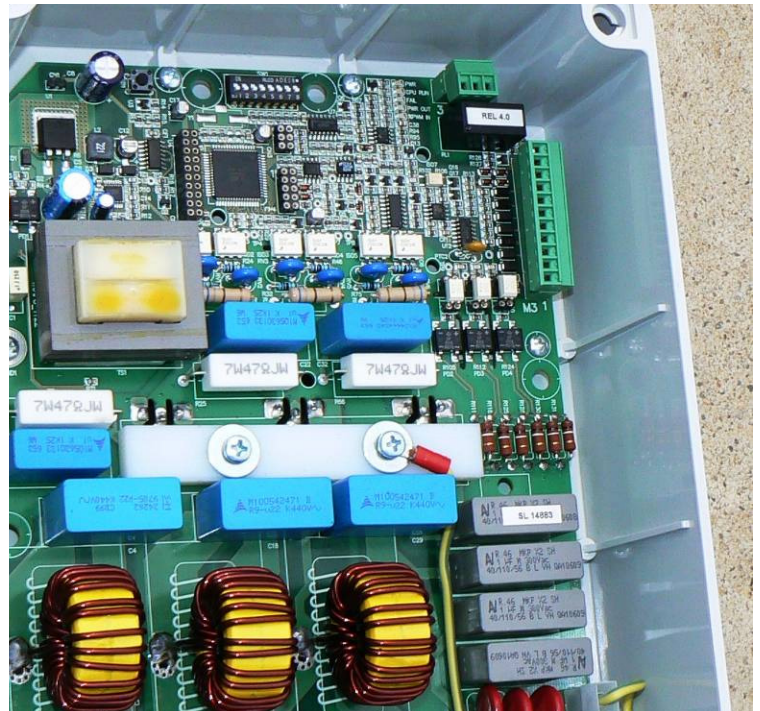
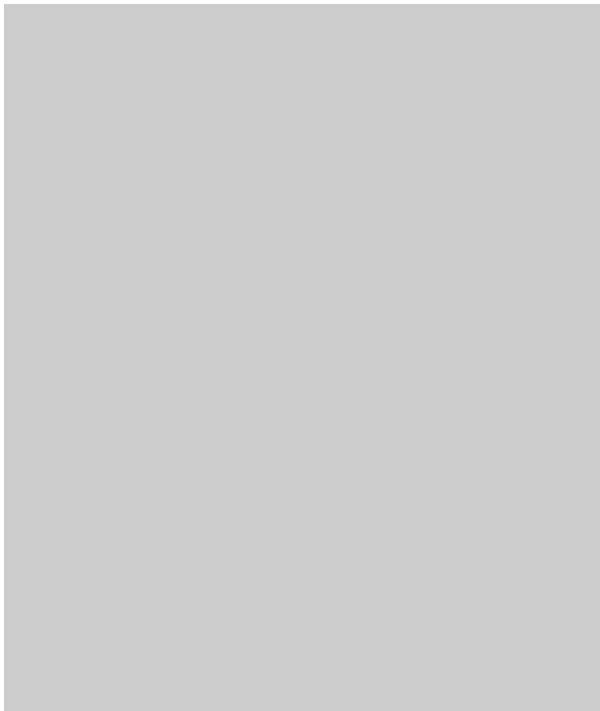


DRM 3~



Global
3
YEAR
Warranty

Vac stepless controllers
for
Three-phase asynchronous Motors of
Axial & Centrifugal Fans

S.EL.PRO.®
sistemi elettronici professionali

FAN speed Control Solutions

DRM300 series Code Selection

The following table shows how order codes are created and which versions are available for each Characteristic or Function

ZN DRM		α	$\beta\beta$	$\chi\chi$	δ	ϵ	ϕ	γ	η	φ
α	Number of Phases	3	Three-phase Power Supply R-S-T + PE							
$\beta\beta$	Nominal current (RMS at 50°C)	08	8 Ampere							
		12	12 Ampere							
		18	18 Ampere							
		20	20 Ampere							
		28	28 Ampere							
$\chi\chi$	Voltage supply	40	400Vac (MIN limit: 380Vac / MAX limit: 440Vac @ +/-10%)							
		23	230Vac +/-10%							
		48	480Vac (MIN limit: 460Vac / MAX limit: 500Vac @ +/-10%)							
δ	Frequency	0	50Hz /60Hz with automatic selection of the power supply frequency							
ϵ	Operating characteristics	0	Controlled Power Unit							
		3	"Step-Starter" Version, for textile ducts (on request)							
ϕ	Control inputs configuration	C	Control Signals Standard Configuration: 0-10Vdc & 4-20mA & PWM (3-30V not polarized)							
γ	Protection CASE	S	For external installation, Protection degree IP 55 / 120°C							
		G	For internal installation, Protection degree IP20							
		P	For internal installation, Protection degree IP00							
η	Options	0	Standard connection three-phase + Ground							
		4	Connection to N° 4 motors (12A/18A/20A models) three-phase + Ground							
		8	Connection to N° 8 motors (20A / 28A model) three-phase + Ground							
φ	Revision index	0	Last SELPRO revision: the most recent revision of the product will be delivered							

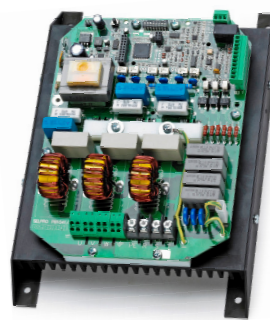
The given current values (RMS) are at full load at an environmental temperature of 50°C



IP 55



IP 20



IP 00



! 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 DRV300 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 **DRM300**.
- **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 three 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 **DRM 300** series devices are designed to vary the three-phase AC voltage thanks to the phase cutting principle, in order to regulate the rotational speed of three-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 DRM300 regulator, you are invited to read this manual, which describes the necessary procedures for correct installation and commissioning of the controller DRM300

The digital **DRM300** series, dedicated to applications for Air-cooled Heat Exchangers, consist of:

- Configurable controller in n° 03 numbers of available SLAVE modes, simply by selecting with DIP-Switch and connecting to the controls signals terminal block
- Two (2) inputs, for the connection and the management of one or two signals through mA – Vdc signals
- 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
- **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 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 three phases, in order to vary the active voltage applied to the load, no neutral connection required.

It is possible to use the device in one of the following SLAVE modes:

- **SLAVE POWER UNIT**: 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 DRM300 regulator, you are invited to read this manual, which describes the necessary procedures for correct installation and commissioning of the controller DRM300

1.3 General functions - DRM 300 series

The DRM300 series, designed & created by the SELPRO Research & Development Department, has been specifically developed to offer a digital UNIVERSAL controller for the regulation of three-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:

i	SIMPLICITY	USER FRIENDLY	- NO need of special cables for the installation
	FUNCTIONALITY	PLUG & PLAY	- NO need of trained operators for the startup procedure
	COMPLETENESS	ALL in ONE	- all regulation parameters are already default preset
			- all regulation modes with mA-Vdc-PWM 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 **DRM300** controller is:

-**SIMPLE**, what concerns electrical connections and programming,

-**FLEXIBLE** and ready to be used, as it is already preprogrammed for all SLAVE applications,

-**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 DRM300 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 one phase toward 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 LEDs.

The controllers are preprogrammed for operation with **SLAVE** (3 modes) configurations.

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 **DRM300** series offers 5 standard rated current values:

i **8 A / 12 A / 18 A / 20 A / 28 A**, with standard power supply **400Vac +20/-10% 50/60Hz** (the controller recognizes and manages automatically the frequency variation); further voltage (**230 Vac / 500 Vac**) 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 **DRM300** controller helps solving issues brought about by the acoustic noise thanks to its dedicated software, which allows with the action of the **NTF300** 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 **NTF300** 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 **DRM300** 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 **DRM300**, 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.

