1 PHASE STEPLESS CONTROLLER

Dinamic Control Technology

ESK

WARRANTY 3 YEARS

PLUG& PLAY

FULL GUARD SYSTEM

QUICK START-UP

INTELLIGENT ENERGY SAVING IES

EMC CIVIL LIMIT

MODBUS INSIDE

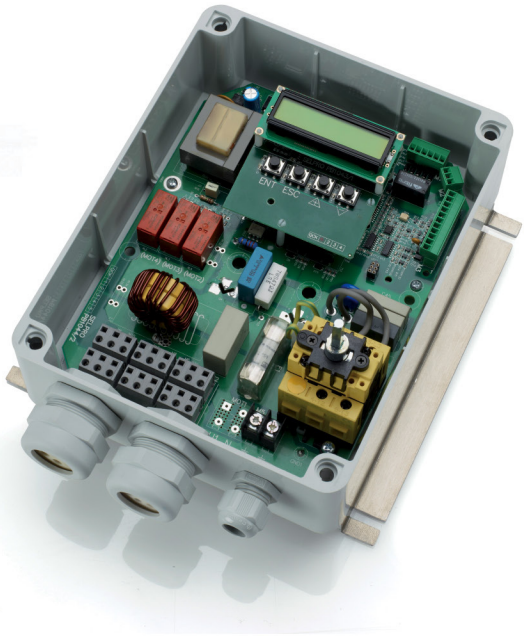
THD LOW

CLIMA SINERGY CLS INSIDE

LOW dB SYSTEM

-0- CROSS SYSTEM





SELPRO

! WARNING !

Safety warnings

- Follow the instructions in this manual exactly and observe all safety measures in force. Always keep the present documentation close to the control device.
- The purchaser must previously ascertain the suitability of the product for the use it is intended for and assume all consequent risks and responsibility.
- This product has been designed to be used only as an operational control device. In the event delicate or great value products should be held within specific working limits, it is recommended to install a separated control device, equipped with alarm contacts.
- The commissioning, start-up and operation of the present device must be performed by qualified technicians with knowledge of the technical regulations in force, in compliance with all the safety standards and able to understand the indications of danger.
- The regulator must be installed by qualified personnel who will connect the electric supply, attach the cables in their permanent positions and commission the plant. Incorrect installation of the ESK100 voltage regulator or the fan connected to it may cause damage to objects or people.
- Before supplying power to the unit, make sure that the regulator is correctly connected to the power supply and to earth.
- The information provided in the present manual consent to install and control correctly the fan speed regulator **ESK100**.
- **Do NOT tamper with or disassemble the regulator internal components; doing so will INVALIDATE THE GUARANTEE and may cause unnecessary damage.**
- **The regulator does not contain components that can be repaired by the user.**
- The regulator must be suitably and effectively earthed by the installer according to the standards in force; Earth is essential for the EMC filter to operate correctly.
- The user must be protected from the electric supply and the motor must be protected from possible overloads in compliance with the standards in force.
- **DO NOT** supply the regulator without the external protection cover.
- **DO NOT** touch any electrical parts of the circuit when the power supply is connected under any circumstances.
- Before supplying power to the unit, make sure that the regulator is correctly connected to the power supply and to earth;
- If the mains supply is "disturbed", which may be due to other electrical power components causing irregularities in the supply (power contactors), it is recommended that supplementary single phase 'SURGE ARRESTER' filters are installed directly on the regulator supply.
- Avoid repeatedly connecting and disconnecting the power supply to the regulator; a constant supply keeps the regulator at working temperature and eliminates problems caused by condensate inside the protection case.
- Alternatively, use the remote terminal board contact **'M3' S2 = ON/OFF**.
- The **S2 = ON/OFF** contact on the terminal card **M3** does not cut the mains supply and therefore cannot be used as a safety switch.
- Install the regulator out of direct sunlight, in order to protect the case from overheating.
- The appliance can operate at environmental temperatures up to **50°C**. Do **not** install it where this temperature may exceed, otherwise the integrity of the regulator will be compromised, since the controller may make the user appliance operate at full load (**100%**) with all consequent effects.
- The equipment must be placed vertically, in order to encourage heat dissipation and to ensure sufficient air circulation in a free space measuring at least **150 mm** above and below the regulator. If several regulators are to be grouped together on a single electric board, please provide forced air circulation with a fan or with a sufficiently powerful cooling unit.
- Use the holes on the lower and power terminal board sides of the appliance, for entrance of the connection cables. This will prevent water, dust etc. from getting in and will ensure the **IP55** protection level is maintained using adequately sized cables and sheaths of suitable quality.
- **Reassemble and check the cover of the external protection panel is properly closed.**
- **DO NOT alter or damage the identification stickers on the equipment.**

Terms of use

The **ESK 100** series devices are designed to vary the single-phase AC voltage thanks to the phase cutting principle, in order to regulate the rotational speed of single-phase asynchronous high-slip motors, to be used with axial and centrifugal fans in Air-Conditioning, Refrigeration, Ventilation and Air Treatment Systems.

Any different use of the equipment is strictly FORBIDDEN.

Manufacturer Declaration

This series is manufactured for the employment into the industrial environments and responds the following communitarian directives:

- Machine Directive **2006/42/EC** and following amendments
- Low Voltage Directive (LVD) **2006/95/EC**
- EMC Directive **2004/108/EC**

(*) ELECTRONIC FANS REGULATION - FULL ENVIRONMENTAL RESPECT

Thanks to the electronic solutions used, the device responds totally to the emission limits required from the European Directives for Residential, Commercial and Light Industrial environments (EMC and PDS applications), and can therefore be installed without particular precautions (ex.: shielded cables).
The equipment does NOT contain filters for the suppression of harmonic distortions.

It is not allowed to commission our equipment when installed in machines that do not comply with the legislation in force.

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Description of symbols used in the present manual



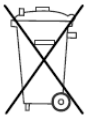
! Attention !



Information



Compliance with: CE mark –Electromagnetic Emissions – Low Voltage Directives



PRODUCT end of life – WEEE directive EU 2002/96/EC

1.0 Presentation

1.1 Introduction

Fans represent the essential part of Air Handling equipments and systems, and the development of machinery for the variation of speed – and, consequently, of air flow rate– in the different types of systems has emphasized their importance.
The variation of volumetric flow rate in a system may be required according to several needs:
- NOISE –operation proportional to appropriate speed values according to environmental conditions
- CONVENIENCE – the energy consumption is always in line with the actual ventilation needs
- FUNCTIONALITY – elimination of heavy and bulky electromechanical components and easier electrical assembly
- CONFORMITY – in full respect for European directives about electrical power drive systems
- MECHANICAL WEAR – mechanical stress in structures, due to an ON/OFF operation
- ELECTRICAL WEAR – stress of the electromechanical components and of the connected devices.

In order to fulfill such requirements, it is necessary to use regulation equipment able to adjust the rotational speed of fans, so as to make the system more suitable for the variations of contextual operating conditions.
There are several types of equipment that allow to control and regulate fans driven by asynchronous motors.
Since a long time the following solutions have been used:

1. ELECTROMECHANICAL equipment for the ON-OFF activation of fans
2. ELECTROMECHANICAL equipment for the ON/OFF + STAR-DELTA activation of fans motors (MIXED mode)

Later, also the following modes have been discovered and used:

3. ELECTRONIC equipment with STEP VOLTAGE control (AUTOTRANSFORMER)
4. ELECTRONIC equipment with FREQUENCY variation (inverter or electronic motor)
5. ELECTRONIC equipment with AC voltage PHASE CUTTING

The activation of an ON-OFF group of fans allows the modulation of the Air System, but the result is very unstable and it never meets the real requirements of the system.
Only thanks to the electronic equipment it has been possible to obtain a steady balanced Air System. Electronic solutions also bring many advantages:

- Reduction of the operating noise: the dBs are proportional to the fan speed, with a consequent general noise decrease (dB) in the Air System and the possibility to set a NIGHT operation mode that allows a further reduction of power consumption and meets the requirements of low noise (dB).
- ENERGY saving: thanks to the gradual absorption of power from the mains, it eliminates current peaks due to a frequent ON-OFF of the group of fans.
- Longer electrical and mechanical life of the equipment, which is preserved from thermal and electrical stresses typical of an ON-OFF regulation.
  Elimination of "fluid hammers", caused by pressure surge due to the ON-OFF modulation of the heat exchanger.
- Constant operating parameters (temperature, pressure, air flow rate, etc…) for the whole Air System, with a sensible increase of mechanical and electrical lifetime of the components of the system.

Furthermore, the proportional regulation allows to:

- Utilize equally the whole surface of the constantly operating heat exchanger;
- Manage the heat exchanger's power in a more rational and balanced way, by operating gradually at low speeds and consequently optimizing the exchange power through a better use of fins;
- Regulate the operating efficiency of the heat exchanger according to the actual cooling needs;
- Reduce the total amount of coolant;
- Reduce dirt and dust accumulation on the heat exchanger fins;
- Make the mechanical structure of the heat exchanger easier, by eliminating the internal partition walls.

Among the different type of equipment that allow to perform a proportional regulation of the rotational speed of fans driven by synchronous and asynchronous motors, there are also the FAN SPEED CONTROLLERS with AC voltage PHASE CUTTING.
With these controllers, the active voltage given to the motor varies proportionally from a minimum up to a maximum value, which corresponds to the AC voltage supply; the required frequency is the mains frequency: 50 or 60 Hz.
This kind of regulation requires the use of motors suitable for phase-cutting control (class F or H and defluxed), since they must be able to stand an increase of the internal temperature at low operating voltages, which may causes a severe deterioration of the motor windings and even short circuit in NOT suitable motors.
In general, it is suggested to use: **motors with resistive, high slipping rotor in silumin, defluxed, tropicalized, CLASS H motors,** since they give better performances in speed variation, are quieter and need lower inrush currents.
When choosing the motor, it is always recommended to contact your equipment supplier and order a motor suitable for voltage variation (**ADJUSTABLE**) and perform practical tests of the motors or prototype machines, in order to verify their proper operation.



! WARNING !



Before installing the ESK100 regulator, you are invited to read this manual, which describes the necessary procedures for correct installation and commissioning of the controller ESK100

The digital **ESK100** series, dedicated to applications for Air-cooled Heat Exchangers, consist of:

- Configurable controller in a great number of available MASTER or SLAVE modes (N. 12), simply by recalling from a keypad one of the already preset default configurations, with the possibility to modify the values of default parameters
- Two (2) inputs, for the connection and the management of one or two sensors through mA – Vdc – kohm (NTC probes) signals
- The SET of regulation parameters (including the setting of: Set-Point – Proportional Band - Cut-Off/Minimum RMP% limit - Maximum RPM% limit - Starter, with acceleration/deceleration time of the regulation control), the following regulation functions are also available:
  - **Direct-Reverse** operating mode
  - **Start-Stop**: contact for remote **OFF** or Heat-Pump mode, active by closing the contact
  - **T.K.**: NO/NC contact for the connection of the thermal motor protection
  - **RL1**: GENERAL alarm relay, with programmable Dip-Switch activation modes

  And the following regulation controls too:

  - **NOISE-JUMP: selection of up to 1 RPM% jump-zones**, in order to avoid keeping the control values in correspondence with high acoustic disturbance (extra **dB**) zones, to be defined through the Min RPM% limit **(JL**) and Max RPM% limit **(Jh**)
  - **ALARM-M&M:** setting of operating POINTS with Minimum-SET (**So**) & Maximum-SET (**Sh**), which allow to set alarm values for both MINIMUM RPM% and MAXIMUM RPM% limitation, so that the fan speed can be driven:
    - down to **ZERO%** (with control signal exceeding **So** value) and
    - up to **MAX RPM%** (with control signal exceeding **Sh** value)

    (when the values of **MIN & MAX RPM%** limits are selected, the system may not be completely stable); it is also possible to define separately the respective hysteresis values, through: **io** (for So) **& ih** (for Sh)

- **Analog output 0-10Vdc, used in order to control**:
  - Up to ten Slave **DRIVER POWER UNITS** (**rS**), with control signal **0-10Vdc**

Once the desired regulation mode and the Set-Point value have been selected, the controller is ready to operate and control the fan speed, so as to maintain the system constantly stable within the preset operating range.

1.2 Operating modes

Phase cutting regulation, totally controlled over the single phase, in order to vary the active voltage applied to the load;
NO neutral connection required.
Through a keypad it is possible to program the device in one of the following modes:

- MASTER CONTROLLER (**rtE/rPr**): the VAC output varies according to the Vdc-mA-kohm input signal, and increases/decreases as the controlled parameter increases; the regulation depends on the signal with the highest value, measured through two sensors (inputs IN1 and IN2)
- SLAVE POWER UNIT (**rS**): the VAC output varies according to the Vdc-mA signal received at the input IN1 & IN2, or to the PWM input, and increases/decreases as the control signal increases.

The number of regulation signals/sensors/transducers can be increased by connecting the control unit to the Universal Input Expansion Module **RGFMEI-4**, which allows to connect up to 4 mA – Vdc – NTC sensors/signals to each controller input; it is always possible to select the signal with Highest/Lowest value as a reference point for the regulation; the controller allows the cascade connection of up to 6 RGFMEI-4 units.
Expansion Modules **MEI-4** have been designed to be connected to diverse regulation and control devices, such as inverters or PLC, which accept a **0-10Vdc** or **0-20mA control** signal.

WARNING !

Before installing the ESK100 regulator, you are invited to read this manual, which describes the necessary procedures for correct installation and commissioning of the controller ESK100

1.3 General functions - ESK 100 series

The ESK100 series, designed & created by the SELPRO Research & Development (R&D) department, has been specifically developed to offer a digital UNIVERSAL controller for the regulation of single-phase asynchronous motors, with dedicated software for applications on Air-cooled Heat Exchangers used in Air Conditioning and Refrigeration Systems.
Such kind of digital regulation optimizes the application-specific performance of ventilation control; it is based on a simple and yet innovative technology, one hundred percent ITALIAN as it has been conceived and developed in SELPRO labs, and it fully satisfies the following requirements:

SIMPLICITY	**USER FRIENDLY**	**- NO need of special cables for the installation** **- NO need of trained operators for the startup procedure**
FUNCTIONALITY	**PLUG & PLAY**	**- all regulation parameters are already default preset**
COMPLETENESS	**ALL in ONE**	**- all regulation modes with mA–Vdc – kohm (NTC) ranges, sensors and signals are already default preset,**
SAFETY	**ALL ROUND PROTECTION**	**- the software supervises the operation of regulator and connected fans,**
CONFORMITY	**COMPLIANCE**	**- the system "Controller + Fan/s" is guaranteed for all PDS applications**

As a consequence, the digital **ESK100** controller is:
-**SIMPLE,** what concerns electrical connections and programming,
-**FLEXIBLE** and ready to be used, as it is already preprogrammed for all applications (12 DEFAULT software),
-**COMPLIANT,** in conformity to the strictest standards concerning power drive systems, with special attention to the EMC Directive (Electromagnetic Compatibility): since it refers to NON tangible protection requirements, the relative Standards are only partially followed by many manufacturers of electronic power devices, and they are ignored especially by final users, which are the contact persons responsible for the EC certification and compliance of the System "Controller + Fan/s".
Like all SELPRO products, the ESK100 series has been built to the very highest quality standards using electronic components of the utmost reliability, which have undergone functional tests that guarantee the use of the product for at least **60,000 hours** of continuous operation without problem.
Thanks to the specialized software for applications on fan motors, it is possible to avoid typical problems with the modulation of oscillation, to reduce the mains current distortion and to limit the magnetic noise of the regulated motor by means of the **Soft-Power** technology, which manages power regulated in "0-cross" mode.
The extended range microprocessor, which performs every control function, is also responsible for monitoring the safety conditions of the regulator by checking its proper operation, the lack of the power supply, the connection of sensors and all other possible electrical situations that could damage the connected air-cooled system or the controller, and by simultaneously informing the operator about the regulation status and operating conditions through the digital display.

The controllers are preprogrammed for operation with **MASTER** (9 modes) or **SLAVE** (3 modes) configurations.
Once the Set-Point (in '**bar**' for Condensers and in '**°C'** for Water chillers) has been selected, the controller in **MASTER** mode operates on the fan speed in order to keep the condensing pressure or the fluid temperature at a desired value.
The controller in **SLAVE** mode operates as a power unit, driven by a remote controller, through a **mA** or **Vdc** or **PWM** control signals.
The **ESK100** series offers 2 standard rated current values:

12 A / 20 A, with standard power supply **230Vac +/-10% 50/60Hz** (the controller recognizes and manages automatically the frequency variation); further voltage and current values are available on request.

