SALVIO

1/16 DIN Process controller

AK48

The model AK48 is a 48x48mm process controller with advanced features.
The user can choose among 13 different input probes including linear inputs. The control output can also be selected by the user.

APPLICATIONS

The **Akros** series is a family of instruments suited for critical applications where control stability is an issue. Due to its wide range of options, the AK48 becomes an universal process controller for all kind of industrial applications.

GENERALS FEATURES

As Standard:

Universal input
Fully configurable input as thermocoule, RTD, current llop or voltage.

Configurable control output
The control output can be configured by the user as SPDT relay or DC pulses for SSR.

Alarms
It comes with one SPST relay alarm as standard and can be equipped with a second relay alarm as an option. The alarms action is fully configurable.

Operation mode
Automatic or Manual.

Three control types
The user can select among three different control actions: ON/OFF, PID or PI+D (PI with automatic derivative action). PID and PI+D include two differente autotuning algorithms.

Keylock
The instrument provides three levels of protection through the keylock function.

Wiring
the wiring is through screws in the rear of the case.

Options:
Fully configurable second alarm.
Current loop control output : 0..20mA , 4..20mA (max. 500Ω)
0..5Vcc , 0..10Vcc (max. 20mA)
Power supply for current loop transmitter 0mA (@13,5 Vcc)

SPECIFICATIONS

Case
1 / 16 DIN 43700 (48x48 mm.), front removable

Display
4 red 7 seg. Led, 10 mm for the process variable
4 green 7 seg. Led, 7 mm for setpoint value

Thermocouple input
User configurable:
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 accuracy: better than 0,5°C after 30 minuts
Resolution: 1°C
Accuracy: +/- 1 digit
Units: °C o °F
Resolution: 20000 points
Accuracy: better than +/- 0,25% FSV

RTD input
Scale : 0..600°C Pt100 (IEC751)
Configuration: 3 wires
Resolution: 1°C
Units: °C o °F
Resolution: 20000 points
Accuracy: better than +/- 0,3°C in the –99..200,0°C scale
and +/-1°C in the 0..600°C scale

Current loop input
0..20mA o 4..20mA , user configurable
Range: Selectable between –999 y 9999.
Decimal point: Selectable as XXX.X o XX.XX
Input impedance: 150Ω

Voltage linear input
0..5Vcc o 0..10Vcc, user configurable
Range: Selectable between –999 y 9999.
Decimal point: Selectable as XXX.X o XX.XX
Input impedance: > 1MΩ

Control output
SPDT relay(2A@250 Vca, resistive load) or 9Vdc pulses (open collector, max. 40 mA), user configurable.
- As an option:
Current loop output: 0..20mA , 4..20mA (500Ω max. load)
0..5 Vcc , 0..10 Vcc (20mA máx. load)

Transmitter supply (as an option)
13,5 Vcc (max. 22mA).

Alarm relay (2nd alarm as an option)
1 Alarm: SPST relay (1A@250 Vca)
2 Alarms: 2 SPST relays (1A@250 Vca) with a shared common

Power supply
85..265 Vca, 50/60 Hz
-Option: 21..53 Vca/Vcc

Consumption
8VA

Room conditions
Operating: 0..50°C
Storage: -10..60°C
Humidity: 0..95 % HR without condensation

Protection degree
IP50 in the front

Case
ABS self extinguishing

Dimmensions
48 x 48 x 109 mm.

Panel cutoff
45,5 x 45,5 mm. (+/- 0,5 mm.)

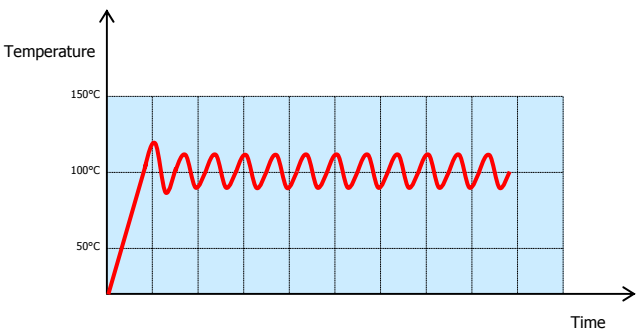
Weigth
140 grs.

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 set-point.
In this working mode, the user must configure the activation–deactivation hysteresis value of the control output.

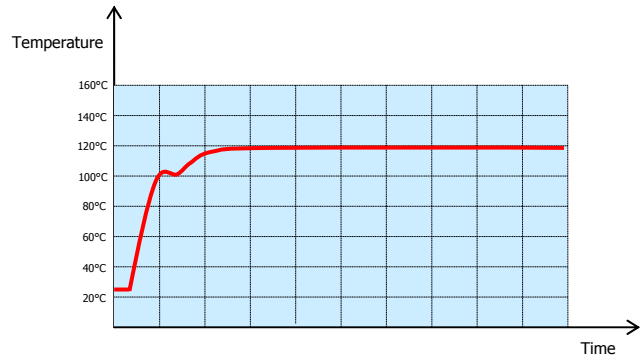


PID Control
On the PID control mode, the controller output is the result of the three control actions added: Proporcional, Integral and Derivative. The controller output will vary from 0 to 100% as a result of this combination.

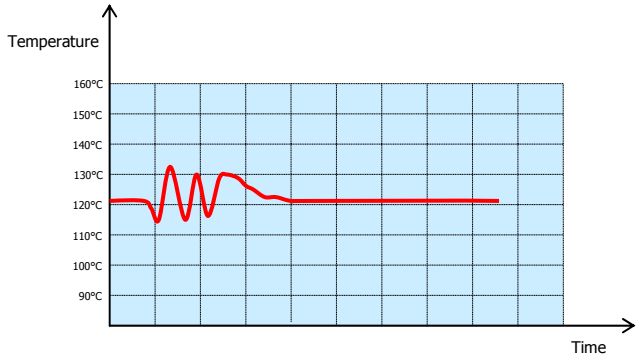
PI+D Control
The PI+D control mode works very similar to the PID but in this case only the Pb (Proporcional Band) and Ti (Integral time) can be modified. The derivative action is automatic. This control action appears to be much more stable when the process is working on the limits of the controller's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

AUTOTUNING

"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.

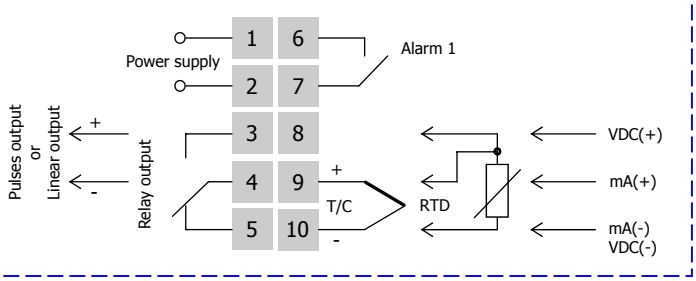


"Relay Feedback" autotuning
This type of autotuning has the advantage that is performed on the set point thus can be activated at any time. However, to perform the autotuning, the controller will create some overshoots and this might not be aceptable by the process.