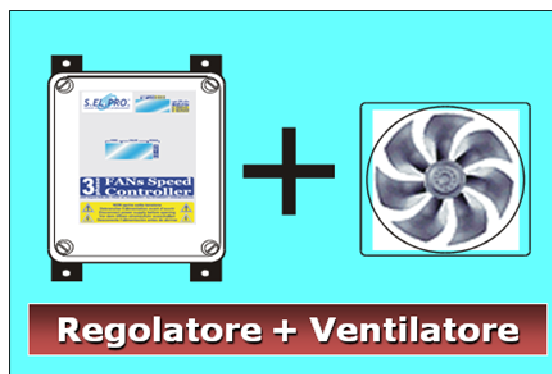
With reference to EMC Compatibility, according to the Marking



with CDM System

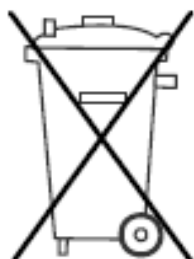


with PDS System



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 DRM300: Technical Characteristics

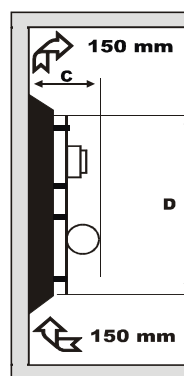
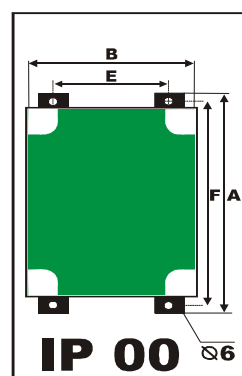
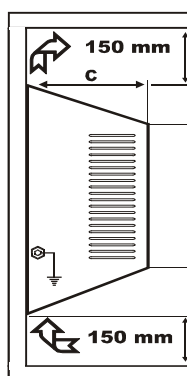
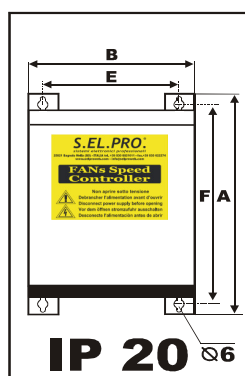
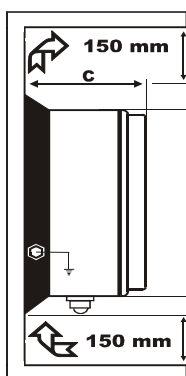
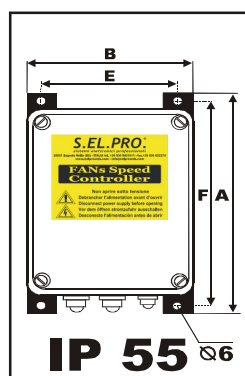
Power supply	Voltage	420VAC +/- 10 % Three-phase - (on request 230VAC / 500 VAC)			
	Frequency	50 / 60 Hz automatic selection			
	Overvoltage Protection	For Installation Category II (4 KV)			
Operating principle	Electronic three-phase voltage regulators for the phase-cutting regulation (through SCR, total control on the three phases) of the active voltage applied to the load; compensation for inductive loads and motors.				
Current	Rated	DRM 308	08 A up to 50°C environment; if over, decrease 0,6 A/°C		
		DRM 312	12 A up to 50°C environment; if over, decrease 0,6 A/°C		
		DRM 318	18 A up to 50°C environment; if over, decrease 0,6 A/°C		
		DRM 320	20 A up to 50°C environment; if over, decrease 1,0 A/°C		
		DRM 328	28 A up to 50°C environment; if over, decrease 1,0 A/°C		
	Overload	150 % of the rated current (max. 10’’ every 3’)			
Power	Control circuits	5VA	Control circuits		
	Thermally dissipated	DRM 308	32 W @ 8A	DRM 320	80 W @ 20A
		DRM 312	48 W @ 12A	DRM 328	112 W @ 28A
		DRM 318	72 W @ 18A		
Operating characteristics	SLAVE CONTROLLERS rS	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			
INPUT Signals & Contacts	Analog control signals	The controller can be preset through the keypad on board. Any combination of the following operating modes is available:			
		0 – 10 Vdc (*)	Ri = 10 kOhm	Code	rS-010
		4 – 20 mA	Ri = 100 Ohm	Code	rS-420
		(*) DEFAULT CONFIGURATION			
	Logic control signal	PWM digital signal, from 3V to 30V, insulated and <u>not polarized</u> .			
		PWM	3 to 30 V	Code	rS PWM
Start-Stop / Heat-Pump	Programmable free potential “On/Off” contact: with Sw4 (for NO or NC)				
T.K. motor	Free potential “On/Off” contact (NC)				
INPUT Signals & Contacts	Analog control signal	Slave Unit control signal : 0-10 Vdc - max 30mA			
	Auxiliary Supply	+20V +/- 20% , max 40mA not stabilized, protected from short-circuit			
		+5V max 20mA stabilized and protected from short-circuit			
	Potentiometer supply	+10V / 5mA stabilized & protected, for external manual command			
RL1 Relay	Contact COM , NC, NA for Alarm relay RL1				
Available functions selections	<div>Dip Swicht</div> <div>DSw</div> <div><div>ON</div><div>OFF</div><div><div><div></div><div></div><div></div><div></div><div></div><div></div><div></div><div></div></div><div>12345678</div></div></div>	DSw	1	Select the regulation 0-10Vdc or 4-20mA for IN1 & IN2	
		DSw	2	Select the regulation mode: Direct / Reverse	
		DSw	3	Select the regulation: Linear / Quadratic	
		DSw	4	Select the NO/NC function mode of the Start-Stop	
		DSw	5	Select the RL1 alarm mode	
		DSw	6	Select the RL1 alarm mode	
		DSw	7	To active the CosPhi adjust	
		DSw	8	Available for CUSTOMER custom, on request	

Visualisation Leds	PWR	DL1	Green	Power supply ON			
	CPU RUN	DL2	Green	<ul style="list-style-type: none">Regulation O.K. : blinking DC 50%, freq ½ HzRegulation CosPhi ON : blinking DC 50%, freq 2 Hz			
	Alarm FAIL	DL3	Red	1 blink	Over max °C control card (85°C)		
				2 blinks	VAC power supply phase loss		
				3 blinks	Thermal protection open		
				4 blinks	Over range signal : <ul style="list-style-type: none">Slave 4-20mA : < 2mA ; > 24mASlave 0-10Vdc : > 11,0Vdc		
	PWR OUT	DL4	Green	DRM run: VAC output on work			
	%PWM IN	DL5	Green	PWM % on input (M3: 8/9)			
RL1	DL6	Green	RL1 relay (NO = relay ON)				
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			Phase loss – Power supply under range (less 20% Vac supply) Verify the phase-loss, 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			Internal thermal protection			
	Mains monitoring			It checks the simultaneous presence of all the three 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		IP 20	IP 00
	Materials			GW-Plast 120°C (max. temperature 120°C) and aluminium			
	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			DRM 308	DRM 312	Flexible cable, rated cross section min. 2,5 mmq.	
				DRM 318	DRM 320	Flexible cable, rated cross section min. 4.0 mmq.	
				DRM 328		Flexible cable, rated cross section min. 6.0 mmq.	
Compliance	2006/42CE			2006/95CE		2004/108CE	

1.6 Mechanical Dimensions

Model	Nominal Current RMS	
	Ampere	kVA
DRM308	8	5,5
DRM312	12	8,0
DRM318	18	12,0
DRM320	20	13,5
DRM328	28	18,6

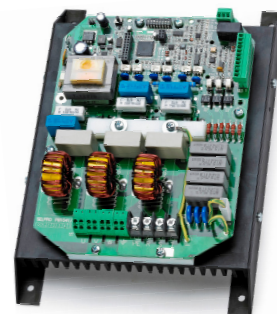
DIMENSIONS (mm)							
IP *	A	B	C	E	F	WEIGHT	Ø FIXING
00	225	234	80	210	200	2,5	6,0 mm.
55	253	234	116	210	200	2,5	6,0 mm.
00	295	201	100	153	255	3,2	6,0 mm.
20	295	201	100	162	260	3,2	6,0 mm.
55	285	201	130	153	255	3,8	6,0 mm.
55	285	201	162	173	255	4,5	6,0 mm.
00	295	192	130	162	260	4,3	6,0 mm.
20	295	192	130	162	260	4,5	6,0 mm.
55	350	235	181	185	320	6,5	6,0 mm.
00	350	203	141	173	320	7,3	6,0 mm.
55	350	235	204	173	320	7,5	6,0 mm.



IP 55



IP 20



IP 00

(*) : For available IP, see at the table

1.7 Electric motors

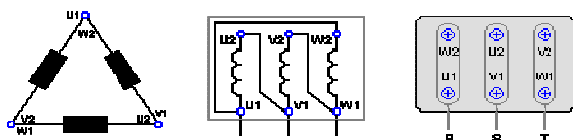
The regulator **DRM300** allows the connection of three-phase asynchronous motors, in applications whose motor torque-speed characteristic IS quadratic. Thus it is especially suitable with axial fans, while centrifugal fans can be connected only if purposely specialized for the phase-cutting regulation.

The correct electrical connection and the supply voltage are reported on the motor data plate; the direction of rotation of the motor can be changed by swapping two of the three supply cables.