Electronic regulations of motors, phase cutting regulation of AC voltage, SCR and TRIAC power drive systems: they all have collateral effects, which require the use of additional technical protection measures especially with applications in residential environments or technological plants; the acoustic noise - generated by the fan because of the magnetization of the motor itself – arises discontinuously within the main speed ranges of the fan speed regulation, and can be **only partially reduced** by means of expensive and bulky acoustic screens installed around the machinery.
The **ESK100** controller helps solving issues brought about by the acoustic noise thanks to its dedicated software, which allows to:
- adjust the COS-PHI of the connected fans,
- define and select the "dB-JUMP zone", in order to avoid keeping the control values within ranges in correspondence with high acoustic peaks (extra **dB**) zones.
With the combined action of the **dB-JUMP** software, of the **COS-PHI** adjustment and of the **NTF100** filters – specifically designed for the **Extra-dB-Noise** applications – it is possible to suppress **up to the 80%** of noise emissions, generated by the fan motors.
The fans can therefore operate at the different required speeds without causing the typical noise arising from a phase cutting regulation; the physical geometry and heat exchange capacity of the finned coil are enhanced by the "clean" regulation obtained, which at the same time consents to save energy.
Unlike INVERTERS, thanks to the application of **NTF100** filters on our devices it is also possible to dramatically lower and almost eliminate harmonic distortions generated by electronic control; the regulator does NOT have any internal filter for the suppression of harmonic distortions (EN-61000-3-2 & 3-12).

1.4 EC Directives & Technical Standards

Like all of our products, the **ESK100** series has obtained the **CE** mark in compliance with the EMC (Electromagnetic Compatibility) directive **2004/108/EC**.
The essential requirements of the directive are satisfied by the conformity to the "**generic standards**" for industrial environments.

Directive	Standard code	Description
2006/42/EC	**EN 60204-1**	Safety of machinery. Electrical equipment of machines.
2006/95/EC	**EN 60204-1**	Safety of machinery. Electrical equipment of machines.
	EN 50178	Electronic equipment for use in power installations.
2004/108/EC	**EN 61800-3**	Adjustable speed electrical power drive systems. Part 3: EMC product standard including specific test methods.

All products have been tested in accordance with the procedures and test conditions laid down in the standards specified in the product technical file.
Since these products are destined to be used not only as "**stand alone**" systems, but also as components of other machines or plants, all compatibility tests to the standards have been performed under typical conditions of use.
In particular, the tests have been performed in a system consisting of a voltage controller **ESK100**, a control cable and relative commands, a supply cable, a motor cable and a group of fans with an equivalent power to the value of the nominal current of the controller.

With reference to EMC Compatibility, according to the Marking

CE EMC LVD

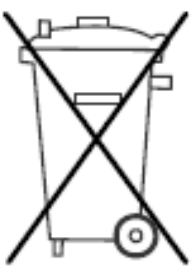
with CDM System



with PDS System



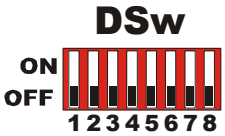
All SELPRO controllers are suitable for the installation in PDS systems (Power Drive System = Controller with connected fan/s), which guarantee the EMC compliance of the System "Controller + Fan/s".
The final specifications of the system or plant, in compliance with the EMC directive, are in any case the responsibility of the installer, who must put the system into operation carefully, according to the rules in force and following the information provided by the present manual.



PRODUCT end of life EU 2002/96/EC

The device must be disposed of separately, according to the local authority advice.

1.5 ESK100: Technical Characteristics

<table>
<tr><td rowspan="3">Power supply</td><td>Voltage</td><td colspan="5">230VAC +/- 10 % Single-phase - (also for 230Vac phase to phase)</td></tr>
<tr><td>Frequency</td><td colspan="5">50 / 60 Hz automatic selection</td></tr>
<tr><td>Overvoltage Protection</td><td colspan="5">For Installation Category II (4 KV)</td></tr>
<tr><td>Operating principle</td><td colspan="6">Electronic single-phase voltage regulators for the phase-cutting regulation (total controlled) of the active voltage applied to the load; compensation for inductive loads and motors.</td></tr>
<tr><td rowspan="3">Current</td><td rowspan="2">Rated</td><td>ESK 112</td><td colspan="4">12 A up to 50°C environment; if over, decrease 0,5 A/°C</td></tr>
<tr><td>ESK 120</td><td colspan="4">20 A up to 50°C environment; if over, decrease 0,5 A/°C</td></tr>
<tr><td>Overload</td><td colspan="5">200% of the rated current (max. 10” every 3’)</td></tr>
<tr><td rowspan="2">Power</td><td>Control circuits</td><td>4VA</td><td colspan="4">Control circuits</td></tr>
<tr><td>Thermally dissipated</td><td>ESK 112</td><td>18 W @ 12A</td><td>ESK 120</td><td colspan="2">30 W @ 20A</td></tr>
<tr><td rowspan="2">Operating characteristics</td><td>MASTER CONTROLLERS
rtE / rPr / rUu / rPu :</td><td colspan="5">The output voltage varies in order to maintain at the Set-Point the prevailing value measured by one of the two transducers (the highest or the lowest value) connected to the inputs.
This action can be:
DIRECT: the output increases as the input increases,
REVERSE: the output decreases as the input increases.
Default: the VAC output increases as the controlled variable increases.</td></tr>
<tr><td>SLAVE CONTROLLERS
rS</td><td colspan="5">The output voltage varies according to the value of the remote control signal
DIRECT: the output increases as the input increases,
REVERSE: the output decreases as the input increases.
Default: the VAC output increases as the controlled variable increases</td></tr>
<tr><td rowspan="5">INPUT Signals & Contacts</td><td rowspan="2">Analog control signals</td><td colspan="5">The controller can be preset through the keypad on board. Any combination of the following operating modes is available:
<table>
<tr><td>NTC (*)</td><td>10 kohm</td><td>Code</td><td>rtE-01 (*)</td></tr>
<tr><td>NTC</td><td>10 kohm</td><td>Code</td><td>rtE-02</td></tr>
<tr><td>0 – 10 Vdc</td><td>Ri = 10 kOhm</td><td>Code</td><td>rS-010 - rUu010</td></tr>
<tr><td>4 – 20 mA</td><td>Ri = 100 Ohm</td><td>Code</td><td>rS-420</td></tr>
<tr><td>4 – 20 mA</td><td>Ri = 100 Ohm</td><td>Code</td><td>rPr420 - rPr015 - rPr025 - rPr030 rPr045 - rPr050</td></tr>
<tr><td>0 – 5 Vdc</td><td>Ri = 10 kOhm</td><td>Code</td><td>rUu-05 - rPu030 – rPu045</td></tr>
</table>
(*) DEFAULT CONFIGURATION</td></tr>
<tr><td rowspan="2">Logic control signal</td><td colspan="5">PWM digital signal, from 3V to 30V, insulated and <u>not polarized</u>.</td></tr>
<tr><td colspan="5">PWM | 3 to 30 V | Code | rS PWM</td></tr>
<tr><td>Start-Stop / Heat-Pump</td><td colspan="5">Programmable free potential “On/Off” contact: with Sw4 (for NO or NC)</td></tr>
<tr><td>T.K. motor</td><td colspan="5">Free potential “On/Off” contact (NC)</td></tr>
<tr><td rowspan="4">INPUT Signals & Contacts</td><td>Analog control signal</td><td colspan="5">Slave Unit control signal : 0-10 Vdc - max 30mA</td></tr>
<tr><td rowspan="2">Auxiliary Supply</td><td colspan="5">+20V +/- 20% , max 40mA not stabilized, protected from short-circuit</td></tr>
<tr><td colspan="5">+5V max 20mA stabilized and protected from short-circuit</td></tr>
<tr><td>Potentiometer supply</td><td colspan="5">+10V / 5mA stabilized & protected, for external manual command</td></tr>
<tr><td>Available functions selections</td><td>Dip Swicht
 
</td><td colspan="5">RL1 Relay</td></tr>
<tr><td colspan="6">
<table>
<tr><td>DSw</td><td>1</td><td>Select the regulation with the Set-Point at MIN or MAX VAC output</td></tr>
<tr><td>DSw</td><td>2</td><td>Select the regulation mode: Direct / Reverse</td></tr>
<tr><td>DSw</td><td>3</td><td>Select the S2 contact function</td></tr>
<tr><td>DSw</td><td>4</td><td rowspan="2">Select the RL1 alarm mode</td></tr>
<tr><td>DSw</td><td>5</td></tr>
<tr><td>DSw</td><td>6</td><td>Reserved</td></tr>
<tr><td>DSw</td><td>7</td><td>Reserved</td></tr>
<tr><td>DSw</td><td>8</td><td>Reserved</td></tr>
</table>
</td></tr>
</table>

Visualisation Leds	**PWR**	**DL4**	**Green**	Power supply ON (+5 V supply O.K.)	
	CPU RUN	**DL5**	**Green**	• Regulation O.K. : blinking DC 50%, freq ½ Hz	
	Alarm **FAIL**	**DL6**	**Red**	**1** blink	Over max °C control card (85°C)
				2 blinks	Thermal protection open
				3 blinks	Under range input signal : • Slave 4-20mA : < 2mA
				4 blinks	Over range input signal : • Slave 4-20mA : > 24mA • Slave 0-10Vdc : > 11,0Vdc
	PWR OUT	**DL7**	**Green**	ESK run: VAC output on work	
	%PWM IN	**DL8**	**Green**	PWM % on input (M3: 8/9)	
	RL1	**DL9**	**Green**	**RL1** relay (NO = relay ON)	
Display	**LDC**	LCD Display, 2 lines for 32 characters			
Settings	**Key-board**	FOUR (4) keys for : "ENTER" , "ESCAPE" , "UP" , "DOWN" ; Display and key.board are used for the visualization and the setting of the working parameters			
Predispositions	Starter	5"			
	Cut-Off	The regulation is setted at the 25% of the VAC power supply			
Alarms	Input command	Verify the input signal range : - **0-10 Vdc > max value under 11Vdc** - **4-20 mAdc >** min value **2mA** and max value **24mA**			
	Power supply	Power supply under range **(less 20% Vac supply)**			
		Verify the low VAC limit (max -20%); Alarm ON with **Led DL4 (red) & relay RL1 (OFF)**			
	Working controller	Verify the working °C, with internal probe (max 85°C)			
Protections	Overvoltage protection	Complying with **EN 61000-4-5**: Overvoltage Category **II** (**4 KV**)			
	Inputs	With PTC for short-circuits			
	Controller	"Protistor" fuse (10 x 30)			
		Internal °C thermal protection			
	Mains monitoring	It checks the simultaneous presence of all the single mains phases; in case of lack of one phase, or insufficient power supply, the device is stopped and the situation is displayed by: Led **FAIL=ON** and **ALARM=OFF** + relay **RL1=OFF**			
	Mains filter EMC (**)	Suitable for the installation in **PDS** systems (Power Drive System = Controller with connected fan/s), for Residential, Commercial and Light Industry environment **(** ATTENTION! : In presence of a protection with DIFFERENTIAL system, use switches with leakage current to ground ≥ 60 mA)**			
Case	Available case	**IP55 (standard)**		**IP 00 (on request)**	
	Materials	**GW-Plast 120°C** (max. temperature 120°C) and aluminum			
	Locking screws	**TPN** series with max. tightness **2,5 Nm**. (according to **CEI 23-58**)			
	Protection degree	**IP 55**			
	Environmental pollution	High pollution			
	Fire resistance	**D** Category			
Insulation	Case	Class **I** (use of protective earthing conductor)			
	Control circuits	**4000Vac** between control input and mains voltage components			
Work environment	Working temperature	**-20 T 50** (from –20°C to + 50°C) for temperatures < -10°C , use **S2**			
	Storage temperature	**-30 T 85** (from –30°C to + 85°C)			
	Humidity	**RH < 85% non condensing**			
	Vibrations	Lower than 1G (9.8 m/s^2)			
Installation	Wall mounting ONLY in vertical position, with **N° 4** holes **Ø 6** mm.				
Electrical Connections	Signal connections	Flexible cable, rated cross section **1,5 mmq / 22-14 AWG Cu**			
	Power connections	**ESK 112**	Flexible cable, rated cross section min. **2,5 mmq.**		
		ESK 120	Flexible cable, rated cross section min. **4.0 mmq.**		
Compliance	**2006/42CE**	**2006/95CE**		**2004/108CE**	

1.6 Mechanical Dimensions

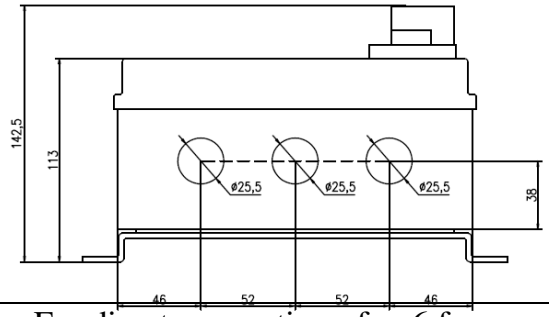
The ESK100 controllers, are available with IP55 & IP00 protection; the IP55 version, are available with custom drilling of box (on request)

Model	Dimensions (mm.)						
	A	B	C	E	F	Peso	Ø fori
ESK 112 std	255	235	142,5	217,5	199	3,8 kg	6,0 mm
ESK 112 hi	255	235	183	217,5	199	4,2 kg	6,0 mm
ESK 120 std	200	285	156,5	154	255	6,,5 kg	6,0 mm
ESK 120 hi	200	285	197	154	255	6,8 kg	6,0 mm

