Rowan Elettronica

Motors, Actuators, Accessories and Services for Automation

UNI EN ISO 9001:2000

400 SERIES INVERTERS

and

VECTOR MOTORS

CATALOGUE

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UNI EN ISO 9001:2000

Caution !

Use of the equipment in any other way than specifically described in the user manuals is strictly forbidden.
ROWAN ELETTRONICA Srl shall not be held responsible for any imprecisions in this catalogue caused by copy and/or printing errors.
Changes for product improvements can be made without notice.
The data and characteristics provided in this catalogue have a maximum tollerance of ±10%.
Rowan Elettronica Srl product warranty is valid for 12 months and ex works.
Electrical equipment can create hazardous situations for persons and objects. The user shall be held responsible for the installation of any equipment and conformity of said installation to statutory requirements.

Rowan Elettronica S.r.l.

THE COMPANY

Rowan Elettronica S.r.l. was established in the Seventies to manufacture variable speed motors and actuators based on proprietory patents. It has progressively developed and consolidated its standing thanks to the quality and reliability of its products and the high professionality and experience of its consultancy and assistence services, growing from its first factory of 200m² in Cresole di Caldogno (VI) to its current 3,000m², which includes the manufacturing base and after sales assistance centre. Rowan Elettronica has a highly specialised technical staff who offer their tried and tested experience in the following departments:

- the **Electronics Research Laboratory,** which studies and creates new technological solutions, equipped with anechoic chamber and all necessary instrumentation for measuring and testing electromagnetic compatibility;
- the **Technical Office**, which produces the printed circuit board masters and electrical wiring diagrams using cutting edge IT instruments and a high level of professionalism and know-how;
- the **Quality Management Department**, responsible for the co-ordination of all activities concerning the Rowan Elettronica Quality System and supervision of the quality controls on all products entering and leaving the company;
- the **Mechanical Prototyping Department** studies and creates new mechanical solutions and versions of non-standard motors;
- the **Production Departments - *AC Actuators - Inverters - Instruments/Interfaces/DC actuators - Motors***, which assemble and test all standard products;
- the **Automation Department,** where appliances equipment and switchboards recieve a high portion of standard Rowan products and thereby offering the possibility to verify every detail in the application of Rowan components, particularly in their installation and improvement;
- the **Technical Assistance/Consultancy Department,** widely appreciated for its disponibilità and puntualità (on average staff dedicate approx 8 hours a day on telephone consulenza/assistance).

In addition to the technical departments, Rowan Electronica has an efficient support organisation with **Administration-Accounts**, **Sales Office**, **Order Admin Office and Buying Office.**

THE PRODUCTION

- single and three phase high speed AC motors and related one or two-way actuators for speed and/or torque control.
- three phase AC motors for inverters.
- Vector inverters and related motors.
- Inverters for three phase asynchronous motors.
- Single axis control instruments for electric axis, loading in motion, cutting in motion and positioner functions.
- Soft starters for three phase asynchronous motors.
- Speed regolators for three and single phase commercial fan motors both indipendent or multiple.
- Three and single phase voltage regulators for resistive and inductive loads for DC power units.
- Voltmeters/ammeters with displays for readings and set thresholds by on/off or PI outputs.
- Interface boards for signal converting, for setting proportional speeds between several motors, for converting signals from temperature probes, sensors, loading cells.
- Accessories for industrial automation such as safety devices, boards for ramp generating, thermoregulators, photoelectric bars, battery chargers and servo-diameter instruments.

QUALITY

*Rowan Elettronica has received certification for its **Quality System** according to UNI-EN ISO9001:2000, keeping in line with the increasing demand to univocally guarantee quality levels in implementing company procedures .*

With regards to Rowan product quality, this is a list of the main company control procedures:

- **Quality control of goods on arrival** carried out by specialist staff who strictly fulfill the procedures and test methods established for each single type of component, a continous thread of information is maintained with suppliers on material conformity and the possibility of improving aspects of performance and reliability.
- **Quality control on products on dispatch:** every product is individually tested according to specific procedures. On completion of the test each article is given a serial number that guarantees its traceability and identification at any time.

For example in **electronic products** sector the test procedure prescribes:
HEATING CYCLE to verify the efficiency of the components mounted on the boards at the temperature range defined for their functions.
SPECIAL RESIN TREATMENT FOR BOARDS to prevent any malfunctions caused by humidity in the switchboards within the statutory limits.
VIBRATION TEST to verify that the components are correctly and solidly anchored in place at worse conditions that quelle normalmente accepted for the construction of quadri elettrici.
GENERAL BOARD TEST CYCLE in real operating conditions. As each board enters the production line, it is assigned a test manual containing the procedures that are then rigorously and integrally carried out by the assigned technical staff. The test manual, among other important indications, also specifies the auxiliary equipment required for the test (which also undergo periodical controls and calibrations), the step by step sequence of tests and the standard setup.
For the **motors** the test procedure includes:
VERIFICATION OF RESISTENCE, IMPEDENCE, INSULATION (2000V).
VERIFICATION OF CHARACTERISTICS in no load operating conditions: this step tests characteristics such as absorption and noise levels and functionality of any other related components such as tachymetric dynamo, brake, encoder, fan, etc.

AN INTRODUCTON to the 400 SERIES INVERTERS

GENERAL CHARACTERISTICS

The inverters in the 400 series are frequency converters designed to control the speed and torque of three phase asynchronous motors in general and especially the ROWAN G SERIES VECTOR MOTORS. They are the natural evolution of the tried and tested 330 series and the result of years' experience in applications covering all sectors of automation.
The same drive can use 2 types of motor control:
S/F scalar and Vectorial FOC.

S/F scalar:
An open-loop control for standard asynchronous motors offering excellent performance especially in locked rotor start-ups thanks to its HIGH TORQUE function.

Vectorial FOC:
Encoder based closed-loop control based on FOC technology. The vectorial control provides excellent precision in controlling speed and thrust dynamics that is greatly appreciated in positioning systems. The fluidity of the torque control also makes 400 inverter + ROWAN VECTOR motors combinations the ideal soluzione in wind/unwinding systems.
The control is optimised for the managements of ROWAN G SERIES VECTOR MOTORS, however is is capable of managing any other asynchronous motor fitted with LINE DRIVER encoder.

APPLICATIONS

Even in the 400 series, Rowan Elettronica has followed the road towards integration of inverter applications that simplify installations even with complex functions.

In accordance with the integrated application, the following 400 inverters are available:
400S Inverters
Inverters with SPEED application; the inverter with only the basic speed/torque control functionality.
400A Inverters
Inverter with SPEED and AXIS applications; the AXIS application offers positioning and electric axis functions.
Inverters 400R
Inverter SPEED and REGULATOR applications; the 'REGULATOR application offers several functions applied to the P/I regulator in managing for example compressors, cutting machinery for marble, wood, etc.

On request customer-specific versions can be supplied for ***CUSTOM*** applications

FIELD BUS

All the inverters in the 400 series have an RS485 serial port; the MODBUS RTU serial protocol is used as standard with a frequency range of 1200 to 115200 baudrate.

PARAMETER TRANSFER

On request an EEPROM KEY is available (order code **C411S.A**); the key offers the facility to save all the inverter parameters or vice versa transfer parameters from the key to the inverter.

FIELD OF APPLICATION OF THE VECTOR MOTOR

- traslazione and lifting systems involving high cycle rates (loaders/unloaders);
- machine tool positioning;
- spingle axis management with variation fields of 1/2000;
- jog advance systems for presses or other feeds with high cycle rates (up to 0.1 seconds for positioning on a 100mm stroke);
- wind/unwind systems with high diameter variation fields.
- extruders - drawbenches - presse eccentriche.
- Marble cutting machinery;
- Lifting systems (lifts/overhead cranes)

COMPARISON OF THE CHARACTERISTICS OF DIFFERENT SPEED CONTROL SYSTEMS

The present state of the art the market offers many speed control solutions, all differing in performance and price. Here is a list of the some, with their pro's and con's:

Satellite, chain, pulley and expansion type mechanical variators
Pro"s: low cost and torque increase up to 3 times nominal with speed reduction.
Con's: limited variation field (maximum 1/6), inability to vary the motor settings when stopped, slow variations, slow remote management, costly and imprecise, high mechanical wear requiring frequent maintenance work and no two-way analog signal management.
Hydraulic varitators
Pro's: their heavyduty construction makes them suitable for difficult environments.
Con's: limited variation field, high cost, high noise levels, not suitable for foodstuffs, costly and slow two-way management, low energy efficiency.
Direct current motors
Pro's: good efficiency with high one and two-way performance.
Con's: brush wear, demagnetisation, low protection rating, maintenance and rewinding on at specialist centres, not recommended for foodstuffs.
Inverter for commercial motors
Pro's: low cost and use with standard commercial motors.
Con's: poor dynamic perfomance, limited speed variation field (max 1/15) also due to the self- ventilation of the commercial motor; not usable in torque control and for axis positioning, high repair costs for imported inverter.
Rowan high speed motor and related actuator
Pro's: heavyduty contruction, low cost one/two-way actuator, combined speed/torque control facility, high tolerance range on line voltage, uniform torque operation even with locked rotor, high variation field (1/50), high peak torque (approx 2.5 times nominal torque), medium to high dynamic performance, external braking resistances unnecessary for braking energy dissipation.
Con's: higher temperature in continuous operation under full load, need for timing adjustment to counteract line absorption, larger in size for equivalent power against Rowan vector motors.
Brushless motor and actuator
Pro's: two-way system with very high dynamic performance and compact size.
Con's: high cost, special motor with permanent magnet rotor not repairable unless by manufacturer, demagnetisation with too high peaks. Need for external restistances to dissipate braking energy.
Rowan Vector motor and actuator
Pro's: two-way system with very high dynamic performance, motor with squirrel cage rotor and not permanent magnet, competitive price against brushless and direct current systems, maintenance reduced to a minimum, rewinding possible anywhere, possibility of operating directly powered by the mains line without actuator, line driver encoder easily available on the trade, extensive range of powers (i.e. 0.18 to 70 kW), motor/actuator assembly from one supplier.
Con's: higher cost than Rowan high speed motor/actuator and need for external resistances to dissipate braking energy.

GENERAL CHARACTERISTICS OF THE VARIOUS VERSIONS OF THE C400 SERIES

C400S (Speed)

BASE FUNCTIONS

1- Rapid installation (base parameters);
2- Two built-in parameter memories commutable on work memory for managing alternately two motors with a single inverter or to simply have 2 completely different parameter setups;
3- EEprom memory key on USB type input to upload and download all setup and work parameters;
4- Default parameters reset;
5- Keypad with custom settings for display and setup for direct use as machine terminal;
6- Programmable digital/analog inputs and outputs;
7- Input/output expansion facility by auxiliary board:
- 6 base digital inputs - 8 on auxiliary board
- 3 base relay digital outputs - auxiliary board with 5 static outputs
- 4 analog outputs on base board
- 4 analog inputs on base board - 5 on auxiliary board

8- “Dead time” compensation (low speed);
9- Automatic PWM frequency change with low/high speed;
10- PWM frequency regulation from 500Hz to 20KHz;
11- Two programmable speed thresholds;
12- One programmable current threshold;
13- Flying start function;
14- 10 Fault history with times;
15- Line dip management to limit machine stops;
16- Service alarms display;
17- Electronic overload protection on inverter, motor and braking resistance;
18- Direct current braking;
19- RS485 serial protocol Mod Bus RTU max baudrate 115200 with special write/read buffers allowing to transmit/receive several parameters or variables in a single message (more details are available in the 400TS user manual available on request);
20- Three maximum speed field options;
21- Seven fixed speed options;
22- Three acceleration + three deceleration ramp options,
23- Motor polarity selection;
24- Motor rated voltage setting;
25- Speed test functions;
26- Jog functions;
27- +/-5V +/-10V +15V +24V output voltages for alimentazione comandi and transducer powers;
28- 12V isolated power supply for encoder (+5V by special order).
29- PTC sensor motor overload protection

SCALAR FUNCTION

1- Three different S/F curve settings;
2- HT (High Torque) function + locked shaft start;
3- Restart after fault management;
4- Slip compensation;
5- Maximum current limitation (rapid and slow);

VECTORIAL FUNCTION

This function offers all the scalare functions with extra upgraded functions:
1- Flying start (no delay in acquiring residual speed);
2- Oscillation free torque limitation even at zero rev's;
3- Fluid rotation from 0.8 rpm;
4- Speed/torque control from 4 to 2 quadrants;
5- Max 20ms start/stop activation time;
6- 0 +/- 10V Programmable analog output, proportional to real motor speed ;
7- 0+/-10V Programmable analog output, , proportional to real motor torque ;
8- Programmable threshold on real motor torque.
9- Encoder impulsi/rev setting for 100 to 5000 speed feedback, without breaks in continuity.
10- Max encoder frequency of 125KHz.
11- Encoder fault emergency.

Lift Function for overhead cranes

Lift function in vectorial control:
1- Peak torque from zero rev's with minimum at twice the nominal torque;
2- Brake command sequence management;
3- Encoder overload or fault safety;
4- Automatic selection of maximum frequency on defluxed motors according to load;
5- Restart from stop position without motion transitors;

Lift function with S/F scalar control in HT function:
1- Peak torque from mininum 5Hz by 2.2 times the nominal torque;
2- Brake command sequence management with release commanded by nominal current;
3- Possibile slight softening on brake release;
4- Automatic maximum frequency selection on defluxed motors, depending on load;

C400A (Axis)

ELECTRIC AXIS function

1- Two encoder inputs for master/slave;
2- SLAVE/MASTER ratio setting facility (from 4.00000 to 0.00466) or directly in the resulting product format;
3- Passage from *electric axis - positioner* and vice versa by command from digital input;
4- Encoder impulse quantity setting;
5- Manual timing correction ;
6- Real measurement setting;
7- Zero position search;
8- Selection, by binary logic digital inputs, of 32 ratios/formats pre-set manually or by serial port;

POSITIONER function

1- Objective distance and real distance display settings with 0 to 3 decimal points;
2- Motor encoder or external encoder reference;
3- Relative positioning with or without zero-setting;
4- Absolute positioning ;
5- Ricerca di zero with or without pre-slowdown;
6- Speed change during positioning;
7- Pre-distance output;
8- Piece counter function with stop at program end;
9- Selection, by binary logic digital inputs, of 32 distance positionings, 8 positioning speeds, 8 positioning acc/dec ramps all pre-set by specific parameters all pre-set manually or by serial port;
10- Programmable outputs:
- tolerance positioning
-zero search complete.
-sync error
-piece counter program end
11- JOG commands
12- Distances memorised on shutdown.

C400R (Regulator)

Zero function

Universal regulator in feedback both for vectorial and scalar with:
1- Feedback from 0 /+10V, +/-10V signal, 4-20mA, 0-20mA by programmable analog input;
2- Proportional/integral regulator;
3- Maximum and minimum speeds;
4- NTC or PTC sensor motor overload protection;
5- NTC or PTC temperature display;
6- Regulation direction reversal;
7- Mininum or maximum feedback Alarm/Fault with delay setting.

