# INSTRUCTION MANUAL

# Cod.390S.C

## UNIDIRECTIONAL DRIVE
## FOR ROWAN THREE-PHASE HIGH SLIP MOTORS

EMC
CE
CONFORMITY


**Rowan Elettronica**
*Motori, azionamenti, accessori e servizi per l'automazione*

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CSQ UNI EN ISO 9001
IQNet CERTIFIED MANAGEMENT SYSTEM


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## *Warning !*

- ROWAN ELETTRONICA s.r.l. declines any responsibility for any inaccuracies contained in this manual, due to printing and/or transcription errors. ROWAN ELETTRONICA s.r.l. reserves the right to make any variations that it considers necessary for better functioning of the product, without prior notification.
- Regarding the data and characteristics mentioned in the manual, a maximum tolerance of 10% has been allowed, if not otherwise indicated.
- The product guaranty is considered ex-works and is valid 6 months from the date of leaving ROWAN ELETTRONICA s.r.l.
- The electrical equipment could create dangerous situations for the safety of both personnel and objects; the user is responsible for the installation of the equipment and for the conformity of the installation with the regulations in force.
- The diagrams contained in this manual are mere examples and should be perfected by the customer according to their specific needs.
- **The equipment must be installed only by qualified personnel**, after having read and understood this manual. In case of doubt, the supplier should be contacted.

# CODE 390S.C

**UNIDIRECTIONAL DRIVE FOR ROWAN THREE-PHASE HIGH SLIP MOTORS**

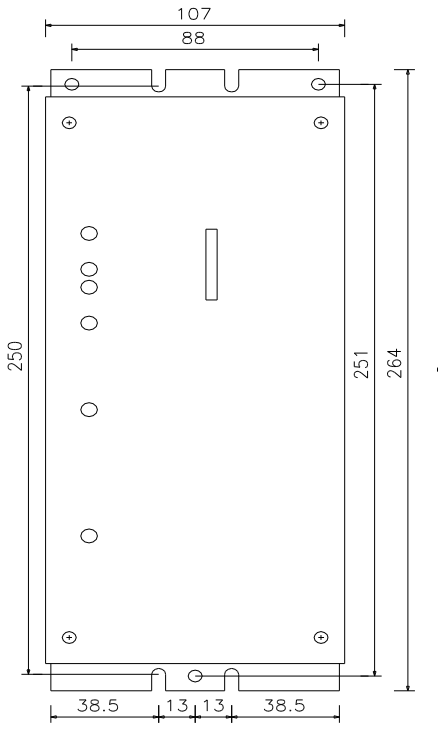
**Technical characteristics**

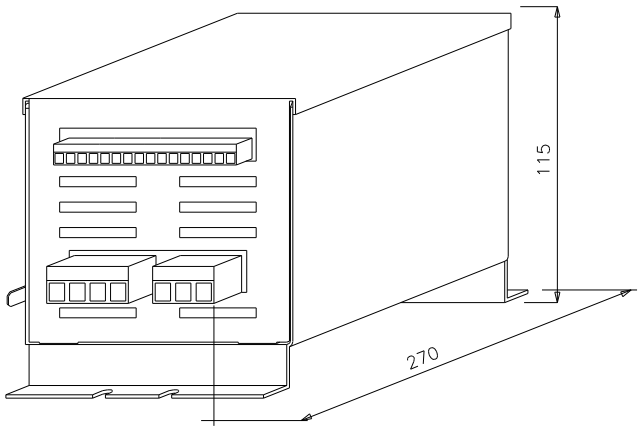
- CE product
  Unidirectional drive for Rowan three-phase high slip motors (A series) with a maximum power of 3kW at 400VAC and 1.5kW at 230VAC.
- Standard commutable supply limits: 170/260VAC and 330/500VAC, frequency 50/60Hz.
- Pre-set for speed control of Rowan 2-4-6-pole motors equipped with 20VDC at 2800rpm tachometrical dynamo.
- Operates with linear acceleration and deceleration ramps which are adjustable from 0.02sec. to 25sec., with automatic insertion of direct current braking with inertial loads. Direct current braking can be excluded.
- Speed adjustment with 3-wire potentiometer (min. 2Kohm, max. 100Kohm), or 0 ÷ +10VDC differential signal. Speed adjustment with 2-wire potentiometer is also possible, but only if 10Kohm.
- Maximum current adjustment (maximum couple) using an internal trimmer, 10Kohm external potentiometer or 0 ÷ 10VDC signal. An amperometric transformer (TA) which reveals the current absorbed by the motor should be connected to adjust the current. The TA should have a maximum output of 4VAC/0.2A.
- Maximum voltage adjustment for ALQUIST type operation, in the case of motors for winders.
- Running permission input (PNP/NPN).
- Stop in ramp input (PNP/NPN)
- Tachometrical dynamo differential input
- Emergency contact output, can be delayed from 1 sec to 15 sec because of overload, absence of line and motor phase, absence of tachometrical dynamo and inverted tachometric polarity if the internal precision rectifier is not used.
- Led display of the running, stop in ramp, emergency, motor rotating, braking, power on functions.
- Adjustment of the stability (from trimmer), acceleration ramp, deceleration ramp, maximum revs., minimum revs., maximum couple.
- Logical parts and controlling circuits protected with 0.5A fuses.
- Connection power and control terminal boards.
- Working temperature external to the cabinet: -5°C to +40°C; internal to the cabinet: -5°C to +55°C;
- Storage temperature: -25°C to +70°C
- Relative uncondensed humidity: 5 to 95%
- Single version in IP20 aluminium container, silk-screened with useful diagrams for operation control and calibration; base dimensions and fixing template interchangeable with the two-way 380S/0 drive.

**In conformity with the following norms:** CEI EN 60204-1 EN 50081-2 EN50082-2 EN 61800-3

**CAUTION**: Accordance with the mentioned norms depends on the connection of the separately supplied filtering devices and the scrupulous observance of the instructions given on page 10 by the installer.

**OVERALL DIMENSIONS (measurements in mm)**



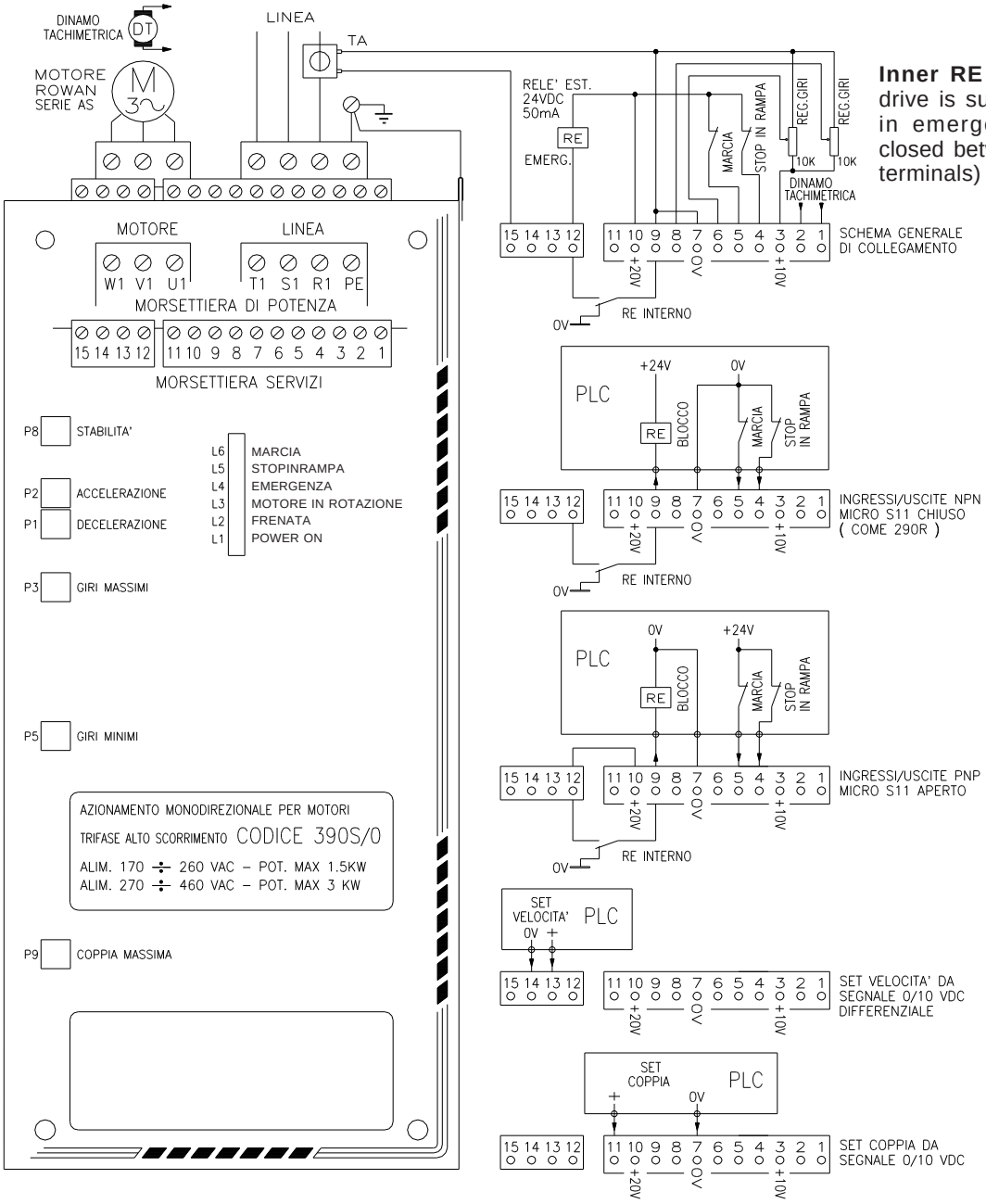




| TABLE OF MAXIMUM POWER AND RECOMMENDED FUSES | | | | | | |
|---|---|---|---|---|---|---|
| CODE | MAXIMUM POWER LINE 230V (240V) | | MAXIMUM POWER LINE 400V (415-440-460V) | | RAPID GL TYPE RECOMMENDED FUSES | NET WEIGHT |
| | HP | kW | HP | kW | A | Kg |
| 390S | 2 | 1,5 | 4 | 3 | 20 | 1,65 |

**OPERATING PRINCIPLES**

The 390S drive is designed to control the speed of Rowan high slip motors (S series) equipped with tachometrical dynamo. It is a three-phase current adjuster with tachometric feedback which uses controlled diodes (SCR) piloted by the system with thyristore for phase control. The voltage which pilots the motor comes from an analogue process which keeps the revolutions constant by means of differential control between the real speed reference extracted by the tachometrical dynamo and the speed set by the potentiometer or external analogue voltage.
When combined with a Rowan threephase high slip motor, the result is a fast system with constant couple that is **extremely quiet and uniform**, from zero to maximum motor revolutions.
The choice of the controlled diodes for the power part (already overdimensioned) guarantees reliability in the case of extra voltages or extra currents. The rotational direction of the motor is selected by exchanging 2 phases of either the supply card or the motor itself, as is done with standard threephase asynchronous motors (to check the rotational direction with a ±10VDC signal use the 380S type bidirectional drive).
It is also possible to adjust the acceleration and deceleration ramps according to the needs of the device moved by the Rowan threephase motor. **Dc braking** (which is also valid for low inertia loads or limited braking needs) starts automatically if the ramp time of deceleration ramps with inertial loads is not respected. If the contrary is necessary, a 380S type two-way drive should be installed. With the 390S drive it is possible to carry out combined couple-revolution control of the Rowan three-phase motor, which can, consequently, work as an electromagnetic brake or gear. Because of this, the combination of a 390S drive and a Rowan high slip motor could be used with excellent results in moving winders/unwinders.

