

# € PID controller's size 48 x 48 mm

Controller designed to display and control the process, with tight adjustment PID control, in appliances where accuracy is required, like water or oil cooling systems, furnaces, gas burners, plastic injection machinery, etc.

Input for type 4-20 mA, Pt100 sensors, Thermocouple J or Thermocouple K. Relay outputs may be used for control and/or alarm. It also has a logic output/input for control/alarm.

## 1- Versions and references

Model	CT Module	4-20mA/0-10V Module	RS485 Module	Relay 3 Module	Supply
AKO-15400	No	No	No	No	20 to 48 V AC/DC
AKO-15401	Yes	No	No	No	20 to 48 V AC/DC
AKO-15402	No	No	Yes	No	20 to 48 V AC/DC
AKO-15403	Yes	No	Yes	No	20 to 48 V AC/DC
AKO-15410	No	No	No	Yes	20 to 48 V AC/DC
AKO-15413	No	Yes	No	Yes	20 to 48 V AC/DC
AKO-15415	Yes	No	No	Yes	20 to 48 V AC/DC
AKO-15430	No	No	No	No	20 to 48 V AC/DC
AKO-15437	No	Yes	Yes	No	20 to 48 V AC/DC
AKO-15450	No	No	No	No	100 to 240 VAC 50/60Hz
AKO-15451	Yes	No	No	No	100 to 240 VAC 50/60Hz
AKO-15452	No	No	Yes	No	100 to 240 VAC 50/60Hz
AKO-15453	Yes	No	Yes	No	100 to 240 VAC 50/60Hz
AKO-15460	No	No	No	Yes	100 to 240 VAC 50/60Hz
AKO-15463	No	Yes	No	Yes	100 to 240 VAC 50/60Hz
AKO-15465	Yes	No	No	Yes	100 to 240 VAC 50/60Hz
AKO-15480	No	Yes	No	No	100 to 240 VAC 50/60Hz
AKO-15487	No	Yes	Yes	No	100 to 240 VAC 50/60Hz

## 2- Installation

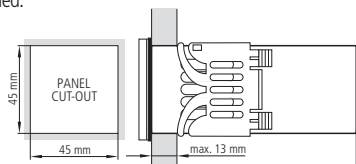
The controller should be installed in a place protected from vibrations, water and corrosive gases, and where ambient temperature does not surpass the value specified in the technical data.

In order for the controllers to have IP55 protection, the gasket should be properly installed between the apparatus and the perimeter of the panel cut-out where it is to be fitted.

In order to give a correct reading, the probe should be installed in a place without heat influences other than the temperature that is to be measured or controlled.

### 2.1-Fastening

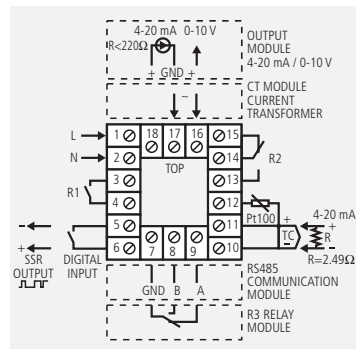
To fix the unit, place the fasteners in the top and the lower parts and press them to enter in the controller lateral sliders. Move the fasteners in direction to the panel until the controller is fixed.



### 2.2- Connection

The probe and its lead should **NEVER** be installed in ducting along with power, control or power supply wiring.

The power supply circuit should be connected with a minimum 2 A, 230 V, switch located close to the unit. Power supply cables should be H05VV-F 2x0,5 mm<sup>2</sup> or H05V-K 2x0,5 mm<sup>2</sup>. Section of connecting wires for relays contacts should range from 1 mm<sup>2</sup> to 2,5 mm<sup>2</sup>. For the 4-20 mA control input, it is necessary to connect the 2.49 Ω resistance supplied between terminals 10 and 11.



## 3- Adjustment and configuration

It should only be programmed or modified by personnel who are fully conversant with the equipment operation and possibilities.

### 3.1 Set Point temperature.

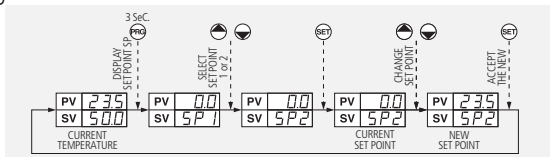
The factory SET POINT default value is 0,0 °C.

