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MEASUREMENT AND CONTROL

JUMO dTRANS Lf 01
Microprocessor transmitter/ controller for conductivity

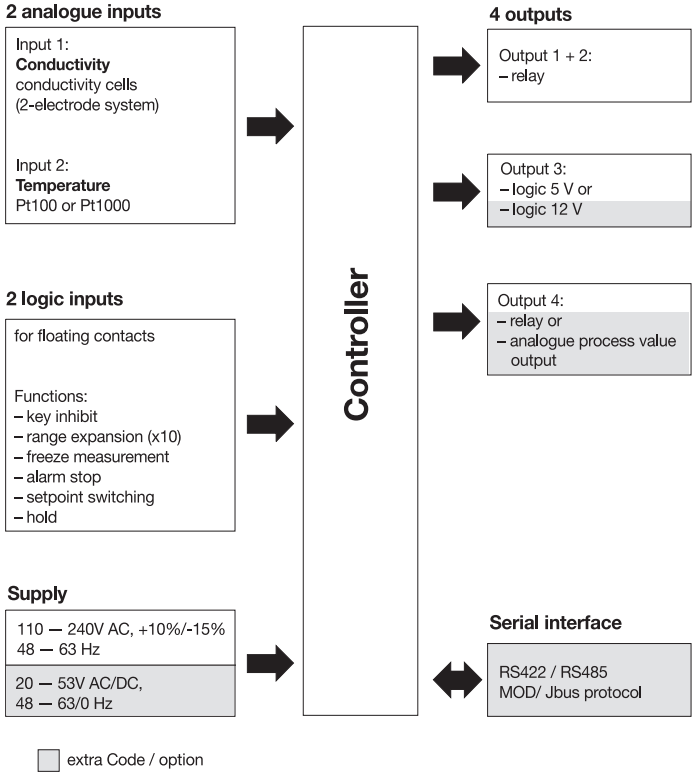
Type 202540
Housing for flush-panel mounting to DIN 43 700

Type 202540 / ...

Brief description

The compact microprocessor transmitter / controller with 96 mm x 48 mm bezel size and plug-in controller chassis measures and controls the conductivity in aqueous solutions.
The transmitter has two analogue and two logic inputs. The first analogue input is suitable for connecting conductivity cells with the cell constants 0.01; 0.1; 1.0; 3.0; 10.0 per cm. The second analogue input can be used to connect Pt100 or Pt1000 resistance thermometers.
The instrument features two 4-digit 7-segment displays for indicating the conductivity process value (red) and the temperature (green). During programming, the displays are available for comments on the inputs.
The two controller relays can be configured as limit controller and / or pulse duration or pulse frequency controller with P, PI, PD or PID structure. A maximum of two relay make contacts, one logic output, one analogue process value output and one serial interface are available. The relay can be supplied with an additional relay changeover contact instead of the analogue process value output.
An RS422 / RS485 interface for integration into a data network is available as an option. The MOD/Jbus protocol is used.

Block structure



Features

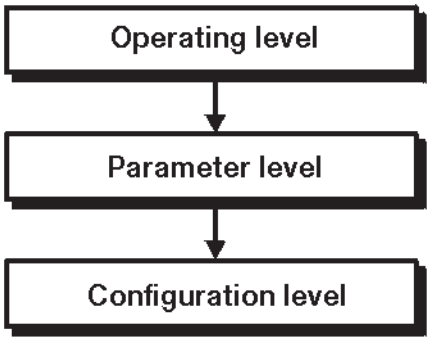
- ❏ Compact design, only 96 x 48 x 110 mm
- ❏ Measuring ranges from 0—0.5 µS to 0—200 mS **in one unit**
- ❏ Cell constants 0.01; 0.1; 1.0; 3.0; 10.0 per cm
- ❏ Display for conductivity (in µS/cm or mS/cm) and temperature
- ❏ Calibration procedure for the relative cell constant
- ❏ Calibration procedure for the temperature coefficient of the measuring solution
- ❏ Monitoring of medium temperature is possible
- ❏ 1 isolated analogue process value output 0(4)—20 mA / 0(2)—10 V, freely selectable and scalable for conductivity or temperature (option)
- ❏ Configurable bi-linear output signal (if analogue process value output is available)
- ❏ External setpoint switching is possible via logic contact
- ❏ 2 relays as standard, freely programmable as limit controller or P, PI, PID, PD controller with pulse duration or pulse frequency output
- ❏ 2 logic inputs
- ❏ 1 logic output (alarm contact or temperature limit-contact)
- ❏ RS485 / 422 serial interface with MOD/ Jbus protocol (option)
- ❏ Compliant with the most stringent CE standard
- ❏ Front protection IP65
- ❏ IP65 surface-mounting /site housing available on request