**MAIN CONNECTING DIAGRAM WITH TRIMMER AND LED POSITIONS**




**Inner RE** excited when drive is supplied and not in emergency (contact closed between 9 and 12 terminals)

**DESCRIPTION OF THE SERVICE TERMINAL BOARD**

**1 - 2** **Tachometrical dynamo** differential **input** 10VDC / 1400r/m (20VDC / 2800r/m).

**3** **+10VDC** reference to supply couple/turn adjustment potentiometers (max. load 5mA).

**7** Common negative **0VDC** reference

**10** Reference for connection of the **external emergency relay**, type 24VDC/max. 50mA

**4 - 7** **Stop in ramp** contact connection in **NPN** logic (micro S11 closed): **active when contact is close**
**4 - 10** **Stop in ramp** contact connection in **PNP** logic (micro S11 open): **active when contact is open**. When stop in ramp is **active**, the L5 pilot light lights up and provokes the controlled deceleration ramp descent of the motor until zero revs.. When stop in ramp is **inactive**, the motor starts in acceleration ramp at the maximum speed set.

**5 - 7** **Running** contact connection in **NPN** logic (micro S11 closed): **active when contact is open**
**5 - 10** **Running** contact connection in **PNP** logic (micro S11 open): **active when contact is closed**. When running is **active** the L6 pilot light lights up and starts the motor in acceleration ramp at the maximum set speed. When running is **inactive** motor voltage is statically removed.

**3 extreme**
**6 cursor**
**7 extreme** 3-wire **speed adjustment potentiometer** connection (micro S1 open – S12 closed) (resistive values from 2 to 100Kohm in line with the maximum load connectable to terminal 3).

**7 extreme**
**6 cursor** 2-wire **speed adjustment potentiometer** connection (micro S1 closed ) (only 10Kohm).

**14 (0V) – 13(positive) Speed adjustment** differential **signal input** 0/+10VDC from PLC or Rowan interface cards (input resistance 100Kohm), micro S12 open

**3 extreme**
**8 cursor**
**7 extreme** Maximum **voltage adjustment potentiometer** connection to the motor (**max. current with TA** connected to terminals 7-15) (resistive values from 2 to 100Kohm in line with the max. load connectable to terminal 3); micro S8 open – S9 closed.

**7 (0V) – 11 (positive)** Maximum **voltage adjustment** signal input 0/+10VDC to the motor (**max. current with TA** connected to terminals 7-15) from PLC or Rowan interface cards (input resistance 100Kohm); micro S8 open – S9 closed.

**9 - 12** **Internal emergency relay** contact (see page 4 for type of connection)

**7 - 15** Amperometric transformer **(TA)** connection for maximum current feedback control of the motor. Input set for TAs of the type with maximum output 4VAC/0.2A.

**DESCRIPTION OF THE POWER TERMINAL BOARD**

**PE** EMI filter earth connection; connect to the main protection conductor in combination with the line inductor to reduce the conducted emissions (see correct installation instructions on page 8).
**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 therefore advisable to use differentials for variable currents.

**R1-S1-T1** Threephase supply line. **Be careful to pre-set the voltage change** correctly before supplying these terminals (see setting at work instructions on page 9).

**U1-V1-W1** Output adjusted to the load. Pre-set a star or delta load according to the information on the plates and the supply voltage.

## TRIMMER DESCRIPTION

**TRIMMERS** THAT CAN BE REACHED WITHOUT REMOVING THE COVER

**P1** **Deceleration**: adjusts the deceleration ramp time in the following adjustment ranges:
with micro S2 open – minimum 0.02 sec. – maximum 2 sec.
with micro S2 closed – minimum 0.25 sec. – maximum 25 sec.
If turned in a clockwise direction the time is increased.

**P2** **Acceleration**: adjusts the acceleration speed ramp in the following adjustment ranges:
with micro S2 open – minimum 0.02 sec. – maximum 2 sec.
with micro S2 closed – minimum 0.25 sec. – maximum 25 sec.
If turned in a clockwise direction the time is increased.

**P3** **Maximum revs.**: adjusts the maximum speed of the motor with the turn adjustment potentiometer or differential speed control input signal = +10VDC. Turning in a clockwise direction increases the speed.

**P5** **Minimum revs.**: adjusts the minimum speed of the motor with a minimum turn adjustment potentiometer at maximum or when the differential speed control input signal = 0VDC. Standard adjustment for motionless motors. Turning in a clockwise direction increases the speed.

**P8** **Stability**: turning in a clockwise direction stabilises possible motor speed oscillation due to particularly unstable loads. (With micros S6 and 7 closed, the proportional gain of the speed control in closed loop lowers).

**P9** **Maximum couple adjustment**: adjusting in a clockwise direction increases the voltage/current to the motor (only active if couple limitation is inserted and micros S9 and S8 are closed).

**TRIMMERS** THAT CAN BE REACHED BY REMOVING THE COVER (only for authorised personnel)

**P4** Internal precalibration for the maximum speed of 4-pole motors.

**P6** Regulating in a clockwise direction increases the P8 stabilising effect.

**P7** Internal precalibration. Do not touch.

**P10** Maximum dc braking adjustment.

**P11** Minimum couple adjustment: turning in a clockwise direction increases the voltage/current to the motor with reference on terminals 8 or 11 at 0VDC (only active if couple limitation is inserted with micros S9 and S8 closed).

**P12** EMERGENCY intervention delay adjustment (minimum 1 sec. maximum 15 sec. when turned fully clockwise) standard calibration 8 sec.

**MICROSWITCH DESCRIPTION**

**Operations to be carried out when the CARD IS NOT SUPPLIED WITH CURRENT**

**To reach the micro open the silk-screened cover – the micros can all be found in the upper card**

**S1 Closed:** prepares for **2-wire** external turn adjustment potentiometer connection to terminals 6 – 7.
**Open:** prepares for **3-wire** external turn adjustment potentiometer connection to terminals 3-6-7.

**S2 Open:** establishes the adjustment range of the acceleration and deceleration ramps, minimum 0.02 sec., maximum 2 sec.
**Closed:** stabilises the adjustment range of the acceleration and deceleration ramps, minimum 0.25 sec., maximum 25 sec.

**S3 Open:** prepares the card for the connection of a 2-pole motor
**Closed:** prepares the card for 4-6-pole motor connection. In the case of 6-pole motors, it is necessary to recalibrate the maximum speed using the P4 trimmer. With the turn adjustment potentiometer at maximum or when the differential signal is at +10VDC, adjust P4 in a clockwise direction until the tachometrical dynamo measures a continuous voltage of approx. 5.7 VDC, which corresponds to maximum speed of 800 r/m

**S4 Closed**
**S5 Open**
} Exclude the tachometrical dynamo polarity rectifying circuit (Necessary when a card is used in pulling or dragging systems for winders/unwinders)

**S4 Open**
**S5 Closed**
} The tachometrical dynamo polarity rectifying circuit is inserted and the card is prepared to work with the motor in the 2 rotational directions without having to invert the dynamo polarity.

**S6 Open:** Establishes a proportional gain on the speed control in closed loop which permits a maximum error on motor turn variation from empty to full load of 2 r/m (only with trimmer P8 in the standard position).

**S6 Closed:** Establishes a proportional gain on the speed control in closed loop which permits a maximum error on motor revolution variation from empty to full load of 15 r/m (only with trimmer P8 in the standard position).

**S7 Closed:** Further reduces the proportional gain (close if it is not possible to eliminate speed oscillations with the stability trimmer).

**S8 Closed:** In the case of internal motor voltage limitation (current if TA is connected) with the P9 trimmer.
**S8 Open:** In the case of external motor voltage limitation (current if TA is connected) with the potentiometer or DC signal.

**S9 Open:** Excludes motor voltage limitation (current if TA is connected).

**S10 Closed:** Excludes DC braking

**S11 Closed:** Prepares the RUNNING and STOP IN RAMP inputs for control by NPN logic
**S11 Open:** Prepares the RUNNING and STOP IN RAMP inputs for control by PNP logic

**S12 Closed:** In the case of speed adjustment by potentiometer connected to terminals 3-6-7.
**S12 Open:** In the case of speed adjustment by differential dc signal connected to terminals 13-14.

## DISPLAY DESCRIPTION

**L1 Power on** when **lit** indicates that supply is present at the card and the controlling circuits.

**L2 Braking** when **lit** indicates direct current braking.

**L3 Motor turning** when **lit** during motor rotation, indicates dynamo voltage presence at terminals 1 and 2.

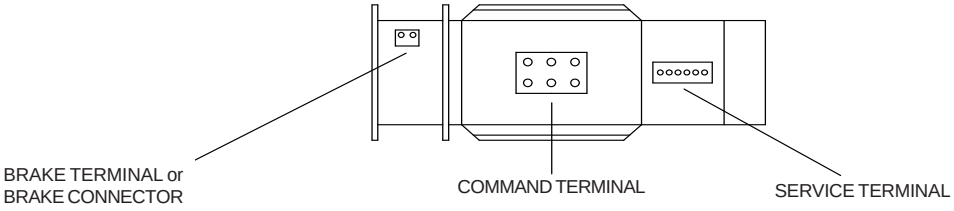
**L4 Emergency** when **lit** indicates an irregular situation due to: overload, absence of on-line and motor phase, absence of a tachometrical dynamo, or tachometric polarity inverted if the internal precision rectifying device has not been used. In this case, the motor cannot rotate and the externally connected emergency relay is commanded. This situation is self-maintained and can only be unblocked by removing current from the card. If the L4 pilot light lights up, consult the "TROUBLESHOOTING " paragraph on page 12.

**L5 Stop in ramp** when **lit** indicates the presence of an active command at terminal 4. In this case the motor stops with the deceleration ramp set up to zero revs.; the led must be switched off for the motor to start again.

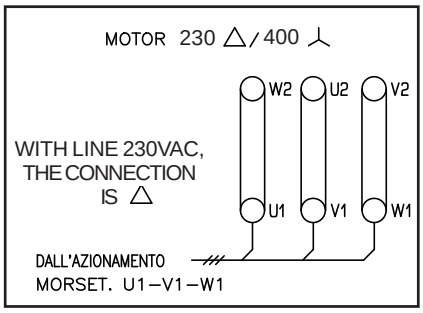
**L6 Running** when **lit** indicates the presence of an active command at terminal 5. In this case the motor can rotate;
when **unlit** indicates that the motor cannot rotate.

