



The AK70 series is a range of dual independent loops process controllers which include multiple input/output options. A module for current measurement in the heating elements and a relay module for remote switching complete the family.

Applications

The AK70 instruments, thanks to their wide range of models, have been specifically designed for multizone temperature control applications such as furnaces, ovens, dryers, packaging machinery, plastic processing industry and in particular for OEM's.



Contact SENSO for any specific HMI you may need. Our technical staff will design the application according to your needs.

General features

Input

Order selectable:

- Two thermocouple input configurable as J, L, K, N, R, S, T
- Two RTD PT100 input channels
- Two RTD PT1000 input channels
- Two 0/4..20mA input channels
- Two 0..5/10V input channels

Heating and Cooling control output

Order selectable:

- DC pulses for SSR
- Relay
- Linear analog output 0/4..20mA or 0..5/10V (Heating only)

Alarms

Each instrument has 4 logic alarms which can be associated to any of the two control loops. It has 2 physical outputs which can be configured as a combination of the logic alarms. These physical outputs can be, order selectable:

- DC pulses for SSR
- Relay

Different control algorithms

It has 3 different control algorithms per each channel/loop:

PID, PI+D or ON-OFF. In addition, the hot runner function can be activated. In this way, the controller will perform the pre-heating algorithm. The autotuning function will calculate the optimum PID or PI+D parameters per each loop.

Ramp function

Besides the preheating function which is automatically activated when the controller is configured in Hot Runner Controller mode, the controllers of the AK70 series include a ramp function that can be programmed by the user. In addition, up to 30 segments can be configured if the segments programmer function is desired.

Autotuning

It has 2 different autotuning algorithms, the "step-response" or "relay feedback" which can be chosen, according to the type of process, to optimize the control performance.

Current measurement

The AK70 series includes a current measurement module for detecting current errors in the heating elements such as heater burnout, or heater overcurrent by means of external current transformers (to be ordered separately- see 'ordering code' for references-).

Communications

All the instruments of the AK70 are connected through a galvanically isolated RS485 network by means of the MODBUS/RTU protocol.

Control modules specifications

Format

DIN rail mounting

Display

1 status Led

Thermocouple input option

User configurable as:

- Type J : 0..600° C (Fe-CuNi, IEC584)
- L : 0..600° C (Fe-CuNi, DIN43710)
- K : 0..1200° C (NiCr-NiAl, IEC584)
- N : 0..1200° C (NiCrSi-NiSi, IEC584)
- T : 0..400° C (Cu-CuNi, IEC584)

R : 0..1600° C (Pt / 13%Rh-Pt , IEC584)

S : 0..1600° C (Pt / 10%Rh-Pt , IEC584)

Cold junction compensation: better than 0,5°C alter 30 minutes.

Measuring resolution: 14 bit.

Accuracy: better than +/- 0,25% fsv (full scale value)

RTD Pt100 input option

User configurable as:

RTD Pt100 2/3 wires, -200..600°C

RTD Pt100 2/3 wires, -99,9..200,0°C

Accuracy: better than 0,3°C (-99,9..200,0°C) or

1°C (-200..600°C)

RTD Pt1000 input option

User configurable as:

RTD Pt1000 2/3 wires, -200..600°C

RTD Pt1000 2/3 wires, -99,9..200,0°C

Accuracy: better than 0,3°C (-99,9..200,0°C) or

1°C (-200..600°C)

Current linear input option

User configurable as:

0..20mA or 4..20mA

Input impedance: 150 Ohm

User configurable range

Voltage linear input option

User configurable as:

0..5V or 0..10V

Input impedance: > 1 MOhm

User configurable range

Control output

Depending on the option:

- 2 open collector outputs (heating + cooling) per loop, max. 40mA @ 12Vcc

- 2 relay outputs (heating + cooling) per loop, SPST 1A 250VAC

- 1 analog output (heating) per loop, 0/4..20mA or 0..5/10V

Alarm output

Depending on the option:

- 2 open collector outputs, max 40mA @ 12Vcc

- 2 relay outputs, SPST 1A 250VAC

Control type

PID or PI+D, (Heating/Cooling or Hot runner Mode) with 2 user

selectable autotuning algorithms, or ON - OFF.

Communications

RS485 MODBUS/RTU™ galvanically isolated.

Baud rate: 2400,4800,9600 or 19200 baud.

Format: 8 bit, 1 stop bit, selectable parity.

Delay: programmable in 10ms intervals.

Power supply

24 Vdc

Consumption

3VA

Room conditions

Working: 0..50°C

Storage: -10..60°C

Humidity: 0..95 % HR non condensing.