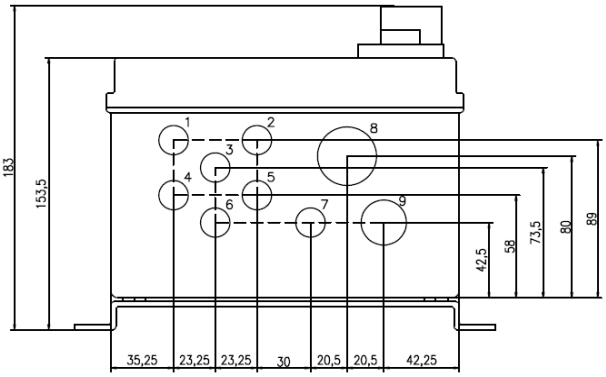
Protection IP55



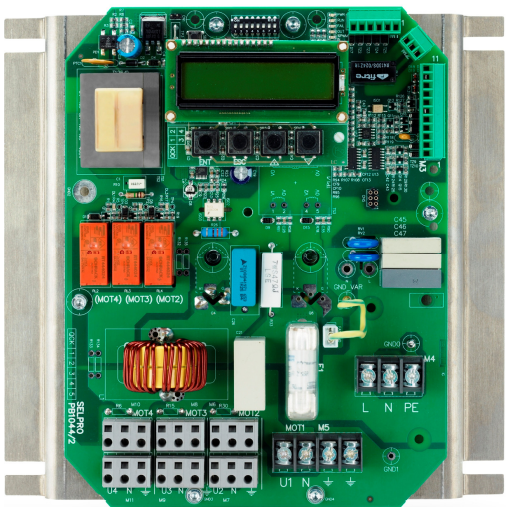
(*) standard

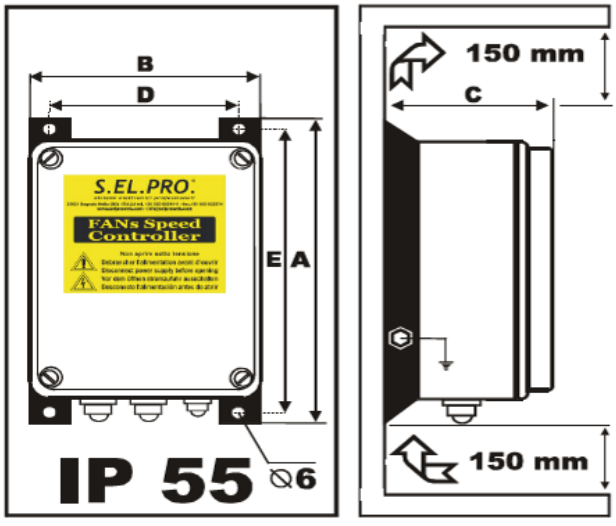


For direct connection of n. 6 fans motors



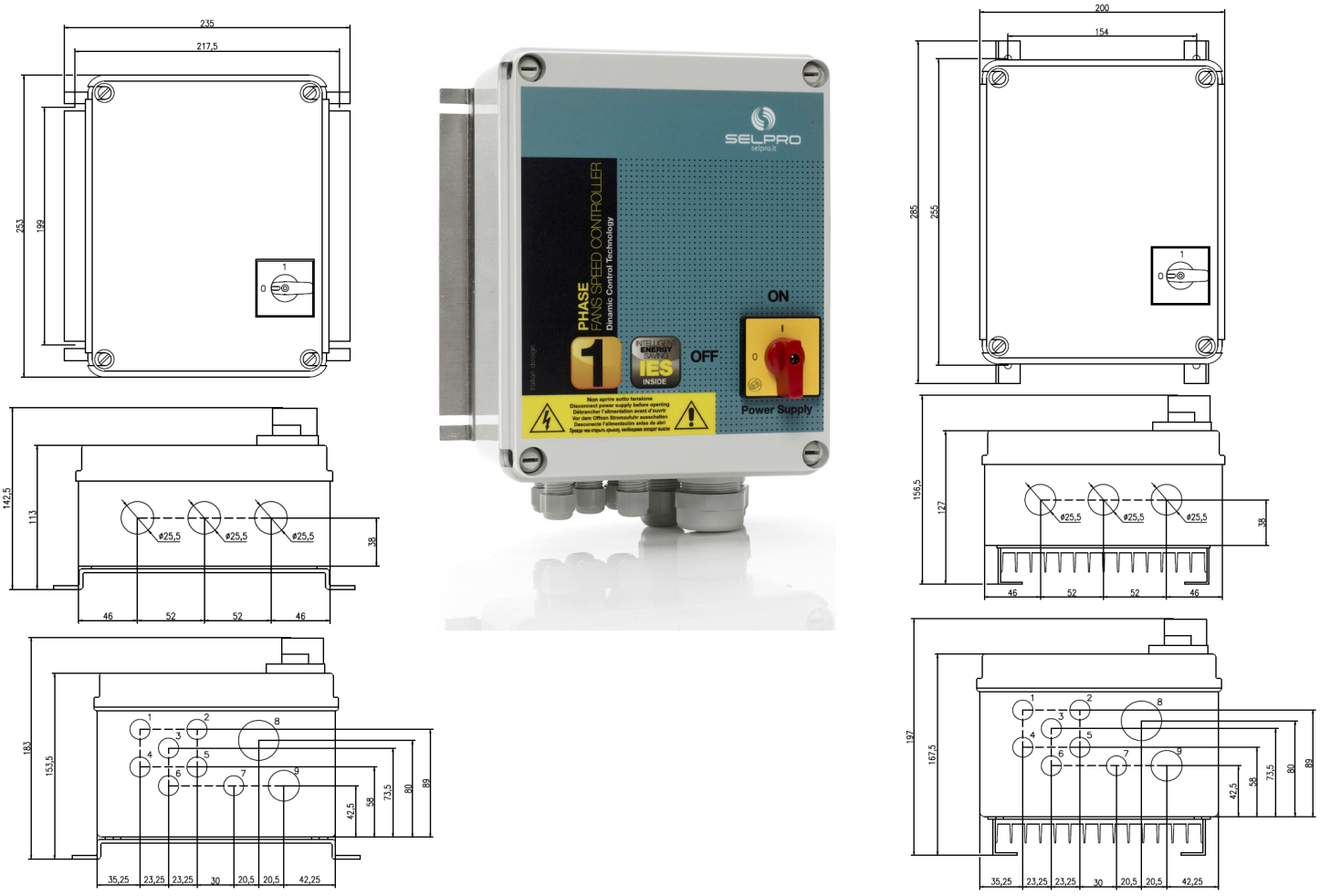
Protezione IP00





The IP55 models, are available with plastic case.
The hole on the bottom for the cable entry, can be customized for the direct connection of :

- Power supply
- Fans motor (max n. 6)
- Input & output digital signal, and modbus (RTU) insulated connection.



1.7 Electric motors

The regulator **ESK100** allows the connection of single-phase asynchronous motors, in applications whose motor torque-speed characteristic IS quadratic. Thus it is especially suitable with axial fans, while centrifugal fans can be connected only if purposely specialized for the phase-cutting regulation.
The correct electrical connection and the supply voltage are reported on the motor data plate.
It is important to keep the power supply cable as short as possible, so as to minimize interferences and leakage (**10 / 15 mt**); otherwise it is recommended to install an auxiliary single-phase filter on the controller's output.
For the connection of the cables, for supply & load, watch at the table :

Cable size	Max. Ampere (In *)
1,5 mmq	6 A / 10 A
2,5 mmq	10 A / 16 A
4,0 mmq	16 A
6,0 mmq	25 A



(*) If the total ampere are equal to the nominal current, use the upper size cable; For the right connection, see the figure

The **ESK100** regulator can control several motors connected in parallel, assuming that the absorption of their total current does not exceed the rated current indicated on the **ESK100** data plate.
The speeds of the motors vary at the same time; variances in behaviour during start up and at low speeds are due to slight differences between the motors, even if they are of the same type;
However, if the required motor speeds have to be different, motors with different rated speeds must be used. Bear in mind that motors with very different characteristics create heterogeneous electrical situations, which may show problems on start up and at low speeds because of different resistances of the stators which require different voltages on start up and at low speeds.

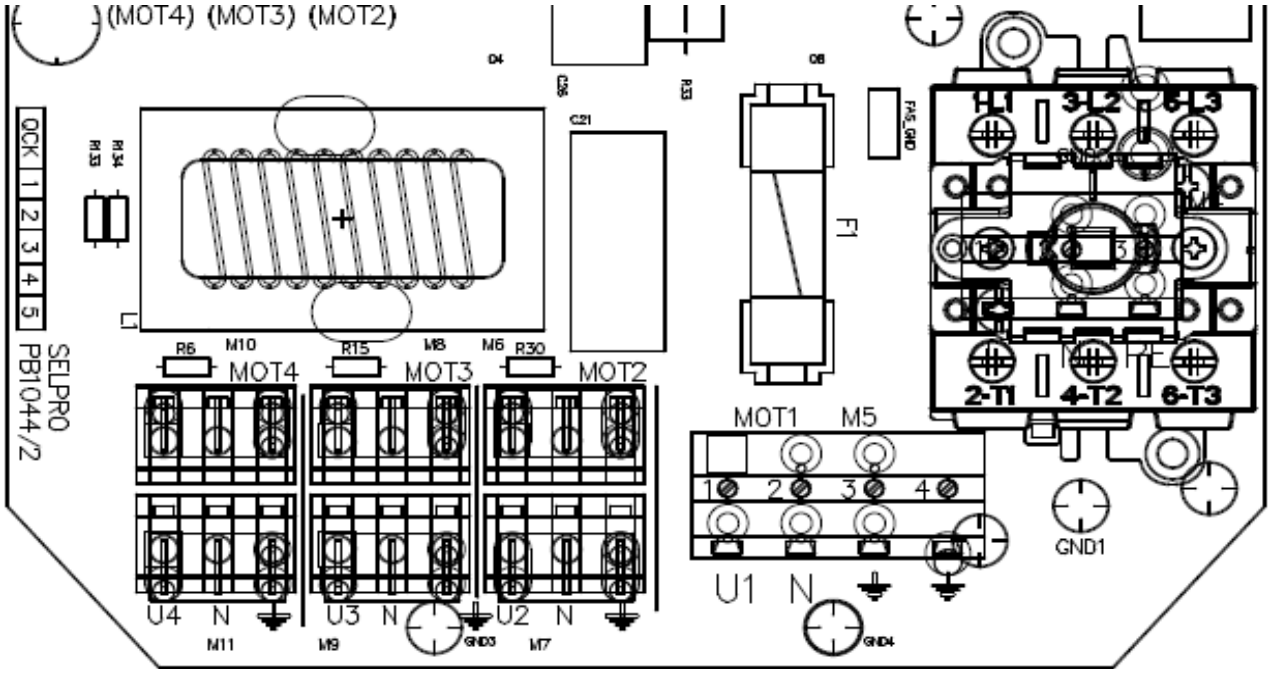
1.8 Magneto-thermal protection

The **ESK100** devices must be protected by a magneto thermal switch fitted upstream of the cutting regulators.
Installation of magneto thermal protections is the responsibility of the installer.
It is advisable to fit an automatic magneto thermal protection with a '**C**' intervention curve having the following capacity:
To prevent the short circuits to the controllers SCR, it's very important the application of the referenced fuses into the table.

Mod. ESK100	PROTISTOR fuse for SCR(*) protection				
	Type	Vac	Amp	Series	Reference
ESK 112 (12A) ESK 120 (20A)	10 x 38	690 V	25	L330014J	FR10GB69V25



⚠ **(*) to protect** ESK controller Power-Semiconductor (**SCR**), use **Ferraz-Shawmut** specialized fuse for electronic power applications.



2.0 Electrical connection

2.1 Connection of Power Supply and Load

Connect the power supply and the load as shown in the figure below, being careful to employ conductors with a cross section suitable to the connected load.
The power cables (power supply and load), must be installed separately from the control cables (analog inputs and **ON-OFF** input/outputs), keeping the maximum possible distance between the power and signal conductors.
Do not place power cables with signal cables in the same raceway.
In case the cables cross one another, ensure it is at 90°.

⚠ **SURGE ARRESTER:** electric protection placed between the regulator supply and the earth, meant to protect the device from transient overvoltage.

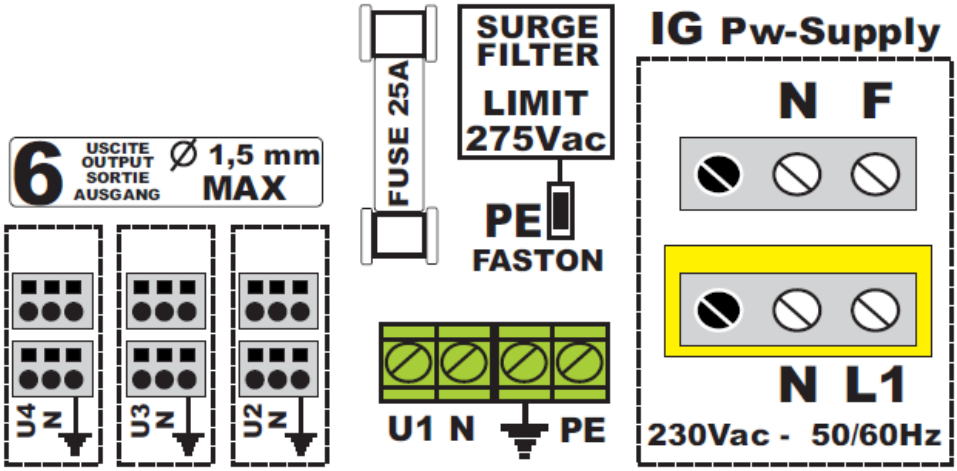
⚠ **WARNING:** disconnect the faston contact from the PE earth reference, before making the "ELECTRIC STRENGTH TEST".

⚠ **WARNING: In presence of a protection with DIFFERENTIAL SYSTEM, use switches with leakage current to earth ≥ 60 mA)**

The **ESK100** regulators allow the connection of single-phase loads, also with phase-phase (@ 230Vac) connection.
It is advisable to provide a Bypass Switch to allow the load activation, even when the cutting regulator is faulty (**Emergency by-pass**).

When connecting the Bypass, the following precautions should be taken into consideration:

- ✓ **The connection through the Bypass Switch must keep the phase correspondence unaltered so as to avoid destructive short-circuits.**
- ✓ **Before supplying the load with maximum voltage, the supply should be disconnected from the Regulator. Therefore:**
  - **It is advisable to use a single-position manual switch as a commutation device**
  - **If automatic commutation is performed by means of contactors, make sure there is some delay (at least 2 seconds) between regulator disconnection and load activation**

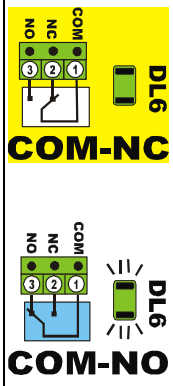


ATTENTION !

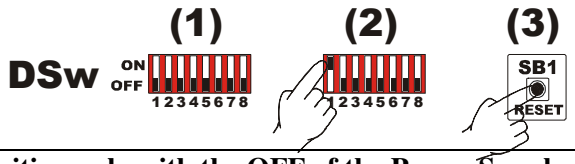
- The fan motor can be connected: phase-phase, if isn0t available the Neutral connection.
- The **ESK100** regulator can control several motors connected in parallel, assuming that the absorption of their total current does not exceed the rated current indicated on the **ESK100** data plate.
- The speeds of the motors vary at the same time; variances in behavior during start up and at low speeds are due to slight differences between the motors, even if they are of the same type;

2.2 DIP-Switch (DSw1 … DSw8)

On the upper side of the card, the is a eight position DIP-Switch (DSw1 a DSw8), to change the regulations functions.

<table>
<tr><th colspan="2">Dip Swicht (DSw)</th><th colspan="3">Description</th></tr>
<tr><td rowspan="2">1</td><td>On</td><td colspan="3">Set-Point at MIN speed (% Vac regulation value)</td></tr>
<tr><td>Off</td><td colspan="3">Set-Point at MAX speed (% Vac regulation value)</td></tr>
<tr><td rowspan="2">2</td><td>On</td><td colspan="3">Reverse mode : the VAC output increases as the input command increases</td></tr>
<tr><td>Off</td><td colspan="3">Direct mode : the VAC output decreases as the input command increases</td></tr>
<tr><td rowspan="4">3</td><td>On</td><td>S2 = NC</td><td>When OPEN = all OFF</td><td rowspan="2">Thermal Contact TK function</td></tr>
<tr><td>On</td><td>S2 = NO</td><td>When CLOSED = all O.K.</td></tr>
<tr><td>Off</td><td>S2 = NC</td><td>When OPEN = START function</td><td rowspan="2">Stop-Start function</td></tr>
<tr><td>Off</td><td>S2 = NO</td><td>When CLOSED = STOP function</td></tr>
<tr><td>4
&
5</td><td> 
</td><td colspan="3">Available Alarm relay setting functions: see the table and watch on the display
<table>
<tr><th colspan="2" rowspan="2">DSw selection</th><th colspan="4">DIP-Switch positions</th></tr>
<tr><th>ALL-1</th><th>ALL-2</th><th>ALL-3</th><th>ALL-4</th></tr>
<tr><td colspan="2">DSw 5</td><td>OFF</td><td>ON</td><td>OFF</td><td>ON</td></tr>
<tr><td colspan="2">DSw 6</td><td>OFF</td><td>OFF</td><td>ON</td><td>ON</td></tr>
</table>
with RL1 = ON >>> led DL6 = ON
<table>
<tr><th>Writed on the DISPLAY</th><th colspan="4">ALLARME RL1 (ON = NA=O.K.)</th></tr>
<tr><td>With > STOP</td><td></td><td>COM-NC</td><td>COM-NC</td><td></td></tr>
<tr><td>With > STAND-BY</td><td></td><td></td><td>COM-NC</td><td></td></tr>
<tr><td>With > ALARM</td><td>COM-NC</td><td>COM-NC</td><td>COM-NC</td><td></td></tr>
<tr><td>With > PWR-OUT</td><td colspan="4">always COM-NO</td></tr>
<tr><td>With > HP OUT (in %VAC)</td><td colspan="4">always COM-NO</td></tr>
<tr><td>With > SET cos-phi</td><td colspan="4">always COM-NO</td></tr>
</table></td></tr>
<tr><td>6</td><td></td><td colspan="3">RESERVED - Available custom function on request</td></tr>
<tr><td>7</td><td></td><td colspan="3">RESERVED - Available custom function on request</td></tr>
<tr><td>8</td><td></td><td colspan="3">RESERVED - Available custom function on request</td></tr>
</table>

N.B. After the Dip-Swicht (DSw) selection, press **RESET : SB1**; the controller restart with the new selected function

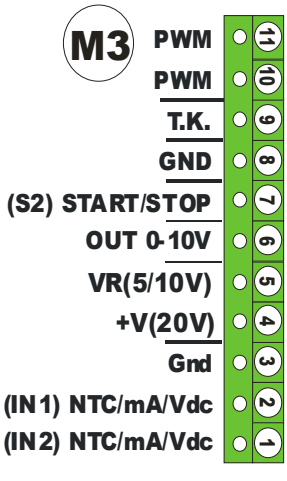


With DSw 5&6 = ON/ON, the alarm relay change to COM-NC position only with the OFF of the Power Supply

2.3 CONTROL SIGNALS & AUXILIARY CONTACTS Connection

The figure below shows the label placed inside the regulator, which reproduces the electrical connections of control sensors/signals and of the available auxiliary contacts.