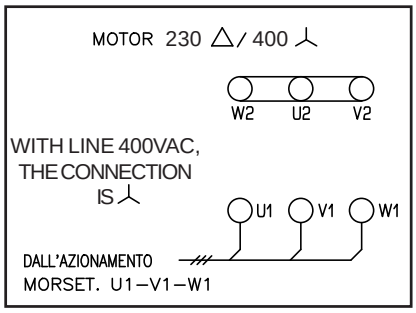
## INSTRUCTIONS FOR CONNECTING ROWAN MOTORS

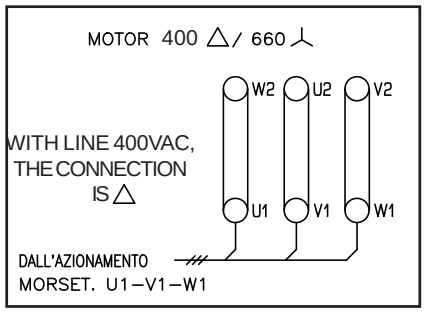
### CONNECTING THE POWER TERMINAL BOARD




Even if power terminal board connection goes through the speed control drive, it remains the same as a normal threephase asynchronous motor, therefore if the following is written on the motor plate,follow the relative instructions:



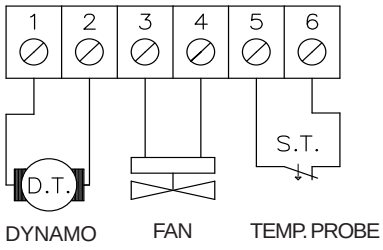




## ELECTRICAL CHARACTERISTICS TABLE OF THE MOTORS THAT CAN BE FIT TO THE 390S BOARD

| MOTOR SIZE KW | | MOTOR MEC | MOTOR RATED CURRENT I n | | POWER of VENTILATION | |
|---|---|---|---|---|---|---|
| | | | 230V | 400V | AXIAL | SCROLL |
| HP | KW | | A | A | VA | VA |
| 0,15 | 0,11 | 63 | 2,6 | 1,5 | 10 | 29 |
| 0,25 | 0,18 | 71 | 2,5 | 1,5 | 16 | 29 |
| 0,5 | 0,37 | 80 | 4 | 2,2 | 16 | 42 |
| 1 | 0,75 | 90 | 8,6 | 5 | 18 | 42 |
| 2 | 1,5 | 100 | 13,6 | 8 | 50 | 42 |
| 3 | 2,2 | 112 | / | 9 | 50 | 83 |
| 4 | 3 | 112L | / | 12 | 50 | 83 |

The motor protecting circuit breaker should be calibrated for a current which is 15% higher than the nominal one. For motors with line voltages of 240-415-440-460V, the relevant absorption data can be obtained by taking the 400V line voltage figures and proportionally calculating the line voltage of the motor to be used.

## CONNECTING THE TERMINAL BOARD TO THE MOTOR SERVICES




**1 - 2 Tachometrical dynamo**: it is possible to extract the tachometrical dynamo voltage that is keyed to the motor shaft from these terminals. The dynamo supplies a continuous voltage equal to 20VDC at 2800r/m directly proportional with the motor speed. Because of this (and also because it is connected to the drive for motor speed control) it can be used for analogue counters with display or other servomechanisms, as long as the total load is not above 3Kohm (maximum dynamo current 10mA). In order to avoid disturbances it is always opportune to connect the tachometrical dynamo with screened cable, above all when the paths are long and close to power cables.

**3 - 4 Fan**: these terminals have to be supplied with a 230VAC voltage for separate motor ventilation. They should be supplied in a manner that ensures ventilation even when the motor is stopped in order to exploit the moments of pause for cooling. Some highly powered Rowan motors equipped with threephase cochlear fan are supplied directly by the fan motor terminal board. Consult the table on page 8 to see the powers used by the fans.

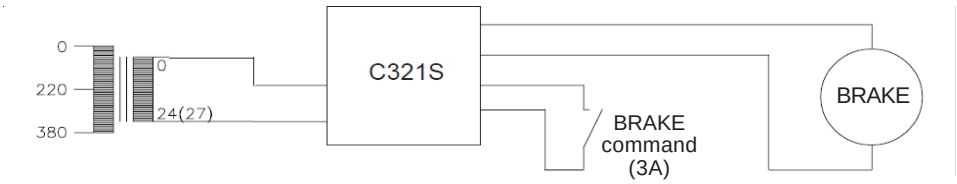
**5 - 6 Temperature probe**: this is a Normally Closed contact that opens when the temperature of the motor windings exceeds 150°C, a safety limit corresponding to class H (180°C). This probe is used as an emergency to deactivate the electromagnetic running switch. Keep in mind that the maximum capacity of the contact is 1A-230VAC.
***Caution!*** Terminals 5-6 are not present on the ROWAN MEC 63 motor service terminal board (the 63 motor is not equipped with thermal probe).

## CONNECTING THE BRAKE

Rowan motors may be supplied, on request, with an electromagnetic brake. This would mean a purposely built motor with a lengthened axle and brake fitted to the front part, supported by a bell shaped cover that reproduces normal flanging.

The brake is a **Spring type:** it is necessary to remove the brake power supply to stop the motor axle. It is used as a safety brake if the power supply should be lost, in the case of over head loads such as bridge cranes, cranes etc. (verify whether it would be necessary to adapt the air gap at 0,3mm ± 0,005).
This brake operates at 24VDC in S6 functioning cycle (max 5' excitation and max 5' de-energization) and is powered by a single connector or a connector found on the bell shaped front brake holder. It is always convenient to connect a diode or R/C in parallel to the brake, above all when close to equipments which are particularly subject to interferences.
It is necessary to bear in mind that the flywheel diode has a maximum filtering efficiency, but it delays spring brake insertion.

***Note:*** for a better use of the brake, Rowan Elettronica suggests the following connection to the C321S device:




This device gives a 34Vdc starting voltage and a succeeding 24Vdc maintainance voltage. In this way the brake release is sped and the overtemperature, during the continuous service, is avoided. For repeated excitations, wait at least for 1 sec. between brake de-energization and re-excitation.

### TABLE GIVING THE POWER USED BY THE 24VDC BRAKE

| BRAKES TORQUE/ABSORBTION CHARACTERISTICS and IDENTIFICATION CODES | | | | | | |
|---|---|---|---|---|---|---|
| MOTOR | SPRING BRAKE | | | | | |
| | TORQUE | ABSORBTION | ROWAN COD. | UNBLOCKING LEVER | BRAKE STARTING TIME | BRAKE STOPPING TIME |
| | Nm | W | Cod. | Cod. | ms | ms |
| 63 / 71 | 4 | 20 | FRM6371K01 | / | 17 | 35 |
| 80 | 8 | 25 | FRM80K02 | / | 35 | 65 |
| 90 / 100 | 20 | 30 | FRM91011K04 | LEVA91011K04 | 40 | 90 |
| 112 / 112L | 30 | 40 | FRM112K05 | LEVA112K05 | 50 | 120 |

**INSTRUCTIONS FOR CORRECT INSTALLATION**

***MECHANICAL INSTALLATION***

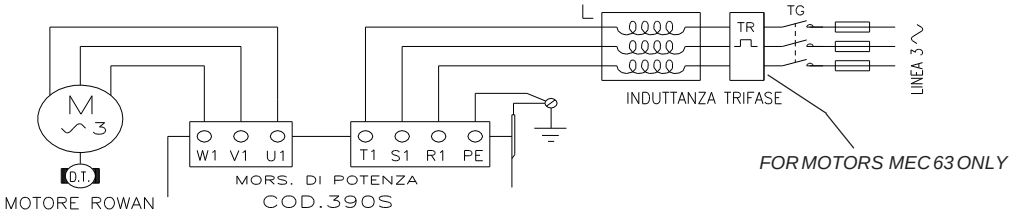
Install the drive keeping in mind the following points:
-Verify that the characteristics of the place where the drive is to be placed is within the environmental characteristics given on page 3 (temperature-humidity-protection grade).
- Favour a cooling airflow as much as possible. Do not place the drives one above the other. Leave a space of at least 100 mm above and below the drive, and one of at least 50 mm on both sides.
- Avoid vibrations and excessive impacts.
- Leave enough space for the possible installation of anti EMI filters (see following paragraph).
**The 390S 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.**

***ELECTRICAL PROTECTIONS***

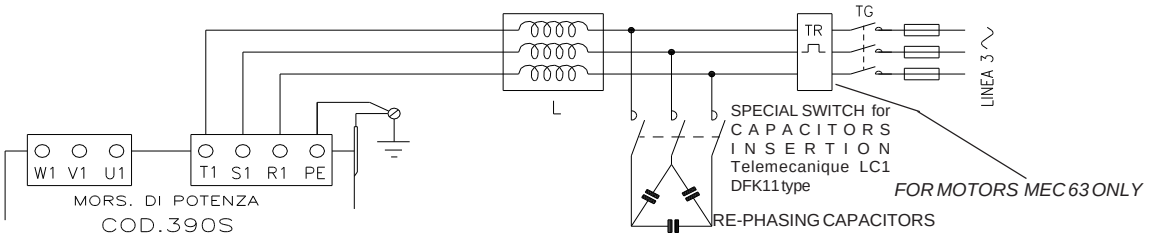
The 390S card is equipped with a protecting device which intervenes when the motor is out of tachometric control i.e. in cases of overload, lack of line and motor phase, in the absence of a tachometrical dynamo and inverted tachometric polarity if the internal precision rectifying device is not being used. The emergency intervention does not let the motor rotate and commands the emergency relay connected externally. The card controlling circuit is also protected by a triad of 0.5A fuses housed in the lower card which carries the power terminal board. It is necessary to install power amperometric connections in the form of external 20A fuses for short circuits of the GL RAPID type, and a relay calculated for a current which is 15% higher than the nominal one.
As an alternative to the thermal relay, a circuit breaker sensor could be incorporated into the motor.
Use relays with low current contacts for the running and stop in ramp commands or to select potentiometers or DC signals. Avoid using the auxiliary contacts of the electromagnetic switches for this type of operation, but if this is necessary wind the contacts together.

***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 potentiometers, tachometrical dynamo and DC signals with screened cable
- Connect an end of each card singularly to the common earth point of the panel.
- Avoid earth loops.
- To limit conducted emissions on the supply line and to better immunity towards disturbances of the same type, connect the filter impedance and connect the terminals indicated by ⏚ and **PE** to the common earth point.

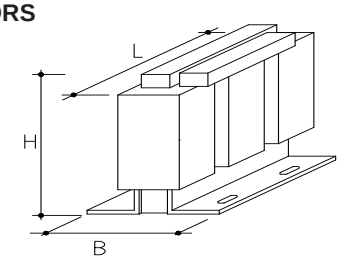



**Warning!** The anti EMI filter works with a small current dispersion towards earth which, at the moment of supply, could cause very sensitive differentials. It is advisable, therefore, to use differentials for variable (impulsive) currents.
Upon request Rowan Elettronica can supply the complete ANTI 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.




**CODES AND CHARACTERISTICS OF THE ANTI E.M.I. THREEPHASE INDUCTORS**

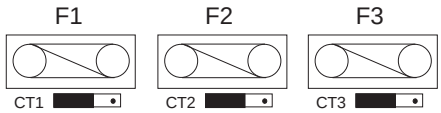
| CODE | MAXIMUM CURRENT (A) | IMPEDANCE (mH) | DIMENSIONS (mm) | | |
|---|---|---|---|---|---|
| | | | H | B | L |
| IMPT.10A.1,5 | 10 | 1.5 | 125 | 65 | 120 |
| IMPT.20A.09 | 20 | 0.9 | 150 | 75 | 150 |



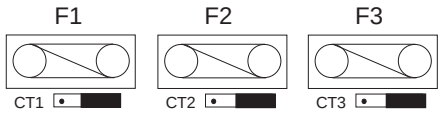
**SETTING AT WORKS**

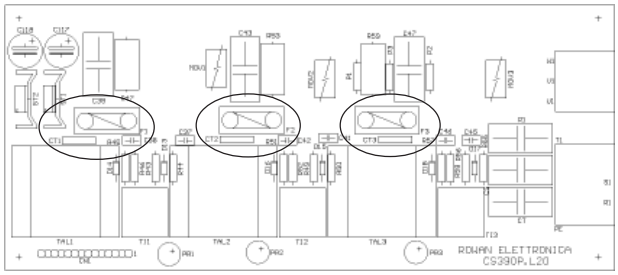
**PRELIMINARY OPERATIONS:**
Before fixing the card, it is convenient to prepare the 3 adjusters according to the supply voltage. It should be kept in mind that the card comes out of the Rowan laboratories set for the higher range of voltages. To reach the adjusters housed in the lower card which goes to the power terminal board, the snap on terminals and then the silk screened cover should be removed. The cover support columns should then be unscrewed, and the upper card which goes to the command terminal board delicately overturned. The adjusters should be pre-set as follows:

Card pre-set for 170VAC÷260VAC supply field




Card pre-set for 330VAC÷500VAC supply field




see to page 21

**F1 - F2 - F3 0.5 A fuses, controlling protection**

**The microswitches, trimmers and leds (their functions are explained on pages 6, 7 and 8) can be found on the upper card, where the rest of the pre-settings are carried out.**

**To take the card to minimum basic operation (motor speed control from potentiometer), follow these instructions:**
Pre-set the S3 micro according to the polarity of the motor to be adjusted
2 pole motor / S3 micro open
4 - 6 pole motor / S3 micro closed
In the case of 6 pole motors, it is further necessary to adjust the P4 trimmer in an anticlockwise direction until the tachimetric generator produces approx. 5.7 VDC with the potentiometer or DC signal at maximum.