One function

Specific regulator for compressors, pumps, fridge compartments
1- Operating level setting by 0-10V signal - motion potentiometer - potentiometer - keypad;
2- Retroazione by 0 /+10V, +/-10V, 4-20mA, 0-20mA transducer;
3- Minimum, maximum speed and delay stop setting;
4- Positive and negative regulation setting;
5- Restart Delta pressure/temperature setting;
6- Proportional/integral setting;
7- 3 S/F curve type settings for different loads (e.g. pumps fans , etc.) as already provided in scalar control;
8- Overload start-up;
9- PTC/NTC temperature read/dispay;
10- Overload speed reduction function setting;
11- Speed reduction setting as a function of the oil or motor temperature and stop after pre-set delay if the temperature does not return to range;
12- Active run condition in stand-by with too low temperature;
13- Work hours memory;
14- Oil change hours setting;
15- Keypad customisation.

Two Function

Regulator for managing the advance/reverse of a cutting assembly for marble, wood, metal, etc.

The P/I regulator controls the carriage motor speed to maintain a constant cutting motor current with the following solutions:

A) dedicated inverter for direct control of the cutting motor speed and P/I regulator that commands the external actuator of the carriage movement by means of a programmable analog output.

B) dedicated inverter for direct control of the carriage motor speed by the P/I regulator; the motor current feedback is read (by CT or 0/10V signal) by a programmable analog input.

Salient functions:

1- Cutting motor speed regulation;
2- Jog function for manual traslazione movements;
3- Manual advance/reverse speed regulation with two motion potentiometer type pushbuttons.
4- Automatic regulation (by the same pushbuttons) of cutting motor current;
5- Passage from MANUAL to AUTOMATIC and vice versa maintaining the actual cutting current constant
6- minimum/maximum current alarm settings;
7- Alarm trip delay regulation;

C400G(GEN_AFE)

GENERATER function:

-Suitable for the construction of variable voltage and frequency power units.
-S/F generater with open-loop voltage regulator or closed-loop with backfeed by an external Vac/Vdc converter applied on output, parallel to load.
- S/F generator with open-loop current regulator, or closed-loop with current feedbackby internal reference or by external Iac/Vdc current/voltage converter applied in series to load used.
-Types of power output available: Three phase, Single phase or Triple Single phase.
-Types of modulated output wave form: Sine, Sinusoidale+third harmonic or Square.
-Output frequency range : 1.0 to 800.0 Hz
-PWM commutation frequency range: 0.5 to 30KHz.(max limit depends on size).
-Special single phase modulated square wave function up to 2500 Hz.
-Selezione di 4 different modulated output frequencies selezionabili by digital inputs.
-Output voltage or current regulation by analog inputs or directly on keypad/display.
-Soft-start with programmable voltage ramp.

AFE REGENERATOR function:

-Suitable for the construction of electric power units and recovery with direct current intermediary circuit (BUS DC), if the system is connected to another C400S inverter actuating a motor that requires dynamic braking, it allows an excess energy recovery by the line instead of dissipating the power through braking resistances.
-Energy exchange with the mains line by AFE technology (Active Front End), which offers a considerable reduction in current harmonic distortion, thanks to the sine waveform in both generation and regeneration, and always having a unitary power factoro.
-Programmable intermediary circuit voltage (BUS DC).
-Programmable generation current limit (from line to BUS DC).
-Programmabile regeneration current limit (from BUS DC to line).
-Line relay switch and BUS D pre-load management by dedicated digital outputs.
-Dedicated digital output to enable stard consensus of slave inverters connected by BUS DC.

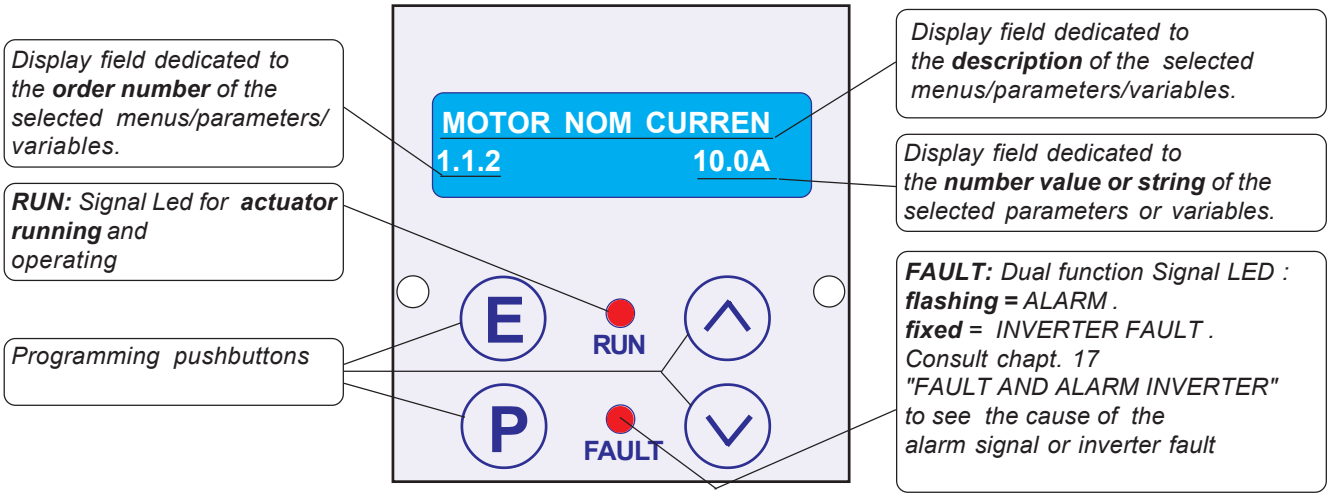
For more details consults the **400S, 400R and 400A** manuals available on request.

Digital control by keypad

The new actuators of the 400 series have a keypad for digitally setting the operating parameters.

General description of the keypad

The keypad can be used to modify the operating parameters (stored on an eeprom) and display useful measurements for the processing such as: the reference speed, motor speed and frequency, motor current, the last fault and many other variables available in the various menus. The keypad has a serial connection so that it can be remote connected to the panel on a control board, at a maximum distance of 25 metres.
On request Rowan Elettronica can supply the cable for remote connecting the keypad.



the kepad comprises:

- An alphanumeric backlit LED display with 2x16 characters.
- Four pushbuttons, with pressed touch confirmation.
- Two signal LED'S for RUN and FAULT.

The key functions

The **ESCAPE** button will return to the initial menu or the higher level.

The **PROGRAM** button opens the submenus, accesses and memorises parameter modifications.

The **UP** button scrolls FORWARD through the variables and to increase the setting towards positive values of variables when modifying parameters.

The **DOWN** button will scroll BACK through the variables displayed and reduce settings toward negative values of the variables when modifying parameters.

TECHNICAL CHARACTERISTICS

Inverter power at terminals L1 L2 L3

Three phase supply voltage ..... from 180VAC to 270VAC (standard voltage: 220/240VAC)
..... from 320VAC to 460VAC (standard voltages: 380/400/415VAC)
..... from 320VAC to 490VAC (standard voltage: 380/460VAC) only for models 400/P to 400/2
..... from 380VAC to 506VAC (standard voltages: 440/460VAC)
..... from 560VAC to 760VAC (standard voltage: 690VAC) only from 400/5 and above

Motor output U V W

Types of motor combinations ..... asynchronous three phase squirrel cage,ROWAN G vector motors
Motor control process: ..... S/F SCALAR
..... VECTORIAL FOC BY ENCODER
Output voltage ..... 0 to 100% of supply voltage
Output frequency 0Hz-800Hz
Waveform ..... sine
Waveform reconstruction technology ..... PWM (Pulse With Modulation)
PWM frequency ..... adjustable from 0.50KHz to 20.00KHz
Overload capacity ..... 110% of nominal current in continuous duty
..... 130% of inverter nominal current for 300sec
..... 175% of inverter nominal current for 30 sec
..... 250% of inverter nominal current for 3 sec

Regeneration control during braking

With braking module ..... built into all 400 series inverters
Regenerated power dissipation system ..... by external resistance connected to terminals F+ and F

Digital inputs

N. of digital inputs ..... 6 standard (I1...I6) + 8 with optional 404S board (I7...I14)
Input insulation ..... optoinsulated if using an external power source
Connection logic ..... NPN or PNP
Activation voltage ..... min 15Vdc, max 30Vdc
Programming ..... I1 input with fixed run function and the others fully programmable
Input resistance ..... approx. 3.6Kohm
Activation/disactivation times ..... 10ms, 20ms for impulse command

Digital impulse inputs

N. of encoders ..... 2standard +1with optional 404S board
N. of encoder zero inputs ..... 2 only with optional 404S board
Input insulation ..... optoinsulated
Connection logic ..... line driver encoder push-pull output
Encoder supply voltage ..... 12Vdc, protected against short-circuits (5Vdc on request)
Maximum frequency .....
125Khz
Input resistance per channel ..... approx. 1.8Kohm
Voltage for logic status 1 ..... min 8Vdc, max 16Vdc (min 3Vdc, max 6Vdc for encoder with 5Vdc supply on request)

Relay outputs

N. of relays 3 (O1,O2,O3)
Programming ..... fully programmable
Relay contacts ..... one in NO and NC switching
Contact capacity ..... 0.5A 120Vac -1A 24Vac
Activation/disactivation times 5ms

Digital outputs

N. of outputs ..... 5 (O4,O5,O6,O7,O8) , only available with optional 404S board
Output insulation ..... optoinsulated if using external power source
Connection logic ..... NPN or PNP
Programming ..... fully programmable
Work voltage ..... max 100Vdc
Maximum current ..... 80 mA
Activation/disactivation times 12ms

Analog inputs

AI1 ..... +/-10Vdc differential...12bit (14bit on request)...sampling time 1ms
AI2 ..... +/-10Vdc differential,4-20mA, 0-20mA...12bit...sampling time 5ms
AI3, AI4 ..... +/-10Vdc....12bit...sampling time 5ms
AI5 (only on optional 404S board) ..... +/-10Vdc...10bit...samplnig time 16ms
AI6, AI7, AI8, AI9 (only on optional 404S board) ..... 0/+10Vdc....10bit...sampling time 16ms
Programming ..... fully programmable

Analog outputs

AO0 ..... 12bit...update time from 2.6ms (only for FAST type associated variables) to 6.6ms
AO1 ..... 12bit...update time 6.6ms
AO2, AO3 ..... 8bit...update time 20ms
Output voltage ..... +/-10Vdc
Output current ..... max 10mA
Programming ..... fully programmable

RS485 serial connection

Standard protocols ..... MODBUS RTU...ROWAN
Baudrate ..... 1200..2400..4800..9600..19200..38400..57600..76800..115200
Insulation ..... optoinsulatedo

Supply voltages

+10Vdc, -10Vdc (for potentiometer power supplies) ..... max 10mA
+24Vdc (for input or other device power supplies) ..... protected against short-circuits...max 500mA
Encoder or sensor power supplies:
- standard +12Vdc ..... optoisolata...protected against short-circuits...max 200mA
- on request +5Vdc ..... optoisolata...protected against short-circuits...max 500mA
+5Vdc ..... protected against short-circuits...max 200mA
+15Vdc ..... protected against short-circuits...max 200mA

Protections

Inverter Fault for electronic thermal cutout (I x I x t) by prolonged overload at terminals U, V, W
..... Fault for maximum peak current protection U, V, W
..... Fault for programmable timeout threshold protection on output current at terminals U, V, W
..... Fault for short-circuit across phases U, V, W and across phases + earth
..... Fault for BUSDC overvoltage
..... Fault for IGBT module overtemperature
..... Allarm without faultfor lifespan end of BUSDC condensers
..... Fault for short-circuit at terminals F and F+ braking resistance connection .
Motor ..... Fault for electriconic thermal cutout (I x I x t) by prolonged overload
..... Fault for overspeed
Braking resistance ..... Fault for electronic thermal threshold on prolonged overload

Special applications

..... ELECTRIC SHAFT (only on code 400A)
..... POSITIONER (only on code 400A)
..... REGULATOR (only on code 400R)
..... Motor with brake management in LIFTING systems (LIFT function on all versions)

Ambient conditions

Ambient temperature ..... -5°C to +40°C
Dissipator temperature ..... -5°C to +70°C
Storage temperature .....
-25°C to +70°C
Altitude .....
..... maximum 1000m a.s.l. (if above reduce load by 1% every 100m)
Protection rating IP20
Relative humidity ..... 5% to 95% condensate free.

Conformity to regulations and electromagnetic compatibility

The actuators in the 400 series are designed for operation in industrial environments. They have CE approval to EMC Directive 89/336/EEC, under product standard CEI EN 61800-3, only if connected in compliance with the cabling system indicated in this manual at chapt.7 "ELECTRICAL INSTALLATION". For models without built-in filter , EMC directive conformity is only satisfied if connected to suitable filters supplied separately (see "***Table of combinations for inverters with three phase anti E.M.I. filters and ferrite toroids***" in Chapt. 7 "ELECTRICAL INSTALLATION"). Moreover they conform to B.T. Directive 73/23/EEC, under
EN 60439-1 and CEI EN 60204-1. **CAUTION:** this product belongs falls under the restricted commercial class conform to EN 61800-3. In a household environment this product may cause radio interference, in this case the user must make appropriate measures.