11	**PWM**	**PWM** digital signal, from **3V** to **30V**, insulated and **not polarized**.
10	**PWM**	
9	**T.K.**	Connection of the thermal contact (**NC**)
8	**Gnd**	Ground Referenced
7	**(S2)Start/Stop HP speed**	**NO/NC** contact (Sw4 selection) for **Stop/Start**; with **HP ≠ 0%**, we have the Heat-Pump or Free-cooling fixed speed: from **0% > 100%**
6	**OUT 0-10V**	**0-10Vdc** (**20mA**) output, for **SLAVE** extra power unit
5	**Vr (5/10V)**	Supply **+10,0V/+5,0V** (automatic commutation), **20mA**, stabilized and protected
4	**+V (20V)**	**+20V +/- 20% ,** max **40mA** not stabilized, protected from short-circuit
3	**Gnd**	Ground Referenced
2	**IN 1 (*)**	**Input 1 for NTC, 4-20mA, 0-10V, 0-5V - (Master or Slave)**
1	**IN 2 (*)**	**Input 2 for NTC, 4-20mA, 0-10V, 0-5V - (Master or Slave)**



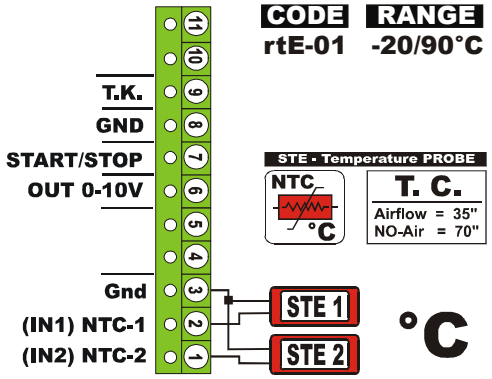
(*) with two (2) sensors/signal working, the regulator selects automatically the signal with the higher value

- **in standard configuration, the Set-point corresponds with the fan MAX. speed limit (C4=hi)**

2.4 Regulation Transducers and Signals (see 3.1 for available software code & scale)

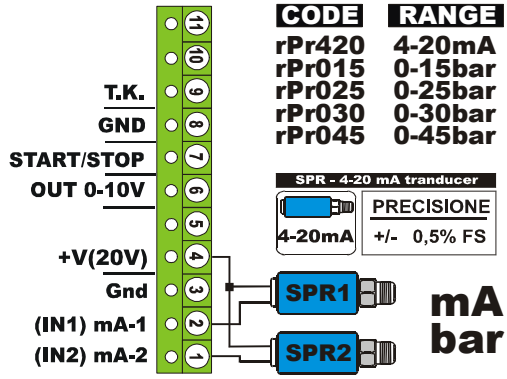
2.4.1 Transducer/s NTC 10 kohm @ 25°C

Selection for MASTER rtE
(range -20T90°C)
See below the connection for one (or two*) **NTC** probes



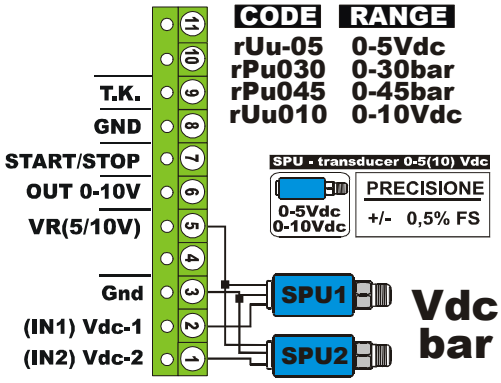
2.4.2 Transducer/s 4-20 mA

Selection for MASTER rPr
(range 4-20mA, 0/15, 0/25, 0/30, 0/45 bar)
See below the connection for one (or two*) **4-20 mA** transducers

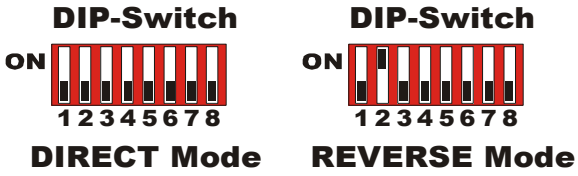


2.4.3 Voltage transducers 0-5Vdc (ratiometric) - MASTER rUu (range 0-5Vdc)
Voltage transducers 0-5Vdc (ratiometric) - MASTER rPu (range 0/30 bar & 0/45bar)
Voltage transducers 0-10Vdc – MASTER rUu (range 0-10Vdc)

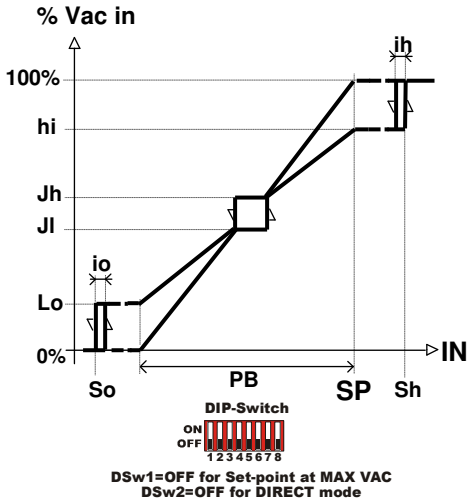
See below the connection of one (or two*) Vdc transducers



ATTENTION :
- **in standard configuration, the Set-point corresponds with the fan MAX. speed**
- **For REVERSE mode function, shift DSw/2 to ON position**
- **with two (2) sensors/signals working, the regulator selects automatically the signal with the higher value**

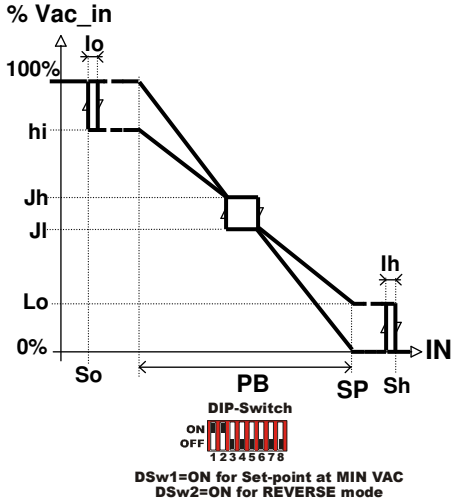


DIRECT mode SP=MAX Vac



DSw1=OFF for Set-point at MAX VAC
DSw2=OFF for DIRECT mode

REVERSE mode SP=MIN Vac



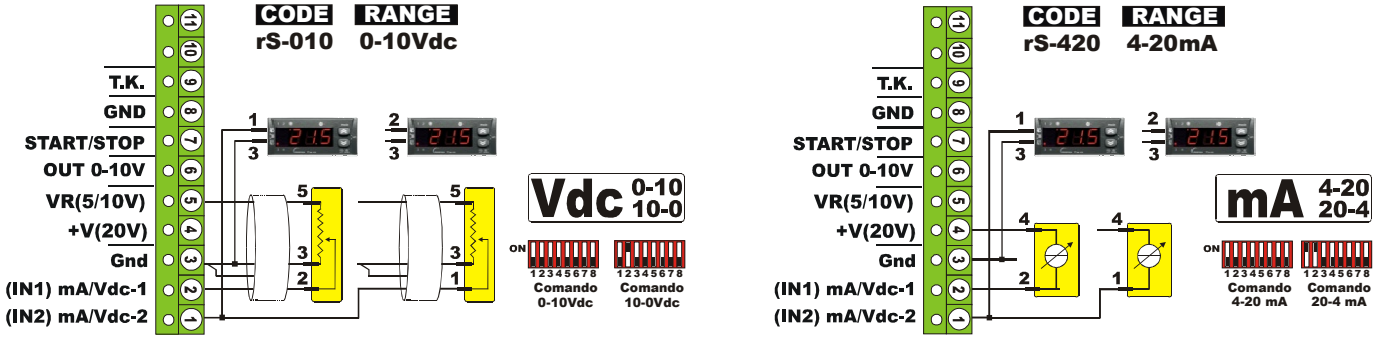
DSw1=ON for Set-point at MIN VAC
DSw2=ON for REVERSE mode

Code	Description
in	IN1 o IN2 input value
SP	Set-point value
Pb	Proportional Band value
hi	MAX-RPM limit, (% VAC)
Lo	MIN-RPM limit, (% VAC)
Jh	Upper jump point (% VAC)
Jl	Lower jump point (% VAC)
So	Cut-Off / Bypass MIN-RPM limit
io	Hysteresis on **So**
Sh	By-pass Max-RPM limit
ih	Hysteresis on **Sh**

(*) with two (2) sensors/signal working, the regulator selects automatically the signal with the higher value

2.4.4 Remote controls signals 0-10 Vdc / 4-20 mA / PWM

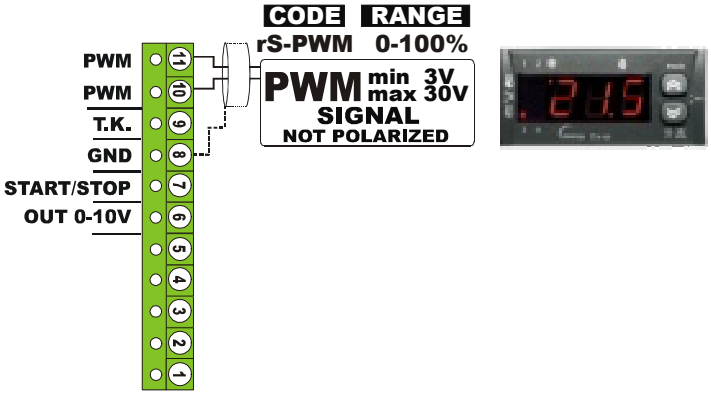
Below are represented the connections for the remote control regulations : **0-10Vdc, 4-20 mA e PWM,** coming from remote control unit, for Automatic regulation or Manual regulation (with Potentiometer);
with **DSw2=ON**, the controller work on **Reverse** mode: **10-0Vdc or 20-4mA** (for **rS** selection)



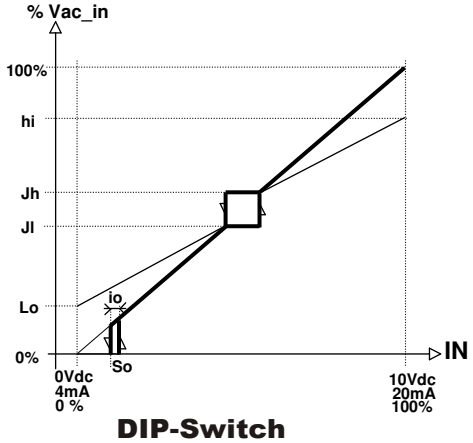
(*) with two (2) signal working, the regulator selects automatically the signal with the higher value

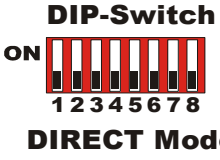
ATTENTION :

- **The controller is configured to receive N° 2 remote control signal: 0-10Vdc or 4-20mA, and N° 1 PWM signal**
- **the regulator selects automatically the signal with the higher value**
- **with rS010 (Vdc) rS420 (mA), it's possible to connect directly the command for remote manual regulation; on terminal M3 are available the stabilized supply Voltage**
- **for REVERSE mode (input: 10-0V or 20-4mA): shift DSw/2 to ON position and set "So" at 95% of the selected scale (max 9,5 Vdc or 19 mA), because it's the Cut-Off value = Vac for FANs OFF;**



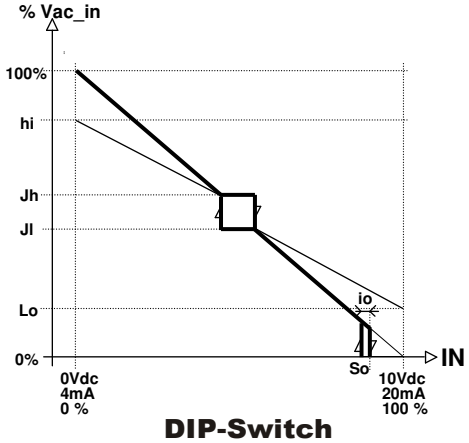
DIRECT mode

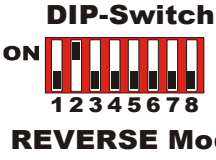




DIRECT Mode

REVERSE mode





REVERSE Mode

Code	Description
in	IN1 o IN2 input value
hi	MAX-RPM limit, (% VAC)
Lo	MIN-RPM limit, (% VAC)
Jh	Upper jump point (% VAC)
Jl	Lower jump point (% VAC)
So (*)	Cut-Off / Bypass MIN-RPM limit
io	Hysteresis on **So**

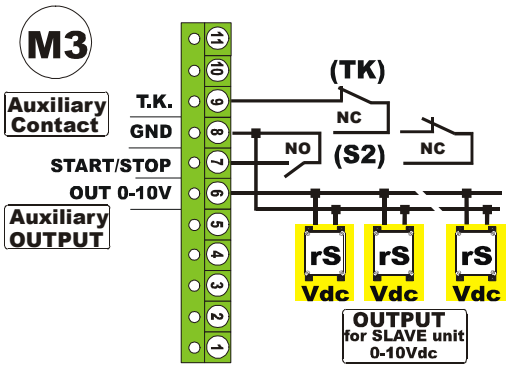
(*) For REVERSE mode set the So value, at MAX scale

Es.: with **rS010**for **0-10 Vdc**
So=0 Vdc for DIRECT mode
So=9,5 Vdc for REVERSE mode

2.5 AUXILIARY CONTACTS & SIGNALS terminal block (M3)

On the M3 signals connections, there are available:
- START/STOP (S2) : contact NO/NC (Dsw4 selection);
- T.K. : contact NC, for thermal protection
- 0-10Vdc output, for extra power (SLAVE units)

OUTPUT (0-10V max 20mA): this output is available for the regulation of other SLAVE unit for extra power;



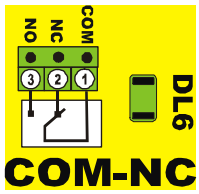
SIGNAL & ON-OFF contacts	**OUT**	**8 – 6**	**0-10Vdc output signal for SLAVE unit**	
	Start Stop (S2)	**8 – 7**	**Remote contact**	**DSw4=OFF**
				DSw4=ON
	TK	**8 – 9**	**Thermal contact**	

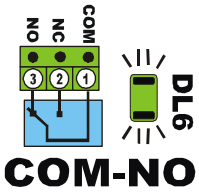
S2=OFF	O.K. for working	**S2=ON**	Stop H.P. (Vac %)
S2=ON	O.K. for working	**S2=OFF**	Stop H.P. (Vac %)
TK=ON	O.K. for working	**TK=OFF**	Thermal Alarm

2.6 RL1 Alarm relay terminal block (M4)

On the upper side of the controller card, there is the RL1 Alarm relay, with programmable function for different level of warning.
With the factory selection, RL1 switch from NC position (1&2) to NO position (1&3).
Different alarm levels are selectable with the DSw 4&5 selection.

N.B. Aftyer the DSw selection, to confirm the change, press the **RESET : SB1** button.
With DSw 5&6 on position ON/ON, the alarm relay switch from NC position only with the Power Supply OFF.