Choose the acceleration and deceleration ramp range:

| | |
|---|---|
| S2 micro open | P1 trimmer adjustment field (deceleration), minimum 0.02 sec. - max. 2 sec. |
| | P2 trimmer adjustment field (acceleration), minimum 0.02 sec. - max. 2 sec. |
| S2 micro closed | P1 trimmer adjustment field (deceleration), minimum 0.25 sec. - max. 25 sec. |
| | P2 trimmer adjustment field (acceleration), minimum 0.25 sec. - max. 25 sec. |

Connect RUN and STOP IN RAMP as shown in the main connecting diagram on page 4; keep in mind that the two contacts must be closed to let the motor turn.

Connect the speed adjusting potentiometer (optimal value 10K) to 3 wires of terminals 3 - 6 - 7, open the S1 micro and close S12; when cursor 6 is towards terminal 7 (6 - 7=0VDC) the motor is stationary; when cursor 6 is towards terminal 3 (6 - 7= -10VDC) the motor turns at maximum speed.
Set the remaining microswitches as follows: S5-S6-S8-S12 closed and S4-S7-S9-S10-S11 open.

Connect the motor card according to the instructions given on pages 8 and 9:
Star or triangle connect according to the line and the motor plate details; earth the motor.
The tachimetric generator signal, which should be connected to terminals 1-2 of the 390S card, should be taken from terminals 1-2 of the motor terminal board.
The cooling fan supply (230VAC - 50/60Hz) should be taken to terminals 3-4 of the motor terminal board and the motor fan should not be connected to the motor operation but to the control panel operation. By doing this it is possible to cool the motor even during rest periods; in motors with threephase cochlear fans connection is carried out directly on the fan base.
The thermal sensor is connected to terminals 5-6 of the motor terminal board. It is a normally closed contact (1A-230VAC), which should be applied in series to the emergencies - in fact it is inserted directly onto the motor windings and opens if the temperature reaches the safety limit for tropicalised windings in class H (150°C).

**TO MAKE THE MOTOR ROTATE**
Adjust the potentiometer so that the cursor connected to terminal 6 is in short with terminal 7.
Supply the card, the motor should be motionless.
The lit **L1 (power on)** lighting indicates the presence of supply at the controlling circuits. The **L6 running** pilot lights up to indicate that the motor can turn.
Turn the potentiometer. The motor should follow the increase or decrease adjustment with the acceleration and deceleration ramps set. Verify that the maximum speed is reached, eventually retouch maximum calibration with the P3 trimmer (MAXIMUM REVS.). Be careful not to exceed the maximum adjustment as this would send the motor into overabsorption,

even if loadless. If this phenomenon is noted in correspondence with maximum speed adjustment, adjust the P3 trimmer in an anticlockwise direction until the motor absorption reaches the same value measured at an **intermediate speed**. If a minimum speed different from the standard is to be set (zero revs.) adjust the P6 trimmer (MINIMUM REVS.). Verify that the absorption, in continuous duty, is balanced in all three phases and does not exceed the motor plate data. Keep in mind that the motor can only turn after 0.3 seconds has passed from the moment when the card is supplied. This reset time is necessary to guarantee correct restarting in acceleration ramp each time supply is given, therefore if frequent running and stopping of the motor is necessary it is advisable to always keep the card supplied and to statically control the motor with the stop in ramp or running contacts.
If great precision while controlling the speed is necessary, micros S6 and 7 can be opened. In this case the speed variation from empty to loaded will be minimal, and the motor will be able to give nominal couple even at very low revs. (2-3 revs./min). The reply times of the speed control will, however, be slightly delayed.

**TROUBLESHOOTING**

1) The motor does not respect the set speed at departure, it rotates at the maximum number of revs.. The L3 pilot light is unlit and after approx. 8 seconds pilot light L4 lights up to signal emergency intervention.
   **Possible causes:** the tachometrical dynamo signal is not reaching terminals 1 and 2. Check dynamo connections up to the motor service terminal board and if necessary the dynamo itself. Remove the fan cover and the ventilator for access.
2) The motor does not respect the set speed at departure, it rotates at the maximum number of revs.. The L3 pilot light is lit and after approx. 8 seconds pilot light L4 lights up to signal emergency intervention. The card is pre-set without the dynamo rectifying circuit, with micro S4 closed and S5 open.
   **Possible causes:** the tachometrical dynamo signal is reaching terminals 1 and 2 with incorrect polarity. Exchange the two signal wires.
3) The motor does not reach the maximum speed at departure, it rotates at very low revs. or remains still, and after approx. 8 seconds pilot light L4 lights up to signal emergency intervention.
   **Possible causes:**
   a) if the motor absorbs a current which is approximately the double of the nominal current in a balanced way at all three phases, there is a mechanical block or a load superior to the motor capacity. Verify the mechanical transmission.
   b) If the motor absorbs in an unbalanced way at the three phases verify if:
      - all the phases at terminals R1 S1 and T1 are present
      - all the phases in the connection between terminals of the card U1 V1 W1 and the motor are present
      - one of the 3 0.5A control protecting fuses has been interrupted. To reach the fuses housed in the lower card which goes to the power terminal board, it is necessary to: remove the cable shoe terminal boards, remove the silk screened cover, unscrew the support columns of the cover and delicately overturn the upper card which carries the command terminal board (fuses F1 F2 F3 are near the adjusters see page 11).
4) The motor rotates in an irregular manner and continues to oscillate.
   **Possible causes:**
   a) mechanical transmission with elastic play or transmission belts: adjust the P8 trimmer (STABIITY) in a clockwise direction until the control is stabilised. If this is not enough, remove the silk-screened cover, adjust the P6 trimmer in a clockwise direction and close micro S7.
   b) The tachometrical dynamo is worn out after many working hours or has been ruined by bad motor assembly.

**STANDARD SETTINGS**

The code 390S card comes out of the Rowan laboratories tested and set as follows:

- Supply set for a supply range of 330VAC÷500VAC
- 3 wire turn adjustment potentiometer connection - S1 open
- Ramp range – minimum 0.02 sec. - maximum 2 sec. - S2 open
- 4-pole motor – S3 closed
- Polarity rectifier on – S5 closed – S4 open
- DC braking off – S10 closed / Couple limitation off - S9 open – the remaining micros: S7 open, S6-S8-S11-S12 closed.

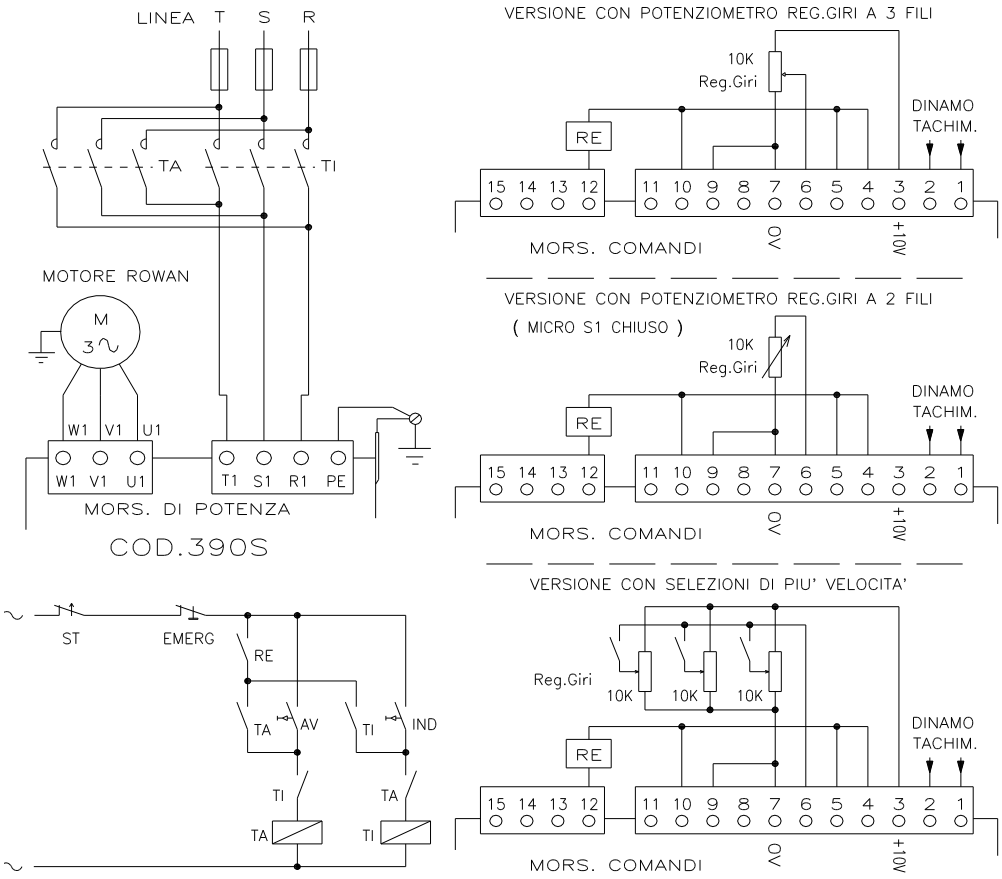
**STANDARD CALIBRATION**

Minimum speed 0 rpm
Maximum speed 1400 rpm
Acceleration/deceleration ramps 2 seconds

