

INSTRUCTION MANUAL

CODE 280S



Rowan Elettronica

Motori, azionamenti, accessori e servizi per l'automazione

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ROWAN ELETTRONICA SRL declines all responsibility for any inaccuracies in this manual due to printing and/or copying errors. We also reserve the right to change the contents of this manual and after specifications of the product without prior notification. A tolerance of +/-10% is permitted for the data and specifications given in this manual.

CODE 280S

BIDIRECTIONAL DRIVE FOR THE CONTROL OF THREE-PHASE ASYNCHRONOUS ROWAN MOTORS

TECHNICAL CHARACTERISTICS

- Range of drives up to a maximum power of 70 Hp/52Kw (400Vac).
- Selectable standard supply voltage 230/400VAC -15% +10% 50/60 Hz. Other supply voltages available on request: 240-415-440-460 VAC.
- Set-up for controlling the speed of Rowan 2-4-6 pole motors, equipped with tachometer dynamo type 20 VDC at 2800 rpm.
- Control of speed and rotation sense by potentiometer or signal reference DC $\pm 10V$.
- Maximum speed control precision $\pm 0.1\%$ referred to maximum speed and for load variations from zero to rated value.
- Operation with acceleration and deceleration ramp adjustable separately via internal trimmers or external potentiometers.
- Facility to activate an adjustable slow speed by pure contact or NPN transistor open collector.
- Torque limitation adjustable externally by potentiometer or $0 \pm 10VDC$ signal.
- All inputs/outputs are galvanically insulated from high voltage and connectable with PLCs, programmable logic boards, etc.
- Output for connection of zero relay with 24VDC max. 50mA coil.
- Protections: 0.5A fuses for driving circuit protection.
- LED indicating the following operation status: power on - motor run - phase failure - zero relay intervention - slow speed activated - Right/Left rotation.
- Code 280S/2/3/4/5 in extruded aluminium container equipped with cooling flaps.
- Code 280S/3/4/5 equipped with cooling fan and thermal probe with contact opening at 80°C.
- Temperature limits of the environment air external to the electric cabinet: $+5^{\circ}C \div +40^{\circ}C$;
internal to the cabinet: $+5^{\circ}C \div +55^{\circ}C$
- Storage temperature $-25^{\circ}C \div +70^{\circ}C$.
- Immunity to power mains noise in conformity to IEC standard 801.4 class 4 (max. class expected).
- Polycarbonate top guard with silkscreen printed diagram for operation control and calibration.
- Level of protection IP 20.
- Plug-in type terminal strip for input/output control connection interchangeable with previous Code 280 model.

In Conformity to Standards:

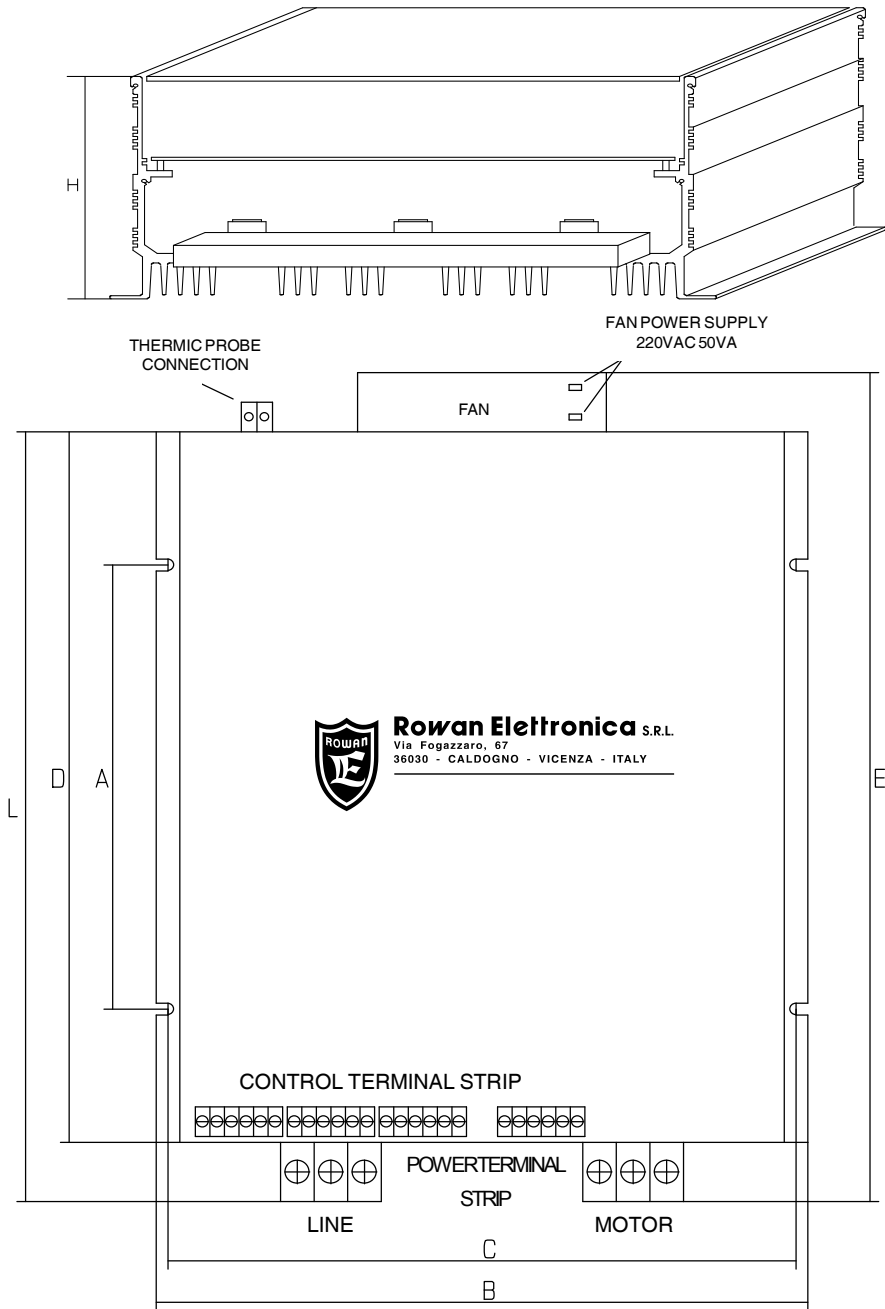
- CEI en 60204-1
- EN 50081-2
- EN 61800-3

Being respected the instructions of filtering on page 17.

OPERATING PRINCIPLE

Code 280S series drive is a tachometer feedback three-phase voltage regulator using controlled diodes (SCR) driven by phase-limiting system. The voltage that powers the motor is the result of an analog process which maintains the speed constant, through the differential control between the reference value as an actual speed value, picked up by the tachometer generator, and the one set by the potentiometer or external analog voltage. The result obtained by the combination of this system with the Rowan three-phase motor is an extremely silent and uniform constant torque and speed system, from zero to the maximum speed of the motor. The fact that controlled diodes (already overdimensioned) were adopted for the power portion enhances reliability in the case of overvoltages or overcurrents. Speed and rotation sense of the motor are determined respectively by the value and polarity of the reference signal with a max. range of $\pm 10VDC$. Functioning extends to all 4 dials; the matching motor is able to generate a driving torque and a braking torque in both rotation directions with a starting torque up to 3 times the rated torque. The system code 280S + Rowan motor is therefore particularly suited for fast movements (e.g. axes control) also when large inertial loads are driven, and without requiring any external device such as the braking resistors typical of frequency controls for normal asynchronous motors and DC motor drives.

C280S /2, /3, /4 and /5



- Model 280S/2 is without fan and thermic probe.

CODE	H	B	L	A	C	D	E
280S/2	150	265	315	200	257	280	
280S/3	150	265	315	200	257	280	360
280S/4	160	265	390	200	257	350	435
280S/5	160	265	390	200	257	350	435

Table of power of drives 280S for coupling with Rowan motors and recommended protection fuses

CODE	MAX POWER 220VAC		MAX POWER 400VAC (415 - 440 - 440 - 460)		DELAYED FUSES RECOMM.	WEIGHT	COOLING FAN INSTALLED	TERMIC PROBE INSTALLED
	HP	KW	HP	KW	A	KG	NR	NR
280S/2	7.5	5.5	14	10	50	5.9	-	-
280S/3	17	12.5	30	22	100	6.1	1	1
280S/4	25	18.5	45	33	160	10.2	2	1
280S/5	40	30	70	51	250	13	2	1

Table for rating of overload cut-out and power absorbed by motor cooling fan

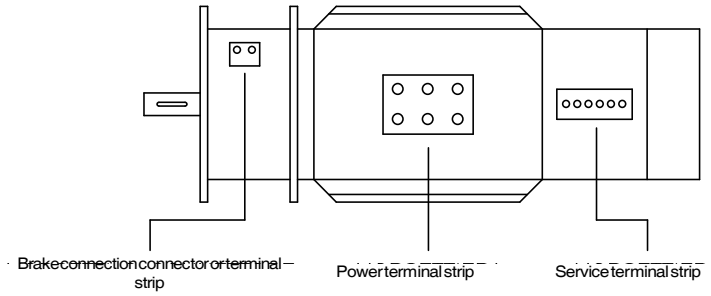
Calibrate the overload cut-out for a current of 15% above the rated. Consumption data of motors with line voltages 240-415-440-460V may be proportionally obtained from the table below which shows current absorption of motors with line voltage 400V.