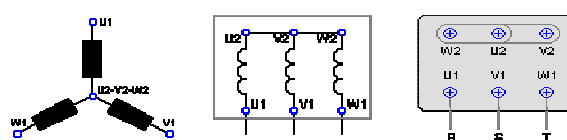
It is important to keep the power supply cable as short as possible, so as to minimize interferences and leakage (**10 / 15 mt**); otherwise it is recommended to install an auxiliary three-phase filter on the controller's output.

The figure below shows the DELTA (High speed) & STAR (Low speed) connections respectively.

DELTA for High speed connection



STAR for Low speed connection



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
10,0 mmq	32 A

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



The **DRM300** 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 **DRM300** 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.

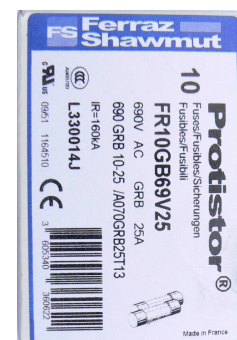
2.2.1 Magnetothermal protection

The **DRM300** devices must be protected by a magnetothermal switch fitted upstream of the cutting regulators.

Installation of magnetothermal 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:

Model	Magnetothermal	Specialized Protection FUSE for SCR (*)			
		Size	Vac	Amp	Reference
DRM 308	16 A	10 x 38	690 V	12	FR10GB69V16
DRM 312	20 A			16	FR10GB69V16
DRM 318	32 A			25	FR10GB69V25
DRM 320	32 A	14 x 51		25	FR14GC69V25
DRM 328	40 A			32	FR14GC69V32



i To prevent the short circuits to the controllers SCR, it's very important the application of the referenced fuses into the table.

! (*) to protect SCR-Power-Semiconductor of the DRM controller, 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 $\geq 60 \text{ mA}$)

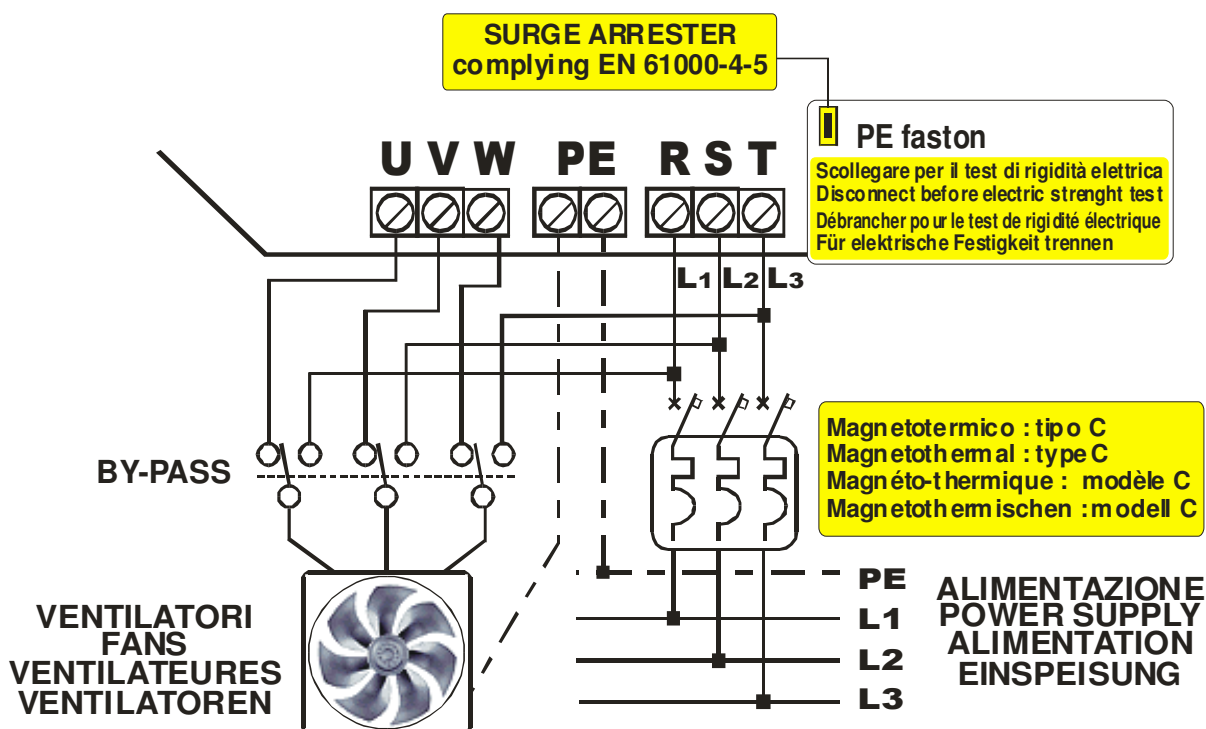
The **DRM300** regulators allow the connection of three-phase loads *without requiring the connection of the neutral*.

This simplifies installation and facilitates the STAR or DELTA load configuration.

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:

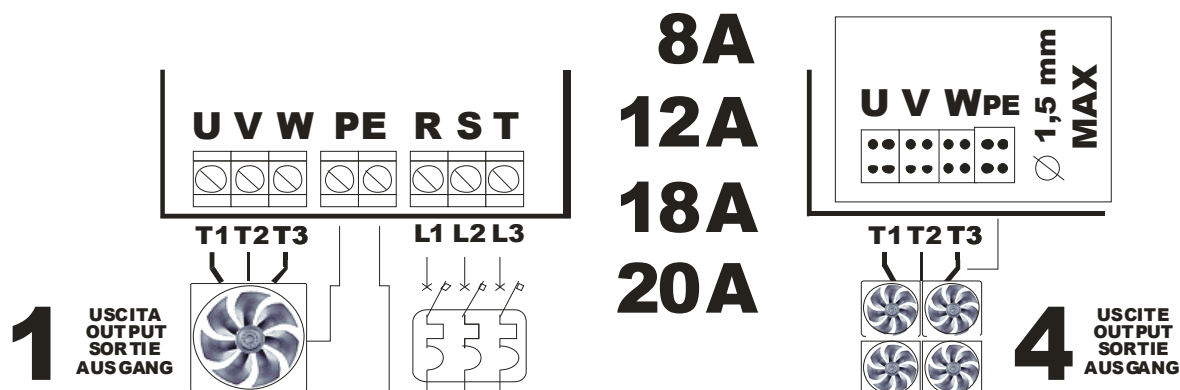
- ✓ The connection through the Bypass Switch must keep the phase correspondence unaltered so as to avoid destructive short-circuits and maintain the sense of rotation of the motor.
- ✓ Before supplying the load with maximum voltage, the supply should be disconnected from the Regulator. Therefore:
 - It is advisable to use a three-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



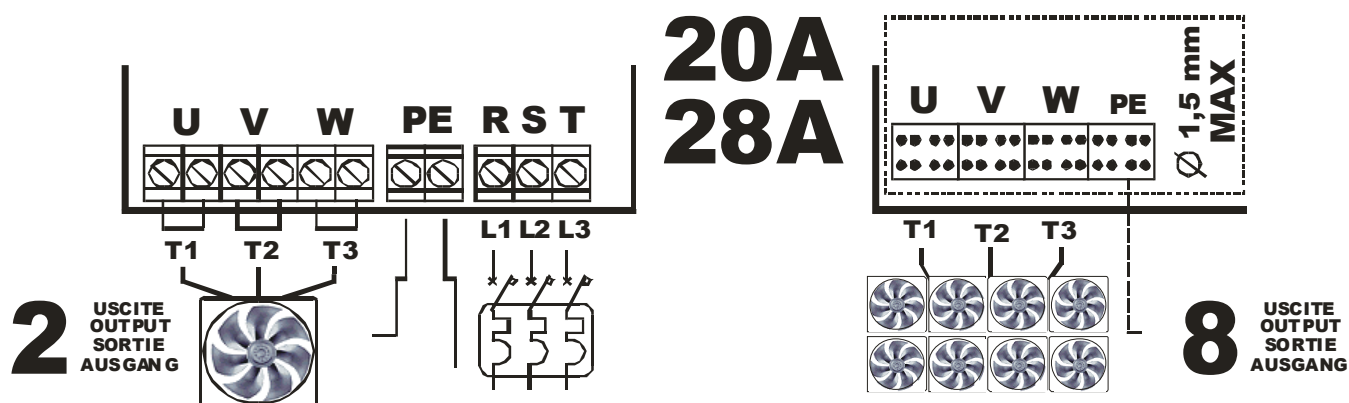
2.2 Available options for multi-fans connections

On request, it's possible order the DRM300 regulators with the terminals for the connection of more than one fan; the figures represent the available options:

- from 8A to 20A, single exit (standard) or four (4) exit (connection cables MAX 1,5 mq.)