Table of electrical power characteristics of 400 series inverters from /P to /6

400 INV. POWER SIZES			/ P	/ R	/ 0	/ 1	/ L	/ 2	/ 3	/ 4	/ 5	/ 6
MAX CONTINUOUS POWERS APPLICABLE ON OUTPUTS U - V - W	230Vac-LINE	Pmotor* KW	0,63	1,3	1,7	3,5	4,5	6,5	10	14,5	18,5	22
		Pmax* KVA	1,2	1,8	2,7	4,7	6	8,7	13	20	23,8	28,6
	400Vac LINE	Pmotor* KW	1,1	2,25	3	6	7,5	11	18,5	25	30	37
		Pmax* KVA	2	3	4,8	8	10	15	25	34	41	50
MAX CONTINUOUS CURRENT AT INPUT L1 - L2 - L3		A	2,25	3,75	5,2	9,2	11,5	17,5	29	40	48	58
MAX CONTINUOUS CURRENT AT OUTPUT U - V - W		A	3,0	5	7	12	15	22	35	50	60	72
LOCKING DRIVE MAXIMUM CURRENT AT OUTPUT U - V - W		A	8,5	13	20	34	42	62	98	140	170	200
FUSES FOR INPUTS L1 - L2 - L3 TYPE GL RAPID		A	4	6	10	16	20	25	40	63	80	80
BRAKING CURRENT IN CONTINUOUS DUTY OUTPUT F F+		A	3,7	5	7	9	16	16	30	45	45	70
MAX BRAKING CURRENT OUTPUT F F+ DUTY CYCLE 70%		A	5,5	7,5	11	12	20	25	38	50	50	75
MINIMUM BRAKING RESISTANCE OUTPUT F.F.+	230Vac LINE	OHM	70	60	40	40	20	20	10	10	10	5
	400Vac LINE	OHM	140	100	70	70	40	30	20	15	15	10
MAXIMUM POWER DISSIPATED BY CONTAINER AT PWM 2KHz		KW	0,05	0,1	0,2	0,3	0,4	0,5	0,6	0,8	1,0	1,2
COOLING FAN			NO	NO	NO	YES	YES	YES	YES	YES	YES	YES
BUILT-IN EMI FILTER			YES	YES	NO*	NO*	YES	YES	YES	YES	YES	YES

* **Pmotor KW =** Typical power at shaft of a standard asynchronous motor.
* **Pmax KVA =** Maximum applicable power with cosfi = 1
* **EMI FILTER**: Soon also available built-in for these sizes

Table of electrical power characteristics of 400 series inverters from /6.5 to /F

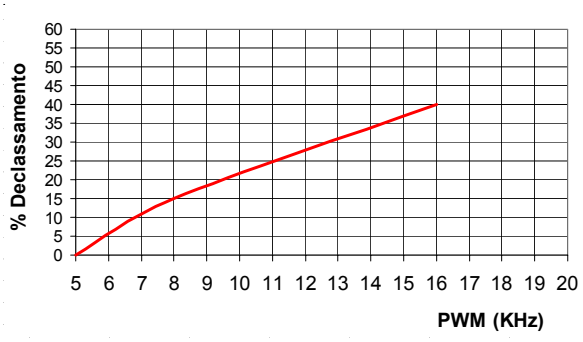
400 INV. POWER SIZES			/ 6,5	/ 7	/ 8	/ 8,5	/ 9	/ A	/ B	/ C	/ D	/ E	/ F PWM 5KHz	/ F PWM 2KHz
MAX CONTINUOUS POWERS APPLICABLE ON OUTPUTS U - V - W	230Vac LINE	Pmotor* KW	26	32	45	52	63	76	90	110	147	170	200	228
		Pmax* KVA	35	42	55	65	81	97	119	147	183	219	270	308
	400Vac LINE	Pmotor* KW	45	55	75	90	110	132	160	200	250	300	350	400
		Pmax* KVA	60	73	95	114	142	170	208	256	318	381	453	516
MAX CONTINUOUS CURRENT AT INPUT L1 - L2 - L3		A	70	82	110	135	164	200	240	296	370	460	550	627
MAX CONTINUOUS CURRENT AT OUTPUT U - V - W		A	87	106	138	165	205	245	300	370	460	550	655	746
LOCKING DRIVE MAXIMUM CURRENT AT OUTPUT U - V - W		A	245	300	385	460	575	685	840	1040	1290	1540	1800	
FUSES FOR INPUTS L1 - L2 - L3 TYPE GL RAPID		A	100	100	125	200	250	315	400	500	630	630	1000	
BRAKING CURRENT IN CONTINUOUS DUTY OUTPUT F F+		A	85	100	100	100	130	130	130	130	330	330	330	
MAX BRAKING CURRENT OUTPUT F F+ DUTY CYCLE 70%		A	75	100	150	150	200	200	200	200	375	375	375	
MINIMUM BRAKING RESISTANCE OUTPUT F.F.+	230Vac LINE	OHM	5	3,3	3,3	3,3	2,5	2,5	2,5	2,5	1,15	1,15	1,15	
	400Vac LINE	OHM	10	7,5	5	5	3,3	3,3	3,3	3,3	2	2	2	
MAXIMUM POWER DISSIPATED BY CONTAINER AT PWM 2KHz		KW	1,4	1,5	2,0	2,0	2,5	3,5	3,5	4,5	6,5	8	10	
COOLING FAN			YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	
BUILT-IN EMI FILTER			YES	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	

* **Pmotor KW =** Typical power at shaft of a standard asynchronous motor.
* **Pmax KVA =** Maximum applicable power with cosfi = 1

Inverter downrating according to PWM frequency

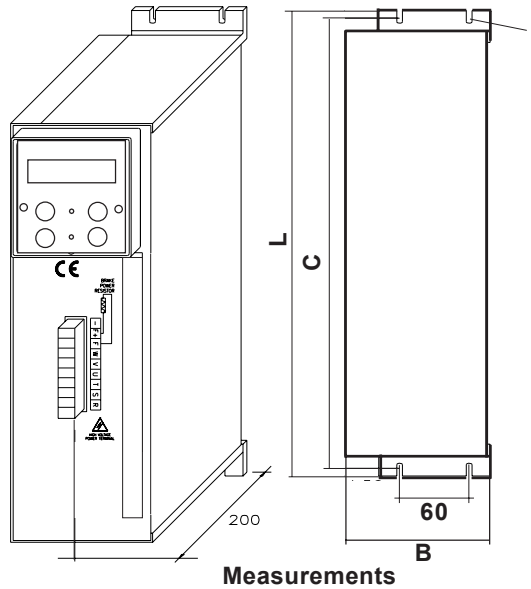
Caution !

The maximum continuous powers provided in the tables are permitted for PWM frequencies up to 5 KHz. With greater frequencies the inverter must be downrated according to the graph on the right.
To set the PWM frequency consult the parameter group:
1.12. PWM GENERATOR.



DIMENSIONS AND WEIGHTS

Dimensions and weights of inverters 400/P to 400/L (vertical versions)

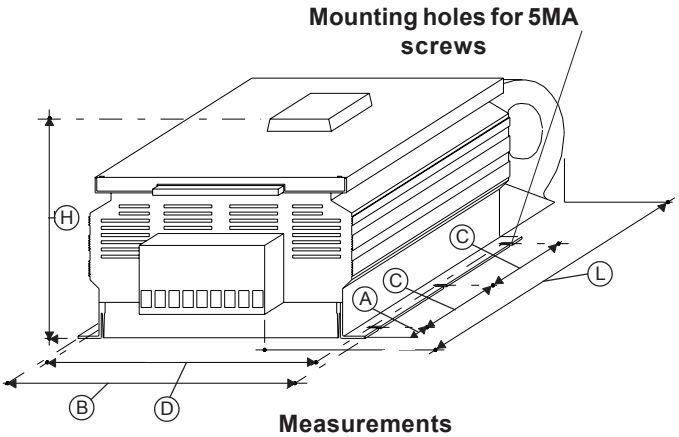


Measurements in mm

Mounting holes for 4MA screws

400 INV. POWER SIZES	B	L	C	WEIGHT KG	BUILT-IN EMI FILTER
/P	114	285	275	2,8	YES
/R	114	285	275	2,8	YES
/0	114	365	353	3,5	NO
/1	134	365	353	3,6	NO
/L	134	365	353	4	YES

Dimensions and weights of inverters 400/2 to 400/F (horizontal versions)



Measurements in mm

Mounting holes for 5MA screws

400 INV. POWER SIZES	H	B	L	A	C*	D	WEIGHT KG	BUILT-IN EMI FILTER
/2	180	265	380	75	200x1	253	8	SI
/3	200	310	430	100	200x1	297	18	SI
/4 /5	280	280	530	65	233x1	263	18,5	SI
/6 /6,5	295	380	570	60	180x2	354	30	SI
/7	295	380	620	110	180x2	364	40	NO
/8 - /8,5	295	480	840	100	150x4	460	55	NO
/9 - /A	295	480	1080	100	200x3	460	80	NO
/B - /C	295	480	1385	100	225x4	460	100	NO
/D/E/F	400	680	1520	110	225x4	650	170	NO

* The number of C distances depends on the number of fixing holes

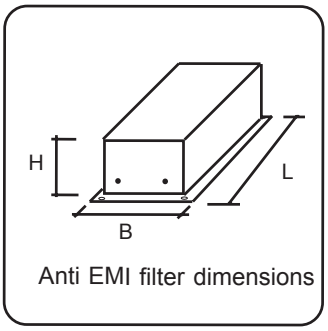
- On request Models /5 to /F are available in a version with EXTERNAL SWITCHBOARD COOLING.

ACCESSORIES for C400 INVERTER

ANTI EMI LINE FILTERS

Table of electrical characteristics and dimensions of external three phase anti EMI filters

EMC FILTER CODE	I_{MAX} FILTER (Arms)	FILTER DIMENSIONS (mm)		
		H	B	L
FT.ROW10A.400	10	55	106	116
FT.ROW25A.400	25	60	135	232
FT.ROW50A.400	50	85	122	250
FT.ROW80A.400	80	87	137	300
FT.ROW120A.400	120	110	214	395
FT.ROW180A.400	180	110	214	395
FT.ROW300A.400	300	110	214	405
FT.ROW500A.400	500	180	350	570



Anti EMI filter dimensions

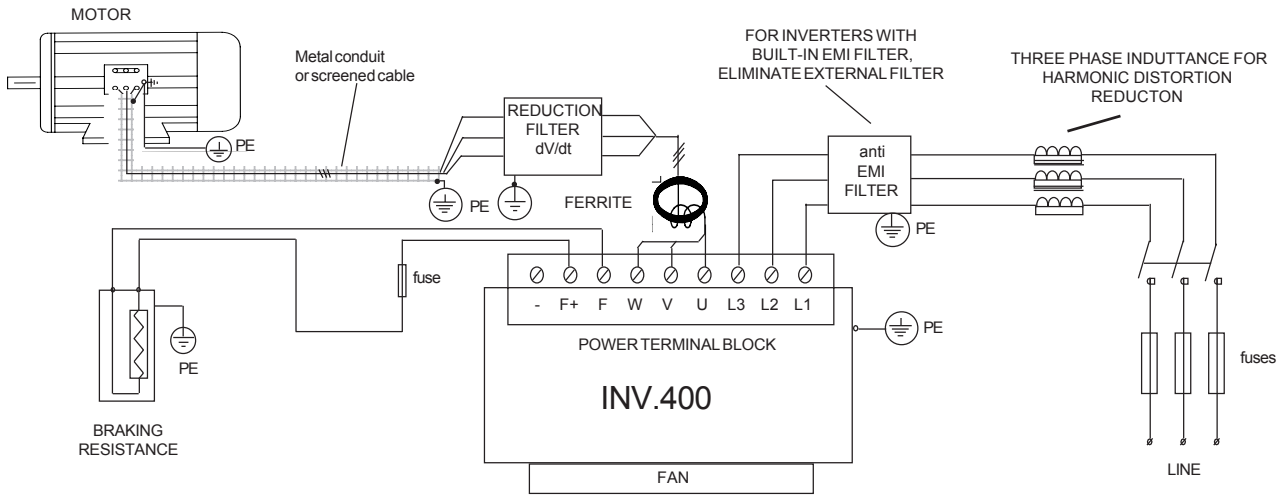
Table of combinations for three phase anti EMI filters and ferrite toroids with inverters

400 INV. POWER SIZES	EMC FILTER CODE	I_{MAX} FILTER (Arms)	INVERTER OUTPUT CABLE SECTION (mm^2)	N°of PASSAGES THROUGH TOROID	N° of TOROIDS	TOROID CODE
/P	FILTRO IINCORPORATO	/	1	3	1	NUFT19
/R	FILTRO IINCORPORATO	/	1	3	1	NUFT19
/0	FT.ROW10A.400	10	2,5	3	1	NUFT19
/1	FT.ROW10A.400	10	2,5	3	1	NUFT19
/L	FILTRO IINCORPORATO	/	2,5	3	1	NUFT19
/2	FILTRO INCORPORATO	/	4	3	1	NUFT38
/3	FILTRO INCORPORATO	/	6	3	1	NUFT38
/4	FILTRO INCORPORATO	/	10	3	1	NUFT38
/5	FILTRO INCORPORATO	/	16	3	1	NUFT38
/6	FILTRO INCORPORATO	/	16	3	1	NUFT38
/6,5	FILTRO INCORPORATO	/	25	2	2	NUFT38
/7	FT.ROW120A.400	120	25	2	2	NUFT38
/8 /8,5	FT.ROW180A.400	180	50	1	2	NUFT38
/9	FT.ROW300A.400	300	70	1	2	NUFT38
/A	FT.ROW300A.400	300	* 3x50 x fase	1	1	NUFT68
/B	FT.ROW300A.400	300	* 3x50 x fase	1	1	NUFT68
/C	FT.ROW500A.400	500	* 3x50 x fase	1	1	NUFT68
/D	FT.ROW500A.400	500	* 4x50 x fase	1	1	NUFT68
/E	2x FT.ROW300A.400	2x300	* 5x50 x fase	1	1	NUFT68
/F	2x FT.ROW500A.400	2x500	* 7x50 x fase	1	1	NUFT68

* When connecting several large section cables, ROWAN can supply special terminals to make connections easier (contact the Rowan Elettronica Technical Office).

Harmonic distortion reduction inductances

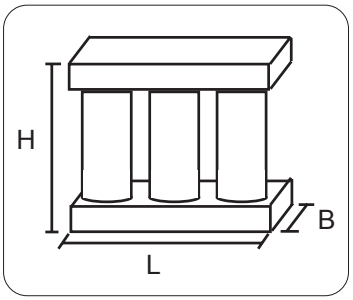
If harmonic distortion has to be reduced a three phase inductance can be supplied for installation between the power line and EMI rilter as shown in the diagram below:



This inductance not only reduces harmonic distortion, it offers the actuator better protection against line voltage dips and peaks; in particular it reduces peak currents through the condensers in the inverter thereby lengthening its life span.

Table for combinations of harmonic distortion reduction induttances with inverters

TABLE OF REDUCTION FILTERS FOR HARMONIC DISTORSION and CURRENT RIPPLE ON CONDENSERS						
FILTER CODE (case)	MAXIMUM CURRENT (A)	MAXIMUM DIMENSIONS AND WEIGHT				400 INV. POWER SIZE
		L (mm)	B (mm)	H (mm)	WEIGHT (KG)	
IMPT.10A.1,5	10	120	70	127	1,7	/P ,/R ,/0
IMPT.20A.09	20	150	80	155	3,6	/1,/L
RZT.30A.0,28	30	190	100	170	9	/2,/3
RZT.60A.0,28	60	180	140	180	9,7	/4,/5
RZT.80A.0,20	80	240	110	230	10,5	/6
RZT.150A.0,138	150	300	180	260	28,8	/6,5,/7,/8,/8,5
RZT.250A.0,083	250	300	200	270	45	/9,/A
RZT.370A.0,059	370	300	200	270	47	/B,/C
RZT.490A.0,042	490	360	205	320	50	/D
RZT.560A.0,037	560	300	170	290	48	/E
RZT.750A.0,0276	750	360	170	345	62	/F



Maximum dimensions of harmonic distortion filers

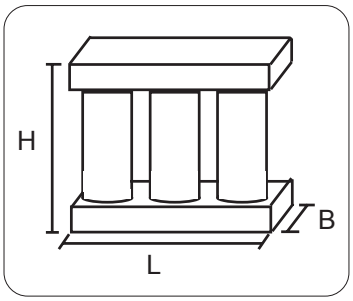
dV/dT reduction filters for motors

The voltage supplying the motor connected to the inverter is generated by PWM technology, this voltage is therefore formed by a impulse sequence of variable lengths. The high speed increase in voltage of these impulses, i.e. dV/dt, can cause of high dispersion currents through the motor power cables and throught the actual motor windings and from them to the actual housing . The high dV/dt also causes , by the intrinsic inductance of the connecting cables, high voltage peaks on the motor windings.
With the scope of reducing all the problems caused by dispersion currents and high overvoltages on the windings, a range of dV/dt reduction filters has been developed. Their codes and relevant power sizes, in addition to dimensions, are given in the table below:

Table for combinations of inverters with dV/dT reduction filters

TABLE OF dV/dt REDUCTION FILTERS reduction obtained dV/dt < 500V/µs						
FILTER CODE	MAXIMUM CURRENT (A)	MAXIMUM DIMENSIONS AND WEIGHT				400 INV. POWER SIZE
		L (mm)	B (mm)	H (mm)	WEIGHT (KG)	
FIT.DV/DT.25A	25	150	82	147	3,6	/P../2
FIT.DV/DT.80A	80	180	130	175	8,6	/3../6
FIT.DV/DT.120A	120	180	160	170	10,9	6,5/7
FIT.DV/DT.200A	200	240	140	230	14,6	/8,/8,5
FIT.DV/DT.300A	300	240	165	225	21,5	/9,/A
FIT.DV/DT.400A	400	300	155	280	26	/B,/C
FIT.DV/DT.500A	500	300	175	280	38	/D
FIT.DV/DT.600A	600	300	200	280	48	/E
FIT.DV/DT.750A	750	360	195	330	53,5	/F

The dV/dt reduction filters should always be used when the insulation class of the motor is not known or for motors that are not specifically constructed for combination with inverters.
Moreover the filters should be used whenever the cable length between inverter and motor is over 15m.
The dV/dt reduction filter has to be installed between the ferrite toroid and the motor, straight after the toroid and as illustrated in the diagram on the previous page.



