

# RS PRO PROCESS CONTROL UNITS



## Universal Input PID Process Controllers

- 4 digit process (PV) and 4 digit set (SV) display
- Universal process input (TC, RTD, mV, V, mA)
- Dual or multi point calibration for Voltage & current inputs
- Programmable ON/OFF, P, PI, PD and PID control forms
- Auto-tune and Self-tune PID
- Manual/Automatic mode selection for control outputs
- Bumpless transfer
- Programmable heating, cooling and alarm functions for control outputs

## SPECIFICATIONS

### PROCESS INPUT

**Universal Input:** TC, RTD, Voltage/Current  
 Thermocouple (TC): L (DIN 43710), J, K, R, S, T, B, E and N (IEC584.1)(ITS90), C (ITS90)  
 Thermoresistance (RTD): PT-100 (IEC751)(ITS90)

**Input:** mV, V, mA  
**Measurement Range:** Please refer to Table-1 for selection of input type and scale  
**Accuracy:** ± 0.25% of full scale for thermocouple, thermoresistance, mV, V and mA input.

**Cold Junction Compensation:** Automatically ± 0.1°C/1°C  
**Line Compensation:** Maximum 10 Ohm  
**Sensor break protection:** Upscale  
**Sampling Cycle:** 3 samples per second  
**Input Filter:** 0.0 to 900.0 seconds

**CONTROL**  
**Control Form:** ON/OFF, P, PI, PD or PID (Control form can be programmed by the user)

**OUTPUT**  
**Standard Relay Outputs:** Two relays. 5A@250V~ (at resistive load) (They can be programmed as Control or Alarm output)  
**SSR Driver Output:** Maximum 17mA, Max. 25V ~ ~

**SUPPLY VOLTAGE**  
 100-240 V ~ 50/60 Hz (-15%; +10%), - 6VA  
 24V ~ 50/60 Hz (-15%; +10%), - 6VA  
 24V ~ ~ (-15%; +10%), - 6W (Must be determined in order)

**DISPLAY**  
**Process Display:**  
 48 x 48 mm : 10.1 mm Red 4 Digits LED Display  
 96 x 48 mm : 13.2 mm Red 4 Digits LED Display  
 72 x 72 mm : 13.2 mm Red 4 Digits LED Display  
 96 x 96 mm : 19 mm Red 4 Digits LED Display  
 48 x 96 mm : 10.1 mm Red 4 Digits LED Display  
**Set Value Display:**  
 48 x 48 mm : 8 mm Green 4 Digits LED Display  
 96 x 48 mm : 8 mm Green 4 Digits LED Display  
 72 x 72 mm : 9.1 mm Green 4 Digits LED Display  
 96 x 96 mm : 10.8 mm Green 4 Digits LED Display  
 48 x 96 mm : 8 mm Green 4 Digits LED Display  
**LEDS:** AT (Auto Tune), M (Manual Mode), A (Automatic Mode), PSET / ASET1 / ASET2 (Control or Alarm Set) Leds, PO, AO1, AO2 (Control or Alarm Status) °C / °F / V Leds

