



# Rowan Elettronica

*Products and Solutions for the Industrial Automation*

## **350 SERIES INVERTERS**

**ASYNCHRONOUS MOTORS SENSORLESS DRIVES**

## **400 SERIES INVERTERS**

**BRUSHLESS ASYNCHRONOUS VECTOR DRIVES**





**IMPORTANT!**

**ROWAN ELETTRONICA s.r.l.** declines any responsibility for inaccuracies contained in this manual, due to printing errors and/or transcription. It also reserves the right to make at its discretion and without notice the changes it deems necessary for the better functioning of the product.

**As for the details and characteristics** reported in this manual there is a maximum tolerance of  $\pm 10\%$ , unless otherwise stated. The relative diagrams are approximate and are to be perfected by the user.

**The warranty** on the products is understood as ex-works under the conditions specified in the appropriate document to be requested from the Commercial Department or through the website [www.rowan.it](http://www.rowan.it)



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## 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 proprietary patents. It has progressively developed and consolidated its standing thanks to the quality and reliability of its products and the high professionalism and experience of its consultancy and assistance services, growing from its first factory of 200m<sup>2</sup> in Cresole di Caldogno (VI) to its current 3,000m<sup>2</sup>, which include 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 Department**, 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 receive 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 willingness (on average, the staff dedicate approx 8 hours a day on telephone assistance).

In addition to the technical departments, Rowan Elettronica has an efficient support organisation such as **Administration-Accounts, Sales Department, Commercial Department and Purchase Department.**

### 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 regulators for three and single phase commercial fan motors both independent 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.

### THE 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 continuous 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:

*SPECIAL RESIN TREATMENT FOR BOARDS* to prevent any malfunctions caused by humidity in the switchboards within the statutory limits.

*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, IMPEDANCE, 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.

# INVERTERS 350 and 400 SERIES

## INTRODUCTION

The **350 SERIES** Digit Inverters are exclusively designed for the speed control of the asynchronous standard motors through the Voltage/Frequency skill, without speed feedback.

They are especially suggested when you need:

- **functioning and setting simplicity**
- **high starting torque**
- **low price**

The **400 SERIES** Digit Inverters along with the G series Vector motors represent our best solution for the "motion control" needs. The speed and torque control are realized by the FOC VECTOR technique with encoder feedback.

They are especially suggested when you need:

- **high precision on speed and torque control**
- **high dynamic performances**
- **short response time**
- **specialized functions for: positioning, processing regulation, winding, regeneration.**

**350 and 400 SERIES INVERTERS, EVEN WITH DIFFERENT FUNCTIONS, HAVE SAME POWER SIZES, OVERALL DIMENSIONS and ACCESSORIES** (see next pages at "Common technical features").

## INVERTER 350 SERIES

## GENERAL FEATURES

- Digit control by DSP microprocessor.
- Simplified start-up menu (**BASIC DATA**) by setting those parameters strictly useful for a quick start.
- Possibility of **copying all parameters** into two internal memories and restoring them onto job memory.
- Possibility of **restoring the default setting of all parameters.**
- Possibility of **bidirectional transfer** (copy / restore), through a USB port, of all the memories of parameters in an external EEPROM KEY available separately (cod. C411S.A).
- Software "Rowan Key Manager" for saving the parameters of the EEPROM KEY into a file and viceversa.
  
- **Standard INPUT/OUTPUT resources** (digital/analog) fully programmable, including:  
7 digit inputs, 3 relay outputs, 1 static output, 4 analog inputs, 2 analog outputs, 1 input dedicated to motor PTC probe.
- **Keypad with remotation and customization possibility** for direct use as terminal on a panel at a side of the machine (2 rows x 16 digits).
- Possibility of **automatic re-start** after fault.
- **Electrical heat protection** of the inverter and the braking resistance.
- **RS485 standard field bus** up to 115200 bps by MODBUS RTU.
- **Two motors simple selection** having different output characteristics to a unique actuator.
- **Speed control system:**
  - V/F scalar control for standard asynchronous motors
  - V/F linear characteristic
  - **HT (High Torque) control** for high performances of starting torque from empty to loaded.
  - Loaded starting with blocked rotor obtaining the maximum torque performance.
  - slow/fast overload control.
  - flying start function.
  - Continuous current braking.
  - Speed setting from analog input, keypad, moto-potentiometer and 3 fixed speeds selectable from digital inputs and modbus.
  - 2 maximum speeds selectable through digital inputs.
  - 2 acceleration ramps selectable through digital inputs.
  - 2 deceleration ramps selectable through digital inputs.
  - 1 switching threshold on the motor speed.
  
- **Special functions:**
  - **REGULATOR** useful for the closed loop control of the pressure on compressors, refrigerators and pumps. See all characteristics on REGULATOR - FUNCTION 1 for C400R inverters on page 10.
  - **Safe Torque Off (STO) function:** it is a function that allows you to implement an EMERGENCY RESPONSE with safe inhibition of the motor torque; in this case the motor becomes free to rotate in base to its own inertia and that of the load.

**INVERTER 350 SERIES**

**TECHNICAL FEATURES**

**Inverter power supply to terminals L1 L2 L3**

Three-phase power supply voltage ..... 180VAC to 270VAC (standard voltage 220/240VAC)  
 ..... 320VAC to 490VAC (standard voltage 380/460VAC) only for models from 350/R to 350/3,5  
 ..... 500VAC (on request) only for models from 350/R to 350/3,5  
 ..... 320VAC to 460VAC (standard voltage 380/400/415VAC) only for models from 350/5 to 350/G  
 ..... on request 380VAC to 560VAC (standard voltage 440/460VAC)  
 ..... on request 560VAC to 760VAC (standard voltage 690VAC) only for models from 350/5 to 350/G

**U V W motor output**

Types of motors connectable ..... asynchronous three-phase caged  
 Motor control techniques: ..... SCALAR V/F  
 Output voltage ..... 0 to 100% of the power supply voltage  
 Output frequency ..... 0Hz-800Hz  
 Waveform ..... sinusoidal  
 Modulation technique ..... PWM (Pulse With Modulation)  
 PWMfrequency ..... adjustable from 0.5KHz to 16KHz  
 Percentage of overload capacity compared to the max current to be adjusted into the inverter with PWM at 5Khz:  
 - up to 110% (not over) in continuous mode without intervention of the inverter fault.  
 - over 110% there is the temperature control with intervention of the inverter fault for prolonged overtemperature if the following limits are overpassed (value varies depending on size):  
 110% of the rated current of the inverter per 300sec, 175% of the rated current of the inverter for 30 sec, max 250% of the rated current of the inverter for 3 sec.

**Regenerative braking control**

Breaking unit ..... included up to 22KW (on request over this power)  
 Regenerated energy dissipation system ..... via external resistance connected to F+ and F terminals

**Digital inputs**

N° of digital inputs ..... 7 (I1 to I7)  
 Input insulation ..... optoisolated if an external power supply is used  
 Connection logic ..... NPN or PNP  
 Activation voltage ..... min 15Vdc, max 30Vdc  
 Programmability ..... Input I1 (RUN) with fixed function, the others completely programmable  
 Input resistance ..... about 3,6Kohm  
 Time of activation/deactivation I1... I6 ..... 2 ms  
 Time of activation/deactivation I7 ..... 51 ms

**Input for motor protector PTC probe**

Type of probe ..... max 250 ohm at 25°C (DIN 44081)  
 Inverter fault activation resistance ..... >2850 ohm ±20%  
 Recovery resistance ..... <1000 ohm ±20%

**Relay outputs**

N° of relays ..... 3 (O1,O2,O3)  
 Programmability ..... completely programmable  
 Relay contacts ..... one in exchange NO and NC  
 Contacts flow rate ..... 0.5A/120Vac -1A/24Vac  
 Activation/deactivation times ..... 5 ms

**Digital outputs**

N° of outputs ..... 1 (O4 )  
 Output isolation ..... optoisolated if an external power supply is used  
 Connection logic ..... NPN or PNP  
 Programmability ..... completely programmable  
 Work voltage ..... max 100Vdc  
 Maximum current ..... 80 mA  
 Activation/deactivation times ..... 50 ms



**INVERTER 350 SERIES**

**TECHNICAL FEATURES**

**Analog inputs**

AI1 ..... differential +/-10Vdc...12 bit ...sampling time 1 ms  
AI2 ..... differential +/-10Vdc,4-20mA, 0-20mA...12 bit...sampling time 1 ms  
AI3, AI4 ..... +/-10Vdc...12 bit...sampling time 1 ms  
Programmability ..... completely programmable

**Analog outputs**

AO0 ..... 12 bit...response time 50 ms  
AO1 ..... 12 bit...response time 50 ms  
Output voltage ..... +/-10Vdc  
Output current ..... max 10mA  
Programmability ..... NO (fixed function)

**RS485 serial connection**

Standard protocols ..... MODBUS RTU...ROWAN  
Baud rate ..... 9600..19200..38400..57600..76800..115200  
Insulation ..... optoisolated

**Power supply voltages available**

+10Vdc, -10Vdc (for potentiometers power supply) ..... max 10mA  
+24Vdc (for inputs power supply or other devices) ..... protected against short-circuit...max 500mA  
+5Vdc ..... protected against short-circuit...max 200mA  
+15Vdc ..... protected against short-circuit...max 200mA

**Protections**

to Inverter ..... electronic thermal protection (I x I x t) on extended overload to terminals U, V, W  
..... protection on the maximum peak current U, V, W  
..... programmable timed threshold protection on the output current to terminals U, V, W  
protection against short-circuit between the U, V, W phases (all sizes) and between the phases and earth (from /5 to /G)  
..... over-voltage protection of the BUS DC  
..... over-temperature protection of the IGBT modules  
..... alarm without fault of the BUS DC capacitors  
..... protection against short-circuit on terminals F and F+ for the braking resistor connection  
to Motor ..... protection from external PTC probe connected to the input of the dedicated inverter  
to Braking resistance ..... threshold electronic thermal protection on prolonged overload

**Special applications**

REGULATOR ..... specializing in the control of compressors, pumps and ventilators  
..... ROLLER IN BEND CONTROL

**Environmental specs**

Environmental temperature ..... -5°C to +40°C  
Heat sink temperature ..... -5°C to +70°C  
Storage temperature ..... -25°C to +70°C  
Altitude ..... maximum 1000mt at s.l (beyond, the load must be reduced by 1% every 100mt)  
Protection degree ..... IP20 standard, IP54 on request  
Relative humidity ..... 5% to 95% without condensation.