Protection degree

IP50 on the front

Case

ABS self extinguishing

Dimensions

Models with DC pulses as output option: 17,5 x 99 x 93 mm

Models with relay or analog output as option: 35 x 99 x 93 mm

Weight

Models with DC pulses as output option: 98 gr

Models with relay or analog output as option: 140 gr

CE conformity (in industrial and commercial environment)

Safety: EN61010

Immunity EMI: EN50082-1

EN61000-4-2, electrostatic discharges

EN61000-4-3, radiated fields

EN61000-4-4, burst

EN61000-4-5, surge

EN61000-4-6, injected currents

EN61000-4-8, magnetic field

EN61000-4-11, PQT

EMI emission: EN50081-1

EN55022-b, conducted

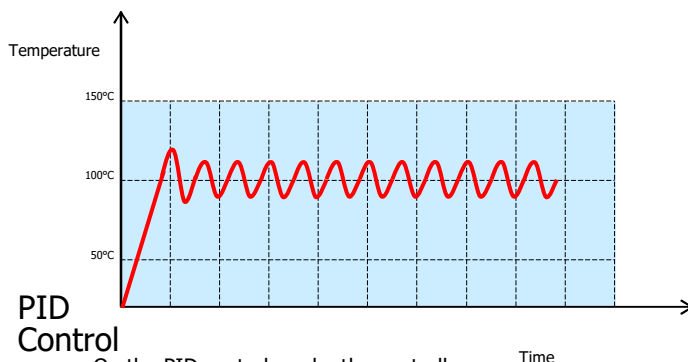
EN55022-b, radiated

Control types

ON / OFF Control

When the controller is configured to work in ON / OFF mode, the controller output only takes two values: 100% when the process is under the setpoint and 0% when the process is over the setpoint. In this working mode, the user must configure the activation-deactivation hysteresis value of the control output.

The following graph shows the "zig-zag" as a result of this type of control.



PID Control

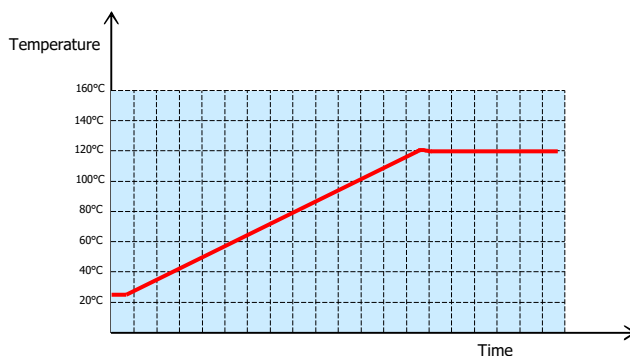
On the PID control mode, the controller output is the result of the three control actions added: Proportional, Integral and Derivative. The controller output will vary from 0 to 100% as a result of this combination.

PI+D Control

The PI+D control mode works very similar to the PID but in this case only the Pb (Proportional Band) and Ti (Integral time) can be modified. The derivative action is automatic. This control action appears to be much more stable when the process is working on the limits of the controller's output variations such as 0..10% or 90..100%.

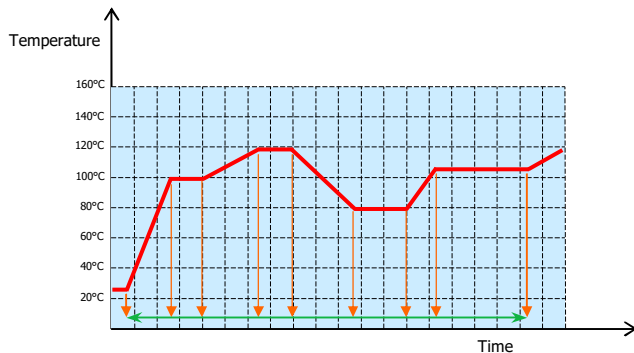
Ramp function

By means of the RATE parameter can be configured a units change per minute to assure an approximation to the set point as a ramp.



Segment programmer

On each control loop up to 30 steps combining ramp, steady state and set points can be programmed.



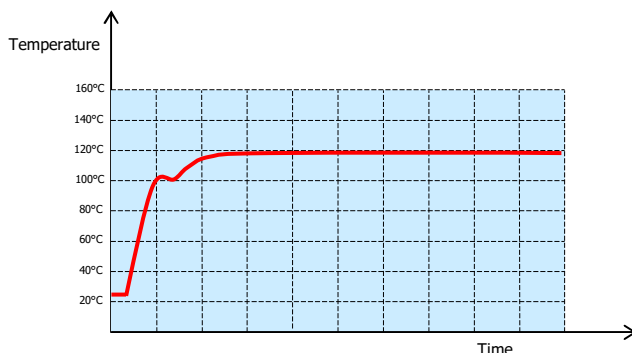
Autotuning types

The autotuning function is very useful to determine which Pb, Ti and Td values are the best to achieve the optimum process stability.

