

## **CODE 280S**

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

#### **TECHNICAL CHARACTERISTICS**

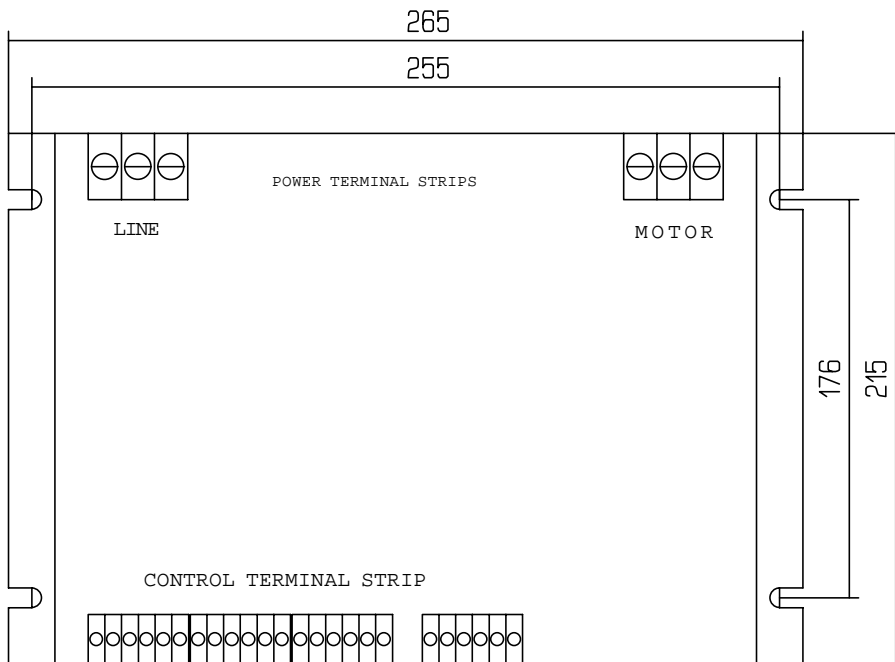
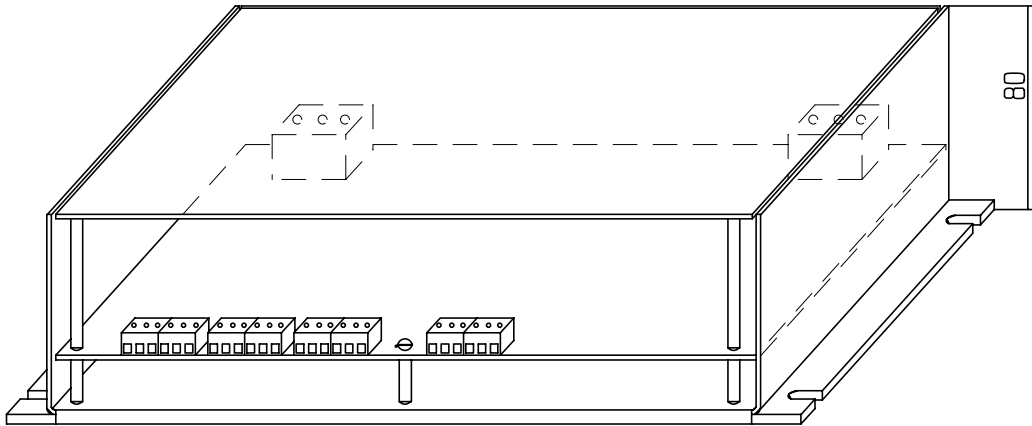
- Range of drives up to a maximum power of 70 Hp/51Kw (380V).
- Selectable standard supply voltage 220/380VAC -15% +10% 50/60 Hz. Other supply voltages available on request: 240-415-440-460 VAC.
- Set-up for controlling the speed of Rowan 2-4-6 pole motors, equipped with tachometer dynamo type 20 VDC 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 model in aluminium container low version.
- Code 280S/1/2/3/4/5 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.
- Operating temperature  $-15^{\circ}C/+60^{\circ}C$ .
- 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 10.
- Plug-in type terminal strip for input/output control connection interchangeable with previous Code 280 model.

#### **OPERATING PRINCIPLE**

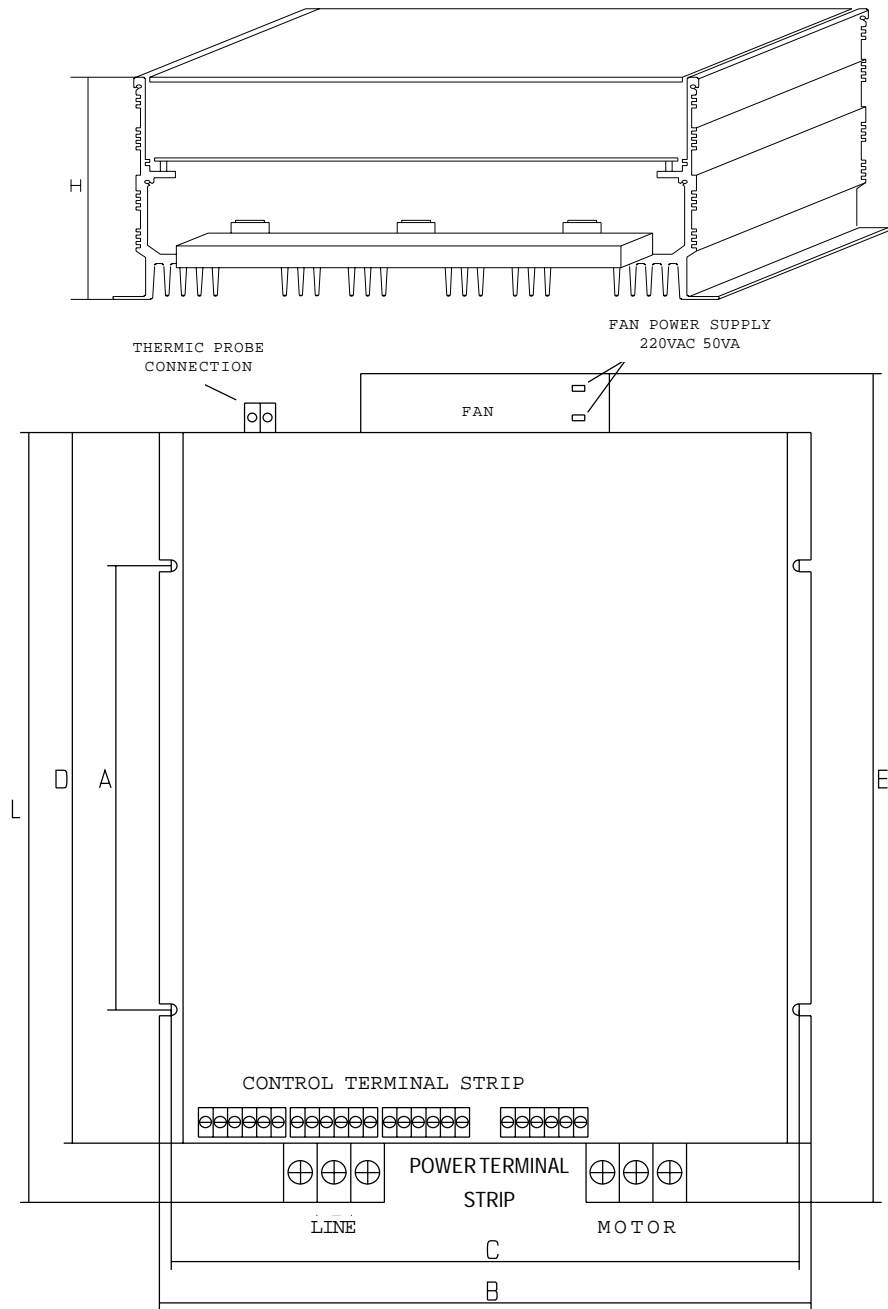
Code 280S series drive is a tachometer feedback three-phase voltage regulator using controlled diodes (SCR) driven by phase-limiting system. The voltage that powers the motor is the result of an analog process which maintains the speed constant, through the differential control between the reference 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.

