, base material ABS with plug-in controller module.

Operating position

unrestricted

Weight

approx. 320g

Optional accessories

Housing, no door at front

Type 2 FGE-125-2/125

Housing with door at front

Type 2 FGE-150-2/185

On request, the dTRANS pH 01 can be supplied already installed in a surface-mounting or site housing.

Both types of housing are robust, and provide IP65 protection for the instrument.

The housing type with a door at the front has been designed for use in extremely harsh conditions. During installation or maintenance of the transmitter, the housing and cable glands can be swung out from the wall as a unit. A clear door at the front, that can also be swung out, provides additional protection for the instrument. The housing is fitted with (3 each) Pg9 and Pg7 cable glands. Unused Pg glands can be sealed off, using the blind grommets that are included in the delivery.

The more economically priced housing (without a door at the front) is particularly suited as an on-site housing, for instance in factory halls and plants. This housing is fitted with 5 size Pg9 cable glands. Here too, unused Pg glands can be sealed off, using the blind grommets that are included in the delivery.

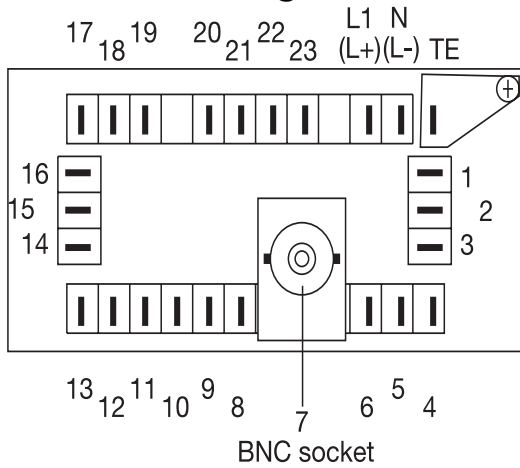
Both types of housing are supplied separately (without the built-in transmitter/controller). The front panel is already provided with a 96 x 48 mm cut-out.

Parameter

Parameter	Display	Value range	Comments
Alarm tolerance pH / redox	AL1	0.00 — 99.99 pH 0000 — 9999 mV	The alarm is only generated when the level (setpoint + alarm tolerance) has been passed, and the alarm delay time has elapsed (only effective for pulse width / pulse frequency controllers). It is internally fixed at 0 for limit controllers.
Alarm delay	AL2	0 — 6000 sec	Delay time before the alarm contact is activated
Proportional band 1 pH / redox	Pb1	0.01 — 99.99 pH 1 — 9999 mV	Influences the P action of the controller
Proportional band 2 pH / redox	Pb2		
Derivative time 1	dt 1	0 — 9999 sec	Influences the D action of the controller If dt = 0, the controller has no D action.
Derivative time 2	dt 2		
Reset time 1	rt 1		Influences the I action of the controller If rt = 0, the controller has no I action.
Reset time 2	rt 2		
Minimum ON time 1 (for limit controller or pulse width controller) or minimum pulse width 1 (for pulse frequency controller)	tr 1	0.2 — 999.9 sec	Determined by the technical data of the dosing device (solenoid valve, dosing pump)
Minimum ON time 2 (for limit controller or pulse width controller) or minimum pulse width 2 (for pulse frequency controller)	tr 2		
Switching differential 1 pH / redox / temperature	HYS1	0.01 — 99.99 pH 1 — 9999 mV 0.0 — 250.0 °C	Defines the switch-off point for the control contact. (Is displayed if pH or temperature-dependent limit comparators have been configured by the corresponding configuration code.)
Switching differential 2 pH / redox / temperature	HYS2		
Switching differential 3 pH / redox / temperature	HYS3		
Switching differential 4 pH / redox / temperature	HYS4		
Switching differential 5 pH / redox / temperature	HYS5		
Pull-in delay 1	Ond1	0.2 — 999.9 sec	Delay time before the contact switches. (This is displayed if pH or temperature-dependent limit comparators have been configured by the corresponding configuration code.)
Pull-in delay 2	Ond2		
Pull-in delay 3	Ond3		
Pull-in delay 4	Ond4		
Pull-in delay 5	Ond5		
Drop-out delay 1	Ofd1	0.2 — 999.9 sec	Delay time until the contact moves back to the initial position. (This is displayed if pH or temperature-dependent limit comparators have been configured by the corresponding configuration code.)
Drop-out delay 2	Ofd2		
Drop-out delay 3	Ofd3		
Drop-out delay 4	Ofd4		
Drop-out delay 5	Ofd5		
Maximum pulse frequency 1	Fr 1	0 — 150 pulse/min	Maximum frequency of pulses (operating a dosing pump, for instance)
Maximum pulse frequency 2	Fr 2		
Pulse period 1	Cy 1	1.0 — 999.9 sec	The period in which a pulse is modulated
Pulse period 2	Cy 2		
Output level limit, relay 1	Y 1	0 — 100%	The maximum output level for a pulse width / pulse frequency controller.
Output level limit, relay 2	Y 2		
Actuator time	tt	15 — 3000 sec	For modulating controller

Connection diagram

Rear view with faston connector (AMP connector) and BNC socket.



