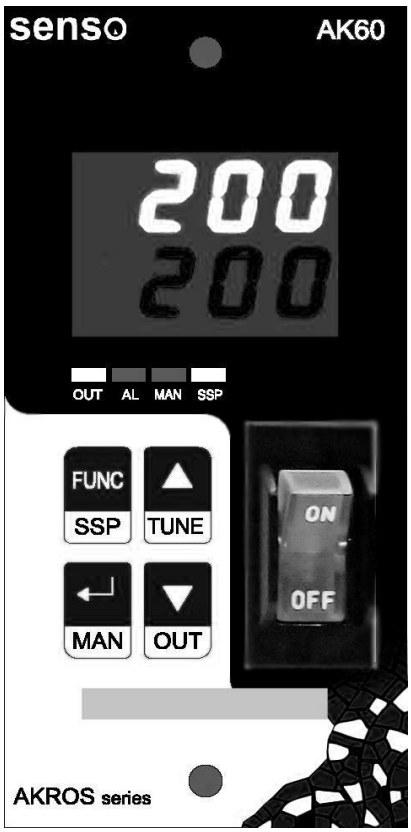
Hot Runner Controller
AK60

Instruction Manual



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1. INTRODUCTION

This instruction manual describes how to install and start up the AK60 hot runner controller.

You must read the instruction manual before starting up the equipment.

1.1. General specifications

The model AK60 is a high-performance process controller specifically designed for temperature control in hot runner systems. Its most outstanding features are as follows:

- Input:

  Thermocouple type J: 0…600°C (Fe-CuNi, IEC584)
  Thermocouple type K: 0...1200°C (NiCr-NiAl, IEC584)

- Control output by triac of 3500W.
- PID or PI+D (PI with automatic derivative) control type with 2 different types of autotuning algorithms user-selectable depending on the application.
- Automatic or Manual working mode.
- Double large digit display.

  4 digits of 10 mm for the process variable.
  4 digits of 10 mm for the Set Point.
- Protection temperature alarm with internal power stop (Optional)
- Supply: 85...265 Vac 50/60 Hz.

2. INPUTS / OUTPUTS

2.1. Signal input

Input signal must be selected setting the parameter .

Thermocouple type J: 0...600°C (Fe-CuNi, IEC584)
Thermocouple type K: 0...1200°C (NiCr-NiAl, IEC584)

2.2. Alarm

The model AK60 can be fitted with 2 alarm. The alarm output is by relay with SPST contacts (a voltage-free contact).

Configuration depends on parameters y .

1) Set point.

Absolute Set Point (y): The activating / deactivating point of the alarm is independent of the value of the process set point. For example, if an alarm Set Point of 200ºC is configured, the alarm will change status at that temperature, regardless of the value of the pre-set temperature for the process (process Set Point).

Current setpoint (, , ,): The activating / deactivating point of the alarm is referred to the current measured at the heating element. If this value is out of the range [CSPx-Crx,CSPx+Crx] alarm is activated. All those values are independent on the working setpoint. All those values are independent on the working setpoint. For instance if is set to 1,2A and is set to 0.3A, alarm will change its state if current measured is over 1.5A or under 0.9A.

Relative Set Point (rA1 y rA2): The activating / deactivating point of the alarm is always linked to the value of the process set point. For example, if a relative Set Point of 20ºC is configured, the alarm's status change point will always be 20ºC higher than the Set Point of the process. With a Set Point of 100ºC for the process, the alarm is set at 120ºC. With a Set Point of 250ºC, the alarm will be set at 270ºC.

Window Set Point (rA1 y rA2): The activating / deactivating point of the alarm becomes a symmetrical value, both above and below the process Set Point. For example, with a window Set Point of 10º for the alarm and a process Set Point of 50ºC, the alarm will change status at 40ºC and 60ºC. With a process Set Point of 250ºC, the alarm will change status at 240ºC and 260ºC.

2) Enabling type.

High alarm: The alarm is triggered when the process variable is greater than the alarm set point. For example, if the alarm's Set Point is at 250ºC, the alarm will remain activated as long as the process is above this temperature.