**Compliance regulations and electromagnetic compatibility**

The 350 series drives are designed to operate in industrial environments. They are EU products in conformity with **EMC 2014/30/UE directive**, with reference to **CEI EN 61800-3 (Cat. C2)** product standard, only if the cabling respects the installation manual, as indicated on Chapt. 4 and 7 of the C350S manual.

For models without internal filter, conformity with directive EMC is met only if they are connected to the appropriate filtering devices provided separately (see table of filters and ferrite rings on the following pages).

They are further in keeping with **B.T. 2014/35/UE directive**, in reference to **EN 61439-1/2** and **CEI EN 60204-1** standard.

**WARNING:** this product belongs to the class of restricted commercialization in compliance with **EN 61800-3 (Cat.C2)**. In a domestic environment this product may cause radio interference, in which case the user must take adequate precautions.



**INVERTER 400 SERIES**

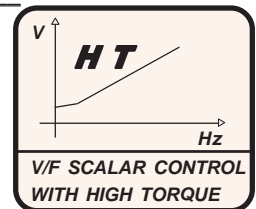
**GENERAL FEATURES**

- Digit control by DSP microprocessor.
- Simplified start-up menu (**BASIC DATA**) by setting those parameters strictly useful for a quick start.
- Possibility of **copying all parameters** into two internal memories and restoring them onto job memory.
- Possibility of **restoring the default setting of all parameters..**
- Possibility of **bidirectional transfer** (copy / restore), through a USB port, of all the memories of parameters in an external EEPROM KEY available separately (cod. C411S.A).
- Software "Rowan Key Manager" for saving the EEPROM KEY parameters into a file and vice-versa.
- **Standard INPUT/OUTPUT resources** (digital/analog) fully programmable, including:  
6 digital inputs, 3 relay outputs, 4 analog inputs, 4 analog outputs, 2 inputs for 125Khz line driver encoder .
- Possibility of **expanding the I/O resources** by including the optional expansion drive, having:  
7 digital inputs, 5 digital static outputs, 1 input for 125Khz line driver encoder.
- **Keypad with remotation and customization possibility** for direct use as terminal on a panel at a side of the machine.
- Network holes managing for limitation of down-times.
- Possibility of **automatic re-start** after fault.
- **Electrical thermic protection** of the inverter, the motor and the braking resistance.
- **RS485 standard serial control** up to 115200 bps by MODBUS RTU.
- **Optional serial control:** PROFIBUS DPV1, CAN OPEN, MODBUS TCP/IP, ETHERCAT and PROFINET.
- **Two motors simple selection** having different output characteristics to a unique actuator, even equipped with encoder, thanks to the possibility of connecting two line driver encoders.

■ **Motor control systems available:**

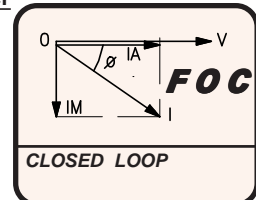
**V/F scalar control for standard asynchronous motors**

- Three different V/F curve settings (for standard load or for two selectable curves on ventilators/pumps)
- **HT (High Torque) control** for high performances of starting torque from empty to loaded.
- Underload starting with blocked rotor obtaining the maximum torque performance.
- Slipping compensation.
- slow/fast overload control.
- Flying start function.
- Continuous current braking.



**VECTOR FOC for Rowan Elettronica vector motors and asynchronous motors with encoder**

- High precision bidirectional speed control and high dynamic performances.
- Speed feedback by line driver encoder.
- Motor torque control with two separate rotational directions and precise displaying in Nm.



■ **V/F scalar and Vector speed control features:**

- speed set can be set by analogic input, keypad, moto-potentiometer , 10 constant speed reference selected by digital input, modbus.
- 3 different speed sets are selected by digital inputs.
- 3 speed limits are selected by digital inputs.
- 3 different acceleration speed ramps can be selected by digital inputs.
- 3 different deceleration speed ramps can be selected by digital inputs.
- 2 thresholds on speed motor can be selected.
- **LIFT function** with MECHANIC BRAKE control, useful for lift system.

■ **Functions available:**

- **AXIS** function implements a position control of the motor.
- **REGULATOR** function implements a closed loop control for compressors, fridges, poms and cutting application with constant current.
- **GEN-AFE** function implements variable frequency and voltage supplies and re-generator toward electric line.
- **WINDER** function for winding and unwinding application.
- **CUSTOM** function on client specifics.

■ **Inverter codes available:**

- **C400A ( SPEED + AXIS )**
- **C400R (SPEED+REGULATOR)**
- **C400G (SPEED+GEN-AFE)**
- **C400W ( SPEED + WINDER)**
- **C400F ( SPEED + AXIS + DIE CUTTER)**

■ **Special functions:**

- **Safe Torque Off (STO) function:** it is a function that allows you to implement an EMERGENCY RESPONSE with safe inhibition of the motor torque; in this case the motor becomes free to rotate in base to its own inertia and that of the load.



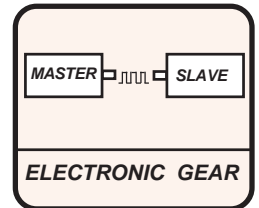
**INVERTER 400 SERIES**

**APPLICATIONS**

**C400A AXIS inverter**

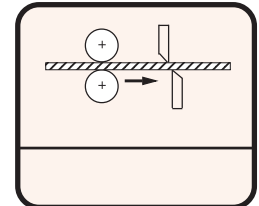
**ELECTRIC MASTER/SLAVE SHAFT**

- Encoder master input in LINE DRIVER logic, max 125KHz.
- **Electric shaft function without** mechanical master/slave step references (e.g. to sync conveyor belts, neutral material cutting without reference notch, bridge cranes etc.).
- **Electric shaft function with** mechanical master/slave step references (e.g. packaging machinery with spot sync, printing machines, to sync chain conveyors with station passage etc.).
- Master/slave ratio selectable from 4.00000 to 0.00466 or directly in product format (mm); the value can be set by:
  - > inverter keypad;
  - > digital input in binary code, 32 ratios are manually set;
  - > modbus serial port.
- Programmable outputs:
  - > sync error;
  - > anticipated slave;
  - > delayed slave.
- **Die-cutter, cut-welding and printing roller function**



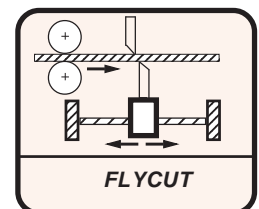
**POSITIONER**

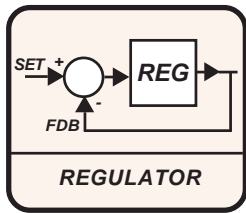
- Positioning: ABSOLUTE, RELATIVE NOT ZEROING, RELATIVE WITH ZEROING.
- Zero search by external sensor or encoder zero notch, with or without pre-slowdown.
- Feedback from motor encoder or external encoder (e.g. metric wheel, optic rule).
- Items-counter function with automatic-stop at program ending.
- Target position set and display of real position with precision from 0 to 3 decimal.
- 32 positioning values, 8 positioning speeds, 8 acc/dec positioning ramps can be selected by digital input or modbus serial port.
- Variable speed during the positioning operation.
- pre-positioning output.
- JOG controls;
- position values memorization at switch-off.
- Software limit switch activation.
- Programmable outputs:
  - > positioning tolerance;
  - > zero searching completed;
  - > sync error;
  - > end of items-counter program;
  - > 2 thresholds on slave position.



**FLYING CUT**

- Cutting start from master measurement or from spot reading by shiftable digital input.
- Cutting point run-up and return programmable ramp.
- Return to home position settable by digital input or maximum position value.
- Programmable output:
  - > slave/master synchronism.



**INVERTER 400 SERIES****APPLICATIONS****C400R REGULATOR inverter****ZERO FUNCTION****Generic feedback regulation for vector and scalar control:**

- Feedback from 0 /+10Vdc, +/-10Vdc, 4÷20mA, 0÷20mA signal, by programmable analog input.
- Proportional/Integral regulation.
- Maximum and minimum speed.
- NTC or PTC temperature probe for motor protection.
- Reversible regulation direction.
- Minimum or maximum alarm/fault with delay setting.

**FUNCTION 1****Specific regulation for compressors, pumps, fridge cells:**

- Operation level setting by 0÷10Vdc, moto-potentiometer, potentiometer, keypad.
- Feedback from transducer 0 /+10Vdc, +/-10Vdc, 4÷20mA, 0÷20mA.
- Mimimum, maximum speed and delayed stop setting.
- Positive and negative regulation setting.
- Pressure hysteresis and restart temperature setting.
- Proportional and Integral gain setting.
- 3 V/F curves for each different tipe of load (pumps, fans, etc...) has already been set in scalar control.
- Overload start.
- Speed reduce setting in relationship with overload.
- Reading/Display oil temperature by PTC/NTC probe.
- Speed reduce setting in relationship with oil temperature or motor temperature and delayed stop if the temperature stays over the limit (the delay can be set).
- Stand-by operation state if the temperature is too low.
- Memorization of work time.
- Period time setting for oil maintain.
- Customizable keypad.

**FUNCTION 2****Regulator for marble, wood, metal, etc... cutting systems**

The P/I controller adjusts the speed of the motor for the translation operation then the current of the motor used for the cut operation is maintained constant by one of the following solutions:

**A)** The inverter implements a direct control of motor speed for the cut operation and the P/I regulator adjusts the external drive for the translation movement by a programmable analog output.

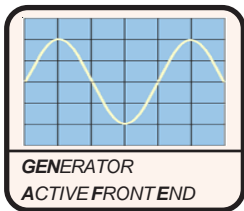
**B)** The inverter implements the direct control of motor speed for the translation movement by the P/I regulator; the current feedback is read by a programmable analog input (TA signal or 0÷10 V).

