INSTRUCTIONS MANUAL

CODE 290S

CONFORMITY

EMC

CE

Rowan Elettronica

Motori, azionamenti, accessori e servizi per l'automazione

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UNI EN ISO 9001:2000

REV. 9 - Date 29/01/16

COD. 290S
VARIABLE SPEED DRIVE FOR 3-PHASE ASYNCHRONOUS ROWAN MOTORS

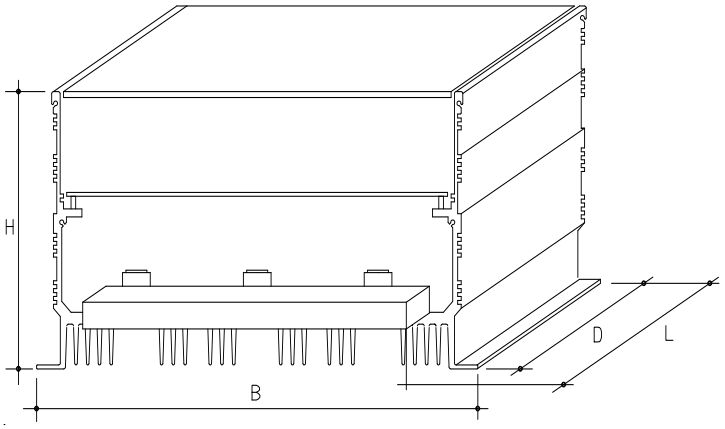
TECHNICAL CHARACTERISTICS

- Range of drives up to max 70HP (52Kw) /400Vac
- Standard voltage supply with possibility of selection 230/400VAC +10% -30%, 50/60Hz;
other voltages on request: 240 - 415 - 440 - 460 Vac.
- Preset for speed controlling of 2 - 4 - 6 pole ROWAN motors, equipped with tachometer type 20VDC/2800RPM.
- Operating with linear acceleration and deceleration ramps.
- Speed control by 10Kohm potentiometer connected to 2 or 3 wires or by reference from signal 0 ÷ +10VDC
- Input for torque control, which can be performed by means of external ROWAN cards (cod. 199/92 or panel instruments cod. 274 and cod. 268)
- Input for RUN consent (AR) and STOP consent with controlled deceleration ramp.
- All input/output commands are galvanically separated from the power and can be controlled with PLC, programmable logics etc.
- Internal regulations: ACCELERATION AND DECELERATION RAMPS - MINIMUM SPEED - MAXIMUM SPEED - STABILITY.
- Led visualizations of the following functions: POWER ON - MOTOR RUNNING - PHASE LACK - PRESENCE OF TACHOMETER.
- Protections: phase lack, with output terminals for commanding an external emergency relay 24VDC max 50 mA. Fuses 0,5A for control circuit protection.
- Plug terminal board for input/output commands
- Environment operating temperature: -5°C +40°C - cabinet internal temperature: -5°C +55°C
- Stocking temperature: -25°C +70°C
- Relative non condensated humidity: 5 ÷ 95%
- Standard version is in a case of aluminium IP 20; polycarbonate covering with useful indications for the checking and the setting.

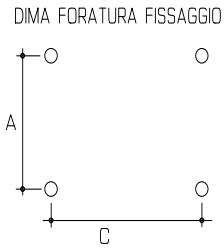
Standards Conformity
- CEI EN 60204-1
- EN 50081-2
- EN 50082-2
- EN 61800-3

- Compliance with the Standards listed above is subject to the connection of the filtering devices to be supplied separately and subject to the strict following, by the installer, of the instructions given on page 17.

MAX OVERALL SIZES (mm)



fixing holes



CODE	H	B	L	A	C	D
290S/1 - 290/S2	150	265	170	/	257	135
290S/3 - 290/S4	150	265	265	160	257	195
290S/5	160	265	375	200	257	280

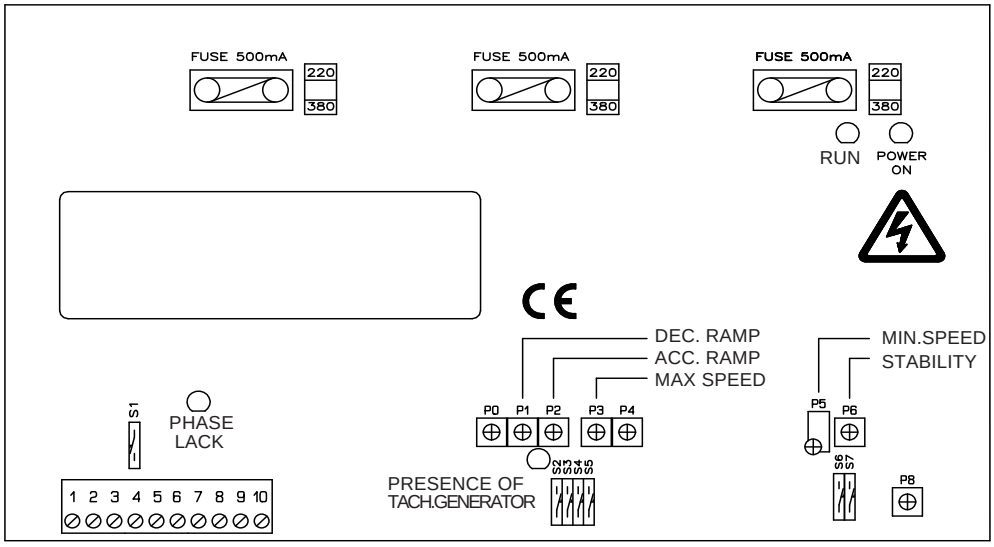
- Codes 290S/1 and 290S/2 have two fixing, placed in the middle of measure D.
- Measure A is referred to side D
- Measure C is referred to side B

OPERATING PRINCIPLE

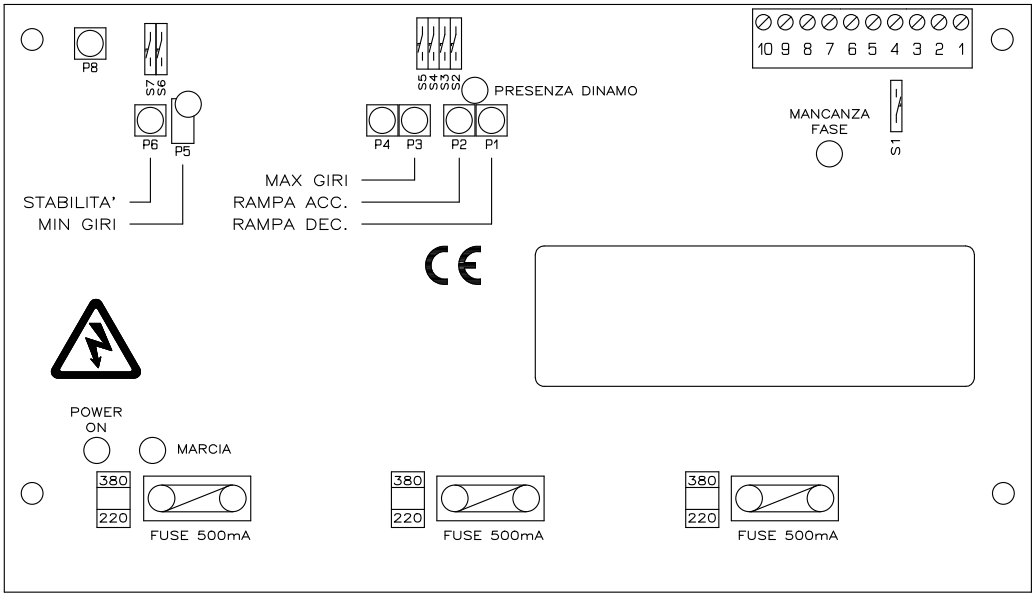
The drive of the series code 290S is a 3 phase voltage regulator with tachimetrical feedback, which uses controlled diodes (SCR) controlled by a phase partializing system.
The tension that controls the motor is the resultant of an analogic process, which keeps the speed constant by means of the differential control between the real speed, from the tachometer, and the setting of the potentiometer or external analogic signal.
The coupling with 3-phase ROWAN motors gives as a result a constant speed and torque system, which is **extremely silent and uniform**, from 0 to max motor speed. The choice of controlled diodes as power devices (they are also over-dimensioned) gives more guarantiees and reliability in case of extra-voltage or extra-current.
It is also possible to regulate acceleration and deceleration ramps according to the requirements of the device driven by the 3-phase ROWAN motor. The deceleration ramp functions only with the motor applied to move braking loads or irreversible systems; in case of inertial loads, it is necessary to use other kinds of drives (see cod. 280S), as code 290S has no dynamic braking. By connecting one of the following interface cards, cod. 199/92 - code 274 - code 268, to terminal 8, it is possible to perform a torque-speed combined control of a 3-phase ROWAN motor. This coupling is necessary when one wants to use a ROWAN motor as brake or static clutch with winders/unwinders.