Available Alarm relay setting functions: see the table and watch on the display

DSw selection	**DIP-Switch positions**			
	ALL-1	**ALL-2**	**ALL-3**	**ALL-4**
DSw 5	**OFF**	**ON**	**OFF**	**ON**
DSw 6	**OFF**	**OFF**	**ON**	**ON**

with RL1 = ON >>> led DL6 = ON

Writed on the DISPLAY	**ALLARME RL1 (ON = NA=O.K.)**			
With > STOP		**COM-NC**	**COM-NC**	
With > STAND-BY			**COM-NC**	
With > ALARM	**COM-NC**	**COM-NC**	**COM-NC**	
With > PWR-OUT	**always COM-NO**			
With > HP OUT (in %VAC)	**always COM-NO**			
With > SET cos-phi	**always COM-NO**			

DSw 5 & 6

ALARM mode Selection for RL1 function

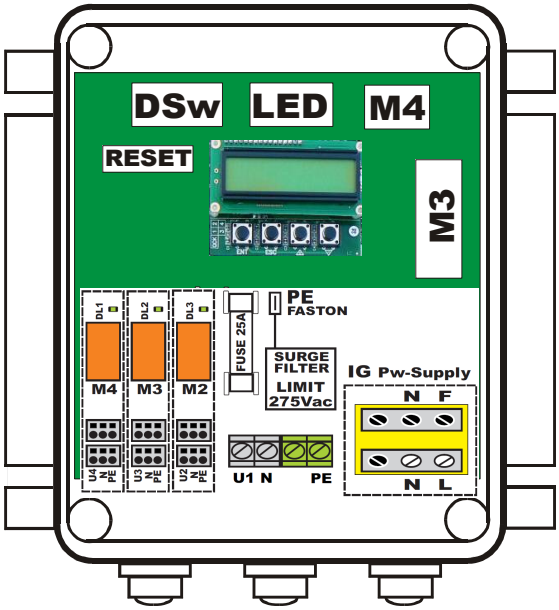
ALARM selection table for relay RL1 function

ALL-1 (COM-NC)	**ALL-2 (COM-NC)**	**ALL-3 (COM-NC)**	**ALL-4 (COM-NC)**
Power Supply OFF	Power Supply OFF	Power Supply OFF	**RL1= COM-NC** only with **Power Supply=OFF**
Power S. under range	Power S. under range	Power S. under range	
Controller K.O.	Controller K.O.	Controller K.O.	
Phase loss	Phase loss	Phase loss	
	Remote STOP active H.P. on work = 0%	Remote STOP active H.P. on work = 0%	
		Vac output = 0%	



3.0 ESK100 Setting & Regulations

In the below figure, the position of the controllers principals components :



DSw	**Switch to change the working parameters**
LED	**Visualization Led for regulation state**
M4	**Alarm RL1 connection**
M3	**Connection for working signals and contacts**
SB1	**RESET botton**
Display	**Visualization Display for the operating parameters, with n. 32 characters on two line, with the four settings buttons:** ENTER-ESCAPE-UP-DOWN, **for programming the operating parameters**
L - N	**Power supply terminal block**
PE	**Ground connections**
U1 – U4	**Output to load/fans terminal block**

After switching on the regulator, or pressing the RESET button, the display shows the following messages in quick succession:

1	**PB1044 vr. 1.0**	Hardware Code and last software version release
2	**selpro.it**	Producer name

After on the display, you can read :

1	**rtE-01 STANDBY**	Working configuration	**rtE-01**	State	**STANDBY**
2	**in 42,0 °C**	"input" parameter	**in**	value & unit	**42,0 °C**

On the display there are single different zones :

1	**(a) : Configuration type**	**(b): State Messages**
2	**(c) : Parameter : Code**	**Value – Measure unit**

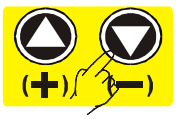
(a) The available **CONFIGURATION** are in the following pages

(b) The **State Messages** are the follow:

- **STAND-BY** Ready for work – Output to load OFF
- **PWR-OUT** VAC output working
- **HP OUT** HEAT-PUMP mode working (settable from 0% to 100%)
- **ALARM** Alarm on working
- **SET cosphi** "cos-phi" regulation on setting

(c) Selectable **Parameters** : parameters list, value and measure unit

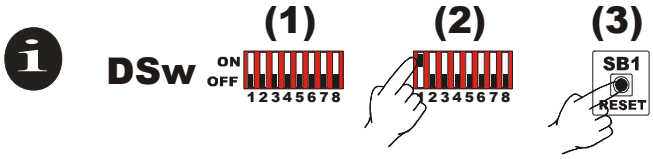
Starting from "**in**", to which it can be always returned pressing key RESET, it's possible to scroll "up & down" with **+/-** all the code.



To speed the setting



N.B. After the Dip-Switch shifting, press always **RESET (SB1)** button



3.1 Codes of the default configurations

After switching on the regulator, it is possible to choose the desired operating mode among the n.11 factory preset DEFAULT configurations. When it is selected right after the activation of the regulator, such operation erases any previous modification to the regulation parameters and always restores all the default values of the selected code (default parameters table).

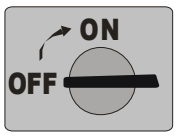
N.B.: In case of first installation, the display will present the DEFAULT (**rtE-01**) configuration or the most recently selected one.

Config.	N° Input	Analog Input	Operating Mode	Transducer Model	Display message
rtE-01(*)	1 o 2	NTC 10K@25°C	MASTER controller	STE	-10 / 90 °C
rPr420		4-20mA Ri= 100 ohm		-	4-20 mA
rPr015				SPR 0-15 bar	0-15 bar
rPr025				SPR 0-25 bar	0-25 bar
rPr030				SPR 0-30 bar	0-30 bar
rPr045				SPR 0-45 bar	0-45 bar
rUu-05		0-5Vdc Ri= 10Kohm		-	0-5 Vdc
rPu030				SPU 0-30 bar	0-30 bar
rPu045				SPU 0-45 bar	0-45 bar
rUu010		0-10Vdc Ri= 10Kohm		-	0-10 Vdc
rS-420	1 o 2	4-20mA Ri = 100 ohm	SLAVE controller	-	4-20 mA
rS-010		0-10Vdc Ri= 10Kohm		-	0-10 Vdc
rS-PWM		3-30 Vdc, max 10mA 100-120Hz		-	0-100%

(*) Factory default code

Once the configuration procedure is finished, the controller restart and the display shows the input value (in)

In order to enter this mode: switch on the regulator (from OFF to ON) or press SB1 (reset button)





In order to reset the default parameters, select the code to restart the default controller functions;

3.2 LCD Display regulation

To modify the display light, press “ENTER” & “UP” to increase, or “DOWN” to decrease ; on the display you can see the lightning value:

1	rtE-01	PWR OUT	Working configuration	rtE-01	State	PWR OUT
2	LCD	xxx dimm.	“LCD” parameter	LCD	value & unit	xxx dimm.



3.3 Regulation parameters codes

The following table shows the codes of the regulation parameters, with the ranges and the default values

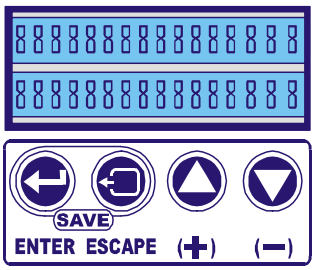
Display				Default	Configuration	Model of transducer or generated signal	Description
Code	Value		UM				
	min	MAX					
SP	-10,0	+90,0	°C	45,0	**rtE-01**	STE –10/+90°C	**Set Point**
	4,0	20,1	mA	14,0	**rPr420**	4-20 mA	
	0	15,0	bar	10,6	**rPr015**	SPR 0-15 bar	
	0	25,0	bar	17,0	**rPr025**	SPR 0-25 bar	
	0	30,0	bar	17,0	**rPr030**	SPR 0-30 bar	
	0	45,0	bar	25,0	**rPr045**	SPR 0-45 bar	
	0	10,0	Vdc	6,0	**rUu010**	0-10 Vdc	
	0	5,0	Vdc	2,9	**rUu-05**	0-5 Vdc	
	0	30,0	bar	18,9	**rPu030**	0-5 Vdc	
Pb	2,0	55,0	°C	7,5	**rtE-01**	STE –10/+90°C	**Proportional Band**
	0,2	16,0	mA	2,6	**rPr420**	4-20 mA	
	0,5	15,0	bar	2,4	**rPr015**	SPR 0-15 bar	
	1,0	25,0	bar	3,5	**rPr025**	SPR 0-25 bar	
	1,0	30,0	bar	3,5	**rPr030**	SPR 0-30 bar	
	1,0	45,0	bar	5,2	**rPr045**	SPR 0-45 bar	
	0,2	10,0	Vdc	1,6	**rUu010**	0-10 Vdc	
	0,1	5,0	Vdc	0,8	**rUu-05**	0-5 Vdc	
	1,0	30,0	bar	3,5	**rPu030**	0-5 Vdc	
hi	0%	100%	% Out	100	**All**	**All**	**Max VAC limit**
Lo	0%	100%	% Out	00	**All**	**All**	**Min VAC limit**
dE	0,1”	60,0”	sec	2,0	**All**	**All**	**Starter**
Jh	0%	100%	% Out	100%	**All**	**All**	**Upper jump points**
JL	0%	100%	% Out	100%	**All**	**All**	**Lower jump points**
Sh	-20,0	+90,0	°C	90,0	**rtE-01**	STE –10/+90°C	**BY-Pass MAX VAC limit**
	4	20	mA	20.0	**rPr420**	4-20 mA	
	0	15	bar	15,0	**rPr015**	SPR 0-15 bar	
	0	25	bar	25,0	**rPr025**	SPR 0-25 bar	
	0	30	bar	30,0	**rPr030**	SPR 0-30 bar	
	0	45	bar	45,0	**rPr045**	SPR 0-45 bar	
	0	10,1	Vdc	10,0	**rUu010**	0-10 Vdc	
	0	5,0	Vdc	5,0	**rUu-05**	0-5 Vdc	
	0	30,0	bar	30,0	**rPu030**	0-5 Vdc	
ih	1	30	°C	1	**rtE-01**	STE –10/+90°C	**Histeresys Sh value**
	0,1	5,0	mA	0,1	**rPr420**	4-20 mA	
	0,1	5,0	bar	0,1	**rPr015**	SPR 0-15 bar	
	0,1	8,0	bar	0,1	**rPr025**	SPR 0-25 bar	
	0,1	8,0	bar	0,1	**rPr030**	SPR 0-30 bar	
	0,1	15,0	bar	0,1	**rPr045**	SPR 0-45 bar	
	0,1	5,0	Vdc	0,1	**rUu010**	0-10 Vdc	
	0,1	2,5	Vdc	0,1	**rUu-05**	0-5 Vdc	
	0,1	15,0	bar	0,1	**rPu030**	0-5 Vdc	
So	-20,0	+90,0	°C	-20,0	**rtE-01**	STE –10/+90°C	**BY-Pass Min VAC Limit - Cut-Off**
	4	20	mA	4	**rPr420**	4-20 mA	
	0	15	bar	0	**rPr015**	SPR 0-15 bar	
	0	25	bar	0	**rPr025**	SPR 0-25 bar	
	0	30	bar	0	**rPr030**	SPR 0-30 bar	
	0	45	bar	0	**rPr045**	SPR 0-45 bar	
	0	10.0	Vdc	0	**rUu010**	0-10 Vdc	
	0	5,0	Vdc	0	**rUu-05**	0-5 Vdc	
	0	30,0	bar	0	**rPu030**	0-5 Vdc	
	4,0	20,0	mA	4,0	**rS-420**	-	
	0	10,0	Vdc	0,1	**rS-010**	-	
	0	100	%	01	**rS-PWM**	-	

io	1	30	°C	1	rtE-01	STE –10/+90°C	**Histeresys So value**
	0,1	5,0	mA	0,1	rPr420	4-20 mA	
	0,1	5,0	bar	0,1	rPr015	SPR 0-15 bar	
	0,1	8,0	bar	0,1	rPr025	SPR 0-25 bar	
	0,1	8,0	bar	0,1	rPr030	SPR 0-30 bar	
	0,1	15,0	bar	0,1	rPr045	SPR 0-45 bar	
	0,1	5,0	Vdc	0,1	rUu010	0-10 Vdc	
	0,1	2,5	Vdc	0,1	rUu 05	0-5.0 Vdc	
	0,1	15,0	bar	0,1	rPu030	0-5.0 Vdc	
	0,1	5,0	mA	0,1	rS 420	-	
	0,1	5,0	Vdc	0,1	rS 010	-	
	0,1	50	%	0,1	rS PWM	-	
HP	0	100	%	0	**All**	-	**Heat-Pump mode (*)**

(*) Set the HP value with DSw4=ON

3.4 Keys button & Display

The ESK100 regulations unit, is equipped with an LCD display back lighted, with 2 lines for 32 characters, and four keys buttons for the functions: "UP"/"DOWN"/"ESCAPE"/"ENTER".
Display & keys buttons are used for to set or change the working parameters.
The settable parameters are into the tables of the below pages; some only to read (ex.. Analog input values), others can be changed to modify the regulations controller functions (ex.: Set-Point, Proportional Band, …); the regulations functions are defined by the eight (8) DIP-Switch positions.
After the switch-on, and the RESET (SB1), on the LCD display is show the input ("**in**") signal value working.



3.5 Parameters Visualized on LCD Display

At the end of the setted functions predispositions, after the switch on on the LCD display you read :

1	rtE-01	STANDBY	Working Configuration	rtE-01	State	STANDBY
2	in	23,0 °C	"Input" parameter	in	value & unit	23,0 °C

By pressing the buttons UP (**+) & DOWM (-)** it is possible to scroll through all parameters:

For example, pressing "**UP**":

1	rtE-01	STANDBY	Working Configuration	rtE-01	State	STANDBY
2	SP	45,0 °C	Set-Point	SP	value & unit	45,0 °C

Pusching again ONE time "**UP (+)** " :

1	rtE-01	STANDBY	Working Configuration	rtE-01	State	STANDBY
2	pB	7,5 °C	Proportional Band	pB	value & unit	7,5 °C

Pusching again SINGLE time "**DOWN (-)** " :

1	rtE-01	STANDBY	Working Configuration	rtE-01	State	STANDBY
2	CO	00 % out	Regulation COmand	CO	value & unit	CO 00 % out

Pressing "**RESET**" button, the controller restart and return to the input selected value:

1	rtE-01	STANDBY	Working Configuration	rtE-01	State	STANDBY
2	in	23,0 °C	"Input" parameter	in	value & unit	23,0 °C

3.6 Functions modes & Regulation parameters

The **ESK100** controller can work into two functions modes, called: **MASTER & SLAVE.**

3.6.1 MASTER (mode Regulator)

In **MASTER mode** are available all the functions parameters:

Code	Display	Description	
ti	**Temperature**	Instantaneous temperature in °C of the card	**V**
Co	**Power Out Value**	Value in % of the control VAC output	
in	**Input Signal**	Value of the active signal selected between the inputs IN1 or IN2	
SP	**Set Point**	Set-point value	**L**
Pb	**Proportional Band**	Proportional Band value	
hi	**Maximum Limit**	Maximum RPM% - VAC limit	
Lo	**Minimum Limit**	Minimum RPM% - VAC limit	
dE	**Accel./Decel. Time**	Soft-Start – acceleration/deceleration time	
Jh	**Jump High Limit**	RPM% upper limit of the VAC output for VAC jump	
JL	**Jump Low Limit**	RPM% lower limit of the VAC output for VAC jump	
Sh	**Input for VAC Out 100%**	Set-Point value for by-pass MAX limit : VAC out = 100%	
ih	**Hysteresis Sh Value**	Hysteresis of the value **Sh**	
So	**Input x Out 0%**	Set-Point value for by-pass MIN limit : VAC out = 0% (Cut-Off point)	
io	**Hysteresis So Value**	Hysteresis of the value **So**	

V : only to read

L : changeable by operator

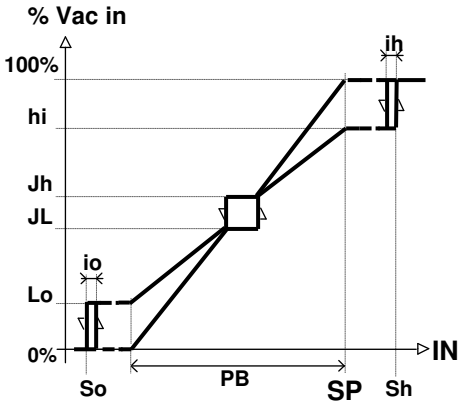
The output VAC, change to maintain into the Proportional Band the setted value, measured by the connected transducers; the action can be:

- **DIRECT :** the VAC output increase with the input signal increase (factory configuration)
- **REVERSE :** the VAC output decrease with the input signal increase.

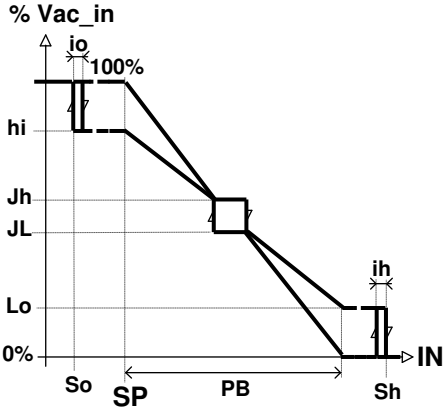
The SET-POINT is setted at the VAC MAX output

In the below figures, the Vac output function it's in relation to the input control signal (**in**), for DIRECT & REVERSE mode.
The VAC out is the % of the VAC input.

