SERIES MIKROTHERM 825

$C\epsilon$

3 years
guarantee
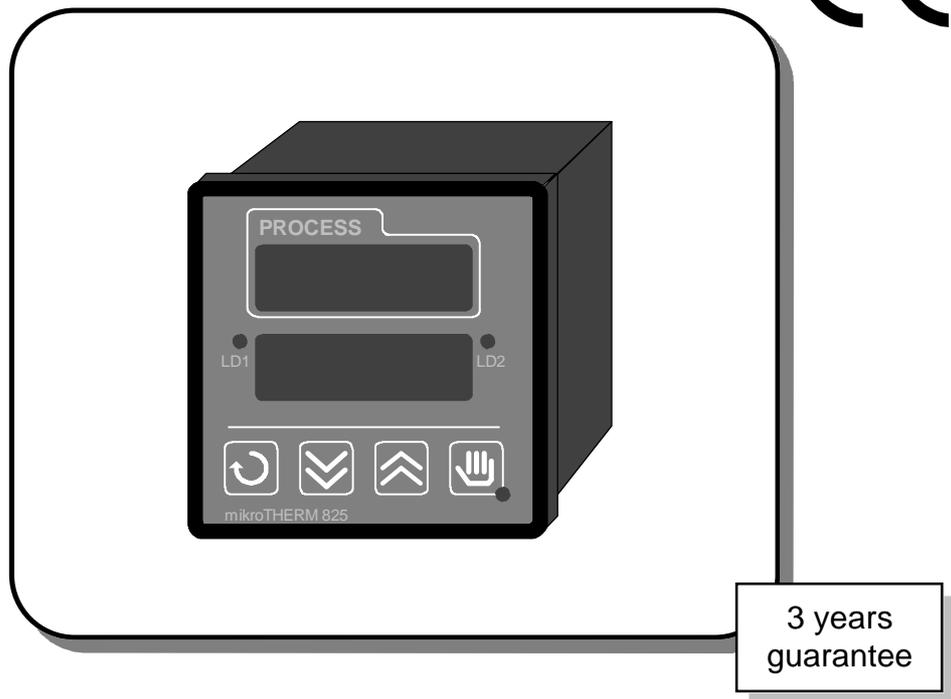
programmable PID controller
1/4 DIN
MT825-**P**x-xxx-xx

10 programms
× 10 steps

User's Manual

THERMOPROZESS s.r.o.

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1   Introduction

The User's Manual provides you with all data regarding operation, set-up, installation, wiring, programming and specifications of the ramping controller MT825. Some functions of the controller are explained in detail in the final chapter. The appendix contains diagrams for setting and operating the controller and the form for recording programms. We recommend making photocopies for entering programms and settings. The original should be kept as a master copy. Information about communiocation through a series line is provided in a separate manual.

1.1   MIKROTHERM Series 825

MIKROTHERM 825 is a series of microprocessor panels measuring instruments, controllers and programmable controllers of the 1/4 DIN format meant especially for thermal processes.

Every instrument in this series (with exception of the multi-channel meter) has one measuring input, one controll output and another output wich can be (depending on the model) configured as a controll, alarm, or event output.A thermocouple sensor, the RTD sensor Pt100, or process signals can be wired to the input. There is a membrane keyboard with four key. Acces to operation can be restricted on several levels. There is two displays and three LED's wich indicate all operational data. The set data is preserved, even after the power supply is switched off..

Modificatins of MT 825

- **MT825-CTx-x-xx** is a multi-channel measuring instruments. It can have as many as eight thermocouple inputs and as many as two alarm outputs. Further, it has the option of selecting the temperature of the cold junction, including separately automatic compensation for each input.

- **MT825-Sx-xxx-xx** is a precise PID controller.It enables among others remote setting of set point, control of difference, ratio, three-setting controll with backbond or without backbond.It is equipped with transfer measured temperature or set point.

- **MT825-Px-xxx-xx** is a PID controller extended by time process control.As many as ten different profiles can be composed of such sections as a linear rise (or drop) to the set point, holding a chosen value, loop and ending the programm. The built in real time clock allows automatic starting of the choosen program at a given time.

1.2   Technical Support

If you encounter a problems with the MT 825 series, review the hardware configuration information and controller settings to check that they are consistent with your application (input, outputs, alarm, working ranges, automatic starting of programs,"running of a program" prompts, clock setting, ...). If you cannot solve the problem, turn to your supplier or to the manufacturer. Plese have the following information ready when calling:

- Complete model description according to the code on the label of the controller
- Your copy of the User's Manual
- All configuration information

1.3   Warranty

The producer provides an extended warranty for 36 months, with exception of defects due to mechanically or electrically worn outputs. Farther, the warranty does not apply to defects resulting from inapropriate storing and transportation, misuse and faulty wiring, external influences (effects of electrical variables and temperatures higher then allowed, chemical materials, mechanical damage) electrical or mechanical overloading of the inputs and outputs, or if the controller was opened without autorization.

1.4   How to Use This Manual

New user:
We recommend getting acquainted with the description of the controls and indicators (Chapter 4), operations modes (Chapter 5), operating states (Chapter 6) and messages (Chapter 7), working in the operation menu and the description of the operation prompts with wich you work (Chapter 9), "Run" Menu (Chapter 10), and programming (Chapter 12), If you are going to create or edit programs further with PID controlling or if you are going to set PID prompts or start auto-tuning, also see (Chapter 11).

Experienced user:
We recommend getting acquainted with the Menu Overview (Chapter 2), description of controls and indicators (Chapter 4), operation modes (Chapter 5), operating states (Chapter 6) and messages (Chapter 7). If some issues are not clear, a more detailed description of the prompts are some functions is provided (Chapters 8 to 13).

Expert user:
An expert user may simply review the diagrams in the appendix, and the description of prompts and functions, If their meaning is not immediately clear.

Installation technician:
For information about installation and wiring, see Chapter 3.

1.5   Putting the Controller into Operation
We recommend this procedure:
- installing into the panel (Chapter 3.1)
- electric wiring (Chapters 3.2, 3.3, 3.4)
- setting the configuration prompts (Chapter 8)
- setting the operation promts (Chapter 9)
- automatic setting of PID prompts (Chapters 11.1 a 11.2)
- programming the profiles (Chapter 12.1)
- setting the operation mode (Chapter 5)
- training the operator

2.0 Menu Overview
All prompts used for setting and operating the controller are in the "Setup Menu" and in the "Operation menu". The "Running a Program" can be accessed by the operator when a program is running. It is used to interrupt and monitor the program running.
The "Setup Menu" is used to set the controller for a specific task, and is usually done only after controller installation or when there is a serious change in technology. This setting should be done by qualified technican. Unqualified operators should only work in the "Operation Menu" and in the "Run Menu". It is not recommended to show to an unqualified operator how to access the "Setup Menu".
The operation mode (see the "ModE" prompt) can be set to prohibit change of operation prompts and certain operations.
A password can be used protect entry into Setup Menu (see the "PASS" prompt).
The "Setup" and "Operation" menus are divided into so called submenus. These contain individual logically related prompts. See the diagrams in the appendix.
A detailed description of individual prompts can be found in Chapters 8, 9, and 10. Here is a brief account of their structure for you:

2.1 Setup Menu ("SEt")

The Setup Menu is divided into the following submenu:

- Input ("InPt")
- Output ("otPt")
- System ("SYS")
- Communication ("CoM")
- Program Run Prompts ("Prun")
- Clock ("CLK")

2.2 Operation Menu ("oPEr")

The Operation Menu contains the set point, setting the operating state"StbY" (see Chapter 6), event input state, program prompts and the following submenus:

- System ("SYS")
- History ("HISt")
- Program ("ProG")
- Automatic Program Starting ("Arun")
- Clock ("CLK")

2.3 Run Menu("run")

The Run Menu contains the current set point, number of program and actual step, end set point and time remaining.

It is also possible to interrupt the program in the "Run" menu.

3 Installation and Wiring

3.1 Installation

The controller is installed into a panel. It is fastened with two mounting brackets wich are included with the controller. The installation requires access to the rear side of the panel.

91 x 91 mm

Panel Thickness
from 1,5 to 10mm
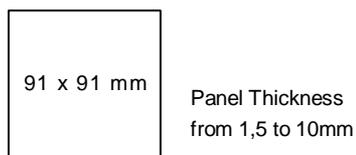
Figure 1.   Panel cutout

Installation procedure:

- Make a panel cutout according to the dimensions in Figure 1.
- Slide the controller into it front to back.
- Insert the mounting brackets into the slots at the top and at the bottom or at both sides of the controller. Gently press each bracket backwards so that it slides into the slots.
- Screw on and tighten the mounting barckets screws.
- The controller will be installed and ready for wiring. Wiring, as described below, differs according to the configuration of the controller.
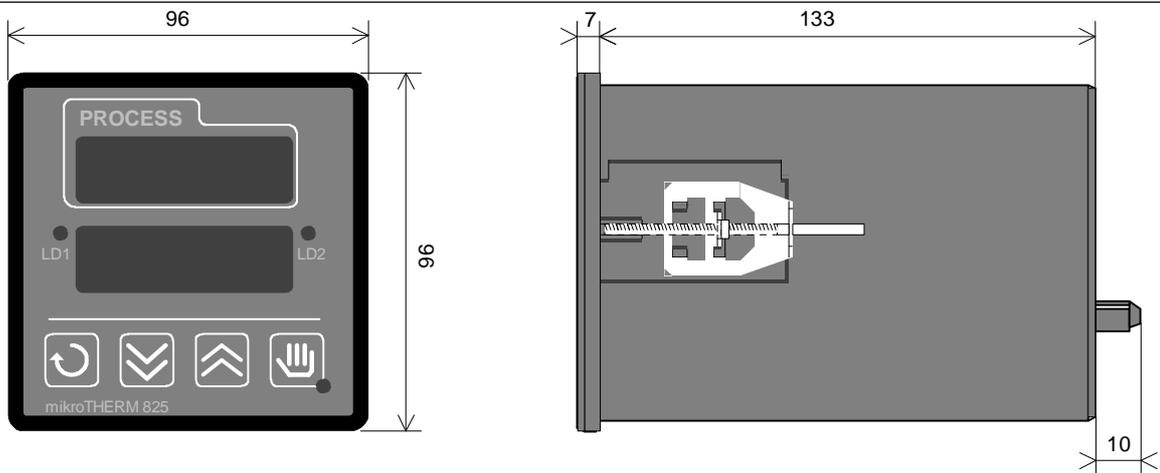
Figure 2.   MT 825 Dimensions

3.2   Power Supply

Before wiring the supply voltage, it is neccessary to verify whether the supply voltage corresponds to the model description (terminal designation sticker).

The controller can be wired only by an operator with appropriate qualifications, following all safety regulations. Failure to do so could result in damage, injury or death.

Low supply voltage

The supply voltage of the MT825-Px-xxx-Ax can be both direct and alternating 50-60 Hz, and must be within 12 to 16 V range. Supply voltage leads are wired to terminals No.15 and 16. regardless of the polarity. A fuse with a nominal value of 1 A (not included) is located outside the controller.

Main supply

The model MT825-Px-xxx-0x has a main voltage supply of 230 V/ 50-60 Hz. Supply voltage leads are wired to terminals No.15 and 16. A fuse with nominal value of 200 mA (not included) is located outside the controller.
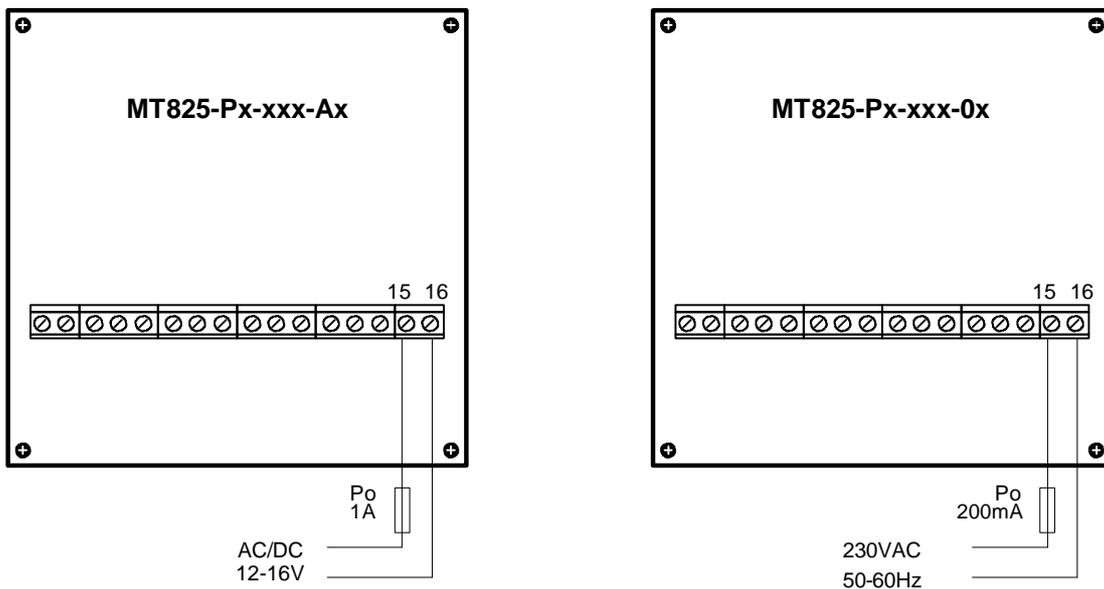
Figure 3.   Voltage Supply Wiring

3.3   Input Wiring

Thermocouple Input
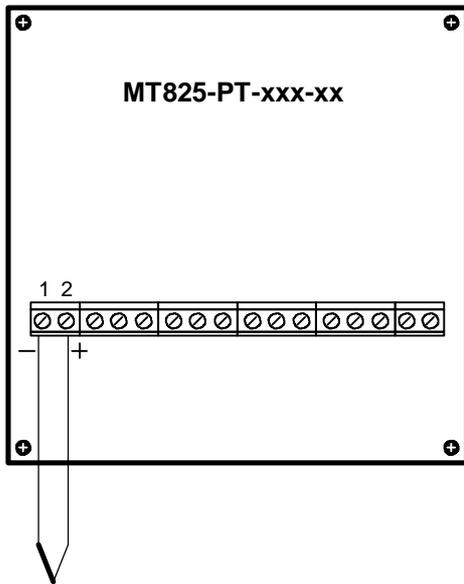
Figure 4.   Thermocouple Input Wiring

The termocouple sensor must be wired by a thermocouple or extension wire of the same type as the sensor. The polarity of both leads and thermocouple wiring must be correct.
If the controller is wired without a sensor or if the sensor is disconected, upper display shows "- - - -".
If an output power element without galvanic isolation is wired to the voltage output with the open collector, interaction between the input and the outputs must be prevented by an isolated thermocouple.

