Industrial Microprocessor Controller

INDU –02

Applications

Three channel controller with logger

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v 1.2

List of Contents

Technical Data

- 3 analogue inputs (24 bit measuring converter)
- PT100, PT500, PT1000, 0..20 mA, 4..20 mA, 0..10 V, thermocouples S,B,R,T,J,E,K,N
- 4 digits display range
- Inner vacuum sensor 0,00 .. 0,99 bar (when ordered)
- 5 relay outputs
- 3 analogue outputs 0..20 mA (4..20 mA), optional –instead of relays
- 2 control inputs (alarm indication or keyboard blocking)
- Power supply 230 / (110) (24) $\pm$ 10% VAC
- Power consumption 3 W
- Protection degree IP65 (from the front)
- Operation temperature –10 °C .. +55 °C
- Storing temperature –15 °C .. +60 °C
- Dimension of casing 134x134x65 mm
- Assembling hole 90x90 mm
- 1 x RS485 – communication with a computer

Type of governor: 2 types of a bistable governor, PID.
Registration of measurements, approximately 1000000 registrations *.

Registration of set values and measured values, approximately 100000 registrations*.
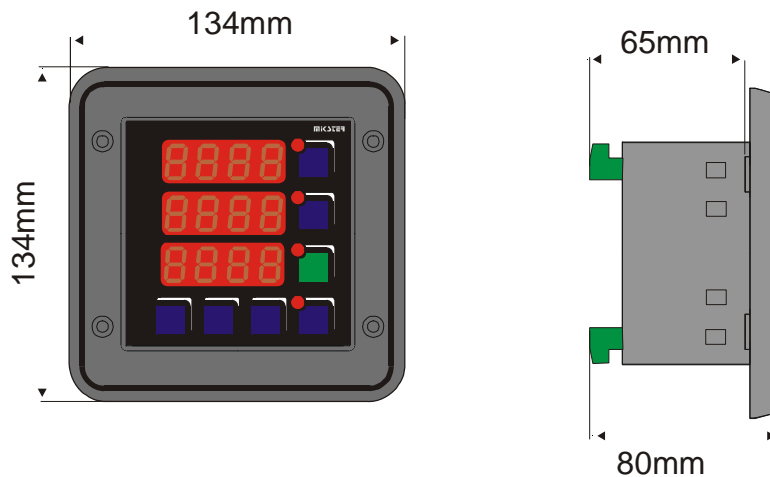
Assembling hole 90x90mm.

* registering module in R version

Destination:

INDU02 controller can be applied to all devices, which require the process regulation in dependence of the given parameters. 24 bit analogue to digital converter enables stable and precise measurements of the measured value. Due to a large variety of configurations the INDU02 controller is a universal three channel governor / recorder. Each of the three measuring channels is assigned to the successive governor (the first channel – the first governor). Each of the governors operates independently from the remaining ones. Regulation is being done according to the previously selected regulation algorithm (Setup cell 26,27,28).

Editing of the Set Values

To correct the set values the key EDIT should be pressed once (diode at the key pulsates). The pulsating value is currently being modified. Displays will show the set values. A change of the setup can be done by keys PLUS / MINUS. Finding the set value for the given channel is done by pressing OK. When the corrects are introduced the key EDIT should be pressed.

Start of the Process

To start the regulation process in the given channel the ON/OFF key, for this channel, should be pressed and hold (until the diode lights). Regulation can be done solely versus the measuring channel with the proper reading. To end the regulation the ON/OFF key should be pressed again (diode at the key is blanking out).