DIRECT mode SP=MAX Vac



REVERSE mode SP=MAX Vac



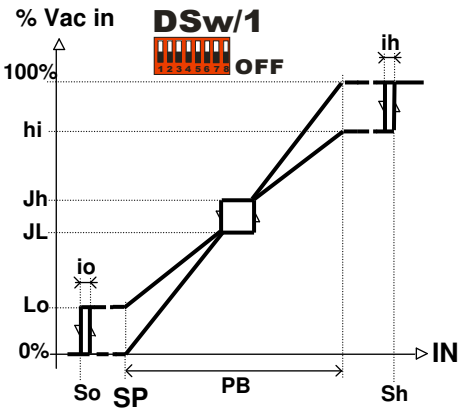
Code	Description
in	Input value working
SP	Set-point
Pb	Proportional Band
hi	Max RPM limit, (% VAC)
Lo	Min RPM limit, (%VAC)
Jh	Upper jump (% VAC)
JL	Lower jump (% VAC)
So	Cut-Off / Bypass MIN Vac limit
io	Hysteresis on **So**
Sh	By-pass Max Vac limit
ih	Hysteresis on **Sh**

The output Vac can work between the MAX & MIN Vac limit; moreover it's possible to set:

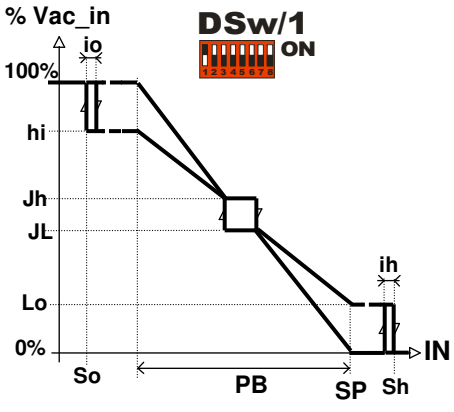
- <u>For the output Vac</u>
  it's possible to set two values: **UPPER** (**Jh**) and **LOWER** (**JL**), setted from 0% to 100%, to delimit the jump zone during the regulation (dB-Jump)
- <u>For the inputs signals</u>
  it's possible to set a **MIN Value** (**So**) and a **MAX Value** (**Sh**), in wich the regulation depend from the choosen function mode:
  - **DIRECT mode** : the VAC output is OFF with **in < So** (Cut-Off) and switch to 100% Vac if **in > Sh**
  - **REVERSE mode** : the VAC output is OFF with **in < Sh** (Cut-Off) and switch to 100% Vac if **in < So**

Shifting to ON position DSw/1, the Set-Point work at the MIN Vac output

DIRECT mode SP=MIN Vac



REVERSE mode SP=MIN Vac



Code	Description
in	Input value working
SP	Set-point
Pb	Proportional Band
hi	Max RPM limit, (% VAC)
Lo	Min RPM limit, (%VAC)
Jh	Upper jump (% VAC)
JL	Lower jump (% VAC)
So	Cut-Off / Bypass MIN Vac limit
io	Hysteresis on **So**
Sh	By-pass Max Vac limit
ih	Hysteresis on **Sh**

3.6.2 SLAVE (DRIVER – Power Unit)

In **SLAVE mode** are available only the functions parameters into the below table:

Code	Display	Description	
ti	**Temperature**	Instantaneous temperature in °C of the card	**V**
Co	**Power Out Value**	Value in % of the control VAC output	
in	**Input Signal**	Value of the active signal selected between the inputs IN1 or IN2	
hi	**Maximum Limit**	Maximum RPM% - VAC limit	**L**
Lo	**Minimum Limit**	Minimum RPM% - VAC limit	
dE	**Accel./Decel. Time**	Soft-Start – acceleration/deceleration time	
Jh	**Jump High Limit**	RPM% upper limit of the VAC output for VAC jump	
JL	**Jump Low Limit**	RPM% lower limit of the VAC output for VAC jump	
So	**Input x Out 0%**	Set-Point value for by-pass MIN limit : VAC out = 0% (Cut-Off point)	
io	**Hysteresis So Value**	Hysteresis of the value **So**	

V : only to read

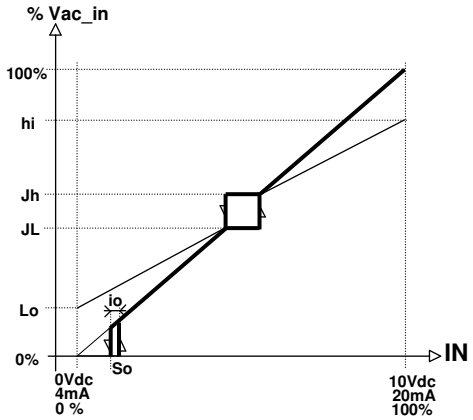
L : changeable by operator

The Vac output change in according to the input (**in**) signal working; the action can be:

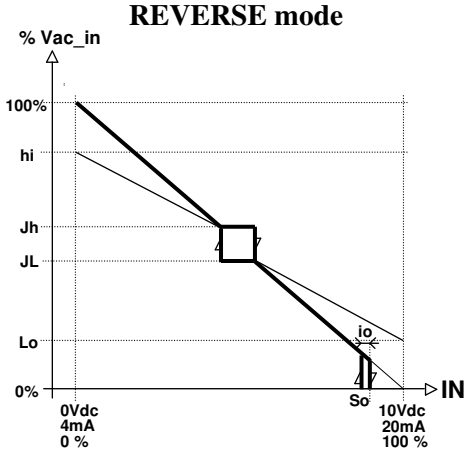
- **DIRECT :** the VAC output increase with the input signal increase (factory configuration)
- **REVERSE :** the VAC output decrease with the input signal increase.

In the below figures, the Vac output function it's in relation to the input control signal (**in**), for DIRECT & REVERSE mode.
The VAC out is the % of the VAC input.

DIRECT mode



REVERSE mode



Code	Description
in	Input value working
hi	Max RPM limit, (% VAC)
Lo	Min RPM limit, (%VAC)
Jh	Upper jump (% VAC)
JL	Lower jump (% VAC)
hi	Max RPM limit, (% VAC)
So (*)	Cut-Off / Bypass MIN Vac limit
io	Hysteresis on **So**

(*) With REVERSE mode, change **So** value to the MAX of the regulation scale

Ex.: with **rS010** for **0-10 Vdc**
So = 0 Vdc for mode **DIRECT**

So = 9,5 Vdc for mode **REVERSE**

The output Vac can work between the MAX & MIN Vac limit; moreover it's possible to set:

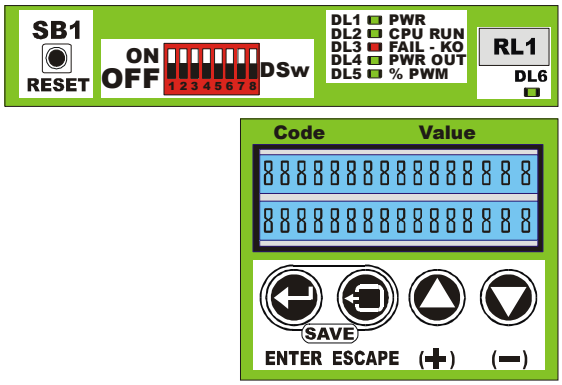
- For the output Vac it's possible to set two values: **UPPER** (**Jh**) and **LOWER** (**JL**), setted from 0% to 100%, to delimit the jump zone during the regulation (dB-Jump)
- For the inputs signals it's possible to set a **MIN/Cut-Off Value** (**So**), in wich the regulation depend from the choosen function mode:
  - **DIRECT mode** : the VAC output is OFF with **in < So** (Cut-Off limit)
  - **REVERSE mode** : the VAC output is OFF with **in > So** (Cut-Off limit)

3.7 "Quick-Start" : selection of the Default Software configurations

At the start-up, it's possible to select the configuration of work, between the N° 12 available software configuration, following the below described procedure.

Selection of the software CONFIGURATION

Regulation components



Starting condition



In order to enter this mode:
- switch on the regulator
- press the "RESET" SB1

3.7.1 Choose the working mode

1- Press simultaneously the buttons "**ENTER**" and "**DOWN** "
2- Switch on the regulator (from OFF to ON) or press the button "**RESET**"
3- After switching on the regulator, wait the conclusion of the RUN-TEST (LCD display = off)
4- Release simultaneously "**ENTER**" e "**DOWN** ": the regulator finds its configuration and the display shows the last selected configuration:

1	**(a) rS 010 (*)**	Working Configuration (*rS 010 factory selection)
2	**choice default**	Message for the operator : "**choose new code**"

4- With "**UP**" & "**DOWN** " scroll down the twelve (12) available default code.
5- Press "**ENTER**"; and the display show:

1	**rPr030**	New configuration selection
2	**store default**	Message : "memorize the new one" (blinking)

6- For EXIT, and to erase the new choice, press **ESCAPE**
7- To confirm the choice, press simultaneously the buttons **ENTER + ESCAPE**, and read on the LCD display:

1	**rPr030 update**	Selected configuration updating
2		Message : "memorized the new one" (blinking)

The controller save the new configuration, changing and working with the new default parameters.
This is the end of the choice.
The controller restart from OFF, and on the display you can read:

1	**PB1044 vr. 1.0**	Hardware Code and last software version release
2	**selproweb.com**	Producer name

After on the display, you can read :

1	**rPr030 STANDBY**	Working Configuration	**rPr030**	State	**STANDBY**
2	**in 12,3 bar**	"input" parameter	**in**	value & unit	**12,3 bar**

Now start the work with the new selected configuration.
To change the factory parameters, precede with the following pages.

3.7.2 Sequence to change the regulation parameters

1 – With the controller working, on the LCD display you can read:

1	rtE-01	PWR OUT	Working Configuration	rtE-01	State (working)	PWR OUT
2	in	42,0 °C	Reading parameter	in	value & unit	42,0 °C



To speed the setting parameters, press "**ENTER** " button with "+/-"



2- Press simultaneously for 2" the buttons "**ENTER**" and "**ESCAPE** ", and read on the display:

1	rtE-01	Program	Working Configuration	rtE-01	State	Program
2	SP	45,0 °C	Set-Point	SP	value	45,0 °C

3- Pressing "**UP**" or "**DOWN** ", on the 2nd display line, read & scroll down the sequence of all the regulations parameters.

4- Choose the parameter (ex.: Proportional Band "**PB**"), and press "**ENTER**": on the LCD display you can read

1	rtE-01	Modify	Working Configuration	rtE-01	State	Modify
2	Pb	7,5 °C	Proportional Band	Pb	value	7,5 °C

5- Pressing "**UP/+**" or "**DOWN/-** ", you can change the value of the selected parameter, to 9,5 °C
(pressing also "**ENTER** " button, you can speed the set running)

1	rtE-01	Modify	Working Configuration	rtE-01	State	Modify
2	Pb	7,5 °C	Proportional Band	Pb	value	9,5 °C

6- To erase the new choice, press **ESCAPE**, and start for a new parameter
7- To confirm the choice, press **ENTER** and read on the LCD display:

1	rtE-01	Program	Working Configuration	rtE-01	State	Modify
2	Pb	9,5 °C	Proportional Band	Pb	value	9,5 °C

8- to modify a further parameter, repeat from point "**3**"

9- For EXIT, and to erase the new choice, press **ESCAPE**
10- To confirm the choice, press simultaneously the buttons **ENTER + ESCAPE**, and read on the LCD display:

1	rtE-01	update	Selected configuration	updating
2	Pb	9,5 °C	Message : "memorized the new one"	(blinking)

The controller save the new changed parameters, working with the new parameters reference, and on the display you can read:

1	PB1044	vr. 1.0	Hardware Code and last software version release
2	selproweb.com		Producer name

After on the display, you can read :

1	rtE-01	PWR OUT	Working Configuration	rtE-01	State	PWR OUT
2	in	42,0 °C	"input" Parameter	in	value & unit	42,0 bar

Now START the work with the new selected parameters.

3.7.3 Setting of the Jh & JL extra dB jump parameters

During the fan speed regulation, there is the possibility of the presence of acoustic peaks (extra dB), coming from the fan motor .
To eliminate this acoustic peak ZONE, proceed as follows

1 – With the controller working, on the LCD display you can read:

1	rtE-01 PWR OUT	Working Configuration	rtE-01	State (working)	PWR OUT
2	in 42,0 °C	Reading parameter	in	value & unit	42,0 °C



To speed the setting parameters, press "**ENTER** " button with "+/-"



2- Press simultaneously for 2" the buttons "**ENTER**" and "**ESCAPE** ", and read on the display:

1	rtE-01 Program	Working Configuration	rtE-01	State	Program
2	SP 45,0 °C	Set-Point	SP	value	45,0 °C

3- Pressing "**UP**" or "**DOWN** ", on the 2nd display line, read & scroll down the sequence of all the regulations parameters.

4- Choose the parameter "**Jh**", and press "**ENTER**": on the LCD display you can read

1	rtE-01 Modify	Working Configuration	rtE-01	State	Modify
2	Jh 100 % out	JUMP higher point	Jh 100	value	% out

5- The controller stops the automatic regulation and supplies the fan/s up to 100% Vac (factory default **Jh = 100 %**); pressing "**UP**" & "**DOWN** ", the operator can scroll all the speed range, hearing the acoustic peak and watching on the display the % zone of the peak. Once the zone of the acoustic peak is reached, select a position slightly above it (1 or 2 % points higher)

(pressing also "**ENTER** " button, you can speed the set running)

1	rtE-01 Modify	Working Configuration	rtE-01	State	Modify
2	Jh 74 % out	higher JUMP point	Jh 74	value	% out

6- For EXIT, and to erase the new choice, press **ESCAPE**.
7- Press **ENTER** to confirm the selected value and read on the LCD display

1	rtE-01 Program	Working Configuration	rtE-01	State	Program
2	Jh 74 % out	higher JUMP point	Jh 74	value	% out

8- Press the button "**+/-**" until finding **JL** and press **ENTER**: the controller stops the automatic regulation and supplies the fan/s up to 100% Vac (default **JL = 100 %**)

1	rtE-01 Modify	Working Configuration	rtE-01	State	Modify
2	JL 100 % out	lower JUMP point	JL 100	value	% out

9- Press the button "**-**" in order to select a position slightly under the value selected for **Jh** (3 or 4 % points below it)

1	rtE-01 Modify	Working Configuration	rtE-01	State	Modify
2	JL 70 % out	lower JUMP point	JL 70	value	% out

10- For EXIT, and to erase the new choice, press **ESCAPE**
11- Press **ENTER** to confirm the selected value and read on the LCD display

1	rtE-01 Program	Working Configuration	rtE-01	State	Program
2	JL 70 % out	lower JUMP point	JL 70	value	% out

Now, in order to confirm yours choices, Press simultaneously the buttons **ENTER + ESCAPE**: the display shows the message "**Update**"

1	rtE-01 update	Selected configuration	updating
2	JL 70 % out	Message : "memorized the new one"	(blinking)

The selected parameters are saved and used immediately; the regulator starts running the automatic regulation with the new parameters, while the display shows the input signal value **(in)**

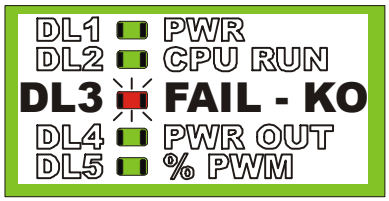
1	rtE-01 PWR OUT	Working Configuration	rtE-01	State	PWR OUT
2	in 42,0 °C	"input" Parameter	in	value & unit	42,0 °C

4.0 Alarm

4.1 Alarm Led DL3

The alarms are displayed also by DL3 Alarm LED, according to the priority indicated in the table above; the presence of an **alarm with higher priority** prevents from displaying alarms with lower priority.