OVERALL DIMENSIONS

C280S.B/0



## C280S.B/1, /2, /3, /4 and /5



- Models 280S/1/2 are without fan and thermal probe.
- Model 280S/4 and 280S/5 are equipped with 2 cooling fans (100VA).

CODE	H	B	L	A	C	D	E
280R/1	150	265	310	200	257	280	
280R/2	150	265	315	200	257	280	
280R/3	150	265	315	200	257	280	360
280R/4	160	265	390	200	257	350	435
280R/5	160	265	390	200	257	350	435

Table of power of drives code 280S.B/... for coupling with Rowan motors and recommended protection fuses

CODE	MAX POWER 220 V		MAX POWER 380V (415-440-460)		DELAYED FUSES RECOMM.	WEIGHT	COOLING FAN INSTALLED	THERMIC PROBE INSTALLED
	HP	KW	HP	KW	A	Kg	NR	NR
280R	2	1,5	4	3	20	2,1		
280R/1	6	4,5	10	7,5	40	5,8		
280R/2	7,5	5,5	14	10	50	5,9		
280R/3	17	12,5	30	22	100	6,1	1	1
280R/4	25	18,5	45	33	160	10,2	2	1
280R/5	40	30	70	51	250	13	2	1

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

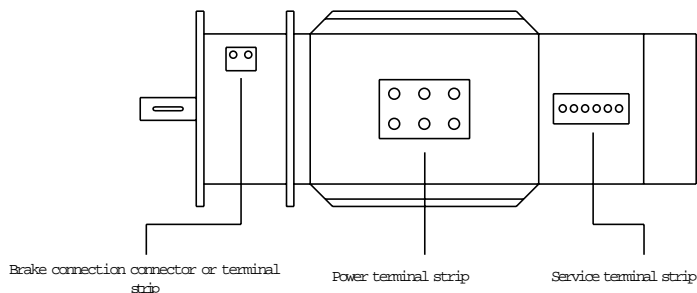
Calibrate the overload cut-out for a current of 15% above the rated. Consumption data of motors with line voltages 240-415-440-460V may be proportionally obtained from the table below which shows current absorption of motors with line voltage 380V.

MOTOR POWER		MEC SIZE	MOTOR RATED CURRENT		COOLING FAN POWERS	
			220V	380V	AXIAL	CENTRIF.
HP	KW		A	A	VA	VA
0,15	0,11	63	1,6	0,9	16	40
0,25	0,18	71	1,9	1,1	16	40
0,5	0,37	80	3,1	1,8	16	40
1	0,75	90	6	3,5	19	55
2	1,5	100	11	6,5	40	55
2,5	1,85	90L	14	8	*	100
3	2,2	112	16	9	40	100
4	3	112L	21	12	40	100
6	4,5	132	31	18	40	100
7,5	5,5	132L	41	24	40	100
10	7,5	160	52	30	100	200
14	10,5	160L	72	42	*	200
18	13,2	200	95	55	*	1000 3ph
25	18,5	200L	110	62	*	1000 3ph

Table of power absorbed by 24VDC brake

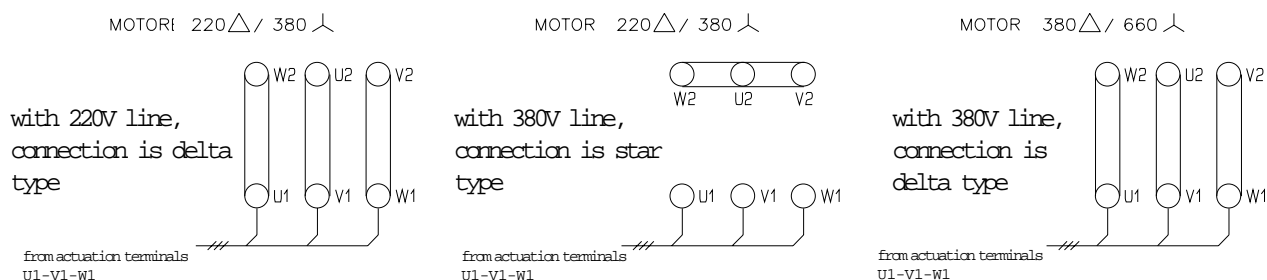
MOTOR	SPRING BRAKE		DIRECT BRAKE	
	TORQUE	ABSORPTION	TORQUE	ABSORPTION
	Kgm	W	Kgm	W
63	0,4	20	0,75	11,5
71	0,4	20	0,75	11,5
80 - 90L	0,8	25	1,5	16
90	1,6	30	3	21
100	1,6	30	3	21
112 - 112L	1,6/3	30/40	3	21
132-132L-160L	8	55	12	38
160	8	55	12	38
200 - 200L	15	65	24	45

## Instructions for Rowan motor connection



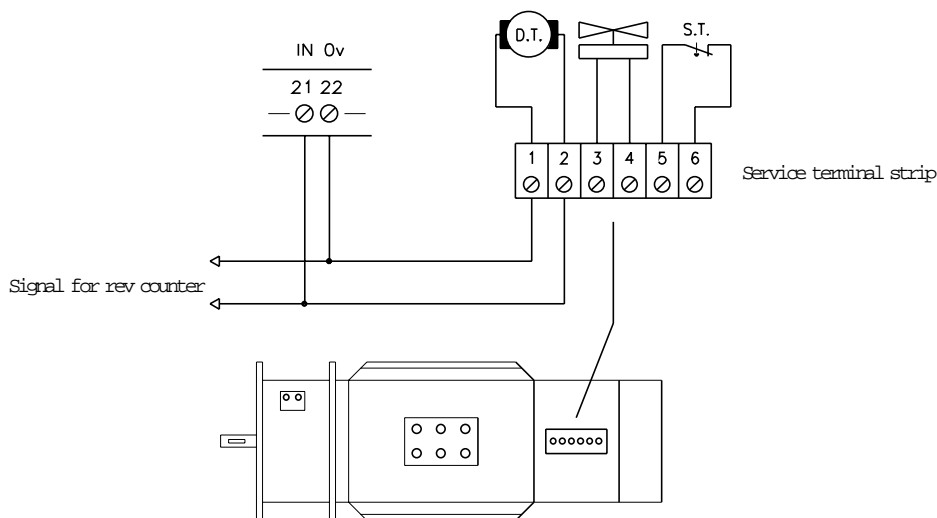
### Power terminal strip connection:

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.**

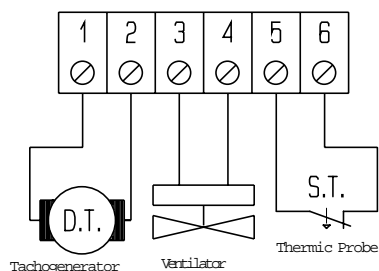
## TACHOMETER DYNAMO CONNECTION



- Perform connection with shielded cable.
- Dynamo generates direct current voltage of 20VDC at 2800 rpm of motor.
- The dynamo signal is directly proportional to 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 VENTILATOR:** 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. (Rowan motor MEC 63 0,15 HP is not equipped with Thermic Probe; for this reason terminals 5-6 are not present in its service terminal board).

