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JUMO dTRON 04.1
JUMO dTRON 08.1
Compact microprocessor controllers

for stock items see price list

Housing for flush-panel mounting to DIN 43 700

Brief description

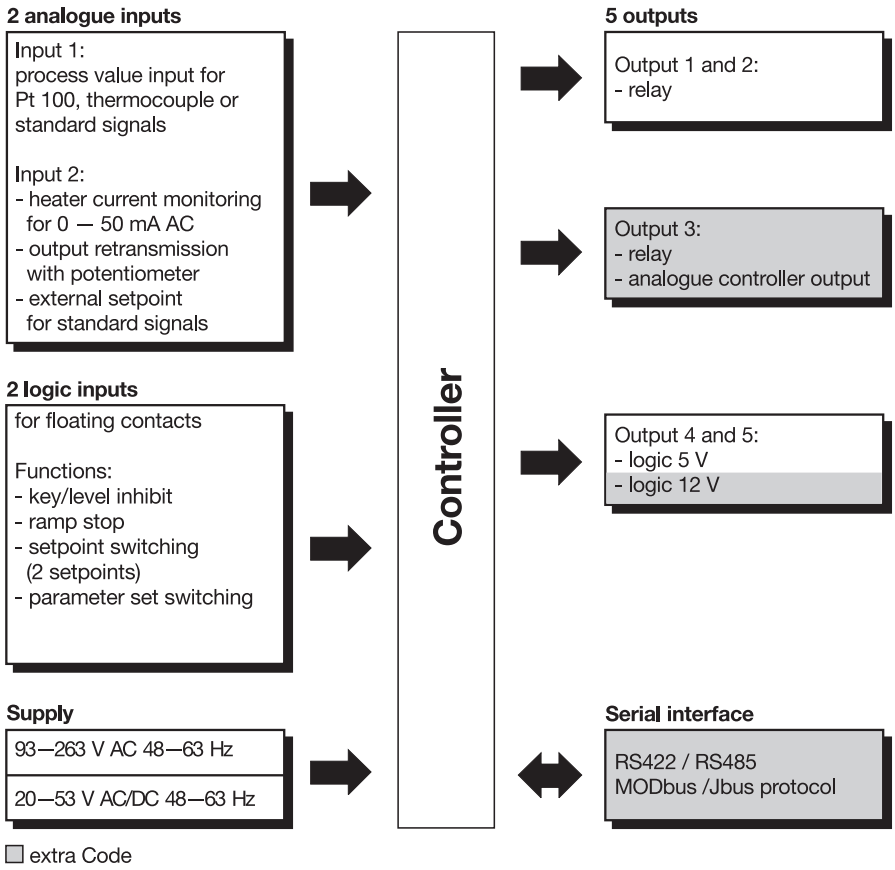
The compact microprocessor controllers JUMO dTRON 04.1 and 08.1, bezel sizes 96mm x 96mm, 96mm x 48mm or 48mm x 96mm, with plug-in controller chassis are particularly suitable for use with industrial furnaces, laboratory apparatus, plastics and packaging machinery, mechanical equipment etc.
The controllers incorporate two 4-digit 7-segment displays for process value (red) and setpoint (green). During programming the displays serve for comments on the inputs. The controllers can be programmed as single or double setpoint controller, modulating or proportional controller with the usual controller structures.
The controllers also have two limit comparators which can be assigned to the input signals. There is a choice of eight different limit comparator functions.
A ramp function with adjustable gradient, a start-up ramp for hot channel method (not with extra Code 050) and self-optimisation are provided as standard.
An interface (RS422 / RS485), available as option, serves for integration into a data network. MODbus/Jbus protocol is being used.
The electrical connections are made through faston tabs 4.8mm x 0.8mm to DIN 46 244 A.