Governor of "the temperature approach"
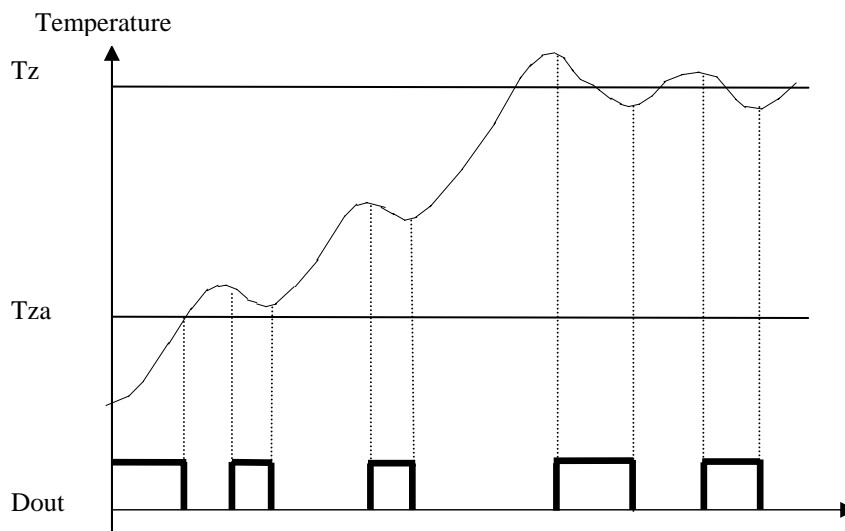
Description of parameters

Tz – set temperature

Tza – temperature of the governor activation; up to this temperature the output is controlled (warming). When this temperature is reached the regulation algorithm activates.

Dout – state at the digital output (high state corresponds to the heater being on).

Selection of Setups of the PID Governor

To gain an access to setups of the PID governor coupled with the given measuring channel the key MINUS should be pressed and hold followed by pressing of the ON / OFF key with the number of the selected governor. Information concerning the given parameter and the governor's number appears in the upper display. Edition of the selected parameter is being done in the middle display (pulsating value). An increase of that value can be done by the key PLUS, while a decrease by MINUS. Moving into the next parameter as well as confirmation of changes is done by the key OK. Exit from the edition mode by the key EDIT.

Regulation is being done on the bases of:
To – sampling period
Pr – strengthening of the proportional element
Ti - integration constant (doubling time)
Td – differentiation constant (advancing time)

Introducing value 0 for proportioning, differentiating or integrating element will cause disabling of this element. Due to that obtaining an arbitrary regulation algorithm is possible.

ALARMS

The INDU02 controller indicates 11 alarm events:

- Err 1   Failure or lack of the measuring element in channel 1
- Err 2   Failure or lack of the measuring element in channel 2
- Err 3   Failure or lack of the measuring element in channel 3
- Err 4   Permissible MAX temperature in channel 1 exceeded
- Err 5   Permissible MAX temperature in channel 2 exceeded
- Err 6   Permissible MAX temperature in channel 3 exceeded
- Err 7   Permissible MIN temperature in channel 1 exceeded
- Err 8   Permissible MIN temperature in channel 2 exceeded
- Err 9   Permissible MIN temperature in channel 3 exceeded
- Err 10   Alarm at the control input 1
- Err 11   Alarm at the control input 2

To activate alarms, in the first place, the time delay [in seconds] between an event and the alarm activation should be selected in SETUP (cells 62..64), and then the selected alarms should be activated in SETUP (cells 51..61).

The alarm occurrence should be confirmed by the OK key. If the reason causing the alarm is not removed, the controller – after the selected time delay – will indicate the alarm again.

User's setup

To enter a user's setup the key MINUS should be pressed and hold, then the key PLUS should be pressed and hold. If the checking of an access code to the user's parameters is active, the code should be entered. Entering the code is done by PLUS and MINUS keys. Confirmation by the OK key. When the code has been entered the letters UF, together with the number corresponding to the cell number, will appear in the upper display of the controller.

Edition of user's parameters: increasing value by the PLUS key, decreasing value by the MINUS key. Confirmation of setup by the OK key. Exit to the upper level (together with the record of change) by the key EDIT.

