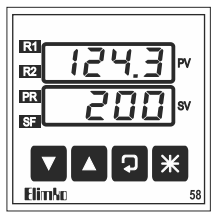


E-58

PROCESS CONTROLLER

USER MANUAL

E-58 series universal process controllers are advanced new generation microcontroller based industrial instruments designed for On/Off and PID control forms, dimensions of 48x48 mm compatible with IEC/TR 60668 standarts. Universal inputs and outputs of controller can be programmed easily by the user.

E-58 process controllers are equipment having high reading sensivity and capability, with no moving parts, having infinite life and very low calibration drift with time and environment conditions. Indicating method is 2x4 digit LED display. E-58 indicating range is from -1999 to 9999 and is able to connect mV, mA, thermocouple, resistance thermometer and other sensors and transmitters. Controllers have high input empedance and protecting and warning the system against the breakage sensors.

E-58 process controllers can be used in every field of the industry for the measurement and control of temperature, pressure, level, speed, current, voltage, resistance and other physical units; as well asin the industry branches of iron&steel, cement, plastic, chemistry, metallurgy, petrochemical refineries, ceramic, glass and others.

E-58 controller is designed for panel mounting and should be used in an industrial environment.

- The package of E-58 controller contains;
  Controller and mounting bracket
  User manual
  Guarantee certificate
- After opening the package, please check the contents with the above list. If the delivered product is wrong type, any item is missing or there are visible defects, contact the vendor from which you purchased the product.
- Before installing and operating the controller, please read the user manual thoroughly.
- The installation and configuration of the controller must only be performed by a person qualified in instrumentation.
- Keep the unit away from flamable gases, that could cause explotions.
- Do not use alcohol or other solvents to clean the controller. Use a clean cloth soaked in water tightly squeezed to gently wipe the outer surface of the controller.
- The product life of this instrument is 10 years.

CE

- This controller complies with the European Low Voltage Directive 2006/95/EC, by the application of safety standard TS EN 61010-1. (Pollution degree 2)
- This controller complies with the EMC Directive 2004/108/EC by the application of EMC standard TS EN 61326.

TECHNICAL SPECIFICATION

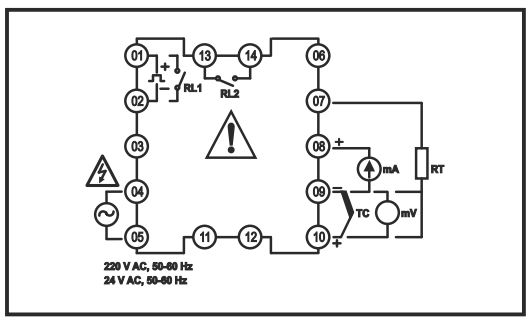
Input Types	**Thermocouple (TC) :** B, E, J, K, L, N, R, S, T, U **Resistance Thermometer (RT) :** Pt-100 **Current :** 0-20 mA, 4-20 mA (Linear) **Voltage :** 0-50 mV, 0-1 V, 0.2-1 V (Linear)
Control Output	**Relay :** SPST-NO 250V AC, 3A **Pulse :** 24V DC (for SSR) (on the Relay1 terminals)
Alarm Outputs	**Relay :** SPST-NO 250V AC, 3A
Display Type	2 x 4 digit 7 mm 7 segment led display
Accuracy	**Thermocouple:** (±0.5% of the reading value or ±1 °C) ±1 digit max. **Pt-100:** (±0.5% of the reading value or ±1 °C) ±1 digit max. **Analog Input:** ±0.5% FS ±1 digit max.
Analog Digital Converter	16 bit
Control Type	On/Off, PID
Operating Voltage	220 V AC, 50-60 Hz 24 V AC, 50-60 Hz
Power Consumption	4W (7 VA)
Protection Class	IP 66 Front Panel (NEMA 4X) IP 20 Rear Case
Operating Temperature	-10 °C, +55 °C (+14 °F, +131 °F) (with no condensation or icing)
Storage Temperature	-25 °C, +65 °C (-13 °F, +149 °F) (with no condensation or icing)
Relay Mechanical Life	10.000.000 operations (The relay life differs according to the usage configuration. When the relays are old, their contacts could melt or burn out.)
Relay Electrical Life	>1.000.000 operations (under 1/10 of load)
Memory	EEPROM (100.000 max. write-erase)
Weight	200 g