Maximum dimensons of dV/dt reduction filters

Electrostatic discharges (ESD)

The inverter contains components that may be damaged by electrostatic discharge (ESD). Therefore it is important to observe the following recommendations:

- do not touch the internal boards unless strictly necessary.
- before handling the boards, make sure the electrostatic in your body is discharged.
- the boards must not come into contact with superinsulating materials (e.g. textile fibres) especially during their processing while in movement.

Table of application characteristics of Rowan braking resistances

RESISTANCE CODE	RESISTANCE (par.1.13.2)	MAX POWER Duty cycle: 5 sec ON 115 sec OFF	MAX CURRENT (par.1.13.4) Duty cycle: 5 sec ON 115 sec OFF	FOR INSTALLATION IN SWITCHBOARD, NOMINAL VALUES CAN BE APPLIED WITH 5% DUTY CYCLE				FUSIBILE DI PROTEZIONE TIPO GL
				FOR EXTERNAL INSTALLATION DUTY CYCLE 100%				
				NOMINAL CURRENT (par.1.13.3)		NOMINAL POWER		
				NON VENTILATED	VENTILATED	NON VENTILATED	VENTILATED	
	OHM	W	A	A		W		A
RES.140R.600	140	600	2	1	/	160	/	2
RES.70R.600	70	600	2,9	1,5	/	160	/	4
CRF.70R.1K3W	70	11800	13	3	4,3	650	1300	6
CRF.40R.2K2W	40	19360	22	5,3	7,5	1125	2250	10
CRF.30R.2K2W	30	18750	25	6	8,5	1080	2160	10
CRF.20R.2K2W	20	19220	31	7,4	10,5	1100	2200	16
CRF.15R.2K2W	15	19440	36	8,4	12	1080	2160	20
CRF.20R.4KW	20	35280	42	9,8	14	1950	3900	16
CRF.10R.4KW	10	36000	60	14	20	2000	4000	25
CRF.5R.4KW	5	35280	84	20	28,2	2000	4000	32

As a guideline the table indicates 2 typical installations for braking resistances and relevant power characteristics that can be used:

Installation in a switchboard

This installation is usually used when the resistances are used intermittently, with high but short peak currents at long intervals, so that the temperature in the switchboard and its other components does not rise over their work limits in continuous duty. In this case the nominal current and power can be applied with a **5% duty cycle.**

Moreover the following installation conditions must be respected:

-Resistances **RES.140R.600** and **RES.70R.600,** in ceramic and protected by an ultra-flat casing, have to be firmly attached with a good contact onto the component support plate of the switchboard.

Resistances **CRF.xxR.xKxW**, housed in an IP22 container in the **non-ventilated** version must be mounted vertically as indicated in the diagrams on the next page.

External installation

This installation is used when in continuous servie the maximum possible power has to be dissipated on the braking resistances, whether ventilated or not. The current and power characteristics in **continuous duty (100% duty cycle),** indicated in the table refers to the following installation conditions:

-Resistances **RES.140R.600** and **RES.70R.600**, have to be attached to a cooler capable of discharging **0.5W/°C. N.B.** Under these conditions the outside temperature of the flat resistance can reach approx.**300°C.**

Adequate protection must be mounted against accidental contact .

-Resistances in IP22 containers in versions, non-ventilated **CRF.xxR.xKxW**, and ventilated **CRF.xxR.xKxW.V** must be mounted vertically as indicated in the diagrams on the next page.

N.B. Under these conditions the outlet air temperature at the container slots can reach approx. **250°C;** adequate protection must be mounted against accidental contact.

Caution !

The ohmic value of the braking resistance must never be lower than:

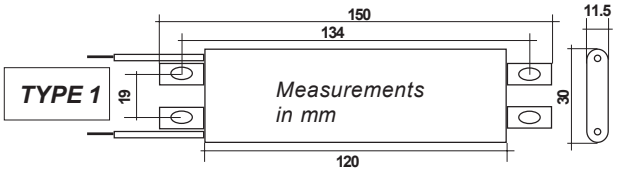
The **"*MINIMUM BRAKING RESISTANCE AT OUTPUT F F+* "** given in the tables with the power characteristics of the 400 series inverters.

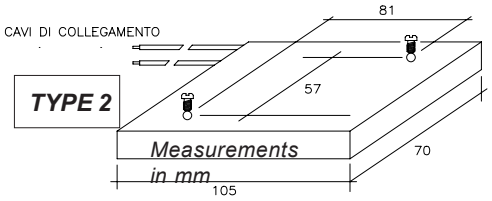
On inverters sizes /3 to /F, the F and F+ output is protected against short-circuit , signalled by an inverter block for FAULT 13. For sizes /P to /2 no protection is provided, so a fuse is recommended.

For safety reasons, mount a fuse in series with the resistance with the capacity indicated in the table.

Overall dimensions of resistances RES.140R.600 and RES.70R.600

2 types of flat resistances can be supplied for the same code:

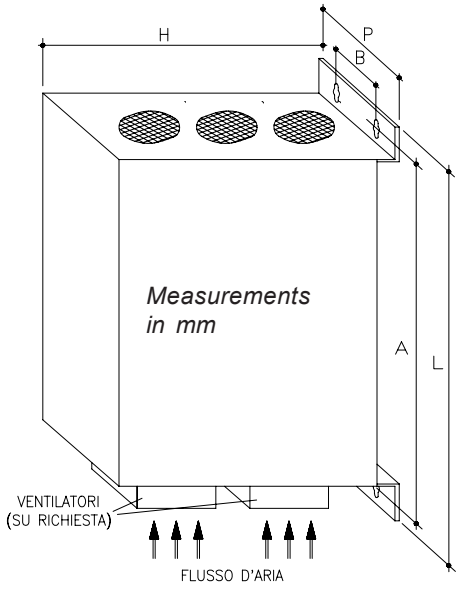




Overall dimensions of resistances in containers CRF. xx R . xKx W

RESISTANCE CODE	H	B	L	A	P
CRF.70R.1K3W	260	67	385	357	100
CRF.30R.2K2W CRF.15R.2K2W CRF.40R.2K2W CRF.20R.2K2W CRF.20R.4KW CRF.10R.4KW CRF.5R.4KW	322	67	486	458	120

OHMS
POWER



Versions available:
C R F. x x R . x K x W:
Standard non-ventilated version
C R F. x x R . x K x W.V:
Standard ventilated version
C R F. x x R . x K x W.VL:
Standard ventilated version with fan fault signal relay

Inverter order codes

Code : **C400 X / 1 . A . E . P XX . YY**

ATTIVE APPLICATIONS
(located in inverter as the digit to the right of the stop, at variable 2.1.38 FIRMWARE VERSION)

S	var. 2.1.38 = XXX.00	Application: **SPEED** (speed control, scalar/vectorial)
A	var. 2.1.38 = XXX.01	Applications: **SPEED** (speed control, scalar/vectorial) + **AXIS** (positioner/electric axis)
R	var. 2.1.38 = XXX.02	Applications: **SPEED** (speed control, scalar/vectorial) + **REGULATOR** (P/I control)
G	var. 2.1.38 = XXX.03	Applications: **SPEED** (speed control, scalar/vectorial) + **GEN_AFE** (sine generator)
P	var. 2.1.38 = XXX.04	Applications: **SPEED** (speed control, scalar/vectorial) + **CUSTOM1** (custom application)

HARDWARE RELEASE
(located in inverter at variable 2.1.40 HARDWARE VERSION)

PART CHARACTERISTICS

ST = NO KEYPAD
RE = EXTERNAL COOLING
SF = NO BRAKING
VV = VERTICAL VERSION
E5 = POWER SUPPLY AND ENCODER INPUTS 1.2 A +5VDC
EE = POWER SUPPLY AND ENCODER INPUTS 1,2,3 A +5VDC + B404S.A BOARD
EX = + B404S.A BOARD

If no parts are required these 2 letters are omitted.

CUSTOM VERSION

P = CUSTOM INVERTER
XX = CUSTOMISATION CODE.

In the standard versions these 3 letters are omitted.

SUPPLY VOLTAGE (50/60Hz)

Supply voltages for inverters from /P to /2	*Supply voltages for inverters from /3 to /E*
D = 220/240VAC **P** = 380/460 VAC	**D** = 220/240VAC **E** = 380/400/415 VAC **O** = 440/460 VAC **W** = 690 VAC (only /5 to /E)

ACTUATOR POWER SIZES

P - R - 0 - 1 - L - 2 - 3 - 4 - 5 - 6 - 6,5 - 7 - 8 - 8,5 - 9 - A - B - C - D - E - F

Eeprom key order code

Code : **C411S . A**

HARDWARE RELEASE

"G" SERIES THREE PHASE ASYNCHRONOUS MOTORS

General characteristics of motors

Rowan three phase motors with squirrel cage rotor have sufficient characteristics to be defined as "**special motors for vectorial inverters**"; in fact they have been designed for use in combination with Rowan vectorial inverters.
The particularly heavyduty construction, independent ventilation, heat cut and high insulation are come of the characteristics that ensure the reliability of the motor, with performance levels that are unquestionably among the best available on the market. To complete this,the vacuum impregnation of the winding pack ensures partial attenuation of the typical humming of frequency controls.
Rowan vector motors are sized to MEC standards of the equivalent series and are therefore perfectly interchangeable with equivalent power commercial asynchronous motors.
Rowan vector motors can even be operated directly from the line power supply, thereby guaranteeing, even though at a fixed speed, their operation without actuator. In this case, make a star or triangle connection depending on the motor ID plate and supply line data as with any standard asynchronous motor. The maximum speed will naturally depend on the number of poles the motor has.

Technical characteristics of the motors

Stator winding

Power supply ..... three phase
Voltages available ..... (125 △ / 220人).. (230 △ / 400 人)...(270△ / 470人) ...(300△ / 520人) ...(400△ / 690人)
Frequency 50Hz
Poles ..... standard 4pole, on request 2 pole, 6 pole
Maximum temperature ..... +180°C
Insulation ..... **tropicalized to class H with vacuum process (**to guarantee greater protection from the environment and ..... lower noise levels, thanks to a more efficiently compacted pack).
Protections ..... trip heat probe with N.C. contact opening at 150°C
..... contact capacity 1A - 230VAC

Rotor

Type ..... squirrel cage free of touching parts (i.e. heads, brushes, rings).

Cooling

Type ..... forced ventilation independent to motor speed
Fans mounted ..... axial, 230Vac single phase, IP23 protection rating
..... scroll, 230Vac single phase, IP44 protection rating
..... axial, 230 △ / 400 人 three phase, IP54 protection rating

Mechanical characteristics

Material .....
aluminium, for housing, shields and brake dome
Versions ..... **no brake**
..... **with 24Vdc safety spring actuated brake, front and rear** (shaft is locked with no power)
Constructions ..... **B3** (footed)...**B5** (flanged)...**B3/B5** (footed and flanged)
Bearings ..... **C3 2RS and 2Z**
Maximum speed ..... 3000rpm to 12000 rpm (dependant on motor, see table in this chapter)
Noise level ..... below 70 dB
Speed transducer ..... standard, without transducer on request

Characteristics of transducers for use in speed feedback

Type ..... LINE DRIVER encoder, PUSH PULL output
Power supply ..... standard +12Vdc, on request +5VDC
Impulses/rev ..... standard 1000, on request 3000 to 500

Ambient conditions

Motor protection rating ..... IP54 (overal protection rating depends on type of fan connected)
.. On request MEC motors 160, 160L, 160XL can be supplied IP23, in this case the nominal torque is 30% greater than the IP54 version .
Ambient temperature ..... -15°C to +40°C
Maximum motor temperature on external housing ..... 70°C with ventilation...110°C without ventilation
Altitude a.s.l.. ..... 1000m, over and up to a max 2000m the motor must be downrated by 1% every 100mt
Relative humidity ..... 5% to 95% condensate free

STANDARD MOTORS 230V/400V, 50Hz, 4 pole IP54
Electrical data referred to with motors powered directly from 50Hz supply line

MEC	NOMINAL POWER		NOMINAL TORQUE	MAX TORQUE	NOMINAL CURRENT		VALUES AT NOMINAL POWER				MOMENT OF INERTIA J	WEIGHT
	KW	HP	Nm	Nm	at 230V TRIANG.	at 400V STAR	SPEED rpm	SLIP rpm	EFFICIENCY %	COS phi	kgm²	kg
63	0.18	0.25	1.25	2.1	1.2	0.7	1360	140	50	0.68	0.00031	7
63L	0.37	0.5	2.5	3.5	2.7	1.5	1360	140	50	0.70	0.00055	9.5
71	0.37	0.5	2.5	4.2	2.8	1.6	1420	80	55	0.70	0.00050	10
71L	0.75	1	5	6.5	4.6	2.7	1400	100	71	0.79	0.00149	14.5
80	0.75	1	5	9	3.8	2.2	1400	100	61	0.79	0.00120	14
80L	1.5	2	10	15	6	3.5	1420	80	74	0.70	0.00488	21.5
90	1.5	2	10	18	8.6	5	1440	60	74	0.65	0.00274	19
90M	2.2	3	15	27	12	7	1406	94	65	0.7	0.00356	22
90L	3.5	4.7	23.5	47	15.5	9	1430	70	74	0.72	0.00577	31
100	3	4	20	36	14	8	1430	70	72	0.71	0.00543	27
100L	6	8	40	60	22	13	1440	60	81	0.72	0.01154	45
112	4	5.5	27.5	41	17	10	1450	50	78	0.73	0.0105	38
112L	5.5	7.5	37.5	56	22	13	1440	60	75	0.72	0.0155	50
112X	7.5	10	50	100	26	15	1445	55	80	0.80	0.0210	62
112XL	10.5	14	70	140	38	22	1450	50	82	0.78	0.02731	78
132	9	12	60	108	38	22	1440	60	83	0.78	0.0395	70
132L	11	15	75	110	45	26	1450	50	87	0.77	0.0564	85
132XL	15	20	100	150	57	33	1450	50	90	0.81	0.0665	113
* 160	15	20	100	150	57	33	1460	40	89	0.77	0.0762	110
* 160L	22	30	150	225	79	46	1460	40	91	0.80	0.105	140
* 160XL	31	42	210	277	99	57	1420	80	87	0.86	0.150	170

* The 1p23 version of these motors have a 30% greater nominal torque.

