



INDU IMAX700

Operating manual

v1.2(2.116)

indu iMAX700

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1. Design, application, possibilities

INDU iMAX 700 is a compact device of the All-in-One type, i.e. it integrates the functions of the controller and touchscreen of the operators panel, extended with communication options and built-in support for input and output signals.

Its main application is the control of thermal processing processes in machines used in meat and fish processing, such as smoking and scalding chambers, ripening chambers, climatic chambers, thawing chambers.

On the front of the controller there is a display with a touch panel, which is used to visualize data and operate the controller. On the back of the controller there are cable connections for inputs, outputs and communication.



ATTENTION!

Installation and configuration of the controller should be carried out by a person with appropriate qualifications in the field of industrial automation.

2. Technical data - power supply, ports, power consumption

Technical data IMAX 700

Power supply	24VDC I _{max} .1A rail-mounted power supply DIN 230VAC/24DC (included)
Display	Coloured 7"
Keyboard	Touchscreen
Connectors	Pluggable terminal strips
Temperature measurement range	-100°C ÷ 500°C
Temperature measurement resolution	0,1°C
Temperature measurement error	≤ ±0,5°C (applies to the measurement path of the controller)
Humidity measurement error	≤ ±1% RH (applies to the measurement path of the controller)
Inputs	6 analog inputs, configurable for measurement (PT100/thermocouple K, J/0÷20mA, 4÷20mA/MasterClip T, H) 8 digital inputs 24V AC/DC (for control) 1 digital input OneWire (measurement) 1 analog input PT100 (safety module)
Communication	32 transistor inputs, 24VDC (load capacity 400mA/channel) 4 analog inputs configurable (0÷20mA, 4÷20mA) 1 relay input 250V 2A (safety module)
Registration	30000 records
Software	Setup I _{max} 700 (PC) , MPC4 (PC)
Dimensions	External dimension 177x270x80mm (width x height x depth) mounting dimension 142x236mm (width x height)

3. Content of the package

- Controller Indu IMAX700,
- set of connectors,
- mounting kit,
- charger,
- operating manual,
- warranty card.

Mounting	Screwed, 8 mounting holes (front) or 4 mounting hooks (back)
Net weight	960g
Protection class: IP	65 (front) 20 (back)
Working conditions	Temperature: 0°C ÷ 55°C Humidity: 5%RH ÷ 85%RH
EC conformity	2014/30/UE ROHS 2011/65/UE 2014/35/UE PN-EN IEC 61000-6-2:2019 PN-EN 61000-4-4:2013-05 PN-EN 61000-4-2:2011 PN-EN 61000-4-11:2007 PN-EN 61131-2:2008

4. Device dimensions

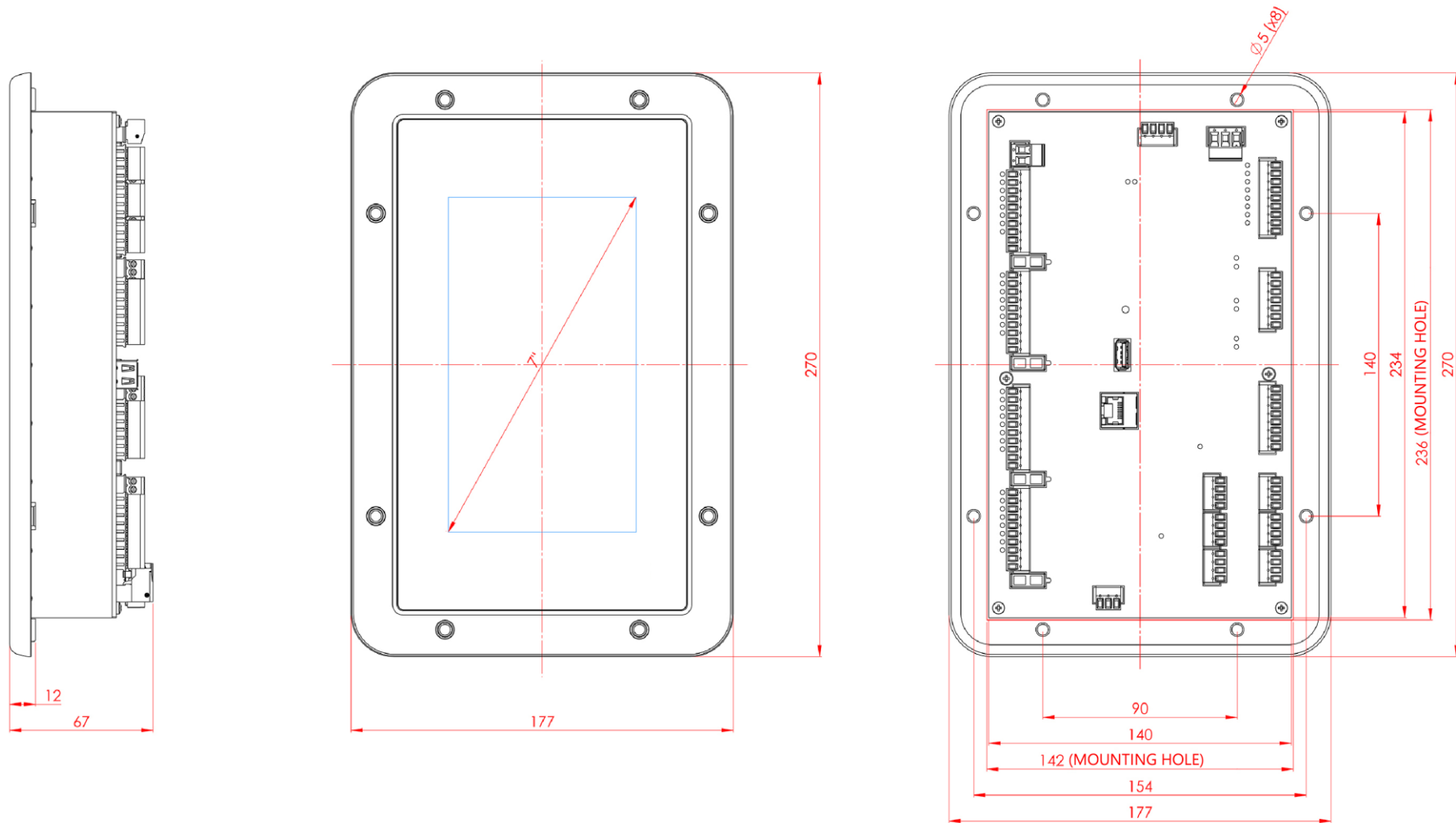


Figure 1

Figure 2

5. Connection description

1. Sensor connection OneWire (CLIP) (98-100).
2. Connection of measuring sensors, analog inputs (1-24).
3. Digital output connections (56-95).
4. Analog output connections.
5. LAN port.
6. USB port.
7. Serial communication port connections.
8. Digital input connections.
9. Power connection.
10. Safety module control output connection.
11. Temperature sensor connection PT100, safety module.
12. Fuses; each of the fuses protects one section (8 pcs.) of binary outputs.

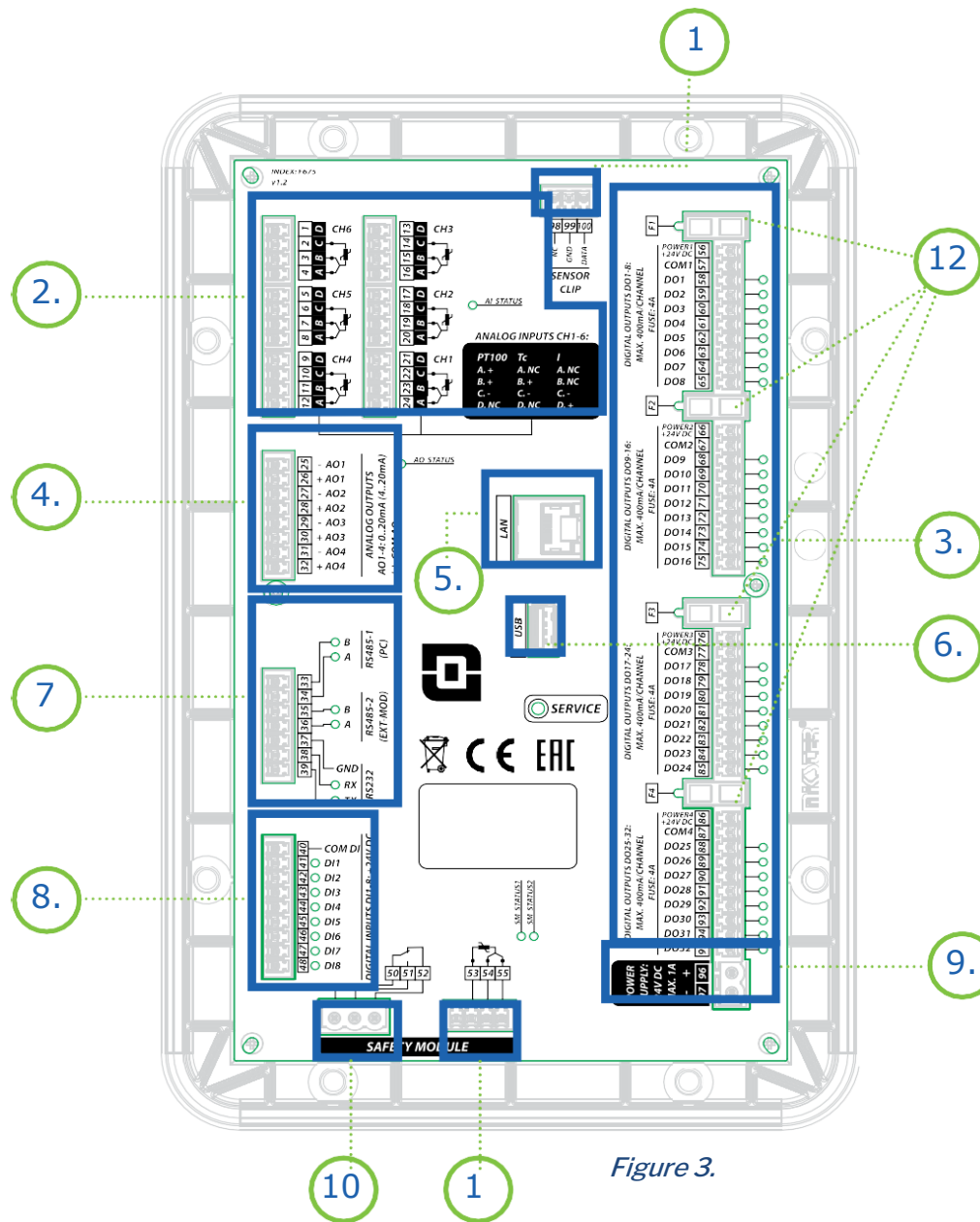
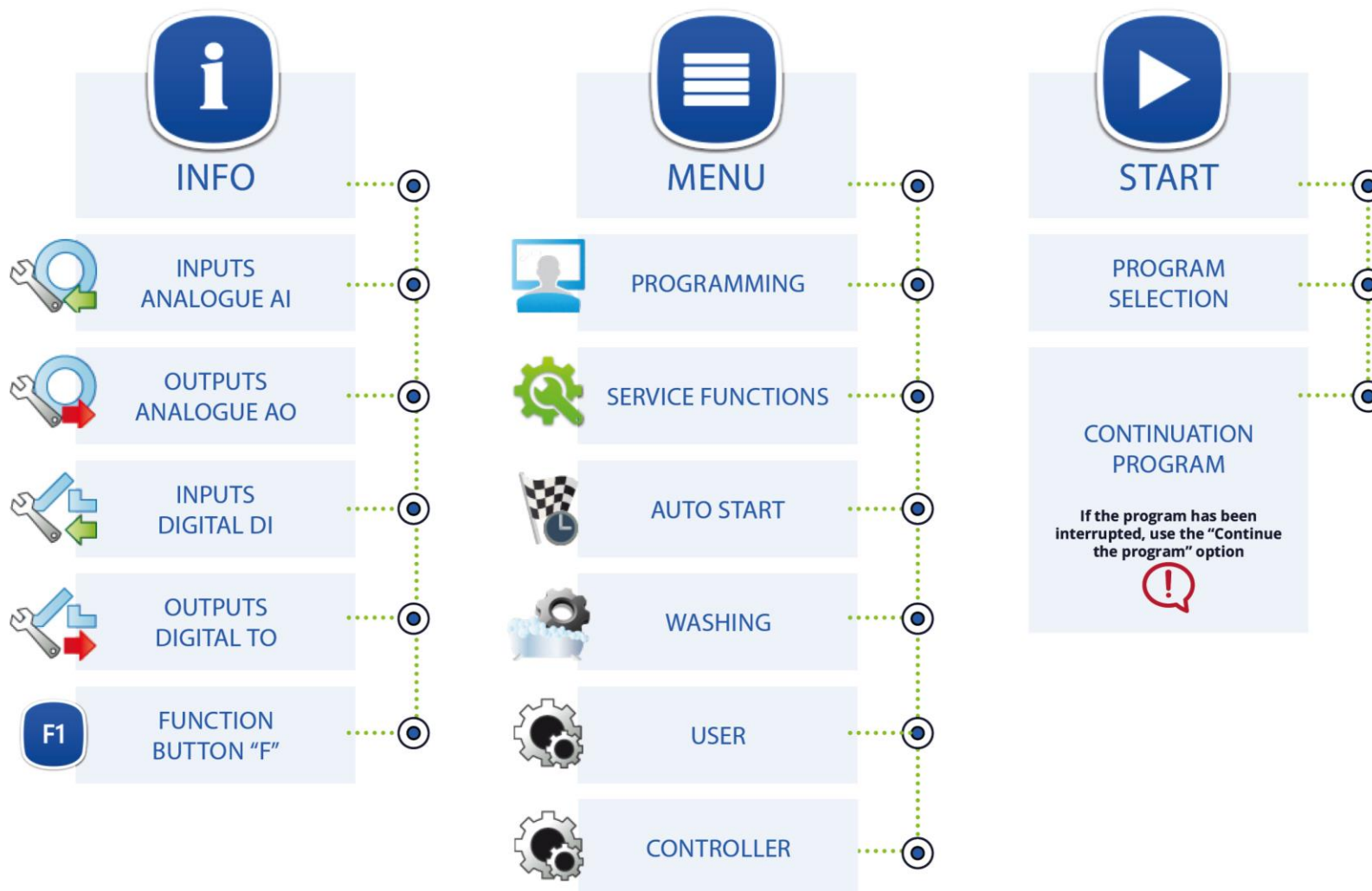


Figure 3.

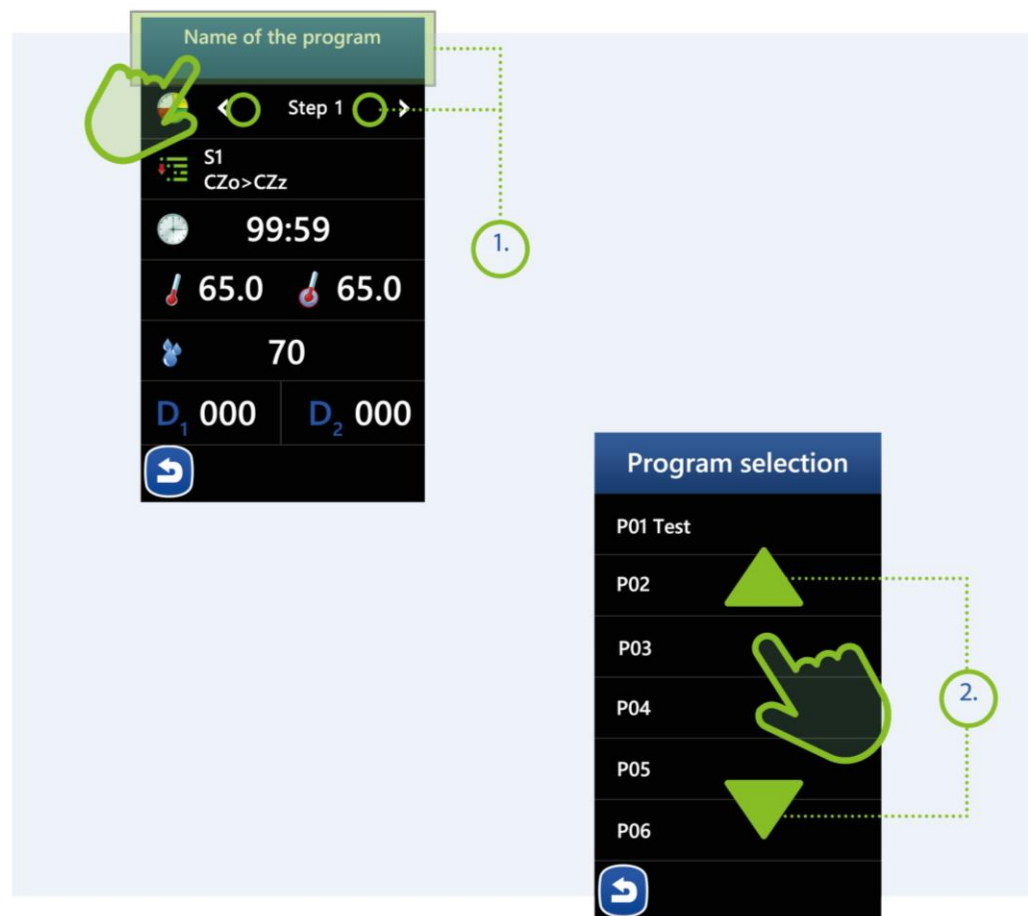
6. Structure diagram Controller menu



7. Supported gestures

We can operate the application using two types of gestures:

1. Selection gesture - pressing the "field" on the screen.
2. List scrolling gesture - move your finger up/down on the screen.



8. Start of work

When the power is turned on, the graphical display shows the home screen, which shows the following information:

1. System information area. This field displays information about the current state of the controller:
 - serial number,
 - software version,
 - date and time,
 - alarm information,
 - Work status
2. Area Clock / Measurements:
 - Depending on the menu parameter >> service functions >> [password] >> settings >> F38 in this area are displayed the real time clock or current measurements from the measurement channel 1, 2 and 3,
 - F38=1 - clock display,
 - F38=0 - measurement display.
3. Washing area:
 - Depending on the parameter Menu >> washing >> settings >> [password] >> Washing time, in this area is displayed an information how much time is left until the necessary washing of the machine.
 - If the parameter "Washing time" is >0, the information is displayed, if <0, the information is not displayed.
4. Customer logo.
5. INFO button.
6. Menu button.
7. Program start button.

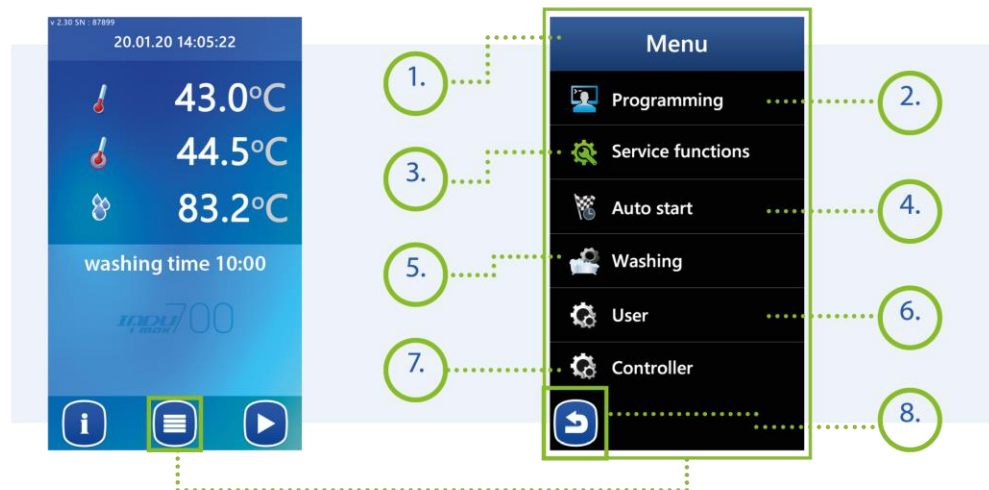


8.1 Menu button

Pressing the **Menu** button will display the following functions on the view screen:

1. The name of the current view.
2. Programming button:
 - Programming of technological processes.
3. Service functions button:
 - Controller configuration. The function is available for the device service technician.
4. Autostart button:
 - Access to the configuration menu and starting the autostart.

5. Washing button:
 - Access to the functions related to the configuration and washing programs of the chamber.
6. Button Settings/User:
 - Access to device settings: date, language, energy costs, logs.
7. Information button:
 - Displaying system information of the controller.
8. Button Back:
 - Back to the home screen.

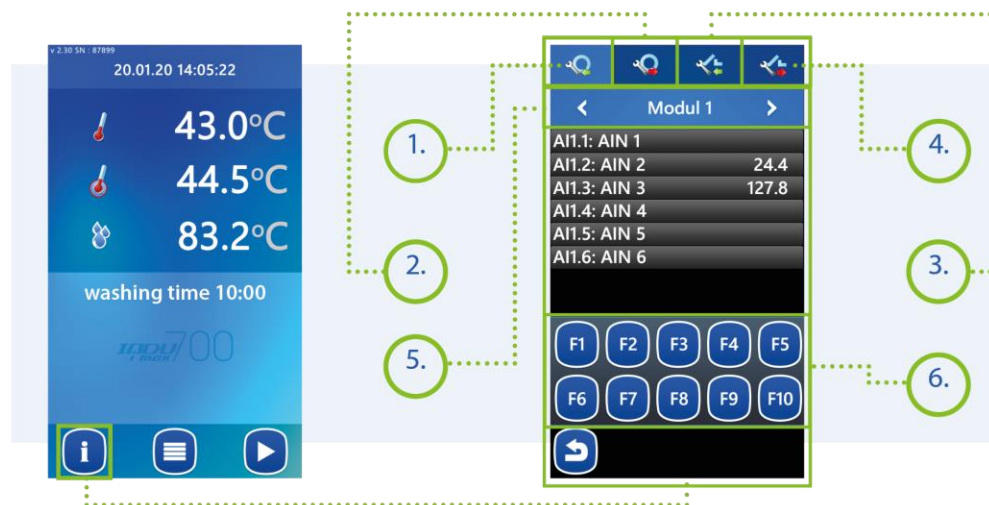


8.2 Button Info

Pressing the Info button will display the following functions on the view screen:

1. Displaying information on the status of analog inputs.
2. Displaying information on the status of analog outputs.
3. Displaying information on the status of digital inputs.
4. Displaying information on the status of digital outputs.

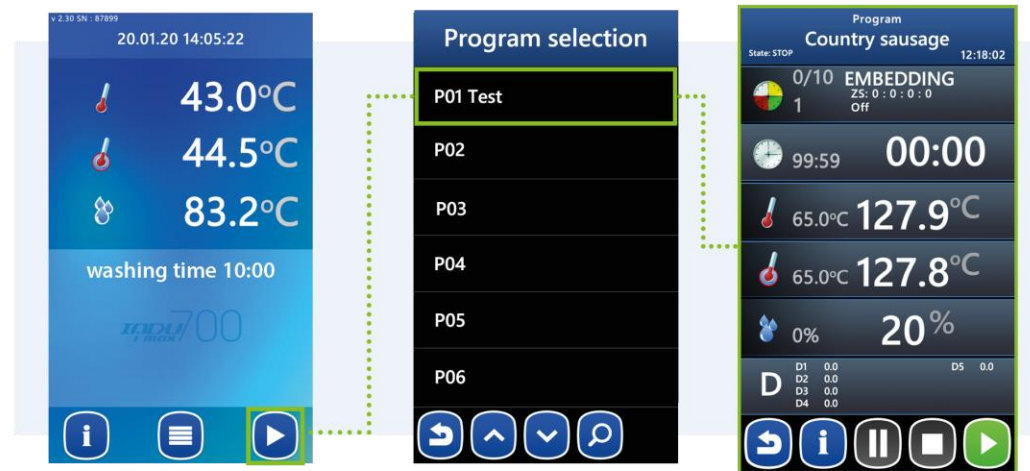
5. Below the input/output selection area, there is a button that allows to change the number of the module from which the information is displayed.
6. At the bottom of the view, there are ten buttons that are used to call special modes (the description will be in the place where the special modes settings are).



Home screen | Start

8.3 Button Start

Pressing the Start button will display the following functions on the view screen.



Home screen | Start

8.3.1 Functions Start

1. Software name, working status, current time.
2. Name, number and step end condition, given constant number of loops.
3. Set and read time.
4. Set and read temperature of the chamber.
5. Set and read bar temperature.
6. Set and read humidity.
7. Active accessories.
8. Back.
9. Info.
10. Pause
11. Stop
12. Start.



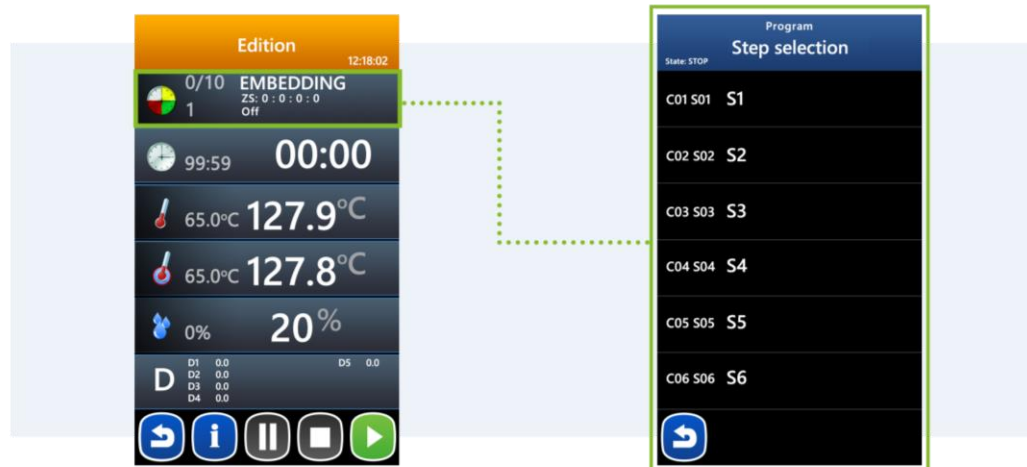
Home screen | Start

8.3.1.1. Step selection

1. **Step time progress area.** In this field, a green indicator will show proportionally how much time has elapsed/ remained in a given step. The indication is indicative.