TYPE CODING

E - 58 - W - 0 - 0 - Z

W	Relay/SSR	Z	Operating Voltage
0	No Relay	0	220 V AC
1	1 Relay	1	24 V AC
2	2 Relays		
3	1 Pulse for SSR		
4	1 Pulse for SSR, 1 Relay		

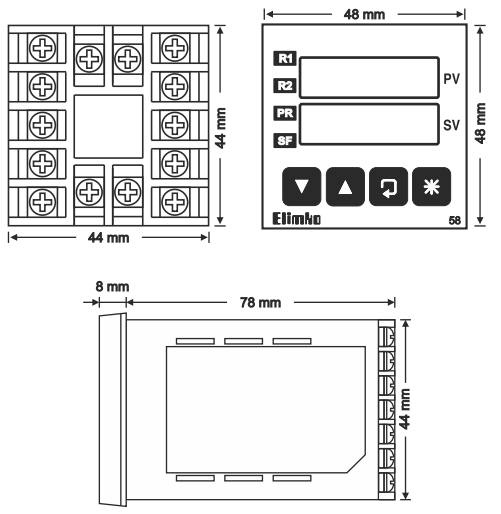
CONNECTION DIAGRAM



The labels on the sides of the controller identify the ordering code (Type), serial number and wiring connections.
The controller options are also indicated on the wiring diagram.

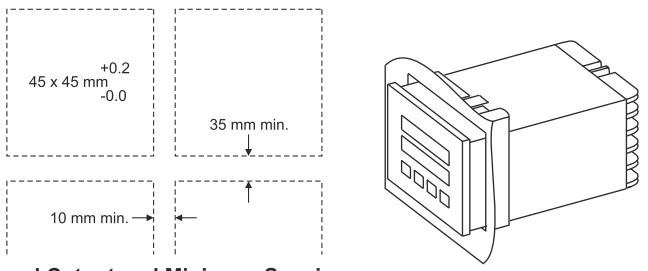
- The terminals 01 to 05 are electrically live. While the instrument is powered, never touch to these terminals.
- Before operating the controller, ensure that the controller is correctly configured. Incorrect configuration could result in damage to the process being controlled.

DIMENSIONS



PANEL MOUNTING

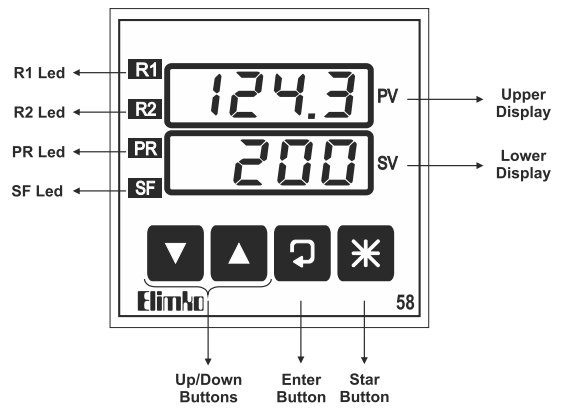
- E-58 controller should be installed inside a suitable grounded metal enclosure (panel). This must prevent the live parts being accessibleto human hands and metal tools.
- E-58 controller does not include a power switch. Therefore, the power supply to the controller and power outputs must be wired through the proper fuse or circuit breaker.
- To minimize the pick-up of electrical noise, the wiring of low voltage lines, particularly the sensor input should be routed away from the high-current power cables. Where it is not possible, use shielded cables with the shield grounded at both ends.
- The cables used for powering the controller and the power outputs must conform to the standarts IEC 60245 and IEC 60227.



Panel Cutout and Minimum Spacing

- Cut a hole in the panel. (See the figure for overall dimensions.)
- Remove the mounting bracket and slide the controller into the cutout from the front of the panel.
- Fit the mounting bracket and slide it until the controller is fastened.