MICROSWITCHES - LEDS - TRIMMERS SERIGRAPHY

Fanless Versions



Ventilated Versions



TRIMMER DESCRIPTION:

P1 DECELERATION: it regulates the time of deceleration ramp in the following ranges:
with microswitch S2 open: min. 0,02 sec. - max 2 sec.
with microswitch S2 closed: min. 0,25 sec. - max 25 sec.
Rotate clockwise to increase the time.

P2 ACCELERATION: it regulates the time of acceleration ramp in the following ranges:
with microswitch S2 open: min. 0,02 sec. - max 2 sec.
with microswitch S2 closed: min. 0,25 sec. - max 25 sec.
Rotate clockwise to increase the time.

P3 MAXIMUM SPEED: it regulates the motor max speed with speed potentiometer set to max or with input +10VDC to terminal 6.
Rotate clockwise to increase the speed.

P4 Revolution adapter 2/4 poles (AUTHORIZED PERSONNEL ONLY)

P5 MINIMUM SPEED: it regulates the minimum speed of the motor with speed potentiometer set to minimum or with input 0VDC to terminal 6. Standard regulation for 0 revolution.
Rotate clockwise to increase the speed.

P6 STABILITY: if rotated clockwise it stabilizes possible oscillations of motor speed due to rather unstable loading.

CONTROL BOARD DESCRIPTION

1 - 2 Input for tachometer generator 10VDC/1400RPM (20VDC/2800RPM).

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3 +10VDC max 10mA reference for speed potentiometer supply.

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7 0V for common negative

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4 - 7 Connection for STOP IN RAMP contact, closed it causes the motor ramp down to min. speed with controlled deceleration.

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5 - 7 Connection for A.R. (RUN consent) contact; open it enables the start of the motor with acceleration ramp, up to the max preset speed; it causes the lighting of led L1.

3 Extreme
6 Cursor open
7 Extreme

Connection for speed potentiometer with 3 wires (microswitch S1); in this case it is possible to connect one or more potentiometers in parallel up to a overall minimum resistance of 3Kohm between terminals 3 - 7.

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6 Extreme
7 Cursor

Connection for speed potentiometer with 2 wires (microswitch S1 closed); in this case it is possible to connect only one 10Kohm potentiometer.

7(0V)-6(positive) Input for signal 0 ÷ +10VDC 2 mA for speed control by PLC or ROWAN interface cards.

7(0V) - 8 Torque control input: for connection to ROWAN cards suitable for the automatic control of current with feedback from amperometric transformer. The cards to couple with are of type cod. 199 - cod. 232 or instruments cod. 249 and cod. 268.

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9 (-) - 10 (+) 24VDC supply for the coil of relay of phase lack emergency max 50mA

MICROSWITCH DESCRIPTION

S1 Closed: It presets the connection for an external speed potentiometer with 2 wires to terminals 6 - 7.
Open : It presets the connection for an external speed potentiometer with 3 wires to terminals 3 - 6 - 7.
It presets the drive for speed control by D.C. signal 0 ÷ +10V.

S2 Open : It selects the regulation range of acceleration and deceleration ramps min. 0,02 sec. max 2 sec.
Closed: It selects the regulation range of acceleration and deceleration ramps min 0,25 sec. max 25 sec.

S3 Open : It presets the drive for connection to a 2 pole motor.
Closed: It presets the drive for connection to a 4 - 6 pole motor. In case of a 6 pole motor, it is necessary to adjust the max speed with trimmer P3. With speed potentiometer set to max speed, or signal 10VDC, rotate P3 anticlockwise till one measures a D.C. voltage from tachometer generator of approximately 5,7VDC corresponding to a max speed of 800RPM.

S4 Closed They shut out the rectifying circuit of tachometer generator
S5 Open polarity. They particularly preset the drive to function in lifting equipments, coupled with card cod. 188.

S4 Open They activate the rectifying circuit of tachometer generator
S5 Closed polarity. They preset the drive to operate with the motor in the 2 rotation senses, with no necessity of inverting tachometer generator polarity.

S6 Open : It sets a speed variation from empty to full load of 0,1% as compared with motor maximum speed.
Closed: It sets a speed variation from empty to full load of 2% as compared with motor maximum speed.

S7 Closed: It activates a soft feedback and speeds up circuit response.

VISUALIZATION DESCRIPTION

L1 RUN: when illuminated, it indicates that the consent to motor rotation has been given by opening the contact A.R. between terminals 7 - 5

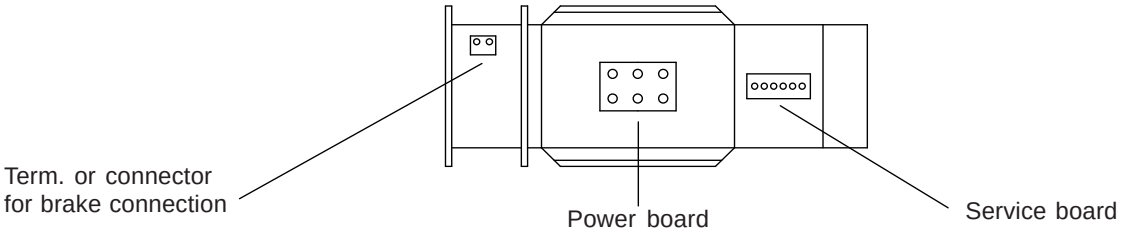
L2 POWER ON: illuminated when power is present on the drive and on control circuits.

L3 PHASE LACK: when ON in indicates:
- the absence of one phase from 3 phase power supply R1 - S1 - T1 or some defective transformers on the card.
- the lighting of phase lack led statically removes the power from the motor (switching off of led L1 RUN) and energizes the emergency relay (if present) connected to terminals 9 - 10.

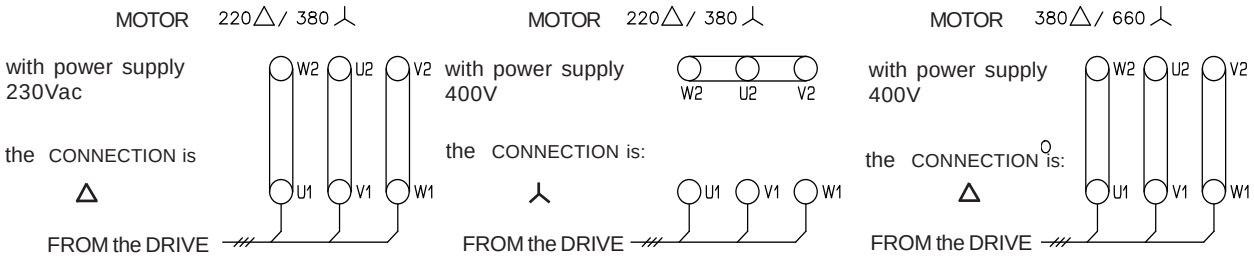
WARNING: the phase lack (R1-S1-T1) means there is a failure on the command circuit (not on the power driver)

L4 TACHOMETER GENERATOR PRESENCE illuminated during motor rotation, it indicates the presence of voltage from tachometer generator on terminals 1 - 2.

INSTRUCTIONS FOR THE CONNECTION WITH ROWAN MOTORS



POWER BOARD CONNECTION: the connection, even if it passes through the drive, remains the same as that of a normal motor, therefore if on the motor you find:



C290S POWER RANGE

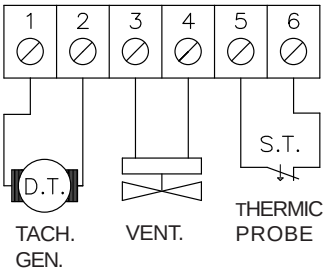
CODE	MAXIMUM POWER LINE 220 VAC		MAXIMUM POWER LINE 380 VAC (415-440-460)		DELAY FUSES SUGGESTED	WEIGHT	FANS MOUNTED	THERMIC PROBE
	HP	KW	HP	KW	A	Kg	NR	NR
290S/1	6	4.5	10	7.5	40	3.4		
290S/2	12	8	16	11	50	3.5		
290S/3	17	12.5	30	22	100	4.3	1	1
290S/4	25	18.5	45	33	160	5.6	2	1
290S/5	40	30	70	51	250	6.5	2	1

VENTILATION and THERMIC PROBE

THE **FAN/S** (1 or 2 depending on the power size) IS MOUNTED ON THE BACK COVER TO GUARANTEE AN OPTIMAL HEAT DISSIPATION TO THE DRIVE, ABOVE ALL WHEN IT IS USED IN CONTINUOUS SERVICE AND TO THE LIMIT OF ITS FEATURES.
EACH FAN ABSORBES 20W AND IS SUPPLIED DIRECTLY FROM THE NET AT 220 VAC (THROUGH TERMINALS WHEN THERE ARE TWO FANS AND THROUGH “FASTON” WHEN THERE IS ONE SINGLE FAN).

THE **THERMIC PROBE**, PROVIDED FOR A MAXIMUM 80°C TEMPERATURE (N.C. CONTACT MAX 4A 220V), IS USED IN SERIES TO THE EMERGENCIES TO LEAVE OUT THE VOLTAGE TO THE DRIVE IF THERE IS AN OVERTEMPERATURE.
THE CONNECTION IS DONE THROUGH TERMINALS.

