INSTRUCTION MANUAL

Code 310S

THREE-PHASE VOLTAGE REGULATOR

CONFORMITY EMC CE

Rowan Elettronica

Motori, azionamenti, accessori e servizi per l'automazione

Via Ugo Foscolo, 20 - CALDOGNO - VICENZA - ITALY
Tel.: 0039 444 905566
Fax: 0039 444 905593 E-mail: info@rowan.it
Internet Address: www.rowan.it

UNI EN ISO 9001:2000

REV. 14 - Date 13/09/19

INSTRUCTION MANUAL

Code 310S

THREE-PHASE VOLTAGE REGULATOR

INDEX

WARNING

- Rowan Elettronica declines any responsabilities for possibile inexactitudes in the present manual, due to printing or transcription errors and reserves the right to make, if necessary and without notice, any variations needed for a better working of the product.
- As concerns the data and the characteristics mentioned in this manual, a max tolerance ±10% is allowed.
- Electrical equipments can create dangerous situations for persons and things; the user is responsible for the installation, operation and maintenance of the equipment and the compliance of the installation to the standards in force.
- Only qualified personnel should work on this equipment, and only after becoming familiar with all safety instructions regarding installation, operation and maintenance procedures contained in this manual. In case of doubts, contact Rowan Elettronica srl.

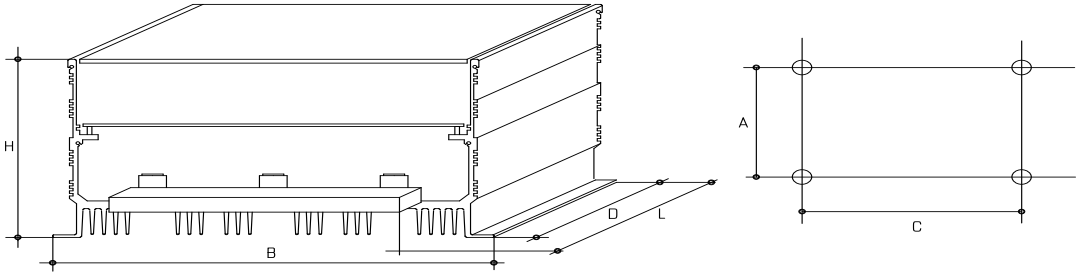
TECHNICAL CHARACTERISTICS:

- Voltage regulation on the load from zero to 100% of line voltage with 3 wire / 3 wire with neutral / 6 wire connection.
- SCR drive range up to a 200A line current on continuos service (on request until 700A).
- Selectable standard three-phase supply voltage: 170÷260VAC (indicated by 230) and 300÷460VAC (indicated by 400), 50-60Hz. Range 320÷485VAC (indicated by 440V) and 330÷500VAC (indicated by 460V) available on request.
- Maximum accepted supply distorsion: 10%
- Drives adjustable through micro-switches for voltage control of: Rowan motors, Alquist motors, fans with max unit power of 0,75Kw, transformers, electrical resistances and lamps.
- Voltage regulation by potentiometer or DC signal 0 ÷ +10VDC with acceleration and deceleration ramps adjustable by internal trimmers.
- Feedback signal input adjustable for 0 ÷ +10VDC or 0 ÷ 4 VAC input from current transformer for the closed-loop control of current or voltage.
- Capability to operate under automatic temperature control with reference from heat probe.
- Inputs/outputs are galvanically isolated from high voltage and can be controlled by PLC, programmable logic or other analog signal.
- Protections: phase failure with output terminals for an external emergency relay (24VDC/50 mA); 0.5A fast fuses for driving circuit protection.
- LEDs indicating the following operation status: power on - phase failure - operation consent - operation - max voltage feedback.
- Plug-in type terminal block for input/output control connection.
- Operating temperature: -5°C to + 40°C (external to cabinet); -5°C to + 55°C (internal to cabinet);
- Storing temperature: -25°C to + 70°C
- Relative humidity: 5 to 95% (non condensing)
- Standard version in aluminium container with polycarbonate lid cover stencilled with reference guide diagrams for operation checks and settings.
- IP 20 protection.
- **Compliance with Standards:** this equipment complies with standard CEI EN 60204-1. As regards Electro Magnetic Compatibility (EMC) in industrial area, this equipment complies with standards EMC 2004/108/CE with reference to these standards:

> CEI EN 61800-3 when used as actuator (or speed regulator for electric motors);
> CEI EN 60947-4-3 when used as regulator (used without electric motors);

To satisfy these standards, C310S **must be connected with the correct filtering devices, and installed in full compliance with instructions reported on page 17.**

OVERALL DIMENSIONS **FIXTURE DRILLING TEMPLATE**



SIZE TABLE							
COD.	**H**	**B**	**L**	**A**	**C**	**D**	**kg**
310S/0	95	265	195	132	255	170	2
310S/1	150	265	230	160	257	195	4
310S/2	150	265	315	200	257	280	5,4
310S/3*	150	265	365	200	257	280	6,2
310S/4*	160	265	500	200	257	350	7,4
310S/5*	260	280	560	233	265	480	15
310S/6*	270	380	580	330	257	450	30

* With ventilation.
Ventilated sizes have a heat probe (maximum temperature + 80°C normally close contact, max 5A - 250Vac) to be connected serially to the emergency circuit in order to leave out voltage to the regulator in case of over temperature.
The fan and the heat probe must be connected by the terminal board outside the PVC grid (lower side).

PRINCIPLES AND CHARACTERISTICS OF OPERATION

CODE 310 Regulator is a three-phase voltage regulator designed to control any type of mixed resistive-inductive balanced load; it is a very versatile board that can be used to control three-phase motors, electrical resistances, transformers, etc. Voltage regulation is by means of a phase partitioning system using controlled diodes (SCR - silicon-controlled rectifiers), power components which ensure reliability in the event of overvoltages or overcurrents. Actuation also involves a feedback input which allows certain parameters such as voltage, current, temperature, speed and so on, to remain constant. It replaces the electromechanical phase changers in the control of Alquist motors in coiling systems.

COD. 310S POWER TABLE

POWER SIZES	RATED CURRENT	HIGH SLIP MOTORS		RESISTIVE LOADS		FANS**		Reccomanded delayed fuse TYPE GL	Fan supply power	Case dissipation	HEAT PROBE presence
		max power		max power		max power					
	A	230* V	400* V	230* V	400* V	230* V	400* V				
		kW	kW	kW	kW	kW	kW	A	W	W	
310S/0	**12**	1,5	3	4,5	8	3	5,5	20	/	60	no
310S/1	**30**	4,5	7,5	12	20	7,5	13	40	/	140	no
310S/2	**38**	5,5	10	15	25	10	18,5	50	/	180	no
310S/3	**75**	12,5	22	30	50	19	33	100	25	340	yes
310S/4	**110**	18,5	33	45	75	30	55	160	25	500	yes
310S/5	**200**	30	51	75	130	51	92	250	25	900	yes
310S/6	**450**	68	123	177	300	123	205	500	50	1500	yes

*** for 240VAC voltage supply see 230VAC power - * for 415/440/460VAC supply see 400VAC power**

**** for fans load the maximum power for each single motors must be lower than 0,75 kW (standard induction motors)**

Note: in case supply voltage allows motor connection with delta configuration, it is possible to use the 6-wire type of connection (see setting on page 7 and diagram on page 4); with this type of connection the maximum power of cod. 310S can be multiplied by 1,73.

DESCRIPTION OF LED INDICATORS

L1 POWER ON
- LED on indicates power supply flowing through the board and driving circuits.