- Press **PRG** key for at least 3 seconds to CHANGE SET POINT SP1 or SP2. It displays SP1.
- Press **▲** or **▼** keys to SELECT SET POINT 1 or 2.
- Press **SET** key to CHANGE SELECTED SET POINT. It displays the CURRENT SET POINT value.
- Press **▲** or **▼** keys to CHANGE SET POINT into the required value.
- Press **SET** key to ACCEPT THE NEW SET POINT. The display returns to the CURRENT TEMPERATURE display status.

### 3.2 Parameters configuration

#### Level 1 Menus

-Press **PRG** key for at least 10 seconds. We are in the programming LEVEL 1 MENUS and the first menu "SPCF" is displayed.



- Press **▲** key to access the next menu and **▼** key to return to the previous one.
- Press **PRG** key, the controller returns to the CURRENT TEMPERATURE display status.
- When **PAS** is displayed, PASSWORD programmed in **PAS1** parameter of **PAR** menu should be entered to access programming LEVEL 1 MENUS.
- Press **▲** or **▼** keys to CHANGE NUMBER and DISPLAY PASSWORD programmed.
- Press **SET** key to ACCEPT PASSWORD. The first menu "SPCF" will be displayed.

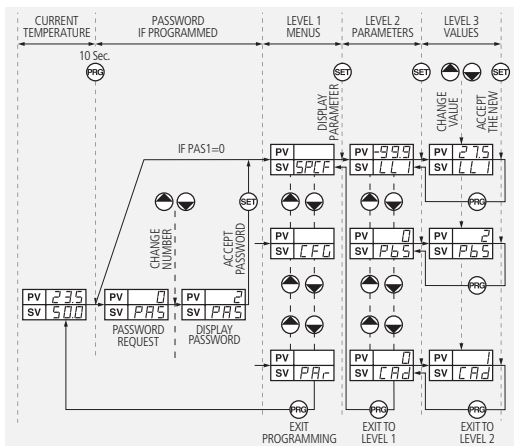
#### Level 2 Parameters

- In the desired menu of LEVEL 1 MENUS, press key **SET**. LEVEL 2 PARAMETERS programming is accessed. The first parameter of the selected menu is displayed on the screen.
- Press **▲** key to access the next parameter and **▼** key to return to the previous one.
- Pressing **PRG** key, returns to the LEVEL 1 MENUS.

#### Level 3 Values

- Press the **SET** key to enter and modify the desired parameter.
- Press **▲** or **▼** keys to CHANGE VALUE.
- Pressing **SET** key, ACCEPT THE NEW VALUE and it returns to LEVEL 2 PARAMETERS.
- Pressing **PRG** key, it returns at LEVEL 2 PARAMETERS without modify value.

**REMARK:** If no key is pressed for 25 seconds in either of the previous steps, the controller will automatically return to the CURRENT TEMPERATURE display status without modifying any of the parameters values.



## 4- Operation

**PRG key:** Accepts the alarms and disconnects alarm outputs. When pressed for at least 3 seconds, the SP SET POINT temperature value is displayed. When pressed for 10 seconds display the first level of menu SPCF of parameters. Exit programming level.

**Key ▼:** Accepts the alarms and disconnects alarm outputs. In programming, it makes the displayed value reduce.

**Key ▲:** Accepts the alarms and disconnects alarm outputs. In programming, it makes the displayed value increase.

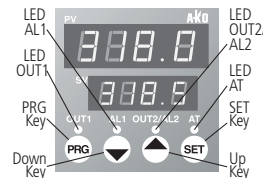
**SET Key:** Accepts the alarms and disconnects alarm outputs. When pressed during 3 seconds, it activates the Autotune function if AtEn=1. Deactivates the Autotune function. In programming, accept the programmed new value.

**LED OUT1:** CONTROL 1 indicator activated.

**LED AL1:** Alarm 1 indicator enabled. Flashing: Alarm 1 detected, relay deactivated but signalling maintained.

**LED OUT2/AL2:** CONTROL 2 or Alarm 2 indicator enabled. Flashing with Alarm 2: Alarm 2 detected, relay deactivated but signalling maintained.