MOTOR SERVICE BOARD CONNECTION



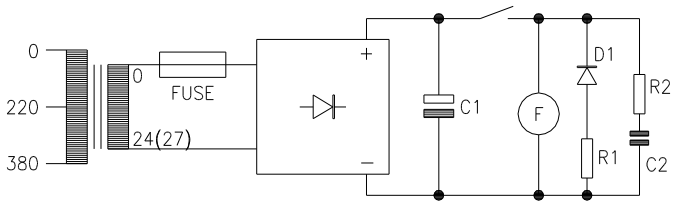
1-2 TACHOMETER GENERATOR:
from these terminals it is possible to have the voltage of the tachometer generator that is spliced to the motor shaft. It supplies a direct voltage of 20VDC at 2800RPM that is directly proportional to motor speed; for this reason, besides being connected to the drive for speed control, it can be used for analog revolution counters, display counters or other servomechanisms, provided that the overall loading does not exceed 3K (I max 10 mA). It is always opportune, 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 VENTILATION:
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 the max cooling efficiency. Some ROWAN motors of great power are equipped with three-phase scroll fans, which must be supplied directly at the base of the fan motor. For the power consumed by the fans, see the table on page 8.

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: On motor MEC63 service board these terminals are not present (this motor has no thermic probe).

BRAKE CONNECTION

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



C1: see N.B. - D1: 1A/400V - R1: 10R/4W - R2: 33R/4W - C2: 0,5 uF/100V

SAFETY SPRING BRAKE
With this brake it is necessary to remove the 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.

This brake operates with direct voltage 24VDC and is 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 (the diode is more filtering but delays the brake detachment).

NOTE: when a transformer with 24VAC secondary is used, it is necessary to insert a smoothing capacitor (C1) suitable for the power brake; otherwise use a transformer with 27VAC secondary.

TABLE OF THE CHARACTERISTICS OF 24VDC BRAKES

MOTOR	SPRING BRAKE	
	TORQUE Kg/m	ABSORPTION **W**
63	0,4	20
71	0,4	20
80	0,8	25
90	1,6	30
100	1,6	30
112 - 112L	1,6 / 3	30 / 40
132 - 132L - 160L	8	55
160	8	55
200 - 200L	15	65

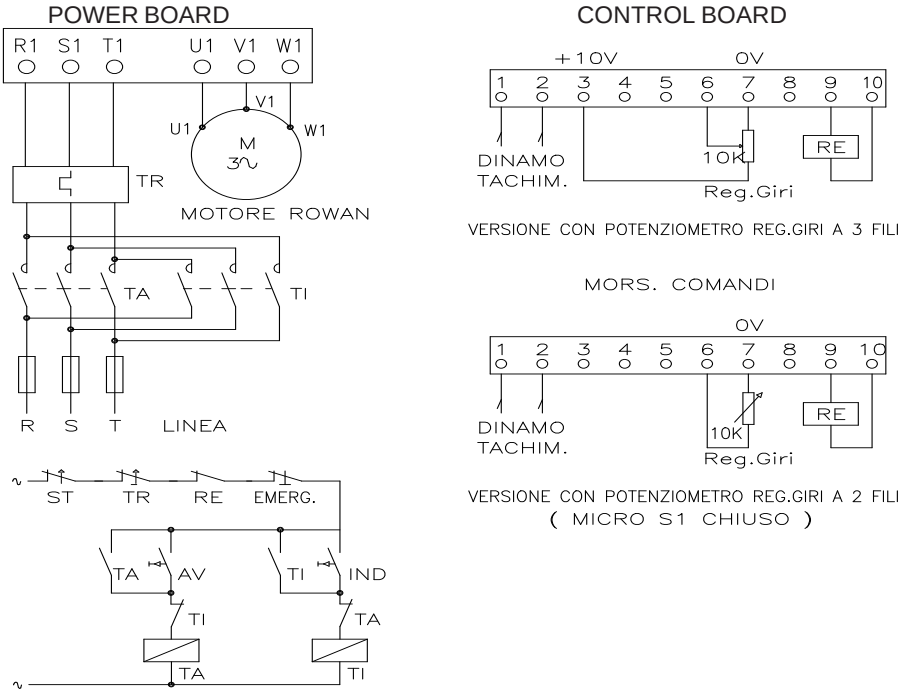
TABLE FOR THE CHOICE OF THE THERMIC CIRCUIT BREAKER FOR MOTOR PROTECTION AND POWER VALUES NECESSARY TO VENTILATORS

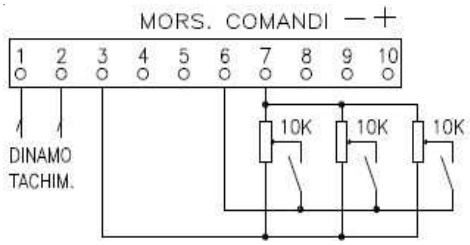
The thermic circuit breaker must be adjusted for a current that exceeds the rated current of 15%. Absorption data, as regards motors with main power supply 240-415-440-460, can be approximately calculated in a proportional way from the current of each respective motor with main supply 400Vac.

MOTOR POWER		MEC SIZE	RATED CURRENT		FANS POWER	
			230VAC	400VAC	AXIAL	SCROLL
HP	KW		A	A	W	W
0.15	0.11	63	1.6	0.9	10	29
0.25	0.18	71	1.9	1.3	16	29
0.5	0.37	80	3.1	1.8	18	42
1	0.75	90	6	3.5	50	83
2	1.5	100	11	6.5	50	83
3	2.2	112	16	9	50	83
4	3	112L	21	12	50	83
6	4.5	132	31	18	65	160
7.5	5.5	132L	41	24	65	160
10	7.5	160	52	30	125	160
14	10.5	160L	72	42	125	160

INSTRUCTIONS FOR THE CONNECTION

Connection Diagram 1
SPEED CONTROL IN 2 ROTATION SENSES BY MEANS OF POTENTIOMETER:





This is the typical connection diagram of drive C290S
Speed regulation is performed by means of an external 3 wire potentiometer. With potentiometer cursor on terminal 7 (0V), the motor does not rotate; whereas with the cursor on terminal 3 (+10VDC), the motor runs at the max preset speed. The potentiometer in this case is 10Kohm but can also have higher or lower values provided that a mimimum resistance of 3Kohm is present between terminals 3-7. In the same way one must calculate the value of possible potentiometers that are used in parallel, for the commutation of different speeds.

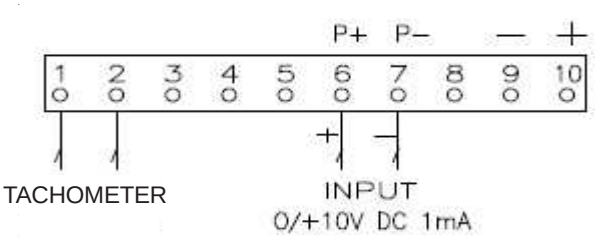
The group of emergencies with opening contacts includes: the thermic circuit breaker (TR) set to the value of motor max current - the thermic probe (ST), which controls the temperature of the windings - the relay of phase lack emergency (RE). In any case, even if relay RE is not connected, the lack of one phase immediately removes the power from the motor statically, switches led L1 (RUN) off, and switches led L3 (phase lack/low voltage) on. This intervention is self retaining and then to reset it, it is necessary to remove the power from drive cod. 290; it is anyway evident that the electromechanic switching off of remote control switches is more reliable in emergency condition, above all in case of bad functioning of drive cod. 290

SELECT MICROSWITCHES IN THE FOLLOWING WAY:

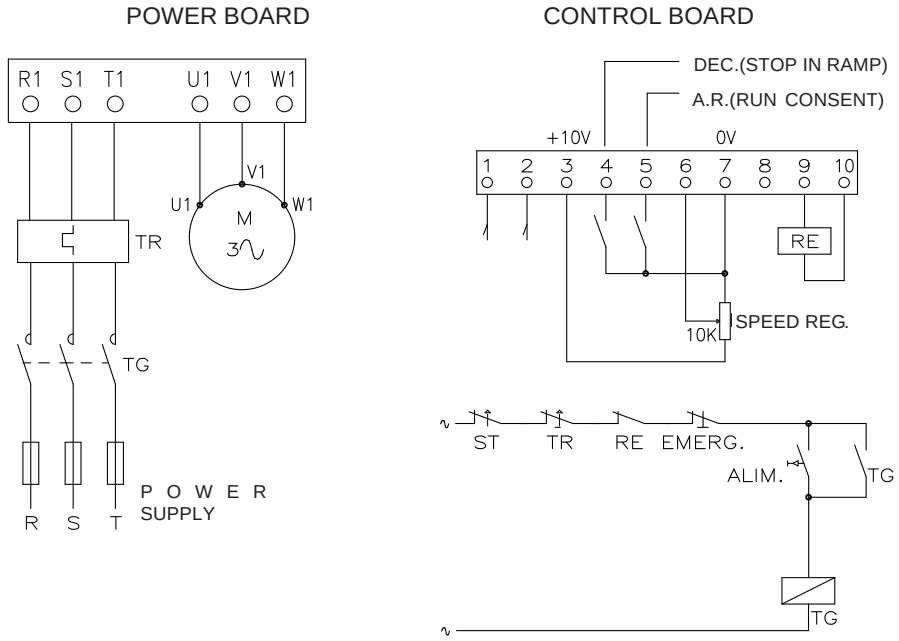
S1 Open (speed regulation with 3 wire potentiometer)
S2 Choose the desired range of ramps (open 0,02 sec - 2 sec / closed 0,25 sec - 25 sec)
S3 Open in case of 2 pole motor
Closed in case of 4 - 6 pole motor
In case of 6 pole motor it is necessary to adjust the max speed with trimmer P3. With speed potentiometer set to max speed, rotate P3 anticlockwise until it measures a direct voltage of approximately 5,7VDC from the tachometer generator, corresponding to a max speed of 800rpm.
S5-S6 Closed
S4-S7 Open