Low alarm: The alarm is triggered when the process variable is less than the alarm set point. For example, if the alarm's Set Point is at 250ºC, the alarm will remain activated as long as the process is below this temperature.

Window alarm: The alarm remains activated as long as the process variable is outside a certain value around the process Set Point, both above and below it. For example, if the process has a Set Point of 200ºC and the alarm a window signal of 30ºC, the alarm will be triggered whenever the process is below 170ºC and above 230ºC.

Current alarm: The alarm activates when the measured current de salida is out of range regarding the currentg setpoint, either above

or under. For instance if [SP1] is set to 1,2A and [Cr1] is set to 0.3A, alarm will change its state if current measured is over 1.5A or under 0.9A.

[CA1]/ [CA2]	Working mode
OFF	Alarm off
Hi	Absolute setpoint, high
Lo	Absolute setpoint, low
rHi	Relative Set Point, high
rLo	Relative Set Point, low
WInd	Window alarm
Curr	Window current alarm

The alarm type of action is controlled by the parameter [Act1] and [Act2]:

Direct Action (dir): The output relay is normally deactivated and is enabled when the enabling condition of the alarm occurs.

Reverse Action (rEV): The output relay is normally activated and is disabled when the enabling condition of the alarm occurs.

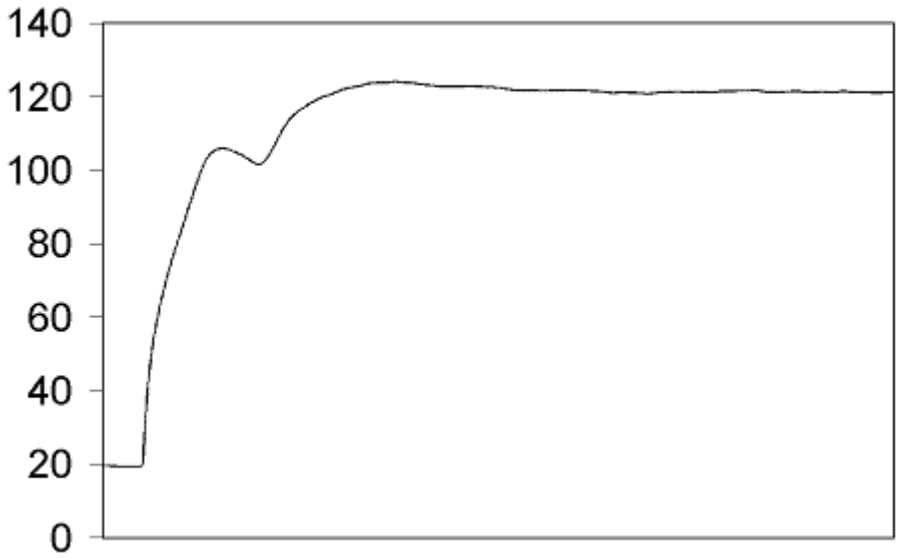
3. AUTOTUNING

Autotune type can be selected trough parameter AtEy

3.1. Step Response autotuning.

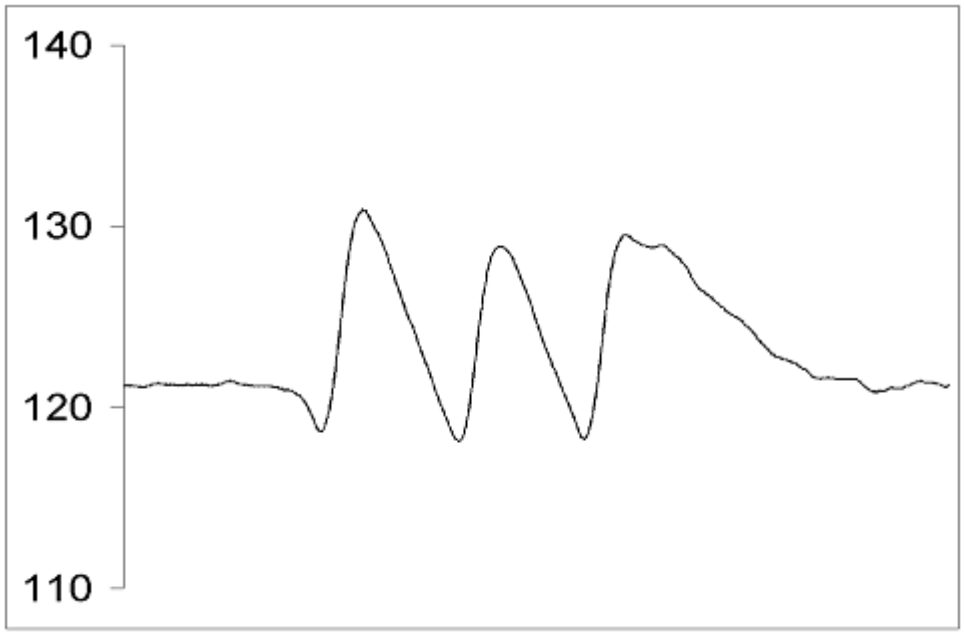
The autotuning process is a very useful function for determining the values of Pb, t1 and td which will give the process the greatest stability.

