
**Electronic voltage regulator
Frequency Converter 50/60Hz
APSS31xxxRTL – Rack version**

INSTRUCTIONS FOR USE AND MAINTENANCE



READ THE MANUAL CAREFULLY BEFORE USING THIS EQUIPMENT



**The USE AND INSTALLATION OF THIS EQUIPMENT ARE RESERVED FOR
QUALIFIED PERSONNEL**



**THE OPENING OF THIS EQUIPMENT IS POTENTIALLY HAZARDOUS, CALL
THE SERVICE BEFORE YOU MAKE ANY OPENING MANOEUVRE**



**WARNING: DANGEROUS VOLTAGE IS PRESENT INSIDE THE EQUIPMENT. DISCONNECT THE
STABILISER BEFORE OPENING THE DOORS. INSTALLATION MUST BE PROVIDED BY A
QUALIFIED OPERATOR. USE ONLY ISOLATED AND PROFESSIONAL TOOLS**

Regulator/Converter Type APSS31XXXRTL



1. Precautions for installation

The use and installation of this equipment, without the necessary preparation, is dangerous.

Before installing or activating the apparatus, the operating personnel must be trained to become sufficiently familiar with the safety procedures.

The manufacturer declines all responsibility for damages to things or persons caused by non-observance of the following paragraphs.

Failure to comply with the safety regulations or the incompetence of the personnel may expose it to risks of electrocution.

In case of accidents, it is recommended to scrupulously follow the first aid procedures provided by the regulations in force.

2. Installation Instructions



The equipment must not be used in areas where there is a potential risk of fire or explosion.



Use the equipment strictly following the prescriptions indicated. Improper use could irreparably damage it. Failure to comply with the installation requirements invalidates the warranty. Removing the seals causes the loss of the guarantee

- Input voltage400Vac
- Degree of ProtectionIP20
- Working room temperature+.....0°C40°C
- Maximum humidity without condensation.....85%
- Place of useprotected from the weather

2.1. Positioning

Place away from heat sources.

Avoid installation in excessively dusty environment.

If metallic workings are carried out in the environment, prepare special filters on the cabinet in which the drawer should be placed.

Make sure that the cabinet in which you intend to place the equipment is sufficiently large to allow adequate ventilation. In particular, in correspondence with the ventilation openings of the equipment, a free space of no less than 5 cm must be foreseen in order not to hinder a correct airflow for the cooling.

The cabinet shall be fitted with openings for surface ventilation at least equal to or higher than those foreseen on the equipment and shall have fans capable of moving an air volume equal to or greater than that of which the converters are equipped.

For the sizing and positioning of the ventilation system, see annex A and annex B of this manual.

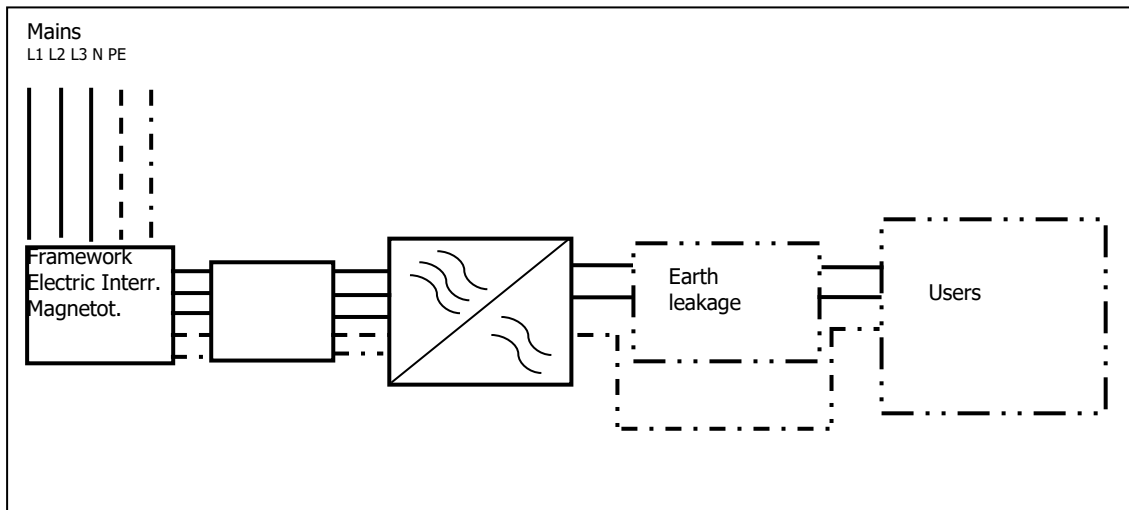
2.2. Connection to the mains and to the load