RTD Input

The temperature coefficient of the used sensor Pt100 must be (in accordance with IEC and DIN) ALPHA = 0.00385 Ohm/Ohm°C. At a temperature 100°C the sensor must have a resistance 138.5Ohm. It can be a 2 wire or 3 wire sensor. In the case of a 2 wire sensor, terminals No.1 and 2. must be short-circuited. Each 1Ohm of leads resistance means an input error of about 2.6°C. The 3 wire RTD perfectly compensates the influence of the lead resistance providing that all three wires have equal resistance (the same material, construction, diameter, lenght). If the controller is wired without a sensor or if the sensor circuit is disconected, the upper display shows "- - - -".
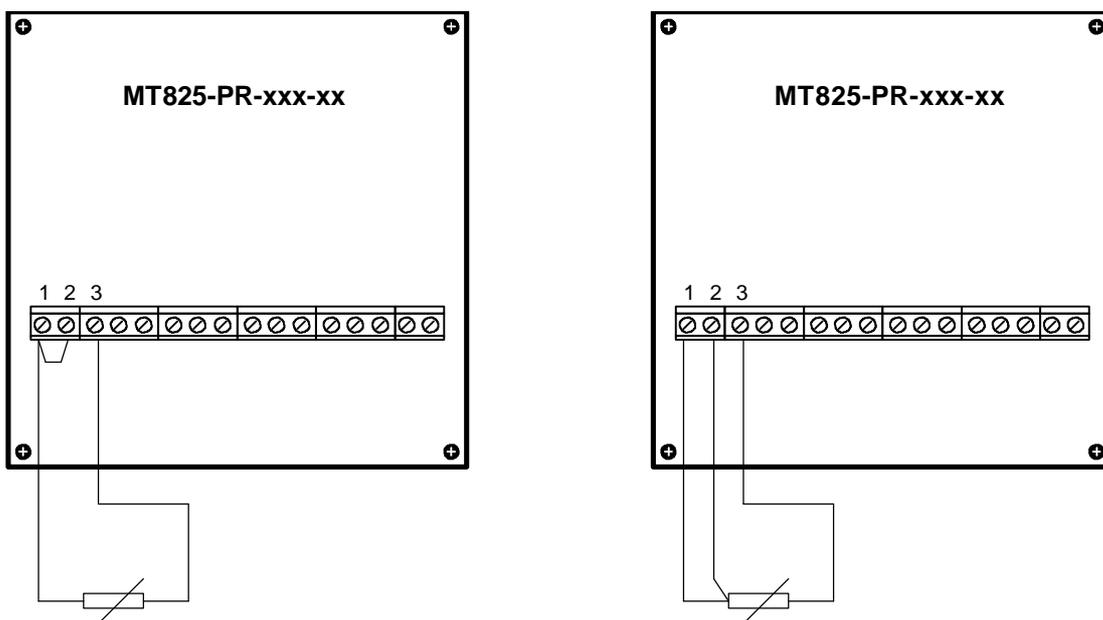
Figure 5.   2 wire and 3 wire RTD sensor Pt100

Process Inputs

When process inputs are used, the prompts "rL" and "rH" set the range for displaying the measured variable (see Chapter 13.5.) There is no signalling of input circuit (signal transmitter). In the case of a defect in the input circuit (signal transmitter), the control output can stay open.
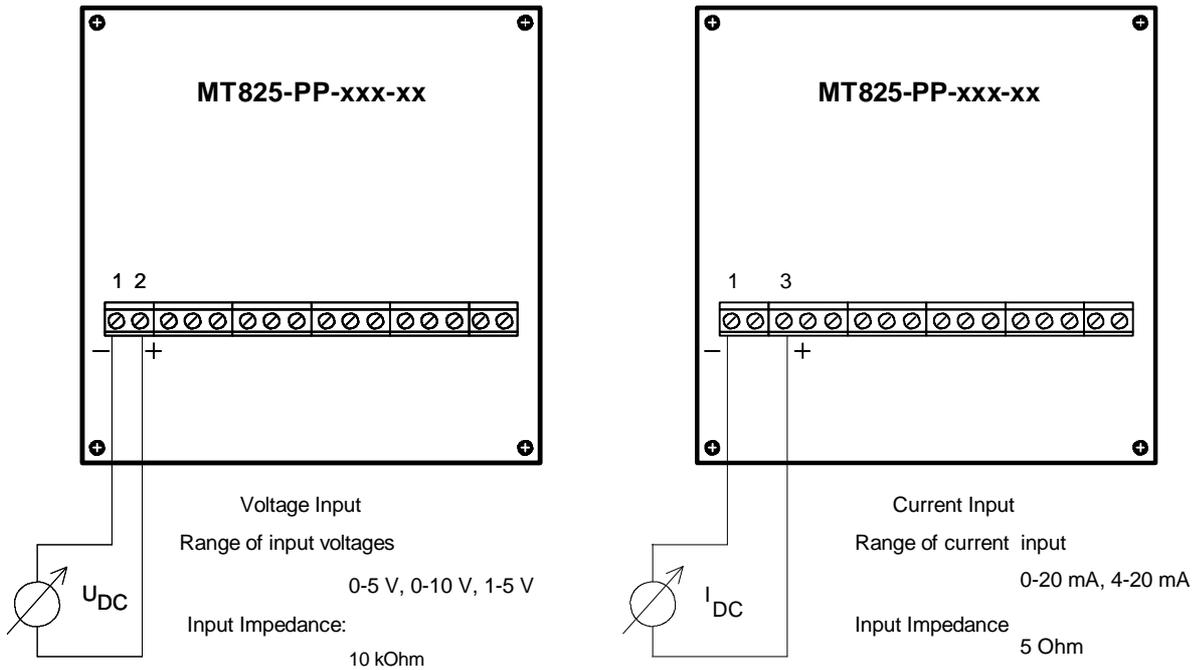
Figure 6.   Voltage and current process inputs wiring

3.4   Output Wiring

Mechanical relay 5A, Switch, Output 1, Output 2
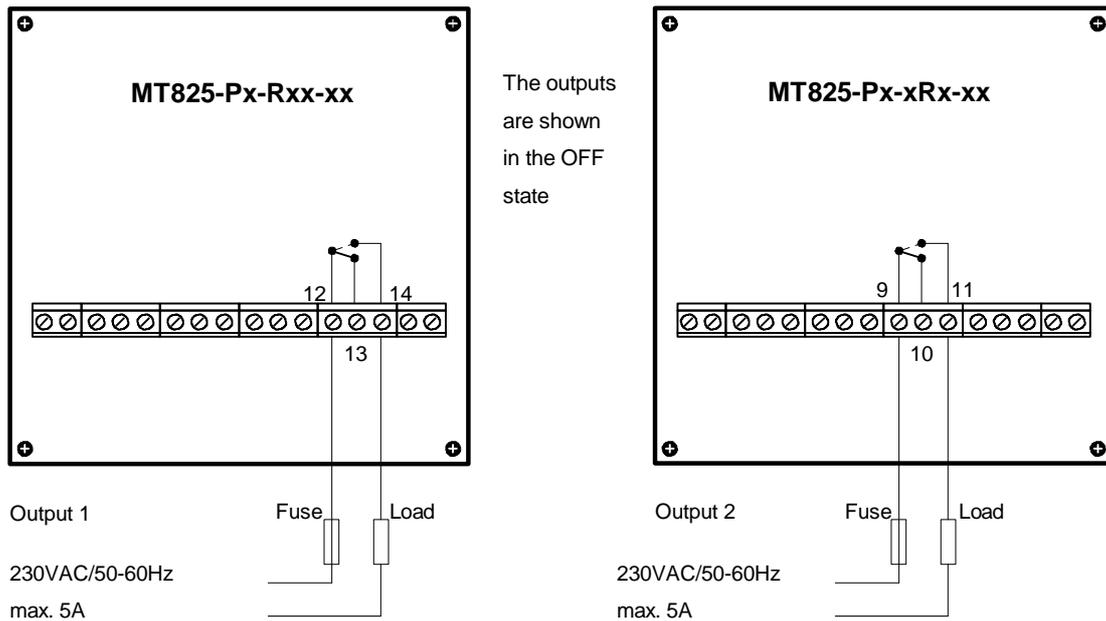
Figure 7.   Mechanical relay, output 1, 2

The relay is wired as a switch. The off state impedance is very high. For switching inductive loads, wiring an RC suppressor in parallel to the load is recommended.

DC Voltage Output (open collector) Output 1, 2

Is low voltage output with an open collector. It is used for switching external power output switches such as SSR relay with a DC input or some electromechanical relays. There is no galvanic isolation.The isolation must be provided by a power output switch. Minimum load impedance is 200 Ohm, maximum output current is 30 mA. The typical voltage per 10 kOhm is 10V.
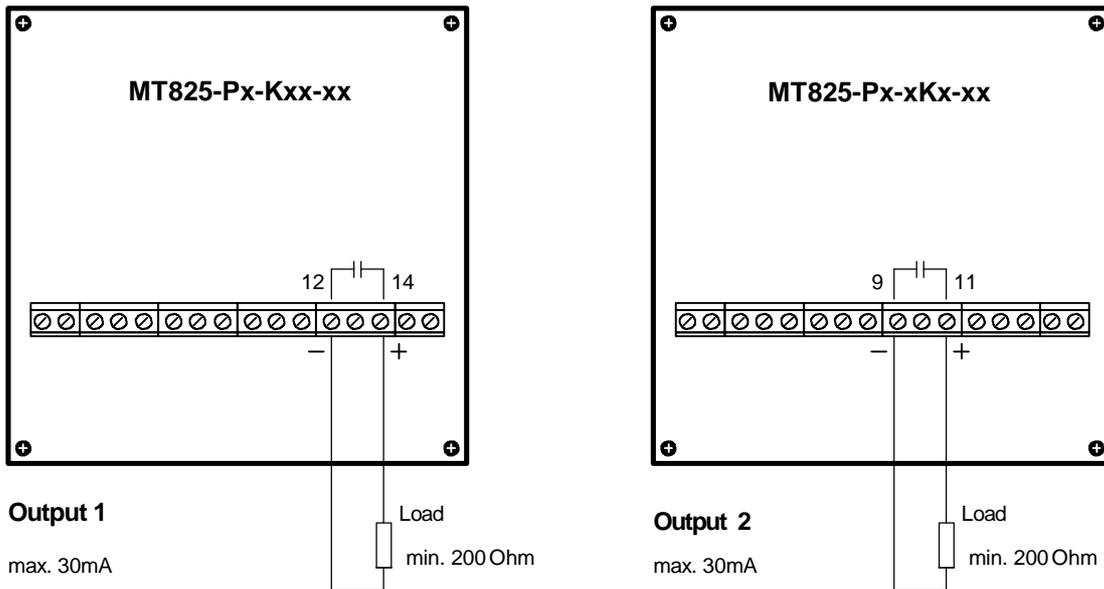
Figure 8.   DC output with an open collector, output 1, 2

Proportional Current 4-20 mA, Output 1

The value of the output current depends on the state of the controlled system. It changes proportionately 4-20 mA range.Maximum load impedance is 500 Ohm. This output is isolated.(see Figure 9).

Proportional Voltage 0-5 V or 0-10 V, Output 1

The value of the output voltage depends on the state of the controlled system. It changes proportionately within the 0-5 V or 0-10 V. Minimum load impedance is 1 kOhm. This output is isolated. (see figure 9).
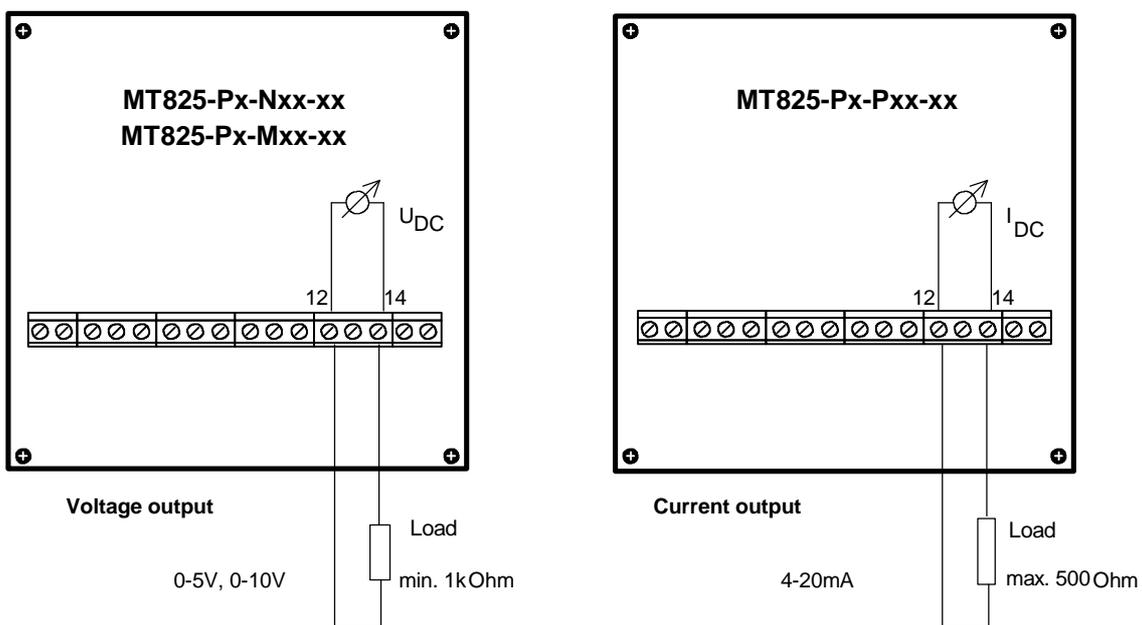
Figure 9.   Proportional output, output 1

Double Relay Output 2 x 5A, Two Switches, Output 2

The relays are wired as independent switches with one shared contact. The off state impedance is very high. For switching inductive loads , wiring an suppressor in parallel to the load is recommended .
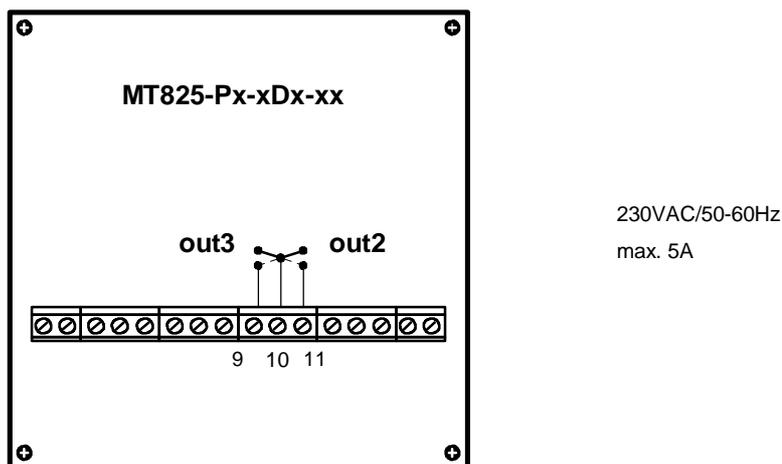
Figure 10.   Double relay output, output 2

Retransmit, 0-20 mA, 4-20 mA, Output 3

With helping this output it can be possible transfer eihter measured or set point value to the analog form. This signal is then possible work on with other devices, wich participate on the regulation.

Input current is in the range 0-20 mA or 4-20 mA.
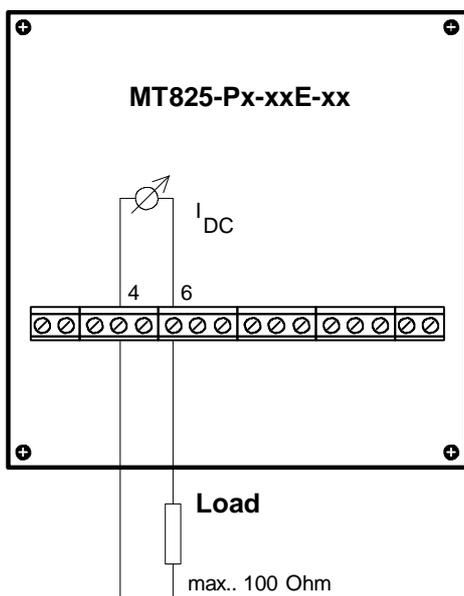
Figure 11.   Retransmit

4　Keys and Displays

4.1　Indicators

The upper display indicates the process value. The lower display indicates the current set point or the operating prompt values"StbY", "oFF" or "PArK".
The LED's LD1 and LD2 signal the control output (LD1) and alarm or event output (LD2).They are lit when the corresponding output is active.
The LED MODE indicates the program running. When the program runs, the LED is lit. During manual starting of a program, the LED flashes.
The displays also show names of menus and submenus, prompts, their values and operation messages.Some of the displays can even be switched off in the basic state - see the "dISP" prompt in the Setup Menu.
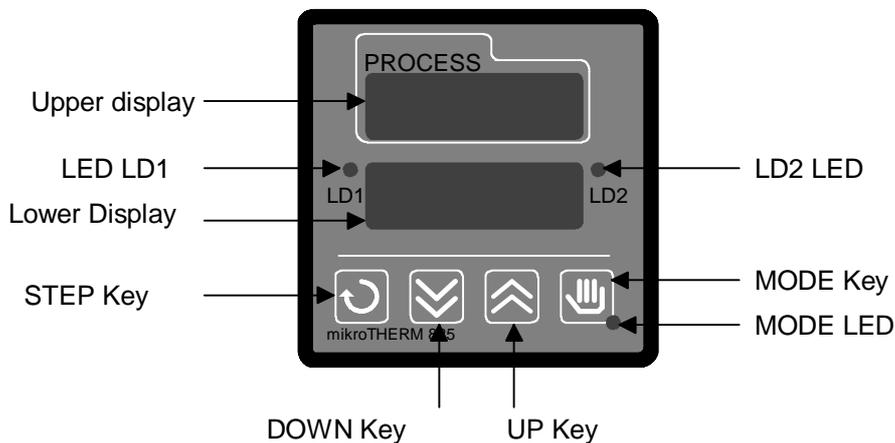
Figure 12.　　MT 825 front panel

4.2　Keys

To operate the controller use the four keys on the front panel. There are no other operation or set up keys.

