

Delivery address: Mackenrodtstraße 14,
36039 Fulda, Germany
Postal address: 36035 Fulda, Germany
Phone: +49 (0) 661 60 03-0
Fax: +49 (0) 661 60 03-5 00
E-Mail: mail@jumo.net
Internet: www.jumo.de

JUMO House
Temple Bank, Riverway
Harlow, Essex CM20 2TT, UK
Phone: +44 (0) 12 79 63 55 33
Fax: +44 (0) 12 79 63 52 62
E-Mail: info@jumoinstruments.fsnet.co.uk

735 Fox Chase
Coatesville PA 19320, USA
Phone: 610-380-8002
1-800-554-JUMO
Fax: 610-380-8009
E-Mail: info@JumoUSA.com
Internet: www.JumoUSA.com



JUMO dTRON 16.1 Compact microprocessor controller

Housing for flush panel mounting to DIN 43 700

Brief description

The compact microprocessor controller Type 703011, bezel size 48mm x 48mm and with plug-in controller chassis, is particularly suitable for packaging machines, laboratory apparatus, plastic machinery, mechanical equipment etc.

The controller incorporates two 4-digit 7 segment displays for process value (red) and setpoint (green). During programming the displays serve for comments on the programming inputs. The controller can be programmed as single or double setpoint controller or proportional controller with different controller structures.

The controller has a process value input for the usual transducers, an optional input for external setpoint setting, two relay outputs, an optional output with different functions, as well as two combined logic inputs/outputs.

In addition, the controller has 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 profile program function with four profile segments, as well as self-optimisation are provided as standard.

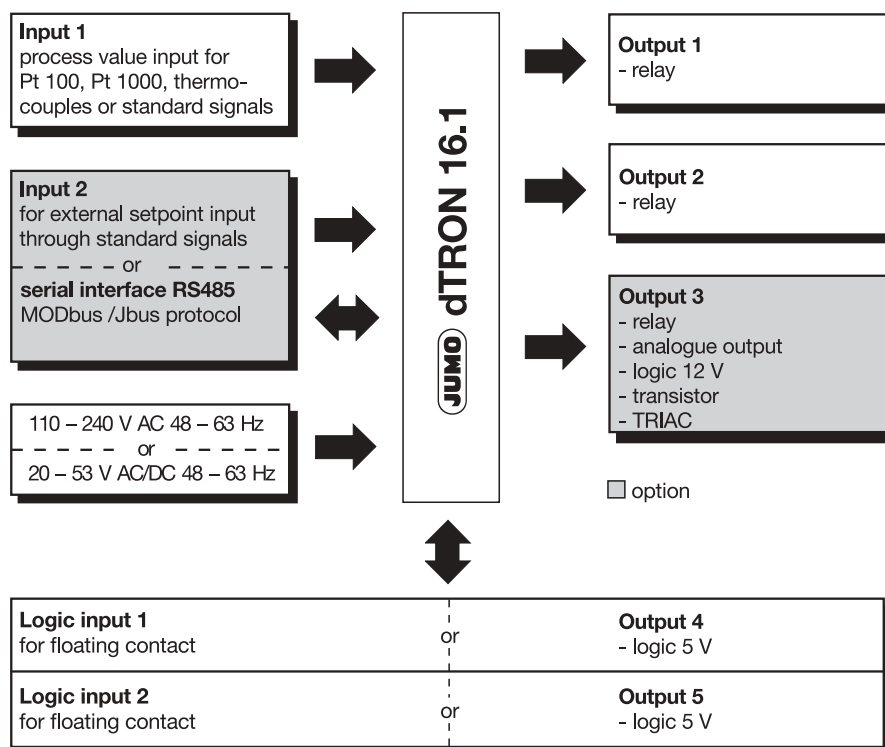
A serial interface (RS 485) is available as option on the controller. The protocol used is MODbus /Jbus.

The electrical connections are made through screw terminals. Front protection is IP65.



Type 703011 / ...

