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**JUMO dTRON 04.1**

**JUMO dTRON 08.1**

**Compact microprocessor controllers**



**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 set-point (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**

**2 analogue inputs**

Input 1:  
process value input for Pt 100, thermocouple or standard signals

Input 2:  
- heater current monitoring for 0 — 50 mA AC  
- output retransmission with potentiometer  
- external setpoint for standard signals

**2 logic inputs**

for floating contacts

Functions:  
- key/level inhibit  
- ramp stop  
- setpoint switching (2 setpoints)  
- parameter set switching

**Supply**

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



**5 outputs**

Output 1 and 2:  
- relay

Output 3:  
- relay  
- analogue controller output

Output 4 and 5:  
- logic 5 V  
- logic 12 V

**Serial interface**

RS422 / RS485  
MODbus /Jbus protocol

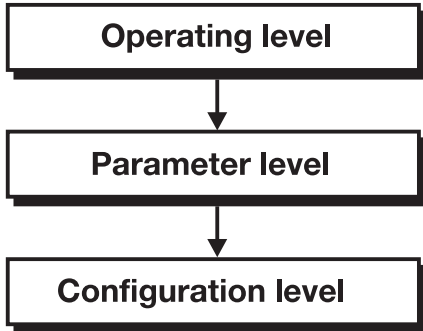
**Features**

- 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

☐ extra Code

## Operation

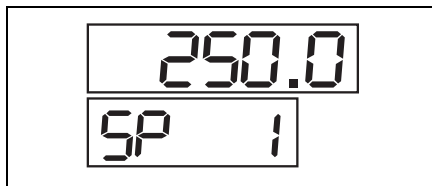
The controller parameters and configuration data are arranged on separate levels for easy programming and operation.



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

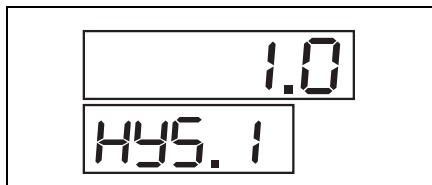
### Operating level

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.



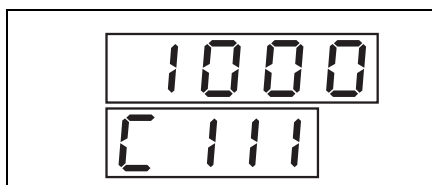
### Parameter level

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).

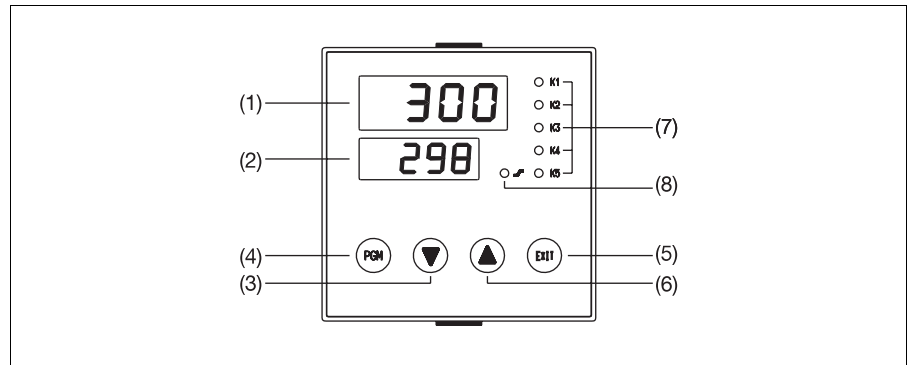


### Configuration level

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



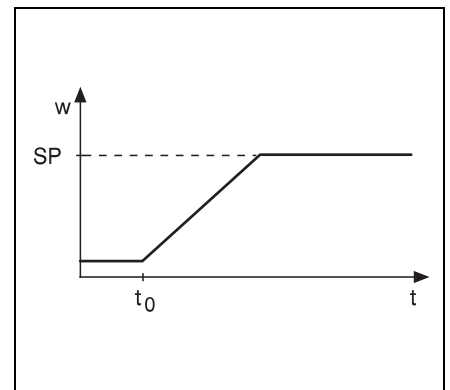
## Indications/controls



(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.

