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JUMO dTRANS Lf 01
µP Transmitter / Controller for electrolytic conductivity

Type 202540

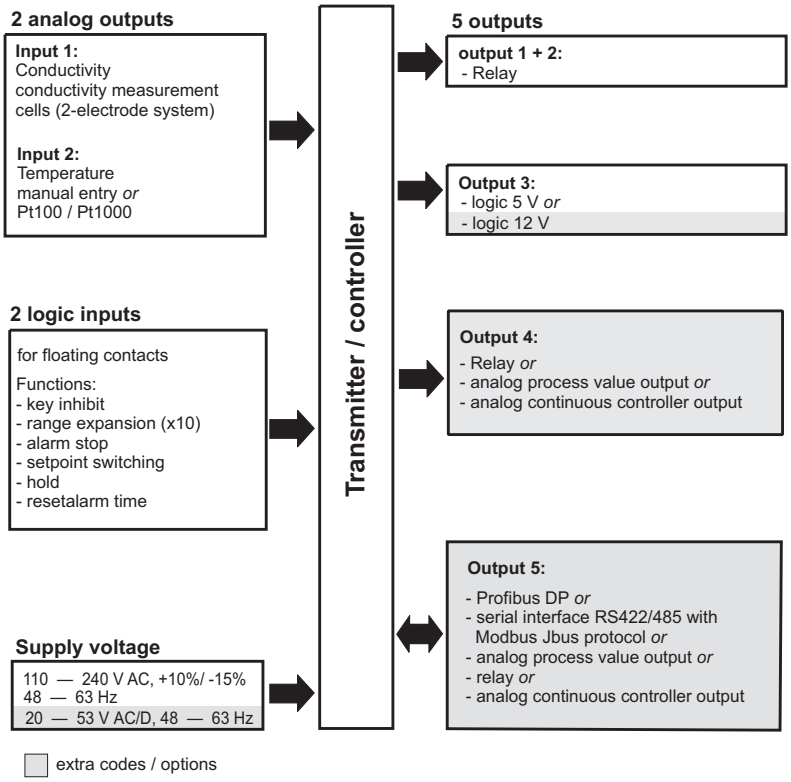
Type 202540 / …

Type 202540 / …/640

Brief description

This instrument measures and controls the conductivity of aqueous solutions.
The transmitter has two analog and two logic inputs. The first analog input is suitable for the connection of conductivity electrodes with cell constants of 0.01, 0.1, 1.0, 3.0 or 10.0 [1/cm]. 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 conductivity 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 entry level 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).

Block structure



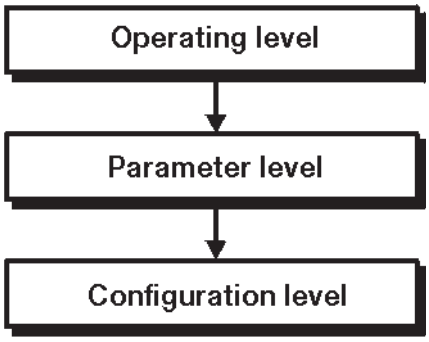
Key features

- Panel-mounting instrument, just 96 x 48 x 110 mm
- Conductivity display (in µS/cm or mS/cm) and temperature
- 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 electrically isolated analog outputs 0(4) — 20 mA / 0(2) — 10 V freely selectable and scalable for conductivity or temperature (option)
- 2 logic inputs
- Monitoring the temperature of the medium is possible
- Calibration procedure for the relative cell constant and temperature coefficient of solution being measured
- OPTION: Profibus-DP or serial interface RS485/422 with Modbus/Jbus protocol
- Measurement ranges from 0 — 0.5 µS to 0 — 200 mS **in one instrument**

Approvals

Operation

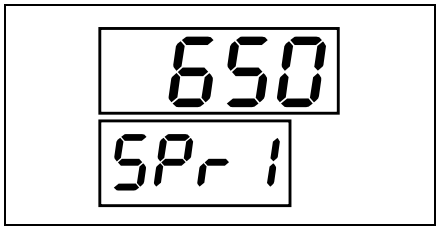
For easy programming and operation, the controller parameter and configuration data are assigned to various levels.