Step Response autotuning takes place below the set point and it can only be enabled if the process variable is less than 50% of the set point value. This process consists of supplying 100% power and disabling the output when the process is at around 80% of the signal. Next, the controller measures the inertia of the process and deduces the values of the PID parameters for the process in question.



3.2. Relay Feedback autotuning.

Relay feedback autotuning has the advantage that it takes place on the set point and can be enabled at any time. However, it has the drawback that, to perform the tuning, the process has to exceed the signal several times and there may be cases where this is unwise, due to damages that could occur in the process.



4. CURRENT MEASUREMENT

AK60 is able to measure power or current consumption using a toroidal transformer. Current measure can be activated setting parameter AMP to on. Once done, current measurement parameters will be available.

The end of scale of the measurement can be selected to 25A or 50A using parameters SCLA.

To be able to measure current, AK60 needs to supply output pulses of at least 300ms. If output power provides output pulses shorter than this for more time than CYA x (Control Cycle), a 300ms pulse will be forced to allow a valid measure.

The parameter dSP allows to setup which value is shown on display. Values available are AMP (current) and PWR (power). If power is selected, the line voltage can be setup trough parameter LINE.

5. OPERATION

5.1. Introduction

Akros series instruments are fully configurable. This feature means there are a large number of configuration parameters. In order to make it easier to program the parameters, for each instrument, only those parameters which, because of their configuration, are available.

Point 5.5 describes all the configurable parameters and point 5.6 sets out the route to be followed to access each of the parameters in graphic form.

The configuration menus have been arranged in 3 levels:

Level 1 The configuration parameters of the work mode appear, but not those affecting the instrument's configuration.

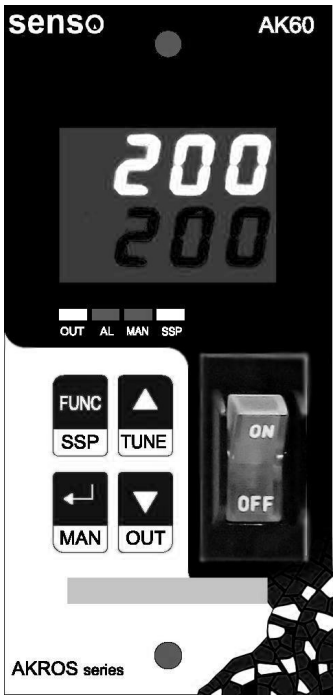
Level 2 At this level, the instrument's configuration parameters not depending on the physical configuration (inputs and outputs) are configured.

Level 3 At this level, the instrument is configured by specifying values affecting the input and output signals.

