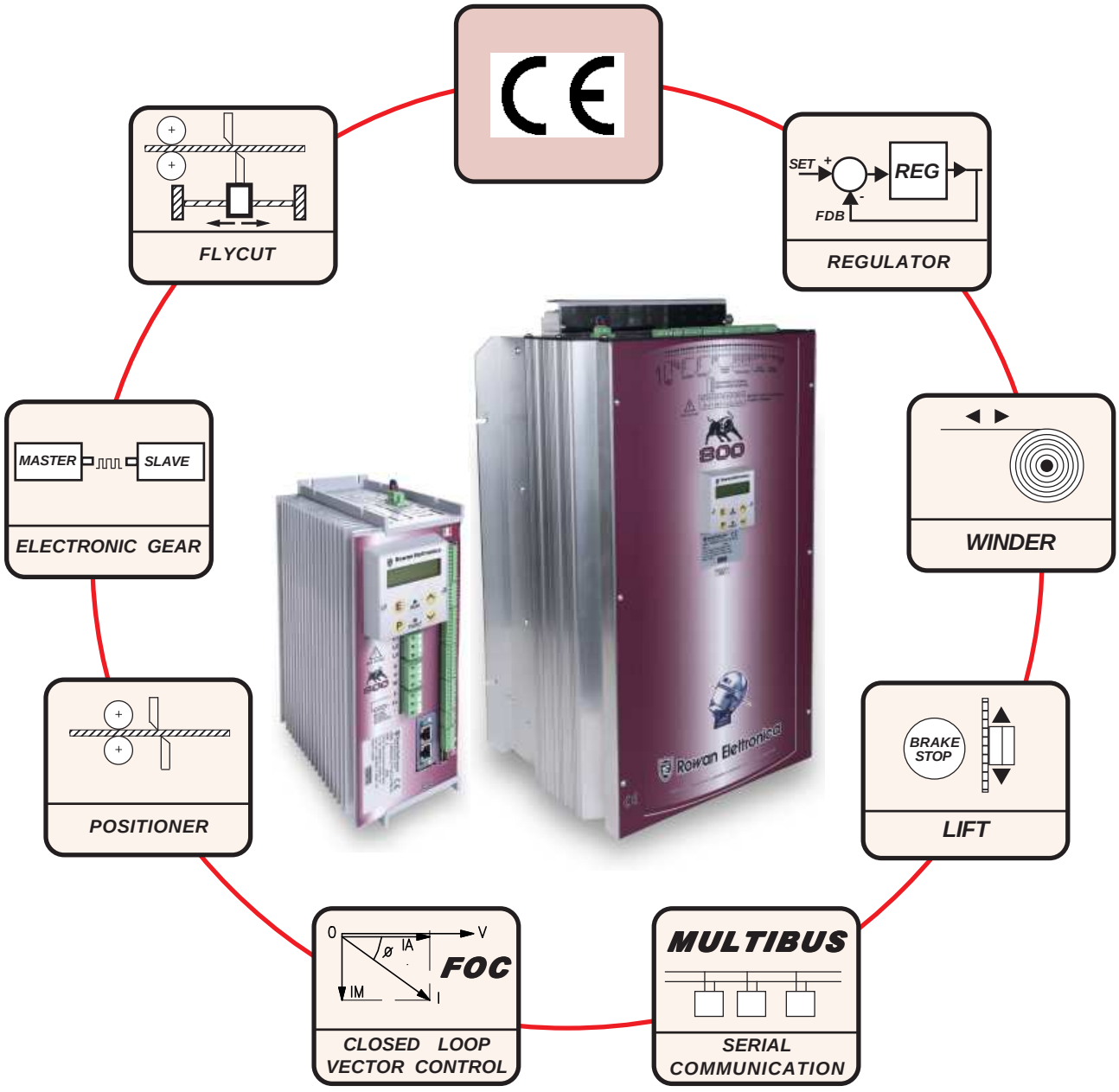
INVERTER SERIE 800

(SYNCHRONOUS RELUCTANCE MOTOR DRIVE)



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Caution ! → **INFORMATION ON THE STRUCTURE OF THIS MANUAL:**

Chapter 1, Chapter 2, Chapter 3 concerning the first pages could be considered as a quick start manual, since they include those basic information for a quick installation; for this reason, the first thing to do is to read these chapters entirely and then to examine closely their subjects in the following pages.
Chapters from 2 to 15 contain the information on the inverter Series 800.
Refer to chapter 0 for the all other manuals relative to the inverter Series 800.

Chapter 8 and **chapter 9** with detailed connection terminals, parameters and display variables menu descriptions are reported in MANU.800S PARAMETER.

Manual Code Description

>MANU.800S.QUICKSTART = INVERTER SERIES 800 quick installation and use manual.
>MANU.800S.PARAMETERS = INVERTER SERIES 800 menu and parameters description manual.

Refer to following manuals to install and set the serial communication end the applicative functionality of inverter series 800:

>MANU.400TS = INVERTER SERIES 400 SERIAL TRANSMISSION.
It is an enclosure of MANU.400S basic installation manual; it includes all instruction for RS485 serial transmission operation, as for MODBUS RTU, CANOPEN, PROFIBUS DVP1, MODBUS TCP/IP, ETHERCAT, PROFINET protocols, **valid for all inverter codes 400 and 800.**

>MANU.400A = AXIS instruction manual for inverter with **XXX01.XX** e **XXX06.XX** firmware version.
It is an enclosure of MANU.800S complete installation manual, necessary to start inverters 800A and 800F series with AXIS Application, equipped with functions:electronic gear, positioner, fly cut and cutting die (only 800F).

>MANU.400R = REGULATOR instruction manual for inverter with **XXX02.XX** firmware version.
It is an enclosure of MANU.800S complete installation manual, necessary to start inverters 800R series with REGULATOR Application and its functions (compressor, cut at costant current)

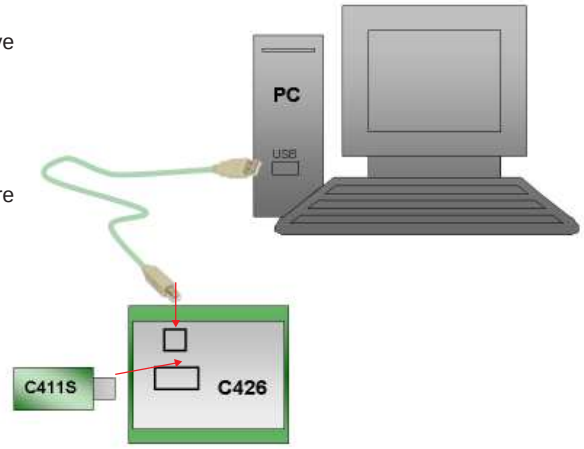
>MANU.400W = WINDER instruction manual for inverter with **XXX05.XX** firmware version.
It is an enclosure of MANU.800S complete installation manual, necessary to start inverters 800W series with WINDER application for winding - rewinding.

>**MANU.STO.INVERTER =** Manual of safety STO function for the inverter 350, 400, 700 and 800; for the inverter with STO this manual must be consider an integrity part of MANU.800S

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**.

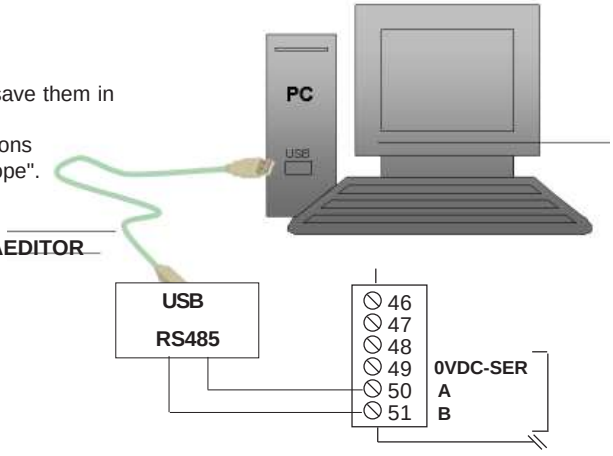
Through "**Rowan Key Manager**" it is allowed to:
> read all parameters contained in EEPROM key, in separated areas and save all datas in a file;
> export all parameters in Excel format and print them;
> save the elaborated data in the EEPROM key;
> read the total picture of the EEPROM key and save that in a file;
> import a total picture file on the key.
For all operations with C411S key an usb cable and interface board C426 are needed. Rowan Elettronica supplies 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

On request, Rowan Elettronica provides the "**Rowan Data Editor**", this software for Windows can be editing the inverter parameters directly from PC through RS485 serial connection:

Through "**Rowan Data Editor**" it is allowed to:
> read / modify all the inverter parameters and save them in a file.
> export the parameters read in format PDF or CSV.
> extract only the modificated parameters compared to default setup and save them in format PDF or CSV.
> with the "TEST MODE" function it is allowed command the inverter functions for a rotate motor test, monitoring the variable with the function "oscilloscope".
For all operations through PC and inverter is necessary a USB / RS485 converter (better if insulated)
On request Rowan Elettronica supplies the complete kit **KIT.ROWAN.DATAEDITOR** that contains:
- CD software installation "**Rowan Data Editor**";
- Complete connection cable from PC with USB/RS485 interface.



Description of symbols in the manual

Caution !
Warning !

It means that the following subject is very important and must be read carefully

It means that the following subject is linked to a generic danger for safety.

It means that the following subject shows the presence of a dangeruos voltage. It indicates that high voltage may cause dangerous accidents or death.

When using the device or the internal cards take care on avoiding the generation of electrostatic discharges (ESD) that may cause irreparable damages to some of the components.

Caution ! GENERAL WARNINGS BEFORE INSTALLATION

- Before installation, connection or any operation on the inverter or on the motor, read this manual carefully, in order to perform correct operations and to pay attention to safety rules.
Any use of the Rowan inverters and motors which may differ from what is written on this manual is strictly forbidden.

- Before installation, connection or any operation on the inverter with STO function it is mandatory read the MANU.STO.INVERTER, that has to be considered part of this manual.

- This instruction manual is addressed to skilled personnel, who is acquainted with installation and use norms in accordance with safety and protection standards. Both the motor and the inverter when connected may be dangerous for things and people. The user is responsible for a correct installation, which must be in accordance with the directives in force.

- The inverter belongs to the restricted sales distribution class in compliance with EN61800-3 standard. In a domestic environment this product may cause radio interferences, in which case the user may be required to take adequate safety measures.

- The inverter, the possible external filter and the motor must be earthed permanently and properly and must be protected from the supply voltage in accordance with the directives in force.

- The max. inverter protection is obtained by B differentials, preferably 300mA-type. Internal or external anti E.M.I. filters have a leak of current to ground (see table on page19); Please remind that the EN50178 directive says that, in case of leakage current >3,5mA, the earth wire must be steady and doubled.

- When the inverter cover needs to be removed, as e.g. for DIP switches setting or for maintenance, it is compulsory to wait for at least 5 minutes after inverter quenching for the internal capacitors to discharge. Internal components and terminals subject to dangerous voltages (L1, L2, L3, U, V, W, F, F+, -) can be touched only in absence of power supply and when the power supply between F+ and – terminals is <50Vdc. Please remind that most internal components are sensitive to ESDs, so limit yourself to set DIP switches without touching any other component.

Dangerous situations

In peculiar setup conditions of the inverter, after power losses, the motor might start automatically. The motor rotation manual controls which can be set by the keyboard must be used with great attention, in order to prevent mechanical damages and accidents against people. Setup errors might cause unintentional starts. At first start, in case of faults on the inverter or of lack of power supply, it may not be possible to control the motor speed and the direction. The rate contact can't be held as valid for a safety stop; in some setup conditions or of inverter faults, its disabling may not be followed by a prompt stop of the motor. Only the inverter electromechanical disconnection from the power supply excludes any action on the motor.

The installation of the inverter in areas at risk, in presence of inflammable substances, combustible vapours and dusts may cause fires and explosions; the inverters must be installed far from this kind of areas.

Avoid the penetration of water or any liquids into the machine in any case.

Do not perform dielectric rigidity tests on the drive parts.

Responsability and warranty

- **ROWAN ELETTRONICA s.r.l.** declines any responsibility for any inaccurancies contained in this manual, due to printing and/or transcription mistakes. It reserves the right to make any variations that it considers necessary for better functioning of the product, without prior notification.

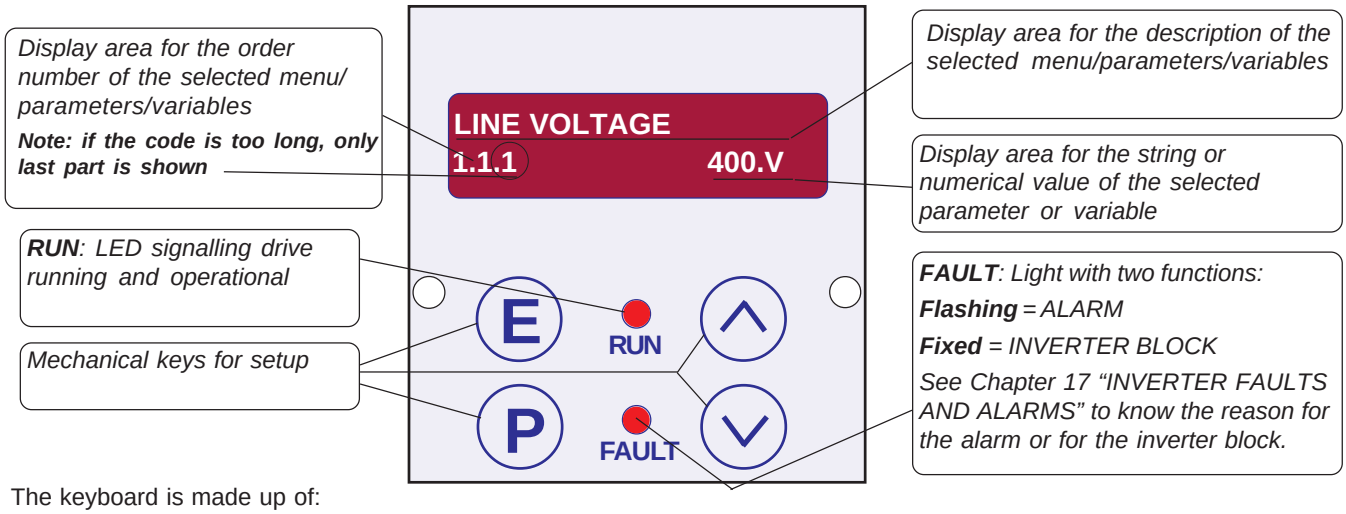
- **Regarding the data and characteristics** mentioned in the manual, a max. 10% tolerance has been allowed, if not otherwise indicated. Diagrams are mere examples and should be perfected by the customer.

- The product warranty is considered ex-works, according to the conditions written on the specific document to be asked ROWAN Sales Department, or download it from www.rowan.it.

Keyboard general description

The keyboard enables to change operation parameters (saved in eeprom) and to visualise useful data during the working phases such as: speed reference, motor reference and frequency, motor current, line voltage and last fault occurrence. Thanks to serial connection, the keyboard can be distanced from the panel of a control panel by a max. 25m distance.

ROWAN ELETTRONICA s.r.l. supplies on request the keyboard distancing cable.



- The keyboard is made up of:
  - an alphanumeric LED display, 2x16 characters, backlit
  - four mechanical keys that give the feel of the key that has been pressed
  - two signalling LEDs, one for run (RUN) and one block for fault (FAULT)

Keys function

E **ESCAPE** key, return to the main menu or to the upper level and save the settings.

P **PROGRAM** key, enter in the sub-menus, modify the parameters with the selection of one number at a time in the case of numeric value.

UP key, scroll FORWARD the variables viewed and set by increasing the numerical digit selected from the PROGRAM key.

DOWN key, scroll BACK the variables viewed and set by decreasing the numerical digit selected from the PROGRAM key.

Display when starting

The machine starts in DISPLAY STATUS and shows one among the 10 default variables from the 2.1 DISPLAY VARIABLE menu. Use UP and DOWN keys to scroll variables. The last variable selected is displayed when starting. See Chapter 10: PARAMETERS AND VISUALISATIONS, on paragraph "DISPLAY STATUS description" to change the default variables displayed.

Procedure to modify a parameter

For example, to modify the parameter 1.1.2 MOTOR NOM CURRENT in the menu BASIC DATA, from the DISPLAY STATUS:

> Press the P key, at this point the 1.1.1 LINE VOLTAGE menu will appear.
> Press the UP key to select par.1.1.2 MOTOR NOM CURRENT.
> Press the P key to modify the parameter:
in the display field dedicated to the numerical value to be set the first number to the right (the least significative) will begin to flash to indicate that it is now possible to modify its value using the UP and DOWN keys.
> Press the UP key to increase the value and the DOWN to decrease it.
> To modify the other numbers it is enough to press the P key with one impulse, at each pressure the following number is selected on the left, until the most significative to then return to the least significative and so on.
> In the case of a positive and negative parameter, the sign will appear after most significative number; to modify it press the P key until it is selected and then, with the UP key set the sign **+** and with the DOWN key the sign -
> To memorize the value press the ESCAPE key (the selection will stop flashing).
> To return to the starting level (DISPLAY STATUS) press the ESCAPE key again. The procedure to modify the parameters with a selection string is exactly the same, in this case the UP and DOWN keys will select the strings available in the menu instead of the numerical values.