The following informations are also displayed:

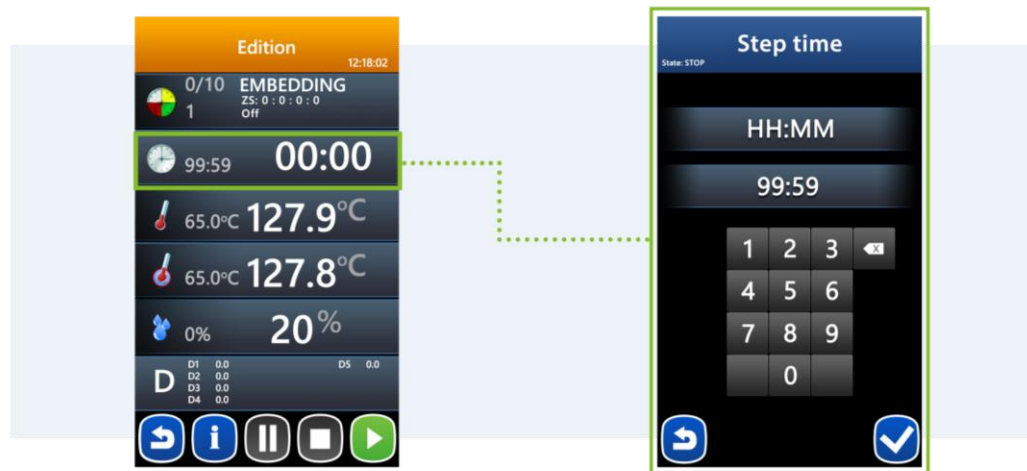
- cycle/step name (e.g. embedding),
- cycle/step number (e.g. 1),
- cycle/step end conditions (e.g. CZo>CZz),
- constant set values for the step, e.g. ZS: 10:25:0:100.



Home screen | Start | Edition

8.3.1.2. Step time settings

1. **Step time set/read value area.** In this field, the set value and the current (read) value of the step time are displayed. The green indicator will proportionally show how much time has elapsed/ remained for the entire process. The indication is indicative.



8.3.1.3. Temperature settings

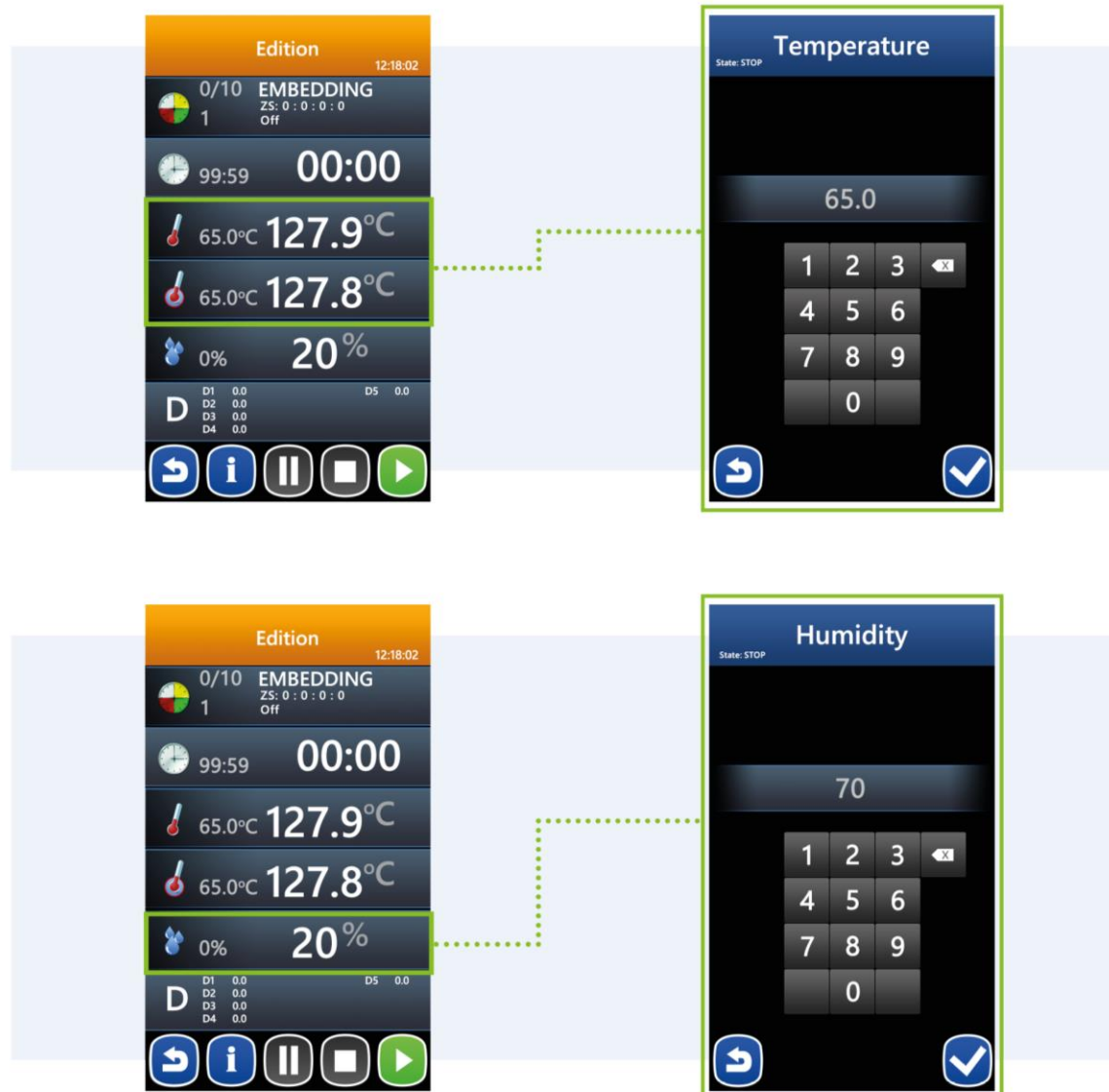
1. Chamber temperature setpoint area. This field displays the following informations:
 - chamber temperature set value (e.g. 65.0°C),
 - chamber read temperature (e.g. 127.9°C).
2. Bar temperature setpoint area. This field displays the following informations:
 - bar temperature set value (e.g. 65.0°C),
 - bar read temperature (e.g. 127.8°C).

8.3.1.4. Humidity settings

1. Humidity set point area. This field displays following informations:
 - humidity set value (e.g. 0%),
 - humidity read value (e.g. 20%),

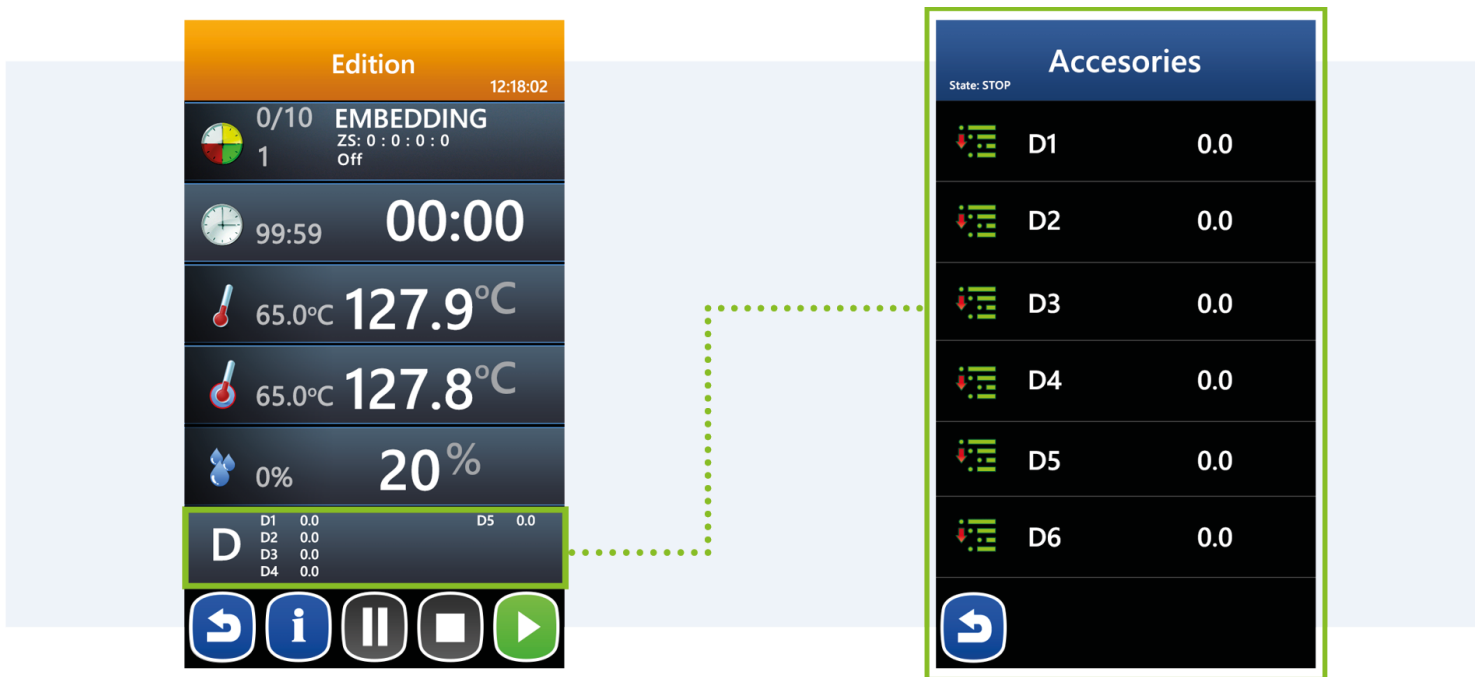
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8.3.1.5. Accessories

- 1. The area of additional parameters set in the step being performed. These values are set parameters for controllers and setpoints. Displayed if D1 to D8 are active.



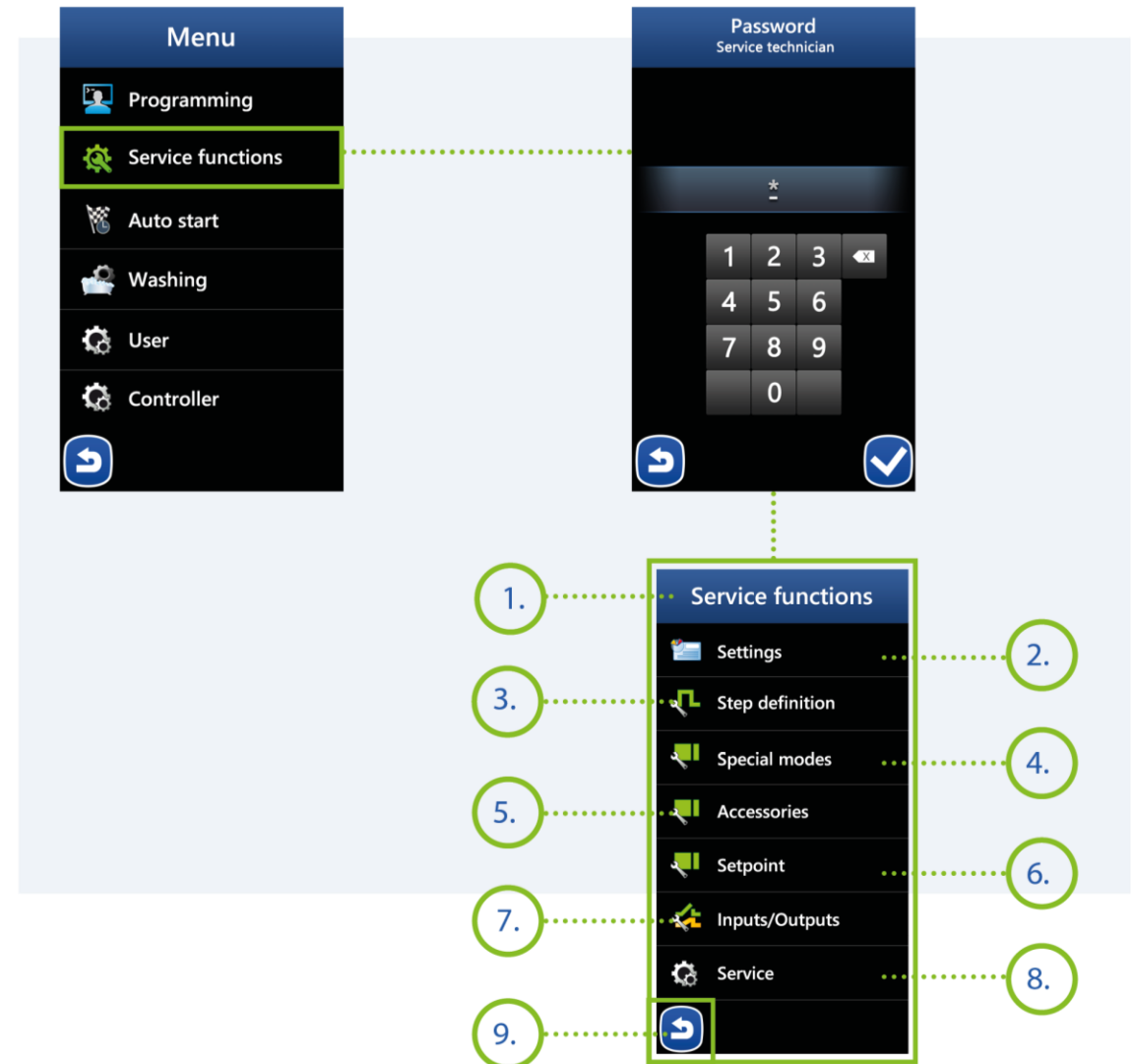
9. Service functions

Selecting the Service function field displays the password view. Entering the correct password (default 2222) allows access to the service functions.

1. The name of the current view.
2. Settings - go to configuration of controller settings.
3. Step definitions - programming of individual steps in the technological process.
4. Special modes - settings for special modes of the controller.
5. Accessories - support for accessories.
6. Setpoint - global values for e.g. controllers, alarms, etc.
7. Inputs / Outputs - configuration of inputs and outputs of the controller.
8. Service - controller settings.
9. Return to the previous screen.



It is possible to disable the password protection if the parameter [menu] >> service functions >> [password] >> settings >> F36=0

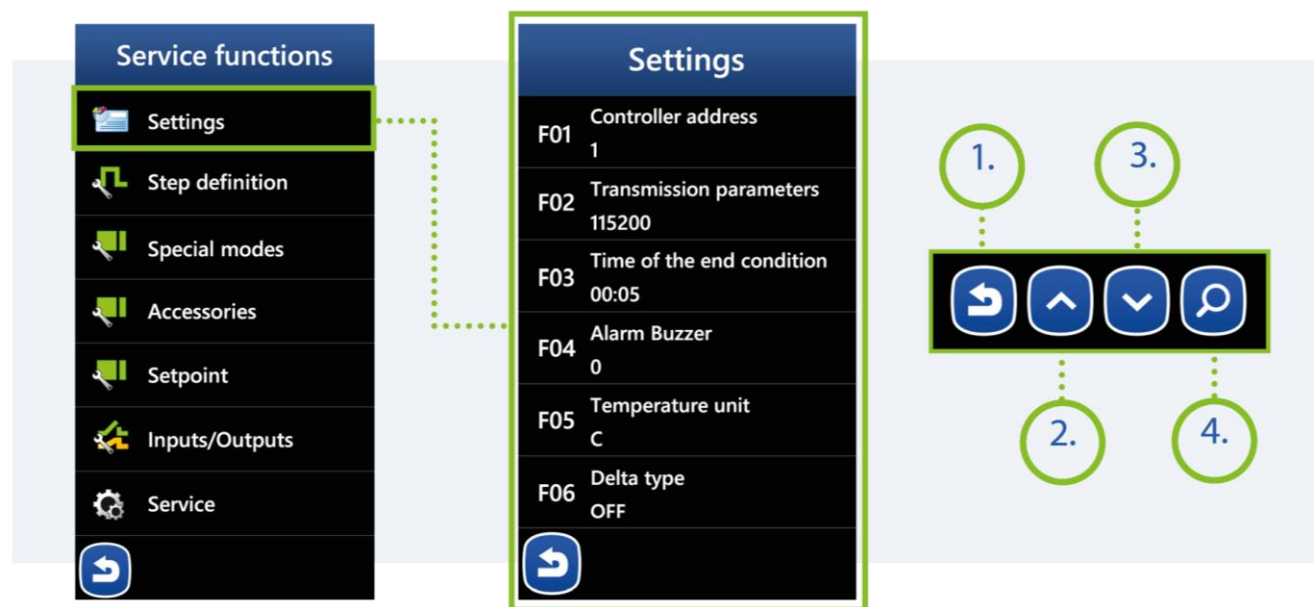


9.1 Settings (setup)

The view **Settings** contains a list of configuration parameters of the controller. Detailed description in the table below.

Navigation keys:

1. Button Back.
2. Button Navigate up.
3. Button Navigate down.
4. Button Selection of a cell number.



9.1.1 Setting the parameters of the controller

No. of the cell	Name of the cell	Factory set value	Area	Description
F01	Controller address	1	1.255	The number in the RS-485 network under which the controller is seen by the PC.
F02	Transmission parameters	115200	-	Transmission speed RS485 – PC connection: <ul style="list-style-type: none"> • 9600, • 19200, • 38400, • 62500, • 115200.
F03	End condition time	5 seconds	From 0 to 99:59	Value given in MM:SS. MM = minutes SS = seconds. Extra time to complete the cycle
F04	Alarm buzzer	Off	On/OFF	<ul style="list-style-type: none"> • OFF – turned off • ON – turned on
F05	Temperature unit	C	C/F	Temperature measurement unit: <ul style="list-style-type: none"> • °C - Celsius, • °F – Fahrenheit.
F06	Delta type	OFF	OFF TK-TB TK/min	<ul style="list-style-type: none"> • OFF - delta turned off. • TK-TB - delta bar - chamber • TK/min - delta temperature increase over time.
F07	Registration frequency	5	From 1 to 60 seconds	Registration write frequency.
F08	Restart after power failure	5h	from 0 to 10 hours	Value given in HH:MM. HH = hours MM = minutes.
F09	Maximum preset chamber temperature (TK)	200	From -99,9 to 999,9	The maximum preset temperature of the chamber in accordance with the selected temperature unit.
F10	Maximum preset bar temperature (TB)	80	From -99,9 to 999,9	The maximum preset temperature of the bar in accordance with the selected temperature unit.

F11	Minimum preset chamber temperature (TK)	0	From -99,9 to 999,9	The minimum preset temperature of the chamber in accordance with the selected temperature unit.
F12	Minimum preset bar temperature (TB)	0	From -99,9 to 999,9	The minimum preset temperature of the bar in accordance with the selected temperature unit.
F13	Alarm retry time	10	From 1 to 999	Value given in S = seconds. Time to re-display the alarm on the controller screen.
F14	INn end condition	DI	DI/DO	<ul style="list-style-type: none"> DI – Digital Input, DO – Digital Output. Selection of the type of output or input that will be controlled or the signal ending the cycle will be given to them.
F15	INn number	4	DI – from 1 to 8 DO from 1 to 32	Input or output number for the Inn condition.
F16	Edition block	OFF	ON/OFF	<ul style="list-style-type: none"> ON – editing of the process parameters during its duration, OFF – no editing of the process parameters during its duration.
F17	Keyboard sound	OFF	ON/OFF	<ul style="list-style-type: none"> OFF – turned off ON – turned on.
F18	Time unit	HH:MM	HH:MM MM:SS	<ul style="list-style-type: none"> HH = hours, MM = minutes, SS = seconds.
F19	ID	OFF	ON/OFF	<ul style="list-style-type: none"> OFF – turned off, ON – turned on, Product or process identification.
F20	Decimal values	OFF	ON/OFF	<ul style="list-style-type: none"> OFF – displayed values, OFF – not displayed values, Decimal temperature values display.
F21	Number of loops	0	From 0 to 100	The number of repetitions of the program being executed.
F22	Engine relay, first gear (B1)	0	From 0 to 32	<ul style="list-style-type: none"> 0 - function inactive, From 1 to 32 - determines which of the relays controls the first gear of the engine.
F23	Engine relay, second gear (B2)	0	From 0 to 32	<ul style="list-style-type: none"> 0 - function inactive, From 1 to 32 - determines which of the relays controls the second gear of the engine.
F24	Engine acceleration time	0	From 1 to 999	Time given in seconds. Specifies the minimum time needed to accelerate the engine in first gear before it can be safely shifted to 2nd gear.

F25	Engine deceleration time	0	From 1 to 999	Time given in seconds. Specifies the minimum time required for the engine to decelerate from second gear before it can be safely shifted into gear.
F26	Display time Info	10	From 0 to 5999	<ul style="list-style-type: none"> • 0 - The "INFO" window is not hidden automatically. • From 1 to 5999 - time after which automatic hiding occurs.
F27	Step edition in the cycle	OFF	ON/OFF	<ul style="list-style-type: none"> • OFF - no editing, • ON - editing possible. Ability to select a technological step for the current cycle.
F28	Time to exit editing	10	From 0 to 9999	The time after which the controller exits editing. S = Second.
F29	Time to logout	10	From 0 to 9999	Time to logout. S = Second.
F30	Screen lock time	5	From 0 to 9999	Screen lock time. S = Second.
F31	Turning off the bar	OFF	ON/OFF	<ul style="list-style-type: none"> • OFF - bar temperature visible, • ON - bar temperature invisible.
F32	Humidity shutdown	OFF	ON/OFF	<ul style="list-style-type: none"> • OFF - humidity visible, • ON - humidity invisible.
F33	Access control	0	Inactive	Function disabled.
F34	User password	1111	From 0000 to 9999	User access password: <ul style="list-style-type: none"> • 0000 - no password, • XXXX - four-digit password.
F35	Programming password	1111	From 0000 to 9999	Programming access password: <ul style="list-style-type: none"> • 0000 - no password, • XXXX - four-digit password.
F36	Service password	1111	From 0000 to 9999	Access password to service functions: <ul style="list-style-type: none"> • 0000 - no password, • XXXX - four-digit password.
F37	Digital sensor	OFF	ON/OFF	<ul style="list-style-type: none"> • ON - connected, • OFF - not connected. Digital sensor CLIP.
F38	Big clock	OFF	ON/OFF	<ul style="list-style-type: none"> • ON - a large clock on the main screen is running, • OFF - the large clock on the main screen is turned off.

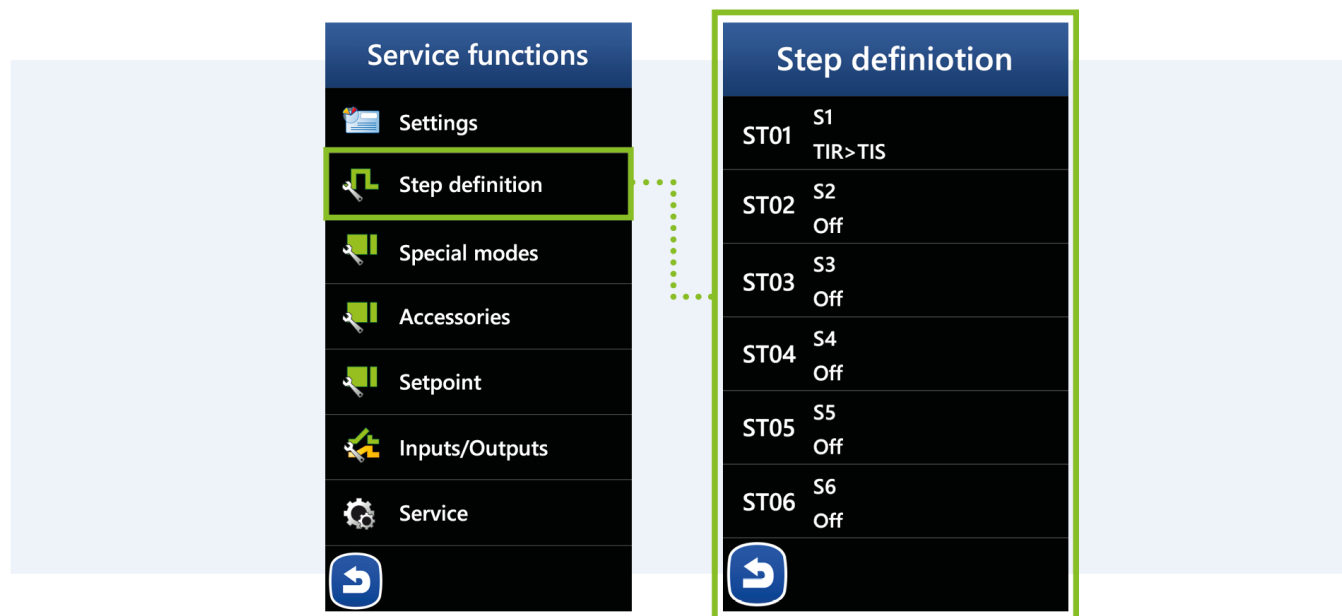
F39	Screensaver	OFF	ON/OFF	<ul style="list-style-type: none"> • ON - activated screensaver, • OFF - no screensaver.
F40	Transmission blocked	OFF	ON/OFF	<ul style="list-style-type: none"> • ON - active, • OFF - inactive. Blocking communication with the program Setup iMAX700.
F41	Factory code	1	Inactive	Inactive.
F42	Hide details INFO	OFF	ON/OFF	<ul style="list-style-type: none"> • ON - hidden configuration details in the INFO screen, • OFF - displaying configuration details in the INFO screen.
F43	Account inquiry	ON	ON/OFF	<ul style="list-style-type: none"> • ON - when the process has been interrupted with the STOP key and restarted, the controller asks whether to continue the interrupted process.
F44	Registration mode - continuous process	Process	Process/Continuous	<ul style="list-style-type: none"> • OFF - the controller does not ask for continuation, Registration only when the START button is activated, • Continuous - always when the controller is powered.
F45	Autostart	ON	ON/OFF	<ul style="list-style-type: none"> • ON - activation of the AUTOSTART function, • OFF - (option available/not available for the user).
F46	Washing edition	OFF	OFF/ON	<ul style="list-style-type: none"> • OFF - no possibility to edit parameters during the process, • ON - permission to edit.
F47	Factory code	ON	ON/OFF	<ul style="list-style-type: none"> • ON - activation of access to code-protected functions by entering the factory code, • OFF - factory code inactive.
F48	User Ain Offset	OFF	OFF/ON	<ul style="list-style-type: none"> • OFF - no possibility to correct the analog input reading by the user, • ON - activating the possibility of correction of the read value of the analog input by the user.
F49	User - access to Diagn	OFF	OFF/ON	<ul style="list-style-type: none"> • OFF - no possibility to diagnose the outputs by the user, • ON - activating the possibility of controlling the controller outputs in the diagnostic mode by the user.