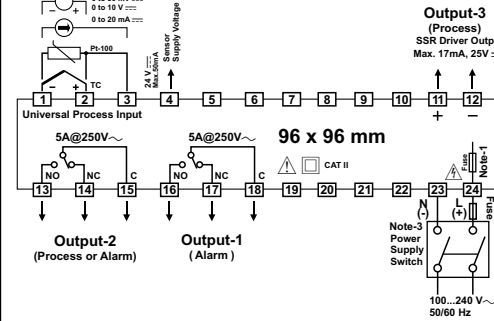
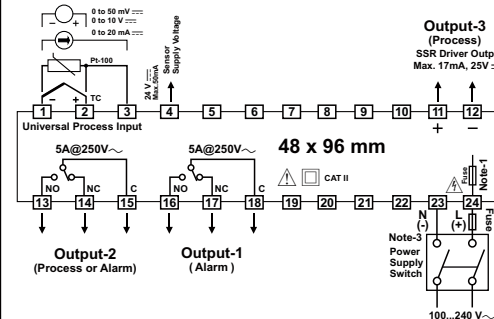
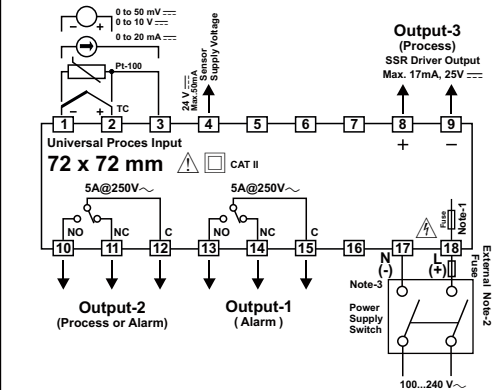
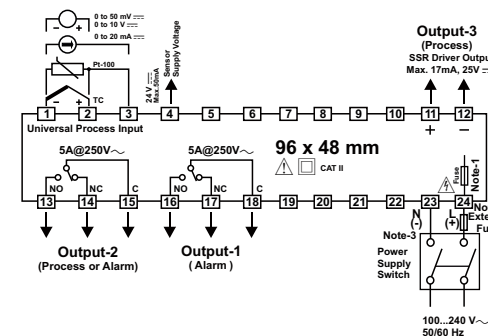
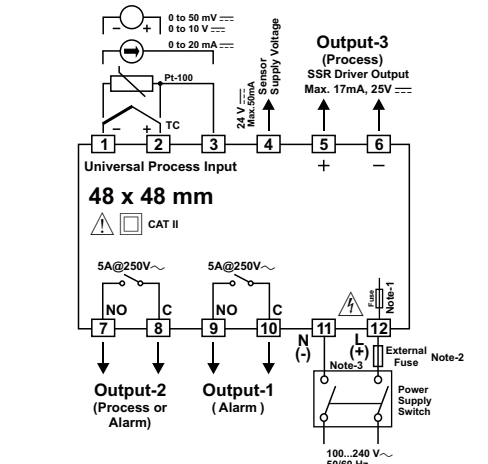
## ENVIRONMENTAL RATINGS AND PHYSICAL SPECIFICATIONS

**Operating Temperature:** 0...50°C  
**Humidity:** 0-90%RH (none condensing)  
**Protection Class:** IP65 at front, IP20 at rear  
**Mounting:** Type-1 Enclosure Mounting  
**Installation:** Fixed installation Category II  
**Over Voltage Category:** II

**Pollution Degree:** II, office or workplace, none conductive pollution  
**Weight:**  
 ESM-4430 : 170 gr.  
 ESM-4930 : 230 gr.  
 ESM-7730 : 230 gr.  
 ESM-9930 : 320 gr.  
 ESM-9430 : 230 gr.

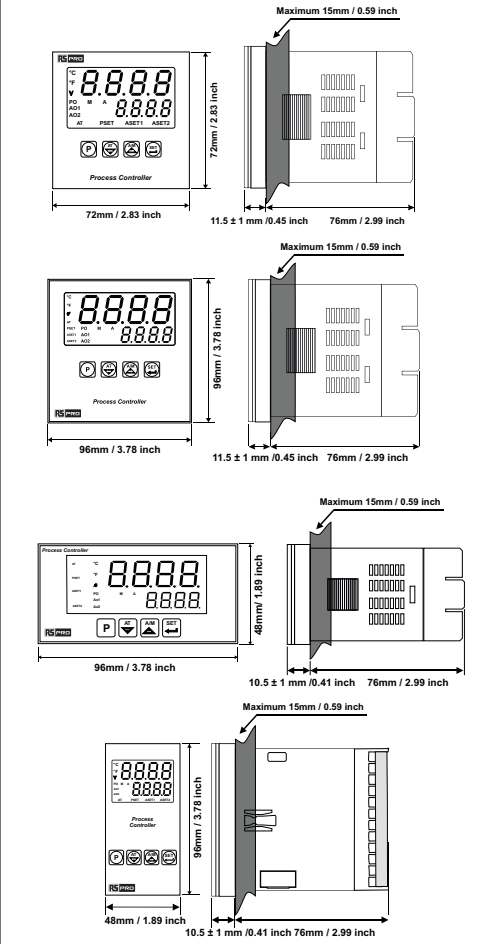
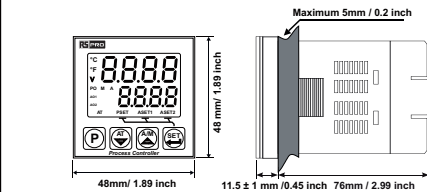
**Dimensions / Panel Cut-Out:**  
 ESM-4430 : (48 x 48mm, Depth:87.5 mm) / (46 x 46mm)  
 ESM-4930 : (96 x 48mm, Depth:86.5 mm) / (92 x 46mm)  
 ESM-7730 : (72 x 72mm, Depth:87.5 mm) / (69 x 69mm)  
 ESM-9930 : (96 x 96mm, Depth:87.5 mm) / (92 x 92mm)  
 ESM-9430 : (48 x 96mm, Depth:86.5 mm) / (46 x 92mm)  
**Minimum Distance Between Panel Cut-Out Centers:**  
 ESM-4430 : X=65mm, Y=65mm  
 ESM-4930 : X=129mm, Y=65mm  
 ESM-7730 : X=97mm, Y=97mm  
 ESM-9930 : X=129mm, Y=129mm  
 ESM-9430 : X=65mm, Y=129mm