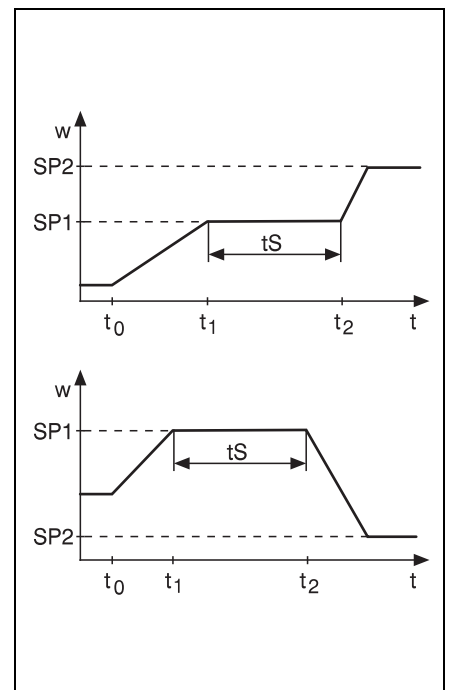


### Start-up ramp for hot channel method

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  $rASd$ . During 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 Ik1

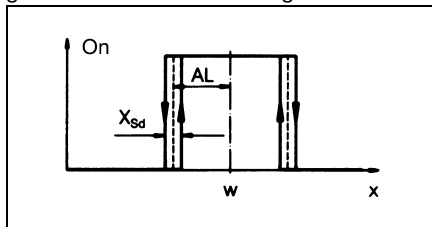
Window function: relay is energised when the process value is within a certain range about the setpoint.

Example:

$W = 200^{\circ}\text{C}$ ,  $AL = 20$ ,  $X_{Sd} = 4$

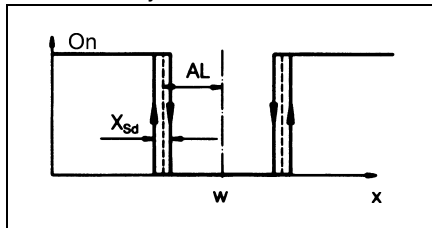
Process value increasing: relay is energised at  $182^{\circ}\text{C}$  and de-energised at  $222^{\circ}\text{C}$ .

Process value decreasing: relay is energised at  $218^{\circ}\text{C}$  and de-energised at  $178^{\circ}\text{C}$ .



### Function Ik2

as Ik1 but relay function reversed.



### Function Ik3

low alarm

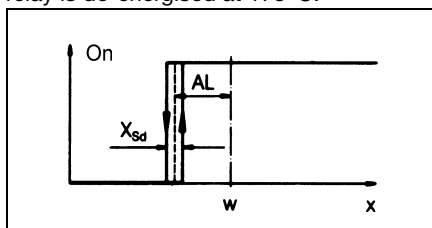
function: relay is de-energised when process value is below (setpoint - limit value).

Example:

$W = 200^{\circ}\text{C}$ ,  $AL = 20$ ,  $X_{Sd} = 4$

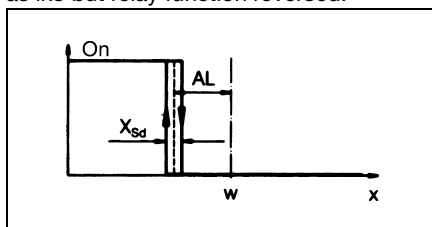
Process value increasing: relay is energised at  $182^{\circ}\text{C}$ .

Process value decreasing: relay is de-energised at  $178^{\circ}\text{C}$ .



### Function Ik4

as Ik3 but relay function reversed.



### Function Ik5

high alarm

function: relay is de-energised when the process value is above (setpoint + limit value).