Important functions:

- Speed regulation of the motor for cutting operations;
- JOG function for manual translation;
- Manual adjusting of the translation speed;
- Manual adjusting of the motor current for the cutting operation;
- Switch between MANUAL/AUTOMATIC and vice-versa; at the moment the motor current for the cut operation is maintained constant.
- Alarm setting for minimum and maximum current;
- A delay can be set for alarm reaction.

**INVERTER 400 SERIES**

**APPLICATIONS**



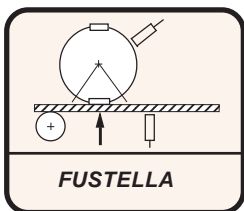
**C400G GEN-AFE inverter**

**GENERATOR:**

- Suitable for building variable voltage and frequency feeders.
- V/F generator with open loop or closed loop voltage regulator, on the second one the feedback is obtained by external Vac/Vdc converter in parallel with the load.
- V/F generator with open loop or closed loop current regulator feedback obtained by an internal reference or by an external Iac/Vdc converter in series with the load.
- Available outputs: three-phase, single-phase or triple single-phase.
- Available output waveforms: sinusoidal, sinusoidal plus triple harmonic or square wave.
- Output frequency range: 1.0 to 800 Hz.
- PWM switching frequency range: 0.5 to 30 KHz (the maximum limit depends on the size).
- Special function single-phase square wave, it's modulated until 2500 Hz.
- 4 output signals with different frequency are selected by digital inputs.
- Output voltage and current are regulated by analogic inputs or directly by keypad.
- Soft-starter, with programmable voltage ramp.

**RE-GENERATOR AFE:**

- Suitable for supply units and electric energy recovery, if an other inverter C400A is connected, the common DC bus allows to recover the brake energy toward the electric line.
- AFE (Active Front End) technology allows to exchange the electric energy from and toward the electric line, a reduction of harmonic distortion is achieved and the power factor will be almost one.
- Programmable level of the bus DC voltage.
- Programmable generation current limit (electric line toward bus DC).
- Programmable re-generation current limit (bus DC toward electric line).
- Remote-control switch and bus DC pre-charge can be controlled by digital output.
- Digital output is reserved for the slave inverters connected on bus DC run enabling.



**C700F DIE CUTTER inverter**

**DIE CUTTER**

In 700 F series, in addition to 700A applicatives, a DIE CUTTER / PRINT ROLLER functionality is enabled. This function allows a in different sizes, digitally settable, cut or print of a material layed on pulling tape master keeping the same roller diameter. A cutting zone is settable where the cutting/printing roller moves at same materiale speed, in the other turn part a alterna-te speed profile will be executed depending on the set sizes.

Some example of applicative fields are:

- cut or pre-cut of paper on measure
- packages die cutting
- pad printing
- gluing parts on packages

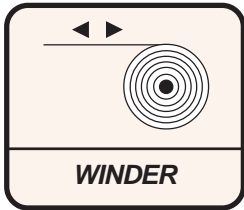
The die cutter applicative is suitable on neutral material or with master referement notch, in this case an automatic centrature position is also provided through master/slave signal with possible digital shift.

Following resources are available in 700F series:

- master referement notch and slave die cutter position inputs (a fast input module is available as optional, sampling time 10 microseconds, standard 1 microsecond)
- line driver encoder input (max 125 kHz) of pulling tape master
- possibility to manage more than one cutter/printer camme
- function parameters (cutting size, shift, etc...) settable through keypad, I/O or cummunication field bus.

**INVERTER 400 SERIES**

**APPLICATIONS**



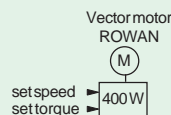
**C400W WINDER inverter**

**BASE FEATURES AVAILABLE IN EACH FUNCTION**

- Speed reference is read by a programmable analog input or by encoder.
- The reel diameter can be determined by one of following solutions:
  - > internal operations based on speed reference reading by analog input;
  - > internal operations based on speed reference reading by encoder;
  - > internal operations based on the number of winding (the initial diameter must be set);
  - > a sonar probe connected to a programmable analog input;
  - > an electro-mechanical tracer or analog sensor connected to a programmable analog input;
  - > In steady state, only for the DANCER function, by control of the dandy roll.
- The reel diameter can be memorized on eeprom memory at switch-off.
- The diameter acquisition can be freezed by a programmable input.
- The winding direction can be selected by a programmable input.
- Programmable inputs for JOG controls.
- Minimum and maximum diameter alarm and relative programmable outputs.
- Available winding/unwinding functions: SPEED/TORQUE, STRETCH, CELL, DANCER, MASTER;
- Switching between the different functions is possible by a different combination of programmable digital inputs.

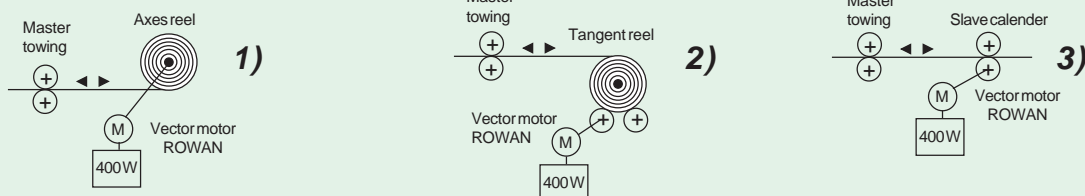
**WINDING/UNWINDING FUNCTIONS DESCRIPTION**

**Function: SPEED/TORQUE**



In this function the speed and torque of the motor are separately controlled, the control specs can be selected by the final user.

**Function: STRETCH**



This function is suitable in every system where it is important to achieve a **constant strength** on the material, between a master towing and reel or slave calender, without any feedback.

This control is utilized for the following systems:

- 1) **axes motorized reel**, 2) **tangent motorized reel**, 3) **slave calender**.

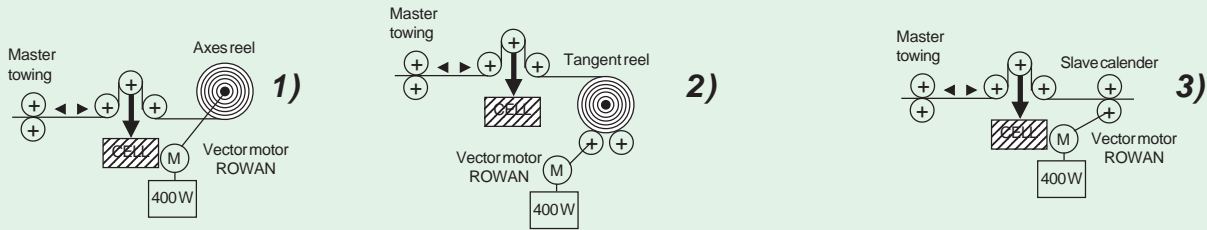
Other important features:

- Static and dynamic friction compensation;
- Reel inertia is compensated by a "kick start";
- Strength decrease at with the reel diameter increasing.

**INVERTER 400 SERIES**

**APPLICATIONS**

**Function: CELL - winding/unwinding**



This function is suitable in every system where it is important to achieve a **constant strength** on the material, between a master towing and reel or slave calender, with feedback from load cells or other transducer systems.

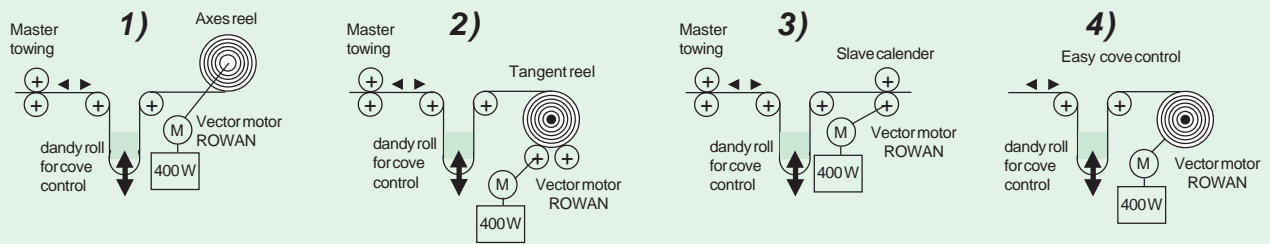
This control is utilized for the following systems:

- 1) **axes motorized reel**, 2) **tangent motorized reel**, 3) **slave calender**.

Other important features:

- Accurate strength control by the P/I regulator;
- Maximum value alarm for the cell, with a programmable output;

**Function: DANCER - winding/unwinding**



This function is suitable for every system where a cove of material is needed, between a master towing and reel or slave calender.

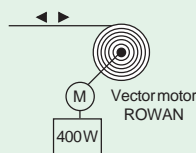
This control is utilized for the following systems:

- 1) **axes motorized reel**, 2) **tangent motorized reel**, 3) **slave calender**. 4) **easy cove control without speed reference**.

Other important features:

- programmable output for ready tensioning;
- programmable output for dandy roll ready in central position.

**Function: MASTER - winding/unwinding**



This function is suitable for axes motorized reel systems and where a constant tangential speed is needed independently from the diameter variation.

Other important features:

- Two possible controls for the linear speed are available:
  - > P/I regulator and closed-loop control with feedback from tacho generator or encoder;
  - > reel diameter reading (sonar, potentiometer, winding-counter).

**INVERTER 400 SERIES**

**TECHNICAL FEATURES**

**Inverter power supply to terminals L1 L2 L3**

Three-phase power supply voltage ..... 180VAC to 270VAC (standard voltage 220/240VAC)  
 ..... 320VAC to 490VAC (standard voltage 380/460VAC) only for models from 400/P to 400/3,5  
 ..... 500VAC (on request) only for models from 400/P to 400/3,5  
 ..... 320VAC to 460VAC (standard voltage 380/400/415VAC) only for models from 400/5 to 400/G  
 ..... on request 380VAC to 560VAC (standard voltage 440/460VAC)  
 ..... on request 560VAC to 760VAC (standard voltage 690VAC) only for models from 400/5 to 400/G

**U V W motor output**

Motor types connectables ..... asynchronous three-phase caged motor, ROWAN G series vector motor

Motor control techniques: ..... SCALAR V/F  
 ..... FIELD ORIENTED VECTOR WITH ENCODER FEEDBACK

Output voltage ..... 0 to 100% of power supply voltage

Output frequency ..... 0Hz-800Hz

Waveform ..... sinusoidal

Modulation technique ..... PWM (Pulse With Modulation)

PWM frequency ..... adjustable from 0.5KHz to 16.00KHz

Percentage of overload capacity compared to the max current to be adjusted into the inverter with PWM at 5Khz:

- up to 110% (not over) in continuous mode without intervention of the inverter fault.