## Electrical Wirings



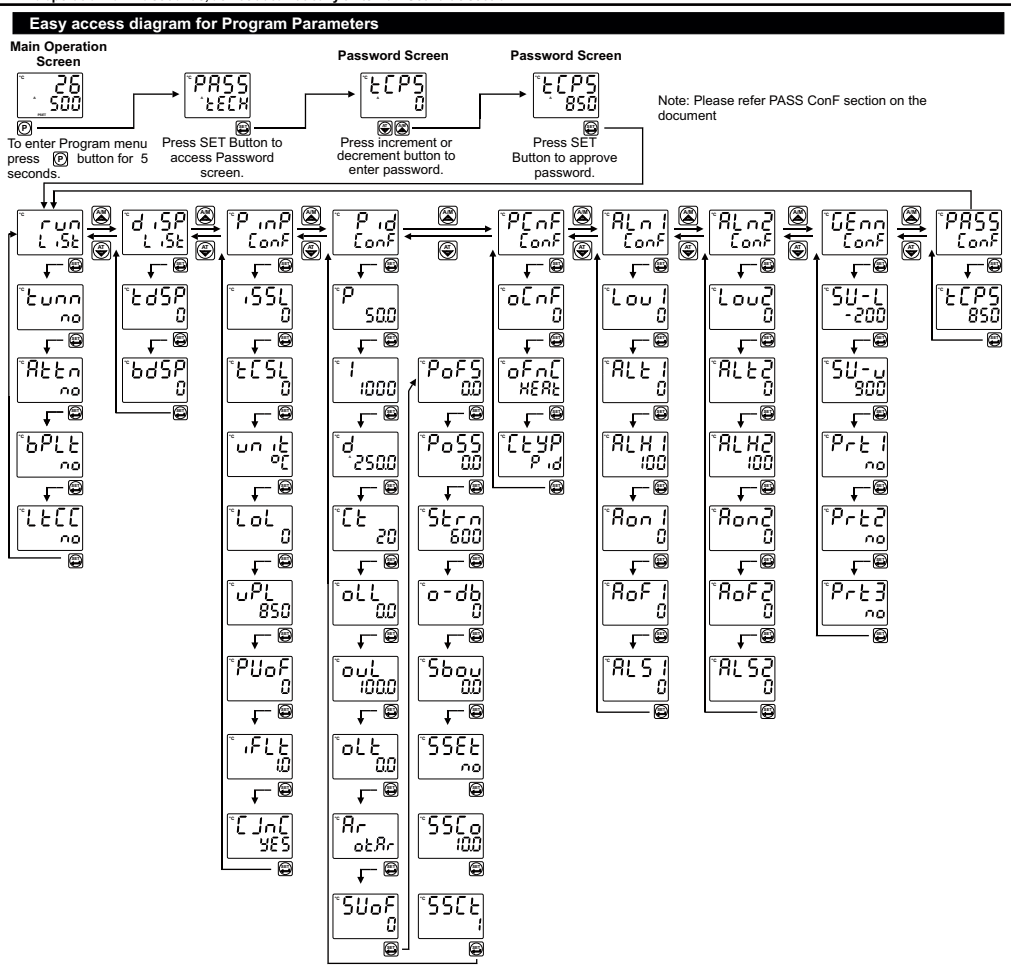
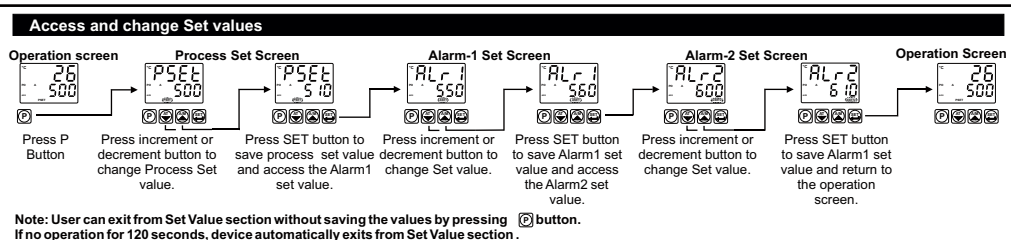
**Note-1:** There is an internal fusible flameproof resistor.  
**Note-2:** External fuse is recommended.  
 1A~T for power supply 100...240 V ~ or 24V ~ ~  
 1A~T for power supply 24V ~ ~  
**Note-3:** "L" is (+), "N" is (-) for 24V ~ ~ supply voltage