## BRAKE CONNECTION

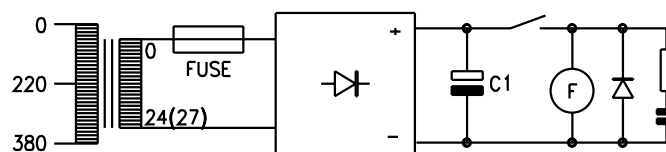
On request, ROWAN motors can be provided with electromagnetic brake. In this case the motor must be constructed expressly with lengthened motor shaft and the brake is mounted on the front part, supported by a bell which reproduces the normal flanging conditions.

There are 2 different types of brakes:

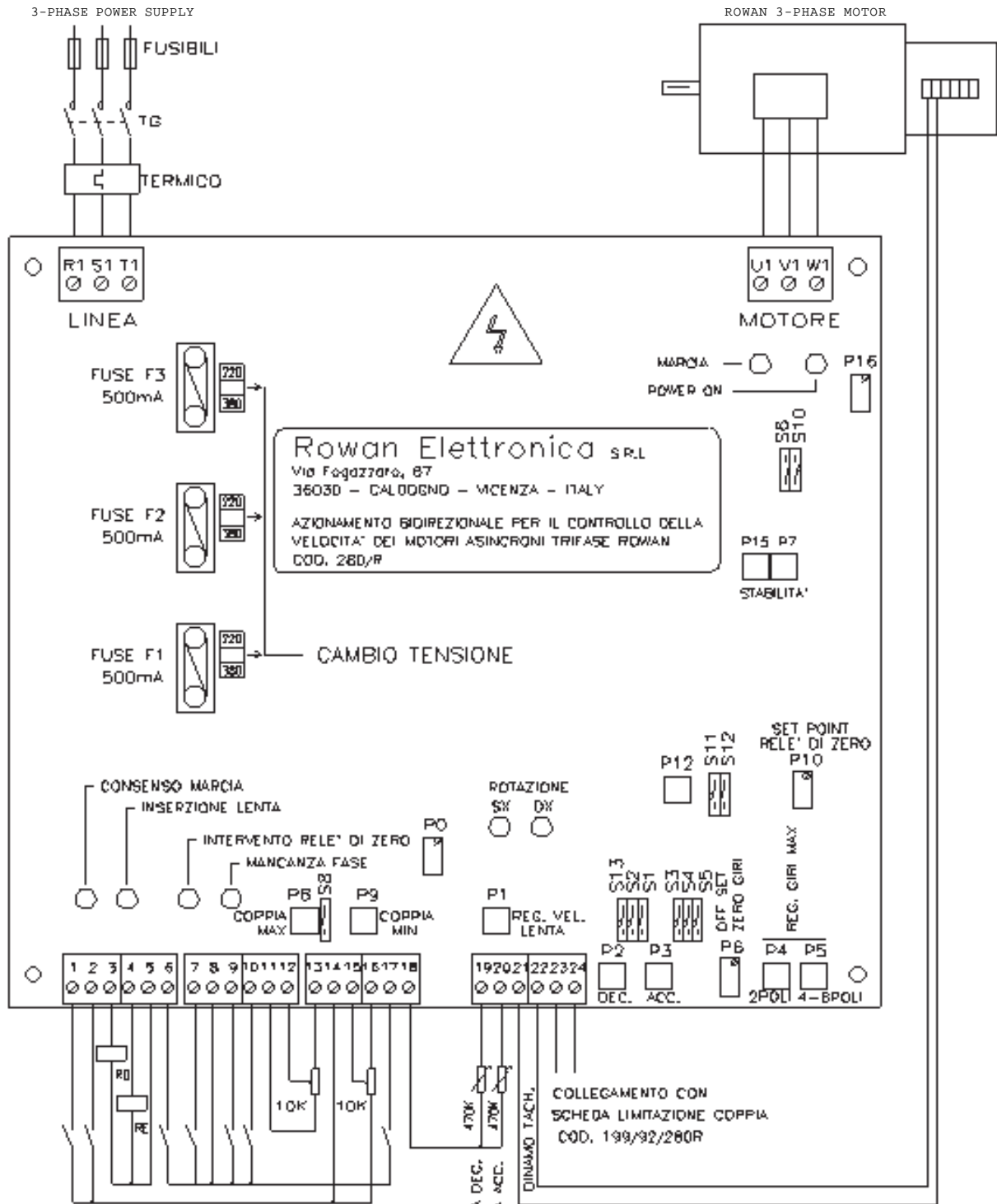
- **DIRECT BRAKE:** in this case it is necessary to supply the brake to block the motor shaft. This kind of brake is suitable for precision stops. Its efficiency can be increased by using ROWAN card cod. 210, which oversupplies it at the stop improving its precision.
- **SAFETY SPRING BRAKE:** in this 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 SCHEMATIC OF CONNECTIONS AND SILKSCREEN OF TERMINAL STRIP-DISPLAYS-TRIMMERS-MICROSWITCHES**



**Caution:** Connections to terminal clamps 1-2-11-12-13-14-15-16-17-18-19-20-21-22-23-24 are to be performed with shielded cable and braiding to ground.

LINEA = LINE FUSIBILI = FUSES TERMICO = THERMAL RELAY  
 MARCIA = RUN STABILITA' = STABILITY  
 CAMBIO TENSIONE = VOLTAGE CHANGE CONSENSO MARCIA = RUN  
 CONSENT  
 INSERZIONE LENTA = SLOW SPEED ACTIVATION  
 INTERVENTO DEL RELE' DI ZERO = ZERO RELAY INTERVENTION  
 MANCANZA FASE = PHASE FAILURE  
 COPPIA MAX = MAX TORQUE COPPIA MIN = MIN. TORQUE  
 REG. VEL. LENTA = SLOW SPEED REG.  
 ROTAZIONE - SX DX = LEFT/RIGHT ROTATION  
 OFF SET ZERO GIRI = ZERO REV. OFF-SET  
 REG. GIRI MAX = MAX SPEED REGULATION  
 SET POINT RELE' DI ZERO = ZERO RELAY SET POINT  
 DEC. = DECELERATION ACC. = ACCELERATION  
 RELE' DI ZERO GIRI = ZERO REV RELAY  
 INIBIT. ROTAZ SX (DX) = INHIBITION LEFT/RIGHT ROTATION  
 LIMITAZIONE COPPIA = TORQUE LIMITATION  
 REG. VELOCITA' = SPEED REGULATION  
 STOP IN RAMPA = STOP WITH RAMP  
 REG. RAMPA ACC. (DEC.) = ACC.(DEC) RAMP REGULATION  
 DINAMO TACH. = TACHOMETER GENERATOR  
 COLLEGAMENTO CON SCHEDA LIMITAZIONE COPPIA COD. 199/92/280R =  
 CONNECTION WITH TORQUE LIMITATION BOARD CODE 199/92/280R

## DESCRIPTION OF LED INDICATORS

- L1 RIGHT Rotation** (Rotation sense of motor rotating field):  
Illuminated 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):  
Illuminated 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**:  
Illuminated 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**:  
Illuminated indicates the presence of voltage to the motor.  
When off it indicates opening of run consent contact.