"Step Response" autotuning

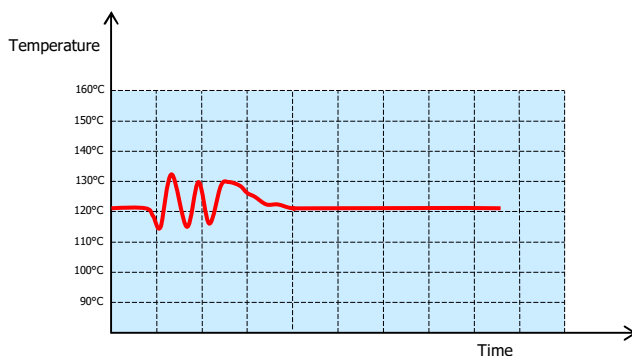
It is performed when the process is below the set point value and can only be activated when the process is under the 50% of this set point.

This tuning consist on increasing the process value with an output of 100% and when it reaches the 80% of the set point, the output falls down to 0%. Then the controller will calculate the optimum PID parameters by measuring the overshoot and the response time.



"Relay Feedback" autotuning

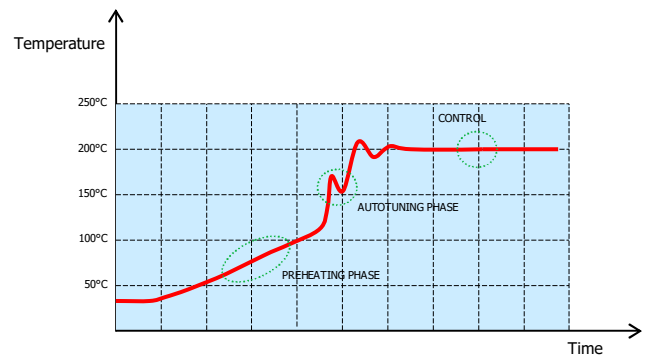
This type of autotuning has the advantage that is performed on the set point thus can be activated at any time. However, to perform the autotuning, the controller will create some overshoots and this might not be acceptable by the process.



Pre-heating for plastic injection moulding applications

The **AK70** is equipped with an advanced and proven pre-heating 'SENSO' algorithm to eliminate the moisture in the heating elements.

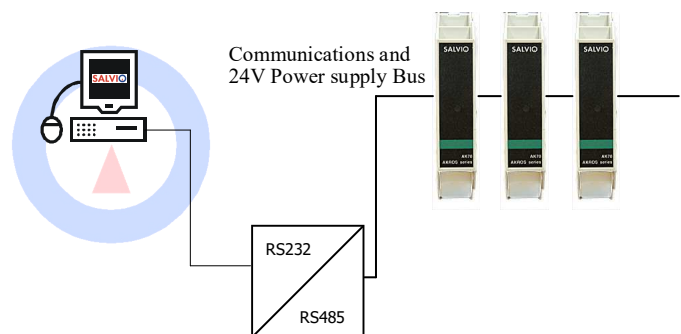
The controller doses the output to the load to increase step by step the temperature without damaging the heater.



Serial communications

Communications are through a RS485 network, 2 wires + common, half duplex.

All the AK70 modules share a MODBUS network through T connectors which are connected one to each other in such a way that with one single connector at the beginning of the bus, all the instruments get connected to the communications bus, including the power supply. This bus based on connectors simplifies dramatically the wiring of the application.



Current measurement module



Heater burnout and heater overcurrent alarms can be assigned by using the current measurement module.

Each AK70 current measurement module can handle up to 5 current transformers which allow the detection of current errors in up to 5 control zones per module.

A heater burnout or heater overcurrent is detected by measuring the heater current while the control output (heating) is ON. This measurement can be done only if the heating output is in the ON state for 200 ms or more.

Current measure specifications

Current transformers input

Up to 5 CT per module

CT Options

2 options. Can be combined in the same module:

- 25A
- 50A

The user can specify the number of turns according to the range of measurement.

Communications

RS485 MODBUS/RTU™ galvanically isolated.

Baud rate: 2400,4800,9600 or 19200 baud.

Format: 8 bit, 1 stop bit, selectable parity.

Delay: programmable in 10ms intervals.

Power supply and Consumption

24 VDC, 3VA

Room conditions

Working: 0..50°C

Storage: -10..60°C

Humidity: 0..95 % HR non condensing.