CONTROL BOARD CONNECTION FOR SPEED REGULATION WITH REFERENCE FROM D.C. SIGNAL

Speed regulation of C290S can be performed, besides the typical potentiometer, by applying a D.C. signal 0 ÷ 10V 2 mA to terminals 6 - 7.
This signal may come (according to requirements) from ROWAN interface cards or from other commercial equipments such as PLC, logics, computer etc.
This connection can be made directly because all drive input commands are galvanically separated from the power.
With 0VDC input, adjust trimmer P5 (min. speed) so that the motor does not run; with +10VDC input, the motor runs at the max preset speed.



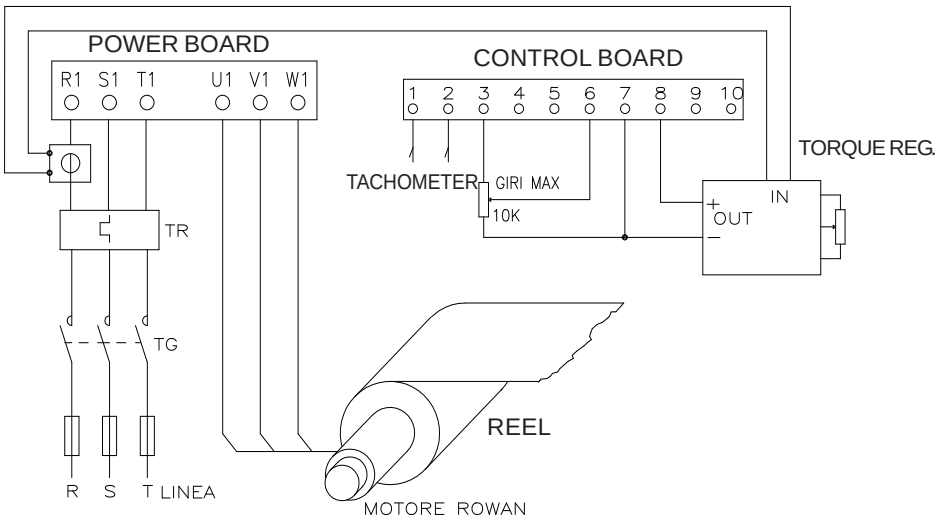
Connection Diagram 2
SPEED CONTROL IN ONE ROTATION SENSE WITH STATIC RUN/STOP IN RAMP COMMAND



This diagram is used in case of one direction movement with frequent starts and stops. By using AR and STOP IN RAMP inputs it is possible to control motor rotation avoiding the command of remote control switches and the flaming of contacts.
Power is applied to the drive by means of a line push-button which energizes TG.
By closing AR contact between terminals 5-7, the voltage is immediately removed from the motor, ramps are set to zero and led L1 (RUN) is switched off.
By opening AR contact the motor starts with acceleration to max preset speed, with a ramp time adjustable with trimmer P2 acceleration.
With AR contact open, the closing of stop in ramp contact (deceleration), causes the ramp down of motor to 0 revolution, with a ramp time adjustable with trimmer P1 deceleration.
The re-opening of stop in ramp contact enables the restart of the motor with acceleration ramp to max speed.
In any case, the regulation of speed potentiometer or signal D.C. is subject to acceleration - deceleration ramps set with trimmers P1 - P2.
As written before, the controlled deceleration ramp operates with braking loads with irreversible systems but it is ineffective with inertial loading.
Microswitch selection is the same as that of connection diagram 1.

Connection Diagram 3

SPEED / TORQUE COMBINED CONTROL



This diagram is used in case ROWAN motor is employed as winder/unwinder.
Max speed is set with speed potentiometer, whereas motor torque is regulated by means of an external interface card, which refers to the current absorbed by the motor by means of an amperometric transformer.
The external interface card controls max torque through the connection to terminals 7-8 of drive C290S.
The kind of card to couple with cod. 290 is chosen according to the application requirements of winder/unwinder systems.
In the case of winder, microswitches must be selected as for diagram 1. The same for unwinder with the exception of S5 open and S4 closed.

Connection Diagram 4

SPEED CONTROL OF UP AND DOWN MOVEMENT WITH UNBALANCED LOADING

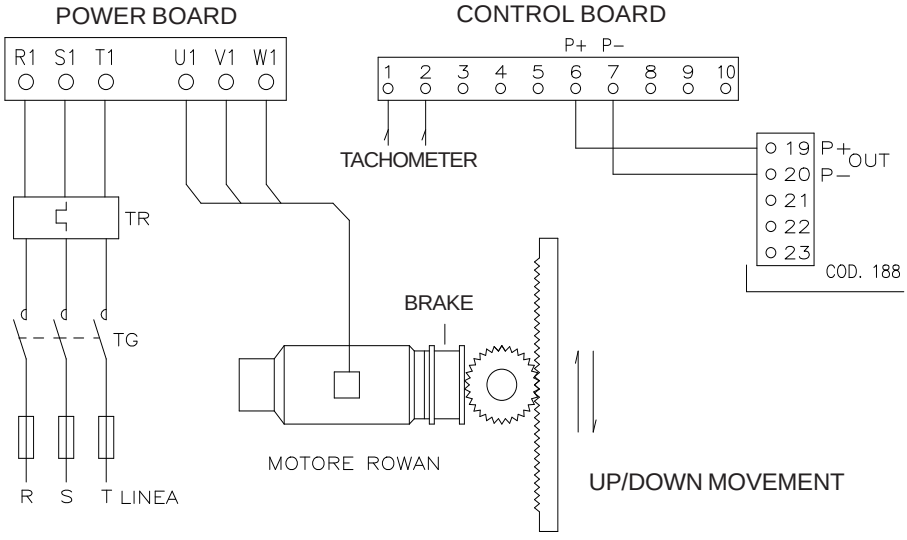
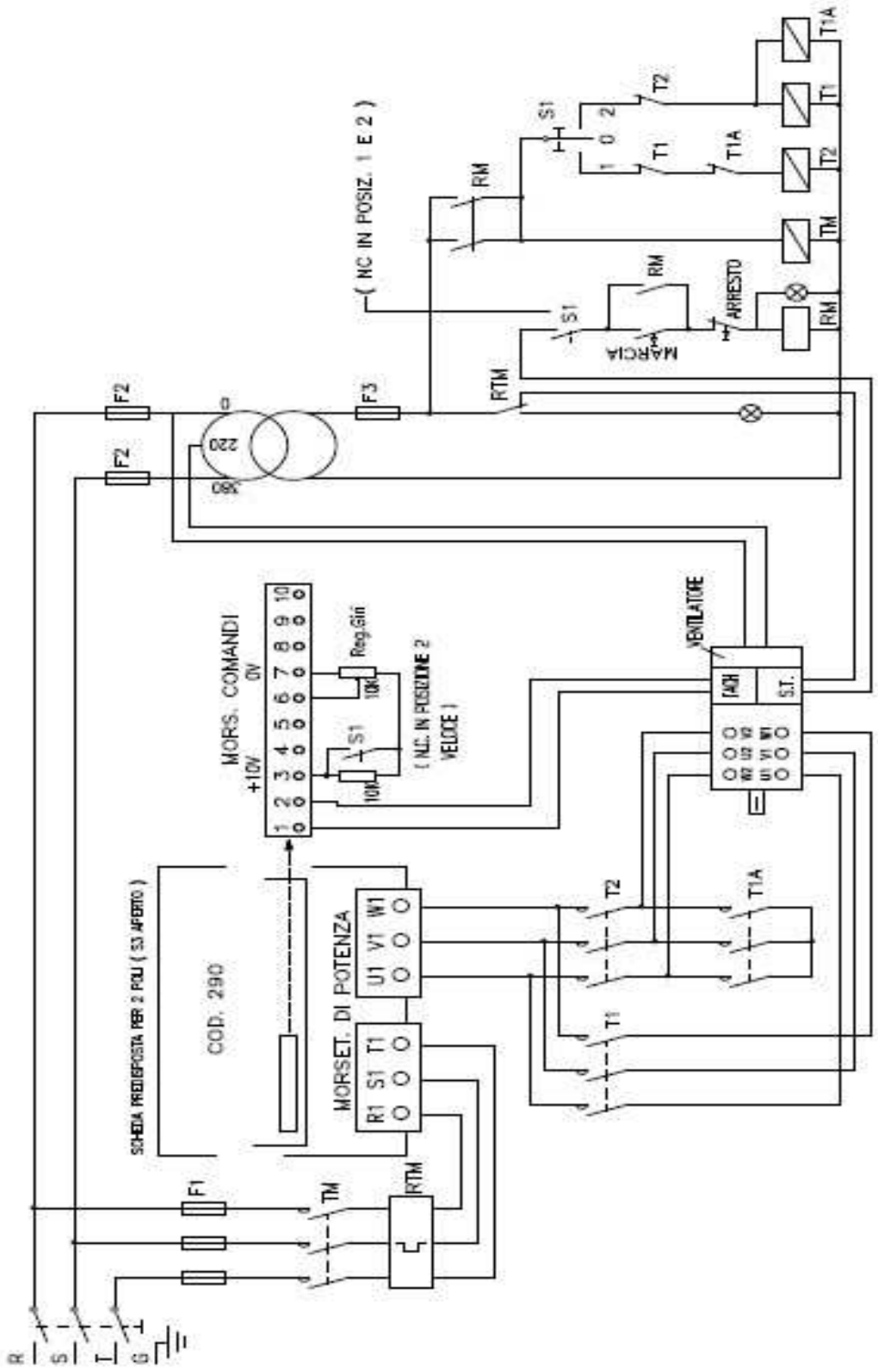