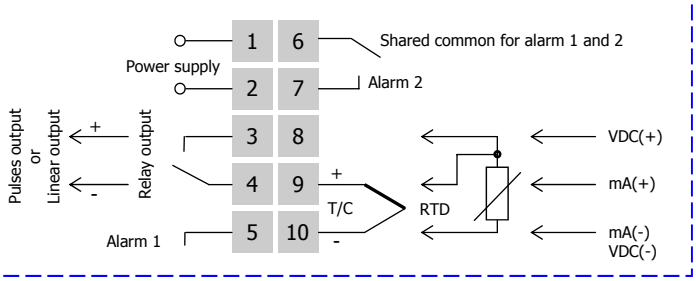


WIRING

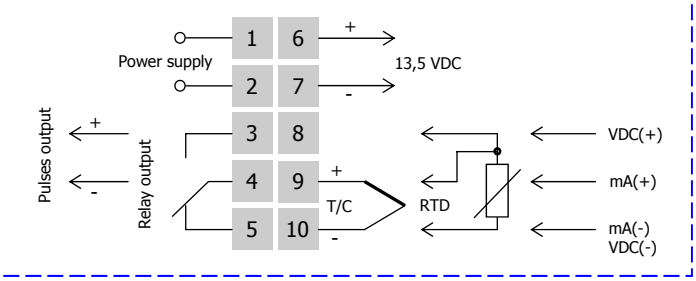
Wiring with 1 alarm



Wiring with 2 alarms



Wiring with transmitter supply



ORDERING CODE

Model	Control output	Base options	Power supply
	1: Relay or DC pulses 3: 0..20 mA 4: 4..20 mA 6: 0..5 Vcc 7: 0..10 Vcc	1: One alarm 3: Two alarms With shared common 9: 13,5 VDC supply for trans-mitter	1: 85..265 VAC 50/60 Hz 2: 21..53 VAC/VDC
AK48	1	1	1

The base option 9 (transmitter supply) excludes the Control output options 3 to 7, and conversely

Example: AK48-111

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SALVIO

1/8 DIN Process controller

AK49

The model AK49 is a 48x96mm process controller with advanced features.
The user can choose among 13 different input probes including linear inputs. The control output can also be selected by the user.

APPLICATIONS

The **Akros** series is a family of instruments suited for critical applications where control stability is an issue. Due to its wide range of options, the AK49 becomes an universal process controller for all kind of industrial applications.

GENERAL FEATURES

As Standard:

Universal input
Fully configurable input as thermocoule, RTD, current llop or voltage.

Configurable control output
The control output can be configured by the user as SPDT relay or DC pulses for SSR.

Alarms
It comes with one SPST relay alarm as standard and can be equipped with a second relay alarm as an option. The alarms action is fully configurable.

Operation mode
Automatic or Manual.

Three control types
The user can select among three different control actions: ON/OFF, PID or PI+D (PI with automatic derivative action). PID and PI+D include two differente autotuning algorithms.

Keylock
The instrument provides three levels of protection through the keylock function.

Wiring
the wiring is through screws in the rear of the case.

Options:
Fully configurable second alarm
Cooling output configurable as ON/OFF or proportional action
Current loop control output : 0..20mA, 4..20mA (max. 500Ω)
0..5Vcc, 0..10Vcc (max. 20mA)
Power supply for current loop transmitter 20mA (@13,5 Vcc)
Control output for servomotors
Linear retransmission:
0..20mA , 4..20mA (max. 500Ω) the range is user configurable
0..5 Vcc , 0..10 Vcc (max. 20mA) the range is user configurable
Remote Setpoint (0..20mA, 4..20mA, 0..5 Vcc, 0..10 Vcc)
the range is user configurable
MODBUS/RTU RS485 communications

SPECIFICATIONS

Case
1 / 8 DIN 43700 (48x96 mm.), front removable

Display
4 red 7 seg. Led, 10 mm for the process variable
4 green 7 seg. Led, 7 mm for setpoint value

Thermocouple input
User configurable:
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 accuracy: better than 0,5°C after 30 minuts
Resolution: 1°C
Accuracy: +/- 1 digit
Units: °C o °F
Resolution: 20000 points
Accuracy: better than +/- 0,25% FSV

RTD input
Scale : 0..600°C Pt100 (IEC751)
Configuration: 3 wires
Resolution: 1°C
Units: °C o °F
Resolution: 20000 points
Accuracy: better than +/- 0,3°C in the –99..200,0°C scale
and +/-1°C in the 0..600°C scale

Current loop input
0..20mA o 4..20mA , user configurable
Range: Selectable between –999 y 9999.
Decimal point: Selectable as XXX.X o XX.XX
Input impedance: 150Ω

Voltage linear input
0..5Vcc o 0..10Vcc, user configurable
Range: Selectable between –999 y 9999.
Decimal point: Selectable as XXX.X o XX.XX
Input impedance: > 1MΩ

Control output
SPDT relay(2A@250 Vca, resistive load) or 9Vdc pulses (open collector, max. 40 mA), user configurable.
- As an option:
Current loop output: 0..20mA , 4..20mA (500Ω max. load)
0..5 Vcc , 0..10 Vcc (20mA máx. load)
- open/close relays for servomotor (2 relays SPDT) -excludes The cooling output-

Cooling output (option)
SPDT relay (2A@250 Vca) configurable as ON/OFF or proportional

Servomotor control (option)
By means of 2 SPDT relays (2A@250 Vca) Open/Close.

Alarm relay (2nd alarm as an option)
1 Alarm: SPST Relay (1A@250 VAC)
2 Alarms: SPST relays (1A@250 Vca)

Transmitter supply (option)
13,5 VDC (max. 22mA)

Configurable digital input
Can be configured as 'secondary setpoint' or as 'keylock' with three levels of protection.

Power supply
85..265 Vca, 50/60 Hz
-Option: 21..53 Vca/Vcc

Consumption
8VA

Room conditions
Operating: 0..50°C
Storage: -10..60°C
Humidity: 0..95 % HR without condensation

Protection degree
IP50 in the front

Case
ABS self extinguishing

Dimensiones
48 x 96 x 98 mm.

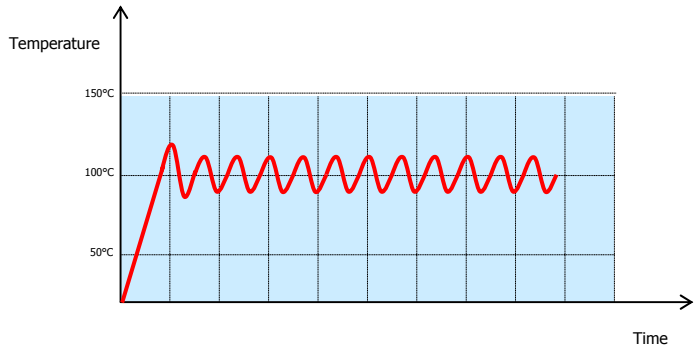
Panel cutoff
45,5 x 91,5 mm. (+/- 0,5 mm.)

Weigth
140 grs.

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.



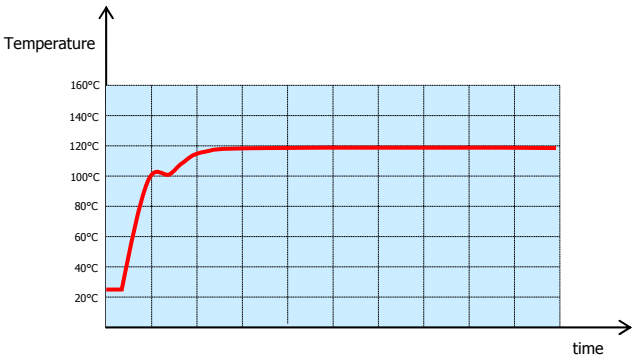
PID Control
On the PID control mode, the controller output is the result of the three control actions added: Proporcional, Integral and Derivative. The controller output will vary from 0 to 100% as a result of this combination.