Protection degree

IP50 on the front

Case

ABS self extinguishing

Dimensions and weight

17,5 x 99 x 93 mm and 98 grs.

CE conformity (in industrial and commercial environment)

Relays module



This module allows the remote activation/deactivation of actions such as alarms, event switching, etc... which can be assigned directly by the main control application by means of MODBUS registers.

Relays module specifications

Relays

4 relays SPST 3A

2 relays SPST 1A

Communications

RS485 MODBUS/RTU™ galvanically isolated.

Baud rate: 2400,4800,9600 or 19200 baud. Format: 8 bit, 1 stop bit, selectable parity.

Delay: programmable in 10ms intervals.

Power supply and consumption

24 VDC, 3VA

Room conditions

Working: 0..50°C. Storage: -10..60°C

Humidity: 0..95 % HR non condensing.

Protection degree

IP50 on the front

Case

ABS self extinguishing

Dimensions

35 x 99 x 93 mm

Weight

140 gr

CE conformity (in industrial and commercial environment)

Analog outputs module

The analog output module can be configured by the user to operate in two modes: As a dual loop controller with linear output for heating plus two alarms or as a signal converter with dual linear retransmission with selectable scale and range for each channel.

Analog outputs

2 configurable as: 0..20mA, 4..20mA 0..5Vdc, 0..10Vdc

Maximum load

500Ω in mA or 20mA in Vdc

Alarm relays

2 relays SPST 1A

Communications

RS485 MODBUS/RTU™ galvanically isolated.

Baud rate: 2400,4800,9600 or 19200 baud.

Format: 8 bit, 1 stop bit, selectable parity.

Delay: programmable in 10ms intervals.

Power supply and consumption

24, 3VA

Room conditions

Working: 0..50°C

Storage: -10..60°C

Humidity: 0..95 % HR non condensing.

Protection degree

IP50 on the front

Case

ABS self extinguishing

Dimensions and weight

35 x 99 x 93 mm and 140 grs

CE conformity (in industrial and commercial environment)

Conforme CE

Ordering code

Model	INPUT *	OUTPUT *
AK70	0 - None	0 - None
	1 - TC	1 - DC pulses for heating + DC pulses for alarm
	2 - RTD Pt100	2 - DC pulses for heating + DC pulses for cooling - DC pulses for Servovalve (open/close)
	3 - RTD Pt1000	3A - DC pulses for heating + relay for cooling + relay for alarm
	4 - 0/4 .. 20 mA	3B - Relay for heating + relay for cooling + relay for alarm - Open/Close relay for servovalve + relay for alarm
	6 - 0 .. 5/10V	4 - 0/4.. 20mA (heating only) + relay for alarm - Linear retransmission
	8 - Current measurement module (5 heaters)	6 - 0 .. 5/10V (heating only) + relay for alarm - Linear retransmission
		8 - 6 relays SPST (Relays Module)
Accessories		
CT7025	25A Current Transformer	
CT7050	50A current Transformer	

Examples:

AK70-1-3 Process control module with 2 TC inputs and dual Heating/Cooling + alarm relay outputs or Open/Close + alarm relay outputs, user selectable.

AK70-8-0 Current measurement module

AK70-3-1 Process control module with 2 PT1000 inputs and dual heating + alarm DC pulses outputs

AK70-0-8 Relays module

AK70-2-6 Process control module with 2 PT100 inputs and dual 0..5/10V linear analog outputs or dual linear retransmission outputs, user selectable.

CT7050 50A Current transformer

* Please, note that some input/output combinations are not possible.

Touch panel HMI



The AK70 instrument family, thanks to the wide range of models, make the extremely flexible. They specially indicated for process or temperature control in ovens, boilers, packing machines, dryers, plastic processing, injection moulding applications and very suitable for OEM applications.

SENSO offers a touch panel HMI interface which can manage several industrial applications.

SENSO engineering team will help you to develop your specific application.

From the touch panel and in a windows environment we can have all the process information in graphic or numeric mode, file management or remote communications.

AK100 Terminal



The AK100 terminal is a very simple and economical solution for configuring a multizone process controller occupying the space of just a 1/8 DIN panel instrument, 48 x 96 mm.

Other SENSO references



Process controllers

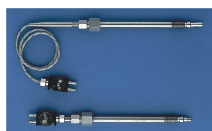
Process indicators



Custom electronics and software



Temperature sensors



Where to find us ?

Few words about us

SENSO is a company based in Mataró at 30Km north of the Barcelona area.

Our activity is electronic instrumentation and sensors for temperature and pressure measurement and control.

We have also a good reputation on plastic injection moulding systems.

You will find us at:

<http://www.senso.es>

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