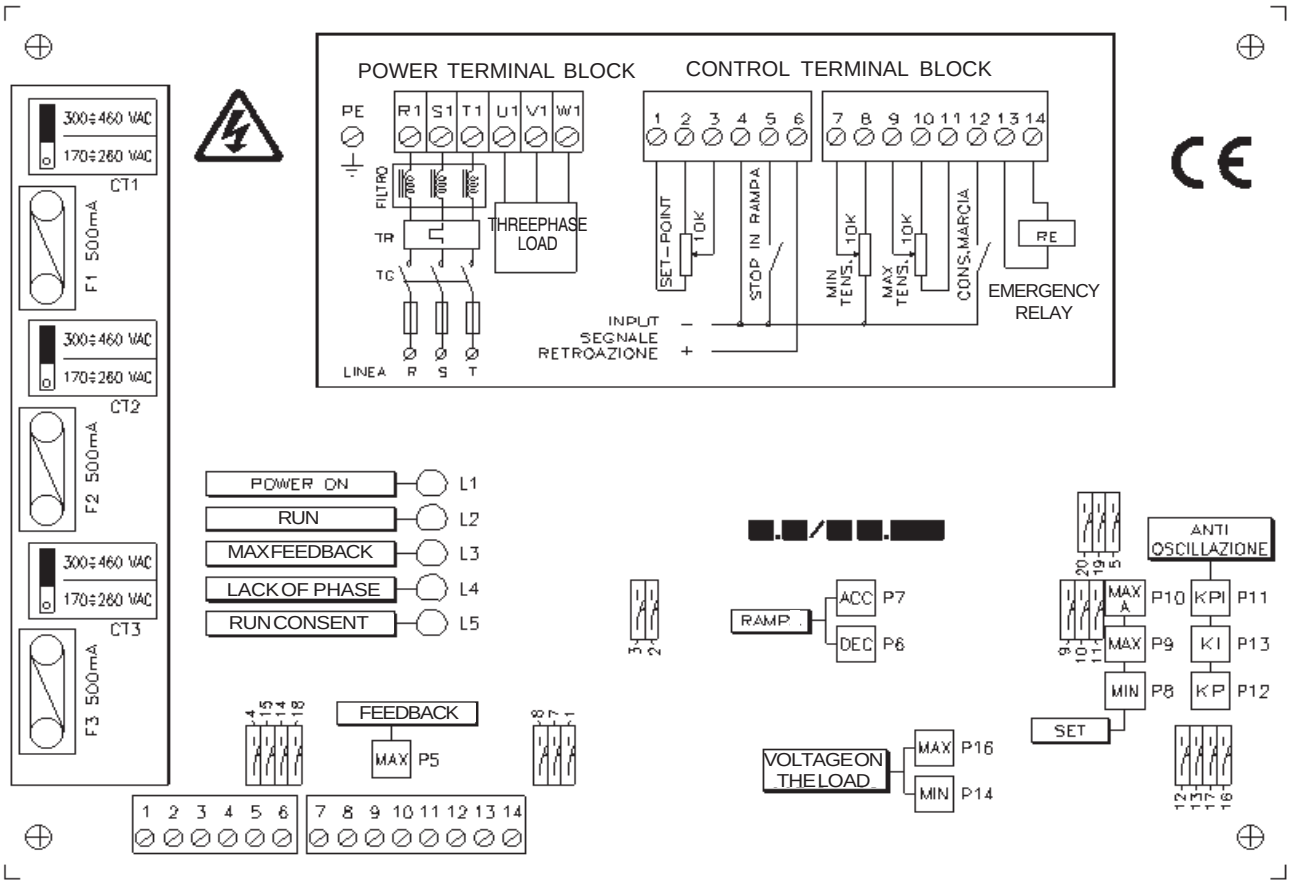
L2 RUN
- LED ON: indicates the presence of voltage on the load (increases luminosity as voltage increases).
- LED OFF: in case of '*operation consent*' opening and '*phase failure*' status intervention.

L3 MAXIMUM VOLTAGE FEEDBACK
- LED ON indicates that voltage on feedback input (terminal 6) has reached the maximum possible; adjust P5 so that the system operates with maximum feedback signal and L3 nearly off.

L4 PHASE FAILURE
- LED on indicates phase failure on one supply phase or in the board internal transformers. Light-up of phase failure status LED also statically removes voltage supply to motor (LED L2 'operation' off) and excites any emergency relay connected to terminals 13-14. To reset remove and then resume voltage supply to the board.

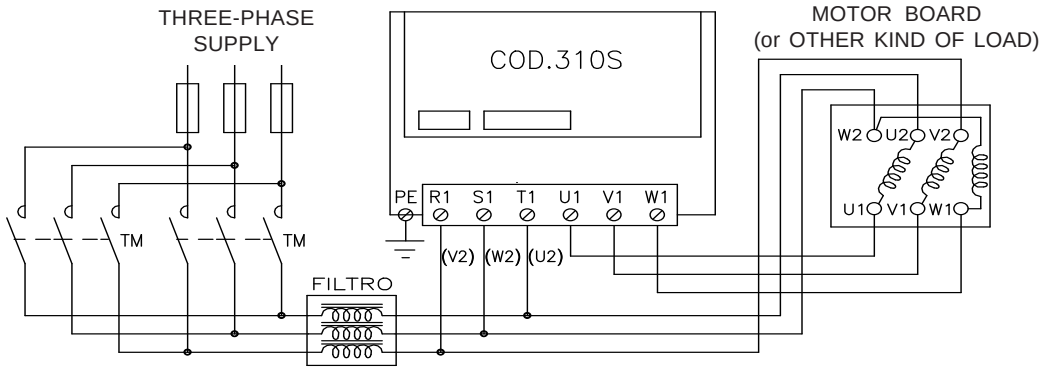
L5 RUN CONSENT
- LED ON: indicates closure of switching contact on terminals 4 - 12 and therefore consent to load voltage regulation;
- LED OFF: indicates static zero-setting of board controls and of load voltage.

MICROSWITCHES - LEDs - TRIMMERS SILKSCREEN



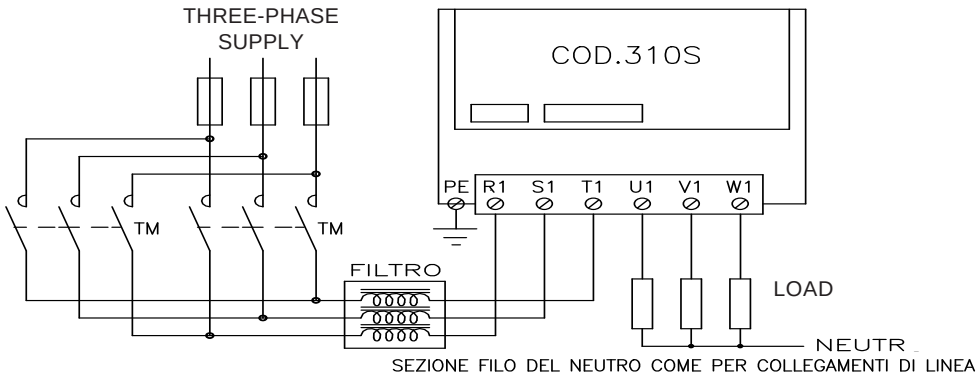
6 WIRE CONNECTION DIAGRAM

(ONLY FOR LOADS WHICH CAN BE CONNECTED WITH D CONNECTIONS)



3 WIRE WITH NEUTRAL CONNECTION DIAGRAM

(FOR UNBALANCE LOADS)



DESCRIPTION OF POWER TERMINAL BLOCK

R1-S1-T1 Power supply three-phase line. Connect to threephase line supply with the EMC filter inductance as described on page 17 (necessary for the CE marking). Be sure to set up the voltage changers correctly before giving power to these terminals (see bridges CT1 - CT2 - CT3 on silkscreen on page 4). If type of functioning n. 5 is used, close microswitch S20 for power supply max 460V, open microswitch S20 for power supply max 260V.
Important: with power supply 60Hz and drive functioning with open-loop configuration, it is necessary to re-adjust the minimum by trimmer P8 (by increasing it) to obtain the correct set-point regulation range.

U1-V1-W1 Regulated output to the load. Set the load in star or delta connection according to motor ratings and power supply voltage.

PE Earth connection. It is necessary to connect the terminal PE to earth for safety and EMC compatibility reasons.

DESCRIPTION OF CONTROLS TERMINAL BLOCK

1 = Extreme
2 = Extreme } set-point potentiometer (standard 10K or any value within the 3K-100K range).
3 = Cursor

2 = reference voltage 10VDC Max 10mA for set-point potentiometer
4 = common negative 0V

4-3 = set point analog voltage input 0 to +10VDC - 2mA

4-5 = ramp stop contact input
- closed: with the deceleration ramp set, zero-sets the set-point signal
- open: with acceleration ramp set, gives consent to set-point signal rise

4-6 = feedback signal input (feedback) settable for TA/TV input 4VAC/0.2A or DC/AC signal max50V

4 = Extreme
7 = Cursor } minimum adjustment external potentiometer (10 Kohm).
8 = Extreme

Sets a fixed minimum voltage on the load irrespective of the set-point value (for example it determines minimum ventilation in the case of automatic temperature control); the potentiometer becomes operational by opening microswitches S14 and S15.

9 = Cursor
10 = Extreme } maximum adjustment external potentiometer (10 Kohm).
11 = Extreme

Regulates the maximum voltage value on the load irrespective of the set-point value; for example it determines maximum ventilation in the case of automatic temperature control through the fans. The regulation is activated by opening microswitch S18 and closing microswitch S17.

4-12 = operation consent (open collector NPN transistor or open contact)
- closed: gives consent to load voltage regulation;
- open: statically removes load voltage and zero-sets the board controls (ramps, set-points ...).

13-14 = 24VDC - 50mA “phase failure” emergency relay coil power supply .
NOTE: for relay with incorporated diode, connect the positive to 13 and the negative to 14.

DESCRIPTION OF TRIMMERS

P1 - P2 - P3 - P4 - P17 Authorised personnel only.

P5 Regulates the feedback signal connected to terminal 6; set up in case of drive mode as close loop voltage regulator (in clockwise direction the feedback signal increases); with terminal 3 at 10VDC and P9 all in clockwise direction, calibrate P5 until the set-point max range request. (P5 in clockwise direction decreases the max).

P6 Regulates **deceleration** ramp time in the following ranges:

	MINIMUM	MAXIMUM
S9 closed	0.20 sec	25 sec
S9 open	5 msec	500 msec

(in clockwise direction the ramp time increases).

P7 Regulates **acceleration** ramp time in the following ranges:

	MINIMUM	MAXIMUM
S9 closed	0.20 sec	25 sec
S9 open	5 msec	500 msec

(in clockwise direction the ramp time increases).