PI+D Control
The PI+D control mode works very similar to the PID but in this case only the Pb (Proporcional 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%.

AUTOTUNING

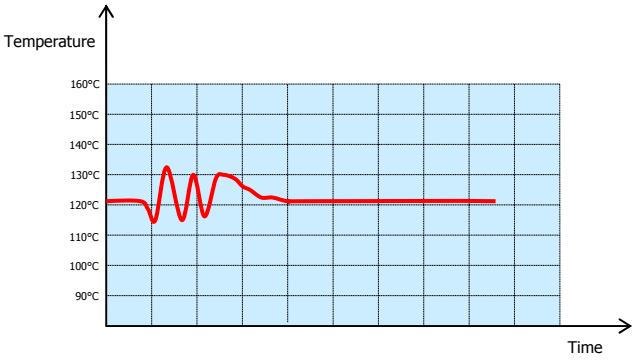
"Step Response" autotuning

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 aceptable by the process.



SERIAL COMMUNICATIONS

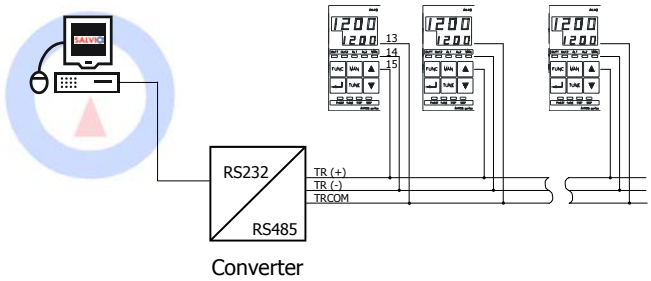
The communications interface is RS485 (isolated), 2 wires + common, half duplex.

OPTIONS

<u>The options have to be installed in the SALVIO facilities and cannot be installed by the end user.</u>

RS485 serial Communications

Allows the connexion of up to 255 units for multizone applications through MODBUS/RTU™ protocol.
The RS485 interface is: 2 wires + common , half duplex.
There is a specific instruction manual for this option.



Converter

Linear control output

The linear control output can be configured as Direct or Reverse action.

Selectable as:
0..20 mA (500Ω max) 0..5 Vcc (20 mA max)
4..20 mA (500Ω max) 0..10 Vcc (20 mA max)

Linear retransmission

The linear retransmission can be configured as Direct or Reverse. The range of retransmission can be also programmed by the user.

Selectable as:
0..20 mA (500Ω max) 0..5 Vcc (20 mA max)
4..20 mA (500Ω max) 0..10 Vcc (20 mA max)

Remote Setpoint input

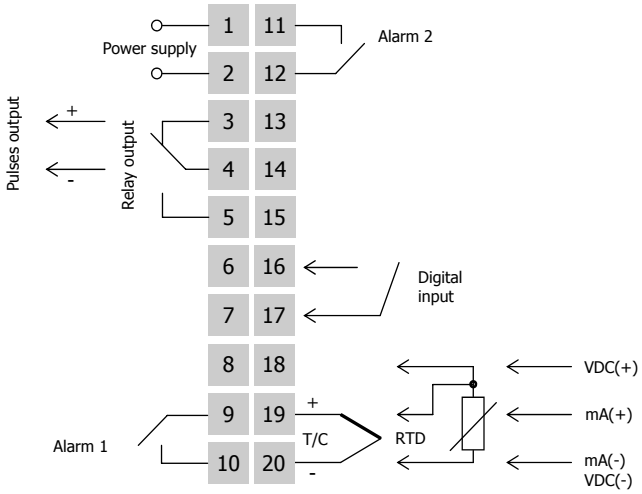
The range of the Remote Setpoint can be programmed by the user.

Selectable as:
0..20 mA (500Ω max) 0..5 Vcc (20 mA max)
4..20 mA (500Ω max) 0..10 Vcc (20 mA max)

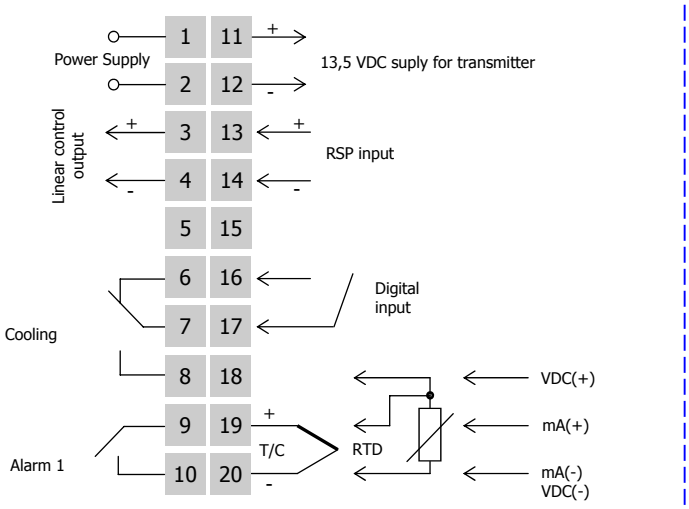
Transmitter supply

The model AK49 can provide a 13,5VDC supply for an external transmitter.

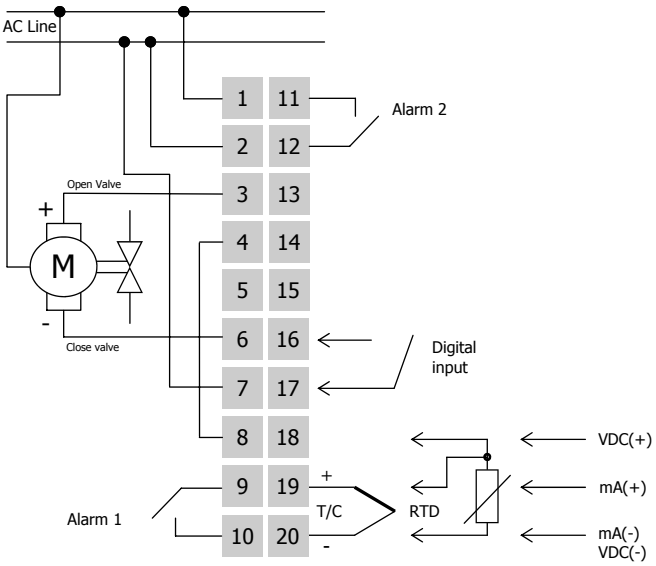
Basic Wiring



Some options wiring



Servomotor control wiring



ORDERING CODE

Model	Control output	Base Options	Linear output (*)	Interface (*)	Power supply
	1: Relay/ Pulses 3: 0..20mA 4: 4..20mA 5: Servomotor 6: 0..5 Vcc 7: 0..10 Vcc	1: One alarm 2: Cooling + one alarm 3: Two alarms 4: Cooling + two alarms	0: None 3: 0..20mA 4: 4..20mA 6: 0..5 Vcc 7: 0..10 Vcc 9: 13,5 VDC transmitter supply	0: None 2: RS485 3: RSP,0..20mA 4: RSP,4..20mA 6: RSP,0..5 VDC 7: RSP,0..10 VDC 9: 13,5 VDC transmitter supply	1: 85..265 VAC 50/60 Hz 2: 21..53 VAC/VDC
AK49	5	1	4	4	1

(*) If a Linear output is selected in conjuction with an Interface, the Base Option 3 (Two alarms) and 4 (Cooling + two alarms) are excluded

Ejemplo: AK49-51441

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SALVIO

1/4 DIN Process controller

AK96

The model AK96 is a 96x96mm process controller with advanced features.
The user can choose among 13 different input probes including linear inputs. The control output can also be selected by the user.