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.

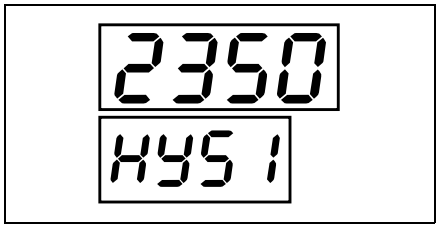
Operating level

The lower display, for example, shows the symbol, the upper display shows the corresponding value. Setpoints SPr1 and SPr2 can be altered by using the membrane keys.



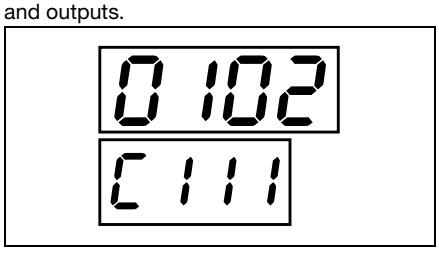
Parameter level

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).

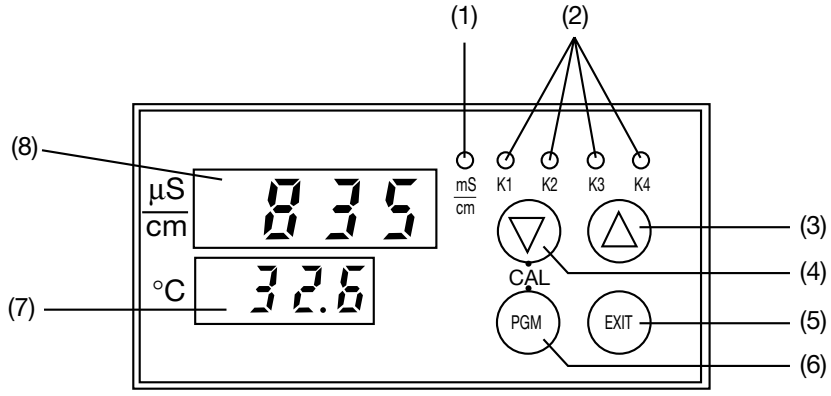


Configuration level

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



Indications / controls



(1) LED display in mS/cm	(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": Initiates calibration + (relative cell constant K_{rel} (6) or temperature coefficient α)
(5) EXIT key to leave the levels	(3) + Initiate manual operation or hold (5)

Calibration options

❑ **Calibration of the cell constant**

Subject to manufacturing tolerances, the cell constant of the conductivity measuring cell may deviate slightly from its nominal (printed) value. In addition, the cell constant may change during operation (due to deposits or wear). This results in a change of the output signal from the cell. The dTRANS Lf 01 offers the user the possibility of compensating any deviation from the nominal value of the cell constant through **manual entry** (range 80 — 120%) or **automatic calibration** of the relative cell constant K_{rel}.

❑ **Calibration of the temperature coefficient α**

The conductivity of almost all solutions is temperature-dependent. To ensure correct measurement, it is therefore necessary to know both the temperature and temperature coefficient α [% per °C] of the measuring solution. The temperature can either be measured automatically, with a Pt100 or Pt1000 temperature probe, or set manually by the user.
When using a dTRANS Lf 01, the temperature coefficient can be determined automatically or entered manually, within the range 0 — 5.5 % per °C.

Additional functions of the JUMO dTRANS Lf 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:

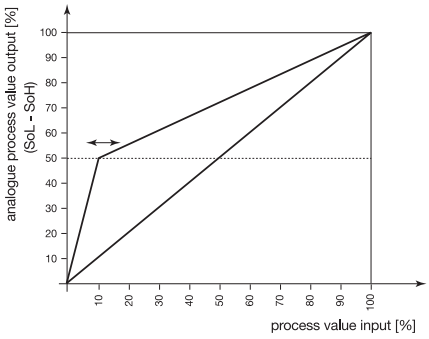
-4%, 0%, 100% or 110% freely selectable

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

The instrument can be set up so that, on exceeding 30 mS/cm, the output signal is either held at 20 mA (100%) or will jump to 22 mA (110%). The 22 mA value can then be recognized as "irregular" by a connected PLC.