MEC SIZE	MOTOR POWER		MOTOR RATED CURRENT		COOLING FAN POWERS	
			63	400VAC	AXIAL	SCROLL
	HP	KW	A	A	W	W
63	0.15	0.11	1.6	0.9	10	29
71	0.25	0.18	1.9	1.3	16	29
80	0.5	0.37	3.1	1.8	18	42
90	1	0.75	6	3.5	50	83
100	2	1.5	11	6.5	50	83
112	3	2.2	16	9	50	83
112L	4	3	21	12	50	83
132	6	4.5	31	18	65	160
132L	7.5	5.5	41	24	65	160
160	10	7.5	52	30	125	160
160L	14	10.5	72	42	125	160

Table of power absorbed by 24VDC brake

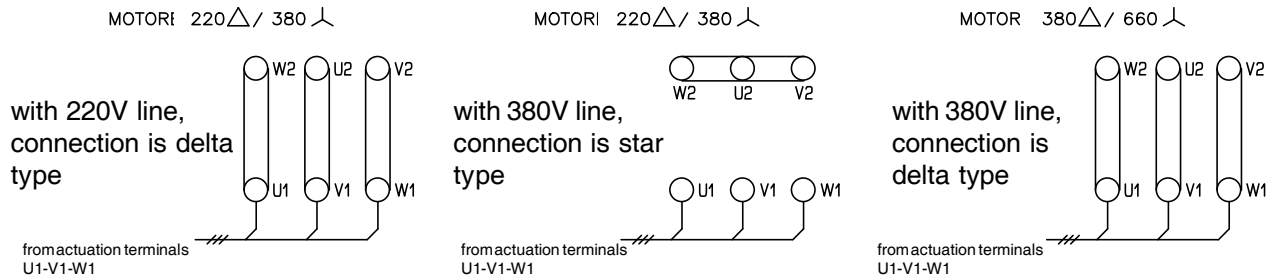
MOTOR	SPRING BRAKE	
	TORQUE	ABSORPTION
	N m	W
63 -71	4	20
80	8	25
90-100	20	30
112 - 112L	30	40
132 - 132L 160 - 160L	80	55

Instructions for Rowan motor connection



Power terminal strip connection:

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

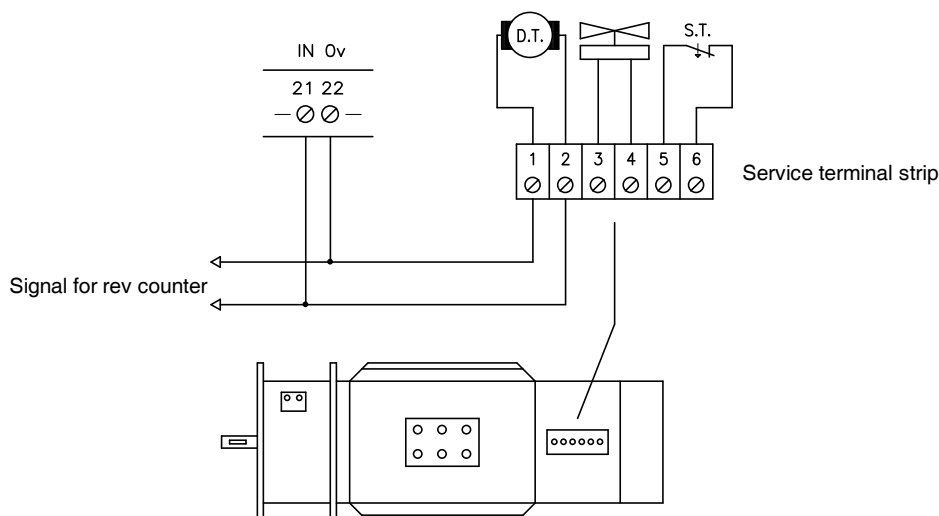


In case of replacement of the 6-wire connection board with the 3-wire type, Rowan motor connection must be delta.

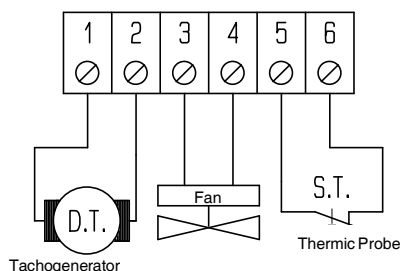
TACHOMETER DYNAMO CONNECTION

- Perform connection with shielded cable.
- Dynamo generates direct current voltage of 20VDC at 2800 rpm of motor.
- The dynamo signal is directly proportional to the motor speed, and can be used as a reference signal for the analog/digital rev counters, interface boards, etc.
- The dynamo signal may be charged for a max. of 10mA.

If the dynamo signal does not arrive or is inverted, the motor revolves at max. speed without complying with the rev control signal at terminal clamp 15. With positive speed reference at 15, the dynamo signal at terminal clamp 21 is positive (same correspondence for negative speed signal).



MOTOR SERVICE BOARD CONNECTION



1-2 TACHOMETER GENERATOR: from these terminals it is possible to have the voltage of the tachometer generator that is spliced to the motor shaft. It supplies a direct voltage of 20VDC at 2800RPM that is directly proportional to motor speed; for this reason, besides being connected to the drive for speed control, it can be used for analog revolution counters, display counters or other servomechanisms, provided that the overall loading does not exceed 3Kohm (max current 10 mA). **It is always necessary, to avoid interferences, to connect the tachometer generator with screened cable, above all if cables are long and run close to power cabling.**

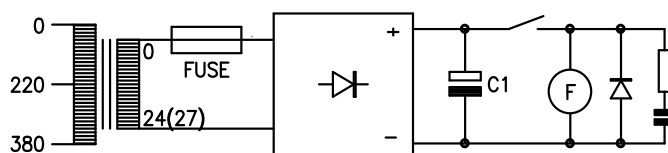
3-4 FAN: it is necessary to supply these terminals with 220VAC for the separated ventilation of motor; make sure that this voltage is present also when the motor is not running, in order to guarantee max cooling efficiency. Some Rowan motors of great power are equipped with 3-phase centrifugal ventilators, which must be supplied directly at the terminal strip of ventilator motor. As for the power absorbed by cooling fans, see table on page 4.

5-6 THERMIC PROBE: it is a N.C. contact which opens when the temperature of motor windings exceeds 150°C, safety limit corresponding to H class (180°C). It is used as emergency for the switching off of run remote control switch. The max capacity of this contact is 1A - 230VAC.

Attention: Rowan motor MEC 630, 15 HP is not equipped with Thermic Probe; for this reason terminals 5-6 are not present in its service terminal board).

BRAKE CONNECTION

On request, ROWAN motors can be provided with electromagnetic brake. In this case the motor must be constructed expressly with lengthened motor shaft and the brake is mounted on the front part, supported by a bell which reproduces the normal flanging conditions. There are 2 different types of brakes:



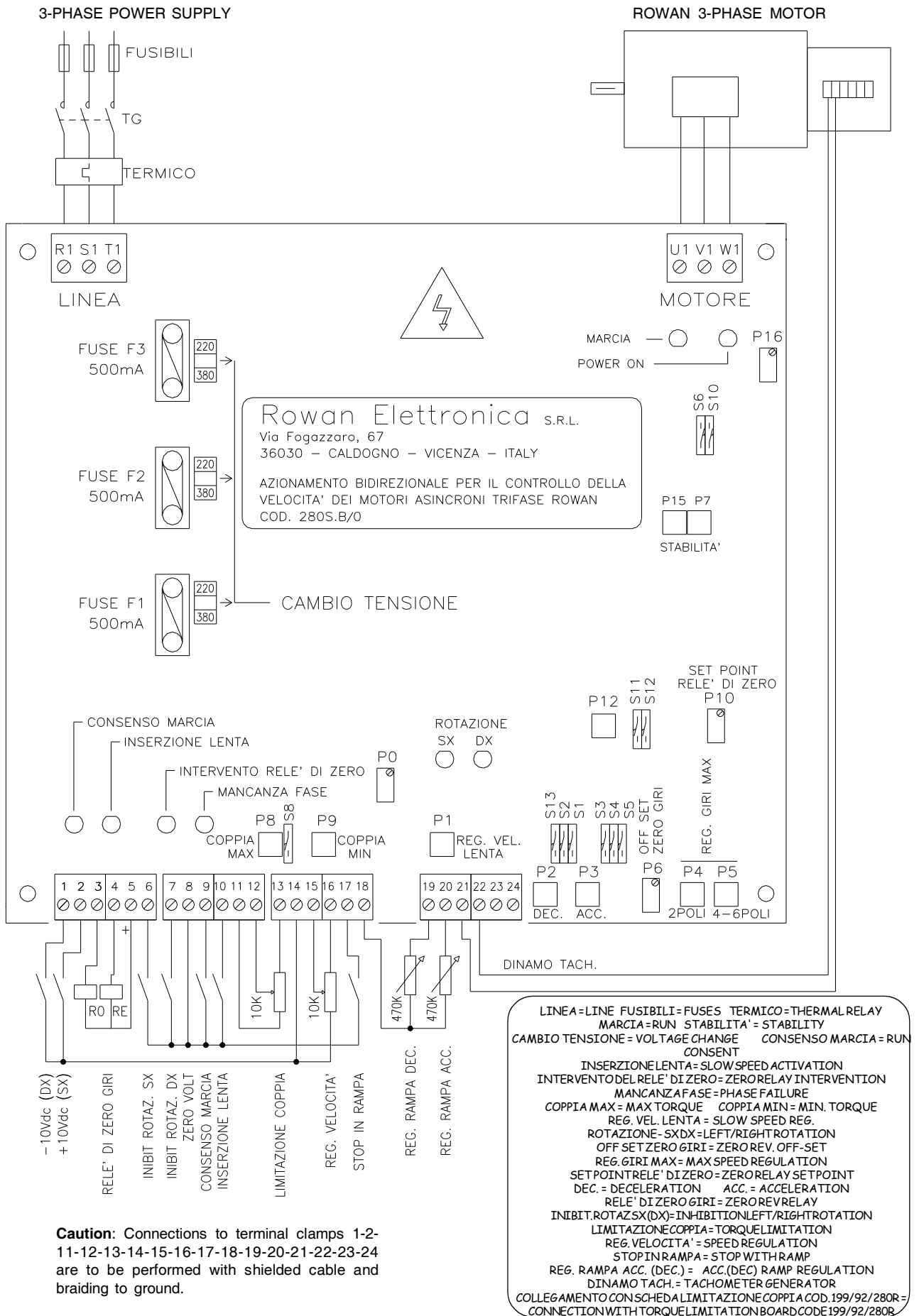
- **DIRECT BRAKE:** in this case it is necessary to supply the brake to block the motor shaft. This kind of brake is suitable for precision stops. Its efficiency can be increased by using ROWAN card cod. 210, which oversupplies it at the stop improving its precision.