- from 20A to 28A, with double exit (standard) or eight(8) exits (connection cables MAX 1,5 mq.)



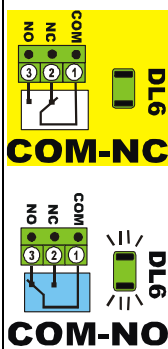
ATTENTION !



- The fan motor can be connected: star and delta, without neutral connection.
- the direction of rotation of the motor can be changed by swapping two of the three supply cables.
- The **DRM300** 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 **DRM300** 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;

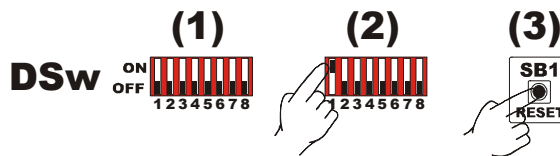
2.3 DIP-Switch (DSw1 ... DSw8)

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

Dip Swicht (DSw)		Description																					
1	On	Selection for 4-20 mA control signal on inputs IN1 & IN 2																					
	Off	Selection for 0-10Vdc control signal on inputs IN1 & IN 2																					
2	On	Reverse mode : the VAC output increases as the input command increases																					
	Off	Direct mode : the VAC output decreases as the input command increases																					
3 (*)	On	Quadratic function mode																					
	Off	Linear function mode																					
4	On	Start/Stop :for NC external contact (ON = run ; OFF = Stop)																					
	Off	Start/Stop: for NO external contact (OFF = run ; ON = Stop)																					
5 & 6		Available Alarm relay setting functions: see the table and watch on the display																					
		<table><tr><th colspan="2">DSw selection</th><th colspan="2" rowspan="2">With ALL O.K. >>> RL1 = ON >>> led DL6 = ON</th></tr><tr><th>DSw 5</th><th>DSw 6</th></tr><tr><td>OFF</td><td>OFF</td><td>RL1 = OFF</td><td>With ONE or more activated Allarms</td></tr><tr><td>ON</td><td>OFF</td><td>RL1 = OFF</td><td>With ONE or more activated Allarms With remote contact STOP = ON (S2 Stop/Start)</td></tr><tr><td>OFF</td><td>ON</td><td>RL1 = OFF</td><td>With ONE or more activated Allarms With remote contact STOP = ON (S2 Stop/Start) With VAC output = 0% (Fans OFF)</td></tr><tr><td>ON</td><td>ON</td><td>RL1 = OFF</td><td>With Power Supply OFF</td></tr></table>	DSw selection		With ALL O.K. >>> RL1 = ON >>> led DL6 = ON		DSw 5	DSw 6	OFF	OFF	RL1 = OFF	With ONE or more activated Allarms	ON	OFF	RL1 = OFF	With ONE or more activated Allarms With remote contact STOP = ON (S2 Stop/Start)	OFF	ON	RL1 = OFF	With ONE or more activated Allarms With remote contact STOP = ON (S2 Stop/Start) With VAC output = 0% (Fans OFF)	ON	ON	RL1 = OFF
DSw selection		With ALL O.K. >>> RL1 = ON >>> led DL6 = ON																					
DSw 5	DSw 6																						
OFF	OFF	RL1 = OFF	With ONE or more activated Allarms																				
ON	OFF	RL1 = OFF	With ONE or more activated Allarms With remote contact STOP = ON (S2 Stop/Start)																				
OFF	ON	RL1 = OFF	With ONE or more activated Allarms With remote contact STOP = ON (S2 Stop/Start) With VAC output = 0% (Fans OFF)																				
ON	ON	RL1 = OFF	With Power Supply OFF																				
7	On	Activation of the Cos-Phi setting modification (only factory procedure)																					
	Off	Normal function (factory Cos-Phi)																					
8	On	Available custom function on request																					
	Off	OFF																					

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

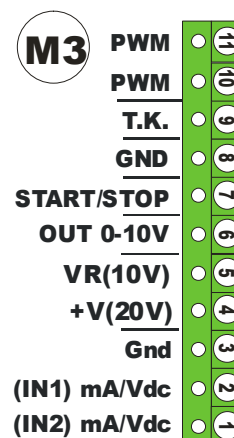
With DSw 5&6 = ON/ON, the alarm relay change to COM-NC position only with the OFF of the Power Supply



2.4 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.

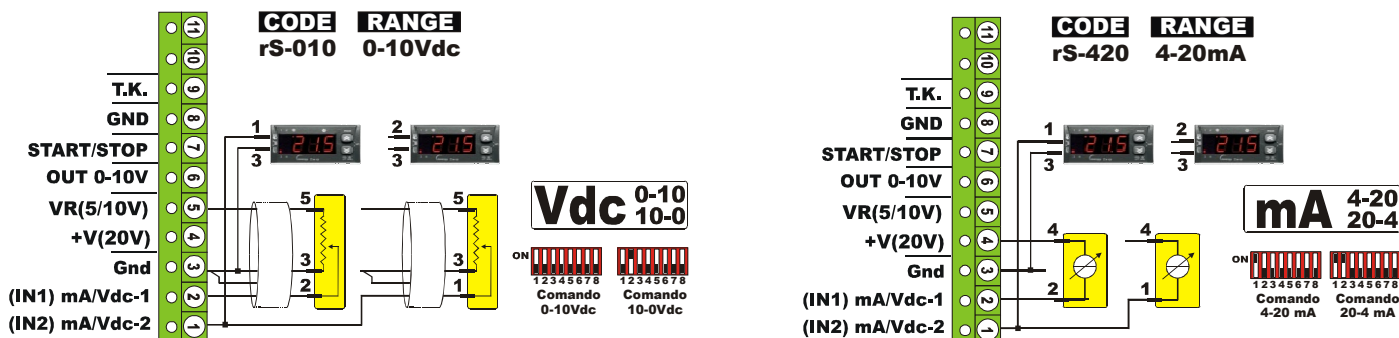
11	PWM	PWM digital signal, from 3V to 30V, insulated and <u>not polarized</u>
10	PWM	
9	T.K.	Connection of the thermal contact (NC)
8	Gnd	Ground Referenced
7	Start/Stop	NO/NC contact (Sw4 selection) for regulation Stop/Start
6	OUT 0-10V	0-10Vdc (20mA) output, for SLAVE extra power unit
5	Vr (5/10V)	Supply +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 4-20mA, 0-10V
1	IN 2 (*)	Input 2 for 4-20mA, 0-10V



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

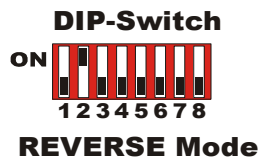
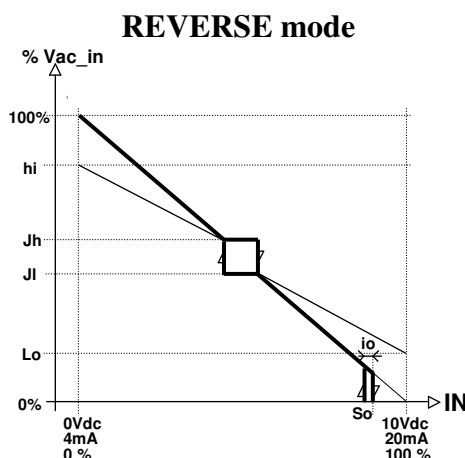
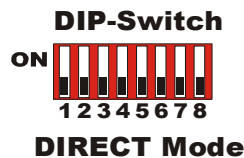
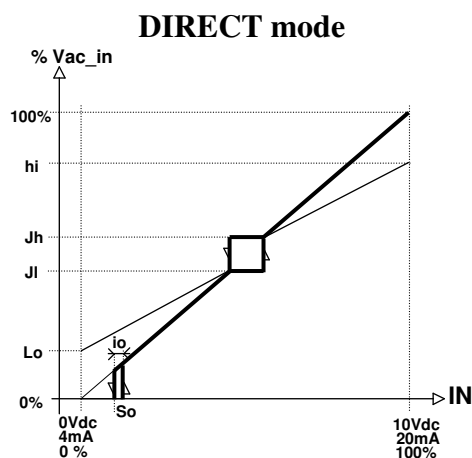
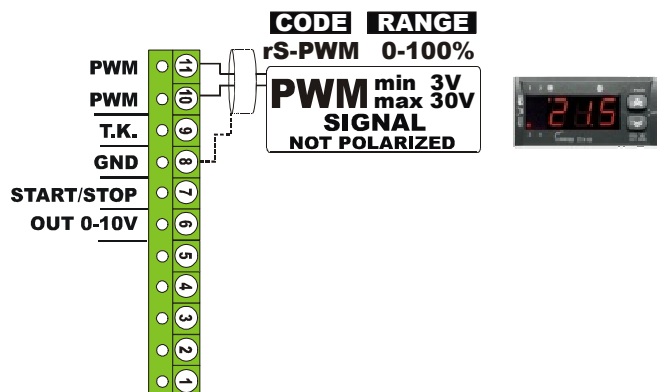
2.5 Remote controls signals 0-10 Vdc / 4-20 mA / PWM