Prepare cables of a section suitable for the power of the equipment and the load to be fed (referring to the CEI-unel standard 35024/1).

Connect the equipment, upstream, to a specially prepared switchboard, equipped with a magnetothermal circuit breaker and possible 5 poles socket with appropriate characteristics (see annex C) .

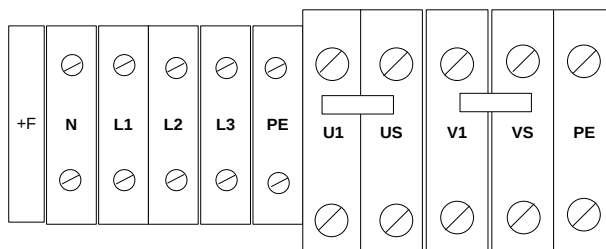
It is advisable to connect downstream of the converter, an earth leakage magnetothermal circuit breaker 0.03 A (for home applications) or 0.3 A (for industrial applications).

Follow the link diagram that is given a representation to the following figure



On the back of the converter, after removing the protective panel or shells, the terminal blocks for the connections and Interfaces are available (Only for versions APSS31010rtl and APSS31017rtl the RS232/LAN converter is placed externally, applied to the rear wall of the drawer).

2. 2.1 Connection Terminal block



OUTPUT Input

Standard Version:

Terminal (L1):	phase R input Power Converter
Terminal (L2):	phase S input Power Converter
Terminal (L3):	phase T input power converter
Terminal (N):	Neutral input power supply converter
Terminal (U1):	output phase
Terminal (V1):	output phase
Yellow/Green Clamps (PE):	Grounding connection: The connection and the use of the device is necessary for the safety of the users and for the security of the equipment connected to the load and the control.

FUSE HOLDER Terminal: A5 x 20 T fuse Port terminal is located next to the connection terminals 1,6
Ato protect the control electronics and ventilation system

Terminals (other initials) Service terminals – **do not use**

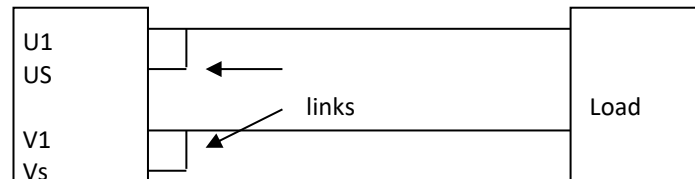
Version with output voltage accuracy >0,5% (opt. "Sense")

The following terminals must be added:

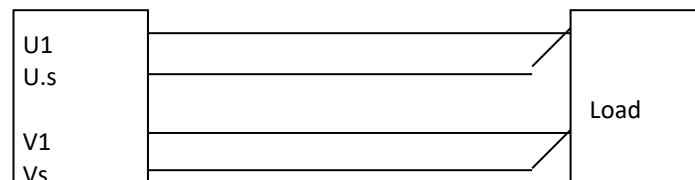
Terminal (U1S/US)	Sens. Voltage
Terminal (VS)	Sens. Voltage

For versions with the "Sense" option, the equipment is supplied with the terminals short-circuited as follows:

U1 with U1S (OR US) AND V1 with VS: This allows to guarantee the stability near the output terminals.