P8 Regulates the set-point minimum limit; (in clockwise direction the minimum limit increases).

P9 Regulates the set-point maximum limit; (in clockwise direction the maximum limit increases).

P10 Determines the maximum limit of motor voltage with blocked motor rotor on Alquist selection mode (see presetting no 7 on page 7) (in clockwise direction the maximum limit increases); **authorised personnel only.**

P11 Increases the integration of the response in case of closed-loop voltage regulation with feedback signal. Rotate in a clockwise direction to smoothen oscillations if it was not possible to dampen them with trimmer P13.

P12 Regulates the proportional action in case of closed-loop voltage regulation with feedback signal. By rotating in a clockwise direction it increases the voltage gain necessary for control and therefore accuracy. Rotate counter-clockwise to smoothen the oscillations during operation if these were not successfully dampened previously with trimmer P13 and then P11; it may be disconnect by microswitch S13 for the maximum possible precision.

P13 Regulates the integral action in case of closed-loop voltage regulation with feedback signal. Rotate in a clockwise direction to smoothen oscillations during operation.

P14 Regulates a fixed minimum voltage on the load irrespective of the set-point value. For example it determines minimum ventilation in the case of automatic temperature control through the fans. The regulation is activated by closing microswitch S14 and opening microswitch S15. Clockwise rotation increases minimum voltage.

P15 Phase failure activation; **authorised personnel only.**

P16 Regulates the maximum voltage value on the load irrespective of the set-point value. For example it determines maximum ventilation in the case of automatic temperature control through the fans. The regulation is activated by closing microswitches S17 and S18 (clockwise rotation increases maximum limit).

DRIVE SETTING TABLE

N°	SETTINGS		MICRO CLOSED (ON)	MICRO OPEN (OFF)
1	3 WIRE WITHOUT NEUTRAL CONNECTION		S1 - S2	S3 - S5
2	3 WIRE WITH NEUTRAL CONNECTION		S2 - S3	S1 - S5
3	6 WIRE CONNECTION (FOR ONLY AVAILABLE DELTA CONNECTION LOAD)		S5	S1 - S2 - S3
4	OPEN LOOP VOLTAGE REGULATOR		S10 - S12 - S15 - S16	S8 - S11 - S17 - S19
5	CLOSED LOOP VOLTAGE REGULATOR WITH INTERNAL VOLTAGE TRASFORMER SIGNAL	V_{MAX} 460VAC MICRO S20 ON	S10 - S12 - S15 - S19	S8 - S11 - S17 - S16
		V_{MAX} 260VAC MICRO S20 OFF		
6	CLOSED LOOP VOLTAGE REGULATOR WITH EXTERNAL FEEDBACK SIGNAL	P12 ENABLE (GAIN SETTABLE)	S8 - S10 - S13 S15 - S16	S11 - S12 - S17 S19
		P12 DISABLE (MAX GAIN COSTANT)	S8 - S10 - S15 S16	S11 - S12 - S13 S17 - S19
7	ALQUIST TORQUE CONTROL WITH ROWAN MOTOR	V_{MAX} 460VAC MICRO S20 ON	S11 - S12 - S15 S19	S8 - S10 - S16 S17
		V_{MAX} 260VAC MICRO S20 OFF		
8	ACCELER/DECELER RAMP SELECTION	5ms / 500ms RAMP	---	S9
		0,2s / 25s RAMP	S9	---
9	FEEDBACK SIGNAL TYPE SELECTION (INPUT N°6)	INPUT TA/TV 4,5VAC 0,2A	S4 - S7	---
		AC SIGNAL INPUT MAX 50V	S7	S4
		DC SIGNAL INPUT MAX 50V	---	S4 - S7
10	LOAD MINIMUM VOLTAGE ACTIVATION (MINIMUM VENTILATION)	INTERNAL WITH P14	S14	S15
		EXTERNAL WITH POT. ON TERMINAL 4-7-8	---	S14 - S15
		DISABLED	S15	---
11	LOAD MAXIMUM VOLTAGE ACTIVATION (MAXIMUM VENTILATION)	INTERNAL WITH P16	S17 - S18	---
		EXTERNAL WITH POT. ON TERMINAL 9-10-11	S17	S18
		DISABLED	---	S17

GUIDE FOR DRIVE SETTING SELECTION:

A) Choose one of the N° 1 - 2 - 3 setting option.

B) Choose one of the N° 4 - 5 - 6 - 7 setting option.

C) Choose the ramp range on set-point (see n°8 setting); for modes no 5 - 6 - 7, ramps higher than 2 sec. are recommended.

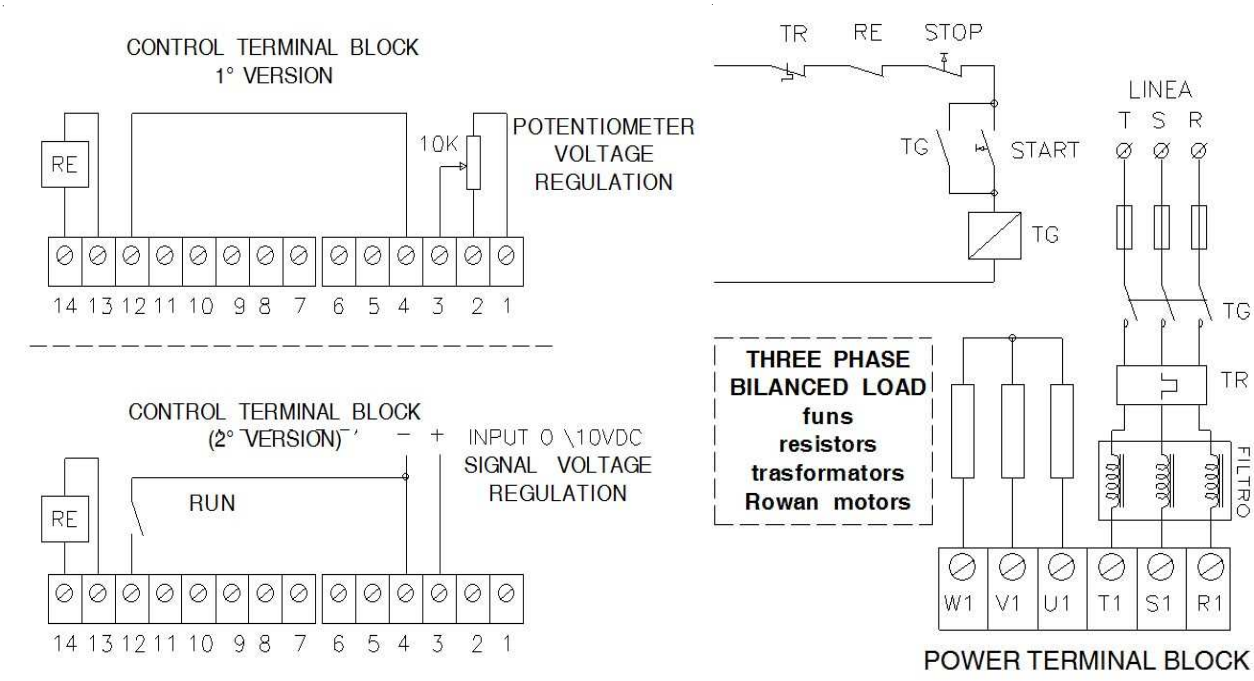
D) In case of N°6 setting mode:
- Select the feedback signal type (n°9 setting)
- Choose whether inserting the internal or external regulation of the minimum output voltage U1 V1 W1; this value is costant even if the feedback signal keeps load voltage at zero (typical application of ventilation control with temperature probe feedback)
- Choose whether inserting the internal or external limitation of the maximum output voltage U1 V1 W1; this value is costant even if the feedback signal keeps load voltage at maximum (typical application of ventilation control with temperature probe feedback); standard setting: regulation not activated.

NOTE: N°5 SETTING remove the problem of the open-loop regulator which output voltage U1 V1 W1 can be affected by current/voltage phase-shift due to load variations (in inductive loads as electric motors) by keeping constant the voltage; in addition, this setting mode keeps output voltage stable also in case of mains-line oscillations within the admitted supply range (Warning: input line voltage must be greater than the output voltage to the load).

STANDARD SETTING

- 3 wire connection without neutral (n°1 operation mode)
- Open loop voltage regulator (setting n° 4)
- Fast acceleration/deceleration ramp (500msec max).
- Closed micro: S1 - S2 - S10 - S12 - S15 - S16; the remaining ones are open.

OPEN-LOOP VOLTAGE REGULATOR (standard Setting)



Description of microswitch operation and set-up for the various types of load (inductive-resistive) with open-loop control board.

In this case CODE 310S Regulator is set up to manually regulate load voltage from zero to 100% of line voltage. Voltage at load can be adjusted by potentiometer, or by DC signal from 0 to 10V derived from PLC, programmable logic or other interface analog boards. If load insertions are frequent, it is convenient to use the starting contact or open collector npn transistor (see controls terminal block 4-12 on page 6). Obviously the load is to be star or delta-connected according to the value of the power supply line and to the load nameplate information.