## DIMENSIONS



## PANEL MOUNTING

- 1-Before mounting the device in your panel, make sure that the panel cut-out is suitable.
- 2-Check front panel gasket position
- 3-Insert the device through the cut-out. If the mounting clamp are on the unit, put out them before inserting the unit to the panel.
- 4-Insert the unit in the panel cut-out from the front side.
- 5- Insert the mounting clamps to the holes that located top and bottom sides of device and screw up the fixing screws until the unit completely immobile within the panel



### Run LySt: Selection of PID Tune and Operation Form

**TUNE SELECTION:** By selecting one of the methods below, device can determine the PID parameters.

- Device operates according to the defined PID parameters
- Auto tune** (Limit Cycle Tuning) operation
- Self tune** (Step Response Tuning) operation
- Auto-Self Tune** Tuning methods are performed according to system conditions by itself.

**AUTOMATIC TUNE SELECTION**

- Device does not perform tuning.
- Device does perform tuning.

**BUMPLESS TRANSFER**

- When automatic mode changes to manual mode, the process output will be last saved manual mode output percentage. Process output value in manual control is not taken into consideration while passing from manual control to automatic control. New control output that is measured in automatic control is applied to process output.

When automatic mode changes to manual mode, the process output will be last automatic mode output percentage. While passing from manual control to automatic control, last process output value in manual control is accepted as first process output value in automatic control.

**ALARM LATCH CANCELING**

- Alarm latch canceling is not performed.
- If there is an alarm output with latching and there is no alarm status, latching operation will be finished by the device. This parameter becomes  automatically.

### dySP LySt: Function Selection for Top and Bottom Display

**Top Display Function**  
This parameter determines which value is shown in top display.

- Process value (PV) is shown in top display.
- Difference between process set value and process value (SV-PV) is shown in top display.

**Bottom display Function**  
This parameter determines which value is shown in bottom display.

- Process set value (SV) is shown in bottom display.
- %Output value that is applied to process control output is shown in bottom display.

### PynP Conf: Process Input Type and Relevant Parameters

**Process Input Type**

- TC input type selection
- RTD input type selection
- Voltage / Current input type selection.

**TC Input Selection**  
This parameter is active if TC input type is selected.

- L (-100.0°C;850.0°C) or (-148°F;1562°F)
- L (-100.0°C;850.0°C) or (-148.0°F;999.9°F)
- J (-200.0°C;900.0°C) or (-328°F;1652°F)
- J (-199.9°C;900.0°C) or (-199.9°F;999.9°F)
- K (-200.0°C;1300.0°C) or (-328°F;2372°F)
- K (-199.9°C;999.9°C) or (-199.9°F;999.9°F)
- R (0.0°C;1700.0°C) or (32°F;3092°F)
- R (0.0°C;999.9°C) or (32.0°F;999.9°F)
- S (0.0°C;1700.0°C) or (32°F;3092°F)
- S (0.0°C;999.9°C) or (32.0°F;999.9°F)
- T (-200.0°C;400.0°C) or (-328°F;752°F)
- T (-199.9°C;400.0°C) or (-199.9°F;752.0°F)
- B (44.0°C;1800.0°C) or (111°F;3272°F)
- B (44.0°C;999.9°C) or (111.0°F ; 999.9°F)
- E (-150.0°C;700.0°C) or (-238°F;1292°F)
- E (-150.0°C;700.0°C) or (-199.9°F;999.9°F)
- N (-200.0°C;1300.0°C) or (-328°F;2372°F)
- N (-199.9°C;999.9°C) or (-199.9°F;999.9°F)
- C (0.0°C;2300.0°C) or (32°F;3261°F)
- C (0.0°C;999.9°C) or (32.0°F;999.9°F)

**RTD Input Selection**  
This parameter is active if RTD input is selected.

- PT-100 (-200.0°C ; 650.0°C) or (-328°F ; 1202°F)
- PT-100 (-199.9°C ; 650.0°C) or (-199.9°F ; 999.9°F)

**Voltage / Current Input Selection**  
This parameter is active if Voltage / Current is selected.

- 0 0..50mV ( -1999 ; 9999 )
- 1 0..5V ( -1999 ; 9999 )
- 2 0..10V ( -1999 ; 9999 )
- 3 0..20mA ( -1999 ; 9999 )
- 4 4..20mA ( -1999 ; 9999 )