**LED AT:** Autotune indicator enabled.



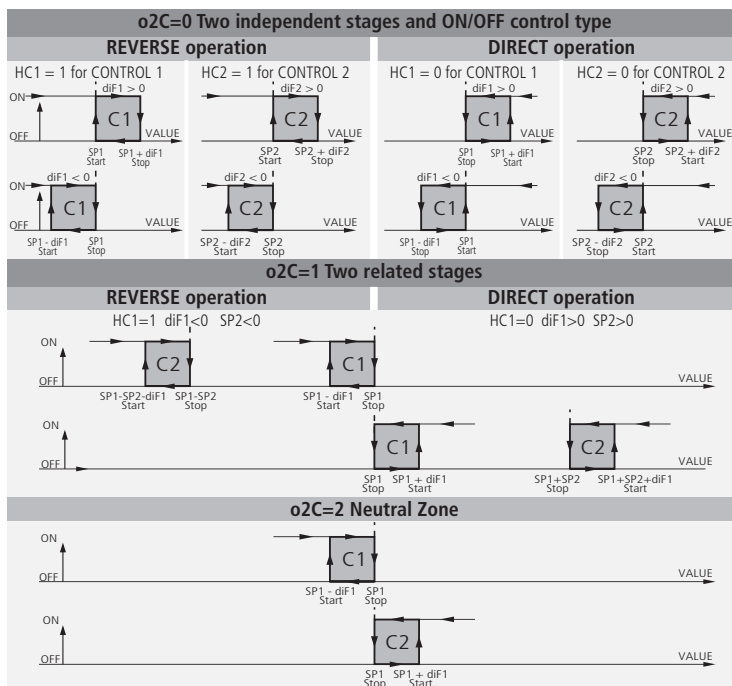
### 4.1 Control 1, control 2 and alarms operation

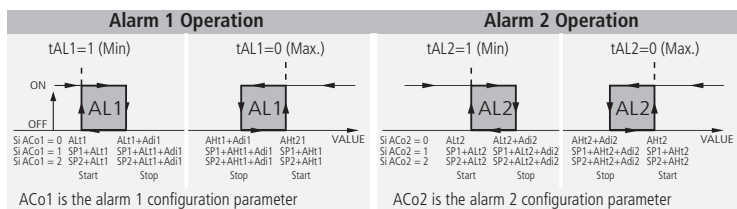
**AUTOTUNE:** Press **SET** key for 3 seconds to activate a SELF-ADJUSTMENT (AUTOTUNE). The controller will configure automatically the parameters at process characteristics setting.

**Gain (GAIN):** The output it is configured proportional to the error signal width.

**Overall time (ti):** The final error it is eliminated by the output regulation proportionally to the error signal width and duration.

**Derivative time (td):** It determines the controller reaction on process temperature changing. Over and lower pulses prevention. It is also used to quicker actuation on the variable process value in the event of a sudden change in the set point.





## 5- Accessories

### PARAMETERS TRANSFER

**AKO-14918** portable server, with no power supply, in which parameters programmed in a powered controller can be copied by transfer. Parameters can be transferred again from the server to other identical powered controllers.

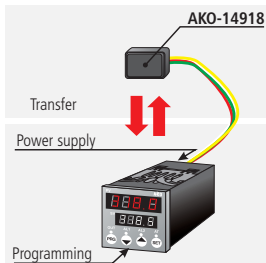
## 6- Maintenance and Warnings

Clean the controller surface with a soft cloth and soap and water. Do not use abrasive detergents, petrol, alcohol or solvents.

The use of the unit without observing the manufacturer's instructions may alter its safety qualification. To ensure correct operation of the apparatus, only probes supplied by AKO should be used.

## 7- Parameters and messages

Values in the **Def.** column are factory-set.