## APPLICATION DIAGRAMS

***Connection diagram nr. 1***

### SPEED CONTROL IN BOTH ROTATIONAL WAYS WITH POTENTIOMETER

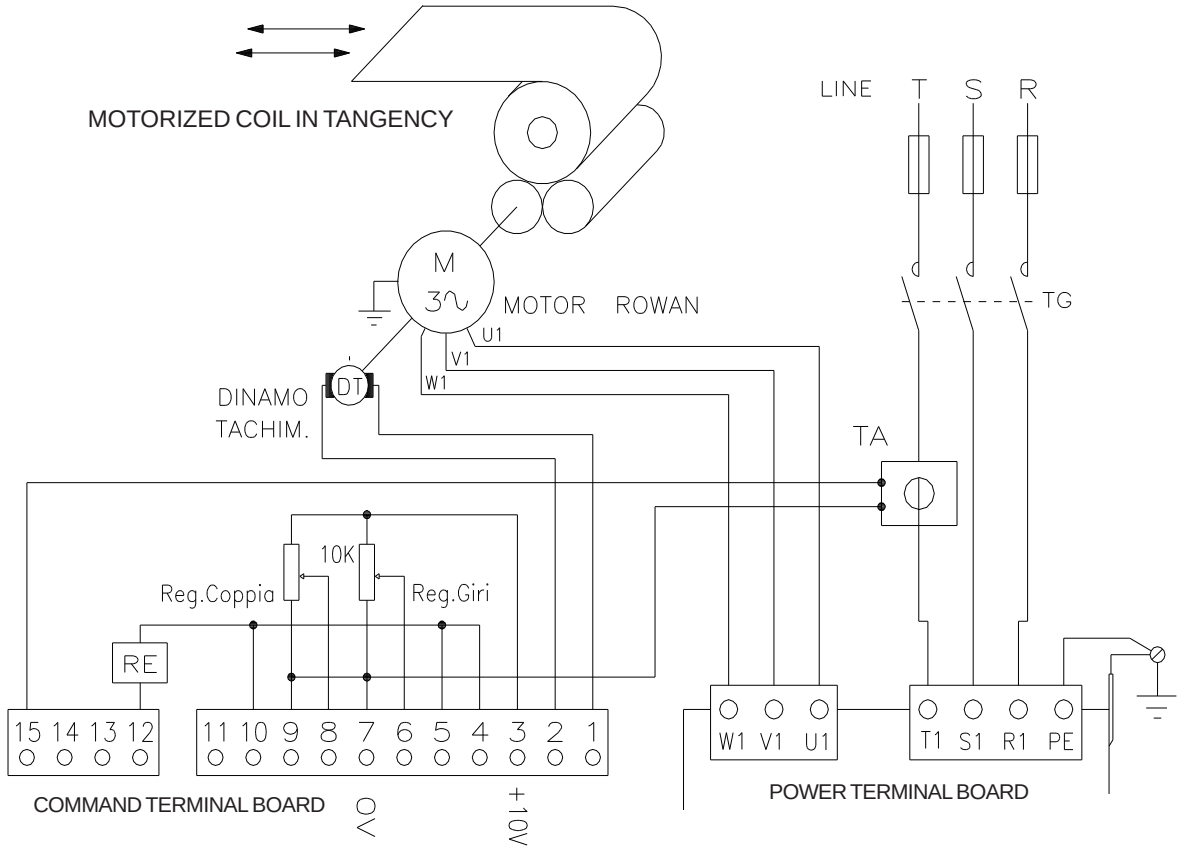



This type of operation foresees speed adjustment using an external potentiometer and selection of the rotational sense with the forward run (TA) and backward run (TI) electromagnetic switches.
The optimum resistance of a potentiometer with 3-wire connection is 10Kohm, but it can assume values of between 2K and 100K. In each case the minimum resistance applied to terminals 3 and 7 should not be less than 2Kohm (keep this in mind if several potentiometers are used in parallel for speed switchover or to supply other potentiometers like those in couple limitation). In the case of adjustment with 2-wire potentiometer, it can only be of 10Kohm. If speed adjustment is carried out by an external 3-wire potentiometer and with the potentiometer cursor towards terminal 7 (0V), the motor remains motionless. With the cursor towards terminal 3 (+10VDC), the motor revs. at the maximum speed set.
The emergency group with opening contacts includes: the current circuit breaker (TR) calibrated at 15% above the nominal current of the motor – the circuit breaker sensor (ST) which reveals the temperature of the windings – the emergency relay (RE).
The relay (RE) is normally active when the card is supplied and deactivates, together with the lighting up of pilot L4, in case of irregularities due to: overload, lack of linear and motor phase, absence of tachometrical dynamo and inverted tachometric polarity if the internal precision rectifying device is not used. When the RE drops, the electromagnetic switch which supplies the card immediately disconnects. If the RE relay is not used for electromechanical detachment of the supply to the card in a block situation, the lighting up of the L4 EMERGENCY pilot immediately blocks the motor with self-maintaining functions from running. It can only be unblocked by removing supply from the card.

**FOR THIS DIAGRAM THE MICROS ARE SET AS FOLLOWS:**
**S1 Open** (turn adjustment with 3 wire potentiometer) / S1 closed (turn adjustment with 2 wire potentiometer)
**S2 Choose** the acceleration and deceleration ramp range (open 0.02 sec. – 2 sec. / closed 0.25 sec. – 25 sec.)
**S3 Open** if a 2-pole motor is being used / **S3 Closed** if a 4 – 6-pole motor is being used.
With 6-pole motors, the maximum speed should be recalibrated using the P3 trimmer
With the turn adjustment potentiometer at maximum, adjust P3 in an anticlockwise direction until the tachometrical dynamo measures a continuous voltage of approx. 5.7VDC, which corresponds to a maximum speed of 800r/m.
**S4 Open – S5 Closed** (tachometric rectifier inserted)
**S6 Closed – S7 Open** (proportional gain with maximum error 15 r/m)
**S8 Closed – S9 Open** (torque limitation closed)
**S10 Open** (dc braking inserted) / **S11 Open** (inputs for PNP logic) / **S12 Closed** (speed adjustment from potentiometer)

***Connection diagram nr. 2***

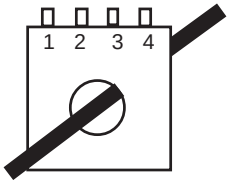
## SPEED / COUPLE CONTROL WITH AMPEROMETRIC FEEDBACK




The diagram shows a usage example of this type of operation: a Rowan motor that tangentially drags a roll to be wound or unwound using adjustable pull.
The maximum speed is established by the turn adjustment potentiometer while the maximum pull is established by the couple adjusting potentiometer, which limits the current of the controlling motor in closed loop with the amperometric transformer (TA). The maximum field of the couple regulating potentiometer can be set using both the P9 MAXIMUM COUPLE trimmer and the way in which the TA is used (outlet connected and number of wire passages).

The card is set to operate with an amperometric transformer of the 151/110 type, with full scale 4VAC/0.2A supplied by Rowan Elettronica. TA characteristics 151/110 with ONE WIRE PASSAGE:

Outlet 1-2 = maximum output 25A
Outlet 1-3 = maximum output 50A
Outlet 1-4 = maximum output 100A



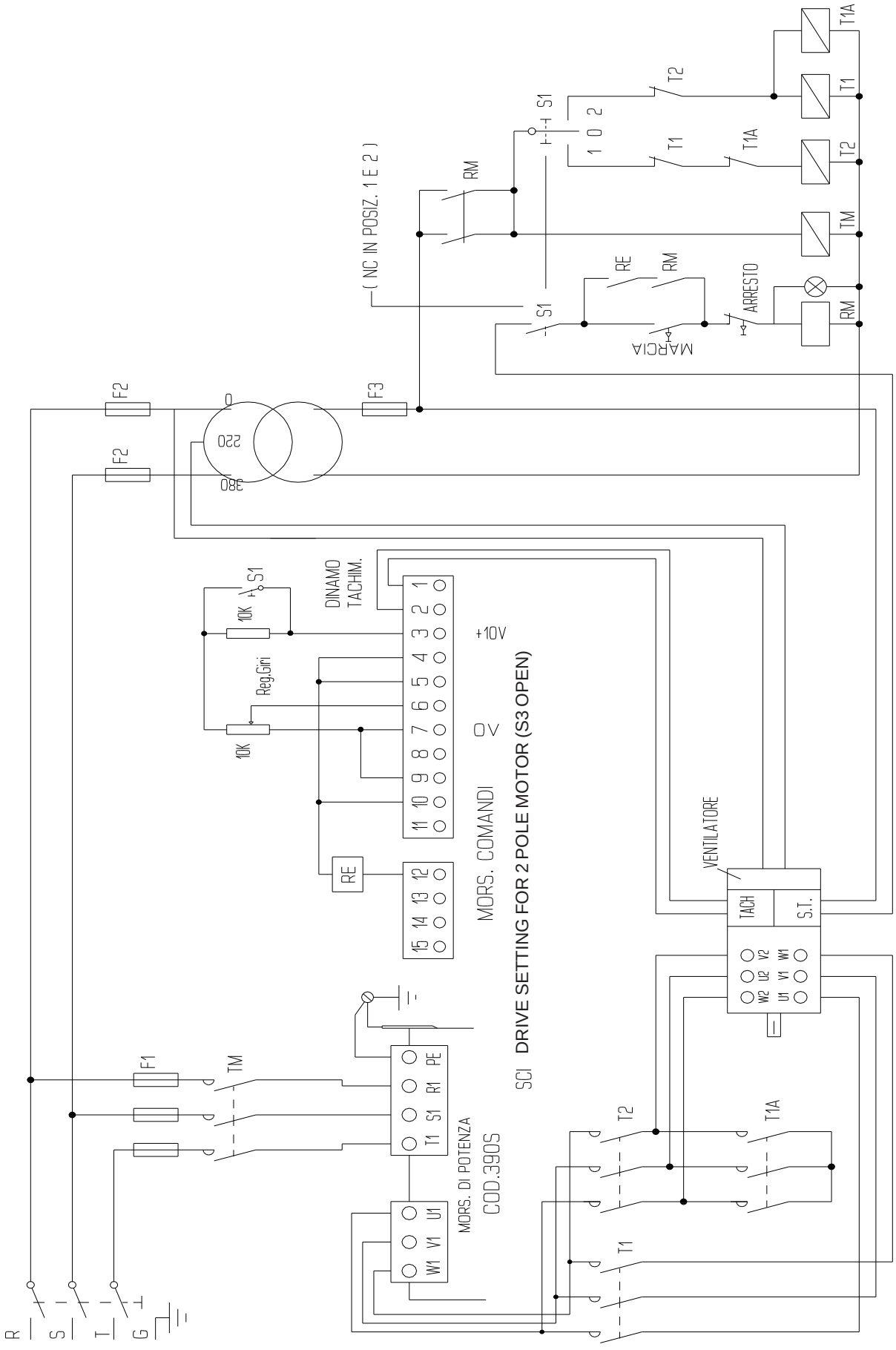

Note: the tachometric rectifier should be excluded (S4 closed – S5 open).

The maximum capacity of the various outlets can be divided by the number of wire passages: for example, if the 1-2 outlet is used and 5 wire passages are carried out inside the TA, the maximum output will be for a current of 5A: choose the TA outlets and the wire passages according to the nominal current of the Rowan motor applied.
This operation can be integrated by automatic systems with external apparatus of the PLC type, or a Rowan code 274 servodiameter instrument (as in the case of winder/unwinder with adjustable pull and motor in axis to the roll). With a 0 / +10VDC signal, this apparatus can supply the maximum speed signal to terminals 13-14 (0V) and the maximum couple signal to terminals 11 – 7 (0V), in place of manual adjustment with potentiometers.

**WARNING**: keep in mind that while operating with blocked rotor the maximum current of the Rowan motor in continuous duty must be at least 20% lower than the nominal current.