．　STEP Key
　　Used to step through all menus. Pressing the key calls up the following prompt
．　UP key
　　increase the value or sets a different value of the prompt displayed on the upper display.
　　The lower display shows the name of the prompt. One touch increases the value by one.
　　Holding the key down increases the value at a rapid rate.
．　DOWN Key
　　Decreases the value or sets a different value of the prompt displayed on the upper display.
　　The lower display shows the name of the prompt. One touch decreases the value by one.
　　Holding the key down decreases the value at the rapid rate.
．　MODE Key
　　Used to start or interrupt the program (see Chapter 12.3), to clear the latched alarm (see Chapter 13.1). and also to cancel the operation states "oFF" and "StbY".

When UP and DOWN keys are pressed simultaneously for at least six seconds, the Setup Menu opens.
The currently opened menu closes after forty seconds without pressing a key and the controller returns to its basic state.

5   Operation Modes

MT 825 has eight different modes of operation, see the "ModE" prompt.

The main difference between modes 0, 1, 2, 3 and the modes 0.P, 1.P, 2.P, 3.P is that the first group enables the operator to control according to a constant value as well as according to a program, while the second group only enables controling according to a program. Within one group individual modes differ in the level of access of the operator to the operation prompts (the higher the number the more restricted acces).

<u>**Review of operation modes**</u>

ModE	Control		Description
	Set Poit	Program	
0	Yes	Yes	**No restriction of operation.** Recommended only for the original prompt setting after installing the controller.For everyday use, chosing some of the higher modes with protection of important prompts against unqualified operators recommended.
1	Yes	Yes	**PID prompts, "Ct" and "CAL" in the submenu "SYS" are protected.** It is possible to change the unprotected prompts (e.g. set the set point, alarm limits, PID prompts only using auto-tuning, further to create, edit or start programs, to set the automatic starting of programs, etc.)
2	Yes	Yes	**Submenu "SYS" is protected.** It is possible to set the set point, to create, edit or start programs, to set the automatic starting of programs and to control real time clock settings.
3	Yes	Yes	**Set point, submenu "SYS", "COM", "PROG" are protected.** It is only possible to set the automatic starting of programs, start programs and control real time clock setting.
0.P	No	Yes	**No restriction of operation.** All operation prompts can be changed, e.g. PID prompts (manually or using auto-tune), alarm limits, to create, edit, or strat programs, etc
1.P	No	Yes	**PID prompts, "Ct" and "CAL" in the submenu "SYS" are protected** It is possible to change the unprotected prompts (e.g. alarm limits, PID prompts only using auto-tuning, further to create, edit or start programs, to set the automatic starting of programs, etc.)
2.P	No	Yes	**Submenu "SYS" is protected.** It is possible to create, edit or start programs, to set the automatic starting of programs and to control real time clock settings.
3.P	No	Yes	**The submenu "SYS", "COM", "PROG" are protected.** It is only possible to set the automatic starting of programs, start programs and control real time clock setting.

6   Operating States

MT825 can operate in several operating states. They are clearly indicated by the display and the LED MODE (see Chapter Keys and Displays)

"Set Point"

The set point is shown in the lower display (as a number), the operator can change it (with exception of the operation mode 3). The LED MODE is not lit. The control is done according to a constant value. In the operation modes 0.P, 1.P, 2.P and 3.P this operating state is not possible.

"Program"

The current set point is shown in the lower display (as a number wich automatically changes during program running). The operator cannot change the set point, but can interrupt the program. The LED MODE is lit.The control is done according to a program.

"Stand by"

The lower display shows "StbY", the LED MODE is not lit. The control output is in standby state (no controlling occurs). The controller is ready to start the program. We shall see later that the program can be started automatically or by the operator. This operating state is typical for the operation modes 0.P, 1.P, 2.P and 3.P, but it can also be set up in the modes 0, 1, 2 and 3. This state is also reached by the controller after completion of some programs.

"Off"

The lower display shows "oFF", the MODE LED is not lit. The control output is permanently switched off. Unlike in the "Stand by" state, the program cannot be started either automatically or by the operator.This operating state is reached by the controller after completion of some programs and when the program is manually interrupted. The operating state "oFF" is cancelled by pressing the MODE key   .

Also in the case of the disconnection of the input circuit (a sensor defect), when the upper display shows the operation message"----" instead of the process value, the lower display shows "oFF". This is not the operating state, but an error state. In this case, the controller will return to its previous operating state as soon as the input circuit is repared.

"Park"

The lower display shows "PARK", the LED MODE is not lit. All outputs are permanently switched off. There is no controlling. The program canot be started.This operating state is meant for maintenance work on the equipment. It is set and switched off with the "PArK" prompt in the Setup menu "SYS" submenu

Review of operating states

Operating state	Data in the lower display	LED MODE	Description
Set Point	set point	not lit	Control according to a constant value. The program can be started.
Program	current set point	lit	The program is started.
Stand by	"StbY"	not lit	The control output is in stand-by state. The program can be started.
Off	"oFF"	not lit	The control output is switched off. The program cannot be started.
Park	"PArK"	not lit	All outputs are switched off. The program cannot be started.

7 Operation Messages

In certain cases (typically when the input circuit is disconected e.g. in case of a sensor defect, power supply failure during running of the program, etc.) the appropriate display shows an operation message indicating the problem that occured. You should familiarize yourself with them in advance so that in case of a failure, you do not lose time going through the manual. The message will occur without an operator's interference under the influence of external circumstances, with the exception of "Aut1" and "Aut2" wich flashes after starting automatic tuning of PID prompts and wich disappears after the tuning is finished.

Review of operation messages

Message	Display	When can it be displayed?	What does it mean?	What to do?
"- - - -" "oFF"	Upper Lower	Anytime, with the exception of controllers with a process input.	Open input circuit of a thermocouple or Pt100.	Check or repair the input circuit.
"-r-"	Lower	Anytime	Process value outside the set working range	Check correctness or correct the input setting (prompt "In) and the input circuit
"Abrt"	Lower	Only while a program is running	Program interrupted due to power failure. Control output was switched off	Abort the program or continue in it.
"hoLd"	Lower	Only while a program is running.	Program interrupted due to power failure. Maintaining of the last achieved set point	Abort the program or continue in it
"GSd"	Lower	Only while a program is running.	Process value is outside the permitted toleration band	
"Err0" "Err1"	Upper	Anytime.	Defect in the controller	Contact the producer.
"Aut1" "Aut2"	Lower	After the operator starts the auto-tune function.	Automatic setting of the first (Aut1) or the second (Aut2) set of PID prompts	

8 Setup Menu

In the Setup Menu (SEt), the basic setting of the controller is done before it is put into operation.
The first setting (and also possible later changes in the setting) should be done by a qualified technician.
Incorrect setting can cause serious damage.

Opening the Setup Menu

Open the Setup Menu by pressing the UP and DOWN keys simultaneously for at least six seconds. If access to the Setup Menu is protected with a password, the "PASS" prompt occurs and you should to set its correct numeric value using the UP and DOWN keys. Enter it by pressing the STEP key. If a faulty password was entered, the Setup Menu will not open. If everything is correct "SEt" will start flashing in the lower display, and in the upper display the code of the first submenu Input ("InPt") will occur. The Setup Menu is open. The Setup Menu cannot be opened while a program is running, during auto-tuning (see Chapter 11.2) and in the case of an input circuit defect. In other words: if the MODE LED is lit, if the operation message "Aut1" or "Aut2 is flashing in the lower display or if the upper display shows "----", the Setup Menu cannot be opened.

Opening a submenu of the Setup Menu

After opening Setup Menu, you can use the UP and DOWN keys to select a submenu. It can be opened by pressing the key STEP. The lower display will show the first prompt (e.g. in the submenu Input it is the prompt "InPt"), the upper display will show its value (e.g.for the prompt "In" it is "K").

Setting prompts

The keys UP and DOWN can be used to set required numeric values or letter codes for all prompts. You can move to the next prompt by pressing the "STEP" key. After stepping through all prompts of the opened submenu, you return automatically to the "beginning" of the Setup Menu. You can open another submenu or complete the setup.

Closing the Setup Menu

Complete your work in the Setup Menu by setting the return function "rET" and verifying it by pressing the STEP key.

The Setup Menu closes after forty seconds without pressing any key, but prompts stay unchanged.

Hidden prompts

Not all prompts given in the table are shown on the controller. For the sake of maintaining clarity and simplicity of operation, only those prompts are displayed wich can be set up. The others remain hidden and they are shown when the setup is changed. In some cases it depends on the hardware setup (e.g. the "dEC" prompt is only shown on controllers with process Inputs - MT825-PP-xxx-xx) or on the setting of the related prompts (e.g. the "LAt" prompt is displayed only if out2 = ALPr or ALdE is set**.**

8.1   The Submenu "Input" (InPt)

The input is set according to the used sensor type. The operation ranges are set according to the technological requirements.

Prompts of the "Input" ("InPt"):

In   **INPUT**
Setting the required input. The "In" prompt values vary according to the controller input.
Changing the value of this prompt sets some other prompts to default values.
Range: **MT825-PT-xxx-xx** (thermocouple): J, K (appears as "H"), t, n, E, r, S,b, C, d
              MT825-PR-xxx-xx (RTD sensor Pt100 with resolution 1°C, 0.1°C): rtd, rt.d
              MT825-PP-xxx-xx (process Input): 0-20, 4-20, 0-5, 0-10, 1-5
Default: (according to the input) K, rtd nebo 4-20

dEC   **DECIMAL**
The location of the decimal point on the display. It is shown only by controllers with process input.
Range: 0, 0.0, 0.00
Default: 0
Hidden if: **MT825-PT-xxx-xx** and **MT825-PR-xxx-xx**

rL   **RANGE LOW**
The low limit of the working temperature range. The low range for process inputs is represented by the values 0mA, 4mA, 0V or 1V. Between the values "rL" and "rh" there is linear division (see Chapter 13.5).
Range: the low range according to the Input type to rh
Default: the low range according to the Input type, -499 for process inputs

rh   **RANGE HIGH**
The high limit of the working temperature range. The high range for process inputs is represented the values 20mA, 5V or 10V. Between the values "rL" and "rh" there is linear division (see Chapter13.5).
Range: rL to the high range according to the input type
Default: the high range according to the input type, 2499 for process inputs

8.2   Output Submenu ("otPt")

Setting the output prompts. The first output is a control output, it can control heating (reverse acting) or cooling (direct acting). The second output can be set as an alarm or event output.. The second, a double relay output in the case of configuration MT825-Px-xDx-xx, can be simultaneously used as alarm and event output.

Output submenu prompts:

out1   OUTPUT 1
Setup of the first (control) output.
Range: ht (heating), CL (cooling)
Default: ht

hYS1   HYSTERESIS 1
Setting switching hysteresis of the first output for the mode of ON/OFF control (if Pb1 or Pb2 = on.oF is set, see the operation menu)
Range: 1 to 199, 0.1 to 19.9, 0.01 to 1.99
Default: 2, 0.2, 0.02

out2   OUTPUT 2
Setup of the second (alarm or event) output. It is not displayed on controllers without the second output. On the controller with the double relay output MT825-Px-xDx-xx the second output can only be set as an alarm output. (see Chapters 13.1 and 13.4)
Range: ALPr (process alarm - alarm derived from absolute values), ALdE (alarm derived from deviation), Ent (event; not possible on the configuration MT825-Px-x**D**x-xx), no (the second output without a function)
Default: ALPr
Hidden if: **MT825-Px-x0x-xx**

LAt   LATCHING
Selection between latching and non-latching alarm. The non-latching alarm lasts only as long as the set limits are exceeded. The latching alarm has to be cleared manually (see Chapter 13.1). The prompt is not displayed if the second output is not configured as an alarm output
Range: LAt, nLA
Default: nLA
Hidden if: **MT825-Px-x0x-xx** or out2 = Ent or no

out3   OUTPUT 3
Setup of the third (event) output. It is displayed only on the controllers MT825-Px-x**D**x-xx with double relay output, and it can be configured only as an event output or as unused output.
Range: Ent (event), no (output without function)
Default: Ent
Hidden if: all configurations with the exception of **MT825-Px-xDx-xx**

Aout   ANALOG OUTPUT
Choice of value, wich will be in analog form transmitted by output of controller (RETRANSMIT). There can be transmitted Set Point (StPt) or Measured Value (PrC).
Range: StPt, PrC
Default: PrC

ProC   PROCESS RANGE
Setup range for the transfer. Output for retransmit is currently, 0-20 mA or 4-20 mA.
Range: 0-20, 4-20
Default: 4-20

rtrL **RETRANSMIT LOW LIMIT**
The low limit for the transmitted value.
Range:　　　-499 to rtrh
Default:　　　0

rtrh **RETRANSMIT HIGH LIMIT**
The high limit for the transmitted value.
Range:　　　rtrL to 2499
Default:　　　1000

8.3　System submenu ("SYS")

Setting system prompts such as operation mode, password, PID prompts switching, switching off displays and power limiting. During maintenance work on the equipment we recommend using the "PArK" prompt, wich can be used to switch off all outputs.

System submenu prompts:

ModE **MODE**
Switching the operation mode (see Chapter 5).
Range:　　　0, 1, 2, 3, 0.P, 1.P, 2.P, 3.P
Default:　　　0

PASS **PASSWORD**
Numerical password for preventing unauthorized entry into the Setup Menu. If it is set PASS = oFF, the function is not used and the Setup Menu can be freely accessed. **If you forget your password, contact your supplier.**
Range:　　　oFF, 1 to 200
Default:　　　oFF

PArK **PARK**
Switching off all outputs. It is recommended to be used during maintenance work on the equipment. If PArK=on, all outputs will remain in the off state under all circumstances and the program cannot be started in any way. The lower display shows "PArK" instead of the set point.
Range:　　　on, oFF
Default:　　　oFF

ALGo **ALGORITHM**
Sets the algorithm of the PID control. ALGo=PId allows using one set of PID prompts. If ALGo=PId2, two sets of PID prompts can be used, separately for "low" and "high" values (see Chapter 11.1.)
Range:　　　PId, PId2
Default:　　　PId

PId2 **PID 2 CROSSOVER SET POINT VALUE**
The set point during wich switching from one PID set to the other takes place. In other words, it is a borderline between the "low" and "high" values (see Chapter 11.1). This value is not related to the similar prompt "SPL".
Range:　　　rL to rH
Default:　　　rH
Hidden if:　　ALGo = PId

dISP **DISPLAY**
This prompt can be used to switch off displaying in the lower or the upper display in the operating states "SP" and "Program".
Range:　　　uPdn (both displays show), uP (the upper display shows the process value), dn (the lower display shows the set point)
Default:　　　uPdn

PLd   POWER LIMITING DOWN
Limiting output power at "low" process values (see Chapter 13.6).
Range: 0 to 100%
Default: 100%

SPL   SWITCH POWER LIMITING
Setting the value at wich power limiting switches. When process values are lower then SPL, the limit set by the "PLd" prompt is used. When process values are higher than SPL, the limit set by "PLu" prompt is used (see Chapter 13.6). This value is not related to the similar prompt "PId2".
Range: rL to rh
Default: rh

PLu   POWER LIMITING UP
Limiting output power at "high" process values (see chapter 13.6).
Range: 0 to 100%
Default: 100%

8.4   Program Running Prompts ("Prun") Submenu

Setting the prompts for starting and running a program.

Program running prompts

Pout   POWER OUTAGE
Sets the reaction to power supply failure during program running. After power supply is renewed, it is possible to continue the program (Cont), to interrupt the program preserving the last set point reached before the failure (hoLd), to interrupt the program and switch off the control output (Abrt), or to start the program again from the beginning (rSEt) see Chapter 13.2.
Range: Cont, hoLd, Abrt, rSEt
Default: Cont

GSd   GUARANTEED SOAK DEVIATION
Setting the permitted width of the band around the set point during program running. If the process value is outside this band, time count of the corresponding program step stops. "GSd" will flash in the lower display. If GSd = oFF, is set the function is not active (see Chapter 13.3).
Range: oFF, 1 to 99
Default: oFF

AtSt   AUTOMATIC PROGRAM START
setting the automatic start of the program. The program can be automatically started eighter immediatelly after the controller is switched on (Strt), or at pre-set time, or pre-set time and date (CLK). Selecting AtSt=no means switching off the option of automatically starting the program (see Chapter12.3).
Range: no, Strt, CLK
Default: no

tdEL   TIME DELAY
Setting the allowed time delay in automatic program starting at a set time (and date), if at this moment the program cannot be started (e.g. if the controller is switched "oFF", etc.) (see Chapter 12.3). The allowed time delay is set in minutes.   .
Range: 1 to 99 min.
Default: 10
Hidden if: AtSt = no or Strt

8.5   Clock Submenu ("CLK")

In this menu the real time clock started, stopped and set. It is possible to set a year (the last two digits of the year are shown), month, day, hour and minute.