Level 2	Level 3	Description	Values	Min.	Def.	Max.
IdY	Digital input enabling delay	(sec.)	0	0	250	
	US11	Set point SP1 variation if Cdin=1	(°C/°F/mA)	-99,9	0,0	2500
Pld	<b>Level 3 PID Parameters (only if rEG=0)</b>					
	GAin	Gain (see item 4.1)	(%)	0	50	100
ti	Overall time (see item 4.1)	(sec.)	0	100	999	
	td	Derivative time (see item 4.1)	(sec.)	0	25	999
toUt	Cycle Control time	(sec.)	1,0	2,0	100,0	
	ATen	AT key blocking (0=Yes, blocked) (1=No, unblocked)		0	0	1
ALr1	<b>Level 3 Alarm 1 Parameters</b>					
	tAL1	Alarm 1 type (0=Max) (1=Min) (2=Max+Min)		0	0	2
AHT1	Max for Alarm 1	(°C/°F/mA)	-99,9	999,9	2500	
	AL11	Min for Alarm 1	(°C/°F/mA)	-99,9	-99,9	2500
ACo1	Alarm 1 configuration (0=Absolute) (1=Relative to set point SP1) (2=Relative to set point SP2)					
	Ad11	Alarm 1 differential	(°C/°F/mA)	1,0	1,0	20,0
AdE1	Alarm 1 delay from the moment at which it should enabled	(min.)	0	0	250	
	Ado1	Alarm 1 delay at start-up	(min.)	0	0	250
ATA	Optional cancellation of output alarms by pressing once a key. (0=Allows to cancel the output alarms) (1=Not allows to cancel the output alarms)					
ALr2	<b>Level 3 Alarm 2 Parameters (If Clo=0, 4, R1=Alarm 2)</b>					
	tAL2	Alarm 2 type (0=Max) (1=Min) (2=Max+Min)		0	0	2
AHT2	Max for Alarm 2	(°C/°F/mA)	-99,9	999,9	2500	
	AL22	Min for Alarm 2	(°C/°F/mA)	-99,9	-99,9	2500
ACo2	Alarm 2 configuration (0=Absolute) (1=Relative to set point SP1) (2=Relative to set point SP2)					
	AdI2	Alarm 2 differential	(°C/°F/mA)	1,0	1,0	20,0
AdE2	Alarm 2 delay from the moment at which it should enabled	(min.)	0	0	250	
	Ado2	Alarm 2 delay at start-up	(min.)	0	0	250
PAR	<b>Level 3 General Parameters</b>					
	PdE	Initial parameters (1=Yes, configure to "Def" and exit programming)		0	0	1
Ptr	Parameters transfer (0=Disabled) (1=Send) (2=Receive)					
	PAS1	Password to parameters and information		0	2	999
CAD	Address for units with communication					
				0	0	254
Ct	<b>Level 3 CT Current transformer parameters (If CtEn=1 in CT module)</b>					
	CtHA	Max for Alarm CT	(A)	0,0	100,0	100,0
CtLA	Min for Alarm CT	(A)	0,0	0,0	100,0	
	CtDy	Alarm CT delay from the moment at which it should enabled	(min.)	0	0	250
CtUA	Current load value (display)					
		(A)	0,0	Value	100,0	
CtIn	Primary current value CT transformer					
		(A)	0	25	999	
CtOut	Secondary current value CT transformer (0=0,05A)					
		(A)	0	0	999	
CtEr	Output CONTROL 1 status in case of CT alarm: (0=OFF) (1=No change)					
			0	1	1	
CtLC	CT alarm memory (0=Without memory) (1=With memory)					
			0	1	1	
<b>MESSAGES</b>						
AH1	<b>Flashing with temperature</b> - Sensor temperature exceeds the parameter programmed in AHT1					
AH2	<b>Flashing with temperature</b> - Sensor temperature exceeds the parameter programmed in AHT2					
AL1	<b>Flashing with temperature</b> - Sensor temperature is lower than the parameter programmed in ALT1					
AL2	<b>Flashing with temperature</b> - Sensor temperature is lower than the parameter programmed in ALT2					
EAL	<b>Flashing with temperature</b> - Active digital input					
StoP	Stopped controller if Cdin=2 and digital input enabled					
E1	Sensor failure (Open circuit, crossed, temperature out of range)					
EE	EEPROM memory failure					
rA	RAM memory failure					
PAS	Password request to enter programming parameters					
ACt	<b>Flashing with temperature</b> - The load intensity circulating through the CT current transformer exceeds the programmed parameter in CtHA or is lower than the programmed parameter in CtLA					
---	<b>Incorrect resolution</b> - See rES parameter					

\* In the 4-20 mA / 0-10V module, it only acts as a repeater/converter.

## 8- Technical data

Range according to type of sensor configured:

Pt 100	.....	-99,9 °C to 850,0 °C (-148 °F to 1562 °F)
J Thermocouple	.....	-99,9 °C to 800,0 °C (-148 °F to 1472 °F)
K Thermocouple	.....	-99,9 °C to 1370 °C (-148 °F to 2498 °F)
4-20 mA	.....	4 mA = 0% to 20 mA = 100%
Set Point 1 range	.....	-99,9 to 2500
Set Point 2 range	.....	-99,9 to 2500
Resolution, Set Point and differential	.....	0, 1 or 1 configurable by parameter rES
Accuracy	.....	±0,25 % (Pt100, Tc, Tck); ±1,5 % (mA)
R1/OUT relay: CONTROL 2 or ALARM 1 or 2 (configurable by param. Clo)	.....	SPST-NO, 6A, 250V, cosφ=1
R2/AL relay: CONTROL 1 or ALARM 1 (configurable by param. Clo)	.....	SPDT, 5A, 250V, cosφ=1
R3 relay: CONTROL 2 (with Relay 3 module) (configurable by param. Clo)	.....	SPDT, 5A, 250V, cosφ=1
Maximum input power	.....	3 VA
Working ambient temperature	.....	0 °C to 55 °C
Storage ambient temperature	.....	-30 °C to 70 °C
Installation category	.....	II under EN 61010-1 standard
Pollution degree	.....	II under EN 61010-1 standard
Double insulation between the power supply, the secondary circuit and the relay output.	.....	