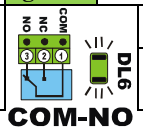
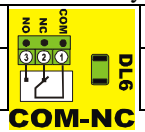
1 blink	Over-°C Control card (>85°C)
2 blinks	Power supply
3 blinks	T.K. contact OPEN
4 blinks	Input signal **(IN)** over range



In this cases, LED blinking intermittently and RL1

Without alarm conditions, LED DL3 "FAIL" is OFF



DL6	green	Indicates the state of the **ALARM** relay	
48 Vac 5 Amp		DL6=ON 1-3=OFF / 2-3=ON	 DL6=OFF 1-3=ON / 2-3=OFF

4.2 Alarm on LCD Display

The Alarm conditions are displayed on the 1st line of the LCD display, with a specific message (see table) + ALARM.
In the 2nd line there are the indications about the working condition

In order to reset the alarm showed on the DISPLAY, press "ESCAPE": the DISPLAY will show for an instant the message CANCER", so as to confirm that the alarm has been erased.
If the ALARM does not disappear, call the SAT (Technical Assistance Service, 0039.0306821611)

The Alarm messages, displaying with higher priority, are:

1	**T board ALARM**	**Alarm** : overheating of the electronic card (temperature > 85°C)
2	xxx YY,Y ZZ	Parameter : code (XXX), value (YY,Y) & unit measure (ZZ)
1	**PH loss ALARM**	**Alarm** : Absence of one power supply phase
2	xxx YY,Y ZZ	Parameter : code (XXX), value (YY,Y) & unit measure (ZZ)
1	**Thermal ALARM**	**Alarm** : Activation of the external thermal protection - T.K. contact
2	xxx YY,Y ZZ	Parameter : code (XXX), value (YY,Y) & unit measure (ZZ)
1	**IN under ALARM**	**Alarm** : Input signal lower than the minimum value
2	xxx YY,Y ZZ	Parameter : code (XXX), value (YY,Y) & unit measure (ZZ)
1	**IN over ALARM**	**Allarme** : segnale d'ingresso superiore al valore massimo consentito
2	xxx YY,Y ZZ	Parameter : code (XXX), value (YY,Y) & unit measure (ZZ)

Value of the lower limit for every configuration

rS-420	**-**	**mA**		**rPr030(*)**	**2,0**	**mA**
rS-010	**-**	**Vdc**		**rPr045(*)**	**2,0**	**mA**
rtE-01	**-24**	**°C**		**rUu-05**	**-**	**Vdc**
rPr420	**2,0**	**mA**		**rPu030(*)**	**-**	**Vdc**
rPr015(*)	**2,0**	**mA**		**rUu010**	**-**	**Vdc**
rPr025(*)	**2,0**	**mA**	(*) Scale conversion on display			

Value of the higher limit for every configuration

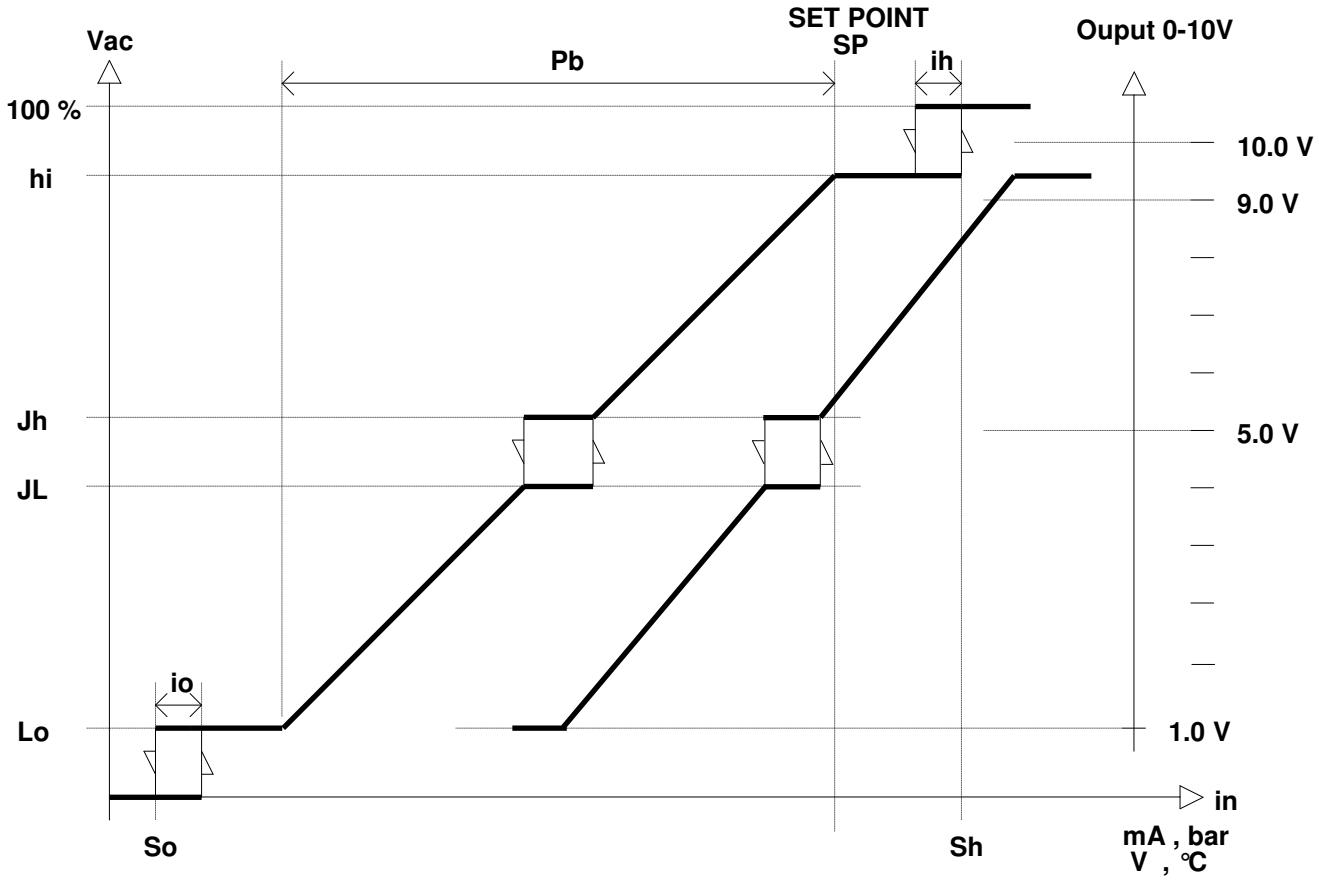
rS-420	**24**	**mA**		**rPr030(*)**	**24**	**mA**
rS-010	**11**	**Vdc**		**rPr045(*)**	**24**	**mA**
rtE-01	**+94**	**°C**		**rUu-05**	**5,5**	**Vdc**
rPr420	**24**	**mA**		**rPu030(*)**	**5,5**	**Vdc**
rPr015(*)	**24**	**mA**		**rUu010**	**11**	**Vdc**
rPr025(*)	**24**	**mA**	(*) Scale conversion on display			

The alarms are not memorized; if the alarm disappear, the controller come back to the normal operation of regulation

5.0 Function diagrams

5.1 MASTER Regulator - Function Diagrams

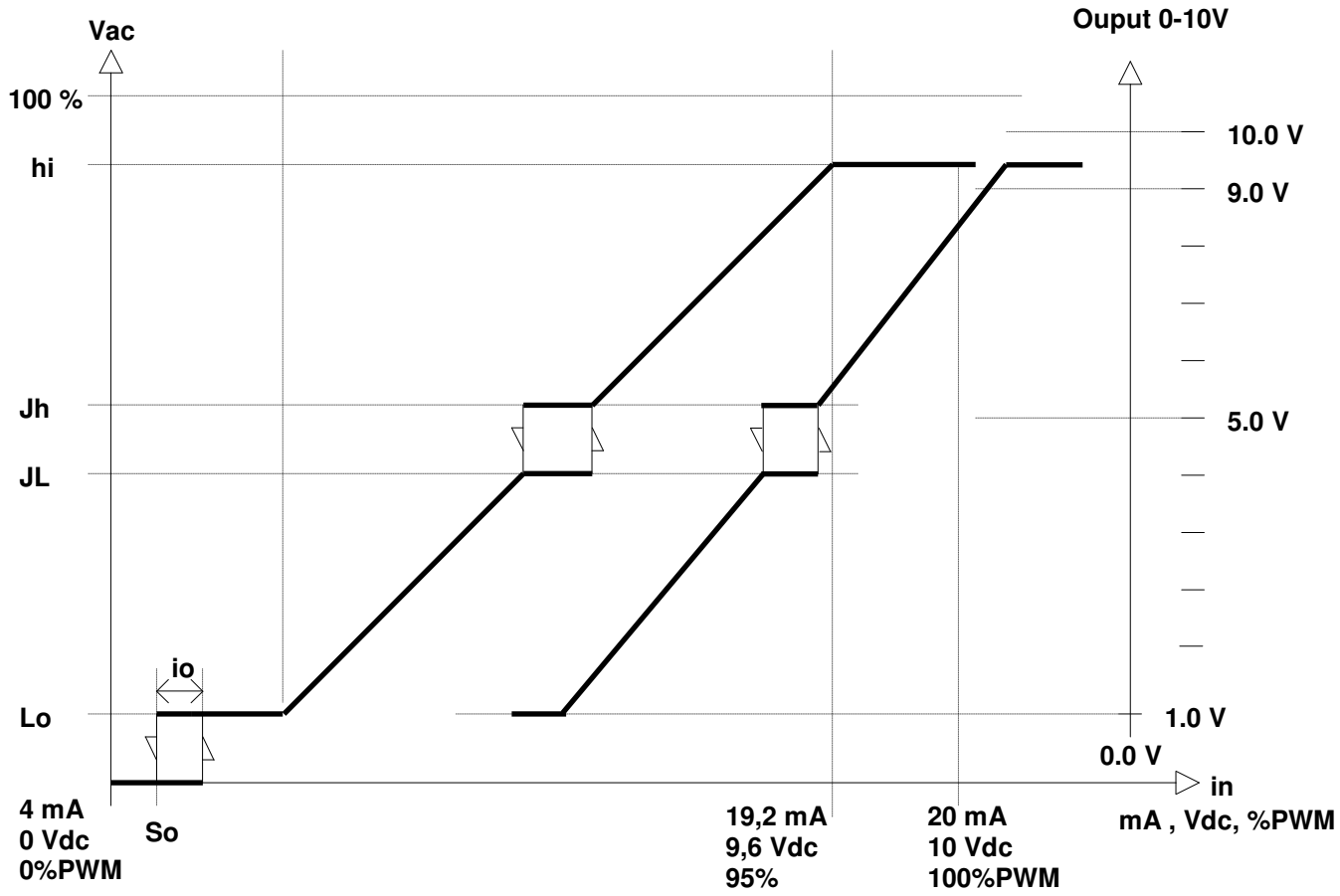
Control	Proportional	**Set-Point**	MAX RPM%
Characteristic	Direct (DSw2=OFF)	**Analog Output**	0-10Vdc



SP	Set-point in use (mA-Vdc-°C-bar)
in	Signal value at the selected input
Jh	Upper limit of the AC voltage “jump-zone”
JL	Lower limit of the AC voltage “jump-zone”
Sh	Input signal value (mA-Vdc-°C) forcing the output up to 100%
ih	Hysteresis of the input signal value **Sh** (mA-Vdc-°C)
So	Input signal value (mA-Vdc-°C) forcing the output down to 0%
io	Hysteresis of the input signal value **So** (mA-Vdc-°C)
hi	Maximum RPM % limit
Lo	Minimum RPM % limit
Pb	Proportional Band in use (mA-Vdc-°C-bar)

5.2 SLAVE Power Unit - Function Diagrams

Control	Proportional	**Remote input**	mA-Vdc-PWM
Characteristic	Direct (DSw2=OFF)	**Analog Output**	0-10Vdc

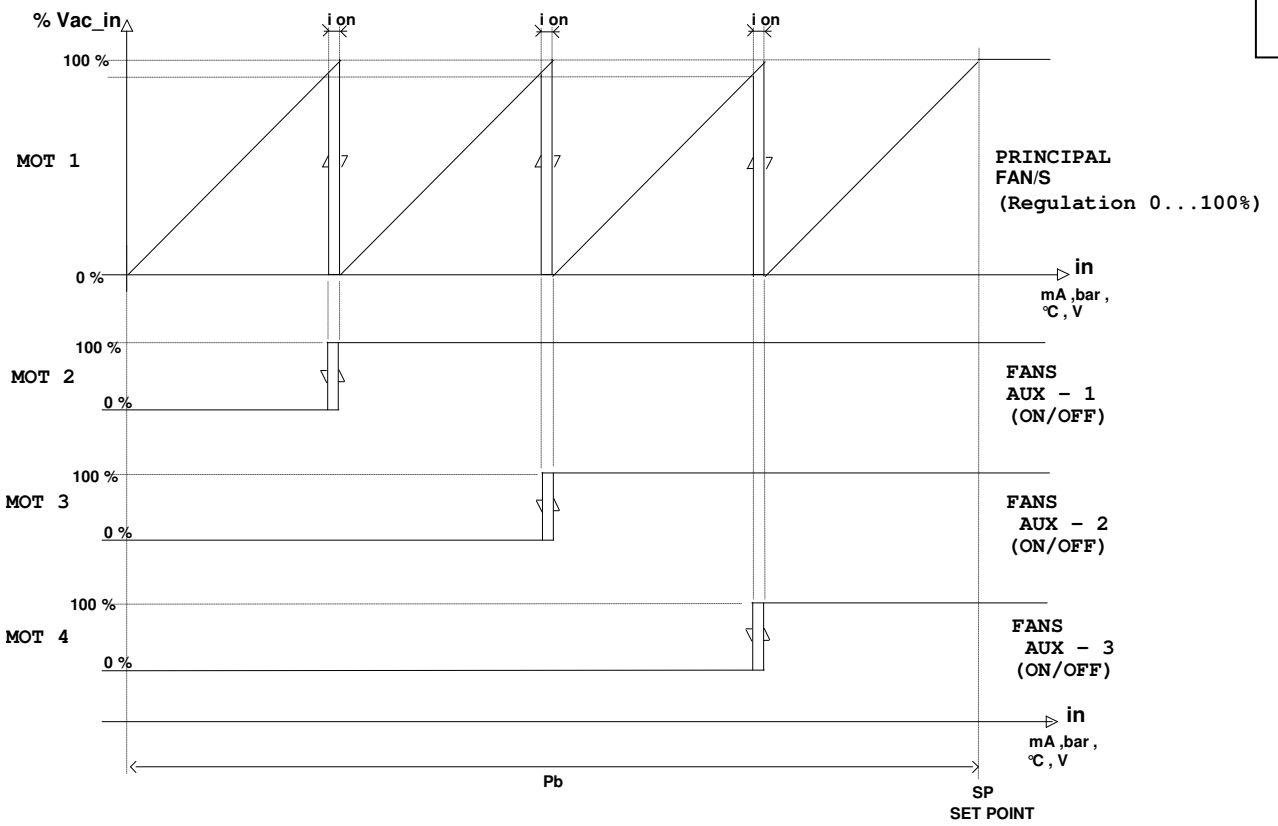


in	Signal value at the selected input (Vdc-mA-PWM)
Lh	Maximum night RPM% limit
Jh	Upper limit of the AC voltage “jump-zone” (
JL	Lower limit of the AC voltage “jump-zone”
So	Input signal value forcing the output down to 0%
io	Hysteresis of the input signal value **So**
hi	Maximum RPM % limit
Lo	Minimum RPM % limit

Available regulation Software

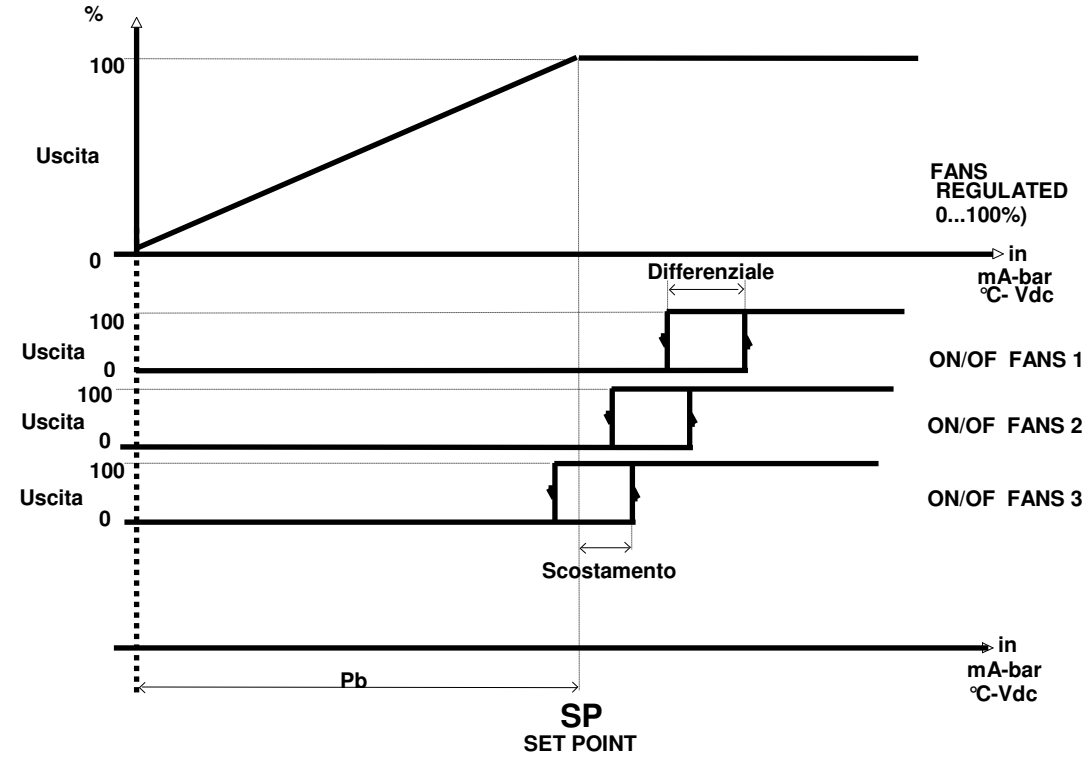
The principal fans-group are always on regulation from 0% to 100%; there are other three aux fans group, for ON-OFF extra power (N/Zone 1-4 parameters). In this way the ESK can be in THD% compliance