Standard accessories
- 2 mounting brackets
- 1 seal for panel mounting
- 1 Operating Instructions B 20.2540

Optional accessories
- housing without door at front
- housing with door at front
- interface description

Operation

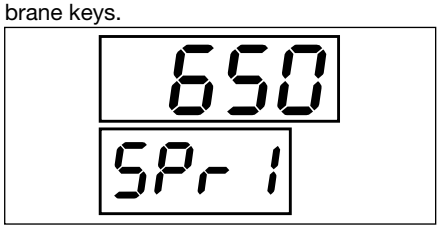
The controller parameters and configuration data are assigned to various levels for easy programming and operation.



Code words protect the levels from unauthorised access.
Membrane keys ensure simple and user-friendly operation.
The two LED displays show the parameter symbols and the corresponding values.

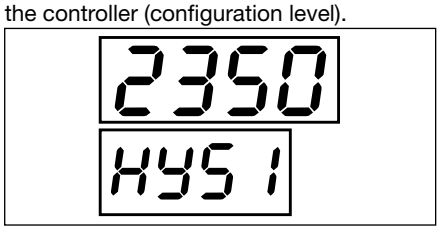
Operating level

The lower display, for example, shows the symbol, the upper display indicates the corresponding value. The setpoints SPr1 and SPr2 can be altered from the membrane keys.



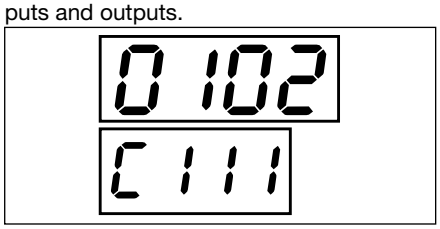
Parameter level

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

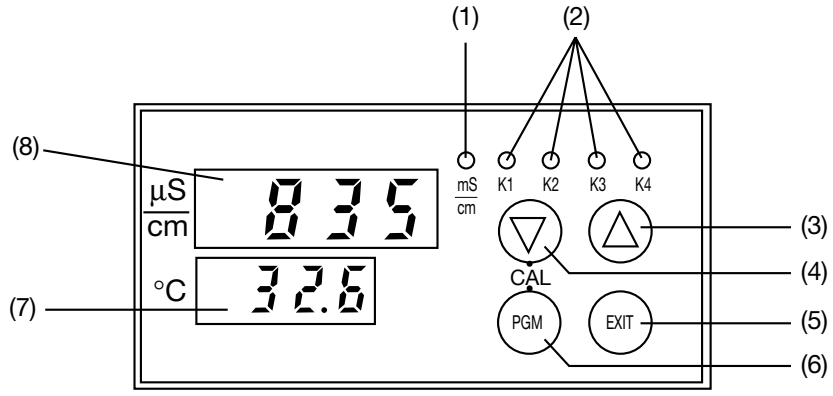


Configuration level

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



Indications/controls



(1) LED display in mS/cm	(6) PGM key to select the parameters and to confirm entries
(2) Status indications (yellow) for the outputs 1 — 4	(7) 4-digit temperature indication (green), 8mm high
(3) Increment key to alter parameters or for manual operation of relay K2	(8) 4-digit process value indication (red), 13mm high
(4) Decrement key to alter parameters or for manual operation of relay K1	(4) "CAL": Starting calibration + (relative cell constant K_{rel} or (6) temperature coefficient α)
(5) EXIT key to leave the levels	(3) + To trigger manual mode or "Hold" (5)

Additional functions of the JUMO dTRANS Lf 01

❑ **Calibrating the cell constant**

As a result of manufacturing tolerances, the cell constant of a conductivity cell can diverge minimally from its nominal (printed) value. In addition, the cell constant can change during operation due to deposits or wear. This alters the output signal of the measuring cell. The dTRANS Lf 01 offers the user the possibility of compensating any divergence from the nominal value of the cell constants either through **manual input** (range 80—120%) or by **automatic calibration** of the relative cell constant K_{rel}.