Level 1	Menus and Description						
SPCF	Level 2	Set Point parameters					
		Level 3	Description	Values	Min.	Def.	Max.
LL	LL1	Set point lower limit (It cannot be set below this value)	(°C/°F/mA)	-99,9	-99,9	HL1	
		Set point upper limit (It cannot be set above this value)	(°C/°F/mA)	LL1	999,9	2500	
		CA	Sensor calibration (Offset)	(°C/°F/mA)	-20,0	0,0	20,0
		LL2	Set Point 2 lower limit (It cannot be set below this value) (only CONTROL 2 Clo=1, 2, 3)	(°C/°F/mA)	-99,9	-99,9	HL2
		HL2	Set Point 2 upper limit (It cannot be set above this value) (only CONTROL 2 Clo=1, 2, 3)	(°C/°F/mA)	LL2	999,9	2500
CFG	Level 2	<b>Configuration Parameters</b>					
PbS	Sensor type selection (0=Pt100) (1=Tc) (2=Tck) (3=4-20mA)			0	0	3	
		HES	Maximum scale value for the sensor type in mA (Only if PbS=3)	-99,9	100,0	2500	
LES	Minimum scale value for sensor type in mA (Only if PbS=3)			-99,9	0	2500	
		bES	Blocking the scale between HES and LES (Only if PbS=3) (0=Free scale) (1=Blocked scale)		0	0	1
rEG	Type of control: (0=PID for CONTROL 1) (1=ON/OFF for CONTROL 1) (CONTROL 2 always ON/OFF, only if Clo=1, 2, 3)			0	0	1	
		HC1	Type of operation in CONTROL 1 (0=Direct, cold) (1=Reverse, heat)		0	1	1
HC2	Type of operation in CONTROL 2 (0=Direct, cold) (1=Reverse, heat) (Only if Clo=1, 2, 3)			0	1	1	
		o2C	CONTROL 2 Ratio Type (Only if CONTROL 2 Clo=1, 2, 3) (0=Two independent stages) (1=Two related stages) (2=Neutral Zone)		0	0	2
rES	Temperature display mode: (0=Integers in °C) (1=One decimal in °C) (2=Integers in °F) (3=One decimal in °F) (4=Integers in mA) (5=One decimal in mA)			0	1	5	
		Er1	CONTROL 1 status with faulty sensor: (0=OFF) (1=ON)		0	0	1
Er2	CONTROL 1 status with faulty sensor: (Only if Clo=1, 2, 3) (0=OFF) (1=ON)			0	0	1	
		CtEn	Enable / Disable CT alarm (0=Disabled) (1=Enabled)		0	1	1
AnCF	Level 2	<b>4-20 mA converter or repeater configuration parameters (only if Clo=0, 1, 2) and 4-20 mA / 0-10 V module</b>					
AHES	Level 3	Maximum output value scale for 20 mA / 10V (If PbS=0, 1, 2, 3) (If PbS=3, AHES=HES)		-99,9	200,0	2500	
		AHES	Minimum output value scale for 4 mA / 0V (If PbS=0, 1, 2, 3) (If PbS=3, ALES=HLS)		-99,9	-50,0	2500
onoF	Level 2	<b>ON/OFF Configuration Parameters (only if rEG=1) or (Clo=1, 2, 3)</b>					
dif1	Level 3	CONTROL 1 Differential (Hysteresis) (only if rEG=1)	(°C/°F/mA)	-50,0	1,0	50,0	
		dif2	CONTROL 2 Differential (Hysteresis) (only CONTROL 2 Clo=1, 2, 3)	(°C/°F/mA)	-50,0	1,0	50,0
ton1	Minimum CONTROL 1 time in ON (only if rEG=1)			(sec.)	0	0	250
		ton2	Minimum CONTROL 2 time in ON (only CONTROL 2 Clo=1, 2, 3)	(sec.)	0	0	250
toF1	Minimum CONTROL 1 time in OFF (only if rEG=1)			(sec.)	0	0	250
		toF2	Minimum CONTROL 2 time in OFF (only CONTROL 2 Clo=1, 2, 3)	(sec.)	0	0	250
inPt	Level 2	<b>Digital INPUT/OUTPUT (I/O, 5-, 6+) and Relays R1, R2, R3 configuration</b>					
Clo	Level 3	Description					
Cdh	Level 3	Description					
IPo	Level 3	Description					