It is possible to guarantee better load accuracy by Removing the two jumpers and moving the sensor wires close to the load supply



NB: In case of remotization of the SENSE connection and the preparation of a magnetothermal switch or isolator, the connection of the two signal conductors of the SENSE must be strictly Carried out on the terminals located upstream of the Magnetothermal or disconnecting switch.

2.3. Interfaces

2.3.1. Analogue interface 0-10 VDC (Voltage Reg.) and Contacts

The analogue interface allows the variation in the remote mode of the voltage; by means of free contacts, it is possible to control the equipment and monitor its status.

- Pin 1: positive input regulation 0:10Vdc. The power supply used must supply not less than 5mA current
- Pin 2: Common (negative) input terminal 0:10Vac
- Pin 3/4: Short-Circuited using a clean contact enable the start-up of the converter.
- Pin. 5/6: With shorted terminals the output frequency is set at 50 Hz, with open contact the output frequency is set to 60 Hz.
- Pin 7: Emitter from Optocoupler of signal repetition "Variac ON"
- Pin 8: Collector from Optocoupler of signal repetition "VARIAC ON"
- Pin 9: Emitter from Optocoupler of "FAULT" signal repetition
- Pin 10: Collector from Optocoupler of signal repetition "FAULT"

2.3.2. RS232 interface (optional)

The 9-pin connector for connection to THE RS232 interface (when provided) is located next to the analogue interface and contacts.

The protocol for the use of this interface and a demo software is provided in the annex to this manual to test the correct functioning of the interface.

The interface is enabled for operation when the LOCAL mode is active

2.3.3. RS232-LAN Converter (optional)

On the rear part of the cabinet, the RS232-Ethernet converter is available.

The protocol for the use of the RS232 interface and a demo software is provided in the annex to this manual to test the correct functioning of the interface.

To use the converter you must access the manufacturer's Web site (WWW.USRIOT.COM), enter the "Products" section, by clicking on "Ethernet to Serial"; Scroll down the list of products and click on "USR-TCP232-302". Then download the program of interest.

The interface is enabled for operation when the LOCAL mode is active

2.3.4. Analogue interface 0-10 VDC-Reg. Frequency (optional)

The Interface for controlling the frequency in remote mode is available through two clamps as follows:

Clamp (+): Control Positive Input 0 – 10 VDC

Clamp (-): Common Control input 0 – 10 VDC

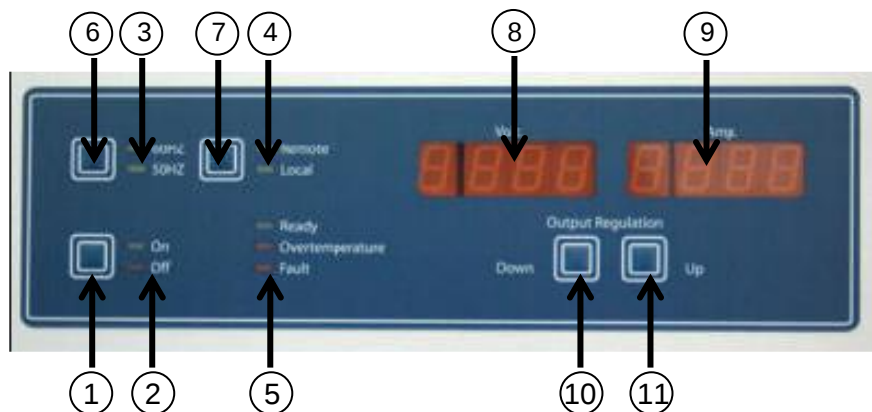
The generator used for the control must be able to dispense a minimum current of 5 mA.

To make the operation easier for the user, near the potentiometer located on the front, we provide a table that allows him to identify the value of the frequency set in relation to the position of the Potentiometer or voltage set with the analogue interface. The values shown in the table are indicative. To have precise values it is necessary to equip yourself with a frequency meter.