APPLICATIONS

The **Akros** series is a family of instruments suited for critical applications where control stability is an issue. Due to its wide range of options, the AK96 becomes an universal process controller for all kind of industrial applications.

GENERAL FEATURES

As Standard:

Universal input
Fully configurable input as thermocoule, RTD, current llop or voltage

Configurable control output
The control output can be configured by the user as SPDT relay or DC pulses for SSR

Alarms
It comes with one SPST relay alarm as standard and can be equipped with a second relay alarm as an option. The alarms action is fully configurable

Operation mode
Automatic or Manual

Three control types
The user can select among three different control actions: ON/OFF, PID or PI+D (PI with automatic derivative action). PID and PI+D include two differente autotuning algorithms

Keylock
The instrument provides three levels of protection through the keylock function

Wiring
the wiring is through screws in the rear of the case

Options:
Fully configurable second alarm
Cooling output configurable as ON/OFF or proportional action
Current loop control output : 0..20mA, 4..20mA (max. 500Ω)
0..5Vcc, 0..10Vcc (max. 20mA)
Power supply for current loop transmitter 20mA (@13,5 Vcc)
Control output for servomotors
Linear retransmission:
0..20mA , 4..20mA (max. 500Ω) the range is user configurable
0..5 Vcc , 0..10 Vcc (max. 20mA) the range is user configurable
Remote Setpoint (0..20mA, 4..20mA, 0..5 Vcc, 0..10 Vcc)
the range is user configurable
MODBUS/RTU RS485 communications

SPECIFICATIONS

Case
1/4 DIN 43700 (96x96 mm.), front removable

Display
4 red 7 seg. Led, 13 mm for the process variable
4 green 7 seg. Led, 10 mm for setpoint value

Thermocouple input
User configurable:
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 accuracy: better than 0,5°C after 30 minuts
Resolution: 1°C
Accuracy: +/- 1 digit
Units: °C o °F
Resolution: 20000 points
Accuracy: better than +/- 0,25% FSV

RTD input
Scale : 0..600°C Pt100 (IEC751)
Configuration: 3 wires
Resolution: 1°C
Units: °C o °F
Resolution: 20000 points
Accuracy: better than +/- 0,3°C in the –99..200,0°C scale
and +/-1°C in the 0..600°C scale

Current loop input
0..20mA o 4..20mA , user configurable
Range: Selectable between –999 y 9999.
Decimal point: Selectable as XXX.X o XX.XX
Input impedance: 150Ω

Voltage linear input
0..5Vcc o 0..10Vcc, user configurable
Range: Selectable between –999 y 9999.
Decimal point: Selectable as XXX.X o XX.XX
Input impedance: > 1MΩ

Control output
SPDT relay(2A@250 Vca, resistive load) or 9Vdc pulses (open collector, max. 40 mA), user configurable.
<u>- As an option:</u>
Current loop output: 0..20mA , 4..20mA (500Ω max. load)
0..5 Vcc , 0..10 Vcc (20mA máx. load)
- open/close relays for servomotor (2 relays SPDT) -excludes The cooling output-

Cooling output (option)
SPDT relay (2A@250 Vca) configurable as ON/OFF or proportional

Servomotor control (option)
By means of 2 SPDT relays (2A@250 Vca) Open/Close.

Alarm relay (2nd alarm as an option)
1 Alarm: SPST Relay (1A@250 VAC)
2 Alarms: SPST relays (1A@250 Vca)

Transmitter supply (option)
13,5 VDC (max. 22mA)

Configurable digital input
Can be configured as 'secondary setpoint' or as 'keylock' with three levels of protection.

Power supply
85..265 Vca, 50/60 Hz
-Option: 21..53 Vca/Vcc

Consumption
8VA

Room conditions
Operating: 0..50°C
Storage: -10..60°C
Humidity: 0..95 % HR without condensation

Protection degree
IP50 in the front

Case
ABS self extinguishing

Dimensiones
48 x 96 x 98 mm.

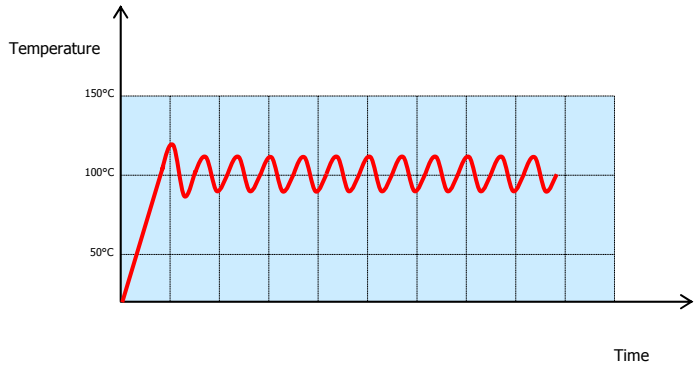
Panel cutoff
94 x 91,5 mm. (+/- 0,5 mm.)

Weigth
140 grs.

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.



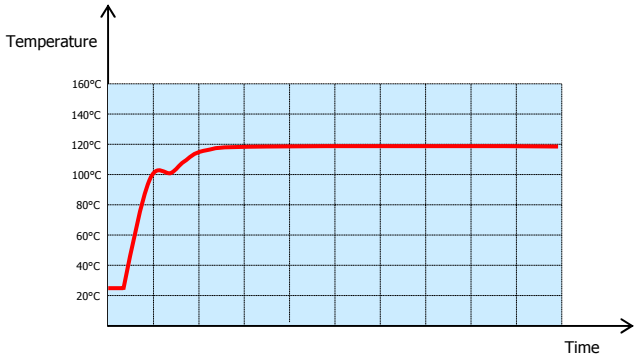
PID Control
On the PID control mode, the controller output is the result of the three control actions added: Proporcional, Integral and Derivative. The controller output will vary from 0 to 100% as a result of this combination.

PI+D Control
The PI+D control mode works very similar to the PID but in this case only the Pb (Proporcional 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%.

AUTOTUNING

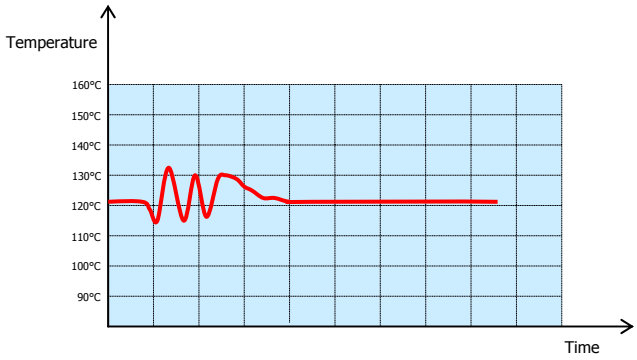
"Step Response" autotuning

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 aceptable by the process.



SERIAL COMMUNICATIONS

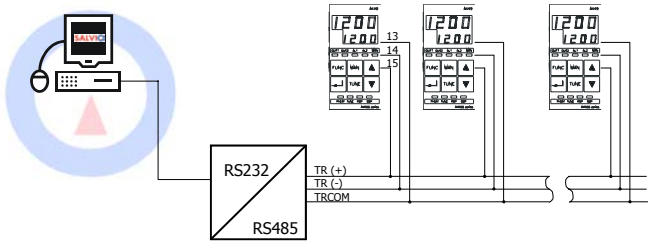
The communications interface is RS485 (isolated), 2 wires + common, half duplex.