Menu | Service functions | Step definitions

9.2. Step definition

Selecting the Step definition option, a list of step definitions is displayed.

By pressing the field on the list with the selected step definition, we go to its edition.



9.2.1 Editing a step

definition

A step definition is a group of parameters.

1. Name - proper name of the step, e.g. **S1**.
2. End condition - a logical dependence which, when met, ends the current step and proceeds to the next step.
3. Status of active digital outputs in a given step.
4. Setpoints for controllers and setpoints assigned to this particular step.



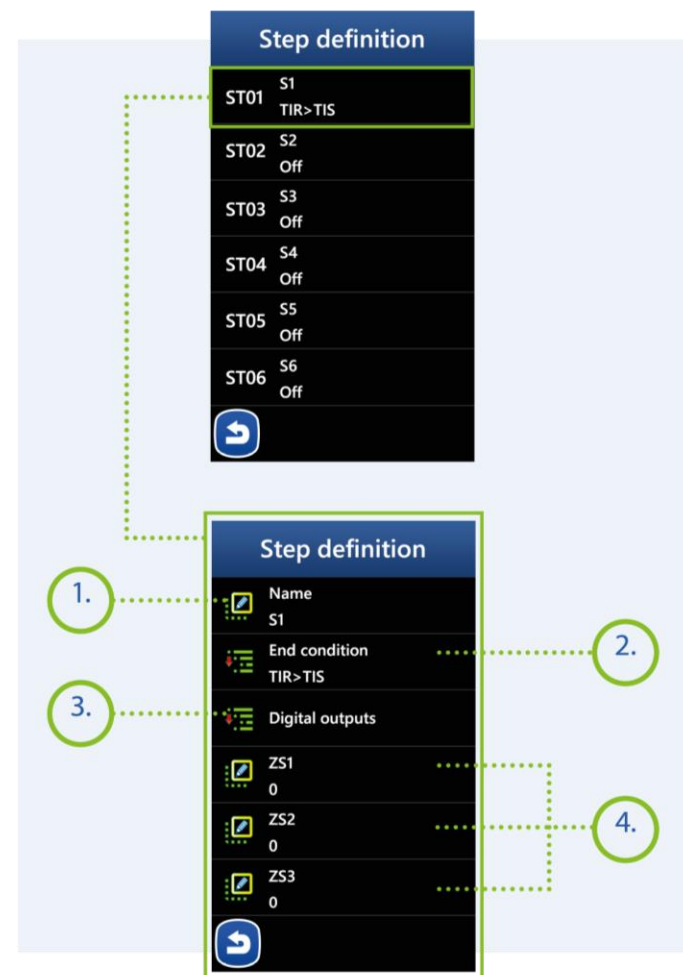
Warning!

The setpoints given in the above parameter are active only during this particular step.

Application example

In the definition of **S2**, we want the air damper to be open at 40%. In this case, assuming that the control signal is generated on the analog output AO1.1, enter the following parameters:

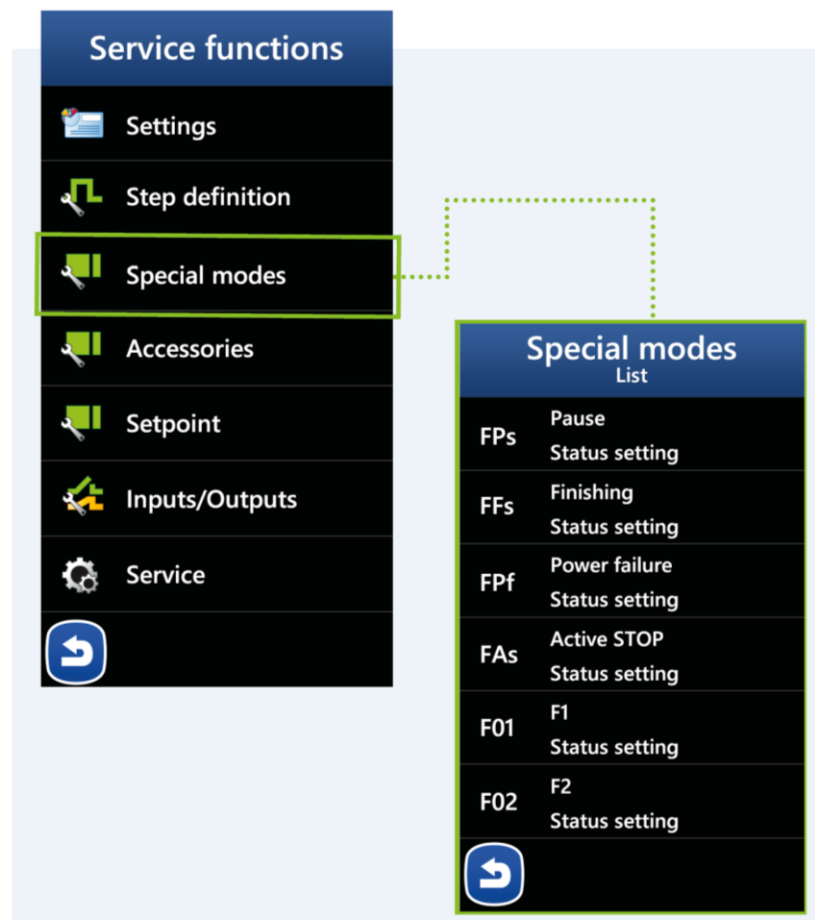
- **setting value ZS1**
[menu >> service functions > [password] >> step definition >> ST01 >> ZS1] = 40 [%];
- **analog output mode definition**
- [menu >> service functions > [password] >> inputs / outputs >> analog outputs >> configuration >> AO1.1 >> mode] = "setter";
- **definition of the minimum value of the analog output**
[menu >> service functions > [password] >> inputs / outputs >> analog outputs >> configuration >> AO1.1 >> min]=0;
- **definition of the maximum value of the analog output**
[menu >> service functions > [password] >> inputs / outputs >> analog outputs >> configuration >> AO1.1 >> max] = 100.



9.3. Special modes



The special mode is understood as the mode of operation initiated by the operator regardless of the program operation of the controller or automatically activated after the completion of the program/process.

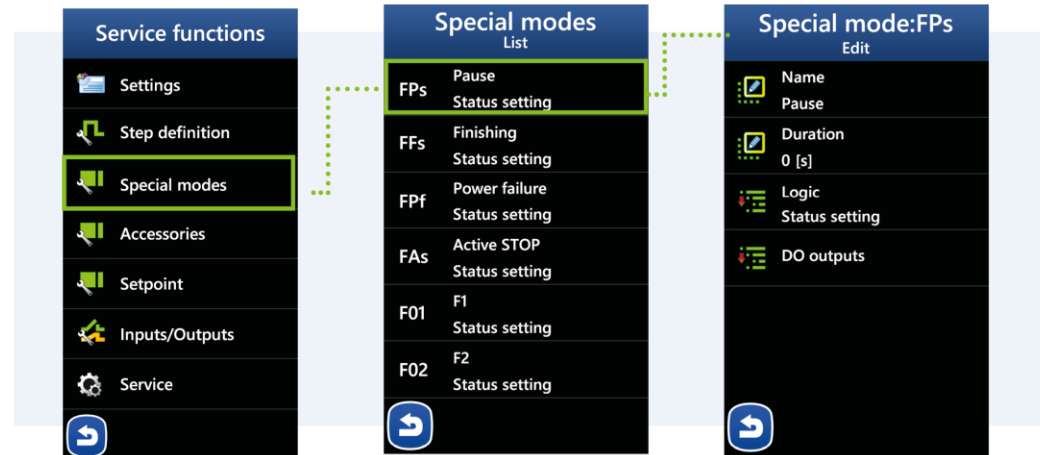
1. Calling the special mode causes the activation of the system of digital DO and analog outputs AO, in accordance with the configuration defined for a given mode. Analog outputs AO, can only be assigned to the following modes: Stop, Active Stop, Pause.



Menu | Service functions | Special modes | Pause

9.3.1 Special modes Pause

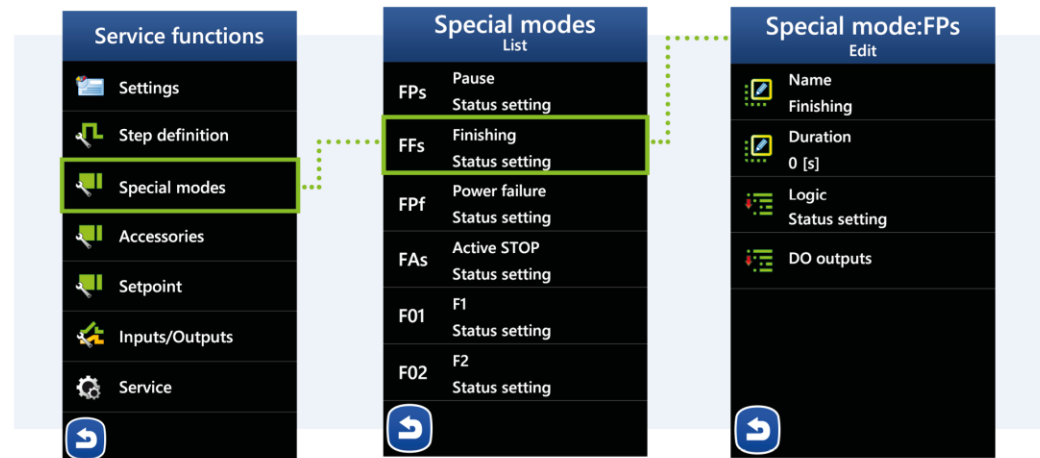
1. The **Pause** - mode is activated with the **PAUSE**  button during the program execution.
2. The **Pause** - mode is ended by pressing the **PAUSE**  **STOP** button after the declared duration of the mode has elapsed.



Menu | Service functions | Special Modes | Stop

9.3.2 Special modes Stop

1. The **Stop** - mode (formerly called the special state STOP) - is activated in two ways.
 - With the **STOP** button during the program execution.
 - Automatically after program ending.
2. The **stop mode is ended by:**
 - pressing the **START** key (restarting the program/process,
 - pressing the **RETURN** key (transition to the **STOP** or **ACTIVE STOP** mode),
 - or after the declared time has elapsed.



9.3.3. Special Modes Power Failure

1. Mode - Power Failure - this mode causes previously configured behavior of the controller when the power is restored, after it is turned off, e.g.: the ability to return to an interrupted process, control of digital outputs.

It is activated when the controller power is turned on, however, provided that:

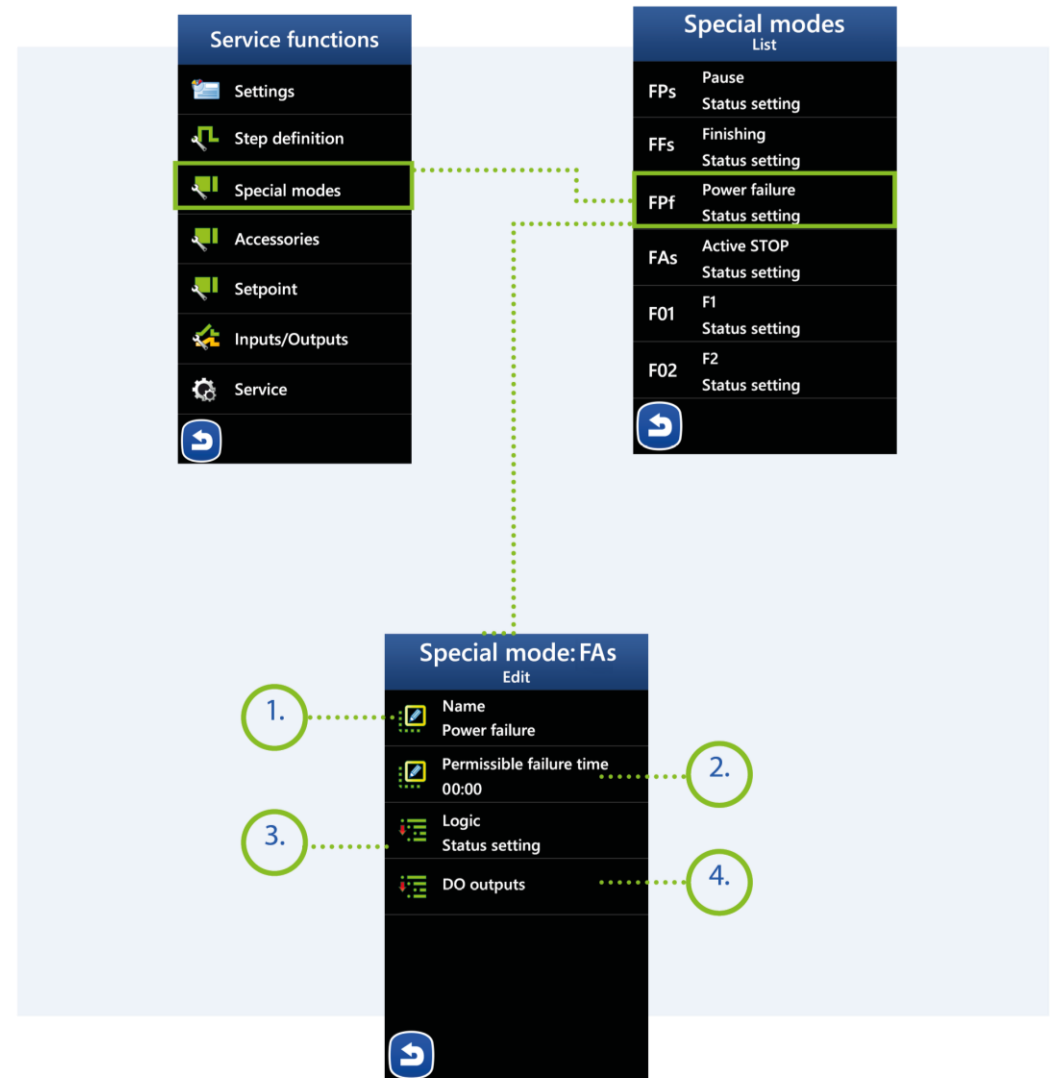
- there was an emergency power shutdown during program execution earlier;
- " **Allowed Power failure time** " has not been exceeded, menu >> service functions > [password] >> special modes >> power failure >> Permissible power failure time".



Warning!
If "permissible decay time"=0, then the function is inactive.

Displaying settings for selected modes:

1. Mode Name - Power Loss.
2. allowable decay time.
3. Logic – defining how the DO outputs are supposed to work:
 - setting the State - the controller will activate only the declared DO outputs,
 - adding a State – the controller will additionally switch on the declared DO outputs (logical sum),
 - State subtraction – the controller will disable the declared DO outputs (logical product).
4. DO outputs – declaration of outputs and their working mode in the configured mode.



9.3.4 Special modes Active STOP

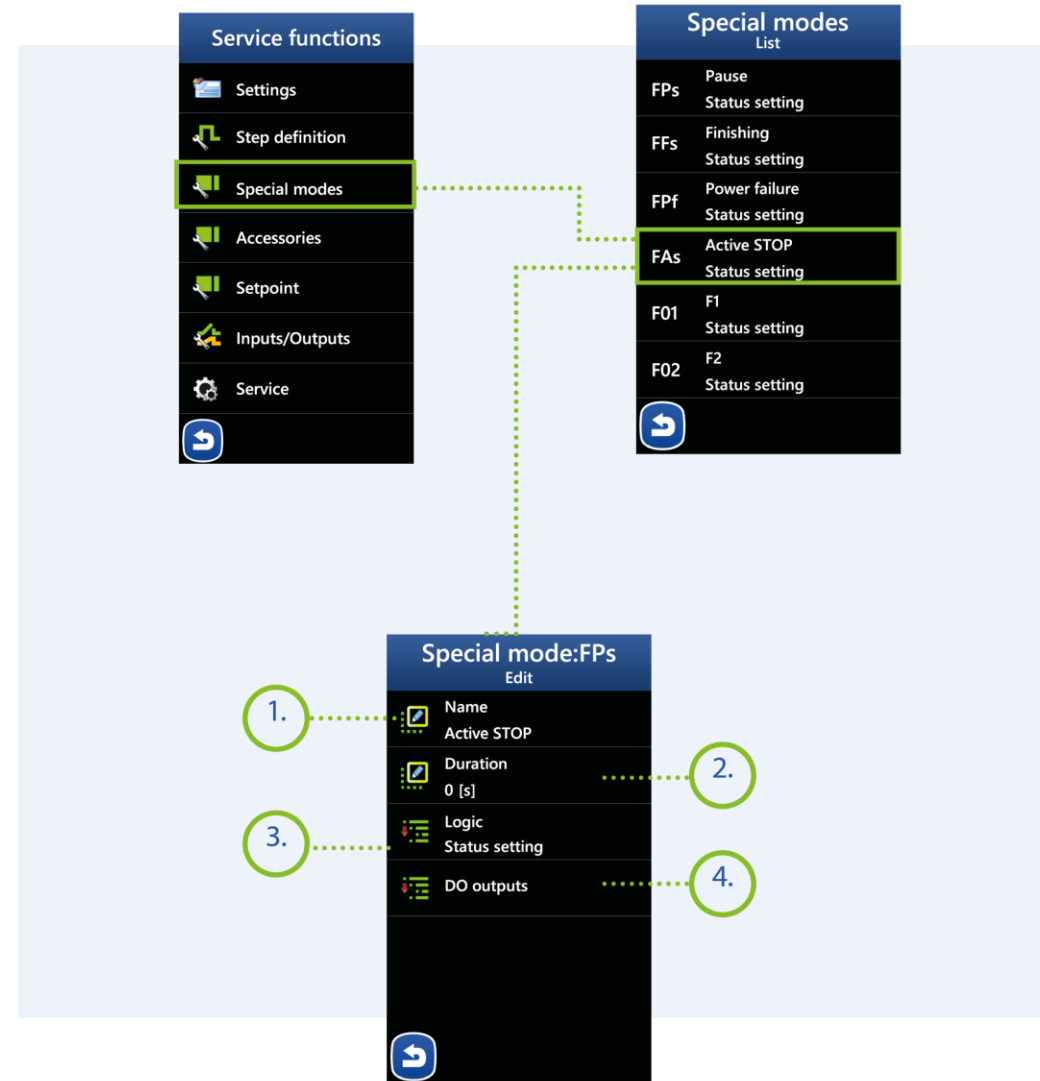
1. Mode - Active STOP

Mode in which, despite the lack of implementation of the technological program, the controller is able to control the digital outputs declared for this mode.

One example of when ACTIVE STOP is activated is to control the opening of the dampers to ventilate the chamber.

Displaying settings for selected modes:

1. Mode Name - Active STOP.
2. Duration from 1 to 999 seconds - determines the duration of the Mode. For the value -1, the mode lasts indefinitely.
3. Logic – defining how the DO outputs are supposed to work:
 - State setting - the controller will turn on only declared,
 - Adding the State - the controller will additionally activate the declared,
 - State subtraction – the controller will disable the declared DO outputs.
4. DO outputs – declaration of outputs and their working mode in the configured mode.



9.3.5 F01 to F10

The F1-F10 modes are activated by pressing the F1-F10 keys in the "INFO" view. Pressing the above-mentioned keys activates the DO digital output system, according to the configuration defined for this mode. The F1-F10 mode is ended after pressing the F1-F10 key again or after the declared time for this mode has elapsed.

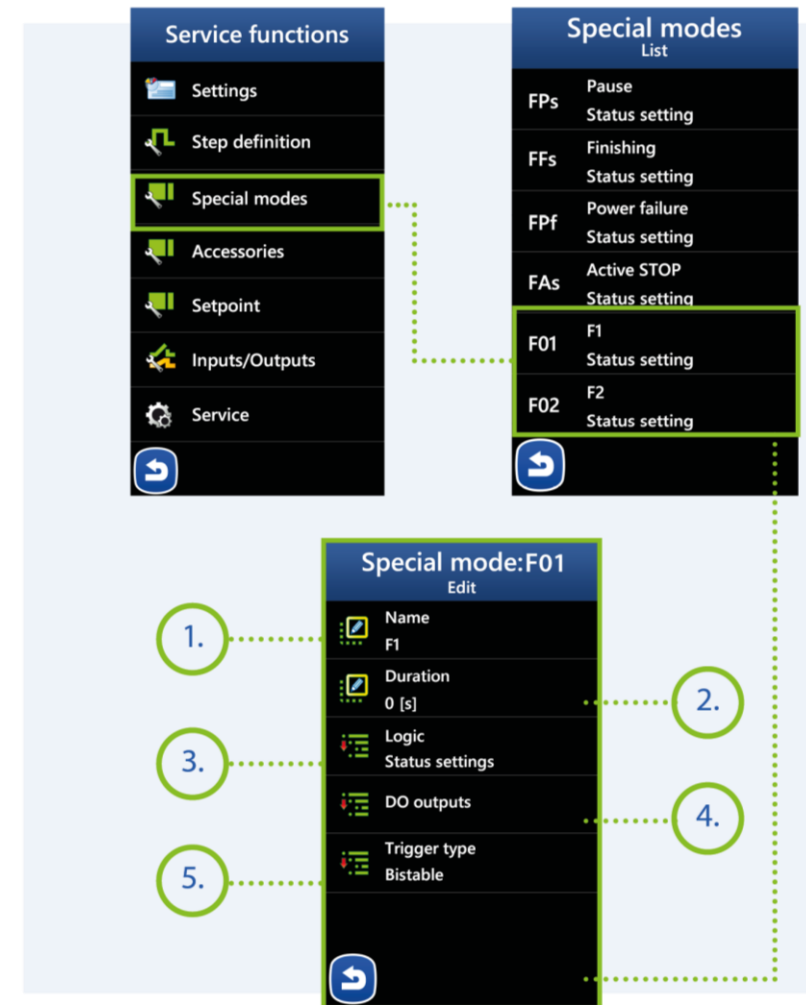


Warning!

There are two ways the F1-F10 keys work. **Monostable** - the key activates the F1-F10 mode as long as it is pressed. Releasing the key disables the F1-F10 mode. **Bistable** - the key activates the F1-F10 mode after the first press. The F1-F10 mode is deactivated by pressing the key again.

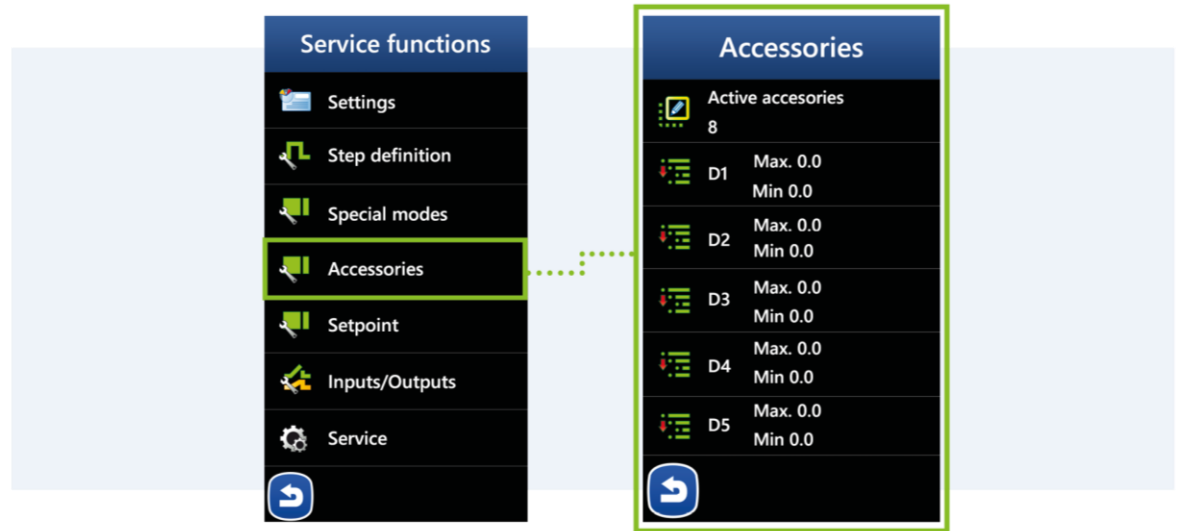
Selection of fields F01 to F10 displays settings for selected special modes:

1. Mode Name - For modes from F1 to F10 it is possible to assign a name.
2. Duration from 1 to 999 seconds - determines the duration of the Mode. For the value -1, the mode lasts indefinitely.
3. Logic - defining how the DO outputs are supposed to work:
 - Status Settings - the controller will activate only the declared DO outputs,
 - Adding a State - the controller will additionally switch on the declared DO outputs (logical product),
 - State subtraction - the controller will disable the declared DO outputs (logical product).
4. Outputs - declaration of outputs and their working mode in the configured mode.
5. Trigger Type:
 - Bistable - DO outputs are switched on for the declared Mode duration times,
 - Monostable - DO outputs are switched on as long as the Mode button from F1 to F10 is pressed.



9.4 Accessories

ACCESSORIES is a group of parameters that can be used as set values in each of the technological steps for regulators and setpoints when defining technological programs and later during their execution.



9.5 Setpoint

SETPOINT is a group of parameters that can be used as setpoints for regulators and setpoints during the controller's operation. These are global values, assignable in all settings that allow it.