Prompts of the Clock Submenu:

YEAr YEAR
>   Setting the year.
>   **Range:**   00 to 99

Mon MONTH
>   Setting the year.
>   **Range:**   1 to 12

dAY DAY
>   Setting the day. The range changes with respects to the pre-set month, and in the case of February also with respect to the pre-set year..
>   **Range:**   1 to 31 (according to the number of days in the month)

hour HOUR
>   Setting the clock.
>   **Range**:   0 to 23

MIn MINUTES
>   Setting minutes.
>   **Range:**   0 to 59

9   Operation Menu

The access to the operation prompts can be restricted on several levels by setting a higher mode of operation through the "ModE" prompt in the Setup Menu. It can also be used to lock out the operating state "SP" (control according to a constant value).

Opening the Operation Menu
The Operation Menu is opened by pressing the key STEP.Wich of the operation prompts occurs first depends on the operating state, operation mode and unit configuration.Working with the "StbY" and "Ent" is described in detail below.

The Operation Menu cannot be opened if a program is running or if input is not connected. In other words: if the LED MODE is lit or if the upper display shows "- - - -", the Operation Menu cannot be opened.

Opening a Submenu of the Operation Menu
If "oPEr", is flashing on the lower display, the UP or DOWN keys can be used to select a submenu. It can be opened by pressing the STEP key. The lower display wil show the name of the first prompt (e.g. in the system submenu it is the "Pb1"prompt), the upper display will show its value (for "Pb1" prompt it is e.g.50).

Setting prompts
The UP and DOWN key can be used to set the required values of all prompts. The next prompt can be called up by pressing the STEP prompt.

Closing the Operating Menu

If you set all prompts of the open submenu, the Operation Menu closes. In the submenu Program, you can finish entering your Program by setting rEt=YES. The Operatin Menu closes after forty seconds without pressing a key.

Hidden prompts

For the sake of clarity and simplicity of operating the unit, only those prompts wich can be set up are displayed. The others remain hidden and they can be shown, when the setup is changed. In some cases, it depends on the hardware setup (e.g. the "Ent" prompt is not displayed on the controller without the second output) or on the setting of the related prompts (e.g. the "It1" prompt is not displayed only if Pb1=on.off is set. The prompts wich are not neccessary to display are marked in the tables by gray colored box.
If the operator's access to some prompts is restricted by the "MODE" prompt, these prompts also remain hidden.

9.1   Operating States

Cancelling the operating state "oFF"

After completing some programs, the controller can remain in the operating state "oFF". The upper display shows the process value, the lower display shows "oFF". The control output is switched off. The operating state "oFF" can be cancelled by pressing the "MODE" key. The lower display then shows the set point or "StbY". The controller is in the operating state "SP" or "StbY".

Setting the operating state "Stand by"

In the operation modes 0, 1, 2 and 3 it is possible to set "StbY"(control output in the stand by state) instead of the operating state "SP" (control according to a constant value) in the following way:

.   The lower display shows the set point.The upper display shows the process value. The MODE LED is not lit.

.   Press the STEP key once.

.   The lower display shows "StbY" and the upper one "no".

.   Press the UP or DOWN key. The upper display now shows "YES"

.   Press the STEP key once more.

.   The operating state "StbY" is set.The upper display shows the process value, the lower one "StbY"

Cancelling the operating state "Stand by"

In the operation modes 0, 1, 2 and 3 the operating state "SP" is set after cancelling the state "Stand by"

.   The lower display shows "StbY".

.   Press the MODE key once.

.   The lower display shows the set point wich the controller will hold.

Of course, this procedure cannot be used to cancel the operating state "Stand by" in the operation modes 0.P, 1.P, 2.P and 3.P

9.2   Event Output

If the second output is set up as an event output in the operation modes 0, 1, 2, 0.P, 1.P and 2.P and in the operating states"SP", "StbY" or "oFF", you can switch it manually using the"Ent" prompt:

Setting the event output in the operating state "SP"

.   The lower display shows the set point. The upper one shows the process value. The MODE LED is not lit

.   After pressing the STEP key, the "StbY" prompt appears and has the value "no".

.   Keep its value unchanged and press the STEP key.

.   The "Ent"prompt appears. If Ent = oFF, the event output is open, if Ent = on, it is closed.

.   The event output can now be manually switched with the UP and DOWN keys.

.   Press the STEP key. This will open acces to submenus of the operation menu. The "oPEr" prompt flashes in the lower display, the upper display indicates the name of the first submenu of operation menu ("SyS").

Setting the event output in the operating state "StbY"

- The lower display shows "StbY".
- Press the STEP key.
- The "Ent" prompt will immediately appear. If Ent = oFF, the Event Output is open, If Ent = on, it is closed.
- The Event Output can be switched manually with the UP and DOWN keys.
- Press the STEP key. This will open access to the submenus of the Operation Menu. The "oPEr" prompt flashes in the lower display, the upper display shows the name of the first submenu of the Operation Menu ("SyS").

In the operation modes 3 and 3.P the operator cannot influence the event output.
The event output is operated automatically while the program is running.

9.3   The Operation Prompts

(SP)   SET POINT
Setting the Set Point.
Range: rL to rh
Default: 25, 2.5, 0.25, 300 (for the T/C "B") according to the input and setting of the "dEC" prompt
Hidden if: ModE = 0.P, 1.P, 2.P or 3.P

StbY   STAND BY
Setting the operation state "StbY". If this operation state is set in the operation modes 0, 1, 2 or 3, it can be cancelled using the MODE key.
Range: on, oFF
Default: oFF
Hidden if: ModE = 0.P, 1.P, 2.P or 3.P, in the operation state "StbY"

Ent   EVENT
Manual setting of the event output. With setting Ent = on the output is closed. If Ent = oFF, the event output is open.
Range: on, oFF
Default: oFF
Hidden if: out2 = ALPr, ALdE or no,**MT825-Px-x0x-xx, MT825-Px-xDx-xx** if out3 = no

9.4   System Submenu ("SYS")

Pb1   PROPORTIONAL BAND 1
The width of the control output proportional band of the first PID prompt set, expressed °C (thermocouple or RTD input) or in units (process input). If Pb1 = on.oF, the controller works as a ON / OFF controller. The switching hysteresis is determined by the "hYS1" prompt.
Range: on.oF, 1 to 2499 (controllers with the thermocouple input) or 0.1 to 249.9 (according to the "In" prompt when the controller has the RTD input) or 0.01 to 24.99 (according to the"dEC" prompt when the controller has the process input)
Default: 50, 5.0, 0.50

It1   INTEGRAL 1
A control prompt of the first PID prompt set eliminating offset of the controlled system. It is expressed in minutes. Setting It1 = oFF can switch off the integral.
Range: oFF, 0.1 to 99.9 min
Default: oFF
Hidden if: Pb1 = on.oF

dE1 **DERIVATIVE 1**
A control prompt of the first set of PID prompts applies during fast changes of the set point or the real value. It is expressed in minutes. The derivative can be switched off by setting dE1 = oFF.
Range: oFF, 0.01 to 9.99 min
Default: oFF
Hidden if: Pb = on.oF

Pb2 **PROPORTIONAL BAND 2**
The width of the control output proportional band of the second PID prompt set, expressed in °C (thermocouple or RTD input) or in units (process input). If Pb2 = on.oF,the controller works as a ON/OFF controller. The switching hysteresis is determined by the "hYS1" prompt.
Range: on.oF, 1 to 2499 (controllers with the thermocouple input) or 0.1 to 249.9
         (according to the "In" prompt when the controller has the RTD input) or 0.01 to
         24.99 (according the "dEC" prompt when the controller has the process input)
Default: 50, 5.0, 0.50

It2 **INTEGRAL 2**
A control prompt of the second PID prompt set eliminating offset of the controlled system. It is expressed in minutes. Setting It2 = oFF can switch off the integral.
Range: oFF, 0.1 to 99.9 min
Default: oFF
Hidden if: Pb2 = on.oF

dE2 **DERIVATIVE 2**
A control prompt of the second set of PID prompts applies during fast changes of the set point or the real value. It is expressed in minutes. The derivative can be switched off by setting dE2 = oFF.
Range: oFF, 0.01 to 9.99 min
Default: oFF
Hidden if: Pb2 = on.oF

Ct   **CYCLE TIME**
Time of the control cycle in seconds. It is the time for the controller to complete one control cycle, that is one connecting and disconnecting of the output.The prompt is not shown on the controllers with the proportional output 4-20 mA, 0-5 V or 0-10 V.
Range: 1 to 99 s
Default: 5s
Hidden if: Pb1 = on.oF and Pb2 = on.oF, **MT825-Px-Pxx-xx**, **MT825-Px-Nxx-xx**
                 MT825-Px-Mxx-xx

ALo **ALARM LOW**
Represents the low alarm, according to the type of alarm either in absolute values, or as a deviation from the set point (see Chapter 13.1).
Range: rL to AhI (out2 = ALPr), -399 to 0 (out2 = ALdE)
Default: rL (out2 = ALPr), -199 (out2 = ALdE)
Hidden if: out2 = Ent or no, **MT825-Px-x0x-xx**

AhI **ALARM HIGH**
Represents the high alarm, according to the type of the alarm either in absolute values, or as a deviation from the set point (see chapter 13.1).
Range: ALo to rh (out2 = ALPr), 0 to 399 (out2 = ALdE)
Default: rh (out2 = ALPr), 199 (out2 = ALdE)
Hidden if: out2 = Ent or no, **MT825-Px-x0x-xx**

CAL **CALIBRATION OFFSET**
The value wich will be added to process value. For more detailed description see Chapter 13.7.
Range: -199 to 199 (controllers with the thermocouple input) or -19.9 to 19.9 (according to
                 the "In" prompt when the controller has the RTD input) or -1.99 to 1.99 (according
                 to the "dEC" prompt when the controller has the process input)
Default: 0

Aut   AUTO-TUNE
Starting the automatic optimization of the PID prompts. For more details see Chapter 11.2.
Range: oFF (switched off), 1 (slow system), 2 (medium speed system), 3 (fast system)
Default: oFF

9.5   Submenu History ("hISt")

After openning the submenu by STEP key it can be possible view the archived data. By the configuration the controller can store 200 data in basic model or 6000 data in model with expanded memory. On the higher display is viewed measured value, on the lower display the hour and minute of record. Pressing DOWN key is viewed data of the former record, pressing UP key the data of next record. Pressing STEP key is viewing of the records ended and step by step are displayed the next prompts.

PEr   PERIOD
Period of data storing in minutes.
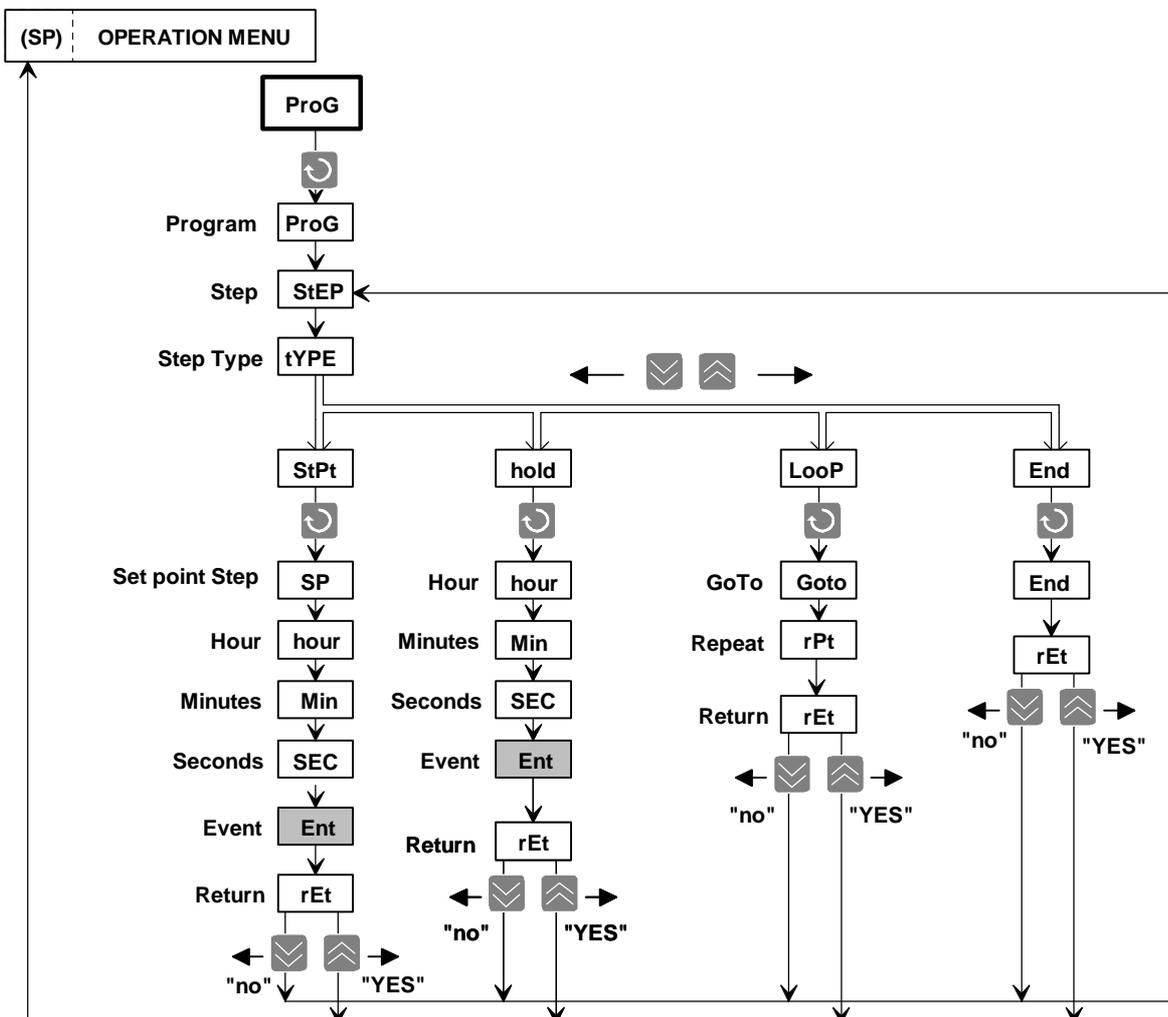**Range:**   1 to 120 min
Default: 10

Stor   STORAGE
Condition of storing. Data will be stored constantly (Cont), if alarm is active (ALMr), if program runs (ProG), or data storing is not set (no).
Range: Cont, ALMr, ProG, no
Default: ProG

Program Submenu

24

9.6 Program Submenu ("ProG")

The time profiles of the set point are programmed, viewed or adjusted. There are as many as ten programs to use. Each program has the capacity of ten steps.

There are four types of steps:
- ramping to the set point ("StPt")
- holding the set point ("hoLd")
- jumping back to a previous step ("LooP")
- ending the program ("End")

ProG PROGRAM NUMBER

The number of the vieved or created program.

Range: 1 to 10
Default: 1

StEP STEP NUMBER

Gives the number of the step wich will be viewed or programed next. In the course of viewing or programing, the number automaticlaly increases.

Range: 1 to 10
Default: 1

tYPE STEP TYPE

The choice of one of four programs steps. If StEP = 1, it is not possible to enter the step type "LooP" (there is nowhere to jump, see below).

Range: StPt, hoLd, LooP nebo End
Default: End

Prompts of the "Ramping to the set point" step ("StPt"):

SP SET POINT

Gives the resulting set point wich should be reached in this step.The ramp is linear. It starts on the preceeding set point, and it ends on the resulting set point. The resulting set point can be higher or lower then the preceding set point.

Range: rL to rh
Default: 25°C or rL (when rL≥25°C≥rh)

hour HOUR

The number of hours wich, together with the "MIn" and "SEC" prompts, give the time during wich the new set point to be reached.

Range: 0 to 15
Default: 0

MIn MINUTES

The number of minutes, wich together with the "hour" and "SEC" prompts, give the time during wich the new set point is to be reached.

Range: 0 - 59
Default: 0

SEC SECONDS

The number of seconds wich, together with the "hour" and "MIn" prompts,give the time during wich the new set point is to be reached.

Range: 0 - 59
Default: 0

Ent EVENT

Setting the event output. The prompt does not appear if the second output is not set as an event output.