OPTIONS

<u>The options have to be installed in the SALVIO facilities and cannot be installed by the end user.</u>

RS485 serial Communications

Allows the connexion of up to 255 units for multizone applications through MODBUS/RTU™ protocol.
The RS485 interface is: 2 wires + common , half duplex.
There is a specific instruction manual for this option.



Convertidor

Linear control output

The linear control output can be configured as Direct or Reverse action.

Selectable as:

0..20 mA (500Ω max)	0..5 Vcc (20 mA max)
4..20 mA (500Ω max)	0..10 Vcc (20 mA max)

Linear retransmission

The linear retransmission can be configured as Direct or Reverse. The range of retransmission can be also programmed by the user.

Selectable as:

0..20 mA (500Ω max)	0..5 Vcc (20 mA max)
4..20 mA (500Ω max)	0..10 Vcc (20 mA max)

Remote Setpoint input

The range of the Remote Setpoint can be programmed by the user.

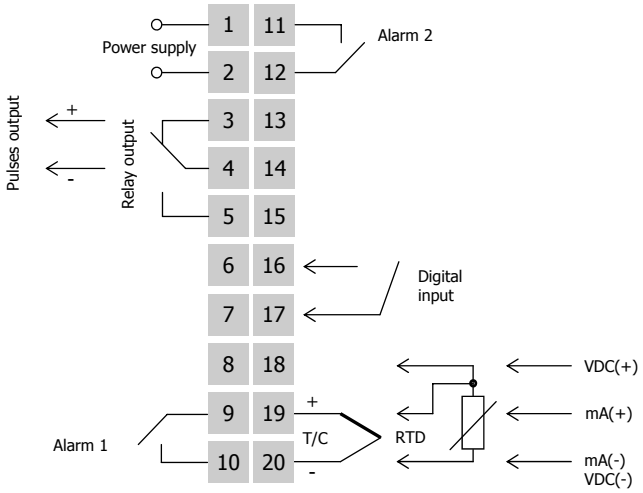
Selectable as:

0..20 mA (500Ω max)	0..5 Vcc (20 mA max)
4..20 mA (500Ω max)	0..10 Vcc (20 mA max)

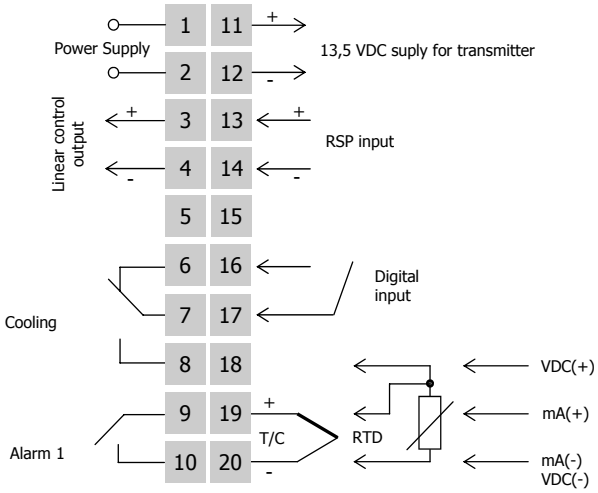
Transmitter supply

The model AK49 can provide a 13,5VDC supply for an external transmitter.

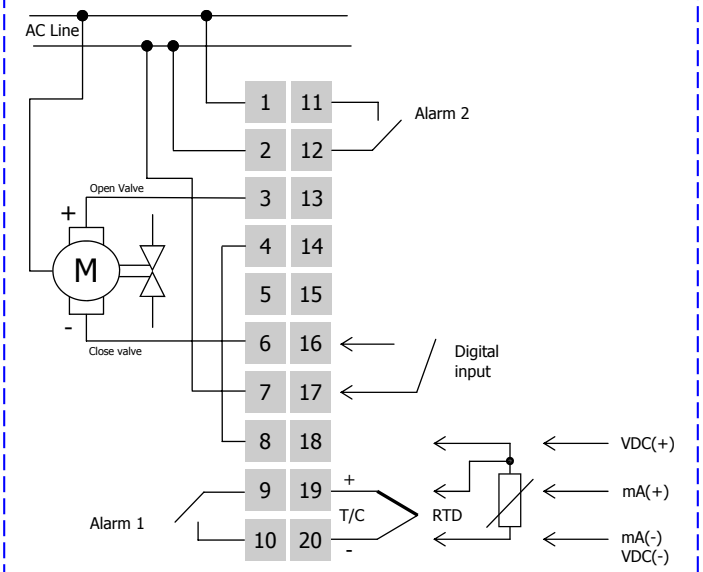
Basic Wiring



Some options wiring



Servomotor control wiring



ORDERING CODE

Model	Control out-put	Base options	Linear output (*)	Interface (*)	Power supply
	1: Relay/Pulses 3: 0..20mA 4: 4..20mA 5: Servomotor 6: 0..5 Vcc 7: 0..10 Vcc	1: One alarm 2: Cooling + one alarm 3: Two alarms 4: Cooling + two alarms	0: None 3: 0..20mA 4: 4..20mA 6: 0..5 Vcc 7: 0..10 Vcc 9: 13,5 VDC transmitter supply	0: None 2: RS485 3: RSP,0..20mA 4: RSP,4..20mA 6: RSP,0..5 VDC 7: RSP,0..10 VDC 9: 13,5 VDC transmitter supply	1: 85..265 VAC 50/60 Hz 2: 21..53 VAC/VDC
AK96	5	1	4	4	1

(*) If a Linear output is selected in conjuction with an Interface, the Base Option 3 (Two alarms) and 4 (Cooling + two alarms) are excluded

Example: AK96-51441

SALVIO BUSQUETS , S.A.
Les Corts, 10
08349– CABRERA DE MAR (BARCELONA)
Tel: (+34) 937566234 Fax: (+34) 937566046
www.salbus.es

SALVIO

Dual loop process controller

AK20

The model AK20 is a dual independent loops process controller. It works with the MODBUS/RTU protocol. A configuration software under Windows is also an available tool.

APPLICATIONS

The AK20 has been specifically designed for multizone aplications. On plastics processing application it can be very useful to control all the zones of an extruder. It can also be configured to work as a hot runner temperature controller in injection moulding processes.

GENERAL FEATURES

Input
Two fully configurable channels as thermocouple, RTD, current loop or voltage.

Configurable control output
Each control output can be configured as DC pulses, servomotor (together with the AK21 module), linear (with the AK25 module) or hot runner temperature controller in injection moulding applications.
Each control loop has a second control output which can be used for the cooling fuction with a proportional or ON-OFF action..

Alarms
Each instrument has 4 logic alarms which can be associated to any of both control loops. It has 2 physical outputs which can be configured as the combination of the logic alarms.

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 control PID or PI+D parameters per each loop.
On each control loop it can be configured and enabled the ramp or segment programmer function.

Autotuning
It has 2 different autotuning algorithms, the 'step-response' on 'relay feedback' which can be chosen, according to the type of process, to optimize the control permormance.

Multifunctional digital input
The **AK20** has a digital input which can be used for different options such secondary set point activation or 'stop loop'.

Transmitter power supply (TPS)
24 Vdc for current or volatge transmitters.

Options
- SPST relay on the main control output.
- Two 'plug and play' analog output that the instrument will identify automatically (**AK25 module**). They can be configured as the control output, signal retransmission or any value given through the serial communications port. These outputs can linked to either loop or both to the same loop.