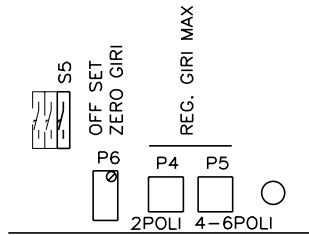
## DESCRIPTION OF TRIMMERS

- 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.

OFF SET 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.

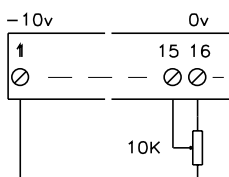
**Beware not to exceed maximum speed when calibrating, as this may cause current overabsorption in the motor even when loadless, and at any rate would cause a delay in response time.**

### ZERO REV OFFSET CALIBRATION

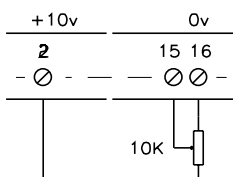
- Feed zero volt to terminal clamp 15 or close stop in ramp.
- Tune P6 until the motor stops.

## SPEED REGULATION VIA EXTERNAL POTENTIOMETER

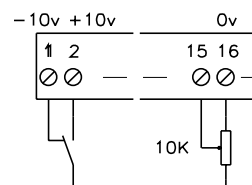
**RIGHT ROTATION SENSE**



**LEFT ROTATION SENSE**



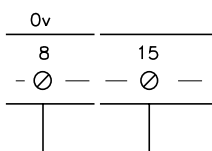
**BIDIRECTIONAL (with selector)**



- 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.**

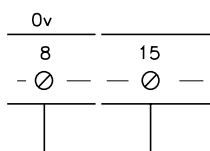
## REGULATION OF SPEED VIA EXTERNAL ±10VDC SIGNAL

**RIGHT ROTATION SENSE**



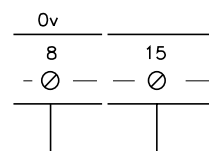
**INPUT 0 ÷ -10VDC**

**LEFT ROTATION SENSE**



**INPUT 0 ÷ +10VDC**

**MOTOR STOPPED**

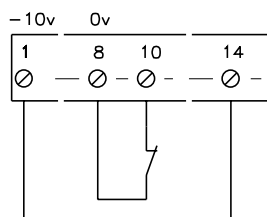


**0 VDC (ZERO REV.)**

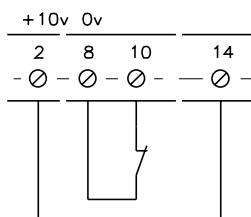
- Input 15 has load resistance > 50 KOhm and can be driven by interface boards, positioner instruments, PLCs, computers with guarantee of galvanic insulation from high voltage.
- **Carry out the connection with shielded cable.**

## INTERNAL REGULATION AND ACTIVATION OF SLOW SPEED

**RIGHT SLOW SPEED**



**LEFT SLOW SPEED**



L7  **SLOW SPEED ACTIVATION**  
 P1  **SLOW SPEED REGULATION**

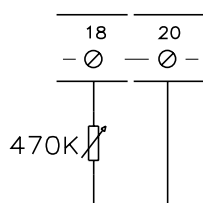
- Slow speed activation may be implemented also with an NPN OPEN COLLECTOR transistor (2.5mA 12VDC).
- The slow speed command excludes speed setting at terminal clamp 15.
- Closure of the contact is displayed by L7 *slow speed activation led*.
- Slow speed can be regulated by trimmer P1 until 70% of 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

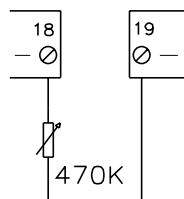
- close microswitches S1-S2;
- P2 regulates the deceleration ramp (turned clockwise increases ramp time);
- P3 regulates the acceleration ramp (turned clockwise increases ramp time);
- S3 open fixes the regulation range of the ramp from a min. of 0.05 sec to a max. of 1 sec.
- S3 closed fixes the regulation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

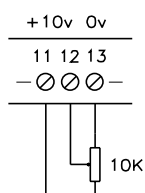
## MAXIMUM VOLTAGE LIMITATION TO ROWAN MOTOR WINDINGS

### 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.

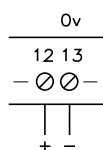
### External regulation with potentiometer or with DC signal:

EXTERNAL REGULATION WITH POTENTIOMETER



- 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

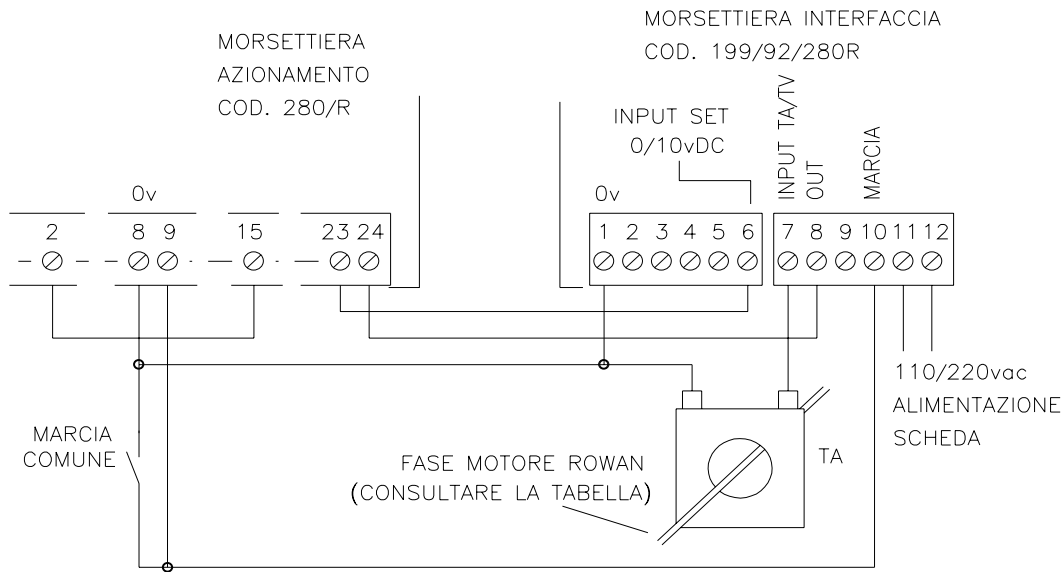


This type of regulation is used to limit the maximum motor torque with rotor stalled as in the case of positive stoppage upon mechanical stall or when using the motor as dynamic friction. This limitation, if maintained also during normal rotation, greatly penalises the motor torque at high speed. Should 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.

INPUT 0V MAX LIMITATION  
INPUT +10V MINIMUM LIMITATION

## LIMITATION OF CURRENT IN ROWAN MOTOR WINDINGS

To limit the current and therefore the torque of Rowan motor at any speed, it is necessary to use interface board code 199/92/280S and related amperometric transformer type 4VAC 0.2A at full scale supplied by Rowan Elettronica.