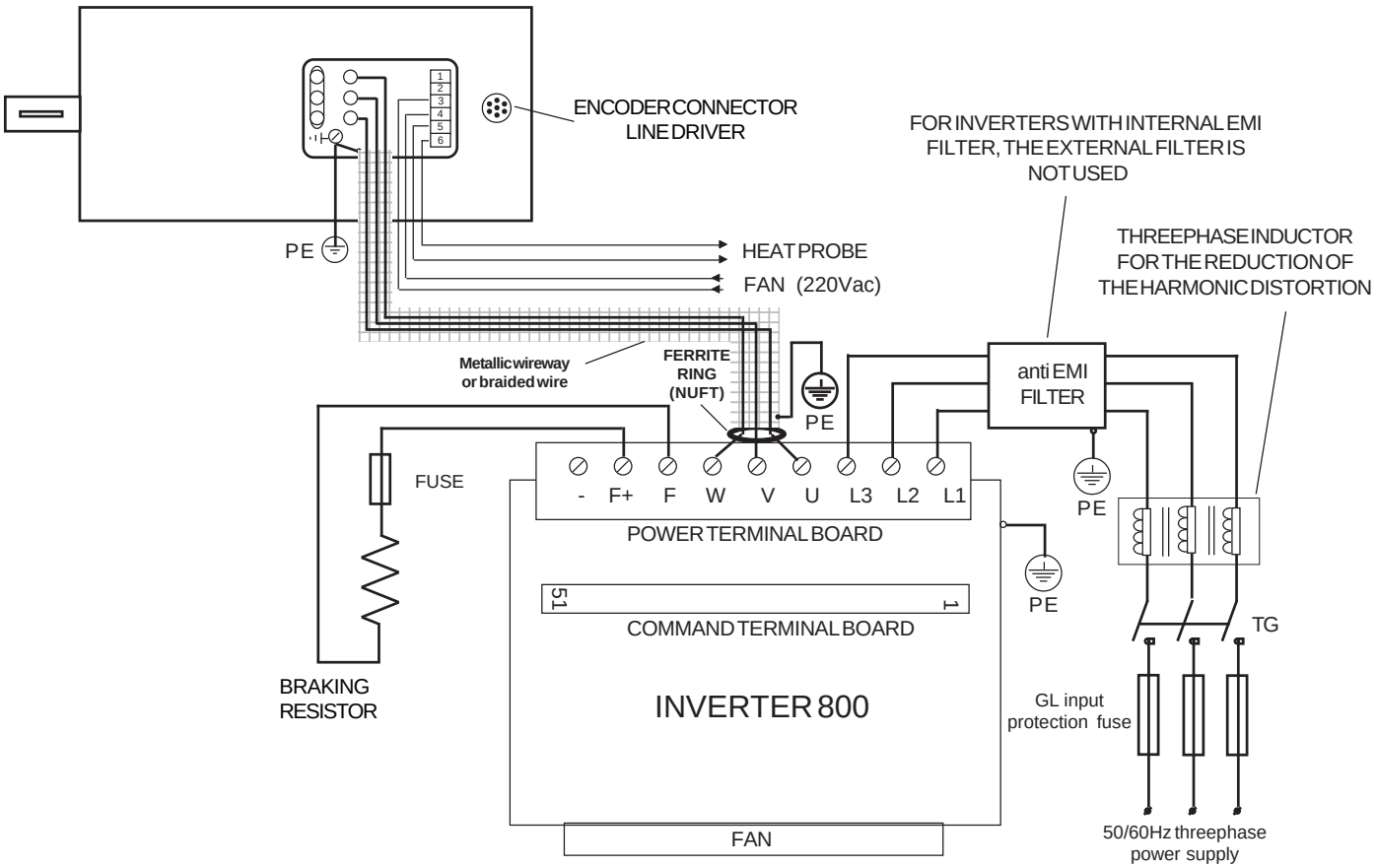
Caution ! ➞ ***The keyboard doesn't contain any parameter buffer (see Chapter 11 PARAMETERS TRANSFER).***

Quick installation aims

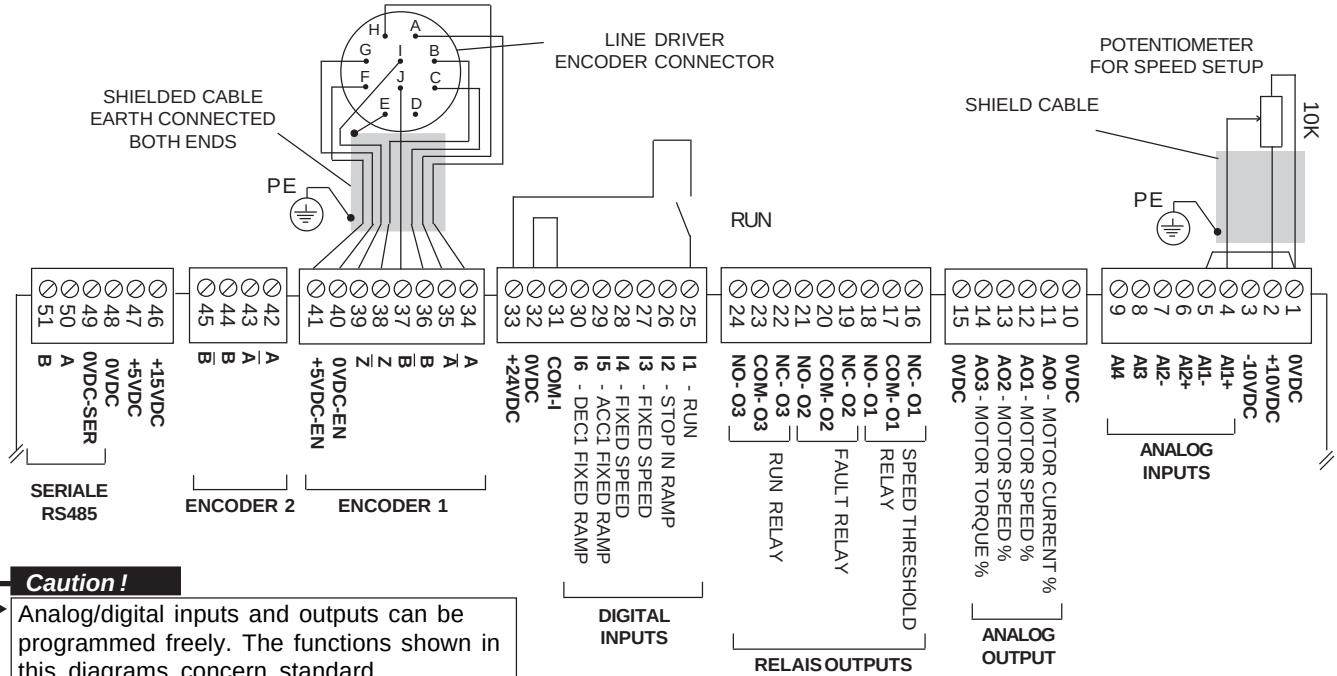
The aim of this paragraph is to teach the user, quickly and correctly, the speed control setup by a potentiometer of a synchronous reluctance motor in field oriented control with closed loop through an encoder or in sensorless control without any position transducer.

Wiring diagrams

• Connection diagram of the power terminal



• Connection diagram of the command terminal board



Caution !

Analog/digital inputs and outputs can be programmed freely. The functions shown in this diagrams concern standard programming in VECTOR MODE.

Starting installation

- Read carefully Chapter 1: GENERAL WARNINGS BEFORE INSTALLATION before installing.
- See Chapter 5: MECHANICAL INSTALLATION for the inverter positioning.
- See Chapter 8: ELECTRICAL INSTALLATION for connecting the inverter and for E.M.C. directives.
- See Chapter 7: BRAKING RESISTORS for connection, if neccessary.
- Connect the inverter with ref. to the ***Connection diagrams*** on the previous page.
- See Chapter 2: KEYBOARD OPERATING INSTRUCTIONS

- Start programming with RUN contact off. The RUN contact cannot be held as valid in case of safety stop, since in case of particular programming conditions or of inverter fault, its disconnection might not determine the sudden motor stop.
  For safety reasons, it is better to be close to the emergency button to activate the safety function of the system, the inverter's STO function too if it is present (see Safety Manual MANU.STO.INVERTER).
  The storage of the inverter for longer than 2 years could damage the DC link capacitors, which shoud be restored: in order to do that, it is suggested to supply power to the inverter in OFF rate for at least 2 hours.

- Supply power to the inverter and check the correct setting of the potentiometer as follows:

- Press ESCAPE key until parameter MOT CONTROL TYPE is displayed:

MOT CONTROL TYPE ***100.1 VECT_SyRM***	***VECT_SyRM =*** vector control of synchronous reluctance motor. Leave the default setting: ***VECT_SyRM***

- Press UP key to select the parameter:

APPLICATION ***100.5 SPEED***	**This parameter enables to select the application concerning the motor function in the final system.** Leave the default setting: SPEED (Motor speed control)

- Press ESCAPE key to return to DISPLAY STATUS
- Press PROGRAM key to modify the following parameters from the BASIC DATA menu:

LINE VOLTAGE ***1.1.1 400.V***	**Set the inverter supply voltage to the L1, L2, L3 terminals.** Choose the voltage which is the closest to the supply voltage true value. Setup range from 150.V to 600.V
MOTOR NOM CURREN ***1.1.2 10.0A***	**Set the nominal current of the motor which is connected to the inverter.** Setup range: from 0.0A to a standard parameter value.
MOTOR NOM FREQUE ***1.1.3 50.0Hz***	**Set the nominal frequency of the motor (frequency to nominal voltage).** See the value on the motor plate. Setup range from 1.0 Hz to 800.0 Hz
MOTOR NOM VOLTAG ***1.1.4 400.V***	**Set the nominal voltage of the motor (nominal voltage to frequency).**See the values on the motor plate according to the type of connection (star network or delta connection) Setup range from 1.V to 2000.V
MOTOR POLES ***1.1.5 4_POLES***	**Set the nr of motor poles** See the value on the motor plate. Setup range: 2_POLES, 4_POLES, 6_POLES, 8_POLES
RAMP ACCEL. TIME ***1.2.1 10.00s***	**Set the motor acceleration ramp** Setup range: from 0.01s to 600.00s
RAMP DECEL. TIME ***1.2.2 10.00s***	**Set the motor deceleration ramp.** Setup range: from 0.01s to 600.00s
MAX MOTOR SPEED ***1.3.1 1500.rpm***	**Set the motor maximum speed** Setup range: from 0 rpm to 30000 rpm
MIN MOTOR SPEED ***1.3.2 0.rpm***	**Set the motor minimum speed** Setup range: from 0 rpm to par. 1.3.1 MAX MOTOR SPEED

E1 ENCODER LINES	
1.6.1	2048

Setup the number of pulses per revolution of the encoder.
Setup range: from 1 to 5000 ppr.
Parameter not used in open loop control (sensorless).

KP GAIN	
1.6.2	25

Setup the proportional gain KP of the motor speed regulator.
Setup range: from 0 to 100.

KI GAIN	
1.6.3	25

Setup the integral gain KI of the motor speed regulator.
Setup range: from 0 to 100.

SENSORLESS CONTR	
1.6.17	NO

Speed control type selection, openloop (sensorless) or closed loop through position transducer (encoder).
Setup range: NO, YES.
Refer to the paragraph ***Open loop speed control (sensorless) activation.***

SET ZERO ANGLE	
1.7.2	150.0deg

Motor synchronization angle.
Setup range: from 0.0deg to 359.9deg.
Refer to the paragraph ***Encoder installation / checking procedure.***

ENCODER TUNING	
1.7.3	NO

Enabling of encoder tuning procedure.
Setup range: NO, YES.
Refer to the paragraph ***Encoder installation / checking procedure.***

MOTOR TUNING	
1.7.4	NO

Enabling of synchronous reluctance motor auto-tuning procedure.
Setup range: NO, YES.
Refer to the paragraph ***Synchronous reluctance motor auto-tuning procedure.***

PWM FREQUENZY	
1.12.1	5.00KHz

PWM Frequency in vector control.
Setup range: from 0.50KHz to 5.00KHz.
Leave the default setup.

- Press the UP key; the following will be displayed:

BASIC DATA OK
E=ESC P=CONTINUE

The screen indicates that the setup of the basic parameter to activate the control is over. Pressing ESCAPE key we go back to DISPLAY STATUS. The motor tuning procedure is needed following the procedure described in the paragraph ***Synchronous reluctance motor auto-tuning procedure***.
To enable the sensorless speed control, eg if a position transducer is not installed on the motor, select the par. 1.6.17 SENSORLESS CONTR = YES (refer to the paragraph ***Open loop speed control (sensorless) activation***). Instead if the speed control will be i closed loop the steps described in the paragraph ***Encoder installation / checking procedure*** have to be executed.

Later on, if further functions differring from the aim of the quick installation are necessary, you can scroll the complete menu of the available parameters by PROGRAM key.

Synchronous reluctance motor auto-tuning procedure

In C800 series an auto-tuning procedure of the inverter for synchronous reluctance motor control is available. Enabled the procedure a measure sequence is executed on the motor connected to the U V W terminals, computing the needed parameters to an optimal motor speed control both in closed loop and sensorless.
The procedure is enabled through the par. 1.7.4 MOTOR TUNING (default setting NO). Setting YES and enabling the RUN command, the RUN led light on and the procedure starts. The procedure duration is about 1 minutes, at the end the par. 1.7.4 MOTOR TUNING returns to NO, then the RUN command should be removed. With the successive RUN command the motor will works in vector control.

The motor tuning procedure upedate the following parameters:
1.7.5 STATOR RESIST.
1.7.6.1 – 1.7.6.10 DIRECT FLUX 1 – 10
1.7.7.1 – 1.7.7.10 QUADR. FLUX 1 – 10

Caution ! → The parameter updated at procedure end are overwritten, the values previoulsly set are not recoverable.

Caution ! → The motor tuning is required to get an optimal speed control both closed loop (through encoder) and open loop (sensorless).

Caution ! → The RUN command disabling before the procedure end (par. 1.7.4 MOTOR TUNING switches to NO) not allow the correct motor tuning, in this case none parameters are updated.

Caution ! → The motor auto-tuning procedure has to executed with motor shaft in no-load condition, free to turn without any mechanical constraint.

Caution ! → Once the motor tuning procedure executed the speed control type has to be selected through the par. 1.6.17 SENSORLESS CONTR, if in closed loop by encoder set NO, otherwise if sensorless set YES. If the closed loop speed control is set the ***Encoder installation / checking procedure*** has to be executed, described in the following paragraph.

Encoder installation / checking procedure

The installation procedure is necessary to check the encoder signal wiring and the power motor wiring too; moreover, that is determined the zero synchronization value insert in the par. 1.7.2 SET ZERO ANGLE.
Caution ! → This procedure must be executed with the shaft free to rotate. The setting of the par. 100.5 APPLICATION must be on SPEED. During the procedure, the motor shaft will be rotating for a few seconds in both senses. After executed the signal and power connection as described in the present manual and prepared a run contact on the I1 input, select YES in the par. 1.7.3 ENCODER TUNING present in the BASIC DATA.

- Activated the run consent in the I1 input, the RUN led switch-on.
  The checking procedure start, don't force the motor shaft, don't disable the run contact.
  During the procedure, the motor shaft will be rotating for a few seconds in both senses.
  The transition of the par. 1.7.3 ENCODER TUNING from the selection YES to NO communicates the end of the procedure.
- Remove the RUN contact on the I1 input.
  If the encoder connections are correct the procedure ends as describeb, otherwise, the inverter shows a Fault condition, the RUN led switch-off and the led FAULT switch-on.
  The variable LAST FAULT present in DISPLAY STATUS (see the Chap.9), shows the value 50.
  The reporting indicates to correct the encoder wiring to invert the A and A/NEGATO on the clamps 34 and 35; once correct the wiring repeat the checking procedure with Yes selection in the par. 1.7.3 ENCODER TUNING.
  If the procedure ends without Fault, the phasing angle of the zero encoder will be shown in the variable 2.1.55 ZERO ANGLE, present in the DISPLAY STATUS of the inverter. The indicate value must be written in the par. 1.7.2 SET ZERO ANGLE.
- At the next activation of the RUN contact, with the par. 1.7.3 ENCODER TUNING set NO, the drive will work in speed control with encoder feedback.

Rotate test

- Press ESCAPE key more than once to return to DISPLAY STATUS.
- Start with the potentiometer set so that the speed in **SPEED REFERENCE** is 0 rpm.
- Enable the rate (RUN light on) and check the correct speed adjustment on the potentiometer, by verifying the display of the following variables: **SPEED REFERENCE**, **MOTOR SPEED** and **ENCODER SPEED**. All variables must display the same speed rate and the same sign.
- Select **MOTOR CURRENT** variable and check the motor absorbption is correct if considered the present load conditions.