Block structure

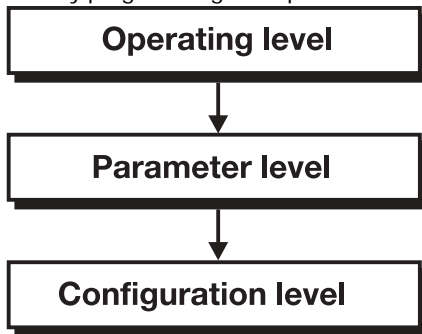


Features

- structured operating and programming layout
- self-optimisation
- ramp function
- profile program function with four profile segments
- external setpoint input
- digital input filter with programmable time constant
- serial interface RS485
- 2 limit comparators
- 5 outputs with freely assigned functions
- process value output
- key and level inhibits
- 2 setpoints with setpoint selection
- 2 parameter sets with parameter set switching
- UL and FM approval

Operation

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

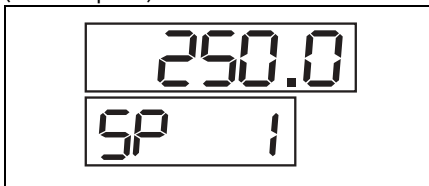


Membrane keys permit simple and user-friendly operation.

The two displays indicate the parameter symbols and the corresponding values and produce a clear operating sequence.

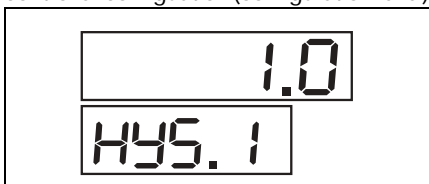
Operating level

The lower display shows the symbol (e.g. SP1), the upper display the corresponding value. The setpoints SP1 and SP2 can be altered from the membrane keys. (SP = setpoint).



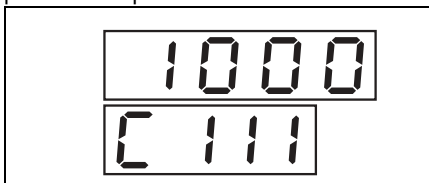
Parameter level

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 relevant to the controller configuration (configuration level).