Outputs	K	Terminal assignments	Symbol
Relay 1 (K1) Status indication LED K1	1	23 common 22 make	
Relay 2 (K2) Status indication LED K2	2	21 common 20 make	
Relay 3 (K3) Status indication LED K3	3	16 break 15 common 14 make	
or analog process value output (electrically isolated)		15 - 14 +	
Logic output 1 (K4) Status indication LED K4	4	19 - 17 +	
Relay 4 (K5) Status indication	5	3 break 2 common 1 make	
or analog process value output (electrically isolated)		2 - 1 +	

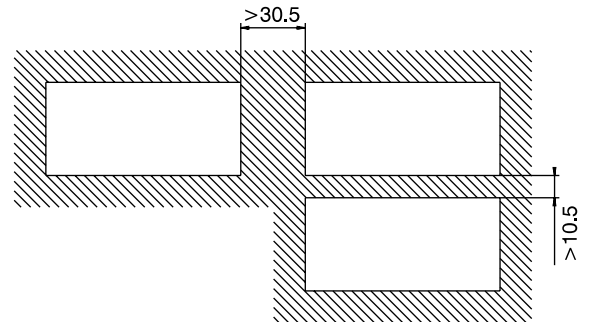
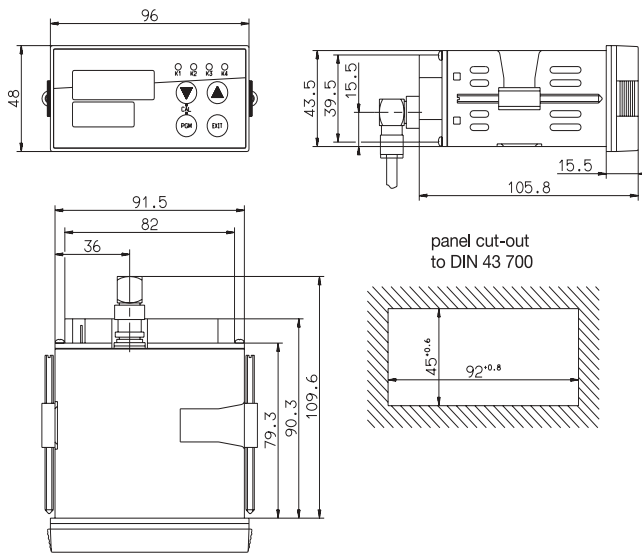
Inputs	Terminal assignments		Symbol
pH combination electrode or redox combination electrode		BNC socket	
pH glass electrode or metal electrode with separate reference electrode		BNC socket	
Reference electrode		8	
Resistance thermometer in 3-wire circuit		9 10 11	
Resistance thermometer in 2-wire circuit		9 10 11	

Serial interface RS422 (option)	RxD	5 4	RxD + RxD -	Receive data	
	TxD	2 1	TxD + TxD -	Transmit data	
	GND	3	GND		
Serial interface RS485 (option)	+	2	TxD/RxD +	Receive data / transmit data	
	-	1	TxD/RxD -		
Serial interface Profibus-DP (option)	VP	4	supply voltage, positive (P5V)		
	RxD/TxD-P	1	receive/transmit data positive, B conductor		
	RxD/TxD-N	2	receive/transmit data negative, A conductor		
	DGND	3	ground for data transmission		
Logic input 1		13 19			
Logic input 2		12 19			
Supply voltage see nameplate	AC/ DC	AC: L1 phase/line N neutral TE technical earth	DC: L + L -		

Dimensions

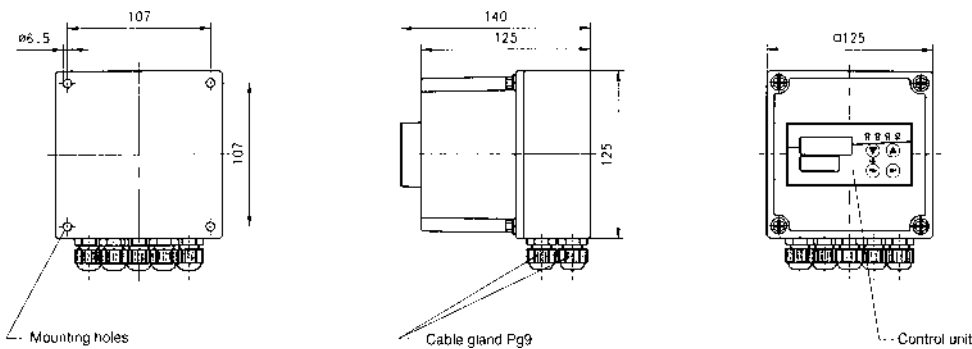
Type 202530 / ...