❑ **Calibrating the temperature coefficient α**

The conductivity of nearly all solutions depends on the temperature. Therefore, the temperature as well as the temperature coefficient α [%/°C] of the measurement solution must be known in order to ensure correct measurement. The temperature can either be measured automatically using a Pt100 or Pt1000 temperature probe, or it has to be set manually by the user.
The temperature coefficient can be calculated automatically by the dTRANS Lf 01, or input manually in the range 0 to 5.5%/°C.

❑ **Programmable response of the process value output on under / overrange**

On under / overrange, the process value output can show the following operating states:

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

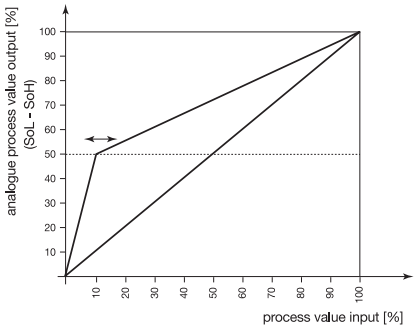
Example: The instrument is programmed to 4 — 20 mA, corresponding to 0 — 30 mS/cm

The instrument can be set in such a way that on going above 30 mS/cm the output signal 20 mA (100%) will either be maintained, or increased to 22 mA (110%). The value of 22 mA can be recognised as "irregular" by a following PLC.

❑ **Bi-linear output**

This function divides the signal of the analogue process value output into two linear portions (0 — 50% and 50 — 100% of the output signal), with a knee-point at 50% of

the output signal. The knee-point of the characteristic can be moved along the dotted 50% line. The factory setting 50% results in a linear characteristic.



The bi-linear characteristic is used when the "normal" measurement range is likely to be exceeded.

Example: The normal measurement range spans from 0 to 20 µS/cm. However, measurements of 80 µS/cm can also occur.
In this case, the range 0 — 100 µS/cm will be chosen and the knee-point fixed at 20% of the range (20% of 100 µS/cm corresponds to 20 µS/cm).
This results in measurements in the range from 0 — 20 µS/cm being converted into an output signal of 0 — 10 mA.
Measurements in the range 20 — 100 µS/cm will be converted into an output signal 10 — 20 mA.

❑ **Response of the controller relays on "Hold" can be defined**

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

0%	Relay de-energised
50% output	For dynamic controllers, 50% of the maximum pulse duration / frequency is produced
100% output	Relay is energised or maximum pulse duration / frequency
Output accepted	The present output continues to be produced

❑ **In "Manual" mode the relays K1 and K2 can be operated manually from the keys.** Either key or switch operation can be selected by presetting them at the parameter level.

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

Switch operation: The first key stroke switches the relay on, the second one switches the relay off (e.g. for emptying larger tanks).

❑ **Simulation of the process value output**

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

Application: Dry commissioning of the plant (without measuring cell; fault search; servicing.

❑ **Possible switching functions of the relays or the logic output**

Output 1, relay: Switching with pulse frequency or pulse duration action / limit monitoring / switched off. Switching function can be reversed.

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

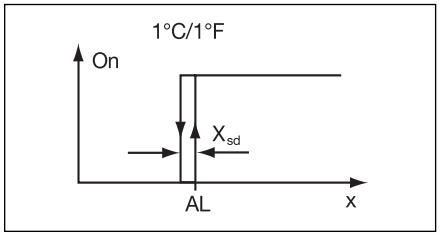
Output 3, logic output: "Hold" / alarm pulse contact / alarm steady contact / max. limit comparator for temperature input / min. limit comparator for temperature input/ no function

Output 4, relay or analogue process value output: "Hold" / alarm pulse contact; alarm steady contact / max. limit comparator for temperature input / min. limit comparator for temperature input / output of the conductivity process value (only for analogue process value output) / output of the temperature process value (only for analogue process value output) / no function

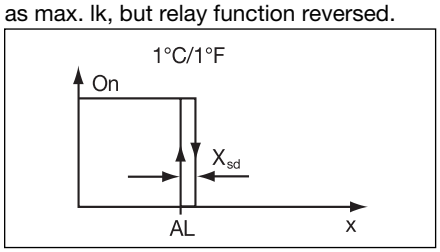
Limit comparator (Limit monitor)

The monitoring of the medium temperature according to the lk function can be assigned to the controller outputs 3 or 4 (depending on the instrument version).
The limit value AL3 can be programmed. The switching differential X_{Sd} is fixed at 1°C or 1°F.