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)



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;



Code	Description
in	IN1 o IN2 input value
hi	MAX-RPM limit, (% VAC)
Lo	MIN-RPM limit, (% VAC)
Jh	Upper jump point (% VAC)
JI	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

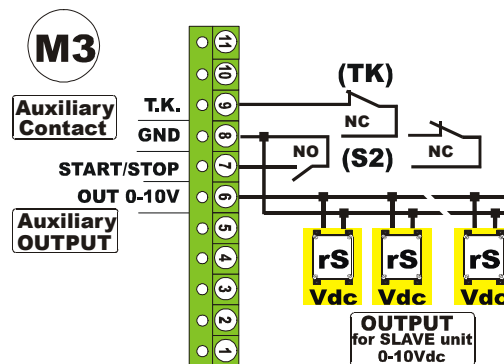
Es.: with rS010 for 0-10 Vdc
So=0 Vdc for DIRECT mode
So=9,5 Vdc for REVERSE mode

2.6 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	S2=OFF	O.K. for working	S2=ON	Stop
	TK	8 – 9	Thermal contact	DSw4=ON	S2=ON	O.K. for working	S2=OFF	Stop
					TK=ON	O.K. for working	TK=OFF	Thermal Alarm

2.7 RL1 Alarm relay terminal block (M4)

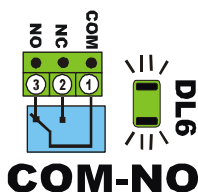
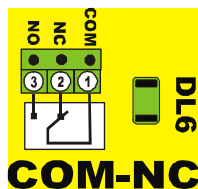
On the upper side of the controller card, there is the RL1 Alarm relay, with programmable function for different level of warning.

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. After 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

Written 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%	



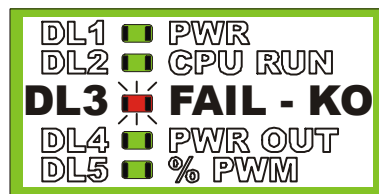
3.0 Alarm

3.1 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	Phase loss on 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

Without alarm conditions, LED DL6 will be OFF					
<div>RL1</div> <div>DL6</div>	DL6	green	Indicates the state of the ALARM relay		
	48 Vac 5 Amp	 COM-NO	DL6=ON	 COM-NC	DL6=OFF
			1-3=OFF / 2-3=ON		1-3=ON / 2-3=OFF

Value of the lower limit for every configuration

rS-420	2,0	mA
rS-010	--	Vdc

Value of the higher limit for every configuration

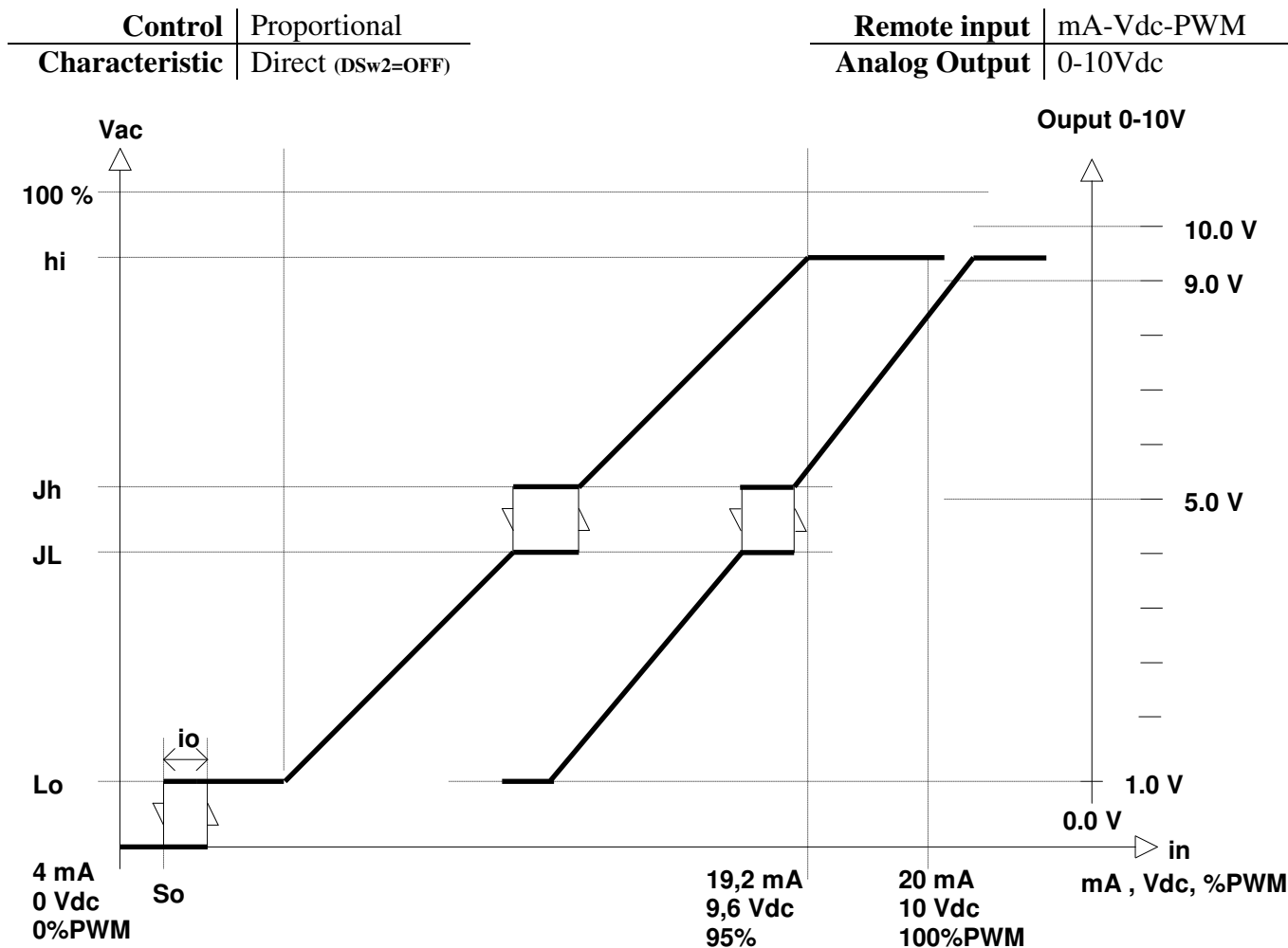
rS-420	24,0	mA
rS-010	11,0	Vdc



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

4.0 Function diagrams






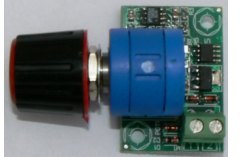
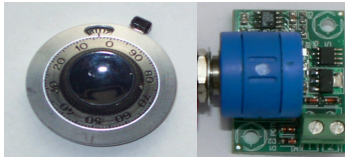
4.1 SLAVE Power Unit - Function Diagrams



in	Signal value at the selected input (Vdc-mA-PWM)	
Jh	Upper limit of the AC voltage “jump-zone”	Factory predisposition
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	