**Display Point Position**  
Active if Voltage / Current input is selected.

- No point
- Between first and second digits "0.0"
- Between second and third digits "0.00"
- Between third and fourth digits "0.000"

**Display Value Adjustment Type**  
Active if Voltage / Current input is selected.

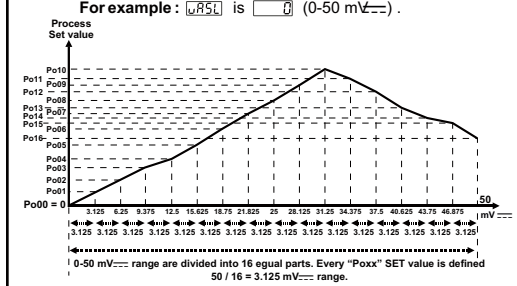
- Fixed dual point display adjustment. Display adjustment low point value is fixed to -1999, display adjustment high point value is fixed to 9999.
- User can do dual point display adjustment with tPoand tPoH.
- User can do defined 16 display adjustment points.

**Low Point Display adjustment (-1999, 9999)Unit**  
Active if Voltage / Current input is selected.

**High Point Display adjustment (-1999, 9999)Unit**  
Active if Voltage / Current input is selected.

**Display adjustment points (-1999, 9999)Unit**  
This parameter is active if Voltage / Current input is selected. In multi point display adjustment operation, defined scale is divided into 16 adjustment points.

For example:  is  (0-50 mV) .



**Coefficient value (1.000, 9.999)**  
Process value is multiplied with this value.  
Active if Voltage / Current input is selected.

**Unit selection**

- Unit is °C
- Unit is °F
- Unit is Voltage. Active if Voltage / Current input is selected
- No unit. Active if Voltage / current input is selected

**Operating Scale Minimum Value (Scale Low Point, Scale High Point)Unit**  
Used for Proportional band calculation and display blink.

**Operating Scale Maximum Value (Scale Low Point, Scale High Point)Unit**  
Used for Proportional band calculation and display blink.

**Display offset for process value (Scale -10%, Scale +10%)Unit** This parameter value is added to the process value.

**Filter Time (0.0, 900.0)Second**  
Defines filter time for display value.

**Cold Junction Compensation**  
This parameter is active if process input is selected TC input.

- Cold junction compensation is active.
- Cold junction compensation is not active.

**Scale:** The difference, between high point and low point of the process input type. Example: If tCSL = 2 (low point is -200, high point is 900), then scale is 1100. If input type is Voltage/Current, then the scale is difference between tPoH and tPoL parameters.

**Pýd ConF: PID Configuration Parameters**

**P** **PROPORTIONAL BAND (0.0, 999.9)%**  
If  $\frac{L_{up}}{P} = 1000 \text{ }^{\circ}\text{C}$ ,  $\frac{L_{ol}}{P} = 0 \text{ }^{\circ}\text{C}$  and  $P = 50.0$  then,  
Proportional Band =  $(\frac{L_{up}}{P} - \frac{L_{ol}}{P}) * P / 100.0$   
Proportional Band =  $(1000-0) * 50.0 / 100.0 = 500 \text{ }^{\circ}\text{C}$

**I** **INTEGRAL TIME (0, 3600)Second**  
Can be changed by the user. After completed the tuning correctly, integral time value changes automatically. If it is 0, integral control is deactivated.

**d** **DERIVATIVE TIME (0.0, 999.9)Second**  
Can be changed by the user. After completed the tuning correctly, integral time value changes automatically. If it is 0, derivative control is deactivated.

**CT** **CONTROL PERIOD TIME (1, 150)Second**  
Process output period time

**OLL** **MINIMUM CONTROL OUTPUT (0.0, OUL)%**  
Even as a result of the PID calculation device calculates the %output value less than this parameter, heating or cooling output is active minimum for OLL parameter.

**OUL** **MAXIMUM CONTROL OUTPUT (OLL, 100.0)%**  
Even as a result of the PID calculation device calculates the %output value greater than this parameter, heating or cooling output is active maximum for OUL parameter.

**OLt** **MINIMUM CONTROL OUTPUT TIME (0.0, CT)Second**  
Heating or cooling output can not be active less than this parameter. Even if this parameter is 0, this parameter is accepted as 50 msec.

**AR** **ANTI-RESET WINDUP (0, SCALE HIGH POINT)Unit**  
While PID operation is running if  $PSE \leq Rr \leq PSE + Rr$  condition is true, integral value is calculated. If the condition is not true, integral value is not calculated and last calculated integral value is used.  
If Ar Parameter is selected  $\frac{OLR}{AR}$ , heating proportional band is used for heating PID process instead of Ar Parameter and cooling proportional band is used for cooling PID process instead of Ar Parameter.