Caution !

Default speed adjustment through AI1 analog input is monodirectional; if you need it to be bidirectional, set par. 4.3.1.3 TYPE INPUT = -10V/+10V

- Through the 3.1.1.3 REVERSE SPEED is possible to programming a command to reverse the rotate sense.

Open loop speed control (sensorless) activation

Once the basic data parameters are set and the motor auto-tuning procedure executed. The open loop speed control (sensorless) is available through the par.1.6.17 SENSORLESS CONTR, setting YES the synchronous reluctance motor is vector controlled by the inverter without encoder feedback.

Caution ! If sensorless control is selected (par. 1.6.17 SENSORLESS CONTR = YES) at each RUN enabling command (I1 input) the initial position identification procedure is executed. The procedure has about 1 second duration, after that the drive is in speed control.
If closed loop speed control is selected (par. 1.6.17 SENSORLESS CONTR = NO) the initial position identification procedure is executed only at the first RUN command enabling (I1 input) after the inverter switching on.

Procedure to restore default setup

It is possible to restore all setups and return to standard ones by following the instruction below:

- Disable the rate (RUN light OFF)
- Keep ESCAPE key pressed until **100.1 MOTOR CONTROL TYPE** parameter is displayed
- Press UP key to select **100.6 SETUP** menu
- Press PROGRAM key to select the parameter:

RESTORE	***SETUP***
100.6.1	***DEFAULT***

Check **DEFAULT** is selected

Press UP key to select the parameter:

ENABLE RESTORE	
100.6.2	***NO***

Select **YES** and confirm by PROGRAM key; **YES** will be displayed until all default setups are restored. Then **NO** will be displayed.

Caution ! After this kind of operation all customized setups are reset definitively.

Inverter supply voltage to L1, L2, L3 terminals

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

U V W motor output

Types of motor ..... Synchronous reluctance motor
Motor control ..... speed and torque vector control closed loop or open loop (sensorless)
Output voltage ..... from 0 to 100% of the voltage supply
Output frequency ..... 0Hz - 800Hz
Wave form ..... sine wave
Tecnique of reconstitution of the waveform ..... PWM (Pulse With Modulation)
PWM frequency ..... set from 0.50KHz to 16.00KHz
% Overload capacity compared to the max nominal current set in the inverter with PWM 5Khz:
- 110% of the inverter nominal current in non-stop service
- over 110%, starts the thermal control with overload fault intervention if it exceeds the following indicative limits of the inverter (varies according to the size of the inverter):
..... 110% In for 300sec, 175% In for 30 sec, 250% In 3 sec

Regenerative braking control

With braking module .....included in all inverters 800-Series
Regenerated energy dissipation system ..... external resistance connected to F+ and F clamps

Digital inputs

Nr of digital inputs ..... 6 as standard (I1..I6) + 8 by 404S optional board (I7..I14)
Input insulation ..... optoinsulated in case of external power supply
Connection logic ..... NPN or PNP
Activation voltage .....15Vdc min., 30Vdc max.
Programming ..... I1 input with fixed run function. The remaining are completely programmable
Input resistance ..... about 3,6Kohm
Enabling/disabling times ..... 10ms, 20ms with pulse control

Pulse digital inputs

Encoder nr. ..... 2 as standard + 1 by 404S optional card
Zero Encoder inputs nr ..... 2 by 404S optional card
Input insulation ..... optoinsulated
Connection logic ..... encoder line driver push/pull output
Encoders voltage inputs ..... 5Vdc, short circuit protected (12Vdc or 24Vdc on request)
Max. frequency 125Khz
Load in ON state of the single-channel encoder 10mA
Logic state 1 voltage (5Vdc encoder) ..... more than 2,7Vdc
Logic state 1 voltage (12Vdc encoder) ..... more than 6Vdc
Logic state 1 voltage (24Vdc encoder) ..... more than 12Vdc

Relay outputs

Relay nr 3 (O1, O2, O3)
Programming ..... completely programmable
Contact nr per relay ..... one NO/NC exchange
Contact current-carrying capacity 0.5A 120Vac- 1A 24Vac
Enabling/disabling times 5ms

Digital outputs

Output nr ..... 5 (O4, O5, O6, O7, O8) available only with 404S optional board
Output insulation ..... optoinsulated in case of external power supply
Connection logic ..... NPN or PNP
Programming ..... completely programmable
Operating voltage supply ..... max. 100Vdc
Max. current 80mA
Enabling/disabling times 12ms

Analog inputs

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

Analog outputs

AO0 ..... 12bit...updating time from 2,6ms (just for FAST associated variables) to 6,6ms
AO1 ..... 12bit...updating time 6,6ms
AO2, AO3 ..... 8bit...updating time 20 ms
Output voltage ..... +/-10Vdc
Output current ..... max. 10mA
Programming ..... completely programmable

RS485 serial connection

RS485 standard comunication ..... MODBUS RTU...ROWAN
Baudrate ..... 1200..2400..4800..9600..19200..38400..57600..76800..115200
Insulation ..... .optoinsulated
Optional board comunications..... PROFIBUS DPV1, CANOPEN, MODBUS TCP/IP, ETHERCAT, PROFINET

Available voltage supply

+10Vdc, -10Vdc (for potentiometers supply) ..... .max. 10mA
+24Vdc (for inputs or other devices) ..... short circuit protected...max.250mA
For encoder sensor supply:
* +5Vdc (on request).....insulated...short circuit protected...max.500mA
* +12Vdc (on request).....insulated...short circuit protected...max.200mA
+5Vdc ..... short circuit protected...max.200mA
15Vdc ..... short circuit protected...max.200mA

Protections

Inverter ..... Fault for thermal/electronic protection (I x I x t) on overloading on U, V, W clamps
.....Fault for protection on max. peak current U, V, W
.....Fault for programmable time-threshold protection on output current on U, V,W clamps
.....Fault for short circuit among U, V, W phases (all models) and between the phases and ground (from /5 to /G)
..... Fault for BUSDC overvoltage
..... Fault for overheating of IGBT modules
..... Alarm without fault for BUSDC capacitors work life end
..... Fault for short circuit on F and F+ terminals for braking resisitor connection
Motor ..... Fault for thermal/electronic protection (I x I x t) on prolonged overloading
..... Fault for overspeed
Braking resistor .....Fault for threshold thermal/electronic protection on prolonged overloading

Special applications

..... ELECTRIC SHAFT, POSITIONER, FLY CUT(Only Code 400A)
..... DIE CUTTER (Only Code 400F)
..... REGULATOR (Only Code 400R)
..... WINDER / UNWINDER (Only Code 400W)
.....Motor with brake in LIFTING systems (LIFT function, in all versions)

Environmental characteristics

Working temperature ..... from -5°C to +40°C
Heatsink temperature ..... rom -5°C to +70°C
Storage temperature ..... from -25°C to +70°C
Altitude ..... max. 1000mt a.s.l. (over this the load must be reduced by 1% every 100mt)
Protection level ..... IP20, IP54 on request
Relative humidit ..... from 5% to 95% without condensation

Law conformity and electromagnetic compatibility

The 800-Series drivers have been designed to operate in an industrial environment. They are **EC** products in compliance with the **EMC 2014/30/UE directive** with reference to the **CEI EN 61800-3 (Cat.C2)** product standard, if connected following the wiring system in Chap. 3,4 and 7.As for the models without internal filter, they are in compliance with the EMC directive only if connected to the relevant filtering devices supplied separately.Moreover, the drives conform to **B.T. LVD 2014/35/Ue directive**, with reference to **CEI EN 61439-1/2** and **CEI EN 60204-1** standards.

Caution! This product belongs to the restricted sales distribution class in compliance with **EN61800-3 (Cat.C2) standard**. In a domestic environment this product may cause radio interferences, in which case the user may be required to take adequate safety measures.

Summary table of power electrical features for inverter from /P to /6

Caution ! → Compare the output rated current of the inverter with the motor rated current to choose the correct drive power size.

INVERTER POWER SIZE				/P	/R	/0	/0M	/1	/L	/2	/2,5	/3	/3,5	/5	/6
RATED 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
RATED CURRENT IN U - V - W OUTPUTS	LINE 230-400Vac	A	MAX SETTINGS	3	5	7	9	12	15	22	30	35	45	60	72
			ABSOLUTE*	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 SETTINGS	-	-	-	-	-	-	-	-	-	-	50	55
			ABSOLUTE*	-	-	-	-	-	-	-	-	-	-	55	60,5
MAX. DRIVE BLOCK CURRENT IN U, V, W OUTPUTS		A		8,5	13	20	25	34	42	62	84	98	126	170	200
L1- L2- L3 GL INPUT PROTECTION FUSES		A		4	6	10	16	16	20	25	32	40	63	80	80
BRAKING CURRENT IN CONTINUOS SERVICE WITH MINIMUM OUTPUT RESISTOR F F+	LINE 230-400Vac	A		5,3	5,3	11	11	11	14	25	36	36	42	64	125
	LINE 690Vac	A		-	-	-	-	-	-	-	-	-	-	64	125
MINIMUN 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 (AT 4KHz PWM)		kW		0,13	0,16	0,17	0,24	0,34	0,43	0,58	0,78	0,89	1,21	1,54	1,76
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
		LINE 690Vac		-	-	-	-	-	-	-	-	-	-	NO	NO

* **ABSOLUTE** = Max. limit of the output current U-V-W in S1, without the fault intervention.

Summary table of power electrical features for inverter from /6,5 to /G

Caution ! → Compare the output rated current of the inverter with the motor rated current to choose the correct drive power size.

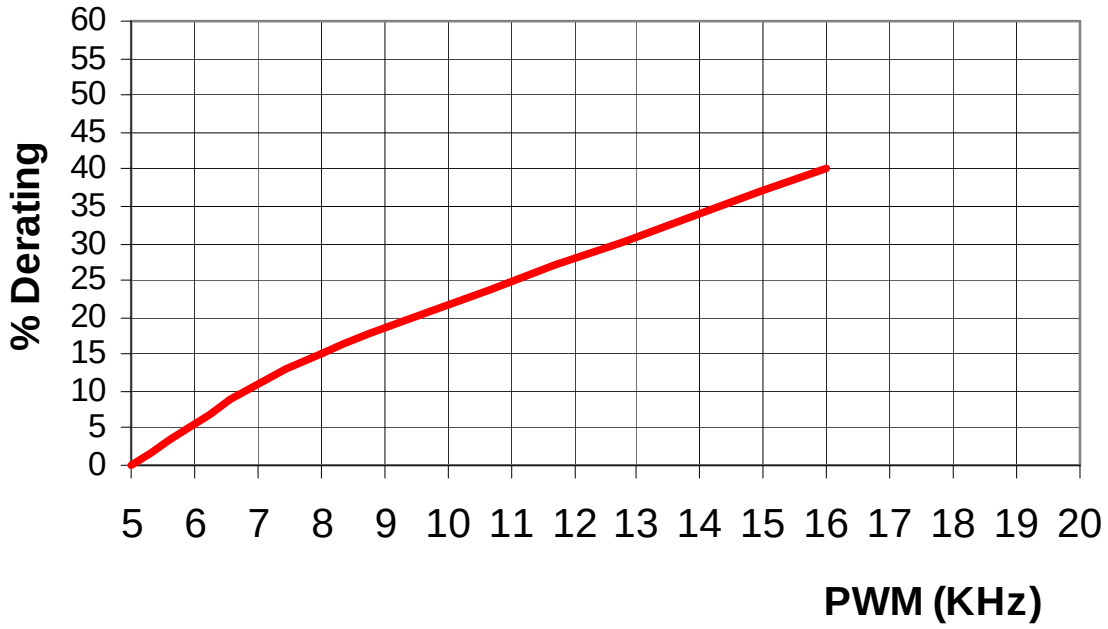
INVERTER POWER SIZE				/6,5	/7	/8	/8,5	/9	/A	/B	/C	/D	/E	/F PWM 5KHz	/F PWM 3KHz	/G PWM 5KHz	/G PWM 3KHz
RATED CURRENT IN L1 - L2 - L3 INPUTS	LINE 230-400Vac	A		87	106	138	165	205	245	300	410	460	550	655	745	780	868
	LINE 230-400Vac with reactance	A		70	82	110	135	164	200	240	325	370	460	550	627	655	730
RATED CURRENT IN U - V - W OUTPUTS	LINE 230-400Vac	A	MAX SETTINGS	87	106	138	165	205	245	300	410	460	550	655	746	780	868
			ABSOLUTE*	95	116	151	181	225	269	330	451	506	605	720	820	858	954
	LINE 690Vac	A	MAX SETTINGS	65	80	110	140	170	210	250	330	350	-	412	470	490	560
			ABSOLUTE*	71	88	121	154	187	231	275	363	385	-	453	517	539	616
MAX. DRIVE BLOCK CURRENT IN U, V, W OUTPUTS		A		245	300	385	460	575	685	840	1000	1290	1540	1800		2090	
L1- L2- L3 GL INPUT PROTECTION FUSES		A		100	125	160	200	250	315	400	500	630	630	1000		1250	
BRAKING CURRENT IN CONTINUOS SERVICE WITH MINIMUM OUTPUT RESISTOR F F+	LINE 230-400Vac	A		125	125	187	187	187	114	114	250	250	250	250		250	
	LINE 690Vac	A		125	125	187	187	187	114	114	250	250	-	250		250	
MINIMUN BRAKING RESISTOR F F+ OUTPUT	LINE 230Vac	OHM		6	6	4	4	4	6,5	6,5	3	3	3	3		3	
	LINE 400Vac	OHM		6	6	4	4	4	6,5	6,5	3	3	3	3		3	
	LINE 690Vac	OHM		9	9	6	6	6	10	10	4,5	4,5	-	4,5		4,5	
MAX. DISSIPATED POWER (AT 4KHz PWM)		kW		2,12	2,31	3,31	3,47	-	-	-	-	-	-	-		-	
MAX. DISSIPATED POWER (AT 2KHz PWM)		kW		-	-	-	-	4,11	4,81	5,60	8,11	9,64	11,-31	14,89		17,74	
COOLING FAN				SI	SI	SI	SI	SI	SI	SI	SI	SI	SI	SI		SI	
INTERNAL EMI FILTER		LINE 230-400Vac		SI	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	
		LINE 690Vac		NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO		NO	

* **ABSOLUTE** = Max. limit of the output current U-V-W in S1, without the fault intervention.

Inverter derating according to PWM frequencies

CAUTION! Direct max. powers in the tables are allowed for PWM frequencies up to 5KHz. For higher frequencies the inverter must be derated following the diagrams on the right.

As for PWM frequency setup, see parameter group: 1.12.PWM GENERATOR



Efficiency level and power losses of Rowan Inverter

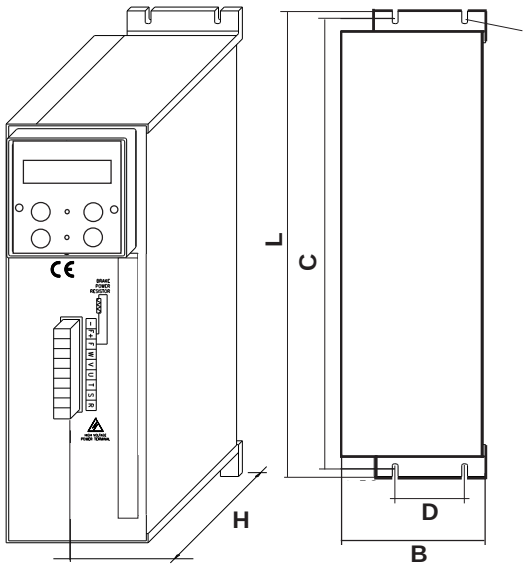
Three-phase Rowan Inverters driving motors rated for direct line start operation on 50/60Hz lines fall within the scope of Commission Regulation (EU) nr 2019/1781 laying down ecodesign requirements for electric motors and variable speed drives pursuant to Directive 2009/125/EC of the European Parliament.
It shall apply from 1 July 2021.

Regulation requires that Variable Speed Drives (VSD) fall within the efficiency class IE2 and to provide to users "power losses in % of the rated apparent output power at the following different operating points for relative motor stator frequency versus relative torque-producing current (0;25) (0;50) (0;100) (50;25) (50;50) (50;100) (90;50) (90;100), as well as standby losses, generated when the VSD is powered up but is not providing current to the load, rounded to one decimal place".

