AGEON
Electronic Controls

A104

Digital temperature controller

Vx.x.4
Rev. 02

User guide

A104

Product description

The A104 model is an automatic electrical temperature sensing controller intended to refrigeration systems without defrosting and that require a voltage monitor. It is widely used in milk cooling tanks because, in addition to controlling the compressor, it can controll the stirrer functioning.

A major A104 competitive differential is the voltage monitor, that can detect possible variations in the power line and actuate the controller protection, if programmed so.

The A series drivers have a number of features at disposal, such as thermometer mode, standby mode, connectivity with FastKey for easy recording and support for WEB communication via the Arcsys monitoring system (through a USB to RS485 converter).

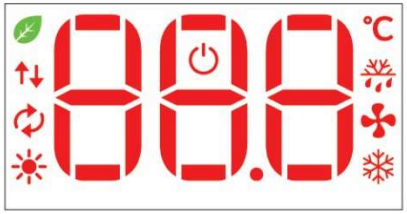
Specifications

Power supply voltage	220 Vac (± 10 %)
Rated power	2 VA
Relay outputs	Compressor (10 A / 250 Vac) Stirrer (10 A / 250 Vac) **Note: The sum of the currents cannot exceed 18 A**
Measurement range	(-50 to +100) °C
Resolution	0,1 °C (within the range: -50 ºC to +100 ºC)
Operating conditions	(0 to 40) °C and (10 to 80) % RH (noncondensing)
Panel cutout	(70 x 29) mm (± 5%)
Protection index	IP 65 (front panel)
NTC Sensor (IP68)	Ø6 mm / L=15 mm (sensor) Standard length 2,5 m (wiring)

Applications

The A104 model is recommended for milk cooling tanks or refrigeration systems that do not use natural or forced defrosting, but require a voltage monitor for protection.

Display



A104 display

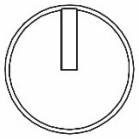
Display icons

LED	Description
	- Off during normal operation. - On if the controller is in thermometer or Stand-by modes.
	- Not used on this model
	- On when the programming key is being used. - Flashing if communicating with ArcSys (remote monitoring system).
	- On when relay 2 (stirrer) is active.
	- Not used on this model
	- On if the information shown on the display is a temperature in degrees Celsius
	- Not used on this model
	- Not used on this model
	- On when the relay 1 (refrigeration) is active. - Slowly flashes when the relays are waiting to be switched on/off for any time defined by the parameters **r9**, **C1** or **C2**.

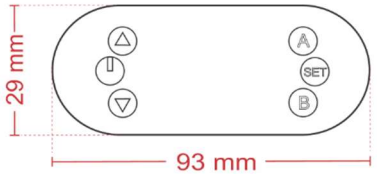
User interface

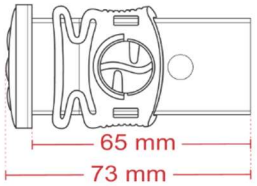
A104 interface

Key functions

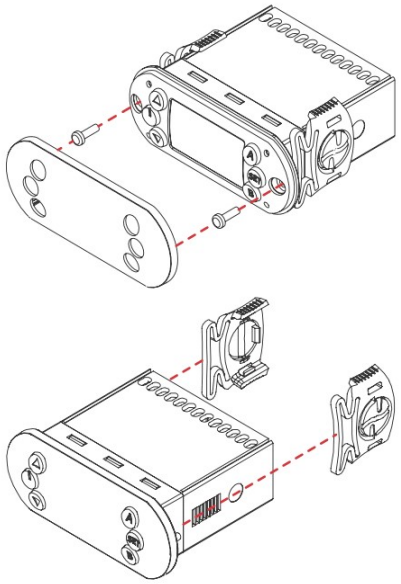
Key	Description
	- Used to increment values. - If pushed together with the **down** key for 4 seconds, the controller will enter or exit the parameters setting list.
	- Used according to the value in the **FP** parameter: 0 - Key disabled 1 - Turn on/off Standby mode 2 - Turns on/off thermometer mode **NOTE: Use this function responsibly. In certain applications, disconnecting loads may spoil/damage the products.**
	- Used to decrement values - If pushed on the initial screen, it displays the power line voltage. - If pushed together with the **up** key for 4 seconds, the controller will enter or exit the parameters setting list.
	- If pushed, the display will show the highest and lowest voltage values (**uL** and **uH**). If pressed again, it will redefine the voltage historical data; - If pushed in the parameters setting list, with **Cd** = **97**, it will reset the parameters to factory default.
	- Used to show the setpoint on the initial screen and the values in the parameters setting list. - Along with the **up** and **down** keys, adjust values of the setpoint and parameters.
	- If pushed, the display will show the highest and lowest temperature values (**tH** and **tL**). If pushed again, it will redefine the temperature historical data. - If pushed in the parameters setting list, the firmware version will be displayed. - If on the test mode (test mode is when parameter **Cd** = **77**), activates the compressor relay.