- over 110% there is the temperature control with intervention of the inverter fault for prolonged overtemperature if the following limits are overpassed (value varies depending on size):

110% of the rated current of the inverter per 300sec, 175% of the rated current of the inverter for 30 sec, max 250% of the rated current of the inverter for 3 sec.

**Regenerative braking control**

Breaking unit ..... integrated in every 400 series inverter

Regenerated energy dissipation system ..... via external resistance connected to F+ and F terminals

**Digital inputs**

N° of digital inputs ..... 6 standard (I1...I6) + 8 with optional 404S board (I7...I14)

Inputs insulation ..... optoisolated if an external power supply is used

Connection logic ..... NPN or PNP

Activation voltage ..... min 15Vdc, max 30Vdc

Programmability ..... Input I1 (RUN) with fixed function, the others completely programmable

Input resistance ..... about 3,6 Kohm

Enable/Disable time ..... 10ms, 20ms for impulsive signal

**Impulsive digital inputs**

N° encoder ..... 2 standard +1 with optional 404S board

N° zero input encoder ..... 2 only with optional 404S board

Inputs insulation ..... optically isolated

Connection logic ..... push-pull output for encoder line driver

Encoders supply voltage ..... 12Vdc, with short-circuit protection (5Vdc or 24Vdc on request)

Maximum frequency ..... 125KHz

Absorption "state ON" for single Encoder channel (A-A o B-B) ..... 10mA

Voltage level for 1 logic state with 12Vdc encoders ..... over 6Vdc

Voltage level for 1 logic state with 5Vdc encoders ..... over 2,7Vdc

Voltage level for 1 logic state with 24Vdc encoders ..... over 12Vdc

**Relay outputs**

N° of relay ..... 3 (O1,O2,O3)

Programmability ..... completely programmable

Relay contacts ..... one in exchange NO and NC

Contacts capacity ..... 0.5A 120Vac -1A 24Vac

Enable/Disable time ..... 5ms

**Digital outputs**

N° of outputs ..... 5 (O4,O5,O6,O7,O8) , available only with optional 404S board

Output insulation ..... optoisolated if an external power supply is used

Connection logic ..... NPN or PNP

Programmable outputs ..... completely programmable

Work voltage ..... max 100 Vdc

Maximum current ..... 80 mA

Enable/Disable time ..... 12ms



**INVERTER 400 SERIES**

**TECHNICAL FEATURES**

**Analog inputs**

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

**Analog output**

AO0 ..... 12bit...updating time from 2,6ms (only for variables with FAST declaration) to 6,6ms  
 AO1 ..... 12bit...updating time 6,6ms  
 AO2, AO3..... 8bit...updating time 20ms  
 Output voltage ..... +/-10Vdc  
 Output current ..... max 10mA  
 Programmable outputs ..... each-one is programmable

**RS485 serial connection**

Standard protocol ..... MODBUS RTU...ROWAN  
 Baud rate ..... 1200..2400..4800..9600..19200..38400..57600..76800..115200  
 Insulation ..... optically isolated  
 Optional protocol..... PROFIBUS DPV1, CAN OPEN, MODBUS TCP/IP, ETHERCAT and PROFINET

**Available voltage supplies**

+10Vdc, -10Vdc (for potentiometers power supply) ..... max 10mA  
 +24Vdc (for inputs power supply or other devices) ..... protected against short-circuit...max 250mA  
 Sensor or encoder power supply:  
 - standard +12Vdc ..... isolated...protected against short-circuit...max 200mA  
 - on request +5Vdc ..... isolated...protected against short-circuit...max 500mA  
 +5Vdc ..... protected against short-circuit...max 200mA  
 +15Vdc ..... protected against short-circuit...max 200mA

**Protections**

to Inverter ..... electronic thermic protection (I x I x t) for extended overload on U,V,W terminals  
 ..... protection on the maximum peak current U, V, W  
 ..... programmable timed threshold protection on the output current to terminals U, V, W  
 protection against short-circuit between the U, V, W phases (all sizes) and between the phases and earth (from /5 to /G)  
 ..... over-voltage protection of the BUS DC  
 ..... over-temperature protection of the IGBT modules  
 ..... alarm without fault of the BUS DC capacitors  
 ..... protection against short-circuit on terminals F and F+ for the braking resistor connections  
 to Motor ..... electronic thermic protection fault (I x I x t) for extended overload  
 ..... over-speed protection  
 to Braking resistance ..... thermic protection with thresholds for extended overload

**Special applications**

..... POSITIONER, ELECTRIC MASTER/SLAVE SHAFT, FLYING CUTOFF (only for 400A model)  
 ..... REGULATOR (only for 400R model)  
 ..... DIE CUTTER (only for 400F model)  
 ..... WINDING/UNWINDING (only for 400W model)  
 ..... motor control with brake for lift systems (LIFT function, in every model)

**Environmental specs**

Environmental temperature ..... -5°C to +40°C  
 Heat sink temperature ..... -5°C to +70°C  
 Storage temperature ..... -25°C to +70°C  
 Altitude ..... maximum 1000mt a.s.l. (beyond that level the load must be reduce of 1% every 100 meter)  
 Protection degree ..... IP20 standard, IP54 on request  
 Relative humidity ..... 5% to 95% without condensation.

**Compliance regulations and electromagnetic compatibility**

The 400 series drives have been designed to work in industrial environments. they are EU products in conformity with **EMC 2014/30/UE directive**, with reference to **CEI EN 61800-3 (Cat. C2)** product standard, only if the cabling respects the installation manual, as indicated on Chapt. 3,4 and 7 of the C400S manual.

For models without internal filter, conformity with directive EMC is met only if they are connected to the appropriate filtering devices provided separately (see table of filters and ferrite rings on the following pages).

They are further in keeping with **B.T. 2014/35/UE directive**, in reference to **EN 61439-1/2** and **CEI EN 60204-1** standard.

**WARNING:** this product belongs to **EN 61800-3 Cat. C2** commercial class. In domestic environment it may cause radio interferences, in this case appropriate precautions must be adopt by the final user.

## INVERTERS 350 and 400 SERIES

## COMMON TECHNICAL FEATURES

### Power electric features from /P to /6 inverters

INVERTER POWER SIZE			/P only 400	/R	/0	/0M	/1	/L	/2	/2,5	/3	/3,5	/5	/6	
MAX. POWERS APPLICABLE IN U- V- W OUTPUTS	LINE 230Vac	Pmotore* kW	0,63	1,3	1,7	2,3	3,5	4,5	6,5	8,1	10	13	18,5	22	
		Smax* kVA	1,2	1,8	2,7	3,6	4,7	6	8,7	10,5	13	17	23,8	28,6	
	LINE 400Vac	Pmotore* kW	1,1	2,25	3	4	6	7,5	11	15	18,5	22	30	37	
		Smax* kVA	2	3	4,8	6,4	8	10	15	20	25	30	41	50	
	LINE 690Vac	Pmotore* kW	-	-	-	-	-	-	-	-	-	-	-	50	55
		Smax* kVA	-	-	-	-	-	-	-	-	-	-	-	60	65
NOMINAL CURRENT IN L1- L2- L3 INPUTS	LINE 230-400Vac	A	3	5	7	9	12	15	22	30	35	45	60	72	
	LINE 230-400Vac with reactance	A	2,25	3,75	5,2	7	9,2	11,5	17,5	25	29	36	48	58	
NOMINAL CURRENT IN U- V- W OUTPUTS	LINE 230-400Vac	A	MAX IMPOSTABILE	3	5	7	9	12	15	22	30	35	45	60	72
		A	ASSOLUTA*	3,3	5,5	7,7	9,9	13,2	16,5	24,2	33	38,5	49,5	66	79,2
	LINE 690Vac	A	MAX IMPOSTABILE	-	-	-	-	-	-	-	-	-	-	50	55
		A	ASSOLUTA*	-	-	-	-	-	-	-	-	-	-	55	60,5
MAX. CARD BLOCK CURRENT IN U - V - W OUTPUTS	A	8,5	13	20	25	34	42	62	84	98	126	170	200		
L1- L2- L3 INPUT PROTECTION FUSES gL or GG TYPE	A	4	6	10	16	16	20	25	32	40	63	80	80		
BRAKING CURRENT F F+ OUTPUT IN CONTINUOUS SERVICE WITH REACTANCE	LINE 230-400Vac	A	5,3	5,3	11	11	11	14	25	36	36	42	64	125	
	LINE 690Vac	A	-	-	-	-	-	-	-	-	-	-	64	125	
MINIMUM BRAKING RESISTOR F F+ OUTPUT	LINE 230Vac	OHM	150	150	73	73	73	57	32	22	22	19	12	6	
	LINE 400Vac	OHM	150	150	73	73	73	57	32	22	22	19	12	6	
	LINE 690Vac	OHM	-	-	-	-	-	-	-	-	-	-	17	9	
MAX. DISSIPATED POWER (HOLDER WITH 5KHz PWM)	kW	0,05	0,1	0,2	0,25	0,3	0,4	0,5	0,55	0,6	0,7	1,0	1,2		
COOLING FAN			NO	NO	NO	SI	SI	SI	SI	SI	SI	SI	SI	SI	
INTERNAL EMI FILTER	LINE 230-400Vac	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	
	LINE 690Vac	-	-	-	-	-	-	-	-	-	-	-	NO	NO	

\* Pmotor KW = Maximum motor power applied to the inverter output according to 4 poles asynchronous motor standard label value. In case of a motor with different poles, check the compatibility with the inverter output maximum current (6 - 8 poles)

\* Smax KVA = Max. applicable power with cosphi = 1

\* ABSOLUTE = The maximum current limit in continuous service on the U-V-W output, without inverter fault.