5.0 Accessories

5.1 – Manual Remote Control Units

	<p>♦ Series of potentiometers for manual remote control</p> <ul style="list-style-type: none"> - Potentiometer for external remote control - Manual speed setting with 0-10 Vdc - Available 1 & 10 turn versions, with standard knob Ø 22 and silk screen label - Available 10 turn version, with knob Ø 30 with 100 Set-points - Mounting in switch cabinet doors, shaft length 15 mm, Ø 6.3 mm - Complete with front plate 50 x 50 mm 	
 <p>ZC RGF PB1034 00000</p>	<p>Linear potentiometer for 0-10 Vdc remote manual control</p> <p>1 turn – 10kohm – 1 W – in Cermet</p> <p>Front plate with silk screen label 50 x 50 mm and knob diameter Ø 22</p>	
 <p>ZC RGF PB1050 10000 with Ø 22 knob</p>	<p>Linear potentiometer for 0-10 Vdc remote manual control</p> <p>10 turns – 10kohm – 3 W – wire</p> <p>Front plate with silk screen label 50 x 50 mm</p>	 <p>ZC RGF PB1050 20000 with 100-points, Ø 30 knob</p>
 <p>ZC RGF PB1035 10000 with Ø 22 knob</p>	<p>AC voltage converter for manual control:</p> <p>Input 24Vdc >>> Output 0-10Vdc with adjustable MAX Vdc-Out LIMIT, for the regulation of:</p> <ul style="list-style-type: none"> - Fan motors - Geared motors for shutters - Geared motors for motorized valves <p>Front plate with silk screen label 50 x 50 mm</p>	
 <p>ZC RGF PB1040 10000 with Ø 22 knob</p>	<p>AC voltage converter for manual control:</p> <p>Input 24Vdc >>> Output 4-20mA for the regulation of:</p> <ul style="list-style-type: none"> - Fan motors - Geared motors for shutters - Geared motors for motorized valves <p>Front plate with silk screen label 50 x 50 mm</p>	
		 <p>ZC RGF PB1040 20000 with 100-points, Ø 30 knob</p>

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

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



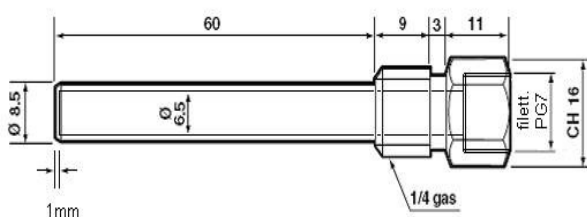
5.3 STE-Temperature probe NTC (10 kohm@25°C)

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



5.3.1 STP housing for NTC

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



5.4 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



5.5 Noise (Extra-dB) Suppression Filter for Phase-Cutting Regulators

By applying the NTF filter between the regulator and the fan motor, it is possible to reduce the extra-dB noise generated by the electronic regulation.

The NTF noise filter can be used only with fans controlled by SCR (phase-cutting) AC voltage controllers.

The noise filter consists of a choke and condensers (one for each phase) for reactive-current compensation.

The choke is directly connected to the controller output.

The filter **MUST NOT** be OPERATED nor SUPPLIED in absence of a connected fan.

- Protection with: **IP 55 Box**

- Power Supply:

3~ 230/420/500Vac +/-10% – 50/60 Hz (standard)

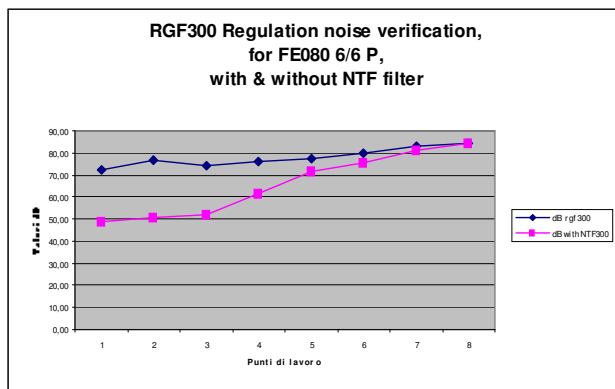
The size of the condensers combined with the filter (MAX 2 condensers per filter) depends on the power (Ampere) of the connected fans.



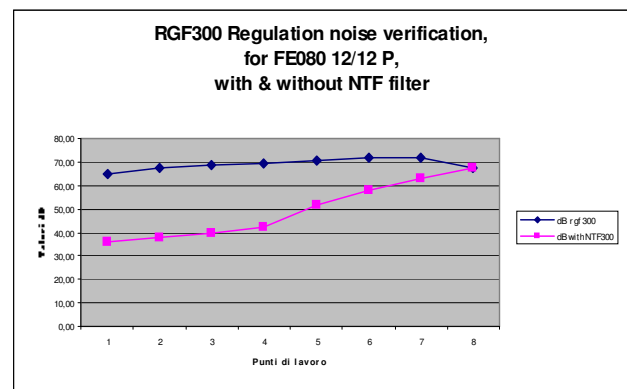
The following tables show the typical noise transfer functions (extra dB value) for the RGF300 (Three-phase cutting regulator) with and without NTF filter.

The values refer to the regulation with NTF noise filter (in red) and without NTF noise filter (in blue).

FE080-SDA.6N.2NV 6/6 P



FE080-NDA.6K.2NV 12/12 P

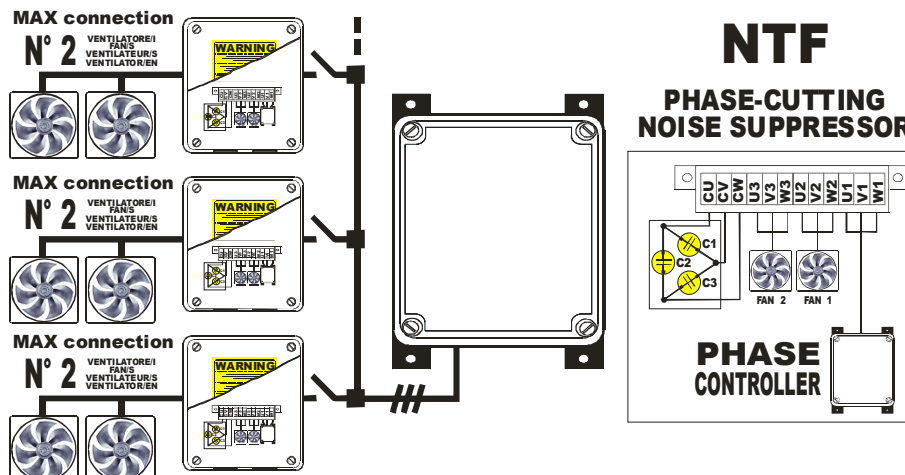


Connect only 1 or 2 (MAX!) fans to the NTF filter;

The given μF value refers to the 3 condensers connected to the three phase lines (1 for each phase)

! WARNING !

Do NOT use the NTF filter in absence of a connected fan: by doing so, the SCRs thyristor of the DRM300 regulator will be damaged



5.6 HWF300 - Filter for the suppression of Harmonic Distortions (IEC 61000-3-2 & 61000-3-12)

By applying the HWF300 filter between the regulator and the supply line, the harmonic distortions generated by the electronic regulation with SCR can be reduced by **98%**.

The filter is directly connected to the Vac input of the controller and must be properly installed in order to ensure the declared performance.

- Protection degree: **IP 20** standard
IP 55 (on request)
- Power supply:
3~ 400Vac +/-10% - 50 Hz
3~ 460Vac +/-10% - 60 Hz

The size of the filter combined with the controller depends on the power (Ampere) of the connected fans



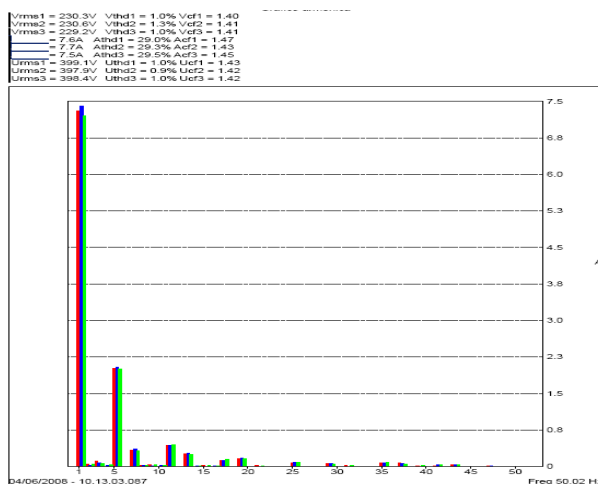
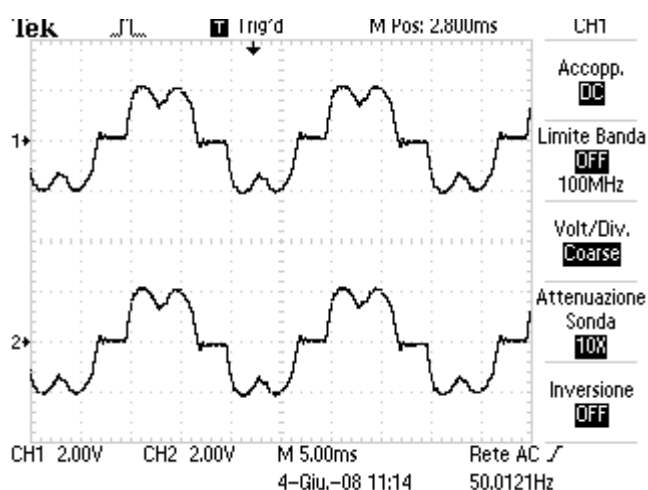
The following tables show the transfer functions relating to the electric noises generated by the AC voltage regulation of the fan motor, with and without HWF300 filter.