Fans: INDUCTIVE LOAD

CODE 310S actuation can be used to control the speed of fans driven by normal motors of unit power of up to approximately 0.75kW. Its use with more powerful fans would cause normal motors to dangerously sustain overcurrent at intermediate speeds; therefore more 0.75kW fans can be connected in parallel choosing actuation setting that supports the overall power engaged. Typical use is in ventilation systems for industrial buildings or sheds for zootechnical breeding. For fans greater than 0.-75kW it is advisable to replace the normal motor with a Rowan type one which eliminates the above-mentioned inconveniences or using standard DEFLATED motors or with SQUIRREL CAGE in SILUMIN.
In case of more fans connected in parallel with the possibility of group exclusion choose the open-loop voltage operation mode with stabilized load voltage (see N°5 operation mode at page 8); in this way, it keeps the output voltage stable even when the quantity of fans changes.

Elettrical Resistance - Lamps: RESISTIVE LOAD

CODE 310S actuator can be used to regulate the temperature in high power furnaces changing the voltage at the electrical resistances wye-connected or delta-connected according to their supply voltage. In the **3-wire star connection the load must be balanced**, otherwise we would have dangerous overvoltage at the lower power load (voltage increase is proportional to the power difference of the loads connected to the other phases); by connecting the neutral to the wye centre you may operate even with unbalanced loads without any problems (N°2 OPERATION MODE PAGE 8). With the load 6-wire delta-connected it is also possible to work with unbalanced loads. The maximum power that may be applied to every single phase can be obtained from the actuator power divided by 3 (refer to the table on page 4). In case of 6-wire load connction the load power can be multiplied by 1.73.

Attention! *sometimes it is necessary to adjust P4 all anti-clockwise to avoid that the load voltage gets 100% without possibility to get back to zero volt.*

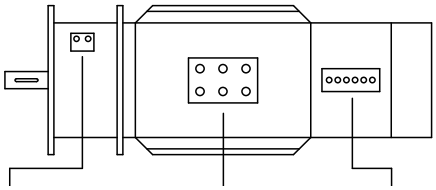
Transformers - Alquist Motors - Rowan Motors: INDUCTIVE LOAD

CODE 310 actuation may also be used to regulate voltage at the three-phase transformer primary. This allows its application as AC/DC low voltage power supplies, even high power ones, with manual regulation of output voltage with or without stabilization (see close loop voltage regulator).
NOTE: For some kinds of Load, to avoid unbalancing of the line absorbtions near to the output max voltage, it is necessary to OPEN micro S2 and adjust the Trimmer P4 all clockwise.

Another important application of CODE 310S actuation is voltage **regulation of ALQUIST type operation motors** (see setting N°7 on page 8).
Like the Rowan motor, the Alquist motor operates at high slips (even with blocked rotor), and with the same voltage at the stator windings its torque increases as slip increases up to 3 times the starting torque. The property of being able to provide a sufficient area at constant power makes it particularly suitable in function as a winder in cases where the ratio between the minimum and maximum diameter of the coil does not exceed 1/3. If the mechanical system has a good output efficiency (minimum friction) the pull of the material to wind will remain constant as the coil diameter varies. If the ratio between the minimum diameter and the maximum diameter of the coil exceeds 1/3 revert to servodiameter control system (like code 274S Rowan instrument).

Attention! *The use of ROWAN MOTORS in ALQUIST MODE at full voltage can be done only during the starting phase in order to rapidly accelerate in the presence of high inertia. This voltage value must be limited to a value in conformity to our diagrams) necessary to keep the current (at locked rotor) within the motor rated value reduced of 15%.*

INSTRUCTIONS FOR ROWAN MOTOR CONNECTION



Brake connection connector or terminal block

Power terminal block

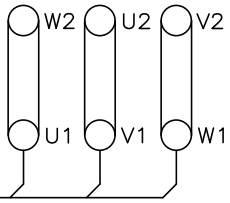
Service terminal block

POWER TERMINAL BLOCK CONNECTIONS

Even if it passes through speed control actuation, the connection remains as a normal motor, therefore if the motor "nameplate" rating states:

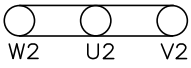
400 star/230 delta motor

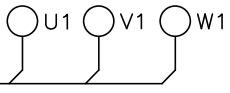
with 230 line connection is delta type



from operation of terminal block U1 V1 W1

with 400 line connection is star type

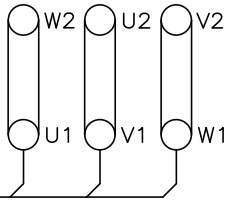




from operation of terminal block U1 V1 W1

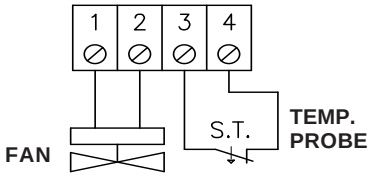
660 star/400 delta motor

with 400 line connection is delta type



from operation of terminal block U1 V1 W1

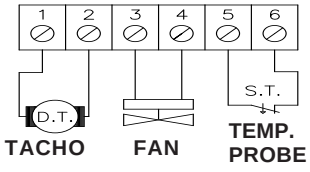
HIGH SLIP MOTOR SERVICE TERMINAL BOARD CONNECTION <u>WITHOUT</u> TACHOMETER



1-2 FAN
To these terminals it is necessary to convey the 230VAC voltage supply for ventilation separated from the motor; be sure that this voltage is present also when the motor is stopped so as to exploit also the down times. For cooling, in some high power Rowan motors equipped with three-phase scroll fans, voltage supply is conveyed directly to the fan motor terminal strip.

3-4 TEMPERATURE PROBE
It is a normally closed contact which opens when the temperature of the motor windings exceeds safety limit class H (150°C). It is used as an emergency measure for when the electromagnetic switch disconnects - note that the maximum current carrying capacity of the contact is 1A - 230VAC.

HIGH SLIP MOTOR SERVICE TERMINAL BOARD CONNECTION <u>WITH</u> TACHOMETER



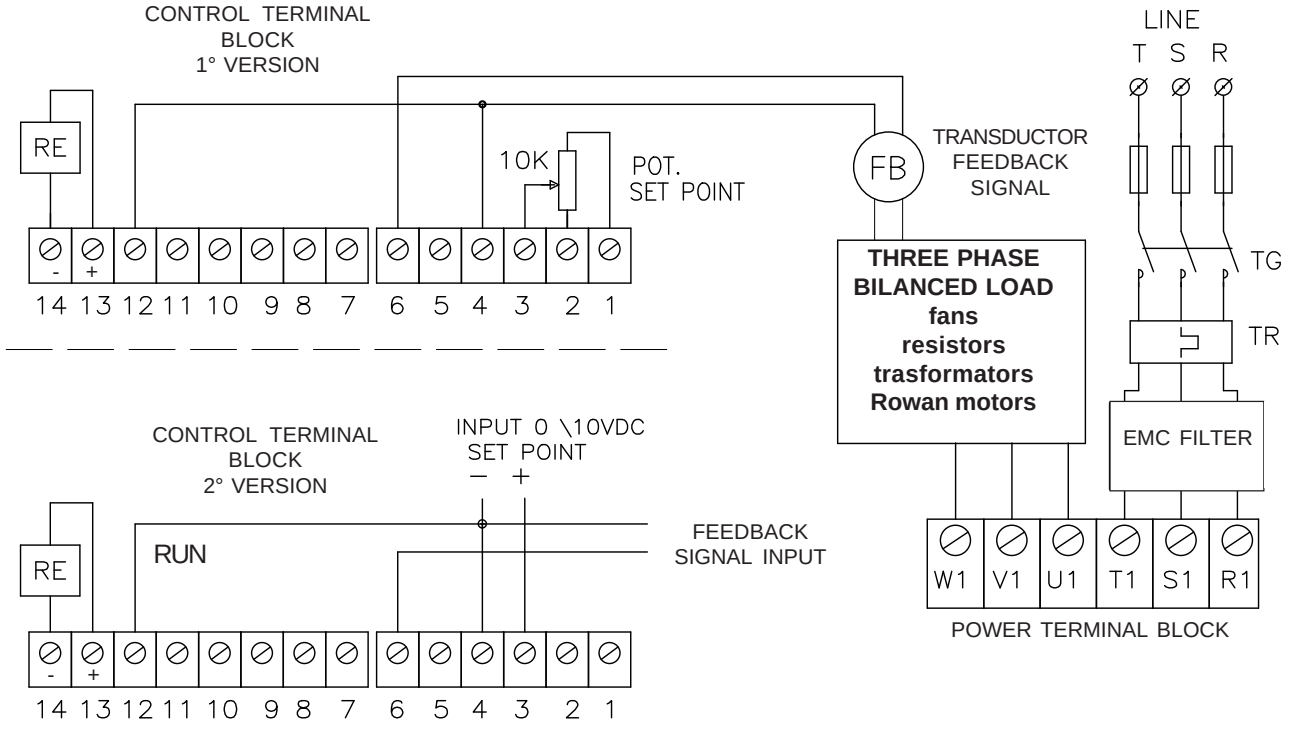
1 - 2 **TACHOMETER** (normally not used with C310 regulator)

3 - 4 **FAN**

5 - 6 **TEMPERATURE PROBE**

CLOSED-LOOP VOLTAGE REGULATOR

(see setting N°6 page 8)