Max. lk function
AL3 determines the switching point.
Function: The status of the output is "ON" when the process value is above the limit value.
Example:
AL3 = 50
Process value rising: relay switches on at 50°C. Process value falling: relay switches off at 49°C.



Min. lk function
as max. lk, but relay function reversed.



Interface

The microprocessor transmitter / controller can be optionally fitted with an RS422 / RS485 interface. It is available for communication with higher-level systems, and for integration into a data network. The transfer protocol used is MOD/Jbus.

Technical data

Inputs

Analogue input 1
Conductivity cells with cell constants 0.01; 0.1; 1.0; 3.0; 10.0 per cm (2-electrode principle).
The cell constant can be adapted within the range 80 — 120%.

Lead compensation for input 1
The influence of long cables on ranges above 20 mS/cm can be compensated by entering the lead resistance in the range from 0.00 to 9.99 Ω.

Analogue input 2
Resistance thermometer Pt100 or Pt1000, in 2-or 3-wire circuit
-50 to +250°C
Measurement indication in °C or °F

Lead compensation for analogue input 2
The lead resistance can be compensated in the software by process value correction.
This is not required when connecting a resistance thermometer in 3-wire circuit.
When connecting a resistance thermometer in 2-wire circuit, lead compensation can be provided by using an external lead compensation resistor.

Functional description of the logic inputs 1 and 2
The two standard logic inputs can be operated through floating contacts (relays), by a PLC or by a switch. The following functions can be assigned as selected:

Key inhibit: The transmitter keys can be inhibited by a PLC or a keyswitch to prevent unauthorised inputs.

Setpoint switching: for convenient process control. When the logic input is not activated, the setpoint pair SPr1 and SPr2 is active. If the logic input (which has been configured accordingly) is operated, then the second setpoint pair becomes active (setpoint switching).

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

"Hold": Using this function, the instrument can be brought to the safe "Hold" condition by a higher-level PLC, for example. It is possible to define the controller response to "Hold" in advance.

Alarm stop: The alarm output via the configured output is reset or prevented; the alarm LED continues to flash as a warning (e.g. K4).
Range expansion (x10): When only a small portion of the measurement range is used, it can be advantageous for the transmitter to react to 0 — 10% of the process value with 0 — 100% of the output signal.

Measurement and control range

0—0.5 µS to 0 — 200 mS, according to the cell constant, see table on page 5/9.

Deviation from characteristic
0.25% max. of range

Ambient temperature error
0.15% max. per 10°C

Temperature indication
-50 to +250°C (can be switched to °F)

Deviation from characteristic
0.25% max. of range

Ambient temperature error
0.1% max. per 10°C

Outputs

2 relay outputs, 1 logic output, 1 analogue output and 1 serial interface are available.

1. **Relay, output 1 / 2 (standard)**
   make contact (n.o., can also be configured as break contact)
   rating: 3A, 250V AC
   on resistive load
   contact life:
   more than $5x10^5$ operations at rated load

2. **Logic output, output 3**
   0/5V R_{load} 250Ω min. (standard)
   0/12V R_{load} 650Ω min. (option)

3. **Process value output, output 4 (option)**
   can be configured freely:
   0(2) — 10V R_{load} 500Ω min. or
   0(4) — 20mA R_{load} 500Ω min.
   isolation from the inputs:
   ΔU 30V AC max. or
   ΔU 50V DC max.