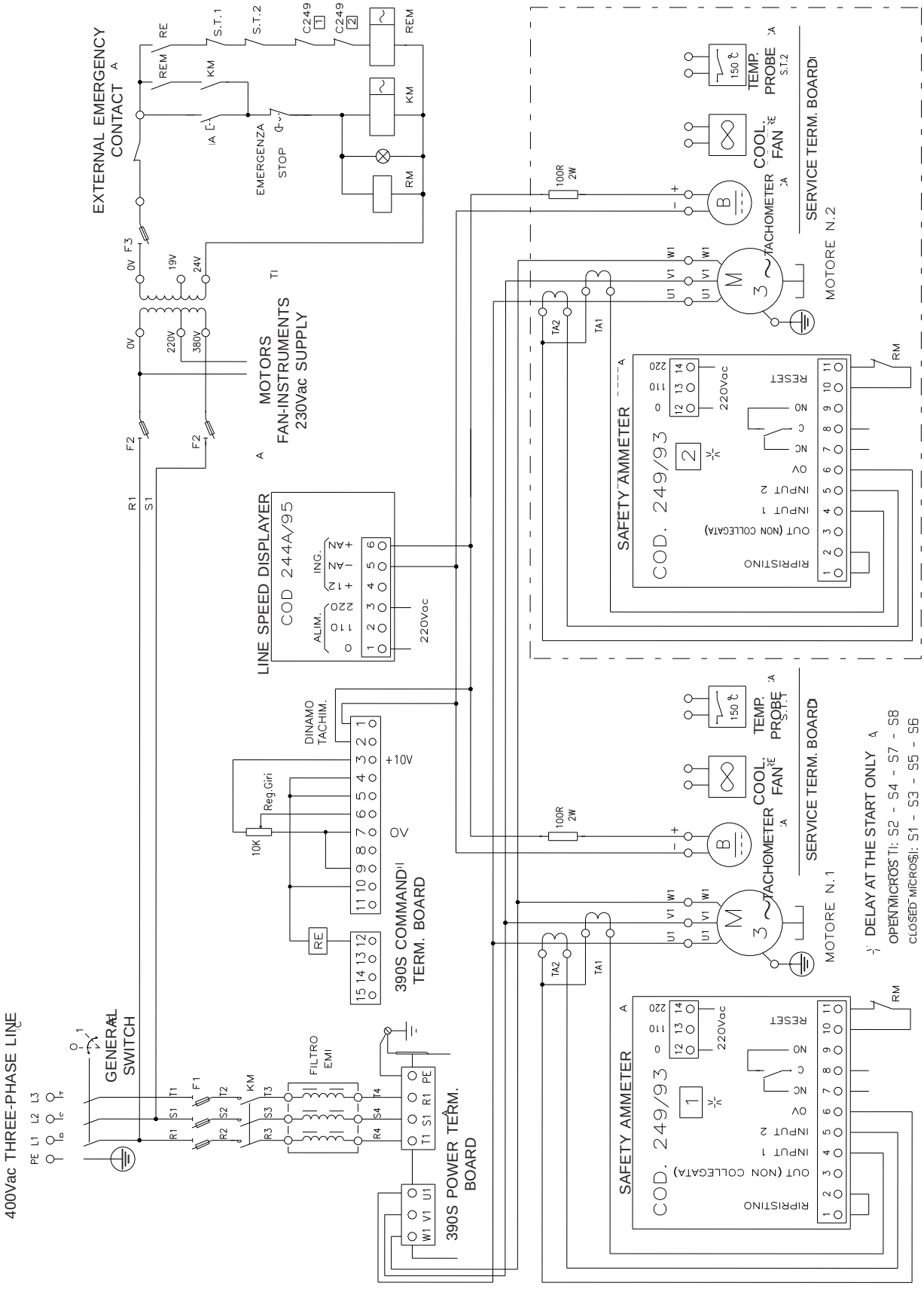
*Connection diagram nr. 3*

## CODE 390S CONNECTION WITH DOUBLE SPEED MOTOR



***Connection diagram nr. 4***
**AUTOMATION FOR CONVEYOR LINES WITH CONNECTION OF TWO (OR MORE) MOTORS IN PARALLEL**

In case of several motors, the part inside the dotted line should be increased for each additional unit, and the power of the Code 390S drive should be suited.

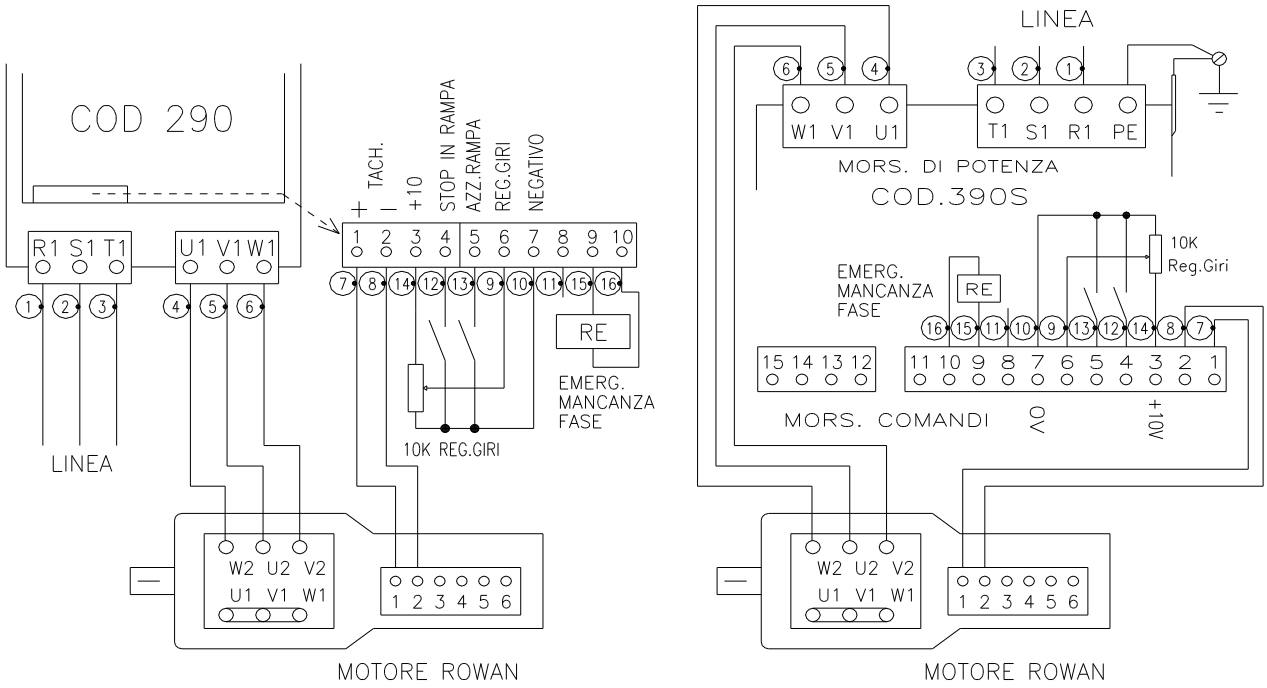


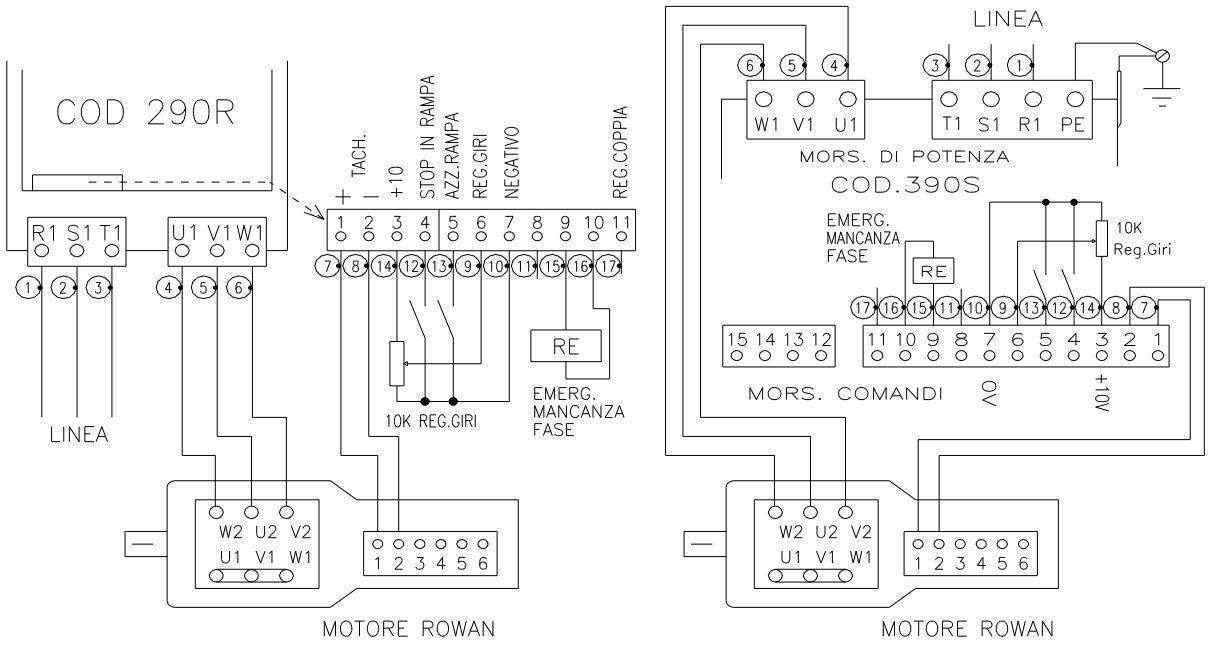
**INSTRUCTIONS AND DIAGRAMS FOR THE REPLACEMENT OF THE CODES 290 AND 290R CARDS WITH THE CODE 390S CARD**

To correctly replace the codes 290 and 290R cards with the 390S type card, follow the circled numbers shown in the diagrams below. As can be seen, the cards are interchangeable even if the terminal boards are dislocated. The terminals R1 S1 T1 and U1 V1 W1 are common to both power terminal boards, as is the numbering of the service terminal board up to number 11.
If terminal 11 (motor current adjustment) is connected in the replacement 390S card, it is necessary to connect the amperometric transformer to terminals 7 – 15, open micro S8, close micro S9 and follow the instructions given on page 14 regarding connection diagram nr. 2.

In both cases, set the micros on the code 390S card as follows:
**S5 – S6 – S8 – S10 – S11 – S12** Closed
**S1 – S4 – S7 – S9** Open
**S2 – S3** See instructions