As required by Regulation power dissipations of Rowan inverters do not exceed the maximum power losses corresponding to the IE2 efficiency level.
Below the table with power losses for each inverter:

Inverter (CDM) Efficiency Level according to Reg. EU n°2019/1781 (nomenclature as described in CEI EN 61800-9-2)												
POWER SIZES	Efficiency Level	$S_{r,equ}$ [kVA]	$P_{L,STANDBY}$ [W]	$p_{L,CDM}$ (0;25)	$p_{L,CDM}$ (0;50)	$p_{L,CDM}$ (0;100)	$p_{L,CDM}$ (50;25)	$p_{L,CDM}$ (50;50)	$p_{L,CDM}$ (50;100)	$p_{L,CDM}$ (90;50)	$p_{L,CDM}$ (90;100)	$P_{L,CDM}$ (90;100) [kW]
/P	IE2	2	15,0	4,0%	4,3%	5,0%	4,1%	4,5%	5,6%	4,8%	6,3%	0,13
/R	IE2	3	15,0	2,4%	2,7%	3,3%	2,5%	2,9%	3,9%	3,2%	4,7%	0,16
/0	IE2	5	15,0	1,9%	2,0%	2,5%	2,0%	2,2%	3,0%	2,5%	3,5%	0,17
/0M	IE2	6	20,0	1,9%	2,1%	2,5%	2,0%	2,3%	3,1%	2,6%	3,8%	0,24
/1	IE2	8	20,0	1,6%	1,8%	2,5%	1,7%	2,1%	3,2%	2,3%	4,1%	0,34
/L	IE2	10	20,0	1,6%	1,8%	2,5%	1,7%	2,0%	3,2%	2,3%	4,1%	0,43
/2	IE2	15	22,0	1,4%	1,6%	2,3%	1,5%	1,9%	2,9%	2,1%	3,8%	0,58
/2,5	IE2	21	25,0	1,5%	1,8%	2,6%	1,6%	2,0%	3,1%	2,2%	3,8%	0,78
/3	IE2	24	27,2	1,4%	1,6%	2,3%	1,5%	1,8%	2,9%	2,1%	3,7%	0,89
/3,5	IE2	31	28,5	1,5%	1,7%	2,5%	1,6%	2,0%	3,1%	2,2%	3,9%	1,21
/5	IE2	42	22,0	1,2%	1,4%	2,0%	1,3%	1,6%	2,7%	1,9%	3,7%	1,54
/6	IE2	50	22,0	1,1%	1,3%	2,0%	1,2%	1,6%	2,6%	1,9%	3,5%	1,76
/6,5	IE2	60	22,0	1,1%	1,3%	2,0%	1,2%	1,5%	2,7%	1,8%	3,5%	2,12
/7	IE2	73	22,0	0,9%	1,1%	1,8%	1,0%	1,4%	2,4%	1,6%	3,1%	2,31
/8	IE2	96	22,3	1,0%	1,2%	1,9%	1,1%	1,5%	2,6%	1,8%	3,5%	3,31
/8,5	IE2	114	22,5	0,9%	1,1%	1,8%	1,0%	1,4%	2,4%	1,6%	3,0%	3,47
/9	IE2	142	23,0	0,8%	0,9%	1,5%	0,9%	1,2%	2,1%	1,4%	2,9%	4,11
/A	IE2	170	23,0	0,7%	0,9%	1,4%	0,8%	1,1%	2,0%	1,4%	2,8%	4,81
/B	IE2	208	23,0	0,7%	0,8%	1,3%	0,8%	1,1%	1,9%	1,3%	2,7%	5,60
/C	IE2	284	57,0	0,7%	0,9%	1,5%	0,8%	1,1%	2,1%	1,3%	2,9%	8,11
/D	IE2	319	64,0	0,7%	0,9%	1,6%	0,8%	1,2%	2,2%	1,4%	3,0%	9,64
/E	IE2	381	66,0	0,7%	1,0%	1,6%	0,8%	1,2%	2,2%	1,4%	3,0%	11,31
/F	IE2	517	83,0	0,7%	0,9%	1,5%	0,8%	1,1%	2,1%	1,4%	2,9%	14,89
/G	IE2	601	86,0	0,7%	0,9%	1,5%	0,8%	1,1%	2,2%	1,4%	2,9%	17,74

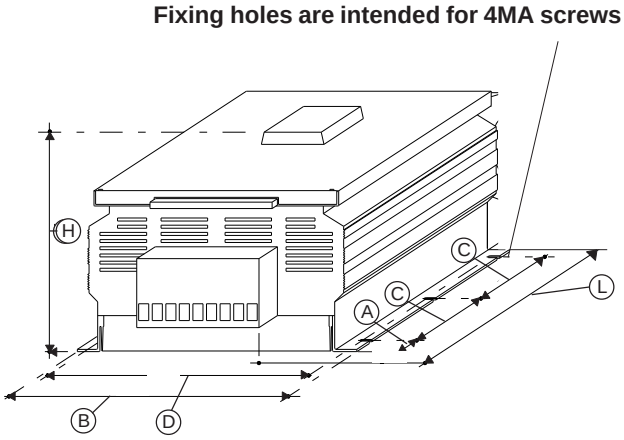
Dimensions and weights for inverters from 400/P to 400/L



All dimensions are in mm

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 and weights for inverters from 400/2 to 400/G



All dimensions are in mm

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 number of C quotes depends of the numbers of fixing holes.

- As for models from /5 to /G, a version with EXTERNAL CABINET COOLING is available on request
WARNING! The version of the inverters at 690Vac is higher than 6 cm (add 60mm to the size H)

Suggestions for a correct mechanical installation

- Make sure that the characteristics of the area in which the inverter is to be installed fall within the recommended characteristics given in Chapter 5: TECHNICAL FEATURES (temperature, humidity, protection level, altitude).

-Install the inverter in a place dedicated to the panel power parts. Avoid placing it near low voltage analog or digital boards (i.e.: opposite side of the metal sheet).

- Favour the cooling air flow as much as possible. Do not stack drives, leave a space of at least 100 mm under and above it and of at least 50 mm sideways.

- Avoid vibrations and knocks.

- Leave enough room to install anti-disturbance filters, should they be necessary.

The drive should be installed vertically with the fans in the lower part and inserted in well ventilated panels. The inverter should also be fixed to a rigid, flat surface in order to force the air that is pushed up from the ventilators through the heat dissipator. If the inverter is installed inside any kind of container, this must have air vents in the higher parts and fans with a grill in the lower part to let hot air out above the highest border of the inverter, as shown in the diagram below. The air flow coming out from the upper part of the inverter should not be obstacled in its way towards the expulsion airvents.

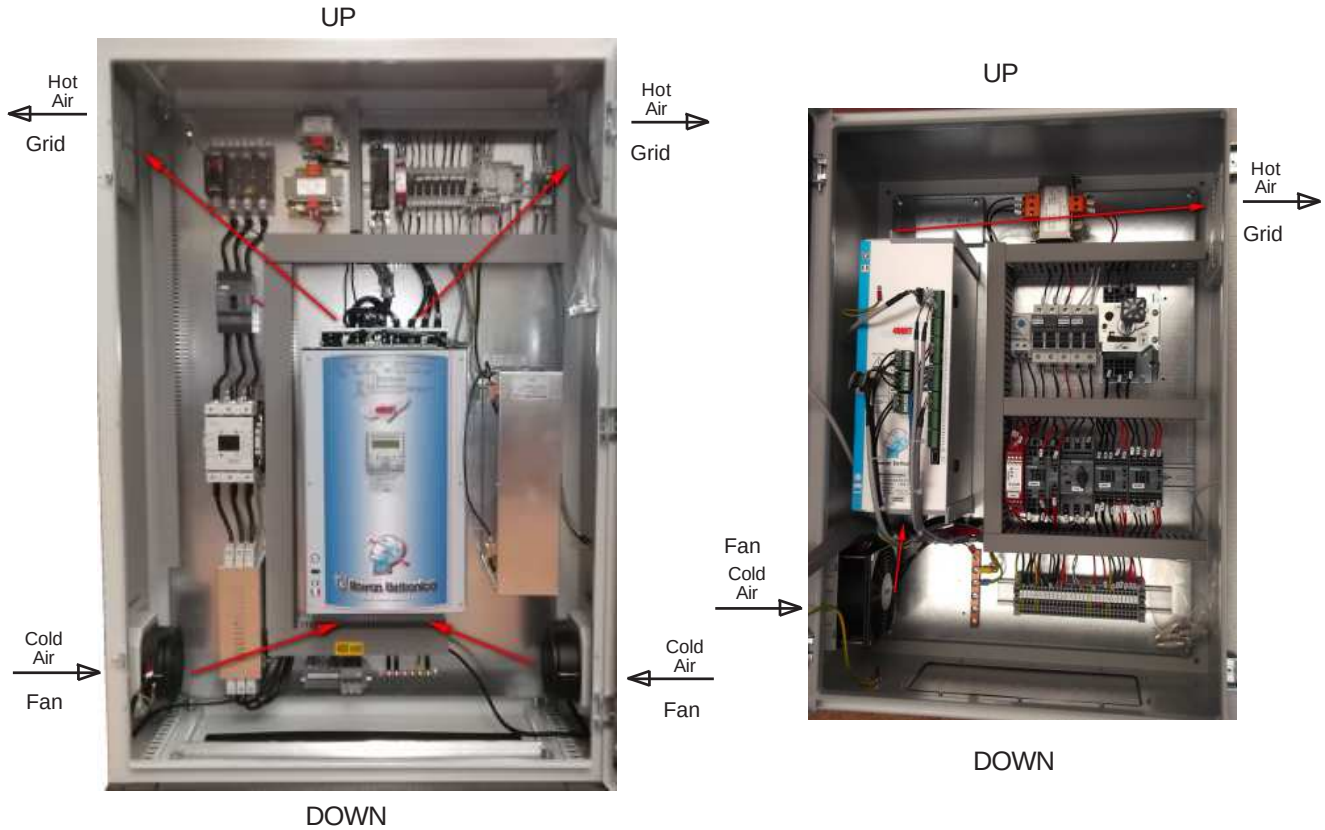
In particular aggressive areas, or if it is not possible to ventilate the panel enough, use heat exchangers or air conditioners.
For the dimensioning of the air exchange within the ELECTRICAL CABINET, takE into account the value: MAX. DISSIPATED POWER (AT 5KHz PWM) of the tables in chapter 5.
In the case of higher PWM frequencies, consequently increase in function of the diagram of derating.

Please remember that if the fault relay (Default O2) is used to block the inverter power supply in case of faults, cooling fans will be stopped as well. If Fault 14 occurs (Power module overheating cooler), the inverter should be powered, but RUN command (I1) disabled, in order to speed up dissipator cooling. In this way O2 relay won't deactivate and cooling fans will continue working.

All inverters from /5 to /G have a thermostat on the cooler activating cooling fans when the dissipator temperature goes over 50°C; fans are deactivated when the dissipator temperature is lower than 40°C.

IMPORTANT: is recommended at least once per year to control the tightening of terminal board, especially the high power one, both the inverter and the motor to avoid the possibility of looseness with consequent overheating of contact and cable connected.

HOW TO PLACE AN INVERTER IN A PANEL



General warnings before connection of the threephase power supply

TN- (Threephase + Neutral to Ground) and TT- (Threephase + Ground) network connections

Rowan inverters are designed to be powered by this kind of threephase nertworks, electrically symmetrical to Ground. The inverter must be connected to earth.

IT- (Threephase without Ground) network connections

For IT-feed, the use of a Ground trial delta/star isolation transformer is compulsory, or any isolation loss by one of the devices connected to the same network might cause inverter faults.

Wiring system and electromagnetic compatibility

The Series 400 drives have been designed to work in industrial environments in accordance with the safety standards dictated by the CEI EN 60204-1 general directive.They comply with EMC 2004/108/CE directive, with reference to the CEI EN 61800-3 (Cat. C2). In order to meet these requirements drives **without internal filter** must be connected via anti E.M.I. filtering device (Electro Magnetic Interference) as indicated in the connection diagram given below, made up of a threephase supply filter. To chose the suitable filter see:

“Table of threephase anti E.M.I. filters and ferrite toroids for different inverters”

-The U- V- W wires **must** also be passed through a ferrite ring several times, which should be positioned as close as possible to the drive.

During the wiring phase, the following rules must be respected:

- **It is compulsory** not to pass the command terminal board connecting wires through the same channel as the power wires of the same drive or of other device (keep a distance of at least 30 cm between them).

- **It is compulsory** to connect braided wire analog inputs/outputs through and place it in a **different** channel from the one used for power cables.

- It is compulsory to connect the encoder (LINE DRIVER) from the motor to the drive by a 6-wires braided cable. The 6 wires must be connected to the inverter terminal board as indicated in the connection diagrams in this manual.

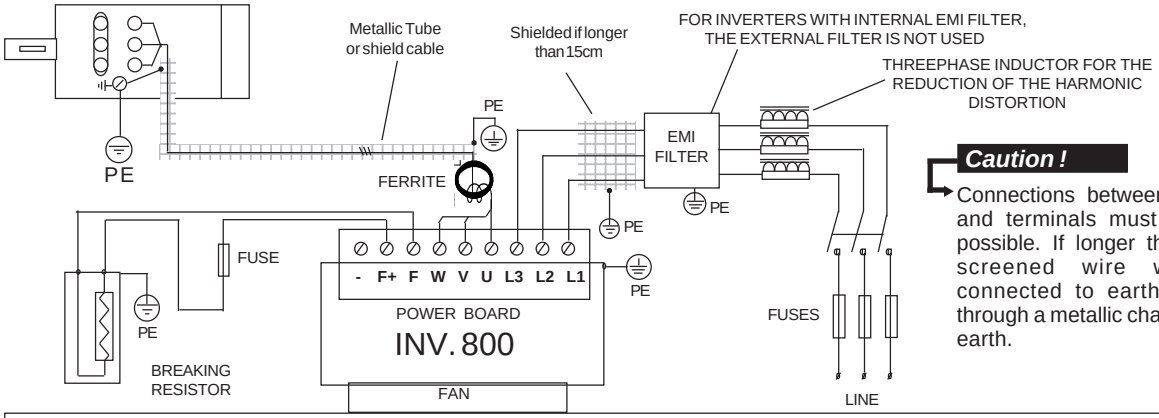
Caution !

the cable shield used must be connected both at pin nr. 7 (D) of the encoder connector and at the inverter common ground point (with ground bar or galvanized plate, using clamps). Avoid the shield stretch through use of wires, otherwise reduce as a possible the length.

The encoder connection cable must pass through a **different** channel from that of the power wires of the same drive or of other device. Moreover:

- **It is compulsory** to connect the end of each shield one by one to the common mass point of the panel. Avoid mass rings.

-The motor power connection **must** be performed by means of a braided cable or by wires inserted into a metallic tube without continuity solution.
Install a filter for riducing of the harmonic distorsion between the line and the EMI filter.



Caution !

Connections between L1-L2-L3 filters and terminals must be as short as possible. If longer than 15cm, use a screened wire with screening connected to earth, or pass wires through a metallic channel connected to earth.

Inverters with inner EMI filter have capacitors connected between the phases and the metal case; for safety it is **absolutely forbidden** supplying the inverters if their PE terminal is not connected to ground. For the same reason it is **absolutely forbidden** supplying external EMI filter if their PE terminal is not connected to ground.

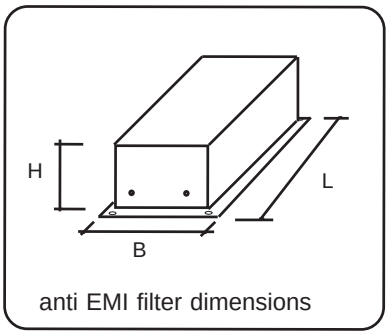
Caution !

- E.M.I. filters and inverters with inner filter must be used with power supply directed to ground (TN or TT).
- Before connecting the inverter and/or the EMI filter, check the correct state of the earth grounding system. Any bad ground connection can affect the right functioning of the filter and damage it.
- If two phases cut off, the leakage current can reach 6 times the values we have in normal conditions.
- Take note that the standard EN50178 specifies that, in presence of leakage currents to ground greater than 3,5mA, the ground connection cable must be of a fix type and doubled for redundancy.
- The maximum protection and the good functioning of the inverter is obtained only by using type B differentials with intervention threshold not lower than 300mA.

Caution ! In a domestic environment this product can cause radio interferences, in that case the user should use adequate precautions.