**Since giugne 2020 the size /P is produced only for Inverter 400.**



<b>INVERTERS 350 and 400 SERIES</b>	<b>COMMON TECHNICAL FEATURES</b>
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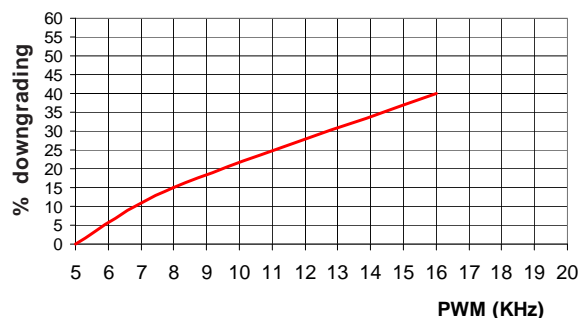
**Power electric features from /6,5 to /G inverters**

INVERTER POWER SIZE			/6,5	/7	/8	/8,5	/9	/A	/B	/C	/D	/E	/F PWM 5KHz 3KHz		/G PWM 5KHz 3KHz	
<b>MAX. POWERS APPLICABLE IN U- V- W OUTPUTS</b>	<b>LINE 230Vac</b>	<b>Pmotore* kW</b>	26	32	45	52	63	76	90	121	147	170	200	228	260	288
		<b>Smax* kVA</b>	35	42	55	65	81	97	119	162	183	219	270	308	310	345
	<b>LINE 400Vac</b>	<b>Pmotore* kW</b>	45	55	75	90	110	132	160	220	250	315	355	400	450	500
		<b>Smax* kVA</b>	60	73	95	114	142	170	208	282	318	381	453	516	540	600
	<b>LINE 690Vac</b>	<b>Pmotore* kW</b>	62	75	105	135	160	200	250	345	355	-	443	500	540	600
		<b>Smax* kVA</b>	78	96	131	167	203	250	298	385	418	-	497	561	600	668
<b>NOMINAL CURRENT IN L1- L2- L3 INPUTS</b>	<b>LINE 230-400Vac</b>	A	87	106	138	165	205	245	300	410	460	550	655	745	780	868
	<b>LINE 230-400Vac with reactance</b>	A	70	82	110	135	164	200	240	325	370	460	550	627	655	730
<b>NOMINAL CURRENT IN U- V- W OUTPUTS</b>	<b>LINE 230-400Vac</b>	A MAX IMPOSTABILE	87	106	138	165	205	245	300	410	460	550	655	746	780	868
		ASSOLUTA*	95	116	151	181	225	269	330	451	506	605	720	820	858	954
	<b>LINE 690Vac</b>	A MAX IMPOSTABILE	65	80	110	140	170	210	250	330	350	-	412	470	490	560
		ASSOLUTA*	71	88	121	154	187	231	275	363	385	-	453	517	539	616
<b>MAX. CARD BLOCK CURRENT IN U - V - W OUTPUTS</b>		A	245	300	385	460	575	685	840	1000	1290	1540	1800	2090		
<b>L1- L2- L3 INPUT PROTECTION FUSES gL or GG TYPE</b>		A	100	100	125	200	250	315	400	500	630	630	1000	1250		
<b>BRAKING CURRENT F F+ OUTPUT IN CONTINUOUS SERVICE WITH REACTANCE</b>	<b>LINE 230-400Vac</b>	A	125	125	187	187	187	114	114	250	250	250	250	250		
	<b>LINE 690Vac</b>	A	125	125	187	187	187	114	114	250	250	-	250	250		
<b>MINIMUM BRAKING RESISTOR F F+ OUTPUT</b>	<b>LINE 230Vac</b>	OHM	6	6	4	4	4	6,5	6,5	3	3	3	3	3		
	<b>LINE 400Vac</b>	OHM	6	6	4	4	4	6,5	6,5	3	3	3	3	3		
	<b>LINE 690Vac</b>	OHM	9	9	6	6	6	10	10	4,5	4,5	-	4,5	4,5		
<b>MAX. DISSIPATED POWER (HOLDER WITH 5KHz PWM)</b>		kW	1,4	1,5	2,0	2,0	2,5	3,5	3,5	5	6,5	8	9,5	10		
<b>COOLING FAN</b>			SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI		
<b>INTERNAL EMI FILTER</b>	<b>LINE 230-400Vac</b>	SI	SI	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		
	<b>LINE 690Vac</b>	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		
INVERTER 650KW / 400V IN CLIMATE CABINET ON REQUEST																

- \* **Pmotor KW** = Maximum motor power connectable to the inverter output, the value refers to 4 poles asynchronous motor ratings, with different number of poles (6 - 8 poles) the compatibility with maximum output current of the inverter must be checked.
- \* **Smax KVA** = Maximum output power with cosphi = 1.
- \* **Absolute** = Maximum current limit in continuous service, without fault intervention.

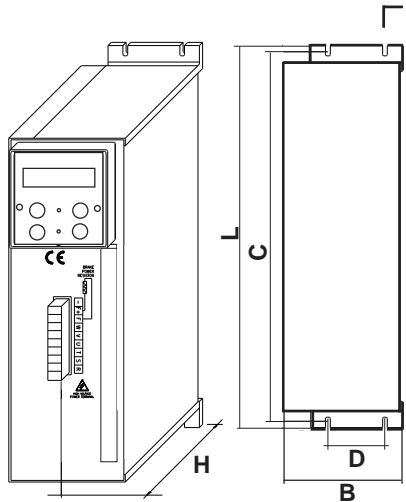
**Inverter downgrading in relation with PWM frequency**

**Caution!**  
 The maximum continuative power reported in the tables are allowed for PWM frequency until 5 KHz. For higher values the inverter must be downgraded following the graphic on the right. It is possible to change the PWM frequency settings by 1.12 PWM GENERATOR parameters group.



<b>INVERTERS 350 and 400 SERIES</b>	<b>COMMON TECHNICAL FEATURES</b>
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**Sizes and weights from /P to /L inverters**

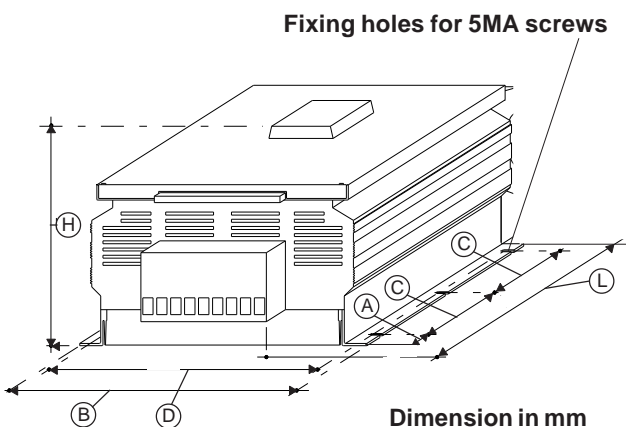


Fixing holes for 4MA screws

INVERTER SIZES	H	B	L	C	D	WEIGHT (Kg)	EMI INTERNAL FILTER
/P	200	90	285	275	60	2,7	YES
/R	200	114	285	275	60	2,8	YES
/0- 0/M	200	134	365	353	60	3,5	YES
/1	200	134	365	353	60	3,6	YES
/L	200	134	365	353	60	4	YES

Dimensions in mm

**Sizes and weights from /2 to /G**



Fixing holes for 5MA screws

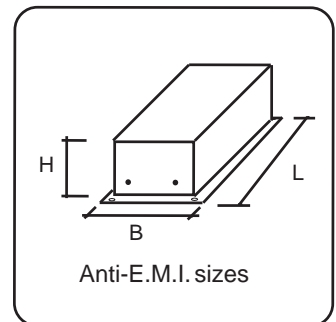
INVERTER SIZES	H	B	L	A	C*	D	WEIGHT (Kg)	EMI INTERNAL FILTER
/2	180	265	385	75	200x1	253	8	SI
/2,5 /3	200	315	430	95	200x1	305	10	SI
/3,5	280	310	420	75	235x1	295	14,5	SI
/5	280	280	515	65	233x1	265	18,5	SI
/6 /6,5	295	380	570	60	360x1	365	30	SI
/7	295	380	570	60	360x1	365	30	NO
/8	295	380	620	110	360x1	365	40	NO
/8,5	295	480	830	100	300x2	465	55	NO
/9 /A	295	480	950	100	300x2	465	80	NO
/B	295	480	1070	100	300x2	465	85	NO
/C	295	480	1270	100	450x2	465	100	NO
/D /E /F	400	680	1250	110	225x4	655	170	NO
/G	400	885	1270	110	225x4	860	200	NO

\* The C dimension value depends on the number of fixing holes

**EXTERNAL COOLING** is available on request from /5 to /G models.  
**WARNING!** The 690Vac inverter model is 6 cm higher (add 60mm to H dimension)

**Electric features and sizes of external three-phase anti-E.M.I. filters**

EMC FILTER CODE	In (A)	DIMENSIONS (mm)			WEIGHT (Kg)	EMC FILTER CODE	In (A)	DIMENSIONS (mm)			WEIGHT (Kg)
		H	B	L				H	B	L	
FT.ROW10A.400	10	55	106	116	1	FT.ROW200A.400	200	125	225	440	6
					FT.ROW200A.690						
FT.ROW25A.400	25	60	135	232	2,5	FT.ROW400A.400	400	125	225	440	6,5
					FT.ROW400A.690						
FT.ROW50A.400	50	85	122	250	3	FT.ROW600A.400	600	200	385	640	18
FT.ROW50A.690						FT.ROW600A.690					
FT.ROW130A.400	130	150	90	270	3	FT.ROW850A.400	850	200	385	640	19
FT.ROW130A.690						FT.ROW850A.690					



**INVERTERS 350 and 400 SERIES**
**COMMON TECHNICAL FEATURES**
**Table of combinations for three-phase anti-E.M.I. filters and ferrite rings with inverters**