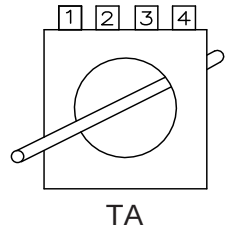


DESCRIPTION OF CLOSED-LOOP OPERATION MODE

In this case the CODE 310 board supplies at load a regulated voltage which is the product of an analog process that maintains the feedback magnitude constant (current, voltage, etc.) through the continuous comparison with the potentiometer set-point value or 0 to 10V analog signal (see controls terminal block connection). In this case the feedback input at terminal 6 is utilised, which must be enabled by the closure of microswitch S8, and set up with microswitches S4-S7 for the following inputs:

- Input AC signal max 50V: micro S7 CLOSED - micro S4 OPEN
- Input DC signal max 50V: micro S4 - S7 OPEN
- Input TA (current transformer) or TV (voltage trasformer): micro S4 - S7 CLOSED

The amperometric transformers have a typical output at full scale 0.2A 4VAC, and have the following characteristics with one wire crossing:



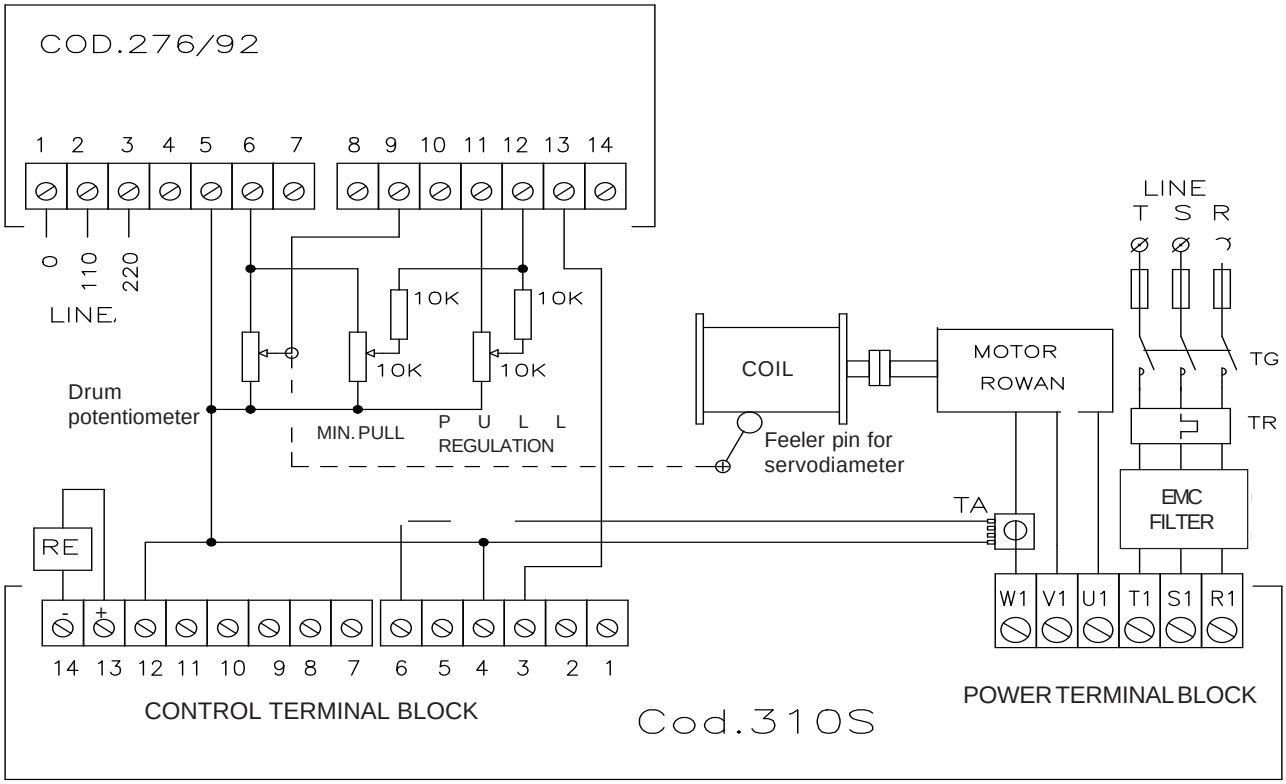
TA

	SETTING RANGE TYPE 151/110	**SETTING RANGE** TYPE 150/150
plug 1-2	0-25A	0-200A
plug 1-3	0-50A	0-300A
plug 1-4	0-100A	0-400A

By performing several wire crossings you may modify the setting range thus adapting it to the various currents. For example: with 151/110 type TA plug 1-2 with 5 wire crossings, the setting range will be 0-5A (full scale divided by the number of wire crossings).
It is possible to adjust the feedback signal with trimmer P5 (in clockwise direction the signal increases); with the control terminal board 3 at 10VDC and P9 fully clockwise, calibrate P5 until the wished set-point max range is performed (P5 in clockwise direction decreases the max); if led L3 lits on, the feedback signal is over-range.

During closed-loop control it may happen that the system starts to hunt and generates dangerous overvoltages on the load. To stabilise control, rotate trimmer P13 clockwise, and if this is not enough first rotate trimmer P11 clockwise and then trimmer P12 counter-clockwise (minimum gain). Trimmers P13 and P11 affect the integral action times, whereas trimmer P12 affects the gain and therefore closed-loop control precision. If it were necessary to modify the set-point setting range, regulate the minimum with trimmer P8 and the maximum with trimmer P9.

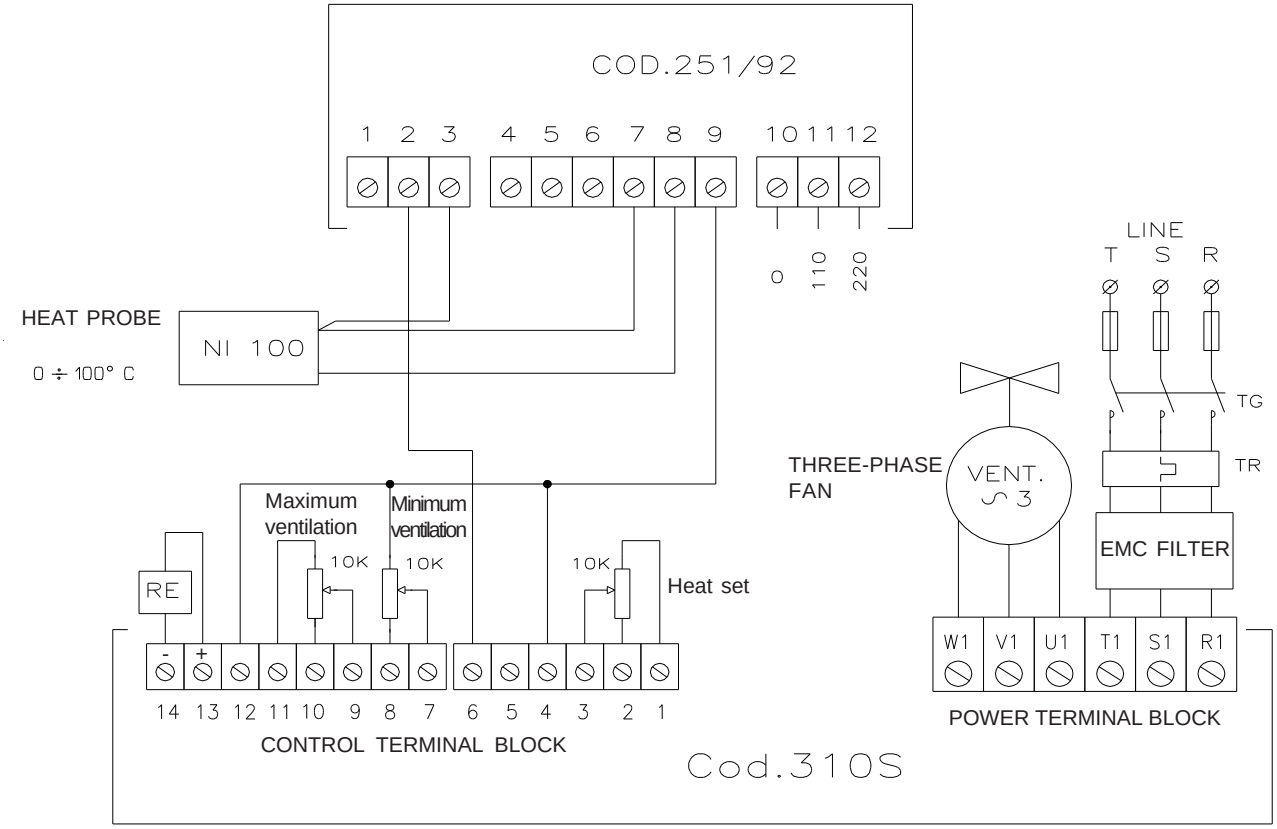
EXAMPLES OF APPLICATION
WINDING/UNWINDING SYSTEM THROUGH MECHANICAL FEELER PIN FOR SERVODIAMETER



In this application the CODE 310S operates at current **CLOSED-LOOP** control through TA. The controlled current, and therefore the torque, is that of the Rowan motor that must wind and unwind material, maintaining a constant pull as coil diameter varies. This type of control in any case is used for winders; for unwinders it is used when the ratio between the minimum and maximum diameter of the coil is greater than 1/3. Torque offset with diameter variation is brought about with a mechanical feeler pin equipped with servodiameter potentiometer and a CODE 276/92 interface board which supplies the torque signal to the CODE 310S board.
The **PULL REGULATION POTENTIOMETER** determines the pull on the material from maximum diameter to minimum diameter. The **MINIMUM PULL REGULATION** potentiometer determines the pull on the material at minimum diameter in order to offset the basic friction of the coil driving mechanisms.
The value of the **DRUM POTENTIOMETER** can be equal to or greater than 1 Kohm, and is to be mechanically positioned so that at zero diameter the wiper is shortcircuited with the extreme connected at point 5.
The minimum value of the PULL REG. and MINIMUM PULL REG. potentiometer can be equal to or greater than 2Kohm, and insert a 10Kohm 1/4 Watt resistance in series with the wiper of each one as per layout.
In the event that continuous offset of minimum pull is not necessary you may omit connection to the relative external potentiometer on the CODE 276/92 board, while fixed minimum pull can be regulated with trimmer P8 of the CODE 310S board.