Description of memory cells with the user's setup:

Cell number	Description
F0	Setup of a real-time clock. Proceeding to the next parameter is done by the OK. key.
F1	Change of the user's access code Range 0..9999 For 0 value – checking of an access code switched off
F2	Information concerning the actual version of software
F3	Switching on / switching off of the keyboard OFF – switching off ON – switching on

Setup

To enter the SETUP the key MINUS should be pressed and hold and then the key EDIT should be pressed and hold. If the checking of an access code to the SETUP parameters is active, the code should be entered. Entering the code is done by PLUS and MINUS keys. Confirmation by the OK key. When the code has been entered the letters SF, together with the number corresponding to the cell number, will appear in the upper display of the controller.

Edition of user's parameters: increasing value by the key PLUS, decreasing value by the key MINUS. Confirmation of the setup by the OK key. Exit to the upper level (together with the record of change) by the key EDIT.

NR	DEFAULT VALUE	RANGE	DESCRIPTION
0	1	0..247	Address in the MODBUS network
1	0	0..4	Transmission rate 0 – 9600 1 – 19200 2 – 38400 3 – 57600 4 – 115200
2	1	0..12	Input type for channel 1 0 – PT-500 1 – PT-100 2 – PT1000 3 – 0..20 mA* 4 – 4..20 mA* 5 – thermocouple S** 6 – thermocouple B** 7 – thermocouple R** 8 – thermocouple T** 9 – thermocouple J** 10 – thermocouple E** 11 – thermocouple K** 12 – thermocouple N** * version with current inputs ** version with thermocouples
3	1	0..12	Input type for channel 2
4	1	0..12	Input type for channel 3
5	0	-99,0 .. 999°C	Value corresponding to 0 mA for channel 1 for the current input 0..20 mA
6	200	-99,0 .. 999°C	Value corresponding to 20 mA for channel 1 For the current input 0..20 mA
7	0	-99,0 .. 999°C	Value corresponding to 0 mA for channel 2 for the current input 0..20 mA
8	200	-99,0 ..	Value corresponding to 20 mA for channel 2 for the current input 0..20 mA

		999°C	
9	0	-99,0 .. 999°C	Value corresponding to 0 mA for channel 3 for the current input 0..20 mA
10	200	-99,0 .. 999°C	Value corresponding to 20 mA for channel 3 for the current input 0..20 mA
11	0	-99,0 .. 999°C	Value corresponding to 4 mA for channel 1 for the current input 4..20 mA
12	200	-99,0 .. 999°C	Value corresponding to 20 mA for channel 1 for the current input 4..20 mA
13	0	-99,0 .. 999°C	Value corresponding to 4 mA for channel 2 for the current input 4..20 mA
14	200	-99,0 .. 999°C	Value corresponding to 20 mA for channel 2 for the current input 4..20 mA
15	0	-99,0 .. 999°C	Value corresponding to 4 mA for channel 3 for the current input 4..20 mA
16	200	-99,0 .. 999°C	Value corresponding to 20 mA for channel 3 for the current input 4..20 mA
17	0,0	-20,0 .. 20,0°C	Correction of the temperature indication for channel 1
18	0,0	-20,0 .. 20,0°C	Correction of the temperature indication for channel 2
19	0,0	-20,0 .. 20,0°C	Correction of the temperature indication for channel 3
20	-99	-99..400°C	Minimal permissible set value for channel 1
21	150	-99..400°C	Maximal permissible set value for channel 1
22	-99	-99..400°C	Minimal permissible set value for channel 2
23	150	-99..400°C	Maximal permissible set value for channel 2
24	-99	-99..400°C	Minimal permissible set value for channel 3
25	150	-99..400°C	Maximal permissible set value for channel 3
26	0	0..3	Kind of governor in channel 1 (only for the relay output) 0 – simple hysteresis 1 – reversed hysteresis 2 – simple hysteresis algorithm „the temperature approach" 3 – PID governor
27	0	0..3	Kind of governor in channel 2
28	0	0..3	Kind of governor in channel 3
29	1,0°C	0,0 .. 5,0°C	Lower hysteresis for channel 1
30	1,0°C	0,0 .. 5,0°C	Upper hysteresis for channel 1
31	1,0°C	0,0 .. 5,0°C	Lower hysteresis for channel 2
32	1,0°C	0,0 .. 5,0°C	Upper hysteresis for channel 2

33	1,0°C	0,0 .. 5,0°C	Lower hysteresis for channel 3
34	1,0°C	0,0 .. 5,0°C	Upper hysteresis for channel 3
35	50°C	0..200°C	Temperature of the governor operation (Tza) in channel 1 for the algorythm of „the temperature approach"
36	50°C	0..200°C	Temperature of the governor operation (Tza) in channel 2 for the algorythm of „the temperature approach"
37	120°C	0..200°C	Temperature of the governor operation (Tza) in channel 3 for the algorythm of „the temperature approach"
38	1	0..100 s	Time delay of the governor operation [in seconds] for channel 1
39	1	0..100 s	Time delay of the governor operation [in seconds] for channel 2
40	1	0..100 s	Time delay of the governor operation [in seconds] for channel 1
41	5	0..1	Recording: 0 - continuous 1 – only when the governor is switched on
42	1	1..360 min	Frequency of measurements recording
43	1	1..360 min	Frequency of alarms recording
44	°C	°C / F	Temperature unit
45	150	-99.. 999°C	Maximal permissible temperature (alarm) for channel 1
46	150	-99.. 999°C	Maximal permissible temperature (alarm) for channel 2
47	150	-99.. 999°C	Maximal permissible temperature (alarm) for channel 3
48	-99	-99.. 999°C	Minimal permissible temperature (alarm) for channel 1
49	-99	-99.. 999°C	Minimal permissible temperature (alarm) for channel 2
50	-99	-99.. 999°C	Minimal permissible temperature (alarm) for channel 3
51	Off	On / Off	Alarm activation- faulty sensor in channel 1
52	Off	On / Off	Alarm activation- faulty sensor in channel 2
53	Off	On / Off	Alarm activation- faulty sensor in channel 3
54	Off	On / Off	Alarm activation – Max. temp. exceeded in channel 1
55	Off	On / Off	Alarm activation – Max. temp. exceeded in channel 2
56	Off	On / Off	Alarm activation – Max. temp. exceeded in channel 3
57	Off	On / Off	Alarm activation – Min. temp. exceeded in channel 1
58	Off	On / Off	Alarm activation – Min. temp. exceeded in channel 2
59	Off	On / Off	Alarm activation – Min. temp. exceeded in channel 3

60	Off	On / Off	Servicing of control input 1
			0 - alarm off
			1 - alarm when inputs 6-8 shorted
			2 - alarm when inputs 6-8 not shorted
			3 - keyboard blocking when inputs 6-8 shorted
			4 – keyboard blocking when inputs 6-8 not shorted
61	Off	On / Off	Servicing of control input 2
			0 - alarm off
			1 - alarm when inputs 7-8 shorted
			2 - alarm when inputs 7-8 not shorted
			3 – keyboard blocking when inputs 7-8 shorted
			4 – keyboard blocking when inputs 7-8 not shorted
62	60	0..999 sek	Time delay of the alarm activation when sensors are faulty.
63	60	0..999 sek	Time delay of the alarm activation when permissible temperatures are exceeded.
64	60	0..999 sek	Time delay of the alarm activation when alarm occurs at the control inputs.
65	0	0..999	Change of the SETUP access code 0 value – code checking switched off
66	0	0..1	Time delay unit in cells no. 62,63 and 64 0 – seconds 1 – minutes