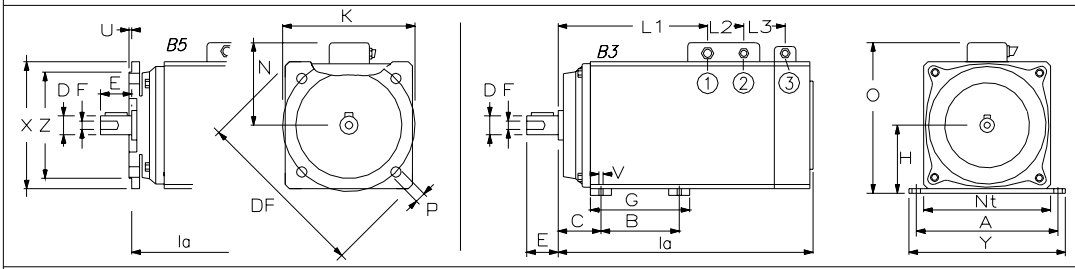
UL MOTORS 240V/420V 60Hz 4 pole, IP54
Electrical data referred to with motors powered directly from 60Hz supply line

MEC	NOMINAL POWER		NOMINAL TORQUE	MAX TORQUE	NOMINAL CURRENT	VALUES AT NOMINAL POWER				MOMENT OF INERTIA J	WEIGHT
	KW	HP	Nm	Nm	at 240V TRIANG.	SPEED rpm	SLIP rpm	EFFICIENCY %	COS phi	kgm²	kg
63	0.15	0.2	1.04	1,75	1.2	1632	168	50	0.68	0.00031	5.7
63L	0.37	0.5	2.1	2,9	2.2	1632	168	50	0.70	0.00055	6.5
71	0.37	0.5	2.1	3,5	2,2	1704	96	55	0.70	0.00050	9
71L	0.75	1	4,2	5,4	4,2	1680	120	71	0.79	0.00149	14.5
80	0.75	1	4,2	7,5	3.8	1680	120	61	0.79	0.00120	14
80L	1.5	2	8,3	12,4	6,8	1704	96	74	0.70	0.00488	21.5
90	1.5	2	8,3	15	6,3	1740	60	74	0.70	0.00274	19
90M	2.2	3	12.5	23	10	1690	110	65	0.70	0.00356	22
90L	3.5	4.7	19,5	39	16	1704	96	74	0.72	0.00577	31
100	3	4	16,6	30	12,5	1716	84	72	0.71	0.00543	24
100L	6	8	33,2	50	24	1728	72	81	0.72	0.01154	45
112	4	5.5	22,8	34	16	1740	60	78	0.73	0.0105	33
112L	5.5	7.5	31,2	47	20	1728	72	75	0.72	0.0155	45
112X	7.5	10	41,5	83	26	1734	66	80	0.80	0.0210	61
112XL	10.5	14	58,1	116	39	1740	60	82	0.78	0.02731	78
132	9	12	50	90	34	1728	72	83	0.78	0.0395	59
132L	11	15	63	92	42	1740	60	87	0.77	0.0564	80
132XL	15	20	83	125	49	1740	60	90	0.81	0.0665	110
160	15	20	83	125	59	1752	48	89	0.77	0.0762	115
160L	22	30	125	187	80	1752	48	91	0.80	0.105	160
160XL	28	38	157	207	91	1704	96	87	0.86	0.150	170

NOTE: 1 Nm = 0.102 kgm.To obtain PD² as a function of inertial moment J considera PD² = 8J
For the electromechanical characteristics of Rowan non-standard 2 or 6 -pole motors contact the Rowan Technical Office.

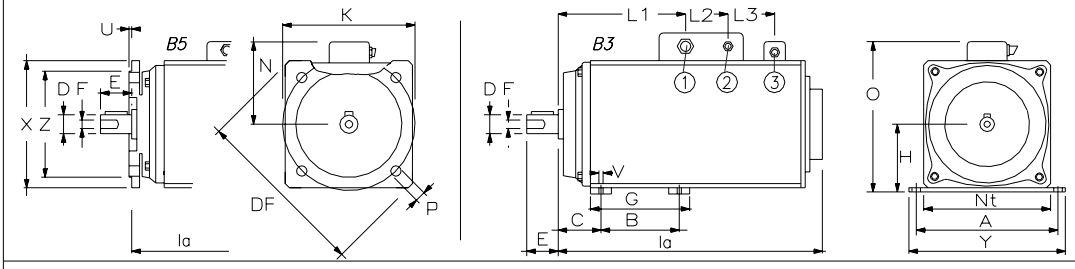
Dimensional drawings of no brake motors and positions of terminal blocks

MEC SERIES FROM 63 TO 100L



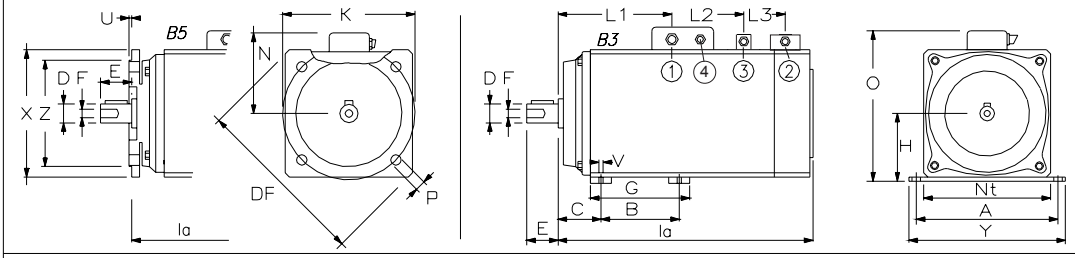
1. Cable gland for connecting: **three phase power to motor + earth**
2. Cable gland for connectingo: **fan, heat probe (+ rear brake in special version)**
3. Connector for connecting: **encoder**

MEC SERIES 112 – 112L – 112XL - 112X



1. Cable gland for connection: **three phase power to motor + earth**
2. Cable gland for connecting: **fan, heat probe (+ rear brake in special version)**
3. Connector for connectingo: **encoder**

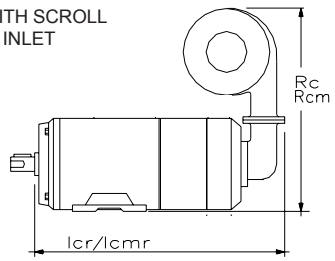
MEC SERIES 132 – 132L – 132XL – 160 – 160L – 160XL



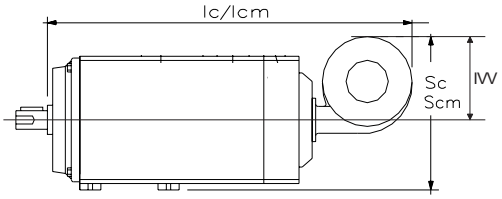
1. Cable gland for connecting: **three phase power to motor + earth**
2. Calbe gland for connecting: **fan**
3. Connector for connecting: **encoder**
4. Cable gland for connecting: **heat probe (+ rear brake in special version)**

SPECIAL VERSIONS ON REQUEST

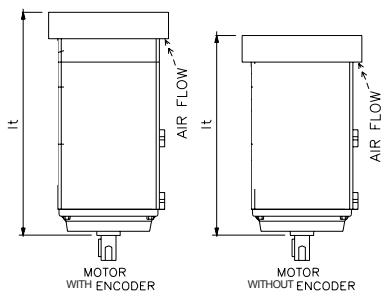
MOTORS WITH SCROLL FAN and 90° INLET



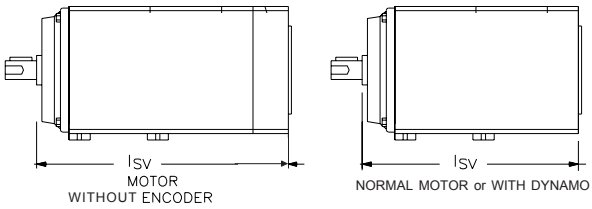
MOTORS WITH SQUARE HOUSING snd SCROLL FAN



MOTORS WITH PROTECTING DOME IP44 or IP54 ONLY on MOTORS WITH AXIAL FAN



NON VENTILATED MOTORS IP54 ONLY for INTERMITTENT 50% DUTY CYCLE, MAX WORK TIME= 1 min. - STANDBY= 1min.



Measurements of no brake motors from MEC 63 to MEC100L (in mm)

MEC SIZE		63	63L	71	71L	80	80L	90	90M	90L	100	100L
HP		0.25	0.5	0.5	1	1	2	2	3	4.7	4	8
KW		0.18	0.37	0.37	0.75	0.75	1.5	1.5	2.2	3.5	3	6
A		125		148		175		190			220	
B		80	145	90	165	100	180	125		207	140	265
C		45		54		60		70			75	
D		11	14	14		19		24			28	
E		23	30	30		40		50			60	
F		M6		M6		M8		M8			M8	
G		105	170	115	190	130	210	155		237	180	305
H		63		71		80		90			100	
la (see note 1)		275	340	295	370	320	400	370	400	475	400	525
lt (see note 2)		/	/	/	/	/	/	/	/	/	/	/
lc (see note 3)		390	460	400	455	460	560	505	535	595	530	685
lcr (see note 4)		/	/	/	/	/	/	/	/	/	/	/
lcm (see note 5)		/	/	/	/	/	/	/	/	/	/	/
lcmr (see note 6)		/	/	/	/	/	/	/	/	/	/	/
lsv (see note 7)		260	335	275	345	305	385	330	360	430	355	480
IVV		95		95		160		160			160	
L1		140	205	155	228	160	245	195	225	298	220	345
L2		168	230	180	253	185	270	235	265	337	260	383
L3		230	295	245	313	270	350	295	325	392	315	442
N		105		120		130		140			150	
Nt		106		130		152		164			184	
O		168		187		210		230			250	
P		8,5		9.5		12		12			14	
Sc (NORMAL SCROLL)		158		168		230		250			260	
Scm (UPRATED SCROLL)		/	/	/	/	/	/	/	/	/	/	/
Rc (NORMAL SCROLL + elbow)		/	/	/	/	/	/	/	/	/	/	/
Rcm (UPRATED SCROLL + elbow)		/	/	/	/	/	/	/	/	/	/	/
Tc		/	/	/	/	/	/	/	/	/	/	/
U		3		3.5		4		4			4	
V		7		7		9		9			12	
Z		95	110	110		130		130			180	
X		108x108		120x120		150150		155x155			205x205	
DF (FLANGE DIAMETER)		140	160	160		200		200			250	
K		115	130	130		165		165			215	
Y		140		160		195		214			250	
TONGUE		4x4x15		5x5x20		6x6x30		8x7x35			8x7x40	
SHORT SHAFT	D	/	/	/	/	14*	/	19*		/	24*	/
	E	/	/	/	/	30	/	40		/	50	/
	F	/	/	/	/	M6	/	M8		/	M8	/
	Tongue	/	/	/	/	5x5x20	/	6x6x30		/	8x7x35	/
SHORT FLANGE	P	8.5		9.5		9.5		9.5			12	
	Z	80		95		110		110			130	
	X	108x108		120x120		150x150		155x155			200	
	K	100		115		130		130			165	
Weight kg		7	9.5	10	14.5	14	21.5	19	22	31	27	45

Notes on motor dimensions:

1) length **l** referring to dimensions of the motors with **axial fan**
2) length **l** referring to dimensions of motors with **axial fan + dome**
3) length **l** referring to dimensions of motors with **normal scroll fan**
4) length **l** referring to dimensions of motors with **normal scroll fan and 90° outlet**
5) length **l** referring to dimensions of motors with **uprated scroll fan**
6) length **l** referring to dimensions of motors with **uprated scroll fan and 90° outlet**
7) length **l** referring to dimensions of motors **without fan**

Measurements of no brake motors from MEC 112 to MEC 160XL (in mm)

MEC SIZE		112	112L	112X	112XL	132	132L	132XL	160	160L	160XL
HP		5.5	7.5	10	14	12	15	20	20	30	42
KW		4	5.5	7,5	10.5	9	11	15	15	22	31
A		230				285			320		
B		140	180		330	240			255	300	300
C		75				90			120		
D		28				38	42		42		
E		60				80	110		110		
F		M8				M10			M10		
G		180	220		370	290			305	350	350
H		112				132			160		
Ia (see note 1)		420	490	560	640	560	610	690	615	705	810
It (see note 2)		/	/	/	/	/	/	/	/		
Ic (see note 3)		580	655	725	855	780	830	930	870	960	1060
Icr (see note 4)		/	/	/	/	/	/	820	760	845	950
Icm (see note 5)		630	705	775	/	810	860	940	905	995	1100
Icmr (see note 6)		/	/	/	/	/	/	/	760	845	950
Isv (see note 7)		400	475	545	625	560	610	690	510	590	690
IVV		160			210	210	210	210	260		
L1		250	325	543	473	315	362	445	355	440	545
L2		288	362	580	510	400	450	530	470	550	655
L3		375	450	670	600	510	560	650	580	665	760
N		160				190			230		
Nt		205				245			276		
O		277				322			390		
P		14				14	16		16		
Sc (NORMAL SCROLL)		272			322	342			420		
Scm (UPRATED SCROLL)		322			/	352		/	420		
Rc (NORMAL SCROLL + elbow)		/	/	/	/	/	/	/	570		
Rcm (UPRATED SCROLL + elbow)		/	/	/	/	/	/	/	610		
Tc		/	/	/	/	/	/	/	/		
U		4				4			4		
V		12				12	14		14		
Z		180				230	250		250		
X		205x205				250x250			280x280		
DF (FLANGE DIAMETER)		250				300	350		350		
K		215				265	300		300		
Y		260				315			365		
TONGUE		8x7x40				10x8x 60	12x8x 80		12x8x80		
SHORT SHAFT	D	24*	24*	/	/	28*	38*		38*		
	E	50	50	/	/	60	80		80		
	F	M8	M8	/	/	M8	M10		M10		
	Tongue	8x7x35	8x7x35	/	/	8x7x40	10x8x 60		10x8x 60		
SHORT FLANGE	P	12				M12	14		M12		
	Z	130				180	230		230		
	X	200				250x250	250x250		280x280		
	K	165				215	265		265		
Weight kg		38	50	62	78	70	85	113	110	140	170

Caution !