MORSETTIERA AZIONAMENTO COD. 280R = TERMINAL STRIP COD. 280R  
 MORSETTIERA INTERFACCIA COD. 199/92/280R = TERMINAL STRIP INTERFACE BOARD COD. 199/92/280R  
 INPUT TA/TV = INPUT TA/TV  
 MARCIA = RUN  
 MARCIA COMUNE = COMMON RUN COMMAND  
 FASE MOTORE ROWAN (CONSULTARE TABELLA) = ROWAN MOTOR PHASE (SEE TABLE)  
 110/220VAC ALIMENTAZIONE SCHEDA = 110/220 VAC BOARD POWER SUPPLY

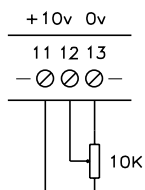
### Internal regulation

- to insert internal regulation of the limitation close S8 - S1 - and open S10 - S12 - S13;
- P8 regulates the maximum current to the motor (max. twice rated current);
- P9 regulates the minimum current (standard regulation at zero);
- P8 - P9 turned clockwise increase current.

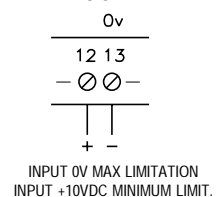
### External regulation with potentiometer or with DC signal:

- carry out the connection with shielded cable;
- to insert external regulation of the limitation close S11 and open S8 - S10 - S12 - S13;
- 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 insulation from high voltage.
- the regulation range of the external potentiometer or DC signal is determined by trimmer P8 (max.) and P9 (min.).

#### EXTERNAL REGULATION WITH POTENTIOMETER



#### EXTERNAL REGULATION WITH DC SIGNAL



### Code 199/92/280S interface board set-up

The board 199/92/280S 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 relevant manual or Rowan Elettronica srl.

**DESCRIPTION OF AMPEROMETRIC TRANSFORMERS AND REF. TABLE FOR ITS USAGE according to the Rowan motor applied for torque control with amperometric feedback.)**

The Amperometric Transformers (TA) supplied by Rowan Elettronica are of two types:

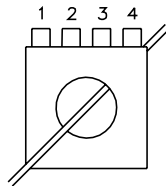
**151/110**

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

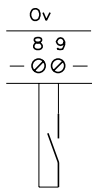
plug 1-4 = 400A max. output

- 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 the code 280S board anti-clockwise.
- During functioning with stalled rotor (winders/unwinders) the maximum current of the Rowan motor cannot be greater than 80% of its rated current.

ROWAN MOTOR	VOLTAGE V	MAX CURRENT A	AMPEROMETRIC TRANSF. TYPE	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
200 18 HP	220	190	150/150	1-2	1
	380	110	151/110	1-4	1
200L 25 HP	220	220	150/150	1-2	1
	380	124	150/150	1-3	2
250 30 HP	220	258	150/150	1-3	1
	380	140	150/150	1-3	2

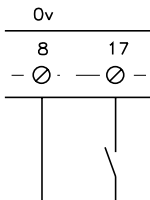
## RUN/STOP COMMANDS

### 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.
- Connect with shielded cables especially in case routes are long and/or running close to power cabling.

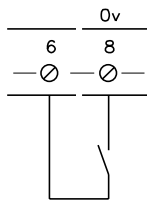
### Ramp stop command



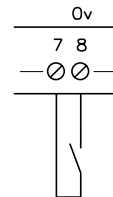
- Carry out the connection with shielded cable.
- A **closed** contact causes motor deceleration from the set speed to zero revs, with the ramp determined by trimmer P2.
- An **open** contact allows motor rotation until set speed, with the ramp determined by trimmer P3.
- The ramp stop command can be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

### 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.
- Connect with shielded cables especially in case routes are long and/or running close to power cabling.



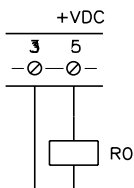
Exclusion of braking action with speed reference on terminal clamp 15 **POSITIVE**



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

## RELAY DRIVING OUTPUTS

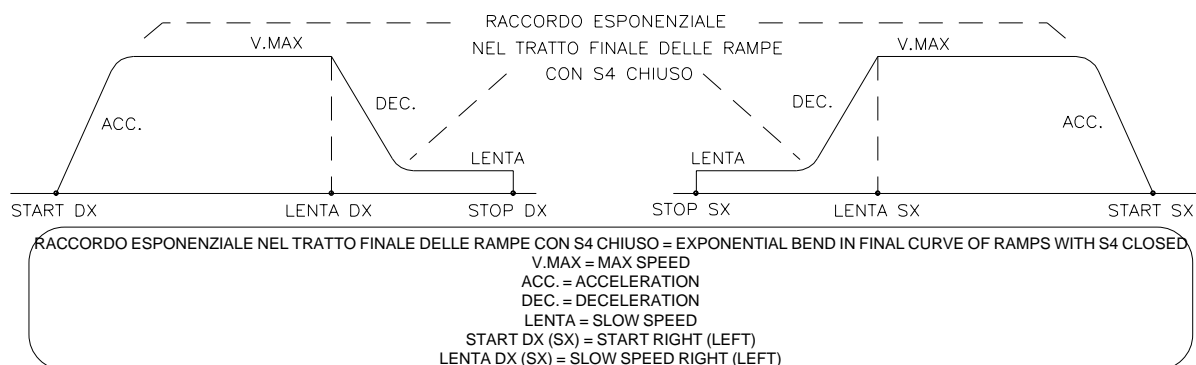
### Zero relay



- 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.

## ILLUSTRATIVE SCHEMATIC

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 assembly with opening contacts comprises:

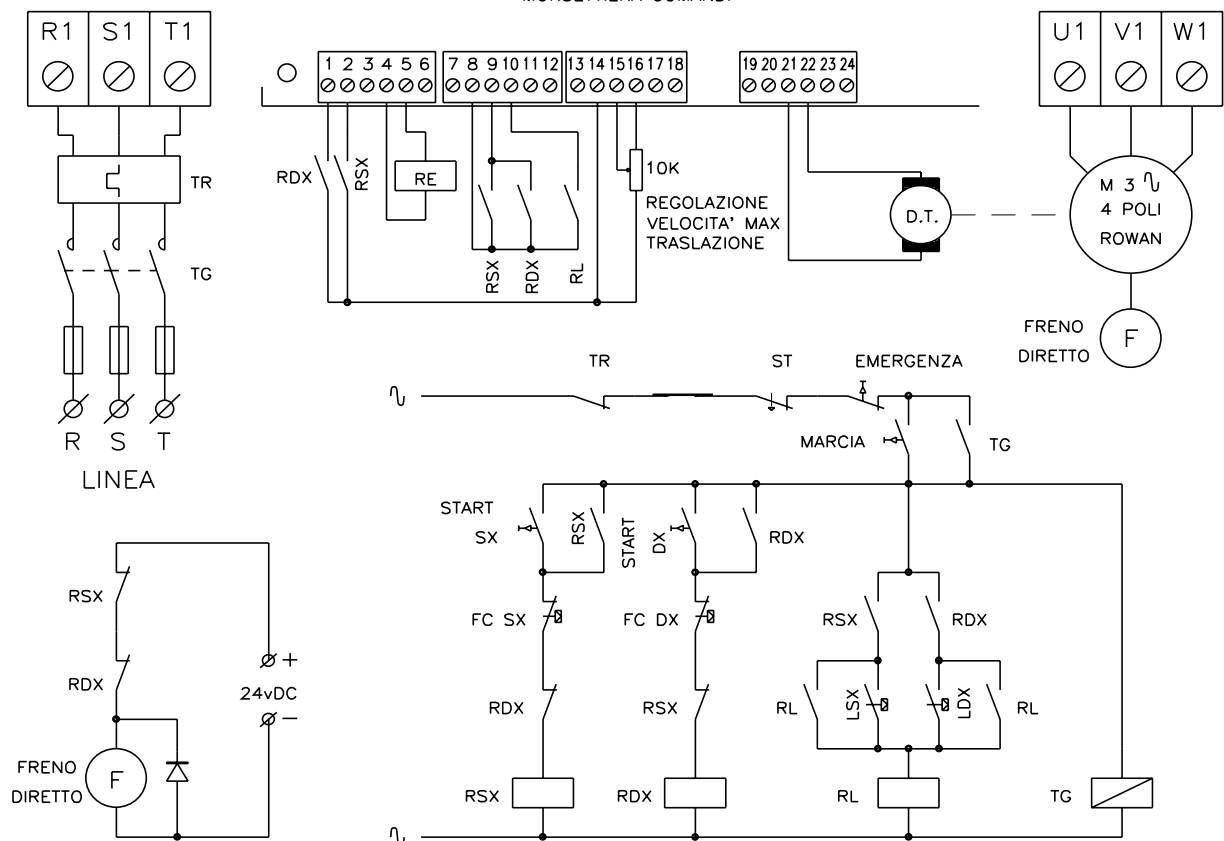
- overcurrent protection (TR);
- the motor temperature thermal sensor (ST) (and eventually the thermal sensor of the board);