Range: on, oFF
Default: oFF
Hidden if: out2 ≠ Ent

rEt   RETURN

   End (select YES) or continue (select no) viewing or programming the profile.
   Range: YES, no
   Default: no

Prompts of the "Holding the set point" step ("hoLd"):

hour   HOUR

   The number of hours wich, together with the "MIn" and "SEC" prompts, give the time during wich
   the new set point is to be held.
   Range: 0 to 15
   Default: 0

MIn   MINUTES

   The number of minutes wich, together with the "hour" and "SEC" prompts, give the time wich the
   new set point is to be held.
   Range: 0 to 59
   Default: 0

SEC   SECONDS

   The number of seconds wich, together with the "hour" and "MIn" prompts, give the time during
   wich the new set point is to be held.
   Range: 0 to 59
   Default: 0

Ent   EVENT

   Setting the event output. The prompt does not appear if the second output is not set as an event
   output.
   Range: on, oFF
   Default: oFF
   Hidden if: out2 ≠ Ent, out3 ≠ Ent on **MT825-Px-xDx-xx**

rEt   RETURN

   End (choice YES) or continue (select no) viewing or programming the profile.
   Range: YES, no
   Default: no

Prompts of the Loop Step ("LooP")

If StEP = 1, this type of step cannot be set.It is not possible to go to the preceding step. The program loops
are not allowed to overlap. See chapter 12.2. Event output cannot be set in this step.

Goto   GO TO

   The number of the step to go to.
   Range: 1 to 9
   Default: 1

rPt   REPEAT

   the number of loops to be performed in the program. By setting rPt = InFt, the repetition of jump
   will be unlimited.
   Range: InFt, 1 to 99
   Default: 1

rEt   RETURN

   End (select YES) or continue (select no) viewing or programming the profile.
   Range: YES, no
   Default: no

Prompts of the "Ending the Program" Step ("End"):

This step ends the program. It sets the required state of the control output after completion of the program. Event output cannot be set in this step.

End   END
>   Select the operating state after the program is completed.
>   **Range:**   StbY, OFF
>   **Default:**   oFF

rEt   RETURN
>   End (select YES)or continue (selct no) viewing or programming the profile.
>   **Range**:   YES, no
>   **Default:**   no

9.7   Submenu of "Automatic Program Starting" ("Arun")

Prompts for automatic starting of programs are set. Depending on the "AtSt" prompt in the Setup Menu, a program can be automatically started immediately after switching on the controller (AtSt = Strt), at a pre-set time or at a pre-set time and date (AtSt = CLK). The operator sets the number of the program wich is to be automatically started. If AtSt = CLK , a time and date are also set.
Selecting AtSt = no disables the automatic start. In this case the "Arun" submenu cannot be opened.

ProG   PROGRAM NUMBER
>   Sets the number of the program wich is to be automatically started. By selecting ProG = oFF, the operator can cancel the function of automatic program starting.
>   **Range**:   oFF, 1 to 10
>   **Default:**   oFF
>   **Hidden if:**   AtSt = no, AtSt = CLK

Mon   MONTH
>   Sets the month. Together with the "dAY" prompt, it determines the date of automatic starting of a pre-selected program. If Mon = oFF, the program is started every day.
>   **Range:**   oFF, 1 to 12
>   **Default:**   oFF
>   **Hidden if:**   AtSt = Strt or no

dAY   DAY
>   Sets the day. Together with the "Mon"prompt, it determines the date of automatic starting of a pre-selected program. If Mon = 0, the "dAY" prompt is not shown and the program started every day.
>   **Range:**   1 to 31
>   **Default:**   1
>   **Hidden if:**   AtSt = Strt or no, or Mon = oFF

hour   HOUR
>   Sets the hour together with the "MIn"prompt, it determines the time of automatic starting of a pre-selected program.
>   **Range**:   0 to 23
>   **Default:**   0
>   **Hidden if:**   AtSt = Strt or no

MIn   MINUTES
>   Sets the minute. Together with the "hour" prompt, it determines the time of automatic starting of a pre-selected program.
>   **Range:**   0 to 59
>   **Default:**   0
>   **Hidden if:**   AtSt = Strt or no

9.8   The "Clock" Submenu ("CLK")

After opening the submenu, the lower display shows the "tIME" prompt while the upper display shows the real time. The keys UP or DOWN can be used to switch to data display. The upper display then shows the pre-set date, with the "dAtE" prompt shown on the lower display. The values displayed cannot be changed.

27

10 "Run" Menu ("run")

Enables the operator to follow and to interrupt the program running. Apart from the current set point, the number of the started program can be read, as well as the mumber of the step currently performed, the resulting set point, and the time left before the end of the performed step. If the program includes a loop, it is also possible see the number of steps to be performed. Individual prompts can be accessed by pressing the STEP key. They are read only prompts, they cannot be changed.

The "Run" Menu is accessible only if program is running. In other words, if the MODE LED is lit, after pressing theSTEP key the "Run" Menu opens. If is not lit, the Operation Menu is opened.

"Run" Menu Prompts:
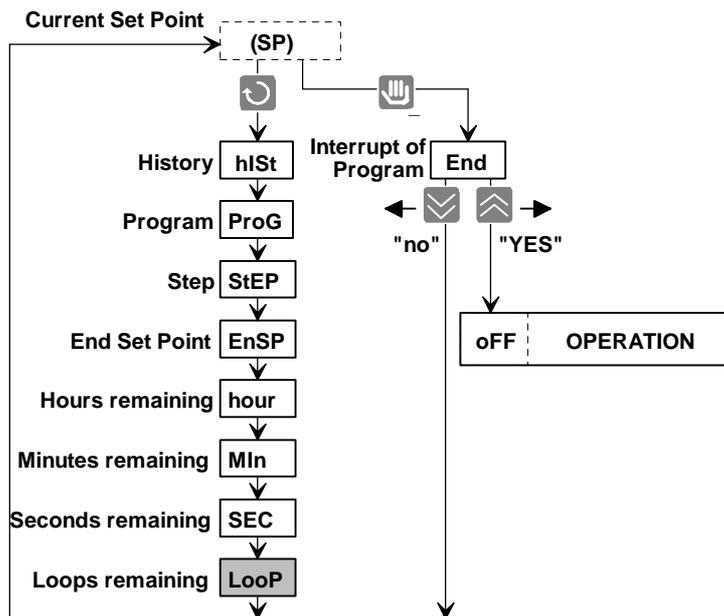
HISt HISTORY
Reading the history of measured values.

(SP) SET POINT
The current set point.

ProG PROGRAM NUMBER
Number of the program running.

StEP STEP NUMBER
The number of the program step currently performed   .

EnSP END SET POINT
The resulting set point to be reached in the given program step.

hour HOUR
Together with the "MIn" and "SEC" prompts, it tells the time left before the end of the given program step

.MIn MINUTES
Together with the "hour" and "SEC" prompts, it tells the time left before the endof the given program step.

SEC SECONDS
Together with the "hour" a "MIn" prompts, it tells the time left before the end of given program step.

Loop LOOP
The number of go to loops in the program to be performed. The value "InFt" means permanent repeatition of a step.

If the Program is manually interrupted, the controller is set to operating state "oFF".

11 Control, PID Prompts, Auto-tune

The programmable controller MT 825 can operate in the state (ON/OFF) control mode or the PID control mode, depending on the state of the "Pb1" and "Pb2"prompts. If Pb1 (Pb2) = on.oF, the controller works as a ON /OFF control with the hysteresis set by the "hYS1"prompt in the Setup Menu. If the width of the proportional band is not set to zero, the controller works in the PID control mode with the prompts "Pb1", "In1", "dE1" (ppossibly "Pb2", "In2", "dE2") in the Operation Menu.

11.1 Two Sets PID Prompts

During PID control, the MT 825 is able to control with one or two sets PID prompts. The chosen control algorithm is set by the "ALGo" prompt in the Setup Menu. It can be set as "PId" (only one set is used) and "PId2" (two sets are used). PID prompts of the first set are used for control in the "low value" range and the prompts of the other set are used in the "high value" range. The user determines what is considered as "low" or "high" value by using the "PId2" prompt in the Setup Menu to set deciding level (see Figure.14).
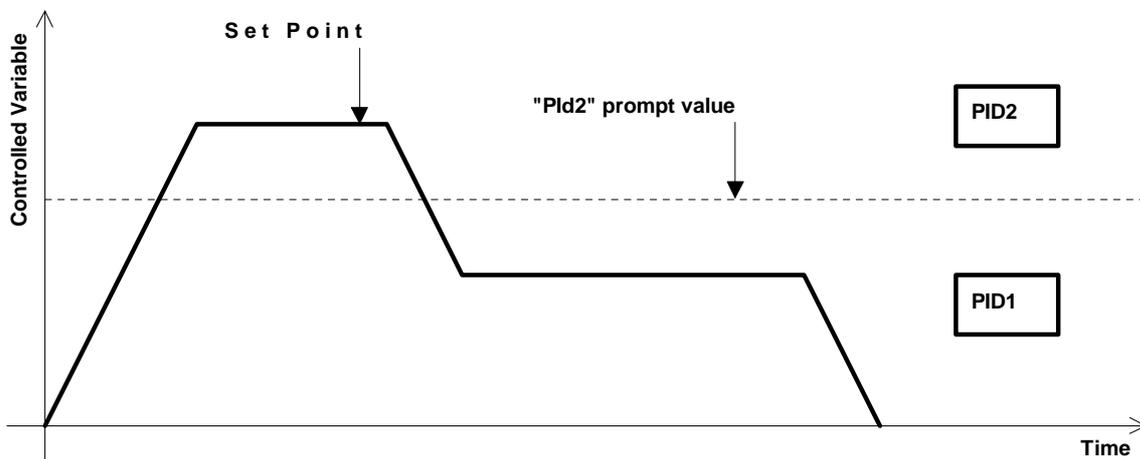
Figure 14.   Two sets of PID prompts

Significance of the second PID prompts set

The majority of controlled systems are non-linear. This means that optimum values of PID prompts depend on the value of the controlled variable. If the controlled variable is distant from the value to wich the PID prompts were tuned, it is not optimum control.The second PID prompt set is a suitable compromise between the demands on the operator's knowledge and increasing quality of control in wide range of values.

11.2 Automatic Setting of Control Prompts

The programmable controller MT 825 is equiped with the auto-tuning function for both sets of control prompts. Auto-tuning can be started if the control output is set for heating (out1 = ht). If both sets of PID prompts are used (the "ALGo" prompt is in the Setup Menu set ALGo = PId2), the two sets of prompts must be tuned separately. Tuning should be performed twice. Auto-tuning can be started in the operating states "SP", "StbY" and also "oFF" and in the modes 0, 1, 0.P and 1.P by seting the "Aut" prompt. In the modes 2, 3, 2.P and 3.P this prompt cannot be accessed by the operator. During the tuning process, the required response rate of a system is set in units: 1 = slow, 2 = medium speed, 3 = fast. The slow response (Aut = 1) is selected when it is not neccessary to reach the set point fast. On the contrary, the fast response (Aut = 3) is selected in a system where the set point is to be approached as soon as posiible. The middle rate (Aut = 2) is suitable for majority of thermal systems. The higher ramp rate, the bigger overshooting of the controlled variable.

Setting the "Aut" prompt selects the behavior of the controlled system. Under no circumstances will it influence wich PID set is tuned.

It is recommended to select identical behavior of the controlled system for both PID sets.

*For example, **Aut = 1** means, that PID prompts will be tuned with respect to minimal overshooting of the cost of decreasing the ramp rate. This does not mean, that the first PID set will be tuned. If you tune the other PID set, you choose Aut = 1 too.*

During auto-tuning, the operation message "Aut1" or "Aut2" flashes on the lower display. This message indicates wich PID set is being tuned. Notice that as soon as the set point crosses the decisive level given by the value of the "PID2" prompt, the message automatically changes. Changing the set point while tuning is in progress can lead to a faulty result. That is why we recommend setting the set point as soon as possible after auto-tuning process do not take place (typically, for example, if the heating output is too small), PID prompts remain unchanged. The optimization can take no more then one hundred minutes. If not passed of all partial steps of auto-tuning in this time, (typically if heating power is too small), the PID prompts stay unchanged. When tuning is successfully completed, the PID values wich have been measured and calculated, are stored in the memory of the controller. The operation message "Aut1" or "Aut2" stops flashing. The prompt values are stored in two sets ("Pb1", "It1", "dE1" a "Pb2", "It2", "dE2") in the Operation Menu, where they can be read or possibly recorded for further use.

Automatically set PID parameters can be if neccessary manual fine-tune (see Chapter 11.3.)

To start auto-tuningu:

.   To achieve accurate tuning results, it is important for the captured section of the ramp to be as long as possible. In the case of thermal systems, start auto-tuning at a low starting temperature.
.   In the Operational Menu, System submenu ("SYS") choose the "Aut" prompt.
.   Set the required response rate of the controlled system by the "Aut" prompt on the upper display (1 = slow, 2 = medium speed, 3 = fast system).
.   Start auto-tuning by pressing the STEP key. "Aut1" or "Aut2" flashes in the lower display.
.   Set the set point for tuning.
.   When auto-tuning is complete, the controller returns to the previous operating state. The "Aut" prompt is set Aut = oFF. The values of PID prompts of the given set are stored in the memory of the controller.

If you also intend to set the second PID prompts set, follow the procedure described above. The difference is that the set point for tuning must be set in the opposite range of "low" and "high" values than it was then the first set was tuned. In other words, if during the first tuning "Aut1" was flashing on the display, now "Aut2" must be flashing and vice versa.

To abort auto-tuning

Auto-tuning can be aborted by resetting Aut = oFF or by switching off the controller. The reached values of PID prompts remain unchanged.

11.3   Manual Tuning of Control Prompts

After the PID prompts have been set automatically, the operator can tune the control prompts according to the behavior of the controlled system. Valuable information provides the system's response to changes in the set point, e.g. during initial ramping. Several pictures below indicate typical behavior of some systems. They can provide some guidance during the tuning.
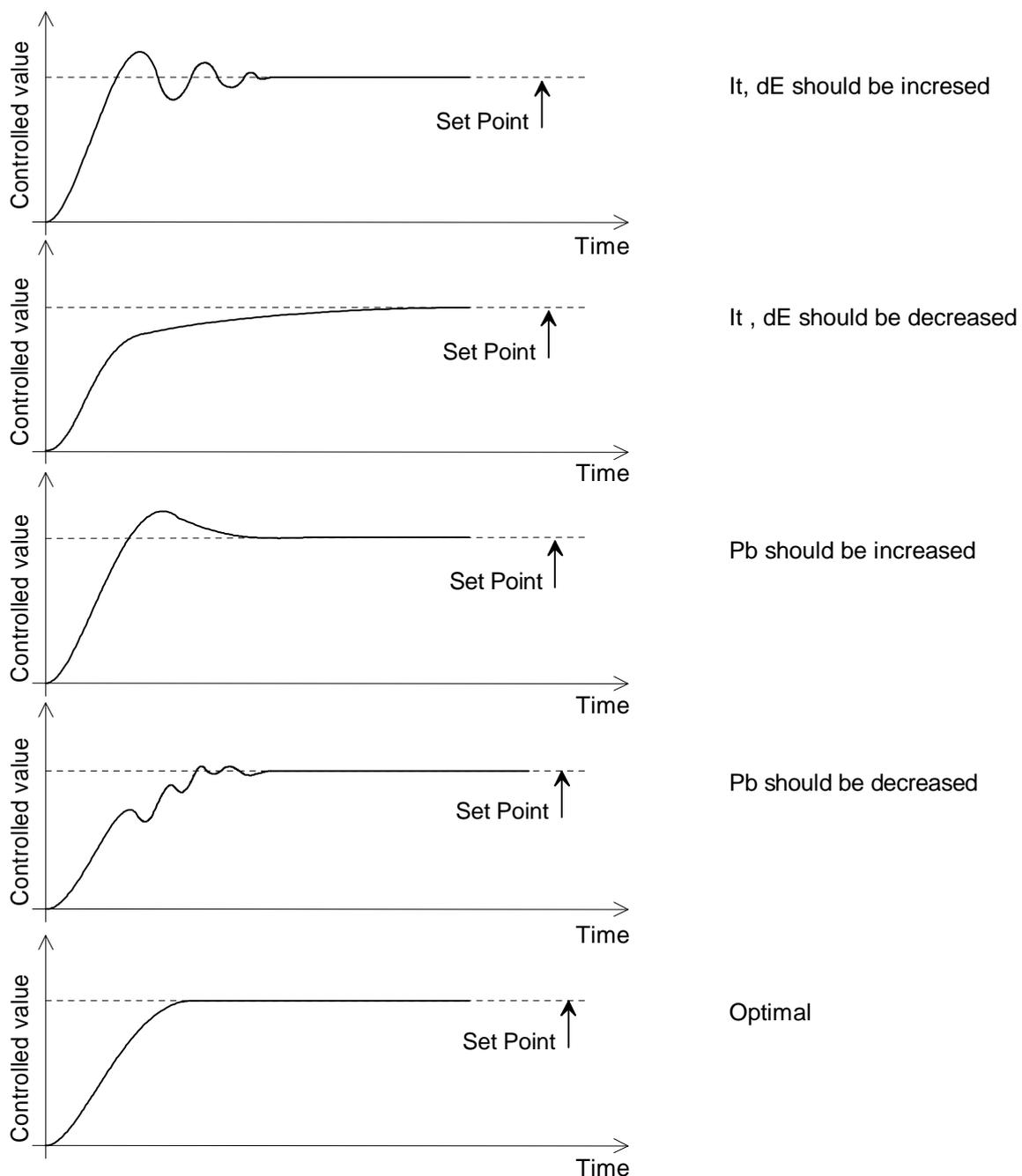
Figure 15. Examples of control system behavior during initial ramping to the set point

12 Programming and Operation while a Program is Running

After becomming with control principles and all Setup and Operation prompts have been set, proceed to programming the profiles of the set point.