FRONT PANEL



R1 Led When lit, it indicates that RL1 output is active.

R2 Led When lit, it indicates that RL2 output is active.

PR Led When lit, it indicates that the controller is in the configuration mode.

SF Led
- When lit, it indicates that the controller is in manual mode.
- SF led will also flash when the auto-tuning is in progress.

Upper Display
- While in normal operation, it displays the process value or error message.
- While in configuration pages, it displays the name of the parameters.

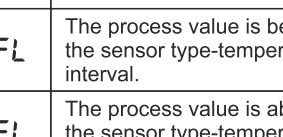
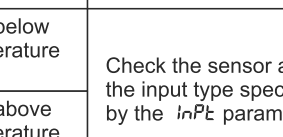
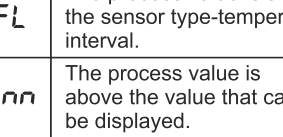
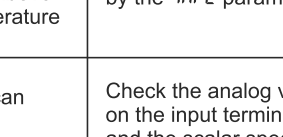
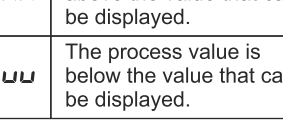
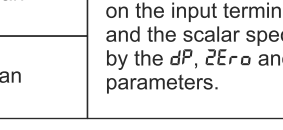
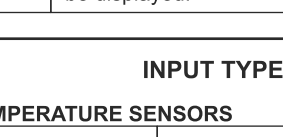
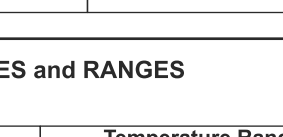
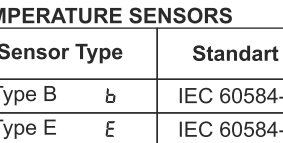
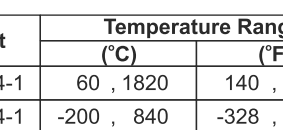
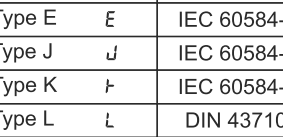
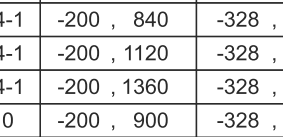
Lower Display
- While in normal operation, it displays the control set point (Automatic mode) or manual output (Manual mode).
- While in configuration pages, it displays the parameter value.

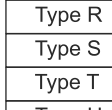
Star Button
- When pressed together with Enter button, password is asked for entering the configuration page.
- While in configuration pages, pressing this button reverts to normal operation.
- While in normal operation, pressing this button for duration 3 seconds, toggles between automatic and manual mode. This operation is disabled if the `nPL` parameter in page `PrtC` is set to `dSb` or if the `CntL` parameter in `oCnF` page is set other than `P Id`.
- While in normal operation, pressing this button acknowledges the latched alarms if configured (`AXLt` = `on`).

Enter Button
- When pressed together with Star button, password is asked for entering the configuration page.
- While in configuration pages, pressing this button selects the next parameter.
- While in configuration pages, pressing this button for duration 2 seconds, returns to the top of the page.
- While in normal operation, pressing this button selects the next parameter in operator page.

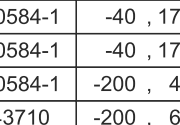
Up/Down Buttons
- While in normal operation, these buttons can be used to edit the control set point (Automatic mode) or manual output (Manual mode).
- While in configuration, these buttons can be used to select the configuration pages and to edit the parameters.

ALARM TYPES

A1tP or A2tP	EXPLANATIONS: A1SP or A2SP > 0	EXPLANATIONS: A1SP or A2SP < 0	
Lo			Low Alarm (Absolute)
Hi			High Alarm (Absolute)
Lod			Low Deviation (Relative)
Hid			High Deviation (Relative)
Lob			Band Alarm (In)
Hib			Band Alarm (Out)
oFF	Alarm function is cancelled when A1tP or A2tP parameters are oFF.		



Shaded areas show the hysteresis.



When alarm state is "1" the output (relay) is active.