Dimensions





Fixing



Fixing methods

NOTE: When making the cut, take into account the thickness of the paint/varnish that will be used.

Recommendations and warnings

If the controller has to be removed, detach the two side clips and pull the controller out. In case the fixing method chosen was by screws, remove the front display protection, remove the screws and pull the controller out.

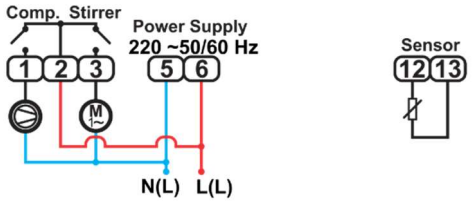
It is recommended to check the tightness of the terminal screws and condition of the wires every 6 months.

It is recommended that the handling and installation of the equipment are carried out by qualified personel.

Connections must be done with suitable connectors for better fixing to the terminals. Before energizing the device, make sure all the connections are correct, otherwise, irreparable damage may be inflicted.

Never subject the system elements to a temperature outside the operating range (0 to 40 °C for the controller and -50 to 100 °C for the NTC sensors), as this could also cause irreparable damage.

Terminal connections



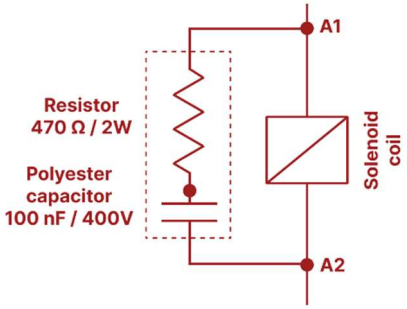
Rear view of the device

Step-by-step installation at 220 V:

1) Power supply: Terminals 5 and 6;
2) Jumper from terminal 6 to terminal 2;
3) Compressor: Terminals 1 e 5;
4) Stirrer: Terminals 3 and 5;
5) Sensor: Terminals 12 and 13.

Noise filtering

When using the controller to manage inductive loads such as solenoid coils, contactors, motors or re-lays, it is recommended to install a noise filter circuit in parallel with the load terminals (A1 and A2), as described below.



Noise filtering diagram

Parameters table

Parameter		Values	Default value
Cd	Access code	0 to 999	0
	Temperature control		
SP	Setpoint	(r1 to r2) °C	0
r0	Differential (hysteresis)	(0.1 to +20) °C	3.0
r1	Setpoint lower limit	(-50 to SP) °C	-50
r2	Setpoint upper limit	(SP to 100) °C	100
r9	Delay for device starting	(0 to 20) min	1
	System protection		
C1	Delay after compressor relay acting	(0 to 20) min	0
C2	Delay after compressor relay disarming	(0 to 20) min	2
C3	Percentage of relay operation in case of “E1” error (time base: 10 min)	(0 to 100) %	50
d1	Time period with the stirrer off during a cycle	(0 to 999) min	10
d2	Time period with the stirrer on during a cycle	(0 to 999) min	5
u1	Minimum voltage allowed	(90 to u2) Vac	190
u2	Maximum voltage allowed	(u1 to 285) Vac	250
u3	Delay for the voltage protection acting	(0 to 60) sec	5
u4	Stirrer off during active protection	YES or no [1]	no
	Full mode **The parameters below appear only if Cd = 38**		
	Key control		
FP	Power key function	0,1 or 2	0
bt	Block of settings changes 10 s after the last use of the keyboard	(oFF, 1 or 2)	oFF
	Arcsys		
Ed	Network address [1]	0 to 32	4
bU	Block settings changes via WEB (ArcSys and Cloud)	YES or no	no
	Temperature alarm		
A0	Temperature alarm differential (Hysteresis)	(0.1 to 20.0) °C	3.0
A1	Minimum temperature alarm	(-50 to A2) °C	-50
A2	Maximum temperature alarm	(A1 to 100) °C	100
A3	Start-up alarm delay	(0 to 999) min	99
A4	WEB notification frequency (ArcSys and Cloud)	(0 to 240) min	0
	Other adjustments		
FL	Digital temperature filter	1 to 40	3
r4	Temperature sensor calibration (offset)	(oFF, -15.0 to +15.00) °C	0.0
u6	Voltage sensor calibration (offset)	(oFF, -60.0 to +60.00) V	0.0
C9	Delay between relay activations	(1 to 240) sec	1
tL	Lowest temperature (historical minimum temperature) [2]	(-50 to 100) °C	-
tH	Highest temperature (historical maximum temperature) [2]	(-50 to 100) °C	-
uL	Lowest voltage (historical minimum voltage) [2]	-	-
uH	Highest voltage (historical maximum voltage) [2]	-	-
	Notes		
[1]	**Visible and adjustable only on the controller and programming key, on Arcsys it will be only visible (not adjustable)**		
[2]	**View only**		