3. Front of the equipment

3.1 Synoptic Panel

On the front panel voltmeter and ammeter displays are available, the control buttons and the LED signals of the operating states.



1. ON button (OFF Inverter)
2. Led Signal Inverter status
3. Led Indication Frequency delivered
4. Led indication of control mode (LOCAL/REMOTE)
5. Alarm Led
6. Output Frequency Selection key
7. Control mode setting key
8. Voltmeter Display
9. Ammeter Display
- 10/11. output voltage adjustment

3.1.1. Analogue measurements displayed

Voltmeter: Displays the output voltage at the regulator terminals with a precision of $2\% \pm 4$ digits

Ammeter: Displays the current absorbed by the load connected to the output by the regulator with a precision of $2\% \pm 4$ digits

N.B.: The instruments inserted in the Panel are not precision instruments, but have only an indicative function of the value of the voltage or current supplied. To have a more precise reading of the measurements, use a certified tool.

3.1.2. LED Indications

50Hz: green ON indicates that the regulator is preset to supply voltage at 50Hz frequency. If the linear frequency adjustment option has been requested, the LED remains off.

60Hz: yellow ON indicates that the regulator is preset to supply voltage at 60Hz frequency. If the linear frequency adjustment option has been requested, the LED remains off.

ON: Green ON indicates that the regulator is in operation; this led goes ON only after the initialization procedure, after which the user commands from local or remote.

OFF: red ON indicates that the regulator is off; this led stays on even during the entire initialization phase

LOCAL: green ON indicates that it is possible to control the regulator by pressing the buttons on the front of the controller; The remote output signals are still available in this condition but the external remote control signals are not accepted.

REMOTE: on yellow indicates that the regulator can be controlled from the interface placed on the back of the controller; This condition excludes the controls located on the front panel. In this mode it is possible to use THE RS232 interface or THE RS232/LAN converter.

READY: green ON indicates that the regulator is ready to run the control commands in a timely manner; During the initialization phase of the regulator THIS LED remains off and in this condition the regulator does not accept any type of control.

OVERTEMPERATURE: red ON indicates that the temperature of the inverter is higher than 70 °C: this causes the regulator to be immediately blocked. It is possible, after turning off the LED, to reset the regulator by turning it off and on again.
If the problem persists, check the positioning of the regulator and the correct operation of the cooling fan.

FAULT: red ON indicates that a serious block of the variator has occurred, which can result from a strong perturbation on the power supply line or, worse, by a malfunction of the variator itself. The immediate ignition of the LED after a reset procedure (switching off and powering on the equipment) indicates a malfunction of the variator

3.1.3. Control buttons

ON/OFF: Each time the button is pressed, the regulator switches on or off; the button is enabled by the system only after the initialization phase.
The button is active only if the controller is in local mode.

50/60Hz: Each press of the button configures the regulator for an output frequency OF 50hz OR 60hz; the button is active only if the controller is in local mode. If the linear frequency adjustment option has been requested, the button is disabled.

REMOTE/LOCAL: Press and hold the button as long as the corresponding LED switches from remote to local or vice versa.; with the regulator on local it is also possible to intervene on the same acting on the buttons placed on the front and use the INTERFACE rs232 and conv.; LAN control is available in remote mode; if it is set to remote, the interface is placed on the back.

UP/DOWN: by pushing the "Up" or "Down" buttons user can increase or decrease the output voltage from the regulator.
 By pressing the button for short periods you get a fine adjustment of the output voltage, if you keep the button pressed you get a voltage setting that increases speed by covering the entire adjustment scale in about 5 seconds.

3.1.4. Keypad lock

In order to prevent accidental tampering of the selections set on the regulator it is possible to activate the keypad lock with the following procedure:

- Press the REMOTE/LOCAL button until the two LEDs (REMOTE and LOCAL) start flashing.
- Press 3 times the same button within 3 seconds.