Type 703031 / …

Type 703032 / …

Type 703030 / …

Block structure



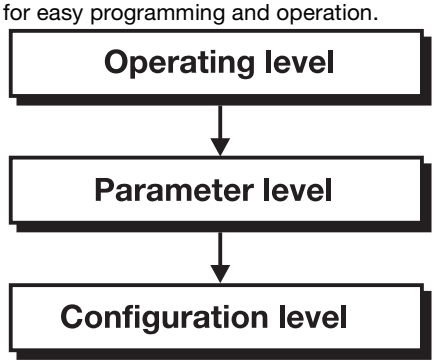
☐ extra Code

Features

- structured operating and programming scheme
- new self-optimisation
- fuzzy module
- ramp function
- start-up ramp for hot channel method (not with extra Code 050)
- output indication on modulating controller
- heater current monitoring
- external setpoint input
- digital input filter with programmable time constant
- serial interface
- 2 limit comparators
- 5 outputs with freely assigned functions
- parameter set switching
- UL approval

Operation

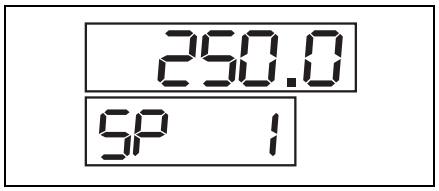
The controller parameters and configuration data are arranged on separate levels for easy programming and operation.



Membrane keys pemit simple and user-friendly operation.
The two LED displays indicate the parameter symbols and the corresponding values and produce a clear operating sequence.

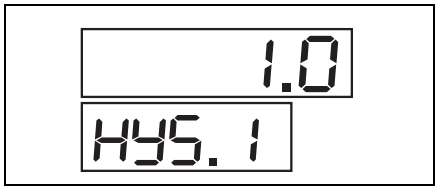
Operating level

The lower display shows e.g. the symbol, the upper display the corresponding value. The setpoints SP1 and SP2 can be altered from the membrane keys.
The controller output can also be indicated.



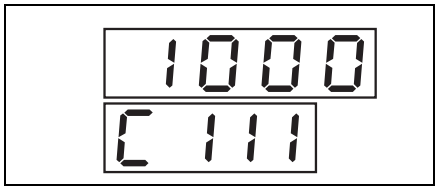
Parameter level

At this level the controller is adapted to the process. The parameters are shown with symbol and value. Only those parameters are indicated which are appropriate to the controller configuration (configuration level).

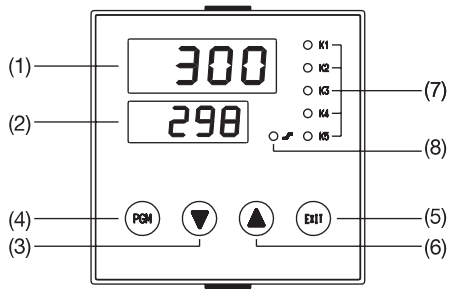


Configuration level

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



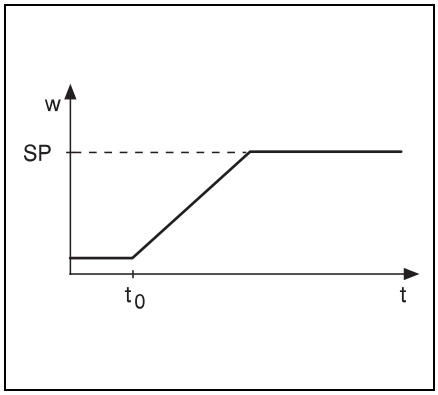
Indications/controls



(1)	4-digit process value indication (red) 13mm or 10mm	(5)	EXIT key to exit from levels
(2)	4-digit setpoint/heater current indication (green), 10mm or 8mm	(6)	increment key to alter parameters
(3)	decrement key to alter parameters	(7)	status indication (yellow) for outputs 1 to 5
(4)	PGM key to select parameters	(8)	LED for ramp function (green) (lights up when configured)

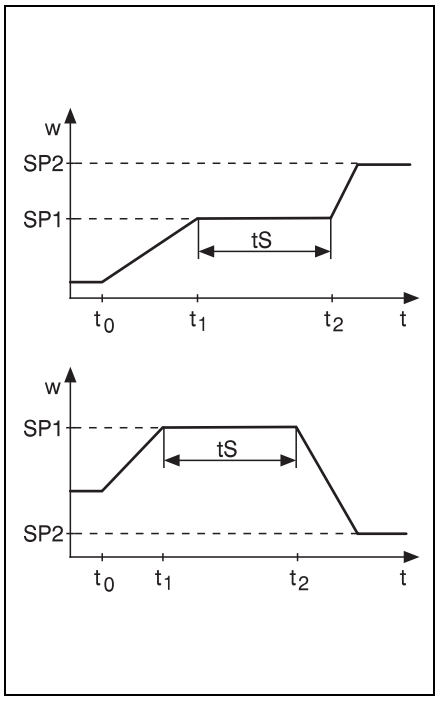
Ramp function

A rising or falling ramp is possible (increasing or decreasing setpoint). The setpoint SP altered at time t_0 represents the final value of the ramp. The ramp begins with the setpoint at time t_0. The slope of the ramp can be programmed; the sign of the ramp is given by the relationship of SP to the setpoint at time t_0. When the power is switched on, the ramp function starts with the current process value.