Table of threephase anti E.M.I. filters electrical features and dimensions

EMC FILTER CODE (LINE 230-400VAC)	I_{MAX} FILTER (Arms)	FILTER DIMENSIONS (mm)			WEIGHT (Kg)
		H	B	L	
FT.ROW10A.400	10	55	106	116	1
FT.ROW25A.400	25	60	135	232	2,5
FT.ROW50A.400	50	85	122	250	3
FT.ROW130A.400	130	150	90	270	3
FT.ROW200A.400	200	125	225	440	6
FT.ROW300A.400	400	125	225	440	6,5
FT.ROW600A.400	600	200	385	640	18
FT.ROW850A.400	850	200	385	640	19



anti EMI filter dimensions

Table of threephase anti E.M.I. filters and ferrite toroids for different inverters

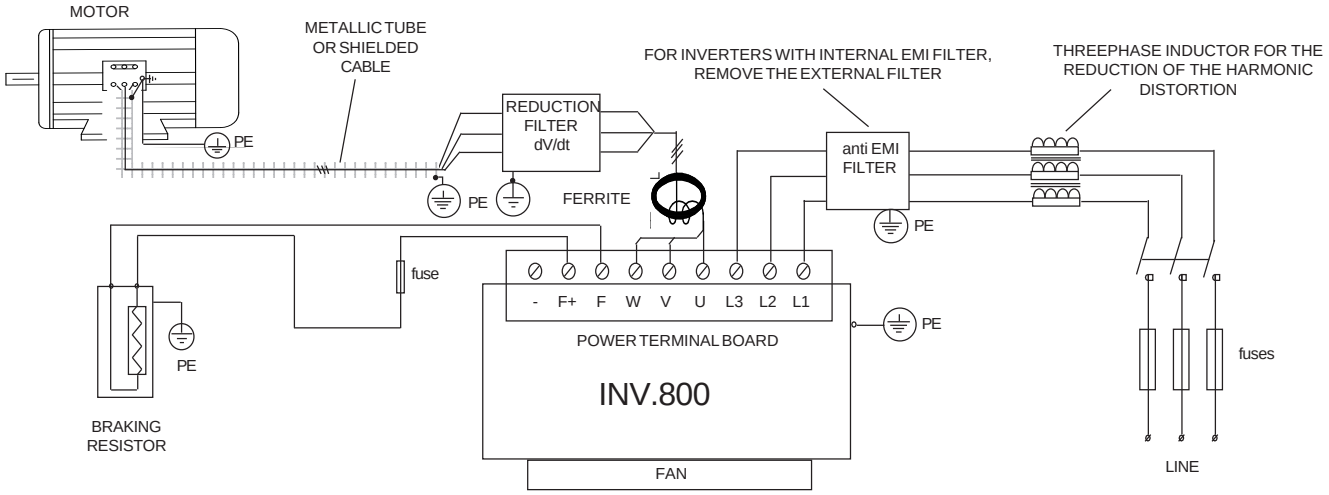
INV.400 POWER SIZE LINE 230VAC-400VAC	CODE EMC FILTER	I_{MAX} FILTER (Arms)	FILTER LEAKAGE CURRENT (1) [mA]	INVERTER OUTPUT WIRES SECTION (mm^2)	PASS NR THROUGH THE TOROID	TOROID NR	TOROIDS CODE
/P	INTERNAL FILTER	/	3,5	1	3	1	NUFT19
/R	INTERNAL FILTER	/	3,5	1	3	1	NUFT19
/0	INTERNAL FILTER	/	3,5	2,5	3	1	NUFT19
/0M	INTERNAL FILTER	/	3,5	2,5	3	1	NUFT19
/1	INTERNAL FILTER	/	3,5	2,5	3	1	NUFT19
/L	INTERNAL FILTER	/	3,5	2,5	3	1	NUFT19
/2	INTERNAL FILTER	/	3,5	4	3	1	NUFT38
/3	INTERNAL FILTER	/	3,5	6	3	1	NUFT38
/3,5	INTERNAL FILTER	/	3,5	10	3	1	NUFT38
/5	INTERNAL FILTER	/	38	16	3	1	NUFT38
/6	INTERNAL FILTER	/	38	16	3	1	NUFT38
/6,5	INTERNAL FILTER	/	38	25	2	2	NUFT38
/7	FT.ROW130A.400	130	18	35	2	2	NUFT38
/8	FT.ROW200A.400	200	18	50	1	2	NUFT38
/8,5	FT.ROW200A.400	200	18	70	1	2	NUFT38
/9	FT.ROW200A.400	200	18	95	1	2	NUFT38
/A	FT.ROW400A.400	400	18	* 2x50 x phase	1	1	NUFT104
/B	FT.ROW400A.400	400	18	* 2x70 x phase	1	1	NUFT104
/C	FT.ROW400A.400	400	18	* 2x95 x phase	1	1	NUFT104
/D	FT.ROW600A.400	600	18	* 2x120 x phase	1	1	NUFT104
/E	FT.ROW600A.400	600	18	* 3x95 x phase	1	2	NUFT104
/F	FT.ROW850A.400	850	18	* 4x95 x phase	1	2	NUFT104
/G	FT.ROW850A.400	850	18	* 4x120 x phase	1	3	NUFT104

(1) This is the EMI filters (inner or external) maximum leakage current to ground in normal and good functioning conditions (460V/50Hz).
ATTENTION: If two phases cut off, the leakage current can reach 6 times the values we have in normal conditions.
* If there are connections with several cables of high section, ROWAN EL. can supply terminals useful to simplify the connection (ask Rowan Elettronica Techn.Dept.).
Filters characteristics for line 690VAC can be supplied by Rowan Elettronica Techn. Dept.

Reducing the harmonic distortion

Inverters cause current harmonic distorsion; the user shall value if the environment or the plant where the inverter is installed needs a reduction of the harmonic distortion as per standards CEI EN 61000-3-2 (In<=16A, directly connected to the public network at low voltage) and CEI EN 61000-3-12 (16A<In<=75A, directly connected to the public network at low voltage); in this case Rowan Elettronica supplies, on request, filters for reduction of the harmonic distorsion as written on the following table.

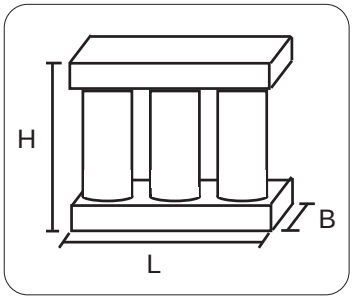
Connection of the filter for the reduction of the harmonic distorsion:



As well as reducing the harmonic distortion, this inductor reduces the effective current absorbed by the inverter and gives also better drive protection against possible power losses and peaks coming from the supply line. In particular, it reduces those current peaks crossing the condensers inside the inverter, which helps them lasting longer.

Table of filters for reducing the harmonic distortion for different inverters

FILTER CODE (case)	MAX CURRENT (A)	DISSIPATED POWER at In (W)	MAX DIMENSIONS AND WEIGHTS				INV.400 POWER SIZE LINE 230-400V	INV.400 POWER SIZE LINE 690V
			L (mm)	B (mm)	H (mm)	WEIGHTS (KG)		
RTZ.5A.5,6	5	16	120	66	115	3	/P /R	-
RTZ.12A.2,2	12	27	150	90	147	6	/0 /1	-
RZT.22A.1,3	22	42	180	89	147	7	/L /2	-
RZT.35A.0,76	35	65	180	100	175	9	/3	-
RZT.50A.0,56	50	87	180	110	175	10,5	/3,5	/5 /6
RZT.72A.0,39	72	123	240	110	242	14,2	/5 /6	/6,5 /7
RZT.106A.0,26	106	195	240	120	242	17,5	/6,5 /7	/8
RZT.165A.0,16	165	187	240	145	242	24,8	/8 /8,5	/8,5 /9
RZT.245A.0,11	245	225	300	130	260	27	/9 /A	/A /B
RZT.370A.0,074	370	285	300	150	320	39	/B /C	/C /D
RZT.460A.0,059	460	438	360	165	370	54	/D	-
RZT.550A.0,049	550	465	360	200	370	69	/E	/F
RZT.655A.0,042	655	500	360	210	370	84	/F	/G



Max. dimensions of filter for reducing the harmonic distortion

Reducing dV/dT ripples to the motor

The voltage supplied the motor connected to the inverter is obtained using the PWM (Pulse With Modulation) technique, which means that it is formed by a sequence of variable duration pulses. The high increasing speed of the voltage of these pulses (dV/dt) can cause high dispersion currents through the motor supply cables, as well as between the motor winding themselves, and also between the motor windings and the motor body. A high Dv/dt also determines very high voltage paeks on the motor windings, through the intrinsic inductance of the connecting wires.

In order to reduce all problems arising from the presence of dispersion currents and high overvoltage on the windings, a range of filters reducing the dV/dt has been produced. Their related codes, power sizes and dimensions are given in the following table:

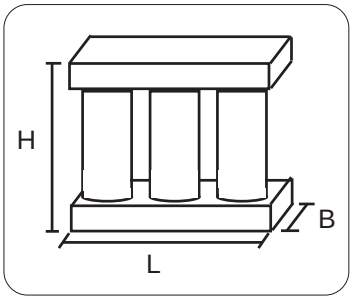
dV/dt reduction filter table for different inverters

FILTER CODE	MAX CURRENT (A)	DISSIPATED POWER at In (W)	MAX DIMENSIONS				INV.400 POWER SIZE LINE 230-400V	INV.400 POWER SIZE LINE 690V
			L (mm)	B (mm)	H (mm)	PESO (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	/3.../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.../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	-

The filters for dV/dt reducing should always be used if the winding insulation level of the motor is not known, or else with motors that were not purposely manufactured to be connected to an inverter.

These filters should also be used each time wires between the inverter and the motor are longer than 15m.

The dV/dt reducing filter should be positioned between the ferrite toroid and the motor next to this toroid, as shown in the diagram on the previous page.



Max. dV/dt reduction filters dimensions

Electrostatic discharges (ESD)

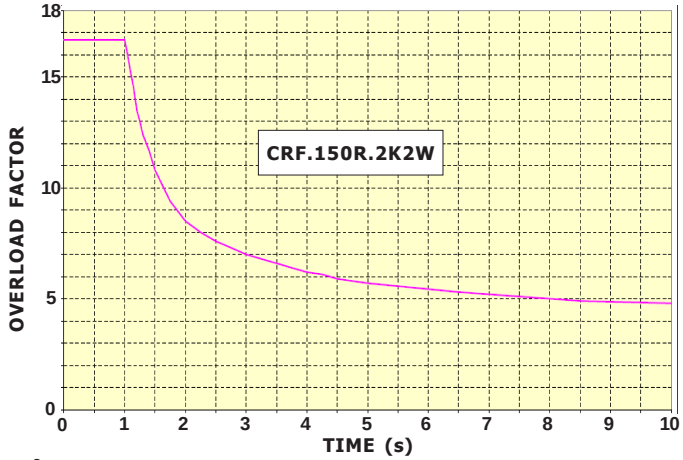
The inverter contains some components that may be harmed by electrostatic discharges (ESD). For that reason it is important to follow the present advises:

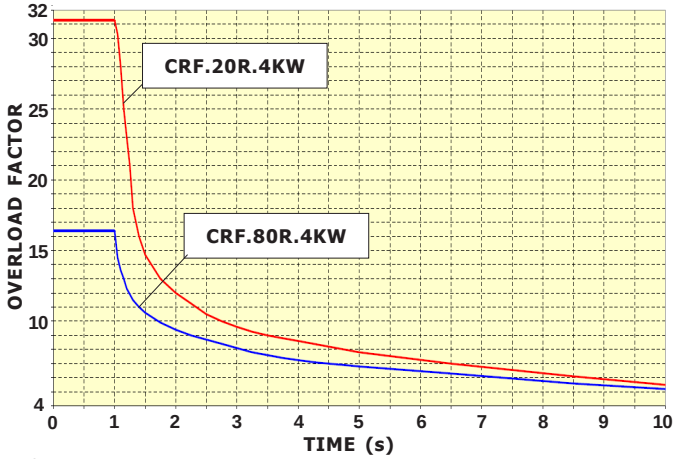
- touch the internal cards only when strictly necessary.
- before handling the cards, provide for discharging yourself electrostatically .
- the cards have not to be touched by very insulating materials (for ex. textile fibers) especially when they are running.

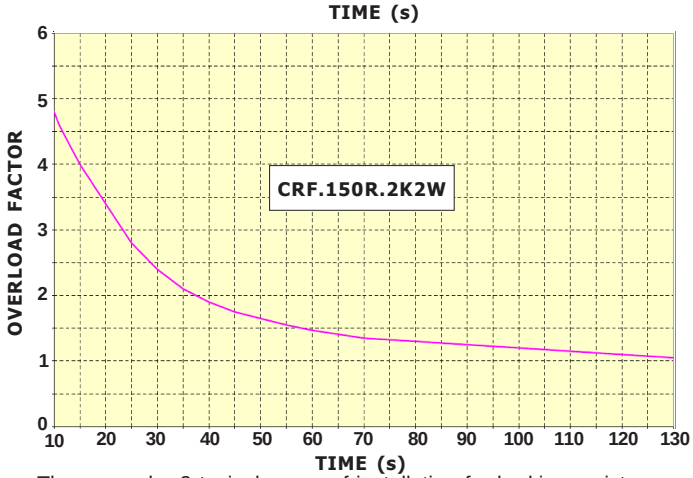
Table of braking resistors for Rowan inverters

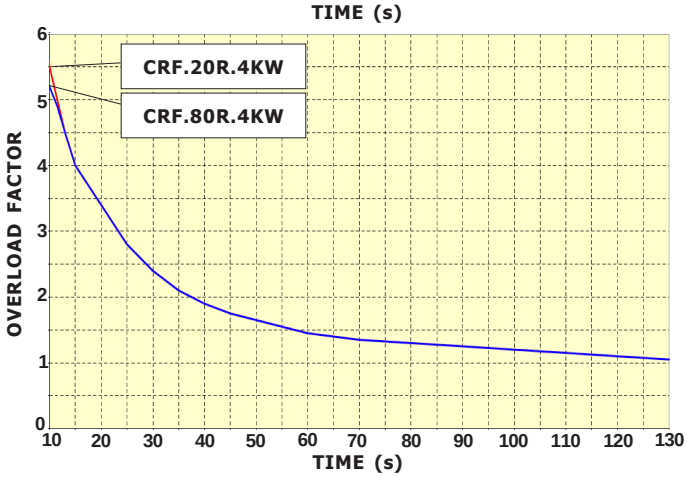
DATA	units	RES.180R. 600	CRF.150R. 2K2	CRF.20R. 2K5	CRF.30R. 2K5	CRF.40R. 2K5	CRF. 20R. 4KW	CRF. 80R. 4KW
NOMINAL POWER	W	600	2200	2500	2500	2500	4000	4000
RESISTOR	ohm	180	150	20	20	40	20	80
NOMINAL CURRENT	A	1.8	3.8	11	9	7.9	14.1	7.0
MAX CURRENT FOR 5 sec	A	2.5 (5s ON - 25s OFF)	9.2 (5s ON - 30min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

To facilitate the choice of the type of resistance CRF (and any combinations series / parallel) as a function of the working cycle, are depicted below the curves of overload. WARNING! The curves refer to a single overload with a maximum ambient temperature of 40 ° C and a resistor installed in a location where it is ensured proper air circulation. The average time that the resistor employ to move back to the ambient temperature is between 20 and 30 minutes, depending on the cooling conditions.









There may be 2 typical cases of installation for braking resistors:

Installation in a cabinet

This kind of installation is generally used in case of intermittant use of the resistors, with high, but distanced current peaks, in order for cabinet and other devices temperatures not to increase too much over their continuous duty cycle limits. In this case, current and power nominal values must be applied, but with **5% duty cycle**.

- **RES.180R.600** and **RES.xxR.2K5** resistors, made of ceramics and protected by an ultra slim covering, must be fixed in close contact with the panel components supporting sheet.

- **RES.CRF.xxR.xKxW** resistors, closed in a IP22 panel without ventilation, must be mounted vertically as shown in the drawings of the page on the right.

External installation

This kind of installation is used when it is neccessary to dissipate in countinuos duty cycle as much power as possible of the brake resistor, with or without ventilation. The current and power in duty cycle 100% characteristics shown in the table are related to the following mounting conditions:

- **RES.180R.600** and **RES.xxR.2K5** resistors must be fixed onto a cooler, which is able to discharge **0,5W/°C**.

Caution! with this features, the flat resisitor external temperature may reach about **300°C**.

Arrange for proper protections against accidental contacts.

Non ventilated resistors in IP22 cabinet **CRF.xxR.xKxW**, and ventilated **CRF.xxR.xKxW.V** must be mounted in vertical position as indicated in diagrams on the facing page.

Caution! with this features, the temperature of the air coming out from the container slits may reach about **400°C**.

Arrange for proper protections against accidental contacts.

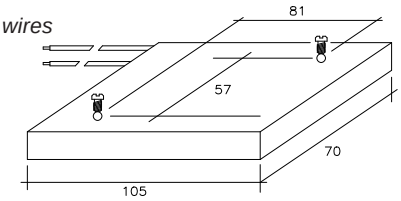
Caution! the ohmic value of the braking resistor can't be lower than that estimated in: **"OUTPUT F F+MIN. BRAKING RESISTOR"** tables of Chapter 5: TECHNICAL FEATURES.
In inverter from /3 size up to /F size, the output for connecting the braking resistance (F and F+) is protected against the short circuit (indicated by the inverter blockage with FAULT13). In sizes from /P up to /2 there is no protection, therefore we suggest using a protection fuse on terminal F+.

For safety reasons, insert a protection fuse in series connection with the resistance on F+ terminal, as shown in the table.