   Deviation from characteristic of the output signal
   0.25% max. ± 50 ppm/°C

4. **Relay, output 4 (option)**
   (only for instruments without process value output)
   changeover contact
   rating: 3A, 250V AC
   on resistive load
   contact life:
   more than $5x10^5$ operations at rated load

5. **RS422 / RS485 interface, output 5 (option)**
   isolated

   Baud rate
   4800 / 9600 baud

   Protocol
   MOD/Jbus

General controller data

A/D converter
resolution better than 15 bit

Controller type
Limit controller and / or pulse duration or pulse frequency controller, freely configurable and selectable

Controller action
Configurable as P, PI, PID or PD

Sampling time
210 msec

Measurement circuit monitoring
input 1: out-of-range
input 2: out-of-range, sensor short-circuit/ break
The outputs move to a defined (configurable) state.

Data backup
EEPROM

Supply
110 — 240V AC +10%/-15%, 48 — 63 Hz
or
20 — 53V AC/DC, 48 — 63/0 Hz

Power consumption
8V A approx.

Electrical connection
through gold-plated faston connectors to DIN 46 244/A;
4.8mm x 0.8mm

Permitted ambient temperature
0 to +50°C

Permitted limit ambient temperature
-10 to +55°C

Permitted storage temperature
-40 to +70°C

Climatic conditions
relative humidity not exceeding 75%, no condensation

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 NAMUR recommendation NE21,
EN 50 081 Part 1, EN 50 082 Part 2

Housing
for flush-panel mounting to DIN 43 700, conductive plastic, base material ABS, with plug-in controller chassis

Operating position
unrestricted

Weight

320g approx.

Optional accessories

Housing without door at front
Type 2 FGE-125-2/125

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

On request, the JUMO dTRANS Lf 01 can be supplied built into a surface-mounting or a site housing.

Both housing types are rugged and provide IP65 protection for the built-in instrument.

The housing with door at the front has been designed for use in extremely harsh environments. During installation and maintenance of the transmitter, the housing and cable glands can be folded back from the wall. A clear door at the front, which can also be folded back, offers additional protection for the instrument. The housing is equipped with 3 Pg9 and Pg7 cable glands. Pg glands that are not used can be sealed tightly with the blind grommets which are included in the delivery.

The more economically priced instrument without door at the front is particularly suitable as an on-site housing, e.g. in factory halls and plants. The housing has 5 Pg9 cable glands. In this case, too, Pg glands which are not in use can be sealed tightly using the blind grommets that are included in the delivery.

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

Cell constants and ranges

Cell constant K[B)]	Measuring range[B)]	Display with configured measurement variable (C111)		Range (rAnG)
		µS	mS	
0.01	0— 0.500 µS/cm	0.500	– –[A)]	1
0.01	0— 2.000 µS/cm	2.000	– –[A)]	2
0.01	0— 10.00 µS/cm	10.00	– –[A)]	3
0.1	0— 5.000 µS/cm	5.000	– –[A)]	4
0.1	0— 20.00 µS/cm	20.00	– –[A)]	5
0.1	0—100.0 µS/cm	100.0	– –[A)]	6
0.1	0— 1.000 mS/cm	1000	1.000	7
0.1	0— 5.000 mS/cm	5000	5.000	8
1.0	0— 50.00 µS/cm	50.00	– –[A)]	9
1.0	0—100.0 µS/cm	100.0	– –[A)]	10
1.0	0— 1.000 mS/cm	1000	1.000	11
1.0	0— 5.000 mS/cm	5000	5.000	12
1.0	0— 20.00 mS/cm	– –[A)]	20.00	13
1.0	0—100.0 mS/cm	– –[A)]	100.0	14
3.0	0— 1.000 mS/cm	1000	1.000	15
3.0	0— 5.000 mS/cm	5000	5.000	16
3.0	0— 30.00 mS/cm	– –[A)]	30.00	17
10.0	0— 30.00 mS/cm	– –[A)]	30.00	18
10.0	0—200.0 mS/cm	– –[A)]	200.0	19

[A)] These settings are not permitted and will result in false indication
[B)] The measuring range and the cell constant are preselected via the "Range" code number