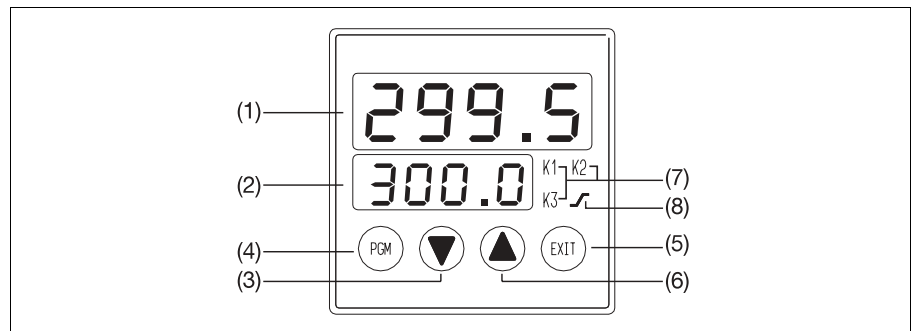


Configuration level

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



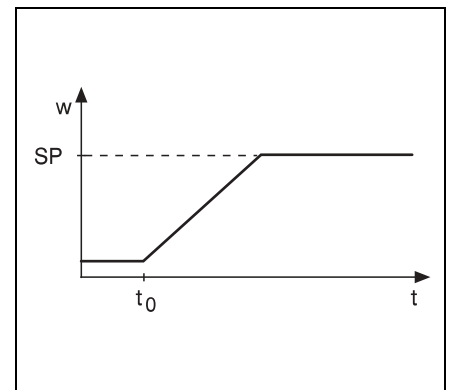
Indications/controls



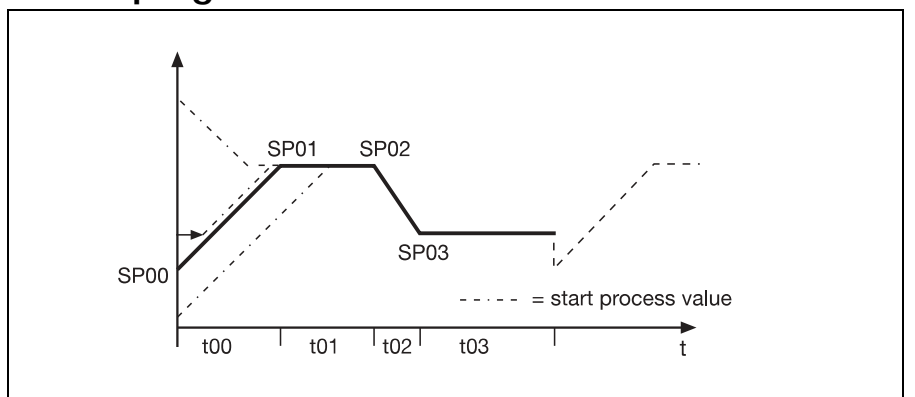
(1)	process value display red, 10mm, 4 digits	(5)	EXIT key to exit from levels
(2)	setpoint display green, 7mm, 4 digits	(6)	increment key to alter values
(3)	decrement key to alter values	(7)	status indicators for outputs 1 to 3, yellow
(4)	PGM key to select parameters	(8)	LED for ramp/profile program function lights up when configured, green

Ramp function

A rising or a 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 gradient 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 power is switched on, the ramp function starts with the current process value.



Profile program function



It is possible to produce a setpoint ramp with up to 4 profile segments. The segment setpoints (SP00 — SP03) and the segment times (t_{00} — t_{03}) are set at the operating level. The timebase can be configured in seconds and minutes (max. segment time 9999 min.). The program starts at the process value, i. e. the profile is examined to find a setpoint corresponding to the process value at the instant of start or power-on. The profile then continues from this point. If the process value is outside the profile, a start is made at the first profile segment and the segment setpoint is then approached at the gradient of the first profile segment (positive or negative). The program can either be run through once or repeated cyclically. In addition, a program end signal can be output and the program can be held.

Limit comparators (limit monitors)

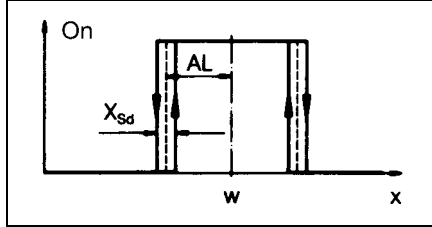
The controller incorporates two limit comparators, each of which can be assigned one of the functions below.

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

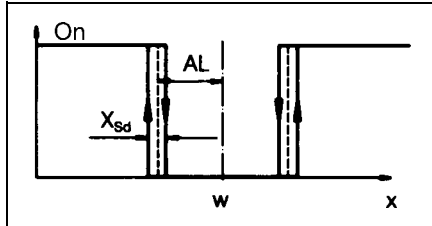
Window function: the relay is energised when the process value is within a certain range about the setpoint.

Example: $w = 200^{\circ}\text{C}$, $AL = 20$, $X_{Sd} = 4$
 Process value increasing: relay is energised at 182°C and de-energised at 222°C .
 Process value decreasing: relay is energised at 218°C and de-energised at 178°C .



Function Ik2

as Ik1 but relay function reversed.

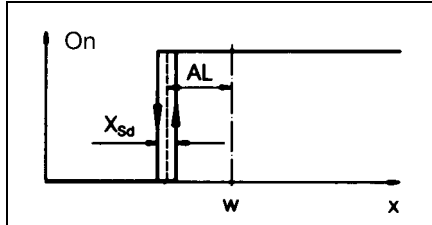


Function Ik3

low alarm

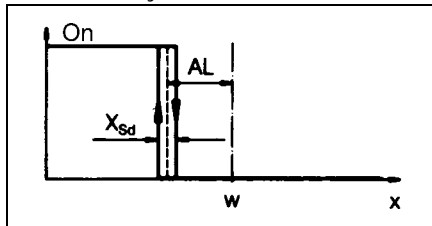
function: relay is de-energised when process value is below (setpoint - limit value).