Diagram used for lifting equipments (loaders - unloaders).
By means of interface card cod. 188, drive C290S receives up and down movement commands at different speeds, synchronized with brake command. When card cod. 188 supplies terminals 6(P+) and 7(P-) with +10VDC, the motor lifts up the load at max preset speed; when card cod. 188 supplies terminals 6 and 7 with -10VDC, the motor lets the load go down, keeping it at the max preset speed. During the down movement, the motor keeps the load at the preset speed but it can not push it. This system can function if the loading is so unbalanced that it can reach and exceed, of course in a very short time, the max speed during the down movement.
In this case acceleration / deceleration ramps are adjusted with the trimmers of drive cod. 188, whereas the trimmers of drive cod. 290 must be adjusted completely anticlockwise so that drive reaction is very fast.

MICROSWITCH SELECTION:
S1-S2-S5-S7 open
S4-S6 closed
S3 open for 2 pole motor - Closed for 4-6 pole motor

Connection Diagram 5

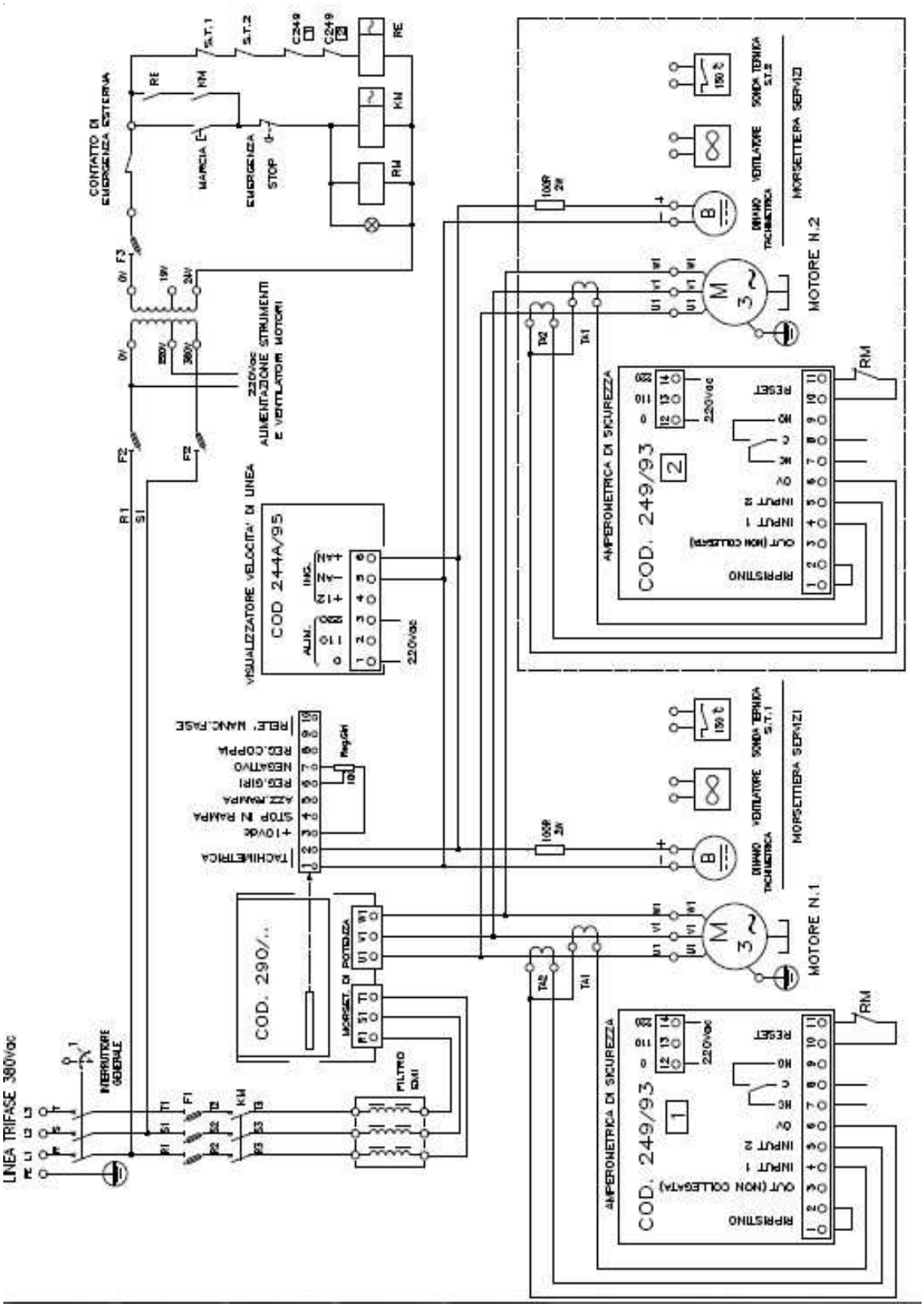
CONNECTION TO A DOUBLE-SPEED MOTOR



Connection Diagram 6

AUTOMATION FOR CONVEYOR SYSTEM WITH CONNECTION to TWO (OR MORE) MOTORS IN PARALLEL

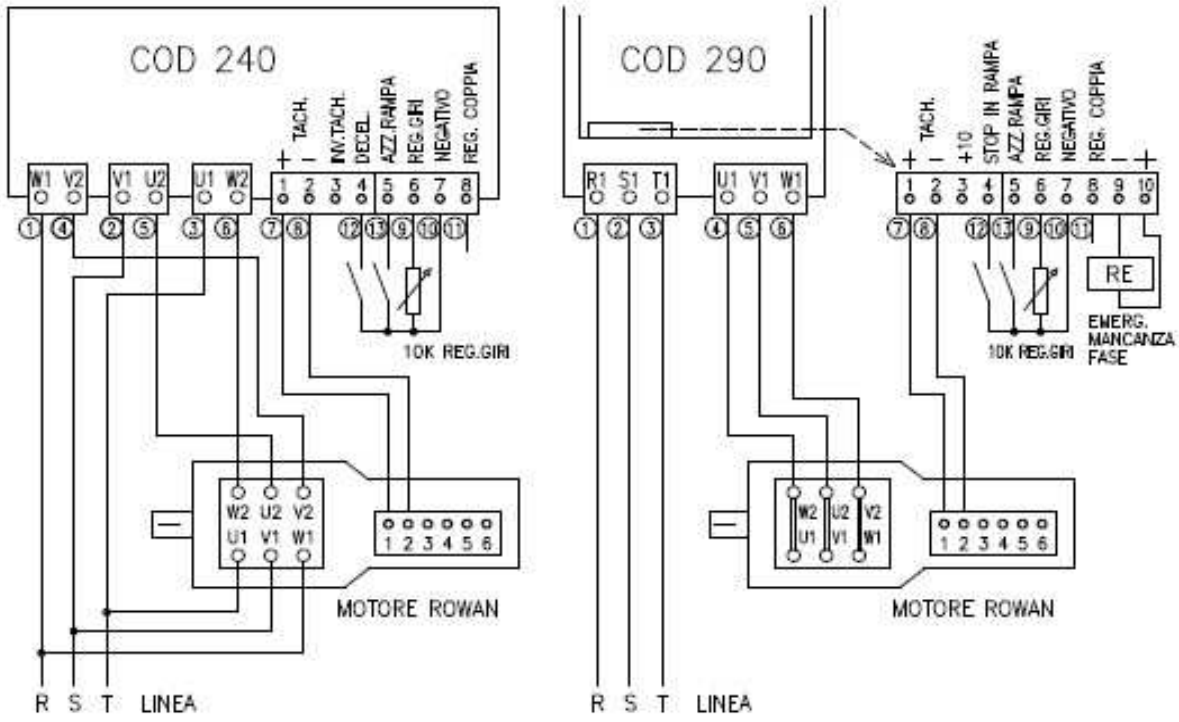
When there are more than two motors, the system must be accorded to the C290S power by adding the units indicated on the dashed box.