- **SAFETY SPRING BRAKE:** in this case it is necessary to remove supply from the brake to block the motor shaft. It is used as safety brake in case of lack of main power supply, with suspended loads as overhead travelling cranes, cranes etc.

Both brakes operate with direct voltage 24VDC, and are supplied through the single terminal or connector placed on the front brake-bearing bell. It is always advisable to connect a diode or a R/C in parallel with the brake, above all when near to equipments that are particularly sensitive to disturbances. As for the power absorbed by brakes see table on page 4.

In case a transformer with secondary 24VDC is used, it is necessary to insert a levelling condenser C1 dimensioned for the power of the brake; when the condenser is not present, a transformer with secondary 27 VAC must be used.

GENERAL DIAGRAM OF CONNECTIONS AND SILKSCREEN OF TERMINAL STRIP-DISPLAYS-TRIMMERS-MICROSWITCHES



ROWAN ELETTRONICA SRL Via Ugo Foscolo, 20 - 36030 CALDOGNO (VICENZA) - ITALY

DESCRIPTION OF LED INDICATORS

- L1 RIGHT Rotation** (Rotation sense of motor rotating field):
Lightening with negative speed reference indicates that the motor is rotating right. Illuminated with positive speed reference indicates that the motor in left rotation is developing a braking torque.
- L2 LEFT Rotation** (Rotation sense of motor rotating field):
Lightening with positive speed reference indicates that the motor is rotating left. Illuminated with negative speed reference indicates that the motor in right rotation is developing a braking torque.
- L3 Zero relay intervention:** illuminated indicates the energisation of the zero relay connected to terminal clamps 3-5.
- L4 Power on:** illuminated indicates power supply flowing through the board and driving circuits.
- L5 Run consent:** illuminated indicates closure of contact on terminals 9-8 and therefore consent to motor start. When off it indicates static zero-setting of board controls and voltage to the motor.
- L6 Phase failure:** permanent illumination of this led during operation or after resuming voltage supply subsequent to the intervention of an overload protection, indicates the failure of a phase on the power supply line R1-S1-T1 (the three phases must be balanced and with a voltage value within $\pm 10\%$ of the one set with voltage changers). If the power supply is correct, inspect the on-board fuses F1-F2-F3.
- Pulsing illumination of led L6 during operation, indicates the presence of disturbances in the power line or an excessive deformation of the power supply wave form, due to the insertion of deforming loads.
- Illumination of led L6 only has a diagnostic function and does not imply lock-up of the board.
- L7 Slow speed activation:**
Lightening indicates that the contact between terminal clamps 10-8 for consent to slow rotation is closed. In this case the motor passes from the speed set by potentiometer or external signal $\pm 10\text{VDC}$, to an independent speed, preset with trimmer P1; speed change takes place with the ramps set by trimmers P2-P3. Slow rotation direction is determined by polarity of the reference voltage present at terminal clamp 14 and available at terminal clamps 1-2.
- L8 Run:**
Lightening indicates the presence of voltage to the motor.
When off it indicates opening of run consent contact.

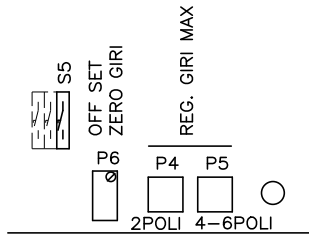
DESCRIPTION OF TRIMMERS

- P0** Ramp offset (AUTHORISED PERSONNEL ONLY).
- P1** Slow speed regulation (see page 10).
- P2-P3** Acceleration/deceleration ramp regulation (see page 11).
- P4-P5** Maximum speed regulation (see page 9).
- P6** Rev zero offset regulation (see page 9).
- P7** Stability regulation (see page 16).
- P8** Maximum torque limitation regulation (see page 12).
- P9** Minimum torque limitation regulation (see page 12).
- P10** Zero relay SET-POINT regulation (see page 14).
- P12** Zero Rev hysteresis area regulation (AUTHORISED PERSONNEL ONLY).
- P15-P16** Stability regulation (see page 16).

DESCRIPTION OF MICROSWITCHES

- S1-S2** Internal/external ramp regulation switching (see page 11).
- S3** Ramp regulation field switching (see page 11).
- S4** Transient end bend activation (see page 15).
- S5** Motor polarity adaptation (see page 9).
- S6** Stability/response regulation (see page 16).
- S8-S10-S11-S12-S13** Torque control set-up (see page 12).

BOARD SET-UP FOR MOTOR POLE NUMBER AND RELATED CALIBRATION



- If the motor is 4- or 6-pole close microswitch S5.
- If the motor is 2 poles open microswitch S5.
- If the motor is a double polarity one (2 poles/4 poles) open microswitch S5.

OFFSET ZERO GIRI = ZERO REV OFFSET
REG. GIRI MAX = MAX SPEED REG.

INTERNAL CALIBRATION OF MAXIMUM SPEED

This calibration is performed beforehand during testing for 2-pole and 4-pole motors, and is to be adjusted by the installing technician only in the case of a 6-pole motor, double polarity motor, or if the board has been miscalibrated; in case adjustment is needed, proceed as follows:

- Feed a +10VDC or -10VDC signal to terminal clamp 15.
- If the motor is a 2-pole one (S5 open) tune **P4** for a max. speed of **2800 rpm** (20VDC tachometer dynamo).
- If the motor is a 4-pole one (S5 closed) tune **P5** for a max. speed of **1400 rpm** (10VDC tachometer dynamo).
- If the motor is a 6-pole one (S5 closed) tune **P5** for a max. speed of **800 rpm** (5.7VDC tachometer dynamo).
- If the motor is a double polarity one (S5 open) tune **P4** for a max. speed at 2-poles of **2600 rpm** (18.5VDC tachometer dynamo); for this usage it is necessary to connect a 10 Kohm 0,5W resistance in series to the positive terminal of speed reg. 10Kohm potentiometer; the before mentioned resistance must be short-circuited when the motor is connected for 2 pole operating.
- P4-P5 increase speed when turned clockwise.

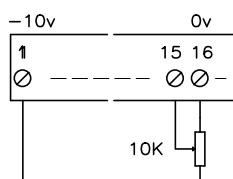
Beware not to exceed maximum speed when calibrating, as this may cause current overabsorption in the motor even when loadless, and at any rate would cause a delay in response time.

ZERO REV OFFSET CALIBRATION

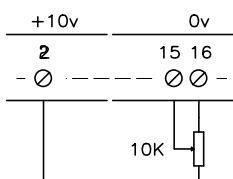
- Feed zero volt to terminal clamp 15 or close stop in ramp.
- Tune P6 until the motor stops.