Example: $w = 200^{\circ}\text{C}$, $AL = 20$, $X_{Sd} = 4$
 Process value increasing: relay is energised at 182°C .
 Process value decreasing: relay is de-energised at 178°C .



Function Ik4

as Ik3 but relay function reversed.

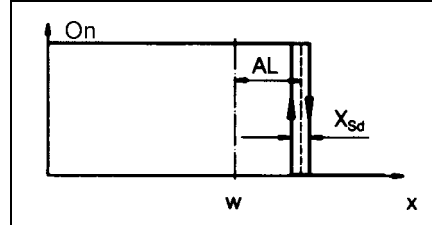


Function Ik5

high alarm

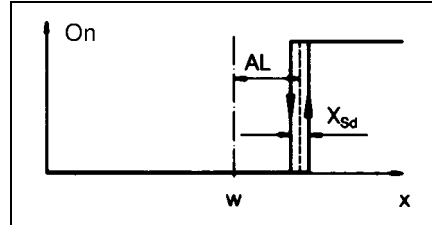
function: relay is de-energised when process value is above (setpoint + limit value).

Example:
 $w = 200^{\circ}\text{C}$, $AL = 20$, $X_{Sd} = 4$
 Process value increasing: relay is de-energised at 222°C .
 Process value decreasing: relay is energised at 218°C .



Function Ik6

as Ik5 but relay function reversed.

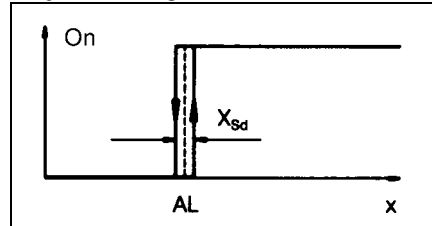


Function Ik7

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

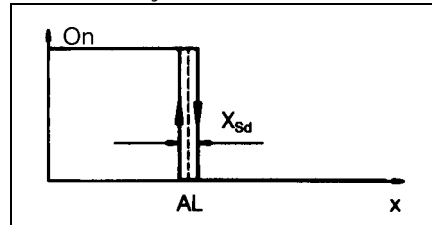
Function: relay is energised when process value is above limit value.

Example:
 $AL = 150$, $X_{Sd} = 4$
 Process value increasing: relay is energised at 152°C .
 Process value decreasing: relay is de-energised at 148°C .



Function Ik8

as Ik7 but relay function reversed.



Self-optimisation

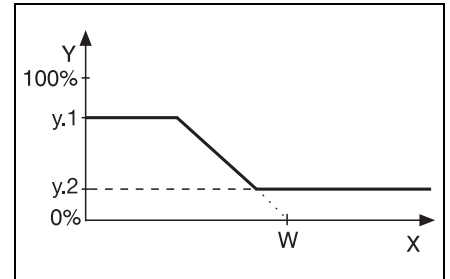
The standard self-optimisation facility produces automatic adjustment of the controller to the process. This permits optimum use of the controller without any control engineering know-how.

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

Output limitation

The maximum and the minimum value of the controller output can be influenced by the output limitation facility.

Example: proportional P controller with falling characteristic



y.1 – maximum output

y.2 – 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).

Interface

As an option, the controllers can be fitted with an RS485 interface. It serves for communication with higher-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 Pt 100, Pt 1000, thermocouples and current 0(4) — 20mA.

Voltage inputs 0(2) — 10V require hardware alteration at the factory.

Controller for use with resistance thermometers (w)

Input

Pt 100, Pt 1000

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 (t)

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

Temperature compensation

internal

Controller for use with linearised transducers with standard signal (u/i)

Input

Signals	Internal resistance R_i voltage drop ΔU_e
0(4) — 20mA	ΔU_e less than 1V
0(2) — 10V	$R_i = 100k\Omega$

Input 2

Controller for use with linearised transducers with standard signal (u/i)

Input

Signals	Internal resistance R_i voltage drop ΔU_e
0(4) — 20mA	ΔU_e less than 1V
0(2) — 10V	$R_i = 100k\Omega$

The standard signals can be configured.