RES.180R.600 and REA.xxR.2K5 braking resistors dimensions

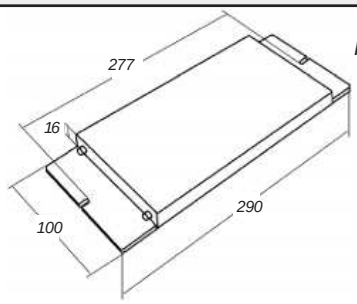
RES.180R.600

Connection wires



Dimensions in mm

RES.xxR.2K5



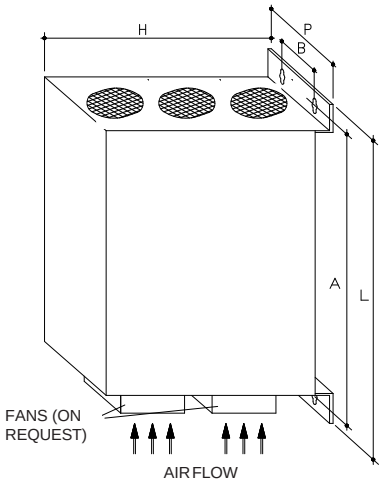
Braking resistors in CRF.xxR.xKxW container dimensions

Resistance value

Power

REISITOR CODE	H	B	L	A	P	WEIGHT (Kg)
CRF.150R.2K2W	322	67	486	458	120	7
CRF.20R.4KW	322	67	486	458	120	7,5
CRF.80R.4KW	322	67	486	458	120	7,5

Dimensions in mm



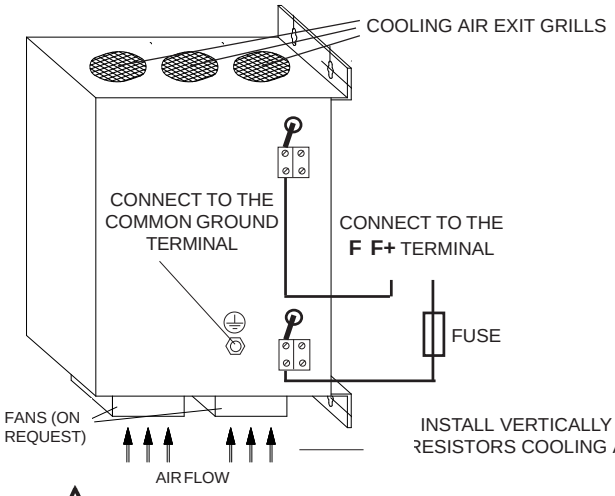
Available versions:

C R F. x x R . x K x W: Standard version without ventilation

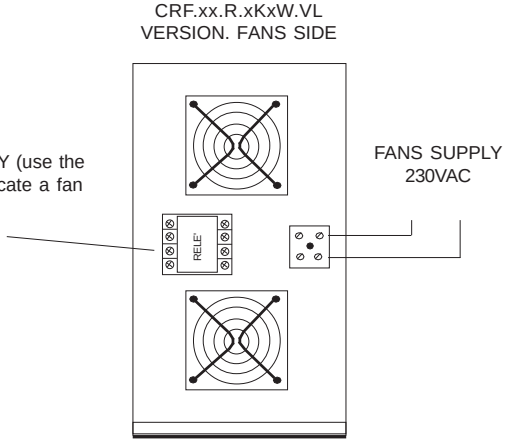
C R F. x x R . x K x W.V: Standard version with ventilation

C R F. x x R . x K x W.VL: Standard version with ventilation with fan fault relay

CRF.xxR.xKxW resistors mechanical installation and electrical connection



CRF.xx.R.xKxW.VL VERSION. FANS SIDE



If the container must be opened for maintenance, it is compulsory to power the inverter off and wait for at least 5 minutes before touching the electric resistor

Inverter setup for dynamic braking

In order to enable dynamic braking it is necessary to set par.1.13.1 ENABLE=YES. The inverter is equipped with an electronic control to the braking resisitor overload; so it is important to set the data on the resistor plate in the following parameters:

-In **par.1.13.2 BRAKE RESISITANCE**, set the resistor ohmic value. In case of parallel or series connection of resistors with common features, set the equivalent resistivity value.

-In **par.1.13.3 NOMINAL CURRENT**, set the resisitor nominal current at the chosen working conditions. In case of parallel connection of resistors with common features, set the current sum; in case of series connection, set the current of each resisitor. If this values is surpassed, the inverter blocks itself and FAULT 18 is displayed.

-In par.**1.13.4 5 SEC CURRENT**, insert the max. current value for 5sec. In case of parallel connection of resistors with common features, set the current sum; in case of series connection, set the current of each resisitor.

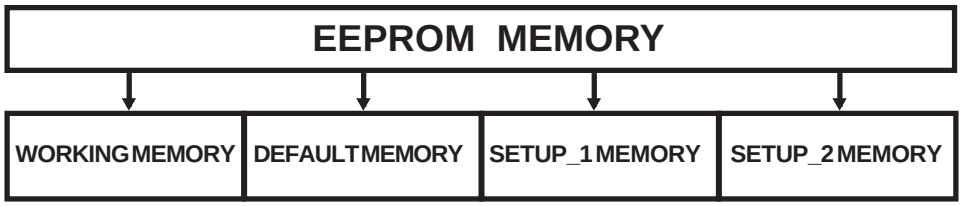
If this values is surpassed, the inverter blocks itself and FAULT 19 is displayed.

As for Rowan braking resistors, draw the data from the table on the previous page:

“Table of braking resistors for Rowan inverters”. In case of parallel connection of resistors, the protection fuses in the table must be set in series for each resistor.

Structure of the internal EEPROM MEMORY of parameters

The inverter eeprom memory is divided into 4 areas, each including copy of all the inverter parameters, the standard ones included, as shown in the diagram below:



WORKING MEMORY	***It includes those parameters which can be modified by the keyboard and shown at each inverter starting.***
DEFAULT MEMORY	***It includes the parameters with standard setups, which cannot be modified by the operator.***
SETUP_1 MEMORY	***First file with customized setup.***
SETUP_2 MEMORY	***Second file with customized setup***

Caution !
All inverters are manufactured with the same copies as those in DEFAULT MEMORY.

Possible operations by parameters memories

Caution ! → It is not possible to activate the inverter RUN during restoring or saving operations.

- ***Restoring, by the keyboard, of DEFAULT memory into WORKING memory (it restores the inverter orignal standard setups).***

PROCEDURE:
Enter 100. parameters. Set **par.100.6.1 RESTORE SETUP= DEFAULT**. To enable restoring, enter **par.100.6.2 ENABLE RESTORE**, select **YES** and confirm by E key. **YES** will be displayed for all restore operation, then the selection will go back to **NO** automatically.

- ***Saving, by the keyboard, of WORKING memory into SETUP_1 memory.***
  It enables to save customized setups in SETUP_1 file.

PROCEDURE:
Enter 100. parameters. Set **par.100.6.3 SAVE SETUP= SETUP_1**. To enable saving, enter **par.100.6.4 ENABLE SAVE**, select **YES** and confirm by E key. **YES** will be displayed for all saving operation (about 20s), then the selection will go back to **NO** automatically.

- ***Saving, by the keyboard, of WORKING memory into SETUP_2 memory. It enables to save customized setups in SETUP_2 file.***

PROCEDURE:
Enter 100. parameters. Set **par.100.6.3 SAVE SETUP= SETUP_2**. To enable saving, enter **par.100.6.4 ENABLE SAVE**, select **YES** and confirm by E key. **YES** will be displayed for all saving operation (about 20s), then the selection will go back to **NO** automatically.

- **Restoring of SETUP_1 and SETUP_2 memory into WORKING memory;** this is possible by the keyboard or by an external command in 2 modes which can be set by **par.100.6.7 TYPE RESTORE:**

  FULL= COMPLETE restore of all parameters. Execution time: about 20s.

  QUICK= Partial restore of the parameters (see **par.100.6.7** description). Execution time: about 0,3s.

  The restore operations of SETUP_1 and SETUP_2 memory into WORKING memory are:

- **Restoring, by the keyboard, of SETUP_1 memory into WORKING memory**

PROCEDURE:

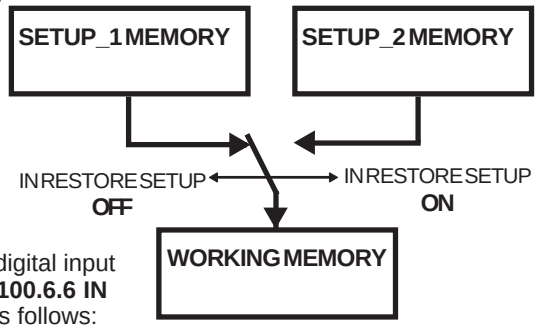
Enter 100. parameters. Set **par.100.6.1 RESTORE SETUP= SETUP 1**. To enable restoring, enter **par.100.6.2 ENABLE RESTORE**, select **YES** and confirm by E key. **YES** will be displayed for all restore operation, then the selection will go back to **NO** automatically.

- ***Restoring, by the keyboard, of SETUP_2 memory into WORKING memory.***

PROCEDURE:

Enter 100. parameters. Set **par.100.6.1 RESTORE SETUP= SETUP 2**. To enable restoring, enter **par.100.6.2 ENABLE RESTORE**, select **YES** and confirm by E key. **YES** will be displayed for all restore operation, then the selection will go back to **NO** automatically.

- ***Restoring, by a digital input command, of SETUP_1 and SETUP_2 memory into WORKING memory.***



The selection of the buffer to be restored is performed by another digital input to be programmed.

This function may be used, e.i. when the same drive is used for vectorial control of two different motors or to enter different applications (SPEED or AXIS CONTROL) by an external PLC logics.

PROCEDURE:

Enter 100. parameters. Program in **par.100.6.5 IN START RESTORE** the digital input **commanding** the start at restoring of the selected buffer. Program in **par.100.6.6 IN RESTORE SETUP** the digital input **selecting** the memory to be restored as follows: When this input if OFF, SETUP_1 memory will be restored; by input ON, SETUP_2 memory will be restored. To start restore, enable the input programmed in **par.100.6.5 IN START RESTORE** for at least 10ms (pulse).

Caution !

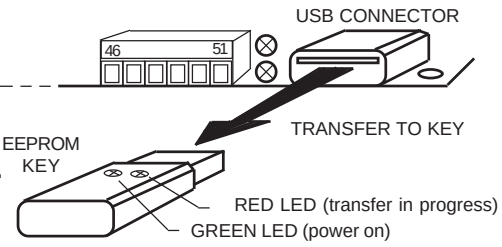
Caution! Var.2.1.41 LAST RESTORE displays the last type of parameters MEMORY, restored in WORKING MEMORY (DEFAULT, SETUP_1, SETUP_2).

Parameters transfer by EEPROM KEY and USB CONNECTOR

The EEPROM KEY includes an eeprom memory which is equivalent to that of the inverter with the same areas divisions into:

WORKING MEMORY, DEFAULT MEMORY, SETUP_1 MEMORY, SETUP_2 MEMORY.
By the EEPROM KEY and the USB CONNECTOR it is possible to save the inverter eeprom memory into the key, or, viceversa, to restore the key eeprom memory into that of the inverter; saving/restoring is possible only with the whole memory and not with single areas. The possible operations are the following:

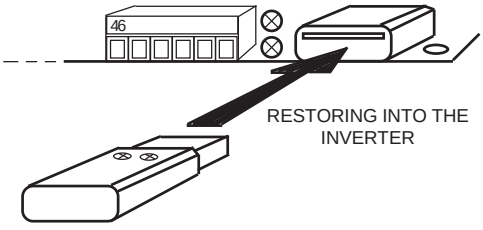
- **Saving of the inverter memory into that of the EEPROM KEY. Procedure**:



insert the key into the USB CONNECTOR; if the **green led** lights up, the key is supplied properly. Enter 100. parameters by pressing ESCAPE key for 5 s; to start saving, enter **par.100.6.9 Copy INV >> KEY**, enter **71**

When the **red led** on the key lights up, transfer is in progress; at the saving end, the red led extinguishes and the selection in **par.100.6.9** goes back to **0.**

- **Restoring of the EEPROM KEY memory into the inverter memory. Procedure**:



insert the key into the USB CONNECTOR; if the **green led** lights up, the key is supplied properly. Enter 100. parameters by pressing ESCAPE key for 5 s; to start saving, enter **par.100.6.8 Copy KEY >> INV**, enter **37**.

When the **red led** on the key lights up, transfer is in progress; at the saving end, the red led extinguishes and the selection in **par.100.6.8** goes back to **0.**

Caution !

During the saving/restoring operations (about 70s), the keyboard is blocked and it is not possible to enable the inverter RUN. If the procedures are performed with no EEPROM KEY inserted, no change takes place, but the keyboard remains blocked; in this case it is necessary to power the inverter off and then to start it again in order to unblock it.

At present, USB commercial keys, used for PCs as memory of an external mass, cannot be used for parameters transfer (this will be possible in the future). In the same way, ROWAN EL. EEPROM KEY cannot be used as mass memory for PCs.

To store parameter in eeprom sum 10000 at the ID MODBUS RAM (dec) address.

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP ** RAM (dec)	
								M30 module (M)	M40 module (G)
1. MOTOR CONTROL									
1.1 INV / MOTOR DATA									
1.1.1 LINE VOLTAGE	150 - 600	V	400	rw	1087	-	-	-	-
1.1.2 MOTOR NOM CURREN	0.1 - par.99.15	A	*1)	rw	1000	-	-	-	-
1.1.3 MOTOR NOM FREQUE	1.0 - 800.0	Hz	50.0	rw	1001	-	-	-	-
1.1.4 MOTOR NOM VOLTAG	1 - 2000	V	400	rw	1002	-	-	-	-
1.1.5 MOTOR POLES	2 POLI, 4 POLI 6 POLI, 8 POLI	-	4 POLES	rw	1003	-	-	-	-
1.1.6 NAMEPLATE SLIP	0 - 1000 rpm	rpm	*1)	rw	1004	-	-	-	-
1.1.7 NAMEPLATE KWatt	0.00 - 10000.00	Kw	*1)	rw	1005/1006	-	-	-	-
1.1.8 NAMEPLATE COS(PHI)	0.000 - 1.000	-	*1)	rw	1007	-	-	-	-
1.1.9 MOTOR PTC AI4	0.00 - 10.00	V	3.50	rw	4000	-	-	-	-
1.1.10 MOTOR LOAD FUNC	NO, YES	-	NO	rw	1044	-	-	-	-
1.2 SPEED RAMP									
1.2.1 RAMP ACCEL. TIME	0.01 - 600.00	s	10.00	rw	1008/1009	2038 (long)	68/69	4992 (long)	5200 (long)
1.2.2 RAMP DECEL. TIME	0.01 - 600.00	s	10.00	rw	1010/1011	2039 (long)	70/71	5008 (long)	5232 (long)
1.2.3 ENABLE S RAMP	NO, YES	-	NO	rw	1036	-	-	-	-
1.2.4 ROUNDING FILTER	0.01 - 300.00	s	0.5	rw	1037	-	-	-	-
1.2.5 FUNC. CHANGE RAMP	NO, YES	-	NO	rw	1042	-	-	-	-
1.2.6 ACC. UNDER SPEED	0.01 - 600.00	s	30.00	rw	1038/1039	-	-	-	-
1.2.7 SPEED ACC LEVEL	0.01 - 600.00	s	800	rw	1043	-	-	-	-
1.2.8 DEC. UNDER SPEED	0.01 - 600.00	s	30.00	rw	1040/1041	-	-	-	-
1.2.9 SPEED DEC LEVEL	0 - par.1.3.1	rpm	800	rw	4001	-	-	-	-
1.3 SPEED LIMIT									
1.3.1 MAX MOTOR SPEED	0 - 30000	rpm	1500	rw	1012	-	-	-	-
1.3.2 MIN MOTOR SPEED	0 - par.1.3.1	rpm	0	rw	1013	-	-	-	-
1.4 TEST MANUAL									
1.4.1 TEST MANU SPEED	0 - par.1.3.1	rpm	300	rw	4002	-	-	-	-
1.4.2 JOG TEST MANU	NO, YES	-	NO	rw	4003	-	-	-	-
1.5 VOLTS/Hz CONTROL (FUNZIONALITA' NON PREVISTA)									
1.5.1 FIXED BOOST	0.0 - 25.0	%	*1)	rw	1014	-	-	-	-
1.5.2 MIN SPEED % SLIP	0 - 500	%	200	rw	1015	-	-	-	-
1.5.3 V/F TYPE	V/F_1, V/F_2, V/F_3	-	V/F_1	rw	1016	-	-	-	-
1.5.4 STOP BOOST FREQ.	10.0 - par 1.1.3	Hz	25.0	rw	1088	-	-	-	-
1.5.5 ACCELER BOOST	0.0 - 25.0	%	0.0	rw	1017	-	-	-	-
1.5.6 ENABLEFLYING VF	NO, YES	-	NO	rw	1022	-	-	-	-
1.5.7 SLIP COMP ENABLE	NO, YES	-	NO	rw	1023	-	-	-	-
1.5.8 NOLOAD I x COS(PHI)	0.1 - 3000.0		*1)	rw	1024	-	-	-	-
1.5.9 OVERLOAD FUNC.									
1.5.9.1 ENABLE OVERLOAD	DISABLE, ON/OFF, REG/PI	-	DISABLE	rw	4004	-	-	-	-
1.5.9.2 MAX OVERLOAD CUR	100 - 300	%	100.0	rw	1018	-	-	-	-
1.5.9.3 MIN OVERLOAD SPE	0 - par.1.3.1	rpm	*1)	rw	1019	-	-	-	-
1.5.9.4 DEC.RAMP.OVERLOAD	0.01 - 300.00	s	10.00	rw	4005	-	-	-	-
1.5.9.5 KP REG OVERLOAD	0.00 - 250.00	-	20.00	rw	4006	-	-	-	-
1.5.9.6 KI REG OVERLOAD	0.00 - 250.00	-	10.00	rw	4007	-	-	-	-
1.5.9.7 MIN SPEED TIME	0.0 - 1800.0	s	0.0	rw	4008	-	-	-	-
1.5.9.8 MIN SPEED UNLOCK	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4009	-	-	-	-
1.5.10 HIGH TORQUE FUNC									
1.5.10.1 PERC UP V/F	0.0 - 25.0	%	*1)	rw	1020	-	-	-	-
1.5.10.2 KP UP V/F	0 - 100	-	*1)	rw	1021	-	-	-	-
1.5.10.3 HT MAX TIME MSEC	0.000 - 30.000	s	10.00	rw	4010	-	-	-	-
1.5.10.4 HT OVERL. SPEED	0 - 30000	rpm	1300	rw	4011	-	-	-	-
1.5.10.5 SPEED DISABLE HT	NO, YES		YES	rw	4012	-	-	-	-
1.5.11 CURRENT LIMIT									
1.5.11.1 MOD I LIM RAMP	DISABLE, STOP_RAMP, PI_RAMP	-	StopRAMP	rw	4013	-	-	-	-
1.5.11.2 I max ACC RAMP	0.1 - par.99	A	*1)	rw	4014	-	-	-	-
1.5.11.3 PERC SLEEP DEC	0 - 300	%	50	rw	4015	-	-	-	-
1.5.11.4 MOD I LIM STEADY	DISABLE ,PI_REG	-	PI_REG	rw	4016	-	-	-	-
1.5.11.5 I max STEADY	0.1 - par.99	A	*1)	rw	4017	-	-	-	-
1.5.11.6 KP REG PI	0 - 1000	-	1000	rw	4018	-	-	-	-
1.5.11.7 KI REG PI	0 - 1000	-	1	rw	4019	-	-	-	-
1.5.11.8 KP Imax BOOST	0 - 1000	-	300	rw	4020	-	-	-	-
1.5.11.9 KI Imax BOOST	0 - 1000	-	50	rw	4021	-	-	-	-
1.5.12 SPEED JUMP									
1.5.12.1 JUMP SET 1	0 - 24000	rpm	0	rw	4022	-	-	-	-
1.5.12.2 JUMP SET 2	0 - 24000	rpm	0	rw	4023	-	-	-	-
1.5.12.3 JUMP BAND	0 - 600	rpm	0	rw	4024	-	-	-	-