On working the regulator DRM300 can create a max. of 30% of the noises produced by the inverter; the report is 1 to 3. Moreover the VAC controller don't produce noises at 0% & 100% of the VAC output.

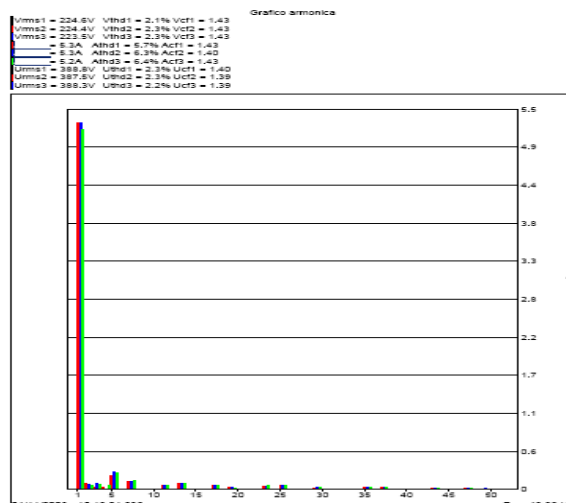
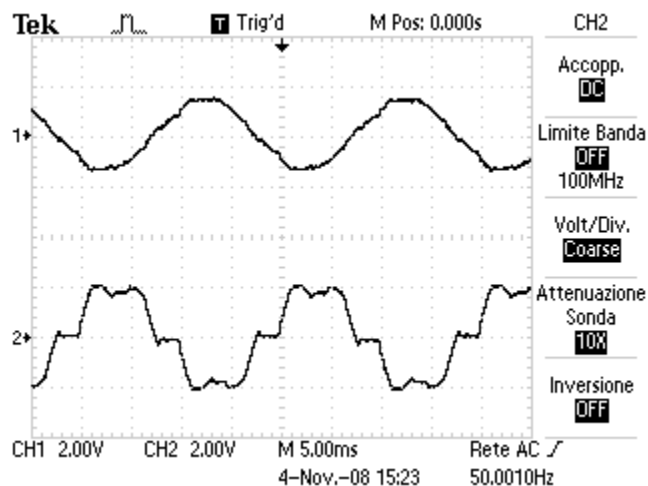
The indicated working point refers to the peak noise level caused by the phase-cutting regulators.

It's also available the ACTIVE-filter for all the applications until 90A.

SCR regulator without HWF filter - Vout 250Vac



SCR regulator with HWF filter - Vout 250Vac



6.0 DRM 300 - Electrical TESTS

Electrical connection for the following tests:

A) Voltage check (electric strength test), according to CEI EN 60204-1

The electrical equipment must support a test voltage applied for at least 1'' (seconds) to all circuit conductors, except for equipotential protection circuits and PELV (Protective Extra-Low Voltage) circuits.

The test voltage must:

1. be the double of the rated supply voltage of the equipment, or be at least of **1000 Vdc** (it is recommended to choose the higher value between the two options);
2. have a frequency of 50Hz, and
3. be equipped with a transformer with minimum rated current of 500VA

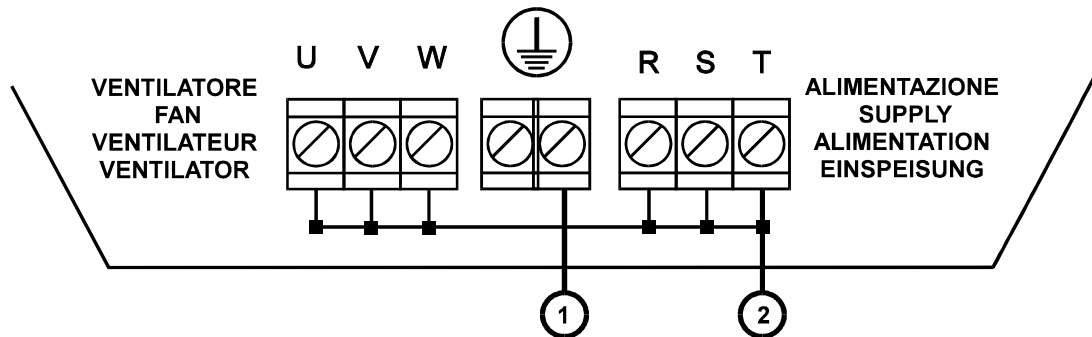
The components which cannot support these voltages must be disconnected during the test.

The test voltage must be applied between the points **1** and **2** as shown in **figure**.

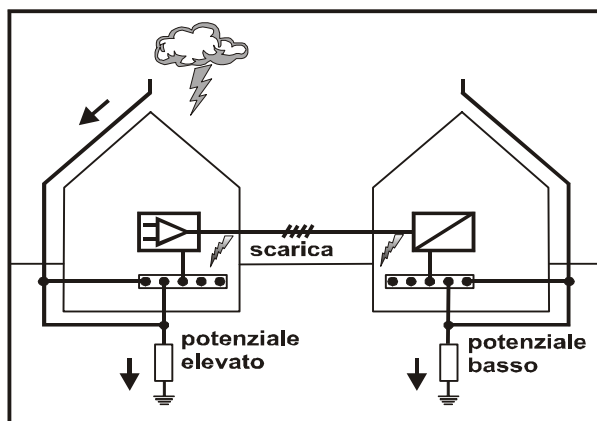
B) Insulation resistance test, according to CEI EN 60204-1

The insulation resistance, measured at **500 Vdc** between the power and the equipotential bonding conductors, must NOT be lower than 1 Mohm.

The test must be performed between the points **1** and **2** as shown in **figure**.



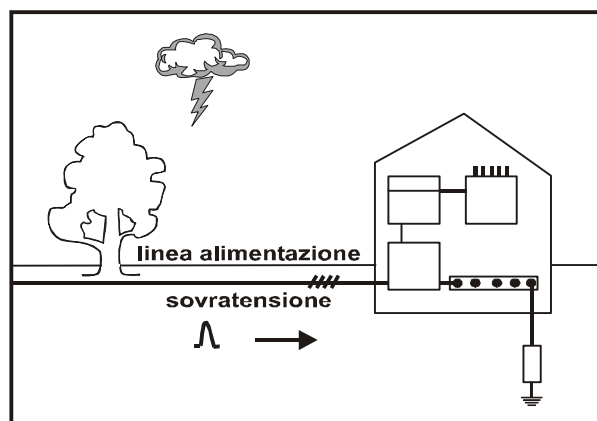
Identification of the sources of OVERVOLTAGE hazards



DIRECT ATMOSPHERIC DISCHARGE

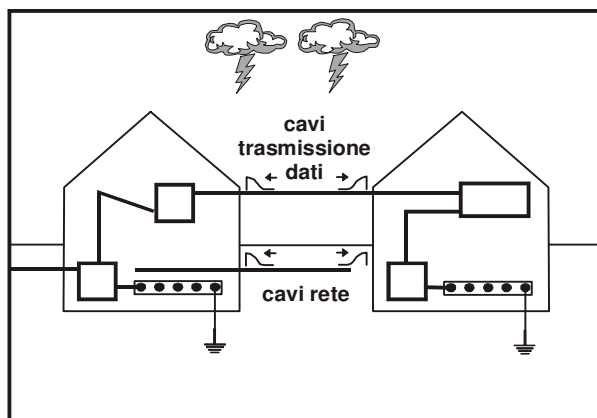
When a lightning strikes directly a building equipped with a common protection system, the components connected to the system (supplementary system) reach a significant electric potential. This event determines such potential differences between the components connected to earth and the active components,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

As a result, the discharge causes irreparable damages to the electric equipment.