ERROR MESSAGES

Message	Meaning	Remedy
oPEn	The connection of the sensor is broken.	Check the sensor and the sensor connection.
UFL	The process value is below the sensor type-temperature interval.	Check the sensor and the input type specified by the InPt parameter.
oFL	The process value is above the sensor type-temperature interval.	
nnnn	The process value is above the value that can be displayed.	Check the analog value on the input terminal and the scalar specified by the dP, 2Ero and SPAn parameters.
uuuu	The process value is below the value that can be displayed.	

INPUT TYPES and RANGES

TEMPERATURE SENSORS

Sensor Type		Standart	Temperature Range (°C)	Temperature Range (°F)
Type B	b	IEC 60584-1	60 , 1820	140 , 3308
Type E	E	IEC 60584-1	-200 , 840	-328 , 1544
Type J	J	IEC 60584-1	-200 , 1120	-328 , 1562
Type K	K	IEC 60584-1	-200 , 1360	-328 , 2480
Type L	L	DIN 43710	-200 , 900	-328 , 1652
Type N	n	IEC 60584-1	-200 , 1300	-328 , 2372
Type R	r	IEC 60584-1	-40 , 1760	104 , 3200
Type S	S	IEC 60584-1	-40 , 1760	104 , 3200
Type T	t	IEC 60584-1	-200 , 400	-328 , 752
Type U	U	DIN 43710	-200 , 600	-328 , 1112
Pt-100	Pt	IEC 60751	-200 , 840	-328 , 1544

LINEAR INPUTS

Type		Range
Current	0A20	0-20 mA DC
Current	4A20	4-20 mA DC
Voltage	0u50	0-50 mV DC
Voltage	00u1	0-1 V DC
Voltage	02u1	0.2-1 V DC

AUTO-TUNE

- Auto-tuning matches the characteristics of the controller to the process being controlled in order to obtain good control. Tuning involves calculating and setting the values of the PID parameters. The Auto-tuner works by switching the output on and off to induce an oscillation in the process value. From the amplitude and period of oscillations PID parameters are calculated.
- Auto-tune can be performed at any time, but normally it is performed only once during the initial commissioning of the process. However, if the process under control subsequently becomes unstable (because its characteristics have changed), you can re-tune again for the new conditions.
- In order to start Auto-tune process:
  1- Set the `CntL` parameter in `oCnF` page as `P Id`.
  2- Set the control set point to the value at which you will normally operate the process. Consider also the process value may exceed the control set point while in Auto-tuning.
  3- Set the `HYS` parameter in `tUnE` page as `0.1` (if `dP`=1) or `1` (if `dP`=0).
  4- Set the `At` parameter in `tUnE` page as `on` to commence Auto-tuning process. Press Star button to revert the normal operation.
- The lower display and SF led will flash to indicate that tuning is in progress.
- After a few cycles of oscillation the tuning is completed and the calculated PID parameters `Pb`, `It` and `dt` are stored.
- While the Auto-tuning in progress if `At` parameter is set the `oFF` or operating power of the controller is interrupted Auto-tune progress is stopped and old PID values are retained.

MANUAL TUNING

If for any reason Auto-tuning gives unsatisfactory results, the controller can be tuned manually. There are a number of standard methods for manual tuning. The one described here is the Ziegler-Nichols method. With the process at its normal running temperature:

1- Set the It, dt and HYS parameters in tUnE page as 0.

2- Set the Ct parameter in oCnF page as 2.

3- Ignore the fact that the temperature may not settle precisely at the set point.

4- If the temperature is stable, reduce the proportional band Pb so that the temperature just starts to oscillate. If the temperature is already oscillating, increase the proportional band until it just stops oscillating. Allow enough time between each adjustment for the loop to stabilize. Make a note of the proportional band value (B) and the period of oscillation (T).

5- Set the Pb, It and dt parameters values according to the calculations given below.