SPEED REGULATION VIA EXTERNAL POTENTIOMETER

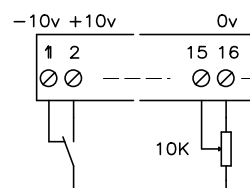
RIGHT ROTATION SENSE



LEFT ROTATION SENSE



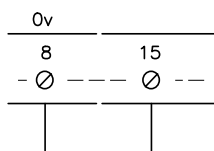
BIDIRECTIONAL (with selector)



- The load on terminal clamps 1-2 must not exceed 5mA.
- The optimum value of the potentiometer is 10 KOhm (min. 3 KOhm - max. 100 KOhm).
- **Carry out the connection with shielded cable.**

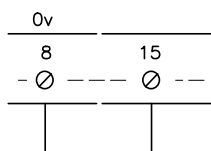
REGULATION OF SPEED VIA EXTERNAL ± 10 VDC SIGNAL

RIGHT ROTATION SENSE



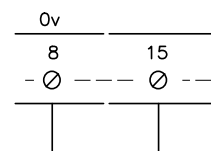
INPUT 0 \div -10VDC

LEFT ROTATION SENSE



INPUT 0 \div +10VDC

MOTOR STOPPED

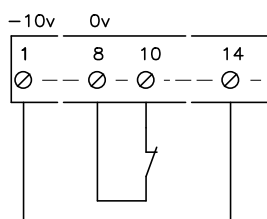


0 VDC (ZERO REV.)

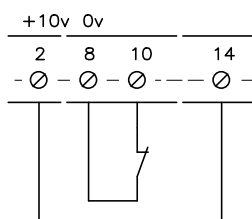
- Input 15 has load resistance > 50 KOhm and can be driven by interface boards, positioner instruments, PLCs, computers with guarantee of galvanic insulation from high voltage.
- **Carry out the connection with shielded cable.**

INTERNAL REGULATION AND ACTIVATION OF SLOW SPEED

RIGHT SLOW SPEED



LEFT SLOW SPEED



L7 SLOW SPEED
ACTIVATION

P1 SLOW SPEED
REGULATION

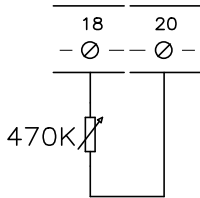
- Slow speed activation may be implemented also with an NPN OPEN COLLECTOR transistor (2.5mA 12VDC).
- The slow speed command excludes speed setting at terminal clamp 15.
- Closure of the contact is displayed by L7 *slow speed activation led*.
- Slow speed can be regulated by trimmer P1 until 70% of motor max. speed; turn clockwise to increase speed.
- The shift from the speed set to slow speed and vice verse is controlled by the acceleration/deceleration ramps set with P3/P2.

REGULATION OF ACCELERATION/DECELERATION RAMPS

Ramp internal regulation

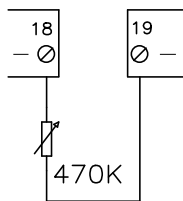
- close microswitches S1-S2;
- P2 regulates the deceleration ramp (turned clockwise increases ramp time);
- P3 regulates the acceleration ramp (turned clockwise increases ramp time);
- S3 open fixes the regulation range of the ramp from a min. of 0.05 sec to a max. of 1 sec.
- S3 closed fixes the regulation range of the ramp from a min. of 1 sec to a max. of 25 sec.

Acceleration ramp external regulation



- carry out the connection with shielded cable and as near as possible to the drive;
- open microswitch S2;
- trimmer P3 is in series with the external potentiometer;
- with S3 open and P3 at max., ramp external regulation from 1 sec to 2 sec;
- with S3 closed and P3 at max., ramp external regulation from 25 sec to 50 sec;
- with P3 at minimum, acceleration ramp external regulation range equal to ramp internal regulation.

Deceleration ramp external regulation



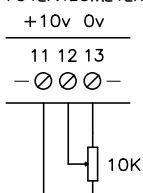
- carry out the connection with shielded cable and as near as possible to the drive;
- open microswitch S1;
- trimmer P2 is in series with the external potentiometer;
- with S3 open and P2 at max., ramp external regulation from 1 sec to 2 sec;
- with S3 closed and P2 at max., ramp external regulation from 25 sec to 50 sec;
- with P2 at minimum, acceleration ramp external regulation range equal to ramp internal regulation.

MAXIMUM VOLTAGE LIMITATION TO ROWAN MOTOR WINDINGS

Internal regulation

- to insert internal regulation of the limitation close S8 - S10 - S12 - S13 and open S11;
- P8 regulates the maximum voltage in the motor (max. 100% line voltage);
- P9 regulates the minimum voltage (standard regulation at zero);
- P8 - P9 turned clockwise increase voltage.

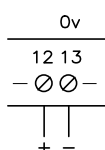
EXTERNAL REGULATION WITH POTENTIOMETER



External regulation with potentiometer or with DC signal:

- carry out the connection with shielded cable;
- to insert external regulation of the limitation close S10 - S12 - S13; open S8 - S11;
- the optimum value of the potentiometer is 10 KOhm (min. 3 KOhm - max. 100 KOhm).
- input 12 has load resistance of 50 KOhm and can be driven by interface boards, PLCs, computers with guaranteed high voltage insulation. The regulation range of the external potentiometer or DC signal is determined by trimmer P8 (max.) and P9 (min.).

EXTERNAL REGULATION WITH DC SIGNAL



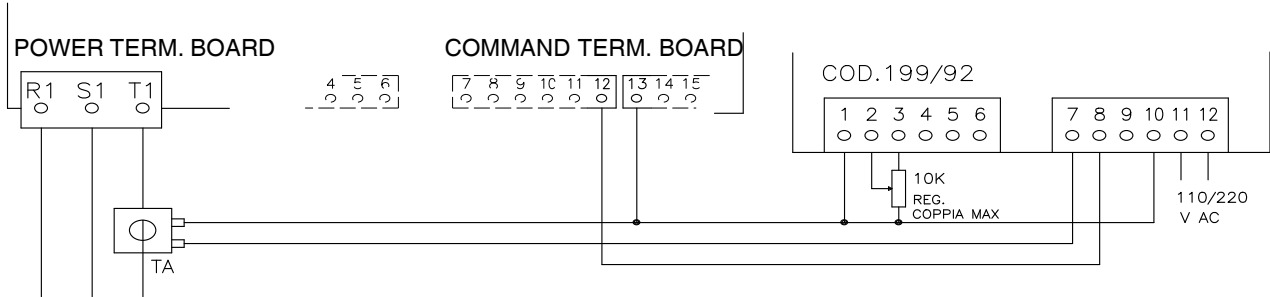
INPUT 0V MAX LIMITATION
INPUT +10V MINIMUM LIMITATION

This type of regulation is used to limit the maximum motor torque with rotor stalled as in the case of positive stoppage upon mechanical stall or when using the motor as dynamic friction. This limitation, if maintained also during normal rotation, greatly penalises the motor torque at high speed. Should you need to limit the maximum torque keeping the same value throughout the whole motor speed range or when using the motor as a dynamic clutch, use the amperometric feedback torque control described in the next paragraph.

CURRENT LIMITATION - TORQUE CONTROL BY AMPEROMETRIC FEEDBACK COMBINED TO ROWAN DEVICE CODE 199/92

To limit the current and therefore the torque of Rowan motors at any speed, it is necessary to use interface board code 199/92 and related amperometric transformer type 4VAC 0.2A at full scale, supplied by Rowan Elettronica.

CONNECTION DIAGRAM:



On code 199/92 CLOSE the the following micros: S2 - S2 - S3 - S5 - S6
On code 280S CLOSE: S8 - S10 - S12 - S13 ; OPEN S1

Code 199/92 interface board set-up

The board 199/92 is already set and pre-calibrated to be combined with the code 280S drive and therefore does not need any calibration. At any rate it is preset with all its microswitches closed. For further information on its operation, consult the relative manual.

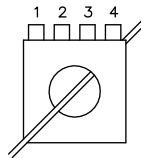
AMPEROMETRIC TRANSFORMERS AND TABLE FOR THE CHOISE (according to the Rowan motor applied for torque control with amperometric feedback.)

Rowan Elettronica supplies two types of Amperometric Transformers (TA):

Attention: During functioning with stalled rotor (winders/unwinders) the maximum current of the Rowan motor cannot be higher than 80% of its rated current. It is therefore necessary to limit the maximum of the C199/92 by adjusting the P7 value.

151/110

WITH ONE WIRE CROSSING
plug 1-2 = 25A max. output
plug 1-3 = 50A max. output
plug 1-4 = 100A max. output



150/150

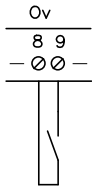
WITH ONE WIRE CROSSING
plug 1-2 = 200A max. output
plug 1-3 = 300A max. output
plug 1-4 = 400A max. output

The following table has been drawn up to obtain the maximum current of ROWAN motor (twice the rated current) with 10VDC torque regulation signal. To limit maximum current to a lower value, regulate trimmer P8 on 280S board anti-clockwise.