Start-up ramp for hot channel method

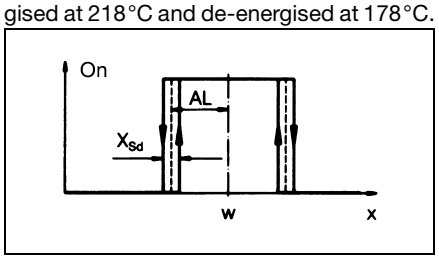
The ramp function with hold phase is used e.g. for the safe operation of ceramic cartridges. During the start-up phase (t_0 — t_2) any moisture is allowed to escape from the hygroscopic heating cartridges, thus preventing damage.
Two setpoints (SP1 and SP2) are programmed. At time t_0 the process value is accepted as the ramp setpoint (= current setpoint as calculated and given by the controller). During the period from t_0 to t_1 the setpoint SP1 is approached at the programmed ramp slope rASd. D uring this period there is a linear setpoint increase. This is followed by a programmed hold phase tS (t_1 — t_2), and then the setpoint SP2 is approached at a second slope. Different controller parameters can be set for the first phase and for the subsequent period.
Another application is temperature control in the food industry.
(not with Code 050)



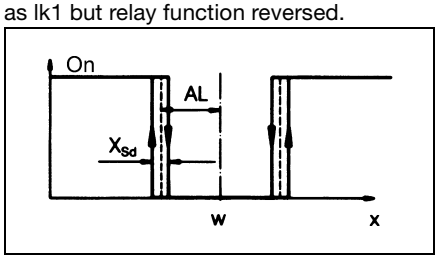
Limit comparators (Limit monitors)

The controller incorporates two limit comparators, each of which can be assigned one of the functions below.
The signals at the analogue inputs 1 and 2 can be monitored. The limit settings AL1 and AL 2 as well as the switching differential X_{Sd} can be programmed.

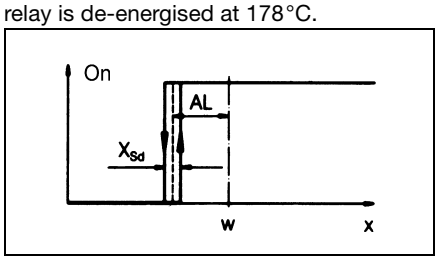
Function lk1
Window function: relay is energised when the process value is within a certain range about the setpoint.
Example:
W = 200 °C, AL = 20, X_{Sd} = 4
Process value increasing: relay is energised at 182 °C and de-energised at 222 °C.
Process value decreasing: relay is energised at 218 °C and de-energised at 178 °C.



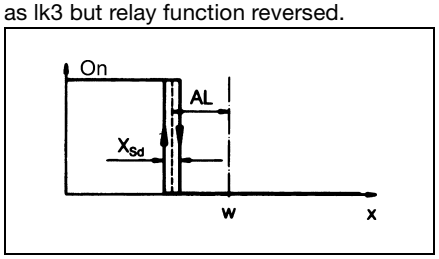
Function lk2
as lk1 but relay function reversed.



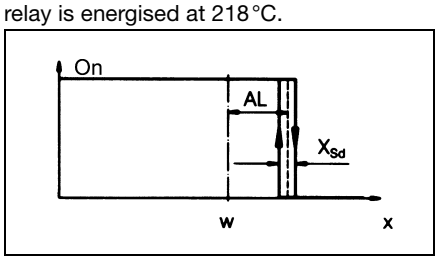
Function lk3
low alarm
function: relay is de-energised when process value is below (setpoint – limit value).
Example:
W = 200 °C, AL = 20, X_{Sd} = 4
Process value increasing:
relay is energised at 182 °C.
Process value decreasing:
relay is de-energised at 178 °C.