The keyboard is so locked and will no longer accept any command,

To unlock:

- Press the REMOTE/LOCAL button;
- When the two LEDs (REMOTE and LOCAL) start flashing, pressing the same button, **press the "DOWN" button for 3 seconds.**

3.2. Potentiometer adjusting the frequency (when required)

A potentiometer for adjusting the frequency from 40Hz to 70Hz (+/-0.5%) is located next to the digital panel. To facilitate the operation to the user we supply, applied on the front of the equipment, A table that allows to identify the value of the frequency set in relation to the position of the potentiometer or the voltage Set with the analogue interface. The values shown In the table are indicative. To have precise values it is necessary to equip yourself with a frequency meter



Frequency reference table

Frequency (Hz)	Potent. Pos. An. Int. Voltage	Frequency (Hz)	Potent. Pos. An. Int. Voltage	Frequency (Hz)	Potent. Pos. An. Int. Voltage
35.55	0.00	50	3.15	61	6.98
40	0.15	51	3.50	62	6.92
41	0.45	52	3.80	63	7.28
42	0.73	53	4.10	64	7.62
43	1.04	54	4.41	65	7.97
44	1.31	55	4.72	66	8.24
45	1.63	56	5.01	67	8.55
46	1.99	57	5.35	68	8.88
47	2.24	58	5.62	69	9.15
48	2.70	59	5.97	70	9.51
49	2.86	60	6.30	71.8	10.00

4. Putting the equipment into operation

Once the equipment has been connected to the mains and the load, observing the prescriptions and suggestions provided in the manual and in compliance with the regulations in force, the equipment is ready to be put into operation.

At the first switching on the system carries out an internal verification which requires a period that can reach up to 120 seconds; At this stage the regulator does not accept any commands.

At the end of the sequence the regulator can be controlled.

The READY led on green indicates that the converter is ready to accept the user's commands.

The ON/OFF command activates and disables the converter: the ON/OFF LED indicates that the inverter is switched on.

The lack of the power line upstream of the regulator causes it to shut off; At the return of this we will have the boot sequence again.

5. Protections

The equipment, in order to preserve it from irreversible faults, is protected electronically by overtemperature and overload (or short circuit).

The variator stops if the heatsink temperature exceeds 70 °C.

It is also blocked if it is overloaded with a current higher than the nominal value of the plate, in the following manner:

- Load > 100% < 150%: block after 6 seconds
- Load > 151% < 200%: block after 0.3 seconds
- Load > 201%: Block after 0.1 seconds

6. Procedure for eliminating the block from overload or Overtemperature.

To restore the functionality of the equipment after an overload (or short-circuit) lock, a reset must be operated by pressing the ON/OFF button (or through the contacts if handled remotely). Before carrying out this operation it is essential to reduce the load within the rated limits.

If the lock has intervened for temperature, the appliance will automatically reset itself when the heatsink temperature has dropped below the unit 60 °C without the need for resetting.

7. Operating conditions and anomalies

It is possible to detect the conditions of use and some problems of operation of the equipment thanks to the LEDs located on the front panel.

The ignition of the LEDS is clearly described in paragraph 4.1.2. of this manual.

Most faults generate the "FAULT" LED's ignition. Below we list briefly the possible causes that cause the ignition.

1. Excessively unbalanced load (when absorbing only on a half-year)
2. Dead IGBT Driver
3. IGBT failure
4. Power Card Faulty
5. Overload.

In this case the LED lights up with the LED "OVERTEMP".

The two LEDS remain lit until a reset is performed.

Other types of problems that may intervene are not reportable by the panel. Some examples are as follows:

1. Panel failure
2. Failure of the diode bridge in the input (is not reportable because the equipment would not be powered)
3. Sinusoidal generator failure on the board.

Please note that if the equipment is operated in "remote" mode, the same conditions that cause the "FAULT" LED to ignite determine the "FAULT" signal that the terminals can pick up.

8. Tips for use and maintenance

No special care is required to maintain APSS31XXXRTL in perfect efficiency.