**SUOF** **SET VALUE OFFSET**  
**((- SCALE HIGH POINT / 2), (SCALE HIGH POINT / 2) Unit)**  
 $PSE + SUOF$  is used as set value in PID calculations. This parameter is used for shifting the proportional band.

**POFS** **PID OUTPUT OFFSET**  
**(FOR HEATING PID 0.0, 100.0)%**  
**(FOR COOLING PID -100.0, 0.0)%**  
This parameter is added to "Output %" which is calculated at the end of the PID.

**POSS** **OUTPUT OFFSET RELATED TO PID SET**  
**(FOR HEATING PID 0.0, 100.0)%**  
**(FOR COOLING PID -100.0, 0.0)%**  
This parameter is added to the %process output that is calculated at the end of the PID according to process set value.  
 $POSS * PSE / (L_{up} - L_{ol})$

**Stcrn** **PROCESS VALUE STABILIZATION**  
**(1, SCALE HIGH POINT)Unit**  
It is used for controlling if process value oscillates or not when  $L_{unn}$  Parameter is  $\frac{Rtwn}{Stcrn}$  or  $\frac{Rtss}{Stcrn}$ . If  $PSE - Stcrn \leq \text{Process Value} \leq PSE + Stcrn$  condition is not true, then device start tunning operation automatically.

**SCALE LOW POINT** : Minimum process input value in Pt-100 and Tc inputs. -1999 for fixed dual point display adjustment used inputs, Scale low point is the lowest one from  $\frac{P_{ol}}{L}$  or  $\frac{L_{poH}}{L}$  for selectable dual point display adjustment used inputs. Scale low point is the lowest one from  $\frac{P_{ol}}{L}$  or  $\frac{P_{oL}}{L}$  for multi point display adjustment used inputs

**SCALE HIGH POINT** : Maximum process input value in Pt-100 and Tc inputs. 9999 for fixed dual point display adjustment used inputs, Scale high point is the biggest one from  $\frac{P_{oh}}{L}$  or  $\frac{L_{poH}}{L}$  for selectable dual point display adjustment used inputs. Scale high point is the biggest one from  $\frac{P_{oh}}{L}$  or  $\frac{P_{oH}}{L}$  for multi point display adjustment used inputs

**o-db** **PROPORTIONAL BAND SHIFTING**  
**((- SCALE HIGH POINT / 2), (SCALE HIGH POINT / 2) Unit)**  
If cooling function is performed ; Cooling process set value is calculated by adding set value  $PSE$  with parameter  $o-db$ . Control form can be ON/OFF or PID.

If set value for heating =  $PSE + SUOF$  ;  
Then set value for cooling =  $PSE + SUOF + o-db$

**Sbow** **SENSOR BREAK OUTPUT VALUE**  
**(FOR HEATING PID 0.0, 100.0)%**  
**(FOR COOLING PID -100.0, 0.0)%**  
When sensor breaks, controlling of the process can continue by entering %output value to  $Sbow$  parameter.  
If this parameter 0.0, process control output does not perform an output when sensor breaks.

**SSEt** **Soft Start Set value (0, 9999)Unit**  
If parameter is selected  $no$ , Soft start function becomes inactive.  
When the device power on, if the Soft start set value different from  $no$  and temperature value is lower than soft start value on processes, device starts soft start operation, until temperature reaches soft start set value. On soft start device output period will be  $SSCo$  parameter value and device control output will be  $SSCo$  parameter value.

**SSCo** **Soft Start Control Output (10.0, 90.0)%**

**SSCb** **Soft Start Control Period (1, 100)Second**

**PCnF ConF: Process Output Configuration Parameters**

**oCnF** **Output Configuration**  
Determines if Process Output ( SSR Driver Output ) and Alarm-2 Output operates together or not.

Process Output (SSR Driver Output) and Alarm-2 Output operates separately.