INVERTER POWER SIZES		EMC FILTER CODE	In FILTER (A)	FILTER LEAKAGE CURRENT(1) (mA)	INVERTER OUTPUT CABLES SECTION (mm <sup>2</sup> )	PASSAGES THROUGH FERRITE RING	Quantity OF FERRITE RINGS	RING CODE
/P only 400	230-400V	BUILT-IN FILTER	/	3,5	1	3	1	NUFT19
	690V	/	/	/	/	/	/	/
/R	230-400V	BUILT-IN FILTER	/	3,5	1	3	1	NUFT19
	690V	/	/	/	/	/	/	/
/O /OM	230-400V	BUILT-IN FILTER	/	3,5	2,5	3	1	NUFT19
	690V	/	/	/	/	/	/	/
/1	230-400V	BUILT-IN FILTER	/	3,5	2,5	3	1	NUFT19
	690V	/	/	/	/	/	/	/
/L	230-400V	BUILT-IN FILTER	/	3,5	2,5	3	1	NUFT19
	690V	/	/	/	/	/	/	/
/2 /2,5	230-400V	BUILT-IN FILTER	/	3,5	4	3	1	NUFT38
	690V	/	/	/	/	/	/	/
/3	230-400V	BUILT-IN FILTER	/	3,5	6	3	1	NUFT38
	690V	/	/	/	/	/	/	/
/3,5	230-400V	BUILT-IN FILTER	/	3,5	10	3	1	NUFT38
	690V	/	/	/	/	/	/	/
/5	230-400V	BUILT-IN FILTER	/	38	16	3	1	NUFT38
	690V	FT.ROW50A.690	50	18	16	3	1	NUFT38
/6	230-400V	BUILT-IN FILTER	/	38	16	3	1	NUFT38
	690V	FT.ROW130A.690	130	18	16	3	1	NUFT38
/6,5	230-400V	BUILT-IN FILTER	/	38	25	2	2	NUFT38
	690V	FT.ROW130A.690	130	18	25	2	2	NUFT38
/7	230-400V	FT.ROW130A.400	130	18	35	2	2	NUFT38
	690V	FT.ROW130A.690	130	18	35	2	2	NUFT38
/8	230-400V	FT.ROW200A.400	200	18	50	1	2	NUFT38
	690V	FT.ROW130A.690	130	18	50	1	2	NUFT38
/8,5	230-400V	FT.ROW200A.400	200	18	70	1	2	NUFT38
	690V	FT.ROW200A.690	200	18	70	1	2	NUFT38
/9	230-400V	FT.ROW200A.400	200	18	95	1	2	NUFT38
	690V	FT.ROW200A.690	200	18	95	1	2	NUFT38
/A	230-400V	FT.ROW400A.400	400	18	* 2x50 x phase	1	1	NUFT104
	690V	FT.ROW400A.690	400	18	* 2x50 x phase	1	1	NUFT104
/B	230-400V	FT.ROW400A.400	400	18	* 2x70 x phase	1	1	NUFT104
	690V	FT.ROW400A.690	400	18	* 2x70 x phase	1	1	NUFT104
/C	230-400V	FT.ROW400A.400	400	18	* 2x95 x phase	1	1	NUFT104
	690V	FT.ROW400A.690	400	18	* 2x95 x phase	1	1	NUFT104
/D	230-400V	FT.ROW600A.400	600	18	* 2x120 x phase	1	1	NUFT104
	690V	FT.ROW400A.690	400	18	* 2x120 x phase	1	1	NUFT104
/E	230-400V	FT.ROW600A.400	600	18	* 3x95 x phase	1	2	NUFT104
	690V	/	/	/	/	/	/	/
/F	230-400V	FT.ROW850A.400	850	18	* 4x95 x phase	1	2	NUFT104
	690V	FT.ROW600A.690	600	18	* 4x95 x phase	1	1	NUFT104
/G	230-400V	FT.ROW850A.400	850	18	* 4x120 x phase	1	3	NUFT104
	690V	FT.ROW600A.690	600	18	* 4x120 x phase	1	2	NUFT104

(1) is the EMI filter (both internal and external) maximum leakage current to ground in normal and correct conditions (460V/50Hz)  
**ATTENTION:** When there are two broken phases, the leakage current could reach 6 times the values shown in normal conditions.  
*\*When connecting several large section cables, ROWAN can supply special terminals to make connections easier (contact the Rowan Elettronica Technical Dept.).*

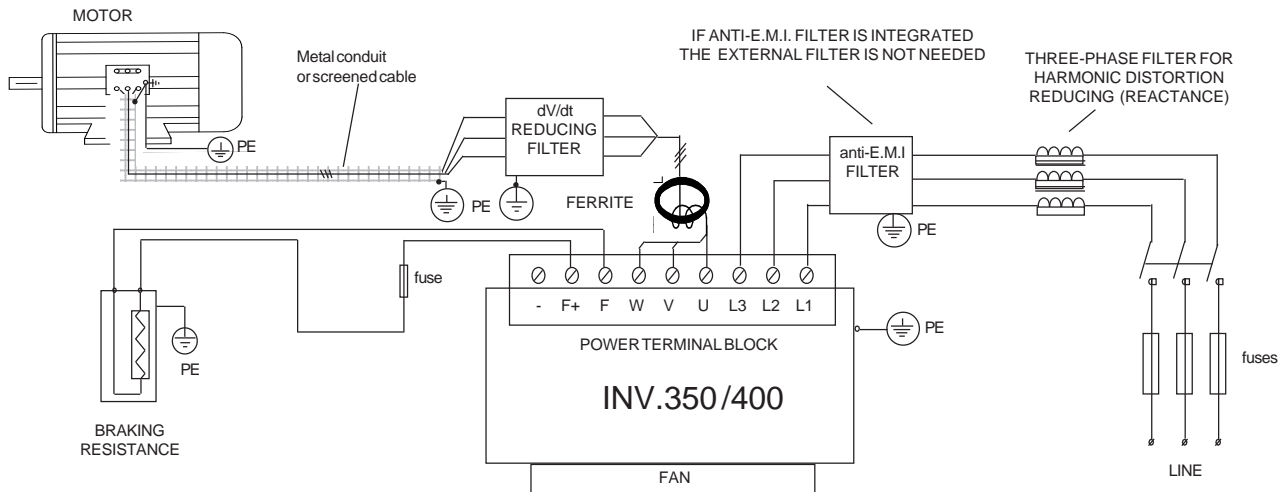
**INVERTERS 350 and 400 SERIES**

**COMMON TECHNICAL FEATURES**

**Filter for harmonic distortion reducing**

The inverters causes some harmonic distortions; the conformity to CEI EN 61000-3-2 ( $I_n \leq 16A$ , if it is directly connected to low voltage public network) and CEI EN 61000-3-12 ( $16A < I_n \leq 75A$ , if it is directly connected to low voltage public network) in the final work system should be estimated by the utilizer; Rowan Elettronica provides the following filter types to reduce that distortion.

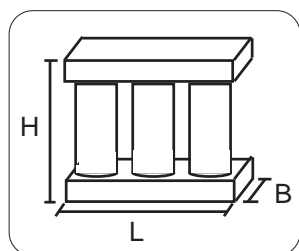
Wiring diagram of the filter for harmonic distortion reducing:



This inductance not only reduces harmonic distortion, further it reduces the effective current absorbed by the inverter and it also offers a 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 combination of harmonic distortion reduction filters with inverters**

CODE	In (A)	Dissipated Power at In (W)	MAXIMUM DIMENSIONS and WEIGHT				INVERTER SIZES 230-400Vac LINE	INVERTER SIZES 690Vac LINE
			L (mm)	B (mm)	H (mm)	WEIGHT (KG)		
RTZ.5A.5,6	5	16	120	66	115	3	/P (2,25A) /R (3,75A) /O (5,2A)	-
RTZ.12A.2,2	12	27	150	90	147	6	/OM (7A) /1 (9,2A) /L (11,5A)	-
RZT.22A.1,3	22	42	180	89	147	7	/2 (17,5A)	-
RZT.35A.0,76	35	65	180	100	175	9	/2,5 (25A) /3 (29A) /3,5 (36A)	-
RZT.50A.0,56	50	87	180	110	175	10,5	/5 (48A)	/5, /6
RZT.72A.0,39	72	123	240	110	242	14,2	/6 (58A) /6,5 (70A)	/6,5 /7
RZT.106A.0,26	106	195	240	120	242	17,5	/7 (82A)	/8
RZT.165A.0,16	165	187	240	145	242	24,8	/8 (110A) /8,5 (135A) /9 (164A)	/8,5 /9
RZT.245A.0,11	245	225	300	130	260	27	/A (200A) /B (240A)	/A /B
RZT.370A.0,074	370	285	300	150	320	39	/C (325A) /D (370A)	/C /D
RZT.460A.0,059	460	438	360	165	370	54	/E (460A)	-
RZT.550A.0,049	550	465	360	200	370	69	/F (550A-5kHz)	/F
RZT.655A.0,042	655	500	360	210	370	84	/F (627A-3kHz) /G (655A-5kHz)	/G



Overall dimensions of harmonic distortion reduction filter

<b><i>INVERTERS 350 and 400 SERIES</i></b>	<b>COMMON TECHNICAL FEATURES</b>
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***dv/dt reduction filters for motors***

The voltage supplying the motor connected to the inverter is generated by PWM technique, this voltage is therefore formed by a variable lengths of impulses sequence. The high speed of voltage increasing on these dv/dt impulses, can cause high stray currents through the motor power cables, through the actual motor windings and from them to their housings. The high dV/dt also causes, by the intrinsic inductance of the connecting cables, high voltage peaks on the motor windings. With the aim of reducing all 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:

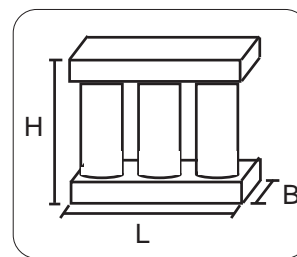
***Table for combination of inverters with dv/dt reduction filters***

CODE	In (A)	Dissipated Power at In (W)	MAXIMUM DIMENSIONS and WEIGHT				INVERTER POWER SIZE 230-400Vac LINE	INVERTER POWER SIZE 690Vac LINE
			L (mm)	B (mm)	H (mm)	WEIGHT (KG)		
FIT.DV/DT.25A	25	27	150	82	147	3,6	/P../2	-
FIT.DV/DT.80A	80	62	180	130	175	8,6	/2,5../6	/5../7
FIT.DV/DT.120A	120	78	180	160	170	10,9	6,5 /7	/8
FIT.DV/DT.200A	200	156	240	140	230	14,6	/8, /8,5	/8,5 /9
FIT.DV/DT.300A	300	195	240	165	225	21,5	/9, /A, /B	/A /B
FIT.DV/DT.400A	400	215	300	155	280	26	/C	-
FIT.DV/DT.500A	500	270	300	175	280	38	/D	/C /D
FIT.DV/DT.600A	600	382	300	200	280	48	/E	/F /G
FIT.DV/DT.750A	750	430	360	195	330	53,5	/F	-

**Reduction achieved: dv/dt < 500V/μs**

The dv/dt reduction filters should always be used when the insulation class of the motor is unknown or for motors that are not specifically built 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 ring and the motor, straight after the ring as illustrated in the diagram on the previous page.