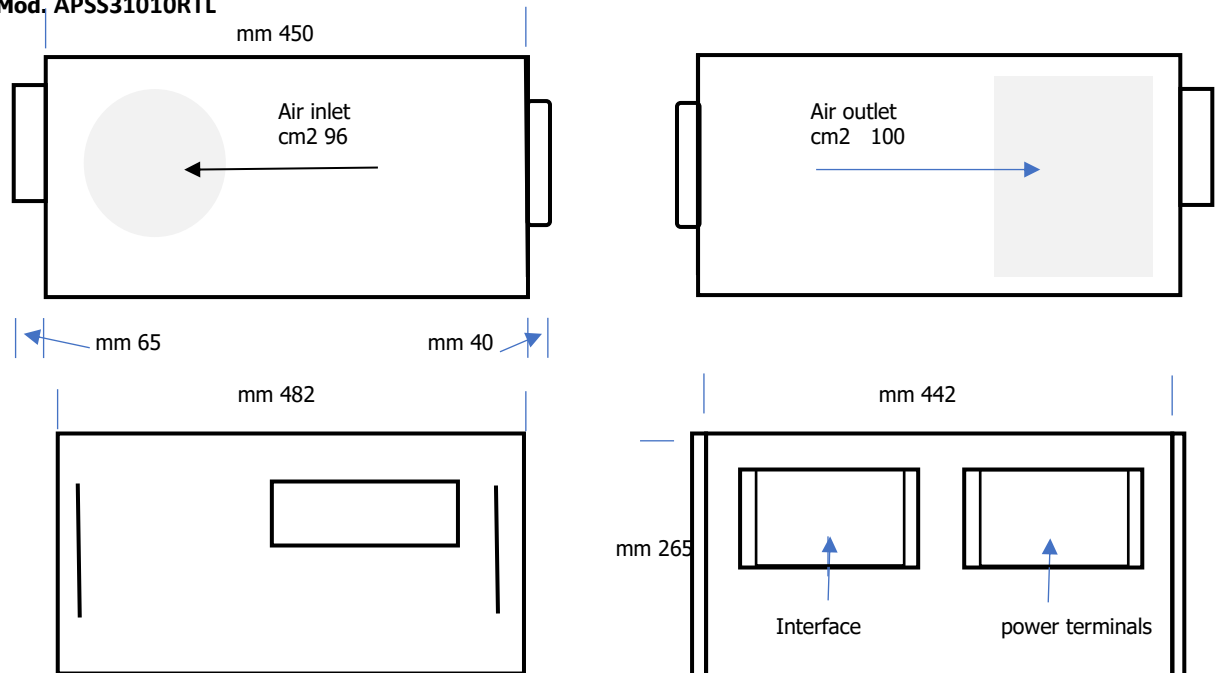
However, some obvious precautions are required that we list:

- Since it is electronic equipment, it fears humidity, so avoid placing it outdoors, exposed to atmospheric agents.
- Avoid, as far as possible, placing the equipment in excessively dusty environments, which would adversely affect the proper functioning of the ventilation. (In this case equip the ventilation openings of adequate filters).
- Avoid placing the equipment in an environment with excessive temperature range, in order to prevent possible condensation. In the same way, avoid placing the APSS31XXXRTL in an environment with too high a temperature (above 40 °) to prevent possible stops for Overtemperature. The operation of the electronic components at high temperatures shortens the life cycle.
- Since the front panel buttons have a micrometric stroke, act on them in a gentle way, to avoid damaging the underlying mechanism. Avoid operating on the keys using objects that could compromise the integrity of the keys themselves (e.g. screwdrivers, pencils etc. ..)
- Periodically clean the front panel with a lightly moistened cloth
- Periodically check the status of the fans and clean them, as well as the cleaning of the filters. The dust deposited on the fan blades affects the speed of rotation, limiting the cooling of the equipment
- Plan maintenance Interventions, shipping the APSS31XXXRTL to the retailer or to the manufacturer, the more frequently the greater is the use made of the equipment. In any case, provide for a general revision at intervals not exceeding 3/4 years, in order to verify the correct functionality and to make any replacement of the components subject to wear (e.g. capacitors and fans).
- In case of faults or anomalies, do not operate independently on the converter, but contact the dealer (unless it is solvable by reading this manual).