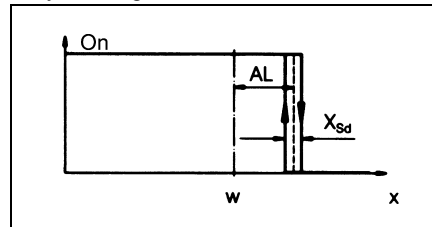
Example:  $W = 200^{\circ}\text{C}$ ,  $AL = 20$ ,  $X_{Sd} = 4$

Process value increasing:

relay is de-energised at  $222^{\circ}\text{C}$ .

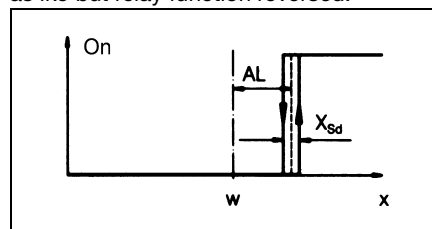
Process value decreasing:

relay is energised at  $218^{\circ}\text{C}$ .



### Function Ik6

as Ik5 but relay function reversed.



### Function Ik7

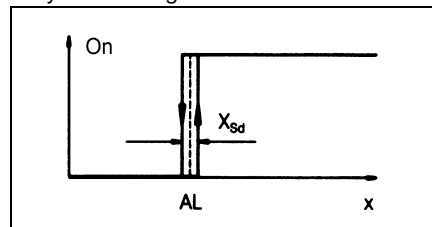
Switching point is independent of controller setpoint and depends only on AL.

Function: relay is energised when process value is above limit value.

Example:  $AL = 150$ ,  $X_{Sd} = 4$

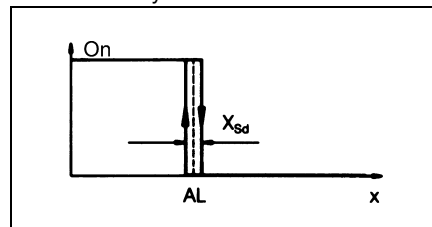
Process value increasing: relay is energised at  $152^{\circ}\text{C}$ .

Process value decreasing: relay is de-energised at  $148^{\circ}\text{C}$ .



### Function Ik8

as Ik7 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.

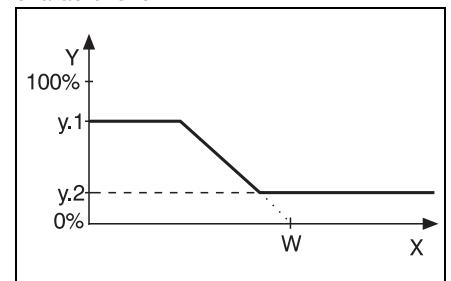
Self-optimisation determines the parameters for PI and PID controllers (proportional band, reset time, derivative time) as well as the cycle time and time constant of the digital input filter.

## 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 $\Delta U_e$
0(4) – 20mA	$\Delta U_e$ less than 1V
0(2) – 10V	$R_i = 500k\Omega$

#### 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 $\Delta U_e$
0(4) – 20mA	$\Delta U_e$ less than 1V
0(2) – 10V	$R_i = 500k\Omega$

#### Display

with or without one decimal place

### Controller for use with potentiometers

$R = 100\Omega$  to  $10k\Omega$

### 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  $5 \cdot 10^5$  operations at rated load

#### 2. Relay output K3

changeover contact  
Rating: 3A 250V AC on resistive load  
Contact life: more than  $5 \cdot 10^5$  operations at rated load

#### 3. Analogue controller output K3

0(2) – 10V  $R_{load} 500\Omega$  min.  
0(4) – 20mA  $R_{load} 500\Omega$  max.  
isolation from the inputs:  
 $\Delta U = 30V$  AC max.  
 $\Delta U = 50V$  DC max.