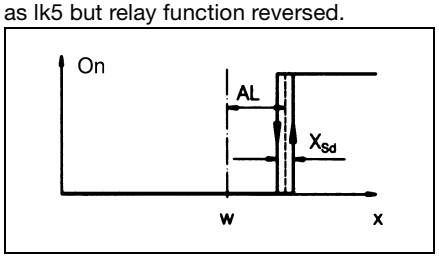
Function lk4
as lk3 but relay function reversed.



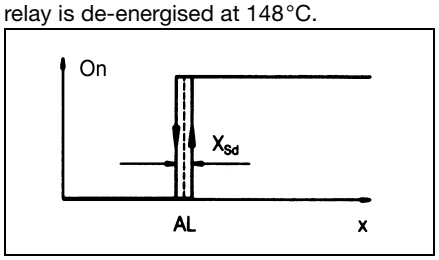
Function lk5
high alarm
function: relay is de-energised when the process value is above (setpoint + limit value).
Example: W = 200 °C, AL = 20, X_{Sd} = 4
Process value increasing:
relay is de-energised at 222 °C.
Process value decreasing:
relay is energised at 218 °C.



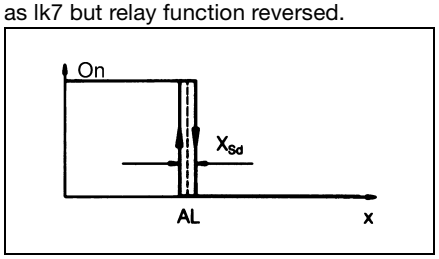
Function lk6
as lk5 but relay function reversed.



Function lk7
Switching point is independent of controller setpoint and depends only on AL.
Function: relay is energised when process value is above limit value.
Example: AL = 150, X_{Sd} = 4
Process value increasing:
relay is energised at 152 °C.
Process value decreasing:
relay is de-energised at 148 °C.



Function lk8
as lk7 but relay function reversed.



Fuzzy logic

Activating the fuzzy logic module improves both control and disturbance response.

Up+Down operation

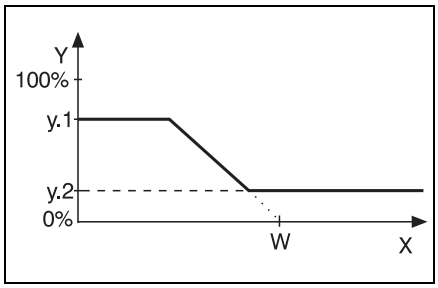
(Extra Code 050)
Continuous variation of setpoints and parameters using two keys.

Self-optimisation

The standard self-optimisation facility produces automatic adjustment of the controller to the process. This permits optimum use of the controller without any control engineering know-how.
Self-optimisation determines the parameters for PI and PID controllers (proportional band, reset time, derivative time) as well as the cycle time and time constant of the digital input filter.

Output limitation

The maximum and minimum value of the controller output can be influenced by the output limitation facility.
Example:
proportional P controller with falling characteristic



Y1 = maximum output
Y2 = minimum output
In the case of switching outputs the controller output is limited through the pulse-interval ratio of the switching cycle.

Parameter set switching

A logic input can be used to switch between two parameter sets (see parameter table, page 5).

Heater current indication and monitoring

The heater current can be measured using a current transformer. The measurement (scaling: 0 — 50.0 A) is indicated on the lower 7-segment display (setpoint display) and identified by the prefix H.
The heater current can be monitored using a limit comparator.

Interface

The controllers can be fitted as option with an RS422 / RS485 interface. It serves for communication with high-level systems and for integration into a data network. The communication protocol used is MODbus/ Jbus.

Technical data

Input 1

The controller can be reconfigured in software between Pt100, thermocouple, 0 — 20mA and 4 — 20mA.
Voltage inputs 0(2) — 10V require a hardware alteration at the factory.

Controller for use with resistance thermometers

Input
Pt100 in 2-wire or 3-wire circuit

Control range
-199.9 +850.0°C
-200 +850 °C

Lead compensation
not required with 3-wire circuit. When used with a resistance thermometer in 2-wire circuit, lead compensation can be provided by an external compensation resistor ($R_{comp} = R_{line}$). In addition, the lead resistance can be compensated in software through process value correction.