ADJUSTMENT SEQUENCE on board CODE 276/92: Position the feeler pin to maximum diameter and regulate trimmer P2 of the CODE 276/92 board until output 11 (referred to terminal 5=0V) attains +10Vdc (LED L1 must be faintly lit); if with trimmer P2 it were not possible to obtain maximum output adjust trimmer P0 ; position the feeler pin for diameter zero and check that output 11 reads 0 Vdc.
Set up the microswitches as follows:
CODE 310S S1 - S2 - S4 - S7 - S8 - S10 - S13 - S15 - S16 CLOSED
OTHERS: OPEN
CODE 276/92 S4 CLOSED
OTHERS: OPEN
The choice of the plug on TA (our supply) and of the number of wire crossings should be done in such a way that the frozen-rotor state motor current does not exceed 80% of the rated nominal value; thus consult the table on page 12.

AUTOMATIC TEMPERATURE CONTROL THROUGH VENTILATION



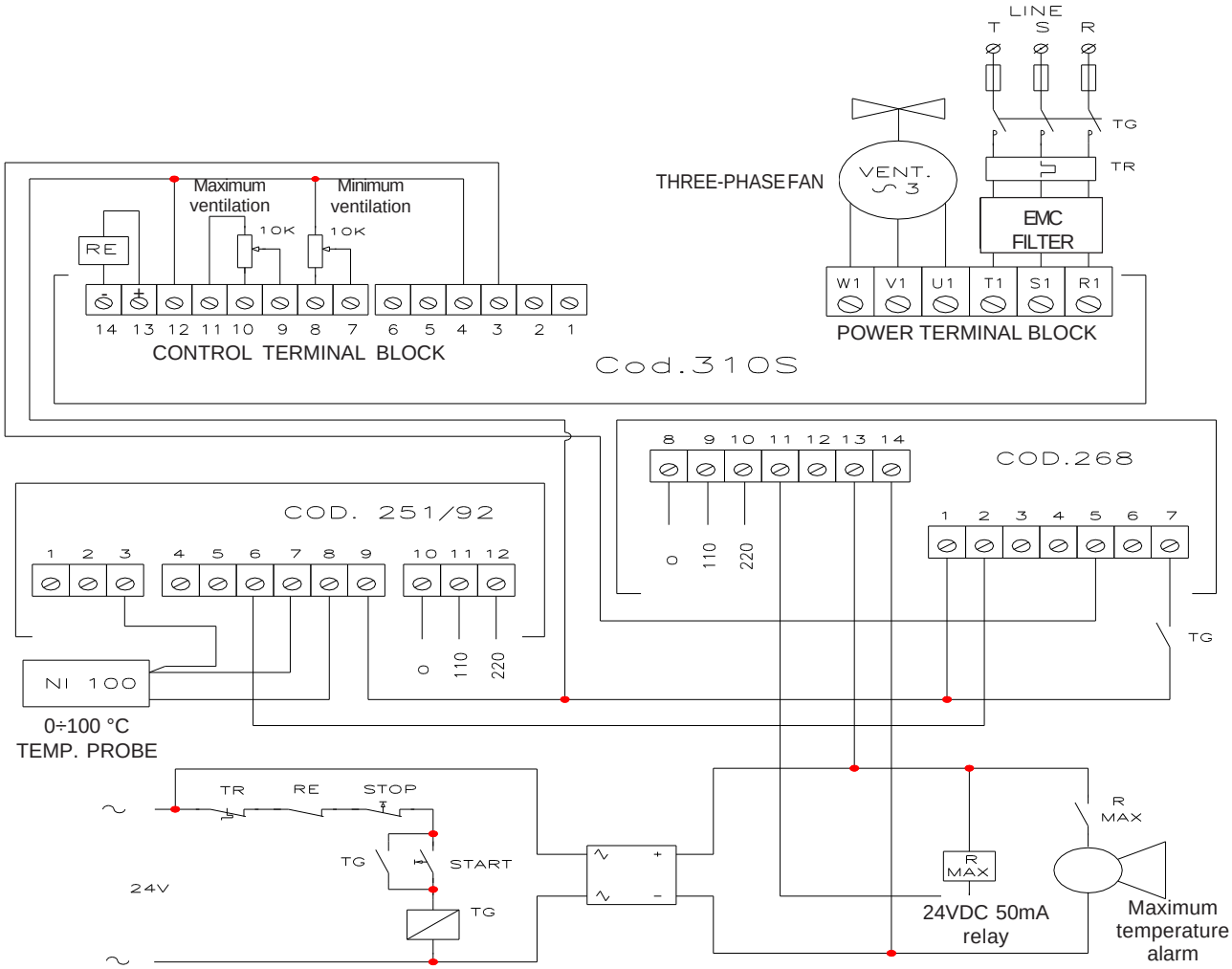
This layout is used for temperature control in zootechnical and industrial environments. CODE 310S, in **CLOSED-LOOP** configuration, is used as a heat probe for the control of parallel-connected fans having unit power of not more than 0.75kW (see section about Fans on page 8); board CODE 251/92 acts as a transducer for the NI100 probe and supplies an output (terminals 6-9) 0VDC at 0°C and +10VDC at 40°C.
At the CODE 310S control terminal block it is moreover possible to connect a **minimum ventilation** potentiometer with which you can set fixed minimum ventilation and fixed **maximum ventilation** to limit maximum cooling - this is done independently of automatic temperature control.

Set up the microswitches of the respective boards as follows:
CODE 310S S1 - S2 - S8 - S10 - S13 - S15 - S19 - S20 CLOSED
OTHERS: OPEN

Regulate P12 full counter-clockwise, and regulate P11 clockwise in order that you obtain accurate temperature control and free of any oscillations. If you wish to limit the setting range in the temperature set potentiometer, regulate trimmer P9 for minimum set-up and trimmer P8 for maximum set-up (setting range min. 0°C max. 40°C).
NOTE: Set minimum temperature when the temperature set potentiometer wiper points towards the end connected to terminal 2 (+10VDC); the maximum temperature is obtained when the potentiometer wiper points towards the end connected to terminal 1 (0VDC).

CODE 251/92 S10 - S11 CLOSED
OTHERS: OPEN

AUTOMATIC TEMPERATURE CONTROL THROUGH VENTILATION WITH DISPLAY INSTRUMENT



This layout is used for temperature control in zootechnical and industrial environments. Board CODE 310S, in **OPEN-LOOP** configuration, as a voltage regulator for the control of parallel-connected fans having unit power of not more than 0.75kW (see section about Fans on page 8); the voltage control signal is supplied to board CODE 310S by panel instrument CODE 268, which enables environment temperature and maximum temperature alarm threshold to be set up and displayed; board CODE 251/92 acts as a transducer for the NI100 probe and supplies at output (terminals 6-9) 0VDC at 0°C and +10VDC at 40°C. At the CODE 310S control terminal block it is moreover possible to connect a **minimum ventilation** potentiometer with which you can set fixed minimum ventilation and fixed **maximum ventilation** to limit maximum cooling - this is done independently of automatic temperature control.
Set up the displays of instrument CODE 268 to show real temperature of the environment.
Further information about boards CODE 268 and CODE 251 can be found in the respective instructions manuals.