#### 4. Logic outputs K4 / K5

0/5V  $R_{load} = 250\Omega$  min.  
0/12V  $R_{load} = 650\Omega$  min.  
(option)

## General controller data

#### Measurement accuracy

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 set-point 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

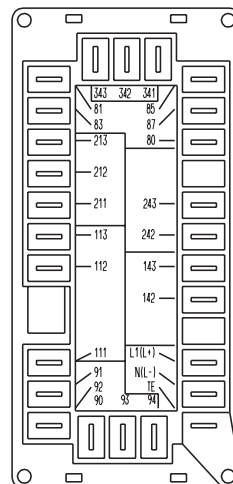
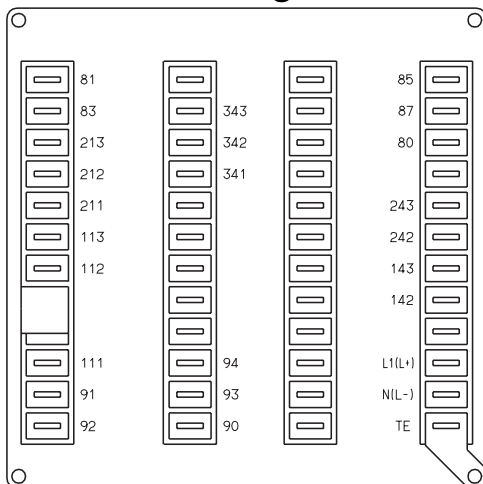
	Display	Factory setting	Value range
Limit for limit comparator 1	AL1 <sup>1</sup>	0	-1999 to +9999 digit
Limit for limit comparator 2	AL2 <sup>1</sup>	0	-1999 to +9999 digit
Proportional band 1	Pb.1	0	0 – 9999 digit
Proportional band 2	Pb.2	0	0 – 9999 digit
Derivative time	dt	80sec	0 – 9999 sec
Reset time	rt	350sec	0 – 9999 sec
Stroke time	tt	60sec	15 – 3000 sec
Cycle time 1	Cy.1	20.0sec	0.5 – 999.9sec
Cycle time 2	Cy.2	20.0sec	0.5 – 999.9sec
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	0.6sec	0.0 – 100.0 sec
Ramp slope	rASd	0	0.0 – 999.9 digit/min or digit/h
Duration of hold phase	tS <sup>2, 3</sup>	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

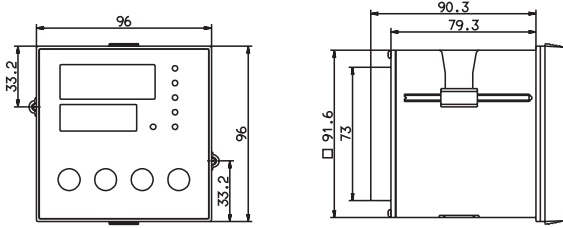
Outputs		Terminals	Diagram
Relay 1*	K1	142 common 143 n.o. (make)	
Relay 2*	K2	242 common 243 n.o. (make)	
Relay 3*	K3	341 n.c. (break) 342 common 343 n.o. (make)	
or analogue output		342 – 343 +	

\* Contact protection circuit: varistor S14 K300

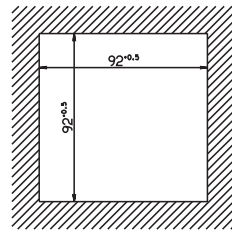
Outputs		Terminals		Diagram
Logic output 1	K4	80 - 85 +		
Logic output 2	K5	80 - 87 +		
Measurement inputs		Input 1	Input 2	
Thermocouple		111 + 112 -	-	
Resistance thermometer in 3-wire circuit		111 112 113	-	
Resistance thermometer in 2-wire circuit Lead compensation via process value correction (OFFS)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