Logic inputs

Functions

- key inhibit
- level inhibit
- profile program/ramp stop
- profile program/ramp start
- setpoint selection
- parameter set switching
- activation of limit comparators

The logic inputs are factory-set for no function.

Outputs

2 relay outputs, 2 logic outputs, and 1 optional output (relay, analogue, logic 0/12V, transistor or TRIAC) 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 (option)

Changeover contact

Rating 3A 250V AC

on resistive load

Contact life more than

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

3. Analogue output K3

or process value output (option)

0(2) — 10V $R_{load} 500\Omega$ min.

0(4) — 20mA $R_{load} 450\Omega$ max.

isolation from inputs:

$\Delta U 30V$ AC max.

$\Delta U 50V$ DC max.

4. Transistor output K3 (option)

isolated

switching voltage: 30VDC

switching current: 50mA max.

5. Logic output K3 (option)

0/12V $R_{load} 650\Omega$ min.

6. Logic outputs

0/5V $R_{load} 250\Omega$ min.

7. TRIAC output K3 (option)

Rating: 1A 230V

General data

Measurement accuracy	Ambient temperature error
----------------------	---------------------------

with resistance thermometers

0.1% or better | 25 ppm max. per °C

with thermocouples within working range

0.25% or better* | 100ppm max. per °C

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

Display

up to 2 decimal places (can be configured)

Controller type

can be configured as single or double set-point controller or proportional controller

Sampling time

210msec (250msec on profile controller)

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

In case of a fault the outputs move to a defined status.

Data back-up

EEPROM

Supply

110 — 240V +10/-15% AC 48 — 63Hz or

20 — 53V $\pm 0\%$ AC/DC 48 — 63Hz

Power consumption

5VA approx.

Electrical connection

through screw terminals for wires up to 1.5mm² and core end sleeves

Permitted

ambient temperature range

0 to + 55°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

clearances 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

plastic, for flush panel mounting

to DIN 43 700, base material PC,

with plug-in controller chassis

Operating position

unrestricted

Weight

140g approx.

Interface RS485

isolated

Baud rate

4800/9600 bps

Protocol

MODbus/Jbus

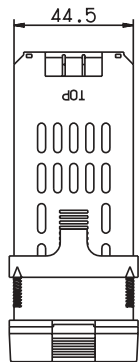
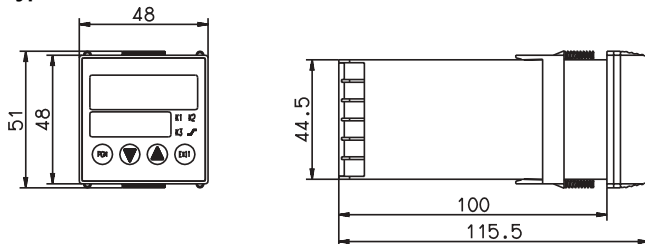
Parameters

	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	80sec	0 — 9999 sec
Reset time	rt	350sec	0.5 — 9999 sec
Cycle time 1	Cy 1	20.0sec	0.5 — 999.9 sec
Cycle time 2	Cy 2	20.0sec	0.5 — 999.9 sec
Contact spacing	db	0.0	0.0 — 100.0 digit
Differential 1	HyS.1	1.0	0.0 — 999.9 digit
Differential 2	HyS.2	1.0	0.0 — 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 gradient	rASd	0	0—999 digit/min or digit/h

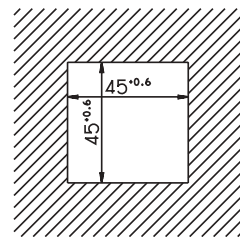
1. only in parameter set 1

Dimensions

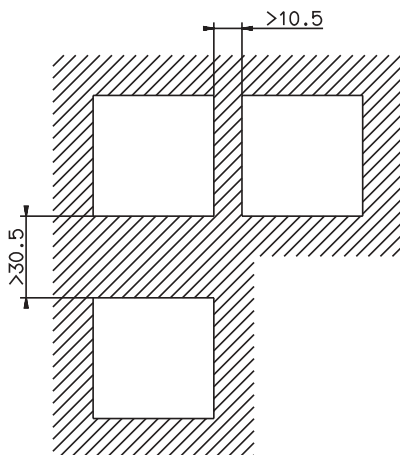
Type 703011 / ...