Type of Control	Proportional Band (Pb)	Integral Time (It)	Derivative Time (dt)
P	2xB	0	0
PI	2.2xB	0.8xT	0
PID	1.7xB	0.5xT	0.12xT

OPERATOR PAGES

- ❑ When the controller power is switched on, it runs through a self-test sequence for about 2 seconds and displays the version number and then enters into normal operation.
- ❑ The controller has two basic modes of operation:
  - Automatic mode in which the output is automatically adjusted to maintain the process value at the control set point.
  - Manual mode in which one can adjust the output independently of the control set point.
- ❑ SF led indicates the operation mode of the controller. It lights while controller is in manual mode.
- ❑ Pressing the ⊛ button for duration of 3 seconds, while in normal operation, toggles between automatic and manual mode. This operation is disabled if the nAtL parameter in page PrtC is set to dSb or if the CntL parameter in oCnF page is set other than PId.
- ❑ In normal operation the process value is displayed in the upper display, the control set point (Automatic mode) or manual output (Manual mode) is displayed in the lower display.
- ❑ The normal operation state and the frequently used parameters are in the operator page. These parameters can be accessed by ↵ button.
- ❑ The parameters in the operator page differ according to the operation mode.

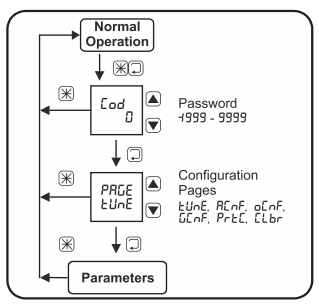
AUTOMATIC MODE

Display	Explanation	Unit	Access Conditions	Key	Key Function/ Setting Interval
23.4 / 0.0	Process Value / Control Set Point	EU / EU		▼/▲	SPLL - SPHL
oUt 0.0	Manual Output	%			
A1SP 0.0	Alarm-1 Set Point	EU	A1tP ≠ oFF	▼/▲	-199.9 - 999.9
A2SP 0.0	Alarm-2 Set Point	EU	A2tP ≠ oFF	▼/▲	-199.9 - 999.9

MANUAL MODE

Display	Explanation	Unit	Access Conditions	Key	Key Function/ Setting Interval
20.0 / 0.0	Process Value / Manual Output	EU / %		▼/▲	oLL - oHL
SP 0.0	Control Set Point	EU		▼/▲	SPLL - SPHL
A2SP 0.0	Alarm-2 Set Point	EU	A2tP ≠ oFF	▼/▲	-199.9 - 999.9

CONFIGURATION PAGES



Input the Configuration Pages

- ❑ The fundamental characteristics of the controller are specified in configuration pages. These pages:

tUnE = PID Tuning Page
ACnF = Alarm Configuration Page
oCnF = Control and Output Configuration Page
GCnF = General Configuration Page
PrtC = Security Adjustment Page
CLbr = Calibration Page

- ❑ In order to access the configuration pages, ⊛ and ↵ buttons are pressed simultaneously.
- ❑ After this operation PR led lights and Cod message and 0 are displayed in the upper and lower displays respectively.
- ❑ ▼ and ▲ buttons are used to adjust the security code in the lower display. When ↵ button is pressed tUnE page is accessed.
- ❑ The factory setting of the security code is "10".
- ❑ The security code is defined by the parameter SCod in PrtC page.
- ❑ If the entered security code is correct all the configuration pages can be accessed and all the parameters in the configuration pages can be edited. Otherwise dPL and APL parameters in PrtC page define the access and edit levels of parameters.
- ❑ ▼ and ▲ buttons are used to select the configuration pages while PAGE message is displayed in the upper display.
  - ↵ button select the parameters in a page sequentially.
  - ↵ button returns to the top of the page if it pressed for duration of 2 seconds, while in configuration pages.
  - ⊛ button reverts to normal operation, while in configuration pages.

PID Tuning Page (PAGE-tUnE)

Display	Explanation	Unit	Access Conditions	Key	Key Function/ Setting Interval
At oFF	Auto-Tune (1)		CntL = PId	▼/▲	on / oFF
Pb 20.0	Propotional Band	EU	CntL = PId	▼/▲	0.1 - 999.9
It 28	Integral Time	s	CntL = PId	▼/▲	0 - 3600
dt 7	Derivative Time	s	CntL = PId	▼/▲	0 - 3600
HYS 0.5	Hysteresis	EU	CntL ≠ oFF	▼/▲	0.0 - 999.9

(1) Auto-tune operation is inhibited in manual mode.