1



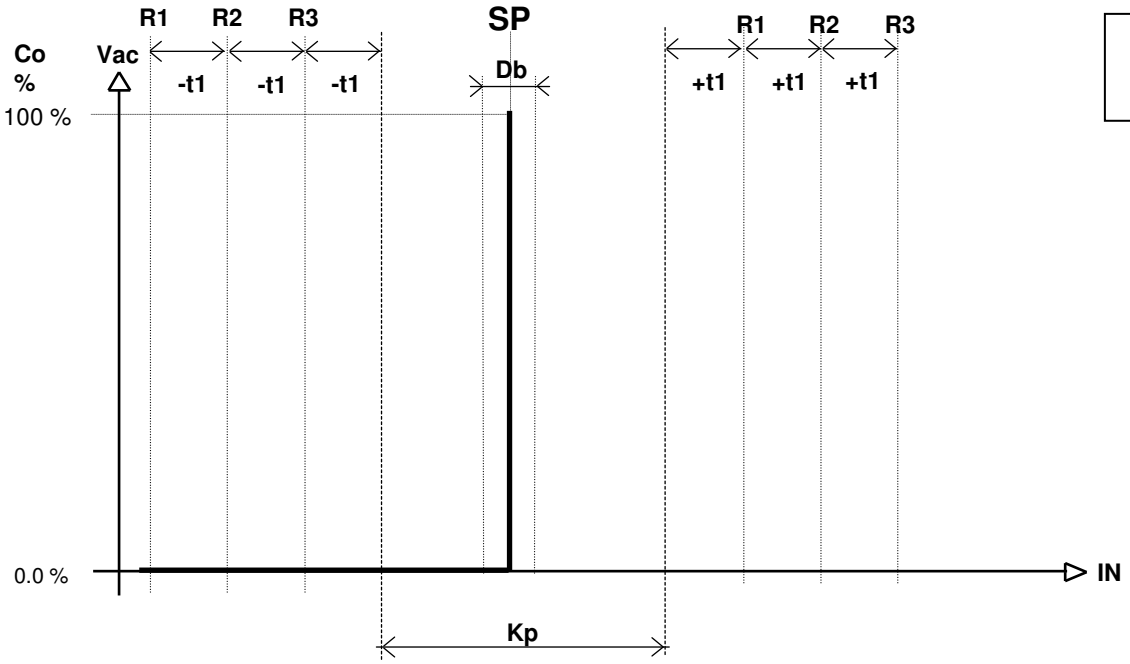
Same application with different solution. The principal fans reach the 100% and the ON-OFF group (N/Zone 1-4 parameter) work over the regulated fans.

2



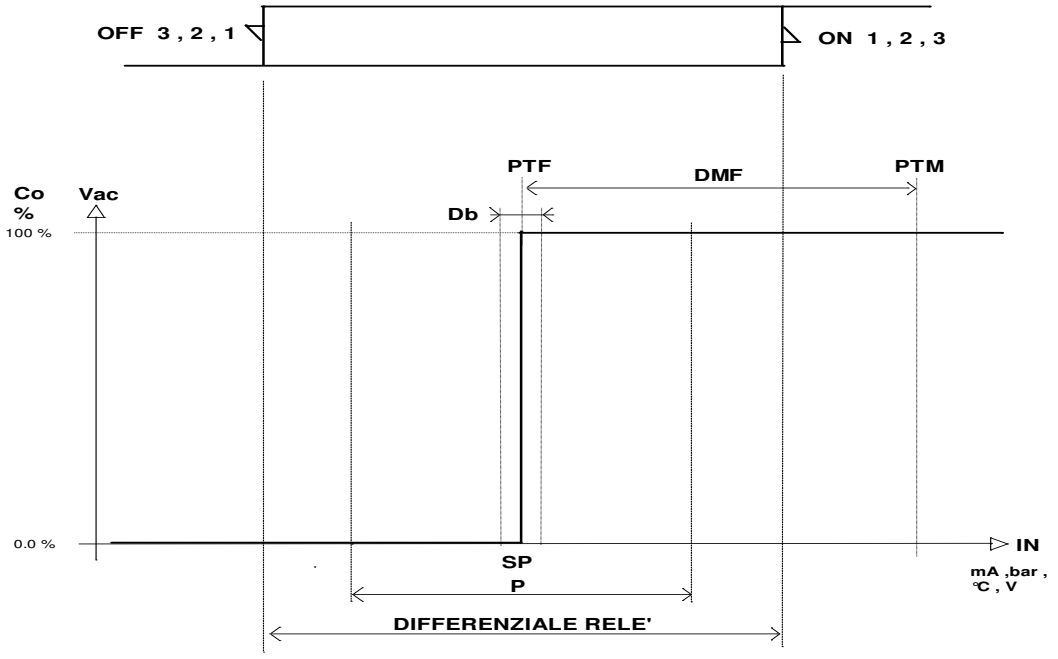
The controller work in PID mode, driving the different fans groups.
In this way we have :

- the °C/bar set-point at the minimum project value,
- no extra THD from electronic regulation.



3

SP	Working point
Db	Set-Point dead band
Kp	Proportional band
t1	delay ON-OFF relays
R1/R2/R3	ON-OFF fans relay



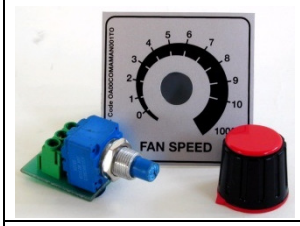
6.0 Accessories

6.1 – Manual Remote Control Units



♦ Series of potentiometers for manual remote control

- Potentiometer for external remote control
- Manual speed setting with 0-10 Vdc
- Available 1 & 10 turn versions, with standard knob ∅ 22 and silk screen label
- Available 10 turn version, with knob ∅ 30 with 100 Set-points
- Mounting in switch cabinet doors, shaft length 15 mm, ∅ 6.3 mm
- Complete with front plate 50 x 50 mm



ZC RGF PB1034 00000

Linear potentiometer for **0-10 Vdc** remote manual control

1 turn – 10kohm – 1 W – in Cermet

Front plate with silk screen label 50 x 50 mm and knob diameter ∅ 22

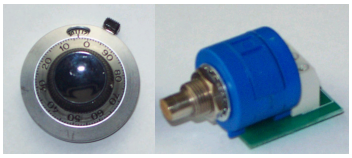


ZC RGF PB1050 10000
with ∅ 22 knob

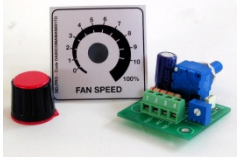
Linear potentiometer for **0-10 Vdc** remote manual control

10 turns – 10kohm – 3 W – wire

Front plate with silk screen label 50 x 50 mm



ZC RGF PB1050 20000
with 100-points, ∅ 30 knob



ZC RGF PB1035 10000
with ∅ 22 knob

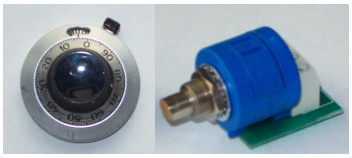
AC voltage converter for manual control:

Input 24Vdc >>> Output 0-10Vdc

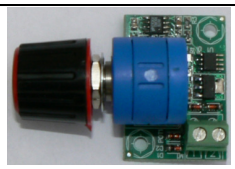
with adjustable MAX Vdc-Out LIMIT, for the regulation of:

- Fan motors
- Geared motors for shutters
- Geared motors for motorized valves

Front plate with silk screen label 50 x 50 mm



ZC RGF PB1035 20000
with 100-points, ∅ 30 knob



ZC RGF PB1040 10000
with ∅ 22 knob

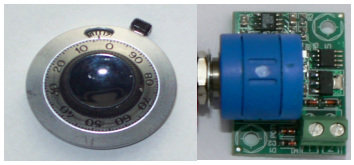
AC voltage converter for manual control:

Input 24Vdc >>> Output 4-20mA

for the regulation of:

- Fan motors
- Geared motors for shutters
- Geared motors for motorized valves

Front plate with silk screen label 50 x 50 mm



ZC RGF PB1040 20000
with 100-points, ∅ 30 knob

6.2 SPR-Pressure Transducer for 4-20 mA & 0-5 V

Description	Trasducer	
Control signal	**4 … 20 mA**	**0,5 … 4,5 V**
Power supply	**7 … 30 V**	**5 V +/- 0,5Vdc**
Range (bar)	**0 … 15/25/30/45**	**0 … 30/45**
Linearity	**< 0,5 % FS max**	
Rated Temperature range	**-25° … 80°C**	
Electrical connection	**2-wire**	**3-wire**
Connection	**Male or Female**	
Mechanical connection	**7/ 16" - 20 UNF**	
Protection	**IP 65**	



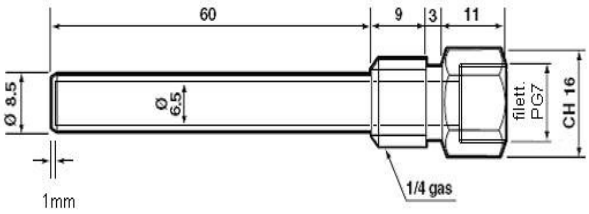
6.3 STE-Temperature probe NTC (10 kohm@25°C)

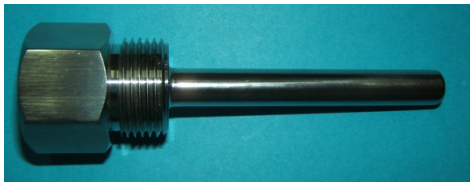
Sensor	**NTC probe** with resinated terminal
Connection	Silicon (light blue) 3.0 mt **cable**
Terminal	**INOX AISI 304 6 x 40 mm.**
Work range (°C)	**–50 T 110**



6.3.1 STP housing for NTC

Housing	**Protection box for NTC probe**
Screw	**1 / 4" GAS**
Component	**INOX AISI 304 da 8,5 x 75 mm.**





6.4 RGF-MEI(4) / UNIVERSAL input Expansion Module

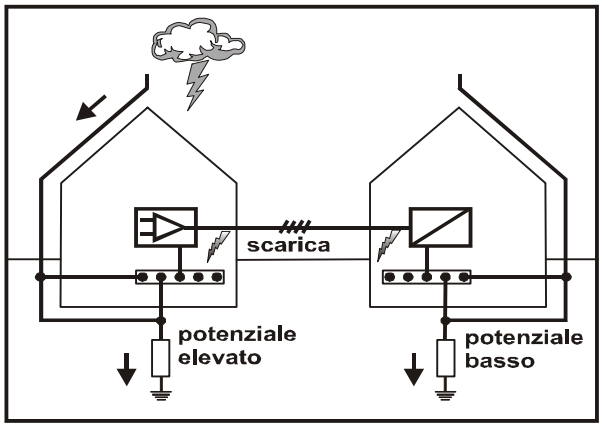
Electronic "All-Round" unit for the connection of 4 additional control and regulation inputs, for all applications with:
Control inputs: **4-20mA, NTC(10k), 0-5Vdc, 0-10Vdc, 0-20mA**
Regulation output: **0-10 Vdc / 0-20 mA**

Selectable MASTER-SLAVE function for:

- NTC Temperature, Pressure, Remote signals, etc.
- Automatic selection between the MAX/MIN values
- OUTPUT connection to other MEI units (max 3)
- LEDs for the visualization of active inputs
- Power supply protection with fuse
- Power supply "surge" protection
- INPUT total protection against short-circuit
- Protection filters against input signal surge

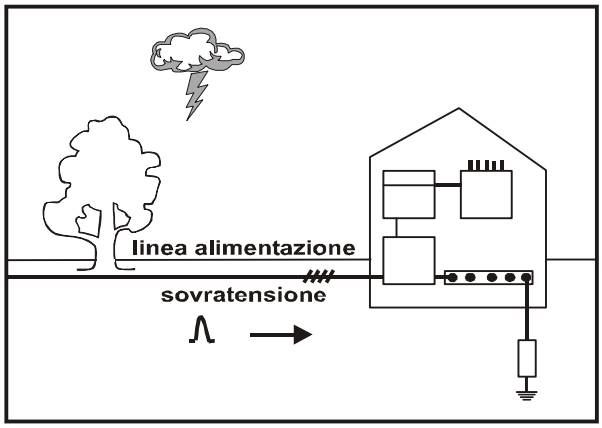


Identification of the sources of OVERVOLTAGE hazards



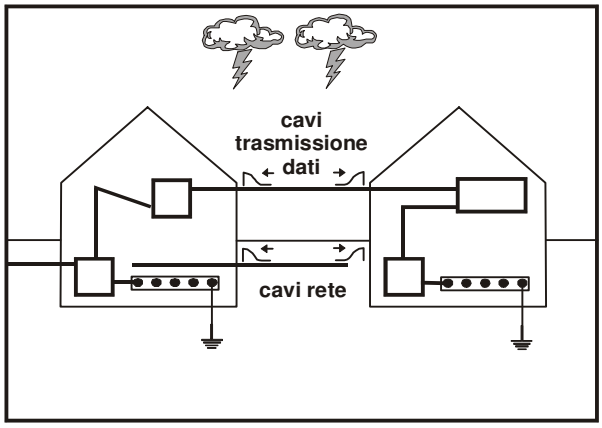
DIRECT ATMOSPHERIC DISCHARGE

When a lightning strikes directly a building equipped with a common protection system, the components connected to the system (supplementary system) reach a significant electric potential.
This event determines such potential differences between the components connected to earth and the active components, that the insulation protection is not strong enough to stand it.
As a result, the discharge causes irreparable damages to the electric equipment.



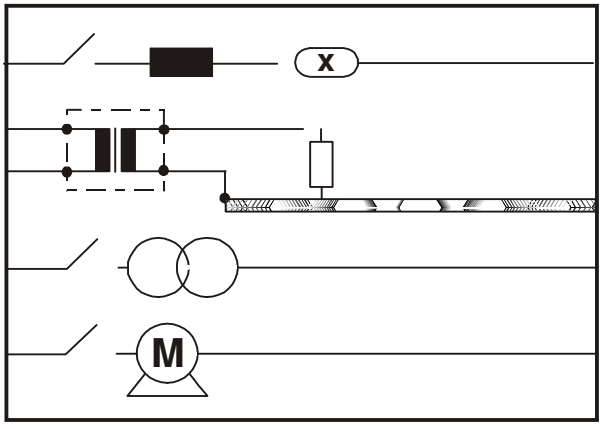
INDIRECT ATMOSPHERIC DISCHARGE

When a lightning strikes directly an electricity supplier, even if remarkably distant from the building, or when it reaches a mains supply cable or the earthing system by flowing through the roots of a tree, the generate overvoltage also in this case may cause severe damages to the electric equipment.



CLOUD TO CLOUD DISCHARGE

When the discharge does not take place between a cloud and the earth's surface, but within two different clouds (intercloud or cloud-to-cloud discharge), the generated overvoltage may even indirectly cause severe damages to the electric equipment.



OVERVOLTAGES DUE TO ON / OFF SWITCHING

Also the operation of power drives in electricity supply networks and in low voltage networks may cause overvoltage.
Overvoltage may arise, for instance, by switching off high voltage lines by no-load operation, or by switching on and off transformers, condensers, heavy inductive loads, etc.


EC CONTROLLERS FRIENDLY SOLUTIONS

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