The measurements in the table refer to the dimensions of no brake motors; to conoscere the overall dimensions of motors complete with front brake add length " l " to the measurement referrring to the brake dome in the table at the relevant paragraph.
In the case of rear brakes, add length " l " to **delta l length** in the same table.
- A line driver encoder mounted on any of the motors will not change the dimensions.

Description of motor with brake

MOTOR WITH FRONT BRAKE.

In the **standard version**, the Rowan motors can be equipped with a **spring actuated brake** by its support dome mounted on the front end of the motor. In this case the motor shaft is lengthened to receive the brake dome that reproduces the normal flange conditions of the no brake version; all the positive aspects of this assembly, the load to brake proximity, which makes the braking action extremely reliable and effective without interessare the whole length of the shaft.

Caution !

The brake cannot be mounted on an existing no brake Rowan G series motor after it leaves the factory, since this would require the replacement of the shaft.

The electromagnetic brakes mounted by Rowan on their motors are distinguished by their reliability and heavyduty construction, in line with the characteristics of the motor. The spring actuated brake operates with a 24V direct current and must have an independent power supply.

The **spring actuated brake (also known as safety brake)** engages its braking action when there is no power.When it is powered by 24VDC, the electromagnet compresses the springs thereby releasing the motor shaft: inversely, when there is no power, the springs are released and the motor shaft is locked. If necessary the braking action can be softened by calibrating the adjustment ring.

On request motors MEC 80 to MEC 160XL can be supplied with spring actuated brake fitted with **manual release** lever, for the smaller motors that do not already have a manual release lever.

The spring actuated brake is primarily used as a safety brake in the event of a power failure in applications involving suspended or inertial loads such as overhead cranes, loaders, unloaders, reciprocators, large capacity trolleys.

The spring actuated brake has a standard IP54 protection rating.

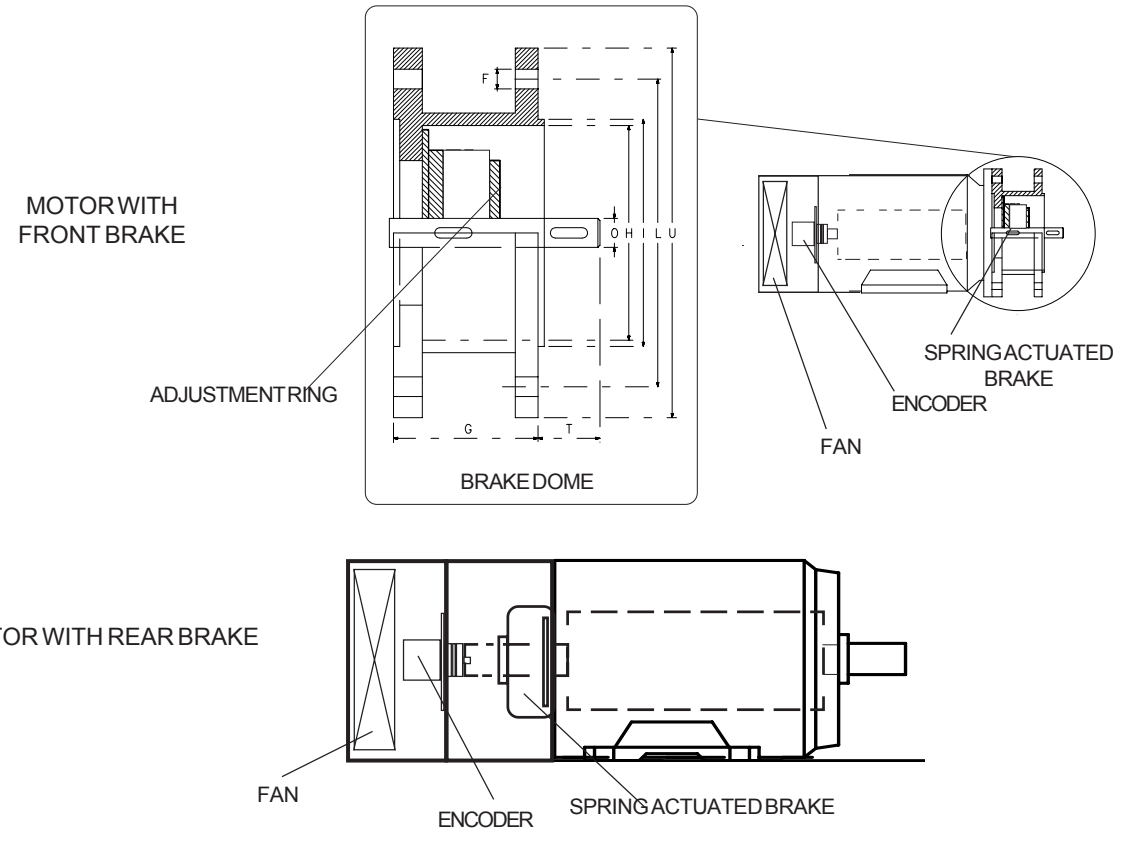
The operating characteristics are maintained with the traferro set to 0.3 mm ± 0.05.

It should be noted that **in some cases the installation of the spring actuated brake will cause a reduction in the standard shaft length** as can be seen by the dimensions given in the table ***Electromechanical characteristics of the brakes;*** for this reason and because the motors with brakes have extended shafts, read carefully the paragraph ***Possible motor installation positions*** , above all when applying lateral stresses to the shaft.

MOTOR WITH REAR BRAKE.

On request a **special version** can be supplied with a rear brake for sizes 80-90-90M - 90L - 100 - 100L - 112 - 112L - 112X -112XL - 132 - 132L - 132XL, 160, 160L, 160XL. This solution involves a reduction in braking capacity compared to standard. In this case the motor, compared to the standard version, is lengthened by the **delta l length** as given in the table:

"Electromechanical characteristics of the brakes".



Electromechanical characteristics of the brakes

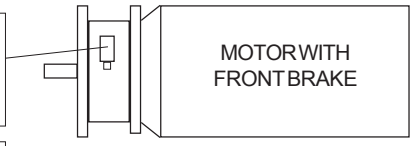
FRONT BRAKE DOME DIMENSIONS Measures are in mm (when into brackets they are out of standard)									REAR BRAKE delta l lenght	BRAKE ELECTRICAL DATA				MOTOR + BRAKE WEIGHT
										FRONT		REAR		
MEC	G	I	O	T	F	U	L	Tongue	mm	POWER ABSORBED W	BRAKING TORQUE Nm	POWER ABSORBED W	BRAKING TORQUE Nm	kg
63	60.5	95	11	23	9.5	140	115	4x4x15	/	15	5	/	/	9
63L	67	110	14	30	9.5	160	128.5	5x5x20	/	20	12	/	/	12.8
71	67	110	14	30	9.5	160	128.5	5x5x20	/	20	12	/	/	14
71L	67	110	14	30	9.5	160	128.5	5x5x20	/	20	12	/	/	19.5
80	92	130	19	40	11.5	200	165	6x6x30	125	30	20	15	5	21
80L	92	130	19	40	11.5	200	165	6x6x30	130	30	20	15	5	28.5
90	92	130	24	50	12	200	165	8x7x40	90	30	20	20	8	26
90M	92	130	24	50	12	200	165	8x7x40	85	30	20	20	8	29
90L	92	130	24	50	12	200	165	8x7x40	85	30	20	20	8	32
100	100	180	28	60	14	250	215	8x7x40	80	45	40	30	16	33.4
										50 (uprated)	60 (uprated)	/	/	38
100L	100	180	28	60	14	250	215	8x7x40	85	45	40	30	16	54.4
										50 (uprated)	60 (uprated)	/	/	59
112	100	180	28	60	14	250	215	8x7x40	110	45	40	45	35	44.4
										50 (uprated)	60 (uprated)	/	/	49
112L	100	180	28	60	14	250	215	8x7x40	110	45	40	45	35	54.4
										50 (uprated)	60 (uprated)	/	/	59
112X	100	180	28	60	14	250	215	8x7x40	110	45	40	45	35	65
										50 (uprated)	60 (uprated)	/	/	70
112XL	100	180	28	60	14	250	215	8x7x40	110	50	60	45	35	92
132	127	230	38	80	14	300	265	10x8x60	75	55	90	45	35- 60	77
132L	127	230(250)	38 *	80	14(16)	300(350)	265(300)	10x8x60	80	55	90	45	35- 60	102
132XL	127	230(250)	38 *	80	14(16)	300(350)	265(300)	10x8x60	/	55	90	45	35- 60	122
160	127	230(250)	38 *	80	14(16)	300(350)	265(300)	10x8x60	95	55	90	50	60	136
160L	127	230(250)	38 *	80	14(16)	300(350)	265(300)	10x8x60	95	55	90	50	60	170
160XL	127	230(250)	38 *	80	14(16)	300(350)	265(300)	10x8x60	/	55	90	50	60	180

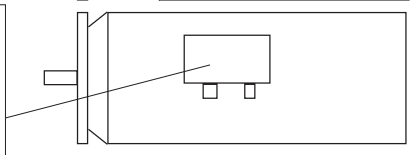
***TEMPERED SHAFTS**

Brake connection

On the **standard** version with **front brake**, the brake has a numbered 4 pin connector on the brake dome.
Connect the brake to terminals 1 and 2 of the connector.

On the special version with **rear brake**, the brake connection is available on the services terminal block mounted by the power terminal block (see also the paragraph ***Dimensional drawings of no brake motors and positions of terminal blocks).***
Power the brake at terminals 1 and 2 on the terminal block.

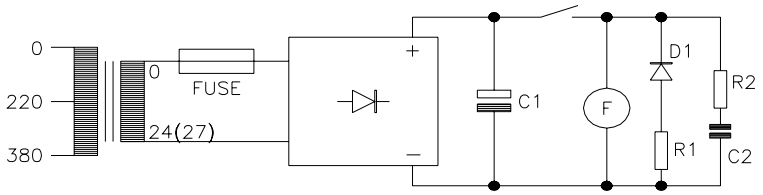




MOTOR WITH REAR BRAKE

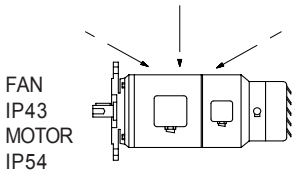
The brake operates with 24VDC. The powers are indicated in the above table.
It is always good practice to connect a flywheel diode or an R/C in parallel with the brake, especially in proximity to appliances that are particularly sensitive to disturbance (the diode has a better filtering effect, but delays the brake release).
N.B. if using a transformer with a 24VAC secondary winding a levelling condenser (C1) must be inserted, duly sized for the brake powre, and up to 25W: C1 = 1000µF 35V min.; over 25W: C1 = 2000µF 35V min.
If no condenser C1 is installed a transformer with a 27VAC secondary winding must be used.

RECOMMENDED WIRING



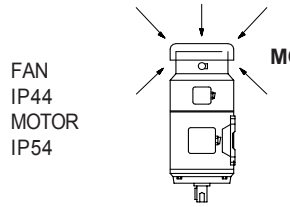
C1=see N.B., D1=1A/400V, R1=10R/4W, R2=27R/4W , C2=0,47 uF/63V

Motor installation conditions according to protection rating



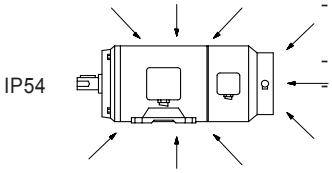
MOTOR WITH AXIAL FAN

- water sprays at max 60° angle
- **dustfree environments** correct position of orientabile copriventilatore in correspondence to direction of sprays



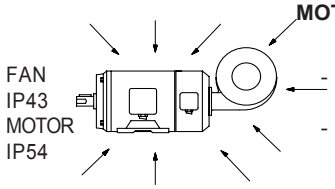
MOTOR WITH AXIAL FAN + DOME

- water sprays from all directions.
- dusty environments.



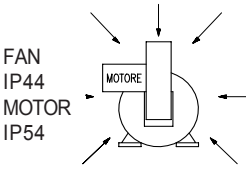
NON-VENTILATED MOTOR

- water sprays from all directions.
- OK for dusty environments.
- Motor for intermittent use, duty cycle 50% duty cycle, max operation=1min, standby = 1 min.



MOTOR WITH SCROLL FAN

- water sprays from all directions.
- **dustfree** environments



MOTOR WITH IP54 SCROLL FAN NO FILTER

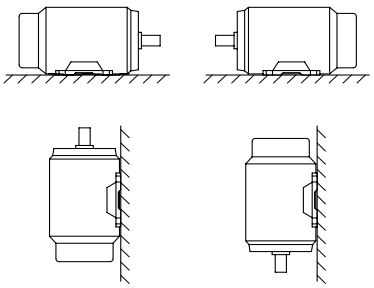
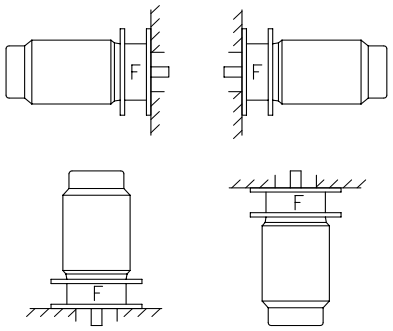
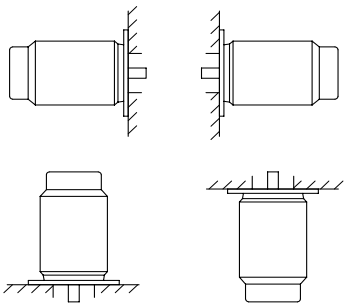
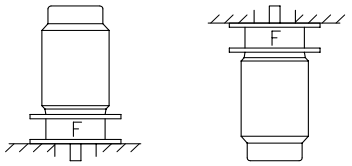
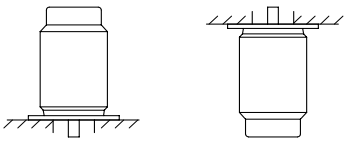
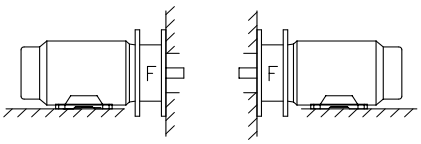
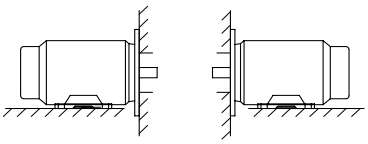
- water sprays from all directions.
- dusty environments.
- Motor power downrated by 20% or intermittent duty

Ventilation system and protection rating of motors and fans

The table below provides the characteristics of **standard fans** mounted on G series motors and the characteristics of fans that can be mounted on request; it also gives the standard and on request protection ratings.