Overall dimensions 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:

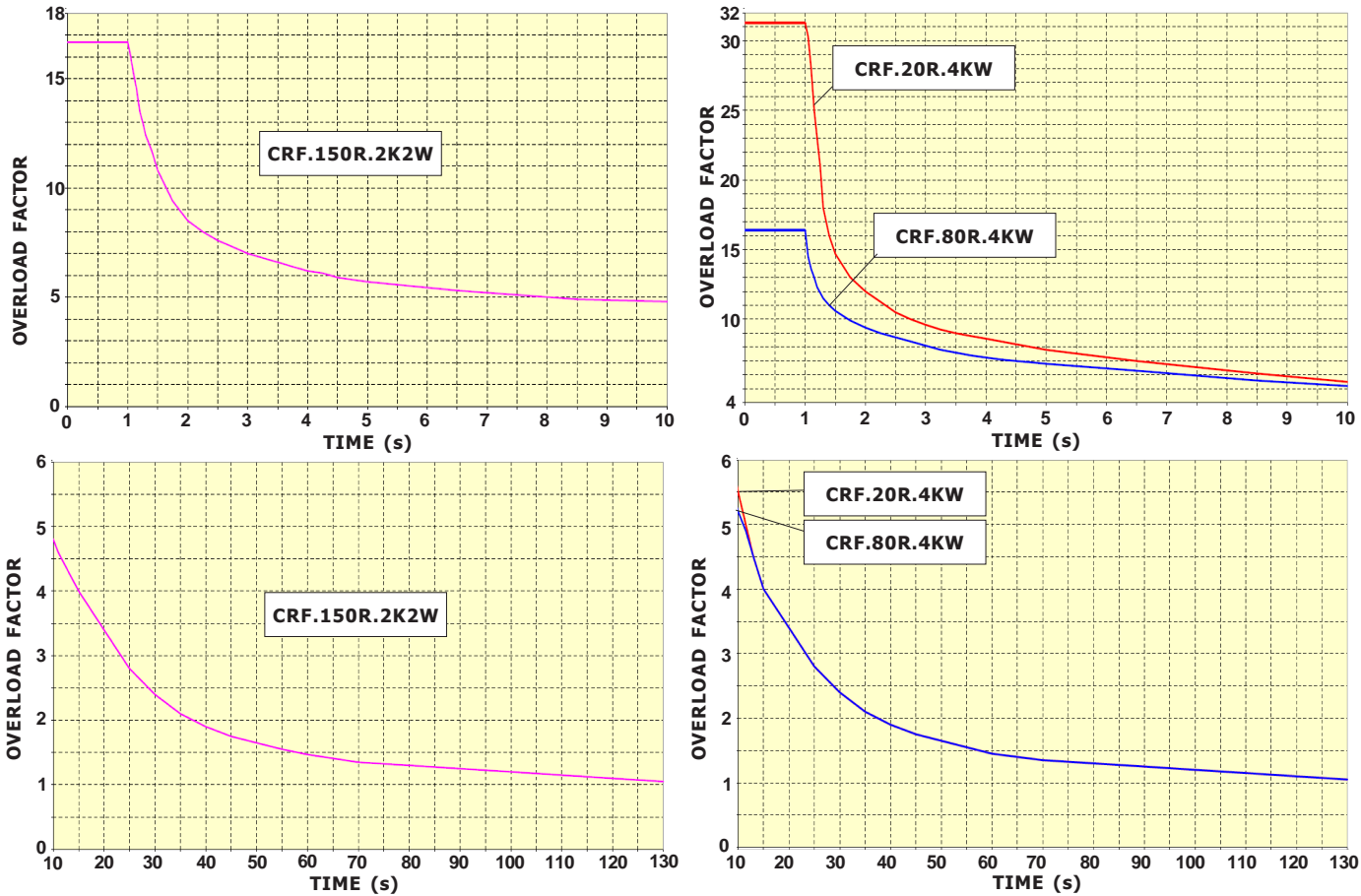
- do not touch the internal boards unless strictly necessary.
- before handling the boards, make sure the electrostatic in your body is discharged.
- the boards must not come into contact with superinsulating materials (e.g. textile fibres ) especially during their processing.

<b>INVERTERS 350 and 400 SERIES</b>	<b>COMMON TECHNICAL FEATURES</b>
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**Table of application for Rowan El. braking resistances**

DATA	units	RES.180R.600	CRF.150R.2K2	RES.20R.2K5	RES.30R.2K5	RES.40R.2K5	CRF.20R.4KW	CRF.80R.4KW
RATED POWER	W	600	2200	2500	2500	2500	4000	4000
RESISTANCE	ohm	180	150	20	30	40	20	80
RATED CURRENT	A	1.8	3.8	11	9	7.9	14.1	7.0
MAX CURRENT for 5 sec	A	2.5 <small>(5s ON - 25s OFF)</small>	9.2 <small>(5s ON - 30min OFF)</small>	16.7 <small>(5s ON - 1min OFF)</small>	12.9 <small>(5s ON - 1min OFF)</small>	10.6 <small>(5s ON - 1min OFF)</small>	39.5 <small>(5s ON - 30min OFF)</small>	18.0 <small>(5s ON - 30min OFF)</small>
gL PROTECTION FUSE	A	2	4	16	10	10	16	8

To simplify the choice of the right **CRF resistance** (and the eventual combinations series/parallel) basing on the work-cycle you can refer to the following curves of overloading. **ATTENTION!** these curves refer to a single overload with 40°C maximum environment temperature and resistor installed in a place with a good airflow. The average time took by the resistor to get back to the environment temperature is between 20 and 30 minutes depending on the cooling conditions.



2 typical installations for braking resistances can be used:

**Installation in cabinet**

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.180R.600** and **RES.xxR.2K5**, 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 **IP22** container in **non-ventilated** version must be mounted vertically as indicated in the diagrams on the next page.

**INVERTERS 350 and 400 SERIES**

**COMMON TECHNICAL FEATURES**

**External installation**

This installation is used when in continuous service 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.180R.600** and **RES.xxR.2K5** used at rated power, 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 non-ventilated version **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. **400°C**; adequate protection must be mounted against accidental contact.

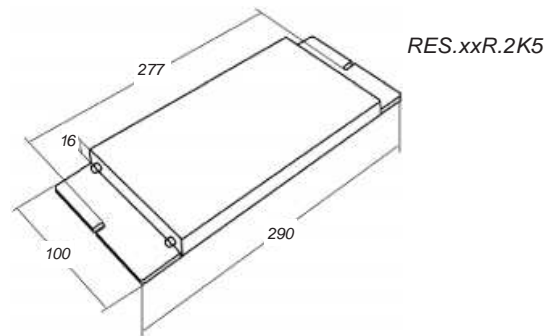
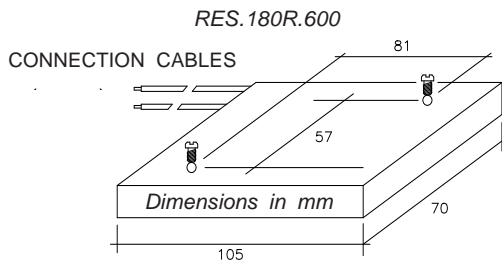
The ohmic value of the braking resistance must never be lower than:

The "**MINIMUM BRAKING RESISTANCE AT OUTPUT F F+** " given in the tables with the power features of the 350 and 400 series inverters.

On inverters sizes /2,5 to /G, 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.

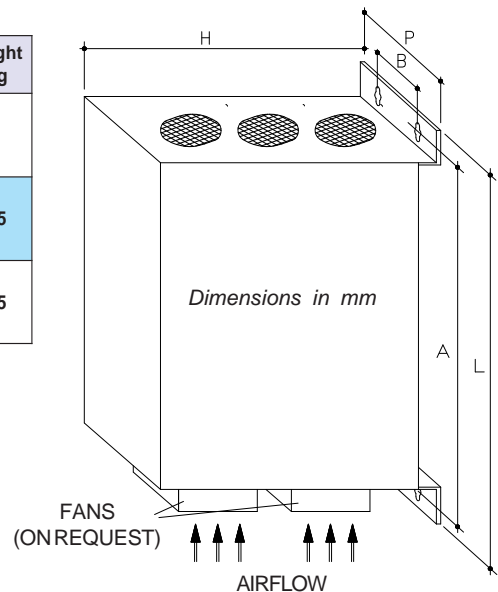
**For safety reasons, mount a fuse in series with the resistance with the capacity indicated in the table.**

**Overall dimensions of resistance RES.180R.600 and RES.xxR.2K5**



**Overall dimensions of resistances in case (code: CRF. xx R. xKx W)**

	CODE	H	B	L	A	P	weight Kg
RESISTANCE VALUE	CRF.150R.2K2W	322	67	486	458	100	7
POWER	CRF.20R.4KW	322	67	486	458	120	7,5
	CRF.80R.4KW	322	67	486	458	120	7,5