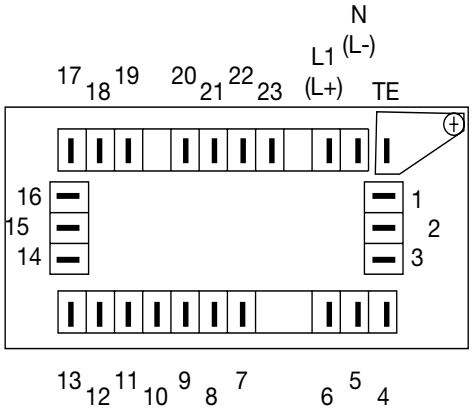
Parameters

Parameter	Display	Value range	factory-set	Notes
Alarm tolerance	AL 1	0.000 — 9999*	0.000*	The alarm is produced only when setpoint + alarm tolerance is exceeded, and after the alarm delay time has elapsed
Alarm delay	AL 2	0 — 6000 sec	300 sec	Delay time until the alarm contact is activated
Limit comparator temperature	AL 3	-50 to 250°C	250°C	Temperature threshold which generates the alarm
Proportional band 1 – Lf	Pb 1	1 — 9999*	20*	Influences the P action of the controller
Proportional band 2 – Lf	Pb 2	1 — 9999*	20*	
Derivative time 1	dt 1	0 — 9999 sec	0 sec	Influences the D action of controller 1. If dt = 0 controller 1 has no D action.
Derivative time 2	dt 2	0 — 9999 sec	0 sec	Influences the D action of controller 2. If dt = 0 controller 2 has no D action.
Reset time 1	rt 1	0 — 9999 sec	0 sec	Influences the I action of controller 1. If rt = 0 controller 1 has no I action.
Reset time 2	rt 2	0 — 9999 sec	0 sec	Influences the I action of controller 2. If rt = 0 controller 2 has no I action.
Minimum ON time 1 (for limit controller or pulse duration controller) or minimum pulse duration 1 (for pulse frequency controller)	tr 1	0.2 — 999.9 sec	0.2 sec	Results from the technical data of the dosing device (solenoid valve, dosing pump)
Minimum ON time 2 (for limit controller or pulse duration controller) or minimum pulse duration 2 (for pulse frequency controller)	tr 2	0.2 — 999.9 sec	0.2 sec	

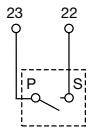
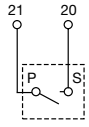
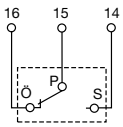
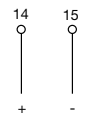
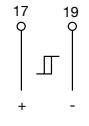
Parameter	Display	Value range	factory-set	Notes
Differential 1 – Lf	HYS1	1 — 9999*	40*	Defines the switch-off point of the control contacts
Differential 2 – Lf	HYS2	1— 9999*	40*	
Pull-in delay 1	tAn1	0.0 — 999.9 sec	1.0 sec	Delay time until the contact is activated
Pull-in delay 2	tAn2	0.0 — 999.9 sec	1.0 sec	
Drop-out delay 1	tAb1	0.2 — 999.9 sec	0.2 sec	Delay time until the contact returns to basic status
Drop-out delay 2	tAb2	0.2 — 999.9 sec	0.2 sec	
Pulse frequency 1	Fr 1	0—150 pulses/min	100 pulses/min	Maximum frequency of the pulses which operate a dosing pump, for example.
Pulse frequency 2	Fr 2	0—150 pulses/min	100 pulses/min	
Pulse period 1	Cy 1	2.0 — 999.9 sec	20.0 sec	Period in which pulse modulation occurs
Pulse period 2	Cy 2	2.0 — 999.9 sec	20.0 sec	
Output limit output 1	Y 1	0 — 100%	100%	Maximum output of a pulse duration / frequency controller
Output limit output 2	Y 2	0 — 100%	100%	

* Decimal place and unit correspond to the selected measurement range

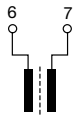
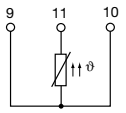
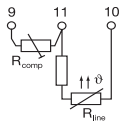
Connection diagram

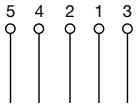
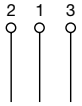
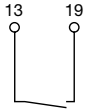
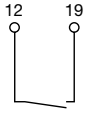
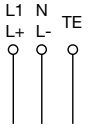


Rear view with faston connectors

Outputs		Terminals	Diagram
Relay 1*	1	23 common 22 n.o. (make)	
Relay 2*	2	21 common 20 n.o. (make)	
Relay 3* **or** analogue process value output (electrically isolated)	4	16 n.c. (break) 15 common 14 n.o. (make)	
		15 – 14 +	
Logic output 1	3	19 – 17 +	