ROWAN MOTOR	VOLTAGE V	MAX CURRENT A	AMPEROMETRIC TRANSF.	TA PLUGS	WIRE CROSSINGS
63 0,15 HP	220	3,2	151/110	1-2	8
	380	1,8	151/110	1-2	14
71 0,25 HP	220	3,8	151/110	1-2	6
	380	2,2	151/110	1-2	11
80 0,5 HP	220	5,6	151/110	1-2	5
	380	3,2	151/110	1-2	8
90 1 HP	220	12	151/110	1-2	2
	380	7	151/110	1-2	4
100 2 HP	220	22	151/110	1-2	1
	380	13	151/110	1-2	2
90L 2,5 HP	220	32	151/110	1-4	3
	380	18	151/110	1-4	5
112 3 HP	220	32	151/110	1-4	3
	380	18	151/110	1-4	5
112L 4 HP	220	42	151/110	1-3	1
	380	24	151/110	1-2	1
132 6 HP	220	66	150/150	1-2	3
	380	38	150/150	1-2	5
132L 7,5 HP	220	82	150/150	1-4	5
	380	48	151/110	1-3	1
160 10 HP	220	110	151/110	1-4	1
	380	64	151/110	1-4	2
160L 14 HP	220	144	150/150	1-3	2
	380	84	150/150	1-4	5

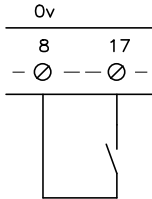
RUN/STOP COMMANDS

Run command



- The run command can be also obtained with a NPN OPEN COLLECTOR transistor (2.5mA 12VDC).
- A **closed** contact allows motor rotation in acceleration ramp until the set speed is reached, and illuminates pilot lamp L5 *run consent*.
- An **open** contact statically removes voltage from the motor (if the motor is rotating it will not brake), zero sets the ramps and excludes the other commands.
- Connection must always be done with shielded cables.

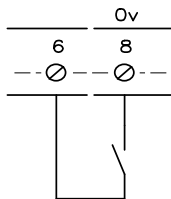
Ramp stop command



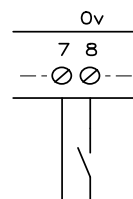
- Carry out the connection with shielded cable.
- A **closed** contact causes motor deceleration from the set speed to zero revs, with the ramp determined by trimmer P2.
- An **open** contact allows motor rotation until set speed, with the ramp determined by trimmer P3.
- The ramp stop command can be performed only with a pure contact.
- Connections must always be done with shielded cables.

Exclusion of braking action

- Exclusion commands can be made also with NPN OPEN COLLECTOR transistor (0.4mA 12VDC).
- Exclusion of the braking action is active by closed contact.
- Connections must always be done with shielded cables.

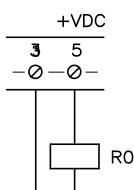


Exclusion of braking action
with speed reference on
terminal 15 **POSITIVE**



Exclusion of braking action
with speed reference on
terminal 15 **NEGATIVE**

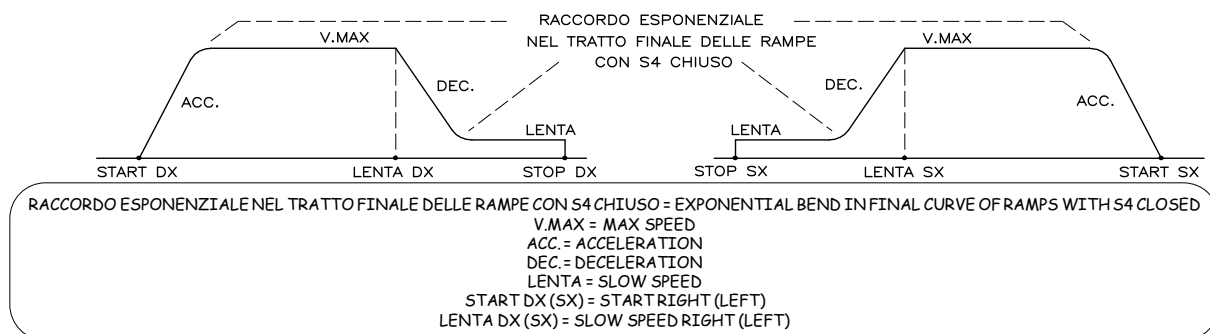
ZERO RELAY COMMAND OUTPUT



- Output for a relay with coil 24VDC 50mA max.
- The zero relay is excited when the motor exceeds the speed threshold set with trimmer P10.
- The trimmer P10 (zero relay set point) sets zero relay intervention level in a speed range of motor from 30 rpm to 1400 rpm.
- Relay energisation is indicated by LED L3 (zero relay intervention).
- The zero relay can be used for the automatic release of the run remote control switch with stopped motor.
- When driving a Rowan motor with 2 polarities, the zero relay can be used for automatic exchange of polarity.

DEMONSTRATIVE DIAGRAM

Forward/reverse motion with pre-stop slowing for precision stop with direct braking command.



The above is a general diagram representing forward/reverse motion of a carriage with slowing and stop by limit switch or proximity sensors. The acceleration/deceleration ramps are calibrated by trimmers P2-P3. The maximum speed is determined by the speed reg. external potentiometer and slow speed by trimmer P1. In this case microswitches are to be positioned as follows:

- | | |
|------------------------------------|---------------------------------------|
| Internal ramp regulation | S1 - S2 closed |
| Fast ramps 0.05 - 1 sec | S3 open |
| Deceleration with exponential bend | S4 closed |
| 4 pole motor | S5 closed |
| Soft response | S6 closed |
| Ext. torque reg. excluded | S8 - S11 - S12 open/ S13 - S10 closed |

The emergency group with opening contacts includes:

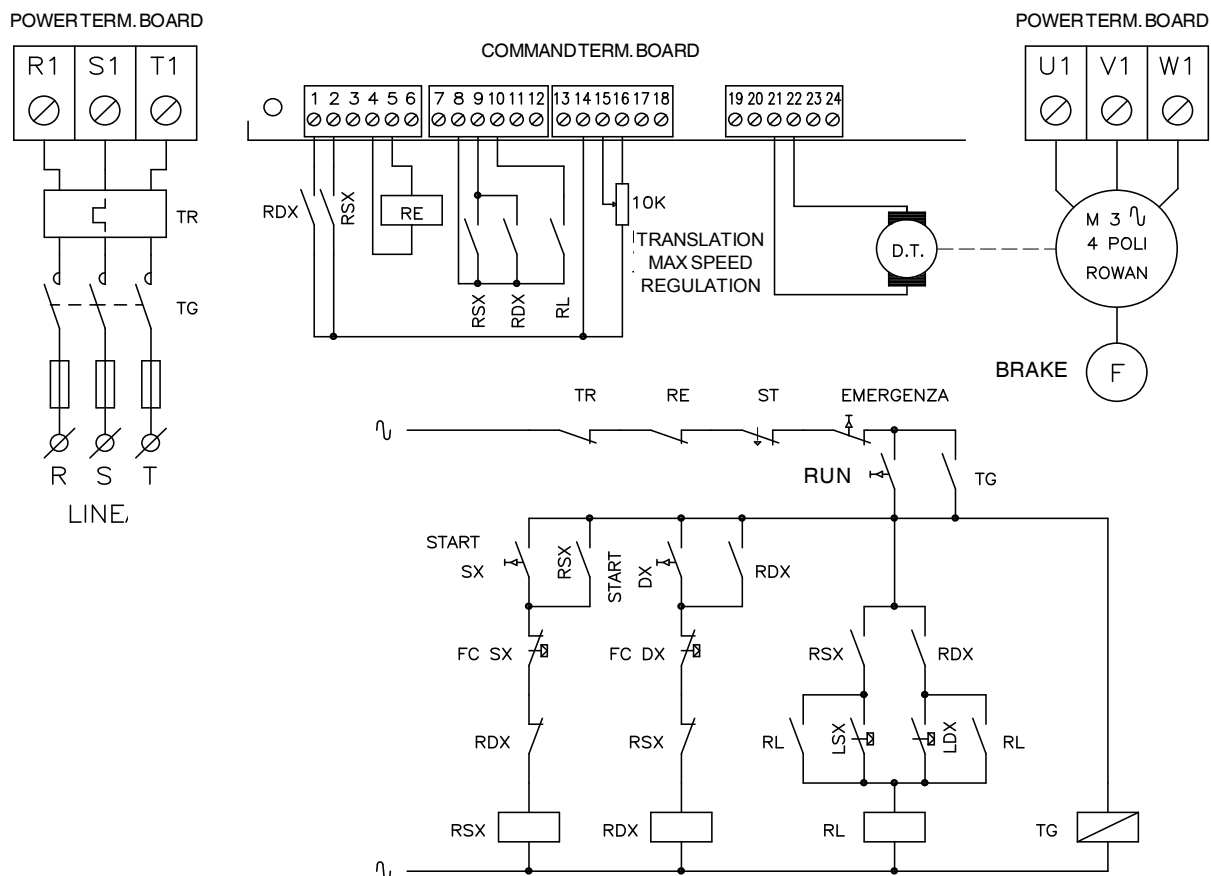
the overcurrent protection (TR);

the motor temperature thermic sensor (ST) (and eventually the thermic sensor of the board);

Provide for timing the brake command so that the motor shaft is free at the moment of the RUN (close RSX or RDX)

FCSX = LEFT stop limit switch
 FCDX = RIGHT stop limit switch

LSX = LEFT slow speed limit switch
 LDX = RIGHT slow speed limit switch



SUPPRESSION OF OSCILLATION PHENOMENA IN SPEED CONTROL

Some degree of oscillation may take place during motor rotation as a result of the type of load and mechanical transmission adopted. This may happen in transmission systems having mechanical backlash between rotating parts, or created with belts that are not sufficiently rigid. In code 280S board there are various ways to stabilize these oscillations; in case of necessity you are recommended to proceed as below instructed:

- close microswitch S6. This will decrease rev control precision. Rev variation from loadless to loaded passes from 2 rpm to 15 rpm; the command is less precise but also less critical. The speed of response to the load variations remains unchanged (proportional regulation).
- Regulate trimmer P7 clockwise. This lengthens speed control response times. The motor reacts with delay to load variations, whereas speed control precision remains unchanged (integral regulation).
- Regulate trimmer P15 clockwise and open microswitch S6. This will further delay motor response times to load variations and also decreases speed control precision (integral/proportional regulation).
- Regulate trimmer P16 clockwise. This regulation is very effective in stabilising fast oscillations that arise when the transmission between motor and load (especially inertial type) is driven by belts that are not rigid enough. It does not penalise speed control precision, while it delays motor response times but with a passing band different from the regulations of P7 - P15.
- Combine the effects of S6 - P7 - P15 - P16 in order to bring about speed control that it is as stable, fast and precise as possible.
- If during motor rotation or with the motor stopped (zero speed reference), rotation LEDs RT/LT continue to blink alternately, regulate trimmer P12 counter-clockwise in order to further widen the inert window between pull and brake.