Operation of the instrument is arranged with 4 keys, the functions of which are as follows:

Tecla	Función
	Function key. It enters to instrument menus when pressed once. Once there is inside the menu, it goes to next level menu when pressed during 2 seconds. Key SSP. If instrument is working in normal mode, this key allows activating the secondary setpoint by holding this key during two seconds.
	Enter key. It should be pressed in order to save changes to any parameter. Man key. I should be pressed during two seconds in order to switch working mode from automatic to manual (and reverse way). In manual working mode, the power output can be varied by keys ▼ y ▲.
	Key Up. It is used to increment a parameter value. If it is hold, the variation of the parameter increases. Key Tune. It should be pressed during two seconds in order to activate autotuning process. It will be executed when it is posible to activate autoning depending on parameter AtUn.
	Tecla Down. It is used to decrement a parameter value. If it is hold, the variation of the parameter decreases. Key Out. In normal operation mode, it switches the display to show setpoint, power output (P) or current measured (A o u (if power is cosen).

5.2. Description of the front panel



There are also the following indicator lights:

OUT	Control or heating output
AL	Lights up if any alarm is active
MAN	Lights up when the instrument is working in manual mode
SSP	Lights up when the secondary Set Point is enabled
ON/OFF	Switch 16 A with a magnetothermic that serves as a protection of the load and the regulator. If current is over 16 A, magnetothermic acts and leave the device inactive. If the regulator is on, switch shows the power output through a pilot.

5.3. Start-up

When connecting the power supply voltage, the instrument displays the message "TEST ON" while the controller initiates all the internal parameters.

5.4. Power loss

When the instrument loses the power supply voltage, all the parameters remain stored in the instrument's internal memory. When the power is restored, the controller will re-start control of the process using the function configured in parameter StFn (nonE, tunE, MAn).