SPECIFICATIONS

Format
DIN rail mounting.

Display
10 status Led.

Thermocouple input
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 input
2 user configurable ranges:
-100,0..200,0°C Pt100 (IEC751)
-200..600°C Pt100 (IEC751)
3 wire connection
Measuring resolution: 14 bit
Accuracy:
Better than +/- 0,3°C on –100,0..200,0°C range
and +/-1°C on –200..600°C range

Current input
Input signal: 0..20mA o 4..20mA , user configurable
Range: -9999...9999 unit
Input impedance: 150Ω

Voltage input
Input signal: 0..5Vdc o 0..10Vdc, user configurable
Range: -9999...9999 units
Input impedance: 1 MΩ

Control output
2 open collector output on each loop maximum 250mA @ 30Vdc
Optionally:
- SPST relay output (2A @ 250Vca) on each control loop
- Analog output by means of the AK25 module. Galvanically isolated.
Configurables as 0..20mA, 4..20mA, 0..5V o 0..10V

Alarm output
One SPST relay alarm output (1A @ 250Vca) on each control loop with a common wire. Fully configurable.

Transmitter Power Supply (TPS)
24 Vdc (max. 22mA)

Control type
PID or PI+D, with 2 user selectable autotuning algorithms, or ON - OFF.

Digital input
Can be configured as 'stop loop' or 'secondary set point'

Communications
Type 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
21..53 Vca / Vdc (50/60 Hz)

Consumption
8 VA

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
55 x 109,5 x 75 mm

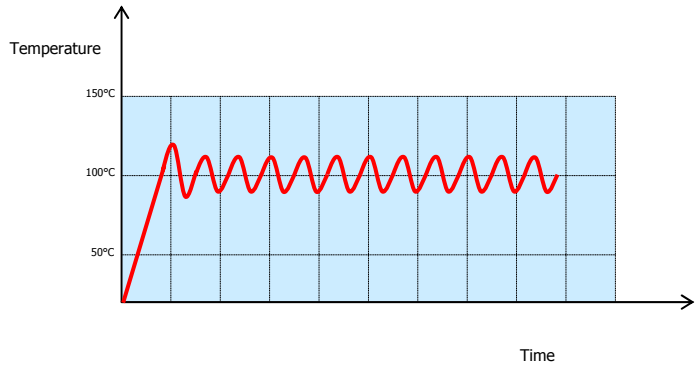
Weight
140 grs.

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.

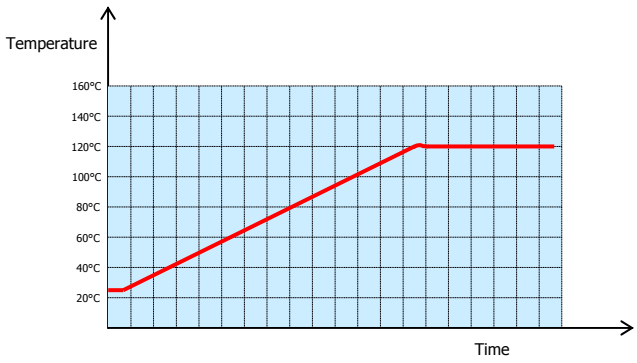


PID Control
On the PID control mode, the controller output is the result of the three control actions added: Proporcional, Integral and Derivative. The controller output will vary from 0 to 100% as a result of this combination.

PI+D Control
The PI+D control mode works very similar to the PID but in this case only the Pb (Proporcional 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%.

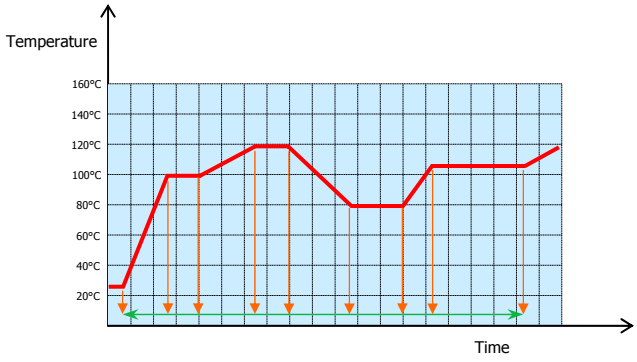
Ramp function

By means of the RATE parameter can be configured a units change per minute to assure an aproximation 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.

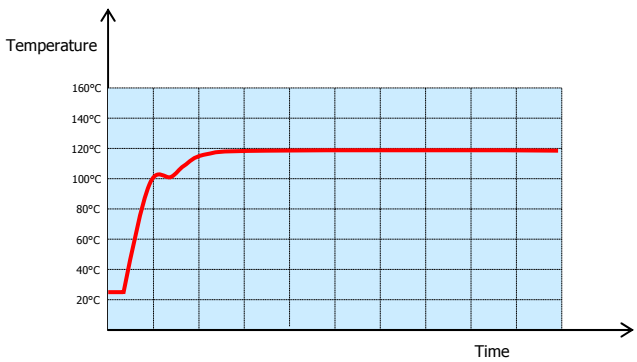


DIFFERENT AUTOTUNING

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

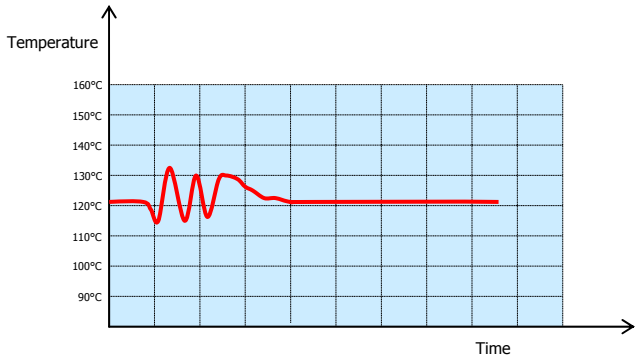
"Step Response" autotuning

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 Pb, Ti and Td parameters, the PID parameters by measuring the overshoot and the response time.



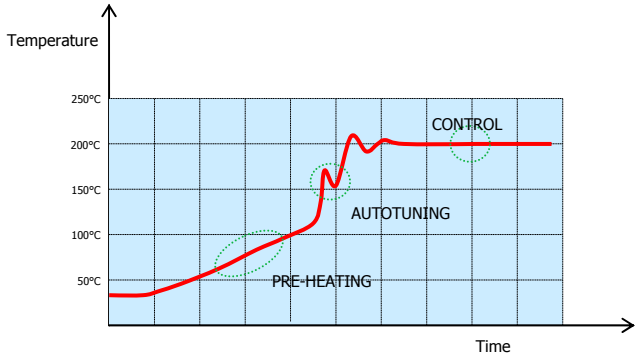
"Relay Feedback" autotuning

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 aceptable by the process.



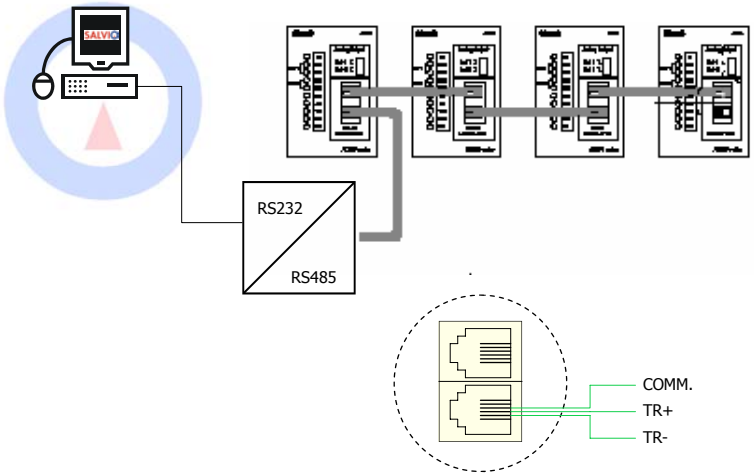
Autotuning on plastic injection moulding applications

The **AK20** is equipped with an advanced and proven pre-heating 'SALVIO' algorithm to eliminate the moisture in the heating elements.
The controller doses the output to the load to increase step by step the temperatura without damaging the heater.