Panel cut-out to DIN 43 700

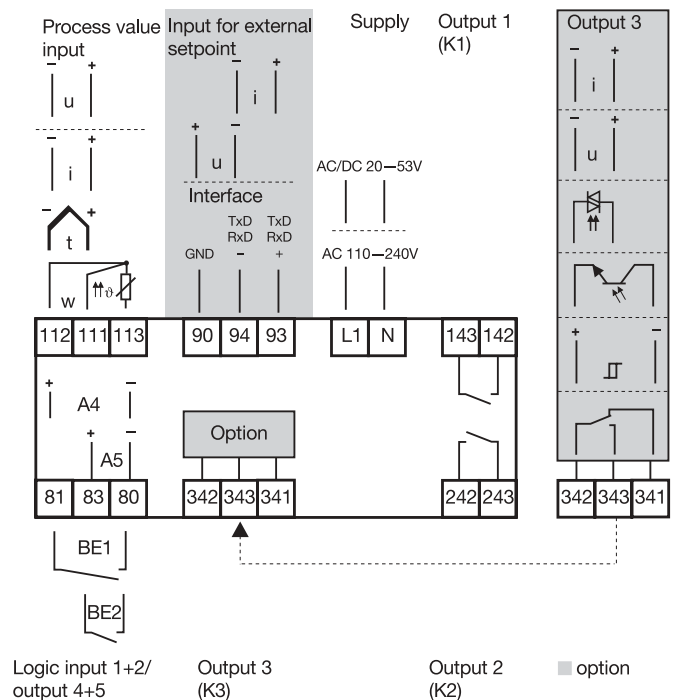
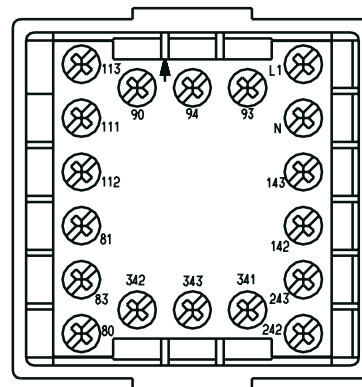


Edge-to-edge mounting



Connection diagram

Rear view with screw terminals



Type designation

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

703011/ (1) - (2) - (3) - (4) - (5) / (6)

(1) Controller function

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

(2) Input 1

	Code
Pt 100	001
Pt 1000	006
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	071

(3) Input 2 (option)

	Code
not used	000
Interface RS485 isolated	053
External setpoint	11 .
0 — 20mA	.. 1
4 — 20mA	.. 2
0 — 10V	.. 7
2 — 10V	.. 8

(4) Output 3 (option)

	Code
not used	000
Relay	101
Logic output 0/12V	113
Analogue output*	
0 — 20mA	001
4 — 20mA	005
0 — 10V	065
2 — 10V	070
Transistor output 30V DC 50mA	106
TRIAC output 1A 230V AC	107

* The analogue output can be configured as process value output

(5) Supply

	Code
110 — 240V +10/-15% AC 48 — 63Hz	23
20 — 53V AC/DC 48 — 63Hz	22

(6) Extra Codes

	Code
no extra Code	000
UL approval	061

Factory assignment of outputs	Output				
	1	2	3	4	5
on					
Single-setpoint controller (O function)	H	X	–	X	X
Single-setpoint controller (S function)	X	C	–	X	X
Double-setpoint controller (switching/switching)	H	C	–	X	X
Double-setpoint controller (analogue/switching)	X	C	H	X	X
Double-setpoint controller (switching/analogue)	H	X	C	X	X
Proportional controller (falling, indirect action)	X	X	H	X	X
Proportional controller (rising, direct action)	X	X	C	X	X

H - heating contact
 C - cooling contact
 lk1 - limit comparator 1
 lk2 - limit comparator 2
 X - no function
 – - not available

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

⇒ for stock versions see Price sheet