# Dimensions

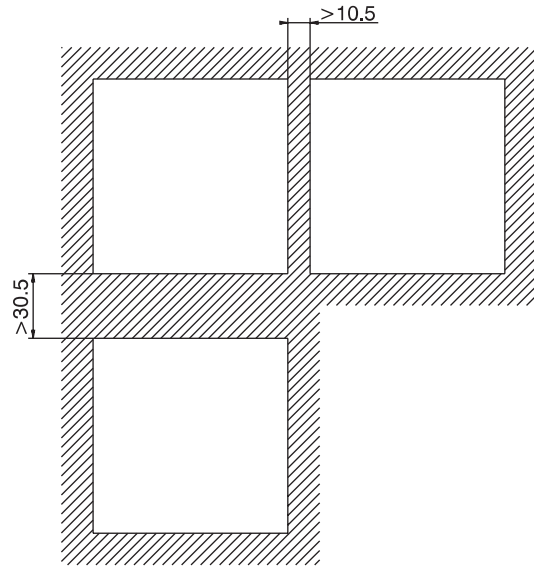
## Type 703030 / ...



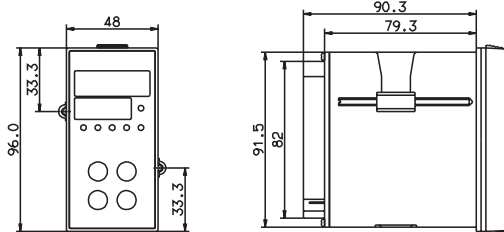
panel cut-out to  
DIN 43 700



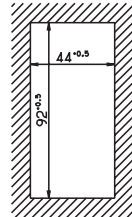
## Edge-to-edge mounting (minimum dimensions)



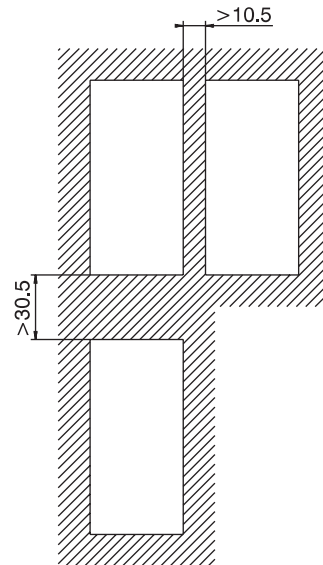
## Type 703031 / ...



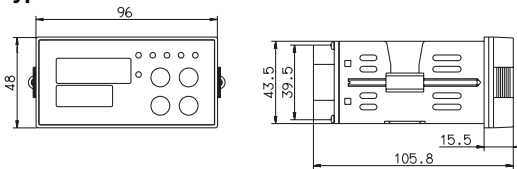
panel cut-out to  
DIN 43 700



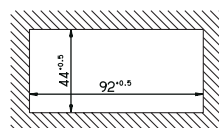
## Edge-to-edge mounting (minimum dimensions)



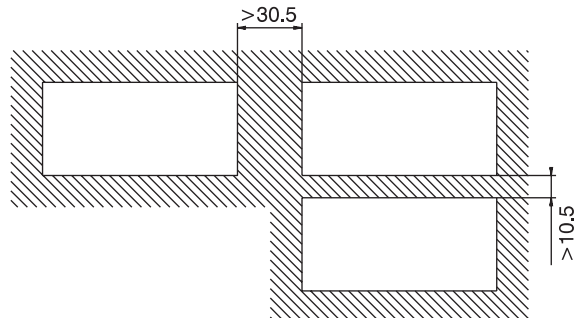
## Type 703032 / ...



panel cut-out to  
DIN 43 700



## 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.

703030/ 

(1)	(2)	(3)	(4)	(5)	(6)	(7)
..	...	...	..	...	..	...

\*  
 703031/ 

(1)	(2)	(3)	(4)	(5)	(6)	(7)
..	...	...	..	...	..	...

\* (Portrait format)  
 703032/ 

(1)	(2)	(3)	(4)	(5)	(6)	(7)
..	...	...	..	...	..	...

, 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	3 .
analogue/switching	.0
switching/analogue	.1
Modulating controller	.2
Proportional controller falling (reverse acting)	40
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	11 .
0 – 20mA	.. 1
4 – 20mA	.. 2
0 – 10V	.. 7
2 – 10V	.. 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	001
4 – 20mA	005
0 – 10V	065
2 – 10V	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 for	Output				
	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