INSTRUCTIONS and DIAGRAMS for REPLACING C240 with C290S

When installing C290S at place of C240 **the tachometer contact of inversion must be eliminated**;
the remaining part of the terminal board is perfectly compatible (from 1 to 8) and it is not necessary to move the connections as shown by the numerical inversion (encircled numbers) on the diagrams below.
Follow the same instruction for the power connections too.
The supply line (W1 - V1 - U1 C240) have to be moved on terminals R1 - S1 - T1 of the C290S; motor outputs (V2 - U2 - W2 cod. 240) have to be moved on terminals U1 - V1 - W1 of the C290S; U1 - V1 - W1 wires of the C240 (previously connected to the motor) have to be left out and the motor have to be delta connected.
Arrange micros of the C290S as follows:
S1 - S5 - S6 Closed
S4 - S7 Open
S2 - S3 see instructions

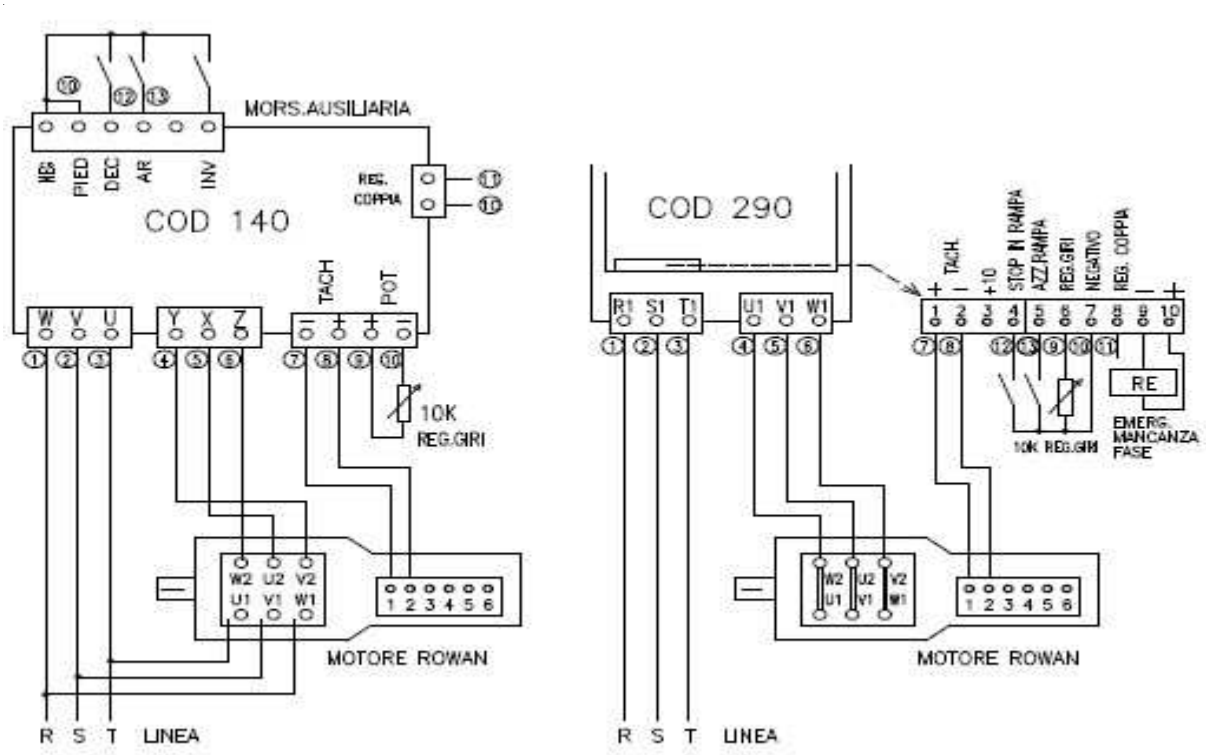
When C188 (for upward/downward movement) is present, follow instructions of page 11.



INSTRUCTIONS and DIAGRAMS for REPLACING C140 with C290S

When installing C290S at place of C140 **the tachometer contact of inversion must be eliminated**;
The contact (A.R.) for zeroing the ramp, if used, have to be moved to terminal 5 of the C290S; the positive of the speed regulation potentiometer (P+) have to be moved on terminal 6 of the C290S; the negative of the potentiometer (P-) and the negative of the auxiliary terminal board have to be connected to terminal 7 of the C290S; the deceleration contact (DEC) have to be moved to terminal 4 of the C290S, the positive signal of the C140 terminal for torque regulation have to be moved to terminal 8 of the C290S; the negative to terminal 7.
The exchange of the connections is stressed by the numerical inversion (encircled numbers) on the below diagrams; Follow the same instruction for the power connections too.
The supply line (W1 - V1 - U1 on C140) have to be moved on terminals R1 - S1 - T1 of the C290S; motor outputs (Z X Y on C140) have to be moved on terminals U1 - V1 - W1 of the C290S; U - V - W wires (previously connected to the motor) have to be left out and the motor have to be delta connected.
Arrange micros of the C290S as follows:
S1 - S5 - S6 Closed
S4 - S7 Open
S2 - S3 see instructions

When C188 (for upward/downward movement) is present, follow instructions of page 11.



INSTRUCTIONS FOR THE CORRECT INSTALLATION

The C290S card is equipped with a protetion device from lack of phase and with fuses 0,5A (F1 - F2- F3) for protection of the piloting circuit. To control the current on the load it is necessary to install external fuses against the short circuit (see page 5) and a heat detector calculated 15% higher than the nominal current.
In alternative to the thermic relay you can use the heat probe installed inside the motor.
Use relay with contacts for low currents for AR commands (RUN consent) and stop in ramp or to select potentiometers or DC signals; absolutely avoid using auxiliary contacts for this kind of operations.

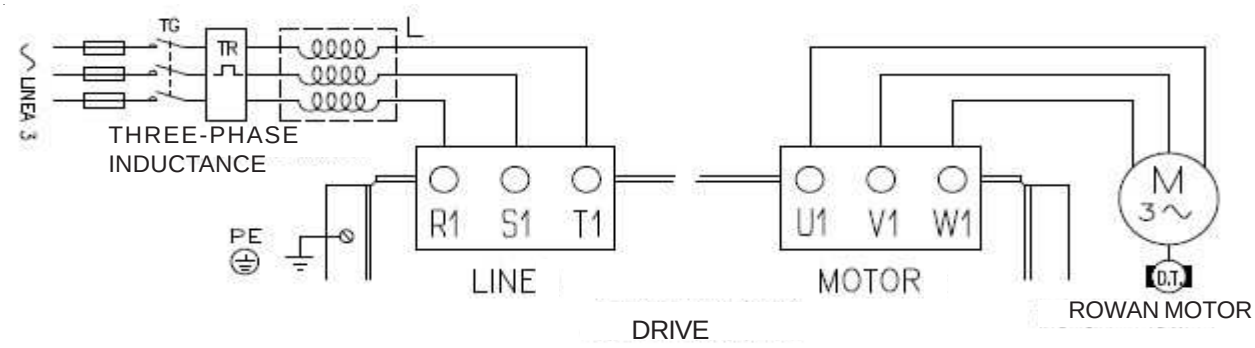
The C290S card works correctly when the container temperature and the temperature inside its housing panel is between –5°C and +55°C. Higher or lower temperatures could cause operational irregularities or drifts in speed control and breakage if the temperature is very high. It is therefore advisable to position the cards far from heat sources and ventilate the panel when the environmental temperature is high.

MECHANICAL INSTALLATION

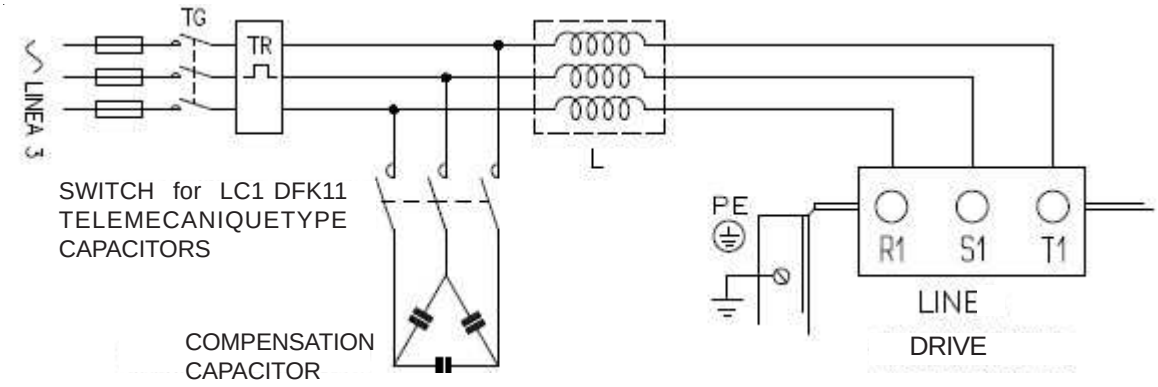
Install the drive following these points:
-Verify that the characteristics of the place where the drive is to be placed is within the environmental characteristics given on page 3 (temperature-humidity-protection grade).
- Allow a cooling airflow as much as possible. Do not place the drives one above the other. Leave a space of at least 100 mm above and below the drive, and at least of 50 mm on both sides.
- Avoid vibrations and excessive impacts.
- Leave enough space for the possible installation of anti EMI filters (see following paragraph).