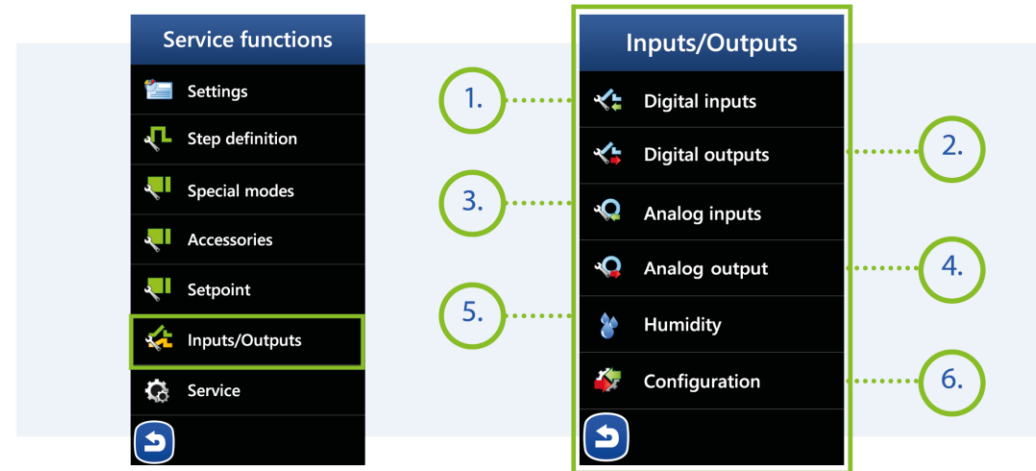


Menu | Service functions | Inputs/Outputs

9.6 Inputs/Outputs

Selecting the **Inputs/Outputs** field displays the following functions on the view screen:

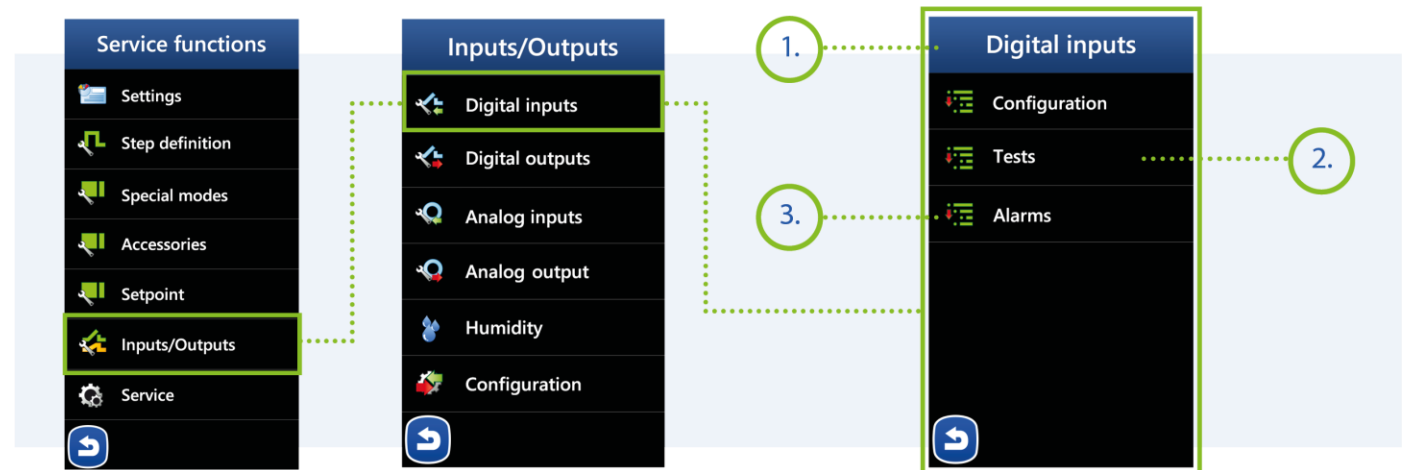
1. Configuration of DI digital inputs (binary inputs).
2. Configuration of digital outputs DO (transistor outputs).
3. Configuration of AI analog inputs (measuring inputs).
4. Configuration of analog outputs AO (current outputs).
5. Humidity measurement configuration.
6. Activation of add-on modules. Currently supported is DIN M2.



Menu | Service functions |
Inputs/Outputs | Digital inputs

9.6.1 Digital inputs DI

1. Configuration of DI digital inputs (binary inputs).
2. Digital output tests.
3. Configuration of alarms assigned to individual digital inputs.



9.6.1.2. Configuration

Selecting the Digital inputs field causes displaying on the screen an exemplary screen with a description of digital inputs.

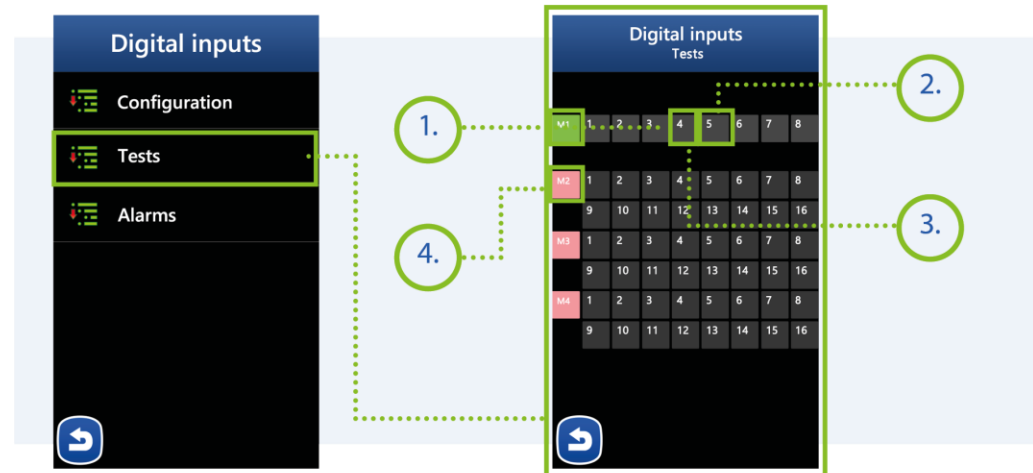
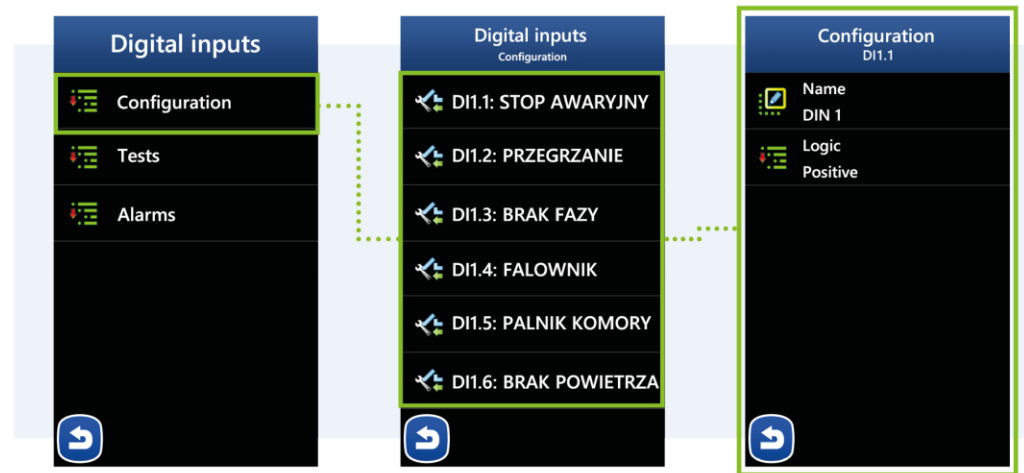
1. Configuration of the name of the selected input.
2. Behavior of the input reaction to the given signal:
 - Positive – the input reacts to signal loss,
 - Negative – the input reacts to the appearance of a signal.

9.6.1.3. Tests

Screen showing the status of digital inputs:

- Green colour active input,
- Grey colour input inactive.

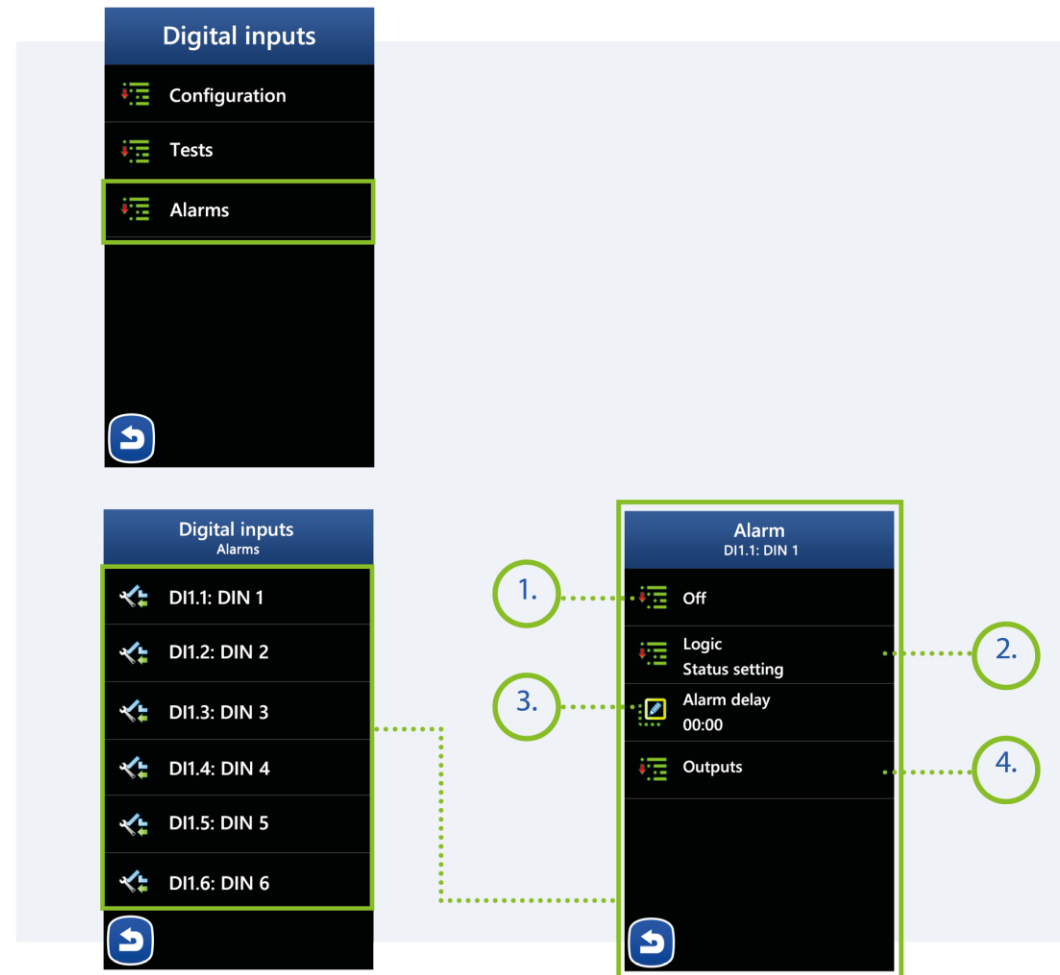
1. Active M1 module:
 - Input module M1 built into the controller (DI 1.1 to DI 1.8).
2. Inactive input no. 5.
3. Active input no. 4.
4. M2 module – additional external module (activation see Configuration).



9.6.1.4. DI alarms

Selecting the Alarms field displays the following view:

1. Alarm Mode:
 - Turned off,
 - program interruption,
 - Continuation of the program.
2. Logic – defining how the DO outputs are supposed to work,
 - Status setting. The state of the digital outputs is set as defined in the OUTPUTS option.
 - Adding status. The state of the digital outputs is the logical sum of the outputs activated during the alarm occurrence and the outputs defined in the OUTPUT option.
 - State subtraction. The state of the digital outputs is the logical product of the outputs activated during the alarm occurrence and the outputs defined in the OUTPUT option.
3. Alarm delay - delay time after which the alarm will be activated.
4. Outputs. Definition of the state of DO outputs after occurring of an alarm.



9.6.2. Digital outputs DO

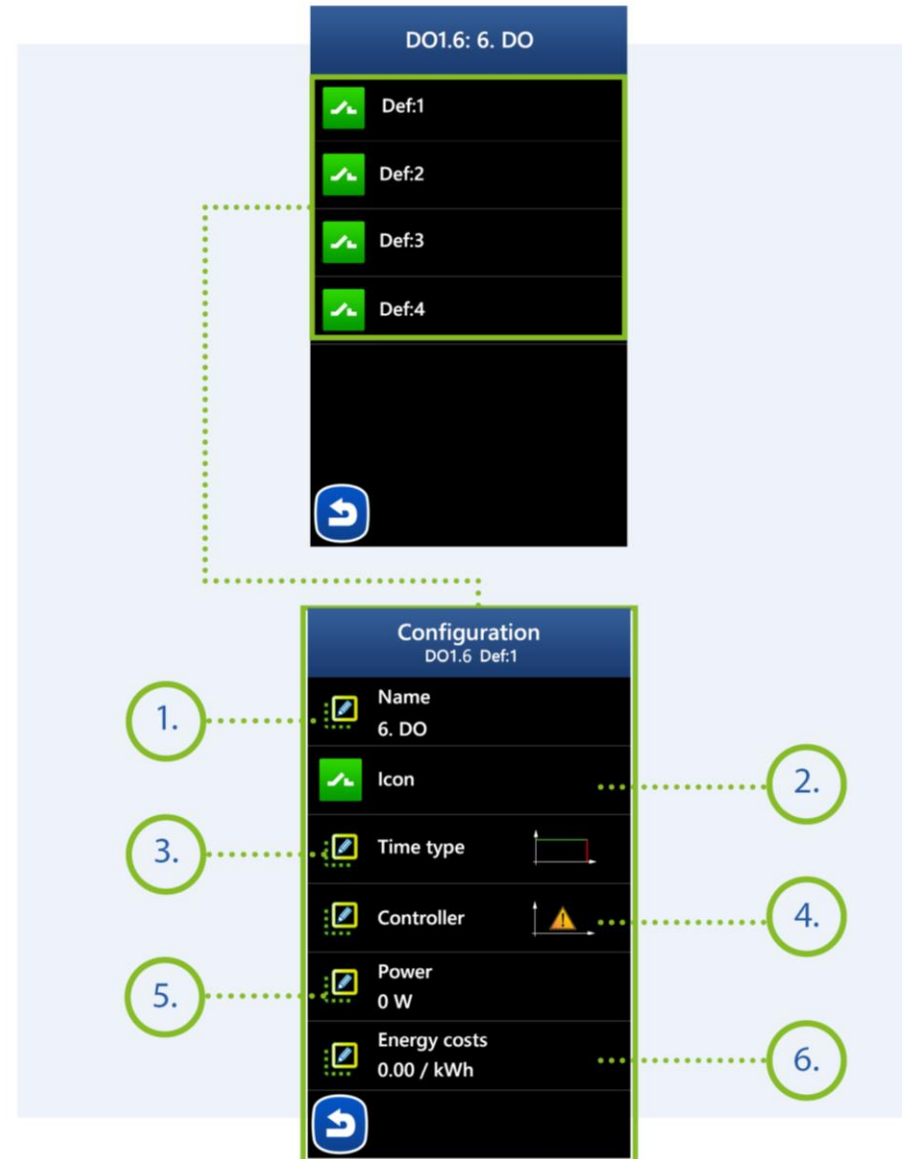
After selecting Digital output, the controller has the ability to assign 4 different work definitions to one digital output DO.



9.6.2.1. Definition of work

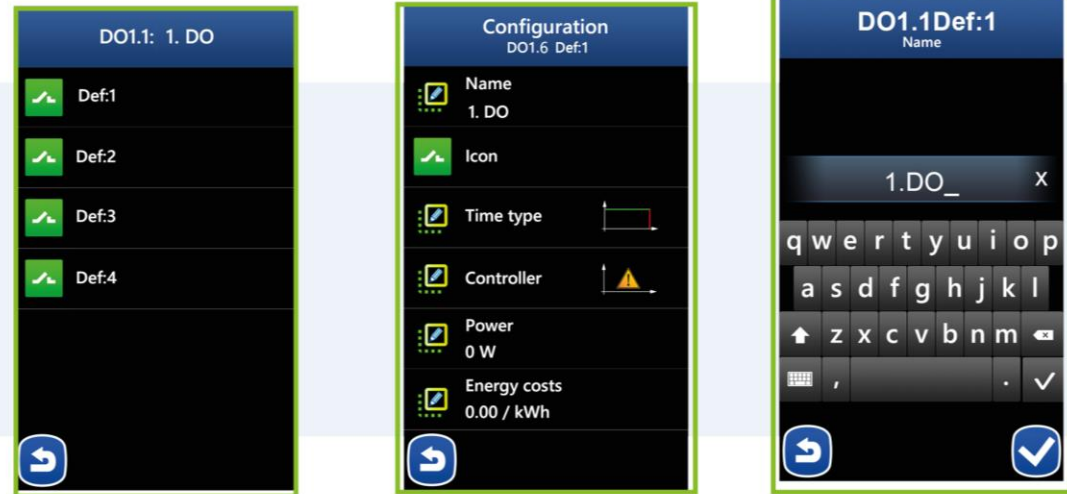
After selecting Digital output, the controller has the ability to assign 4 different work definitions to one digital output DO.

1. The name of the configured output.
2. Selection of the output icon.
3. Selection of the digital output operation mode depends on the defined times - Parameters Ta and Tb.
4. Selection of the regulator type on the basis of which the digital output operates.
5. Power assigned to the output.
6. Selection of defined energy costs (User function).



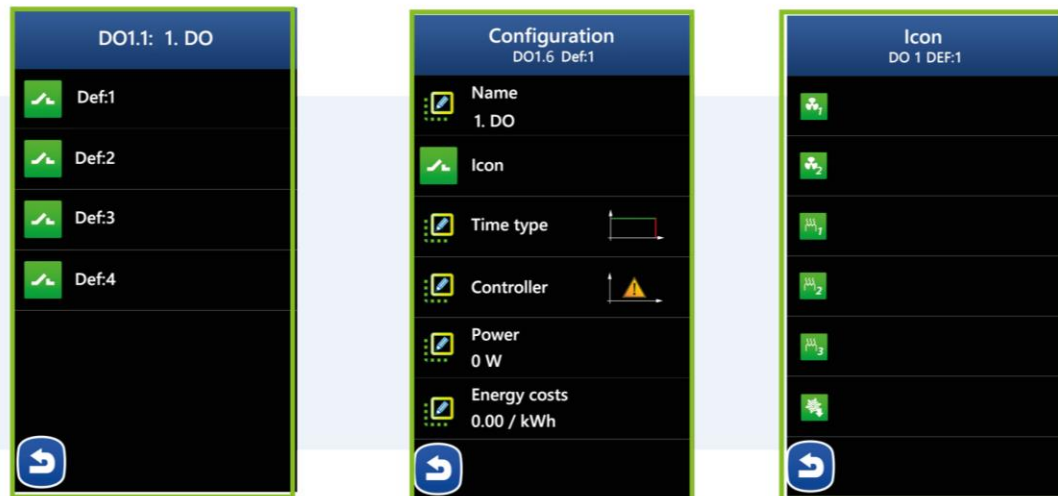
9.6.2.1.1. Name

1. Name of the configured output - it is possible to assign a name.



9.6.2.1.2. Icon

1. Name of the configured output - it is possible to change the icon.



9.6.2.1.3. Time type configuration

Type (time settings):

1. OFF – output disabled.
2. Output enabled.
3. Delayed activation (Ta - delay time).
4. Delayed shutdown (Ta - delay time).
5. Working mode as pulse generator Ta turn-on time Tb turn-off time. Start from the "high" state.
6. Working mode as pulse generator Ta turn-on time Tb turn-off time. Start from the "low" state.
7. Operating mode - single impulse Ta "low" state time Tb "high" state time.
8. Operating mode - single impulse Ta "high" state time Tb "low" state time.

Configuration:

1. Ta, Tb – time in seconds for switching the output on or off, depending on the selected type.
2. Trigger mode – dependency against which the output will be turn on..
3. Step – output triggered relative to the beginning of the step.
4. Regulator – output activated relative to the regulator.

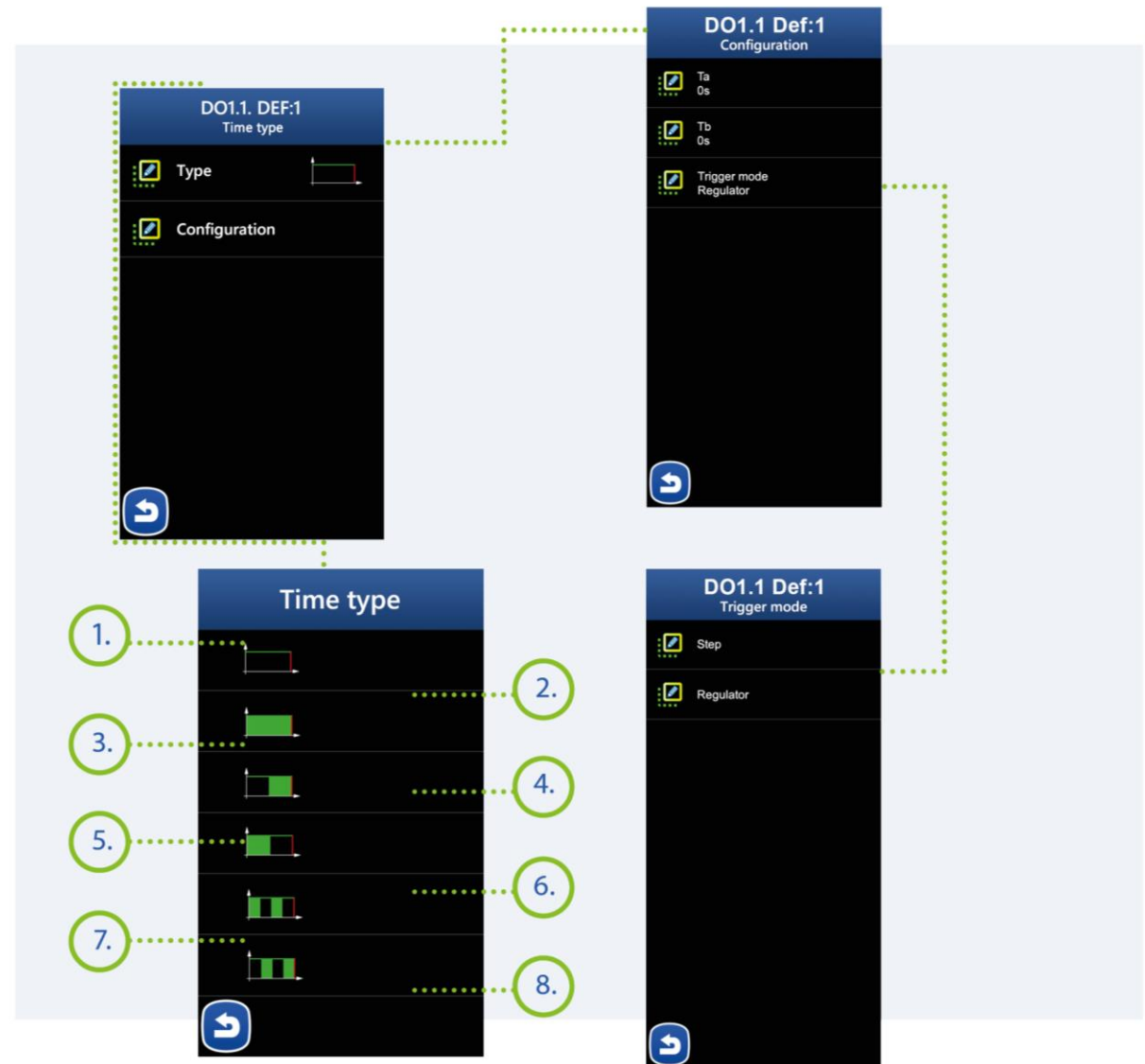


FIGURE 4.

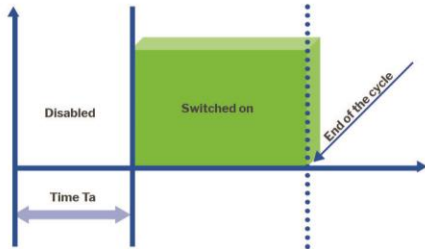


FIG. 4.1 SWITCH-ON DELAY

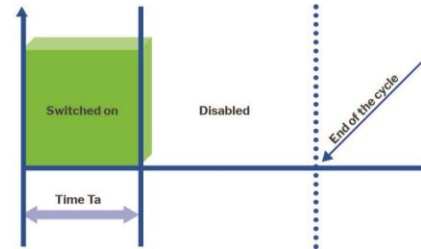


FIG. 4.2 OFF DELAY

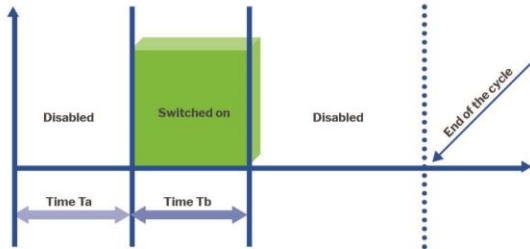


FIG. 4.3 SINGLE IMPULSATOR OFF AT THE START

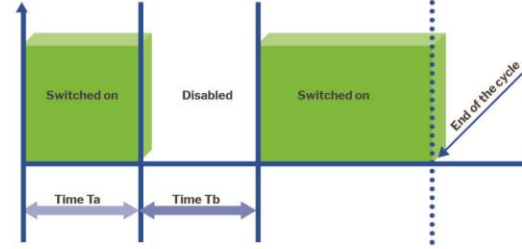


FIG. 4.4 SINGLE IMPULSATOR ON AT THE START

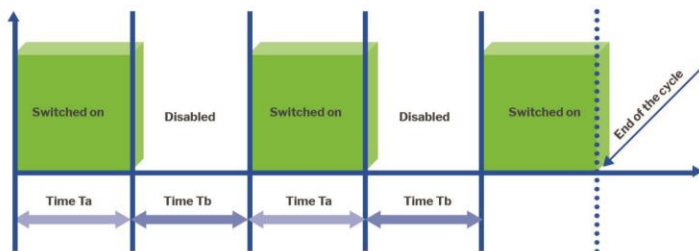


FIG. 4.5 IMPULSATOR ON AT THE START

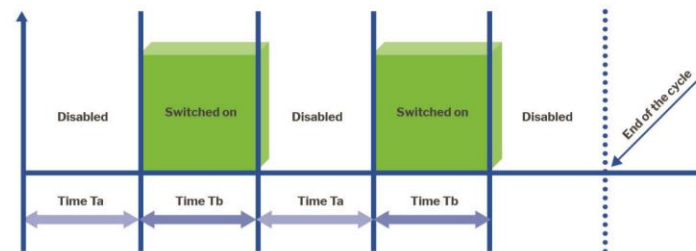
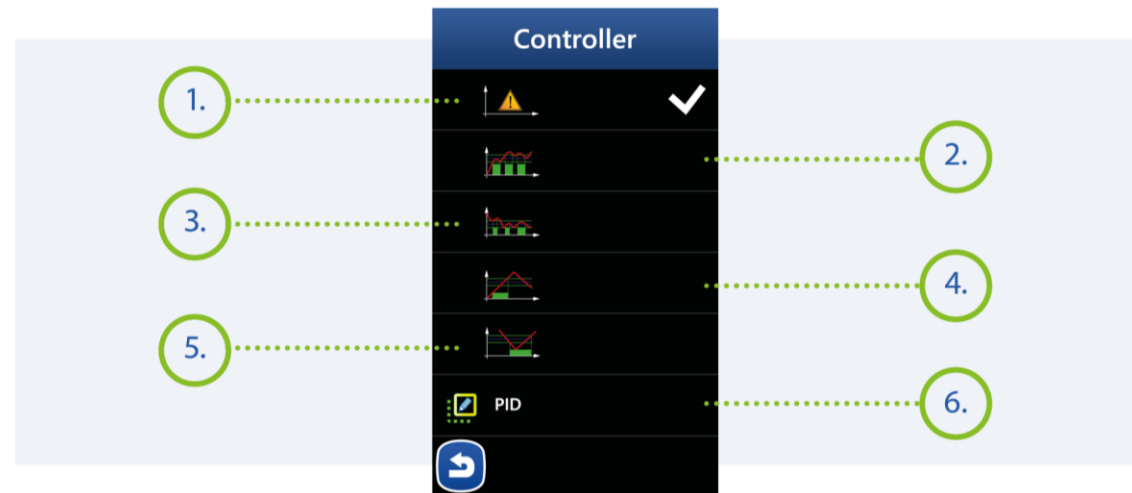
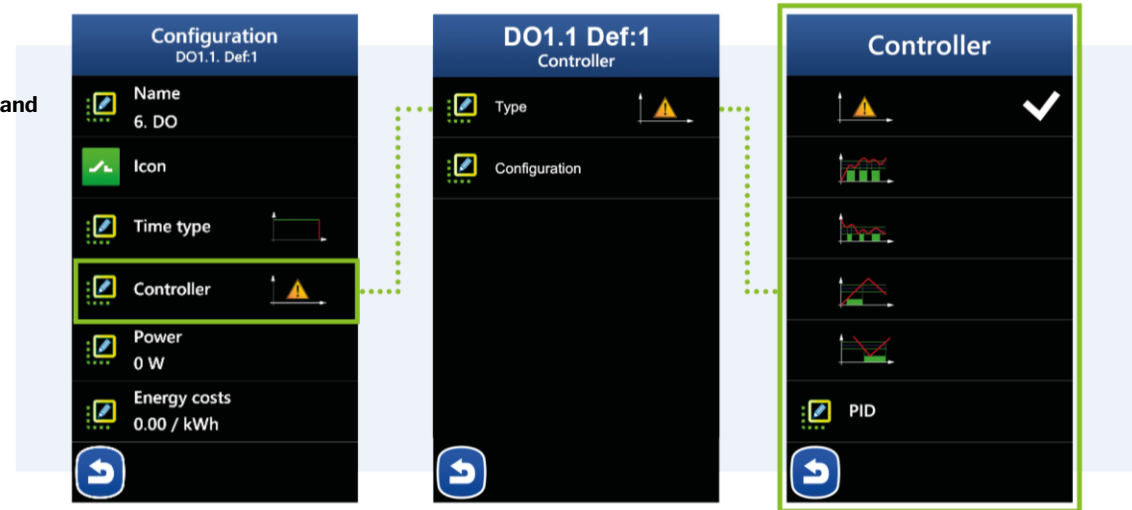


FIG. 4.6 IMPULSATOR OFF AT THE START

9.6.2.1.4. Controller Type

Selecting the Controller field gives the possibility to define the type of regulator and configuration of the selected type:

1. Controller turned off.
2. Heating-coming (s).
3. Cooling-coming.
4. Heating-hysteresis (p. 34. fig. 2).
5. Cooling-hysteresis.
6. PID controller - (Proportional-integral-derivative controller).