Controller for use with thermocouples

Control ranges

Fe-Con L	-200 + 900°C
Fe-Con J	-200 +1200°C
NiCr-Ni K	-200 +1372°C
Cu-Con U	-200 + 600°C
NiCrSi-Nisi N	-100 +1300°C
Pt10Rh-Pt S	0 +1768°C
Pt13Rh-Pt R	0 +1768°C
Pt30Rh-Pt6Rh B	0 +1820°C

Temperatur compensation
internal

Controller for use with linearised transducers with standard signal

Input

Signals	Internal resistance R_i voltage drop ΔUe
0(4) — 20mA	ΔUe less than 1V
0(2) — 10V	R_i = 500kΩ

Display
with or without decimal place

Input 2

The input can be switched in software between 0(4) — 20mA (external setpoint) and 0 — 50mA AC (heater current monitoring).
Voltage inputs 0(2) — 10V and potentiometer input require hardware changes at the factory.

Controller for use with linearised transducers with standard signal

Input

Signals	Internal resistance R_i voltage drop ΔUe
0(4) — 20mA	ΔUe less than 1V
0(2) — 10V	R_i = 500kΩ

Display
with or without one decimal place

Controller for use with potentiometers

R = 100Ω to 10kΩ

Controller for use with current transformer (heater current monitoring)

Connection through current transformer (transformer ratio 1:1000)
0 — 50mA AC (sinusoidal)
Scaling: 0 — 50.0A

Outputs

2 relay outputs, 2 logic outputs, and 1 optocoupler relay or analogue output are available.

1. **Relay outputs K1 / K2**
   n.o. (make) contact
   Rating: 3A 250V AC on resistive load
   Contact life: more than 5 • 10^5 operations at rated load
2. **Relay output K3**
   changeover contact
   Rating: 3A 250V AC on resistive load
   Contact life: more than 5 • 10^5 operations at rated load
3. **Analogue controller output K3**
   0(2) — 10V R_{load} 500Ω min.
   0(4) — 20mA R_{load} 500Ω max.
   isolation from the inputs:
   ΔU = 30V AC max.
   ΔU = 50V DC max.
4. **Logic outputs K4 / K5**
   0/5V R_{load} = 250Ω min.
   0/12V R_{load} = 650Ω min. (option)

General controller data

Measurement accuracy	Ambient temperature error
when used with resistance thermometers	
0.05% or better	25ppm max. per °C
when used with thermocouples within the working range	
0.25% or better*	100ppm max. per °C
when used with linearised transducers with standard signal	
0.1% or better	100ppm max. per °C

These values include the linearisation tolerances.
* on Pt30Rh-Pt6Rh B within the range 300 — 1820°C

A/D converter
resolution better than 15 bit

Controller type
can be configured as single or double setpoint controller, modulating or proportional controller

Sampling time
210msec

Measurement circuit monitoring

Transducer	Sensor break	Short-circuit
resistance thermometer	X	X
thermocouples	X	–
0 — 10V	–	–
2 — 10V	X	X
0 — 20mA	–	–
4 — 20mA	X	X

X = recognised – = not recognised

The outputs move to a defined status.

Data back-up
EEPROM

Supply
93 — 263V AC 48 — 63Hz or
20 — 53V AC/DC 48 — 63Hz

Power rating
8V A approx.

Electrical connection
through faston tabs to DIN 46 244/A, 4.8mm x 0.8mm

Permitted ambient temperature range
0 to +50°C

Permitted storage temperature range
-40 to +70°C

Climatic conditions
relative humidity not to exceed 75%, no condensation

Protection
to EN 60 529,
front IP65, rear IP20

Electrical safety
to EN 61 010
Class 2
clearance and creepage distances for
- overvoltage category 2
- pollution degree 2

Electromagnetic compatibility
EN 61 326

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

Operating position
unrestricted

Weight
Type 703030 430g approx.
Type 703031/32 320g approx.