Alarm Configuration Page (PAGE-ACnF)

Display	Explanation	Unit	Access Conditions	Key	Key Function/ Setting Interval
A1tP oFF	Alarm-1 Type	Table 1	CntL=oFF	▼/▲	Table 1
A1HY 0.5	Alarm-1 Hysteresis	EU	A1tP ≠ oFF	▼/▲	0.0 - 999.9
A2tP oFF	Alarm-2 Type	Table 1		▼/▲	Table 1
A2HY 0.5	Alarm-2 Hysteresis	EU	A2tP ≠ oFF	▼/▲	0.0 - 999.9

Control and Output Configuration Page (PAGE-oCnF)

Display	Explanation	Unit	Access Conditions	Key	Key Function/ Setting Interval
CntL onoF	Control Type	Table 2		▼/▲	Table 2
CF rEv	Control Form		CntL ≠ oFF	▼/▲	dir (Direct) rEv (Reverse)
oLL 0.0	Minimum Output	%	CntL = PId	▼/▲	0.0 - oHL
oHL 100.0	Maximum Output	%	CntL = PId	▼/▲	oLL - 100.0
bIAS 50.0	Output Offset Value	%	CntL = PId	▼/▲	0.0 - 100.0
Ct 2	Control Period	s	CntL=PId	▼/▲	1 - 240

General Configuration Page (PAGE-GCnF)

Display	Explanation	Unit	Access Conditions	Key	Key Function/ Setting Interval
InPt K	Input Type	Table 3		▼/▲	Table 3
dP 1	Decimal Point (1)			▼/▲	0 - 3
2Ero 0.0	Linear Input Scale Low Limit	EU	InPt= Linear	▼/▲	-199.9 - 999.9
SPAn 100.0	Linear Input Scale High Limit	EU	InPt= Linear	▼/▲	-199.9 - 999.9
Unit oC	Temperature Unit (2)		InPt= TC / RT	▼/▲	oC (°C) oF (°F)
inS 0.0	Input Offset Value	EU		▼/▲	-199.9 - 999.9
FLtr 0.5	Input Filter Coefficient	EU		▼/▲	0.1 - 10.0
Sbr HI	Sensor Break Case	Table 4	InPt ≠ miliamper	▼/▲	Table 4
SPLL -199.9	Set Point Low Limit	EU		▼/▲	-199.9 - SPHL
SPHL 999.9	Set Point High Limit	EU		▼/▲	SPLL - 999.9

(1) When the dP parameter is edited, all the parameters with EU unit should be readjusted.

(2) The EU (Engineering Unit) used in tables, thermocouples and resistance thermometer input type units °C or °F, and for linear inputs types, are the controlled measurement unit.

Security Adjustment Page (PAGE-PrtC)

Display	Explanation	Unit	Access Conditions	Key	Key Function/ Setting Interval
dPL 4	Parameter Access Level	Table 5		▼/▲	Table 5
APL 2	Parameter Edit Level	Table 6		▼/▲	Table 6
nAtL dSb	Manual Mode Select			▼/▲	Enb (Enable) dSb (Disable)
CPL dSb	Calibration Page Access			▼/▲	Enb (Enable) dSb (Disable)
FS oFF	Loading Factory Settings (1)			▼/▲	on / oFF
SCod 10	Password Set Value (2)			▼/▲	-199.9 - 999.9

(1) The factory settings of the parameters are given in "Display" column (except the CALb page). The parameter values in the CALb page are the typical.

(2) Factory setting of password is "10".