Process Output (SSR Driver Output) and Alarm-2 Output operates together. Alarm functions of Alarm-2 Output can not be used

**oFncL** **Process Output Function**

Heating

Cooling

**CTYP** **Process Output Control Type**

ON/OFF control algorithm

PID control algorithm

**HYS** **Hysteresis of Process Output (Scale 0%, Scale 50%)Unit**  
Active if ON/OFF control is selected.

**HYN** **Operation form of hysteresis**  
Active if ON/OFF control is selected.

SV + HYS/2 and SV - HYS/2

SV and SV+HYS or SV and SV-HYS

**OFFt** **OFF Time (0.0, 100.0)Second**  
In ON/OFF operation, this time must be passed for the output to be energised again. (Active if ON/OFF control is selected)

**Aln1 ConF: Alarm Output-1 Configuration Parameters**

**LoU1** **Logic Output-1**  
Determines logic output function for Alarm-1 Output

Alarm output

Manual / Automatic selection output

Sensor break alarm output

Output is active when the process value is out of the band which is defined with minimum value of operating scale  $L_{ol}$  and maximum value of operating scale  $L_{up}$

**AL1 Alarm-1 Type**

Determines alarm type for Output-1. Active if logic output function of Alarm-1 Output is alarm output.

Process high alarm

Process low alarm

Deviation high alarm

Deviation low alarm

Deviation band alarm

Deviation range alarm

**ALH1** **Alarm-1 hysteresis value (Scale 0%, Scale 50%)Unit**  
Active if logic output function of Alarm-1 Output is alarm output.

**AROn1** **Alarm-1 On Delay Time (0, 9999)Second**  
Active if logic output function of Alarm-1 Output is alarm output.

**AROf1** **Alarm-1 Off Delay Time (0, 9999)Second**  
When the value is greater than 9998,  $AL1$  seen on the screen. It means alarm latching output is selected. Active if logic output function of Alarm-1 Output is alarm output.

**ALSt1** **Alarm-1 Stabilization Time (0, 99)Second**  
Active if logic output function of Alarm-1 Output is alarm output. After the unit is power-on and Alarm Stabilisation Time is expired, if an alarm condition which is selected with  $Alt1$  is present, then Alarm-1 output becomes active.

**Aln2 ConF: Alarm-2 Output Configuration Parameters**

**Aln2 ConF** Menu is accessible if  $oCnF$  parameter in "PCnF ConF" is

**LoU2** **Logic Output-2**  
Determines logic output function for Alarm-2 Output

Alarm output

Manual / Automatic selection output

Sensor break alarm output

Output is active when the process value is out of the band which is defined with minimum value of operating scale  $L_{ol}$  and maximum value of operating scale  $L_{up}$

**AL2 Alarm-2 Type**

Determines alarm type for Output-2. Active if logic output function of Alarm-2 Output is alarm output.

Process high alarm

Process low alarm

Deviation high alarm

Deviation low alarm

Deviation band alarm

Deviation range alarm

**ALH2** **Alarm-2 hysteresis value (Scale 0%, Scale 50%)Unit**  
Active if logic output function of Alarm-2 Output is alarm output.

**AROn2** **Alarm-2 On Delay Time (0, 9999)Second**  
Active if logic output function of Alarm-2 Output is alarm output.

**AROf2** **Alarm-2 Off Delay Time (0, 9999)Second**  
When the value is greater than 9998,  $AL2$  seen on the screen. It means alarm latching output is selected. Active if logic output function of Alarm-2 Output is alarm output.

**ALSt2** **Alarm-2 Stabilization Time (0, 99)Second**  
Active if logic output function of Alarm-2 Output is alarm output. After the unit is power-on and Alarm Stabilisation Time is expired, if an alarm condition which is selected with  $Alt2$  is present, then Alarm-2 output becomes active.

**Gen ConF: General Parameters**

**SU-L** **Process Set Value Low Limit (Scale Low Point  $SU-w$ ) Unit**

**SU-w** **Process Set Value Up Limit  $SU-L$ , Scale High Point) Unit**

**PrEt** **Alarm Set Values Protection**

Alarm Set values can be changed

Alarm Set values can not be changed. Alarm set values parameters,  $ALr1$  and  $ALr2$ , are not accessible

**PrEt2** **AUTO / MANUAL Selection Button Protection**

Auto or Manual selection is possible with A/M button in Main Operation screen

Auto or Manual selection is not possible with A/M button in Main Operation screen

**PrEt3** **AT (AUTO TUNE) Button Protection**

Limit Cycle Tuning operation can be activated or deactivated with AT (Auto Tune) Button in Operation screen

Limit Cycle Tuning operation can not be activated or deactivated with AT (Auto Tune) Button in Operation screen

**PASS ConF: Password Parameters**

**TEPS** **Technician Password (0, 9999)**

Uses for protecting and accessing to the technician parameters.

If this parameter is  ; there is no password protection while entering to the technician parameters.

If this parameter is different from "0" and user wants to access to the technician parameters;

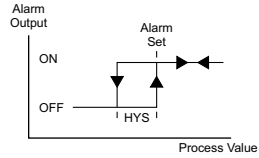
1- If technician does not enter  $TEPS$  password correctly: It turns to operation screen without entering to technician parameters.