**Versions available:**

**CRF. xx R. x K x W:**

Standard non-ventilated version

**CRF. xx R. x K x W.V:**

Standard ventilated version

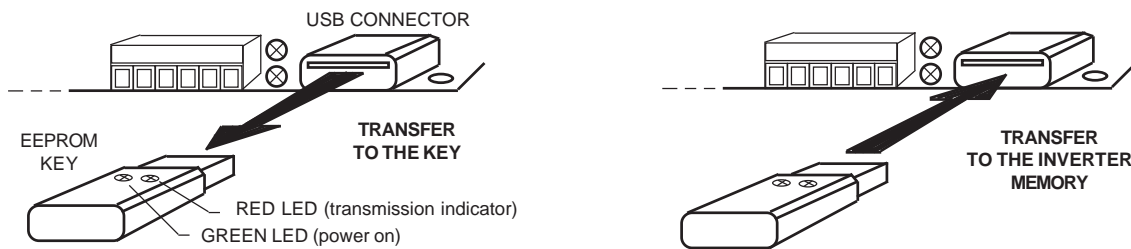
**CRF. xx R. x K x W.VR:**

Standard ventilated version with fan fault signal relay

**INVERTERS 350 and 400 SERIES**

**EEPROM KEY AND PROGRAMMING SOFTWARE**

All Rowan Elettronica inverters have an USB port, then it's possible to transfer all the inverter parameters from the inverters memory to the EEPROM key (cod. C411S) or vice-versa:



**CAUTION! At the moment the normal USB keys can not be utilized for this data transfer and the ROWAN EL. USB key can not be utilized for PCs memory transfer.**

**Software and accessories for the managing of parameters through PC**

**Software for eeprom key managing**

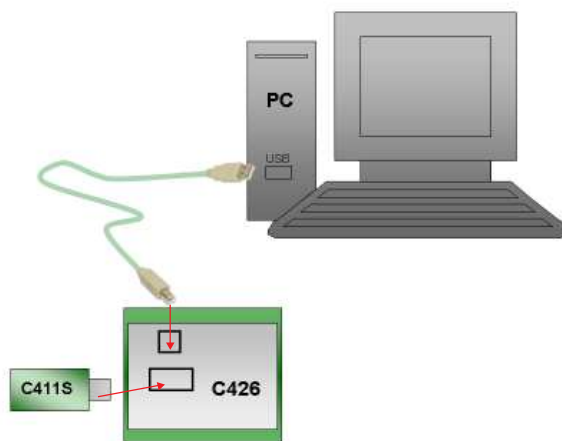
On request, Rowan Elettronica provides the "Rowan Key Manager"; this software allows, through your PC, to elaborate the inverter parameters in eeprom key cod. C411S.

Through "Rowan Key Manager" it is allowed to:

- > read all parameters contained in EEPROM key, in separated areas and save all datas in a file;
- > export all parameters in Excel format;
- > save the elaborated data in the EEPROM key;
- > read the total picture of the EEPROM key and save that in a file;
- > import a total picture file on the key.

For all operations with C411S key an USB cable and an interface board C426 are needed. Rowan Elettronica supplies, on request, the KIT.426R.A, that kit contains:

- installation cd with 2 versions of "Rowan Key Manager":
  - > "Rowan Key Manager" for 350S inverter;
  - > "Rowan Key Manager" for 400S inverter;
- USB cable A-B-M-M type;
- EEPROM key C411S;
- interface board C426.



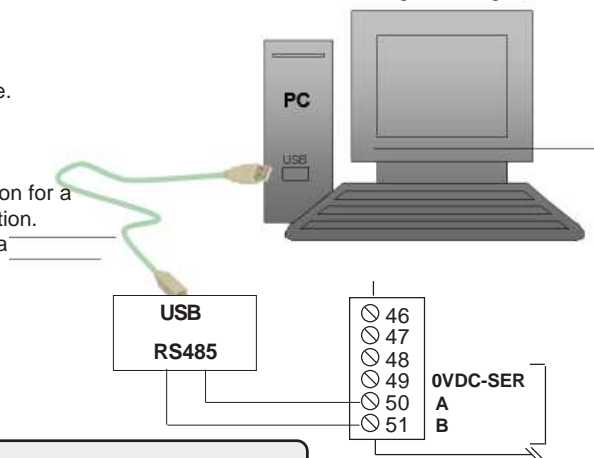
**● Software for editing the inverter parameters through PC: ROWAN DATA EDITOR**

Upon request, Rowan Elettronica can supply the "Rowan Data Editor", a software for Windows able to manage, through PC and RS 485 serial connection the inverter parameters.

Through "Rowan Data Editor" it is possible to:

- > read/modify all parameters contained in the inverter and save them on a file.
- > export the parameters in PDF or CSV format.
- > export the parameters modified from the default setting and save them in PDF or CSV format.
- > by the function "TEST MODE" it is possible to command the inverter function for a test with a running motor, checking the variables under "oscilloscope" function.

As shown besides, to connect the PC to the inverter, it is necessary to use a converter (better if insulated) between USB and RS485.



With this aim, Rowan Elettronica can supply, on request, the kit

**KIT.ROWAN.DATAEDITOR** containing:

- the installation cd for the "Rowan DataEditor" software;
- the connection cable to PC and the USB/RS485 interface.

**eeprom KEY CODE**

**C411S. A**

**RELEASE HARDWARE**

**CONNECTION KIT for EEPROM KEY C411S.A to PC**

**KIT.426R. A**

**RELEASE HARDWARE**



<b>INVERTERS 350 and 400 SERIES</b>	<b>INVERTER 350 CODING</b>
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*Inverter order codes*

Code : C350 S / 1 . A . E . N . N N . N

**S = standard**  
**M = single-phase output**

**RELEASE HARDWARE**  
*(identifiable in the inverter through variable 6.30 HARDWARE VERSION)*

**CUSTOMIZED VERSION**  
NN=NOCUSTOMIZATION

**"STO" SAFETY FUNCTION**  
N=WITHOUT  
S=WITH

**BRAKING MODULE**  
N=WITHOUT  
F=WITH

**DRIVER POWER SIZE**  
R - 0 - 0M - 1 - L - 2 - 2,5 - 3 - 3,5 - 5 - 6 - 6,5 - 7 - 8 - 8,5  
- 9 - A - B - C - D - E - F - G

<b>POWER SUPPLY VOLTAGE (50/60Hz)</b>	
<p><i>Power supply voltages for inverters from /P to /3.5</i></p> <p>D = 220/240 VAC P = 380/460 VAC M = 220/240 VAC SINGLE-PHASE N = 500 VAC</p>	<p><i>Power supply voltages for inverters from /5 to /G</i></p> <p>D = 220/240 VAC E = 380/400/415 VAC O = 440/460 VAC W = 690 VAC (only from /5 to /G)</p>

**INVERTERS 350 and 400 SERIES** **INVERTER 400 CODING**

Code : **C400 X / 1 . A . E . 1 2 . N N . N N . N**

**STOSAFETY FUNCTION**  
N = WITHOUT  
S = WITH

**CUSTOMIZATION**  
NN = WITHOUT  
CUSTOMIZATION

**HARDWARE  
RELEASE**

**ACTIVE APPLICATIONS (to be identified on the inverter by the number on the right of the dot, in var.2.1.38 FIRMWARE VERSION)**

<b>A</b>	var. 2.1.38 = XXX01.XX Active application:
	<b>SPEED</b> (speed control, scalar/vectorial)
<b>R</b>	var. 2.1.38 = XXX02.XX Active application:
	<b>REGULATOR</b> (P/I regulator)
<b>G</b>	var. 2.1.38 = XXX03.XX Active application:
	<b>GEN_AFE</b> (sinusoidal generator)
<b>P</b>	var. 2.1.38 = XXX04.XX Active application:
	<b>CUSTOM1</b> (customized application)
<b>W</b>	var. 2.1.38 = XXX05.XX Active application:
	<b>WINDER</b> (winding/unwinding system)
<b>F</b>	var. 2.1.38 = XXX06.XX Active application:
	<b>DIE-CUTTER</b> (positioner/electric master + die-cutter)

Inputs / Outputs	Field Bus
<b>N</b> = drive without I/O <b>A</b> = drive with I/O: - 1 encoder line driver - 2 input zero encoder - 8 digital inputs - 5 digital outputs - 5 analog inputs <b>B</b> = drive with I/O: - 1 encoder line driver - 2 input zero encoder - 4 digital inputs - 2 digital outputs	<b>N</b> = none <b>P</b> = PROFIBUS DPV1 - M30 <b>C</b> = CANOPEN - M30 <b>M</b> = MODBUS TCP/IP - M30 <b>E</b> = ETHERCAT - M40 - V.1.0.8 no longer available <b>F</b> = PROFINET - M30 <b>G</b> = MODBUS TCP/IP - M40 <b>H</b> = PROFINET - M40 <b>I</b> = ETHERCAT - M40
<b>NN = no expansion drive</b>	
<b>OPTIONAL EXPANSION DRIVE with I/O and FIELD BUS</b>	

**ENCODER SUPPLY**  
**05** = 5Vdc ENCODERS (on request), terminal output 38-39 and 44-45= + 5Vdc  
**12** = 12Vdc ENCODERS (standard), terminal output 38-39 and 44-45= + 12Vdc  
**24** = 24Vdc ENCODERS (standard), terminal output 38-39 and 44-45= + 24Vdc

**POWER SUPPLY VOLTAGE (50/60Hz)**

<b>Power supply voltage for inverters from /P to /3,5</b> <b>D</b> = 220/240 VAC <b>P</b> = 380/460 VAC <b>M</b> = 220/240 VAC SINGLE-PHASE <b>N</b> = 500 VAC	<b>Power supply voltage for inverters from /5 to /G</b> <b>D</b> = 220/240 VAC <b>E</b> = 380/400/415 VAC <b>O</b> = 440/460 VAC <b>W</b> = 690 VAC
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**DRIVE POWER SIZE**  
 P - R - 0 - 0M - 1 - L - 2 - 2,5 - 3 - 3,5 - 5 - 6  
 6,5 - 7 - 8 - 8,5 - 9 - A - B - C - D - E - F - G

**eprom key code**

**C411S . A**

**RELEASE  
HARDWARE**

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