9.6.2.1.5. Configuration

Selecting the Configuration field gives access to declaring the following functions:

1. Selection field of the channel against which the measurement for the controller will be performed.
2. Channel selection window in which the adjustment value is set.
3. Offset value for hysteresis.
4. Window for heating-coming type.
5. Hysteresis value for the hysteresis controller.
6. Hysteresis value for the hysteresis controller.

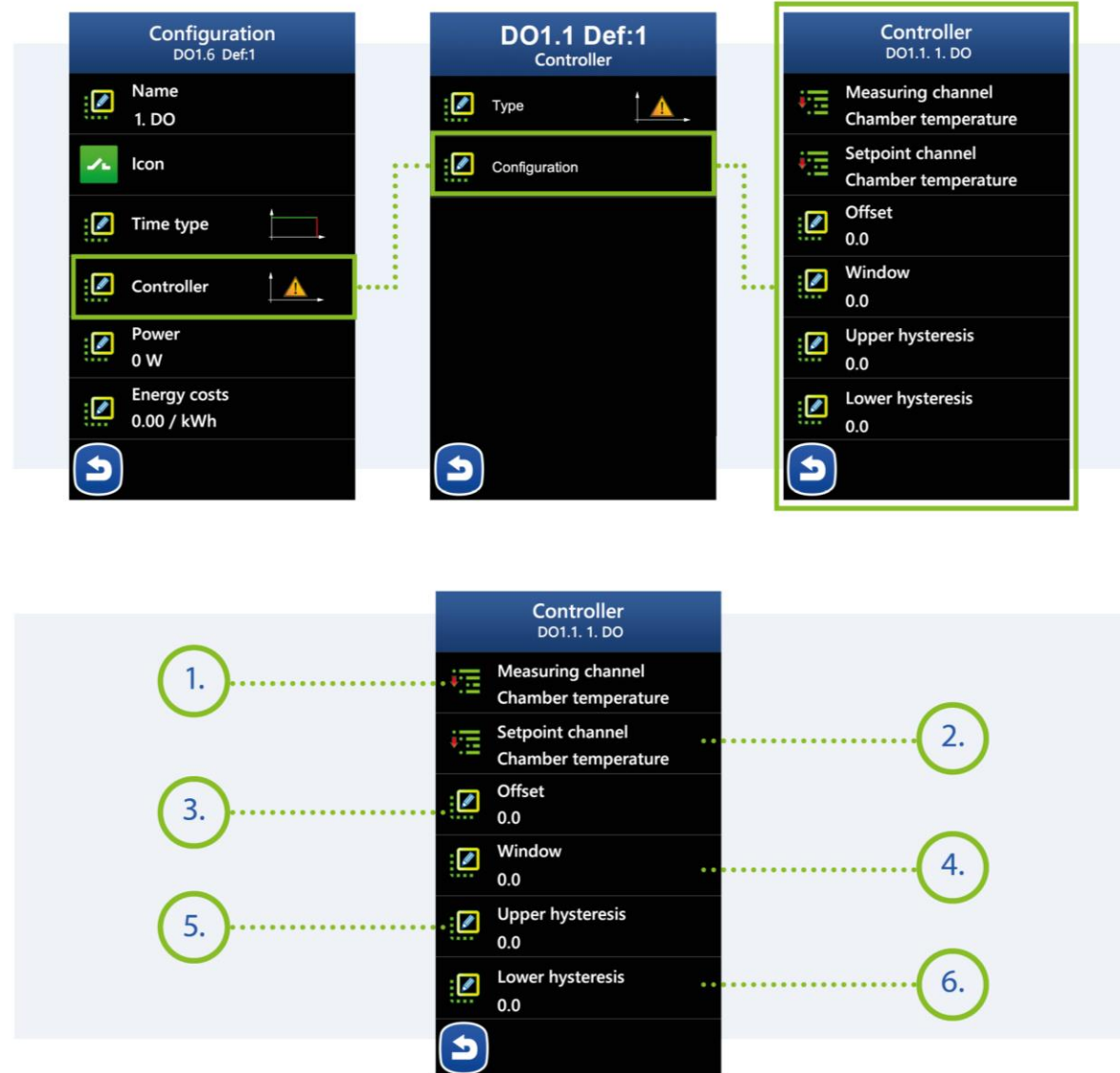


FIGURE 5.

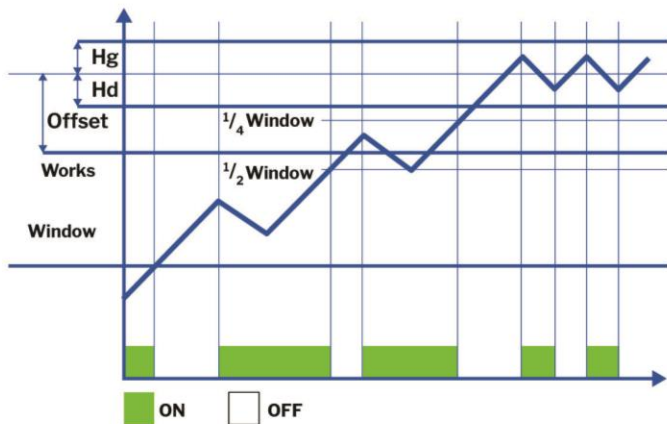


FIG. 5.1 HEATING INVESTIGATION

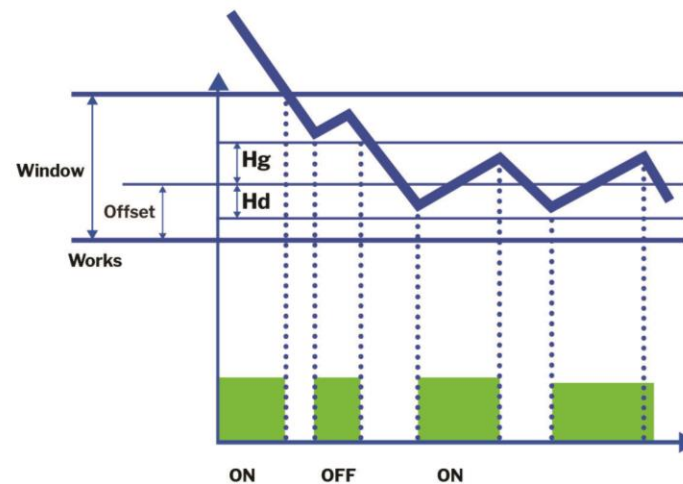


FIG. 5.4 COOLING INVESTIGATION

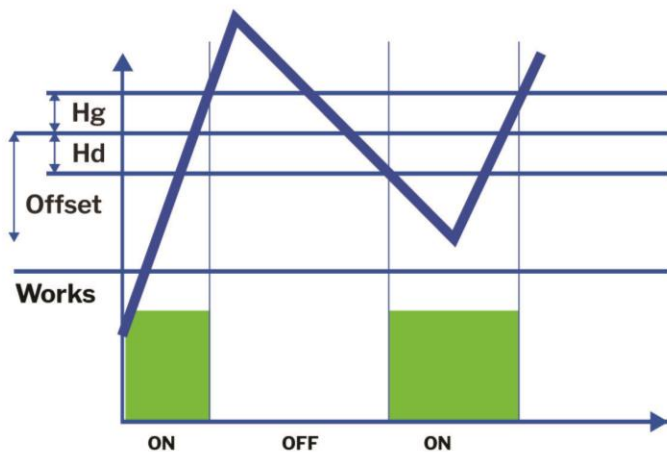


FIG 5.3 HEATING HYSTERESIS

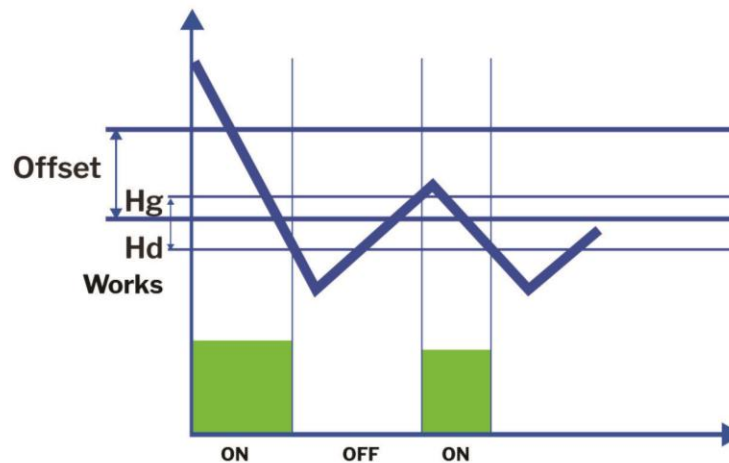
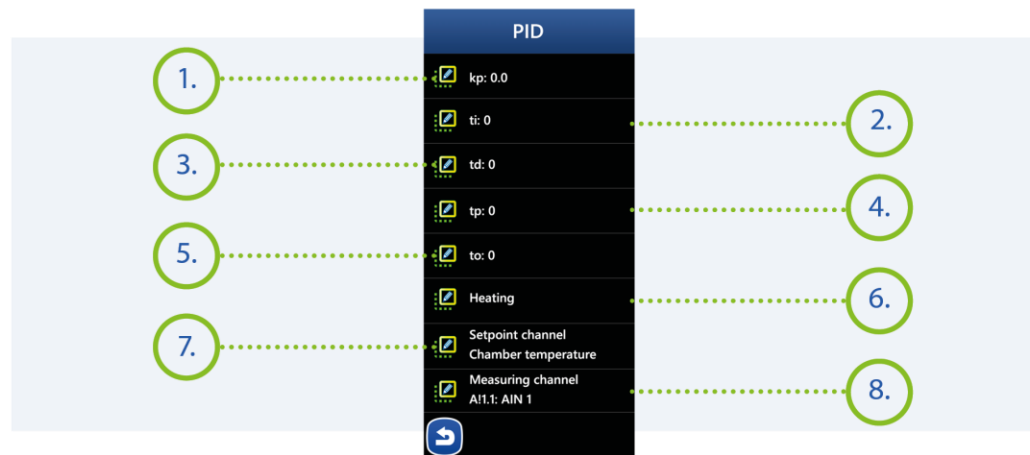
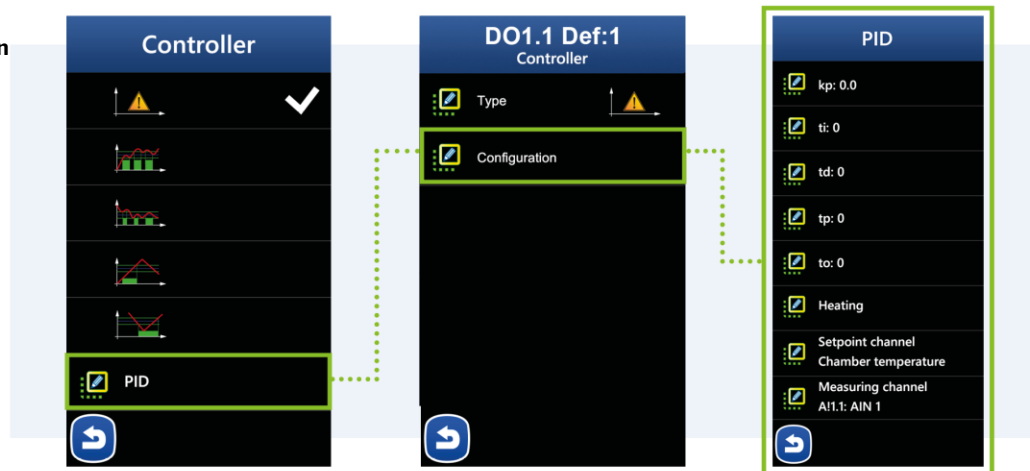


FIG. 5.2 COOLING HYSTERESIS

9.6.2.1.6. PID

Selecting the POD field results in displaying the PID Controller configuration view on the screen::

1. Reinforce proportionality factor.
2. Integration time.
3. Differentiation time.
4. Sampling time.
5. Period in seconds for the digital output.
6. Heating / Cooling.
7. The setpoint channel of the controller.
8. Controller measuring channel.



[Menu](#) | [Service functions](#) | [Inputs/Outputs](#) | [Digital Outputs](#) | [Configuration](#)

9.6.2.2. Output Power

The **OUTPUT POWER** and **ENERGY COST** parameters allow you to estimate the energy consumption of the machine for each technological process.

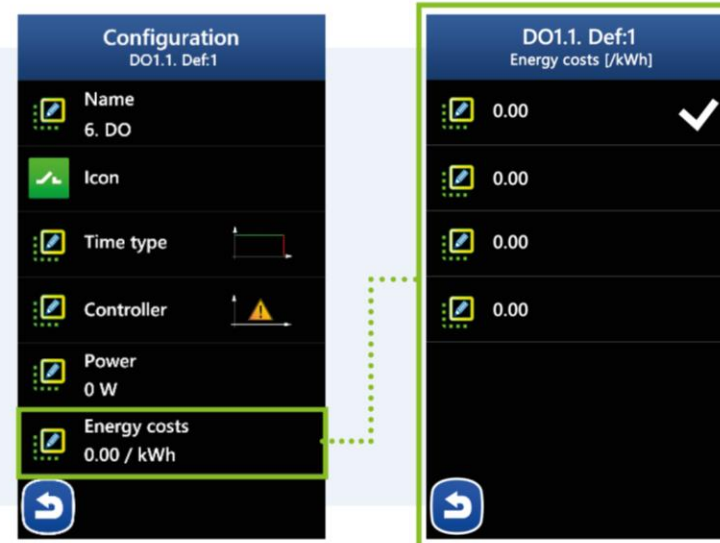
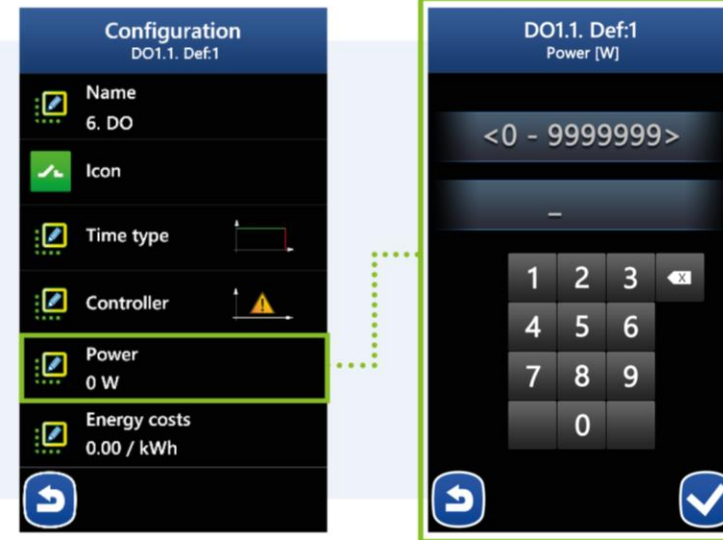
For example, if the defined output controls a 20,000W electric heater, and the total working time of this output in the technological process was 1h, the energy consumed was 20kW/h, assuming the energy cost of 1EUR/kWh. The energy cost for this output is 20 EUR/process.

[Menu](#) | [Service functions](#) | [Inputs/Outputs](#) | [Digital Outputs](#) | [Configuration](#)

9.6.2.3. Energy costs

The **OUTPUT POWER** and **ENERGY COST** parameters allow you to estimate the energy consumption of the machine for each technological process.

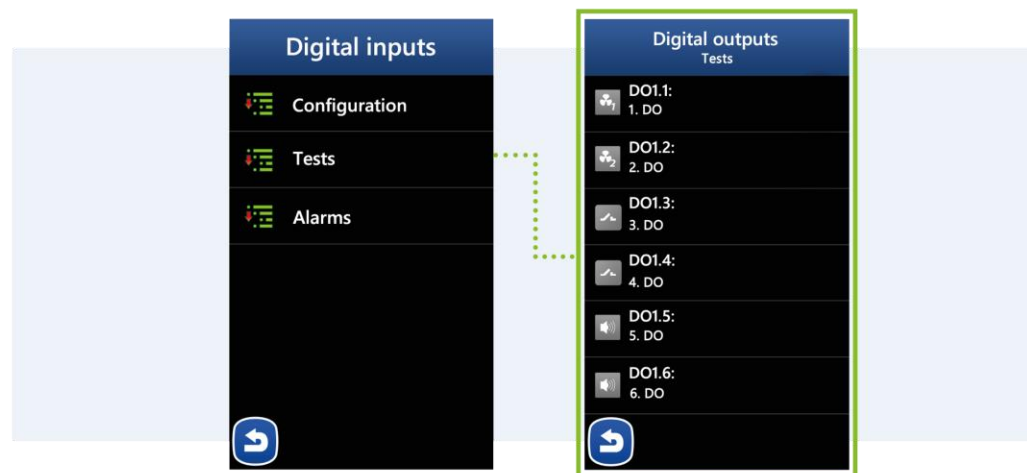
For example, if the defined output controls a 20,000W electric heater, and the total working time of this output in the technological process was 1h, the energy consumed was 20kW/h, assuming the energy cost of 1EUR/kWh. The energy cost for this output is 20 EUR/process.



Menu | Service functions | Inputs/Outputs | Digital Outputs | Tests

9.6.2.3.1. Tests

Selection of the Tests field enables the activation of selected digital outputs in order to check their operation. The output is switched on/off by pressing the field on the controller screen.



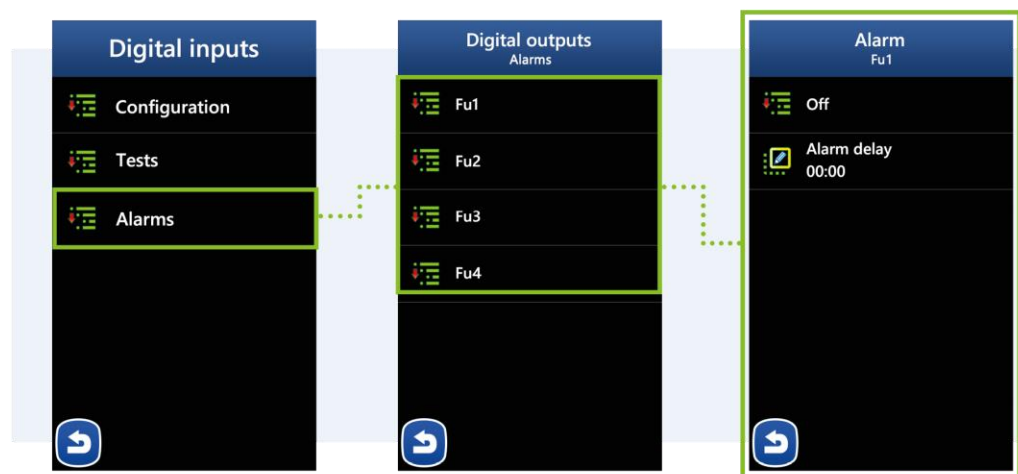
Menu | Service functions | Inputs/Outputs | Digital outputs | Alarms

9.6.2.3.2. Power Alarm Settings

The power alarm setting allows you to activate/deactivate the power loss indicator on the digital output sections. Selecting the option "Turned-on" causes the displaying of the message "FX Output Power Alarm" in the case of a power failure of the selected digital output sections.

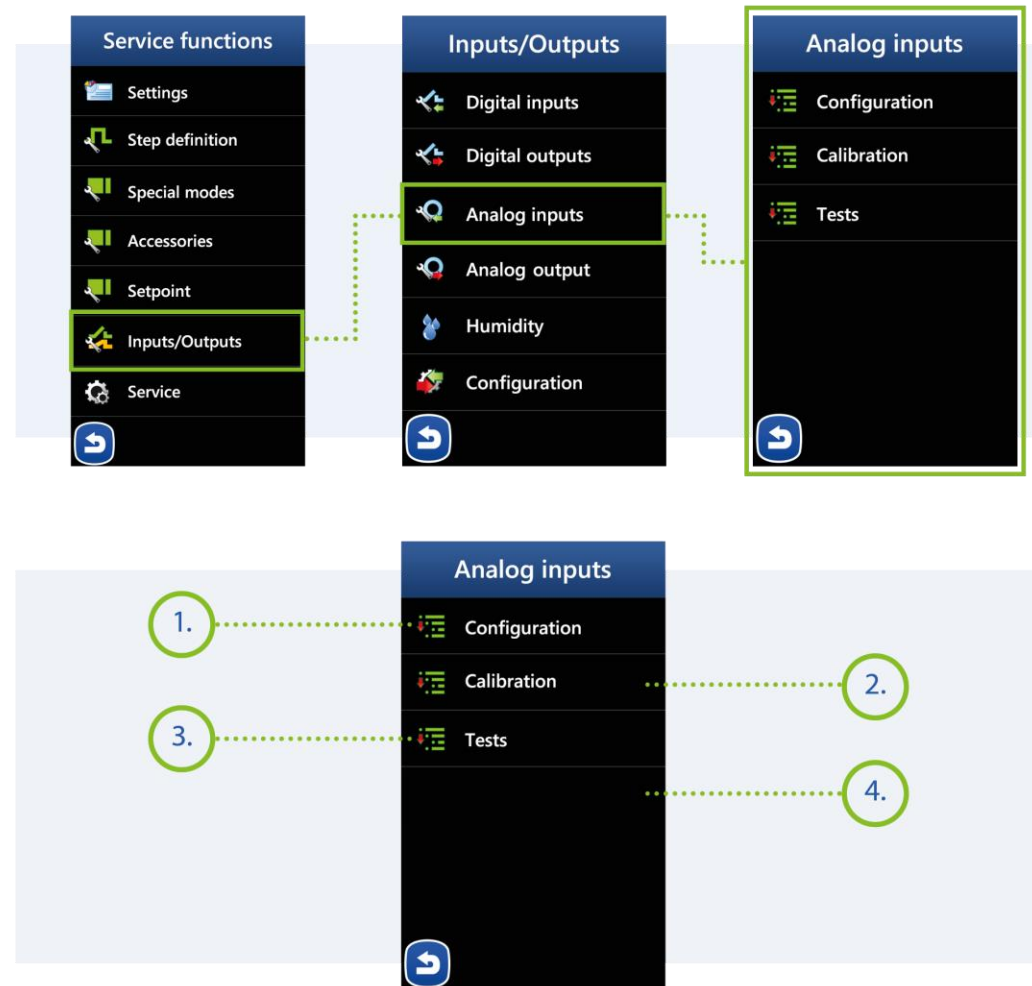
The configuration of the alarm takes place in two steps:

- Alarm Mode Off / Program Interruption,
- Alarm delay - given in seconds



9.6.4. Analog inputs

1. Configuration of AI analog inputs (measuring inputs).
2. Calibration - function available for the device manufacturer (access protection).
3. Analog input test.
4. Configuration of alarms assigned to analog inputs.