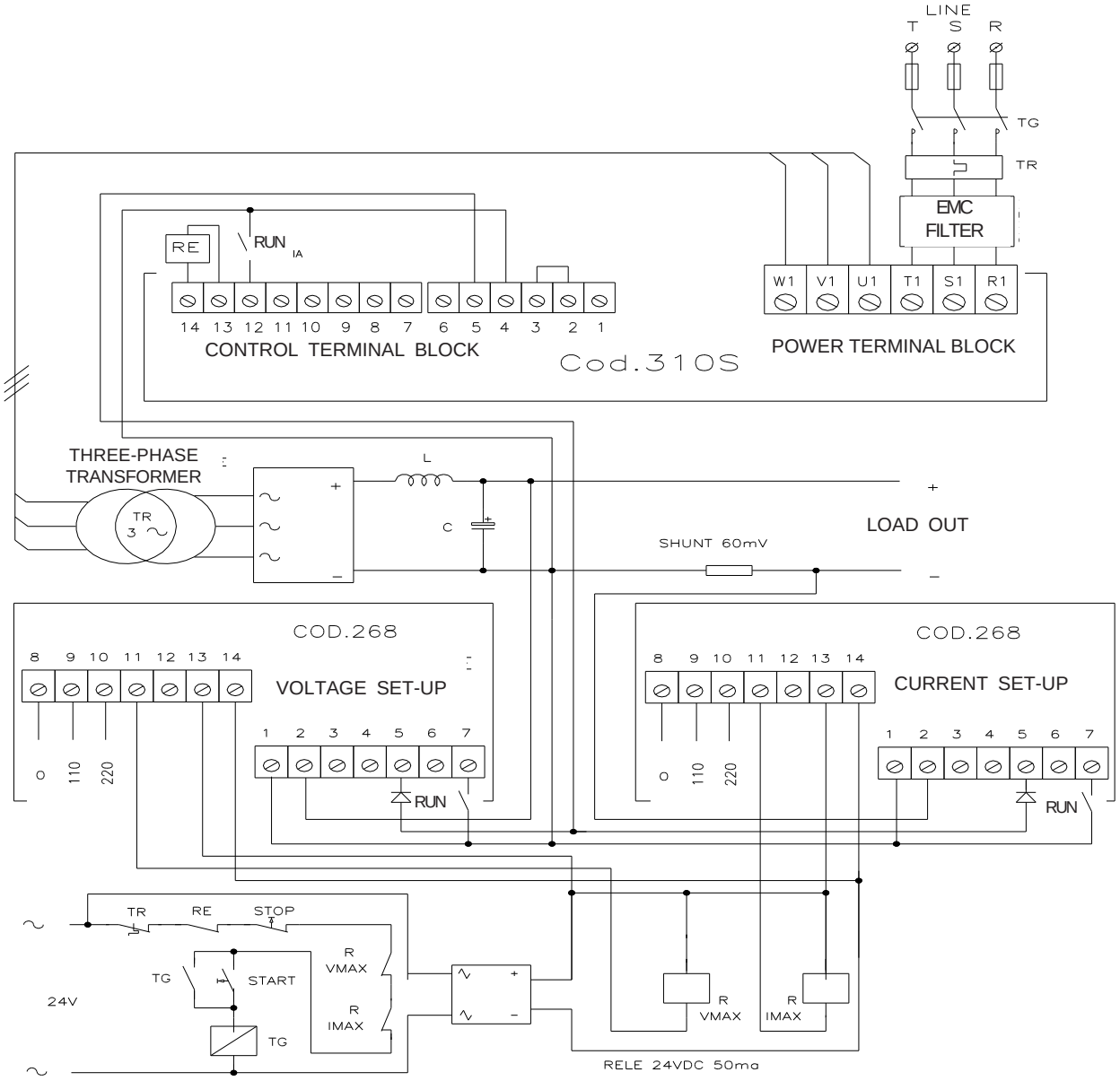
Set up the microswitches of the respective boards as follows:

CODE 310S S1 - S2 - S10 - S12 - S15 - S19 CLOSED
OTHERS OPEN
Regulate trimmers P2 and P3 for minimum ramps (full counter-clockwise).

CODE 268 S1 - S2 - S5 - S9 - S10 - S11 - S12 - S16 - S18 - S19 - S22 - S24 CLOSED
OTHERS OPEN
Adjust trimmers I and P/I of CODE 268 in order to avoid any hunting during ventilation.

CODE 251/92 S10 - S11 CLOSED OTHERS OPEN

VARIABLE CURRENT AND VOLTAGE STABILISED POWER SUPPLY



CODE 310S in this case is used as an **OPEN-LOOP** voltage regulator at the primary of a three-phase transformer. The voltage command is supplied to board CODE 310S by two CODE 268 instruments which operate in closed-loop control with direct voltage and current supplied at the load; the CODE 268 instruments, besides setting and displaying current and voltage, enable you to utilise a presettable maximum emergency threshold. Setting takes place with current priority, which means that in any case the load voltage is modified to maintain the preset consumption constant, even in the event of a short circuit.

Set up the microswitches of the respective boards as follows:

CODE 310S S1 - S2 - S10 - S12 - S15 - S16 CLOSED OTHERS OPEN

Note: *for some kinds of load, it is necessary to open microswitch S2 and adjust trimmer P4 all clockwise in order to avoid any network absorption unbalancing near to the maximum voltage at the output.*

CODE 268 CURRENT (max. SHUNT current signal 60mVdc)

S1 - S7 - S8 - S9 - S18 - S19 - S21 - S23 CLOSED OTHERS OPEN

CODE 268 VOLTAGE (max. VOLTAGE signal 24Vdc)

S1 - S2 - S5 - S9 - S18 - S19 - S21 - S23 CLOSED OTHERS OPEN

In this case CODE 268 instruments are set up to control a voltage not greater than 24VDC with a SHUNT current signal of 60mVdc; the minimum and maximum voltage and current emergencies are set for istantaneus release. Set I and P/I trimmers on frontal board of code 268 to shut up undesired overshoot. For calibration or for any other setting for different voltages and currents refer to the CODE 268 manual.

MECHANICAL INSTALLATION

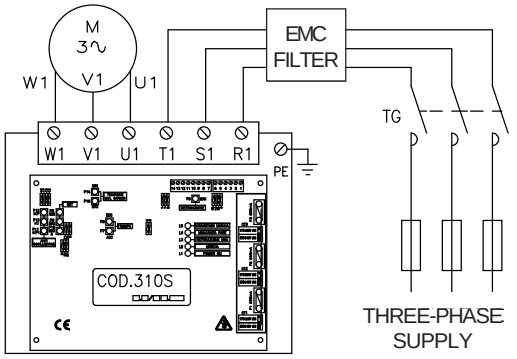
When installing the drive, follow the following precautions:
- Make sure that the room in which it is installed complies with the environmental specifications outlined on page 3(temperature - humidity - degree of protection)
- Install it on the internal cabinet place dedicated to the power devices, avoiding to be near to the analog and digital low voltage devices.
- Maximize cooling air flow and avoid stacking drives. Leave a space of at least 100 mm under and above the drive and at least 50 mm on the sides.
- Avoid excessive vibration and knocks.
- Leave space for any 'anti EMI' filters (see next paragraph).

WIRING SYSTEM AND (EMC) ELECTROMAGNETIC COMPATIBILITY

To minimize interferences induced in the connections cables:
- Avoid passing connection wires of the control or power terminal board of the same drive or other appliances into the same duct.
- Connect analog inputs / outputs with screened cable.
- Connect one end of each screen singly to the common earth point of the control panel.
- Avoid earth rings.
- Equipment cod. 310S has been designed to operate in industrial area, complying with requirements of CE; for this purpose, the general standard CEI EN 60204-1 has been applied, which complies with the essential safety requirements of standard 89/392/CEE, modified by standards CEE 91/368 - 93/44 - 93/68.
  As regards Electro Magnetic Compatibility (EMC) in industrial area, this equipment complies with standards EN 50081-2 for emission and EN 50082-2 for immunity if connected with the relevant filtering devices as indicated in the connection diagram reported below, made with a 3-phase induction 0,5 mH.

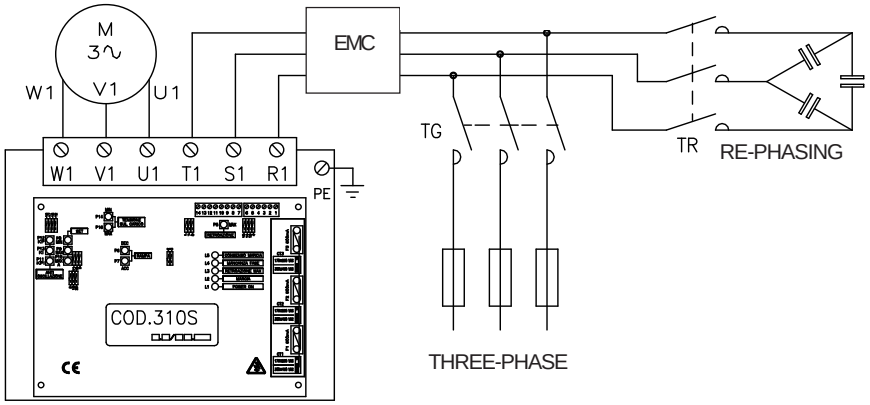
Warning: to let the filter working correctly and for safety reasons, before giving voltage to the regulator, connect the PE terminal to the ground. Connections between the filter and the R/S/T terminals must be as shorter as possible and the sensitivity of the differential protection circuit must be higher than 0.3A.