❑ **Bilinear output**

This function divides the signal for the analog 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 shifted along the dotted 50% line. The 50% factory setting produces a straight-line characteristic.



The bilinear characteristic is used when the "normal" measurement range is likely to be frequently exceeded.

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

❑ **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 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 measuring cell, fault search, 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 / MIN limit comparator for temperature / 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 / MIN comparator for temperature input / output of conductivity 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 for temperature input / MIN limit comparator for temperature input / no function.

Output 5, relay or analog process value output: "Hold" / alarm pulse contact; alarm steady contact / MAX / MIN limit comparator / output of conductivity 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 on going above, or going below a limit), pull-in and/or drop-out delay, and a hysteresis can all be defined.

Interface

The microprocessor/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
Electrolytic conductivity cell, with cell constants: 0.01, 0.1, 1.0, 3.0, 10.0 [1/cm] (2-electrode principle).
The cell constants can be adjusted over a range 80 — 120%.

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

Analog input 2
Resistance thermometer Pt100 or Pt 1000, in 2- or 3-wire circuit
-50 to +250°C
Measurement display in °C or °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 SPr1 and SPr2 is active. If the appropriately configured logic input is operated, then the second setpoint pair is activated (setpoint switching).

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 for HOLD, but when the logic input is open.

Alarm stop: The alarm generation via the configured output is reset or prevented, but 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

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

Deviation from characteristic
≤ 1.0% of measurement range

Ambient temperature error
≤ 0.25% per 10 °C

Reference temperature
25°C

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

Deviation from characteristic
≤ 0.25% of measurement range

Ambient temperature error
≤ 0.1% per 10 °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:
   > $5x10^5$ 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:
   $\Delta U \leq 30$V AC or
   $\Delta U \leq 50$V DC.

   Deviation from characteristic of the output signal
   ≤ 0.25% ± 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:
   > $5x10^5$ 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 and / or pulse width or pulse frequency controller, modulating controller.
Freely configurable and mixable

K3 / K5:
continuous controller

Control action
configurable as P, PI, PID or PD.

Sampling time
210 msec

Measuring 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

Instrument for switchgear cabinet (basic version)
via gold-plated faston connectors to DIN 46 244/A; 4.8mm x 0.8mm

Wall-mounting housing (extra code /640)
via screw terminals
(wire cross-section up to 2.5 mm^2)
6 cable glands (1 x M16, 5 x M20

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 ≤ 75%, no condensation

Enclosure protection
to EN 60 529

Instrument for switchgear cabinet
front IP65 / rear IP20

Wall-mounting instrument
IP67

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
Instrument for switchgear cabinet (basic version)
panel-mounting housing in conductive plastic to DIN 43 700, base material ABS
with plug-in controller module.

Wall-mounting housing (extra code /640)
base material PC

Operating position
unrestricted

Weight
Instrument for switchgear cabinet (basic version)
approx. 320g

Wall-mounting housing (extra code /640)
approx. 1400 g

Option

Wall-mounting housing
extra code /640
On request, the JUMO dTRANS Lf 01 can be supplied built into a surface-mounting housing. The housing is suitable for wall-mounting or for mounting on a 35 x 7.5 mm DIN rail to EN 50 022.

The housing is sturdy and provides IP67 protection for the built-in instrument and is fitted with six cable glands. Unused cable glands can be tightly sealed using the blind grommets that are included in the delivery.
The electrical connection is made via screw terminals (wire cross-section up to 2.5 mm^2).