MEC MOTOR SIZE	MOTOR PROTECTION RATING	STANDARD VENTILATION				SPECIAL VENTILATION ON REQUEST			
		TYPE	FAN PROTECTION RATING	FAN POWER W	FAN SUPPLY (50/60Hz)	TYPE	FAN PROTECTION RATING	FAN POWER W	FAN SUPPLY (50/60Hz)
63 / 63L	IP54	AXIAL	IP43	10	single phase 230Vac	NORMAL SCROLL	IP44	29	single phase 230Vac
71 / 71L	IP54	AXIAL	IP43	16	single phase 230Vac	NORMAL SCROLL	IP44	29	single phase 230Vac
80 / 80L	IP54	AXIAL	IP43	18	single phase 230Vac	NORMAL SCROLL	IP44	42	single phase 230Vac
90 / 90M 90L / 100	IP54	AXIAL	IP43	46	single phase 230Vac	AXIAL	IP54	42	single phase 230Vac
100L / 112 112L	IP54	AXIAL	IP43	46	single phase 230Vac	AXIAL	IP43	46	single phase 230Vac
112X 112XL	IP54	AXIAL	IP43	46	single phase 230Vac	AXIAL	IP43	146	single phase 230Vac
132 / 132L	IP54	AXIAL	IP43	65	single phase 230Vac	AXIAL	IP54	140	three phase 230V triangle 400V star
132XL	IP54	AXIAL	IP43	65	single phase 230Vac	AXIAL	IP54	140	three phase 230/400Vac
160	IP54	AXIAL	IP43	125	single phase 230Vac	AXIAL	IP54	203	three phase 230V triangle 400V star
160L	IP54	AXIAL	IP43	125	single phase 230Vac	AXIAL	IP54	203	three phase 230V triangle 400V star
160XL	IP54	AXIAL	IP43	125	single phase 230Vac	AXIAL	IP54	203	three phase 230V triangle 400V star

Possible motor installation positions

STANDARD MOTORS (ALSO IN REAR BRAKE VERSION)		MOTORS WITH FRONT BRAKE (N.B. OUTPUT ONLY with JUNCTION OR REDUCTION)	
B3 VERSION MOTORS: 63 - 63L - 71 - 71L 80 - 80L - 90 -90M 90L-100 - 100L - 112-112X - 112L - 112XL132 - 132L 132XL-160- 160L 160XL		**B5 VERSION** MOTORS: 63 - 63L 71 - 71L 80 - 80L 90 - 90M - 90L 100	
B5 VERSION MOTORS: 63 - 63L 71 - 71L 80 - 80L 90 - 90M - 90L 100 - 100L 112		**B5 VERSION** MOTORS: 100L 112 - 112L - 112X - 112XL - 132 - 132L - 132XL -160 - 160L - 160XL	
B5 VERSION MOTORS: 112L - 112X - 112XL 132 - 132L - 132XL 160 - 160L - 160XL		**B3/B5 VERSION** MOTORS: 100L 112 - 112L - 112X - 112XL - 132 - 132L - 132XL -160 - 160L - 160XL.	
B3/B5 VERSION MOTORS: 112L -112X - 112XL 132 - 132L - 132XL 160 - 160L - 160XL			

Mechanical limits of the motors

Caution !

In order to avoid malfunctions or breakdowns in mechanical parts it is recommended that the motor speed does not exceed the mechanical characteristics given in the table below, and set at parameter 1.3.1MAX MOTOR SPEED.

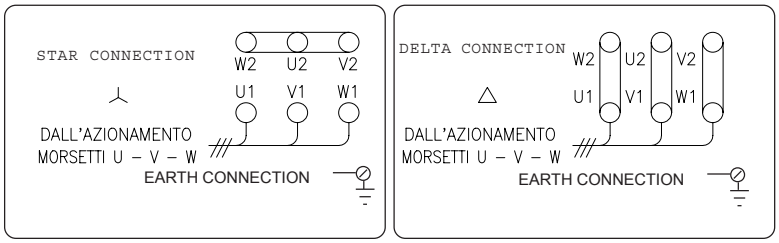
MAXIMUM SPEED COMPATIBLE WITH MECHANICAL CHARACTERISTICS OF MOTORS													
MEC Size	63	63L	71	71L	80	80L	90	90M	90L	100	100L	112	112L
Rpm	12000	12000	12000	12000	12000	12000	12000	12000	12000	12000	12000	9800	9800
MEC Size	112X	112XL	132	132L	132XL	160	160L	160XL					
Rpm	9800	9800	7800	7800	7800	7000	7000	7000					

Moreover, the following ***minimum lifespan*** is estimated for the bearings mounted on Rowan Serie G Series three pase motors:
-**B3** construction motors: minimum lifespan of 2 years, 8 work hours per day at 1500rpm , considering the torsional load, the tangential load and axial load;
-**B5** construction motors: minimum lifespan of 2 years, 8 work hours per day at 1500rpm , only considering the torsional load.
For more details contact the Rowan Elettronica Technical Office.

Description of motor connections

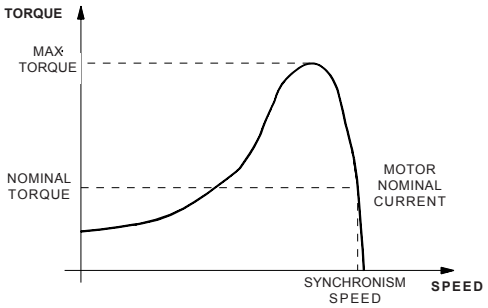
Connecting a three phase supply to the motor

To locate the terminal block on the motor see the tables:
Dimensional drawings of no brake motors and positions of terminal blocks.



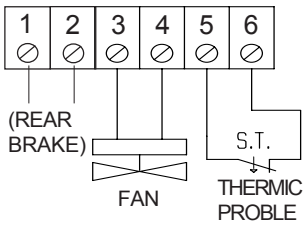
Connecting the motor to a 400 series inverter in closed loop vectorial control by encoder.
The motor can be star or triangle connected regardless of the supply voltage since the inverter control is based on the absorbed current of the actual motor.
However the choice of connection related to the supply voltage does affect the motor's torque characteristics, as illustrated in the diagams at paragraphs ***Motor/inverter combinations.*** So consult the tables in these paragraphs when choosing the possible torque characteristics according to the specific motore/inverter combination in question.
In base alla torque characteristic scelta sarà possibile conoscere the type of motor connection to make and the data settings of the base parameters for the inverter initial start-up.

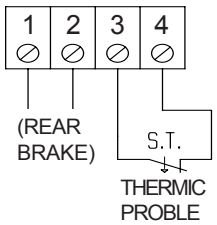
Connecting the motor directly to the power supply line
In this case the motor ID plate specifications must be respected as for any other normal asynchronous motor.
The choice of connection should therefore be based on the power supply; e.g. a standard Rowan motor 230Vac star and 400Vac triangle, will be star connected to a 400Vac line.
When using a direct power connection the motor torque will have similar characteristics to the diagram to the right .

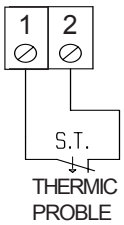


Connecting the heat probe.

To locate the terminal block on the motor see the tables:
Dimensional drawings of no brake motors and positions of terminal blocks.
The heat probe is a N.C. contact that opens when the motor winding temperature rises above 150°C, this safety limit corresponds to H class (180°C). It is used as an emergency for the run relay, accounting for the fact that the maximum contact capacity is 1A - 230VAC.
Dependant on the type of motor, the probe connection can be found in the following types of terminal blocks:







Connecting the fan

To locate the fan connection terminal block on the motor see the tables:

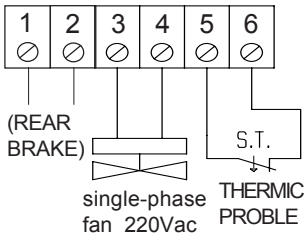
Dimensional drawings of no brake motors and positions of terminal blocks.

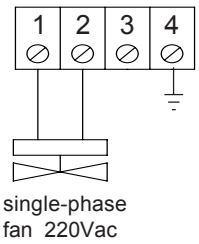
The fan characteristics are provided in the table:

Fan systems and protection ratings of motors and fans.

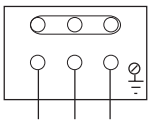
Power the fan even when the motor is shutdown so as to optimise cooling also during standby.

Dependant on the type of motor, the fan connection can be found in the following types of terminal blocks:

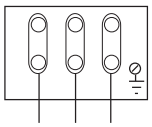




THREE PHASE SCROLL FANS (direct connection through base of fan motor)



400Vac three phase line



230Vac three phase line

LINE DRIVER encoder connector

To locate the terminal block on the motor see the tables:

Dimensional drawings of no brake motors and positions of terminal blocks.

Standard Rowan "G" series motors are fitted with a LINE DRIVER encoder with a +12VDC supply voltage and 1000 impulses /rev resolution.

On request encoders with different resolutions and a +5Vdc supply voltage can be supplied. For a +5Vdc supply the inverter will also have to be modified for this voltage

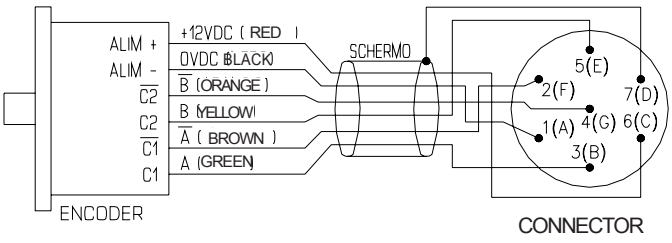
Caution !

The maximum speed that a motor can achieve depends, over and above its mechanical limits, also on the number of impulses/rev of the encoder; consult the table below to find the maximum speeds possible with standard encoders.

In any event the maximum frequency of the encoder signals cannot be over 125 KHz.

However, precision in speed control at low rev's improves with high resolution ecoders such as the 00 impulses/ rev.

The encoder power supply and phase signals are taken to the connector according to the wiring diagram: below



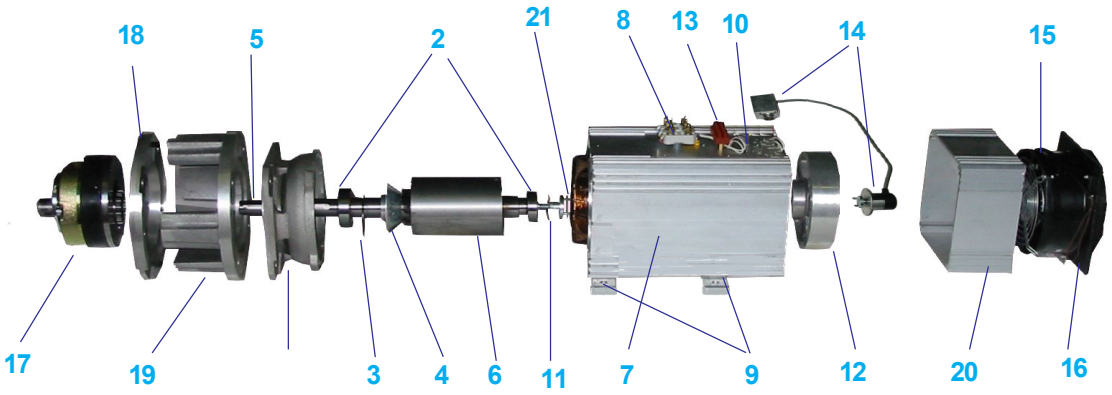
ENCODER max imp./rev.	500	1000	2000
MAXIMUM SPEED rpm	12.000	6000	3000

Caution !

The standard encoders have bearings that support a maximum speed of 3000 rpm.

For higher speeds other types of encoder are required (contact the Rowan Technical Office).

Component parts of the vector motor



This is a general parts list for a Rowan Vector Motor. The list is given as a guidleine and includes all the main variants; the above blow out refers to a typical 1.5kW B3/B5 motor with spring actuated brake and axial fan.

1 > FRONT SHIELD (aluminium), available in 2 versions:
FLANGED for motor versions B5, B3/B5 or with auxiliary electromagnetic brake;
FOOTED for motor versions B3 and B3/B5.
2 > FRONT AND REAR BEARINGS in C3 2RS.
3 > ANELLO SEGEER, (on Mec 63, 71 and 80 motors only in versions with brake).
4 > "fan" CONED BAFFLE (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 fitted with auxiliary electromagnetic brake.
SHORT SHAFT (tempered steel) with reduced endpiecedimensioni dell'estremità di uscita.
6 > SQUIRREL CAGE ROTOR
7 > STATOR HOUSING, comprising:
FINNED HOUSING with alloggiamento for power terminal block (Aluminium F91);
STATOR PACK (iron);
STATOR WINDING (iron).
8 > POWER TERMINAL BLOCK for connecting motor windings, with cover.
9 > FEET for versions B3 or B3/B5.
10 > HEAT PROBE IN WINDING
11 > COMPENSATION RING
12 > REAR RING for bearing support.
13 > SERVICE TERMINAL BLOCK, for connecting dinamo tachimetrica, fan and heat probe.
14 > ENCODER WITH CONNECTOR
15 > INDEPENDENT FAN for motor cooling, with two types available: *Axial* and *Scroll*.
16 > FAN HOOD for axial fan; not mounted on motors with scroll fans where, instead of the fan hood, the fan support is mounted.
17 > ELECTROMAGNETIC SPRING ACTUATED BRAKE *or safety brake* (with no power it locks the motor SHAFT);
on request the *spring actuated/safety* brake can be fitted with a manual release lever.
18 > FLANGED BRAKE DOME DISK; separate from brake dome (19) only on motors
Mec 90, 100, 112 and 112L.
19 > BRAKE DOME (aluminium)
20 > REAR SPACER
21 > ENCODER JUNCTION

Guide to consulting the "Motor/inverter combinations" tables

The tables in the following pages provide all the electromechanical characteristics of the **base** combinations of the vettoriale control inverter with a Rowan motor, for rated speeds of **1500 rpm, 3000 rpm,** and a supply voltage of **380/460Vac.**
These tables should also be used to obtain the parameters necessary to set up the vectorial control

The tables give the following data:
NOMINAL SPEED:
the speed of the motor at the nominal power **(*Pn*)** and nominal torque **(*Cn*).**

TYPICAL TORQUE CURVES :
a graph showing 2 typical torque curves as a function of the motor speed:
Cmax = curve of the maximum torque of the motor without actuator limitation.
C continuous duty = curve of the torque available in continuous duty.

Caution !
The graph is merely a guideline and reflects the average characteristics of all Rowan G series motors.
To receive specific graphs for each motor contact the Rowan Technical Office.

INVERTER POWER SUPPLY AT L1, L2, L3 :
the voltage that has to be supplied to the inverter at terminals L1, L2, L3.

MOTOR CONNECTION :
The motor connection that has to be followed for all the combinations in the table.