Below is a detailed description of creating, viewing and editing a program and its manual and automatic starting aborting and operating in case of power failure. There is also a detailed explanation of a program loop.

12.1 Entering, Viewing and Changing a Program

Before a program is entered, it is necessary to divide the required course of temporal dependence of controlled variable into several linear sections (a maximum of 10). If some sections are repeated you can use a loop. Submenu "Program" in Operation Menu is used for enter a program.

An example of creating a simple program

The controller MT825-PT-K00-00 is to be programmed to perform this task: Heating material to the temperature 120°C in 30 minutes. After 15 minutes of maintaining the temperature, cooling to 50°C in 5 minutes. When the program is complete, heating is to remain switched off. See the following record of the program:

Step		Step Type		Values		Time				Event	
1	ü	StPt	SP:	120		hour: 0	MIn: 30	SEC: 0		oFF	on
		hoLd				hour:	MIn:	SEC:		oFF	on
2		StPt	SP:			hour:	MIn:	SEC:		oFF	on
	ü	hoLd				hour: 0	MIn: 15	SEC: 0		oFF	on
		Loop	Goto:		rPt:						
		End		oFF		StbY					
3	ü	StPt	SP:	50		hour: 0	MIn: 5	SEC: 0		oFF	on
		hoLd				hour:	MIn:	SEC:		oFF	on
		Loop	Goto:		rPt:						
		End		oFF		StbY					
4		StPt	SP:			hour:	MIn:	SEC:		oFF	on
		hoLd				hour:	MIn:	SEC:		oFF	on
		Loop	Goto:		rPt:						
	ü	End	ü	oFF		StbY					

CHART:

NOTES:

A Simple Program

No. 3

Figure 16.   Record of a program according to the example

The keys UP and DOWN are used to set the values. The next prompt can be accessed by pressing the STEP key.

Procedure:

. Open the "Program" submenu.

. Select a number for the program being created: The lower display shows "ProG" (number of the program), the upper display shows its value (1 to 10). Select a number for the program, e.g.3.

. The first step - heating up to 120°C in 30 minutes:
The next prompt is the number of the program step "StEP". Keep StEP = 1. After pressing the key one more time "tYPE", prompt flashes in the lower display, the upper display shows its value (default "End"). Set tYPE = StPt by pressing the UP, DOWN keys. Set the final set point 120°C (SP = 120) and set the step to last 30 minutes (hour = 0, MIn = 30, SEC = 0).

. The second step - holding the temperature 120°C for 15 minutes:
Keep "rEt" prompt at rEt = no, The process of entering the program continues by programming the second step. The number of the program increases automatically (StEP = 2). As the next step, choose holding the reached temperature (tYPE = hoLd). The step will last 15 minutes (hour = 0, MIn = 15, SEC = 0).

. The third step - cooling to 50°C within 5 minutes:
Keep rEt = no. Select the type of third step tYPE = StPt, the final set point 50°C (SP= 50) and lenght of the step 5 minutes (hour = 0, MIn = 5, SEC = 0).

. Set the end the programe:
Keep rEt = no. The fourth step is end the program (tYPE = End) with switching off the control output (End = oFF).

. End entering the program:
This time the "rEt" prompt is rEt = YES. Program entering is completed, the Operation Menu is closed.

Viewing and changing the entered program

Open the "Program" submenu. Choose the number of the program ("ProG") and the number of the step ("StEP"), wich you want to view. The prompts of the step can be viewed or also changed. If you keep rEt = no, you move to the next step.
Program viewing can be ended by setting rEt = YES.

12.2 Program Loops

Programs enable loops to a precceding step, with the exception of the step immediately preceding. The number of the step to jump to ("Goto" prompt) must be smaller by at least two than the number of the given loop step. It is not allowed for the loops to overlap in any way. See the picture. The number of loops is determined by the "rPt" prompt wich can acquire values: InFt, 1-99. When rPt = InFt is set, jumps will repeat without limits till the program is interrupted.

Rectangles represent program steps
Dashed line represents examples of forbidden jumps
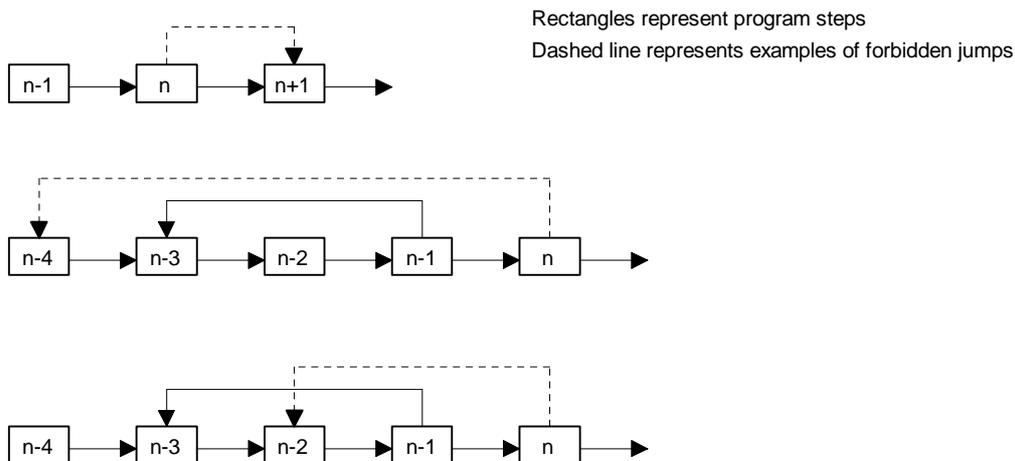
Figure 17.   Examples of forbidden program loops

12.3 Starting, interrupting and ending a program

Starting a program manually

In the operating state "SP" and "StbY" the MODE LED starts flashing after pressing the MODE key and the lower display shows wich program is to be started ("Prog"). The UP, DOWN keys set the number of the required program. Pressing the MODE key one more time starts the program. The MODE LED is lit. The controller returns to the previous operating state after forty seconds without pressing the MODE key. If the STEP key is pressed instead of the MODE key, immediate return is possible by choosing "YES" and verified by pressing the STEP key.
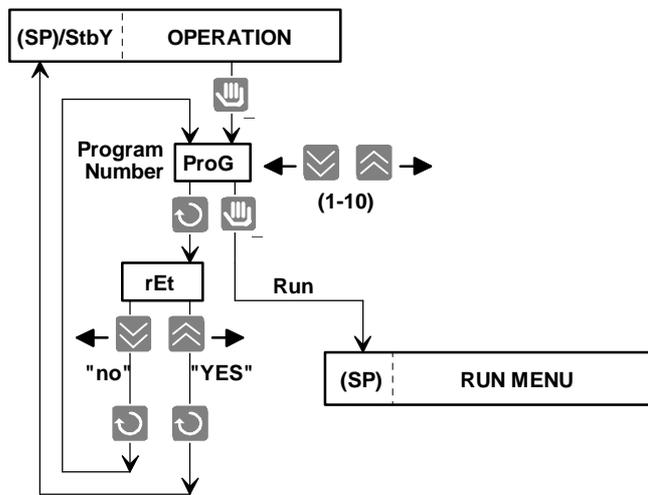
Figure 18. Starting a program manually

If the controller is in the "oFF" state, or when the operation mode is 0, 1, 2 or 3 in the operating state "StbY", it is first neccessary to cancel the operating state by pressing the MODE key. The program then starts in the manner described above. In other words: for the "ProG" prompt to be displayed, press the MODE key twice.

A program cannot be started manually if the Setup Menu is opened, during auto-tuning, or in the operating state "PArK".

Starting the program automatically

A selected program can be started automatically either at a pre-set time or immediately after the controller is switched on. Chose options with the "AtSt" prompt in the Setup Menu:

. **AtSt = CLK**
   The program starts automatically at a pre-set time. The number of the automatically started program and the time is set by the operator through the "ProG" prompt in the "Automatic program start" Submenu ("Arun"). The starting time in hours and minutes is set by the "hour" and "MIn" prompts. The selected program can also be started at a certain date. Then also set the "Mon" and "dAY" prompts (month and day) according to the requirement. On the other hand, if you keep Mon = oFF, the "dAY" prompt is not displayed and the program is started every day. The "tdEL"prompt in the Setup Menu is used to set the time of the allowed time delay in starting the program.

. **AtSt = Strt**
   The slected program is started automatically after switching on the controller. The number of the automatically started program is set through "ProG" prompt in the Operation Menu.

. **AtSt = no**
   The program cannot be started automatically.

The example:
AtSt = CLK, ProG = 2, Mon = 0, hour = 22, MIn = 0, tdEL = 90
Program number 2 is started every day in 22 hours. If in this time is controller switched off (e.g. power cut), after his switched on till the time 23 hours 30 min. program is starting. If is switched on later, the program can automatically started till next day.

The operator can cancel the function of automatic program starting by ProG = oFF.

The program cannot be started automatically if, at the moment of pre-set start of the program and during the time interval allowed for start delay (See the "tdEL" prompt) the controller is switched off, or the Setup Menu is opened, or if auto-tuning is in progress, or in operating states "oFF" and possibly "PArK".

34

Ending a program

After ending any program, the state of control output depends on program prompt "End", that means: if (End = StbY) the control output is the rest state, or is switched off if (End = oFF). See Chapters Operating states and Submenu "Program" ("ProG").

In case of short program and long time allowed time delay of starting a program ("tdEL") prompt, when program is ending stil before this time, it is necessary set End = oFF, else the program starts automatically again.

Interrupting a program

The operator can interrupt a running program. After pressing the MODE key the "ProG/End" prompt flashes in the lower display. Running of a program is interrupted by setting the "YES" value on the upper display and verifying it by the STEP key. Setting the "no" value does not have any influence on the program running. When the program has been interrupted, the controller enters the "oFF" state. See the "Run" Submenu.

Operation when running of a program is interrupted due to a power failure

If a program was interrupted due to a power failure and the "Pout" prompt is set to holding the last set point (Pout = hoLd), or to aborting the control output (Pout = Abrt), it is possible after the power supply has been renewed, to read on the controller at wich step the power failure occured, and to decide whether to continue, or to end the program.

Using the STEP key, you can read the number of the program, the number of the last step performed and (if the program included a loop) also the number of loops to be performed.

After pressing the MODE key the lower display shows the question "Cont". If "YES" is set and verified by the STEP key, the program can continue. If "no" is set and verified by the STEP key, is the program aborted and the MODE LED turns off.

If program continuation is selected through the "Pout" prompt (Pout = Cont), or if it is restarting the program from the beginning (Pout = rSEt), the selected action is carried out automatically after power supply is renewed.
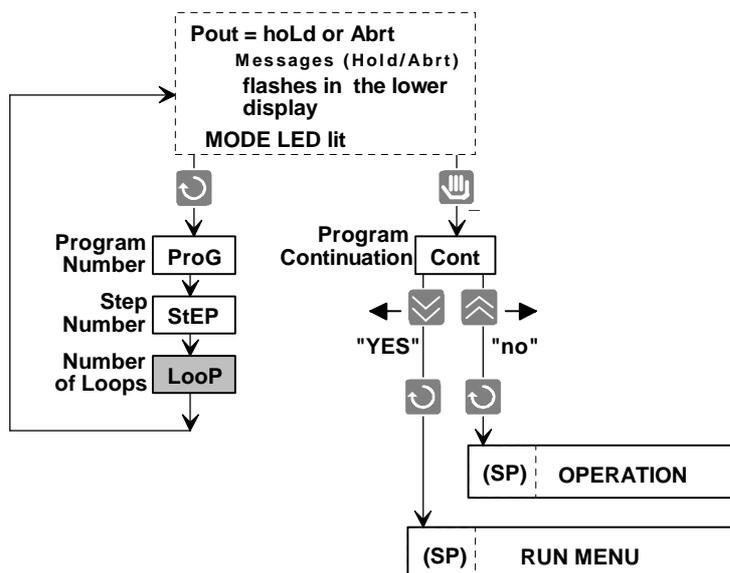

Figure 20.   Continuing /ending a program interrupted due to power failure

13   Other functions

13.1   Alarm

The second output can be configured as an alarm by setting out2 = ALdE or ALPr in the Setup Menu. The alarm limits are set by the "ALo" and "AhI" prompts in the Operation Menu.

Types of alarm
MT 825 has two types of alarms, wich differ in the manner of entering the alarm limits. One is alarm derived from the absolute values of the process temperature (PROCESS ALARM). The other is derived alarm from the deviation from the set point (DEVIATION ALARM).

Example*1:*
The set point is 100°C, deviation alarm (out2 = ALdE), the lower range ALo = -5°C, the high range AhI = +7°C. Alarm occurs when temperatures lower then 95°C and higher then 107°C are reached. If the set point is changed to e.g. 130°C alarm occurs at temperatures lower then 125°C and higher then 137°C.

Example 2:
Absolute value alarm or process alarm (out2 = ALPr), low range ALo = 1050°C, high range AhI = 1100°C. Alarm occurs when temperatures lower then 1050°C and higher then 1100°C are reached. Setting the set point does not influence the alarm limits in this case.

Latching and non-latching alarm
The "LAt" prompt can set an alarm as latching (LAt = LAt), or non-latching (LAt = nLA). If the conditions wich caused the alarm pass, the non-latching alarm switches off the alarm output. On the other hand, the latching alarm has to be switched off manually by the operator.

Alarm indication
Alarm is indicated by the LD2 LED being lit.

Alarm switching off
Before silencing athe alarm, it is neccessary to decrease the deviation of the process value from the set point so that it falls into the permitted range where the conditions for the setting off the alarm are not met. Otherwise it cannot be switched off. Then ...
>   ... if the alarm is latching (LAt = LAt),
>   it is switched off by pressing the MODE key.
>   ... if the alarm is non-latching (LAt = nLA),
>   it is switched off automatically.

13.2   The Power Outage Function "Pout"

The function can be used to select the response of the controller to a failure of power supply while a program is running. The "Pout" prompt is included in the Setup Menu, in the "Running a Program" submenu.

Continuing the program (Pout = Cont)
After the supply of power to the controller is renewed, the program continues from the moment where it was interrupted by the power failure.

Restarting the program from the beginning (Pout = rSEt)
After the supply of power to the controller is renewed, the program is started from the beginning.

Interrupting a program, holding the reached set point (Pout = hoLd)
After the supply of power to the controller is renewed, the system is maintained on the last set point reached before the power failure. The "hoLd" prompt flashes in the lower display together with the set point reached as last. The MODE LED is lit. The operator can find out at wich program step the power failure occured. He can chose to continue or to abort running of the program.

Aborting the program, switching off the control output (Pout = Abrt)

After the supply of power to the controller is renewed, the control output is switched off. The "Abrt" prompt flashes in the lower display together with set point reached last. The MODE LED is lit. The operator can find out at wich program step the power failure occured. He can chose to continue or to abort running of the program.

13.3 The Guaranted Soak Deviation Function ("GSd")

The GSd function insures that while the program is running, the process value lies within the permissible range around the set point (see the picture). The value of the "GSd" prompt is set in the Setup Menu.