Standard accessories

- 2 mounting brackets (not with extra code / 640 (wall-mounting housing))
- 1 seal for panel-mounting (not with extra code /640 (wall-mounting housing))
- sundry items for wall-mounting (only with extra code /640 (wall-mounting housing))
- sundry items for DIN rail mounting (only with extra code /640 (wall-mounting housing))
- 1 Operating Manual B 20.2540.0.1

Optional accessory

Interface Description B 20.2530.2

Cell constants and measurement ranges

Cell constant K [B]	Meas. range [B]	Display with configured measurement (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 permissible – they would cause an incorrect display
[B] The selection of the measurement range and cell constant is made through the code number “Range”

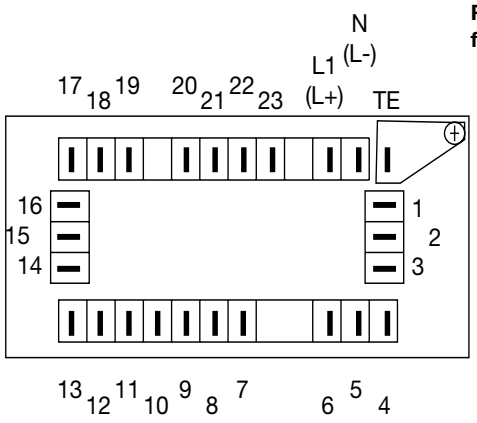
Parameters

Parameter	Display	Value range	Comment
Alarm tolerance	AL1	0.000 — 9999*	The alarm is only generated when the level (setpoint + alarm tolerance) has been passed, and the alarm delay time has elapsed
Alarm delay	AL2	0 — 6000 sec	Delay time before the alarm contact is activated
Proportional band 1	Pb1	1 — 9999*	Influences the P action of the controller
Proportional band 2	Pb2		
Derivative time 1	dt1	0 — 9999 sec	Influences the D action of the controller If dt = 0, the controller has no D action.
Derivative time 2	dt2		
Reset time 1	rt1		Influences the I action of the controller If rt = 0, the controller has no I action.
Reset time 2	rt2		
Minimum ON time 1 (for limit controller or pulse width controller) or minimum pulse width 1 (for pulse frequency controller)	tr1	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)	tr2		
Switching differential 1	HYS1	1 — 9999*	Defines the switch-off point for the control contacts
Switching differential 2	HYS2		
Switching differential 3	HYS3		
Switching differential 4	HYS4		
Switching differential 5	HYS5		

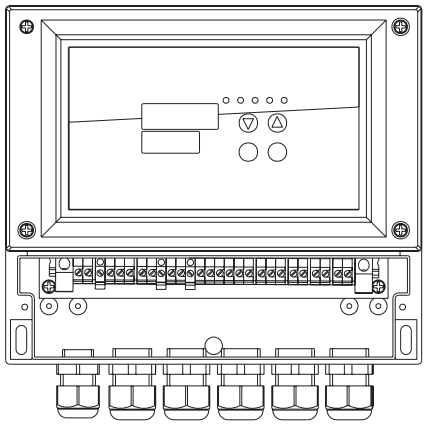
Parameter	Display	Value range	Comment
Pull-in delay 1	Ond1	0.0 — 999.9 sec	Delay time before the contact is activated
Pull-in delay 2	Ond2		
Pull-in delay 3	Ond3		
Pull-in delay 4	Ond4		
Pull-in delay 5	Ond5		
Drop-out delay 1	Ofd1	0.2 — 999.9 sec	Delay time until the contact moves back to the initial position
Drop-out delay 2	Ofd2		
Drop-out delay 3	Ofd3		
Drop-out delay 4	Ofd4		
Drop-out delay 5	Ofd5		
Pulse frequency 1	Fr1	0 — 150 pulses/min	Maximum frequency of pulses (operating a dosing pump, for instance)
Pulse frequency 2	Fr2		
Pulse period 1	Cy1	2.0 — 999.9 sec	The period in which a pulse is modulated
Pulse period 2	Cy2		
Output level limit, output 1	Y1	0 — 100%	The maximum output level for a pulse width / pulse frequency controller
Output level limit, output 2	Y2		
Actuator time	tt	15 — 3000 sec	For modulating controller

* Decimal point and dimensional unit corresponding to chosen range

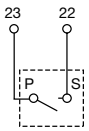
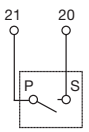
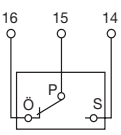
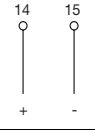
Connection diagram