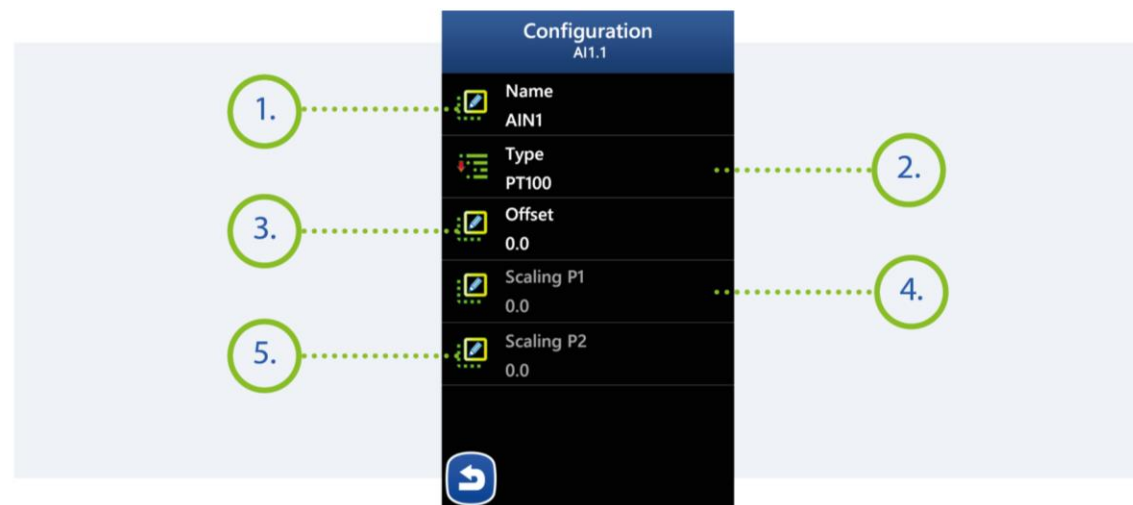
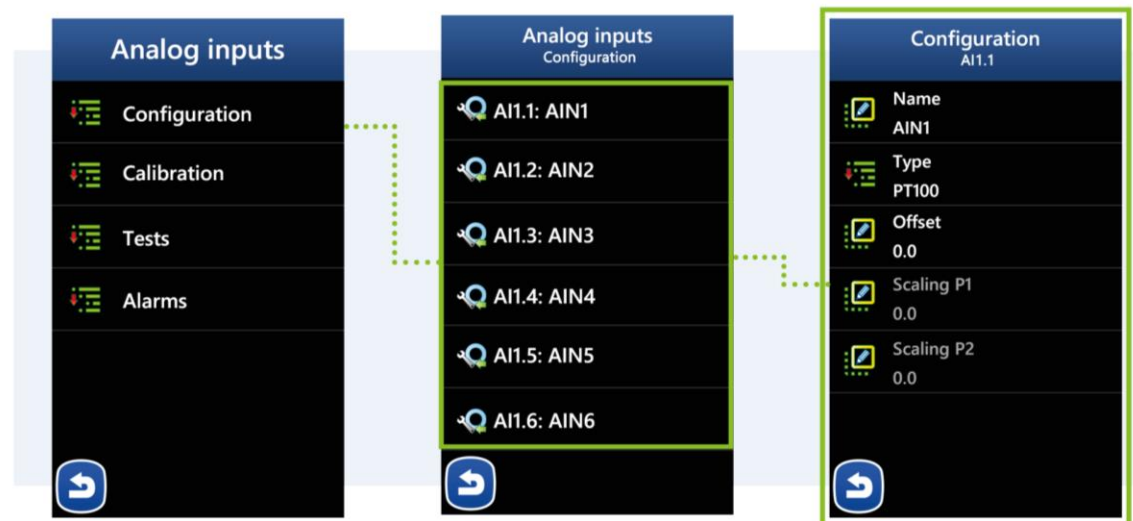


Menu | Service functions | Inputs/Outputs | Analog inputs | Configuration

9.6.4.1. Configuration

Selecting the Configuration field displays on the screen a list of available analog inputs A11.1 to A11.6:

1. Analog input name.
2. Analog input type selection:
 - PT100,
 - TP K (thermel type K),
 - TP J (thermel type J),
 - current signal 0.20mA,
 - current signal 4.20mA,
 - Mixer Clip T, - measurement of the temperature itself from a digital sensor.
 - Mixer Clip T, - measurement of the humidity itself from a digital sensor.
3. Offset (correction) of the measured value on the analog input.
4. Temperature scaling for current signal 0/4mA.
5. Temperature scaling for current signal 20mA.

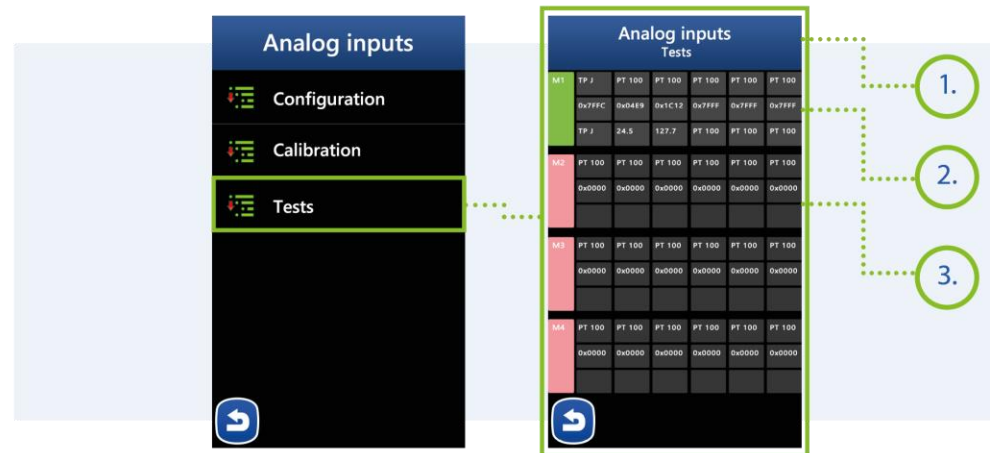


9.6.4.2. Tests

Selecting the Tests field causes displaying on the screen a view showing the status of analog inputs:

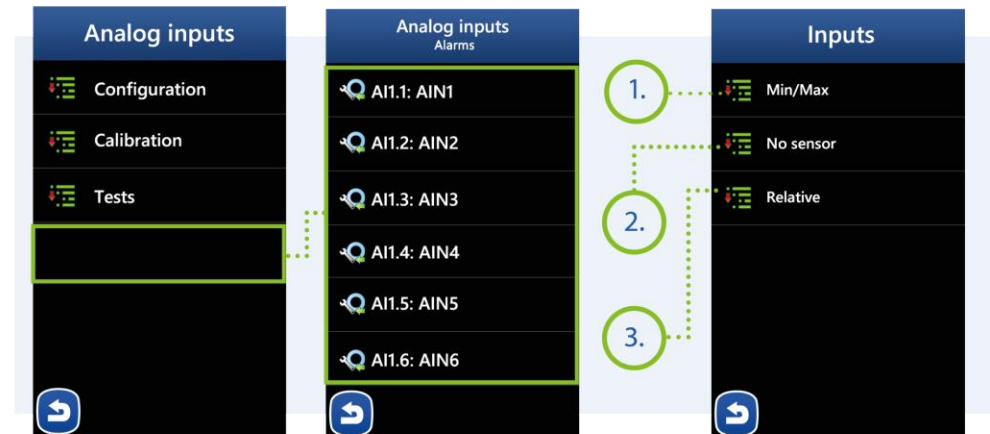
- Green colour - active internal M1 module.
- Pink colour - inactive M2 to M4 add-on modules.

1. Type of defined analog input.
2. AD converter value.
3. Current measurement value.



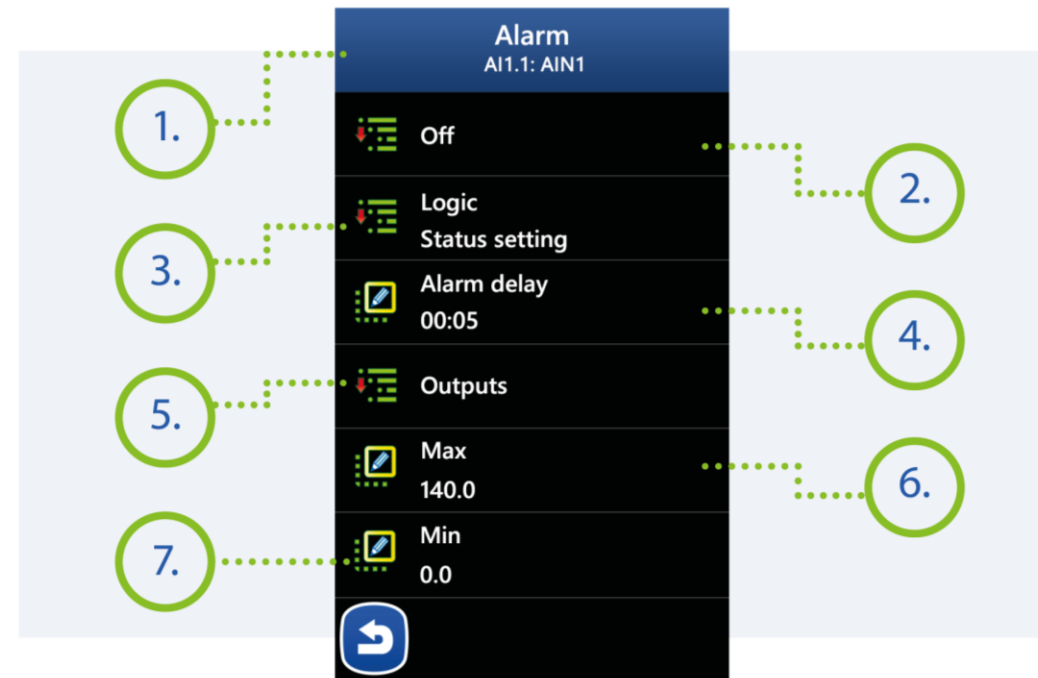
9.6.4.3. Alarm list

1. Alarm - exceeding the minimum or maximum temperature.
2. Sensor failure alarm or alarm about its absence.
3. Overtemperature alarm, relative to the set temperature.



9.6.4.3.1. Alarm Settings - Min/Max

1. Name of the input being configured.
2. Alarm Mode:
 - Turned off,
 - Interruption of the program (after an alarm the program is interrupted),
 - Program continuation (continues running program after an alarm condition occurs).
3. Logic – defining how the DO outputs are supposed to work,
 - Setting the State - the controller will activate only the declared DO outputs,
 - Adding the State - the controller will additionally activate the declared DO outputs, (logical sum).
 - State subtraction – the controller will disable the declared DO outputs. (logical product).
4. Alarm delay – the time after which the configured alarm is to be triggered.
5. Outputs – declaration of outputs and their operating mode in the configured state.
6. The maximum temperature value for the alarm condition.
7. The minimum temperature value for the alarm condition.

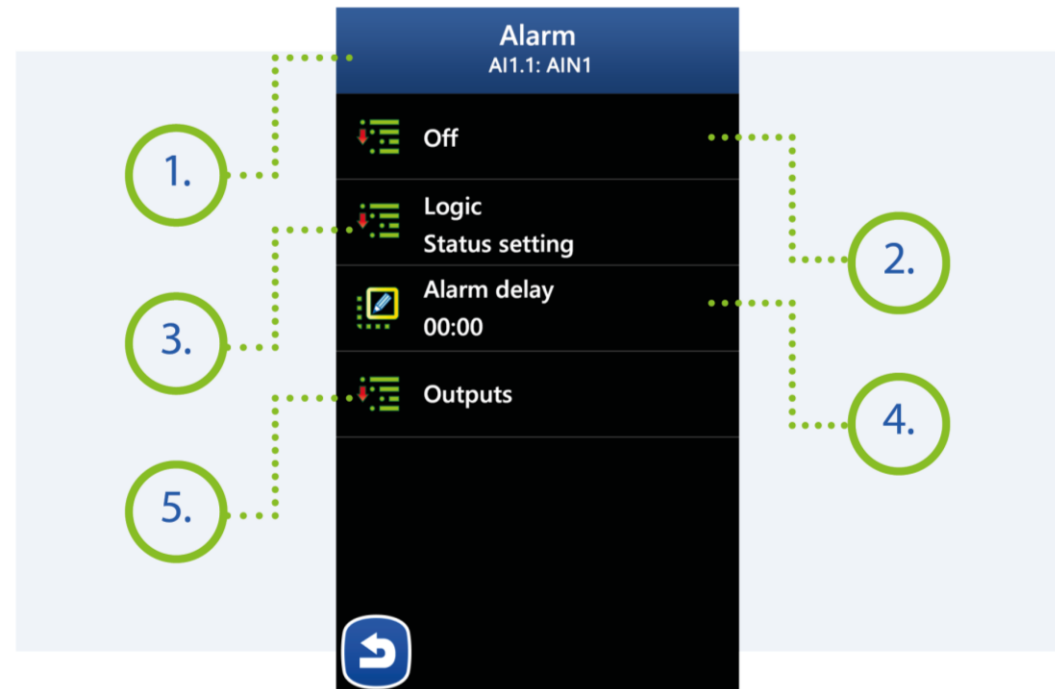


Menu | Service functions | Inputs/Outputs | Analog inputs | Alarms

9.6.4.3.2. Alarm Settings - No Sensor

Selecting the **No sensor** field causes displaying on the screen the view of the following functions:

1. Name of the input being configured.
2. Alarm Mode:
 - Turned off,
 - Program interruption (after an alarm interrupts the program),
 - Program continuation (continues running program after an alarm condition occurs).
3. Logic – defining how the DO outputs are supposed to work,
 - Setting the State - the controller will activate only the declared DO outputs,
 - Adding the State - the controller will additionally activate the declared DO outputs,
 - State subtraction – the controller will disable the declared DO outputs. (logical product).
4. Alarm delay – the time after which the configured alarm is to be triggered.
5. Outputs – declaration of outputs and their operating mode in the configured state.

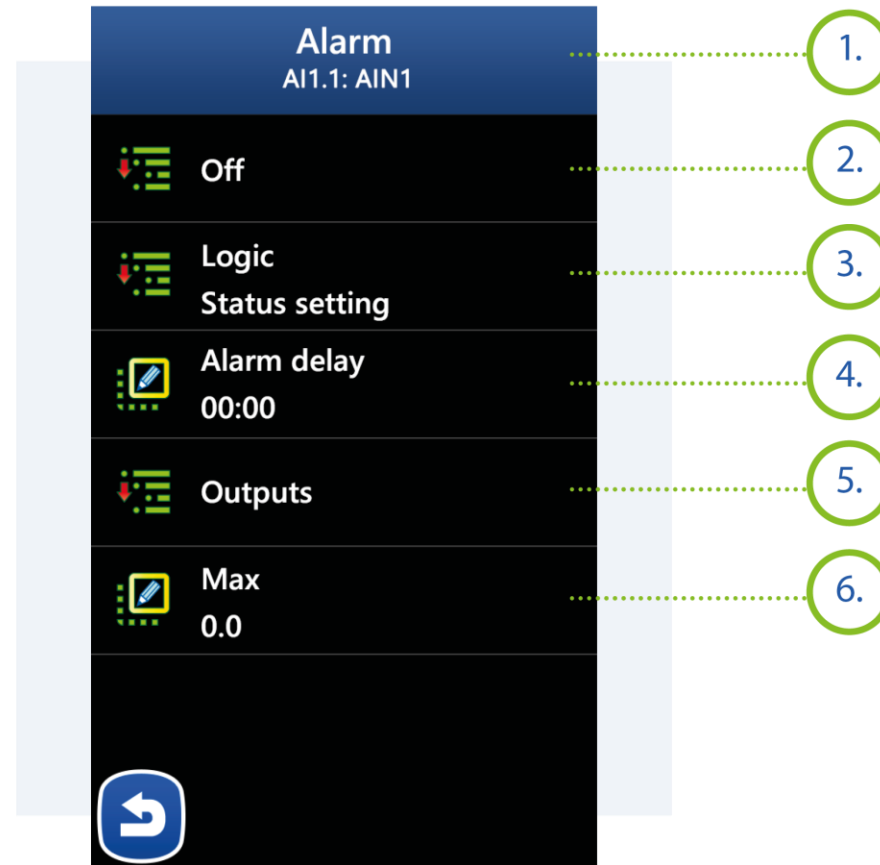


Menu | Service functions | Inputs/Outputs | Analog inputs | Alarms

9.6.4.3.3. Alarm Settings - Relative

Selecting the **Settings** field displays the following functions on the view screen:

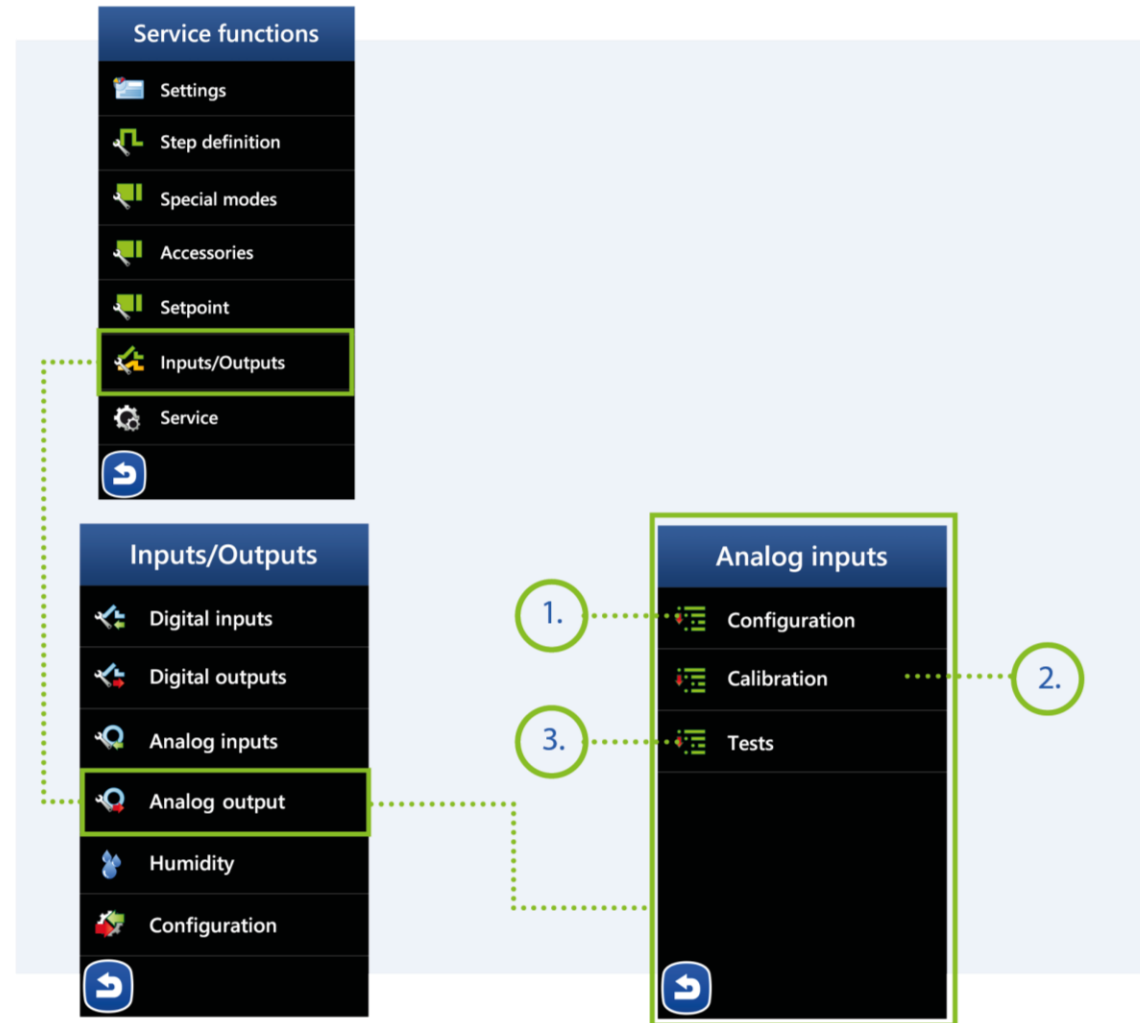
1. Name of the input being configured.
2. Alarm Mode:
 - Turned off,
 - Interruption of the program (after an alarm the program is interrupted),
 - Program continuation (continues running program after an alarm condition occurs).
3. Logic – defining how the DO outputs are supposed to work,
 - Setting the State - the controller will activate only the declared DO outputs,
 - Adding the State - the controller will additionally activate the declared DO outputs,
 - State subtraction – the controller will disable the declared DO outputs. (logical).
4. Alarm delay – the time after which the configured alarm is to be triggered.
5. Outputs – declaration of outputs and their operating mode in the configured state.
6. Relative alarm temperature value. The alarm will be triggered when the sum of temperatures according to the given formula is exceeded: [set value in the process for AI1.1] + [Max value] e.g. set value for the process 100°C, Max 20°C alarm value, will be triggered after exceeding 120°C.



Menu | Service functions | Inputs/Outputs | Analog outputs | Configuration

9.6.5. Analog outputs

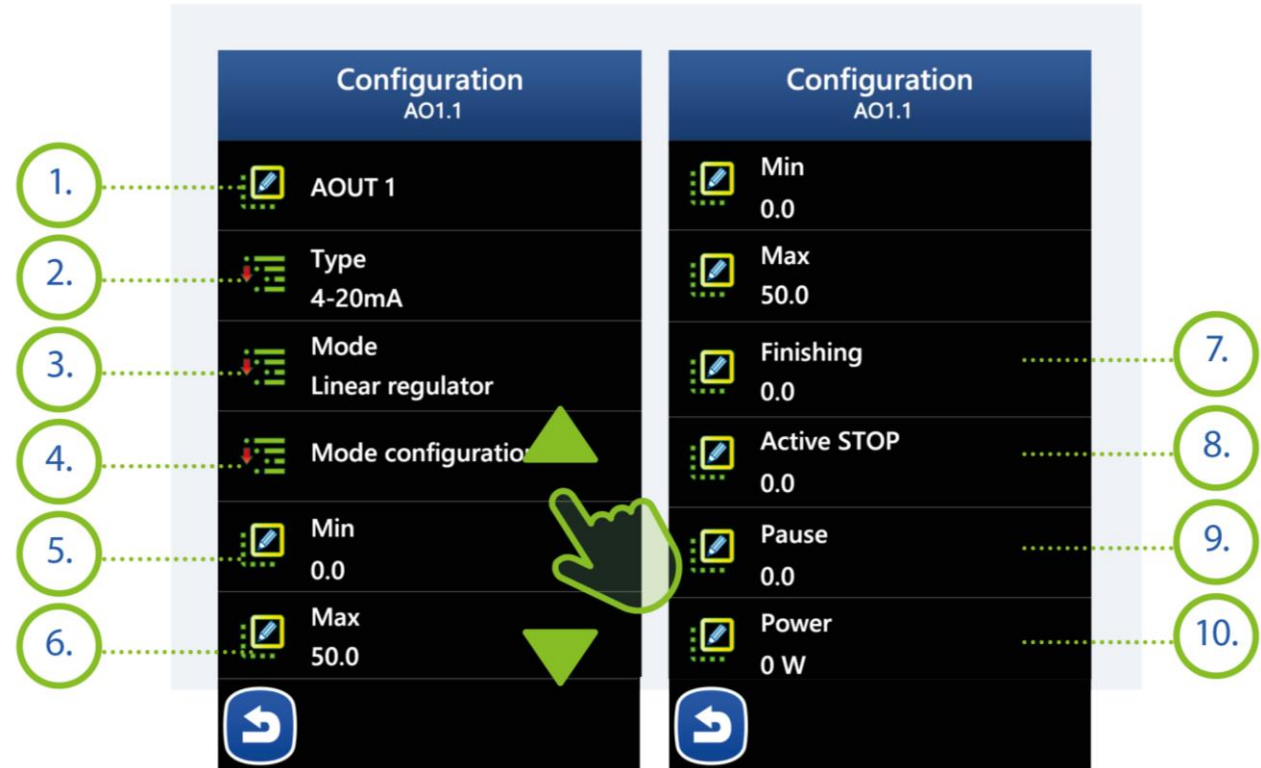
1. Configuration of analog outputs AO (current output).
2. Calibration - function available for the device manufacturer.
3. Analog output test.



Menu | Service functions | Inputs/Outputs | Analog outputs | Configuration

9.6.5.1. Settings

1. Analog output name.
2. Output type 0-20mA or 4-20mA.
3. Output working modes:
 - Off – output inactive,
 - Setter - output controlled in relation to the selected set value,
 - PID regulator,
 - Linear regulator.
4. Mode configuration – configuration of parameters for the selected mode.
5. Specifying the minimum value for the analog output.
6. Specifying the maximum value for the analog output.
7. Analog output value in Finishing mode.
8. Analog output value in ACTIVE STOP mode.
9. Analog output value in PAUSE mode
10. Power value of the device controlled by the output.