Calibration Page (PAGE-CLbr)

Display	Explanation	Unit	Access Conditions	Key	Key Function/ Setting Interval
00.mV -10	0 mV Calibration (1)			⊛▼	Save Calibration Value
50.mV 6846	50 mV Calibration (2)			⊛▼	Save Calibration Value
0.dEG 64	Type K 0°C Calibration (3)			⊛▼	Save Calibration Value
00.r -80	0 Ω Calibration (4)			⊛▼	Save Calibration Value
390.r 6522	390 Ω Calibration (5)			⊛▼	Save Calibration Value
00.mA 2	0 mA Calibration (6)			⊛▼	Save Calibration Value
20.mA 6781	20 mA Calibration (7)			⊛▼	Save Calibration Value

❍ The basic calibration of the controller is highly stable and set in the factory. Any erroneous operation in the CALb page will corrupt the calibration parameter, and measurements will be faulty. The calibration parameters of the controller can be reinstalled in the CALb page. If accurate calibration devices are not avaible, entering to the CALb page is not advised.

(1) Set the calibrator as a milivolt source and adjust the calibrator output 0.000 mV. Apply the calibrator output to the input terminals 9(-) and 10(+) of the controller. Select this parameter and press ⊛ and ▼ buttons simultaneously to store the parameter.

(2) Set the calibrator as a milivolt source and adjust the calibrator output 50.000 mV. Apply the calibrator output to the input terminals 9(-) and 10(+) of the controller. Select this parameter and press ⊛ and ▼ buttons simultaneously to store the parameter.

(3) Set the calibrator to Type K thermocouple and adjust the calibrator output 0.00 °C. Apply the calibrator output to the input terminals 9(-) and 10(+) of the controller. Select this parameter and press ⊛ and ▼ buttons simultaneously to store the parameter.

(4) Short circuit the terminals 7-9 and 9-10 of the controller. Select this parameter and press ⊛ and ▼ buttons simultaneously to store the parameter.

(5) Set the calibrator as a resistance source and adjust the calibrator output 390.00 Ω. Short circuit the terminals 9 and 10 of the controller. Apply the calibrator output to the input terminals 7 and 9 of the controller. Select this parameter and press ⊛ and ▼ buttons simultaneously to store the parameter.

(6) Set the calibrator as a miliamper source and adjust the calibrator output 0.00 mA. Apply the calibrator output to the input terminals 8(+) and 9(-) of the controller. Select this parameter and press ⊛ and ▼ buttons simultaneously to store the parameter.

(7) Set the calibrator as a miliamper source and adjust the calibrator output 20.00 mA. Apply the calibrator output to the input terminals 8(+) and 9(-) of the controller. Select this parameter and press ⊛ and ▼ buttons simultaneously to store the parameter.

Tables

Tablo 1 Alarm Types

oFF	Off
Lo	Low Alarm (Absolute)
HI	High Alarm (Absolute)
Lod	Low Deviation (Relative)
HId	High Deviation (Relative)
Lob	Band Alarm (In)
HIb	Band Alarm (Out)

Table 2 Control Types

oFF	None
onoF	On-Off Control
PId	PID Control

Table 3 Input Types

b	Type B (TC)
E	Type E (TC)
J	Type J (TC)
K	Type K (TC)
L	Type L (TC)
n	Type N (TC)
r	Type R (TC)
S	Type S (TC)
t	Type T (TC)
U	Type U (TC)
Pt	Pt-100 (RT)
0A20	0-20 mA (Linear)
4A20	4-20 mA (Linear)
0u50	0-50 mV (Linear)
00u1	0.0-1.0 V (Linear)
00u2	0.2-1.0 V (Linear)

Table 4 Sensor Break Case

Lo	Lower The Process Value
HI	Higher The Process Value

Table 5 Parameter Access Level

0	Only process value can be accessed.
1	Process and set value can be accessed.
2	Operator page parameters can be accessed.
3	tUnE page parameters can be accessed.
4	ACnF page parameters can be accessed.
5	oCnF page parameters can be accessed.
6	GCnF page parameters can be accessed.

Table 6 Parameter Edit Level

0	None of the parameters can be edited.
1	Only set value can be edited.
2	Operator page parameters can be edited.
3	tUnE page parameters can be edited.
4	ACnF page parameters can be edited.
5	oCnF page parameters can be edited.
6	GCnF page parameters can be edited.

In Table 5 and Table 6 levels with arge numerials covers all previous levels.

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