***1) Dipends on size.**
**** See Chapt.15 Inverter coding.**

To store parameter in eeprom sum 10000 at the ID MODBUS RAM (dec) address.

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP ** RAM (dec)	
								M30 module (M)	M40 module (G)
1.6 ENCODER VECTOR									
1.6.1 E1 ENCODER LINES	1 - 5000	-	1000.	rw	1025	-	-	-	-
1.6.2 KP GAIN	0 - 100	-	*1)	rw	1026	-	-	-	-
1.6.3 KI GAIN	0 - 100	-	*1)	rw	1027	-	-	-	-
1.6.4 VECT MAGNET CURR	0.0 - 100.0	%	*1)	rw	1028	-	-	-	-
1.6.5 ROTOR COSTANT	0.0 - 100.0	Hz	*1)	rw	1029	-	-	-	-
1.6.6 E2 ENCODER LINES	1 - 5000	-	2000	rw	1030	-	-	-	-
1.6.7 IN ENABLE ENC 2	NO, YES	-	REMOTE	rw	1031	-	-	-	-
1.6.8 ADAPT Id TABLE	10.0 - 200.0	%	100.0	rw	4025	-	-	-	-
1.6.9 EMPTY (Gruppo parametri non abilitato)									
1.6.10 FT DERIVATIVE	1 - 1000	Hz	150	rw	4026	-	-	-	-
1.6.11 KD GAIN	0 - 100	-	0	rw	4027	-	-	-	-
1.6.12 DERIVATIVE MODE	FEEDBACK, ERROR, BOTH	-	FEEDBACK	rw	4028	-	-	-	-
1.6.13 KP KI REGULATOR									
1.6.13.1 KP ID REGULATOR	0.0000 - 3.0000	-	*1)	rw	4029	-	-	-	-
1.6.13.2 KI ID REGULATOR	0.0000 - 3.0000	-	*1)	rw	4030	-	-	-	-
1.6.13.3 KP IQ REGULATOR	0.0000 - 3.0000	-	*1)	rw	4031	-	-	-	-
1.6.13.4 KI IQ REGULATOR	0.0000 - 3.0000	-	*1)	rw	4032	-	-	-	-
1.6.14 KP UP NOM SPEED	0 - 100	-	5	rw	1090	-	-	-	-
1.6.15 FIELD WEAK TYPE	TABLE, FEEDBACK	-	TABLE	rw	1091	-	-	-	-
1.6.16 SENSORLESS CONTROL	NO, YES	-	NO	rw	4276	-	-	-	-
1.7 PM MOTOR PARAM.									
1.7.1 POS START CURR.	0.0 - 100.0	%	15.0	rw	4246	-	-	-	-
1.7.2 SET ZERO ANGLE	0.0 - 359.9	deg	150.0	rw	4251	-	-	-	-
1.7.3 ENCODER TUNING	NO, YES	-	NO	rw	4252	-	-	-	-
1.7.4 MOTOR TUNING	NO, YES	-	NO	rw	4253	-	-	-	-
1.7.5 STATOR RESIST.	0 - 3000	mOhm	0	rw	4254	-	-	-	-
1.7.6 DIRECT FLUX LUT									
1.7.6.1 DIR. FLUX LUT 1	0.0 - 100.0	%	0.0	rw	4255	-	-	-	-
1.7.6.2 DIR. FLUX LUT 2	0.0 - 100.0	%	0.0	rw	4256	-	-	-	-
1.7.6.3 DIR. FLUX LUT 3	0.0 - 100.0	%	0.0	rw	4257	-	-	-	-
1.7.6.4 DIR. FLUX LUT 4	0.0 - 100.0	%	0.0	rw	4258	-	-	-	-
1.7.6.5 DIR. FLUX LUT 5	0.0 - 100.0	%	0.0	rw	4259	-	-	-	-
1.7.6.6 DIR. FLUX LUT 6	0.0 - 100.0	%	0.0	rw	4260	-	-	-	-
1.7.6.7 DIR. FLUX LUT 7	0.0 - 100.0	%	0.0	rw	4261	-	-	-	-
1.7.6.8 DIR. FLUX LUT 8	0.0 - 100.0	%	0.0	rw	4262	-	-	-	-
1.7.6.9 DIR. FLUX LUT 9	0.0 - 100.0	%	0.0	rw	4263	-	-	-	-
1.7.6.10 DIR. FLUX LUT 10	0.0 - 100.0	%	0.0	rw	4264	-	-	-	-
1.7.7 QUADR. FLUX LUT									
1.7.7.1 QUADR. FLUX LUT 1	0.0 - 100.0	%	0.0	rw	4265	-	-	-	-
1.7.7.2 QUADR. FLUX LUT 2	0.0 - 100.0	%	0.0	rw	4266	-	-	-	-
1.7.7.3 QUADR. FLUX LUT 3	0.0 - 100.0	%	0.0	rw	4267	-	-	-	-
1.7.7.4 QUADR. FLUX LUT 4	0.0 - 100.0	%	0.0	rw	4268	-	-	-	-
1.7.7.5 QUADR. FLUX LUT 5	0.0 - 100.0	%	0.0	rw	4269	-	-	-	-
1.7.7.6 QUADR. FLUX LUT 6	0.0 - 100.0	%	0.0	rw	4270	-	-	-	-
1.7.7.7 QUADR. FLUX LUT 7	0.0 - 100.0	%	0.0	rw	4271	-	-	-	-
1.7.7.8 QUADR. FLUX LUT 8	0.0 - 100.0	%	0.0	rw	4272	-	-	-	-
1.7.7.9 QUADR. FLUX LUT 9	0.0 - 100.0	%	0.0	rw	4273	-	-	-	-
1.7.7.10 QUADR. FLUX LUT 10	0.0 - 100.0	%	0.0	rw	4274	-	-	-	-
1.8 POWER LOSS CNTRL									
1.8.1 ENABLE LOSS CNTR	NO, YES	-	NO	rw	1045	-	-	-	-
1.8.2 START THRESHOLD	0 - 2000	V	450	rw	1046	-	-	-	-
1.8.3 + STOP THRESHOLD	0 - 2000	V	25	rw	1047	-	-	-	-
1.8.4 ACCEL TIME	0.01 - 600.00	s	15.00	rw	1048/1049	-	-	-	-
1.8.5 DECEL TIME	0.01 - 600.00	s	5.00	rw	1050/1051	-	-	-	-
1.8.6 START SPEED	0 - par.1.3.1	rpm	500	rw	1052	-	-	-	-
1.8.7 TIME LIMIT	0.001 - 30.000	s	10.000	rw	1053	-	-	-	-
1.9 I1 FUNCTION									
1.9.1 I1 SPEED STOP	NO, YES	-	NO	rw	1054	-	-	-	-
1.9.2 I1RESET FAULT	NO, YES	-	NO	rw	1055	-	-	-	-
1.9.3 I1 DC BRAKE	NO, YES	-	NO	rw	1056	-	-	-	-
1.9.4 OUT RUN	REMOTE, O1..O8	-	O3	rw	4033	-	-	-	-
1.9.5 OUT FAULT	REMOTE, O1..O8	-	O2	rw	4034	-	-	-	-
1.9.6 MECHANICAL BRAKE									
1.9.6.1 ENABLE MEC. BRAKE	NO, YES	-	NO	rw	4035	-	-	-	-
1.9.6.2 IN RUN - SPEED	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4036	-	-	-	-
1.9.6.3 OUT MEC. BRAKE	REMOTE, O1..O8	-	REMOTE	rw	4037	-	-	-	-
1.9.6.4 DELAY STOP	0.000 - 30.000	s	0.250	rw	4038	-	-	-	-
1.9.6.5 PERC In START	0 - 1000	%	1000	rw	4039	-	-	-	-
1.9.6.6 DELAY START	0.000 - 30.000	s	0.100	rw	4040	-	-	-	-
1.9.6.7 DELAY RAMP START	0.000 - 30.000	s	0.200	rw	4041	-	-	-	-
1.9.6.8 % In LIMIT SPEED	0 - 1000	%	1000	rw	4042	-	-	-	-
1.9.6.9 DELAY % In LIMIT	0.000 - 30.000	s	1.000	rw	4043	-	-	-	-
1.9.6.10 LIMIT SPEED	30 - 30000	rpm	3000	rw	4044	-	-	-	-
1.9.6.11 SPEED FAULT ENC.	0 - 30000	rpm	0 rpm	rw	4045	-	-	-	-
1.9.6.12 DELAY FAULT ENC.	0.000 - 30.000	s	0.200	rw	4046	-	-	-	-
1.9.7 IN RESET FAULT	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4047	-	-	-	-

***1) Dipends on size.**
**** See Chapt.15 Inverter coding.**

To store parameter in eeprom sum 10000 at the ID MODBUS RAM (dec) address.

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP ** RAM (dec)	
								M30 module (M)	M40 module (G)
1.10 TORQUE CONTROL									
1.10.1 MAX TORQUE	0 - par.99	%	200	rw	1057	-	-	-	-
1.10.2 TORQUE SOURCE	REMOTE, AI1..AI5, MOTOPOT, OPERATOR	-	AI3	rw	1058	-	-	-	-
1.10.3 TORQUE CONTROL	MAX_TORQ, SET_TORQ	-	MAX_TORQ	rw	1059	-	-	-	-
1.10.4 RAMP TORQUE	0.01 - 600.00	s	1.0	rw	1060	-	-	-	-
1.10.5 IN DX ENABLE LIM	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4048	-	-	-	-
1.10.6 IN SX ENABLE LIM	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4049	-	-	-	-
1.10.7 SAVE MOTOPOT.	NO, YES	-	YES	rw	4050	-	-	-	-
1.10.8 IN + TORQUE MOT.	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4051	-	-	-	-
1.10.9 IN - TORQUE MOT.	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4052	-	-	-	-
1.10.10 TORQUE THRESHOLD	0 - 300	%	100	rw	1061	-	-	-	-
1.10.11 THRESHOLD DELAY	0.1 - 30.0	s	5.0	rw	1062	-	-	-	-
1.10.12 OUT TORQUE THRES	REMOTE, O1..O8	-	REMOTE	rw	4053	-	-	-	-
1.10.13 SAVE SET MANUAL	NO, YES	-	YES	rw	4054	-	-	-	-
OP * 1.10.14 SET TORQUE OPERAT.									
SET MAN	0 - par.1.10.1	%	0	rw	4055	-	-	-	-
TORQUE	0 - 300	%	var.	ro	2021	-	-	-	-
1.10.15 ADAPT PERC TORQ.	10.0 - 200.0	%	100.0	rw	4056	-	-	-	-
1.10.16 ADAPT TORQ. [Nm]	10.0 - 200.0	%	100.0	rw	4057	-	-	-	-
1.10.17 IN EN. TORQ. FIL	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4058	-	-	-	-
1.10.18 TORQUE FIL	0.0 - 100.0	Hz	5.0	rw	4059	-	-	-	-
1.10.19 F. STOP FIL	0.0 - 100.0	Hz	25.0	rw	4060	-	-	-	-
1.11 CURRENT CONTROL									
1.11.1 CURRENT THRESHOL	0.0 - 3000.0	A	0.0	rw	1063	-	-	-	-
1.11.2 THRESHOLD DELAY	0.1 - 30.0	s	3.0	rw	1064	-	-	-	-
1.11.3 OUT CUR THRESHOL	REMOTE, O1..O8	-	REMOTE	rw	4061	-	-	-	-
1.11.4 RESET MAX Imax	NO, YES	-	NO	rw	4062	-	-	-	-
1.12 PWM GENERATOR									
1.12.1 PWM FREQUENCY	0.50 - par.99	KHz	5.00	rw	1065	-	-	-	-
1.12.2 START PWM FREQ.	0.50 - par.99	KHz	1.00	rw	1085	-	-	-	-
1.12.3 CHANGE PWM SPEED	0 - 30000	rpm	500	rw	1086	-	-	-	-
1.13 BRAKE UNIT									
1.13.1 ENABLE	NO, YES	-	YES	rw	1066	-	-	-	-
1.13.2 BRAKE RESISTANCE	0.1 - 200.0	ohm	*1)	rw	1067	-	-	-	-
1.13.3 NOMINAL CURRENT	0.0 - 3000.0	A	*1)	rw	1068	-	-	-	-
1.13.4 5 SEC CURRENT	0.0 - 3000.0	A	*1)	rw	1069	-	-	-	-
1.14 STALL FAULT									
1.14.1 STALL TIME	0.000 - 30.000	s	5.00	rw	1070	-	-	-	-
1.14.2 CURRENT LIMIT	0.1 - 3000.0	A	3000.0	rw	1071	-	-	-	-
1.15 AUTO RESTART									
1.15.1 ENABLE	NO, YES	-	NO	rw	1072	-	-	-	-
1.15.2 ATTEMPTS	1 - 100	-	5	rw	1073	-	-	-	-
1.15.3 RESTART DELAY	0.1 - 300.0	s	3.0 s	rw	1074	-	-	-	-
1.15.4 1° FAULT	0 - 100	-	1	rw	1075	-	-	-	-
1.15.5 2° FAULT	0 - 100	-	5	rw	1076	-	-	-	-
1.15.6 3° FAULT	0 - 100	-	6	rw	1077	-	-	-	-
1.15.7 4° FAULT	0 - 100	-	0	rw	1078	-	-	-	-
1.15.8 RESET TIME	0 - 100000	s	3600. s	rw	1079/1080	-	-	-	-
1.15.9 OUT RESTART END	REMOTE, O1..O8	-	REMOTE	rw	4063	-	-	-	-
1.16 DC BRAKING (MENU NOT ACTIVE)									

OP * OPERATOR-type setup importable in the menù BASIC DATA.