Menu | Service functions | Inputs/Outputs | Analog outputs | Configuration

9.6.5.1.1. Configuration mode

Selecting the Configuration mode field displays the following functions on the view screen:

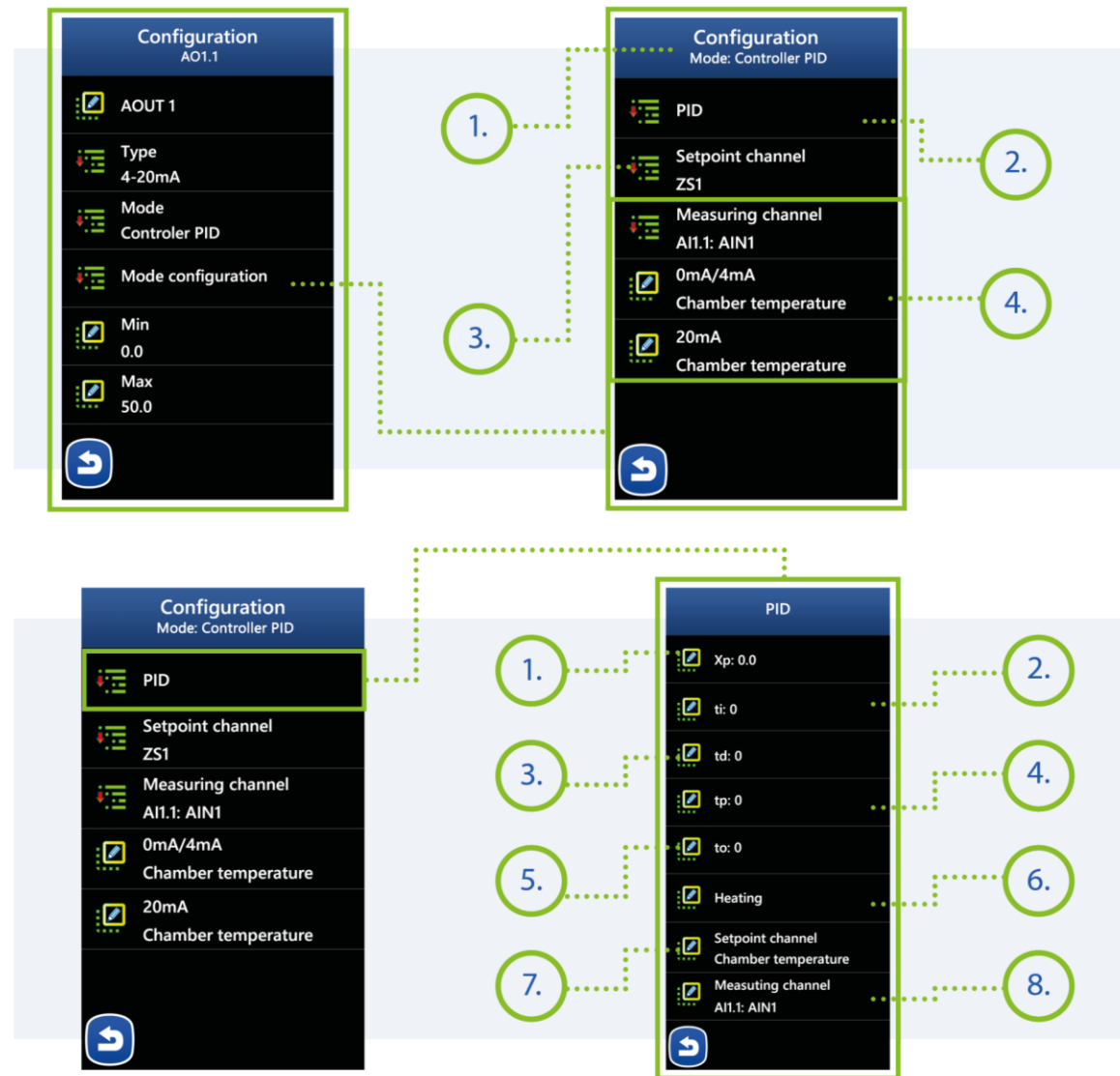
1. Name of the selected mode for the analog output, e.g. PID.
2. Settings for PID mode.
3. Settings for the Setter mode.
4. Linear regulator mode settings. The previously selected mode is highlighted and configurable.

Menu | Service functions | Inputs/Outputs | Analog outputs | Configuration

9.6.5.1.2. PID mode settings

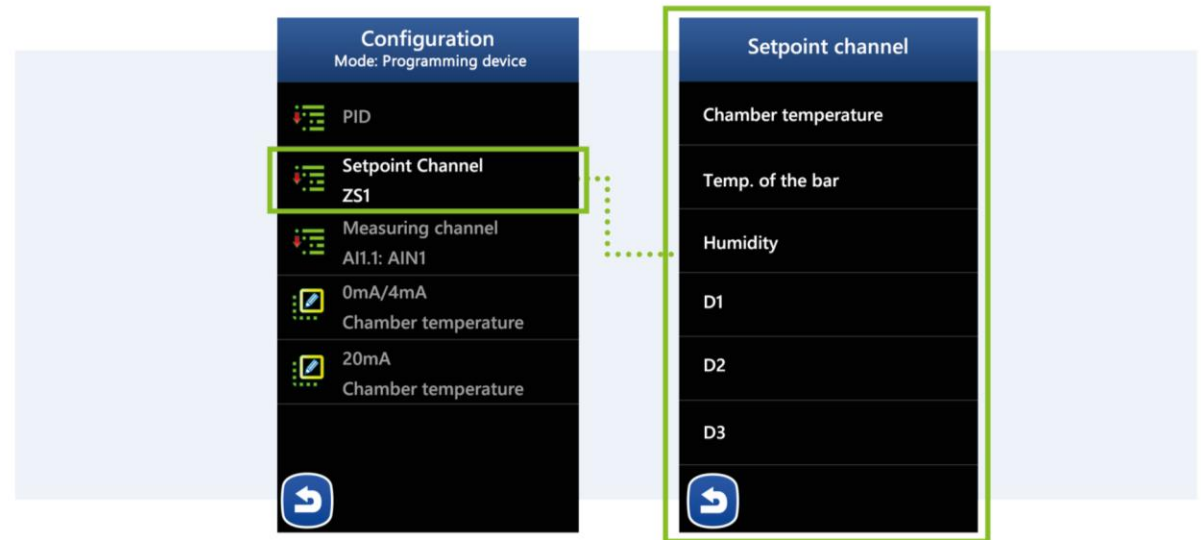
Configuration of the PID field is available after selecting the PID mode.

1. Reinforce proportionality factor.
2. Integration time.
3. Differentiation time.
4. Sampling time.
5. Period in seconds for the digital output.
6. Heating /Cooling.
7. The preset channel of the controller.
8. Controller measuring channel.



9.6.5.1.3. Setter mode settings

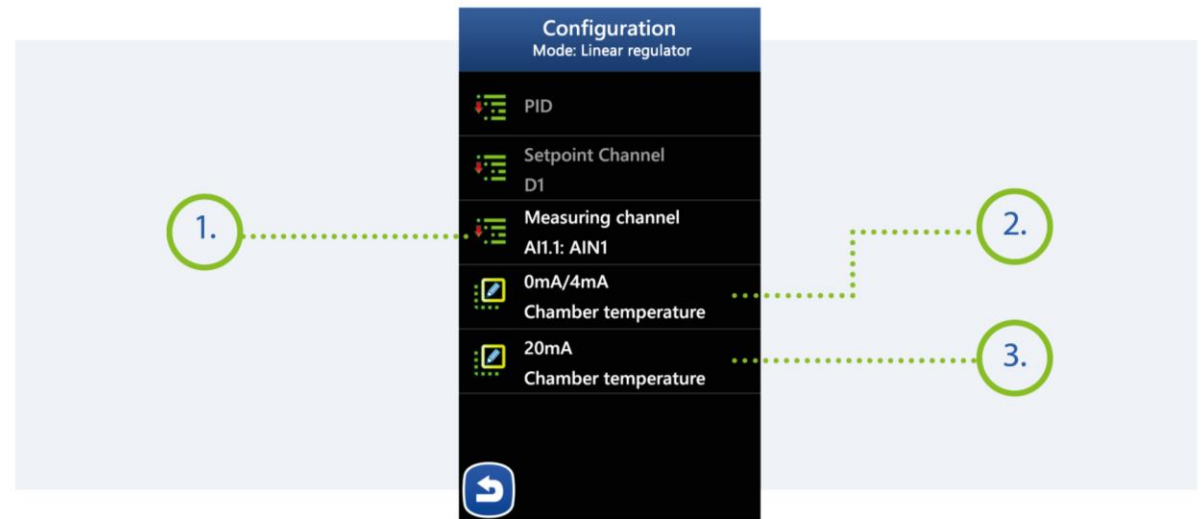
Selection of the Setpoint channel field causes displaying on the screen a list of available channels with respect to which the adjustment will take place.



9.6.5.1.4. Screen description Linear regulator

Selecting the Linear regulator field displays the following functions on the view screen:

1. Selection of the measurement channel against which the adjustment will be made.
2. Setpoint channel selection for 0mA/4mA.
3. Setpoint channel selection for 20mA.

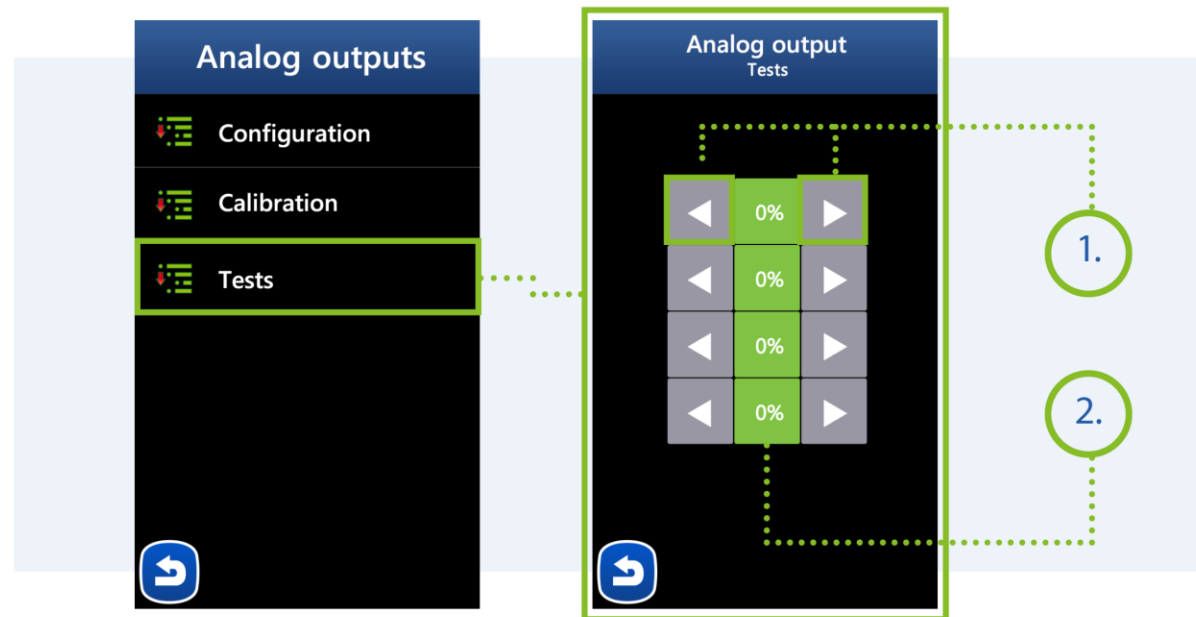


Menu | Service functions | Inputs/Outputs | Analog Outputs | Tests

9.6.5.1.5. Tests

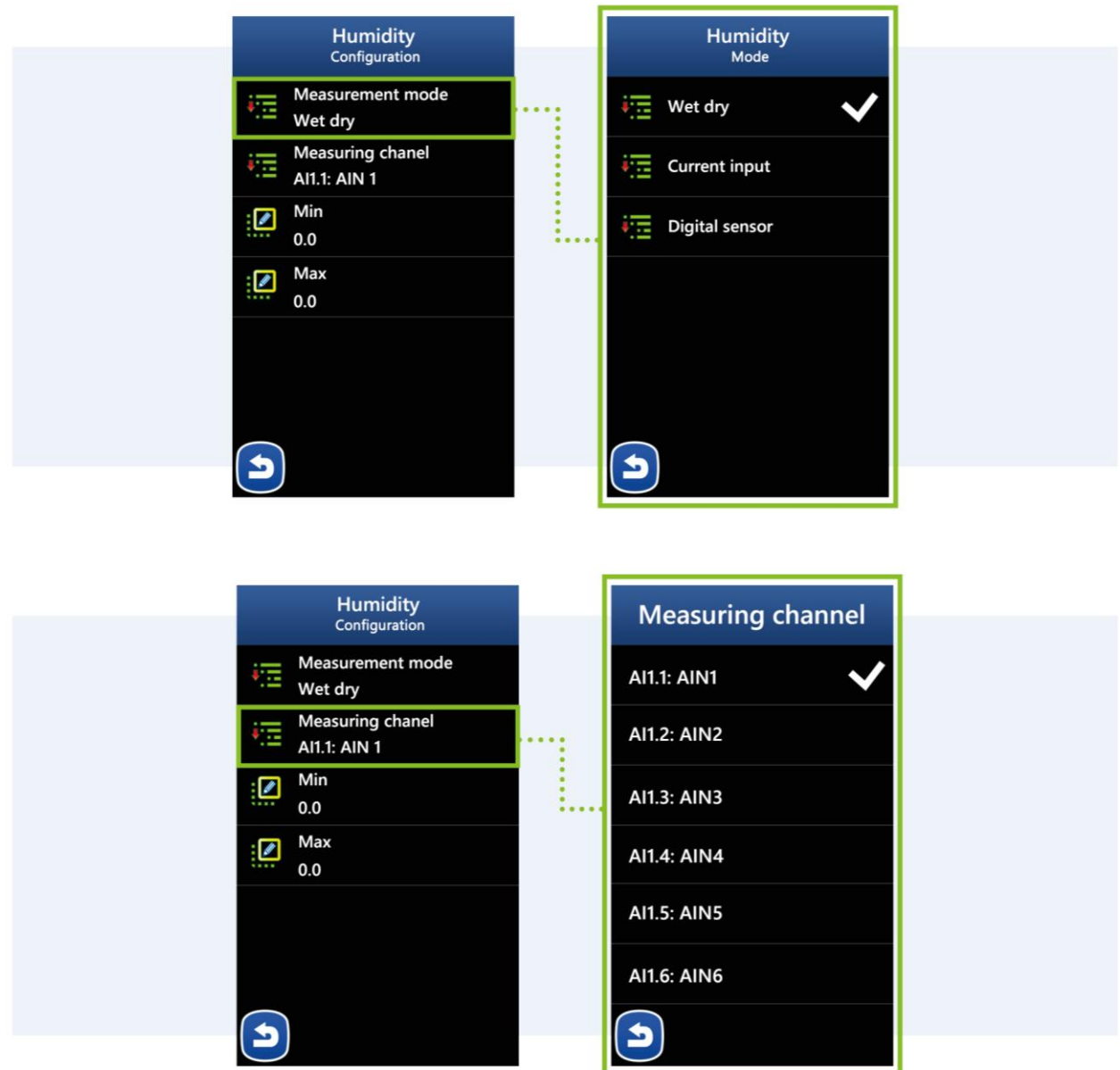
Selecting the **Settings** field displays the following functions on the view screen:

1. Value change.
2. The percentage value of the output current.



9.6.6. Humidity

1. Measurement mode:
 - Wet dry,
 - current input,
 - Digital sensor.
2. Measuring channel – AI input to which the current signal is connected.
3. Min - the minimum value that can be set in the process.
4. Max - the maximum value that can be set in the process.



9.6.6.1. Alarms

Selecting the Alarms field causes displaying on the screen a view the following functions:

1. Turned off.
2. Logic:
 - Setting the State - the controller will activate only the declared DO outputs,
 - Adding the State - the controller will additionally activate the declared DO outputs, (logical sum),
 - State subtraction – the controller will disable the declared DO outputs. (logical product).
3. Alarm delay – the time after which the configured alarm is to be triggered.
4. Outputs – declaration of outputs and their operating mode in the configured state.
5. Min – minimum humidity alarm value.
6. Max – alarm value of the maximum value.



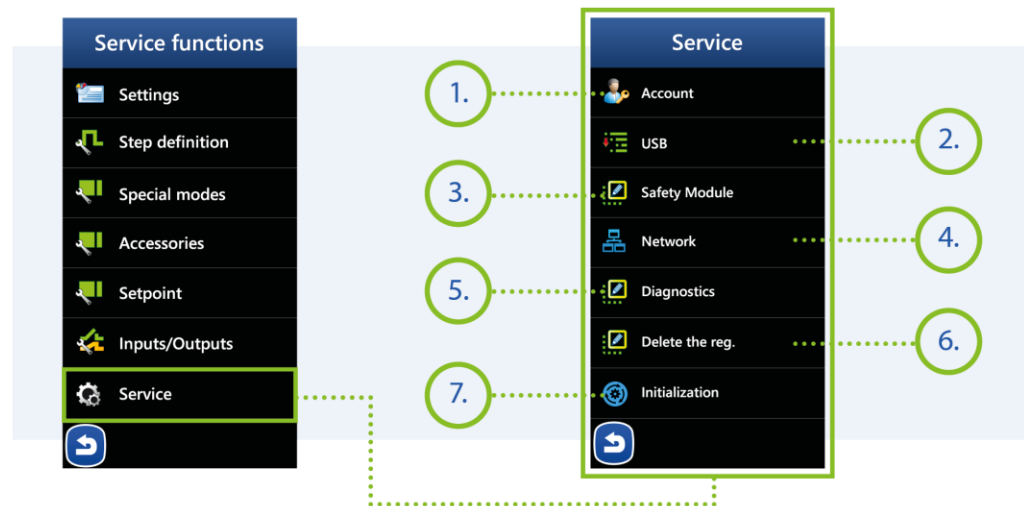
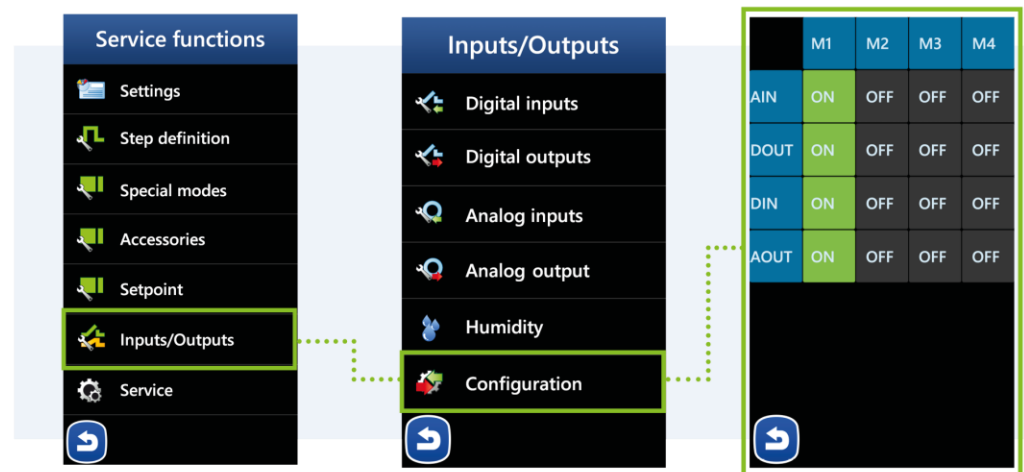
9.6.7. Module configuration

Activation of additional external modules supported by the controller.

9.7. Service

Selecting the Settings field displays the following functions on the view screen:

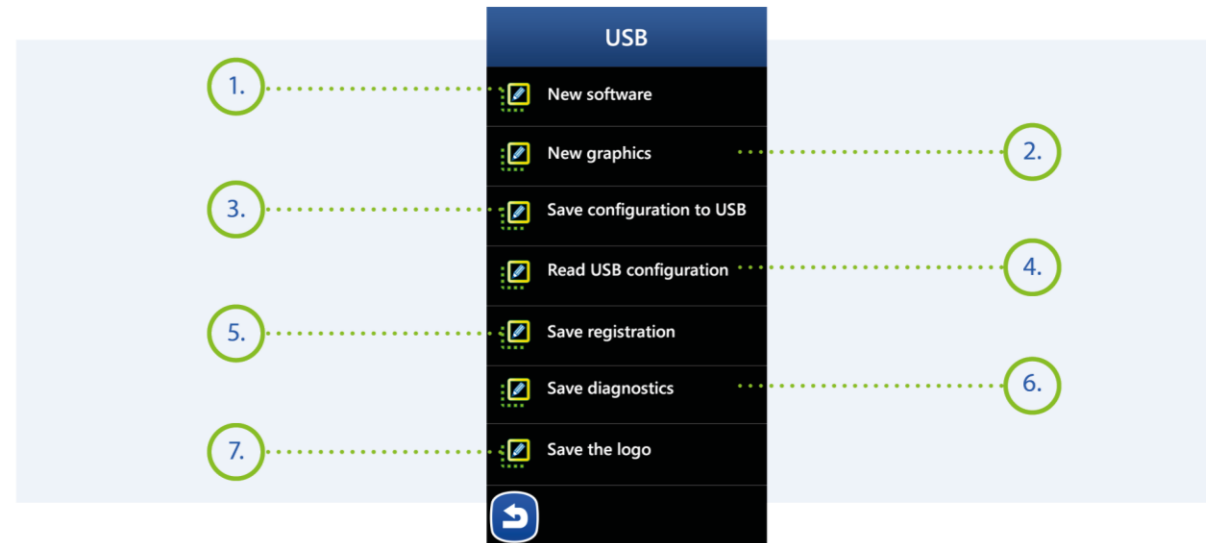
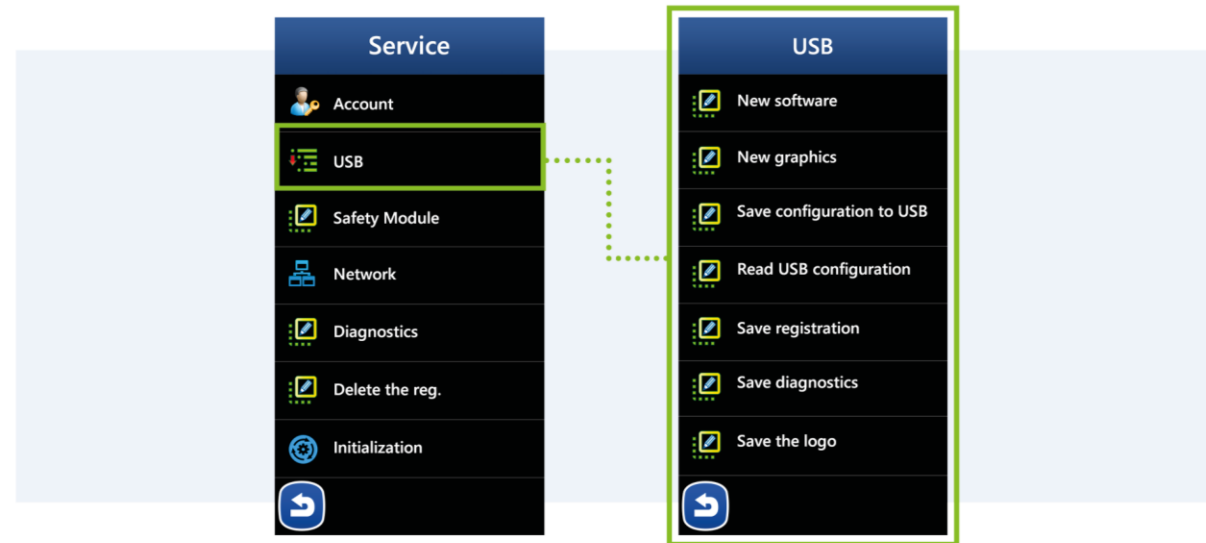
1. Function disabled for the user.
2. USB – The function is available after connecting the flash drive to the USB port of the controller (see figure XXX)
 - The function is used for communication of the controller with the USB flash drive.
3. Configuration of parameters for the safety module. Caution. The safety module is an independent regulator from the operation of the main processor of the controller. If the permissible operating temperature of the device is exceeded as a result of damage to the main processor or incorrect set parameters - the safety module (depending on the defined parameters) will activate the module's relay output. The output can be used for emergency shutdown of the device/machine.
4. Configuration of the Ethernet connection
5. Diagnostic data for the service.
6. Deleting driver registration.
7. Controller initialization (restore to factory state).



9.7.1. USB

Selecting the USB field causes the function view to be displayed on the screen after connecting of the flash drive.

1. Software update. File format fw.new.
2. Controller graphics update. A file with the gfx.new format.
3. Saving the controller configuration on a USB stick (Input and output parameters, steps, programs).
4. Reading the saved configuration from USB memory stick.
5. Saving device registration data on a USB memory stick.
6. Saving data from the device's diagnostics on a USB memory stick.
7. Uploading a graphic file with the manufacturer's logo.
File format 600x128 File in .bmp format the file should be processed in the LogoUploader program before uploading. The final upload file must be in the logo.new format.

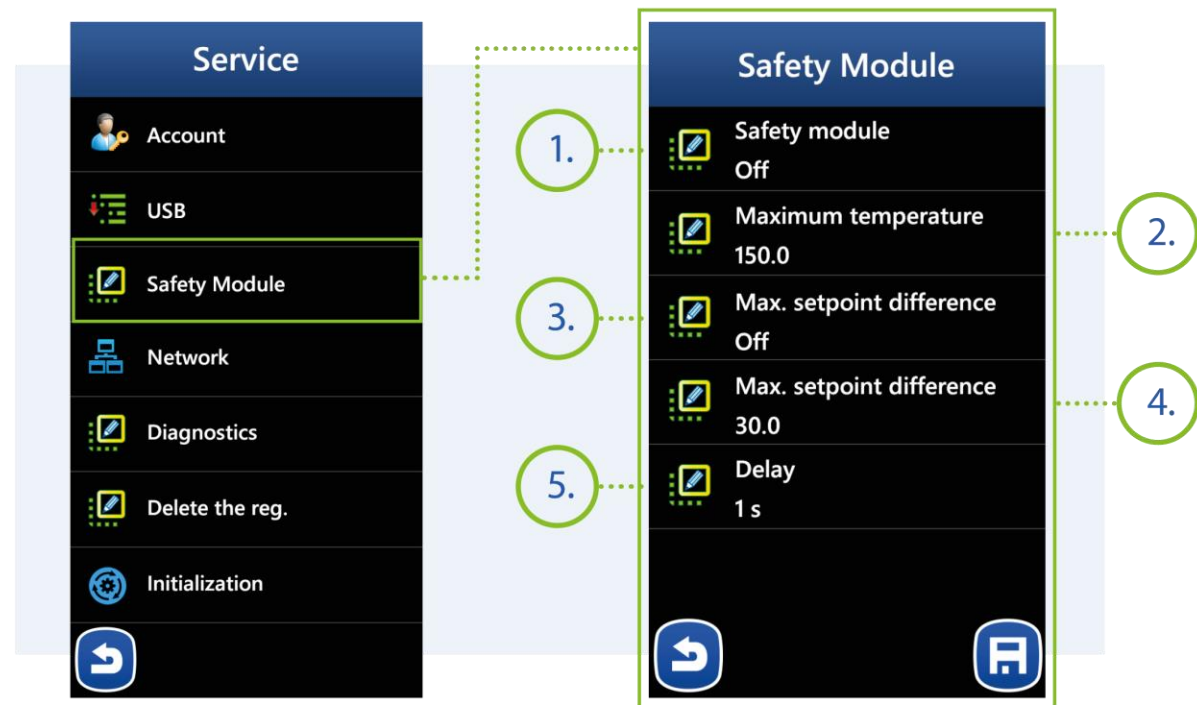


9.7.2. Safety module

The safety module consists of an independent processor, relay output and measurement input. Its purpose is to independently protect the device against damage. (see figure 3).

Selecting the **Safety module** field displays the following functions on the view screen:
displaying the following functions on the view screen:

1. Security module activation.
2. The maximum temperature that triggers the protection.
3. Activation of the "set difference" function.
4. Set difference value.
5. Safety module activation delay time.