Parameters description

Cd – Access code: the parameters must be unlocked so they can be adjusted. To unlock them, enter the value **28** in **Cd** for the simplified parameterization mode or **38** for the full mode. If it is not done, the parameter values can only be viewed, but not changed. This parameter prevents unauthorized people from changing the programmed values.

SP – Setpoint: temperature value that the user wants to obtain with the system/milk. **NOTE: The Setpoint can be changed either through this parameter or on the initial screen with the "Set" key.**

r0 – Differential (Hysteresis): the value of this parameter controls the operation of the relay, that is, it defines the temperature difference at which the relay will turn on/off. For example, if the device is configured with setpoint = **5 ºC** and **r0 = 2 ºC**, the relay remains activated until the temperature reaches 5 ºC, then, it turns off. It only turns on again when the temperature reaches 7 ºC (5 ºC + 2 ºC).

r1 – Setpoint lower limit: defines the lowest temperature value the user can assign to the Setpoint. Prevents a value below the recommended temperature limit from being applied to the system.

r2 – Setpoint upper limit: defines the highest temperature value the user can assign to the. Prevents a value above the recommended temperature limit from being applied to the system.

r9 – Delay for device starting: defines a period after energizing the device in which all relays remain off. During this time, the device will only indicate the temperature value. This parameter protects the compressor from constant starts in case of power surges (consecutive power outages). It is also used in large refrigeration systems to prevent simultaneous activation of compressors when returning from a power failure.

C1 – Delay after relay switching on: after activating the relay, it will remain on regardless of the temperature, for the period defined in **C1**. This parameter prevents voltage spikes in the power line.

C2 – Delay after relay switching off: after turning off the relay, regardless of the temperature, it will remain off for the period defined in **C2**.

C3 – Percentage of relay operation in case of "E1" error: if a problem occurs with the sensor (error E1), the relay will be activated cyclically and this parameter defines the percentage of 10 minutes that the relay will remain on. For example, 50% of 10 minutes is 5 minutes.

d1 – Time period with the stirrer off during a cycle: this parameter defines (in minutes) the time that relay 2 (stirrer) will remain off. After switching on, it will remain on for the time programmed in **d2**.

d2 – Time period with the stirrer on during a cycle: this parameter defines (in minutes) the time that relay 2 (stirrer) will remain on. After switching off, it will remain off for the time programmed in **d1**.

u1 – Minimum voltage allowed: in this parameter, the user determines the minimum operating voltage for the voltage control.

u2 – Maximum voltage allowed: in this parameter, the user determines the maximum operating voltage for the voltage control.

u3 – Delay for the voltage protection acting: when turning on the system, voltage control will be inactive for the time programmed in this parameter.

u4 – Stirrer off during active protection: the user can choose, with this parameter, whether the agitator will be on if any voltage protection is active.