* contact protection circuit: Varistor S14K300

Inputs		Terminals	Diagram
Conductivity cell		6 Outer electrode with coaxial cells 7 Inner electrode with coaxial cells	
Resistance thermometer in 3-wire circuit		9 10 11	
Resistance thermometer in 2-wire circuit		9 10 11	

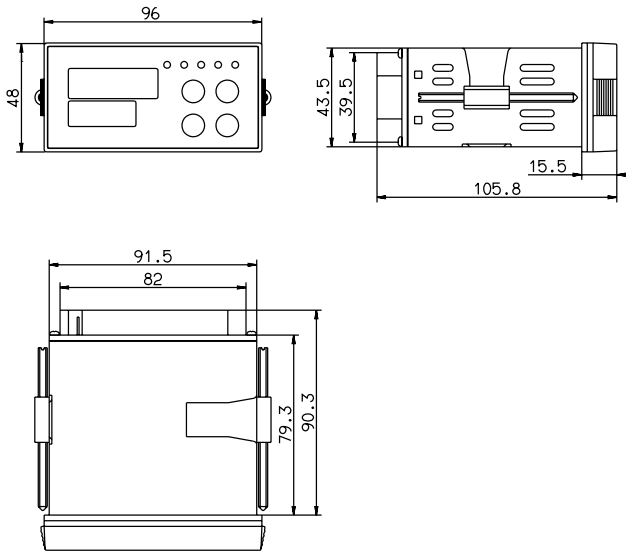
Inputs		Terminals		Diagram
RS422 serial interface (option)	RxD	5 RxD + Receive data 4 RxD –		
	TxD	2 TxD + Send data 1 TxD –		
	GND	3 GND		
RS485 serial interface (option)	RxD/ TxD	2 RxD/TxD + Receive data 1 TxD/TxD –		
	GND	3 GND		
Logic input 1		13 19		
Logic input 2		12 19		
Supply as on label	AC/ DC	AC: L1 line N neutral TE technical earth	DC: L + L –	

Connecting a conductivity cell

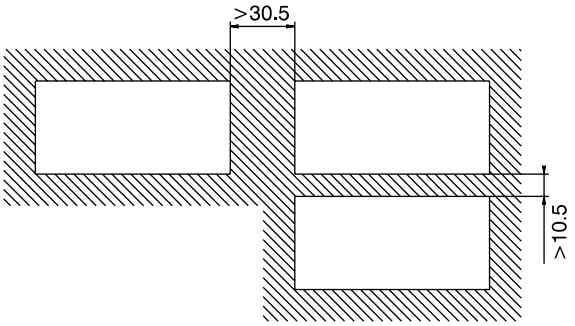
	Conductivity cell (JUMO types)		dTRANS Lf 01
	connector	attached cable	
Outer electrode	⏚	white	6
Inner electrode	2	brown	7
Temperature compensation	1 + 3	yellow + green	11 + 10
Link			10 + 9

Dimensions

Type 202540 / …

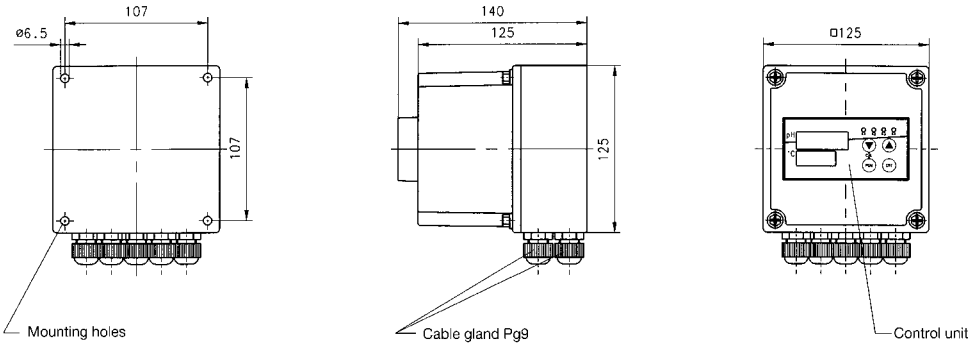


Panel cut-out to DIN 43 700
Edge-to-edge mounting (minimum dimensions)