- |                                |                                     |
|--------------------------------|-------------------------------------|
| FCSX = LEFT stop limit switch  | LSX = LEFT slow speed limit switch  |
| FCDX = RIGHT stop limit switch | LDX = RIGHT slow speed limit switch |

MORSETTIERA DI POTENZA

MORSETTIERA COMANDI

MORSETTIERA DI POTENZA



Morsetti di potenza = Power terminal strip	Morsetti comandi = Control terminal strip	Emergenza = Emergency
Regolazione velocità max traslazione = Translation max speed regulation	Freno diretto = Direct brake	Linea = Line

## 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 stabilise 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. **Note: Trimmer P16 is not present in first series code 280S boards.**
- 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 380VAC (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

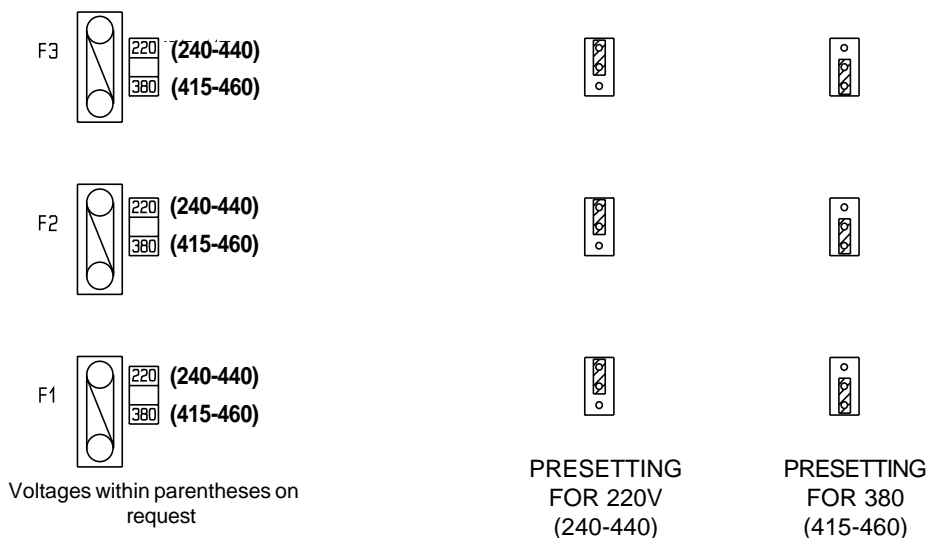
### Calibration

- 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

## OPERATIONS FOR STARTING

### Before powering the board

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



- 2) Consult the table on page 4 to choose the protection fuses.
- 3) Refer to motor rating to determine:
  - type of connection star/delta (see page 5);
  - motor overcurrent protection value (page 4);
  - board set-up or max. speed calibration according to motor poles (page 9);
  - connection of motor service terminal strip and power supply rating for fan and brake (page 4).
- 4) Choose the internal/external acceleration/deceleration ramp range (page 11).
- 5) If you use torque limitation consult 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 I5).
- 8) Close 'run consent' between 8-9 (otherwise the board is not enabled).

### Feed power supply to board

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

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 illuminated, 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 I5;
- 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 I5, 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

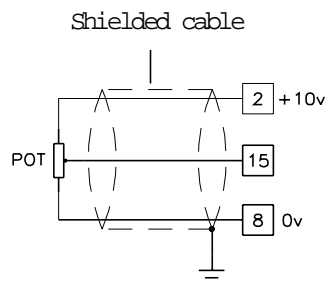
**10VDC** at 1400 rpm for a 4-pole motor

**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.

#### INSTRUCTIONS FOR CORRECT USE OF CODE 280S DRIVE

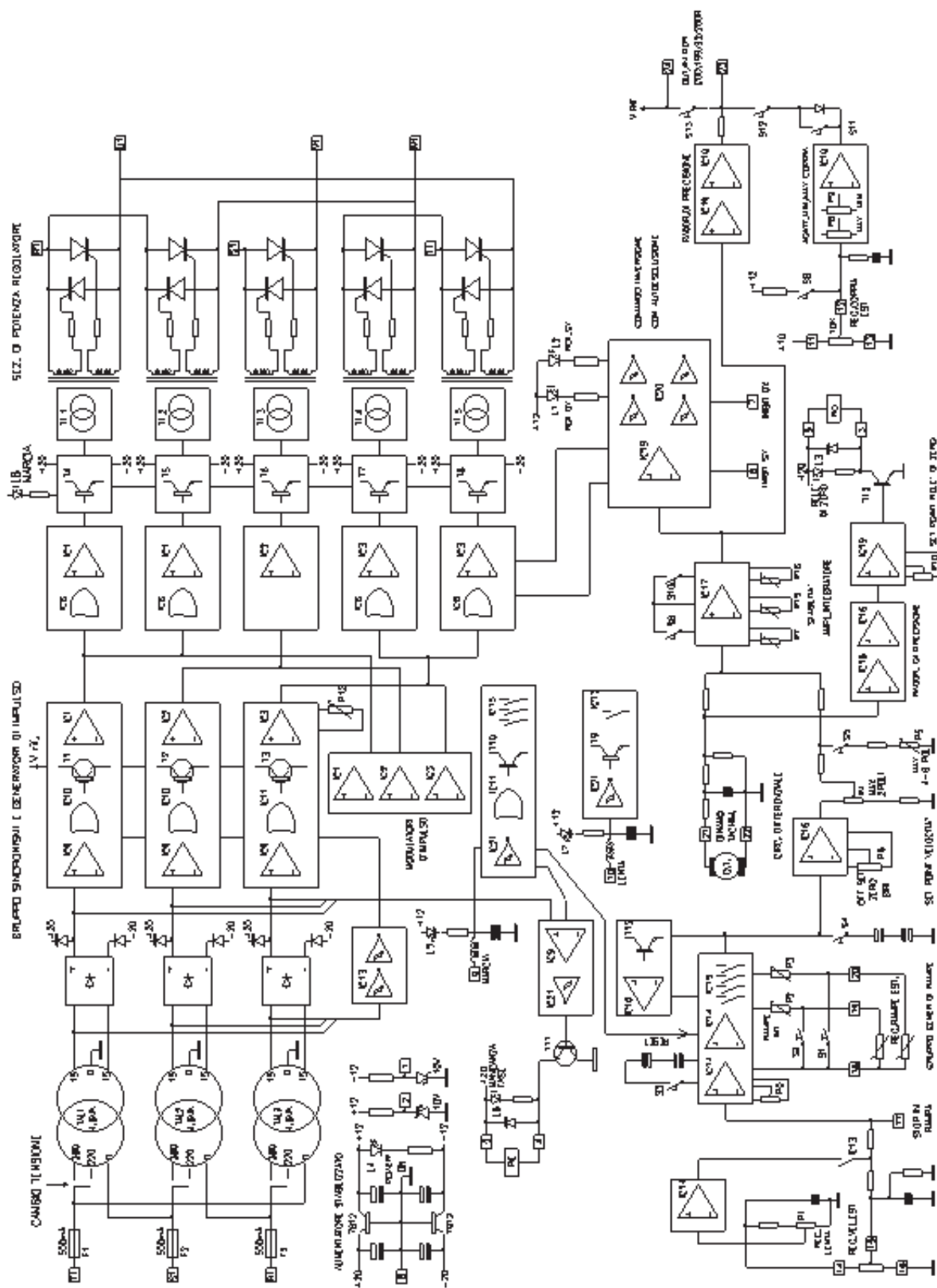
- Code 280S board is equipped with three 0.5A fuses (F1-F2-F3) for protection of the driving circuit. As for power amperometric protection use external fuses against short circuits (see page 4) and a thermal switch, calculated for a current in excess by 30% of the rated current.
- The board has been designed to work with line disturbances equivalent to Class 4 of the IEC standards 801.4. In any case use shielded cables for all board control signals, and avoid the passage of these wires close to power cables. Connect the cable braid to ground only at one side and not to the negative of the board (terminal clamp 8 zero Volts), as shown in the example:



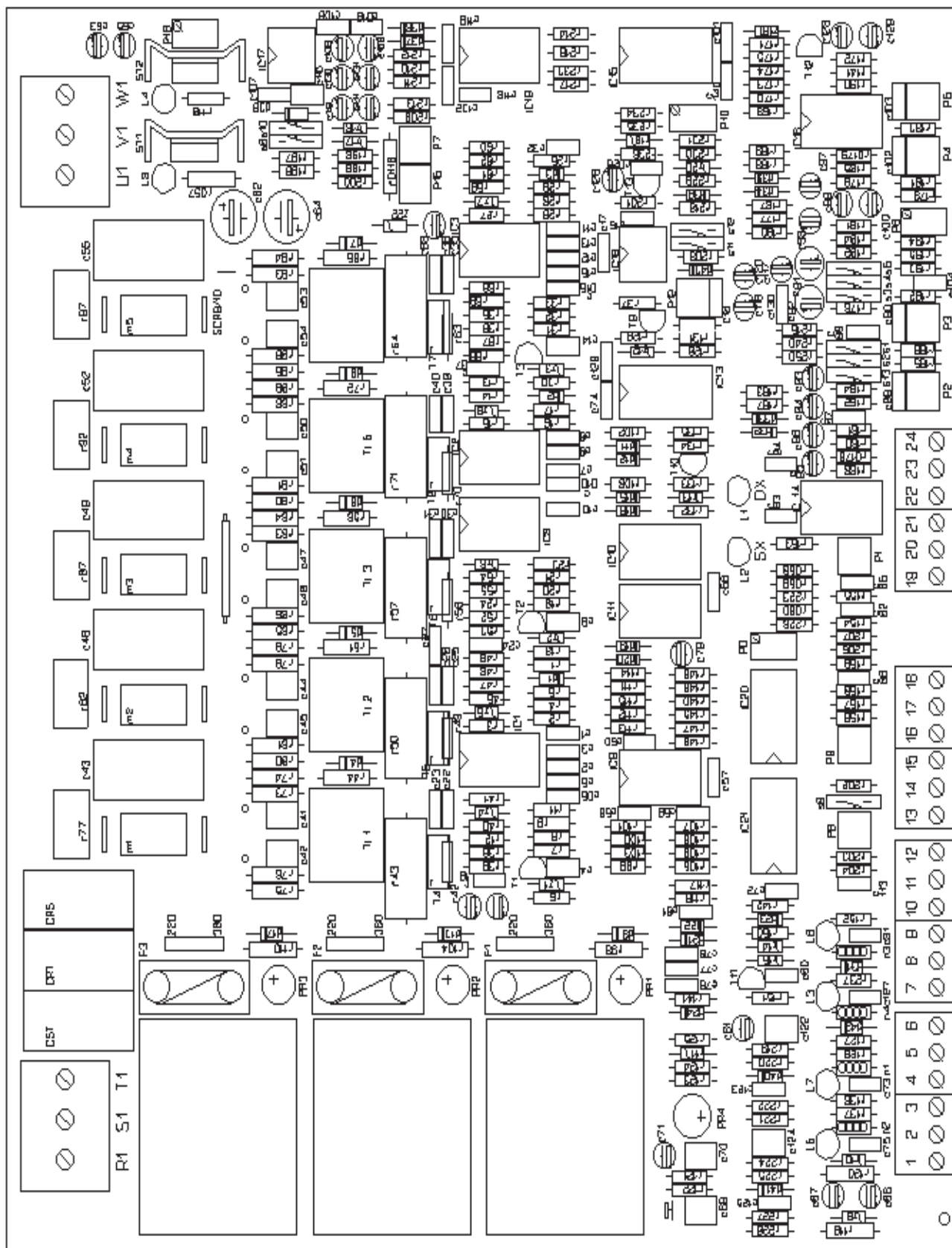
- Use relays with suitable contacts for low currents in order to select potentiometers or DC signals; do not use electromagnetic switch auxiliary contacts for this type of operation.
- Code 280S series boards work properly with temperatures between -15°C to +60°C inside their container and the panel housing them; temperatures outside this range can cause malfunctions, speed control deviations, and if temperatures are particularly high, may even cause breakdown; you are therefore recommended to install the boards away from heat sources and ventilate the control panel if the temperature in the environment is particularly high.
- Models code 280S/3/4/5 are equipped with fans to be fed separately with 220V, and a thermal probe. The thermal probe is a contact (1A 230VAC) which opens when cooler temperature exceeds 80°C; it must be used to cut out the power supply electromagnetic switch while leaving the fan on.

Note: the electronic regulations by phase partialising system generates harmonics (3th and 5th) which cause phase shift on mains power supply; it will therefore be the user's care to evaluate its entity and eventually to provide for by a fitting re-phasing proportional to the load.

# BLOCK DIAGRAM



CIRCUIT SILKSCREEN



## INSTRUCTIONS FOR THE MAINTENANCE OF ROWAN MOTORS

Motors "ROWAN" are expressly manufactured to be driven by electronic cards with tachometer feedback and are particularly suitable, because of their intrinsic characteristics, for functioning with repeated starts and dynamic brakings.

As they have no brushes, they require little maintenance. The maintenance mainly concerns the bearings and the replacement of the tachometer generator, which may anyway occur after at least 5000 hours' work.