Interface RS422 / RS485

isolated

Baud rate
1200 — 9600 baud

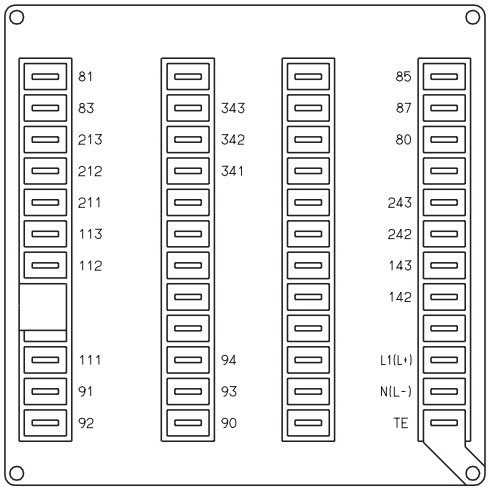
Protocol
MODbus/Jbus

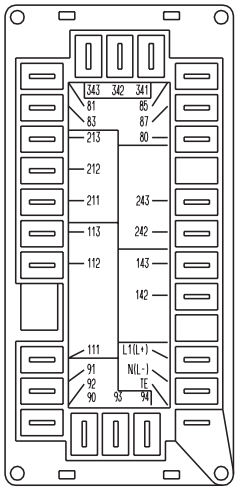
Parameters

	Display	Factory setting	Value range
Limit for limit comparator 1	AL1[1]	0	-1999 to +9999 digit
Limit for limit comparator 2	AL2[1]	0	-1999 to +9999 digit
Proportional band 1	Pb.1	0	0 — 9999 digit
Proportional band 2	Pb.2	0	0 — 9999 digit
Derivative time	dt	80 sec	0 — 9999 sec
Reset time	rt	350 sec	0 — 9999 sec
Stroke time	tt	60 sec	15 — 3000 sec
Cycle time 1	Cy.1	20.0 sec	0.5 — 999.9 sec
Cycle time 2	Cy.2	20.0 sec	0.5 — 999.9 sec
Contact spacing	db	0.0	0.0 — 100.0 digit
Differential 1	HyS.1	1.0	0.1 — 999.9 digit
Differential 2	HyS.2	1.0	0.1 — 999.9 digit
Working point	y.0	0 %	-100 to +100 %
Maximum output	y.1	100 %	0 — 100 %
Minimum output	y.2	-100 %	-100 to +100 %
Filter time constant	dF	0.6 sec	0.0 — 100.0 sec
Ramp slope	rASd	0	0.0 — 999.9 digit/min or digit/h
Duration of hold phase	tS[2, 3]	0	0 — 9999 min

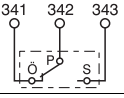
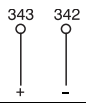
1. only in parameter set 1 2. only in parameter set 2 3. not available with extra Code 050

Connection diagram

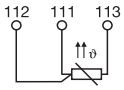
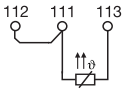
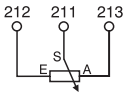
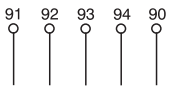
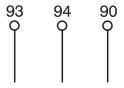
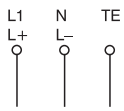




Rear view with faston connectors

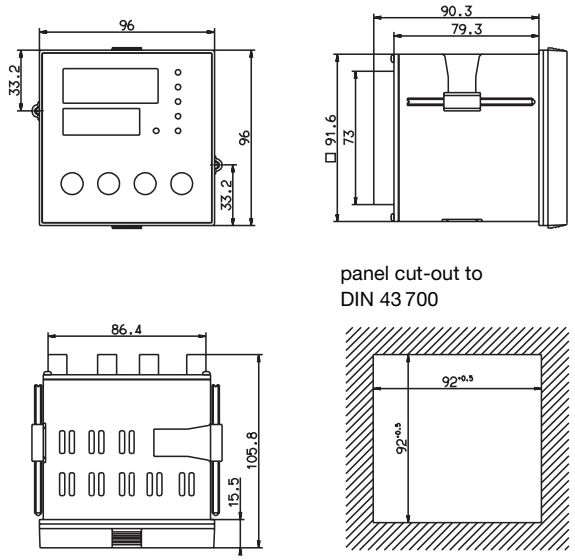
Outputs		Terminals	Diagram
Relay 1*	K1	142 common 143 n.o. (make)	
Relay 2*	K2	242 common 243 n.o. (make)	
Relay 3* or analogue output	K3	341 n.c. (break) 342 common 343 n.o. (make)	
		342 – 343 +	