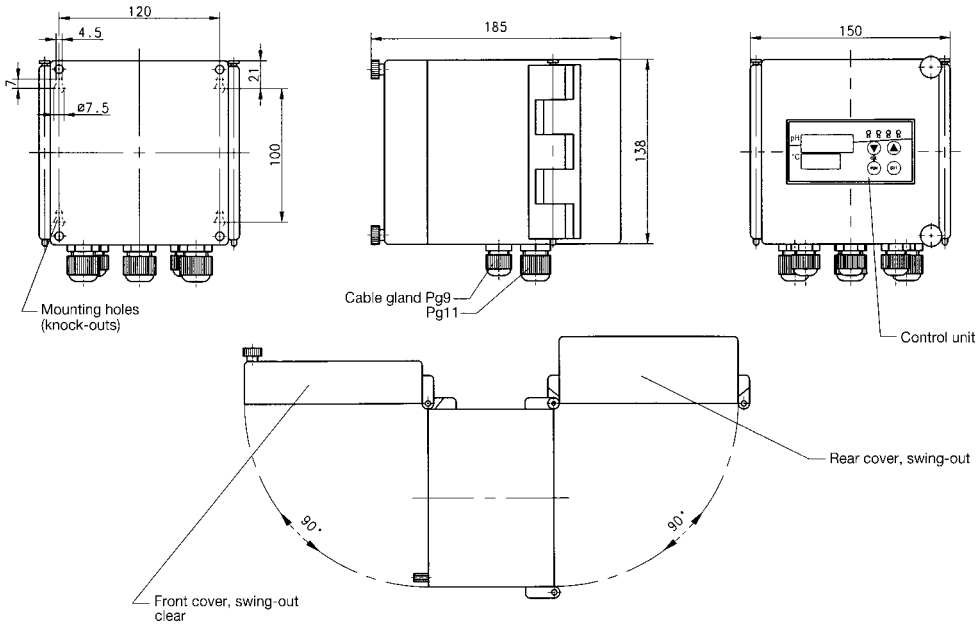


Optional accessories

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



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



Type designation

202540/ [. .] – [. . .] – [. .] – [. .] / [. . .] , [...]

						Basic type
202540						JUMO dTRANS Lf 01, microprocessor transmitter / controller for conductivity
I						**Basic type additions**
I	00					controller off*
I	10					limit controller* (output 1/2)
I	21					pulse duration output with P controller structure* (output 1/2)
I	31					pulse frequency output with P controller structure* (output 1/2)
I	I					**Outputs**
I	I	000				no output
I	I	310				relay, changeover contact (output 4)[B]
I	I	888				process value output, freely configurable (output 4)[B]
I	I	I				**Supply***
I	I	I	22			20—53 V AC/DC ±0%, 48—63/0 Hz
I	I	I	23			110—240 V AC +10%/-15%, 48—63 Hz
I	I	I	I			**Interface**
I	I	I	I	00		no serial interface
I	I	I	I	54		RS422/485 serial interface (output 5)
I	I	I	I	I		**Extra Codes[A]**
I	I	I	I	I	000	no extra Codes
I	I	I	I	I	015	logic output 0/12 V DC, instead of standard 0/5 V DC (output 3)
I	I	I	I	I	I	
202540	/	–	–	–	/	**Ordering example**

*Generally,

on **all** controllers of the 202540 series the user can freely select the following configurations:

- ❏ controller off
- ❏ limit controller
- ❏ pulse duration controller with P, PI, PD, PID action
- ❏ pulse frequency controller with P, PI, PD, PID action

The possibilities given in the type designation are only factory **default settings**!

[A] Extra Codes can be combined – listed in sequence and separated by a comma

[B] Output “310” not possible in combination with output "888"!

Available from stock

Type	Sales No.
202540/00-888-23-00/000	20/00358837
202540/10-888-23-00/000	20/00358838

Accessories

Designation	Type	Sales No.
Surface-mounting housing, no door at front	Type 2 FGE-125-2/125	20/00358823
Surface-mounting housing with door at front	Type 2 FGE-150-2/185	20/00358827