2- When  $TEPS$  in top display and  in bottom display, if technician presses SET button without entering  $TEPS$  password (For observing parameter)

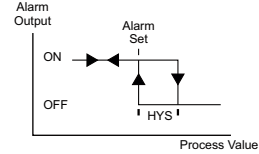
Technician can see all menus and parameters except Technician Password menu ("Pass Conf"), but parameters can not be changed.

### Alarm Types

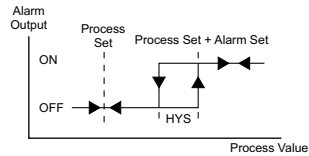
#### Process high alarm



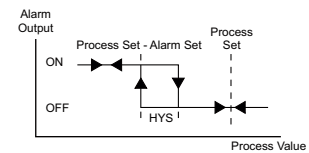
#### Process low alarm



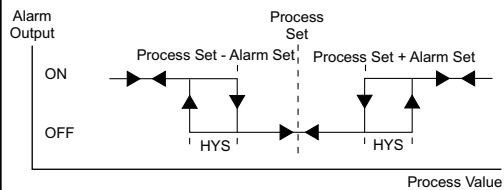
#### Deviation high alarm



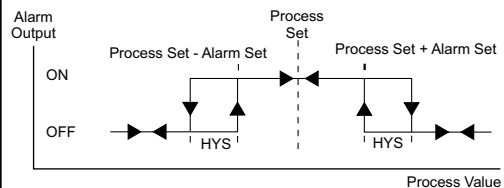
#### Deviation low alarm



#### Deviation Band Alarm



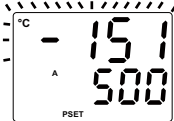
#### Deviation Range Alarm



### Failure message in RS ESM-XX30 Process Controllers



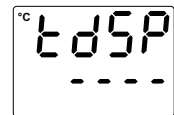
1 - Sensor failure in analogue input. Sensor connection is wrong or there is no sensor connection.



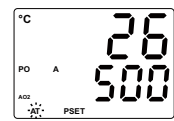
2 - If value on top display blinks : If analogue input value is less than minimum value of operating scale [LCL], display value on the top display starts to blink.



3 - If value on top display blinks : If analogue input value is greater than maximum value of operating scale [UPL], display value on the top display starts to blink.



4 - If technician password is different from "0" and technician accesses to the parameters by Set button without entering the technician password and wants to change a parameter, device does not allow to do any changes in parameters. If increment or decrement button is pressed, a warning message will appear on the bottom display as shown on the left.



5 - If tuning operation can not be completed in 8 hours, AT led starts to blink. Blinking can be canceled by pressing Enter button.

### Installation



Before beginning installation of this product, please read the instruction manual and warnings below carefully.

- In package ,
- One piece unit
  - Two pieces mounting clamp
  - One piece instruction manual

A visual inspection of this product for possible damage occurred during shipment is recommended before installation. It is your responsibility to ensure that qualified mechanical and electrical technicians install this product.

If there is danger of serious accident resulting from a failure or defect in this unit, power off the system and separate the electrical connection of the device from the system.

The unit is normally supplied without a power switch or a fuse. Use power switch and fuse as required.

Be sure to use the rated power supply voltage to protect the unit against damage and to prevent failure.

Keep the power off until all of the wiring is completed so that electric shock and trouble with the unit can be prevented.

Never attempt to disassemble, modify or repair this unit. Tampering with the unit may results in malfunction, electric shock or fire.

Do not use the unit in combustible or explosive gaseous atmospheres. During the equipment is putted in hole on the metal panel while mechanical installation some metal burrs can cause injury on hands, you must be careful.

Montage of the product on a system must be done with it's mounting clamp. Do not do the montage of the device with inappropriate mounting clamp. Be sure that device will not fall while doing the montage.

It is your responsibility if this equipment is used in a manner not specified in this instruction manual.

### Warranty

Warrants that the equipment delivered is free from defects in material and workmanship. This warranty is provided for a period of two years. The warranty period starts from the delivery date.

This warranty is in force if duty and responsibilities which are determined in warranty document and instruction manual performs by the customer completely.

### Maintenance

Repairs should only be performed by trained and specialized personnel. Cut power to the device before accessing internal parts.

Do not clean the case with hydrocarbon-based solvents (Petrol, Trichlorethylene etc.). Use of these solvents can reduce the mechanical reliability of the device. Use a cloth dampened in ethyl alcohol or water to clean the external plastic case.