CABLING SYSTEM AND ELECTROMAGNETIC COMPATIBILITY

In order to limit disturbances induced in the connecting cables as much as possible:
- Avoid passing the control terminal board connecting cables in the same channel as the power connecting cables
- Connect analog inputs/outputs with screened cable and connect the end of each cable singularly to the common earth point of the panel.
- Avoid earth loops.
- To limit emissions conducted on the supply line and to improve the immunity towards disturbances of the same type, connect the filter inducer and connect the terminals indicated and to the common earth point.



Warning! The anti EMI filter works with a small current dispersion towards earth which, at the moment of supply, could cause very sensitive differentials to intervene. It is advisable, therefore, to use differentials for variable currents.
Upon request Rowan Elettronica can supply the complete ANTI EMI filter: the inductors are chosen according to the nominal current of the applied Rowan motor, or to the total of several motors. A single inductor can serve several drives in parallel.
If a power factor improvement circuit is to be applied, it must be inserted upstream of the ANTI EMI filter, but the emission reduction effect will be eliminated. Inserting power factor improvement capacitors also further reduces EMI emissions.



INSTRUCTIONS FOR SETTING UP

First of all, connect the 3 voltage jumpers according to the mains supply voltage as follows:

Drive adjusted for 230Vac (240-440)(voltages between brackets on request)

Drive adjusted for 400Vac (415-460)(voltages betweeen brackets on request)

Select micro S3 according to the polarity of the motor:

2 pole motor / microswitch S3 open
4-6 pole motor / microswitch S3 closed

In case of 6 pole motor, it is necessary, in addition, to rotate trimmer P3 anticlockwise, till the tachometer generator generates approximately 5,7VDC, with potentiometer or D.C. signal set to max.

Select the desired range of acceleration and deceleration ramps:
Micro S2 open: Regulation range of trimmer P1 deceleration min. 0,02 sec.- max 2 sec. Regulation range of trimmer P2 acceleration min. 0,02 sec - max 2 sec.
Micro S2 closed: Regulation range of trimmer P1 deceleration min. 0,25 sec - max 25 sec. Regulation range of trimmer P2 acceleration min. 0,25 sec. - max 25 sec.

Select the kind of external speed control:
- External 3 wire potentiometer connected to terminals 3-6-7: microswitch S1 open, standard value 10Kohm, minimum value 3Kohm.
In this case potentiometer regulation as related to motor speed is linear.
With cursor 6 on terminal 7 (6-7 0VDC), the motor does not rotate; with cursor 6 on terminal 3 (6-7 10VDC), the motor runs at max speed.
- External 2 wire potentiometer connected to terminals 6-7: microswitch S1 closed, fixed value 10Kohm. In this case potentiometer regulation as related to speed is not linear. With potentiometer 0ohm, the motor does not rotate; with potentiometer 10Kohm, the motor runs at max speed.
- D.C. signal input 0 ÷ 10VDC 2 mA to terminals 6(P+) and 7(P-): micro S1 open
Motor speed is proportional to the value of input signal.
With 0VDC the motor does not rotate; with 10VDC the motor runs at max speed.

Connect the drive and select the other microswitches as specified in the preceding examples:
Standard selection: S4 - S7 open / S5 - S6 closed
Besides the signal of the tachometer generator present on terminals 1-2, it is necessary to connect to motor control board:
- the ventilator to terminals 3 - 4
- the thermic probe to terminals 5 - 6
The single phase ventilator must be supplied with 220VAC 50/60Hz; it must not depend on motor RUN command but on the general panel. In this way it is possible to cool the motor also when it does not run.
In case of motors with 3 phase cochlea ventilator, the connection is made directly at the base of the ventilator.

The thermic probe is a N.C. contact that must be connected in series with emergencies. It is directly inserted in the motor windings and opens if the temperature approaches the safety limit for windings tropicalized in H class.

Set the potentiometer or D.C. signal to speed 0. Apply power to the drive, the motor must not run. The lighting of led L2 (power on) indicates the presence of power on control circuits, the lighting of led L1 RUN indicates that there is the consent for motor running.
Rotate the potentiometer or increase D.C. signal, the motor must follow the regulation up or down with the preset acceleration/deceleration ramps.
Verify the reaching of max speed. If necessary adjust the setting of max speed with trimmer P3. Be careful not to exceed max regulation, because there may be a motor overabsorption even without loading. If there is a motor overabsorption at max speed, rotate trimmer P3 anticlockwise till motor absorption is equal to the absorption measured at an intermediate speed.
In any case verify that the absorptions are balanced on all three phases and of course that they do not exceed motor ratings. In case the motor does not follow the regulation of the potentiometer or D.C. signal, verify, besides the position of micro S4 - S5, the connection of tachometer generator and the presence of voltage on terminals 1-2, both on motor service board and on drive control board. In any case, while the motor runs, the presence of tachometer generator is

signalled by the lighting of led L4; (L4 is off if tachometer generator is absent or the motor does not run). If one desires to set a minimum speed different from standard (0 rev.), one can do it by adjusting trimmer P6.
Drive C290S is provided with a protection device to command an emergency relay in case of phase lack. This relay of type 24VDC max 50 mA can be connected to terminals 9 - 10 and can be used to switch off RUN remote control switch in emergency situations; even if it is not used, in case of phase lack, the drive statically removes the voltage from the motor, switches led L1 RUN off and lights up phase lack led L3. This intervention is self-retaining and it is necessary to remove the power from the drive to reset it. In this case, before restarting, it is obviously necessary to verify main supply voltage.
Drive C290S has a reset time of 0,5 sec., which is enough to guarantee a correct restart with acceleration ramp, any time power is applied to the drive.
As already mentioned before (diagram n° 2), in case of frequent operations it is advisable not to remove the power from the drive and to command it statically with STOP IN RAMP or A.R. (RUN consent) contacts.
If, while the motor runs, there are oscillations due to the particular kind of loading or mechanic transmission, it is possible to eliminate them by rotating trimmer P6 (stability) clockwise. If one desires a more soft and fast response of the motor, close micro S7.
Whenever a great speed control precision is necessary, open micro S6; in this case there is a minimum speed variation from empty to full load and the motor is able to furnish the nominal torque even at low speed (2 - 3 rev.), with the disadvantage of slowing the time of drive response; in this case micro S7 must remain open.

USAGE INSTRUCTIONS FOR CORRECT FUNCTIONING

Drive C290S is provided only with a protection device for phase lack and three fuses (0,5A rapid) for control circuit; as for amperometric protections, it is necessary to provide externally with fuses against short circuit and with thermic circuit breakers of the correct rating according to motor max current (see tables).
It is necessary to use screened cable for the following connections: potentiometer - analogic command signal - tachometer generator - torque control signal - A.R. and deceleration commands. The screens must be connected to earth and not to drive negative pole (0V). Besides this, do not connect the drive negative pole to earth. Avoid, if possible, placing the drive near the power cabling or big transformers. Use relays for low current operation, for A.R. (RUN consent) and STOP IN RAMP commands or for selecting potentiometers or D.C. signals; absolutely avoid using the auxiliary contacts of remote control switches for this kind of operations.
Drives C290S work correctly with cubicle temperature ranging from -15°C to +55°C. Higher temperatures could cause working anomalies and, if excessive, breaksdown. It is therefore advisable to place them far from heat sources and ventilate the cubicles when the ambient is too hot.