If the process value lies outside the permissible range (e.g. when a fast temperature change is set while the equipment power is insufficient), time count stops during running of the program. The "GSd" prompt flashes in the lower display. Time count is renewed automatically when the process value returns to the allowed range. The function is disabled by setting GSd = oFF.
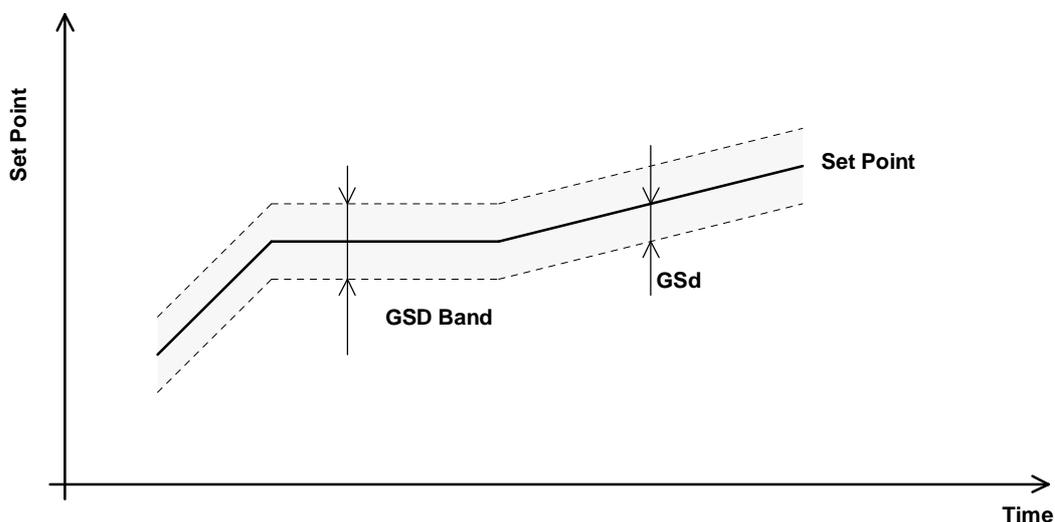
Figure 21.   GSD function

13.4 Event Output

The second output can be used as an event output for controlling other equipment wich takes part in controlling or monitoring the process. This is done by setting out2 = Ent (or out3 = Ent for the MT825-Px-x**D**x-xx) in the Setup Menu. It always works in the DIP mode. The event output can be set manually through the "Ent" prompt in the Operation Menu. However its automatic control during program running is more important. If the second output is configured as an event output, we use the "Ent" prompt in the "Program" submenu to program it for steps such as "StPt" or "hold".
Examples of application:
control of chimney flap
control of ventilator
signalling of the program end
run linear recorder

13.5 Operating Range

MT 825 enables the user to set operating ranges according to technological requirements. The low operating range is set by the "rL" prompt, the high operating range by "rh" prompt in the Setup Menu, "Input" submenu. **The set point can be set only within the operating range. If the process value is outside the operating range, the message " -r-" flashes in the lower display.**

For the MT825-PP-xxx-xx model with the process input, it is possible to use the "rL" and "rh" prompts to set the measure for displaying the measured variable.

Example:

Pressure transducer with output 4-20mA has the range 0 to 300 kPa. By setting In = 4-20, rL = 0 and rh = 300. MT825-PP-xxx-xx shows the real pressure value in kPa.

This can be used:
to limit the maximum operation temperature of a kiln
to set the measures of a process input

13.6 Power Limiting

The POWER LIMITING function allows limitations of the power supplied to the controlled system. Power can be limited separately for the "low" values ("PLd" prompt in the Setup Menu) and "high" values ("PLu" prompt). It is given in percentages. The border between the "low" and "high" values ("SPL"prompt) can be selected with respect to the requirement in the operation values range ("rL" to "rh").

If the process value is lower then "SPL" the controller connects outputs only up to the value given in percentages by the "PLd" prompt. If the process value is higher then "SPL", outputs are opened only up to the value given by the PLu"prompt.
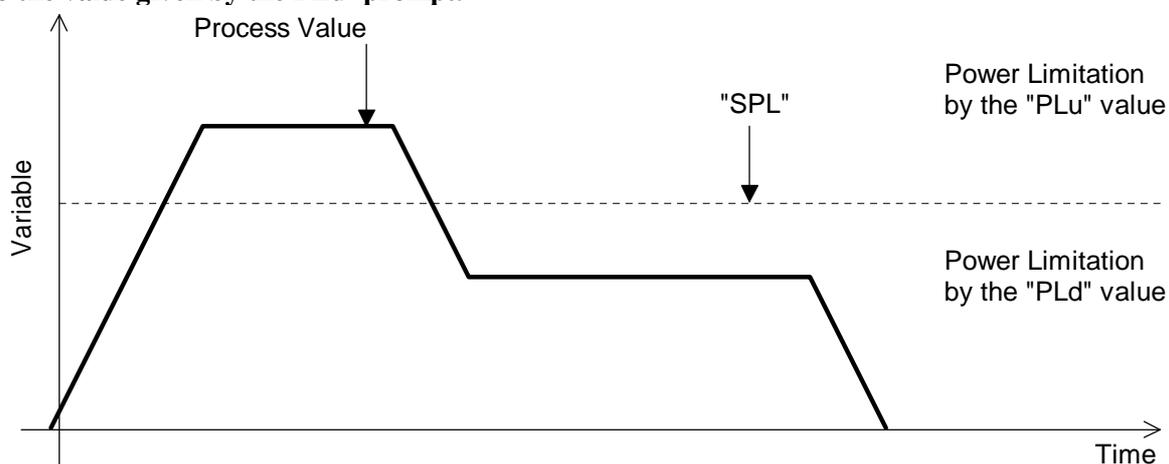
Figure 22.   Power limitation at "low" and "high" process values

If identical power limitation is used for the whole range of the operating values, it is suffcient to set the "PLd" value according to the requirement and leave the "SPL" set to the value of the high operating value ("rh").

Example:
Controller control the heating. Up to 150°C it has to heat limited power on 10%, because the cold heating bodies are overload with excessive current. After heating them it is possible to heat with full power. Relevant prompts in Setup Menu we set this way:
PLd = 10%, SPL = 150°C, PLu = 100%
The permitted power at low temperatures (in the case of heating) must be high enough for the borderline SPL temperature to be reached. It is similar in the case of cooling.

13.7 Input Calibration

The "CAL" prompt in the Operation Menu can be used to offset a known error of a sensor wired to the controller input. The value of the "CAL" prompt is added to the real process value, and only this result is regarded as a correct process value.
Example:
RTD sensor Pt100 is 2 wires wired to the controller input. The resistance both wires was measured and is 1.5 Ohm. This resistance is added to value of resistance the RTD sensor. This create by working temperature 100°C error of measuring +4°C. If we set CAL = -4, the error incurred by two wires connecting RTD sensor is subtract and controller indicate the correct value.

14 Appendix

<u>Specifications</u>

Input:

- **Sensor Ranges MT825:**

MT825-PT-xxx-xx			
Thermocouple	**Range/°C**		
J (Fe-CuNi)	-200	to	900
K (NiCr-Ni)	-200	to	1 360
T (Cu-CuNi)	-200	to	400
N (NiCrSi-NiSiMg)	-200	to	1 300
E (NiCr-CuNi)	-100	to	700
R (PtRh13-Pt)	0	to	1 760
S (PtRh10-Pt)	0	to	1 760
B (PtRh30-PtRh6)	300	to	1 820
C (W5Re-W26Re)	0	to	2 320
D (W3Re-W25Re)	0	to	2 320

MT828-PR-xxx-xx			
RTD	**Range/°C**		
Pt100, 1°C	-200	to	600
Pt100, 0.1°C	-99.9	to	200.0

MT825-PP-xxx-xx			
Process	**Range / Unit**		
0 to 20 mA	-500	to	2 500
4 to 20 mA	-500	to	2 500
0 to 5 V	-500	to	2 500
0 to 10 V	-500	to	2 500
1 to 5 V	-500	to	2 500

Accuracy:

- Calibration accuracy: $\pm$ 0.1% of span, $\pm$ 1 LSD, 25°C $\pm$ 3°C ambient and rated line voltage +-10%
- Temperature stability 0.1°C/°C change in ambient

Output options:

- Open collector, switched DC signal, minimum load impedance 200 Ohm, maximum 30 mA, typical voltage on the load 1kOhm is 10 V.
- Electromechanical relay, Form C, 230 VAC, 5 A, without contact suppression
- Process 4-20 mA, elektrical isolated (Output 1 only)
- Process 0-5 V, 0-10 V, elektrical isolated (Output 1 only)

Power:

- 230 VAC +10 %/-15%, 50 to 60 Hz, maximum. 6 VA
- 12 to 16 V, AC 50 to 60 Hz or DC, maximum 6 VA

Operating environment:

- 0-50 °C, 0-90 %RH, non-condensing

Mechanical:

- 1/4 DIN
- Overall depth: 150 mm
- Depth behind panel: 143 mm

Certification:

Specification: controller, class protection II
Product is in accordance with norms

- electrical security: ČSN EN 61010-1, čl. 5.1, 5.1.4, 6, 6.7, 6.8.2, 6.8.4, 6.11, 8.2, 9, 10
- EMC: EN 55011, EN 50082-2, EN 61000-4-2, EN 61000-4-4, EN 61000-4-5, EN 61000-4-11, EN 61000-4-6

14.1   Model description

MT 825 - <u>a</u> <u>b</u> - <u>c</u> <u>d</u> <u>e</u> - <u>f</u> <u>h</u> - <u>i</u>

<u>a</u>   **modification**
    P = PID ramping control, 10 programs each 10 steps, real-time clock

<u>b</u>   **Input**
    T = Thermocouple
    R = RTD
    P = Process

<u>c</u>   **Output 1**
    K = Open collector
    R = Electromechanical relay 5A without contact suppression
    P = Process 4-20 mA
    N = Process 0-5 V
    M = Process 0-10 V

<u>d</u>   **Output 2**
    0 = None
    K = Open collector
    R = Electromechanical relay 5A without contact suppression
    D = Double electromechanical relay 5A, without contact suppression
    E = Retransmit 0-20 mA, 4-20 mA

<u>e</u>   **Input 2, Output 3**
    0 = none
    E = Retransmit 0-20 mA, 4-20 mA
    X = Communication RS 232, isolated
    A = Communication EIA 485, isolated

<u>f</u>   **Power**
    0 = 230 V/50-60 Hz
    A = 12 to 16 V, AC or DC

<u>h</u>   **Special version**
    0 = Basic version
    2 = Memory 32 kB - 6000 values

<u>i</u>   **EMC**
    0 = Standad
    E = Enhanced

14.2 Operation menu MT825-Px-xxx-x0, mode 0, 0.P

Operation Menu you can reach using the STEP key

After openning Operation Menu on the lower display flashes "oPEr".

Use the UP/DOWN keys to set value or submenu

Use the STEP key to cycle through the menu

this parameter appear always

this parameter may not appear

Parameters for your setting

Names of the keys:

STEP DOWN UP MODE

(SP)/StbY/oFF

StbY — Stand by
"YES"
"no"

Ent — Event

oPEr

SYS — System

Pb1 — Proportional Band 1
It1 — Integral 1
dE1 — Derivative 1
Pb2 — Proportional Band 2
It2 — Integral 2
dE2 — Derivative 2
Ct — Cycle Time
ALo — Alarm/Signal Low
Ahi — Alarm/ Signal High
CAL — Calibration offset
Aut — Auto-tuning

hISt — History — Reading history
(hISt)
PEr — Periode
Stor — Condition

ProG — Program
Program Submenu

Arun — Auto-start
ProG — Program
Mon — Month
dAY — Day
hour — Hour
Min — Minutes

CLK — Clock
tIME — Time/Date
dAtE

14.3 Operation Menu MT825-Px-xxx-x0, mode 1, 1.P

Using the STEP key you can open Operation Menu

After opening the Operation Menu on the lower display flashes "oPEr".

Values of parameters you can set using the UP or DOWN key

Next parametr is reached using the STEP key.

→ This parameter appear always

→ This parameter may not appear

for your settings

Keys:

MODE
UP
DOWN
STEP

(SP)/StbY/oFF

StbY — Stand by

"YES"
"no"

Ent — Event

OPEr

SYS — System

ALo — Alarm /Signal Low

Ahl — Alarm / Signal High

Aut — Auto-tuning

hISt — History

(hISt) — Reading history

PEr — Periode

Stor — Condition

ProG — Program

Program Submenu

Arun — Auto-start

ProG — Program

Mon — Month

dAY — Day

hour — Hour

MIn — Minutes

CLK — Clock

tIME — Time/Date

dAtE

14.4 Operation Menu MT825-Px-xxx-x0, mode 2, 2.P
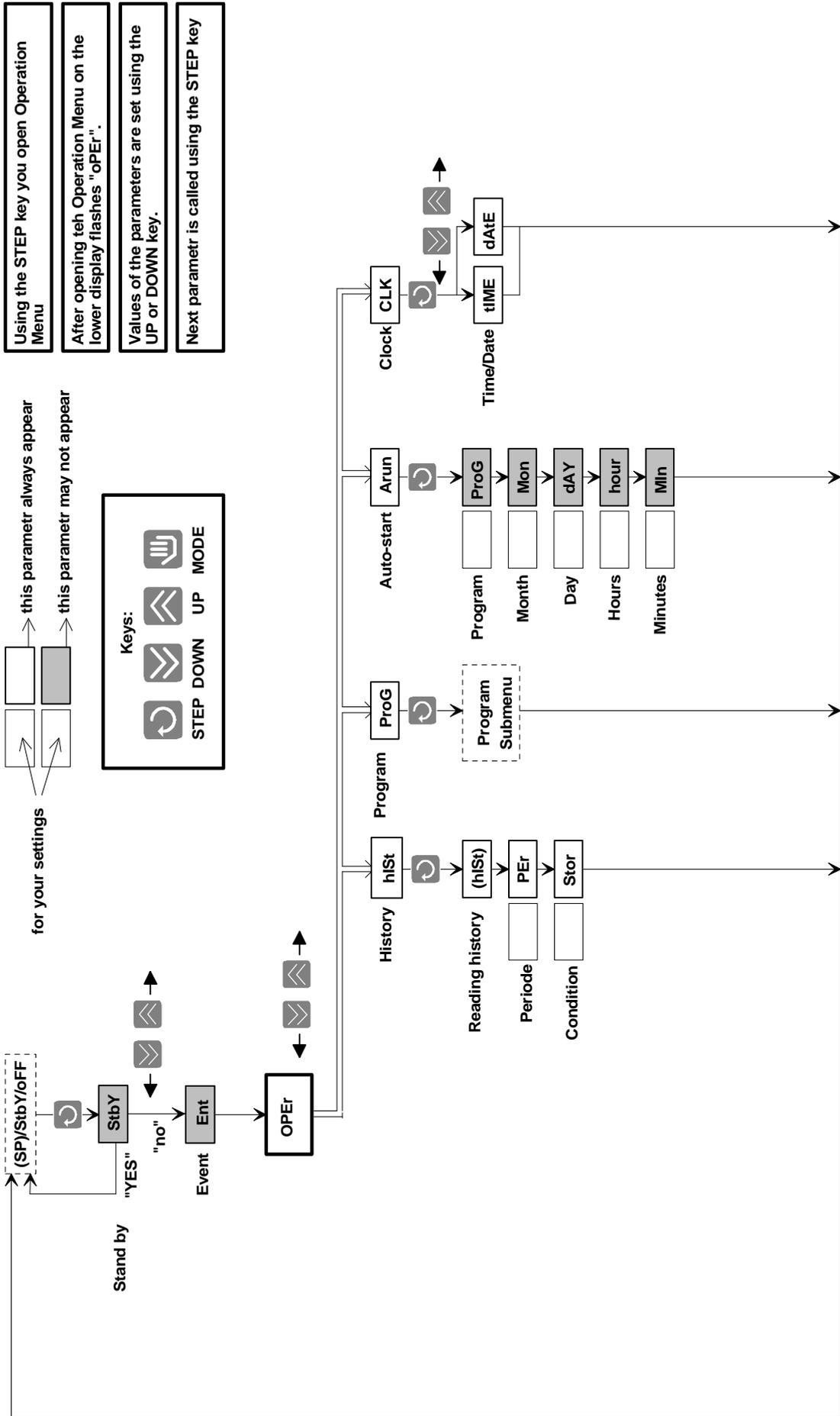
Using the STEP key you open Operation Menu