COMMON PARAMETER SETTINGS :
The parameter settings that are the same for all combinations:
par.1.1.1 LINE VOLTAGE, **par.1.1.3 MOTOR NOM FREQUE**, **par.1.1.4 MOTOR NOM VOLTAG**, **par.1.1.5 MOTOR POLES, par.1.12.1 PWM FREQUENCY**, **par.1.10.1 MAX TORQUE.**

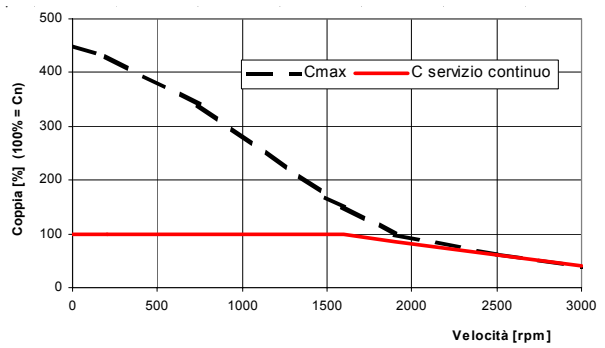
MOTOR DATA:
MEC : MEC size of the motor.
Pn : Nominal power of the motor. Power at **NOMINAL SPEED** and nominal torque (***Cn***).
Cn : Nominal torque of the motor in continuous duty at nominal power **(*Pn*)**, corresponding to 100% in the graph.
Cmax : maximum torque in intermittent duty as a % of the nominal torque of the motor ***(Cn).***
This is also the maximum setting accepted at **par.1.10.1 MAX TORQUE.**
In motor : nominal current of motor in continuous duty at nominal torque (***Cn***).
This must also be set at **par.1.1.2 MOTOR NOM CURREN.**

INVERTER DATA:
SIZE : the power size of the 400 series inverter.
In : nominal output current to inverter in continuous duty at terminals U V W.
I magnet : magnetising current to set at **par.1.6.4 VECT MAGNET CURR.**
K rotor : motor rotorica constant to set at **par.1.6.5 ROTOR COSTANT.**
KP gain : proportional gain of speed regulator to set at **par.1.6.2 KP GAIN.**
KI gain : integral gain of speed regulator to set at **par.1.6.3 KI GAIN.**
Adapt Perc Torq.: % torque adaption settings/displays against nominale, to set at **par.1.10.15 ADAPT PERC TORQ.**
Adapt Torq. Nm: real torque in Nm adaption settings/displays to set at **par.1.10.16 ADAPT TORQ. (Nm)**
Acc : minimum acceleration time to take the motor from 0 rpm to ***NOMINAL SPEED.***

Motor/inverter combinations (1500 rpm - 380/460Vac)

NOMINAL SPEED	INVERTER SUPPLY L1, L2, L3
1500 rpm	380/460Vac

TYPICAL TORQUE CURVE



MOTOR CONNECTION

STAR

COMMON PARAMETER SETTINGS

par.1.1.1 LINE VOLTAGE	Set Line voltage in Volts
par.1.1.3 MOTOR NOM FREQUE	50.0Hz
par.1.1.4 MOTOR NOM VOLTAG	360.V
par.1.1.5 MOTOR POLES	4_POLES
par.1.12.1 PWM FREQUENCY	5.00KHz

MOTOR DATA / INVERTER DATA

MEC	Pn		Cn	Cmax (par.1.10.1)	Inmotor (par.1.1.2)	SIZE	In	Imagnet (par.1.6.4)	Krotor (par.1.6.5)	KP GAIN (par.1.6.2)	KI GAIN (par.1.6.3)	Adapt Perc Torq. (par.1.10.15)	Adapt Torq. Nm (par.1.10.16)	Acc
	KW	HP	Nm	%	A		A	%	Hz	adim.	adim.	%	%	ms
63	0.18	0.25	1.25	400.0	0.7	/ P	3	74.3	120.0	5	5	226.0	170.0	20
63L	0.37	0.5	2.5	400.0	1.2	/ P	3	77.5	52.0	7	7	154.0	134.0	22
71	0.37	0.5	2.5	400.0	1.4	/ P	3	73.8	30.0	10	10	155.0	123.5	20
71L	0.75	1	5	355.0	2.4	/ P	3	70.0	16.0	22	22	137.0	128.5	24
80	0.75	1	5	400.0	2.1	/ P	3	68.0	17.0	33	33	136.0	147.5	22
80L	1.5	2	10	363.0	3.6	/ R	5	66.6	13.5	30	30	131.0	136.0	27
90	1.5	2	10	400.0	5.0	/ R	5	90.0	10.0	20	20	210.0	154.0	20
90M	2.2	3	15	330.0	6.2	/ 0	7	70.0	13.0	20	20	145.0	123.0	20
90L	3.5	4.7	23.5	384.0	9.0	/ 1	12	80.0	15.0	20	20	140.0	128.0	20
100	3	4	20	400.0	8.0	/ 1	12	87.0	14.0	20	20	165.0	140.0	20
100L	6	8	40	301.0	13.5	/ L	15	70.0	8.3	25	25	135.0	120.0	20
112	4	5.5	27.5	313.0	10.0	/ 1	12	65.0	5.5	30	30	127.0	114.0	20
112L	5.5	7.5	37.5	306.0	13.0	/ L	15	62.0	7.0	35	35	132.0	113.0	25
112X	7.5	10	48	248.0	15.0	/ L	15	62.4	4.9	35	35	123.4	118.0	30
112XL	10.5	14.5	70	251.0	22.0	/ 2	22	67.0	5.2	45	45	117.5	112.5	30
132	9	12	60	264.0	21.0	/ 2	22	63.8	5.6	50	50	117.6	100.0	45
132L	11	15	75	296.0	25.0	/ 3	35	51.6	5.4	50	50	122.0	103.3	40
132XL	13.5	18	90	232.0	30.0	/ 3	35	53.4	4.4	50	50	115.0	97.5	40
160	15	20	100	218.0	32.0	/ 3	35	56.0	2.7	50	50	115.0	102	50
160L	22	30	150	238.0	47.5	/ 4	50	47.0	3.9	20	20	110.0	103.5	44
160XL	28	38	190	230.0	58.0	/ 5	60	29.0	6.6	50	50	111.0	110.0	60

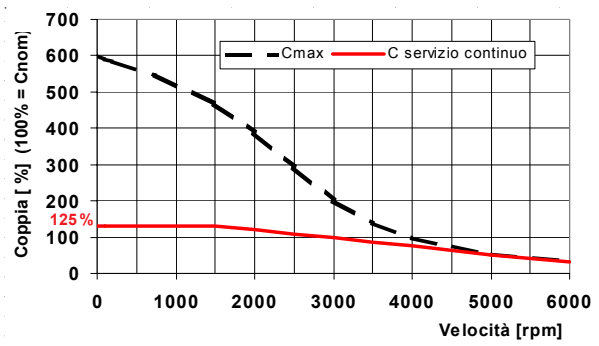
Caution !

- Nominal characteristics of motors refer to ambient temperature 40°C.

Motor/inverter combinations (3000 rpm - 380/460Vac)

NOMINAL SPEED	INVERTER SUPPLY L1, L2, L3
3000 rpm	380/460Vac

TYPICAL TORQUE CURVE



MOTOR CONNECTION

TRIANGLE

COMMON PARAMETER SETTINGS

par.1.1.1 LINE VOLTAGE	Set Line voltage in Volts
par.1.1.3 MOTOR NOM FREQUE	100.0Hz
par.1.1.4 MOTOR NOM VOLTAG	410.V
par.1.1.5 MOTOR POLES	4_POLES
par.1.12.1 PWM FREQUENCY	5.00KHz

MOTOR DATA / INVERTER DATA

MEC	Pn		Cn	Cmax (par.1.10.1)	Inmotor (par.1.1.2)	SIZE	In	Imagnet (par.1.6.4)	Krotor (par.1.6.5)	KP GAIN (par.1.6.2)	KI GAIN (par.1.6.3)	Adapt Perc Torq. (par.1.10.15)	Adapt Torq. Nm (par.1.10.16)	Acc
	KW	HP	Nm	%	A		A	%	Hz	adim.	adim.	%	%	ms
63	0.28	0.38	0.94	400.0	1.1	/ P	3	87.0	65.0	7	7	245.0	100.0	40
63L	0.56	0.75	1.88	400.0	1.8	/ P	3	85.0	30.0	13	13	173.0	76.3	40
71	0.56	0.75	1.88	400.0	2.2	/ P	3	85.0	15.0	21	21	172.4	67.8	38
71L	1.13	1.5	3.75	400.0	3.6	/ R	5	81.8	10.5	25	25	144.9	61.2	40
80	1.13	1.5	3.75	400.0	2.9	/ R	5	74.0	16.3	31	31	130.6	63.0	75
80L	2.3	3	7.5	373.0	5.4	/ 0	7	64.0	11.0	40	40	143.0	70.0	50
90	2.3	3	7.5	400.0	6.8	/ 1	12	75.0	14.0	22	22	150.0	53.9	40
90L	5.3	7.2	17.6	400.0	13	/ 2	22	80.0	14.9	16	16	154.3	62.3	30
90M	3.3	4.5	11.0	400.0	9.0	/ 1	12	75.0	12.5	20	20	149.0	59.5	38
100	5	6.5	15	384.0	11.0	/ L	15	73.0	9.8	36	36	139.6	56.8	30
100L	9	12	30	400	21.5	/ 3	35	82.0	8.1	25	25	144.4	56.9	45
112	6	8	21	400	14.7	/ 2	22	77.0	7.3	32	32	151.7	64.7	35
112L	8.5	11.5	28	400	20	/ 3	35	75.0	8.4	34	34	144.0	56.9	50
112X	10.8	14.7	36	346.6	22.0	/ 3	35	70.9	5.7	27	27	124.9	57.7	80
112XL	16	22	53	400.0	34	/ 4	50	78.0	7.3	26	26	150.4	70.0	80
132	14.0	19.0	45	400.0	30.0	/ 4	50	72.0	7.8	29	29	135.1	60.5	110
132L	16.5	22.5	56	351.3	34.0	/ 4	50	53.8	5.4	29	29	115.3	56.6	150
132XL	20	27	67	337.0	44.0	/ 5	60	66.0	5.2	42	42	122.6	55.8	80
160	23	30	75	312.5	48.0	/ 5	60	66.0	4.2	42	42	124.0	57.9	120
160L	34	45	113	337.0	67.0	/ 6.5	87	64.2	4.8	25	25	125.7	61.2	100
160XL	42	57	143	292.0	75.0	/ 7	106	37.0	6.7	41	41	100.0	55.0	170

Caution !

1) With these combinations at 3000rpm, from 0Hz to 55Hz, the motors can take a **25% extra** torque over the nominal torque ***Cn*** (see andamento in TYPICAL TORQUE CURVES graph).

2) Nominal characteristics of the motors refer to ambient temperature 40°C.

3) The graph shows a maximum speed that not all motors can reach; a questo riguardo see the table at paragraph MECHANICAL LIMITS OF ROWAN G SERIES MOTORS in this chapter.

Codings for the "G" SERIES VECTOR MOTORS

1	2	3	4	5	6	7	8	9	10	11	12	13
T	G	D	4	R	5	M	A	X	F	X	5	X

Typical example:
THREE PHASE ASYNCHRONOUS MOTOR, G SERIES MEC 90 - 4POLE - 230/400VAC 50Hz SUPPLY ENCODER LD 2000 i/g ENCODER - AXIAL FAN - STANDARD B5 CONSTRUCTION - IP 54 PROTECTION RATING NO FILTER

Power supply type 1

T = three phase

Motor series 2

G = *G* series
"with squirrel cage rotor"

MEC class 3

	[Hp	KW]
A = 63	0.25	0.18
I = 63L	0.5	0.37
B = 71	0.5	0.37
Q = 71L	1	0.75
C = 80	1	0.75
W = 80L	2	1.5
D = 90	2	1.5
V = 90M	3	2.2
E = 90L	4.7	3.5
F = 100	4	3
K = 100L	8	6
G = 112	5.5	4
H = 112L	7.5	5.5
Y = 112X	10	7,5
J = 112XL	14	10.5
L = 132	12	9
M = 132L	15	11
N = 132XL	18	13
P = 160	20	15
R = 160L	30	22
X = 160XL	42	31

Number of poles 4

2 = 2 pole **4** = 4 pole
6 = 6 pole

Winding voltage 5

Three phase power supply
R = 230/400 **I** = 125/220
V = 400/690 **Z** = 300/520
W = 270/470

Hertz 6

5 = 50 Hz

Tipo trasduttore 7

G = LD 512i/g encoder, no zero
L = LD 500i/g encoder, no zero
M = LD 1000i/g encoder, no zero
N = LD 1024i/g 8/24V encoder, no zero
O = LD 1024i/g 5V encoder, with zero
P = LD 2000i/g encoder, no zero
R = LD 2000i/g encoder, with zero
T = LD 1000i/g encoder, with zero
S = LD 2000i/g 5V encoder, with zero
U = LD 750i/g encoder, no zero
X = no transducer

Fan type and accessories 8

A = axial
B = axial + dome
C = normal scroll
D = normal scroll with 90° outlet
G = uprated scroll
H = uprated scroll with 90° outlet
X = motor without fan

Brake type and accessories 9

M = spring actuated brake
L = spring actuated brake + release lever
A = uprated spring actuated brake
B = uprated spring actuated brake + release lever
X = motor without brake

Motor construction * 10

F = B5 standard
Z = B3 standard
S = B3/B5 standard
R = B5 short shaft and flange
G = B5 standard shaft and short flange
H = B5 short shaft and standard flange
B = B3 short shaft
L = B3/B5 short shaft and flange
M = B3/B5 standard shaft and short flange
P = B3/B5 short shaft and standard flange
A = B3 special 200mm shaft 12MA thread L.40

Construction details 11

X = none
S = left-hand terminal block
V = power terminal box cover with 2 cable glands
L = smooth flange
C = short rear

Grado di protezione motore 12

2 = IP 23
5 = IP 54
6 = IP 54 no ventilation
7 = IP 54 liquid cooled

Free digit for extra specifications 13

X = no extra specifications

Codings for "G" SERIES VECTOR MOTORS to UL standards

1	2	3	4	5	6	7	8	9	10	11	12	13
T	G		4	A	X							

Power supply type 1

T = three phase

Motor series 2

G = *G series*
"with squirrel cage rotor"

MEC Class 3

A = 63
I = 63L
B = 71
Q = 71L
C = 80
W = 80L
D = 90
V = 90M
E = 90L
F = 100
K = 100L
G = 112
H = 112L
Y = 112X
J = 112XL
L = 132
M = 132L
N = 132XL
P = 160
R = 160L
X = 160XL

Number of poles 4

4 = 4 pole

Winding voltage and hertz 5 and 6

AX = 240V at 60Hz
230/400V at 50Hz

Transducer type 7

L = LD 500i/g encoder
M = LD 1000i/g encoder
P = LD 2000i/g encoder

8 **Fan type and accessories**

A = axial
C = normal scroll

NB: motors MEC E, K, H, J, N only mount scroll fans.

9 **Brake type and accessirues**

M = spring actuated brake
L = spring actuated brake + release lever
X = no brake

10 **Motor construction ***

F = B5 standard
Z = B3 standard
S = B3/B5 standard
R = B5 short shaft and flangei
G = B5 standard shaft and short flange
H = B5 short shaft and standard flange
B = B3 short shaft
L = B3/B5 short shaft and flange
M = B3/B5 standard shaft and short flange
P = B3/B5 short shaft and standard flange
A = B3 special shaft 200mm thrd. 12MA L.40

11 **Construction details**

X = none
S = left-hand terminal block

12 **Motor protection rating**

5 = IP 54
6 = IP 54 non-ventilated
7 = IP 54 liquid cooled

13 **Free digit for extra specifications**

X = no extra specifications

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