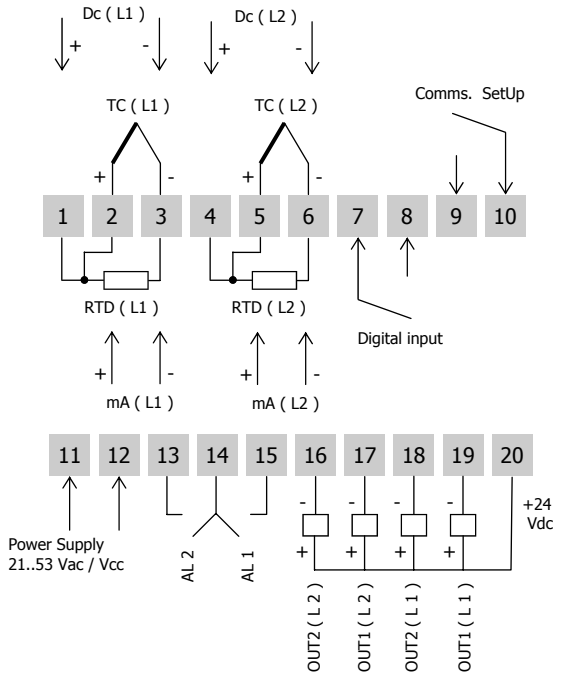


SERIAL COMMUNICATIONS

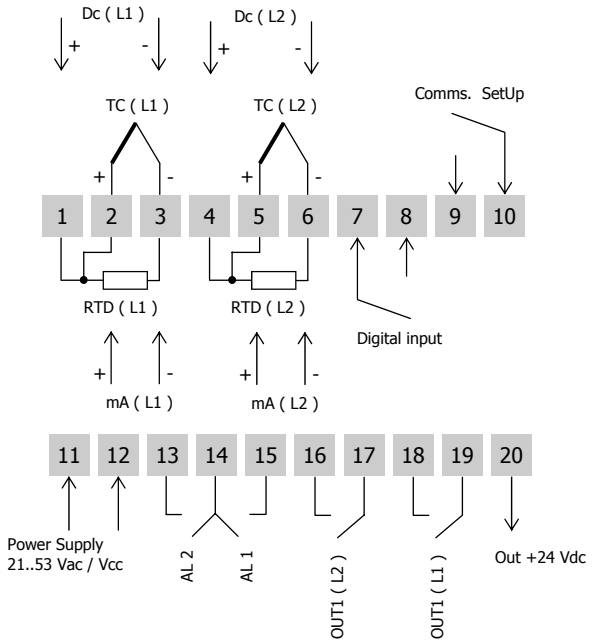
The communications interface is RS485, 2 wires + common, half duplex.



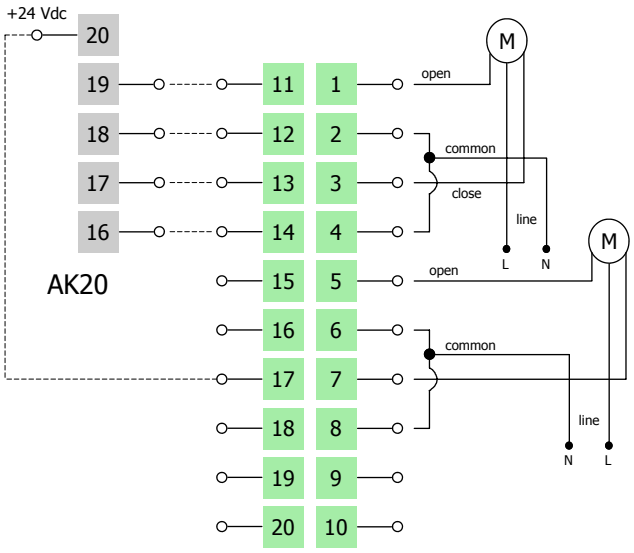
DC voltaje pulses output



Relay control output



Servomotor output



AK21 module

AK20 ACCESSORIES

The **AK20** family is completed with several accessories.
The **AK21** model is an output passive relay to be mounted on DIN rail. The purpose of this module is to increase the AK20 control output capability. These ar free voltage relays.
The model **AK25** is an option card which increases the **AK20** capabilities. It can be configured via modbus commands.
The **IFC** is the bus link to link several AK20 in the same communications bus.

Specifications AK21

Format
DIN rail mounted.
Suply
Takes the power from the **AK20**
Dimensions
55 x 109,5 x 75 mm.
Output
4 SPST relays (2A @ 250 Vca)
Room conditions
Working: 0..50°C
Storage: -10..60°C
Humidity: 0..95% HR non condensing.
Weight
200 grs.

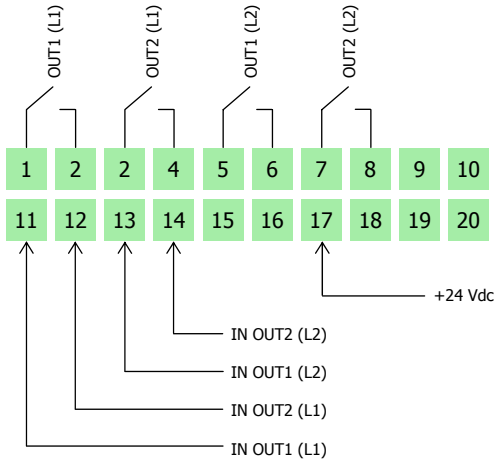
Specifications AK25

Power Supply
It takes the power from the **AK20**.
Dimensions
It is mounted inside the **AK20** controller by menas of an internal connector.
Output
2 galvanically isolated outputs
Configurable as: 0..20mA, 4..20mA, 0..5V or 0..10V
Max. Load: 500Ω in mA or 20mA in Vdc
Configuration:
By jeans of DIP switches. By means of modbus commands they can be assigned to any channel and any function.

Specifications IFC cable

Interface cable to link several **AK20** in the same communications bus.
Standard length
140mm. (other Ander request).
Connector
RJ11 connector on both ends.

AK21 relay module wiring



Ordering code

Model	
AK21	Unique model
AK25	Unique model
IFC	Unique model

Ordering code

Model	Options
	0: DC pulses control output **1**: DC pulses control output with AK25 analog output module embebed **2**: Relay control output **3**: Relay control output with AK25 analog output module embeded
AK20	0

Example: AK20-2

SALVIO

Dual Loop Controllers and I/O Modules

AK70 series

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 furnaces, ovens, dryers, packaging machinery, plastic processing industry and in particular for OEM's.

Contact SALVIO for any specific HMI you may need. Our technical staff will design the application according 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 o 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 outpus 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 permormance.