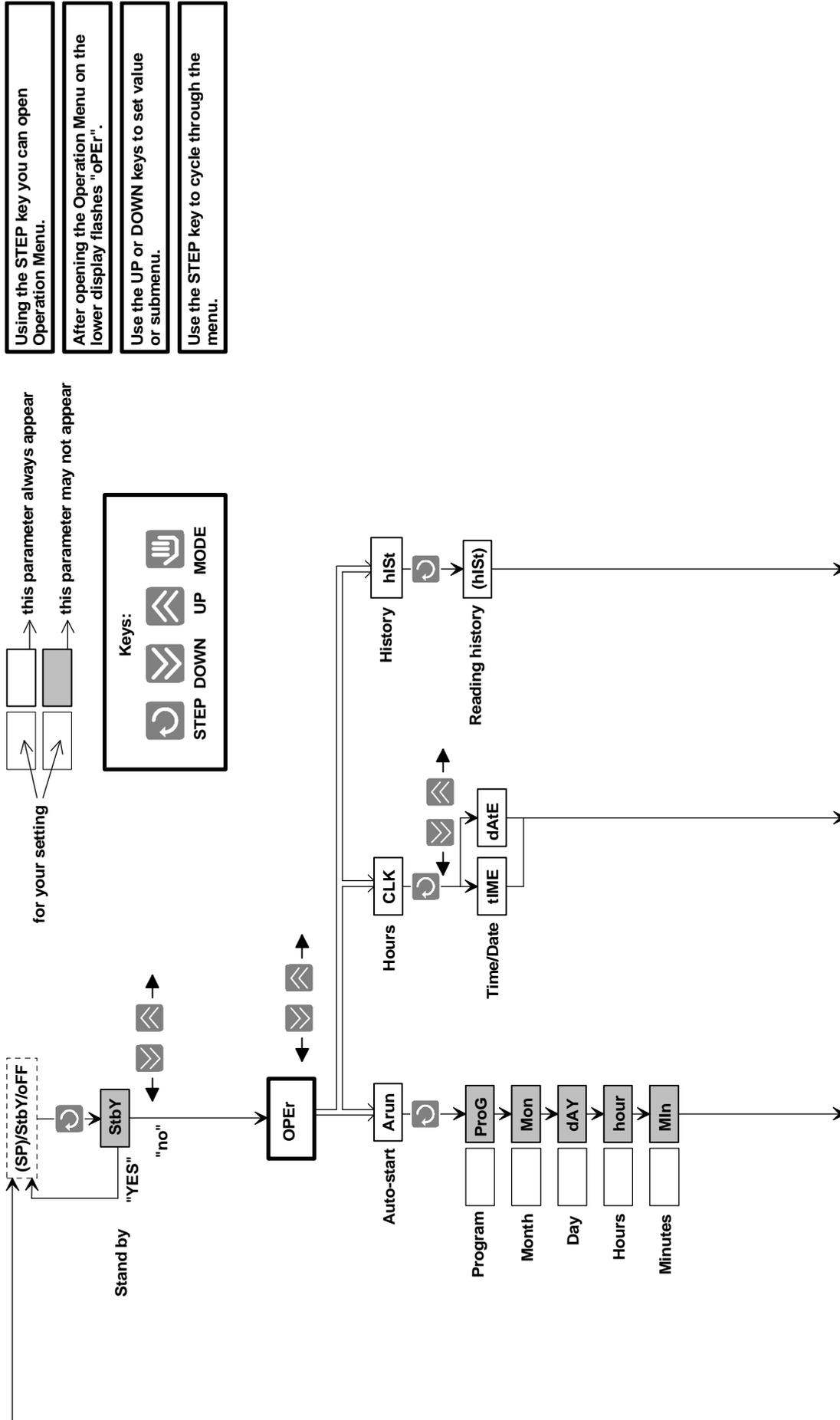After opening teh Operation Menu on the lower display flashes "oPEr".

Values of the parameters are set using the UP or DOWN key.

Next parametr is called using the STEP key

this parametr always appear

this parametr may not appear

for your settings

Keys:

STEP   DOWN   UP   MODE

Stand by

(SP)/StbY/oFF

"YES"

StbY

"no"

Event

Ent

OPEr

History

hISt

Reading history

(hISt)

PEr

Stor

Periode

Condition

Program

ProG

Program Submenu

Auto-start

Arun

ProG

Mon

dAY

hour

MIn

Program

Month

Day

Hours

Minutes

Clock

CLK

Time/Date

tIME

dAtE

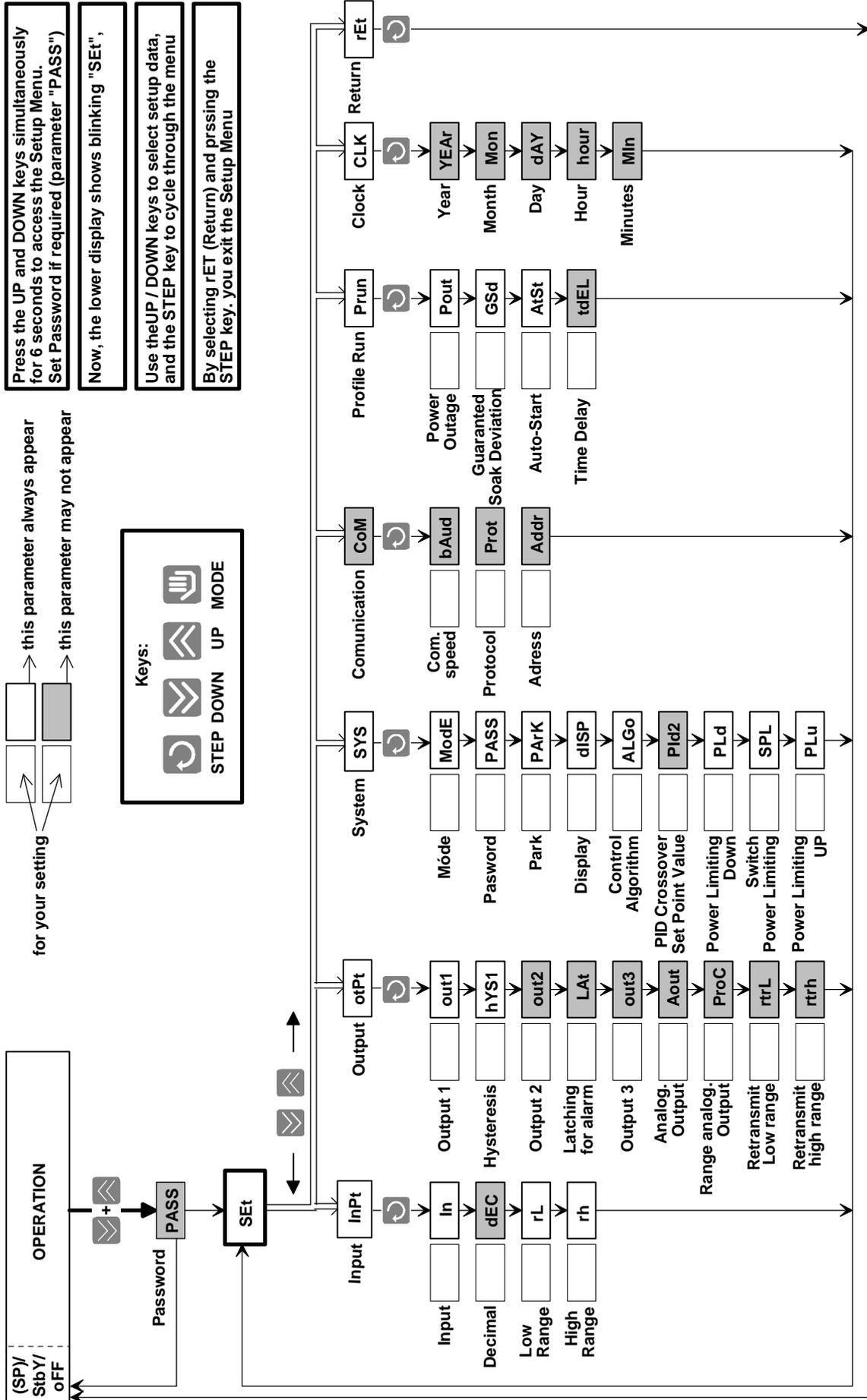## 14.5 Operation Menu MT825-Px-xxx-x0, modes 3, 3.P

Using the STEP key you can open Operation Menu.

After opening the Operation Menu on the lower display flashes "oPEr".
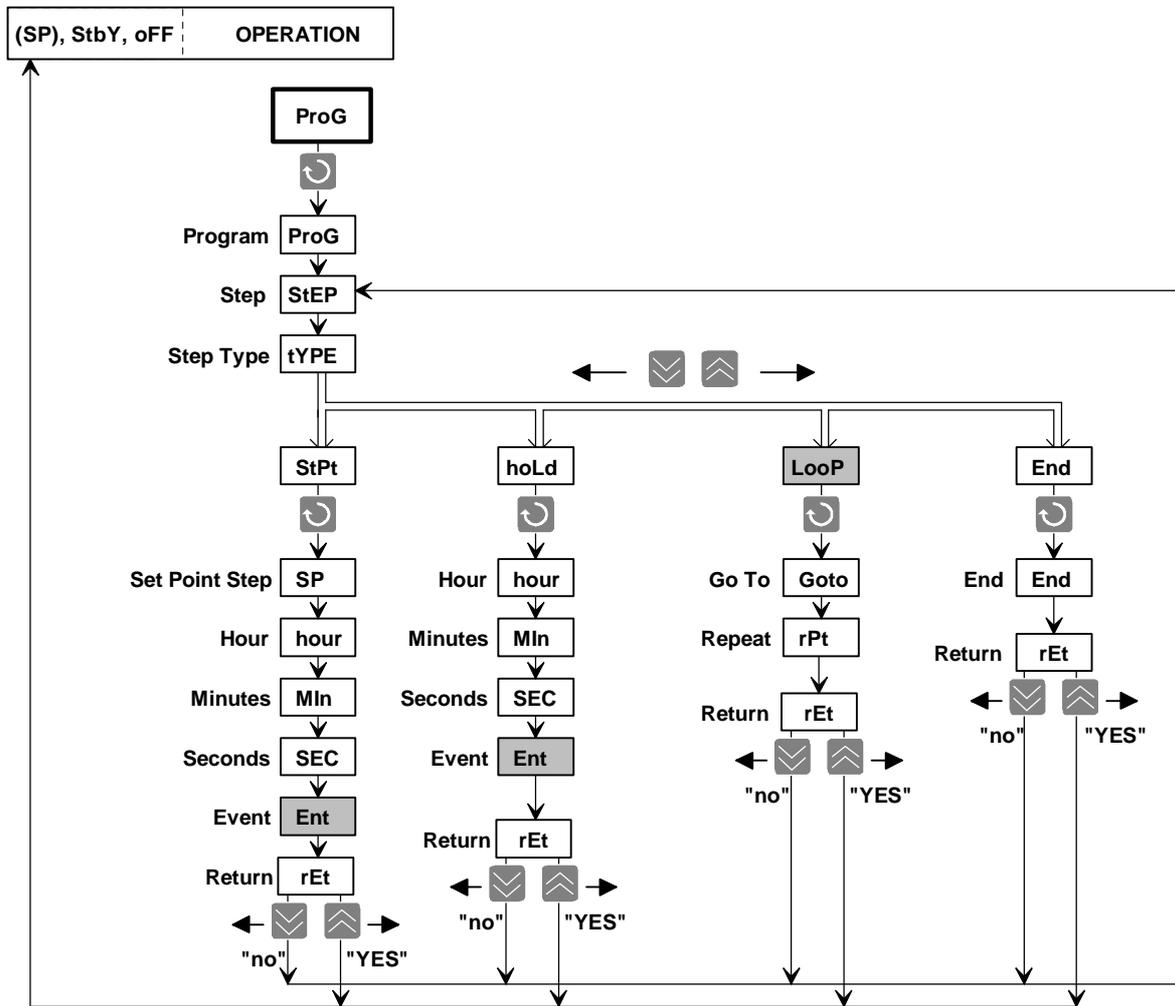
Use the UP or DOWN keys to set value or submenu.

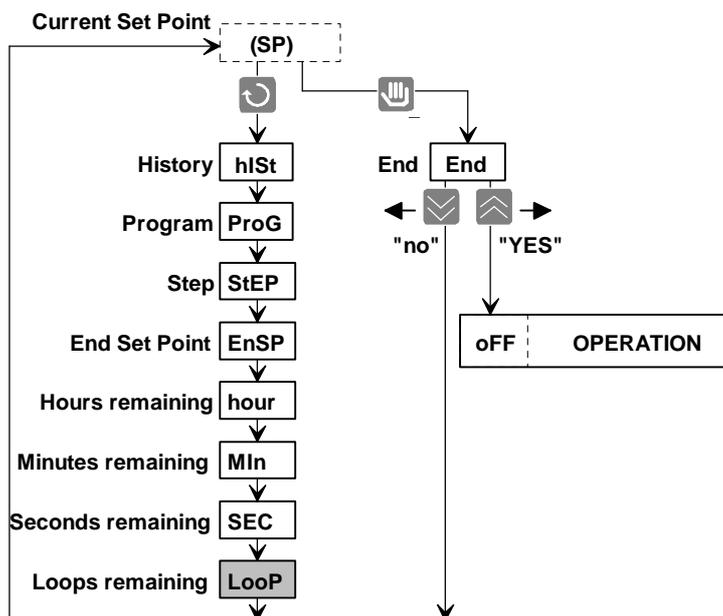Use the STEP key to cycle through the menu.

this parameter always appear

this parameter may not appear

for your setting

Keys:

STEP   DOWN   UP   MODE

Stand by

(SP)/StbY/oFF

"YES"   StbY   "no"

OPEr

Auto-start   Arun

Program   ProG

Month   Mon

Day   dAY

Hours   hour

Minutes   MIn

Hours   CLK

Time/Date   tIME   dAtE

History   hISt

Reading history   (hISt)

14.6 Setup MT825-Px-xxx-xx

Press the UP and DOWN keys simultaneously for 6 seconds to access the Setup Menu. Set Password if required (parameter "PASS")

Now, the lower display shows blinking "SEt",

Use theUP / DOWN keys to select setup data, and the STEP key to cycle through the menu

By selecting rET (Return) and prssing the STEP key, you exit the Setup Menu

this parameter always appear
this parameter may not appear
for your setting

Keys:
STEP DOWN UP MODE

OPERATION
(SP)/ StbY/ oFF

Password — PASS
SEt

Input — InPt
- In — Input
- dEC — Decimal
- rL — Low Range
- rh — High Range

Output — otPt
- out1 — Output 1
- hYS1 — Hysteresis
- out2 — Output 2
- LAt — Latching for alarm
- out3 — Output 3
- Aout — Analog. Output
- ProC — Range analog. Output
- rtrL — Retransmit Low range
- rtrh — Retransmit high range

System — SYS
- ModE — Mode
- PASS — Password
- PArK — Park
- dISP — Display
- ALGo — Control Algorithm
- PId2 — PID Crossover Set Point Value
- PLd — Power Limiting Down
- SPL — Switch Power Limiting
- PLu — Power Limiting UP

Comunication — CoM
- bAud — Com. speed
- Prot — Protocol
- Addr — Adress

Profile Run — Prun
- Pout — Power Outage
- GSd — Guaranted Soak Deviation
- AtSt — Auto-Start
- tdEL — Time Delay

Clock — CLK
- YEAr — Year
- Mon — Month
- dAY — Day
- hour — Hour
- MIn — Minutes

Return — rEt

14.7 Program Submenu

(SP), StbY, oFF | OPERATION

ProG

Program | ProG
Step | StEP
Step Type | tYPE

StPt   hoLd   LooP   End

Set Point Step | SP   Hour | hour   Go To | Goto   End | End
Hour | hour   Minutes | MIn   Repeat | rPt   Return | rEt
Minutes | MIn   Seconds | SEC   Return | rEt   "no" "YES"
Seconds | SEC   Event | Ent
Event | Ent   Return | rEt   "no" "YES"
Return | rEt   "no" "YES"
"no" "YES"

14.8 Run Menu

Current Set Point | (SP)

History | hISt   End | End
Program | ProG   "no" "YES"
Step | StEP
End Set Point | EnSP   oFF | OPERATION
Hours remaining | hour
Minutes remaining | MIn
Seconds remaining | SEC
Loops remaining | LooP

Kork		Typ	Hodnoty			Trvání						Příznak (Ent)		
1		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
2		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
		Loop	Goto:		rPt:									
		End		oFF		StbY								
3		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
		Loop	Goto:		rPt:									
		End		oFF		StbY								
4		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
		Loop	Goto:		rPt:									
		End		oFF		StbY								
5		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
		Loop	Goto:		rPt:									
		End		oFF		StbY								
6		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
		Loop	Goto:		rPt:									
		End		oFF		StbY								
7		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
		Loop	Goto:		rPt:									
		End		oFF		StbY								
8		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
		Loop	Goto:		rPt:									
		End		oFF		StbY								
9		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
		Loop	Goto:		rPt:									
		End		oFF		StbY								
10		StPt	SP:			hour:		MIn:		SEC:		oFF		on
		hoLd				hour:		MIn:		SEC:		oFF		on
		Loop	Goto:		rPt:									
		End		oFF		StbY								

GRAF:

Notes: