PC109X / PC107X
AUTO-TUNE PID TEMPERATURE STEP CONTROLLER

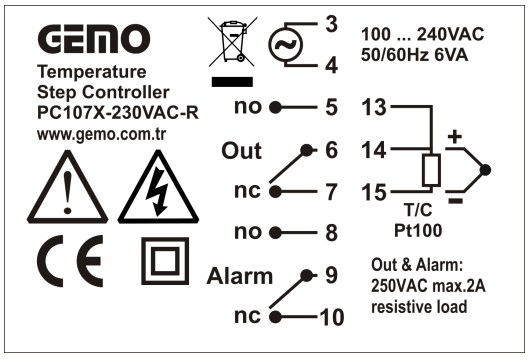
Attention, Risk of, Danger, Warning	High Voltage, Risk of Electric Shock	Double / Reinforced Insulation	NOT Litter	CE Mark

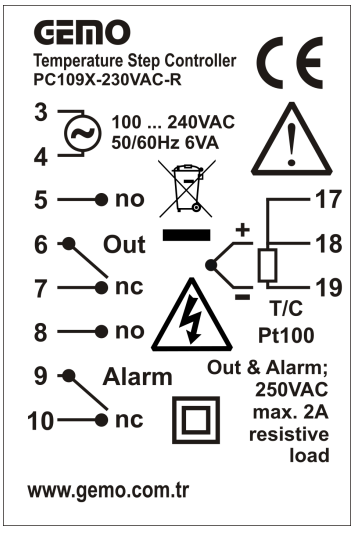
TECHNICAL SPECIFICATION

- **Dimensions** : PC109X:96x96, PC107X:72x72mm
- **Panel Cut-out** : PC109X:91x91, PC107X:68x68mm
- **Display** : 4 Digits 7 Segment (PV), 4 digits 7 Segment (SV)
- **Sensor Type** : J,K,T,S,R type T/C, Pt100 selectable
- **Measuring Scale** : -100..600 °C, J type T/C (Inpt=J), -100.0 .. 600.0 °C, J type T/C (Inpt=J.0)
  -100..1300 °C, K type T/C (Inpt=k), -100.0..999.9 °C, K type T/C, (Inpt=k.0)
  -100..400 °C, T type T/C (Inpt=t), -100.0 .. 400.0 °C, T type T/C (Inpt=t.0)
  0..1750 °C, S type T/C (Inpt=S) 0 .. 1750 °C, R type T/C (Inpt=r)
  -100..600 °C, Pt100, (Inpt=Pt) -100.0 .. 600.0 °C, Pt100, (Inpt=Pt.0)
- **Resolution** : ± 1 °C or ± 0.1 °C
- **Accuracy** : ± 1 % (Over full scale)
- **Timer Accuracy** : ± % 1.5 (of timer set value)
- **Control Form** : ON-OFF or P, PI, PD, PID - selectable
- **Heat Output** : Relay (NO + NC), 250VAC, 2A, Resistive load, (optional SSR)
- **Alarm Output** : Relay (NO + NC), 250VAC, 2A, Resistive load
- **Cold. Junc. Comp.** : 0 .. 50 °C (T/C)
- **Line Compensation** : 10 Ohm max. (3 wire Pt100)
- **Sensor Failure** : OUT output is active according to P.Err and Ct parameters in case of sensor failure, measurement out of range or hardware fails to measure input signal (OUT output is OFF if Perr is 0). For Alarm look “Alarm Output”.
- **Supply Voltage** : 100..240VAC, 50-60Hz or 24VDC/AC (isolation voltage: 40VAC max.)
- **Power Consumption** : < 8VA
- **Humidity** : < 70% (non-condensing)
- **Altitude** : < 2000 m
- **EMC** : EN 61000-6-1, EN 61000-6-3 (Only light industrial environment)
- **Safety** : EN 61010-1; Pollution degree 1, measurement category I, (Only light industrial environment, double/reinforced isolated, non-conductive pollution environment)
- **Protection Class** : IP20; according to EN 60529
- **Operation Temp.** : 0 .. 50 °C
- **Storage Temperature** : -10°C .. 60°C (no icing)
- **Weight** : < 0.5 kg
- **Torque for screwing** : Max. 0.5 N.m

WARNING: if 2 wire Pt100 is used, connect compensation lead to measuring lead:
(PC109X:**17-18**, PC107X: **13-14**)

no: normally open
nc: normally closed





CLAEANING

Do not use any solvents (alcohol, thinners, benzine, acid, etc.) or corrosive substances to clean the device. Use only a dry and clean non-abrasive cloth. Before cleaning, disconnect the power supply and mains connections.

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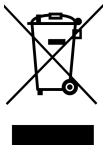
INSTALLATION, USE and WARNINGS



- This device and its packing is NOT litter and may NOT be disposed of with domestic waste. Please return this device and its packing to an appropriate recycling point at the end of its service life.
- Please read this user manual carefully and completely before installation and use. Please take into consideration all warnings mentioned in this manual.
- PC109X / PC107X are suitable only for permanent panel type mounting
- Installation and use of this device must be done by qualified, authorized and trained technical personnel only.
- Inspect device carefully before installation. Do not install and use broken and defective devices.
- Do not disassemble device. Do not make any repair on any part of the device. There is no accessible part inside the device. Please contact to manufacturer for broken and defective devices.

- Do not use device in environments subject to flammable, explosive and corrosive gases and/or substances.
- This device is designed for applications only in light industrial environments. This device is not suitable for medical and residential use. This device is not suitable for use related with human health and safety. This device is not suitable for automotive, military and marine use.
- Do not allow children and unauthorized people to use this device.
- Before installation and any technical work, disconnect the power supply and mains connections.
- Check the power supply voltage level before power on, and make sure voltage level is in specified limits. Check quality of neutral line. Improper neutral line may give permanent damage to the device.

- Connect an external power switch and an external fuse (1A, 250VAC) to the power supply line that are easily accessible for rapid intervention. Connect an external fuse (2A, 250VAC) for each relay output separately.
- Use appropriate cables for power supply and mains connections. Apply safety regulations during installation.
- Install the device in a well ventilated place. Install the device permanently into a proper panel cut-out. Fix the device with two fasteners supplied with the device. Only front panel must be accessible after installation is completed.
- Do not operate the device other then the environmental conditions given in Technical Specification.
- Do not operate the device in environments that may cause conductive pollution.

- Take precautions against negative environmental conditions like humidity, vibration, pollution and high/low temperature during installation.
- Use correct compensation cables for T/C sensors. Connect T/C cable directly to the device connectors.
- Keep device, signal cables and communication cables away from circuit breakers, power cables and devices/cables emitting electrical noise. Use shielded and twisted signal and communication cables and connect shield to earth ground on device side. Keep length of signal and communication cables less than 3m.
- In your applications, always use separate and independent mechanical and/or electromechanical devices/apparatus to support PC109X / PC107X to handle emergency cases.

- Use insulated cable end-sleeves at the end of cables screwed to the device connector terminals.
- Maximum torque for screwing; 0.5 N.m.
- Please check www.gemo.com.tr for latest device and documentation updates regularly. All updates and all information are subject to change without notice.

GENERAL SPECIFICATION

- PID temperature step controller with HEAT and ALARM outputs
- Auto-tuning for PID parameters
- Sensor type: T/C (J, K, T, S, R), Pt100, selectable, multi-input
- Selectable control type: P, PI, PD, PID or ON-OFF
- “Anti-windup”
- Maximum 5 programs, 30 steps/program, selectable
- Maximum 100 hours/step timer setting
- Selectable alarm output
- Displays SET, Process, Program No, Step no and Remaining time values
- Cold-junction compensation for T/C
- Line compensation for Pt100
- Excellent linearity with ºC/mV and ºC/Ohm look-up tables
- Input “Offset” feature
- Password protection
- High accuracy
- EEPROM memory to store settings
- Optional SSR output
- Easy connection with plug-in connectors

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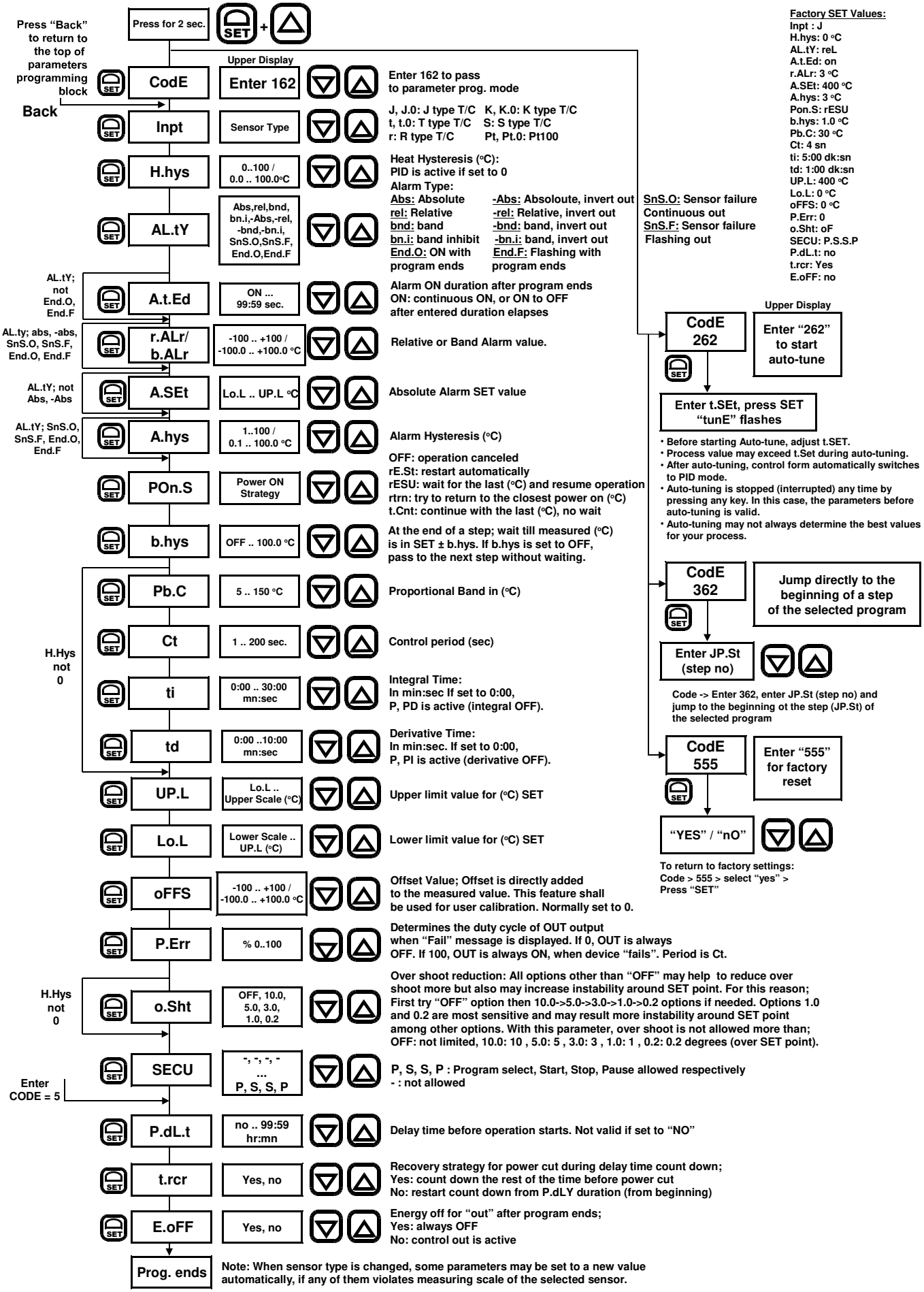
PROGRAMMING SYSTEM PARAMETERS



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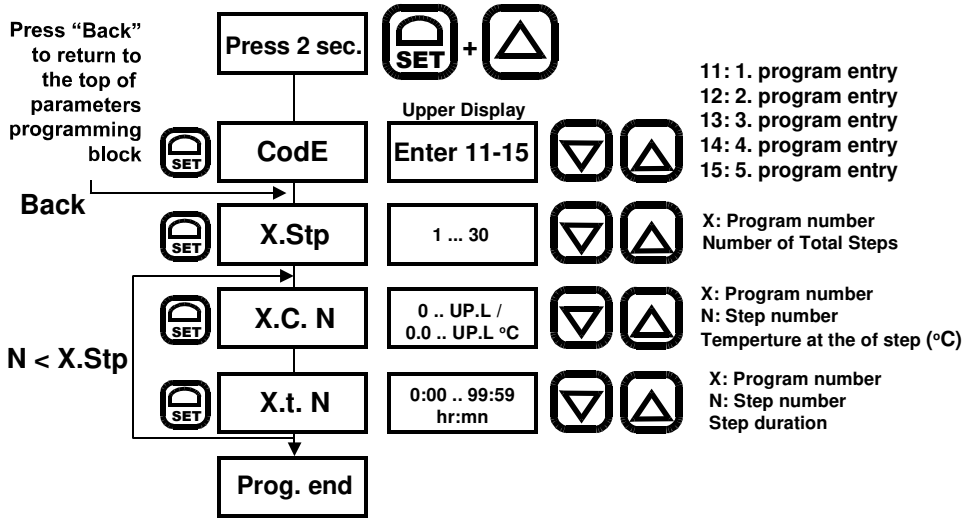
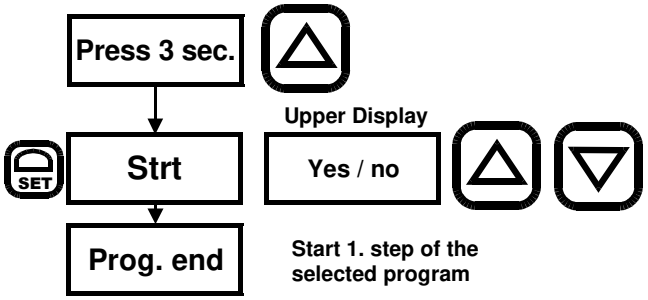
PROGRAMMING STEP TEMPERATURE SET / STEP DURATION VALUES

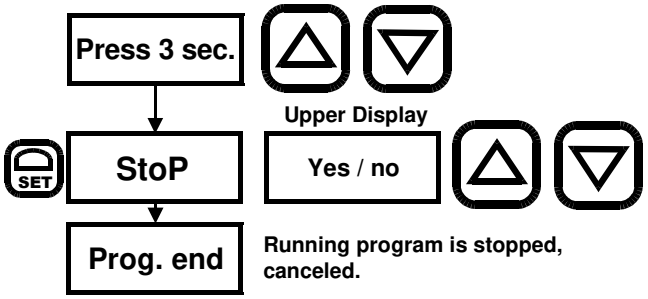


STARTING STEP CONTROL; "START" COMMAND

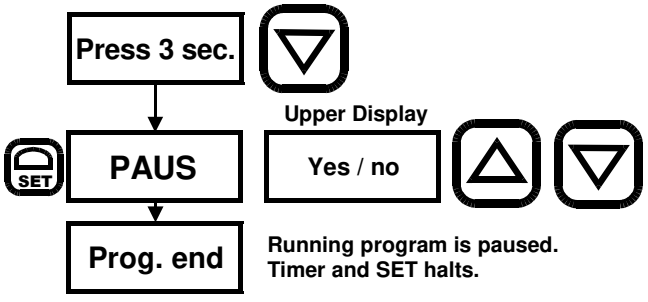


- The [time/(°C)] slope of the 1.step is calculated with a starting reference temperature of 25°C. But the program starts with current measured temperature (PV) anyhow. So, the real total duration (recalculated upon restart for PV) may be different than the duration entered for 1.step, if PV is not equal to 25°C

RESETTING (STOPPING) STEP CONTROL; "STOP" COMMAND



PAUSING STEP CONTROL TEMPORARILY; "PAUSE" COMMAND



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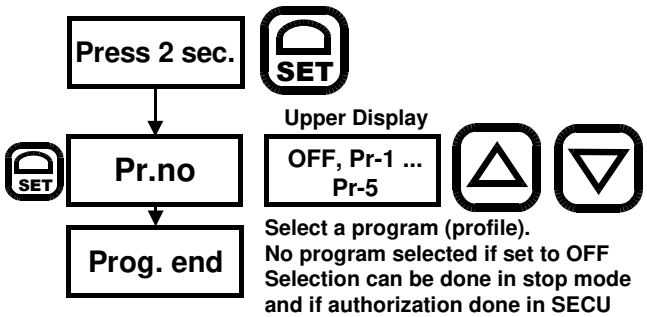
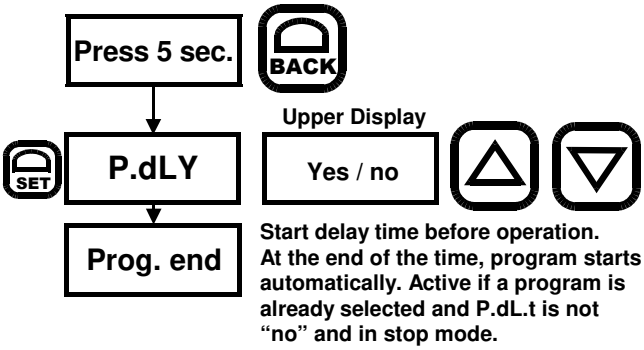
SELECTING A PROGRAM

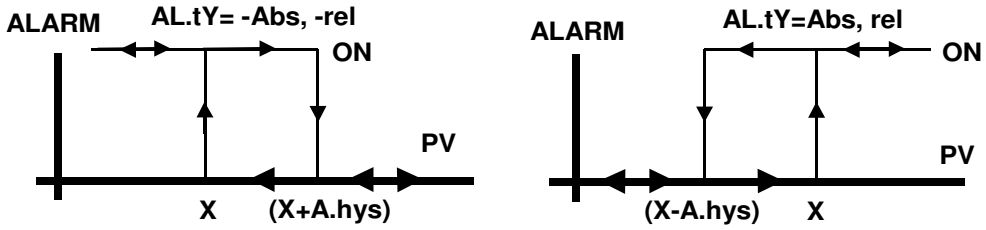


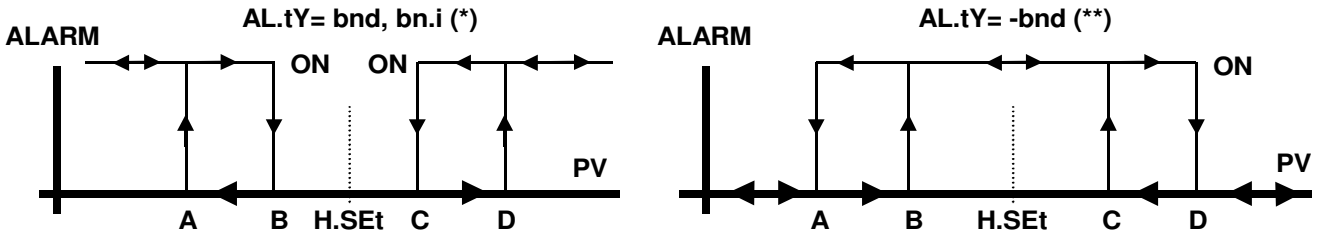
STARTING DELAY TIME BEFORE OPERATION



ALARM OUTPUT

AL.tY = Abs, -Abs; X = A.SEt
AL.tY = rel, -rel ; X = H.SEt + r.ALr





A = H.Set-b.Alr, B = H.SET-b.Alr+A.hys, C = H.SEt+b.Alr-A.hYS, D = H.SET+b.Alr

(*) AL.tY = bn.i is same as bnd except that if AL.tY = bn.i, ALARM is never ON before PV is in band.
(**) AL.tY = -bn.i is always same as -bnd.

- **AL.ty = SnS.O:** If sensor measurement fails; Alarm out is continuously ON.
- **AL.ty = SnS.F:** If sensor measurement fails; Alarm out is flashing (1 second ON then 2 seconds OFF, periodically).
- **AL.ty = End.O:** When a program ends (END); Alarm out is continuously ON.
- **AL.ty = End.F:** When a program ends (END); Alarm out is flashing (1 second ON then 2 seconds OFF, periodically).

PID PARAMETERS

- **P, PI, PD, PID** is active when **"H.Hys"** is set to 0 (if not 0 then **ON-OFF** is active)
- **PbC:** Proportional band in ºC.
- **Ct:** Control period for PID control. Prefer 4-10 sec.
- **Ti:** Integral time; Set in minutes. Determines how fast controller reacts to compensate the offset between SET point and the process value. If set to 0, integral part is OFF. If set too low, process value may oscillate.
- **Td:** Derivative time; Set in minutes. If set to 0, derivative part is OFF. Determines how sensitive the controller is to changes of the offset between SET point and the process value. If set too high, process value may oscillate or overshoot.

STEP CONTROL PRINCIPLE

- Step control is done by adjusting SET value against time according to user configurable SET and time parameters. Device controls OUT output to equate process value (PV) to calculated SET value.
- **START:** Starts step control.
- **STOP:** Step control is reset with "STOP" command; OUT and ALARM outputs are OFF
- **PAUSE:** Step control is paused temporarily by the user. PAUSE/START command resumes operation.
- User may enter maximum 5 programs; each with maximum 30 SET and 30 timer values to establish a profile. Number of steps is determined by user programmable "StEP" parameter.
- If step control reaches to the end of last step, "End" message is displayed, meaning selected program has ended.
- Measured temperature (PV) is expected to be in [end of step temperature **±** b.hyS] band, after step timer duration elapses. If not so, SET value is kept as is with "HOLD" message and timer value as 00:00. It is passed to the next step after PV is detected in the band. If "b.hyS" is set to OFF, no band detection is done, next step starts immediately.
- Delay time before operation may be started as shown in the relevant flowchart above. Delay time can only be started manually. In order to start delay time, "P.dL.t" must have a time duration value (not OFF), a program must be selected, the device must be in stop mode and authorization must be done in SECU parameter. After delay time starts, device waits delay time to elapse and then performs a restart for the selected program regardless of the POn.S (power on strategy) parameter.
- Delay time count down may be prematurely ended manually by pressing "BACK" button for 5 secs during delay time count down.
- If power is interrupted during delay time count down, device resumes operation according to the "t.rcr" (delay timer recovery) parameter. If "t.rcr" is "yes", delay timer counts down with the remaining duration. If "t.rcr" is "no", delay timer counts down from the beginning ("P.dL.t" parameter).

POWER ON STRATEGIES

- Device may detect power failure and saves current state to its memory. It loads saved values upon power on.
- Power on strategy is determined by "POn.S" parameter:
- **OFF:** Device becomes OFF after power on, regardless its operating state that it has before last power down.
- **rE.St:** Device restarts selected program automatically, regardless its operating state that it has before last power down.
- **rESU:** Device tries to resume its operating state that it has before last power down. It waits for measured temperature (PV) to be in [last temperature SET **±** b.hyS] band, and then continues operation. If "b.hyS" is set to OFF, no band detection is done.
- **rtrn:** Device scans the profile of the selected program, and returns to the point where the profile SET is equal to PV. In some cases, a "**rE.St**" or "**rESU**" may be done.
- **t.Cnt:** Device continues operation with its operating state that it has before last power down without any condition automatically.

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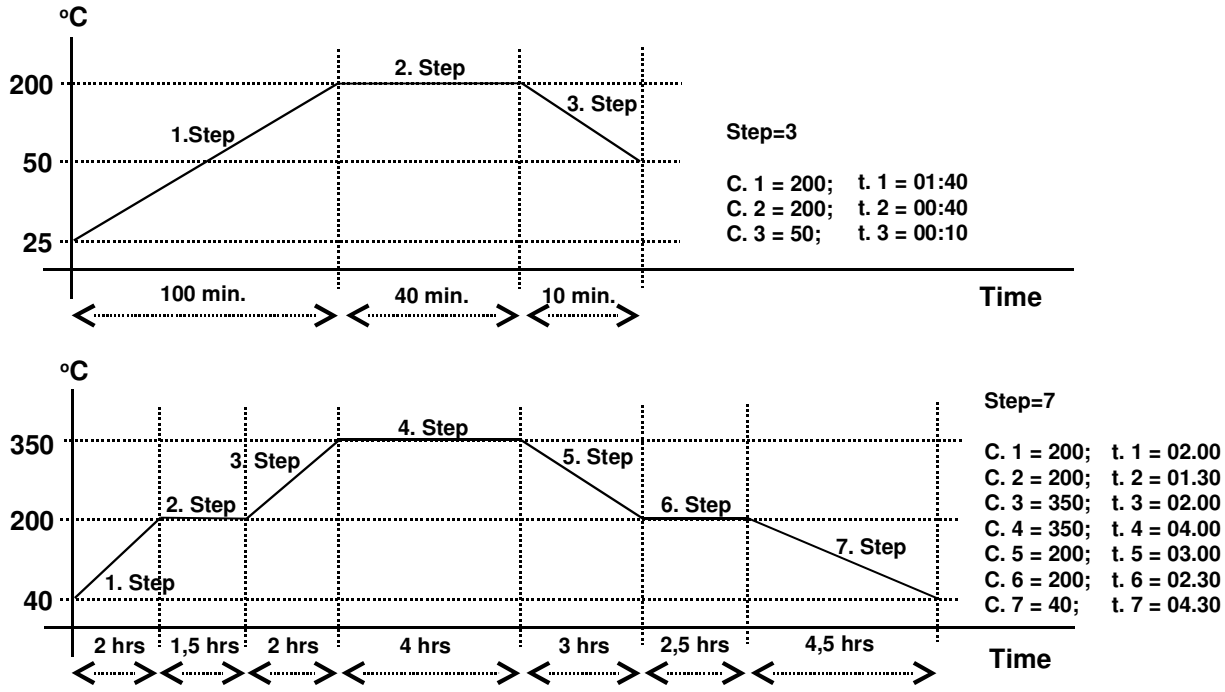
OPERATING STATES / MESSAGES

- **OFF:** No program has been selected. Device is not active. OUT and Alarm outputs are OFF.
- **STOP:** A program has been selected, but not started yet. Device is not active. OUT and Alarm outputs are OFF.
- **rAPn:** Selected program has been started.
- **HOLD:** Selected program is active. Device is waiting for measured temperature (PV) to be in "b.hyS" band. Device is active. OUT and Alarm outputs are active. Timer does not count back, SET is not altered.
- **Pr. n:** Active program number; n: 1...5.
- **St. n:** Active step number; n:1...30.
- **END:** Selected program ended.
- **FAiL:** Measurement error
- **Err:** Hardware failure

SAMPLE PROFILES



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