EN

INDU 20

USER MANUAL v1.6(19)EN

MIKSTER

ul. Wojkowicka 21, 41-250 Czeladź, Poland
tel. +48 32 763 77 77
fax: +48 32 763 75 94
mikster.eu

CONTENTS

1. TECHNICAL SPECIFICATIONS

Power supply:	230VAC option: 24VAC, 110VAC ± 10% VAC
Power consumption:	3 W
Housing:	One-piece Front Panel
Dimensions:	134x134x65mm
Mounting hole:	90x90mm
Weight:	500g
Display:	LED ½ '' x 4 digits LED ½ '' x 2 digits LED ½ '' x 2 digits
Keyboard:	Micro switch buttons
Temperature measurement range:	– 30°C ÷ 400°C
Temperature measurement resolution:	0,1°C od – 9,9°C do 99,9°C 1°C in other ranges
Inputs:	1x analogue PT100/PT500/PT1000 2x control (alarm signaling or keyboard lockout)
Outputs:	1x analogue 0/4..20mA 4x relay
Other features:	Internal vacuum sensor
IP rating:	IP65 (front) IP20 (rear)
RTC:	Yes
Communication:	1xRS485
Registration:	100000 records*
Operating conditions:	Temperature: 0°C ÷ 55°C Humidity: 5%RH ÷ 85%RH

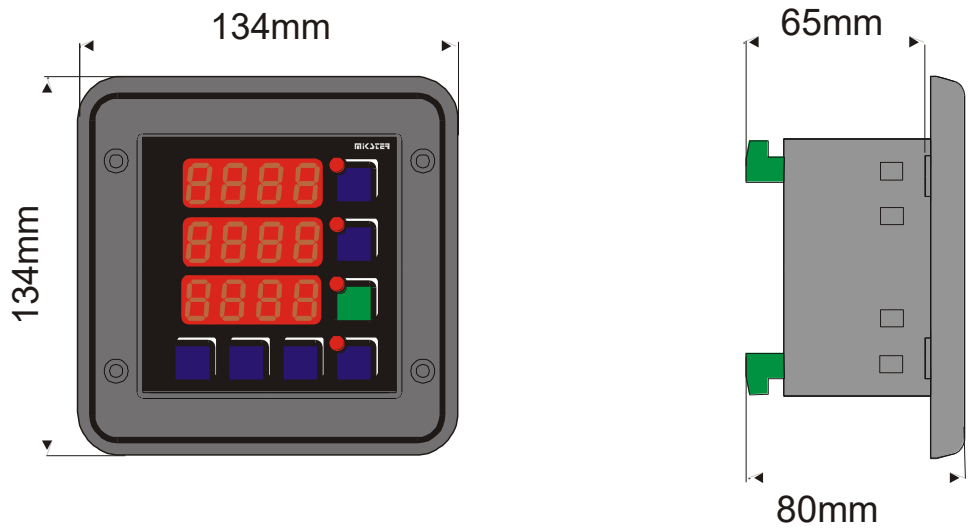
AUTOSTART: according to RTC, with the possibility of an advanced programming (up to 10 days) of the controller switching on.

Types of the temperature control: 2 types of bistable governors and the PID governor.

Ending of the process can be done either by the set time or manually.

* recording module, R - version

2. DIMENSIONS



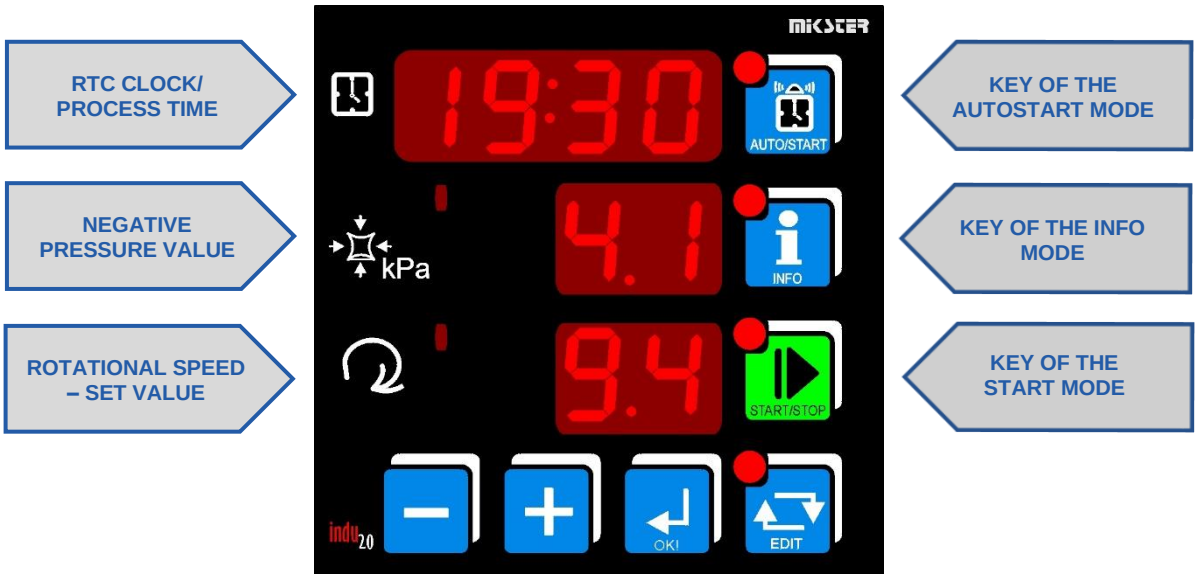
3. START UP

After the mains are connected the controller is automatically activated. After the welcoming words the device displays in turn: current hour and minute, measurement in channel 1 – vacuum in %, set value of the rotational speed of the drum. Three horizontal lines indicate the lack or failure of a measuring element. Diodes on the keys signal the mode of the device (e.g. editing or autostart mode). Horizontal lines at the left side of the displayed measured value signal the governor's mode: controlled output causes that the diode lights. Diodes on the keys indicate the controller's mode. Possible modes of operation are: AUTOSTART, START, INFO and EDIT.

In the STOP mode, when the START mode ended, the word „STOP" is displayed on the screen – instead of an hour and minute.

NOTE: in the case of power failure the controller remembers the mode of operation and returns to this mode at the power supply restart. (unless the time set in the 48 Setup cell expires).

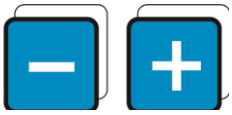
3.1 OPERATING PANEL



3.2 EDIT MODE – CHANGING OF THE SET VALUES

In order to enter the mode of editing the set parameters of the process the key should be pressed 

. Entering into the edit mode is indicated by pulsation of the diode on the key EDIT.

Keys  are used for correction of parameters. Parameter being edited is pulsating, confirmation and proceeding to the next editing field is done by the OK key. Consecutive pressing of the key EDIT means exit from the editing mode.

The set parameters are co:

- START mode duration (number of hours and minutes)
- Negative pressure – set value
- Rotational speed – set value

3.3 INFO MODE

Single pressing of the 

causes the display of information in dependence of the controller's mode of operation::

For the AUTOSTART mode

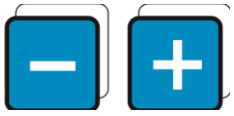
Depending on the parameter in the 47 Setup cell:

At selecting HMD – hour, minute and twenty-four hours delay before the START mode commences,

At selecting HM – number of hours and minutes remaining to the START mode

Consecutive information, for all modes, are the same:

- temperature measurement: the upper display shows the current temperature measurement in channel 1, the lower reads TE,
- the upper display shows PSET, the middle one the negative pressure (set value), the lower display indicates the rotational speed of the drum,
- current date: starting from the upper display - one can read the year, month and day,
- current time: starting from the upper display - one can read hour, minute and second.

Proceeding into the next (previous) information can be done by keys  . To exit the INFO mode the INFO key should be pressed again.

3.4 AUTOSTART MODE

The autostart mode is used for entering the START mode with a time delay.

Pressing 

causes transition to the parameters editing of this mode.

There are two possibilities of setting the moment of the controller AUTOSTART:

1. Activation at the predetermined hour and minute – with the possibility of adding the twenty-four hour delay (F47 SETUP - HMD).
2. Activation after the predetermined number of hours and minutes (F47 SETUP - HM)

To exit the AUTOSTART mode the AUTO/START key should be pressed again.

There is also a possibility of a direct transition from the AUTOSTART into the START mode. Single pressing of the START key is needed.

3.5 START MODE

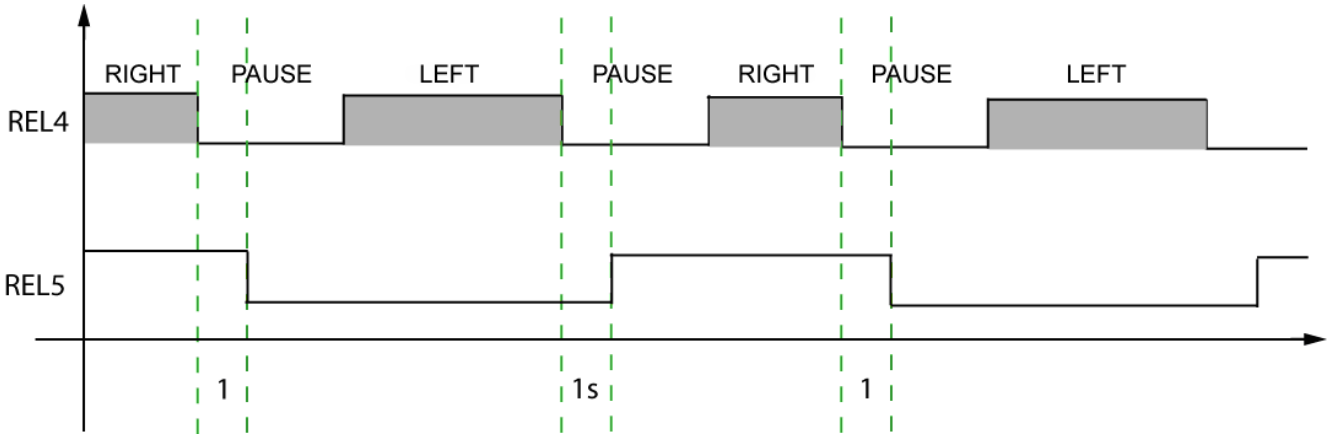
When all set parameters are introduced (see: EDIT MODE – CHANGING OF THE SET VALUES) the process can begin, which means the controller should be in the START mode. Beginning and ending of the START mode is done by pressing the key: 

.

For the typical settings of the controller, entering the START mode activates governors and the countdown of the process time starts.

The display shows the number of hours and minutes remaining to the end of the process.

The end of the process is indicated by the internal sound signal of the controller and by controlling of the relay output REL5 (unless it is declared in the SF81 Setup as the temperature governor). If the cell SF81 value is set to 2 relays REL4, REL5 work in the Left/Right turnover.



SF81 ⟶ 2 ⟶ REL4 and REL5 carries out the functions, which illustrate the chart.

SF75 TL - time relay attach turnover LEFT (default = 10sek.)

SF76 TR - time relay attach turnover RIGHT (default = 10sek.)

SF77 Tp – pause time (default = 20sek)

Pressing the OK key switches off the sound signal.

4. FUNCTION OF RELAYS

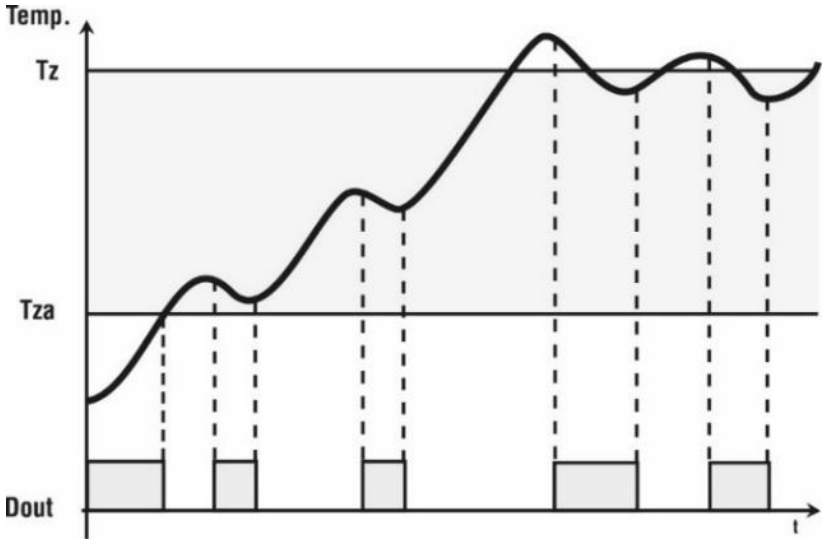
REL 2: is responsible for the increase of the negative pressure and the pump controlling (governor: simple hysteresis).

REL 3: is responsible for the decrease of the negative pressure (governor: reversed hysteresis).

REL 4: controlled in the START mode.

REL 5: temperature regulation or alarm event signaling.

5. GOVERNOR OF THE "TEMPERATURE APPROACH"



Parameters:

Tz – set temperature value.

Tza – temperature of the governor activation; up to this temperature the output is controlled (heating). When this temperature is reached the governing algorithm starts.

Dout – state at the digital output (high state corresponds to the heaters being ON).

6. SELECTION OF SETTINGS OF THE PID GOVERNOR

To obtain an access to the settings of the PID governor coupled with the particular measuring channel the MINUS key should be pressed and held and then the INFO key. If the temperature governor is selected on the relay (REL 5) the upper display shows the information that the governor can be adjusted – the OK key should be pressed. The edition of the selected parameter is being done on the middle display (pulsating value). Increasing of the parameter's value can be done by the PLUS key, while decreasing by the MINUS key. Proceeding to the next parameter and confirmation of changes is done by pressing OK. Exit from the edition mode - by pressing the EDIT key.

Regulation is being done on the bases of:

To – sampling period,

Pr – amplification of the proportional element,

Ti – integration constant (doubling time),

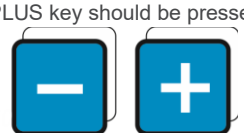
Td – differential constant (advancing time),

TS – set temperature,

Writing 0 value for the integrating or differentiating element causes its switching off. Due to that feature, it is possible to obtain the arbitrary governing algorithm.

7. FUNKCJE SERWISOWE DOSTĘPNE DLA UŻYTKOWNIKA

Cell number	Description
F0	Setting of the real time clock. Next parameter is reached by the OK key.
F1	Change of the access code for the user Range 0..9999 For 0 value – checking of the access code is switched off
F2	Information concerning the current program version
F3	Switching ON/OFF of the keyboard click OFF – switching off ON – switching on

To enter the user's mode the MINUS key should be pressed and held, the PLUS key should be pressed and held. Those functions are accessible when the access code is given. The access code is introduced by  keys.

To switch off the checking of the access code its value should be set as zero.

As a rule the access to the user's settings is switched off.

8. ALARMS

Controller INDU 20 signals 11 alarm events:

- Err1 Failure of the internal sensor of negative pressure,
- Err2 Failure or lack of the measuring element in the channel 1 (temperature),
- Err3 -
- Err4 Permissible MAX negative pressure exceeded,
- Err5 Permissible MAX temperature exceeded,
- Err6 -
- Err7 Permissible MIN negative pressure exceeded,
- Err8 Permissible MIN temperature exceeded,
- Err9 -
- Err10 Alarm from the control input 1,
- Err11 Alarm from the control input 2.

The first step in an alarm activation is the setting of the time delay [seconds] in SETUP (cells 71..73) between an alarm event and the alarm activation. Then the activation of the selected alarms in SETUP (cells 60..70) should be done.

Alarms are signaled on the display by the word Err with the adequate number, by internal howler, and - when in Setup cell 81 the relay REL 5 is in the mode of alarm signaling - by controlling of its output.

Alarm should be confirmed by the OK key. If the cause of an alarm is not removed, the controller – after the time delay of the alarm activation - will again signal the alarm.

9. CONTROLLER SETUP

Nr	Default value	Range	Description	User settings
SF0	1	0..99	Address in the MODBUS network	
SF1	0	0..4	Transmission rate: 0 - 9600, 1 - 19200, 2 - 38400, 3 - 57600, 4 - 115200	
SF2	1	0..12	Type of the measuring input for channel 1 • 0 – PT-500 • 1 – PT-100 • 2 – PT1000 • 3 – 0..20mA* • 4 – 4..20mA* • 5 – thermocouple s** • 6 – thermocouple b** • 7 – thermocouple r** • 8 – thermocouple t** • 9 – thermocouple j** • 10 – thermocouple e** • 11 – thermocouple k** • 12 – thermocouple n** * - current input version ** - thermocouple servicing version	
SF3	-	-	-	
SF4	-	-	-	
SF5	0°C	-99,0..999°C	Value corresponding to 0 mA for channel 1 for 0..20 mA	
SF6	100°C	-99,0..999°C	Value corresponding to 20 mA for channel 1 for 0..20 mA	
SF7	-	-	-	
SF8	-	-	-	
SF9	-	-	-	
SF10	-	-	-	
SF11	0°C	-99,0..999°C	Value corresponding to 4 mA for channel 1 for 4..20 mA	
SF12	100°C	-99,0..999°C	Value corresponding to 20 mA for channel 1 for 4..20 mA	
SF13	-	-	-	
SF14	-	-	-	
SF15	-	-	-	
SF16	-	-	-	
SF17	0,0°C	-20,0..20°C	Temperature correction for channel 1	

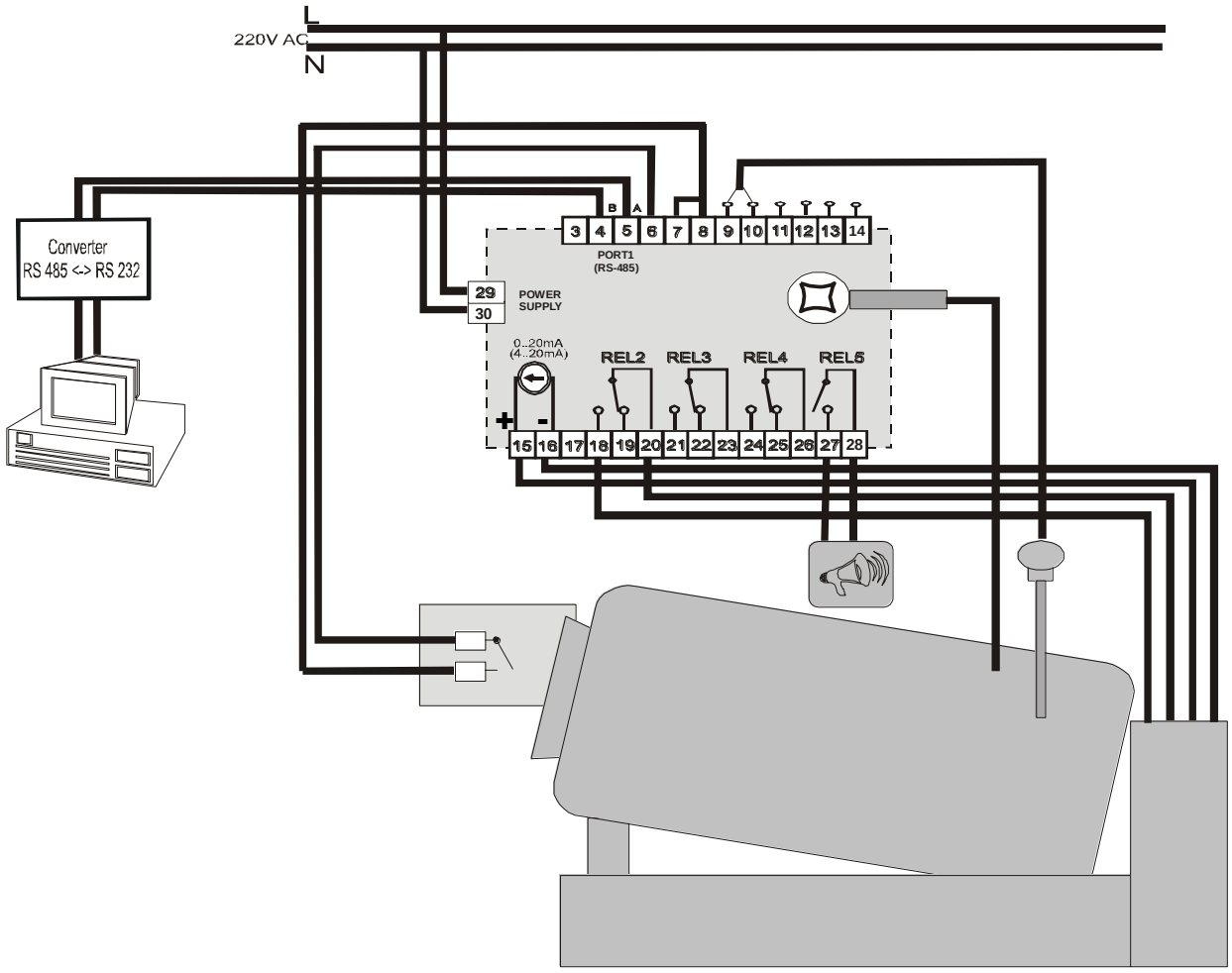
Nr	Default value	Range	Description		User settings
SF18	-	-	-		
SF19	-	-	-		
SF20	On	On / Off	Negative pressure governor:		
			Off – always	On – only in the START mode	
SF21	On	On / Off	Temperature governor:		
			Off – always	On – only in the START mode	
SF22	-	-	-		
SF23	0	0..99%	The lowest negative pressure value, which could be set by the user		
SF24	99	0..99%	The highest negative pressure value, which could be set by the user		
SF25	-	-	-		
SF26	-	-	-		
SF27	-	-	-		
SF28	-	-	-		
SF29	1	0..3	Temperature governor coupled to relay REL 5 • 0 – simple hysteresis • 1 – reversed hysteresis • 2 – approaching hysteresis • 3 – PID		
SF30	-	-	-		
SF31	1	0..5	Lower hysteresis for the governor coupled to REL2		
SF32	1	0..5	Lower hysteresis for the governor coupled to REL3		
SF33	1	0..5	Lower hysteresis for the governor coupled to REL5		
SF34	-	-	-		
SF35	0	0..5	Upper hysteresis for the governor coupled to do REL2		
SF36	1,0°C	0,0..5,0°C	Upper hysteresis for the governor coupled to do REL3		
SF37	1,0°C	0,0..5,0°C	Upper hysteresis for the governor coupled to do REL5		
SF38	50°C	-99..999°C	Set temperature		
SF39	-	-	-		

Nr	Default value	Range	Description	User settings
SF40	-	-	-	
SF41	20°C	0..99°C	Temperature of activation (Tza) of the governor coupled to REL 5 for the „ temperature approach" algorithm	
SF42	-	-	-	
SF43	-	-	-	
SF44	1	0..100 sek	Time delay of the governor [seconds] coupled to REL 5	
SF45	-	-	-	
SF46	1	0..1	Recording: • 0 – continuous recording • 1 – recording only in the START mode	
SF47	HMD	HMD/HM	AUTOSTART mode – parameters format: • HMD – hour, minute and twenty-four hours delay before the START of the process • HM – number of hours and minutes remaining to the START mode	
SF48	5	0..10 godz.	Maximal time (in hours) after which (when there was a power failure) the controller does not return to the START mode	
SF49	1	1..360 min	Rate of the measurements recording	
SF50	1	1..360 min	Rate of alarms recording	
SF51	°C	°C/°F	Temperature unit	
SF52	1 [min]	0..99 [min]	Sound signal - duration. Note! When 0 value entered, the signal can be deleted by the OK key!	
SF53	1	0 .. 1	Alarm output mode of operation: • 0 – interrupted signal • 1 – continuous signal	
SF54	99	0..99%	Maximal permissible negative pressure (alarm)	
SF55	150°C	-99..999°C	Maximal permissible temperature (alarm)	
SF56	-	-	-	
SF57	0	0..99%	Minimal permissible negative pressure (alarm)	
SF58	-99°C	-99..999°C	Minimal permissible temperature (alarm)	
SF59	-	-	-	
SF60	Off	On / Off	Alarm activation – failure of the negative pressure sensor	
SF61	Off	On / Off	Alarm activation – failure of the temperature sensor	

Nr	Default value	Range	Description	User settings
SF62	-	-	-	
SF63	Off	On / Off	Alarm activation - Max negative pressure exceeded	
SF64	Off	On / Off	Alarm activation - Max temperature exceeded	
SF65	-	-	-	
SF66	Off	On / Off	Alarm activation - Min negative pressure exceeded	
SF67	Off	On / Off	Alarm activation - Min temperature exceeded	
SF68	-	-	-	
SF69	0	0..4	Control input 1 0 - alarm switched off 1 – alarm, when inputs 6-8 shorted 2 – alarm, when inputs 6-8 not shorted 3 – keyboard lockout when inputs 6-8 shorted 4 - keyboard lockout when inputs 6-8 not shorted	
SF70	0	0..4	Control input 2 0 - alarm switched off 1 – alarm, when inputs 7-8 shorted 2 – alarm, when inputs 7-8 not shorted 3 – keyboard lockout when inputs 7-8 shorted 4 - keyboard lockout when inputs 7-8 not shorted	
SF71	60	0..999 sek	Time delay in the alarm signaling, when sensors are faulty	
SF72	60	0..999 sek	Time delay in the alarm signaling, when the permissible settings are exceeded	
SF73	60	0..999 sek	Time delay in the alarm signaling, when there is an alarm on inputs	
SF74	0	0..9999	Change of the access code to SETUP	
			0 value – checking the code switched off	
SF75	10	0..9999 sek	Attach a turnover time of the relay LEFT	
SF76	10	0..9999 sek	Attach a turnover time of the relay RIGHT	
SF77	20	0..9999 sek	Pause time	
SF78	-	-	-	
SF79	1	-99.100	Negative pressure offset for the governor coupled to REL2	
SF80	99	0..99	Set speed value corresponding to 20mA on the current output	
SF81	0	0..2	Mode of operation of the REL5 relay : • 0 – alarms signaling, • 1 - temperature governor • 2 - relays REL4, REL5 operate in a mode RIGHT/LEFT turnover	

Nr	Default value	Range	Description	User settings
SF82	1	0..1	Response to alarm: measuring sensors faulty: 0 - signaling, 1 - process stops	
SF83	1	0..1	Response to alarm: settings exceeded 0 - signaling, 1 - process stops	
SF84	1	0..1	Response to alarm from the control input 0 - signaling, 1 - process stops	
SF85	0	0..1	Type of the current output: 0: 0..20 mA 1: 4..20 mA	
SF86	1	0..1	State of the relay output REL3 (aerating valve) when the controller is not in the START mode 0: REL3 not controlled 1: REL3 controlled (aeration)	
SF87	0	0..1	Unit processing time 0 – hours:minutes HH:MM 1 - minute:second MM:SS	

10. EXAMPLE OF APPLICATION*



* The example of application should give the user a general idea only, and can not be considered the project of the control system - neither as total nor as its part.

NOTES

NOTES