– Parameters available in full mode (Cd = 38) –

FP – Power key function: parameter to control the function of the power key. The values and descriptions are listed below:
- 0 – key disabled;
- 1 – key will turn off/on the system standby mode;
- 2 – key activates/deactivates thermometer mode.

bt – Block of settings changes 10 s after the last use of the keyboard: in this parameter, the user can enable a lock for 10 seconds after the last use of keyboard, where:
- oFF – function disabled;
- 1 – Blocks all changes, except the setpoint;
- 2 – Blocks all changes.

Ed – Network address: this parameter defines the device address in standard RS-485 communication with the ISX10 (Arcsys). If the system has two or more controllers, they must not have the same **Ed** value.

bU – Block settings changes via WEB (ArcSys and Cloud): this parameter, when set to **YES**, prevents changes to controller parameters from being made via Arcys/Cloud.

A0 – Temperature alarm differential (Hysteresis): this parameter defines the alarm temperature differential. In other words, how many degrees the temperature must be above the parameters **A1** or below **A2** so the alarm shuts off after activated.

A1 – Minimum temperature alarm: sets the lower alarm limit. If this limit is reached, the display will flash and the relay output will be switched off.

A2 – Maximum temperature alarm: sets the upper alarm limit. If this limit is reached, the display will flash and the relay output will be switched off.

A3 – Start-up alarm delay: defines the time during which alarm monitoring will be deactivated after system initialization.

A4 – WEB notification frequency (ArcSys and Cloud): this parameter defines the frequency at which Arcsys/Cloud should send alert emails to the user, as long as the recipient's email is determined.

FL – Digital temperature filter: this parameter applies a filter to the temperature variation. The higher the filter value, the slower the temperature variation and the lower the filter value, the faster the variation. If the filter is at the maximum value (40), the temperature varies 0.1 ºC every 2 seconds and, if it is at the lowest value (1), the temperature varies 0.1 ºC every 0.05 seconds.

r4 – Sensor calibration (offset): the value defined in this parameter applies an offset to the temperature reading for possible deviations in the sensor's accuracy.

u6 – Voltage sensor calibration (offset): the value defined in this parameter applies an offset to the voltage reading for possible deviations in the sensor's accuracy.

C9 – Delay between relay activations: the user sets a minimum time, in seconds, for the relays to wait between activations. This parameter prevents spikes in the network due to the starting of multiple loads simultaneously.

tL – Lowest temperature (historical minimum temperature): this parameter indicates the lowest temperature recorded throughout the system's operation. **NOTE: This parameter is not adjustable, it is for viewing only (it can be redefined as wished).**

tH – Highest temperature (historical maximum temperature): this parameter indicates the highest temperature recorded throughout the system's operation. **NOTE: This parameter is not adjustable, it is for viewing only (it can be redefined as wished).**

uL – Lowest voltage (historical minimum voltage): this parameter indicates the lowest voltage recorded throughout the system's operation. **NOTE: This parameter is not adjustable, it is for viewing only (it can be redefined as wished).**

uH – Highest voltage (historical maximum voltage): this parameter indicates the highest voltage recorded throughout the system's operation. **NOTE: This parameter is not adjustable, it is for viewing only (it can be redefined as wished).**

Setting parameters

Follow the below steps to adjust the parameters, starting on the controller's initial screen (in which the temperature is indicated):

a) Keep the **up** and **down** keys pushed simultaneously for 4 seconds. At the end of the 4 seconds, **Cd** will be shown on the display;

b) With the display showing **Cd**, keep the **set** key pushed and, using the **up** and **down** keys, increase the parameter value to **28** to allow the settings in simplified mode or **38** to full mode. Then, release the **set** key and **Cd** will be displayed again;

c) Using the **up** and **down** keys, navigate until you reach the parameter that needs to be modified. When the parameter to be changed is displayed, keep the **set** key pushed and, using the **up** and **down** keys, change the values as desired. Release the **set** key so the value will be defined and you will go back to the parameters listing. The same can be done for the rest of the parameters;

d) After finishing all adjustments, keep the **up** and **down** keys pushed for 4 seconds to leave the parameters listing and return to the controller initial screen. **NOTE: Within 30 seconds, if no key is pushed, the controller will automatically leave the parameters listing.**

User access

✓ **Setpoint** – To change the system setpoint, push and hold the **set** key and adjust the value using the **up** and **down** keys (while still holding the **set** key). As soon as you reach the target setpoint, you can release the **set** key and the new setpoint will be defined. If you just want to view the setpoint value, just push and hold the **set** key.