5.5. Description of all the configurable parameters

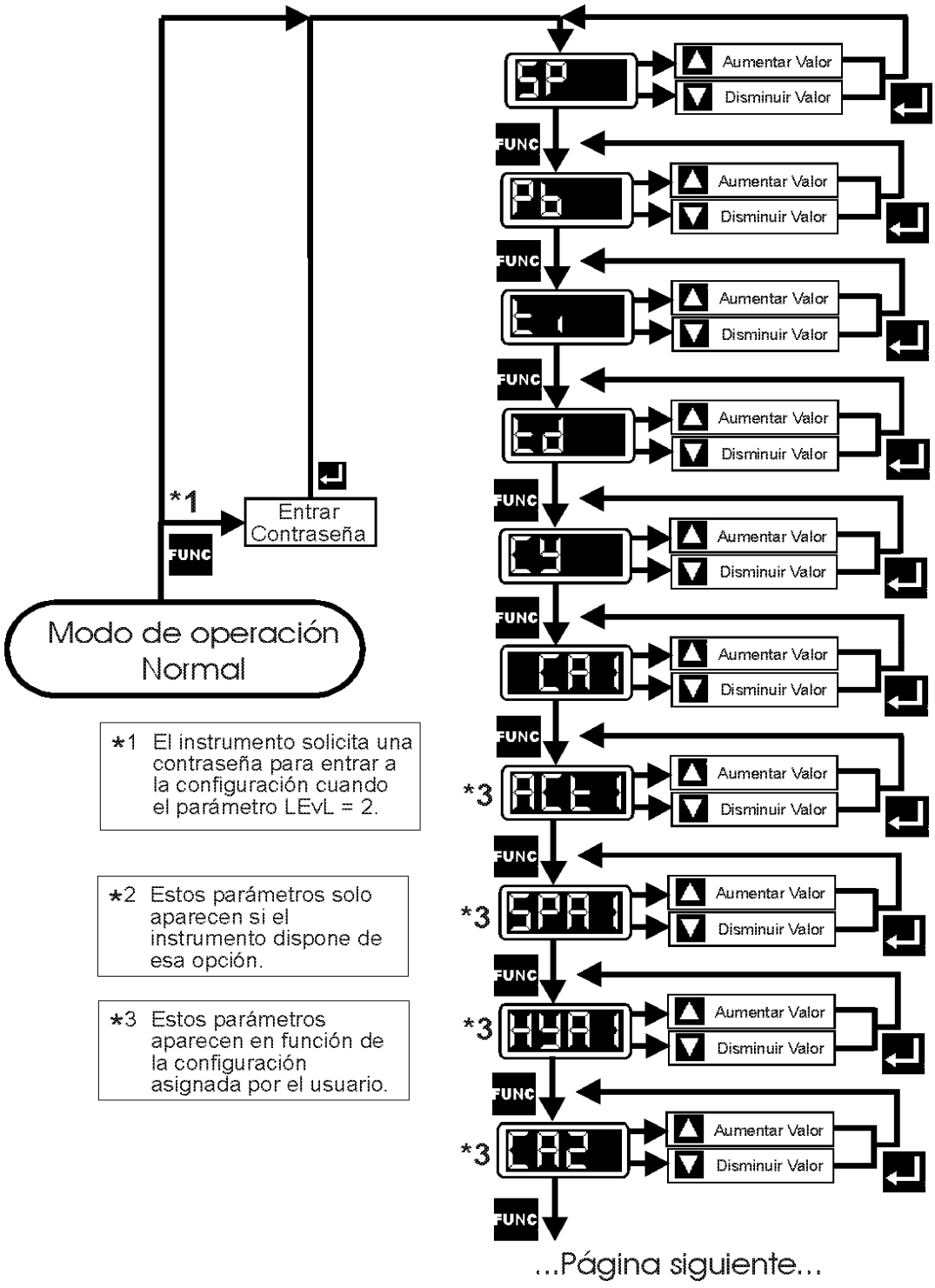
Símbolo	Descripción	Valor	Fábrica
SP	Setpoint of the process	From SP.LL To SP.HL	150
Pb	Proporcional band	From 0.1% To 100.0%	2,5
t i	Integral time	From 1s To 4000s	320
td	Derivative time	From 1s To 4000s	60
Cy	Cycle of control output	From 1s To 120s	1
CA1	Configuration of the work mode alarm 1	OFF : disabled Hi : Absolute high alarm	OFF
Act 1	Alarm 1 actuator direction	dir : Relay is normally open rEU : relay is normally closed	dir
SPA1	Absolute Alarm 1 Setpoint	From SP.LL To SP.HL	155
HyA1	Alarm 1 Hysteresis	From 0 To 9999	1
CA2	Configuration of the work mode alarm 2	OFF : Disabled Hi : Absolute high alarm Lo : Absolute low alarm rHi : Relative high alarm rLo : Relative low alarm UUnd : Window alarm Curr : Window current alarm	OFF
Act2	Alarm 2 actuator direction	dir : Relay is normally open rEU : Relay is normally closed	dir
SPA2	Absolute Alarm 2 Setpoint	From SP.LL To SP.HL	155
rA2	Relative Alarm 2 Setpoint	From -999 To 9999	5
CSP2	Setpoint of current regarding alarm 2	Only last value of measured current can be assigned	0
Cr2	Relative setpoint of current regarding window alarm 2	From 0,1 To 50,0	0,5
HyA2	Alarm 2 hysteresis	From 0 To 9999	1

nnA2	Mask alarm 2	From 0 To 1	1
SSP	Secondary Setpoint	From SPLL To SPHL	100
bIAS	Bias (value added to measured control variable)	From -999 To 9999	0
unit	Temperature units	F °C	°C
outL	Control Output top limit	From 0 To 100	100
SPHL	High limit of setpoint value	From SPLL +1 To high input signal value	600
SPLL	Low limit of setpoint value	From low input signal value To SPHL -1	0
AtTY	Autotune type	rLAY : relay feedback StEP : step response	rLAY
StFn	Start up function	nOnE : No special function tunE : Autotune on startup MAn : Manual mode on startup	nOnE
OutS	Value of power output at startup if the startup function is MAn	From 0 To OutL	100
CtTY	Control type	PId : control PID PI d : control PI+D	PId
tHt	End of preheating	From SPLL To SP	120
inP	Input sensor type	tc-J : Thermocouple J tc-P : Thermocouple K	tc-J
Addr	Modbus address of the device	From 1 To 255	1
bAud	ModBus baudrate	2.4k : 2400 bps 4.8k : 4800 bps 9.6k : 9600 bps 19.2k : 19200 bps 38.4k : 38400bps 56.0k : 56000bps 57.6k : 57600bps	19.2
PrTY	Parity	nonE : No parity EUEn : Even parity Odd : Odd parity	nonE
dLAY	ModBus delay	From 0ms To 10ms	5

	Current measure enable	On : Enable OFF : Disable	OFF
	Value showed in the display	AMP : Show current PUWr : Show power	AMP
	Voltage line	From 100 To 265	220
	Maximum number of power output cycles among current measures	From 0 To 120	30
	Keyboard protection level	FrEE : Unlocked SP : Only allowed Setpoint SP A : Only allowed SP and alarm LoCP : Everything locked	FrEE
	Keyboard protection code	From 0 To 9999	0

5.6. General diagram of menus

Level 1

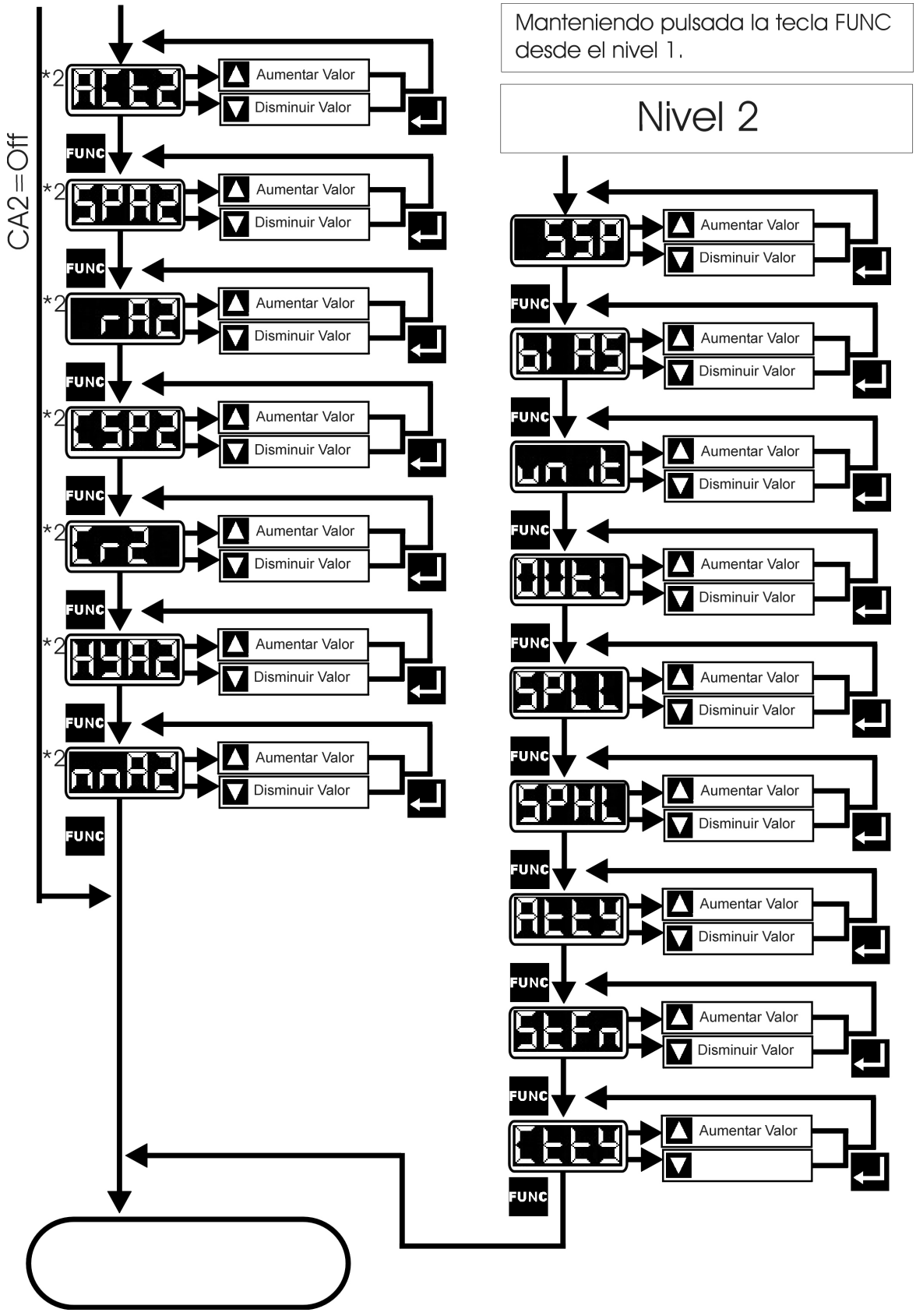


*1 El instrumento solicita una contraseña para entrar a la configuración cuando el parámetro LEvL = 2.

*2 Estos parámetros solo aparecen si el instrumento dispone de esa opción.

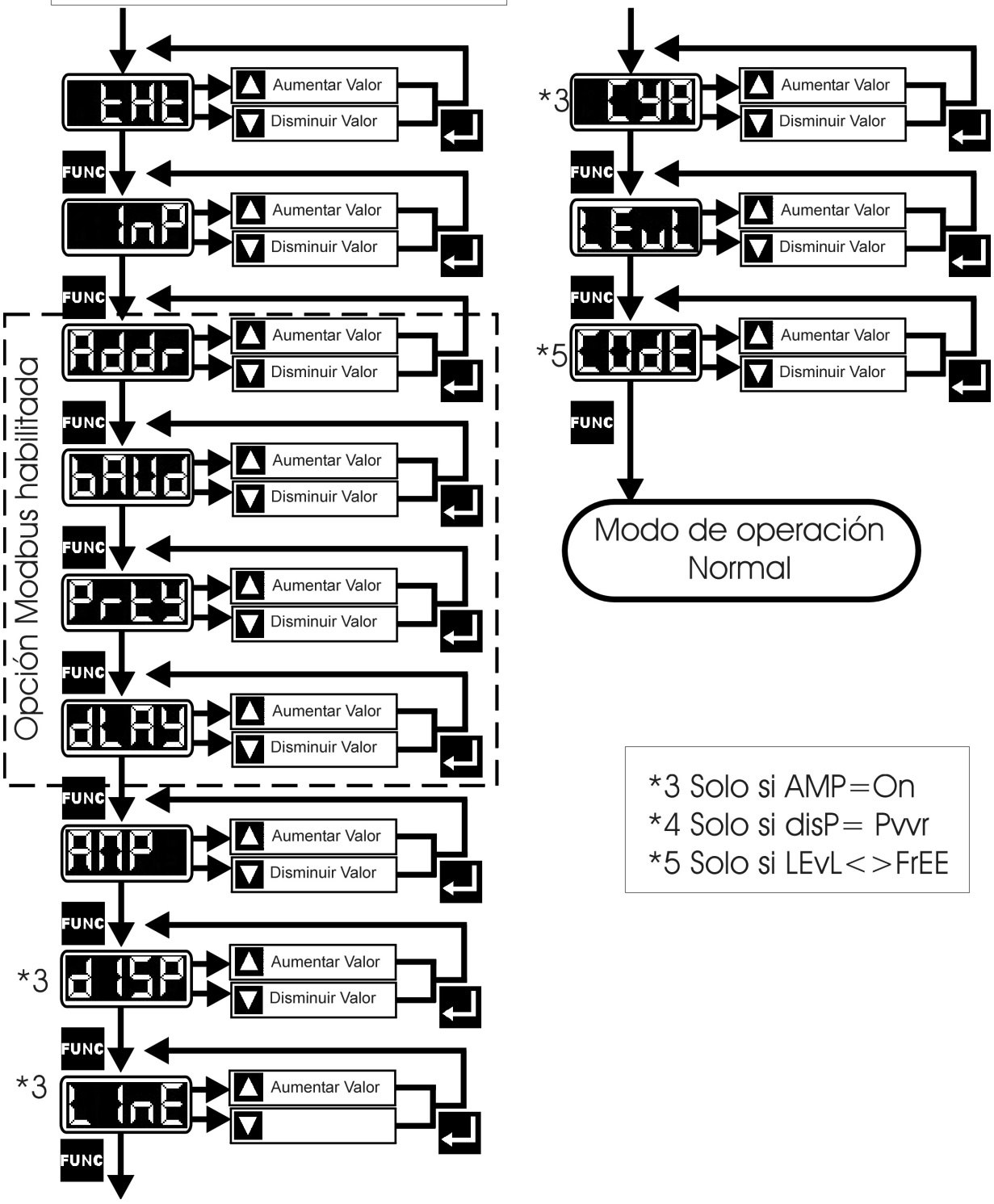
*3 Estos parámetros aparecen en función de la configuración asignada por el usuario.

Level 2


Manteniendo pulsada la tecla FUNC desde el nivel 1.
Nivel 2
CA2=Off
*2
FUNC
Aumentar Valor
Disminuir Valor

Level 3

Manteniendo pulsada la tecla FUNC desde el nivel 2.



*3 Solo si AMP=On
*4 Solo si disP= Pvvr
*5 Solo si LEvL<>FrEE

5.7 Keyboard lock

The keyboard can be locked entering a password to the CODE parameter or trough the digital input. If keyboard lock is configured using digital input code will not be available. Keyboard can be locked. Level of protection is selected with parameter LEVL:

FrEE	Unlocked
SP	Only the Set Point can be modified. Password is required to access the rest of parameters
SP A	Only the Set Point and alarm setpoint can be modified. Password is required to access the rest of parameters
LoCK	It is not possible to see and modify any parameter without password

If keyboard lock is setup using parameter LEVL, controller will ask for password. When password is required, message PASS is shown and code can be set digit by digit. To select next digit use key MAN. Once desired code is set press FUNC SSP. Next parameter will be shown if code is correct. LoCK message will be shown if password is not correct.

6. TECHNICAL SPECIFICATIONS

Size	Plug-in in RACK format EuroCard 100x160mm
Power supply	85..265 Vca 50/60 Hz
Consumption	8 VA
Atmos. Temp.	0..50°C (interior use)
Relative humidity	máx. 80% non condensing
Altitude	máx. 2000 m
Installation Cat.	II as per EN61010-1
Degree of pollution	I as per EN61010-1
Display	4 digits of 10 mm for the process variable 4 digits of 10 mm for the signal
Input	J : 0..600°C (Fe-CuNi, IEC584) K: 0..1200°C (NiCr-NiAl, IEC584)
Precision	± 0,25% v.f.e
Control Output	Triac of 3500W
Alarm	Over temperatura protection with power intern stop protection. (Opcional)
Type of control	PID or PI+D, with 2 autotuning algorithms.

CE certification (for both industrial and commercial environments)	• Seguridad: EN61010
	• EMI susceptibility: EN50082-1
	  • EN61000-4-2, descargas electrostáticas
	  • EN61000-4-3, campos radiados
	  • EN61000-4-4, transitorios
	  • EN61000-4-5, onda de choque
	  • EN61000-4-6, corrientes inyectadas
	  • EN61000-4-8, campo magnético
	  • EN61000-4-11, interrupciones de tensión
	• EMI emission: EN50081-1
	  • EN55022-b, conducted emissions
	  • EN55022-b, radiated emissions
	• Harmonics: EN61000-3-2
	• Voltage fluctuations: EN61000-3-3

7. ERROR AND ALARM MESSAGES

Akros series modules can show different error or warning messages.

Error in the unit's internal electronics. If this message appears, the instrument must be sent to your nearest distributor for repair.

Error in the unit's internal memory. If this message appears, the instrument must be sent to your nearest distributor for repair.

The circuit of the input signal has been broken or else the input signal is over the top limit.

The input signal is below the bottom limit of the scale, or else the connections are inverted.

There is no current measurement sample acquired. This message can be shown for instance, while autotune is on because current sensing is suspended in order to don not interfere with the process.

It appears in case that the power is shown instead of current.

8. GUARANTEE AND SERVICE

This instrument is guaranteed against all kinds of manufacturing defect or faults in its component parts for one year as from the date of purchase. This guarantee includes repair or replacement of the faulty parts in our factory, free of charge, unless the fault is caused by mishandling of the equipment or any component of it has been changed.

Instruments requiring service or repair should be sent to your nearest distributor.

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