EXAMPLE OF AN APPLICATION*
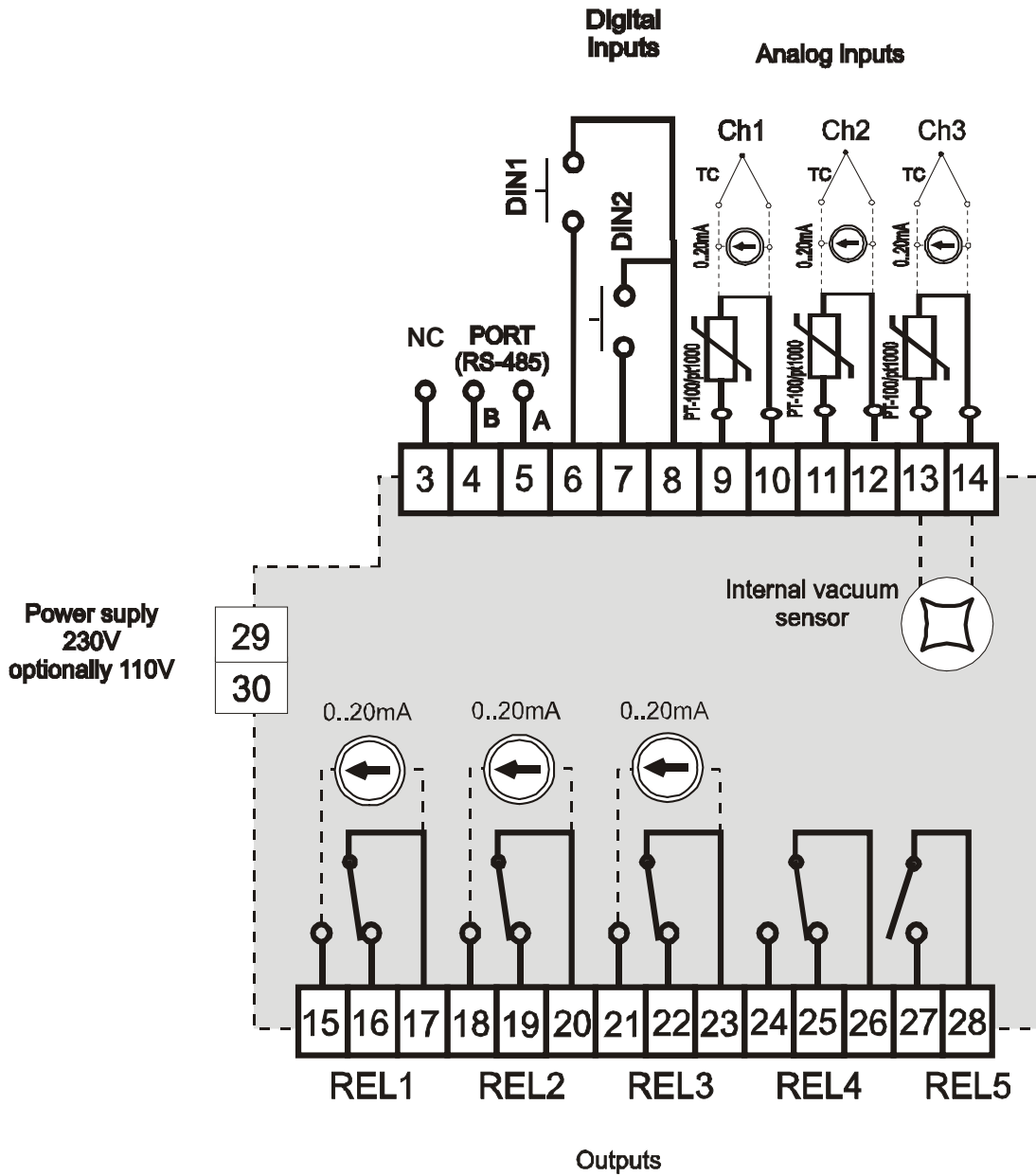
* This is only a pictorial diagram shown as an example of the possible application. It can not be treated neither as a whole nor as a part of the project of the control system.

Notes

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