STANDARD SET-UP

The code 280S series boards leave Rowan laboratory tested and set-up as follows:

- power supply set for 400VAC (see voltage change)
- 4-pole motor S5 closed
- internal ramp reg. S1 - S2 closed
- fast ramps range 0.05 sec - 1 sec S3 open
- torque limitation excluded S8 - S11 - S12 open/ S10 - S13 closed
- linear deceleration S4 open
- normal feedback S6 closed

Default Calibration

- max. speed 1400 rpm
- slow speed 100 rpm
- acceleration/deceleration ramps 1 sec
- P7 trimmer calibrated for stable response with loadless motor
- P15 and P16 regulated fully counter-clockwise (max. response speed)
- zero relay action at 30 rpm of motor
- P8 calibrated for max. motor torque
- P9 calibrated for zero torque

Mor:
Regolazione velo

INSTRUCTIONS FOR THE CORRECT INTALLATION

The C280S series is equipped with three 0,5A fuses (F1 - F2- F3) for protection of the piloting circuit. To obtain powering amperometric protections it is necessary putting some external fuses against the short-circuit (see page 5) and thermic contactor calculated for a current 15% higher the rated one (see page 6).

Use relays with contacts suitable for low currents to select potentiometers or DC signals; never use auxiliary contacts from contactors for these kind of operations.

In alternative to the thermic relay, the motor thermic probe can be used.

The C280S series boards work correctly when the temperatures on their cases and inside their housing cabinets are between -5°C e +55°C; temperatures above or below could cause operating anomalies, speed control drifts and, when too high, they could cause breakages; it is therefore advisable to position the board away from heat sources and to ventilate the cabinet if environmental temperatures are high.

MECHANICAL INSTALLATION

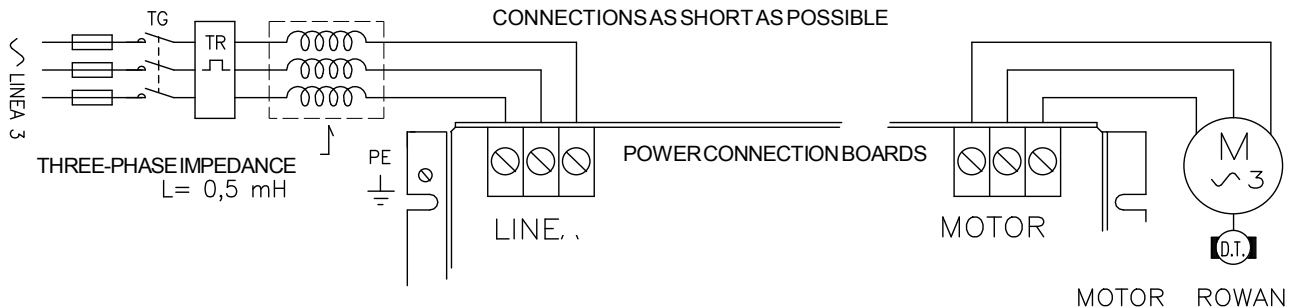
Please note the following warnings while installing the driver:

- Check that the environment in which it has to be installed complies with the environmental characteristics as described on page 3 (temperature - humidity - protection degree).
- Allow maximum air flow for cooling, avoiding driver overlaying and leaving a space of at least 100 mm both above and below the driver and at least 50 mm at the sides.
- Avoid excessive vibrations and collisions.
- Leave enough space for any anti-EMI filters (see the following paragraph).

WIRING AND ELECTROMAGNETIC COMPATIBILITY

In order to limit the disturbances induced in the connection cables:

- Avoid passing the command connector connection cables in the same cable run as the power cables.
- Connect potentiometers, tachometrical dynamo, DC signals using screened cable.
- Connect each end of the screen separately to the common ground point of the cabinet.
- Avoid ground loops.
- To avoid conducted emissions on the power line and improve immunity to this type of disturbances, connect the filter inductance and connect the PE ⊕ terminal to the ground common point.



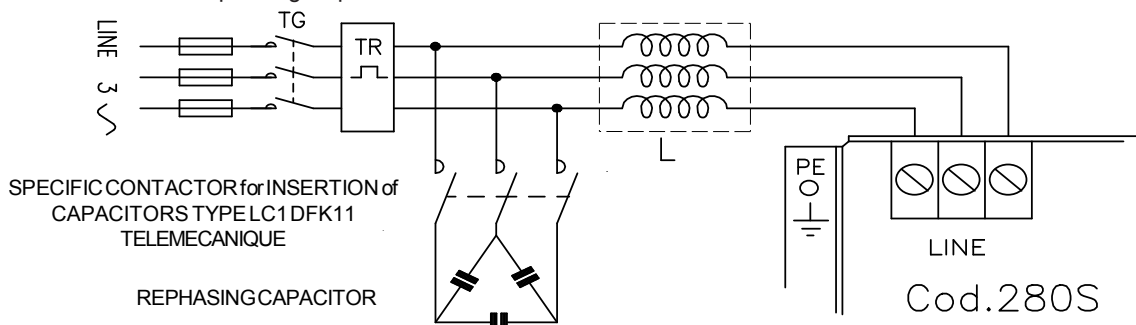
Warning ! The anti-EMI works with a small ground dispersion current which may cause too sensitive differentials to intervene at the moment of power-up. The use of differentials is recommended for impulsive current.

Rowan Elettronica may supply the complete ANTI EMI on request: the inductances are chosen accordingly to the nominal current of the applied Rowan motor, or the sum of the motors. A single inductance may serve more than one driver in parallel.

The external EMI filter is constituted by an inductance L and by three EMI condensers type Cx; the condensers are supplied in plastic box (dim. 65x35x29mm) along with connectors type Faston named CXT.ROW0.15.440.

See drawing for connection:

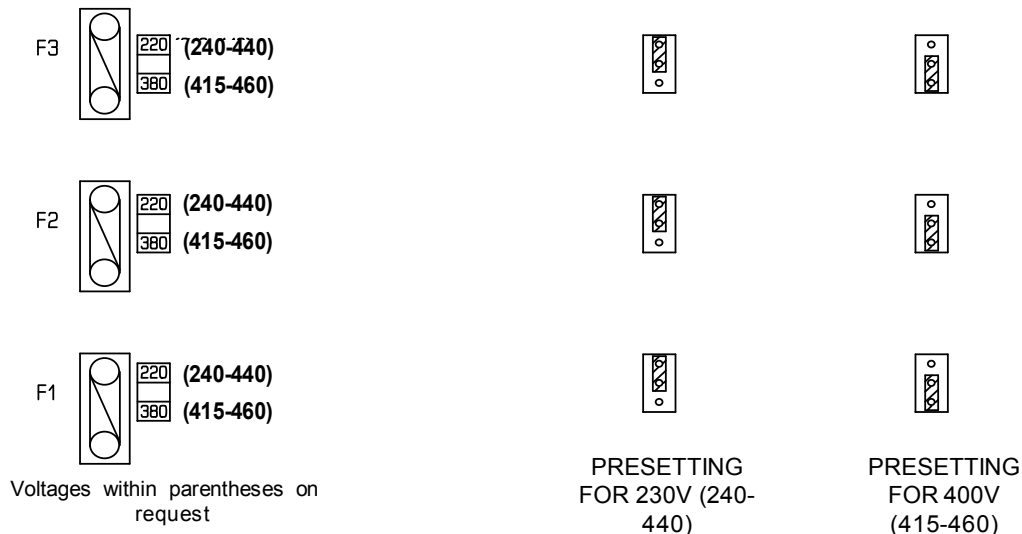
If a **rephasing circuit**, is needed, this must be mounted before the ANTI EMI filter, otherwise the emission reduction will not work. The use of rephasing capacitors will reduce the EMI emissions further.