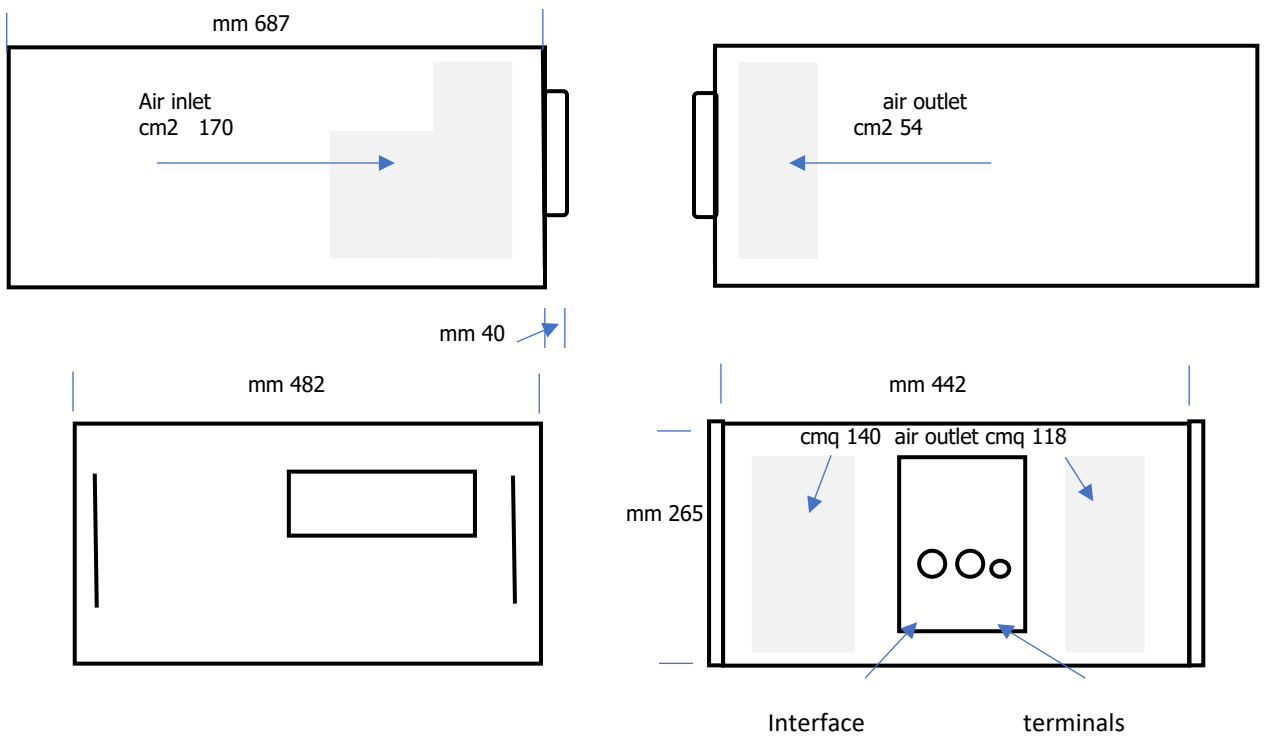
Annex "A"

Mechanical drawings

Mod. APSS31010RTL



Mod. APSS31017RTL



Annex "B"

Magnetothermal Switches

Modello	Interruttore MT ingresso
APSS31010RTL	3X32A "C"
APSS31017RTL	3X50A "C"

Dati tecnici e immagini sono solo indicativi e possono essere variati in qualsiasi momento senza alcun preavviso

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