Menu | Service functions | Service | Network

9.7.3. Network

Selecting the Network field causes displaying on the screen a view of the following functions:

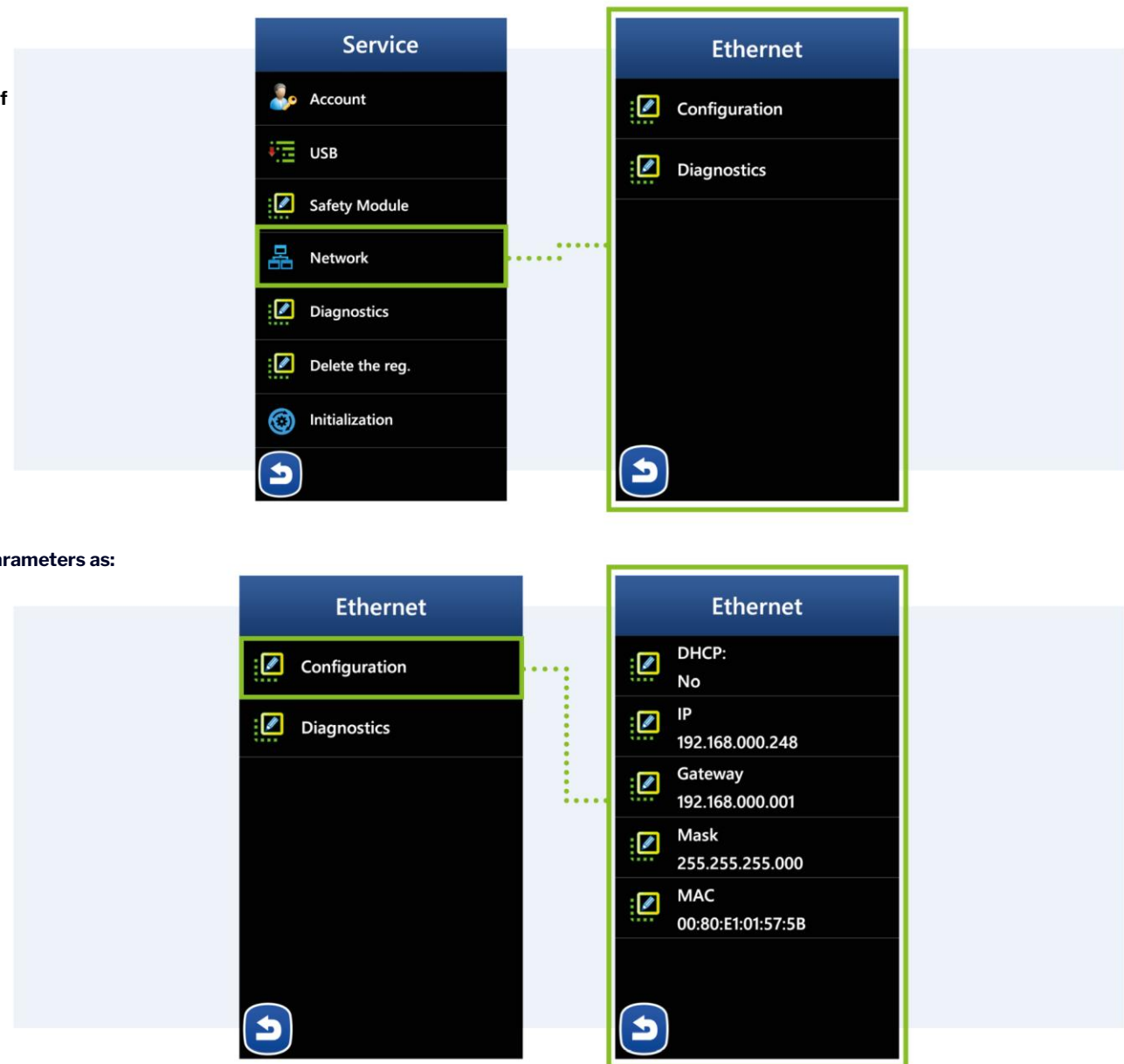
- Configuration of the network settings.
- Network connection diagnostics.

Menu | Service functions | Service | Network | Configuration

9.7.3.1. Network configuration

Network configuration consists in the appropriate setting of such parameters as:

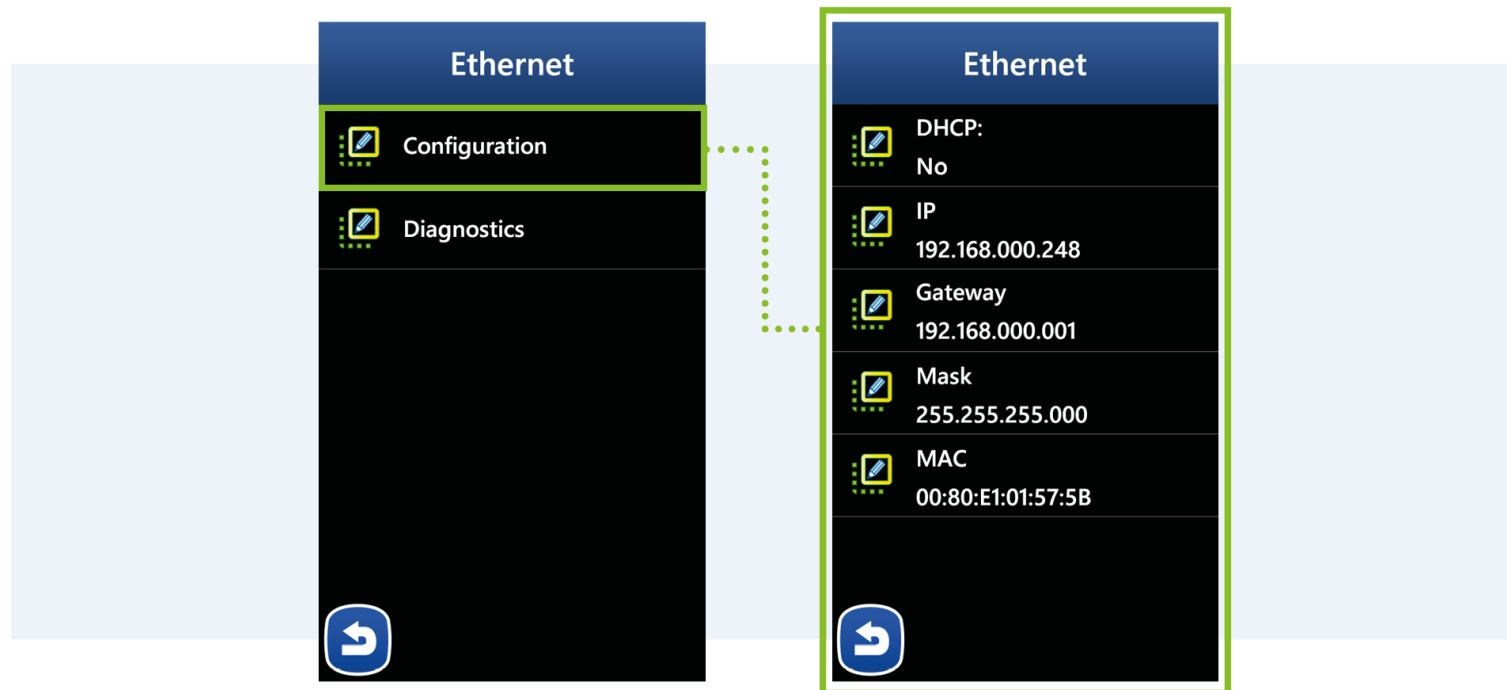
- DHCP,
- IP,
- Gateway,
- Mask,
- MAC,
- Gate.



9.7.3.2. DHCP settings

Selecting the DHCP field causes displaying on the screen a view of the following functions:

Input field for the DHCP server service to assign IP addresses.

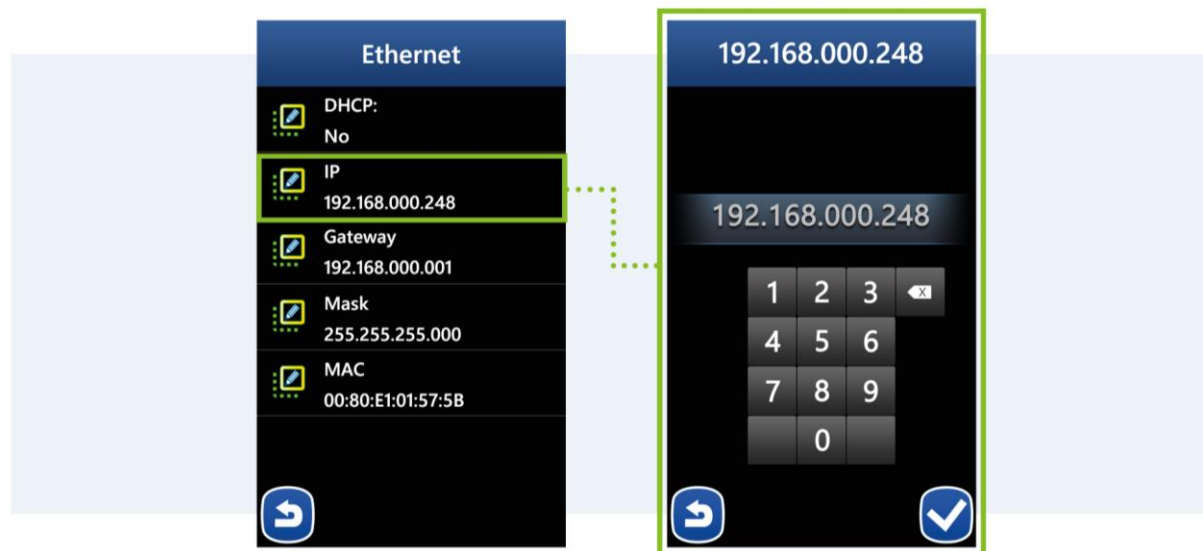


Menu | Service functions | Service | Network | IP

9.7.3.3. "IP" network settings

Selecting the IP field causes displaying on the screen a view of the following functions:

Field to enter the IP network address.

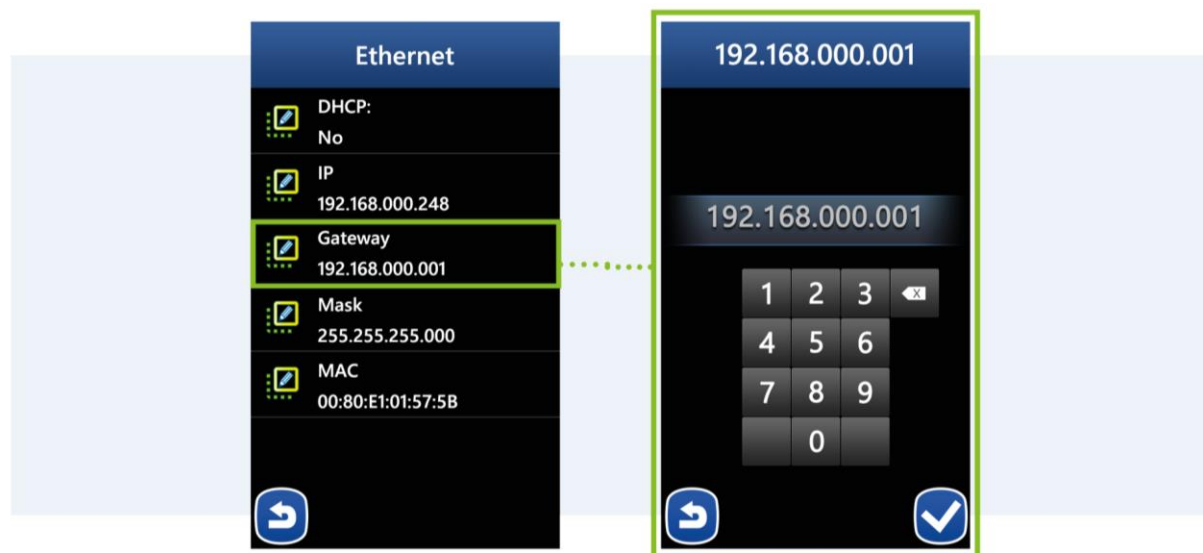


Menu | Service functions | Service | Network | Gateway

9.7.3.4. "Gateway" network settings

Selecting the Gateway field causes displaying on the screen a view of the following functions:

Field for entering the address of the local network gateway.



Menu | Service functions | Service | Network | Mask

9.7.3.5. "Mask" network settings

Selecting the Mask field causes displaying on the screen a view of the following functions:

Field for entering the mask used in the network.



Menu | Service functions | Service | Network | MAC

9.7.3.6. "MAC" network settings

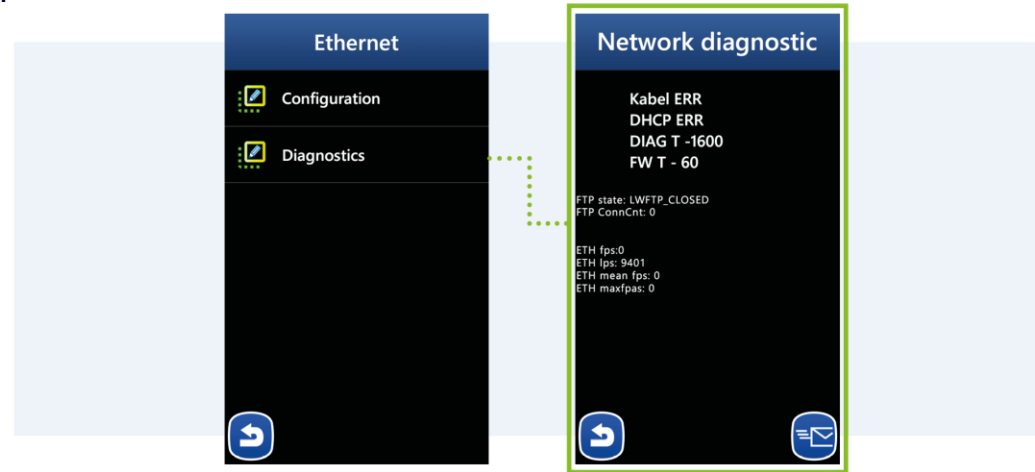
The MAC address of the controller. The MAC field is non-editable.



Menu | Service functions | Service | Network | Diagnostics

9.7.3.7. Network Diagnostic

Selecting the Network Diagnostic field causes displaying on the screen a view of the following functions:



Menu | Service functions | Service | Diagnostics

9.7.4. Diagnostics

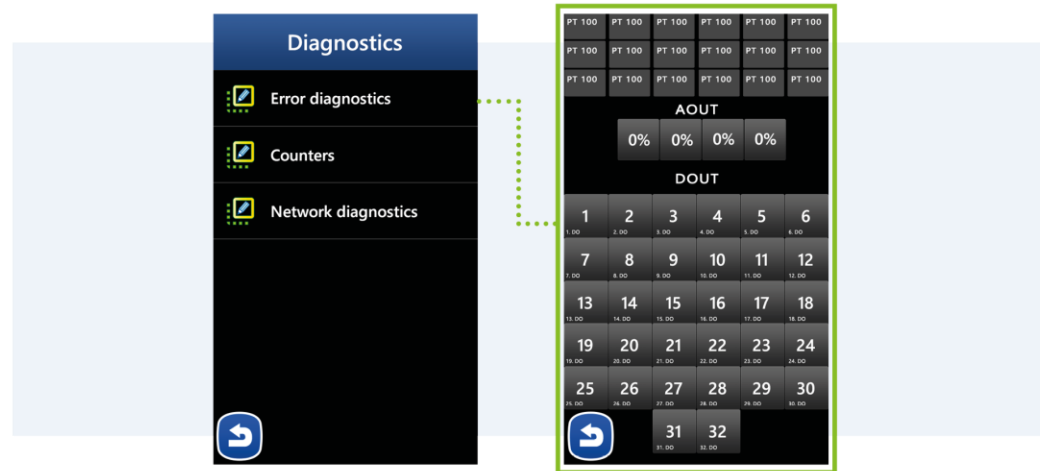
Selecting the Diagnostics field causes displaying on the screen a view of the following functions:



Menu | Service functions | Service | Diagnostics | Error diagnosis

9.7.4.1. Error diagnostics

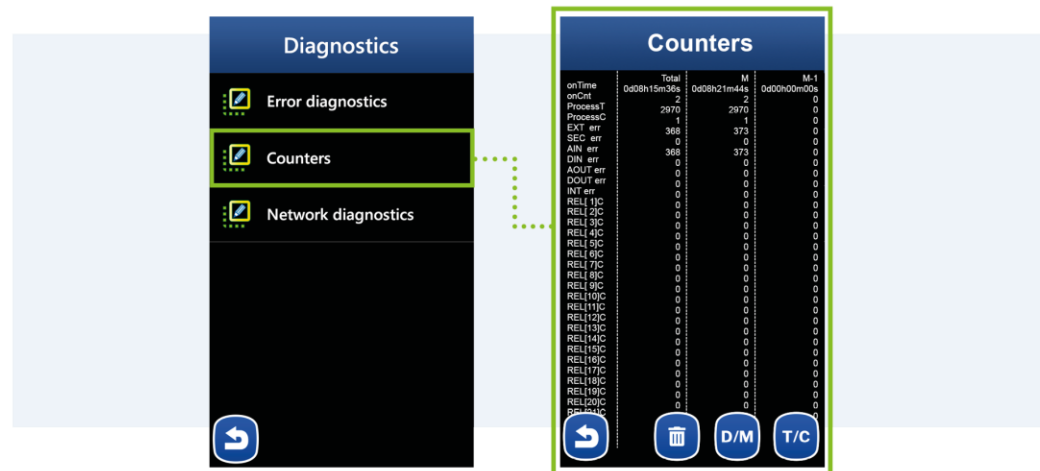
Selecting the Error diagnostics field displays the following functions on the view screen:



Menu | Service functions | Service | Diagnostics | Counters

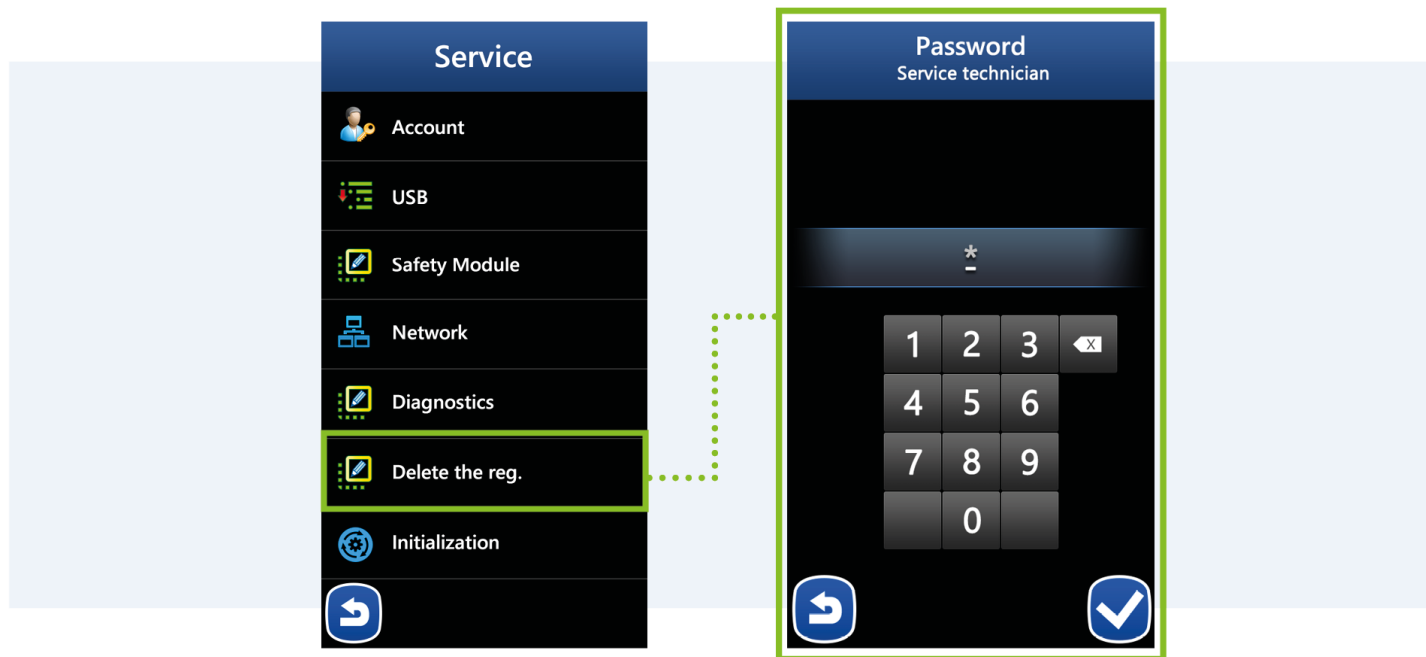
9.7.4.2. Counters diagnostics

Selecting the Counters field displays the following functions on the view screen:



9.7.5. Deleting the registration (serviceman's password)

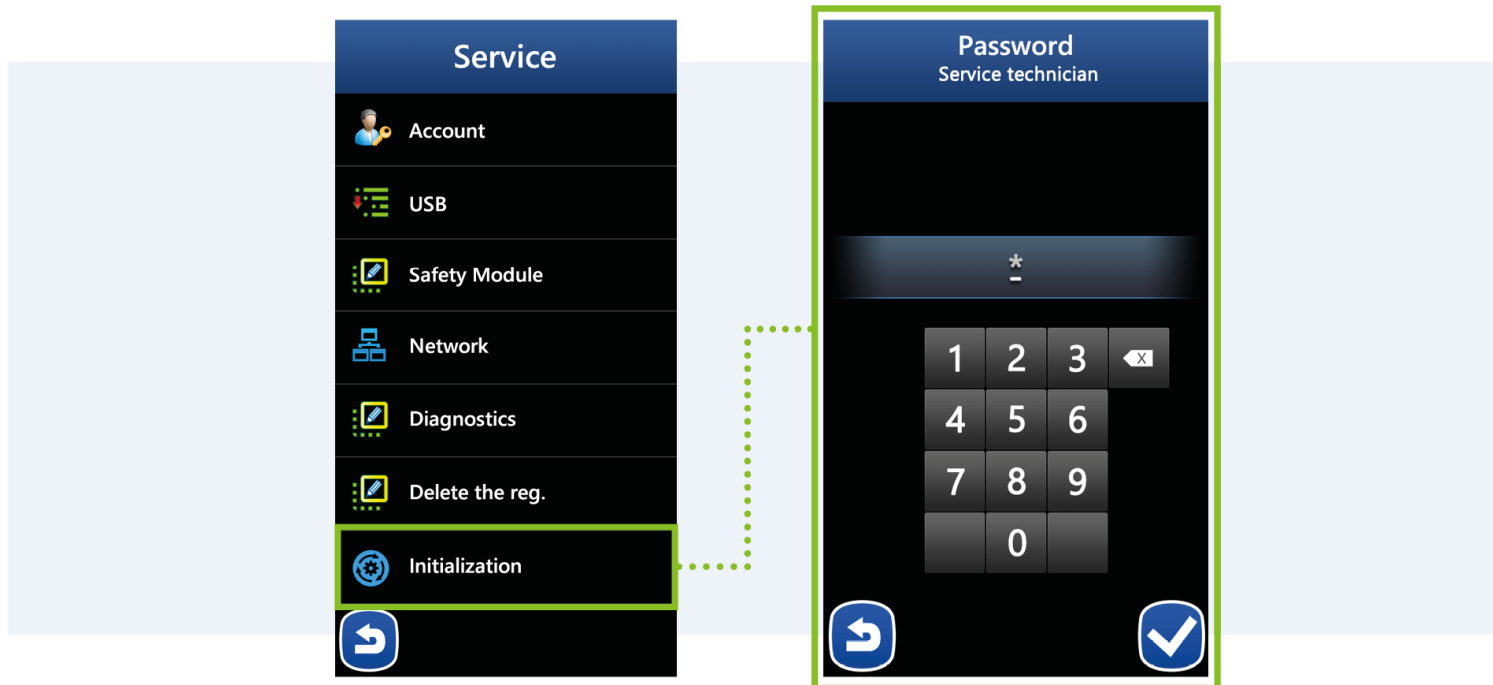
Selection of the Deleting of the registers field causes the following functions to be displayed on the view screen:



Menu | Service functions | Service | Initialization

9.7.6. Initialization (serviceman's password)

Selecting the Initialization field displays the following functions on the view screen:



10. End Condition Table

Condition table - when it is reached, the step is completed.

No.	Symbol	End condition
C01	Off	Step disabled
C02	TIR>TIS	Ends when the set time is reached.
C03	TCHR>TCHS	Ends after exceeding the set temperature in the chamber.
C04	TCR>TCS	Ends after exceeding the set temperature in the bar.
C05	HUR>HUS	Ends after exceeding the set temperature of the humidity.
C06	TIR>TIS or TCHR>TCHS	Ends after reaching the set time or after exceeding the set temperature in the chamber.
C07	TIR>TIS or TCR>TCS	Ends after reaching the set time or after exceeding the set temperature in the bar.
C08	TIR>TIS or HUR>HUS	Ends after reaching the set time or after exceeding the set humidity.
C09	TIR>TIS or TCHR>TCHS	Ends after reaching the set time and after exceeding the set temperature in the chamber.
C10	TIR>TIS and TCR>TCS	Ends after reaching the set time and after exceeding the set temperature in the bar.
C11	TIR>TIS and HUR>HUS	Ends after reaching the set time and after exceeding the set humidity.
C12	TCHR<TCHS	Ends when the temperature in the chamber drops below the set value.
C13	TCR<TCS	Ends when the temperature in the bar drops below the set value.
C14	HUR<HUS	Ends when the humidity drops below the set value.
C15	TIR>TIS or TCHR<TCHS	Ends after reaching the set time or after the temperature in the chamber drops below the set value.
C16	TIR>TIS or TCR<TCS	Ends after reaching the set time or after the temperature in the bar drops below the set value.
C17	TIR>TIS or HUR<HUS	Ends after reaching the set time or after the humidity drops below the set value.
C18	TIR>TIS and TCHR<TCHS	Ends after reaching the set time and after the temperature in the chamber drops below the set value.
C19	TIR>TIS and TCR<TCS	Ends after reaching the set time and after the temperature in the bar drops below the set value.
C20	TIR>TIS and HUR<HUS	Ends after reaching the set time and after the humidity drops below the set value.

No.	Symbol	End condition
C21	INn=1	Ends when a high signal appears on the control input.
C22	TIR>TIS and INn=1	Ends after reaching the set time and after the appearance of a high signal on the control input.
C23	TIR>TIS or INn=1	Ends after reaching the set time or after the appearance of a high signal on the control input.
C24	INn=0	Ends when a low signal appears on the control input.
C25	TIR>TIS and INn=0	Ends after reaching the set time and after the appearance of a low signal on the control input.