✓ **Keyboard blocking –** Using the **bt** parameter, it is possible to configure the blocking of keys behavior.

✔ **Check controller status** – To check the operating state of the controller (whether it is refrigerating or defrosting), check which LED is on.

✔ **Standby mode –** If the **FP** parameter is set to **1**, push the power key to activate or deactivate Standby mode. In this mode, the controller switches off all relays and turns off the display.

✔ **Thermometer mode –** If the **FP** parameter is set with the value **2**, push the power key to activate or deactivate the thermometer mode. In this mode, the controller switches off all relays activation rules and just keeps the temperature indication on the display.

✔ **Voltage monitor –** The voltage monitor functionality will act in the event of unwanted voltages values noticed in the power supply terminals, as both high and low voltages can permanently damage the compressor. The **Lo** error indicates low voltage and **Hi** indicates high voltage. The attributes related to the voltage monitor can be adjusted by the parameters **u1**, **u2**, **u3**, **u4** and **u6**.

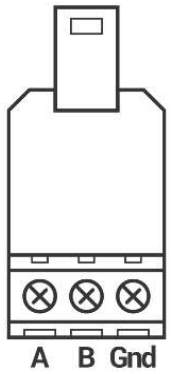
✔ **Reset parameters to default values –** To reset the controller to factory default settings, apply the value **97** to the **Cd** parameter and push the **A** key.

✔ **Historical highest and lowest voltages –** To view the highest and lowest voltages recorded by the controller, on the controller initial screen (in which the temperature is shown) push the **A** key. The controller will alternate the values on the display. If it is necessary to reset the highest and lowest voltages records, push the **A** key again during the historical temperatures displaying for about 1 second.

✔ **Historical highest and lowest temperatures –** To view the highest and lowest temperature recorded by the controller, on the controller initial screen (in which the temperature is shown) push the **B** key. The controller will alternate the values on the display. If it is necessary to reset the highest and lowest temperatures, push the **B** key again during the historical temperatures displaying for about 1 second.

✔ **Relay testing –** If the user wants to ensure that the compressor and stirring relays are working, it is possible to manually test them. To start the test mode, enter the parameters listing, adjust the **Cd** parameter to the value **77** and wait for the value **tst** to appear on the display. Push button **B** to test the refrigeration relay and the **power** button to test the stirring relay. Each relay activation will be shown by the respective led on the display.

✔ **Communication with Arcsys –** The controller has a USB input that can be connected to the ISX10, device for monitoring via the ArcSys interface. If you want to monitor and manage the controller via WEB, get in touch with a sales partner to purchase this device. Have in mind that you will also need a RS-485 adapter to the wiring connection between the controller and ISX10.



RS-485 adapter

Connect the adapter to the controller USB output and attach to the iSX10. It is important to notice that the connection must be A-A, B-B and Gnd-Gnd.

✔ **Firmware version –** To find out the firmware version of your controller, push the **B** key on the parameters listing screen.

✔ **Programming key –** Another product that can be purchased separately is the programming key (FastKey). This device allows changing the controller parameters quickly and easily, as well as permit replicating the settings of a controller to other controllers.

Error alerts

The **E1** error indication will appear on the device display whenever there is a problem with the temperature sensor. If this happens, check if:

✔ The sensor is well connected to the device;

✔ The sensor is within its temperature range -50°C to +100 °C;

✔ The sensor or its cable are damaged.

Package content

✔ 1 x A104 Temperature controller;

✔ 1 x stainless steel NTC sensor probe, 2.5 m long (wiring);

✔ 1 x A104 user guide.

Classification according to IEC 60730-2-9

Mounting surface temperature limit	Ts max 50ºC
Storage conditions	(-20 to 70)°C; < 90% RH (noncondensing)
Operation frequency	Minimum T OFF between two starts must be greater than 1 min
Operation time limitation	@85°C – 2,000 h; @40°C – 100,000 h
Automatic action type	Type 1.C
Control pollution situation	2
Rated impulse voltage	1.5kV
Temperature for ball pressure test	(75 and 125)ºC

Notes