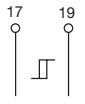
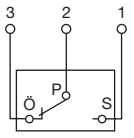
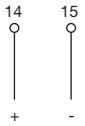


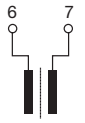
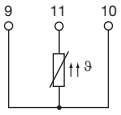
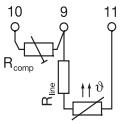
Rear view with faston connectors

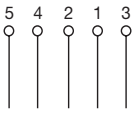
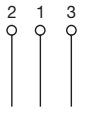
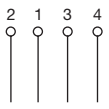
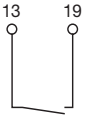
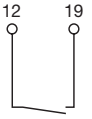
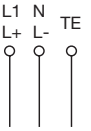


Wall-mounting housing (extra code /640) with terminal strip

Outputs	K	Connections	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 **or** analog process value output (electrically isolated)	3	16 break 15 common 14 make	
		15 – 14 +	

Logic output 1 (K4) Status indication LED K4	4	19 – 17 +	
Relay 4 (K5) No status indication **or** analog process value output (electrically isolated)	5	3 break 2 common 1 make	
		2 – 1 +	

Meas. inputs		**Connections**	**Symbol**
Conductivity cell		6 Outer electrode, on coaxial cells 7 Inner electrode, on coaxial cells	
Resistance thermometer in 3-wire circuit		9 10 11	
Resistance thermometer in 2-wire circuit		9 10 11	

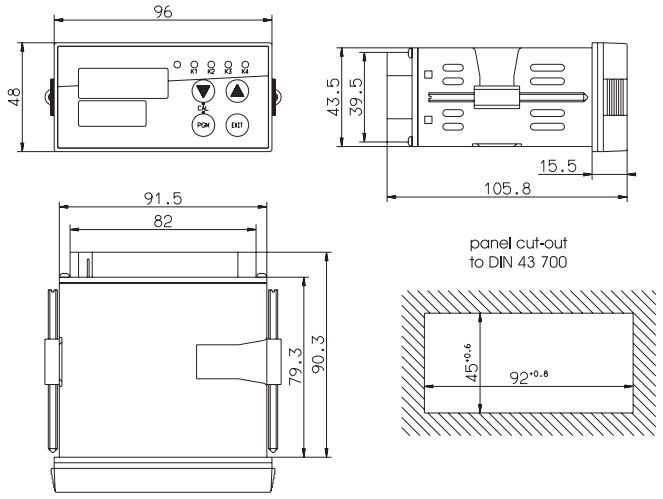
Meas. inputs		**Connections**			**Symbol**
Serial interface RS422 (option)	RxD	5 4	RxD + RxD –	Receive data	
	TxD	2 1	TxD + TxD –	Transmit data	
	GND	3	GND		
Serial interface RS485 (option)	+ -	2 1	TxD/RxD + TxD/RxD –	Receive data / transmit data	
	GND	3	GND		
Serial interface **Profibus-DP** (option)	VP	4	supply voltage positive, (P5V)		
	RxD/TxD-P	2	receive / transmit data positive, B conductor		
	RxD/TxD-N	1	receive / transmit data negative, A conductor		
	GND	3	GND		
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 –	

Connection for conductivity cell

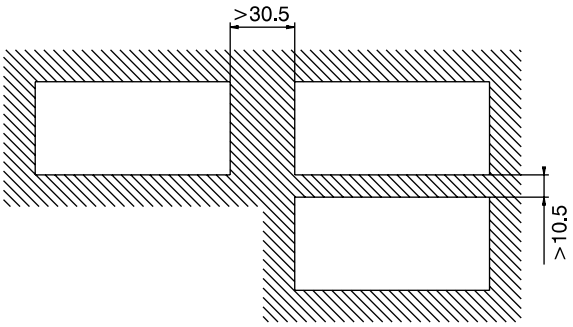
	Conductivity cell (JUMO types)		dTRANS Lf 01
	Cap	Fixed cable	
Outer electrode	⏚	white	6
Inner electrode	2	brown	7
Temperature compensation	1 3	yellow green	11 10
Link			10 + 9