* Contact protection circuit: varistor S14 K300

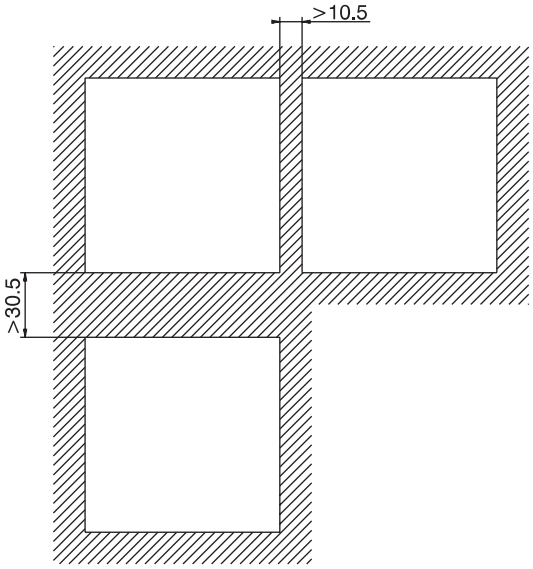
Outputs		**Terminals**		**Diagram**
Logic output 1	K4	80 – 85 +		
Logic output 2	K5	80 – 87 +		
Measurement inputs		**Input 1**	**Input 2**	
Thermocouple		111 + 112 –	–	
Resistance thermometer in 3-wire circuit		111 112 113	–	
Resistance thermometer in 2-wire circuit Lead compensation via process value correction (OFFS)		111 112 113	–	
Potentiometer			211 S slider 212 E end 213 A start	
Current input		111 + 112 –	211 + 212 –	
Voltage input		111 + 112 –	211 + 212 –	
Heater current input 0 — 50 mA AC		–	211 AC 212	
Serial Interface RS422	RxD	91 RxD + 92 RxD –	receive data	
	TxD	93 TxD + 94 TxD –	transmit data	
	GND	90 GND		
Serial interface RS485	RxD/ TxD	93 RxD/TxD + 94 RxD/TxD –	receive data / transmit data	
	GND	90 GND		
Logic input 1		81 80		
Logic input 2		83 80		
Supply **as on label**	AC/ DC	L1 line N neutral AC TE technical earth	L + L – DC	

Dimensions

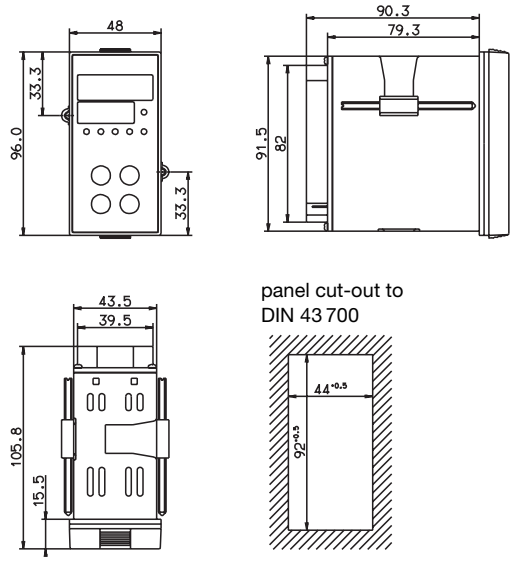
Type 703030 / …



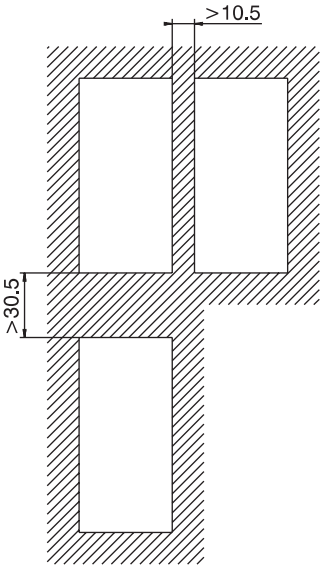
Edge-to-edge mounting (minimum dimensions)