**DIAGRAM SHOWING HOW TO REPLACE A CODE 290 CARD**



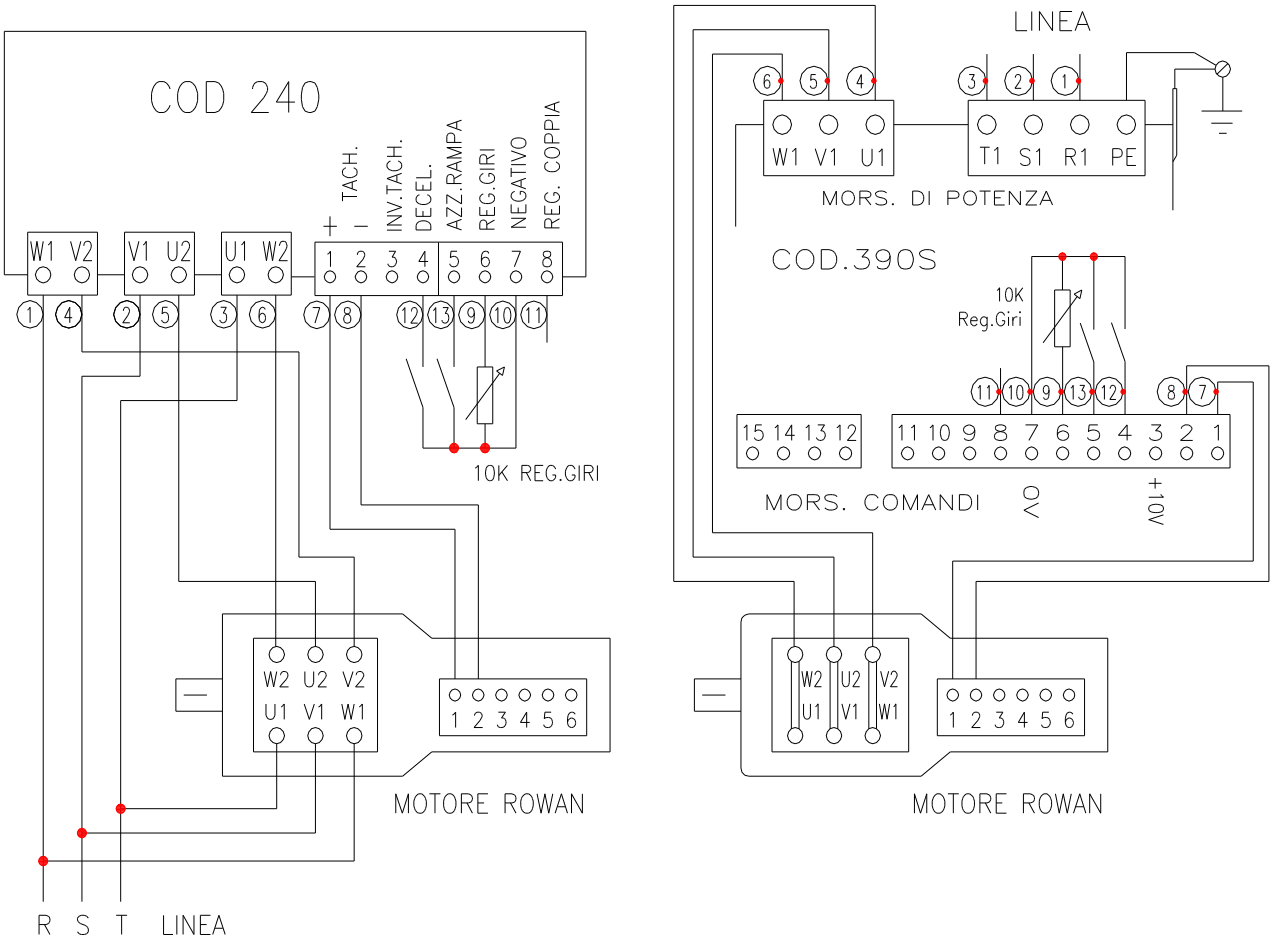



**INSTRUCTIONS AND DIAGRAMS FOR THE REPLACEMENT OF THE CODE 240 CARD WITH THE CODE 390S CARD**

When installing the code 390S in the place of the code 240, the **tachometric inversion contact is eliminated**. The rest of the terminal board numbered from 1 to 8 is perfectly compatible and the connections do not need to be moved as shown by the circled numbers in the diagram below.
Follow the same indication for the power connections.
The supply line (W1-V1-U1 code 240) is moved to terminals R1-S1-T1 of the code 390, and the motor outputs (V2-U2-W2 code 240) should be moved to terminals U1-V1-W1 of the code 390. The 3 wires (U1-V1-W1) of the code 240 that first went to the motors should be removed and the motor should be delta connected.
If terminal 8 for motor couple limitation on card 240 is connected, close the S9 micro on card 390S.

Set the micros on the code 390S card as follows:
**S1 – S5 – S6 – S8 – S10 – S11 – S12** Closed
**S4 – S7 – S9** Open
**S2 – S3** see instructions

**DIAGRAM SHOWING HOW TO REPLACE A CODE 240 CARD**



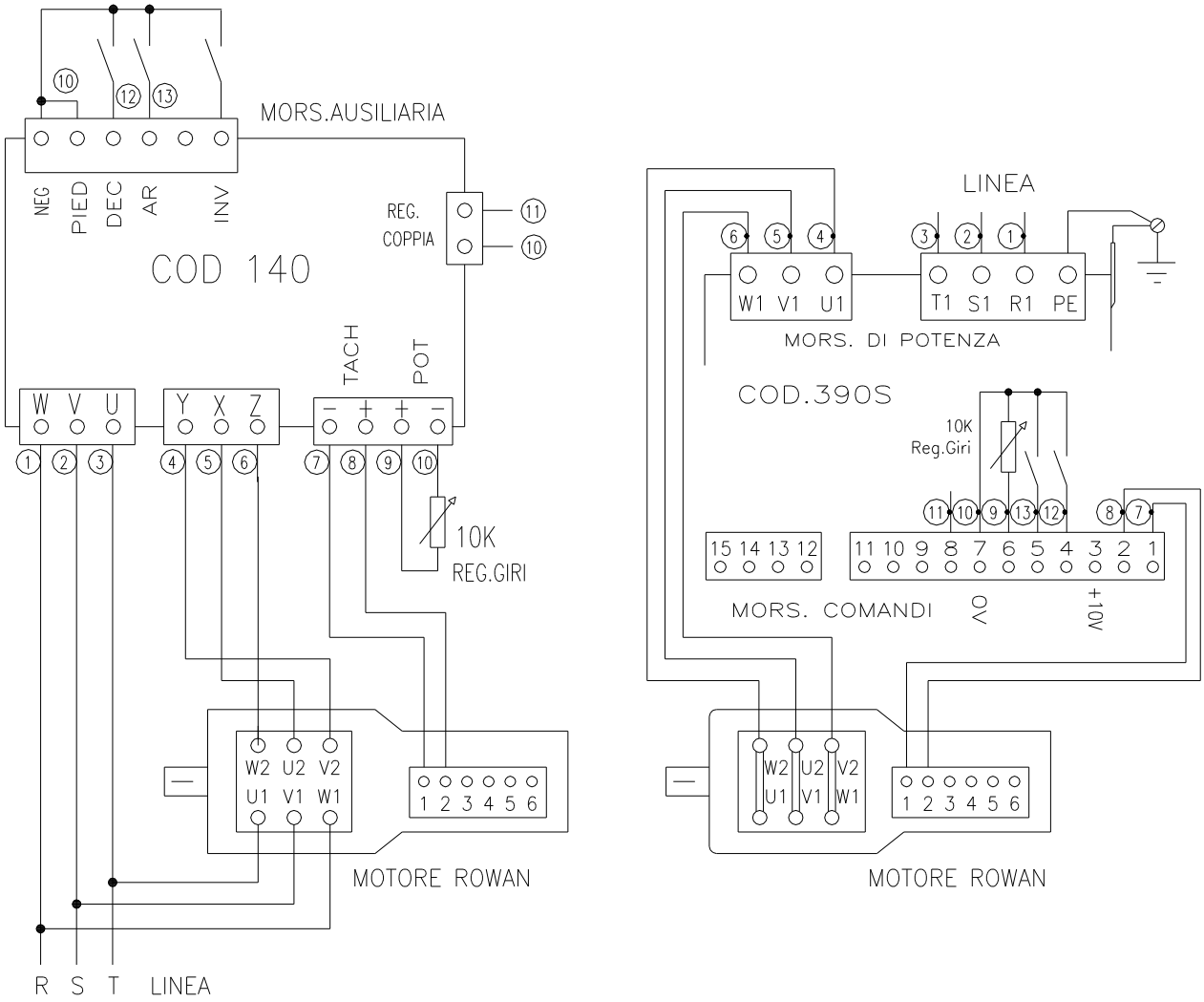
**INSTRUCTIONS AND DIAGRAMS FOR THE REPLACEMENT OF THE CODE 140 CARD WITH THE CODE 390S CARD**

When installing the code 390S in the place of the code 140, the tachometric inversion contact is eliminated.
The ramp zeroing contact (AR), if used, should be moved to terminal 5 of the code 390S, the positive of the turn adjustment potentiometer (P+) should be moved to terminal 6 of the code 390, and the negative of the auxiliary terminal board should be connected to terminal 7 of the code 390S. The deceleration contact (DEC) should be moved to terminal 4 of the code 390S, the positive of the code 140 couple adjustment terminal should be moved to terminal 8 of the code 390S (in this case micro S9 should be closed on the 390S card), and the negative moved to terminal 7.
The connection exchange is highlighted by the circled numbers in the diagrams below – follow these numbers for power connections also.
The supply line (U V W on the code 140) should be moved to terminals R1 – S1 – T1 of the code 390S. The outputs for the motor (Z X Y for the code 140) should be moved to terminals U1 – V1 – W1 of the code 390S. The three wires (U V W) which previously went to the motor should be removed and the motor should be delta connected.

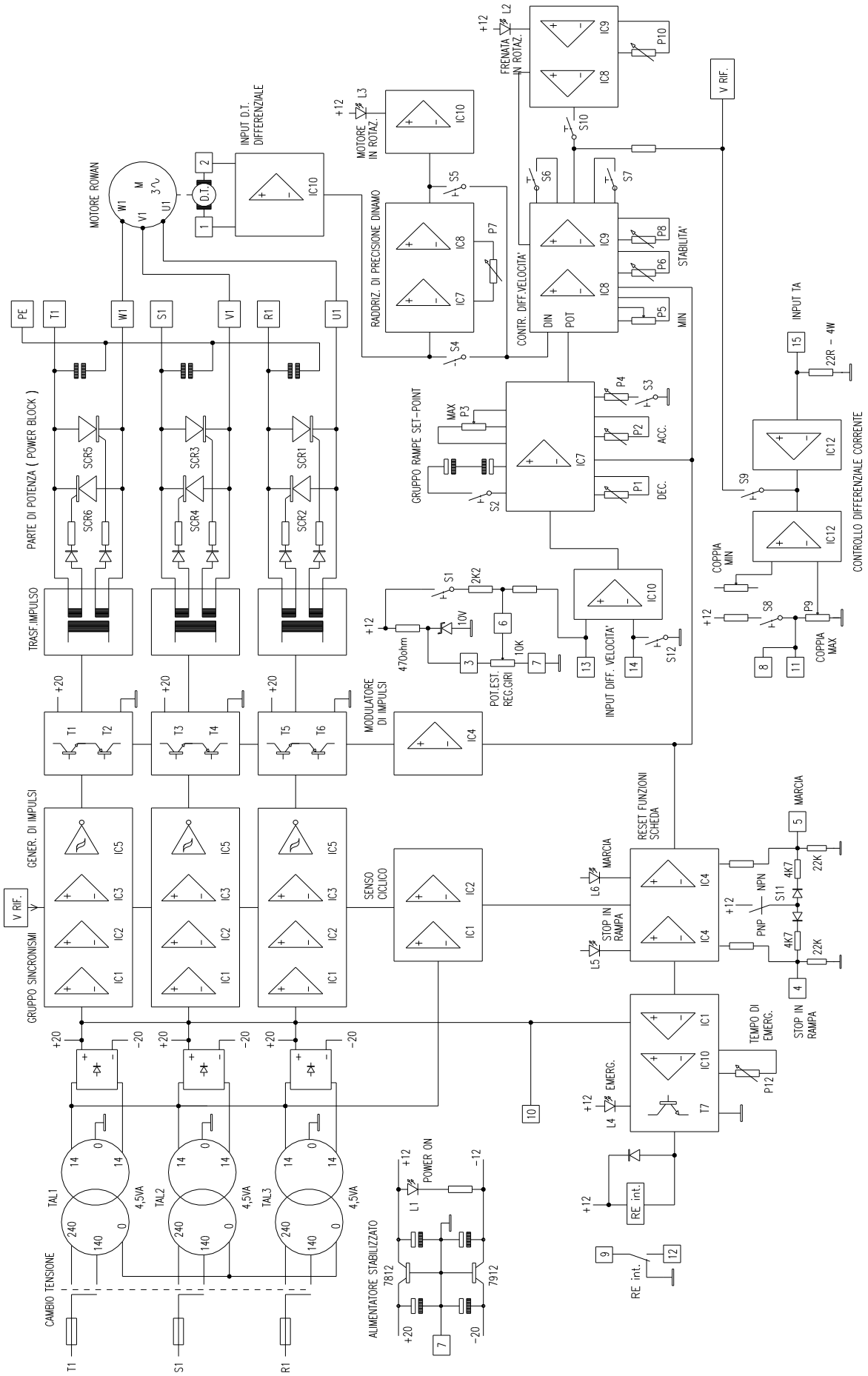
Set the micros on the code 390S card as follows:

| | |
|---|---|
| **S1 – S5 – S6 – S8 – S10 – S11 – S12** | Closed |
| **S4 – S7 – S9** | Open |
| **S2 – S3** | see instructions |