CODE	In Filter (A)	TYPE OF LOAD					
		MOTOR		TRASFORMER		RESISTIVE	
		Cat. C2	Cat. C1	Cat. C2	Cat. C1	Cat. C2	Cat. C1
RZT.12A.2,2	12	YES	YES *	YES	YES *	YES *	NO
RZT.35A.0,76	35	YES	YES *	YES	YES *	YES *	NO
RZT.50A.0,56	50	YES	YES *	YES	YES *	YES *	NO
RZT.72A.0,39	72	YES	YES *	YES	YES *	YES*	NO
RZT.106A.0,26	106	YES	YES *	YES	YES *	YES *	NO
RZT.165A.0,16	165	YES	YES *	YES	YES *	YES *	NO
RZT.245A.0,11	245	YES	YES *	YES	YES *	YES *	NO
RZT.370A.0,074	370	YES	YES *	YES	YES *	YES *	NO

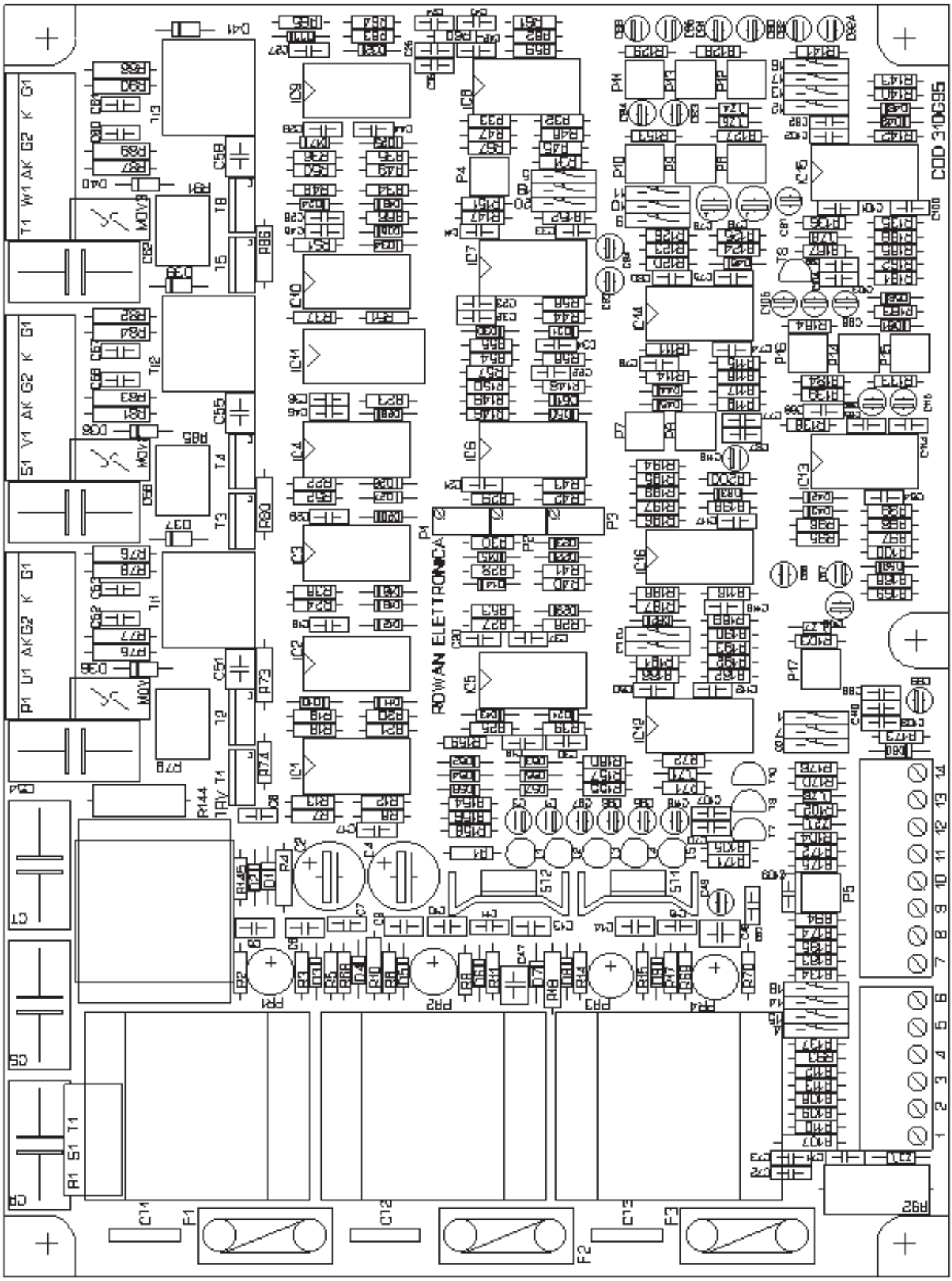


* : only when used with the CXT.ROW0.15.400 filtering module.
The three C_x=0,15mF (internal to the CXT.ROW0.15.440) have to be connected between the phases and put between regulator and inductance filter; there is one header with plastic case where housing the three condensers.

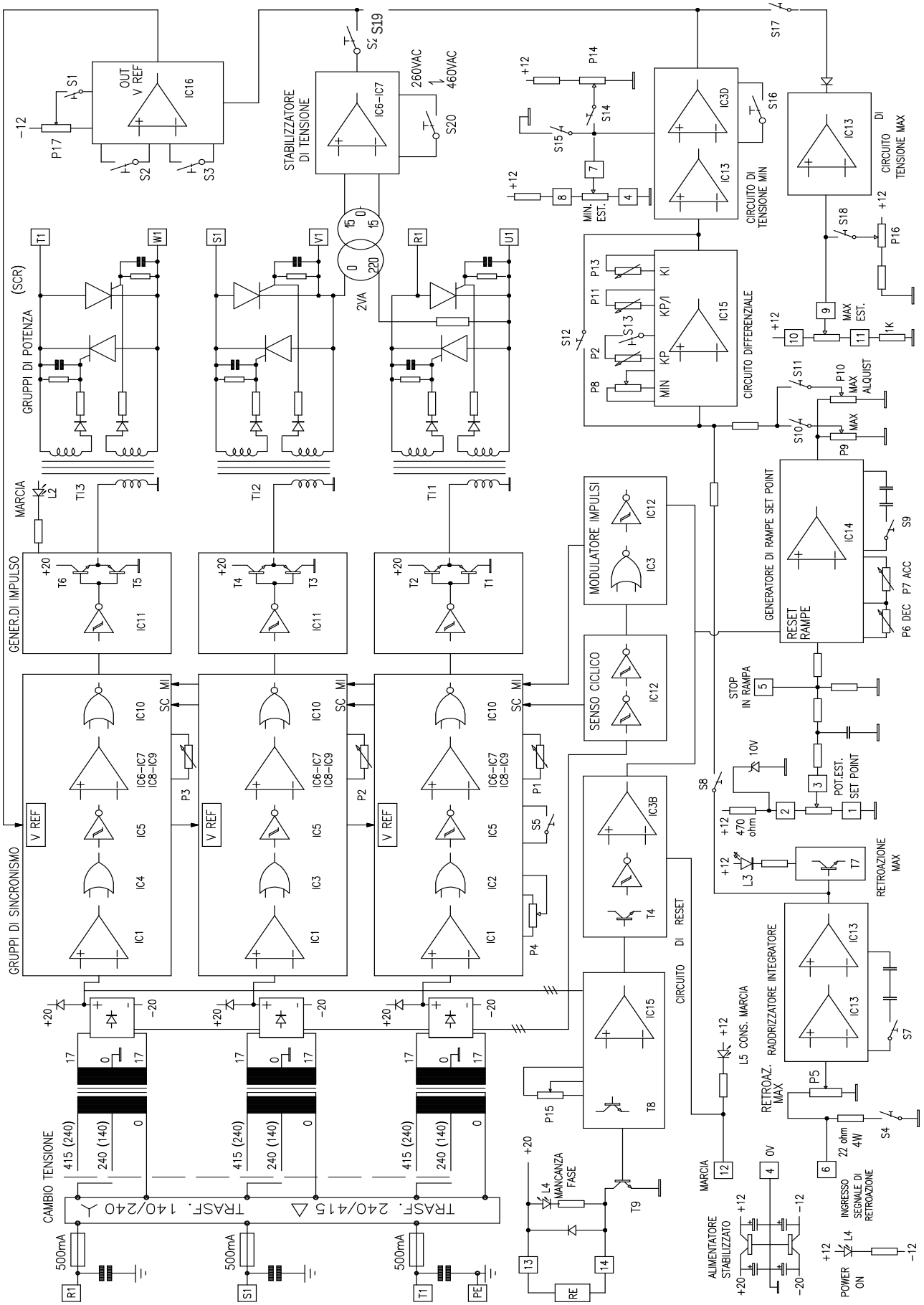
Should you wish to fit a phase correction circuit (electronic phase partializing regulation generates harmonics, especially the 3rd and 5th, on the power supply line), it must be fitted before the ANTI EMI filter, to prevent cancellation of the emission reduction effect. The installation of phase correction capacitors also reduces further EMI emissions.



CIRCUIT SILKSCREEN



BLOCK DIAGRAM



CONFORMITY

EMC

CE

Rowan Elettronica

Motori, azionamenti, accessori e servizi per l'automazione

Via Ugo Foscolo, 20 - CALDOGNO - VICENZA - ITALY

Tel.: 0039 444 905566

Fax: 0039 444 905593 E-mail: info@rowan.it

Internet Address: www.rowan.it

UNI EN ISO 9001:2000