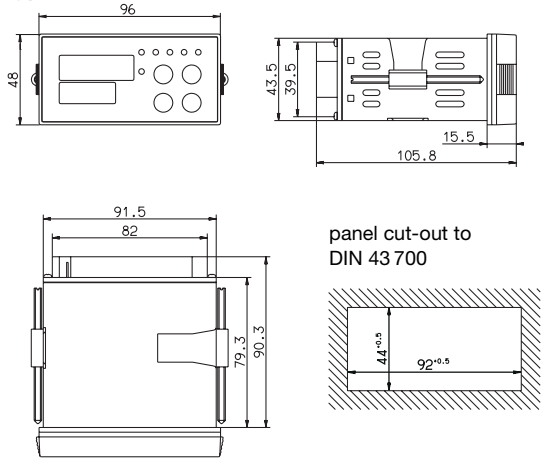
Type 703031 / …



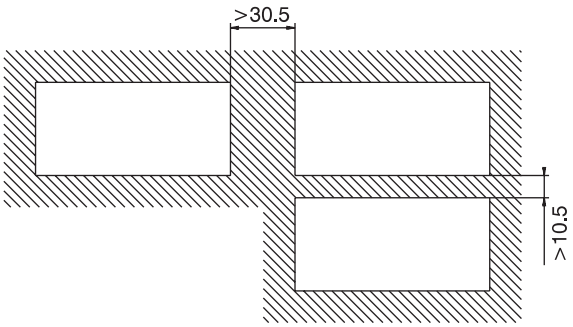
Edge-to-edge mounting (minimum dimensions)



Type 703032 / …



Edge-to-edge mounting (minimum dimensions)



Type designation

If the stock version does not meet your requirements, you can determine the controller specification yourself using the number codes.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	
703030/	..	– ...	– ...	– ..	– ...	– ..	/ ...	*
703031/	..	– ...	– ...	– ..	– ...	– ..	/ ...	* **(Portrait format)**
703032/	..	– ...	– ...	– ..	– ...	– ..	/ ...	, 050* **(L'scape format)**

* list extra Codes in sequence, separated by comma

(1) Controller function

	Code
1-stpt. controller, O function (relay (de -energised above setpoint)	10
1-stpt. controller, S function (relay de-energised below setpoint)	11
2-setpoint controller switching/switching analogue/switching switching/analogue	3 . . 0 . 1 . 2
Modulating controller	40
Proportional controller falling (reverse acting) rising (direct acting)	5 . . 0 . 1

(2) Input 1

	Code
Pt 100	001
Fe-Con J	040
Cu-Con U	041
Fe-Con L	042
NiCr-Ni K	043
Pt10Rh-Pt S	044
Pt13Rh-Pt R	045
Pt30Rh-Pt6Rh B	046
NiCrSi-NiSi N	048
Linearised transducers	
0 — 20mA	052
4 — 20mA	053
0 — 10V	063
2 — 10V	070

(3) Input 2

	Code
no function	000
Heater current indication 0 — 50mA AC	090
Stroke retransmission potentiometer	101
External setpoint 0 — 20mA 4 — 20mA 0 — 10V 2 — 10V	11 . . . 1 . . 2 . . 7 . . 8

(4) Function of logic inputs

Logic input 1	Logic input 2	Code
no function	no function	00
Key inhibit	Parameter set switching	01
Level inhibit	Parameter set switching	02
Ramp stop	Parameter set switching	03
Setpoint switching	Parameter set switching	04
Key inhibit	Setpoint switching	05
Level inhibit	Setpoint switching	06
Ramp stop	Setpoint switching	07
Key inhibit	Ramp stop	08
Level inhibit	Ramp stop	09

(5) Output 3

	Code
not used	000
Relay	101
Analogue output 0 — 20mA 4 — 20mA 0 — 10V 2 — 10V	 001 005 065 070

(6) Supply

	Code
93 — 263V AC 48 — 63Hz	01
20 — 53V AC/DC 48 —63Hz	22

(7) Extra Codes (can be combined)

	Code
no extra Code	000
Interface RS422 / RS485	054
Logic outputs 4 and 5 0 / 12V output signal	015
UL approval	061
Up+Down operation	050

Accessory

Current transformer (1:1000) Size: 38mm x 20mm x 38mm Cable entry 13mm dia. Sales No. 70/00055040

In principle, the outputs can be freely assigned through configuration codes.
Outputs 4 and 5 are normally logic outputs (0/5V).

Factory assignment of the outputs	**Output**				
for	1	2	3	4	5
Single-setpoint controller (O function)	H	X	–	lk1	lk2
Single-setpoint controller (S function)	X	C	–	lk1	lk2
Double-setpoint controller (switching/switching)	H	C	–	lk1	lk2
Double-setpoint controller (analogue/switching)	X	C	H	lk1	lk2
Double-setpoint controller (switching/analogue)	H	X	C	lk1	lk2
Modulating controller	H	C	–	lk1	lk2
Proportional controller (falling, reverse action)	X	X	H	lk1	lk2
Proportional controller (rising, direct action)	X	X	C	lk1	lk2

H = heating contact / valve open
C = cooling contact / valve closed
lk1 = limit comparator 1
lk2 = limit comparator 2
X = no function
– = not available