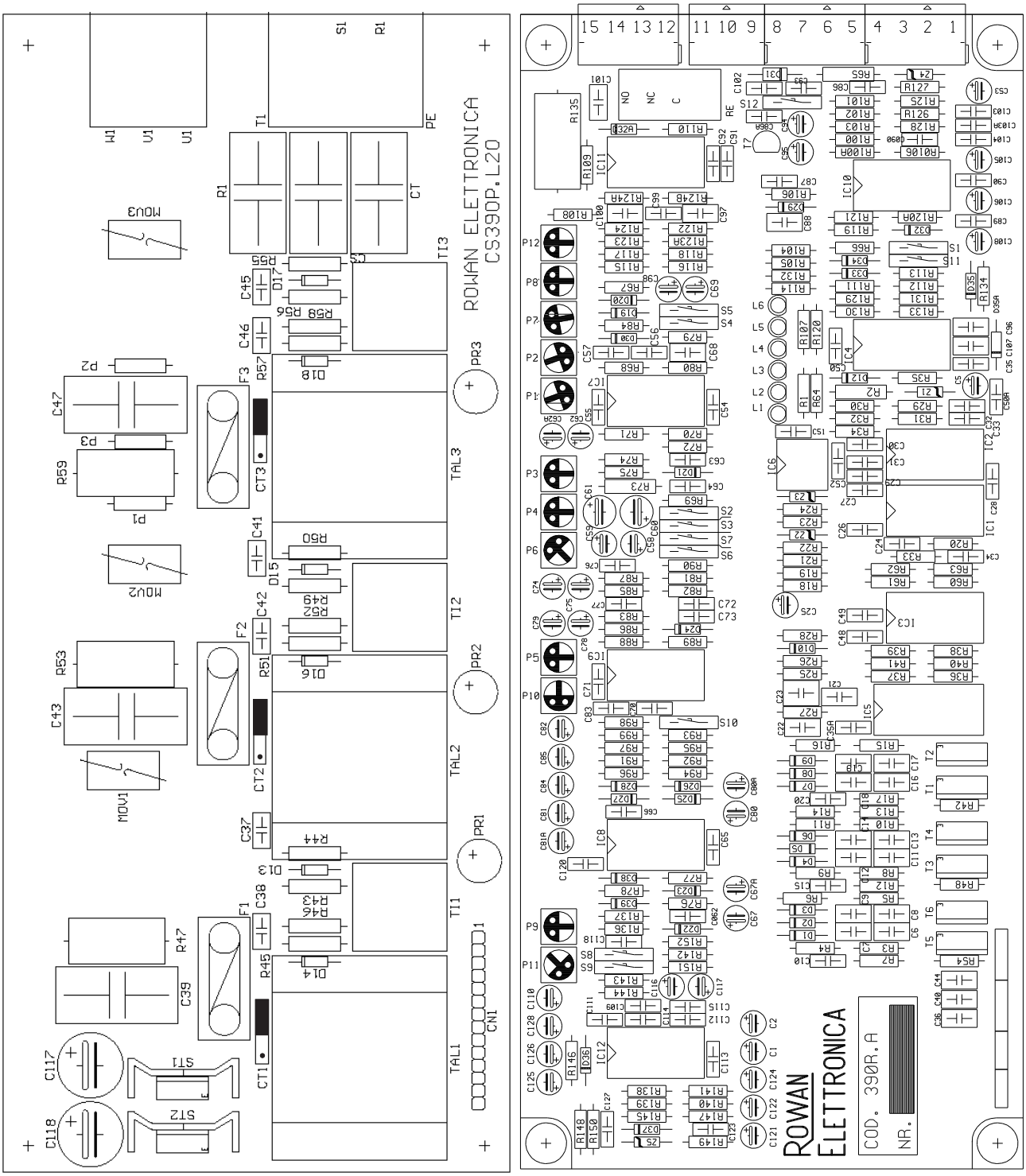
**DIAGRAM SHOWING HOW TO REPLACE A CODE 140 CARD**



## BLOCK DIAGRAM



## COMPONENT SERIGRAPHY



## MAINTENANCE INSTRUCTIONS FOR THE ROWAN S SERIES MOTORS (HIGH SPEED TYPE)

The "ROWAN" S series motors, which have been designed to be piloted by voltage regulators with tachometrical feedback are particularly adapted, because of their intrinsic characteristics, to withstand repetitive power peaks and harsh braking. Being brushless, their maintenance is reduced to a minimum and regards in particular the replacement of their **bearings** and the **tachometrical dynamo** which occurs, however, after at least 5000 hours of operation.

### Bearing and tachometrical dynamo replacement

Whenever it is necessary to disassemble the motor in order to replace the bearings, proceed in the following way:
1- remove the screws over the back vent shield or the cochlea fan and slide it off having first disconnected the wires from the service connector;
2- remove the tachometrical dynamo;
3- slide the tie-rods out and remove the back shield;
4- slide out the front shield which comes out followed by the rotor - which it blocks;
5- whenever the front bearing need removing, remove the dust guard screws and remove the segger ring (if present) from the axle;
6- slide the axle out from the bearing;
7- remove the segger ring (if present) that holds the bearing to the shield;
8- slide out the bearing and substitute it with one of similar type - Z C3 version, lubricated version with high temperature resistant grease;
9- the back bearing must be type 2RS C3.
If necessary, replace the tachometrical dynamo when re-putting together the motor.

### Brake maintenance

The brake and brake parts need frequent inspection. The wearing out of the brake depends on many factors, mainly on the inertial force of the load, the motor speed and the frequency of interventions. It is essential to replace the disc after a material consumption equal to 3mm.
Make sure that after inspection the air gap is correctly regulated. The brake inspection operations must be carried out with the brake electrically disconnected after checking the ground connection.
A good brake operation can be guaranteed only if original components, supplied by our firm, are used. For more detailed information contact the technical department at Rowan Elettronica.

**N.B. When the air gap reaches a value equal to 0,7 mm it is necessary to bring such value to 0,2 mm**

### Spring brake or direct brake air gap regulation

If a **spring brake** is mounted and it needs an air gap regulation, proceed in the following way:

1- remove the connection bolts between the motor and the brake holder bell-shaped case;
2- slide the bell-shaped case out of the axle together with its brake;
3- remove the screws that secure the brake to the bell-shaped case,
4- slide the brake cable out of the terminal block;
5- slide the brake itself out of the bell-shaped case.

At this point it is possible to proceed with the regulation by turning the 3 bolts to obtain an air gap between 0,2 e 0,3mm.
If the brake is provided with anti-dust ring, remove it in order to access the regulating bolts.
The spring brake is provided with the maximum braking couple, which may be reduced unscrewing the special nut, up to a maximum of 40%, making sure that it is not unscrewed until it leaves its seat.

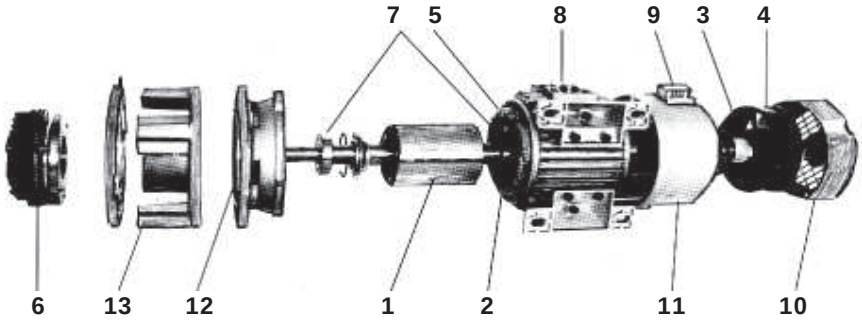
If a **direct brake** is mounted, it is not necessary to dismount it, just check the air gap (maximum 0,3 mm) with a thickness gage through the side slots, and regulate by loosening the fixing grain on the brake holder hub if needed.

# HIGH SPEED ROWAN MOTOR PART LIST

ROWAN MOTORS WORK CORRECTLY AT TEMPERATURES BETWEEN -15°C E +40°C; HIGHER TEMPERATURES CAN CAUSE FUNCTIONING ANOMALIES, AND, IF VERY HIGH, BREAKAGES. IT IS WISE, THEREFORE, TO LOCATE THEM FAR FROM HEAT SOURCES AND GIVE THEM A MINIMUM AIR FLOW.

## OLD ROUND-CAGE MOTORS

1 FRONT SHIELD
2 Front and Rear bearings
3 Seeger ring
4 Conic Deflecter
5 Motor shaft
6 Massive Rotor
7 Stator frame
8 Power terminal board
9 Feet for B3 or B3/B5 versions
10 Temperature probe internal of winding
11 Compensator ring
12 Rear ring
13 Service terminal board
14 Dynamo (tachometer)
15 Indipendent fan
16 Fan cover
17 Electromagnetic brake
18 Flanged disk for brake bearing bell
19 Brake bearing bell
20 Rear spacer
21 Coupling




## ACTUAL SQUARE-CAGE MOTORS

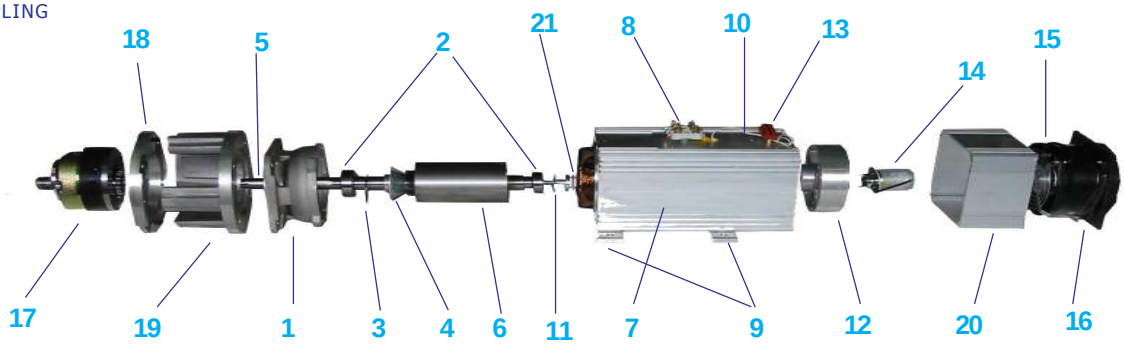
1 FRONT SHIELD (aluminium),
which can be supplied in the following versions
- FLANGED for B5, B3/B5 motors or with auxiliary electromagnetic brake motors;
- FOOTED for B3 and B3/B5 motors.

2 FRONT AND REAR BEARING in C32RS.
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 cover.
9 FEET for B3 or B3/B5 versions.
10 TEMPERATURE SENSOR INSIDE WINDINGS
11 COMPENSATOR RING
12 AREAR RING for rear bearing housing.
13 SERVICE TERMINAL BOARD for tachometer generator, ventilatorand thermic sensor connection.
14 TACHOMETER GENERATOR TYPE 24VDC/2800rpm, 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 VENTILATION, for motor cooling, of 2 possible types: Axial and Scroll
16 VENTILATION COVERING for axial fans; not present on motors with scroll fans 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 (19) only on motors Mec 90, 100, 112 and 112L.
19 BRAKE BEARING BELL (aluminium)
20 REAR SPACER
21 COUPLING



EMC
CE
CONFORMITY


**Rowan Elettronica**

*Motori, azionamenti, accessori e servizi per l'automazione*

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