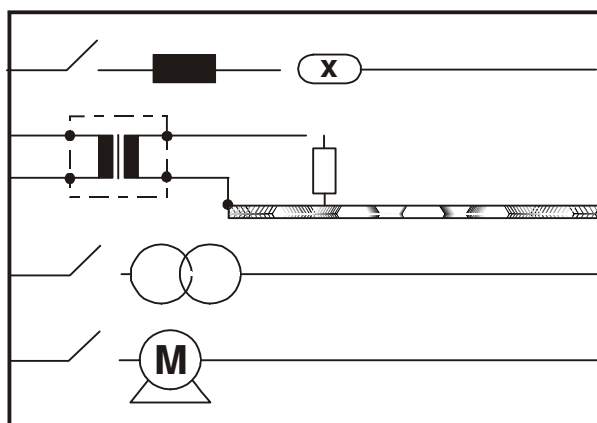
INDIRECT ATMOSPHERIC DISCHARGE

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.

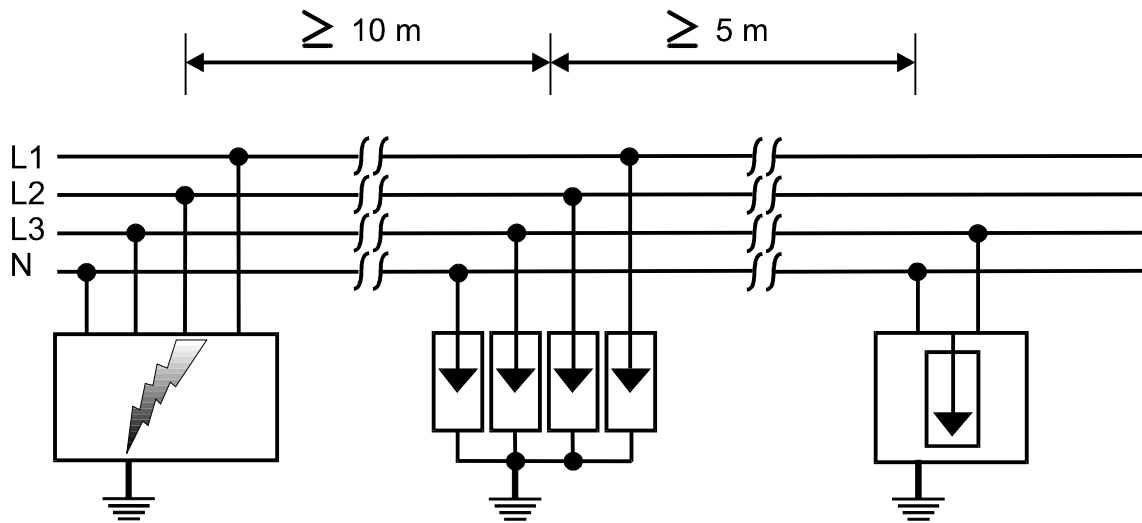
Connecting Conductors and their Cross Section

For the connection of an overvoltage protector to the mains network (L1, L2, L3, N), the cross section of the conductor must be of the same size as the cross section of the existing conductor.

Otherwise, in case the cable has a smaller rated section, it is necessary to provide a surge protection by means of a 100A fuse, gL type.

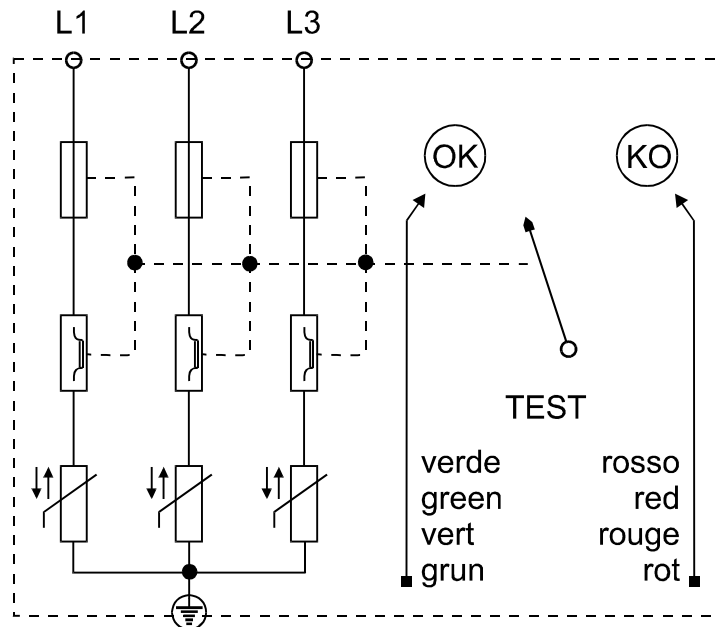
For the connection of the overvoltage protector to the ground, the rated cross section of the conductor must measure the 50% of the main equipotential bonding conductor cross section; in any case it doesn't have to be smaller than 6 mm, nor larger than 25 mm.

The connector between overvoltage protector and earth must be installed so as to be as shorter as possible.



The figure below shows the circuit diagram of a three phase surge filter, for the connection of a controller DRM300 to the supply line.

The filter has a small window, situated on the interchangeable cartridge, which shows the status of the overvoltage protector (OK = green - KO = red).



TECHNICAL ASSISTANCE FORM

- All **DRM300** equipments are guaranteed for **36** months from the date of testing.
- The guarantee will be rendered invalid under these circumstances:
 - evidence of tampering with the mechanical or electrical parts
 - improper use
 - incorrect installation
 - external electrical causes

Please keep this sheet close to the 'DRM300' regulator. To improve the assistance service and quick fault diagnosis, please fill this sheet in and send it to the Assistance centre together with the regulator in the event of a breakdown.

Customer:		Regulator model:	
N° of serial no:	Date of installation:	Date of breakdown:	

Description of the anomaly

<input type="checkbox"/> Noisy motor <input type="checkbox"/> Unbalanced phases <input type="checkbox"/> Blocked motor	<input type="checkbox"/> Burnt motor <input type="checkbox"/> Protection interrupt <input type="checkbox"/> Differential interrupt	Burnt fuse <input type="checkbox"/> phase R <input type="checkbox"/> phase S <input type="checkbox"/> phase T
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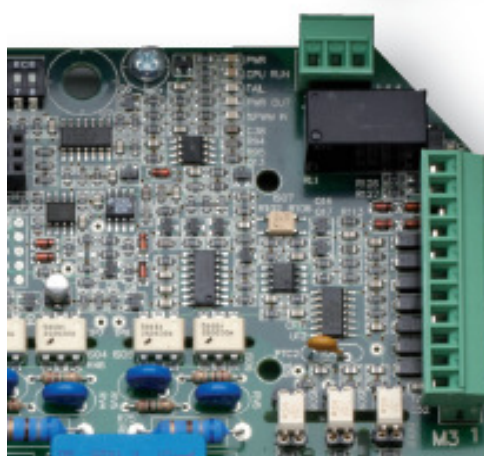
☐ **Description:**

Control and contacts check card

<input type="checkbox"/> Soft-Start dE <input type="checkbox"/> Prop.Band Pb <input type="checkbox"/> Set-point SP <input type="checkbox"/> INPUT 4/20 mA <input type="checkbox"/> INPUT 0/5 Vdc <input type="checkbox"/> INPUT 0/10 Vdc	<input type="checkbox"/> INPUT NTC <input type="checkbox"/> Lim.Max. Out. Hi <input type="checkbox"/> Lim.Min. Out. Lo <input type="checkbox"/> Cut-off So <input type="checkbox"/> Input IN1 <input type="checkbox"/> Input IN2	<input type="checkbox"/> Contact DIR/REV S1 <input type="checkbox"/> Contact Stop S2 <input type="checkbox"/> Contact SP1/SP2 S3 <input type="checkbox"/> Thermal contact TK <input type="checkbox"/> Transducer Supply 24 Vdc / 40mA <input type="checkbox"/> Potentiometer Supply 10Vdc / 5mA <input type="checkbox"/> RL1 <input type="checkbox"/> 1/3 <input type="checkbox"/> 2/3
--	--	--

Charatteristics of the connected load

Manufacturer:		Type <input type="checkbox"/> fans <input type="checkbox"/> electric resistors	
Electrical data <input type="checkbox"/> VAC <input type="checkbox"/> Amp <input type="checkbox"/> Start Amp <input type="checkbox"/> Code			
Motor data Electrical connection Traction Mechanics	<input type="checkbox"/> star <input type="checkbox"/> direct <input type="checkbox"/> helical	<input type="checkbox"/> delta <input type="checkbox"/> belt driven <input type="checkbox"/> centrifugal	Anomaly electrical data phase R S V Amp phase S T V Amp phase T R V Amp
Operator name:		Company stamp:	



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SELPRO - Via Padre Giovanni Piamarta, 5/11- 25021 Bagnolo Mella - Brescia Italia
tel: +39(0)306821611 r.a. fax: +39(0)30622274 www.selproweb.com – info@selproweb.com

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