Dimensions

Type 202540 / …

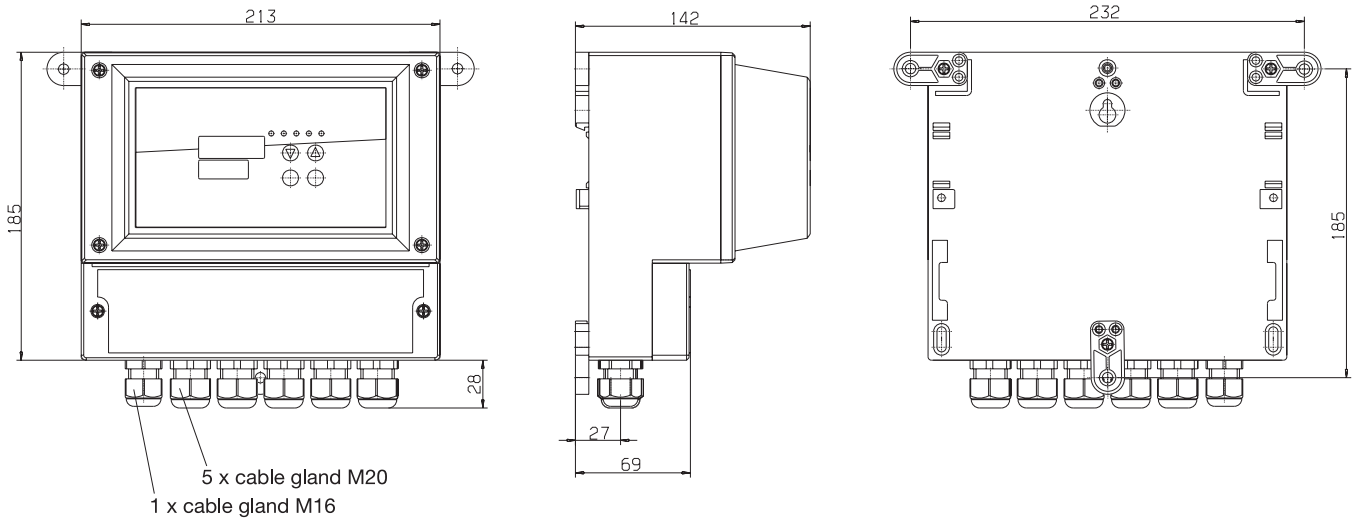


Panel cut-out to DIN 43 700
close mounting (minimum dimensions)



Option

Surface-mounting housing, extra code /640, IP67 protection



Type designation

(1) Basic type

202540 JUMO dTRANS Lf 01,
microprocessor transmitter/controller for conductivity

(2) **Basic type extensions**

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 contact[1]
888 process value output, freely configurable[1]

(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 RS422/485[1]
64 serial interface Profibus-DP[1]

(7) Extra codes

000 no extra codes
015 logic output 0/12 V DC,
instead of standard 0/5 V DC
640 surface-mounting housing for mounting on wall or DIN rail, IP67 protection

	(1)		(2)		(3)		(4)[1]		(5)		(6)[1]		(7)
Order code	202540	/	10	-		,		-		-		-	
Order example	202540	/	10	-	888	,	000	-	23	-	00	-	000

*Generally

on **all** controllers of the 202540 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

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

Stock items

Type	Sales No.
202540/10-888,000-23-00/000	20/00377231
202540/10-888,000-23-00/640	20/00431436

Non stock items

Type	Sales No.
202540/10-888,000-22-00/000	20/00401180

Optional accessories 1 (switchgear cabinet instrument)

Designation	Sales No.
Bracket for C-rail	70/00375749
Blind cover 96 x 48 mm	70/00069680

Optional accessories 2 (wall-mounting instrument)

Designation	Sales No.
Pole clamp, 60 mm dia. (clamping area: 50 — 70 mm dia.)	20/00437485
Pole clamp, 120 mm dia. (clamping area: 100 — 120 mm dia.)	20/00437486