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 separatelly- 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..600ºC
RTD Pt100 2/3 wires, -99,9..200,0ºC
Accuracy: better than 0,3ºC (-99,9..00,0ºC) or 1ºC (-200..600ºC)

RTD Pt1000 input option
User configurable as:
RTD Pt1000 2/3 wires, -200..600Cº
RTD Pt1000 2/3 wires, -99,9..200,0º
Accuracy: better than 0,3ºC (-99,9..200,0ºC) or 1ºC (-200..600ºC)

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

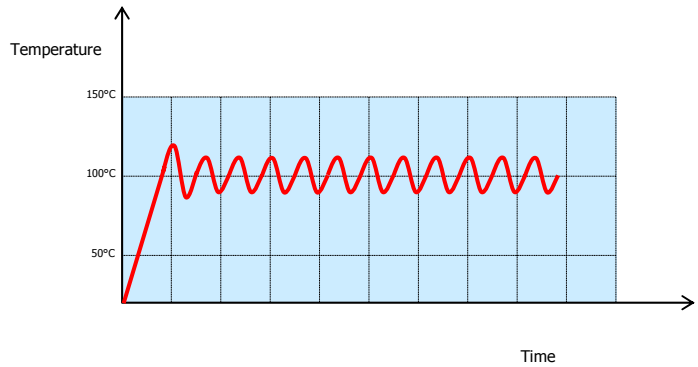
Weight
Models with DC pulses as output option: 98 gr
Models with relay or analog output as option: 140 gr

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.

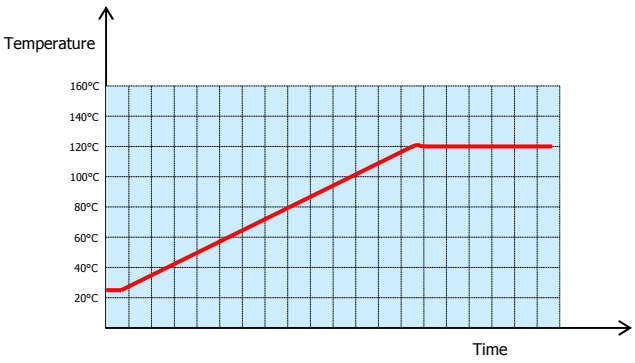


PID Control
On the PID control mode, the controller output is the result of the three control actions added: Proporcional, Integral and Derivative. The controller output will vary from 0 to 100% as a result of this combination.

PI+D Control
The PI+D control mode works very similar to the PID but in this case only the Pb (Proporcional 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%.

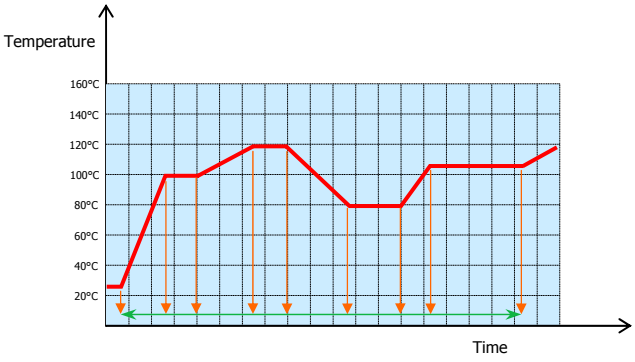
Ramp function

By means of the RATE parameter can be configured a units change per minute to assure an aproximation 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.

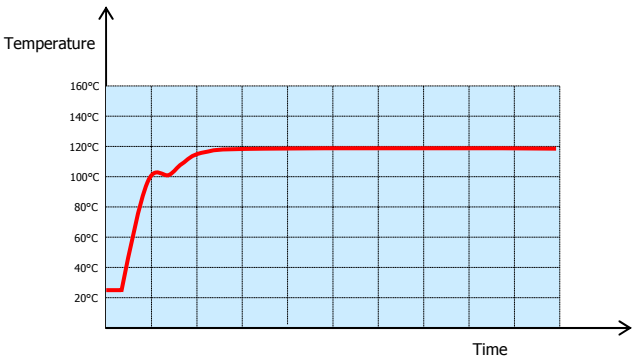


DIFFERENT AUTOTUNING

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

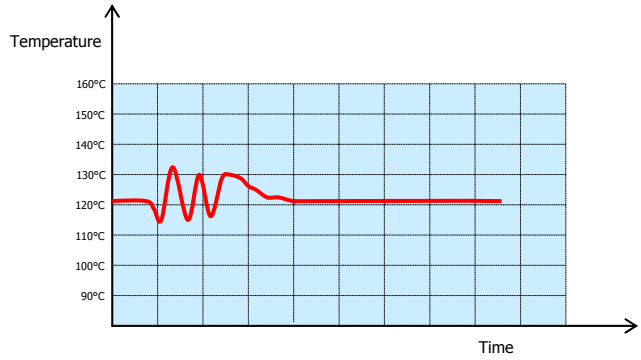
"Step Response" autotuning

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.



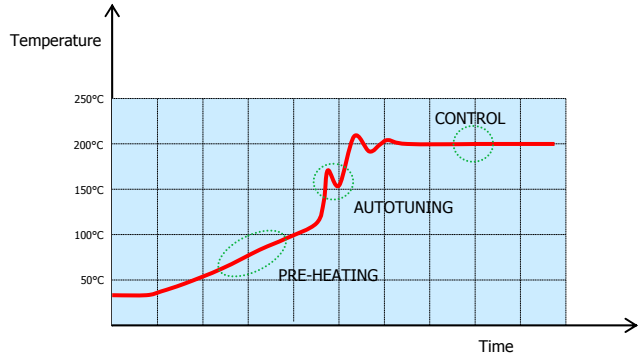
"Relay Feedback" autotuning

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 aceptable by the process.



Pre-heating for plastic injection moulding applications

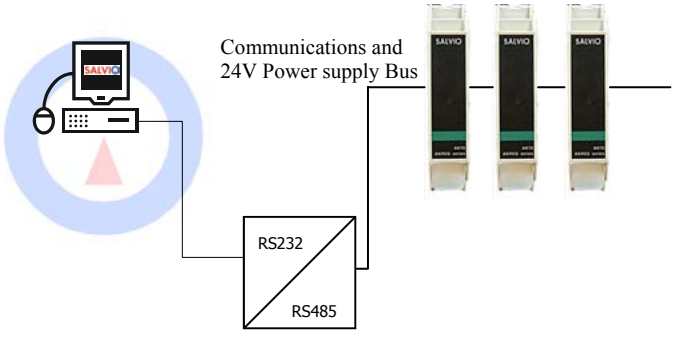
The **AK70** is equipped with an advanced and proven pre-heating 'SALVIO' algorithm to eliminate the moisture in the heating elements.
The controller doses the output to the load to increase step by step the temperatura without damaging the heater.



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 measuremnt 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 MEASUREMENT MODULE 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

Dimmensions
17,5 x 99 x 93 mm

Weight
98 gf

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

Dimmensions
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 MODULE SPECIFICATIONS

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

Dimmensions
35 x 99 x 93 mm

Weight
140 gr

CE conformity (in industrial and commercial environment)

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	**3** - Relay for heating + relay for cooling + relay for alarm - Open/Close relay for servovalve + relay for alarm
	4 - 0/4 .. 20 mA	**4** - 0/4.. 20mA (heating only) + relay for alarm - Linear retransmission
	6 - 0 .. 5/10V	**6** - 0 .. 5/10V (heating only) + relay for alarm - Linear retransmission
	8 - Current measurement module (5 heaters)	**8** - 6 relays SPST (Relays Module)
Accessories		
CT-7025	25A Current Transformer	
CT-7050	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.
CT-7050 50A Current transformer

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

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