Panel cut-out to DIN 43 700
close mounting (minimum dimensions)

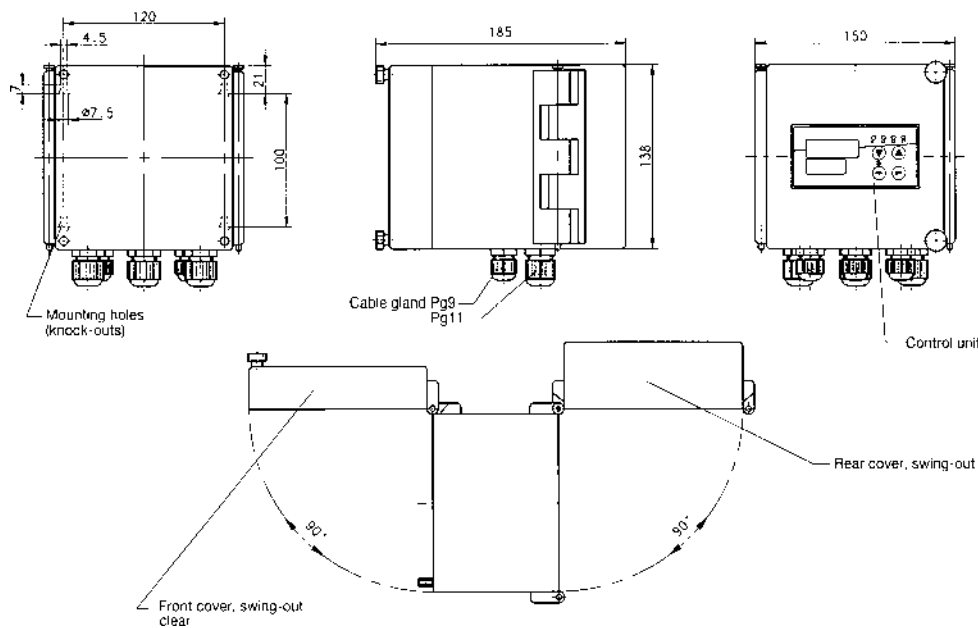


Optional accessories

Housing, no door at front, enclosure IP65, Type 2 FGE-125-2/125



Housing with door at front, enclosure IP65, Type 2 FGE-150-2/185



Type designation

- (1) Basic type**
202530 dTRANS pH 01,
Microprocessor transmitter/controller for pH value
(can be changed over to redox voltage)
- (2) Basic type extensions**
00 Controller off*
10 Limit controller*
- (3) Output I**
000 no output
310 relay, changeover contact
888 process value output, freely configurable
- (4) Output II**
000 no output
310 relay, changeover contact¹
888 process value output, freely configurable¹
- (5) Supply voltage**
22 20 — 53 V AC/DC, 48 — 63/0 Hz
23 110 — 240 V AC +10%/-15%, 48 — 63 Hz
- (6) Interface**
00 no serial interface
54 serial interface RS422/485¹
64 serial interface Profibus-DP¹
- (7) Extra codes**
000 no extra codes
014 logic output 0/12 V DC,
instead of standard 0/5 V DC

***Generally**

on all controllers of the 202530 series, the user can freely select the following configurations:

- Controller off
- Limit controller
- Pulse width controller with P, PI, PD, PID control action
- Pulse frequency controller with P, PI, PD, PID control action
- Modulating controller

The options given in the type designation are just the **factory default settings!**

¹ If output II (4) = "310" or "888" then the interface option (6) is not possible (or the other way round)!

	(1)	(2)	(3)	(4) ¹	(5)	(6) ¹	(7)						
Order code	202530	/	□	-	□	,	□	-	□	-	□	-	□
Order example	202530	/	10	-	888	,	000	-	23	-	00	-	000

Stock items

Type	Sales No.
202530/00-888,000-23-00/000	20/00362662
202530/10-888,000-23-00/000	20/00377252

Optional accessories 1 available ex-stock

Designation	Sales No.
Surface-mounting housing, no door at front, Type 2 FGE-125-2/125	20/00361257
Surface-mounting housing, door at front, Type 2 FGE-150-2/185	20/00361259

Optional accessories 2

Designation	Sales No.
Fixing for DIN rail	70/00375749
Blank cover 96 x 48 mm	70/00069680