OPERATIONS FOR THE START UP

Before powering the board

1) First of all set up the 3 voltage changers according to the power supply as below illustrated:



- 2) Consult the table on page 5 to choose the protection fuses.
- 3) Connect the cooling fans and the thermic probe where existing (see table on page 5):
 - Fans have to be supplied separately at 220VAC through their terminals (or faston when there is just one fan); each fan takes 20W.
 - the thermic probe contact is normally closed (1A - 230 VAC); it opens when the cooler temperature gets over 80 °C and must be used in series to the emergencies to turn off the supply switch, leaving the fan active; it has to be connected through their terminals.
- 4) Refer to motor rating to determine:
 - type of connection star/delta (see page 6);
 - motor overcurrent protection value (page 5);
 - board set-up or max speed calibration according to motor poles (page 10);
 - connection of motor service terminal strip and power supply rating for fan and brake (page 4).
- 5) Choose the internal/external acceleration/deceleration ramp range (page 12).
- 6) Choose the type of speed control (page 10).
- 7) Regulate the potentiometer or DC signal for zero speed (zero Volts reference voltage at terminal clamp 16).
- 8) Close 'run consent' between 8-9 (otherwise the board is not enabled).

Give power supply to board

The motor must be stationary. The lighting of L4 power-on LED indicates the flow of voltage supply to driving circuits; RUN, RUN CONSENT and LT or RT rotation LEDs must turn on.

Turn the potentiometer or increase DC signal; the motor must follow the regulation in increase or in decrease with the acceleration/deceleration ramps set.

If it does not follow the regulation but revolves at max. speed, it means that:

- with L3 ON, it is necessary to invert tachometer dynamo polarity (invert wires at terminal clamps 21 - 22).
- with L3 OFF, the tachometer dynamo signal does not reach terminal clamps 21 - 22, therefore inspect the connections to the motor service terminal strip.

If instead the motor does not follow speed regulation and remains idle, check that:

- the regulation signal is present at terminal clamp 15;
- ramp stop contact is not closed;
- slow speed at zero revs is not activated;
- motor is not mechanically blocked;
- phase failure L6 LED is illuminated (see page 8).

If everything is in order make sure that max. speed is reached in both rotation directions by supplying a reference voltage of -10V (RIGHT rotation) or +10V (LEFT rotation) to terminal clamp 15, if necessary fine adjusting the maximum value with trimmers P4 (2 pole motors) or P5 (4-6 pole motors) (see page 9).

Be sure not to exceed the maximum regulation as this could cause motor overabsorption even when loadless, and

would in any case cause a delay in response times; referring to the tachometer dynamo voltage, at maximum speed for every motor you will have:

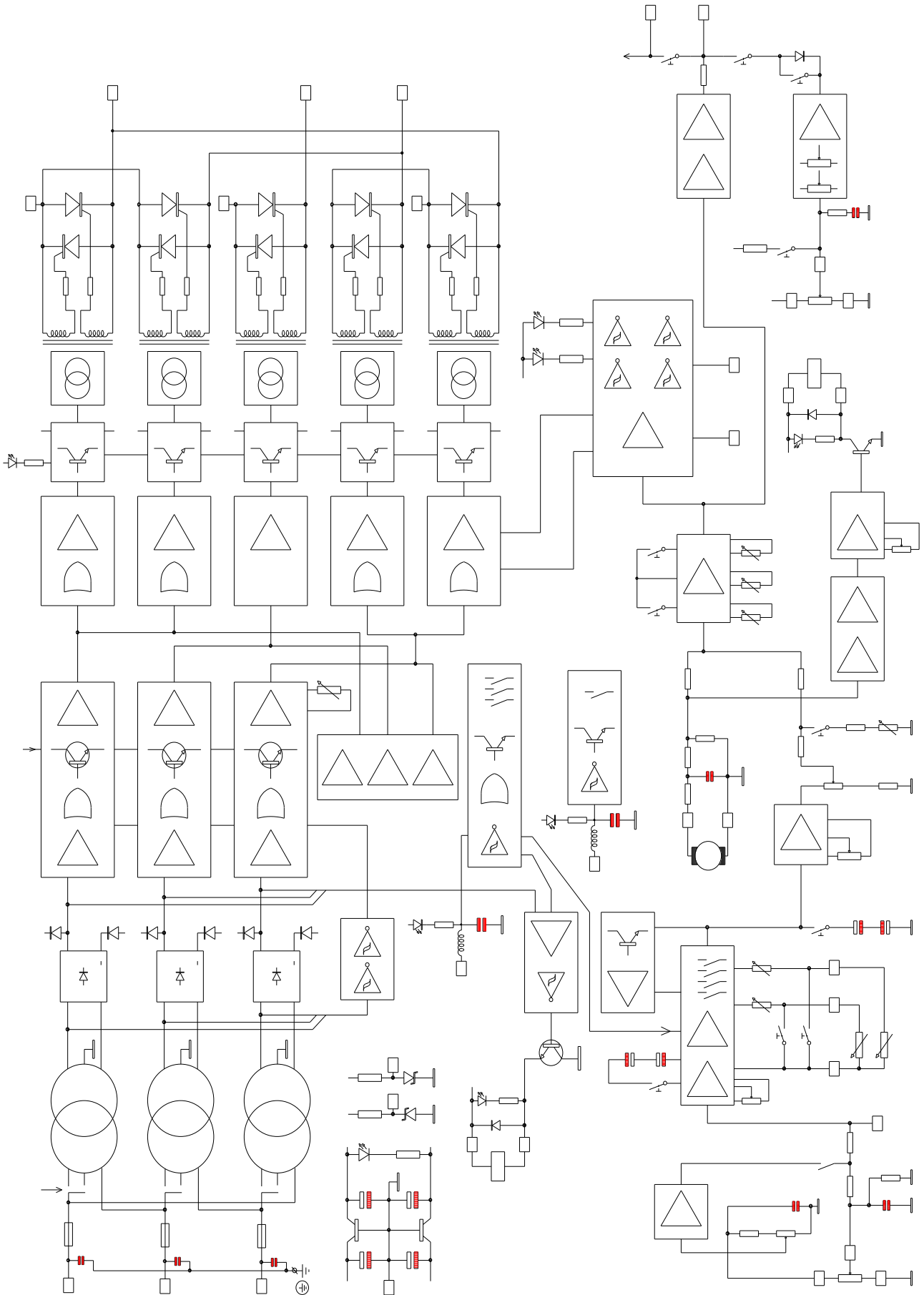
20VDC at 2800 rpm for a 2-pole motor

10VDC at 1400 rpm for a 4-pole motor

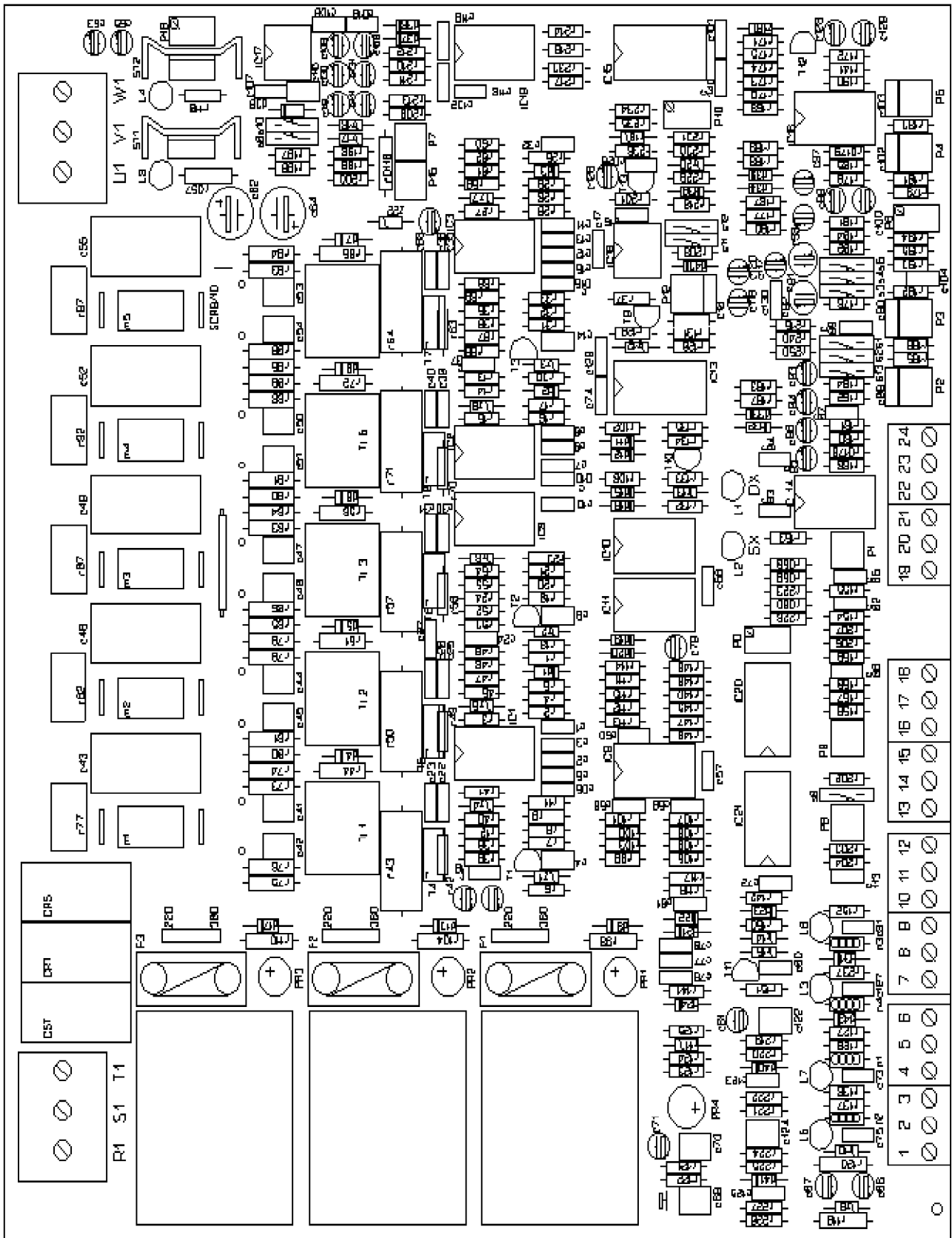
5,7VDC at 800 rpm for a 6-pole motor

- If with zero speed reference the motor tends to rotate, regulate zero revs OFFSET with P6 (page 9).
- Motor rotation should correspond to the lighting of L8 LED Run which indicates that voltage is present in the windings.
- Check that consumption is balanced in all three phases and that it does not exceed motor rating in continuous operation.
- Check illumination of L3 LED (zero relay action) for the speed levels determined by trimmer P10 (min. 30 rpm max. 1400 rpm).
- Take motor to maximum speed and close slow speed activation contact: led L7 should illuminate. The motor, with deceleration ramp set by P2, must reach a slow speed that can be regulated with trimmer P1.
- Each time that the motor shaft is accelerated with respect to the speed set, due to the effect of an inertial load, board code 280S automatically changes rotation direction of rotating field (RIGHT/LEFT rotation LED lighting exchange); in this way a sufficient voltage for the development of a braking torque that can keep the speed constant, is supplied to the motor. If you want to avoid motor braking consult page 14.
- If there are oscillations during motor rotation consult page 16.

BLOCK DIAGRAM



CIRCUIT SILKSCREEN



INSTRUCTIONS FOR THE MAINTENANCE OF ROWAN MOTORS

“HIGH SLIP ROWAN” type motors are specifically designed to be controlled by tachometrically controlled electronic circuits and their intrinsic characteristics are especially suited to support repeated start-up surges and dynamic braking.

Since they are brushless their maintenance is reduced to a bare minimum and normally merely concerns the bearings and changing the tachometric dynamo, which nevertheless may be necessary after a minimum of 5000 work hours.

Changing bearings or tachometric dynamo

If the motor has to be dismantled to change the bearings, proceed as follows:

- 1- remove the screws on the rear fan housing or scroll fan and slide it out, disconnecting the wires on the service terminal block
- 2- take out the tachometric dynamo
- 3- slide the stays out and remove the rear housing
- 4- remove the front housing that comes out followed by the rotor attached to it
- 5- if necessary remove the front bearing, the dust guard screws and remove the snap ring (if mounted) on the shaft
- 6- slide the shaft out of the bearing
- 7- remove the snap ring (if mounted) that holds the bearing on the housing
- 8- slide off the bearing and replace it with an equivalent type - Z C3 version lubricated with high temperature stringy grease
- 9- the rear bearing must be type 2RS C3.

If necessary, replace the tachometric dynamo while assembling the motor.

Calibration of the air gap on the spring or direct brake

If a **spring brake** is mounted and the air gap requires calibration, proceed as follows:

- 1- remove the bolts coupling the motor to the brake hub
- 2- slide off the hub and brake off the shaft
- 3- remove the screws attaching the brake to the hub,
- 4- disconnect the brake cable from the terminal block
- 5- slide the brake off the hub.

At this stage the calibration can be made by adjusting the 3 bolts until an air gap between 0.2 and 0.3mm is obtained. If the brake mounts a dustproof filter, remove it to access the calibration bolts.

The spring brake is supplied with the maximum braking torque, which can be reduced by unscrewing the specific crown to a maximum of 40%, always making sure not to unscrew it right out.

If the **direct brake** has been mounted, there is no need to dismantle it, just control the air gap (maximum 0.3 mm) with a calliper through the side vents and if necessary correct it by slackening the grubscrew on the brake hub. Rowan motors require continuous ventilation and therefore it is essential that all the internal and external air passages in the motor are not blocked by foreign bodies and moreover an adequate air change must be provided. In particularly aggressive environments Rowan motors, which are normally **IP 23**, can mount a dustproof filter up to an **IP 54** protection rating, and especially in this case frequent controls have to be made to ensure the filter is clean and the fan is in perfect working order.

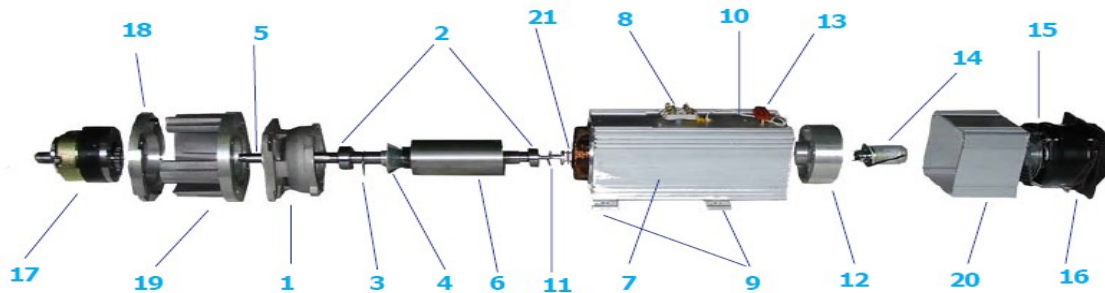
Greater protection ratings can be obtained, up to **IP 55**, providing a completely closed motor down-rated by 50%. The motor has a **heat sensor** in the windings that is calibrated to trip at 150°C (Rowan motor windings are class H with a working temperature limit of 180°C).

The sensor gives a normally closed contact that opens at 150°C and has to be used to cut off the motor power by a suitable relay switch in the event of an overload. The sensor will take a maximum load of 1A at 230VAC.

If the overload probe trips, check:

- the fan operation
- a free air flow
- the motor absorption, if over the ID plate data, may be caused by excessive load or worn bearings.

The stator winding is for a three or single phase asynchronous motor, particularly well built in class H insulation and under vacuum impregnated. If re-winding is necessary, always contact Rowan Elettronica.



- 1 > **FRONT SHIELD** (aluminium), which can be supplied in the following versions
 - *FLANGED* for B5, B3/B5 motors or with auxiliary electromagnetic brake motors;
 - *FOOTED* for B3 and B3/B5 motors.
- 2 > **FRONT AND REAR BEARING** in C3 2RS.
- 3 > **SEEGER RING** (63, 71 and 80 motors have this part only if equipped with brake).
- 4 > **CONIC DEFLECTER** (aluminium).
- 5 > **MOTOR SHAFT** (C40 Steel) normally supplied in the following versions:
 - **STANDARD SHAFT** for B3 or B5 motors without brake; **LONG SHAFT** for motors equipped with brake; **REDUCED SHAFT** (hardened steel) with reduced output dimensions.
- 6 > **MASSIVE ROTOR** (iron) with cavities for air cooling passage.
- 7 > **STATOR FRAME** composed by: **EXTERNAL RIBBED FRAME** with the housing for power terminal board (Aluminium F91); **STATOR CORE** (iron); **STATORIC WINDING** (copper).
- 8 > **POWER TERMINAL BOARD** for the connection of motor windings, with relative terminal board covering.
- 9 > **FEET** for B3 or B3/B5 versions
- 10 > **THERMIC SENSOR INSIDE WINDINGS**
- 11 > **COMPENSATOR RING**
- 12 > **REAR RING** for rear bearing housing.
- 13 > **SERVICE TERMINAL BOARD** for tachometer generator, ventilator and thermic sensor connection.
- 14 > **TACHOMETER GENERATOR TYPE 24VDC/2800 rpm, IP54, with relative joints; it can be supplied in 2 versions:**
 - DIN55: for motors MEC 63, 71, 80, 90, 100
 - DIN70: for motors from MEC 112 to MEC 200L
- 15 > **INDEPENDENT VENTILATOR**, for motor cooling, of 2 possible types: Axial and Scroll.
- 16 > **VENTILATOR COVERING** for axial fan; not present on motors with scroll fan where there is the fan support only.
- 17 > **ELECTROMAGNETIC BRAKE** which can be supplied in the following 2 types: spring/safety brake (normally closed) and direct brake (normally open); the spring/safety brake can be equipped on request with a lever for manual opening.
- 18 > **FLANGED DISC of BRAKE BEARING BELL** (separated from the brake bearing bell only on motors Mec 90, 100, 112 and 112L).
- 19 > **BRAKE BEARING BELL** (aluminium).
- 20 > **REAR SPACER**.
- 21 > **TACHOMETER JOINT**.

ROWAN MOTORS OPERATE CORRECTLY AT AMBIENT TEMPERATURES BETWEEN -15°C AND +40°C; HIGHER TEMPERATURES CAN CAUSE OPERATING FAULTS AND, IF VERY HIGH, BREAKDOWNS. THEREFORE, IT IS RECOMMENDED TO KEEP THEM AWAY FROM HEAT SOURCES AND GUARANTEE A MINIMUM AIR CHANGE.



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