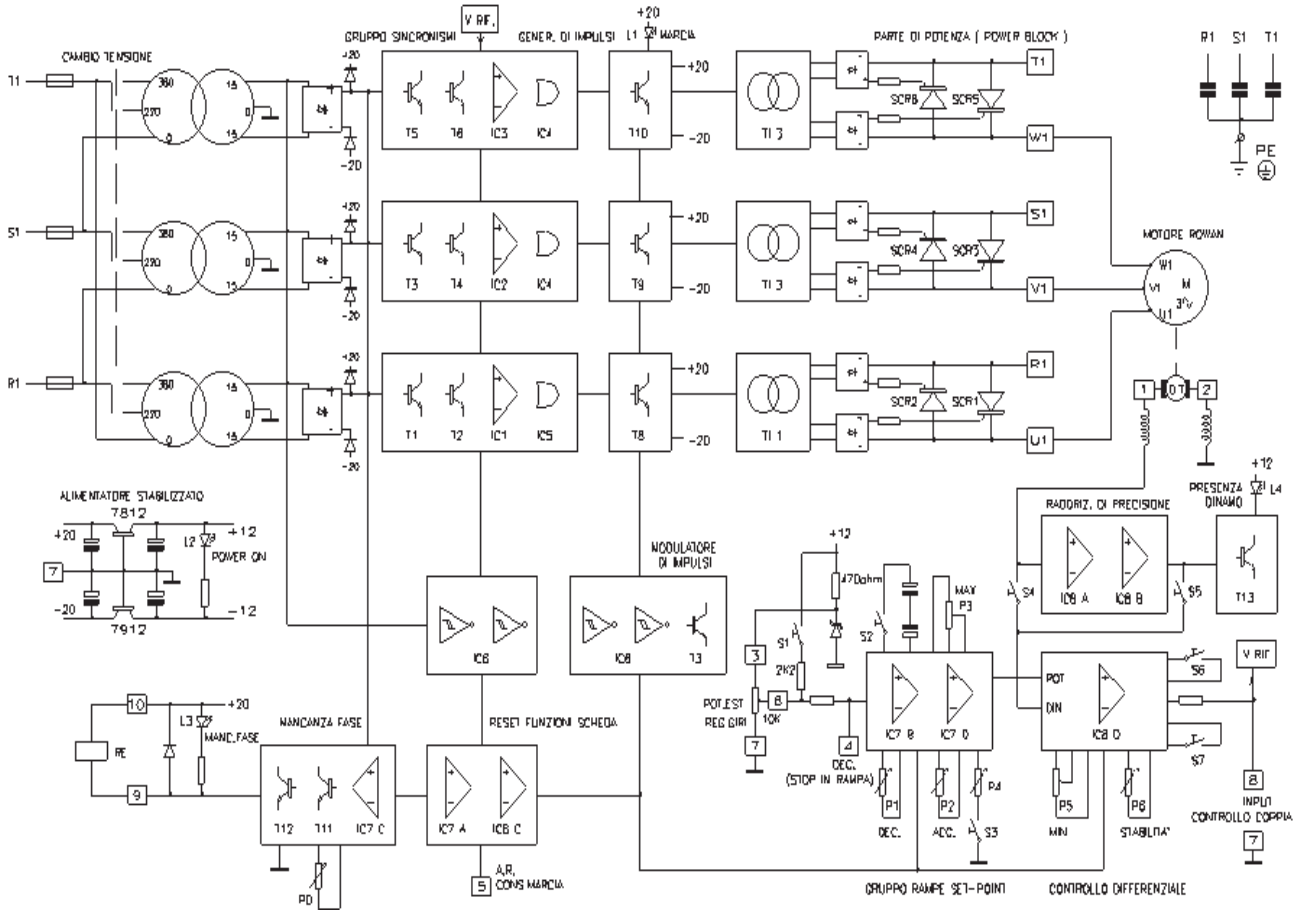
STANDARD ADJUSTMENT

Drives C290S are tested and adjusted in the following way:
- 400VAC mains voltage supply
- Connection for 3 wire speed potentiometer - S1 open
- Range of ramps - min. 0,02 sec. - max 2 sec. / S2 open
- 4 pole motor - S3 closed
- Polarity rectifying circuit activated - S5 closed/S4 open
- S7 open - S6 closed

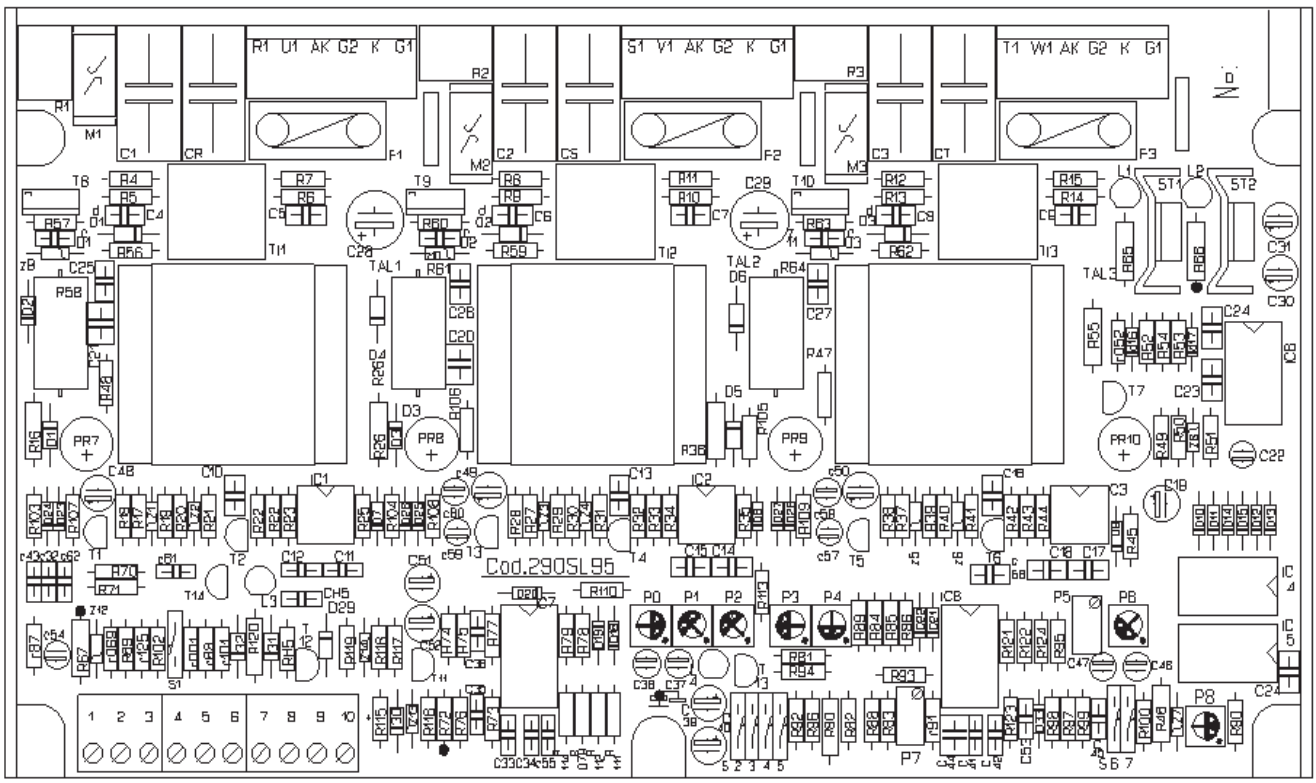
SETTING

Minimum speed 0rpm
Max speed 1400rpm
Acceleration/deceleration ramps 2 sec.

BLOCK DIAGRAM



CIRCUIT SERIGRAPHY



MAINTENANCE INSTRUCTIONS FOR HIGH SLIP 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

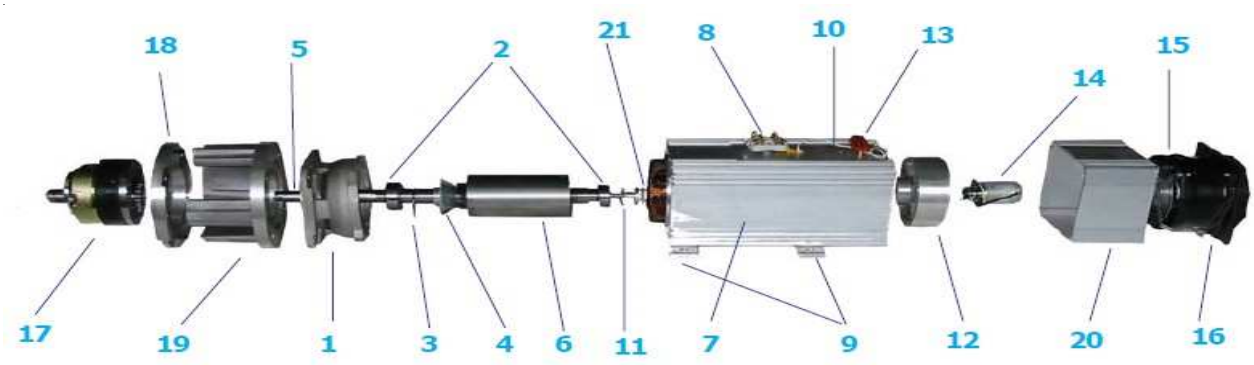
If the motor has to be dismantled to change the bearings, proceed as follows:
1- remove the screws on the rear fan housing or scroll fan and slide it out, disconnecting the wires on the service terminal block
2- take out the tachometric dynamo
3- slide the stays out and remove the rear housing
4- remove 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 of 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. If necessary it can be carried out by any coil winder so long as the winding data is respected, which is available from our technical office.



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 in 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

CONFORMITY

EMC

CE

Rowan Elettronica

Motori, azionamenti, accessori e servizi per l'automazione

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