### Replacement of bearings or tachometer generator

Whenever it is necessary to disassemble the motor for bearing replacement, proceed as follows:

- 1- remove the screws from the rear ventilator-protecting shield or from the cochlea ventilator. Remove the ventilator after disconnecting its wires from the service terminal board;
- 2- remove the tachometer generator;
- 3- take out the rigid stays and remove the rear shield;
- 4- take out the front shield together with the rotor connected to it;
- 5- whenever it is necessary to remove the front bearing, take the screws of the anti-dust protection off and remove the Seger ring (if present) on the shaft;
- 6- take out the shaft from the bearing;
- 7- remove the Seger ring (if present) which keeps the bearing close to the shield;
- 8- take the bearing off and replace it with one of the same kind - of the type Z C3 greased with high temperature grease;
- 9- the rear bearing must be of the type 2RS C3.

If necessary, replace the tachometer generator while re-assembling the motor.

### Air gap adjustment of spring- or direct brakes

If a **spring brake** is installed on the front part and it is necessary to adjust the air gap, proceed as follows:

- 1- remove the bolts that fasten the brake-bearing bell to the motor;
- 2- take out the bell and the brake from the shaft;
- 3- remove the screws that fasten the brake to the bell;
- 4- take out the brake wires from the terminal board;
- 5- take out the brake itself from the bell.

At this point it is possible to perform the regulation by adjusting the 3 bolts till you obtain an air gap between 0,2 and 0,3 mm.

If the brake is provided with an anti-dust ring, remove it to reach the 3 regulation bolts. The spring brake is usually furnished set for max braking torque, which can be reduced by unscrewing the proper ring up to a maximum of 40%; be careful not to unscrew it to much and cause it to go out of its seat.

In case a **direct brake** is installed, it is not necessary to disassemble it, but it is enough to control the air gap (max 0,3 mm) with a thickness-meter through the side openings and, if necessary, to correct it by loosening the fixing screw on the brake-bearing hub.

ROWAN motors need continuous ventilation and it is therefore necessary that all internal and external air passages are free of obstructions and it is necessary to ensure sufficient air changing. In case they are used in particularly severe conditions, ROWAN motors, normally **IP 43**, can be equipped with anti-dust filter up to a protection degree IP 53; in this case it is necessary to check the filter cleanliness and the ventilation efficiency more frequently.

It is possible to reach higher protection degrees up to IP 54 with particular protecting arrangements performed by the customer during installation or up to IP 55 by supplying a completely closed motor diminished of 50% as for the power.

The motor (except 0,15hp mec 63 motor) is provided with a **thermic probe** inserted in the windings that is adjusted for intervention at 150°C (the windings of ROWAN motors are of H class with working limit temperature of 180°C).

This thermic probe supplies a normally closed contact which opens at 150°C and must be used to remove the power from the motor (by means of the remote control switch) in case of over-temperature. The probe max load is 1A - 230 VAC.

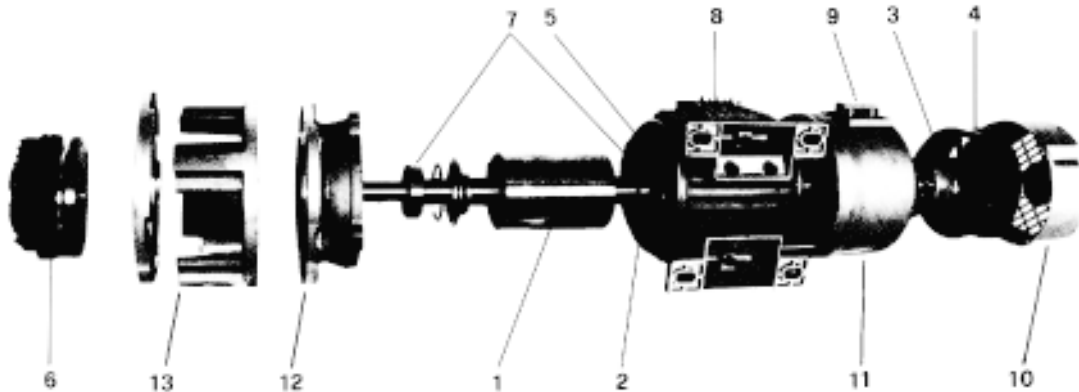
In case of over-temperature intervention of the probe, it is necessary to verify the following:

- the functioning of the cooling fan;
- the correct passage of the air flow;
- the absorption of the motor; if it is beyond the rated values, it may be caused by an excessive loading or worn-out bearings;

The **statoric winding** is of the kind used for asynchronous three-phase or single-phase motors; it is manufactured with particular care with **H class insulation**; it can be made, in case of necessity, by any winding builder, provided that he respects the winding data which can be supplied by our technical office.

## ROWAN MOTOR

- |  |  |
|--|--|
| 1 Massive rotor for high-sliding               | 8 Motor windings connection board                                  |
| 2 Winding                                      | 9 Service terminal board (tach.generator-ventilator-thermic probe) |
| 3 Tachometer generator<br>(type 20VDC 2800rpm) | 10 Ventilator-protecting shield                                    |
| 4 Ventilator                                   | 11 Rear shield   |
| 5 Safety thermic probe                         | 12 Front shield  |
| 6 Brake  | 13 Brake bearing-bell  |



*ROWAN motors work properly with temperatures ranging from  $-15^{\circ}$  to  $+60^{\circ}$ ; higher ambient temperatures could provoke working anomalies and, if excessive, breakdowns. It is therefore necessary to locate them far from heat sources and provide a minimum air changing.*

## INSTRUCTION MANUAL

# CODE 280S

	<b>Rowan Elettronica</b> <i>Motori, azionamenti, accessori e servizi per l'automazione</i> Via Fogazzaro, 67 - CALDOGNO - VICENZA - ITALIA Tel.: 0444 - 905566 (3 linee r.a.) Fax: 0444 - 905593 - E-mail: <a href="mailto:info@rowan.it">info@rowan.it</a>	 <small>UNI EN ISO 9002 27-03-1998</small>
---	---	--

REV. 2 - Data 24/11/94

Data

Controllato/Approvato

## INDEX

page	
	1
Technical characteristics - Operating principle	1
Overall dimensions Code 280R	2
Overall dimensions Code 280R/1/2/3/4/5	3
Code 280R/... boards power ranges table - Recommended protection fuses	
Table for rating of overload cut-out and power absorbed by motor cooling fan -	
Table of power absorbed by 24VDC brake	4
<b>Instructions for Rowan motor connection</b>	
Power terminal strip connection - Tachometer dynamo connection	5
Motor service terminal strip connection - Brake connection	6
General schematic of connections and silkscreen of terminal strip, displays, trimmers, microswitches	
	7
Description of led indicators/trimmers/microswitches	8
Board set-up for motor pole number and related calibration -	
Internal calibration of maximum speed - Zero rev. offset calibration	9
Speed regulation via external potentiometer -Regulation of speed via external $\pm 10$ VDC signal - Internal regulation and activation of slow speed	10
Regulation of acceleration/deceleration ramps -Maximum voltage limitation to Rowan motor windings	11
Limitation of current in Rowan motor windings -	
Code 199/92/280R interface board set-up	12
Description of amperometric transformers and ref. table	13
Run/stop commands - Relay driving outputs	14
Illustrative schematic	15
Suppression of oscillation phenomena in speed control - Standard set-up	16
Operations for starting	17
Instructions for correct use of Code 280R drive	18
Block diagram	19
Circuit silkscreen	20
Instructions for maintenance of Rowan motors	21

***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.***