VARIABLES	RANGE min / max	Um	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP ** RAM (dec)	
							M30 module (M)	M40 module (G)
2. DISPLAY VARIABLE								
2.1 GENERAL VARIABLE								
2.1.1 SPEED REFERENCE	- 30000 / +30000	rpm	ro	2000/2001	2001 (long)	1/2	4112 (long)	4128 (long)
2.1.2 MOTOR SPEED	- 30000 / +30000	rpm	ro	2002/2003	2002 (long)	3/4	4128 (long)	4160 (long)
2.1.3 MOTOR FREQUENCY	0.0 / 800.0	Hz	ro	2004/2005	2003 (long)	5/6	4144 (long)	4192 (long)
2.1.4 MOTOR CURRENT	0.0 / 3000.0	A	ro	2006	2004	7	4160	4224
2.1.5 BUS DC VOLTS	0 / 3000	V	ro	2007	2005	8	4176	4240
2.1.6 MOTOR VOLTAGE	0 / 3000	V	ro	2008	2006	9	4192	4256
2.1.7 MEMO MAX Imax	0.0 / 3000.0	A	ro	2009	2007	10	4208	4272
2.1.8 ACTIVE POWER	0.00 / 900.00	Kw	ro	2010/2011	2008 (long)	11/12	4224 (long)	4288 (long)
2.1.9 REACTIVE POWER	0.00 / 900.00	KVAr	ro	2012/2013	2009 (long)	13/14	4240 (long)	4320 (long)
2.1.10 COS (PHI)	0.000 / 1.000	-	ro	2014	200A	15	4256	4352
2.1.11 I x COS (PHI)	0.0 / 3000.0	A	ro	2015	200B	16	4272	4368
2.1.12 MOTOR SLIP V/F	0 / 1000	rpm	ro	2016	200C	17	4288	4384
2.1.13 CALC MOTOR TORQ.	-10000.0 / +10000.0	Nm	ro	2017/2018	200D (long)	18/19	4304 (long)	4400 (long)
2.1.14 MOTOR TORQ.	-10000.0 / +10000.0	Nm	ro	2019/2020	200E (long)	20/21	4320 (long)	4432 (long)
2.1.15 MOTOR TORQUE %	-300 / +300	%	ro	2021	200F	22	4336	4464
2.1.16 LAST FAULT	0 - 100	-	ro	2022	2010	23	4352	4480

***1) Dipends on size.**

**** See Chapt.15 Inverter coding.**

VARIABLES	RANGE min / max	Um	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP ** RAM (dec)	
							M30 module (M)	M40 module (G)
2.1.17 INVERTER I x I	0 - 10000	%	ro	2023	2011	24	4368	4496
2.1.18 MOTOR I x I	0 - 10000	%	ro	2024	2012	25	4384	4512
2.1.19 IGBT BRAKE CURR.	0.0 - 3000.0	A	ro	2025	2013	26	4400	4528
2.1.20 DIG. INPUT I1..8	0 - 255	-	ro	2026/2027	2014 (long)	27/28	4416 (long)	4544 (long)
2.1.21 DIG. INPUT I9.14	0 - 255	-	ro	2028/2029	2015 (long)	29/30	4432 (long)	4576 (long)
2.1.22 DIG. OUTPUT O1.8	0 - 255	-	ro	2030/2031	2016 (long)	31/32	4448 (long)	4608 (long)
2.1.23 ANALOG INPUT AI1	-100.00 - +100.00	%	ro	2032	2017	33	4464	4640
2.1.24 ANALOG INPUT AI2	-100.00 - +100.00	%	ro	2033	2018	34	4480	4656
2.1.25 ANALOG INPUT AI3	-100.00 - +100.00	%	ro	2034	2019	35	4496	4672
2.1.26 ANALOG INPUT AI4	-100.00 - +100.00	%	ro	2035	201A	36	4512	4688
2.1.27 ANALOG INPUT AI5	-100.00 - +100.00	%	ro	2036	201B	37	4528	4704
2.1.28 ANALOG INPUT AI6	-100.00 - +100.00	%	ro	2037	201C	38	4544	4720
2.1.29 ANALOG INPUT AI7	-100.00 - +100.00	%	ro	2038	201D	39	4560	4736
2.1.30 ANALOG INPUT AI8	-100.00 - +100.00	%	ro	2039	201E	40	4576	4752
2.1.31 ANALOG INPUT AI9	-100.00 - +100.00	%	ro	2040	201F	41	4592	4768
2.1.32 ACTIVE VAR AO0	-100.00 - +100.00	%	ro	2041	2020	42	4608	4784
2.1.33 ACTIVE VAR AO1	-100.00 - +100.00	%	ro	2042	2021	43	4624	4800
2.1.34 ACTIVE VAR. AO2	-100.00 - +100.00	%	ro	2043	2022	44	4640	4816
2.1.35 ACTIVE VAR AO3	-100.00 - +100.00	%	ro	2044	2023	45	4656	4832
2.1.36 COUNT AUTORESTAR	0 - 100	-	ro	2045	2024	46	4672	4848
2.1.37 MOTOR CONTROL I	0.0 - 3000.0	A	ro	2046	2025	47	4688	4864
** 2.1.38 FIRMWARE VERSION	0.00 - 999999.99	-	ro	2047/2048	2026 (long)	48/49	4704 (long)	4880 (long)
2.1.39 OPERATE HOURS	0.00 - 100000.00	h	ro	2049/2050	2027 (long)	50/51	4720 (long)	4912 (long)
2.1.40 HARDWARE VERSION	0.00 a 300.00	-	ro	9100	-	-	-	-
2.1.41 LAST RESTORE	DEFAULT, SETUP_1, SETUP_2	-	ro	2074	-	-	-	-
2.1.42 POWER LOSS COUNT	0 - 30000	-	ro	2053	2028	52	4736	4944
2.1.43 LAST TWO ERR COM	0 - 9999	-	ro	2054	2029	53	4752	4960
2.1.44 COUNT ERROR COM	0 - 30000	-	ro	2055	202A	54	4768	4976
2.1.45 SET TORQUE %	0 - 300	%	ro	2071	202B	55	4784	4992
2.1.46 ENCODER SPEED	- 30000 - +30000	rpm	ro	2072	202C	56	4800	5008
2.1.47 (visualizzazione doppia)								
SET	0 - 300	%	ro	-	-	-	-	-
TORQUE	0 - 300	%	ro	2021	-	-	-	-
2.1.48 (visualizzazione doppia)								
SET OP	- 30000 - +30000	rpm	ro	4119	-	-	-	-
SPEED	- 30000 - +30000	rpm	ro	2002/2003	-	-	-	-
2.1.49 I MAX MONITOR	0.0 - 3000.0	A	ro	2075	-	-	-	-
2.1.50 INVERTER ALARM	NONE, CAP_LIFE, PROG_IN, PROG_OUT, AXIS_LIM, COILDMIN, COILDMAX, CELLMAX, DANCUP, BREAK, STO_OPEN	-	ro	2073	202D	57	4816	5024
2.1.51 ANYBUS TYPE	NONE (0), CAN_OPEN(32), PROFIBUS (5), MODB_TCP (147), ETHERCAT (135), PROFINET (150)	-	ro	2076	-	-	-	-
2.1.52 ANYBUS STATE	SETUP, NW_INIT, WAIT PROCESS, IDLE, PROCESS_ACTIVE, ERROR, EXCEPTION	-	ro	2077	-	-	-	-
2.1.53 ROTOR K CORRECT	0.25 - 2.00	-	ro	2088	-	-	-	-
2.1.54 I P ADDRESS	000.000.000.000 - 255.255.255.255	-	ro	2089 2090 2091 2092	-	-	-	-
2.1.55 ZERO ANGLE	0.0 - 359.9	-	ro	2093	-	-	-	-

** This manual is updated to the inverter C800 firmware version: **3502XX.XX**

To store parameter in eeprom sum 10000 at the ID MODBUS RAM (dec) address.

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP ** RAM (dec)	
								M30 module (M)	M40 module (G)
2.2 DEFAULT DISPLAY									
2.2.1 DEFAULT DIS1	2.1.1 - *2)	-	2.1.1	rw	2056	-	-	-	-
2.2.2 DEFAULT DIS2	2.1.1 - *2)	-	2.1.2	rw	2057	-	-	-	-
2.2.3 DEFAULT DIS3	2.1.1 - *2)	-	2.1.3	rw	2058	-	-	-	-
2.2.4 DEFAULT DIS4	2.1.1 - *2)	-	2.1.4	rw	2059	-	-	-	-
2.2.5 DEFAULT DIS5	2.1.1 - *2)	-	2.1.46	rw	2060	-	-	-	-
2.2.6 DEFAULT DIS6	2.1.1 - *2)	-	2.1.5	rw	4064	-	-	-	-
2.2.7 DEFAULT DIS7	2.1.1 - *2)	-	2.1.15	rw	4065	-	-	-	-
2.2.8 DEFAULT DIS8	2.1.1 - *2)	-	2.1.49	rw	4066	-	-	-	-
2.2.9 DEFAULT DIS9	2.1.1 - *2)	-	2.1.16	rw	4067	-	-	-	-
2.2.10 DEFAULT DIS10	2.1.1 - *2)	-	2.1.38	rw	4068	-	-	-	-
2.3 FAULT HISTORY									
2.3.1 FAULT 1	0 - 100	-	var.	ro	2061	202E	58	4832	5040
2.3.2 FAULT 2	0 - 100	-	var.	ro	2062	202F	59	4848	5056
2.3.3 FAULT 3	0 - 100	-	var.	ro	2063	2030	60	4864	5072
2.3.4 FAULT 4	0 - 100	-	var.	ro	2064	2031	61	4880	5088
2.3.5 FAULT 5	0 - 100	-	var.	ro	2065	2032	62	4896	5104
2.3.6 FAULT 6	0 - 100	-	var.	ro	2066	2033	63	4912	5120
2.3.7 FAULT 7	0 - 100	-	var.	ro	2067	2034	64	4928	5136
2.3.8 FAULT 8	0 - 100	-	var.	ro	2068	2035	65	4944	5152
2.3.9 FAULT 9	0 - 100	-	var.	ro	2069	2036	66	4960	5168
2.3.10 FAULT 10	0 - 100	-	var.	ro	2070	2037	67	4976	5184
2.4 SETUP OPERATOR									
2.4.1 OPERATOR SET1	1.10.14 - *2)	-	3.1.9.2	ro	4069	-	-	-	-
2.4.2 OPERATOR SET2	1.10.14 - *2)	-	1.10.14	ro	4070	-	-	-	-
2.4.3 OPERATOR SET3	1.10.14 - *2)	-	3.1.9.2	ro	4071	-	-	-	-
2.4.4 OPERATOR SET4	1.10.14 - *2)	-	3.1.9.2	ro	4072	-	-	-	-
2.4.5 OPERATOR SET5	1.10.14 - *2)	-	3.1.9.2	ro	4073	-	-	-	-
2.4.6 ACTIVE SET OPER.	1 - 5	-	2	ro	4074	-	-	-	-

***1) Dipends on size.**

**** See Chapt.15 Inverter coding.**

To store parameter in eeprom sum 10000 at the ID MODBUS RAM (dec) address.

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP ** RAM (dec)	
								M30 module (M)	M40 module (G)
3. APPLICATIONS									
3.1 SPEED									
3.1.1 SPEED COMMANDS									
3.1.1.1 SPEED SOURCE	REMOTE, AI1..AI5, MOTOPOT, OPERATOR	-	AI1	rw	3100	-	-	-	-
3.1.1.2 IN STOP SPEED	REMOTE, I2..I14, ENABLE	-	I2	rw	4075	-	-	-	-
3.1.1.3 IN REVERSE SPEED	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4076	-	-	-	-
3.1.2 SPEED MAX									
3.1.2.1 SET SPEED MAX1	30 - 24000	rpm	1250	rw	4077	-	-	-	-
3.1.2.2 SET SPEED MAX2	30 - 24000	rpm	1000	rw	4078	-	-	-	-
3.1.2.3 SET SPEED MAX3	30 - 24000	rpm	750	rw	4079	-	-	-	-
3.1.2.4 IN1 SPEED MAX	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4080	-	-	-	-
3.1.2.5 IN2 SPEED MAX	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4081	-	-	-	-
3.1.3 SPEED THRESHOLD									
3.1.3.1 SPEED THRESHOLD1	0 - 30000	rpm	100	rw	3101	-	-	-	-
3.1.3.2 THRESHOLD1 DELAY	0.1 - 30.0	s	0.0	rw	3102	-	-	-	-
3.1.3.3 OUT THRESHOLD1	REMOTE, O1..O8	-	O1	rw	4082	-	-	-	-
3.1.3.4 SPEED THRESHOLD2	0 - 30000	rpm	1500	rw	3103	-	-	-	-
3.1.3.5 THRESHOLD2 DELAY	0.1 - 30.0	s	1.0	rw	3104	-	-	-	-
3.1.3.6 OUT THRESHOLD2	REMOTE, O1..O8	-	REMOTE	rw	4083	-	-	-	-
3.1.3.7 SPEED THR STOP	0 - 300	rpm	0	rw	2051	-	-	-	-
3.1.4 MANUAL									
3.1.4.1 MANUAL SPEED	0 - par. 1.3.1	rpm	300	rw	3105	-	-	-	-
3.1.4.2 IN ENABLE MANUAL	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4084	-	-	-	-
3.1.4.3 IN JOG+	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4085	-	-	-	-
3.1.4.4 IN JOG-	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4086	-	-	-	-
3.1.5 MOTOPOTENTIOM.									
3.1.5.1 SAVE MOTOPOT.	NO, YES	-	YES	rw	4087	-	-	-	-
3.1.5.2 IN INCREASE MOT	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4088	-	-	-	-
3.1.5.3 IN DECREASE MOT	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4089	-	-	-	-
3.1.5.4 ACC DEC MOTP SET	0.01 - 600.00	s	10.00	rw	4090/4091	-	-	-	-
3.1.6 FIXED SPEED									
3.1.6.1 SET SPEED 1	-30000 - +30000	rpm	500	rw	4092	-	-	-	-
3.1.6.2 SET SPEED 2	-30000 - +30000	rpm	1000	rw	4093	-	-	-	-
3.1.6.3 SET SPEED 3	-30000 - +30000	rpm	- 500	rw	4094	-	-	-	-
3.1.6.4 SET SPEED 4	-30000 - +30000	rpm	1500	rw	4095	-	-	-	-
3.1.6.5 SET SPEED 5	-30000 - +30000	rpm	- 750	rw	4096	-	-	-	-
3.1.6.6 SET SPEED 6	-30000 - +30000	rpm	-1500	rw	4097	-	-	-	-
3.1.6.7 SET SPEED 7	-30000 - +30000	rpm	-1000	rw	4098	-	-	-	-
3.1.6.8 IN1 SPEED	REMOTE, I2..I14, ENABLE	-	I3	rw	4099	-	-	-	-
3.1.6.9 IN2 SPEED	REMOTE, I2..I14, ENABLE	-	I4	rw	4100	-	-	-	-
3.1.6.10 IN3 SPEED	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4101	-	-	-	-
3.1.7 FIXED ACC. RAMPS									
3.1.7.1 SET ACC1	0.01 - 600.00	s	1.00	rw	4102/4103	-	-	-	-
3.1.7.2 SET ACC2	0.01 - 600.00	s	2.00	rw	4104/4105	-	-	-	-
3.1.7.3 SET ACC3	0.01 - 600.00	s	3.00	rw	4106/4107	-	-	-	-
3.1.7.4 IN1 ACC	REMOTE, I2..I14, ENABLE	-	I5	rw	4108	-	-	-	-
3.1.7.5 IN2 ACC	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4109	-	-	-	-
3.1.8 FIXED DEC. RAMPS									
3.1.8.1 SET DEC1	0.01 - 600.00	s	1.00	rw	4110/4111	-	-	-	-
3.1.8.2 SET DEC2	0.01 - 600.00	s	2.00	rw	4112/4113	-	-	-	-
3.1.8.3 SET DEC3	0.01 - 600.00	s	3.00	rw	4114/4115	-	-	-	-
3.1.8.4 IN1 DEC	REMOTE, I2..I14, ENABLE	-	I6	rw	4116	-	-	-	-
3.1.8.5 IN2 DEC	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4117	-	-	-	-
3.1.9 MANUAL OPERATOR									
3.1.9.1 SAVE MAN OPERAT.	NO, YES	-	YES	rw	4118	-	-	-	-
OP * 3.1.9.2 SET MAN OPERATOR									
SET OP	-30000 - +30000	rpm	0.rpm	rw	4119	-	-	-	-
SPEED	-30000 - +30000	rpm	var.	ro	2002/2003	-	-	-	-
3.1.10 SPECIAL FUNCTION (MENU NON ATTIVO)									

** See Chapt.15 Inverter coding.

OP * OPERATOR-type setup importable in the menù BASIC DATA.

To store parameter in eeprom sum 10000 at the ID MODBUS RAM (dec) address.

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP ** RAM (dec)	
								M30 module (M)	M40 module (G)
4. INPUT/OUTPUT									
4.1 DIGITAL INPUT									
4.1.1 INVERT I2	NO, YES	-	NO	rw	4123	-	-	-	-
4.1.2 INVERT I3	NO, YES	-	NO	rw	4124	-	-	-	-
4.1.3 INVERT I4	NO, YES	-	NO	rw	4125	-	-	-	-
4.1.4 INVERT I5	NO, YES	-	NO	rw	4126	-	-	-	-
4.1.5 INVERT I6	NO, YES	-	NO	rw	4127	-	-	-	-
4.1.6 INVERT I7	NO, YES	-	NO	rw	4128	-	-	-	-
4.1.7 INVERT I8	NO, YES	-	NO	rw	4129	-	-	-	-
4.1.8 INVERT I9	NO, YES	-	NO	rw	4130	-	-	-	-
4.1.9 INVERT I10	NO, YES	-	NO	rw	4131	-	-	-	-
4.1.10 INVERT I11	NO, YES	-	NO	rw	4132	-	-	-	-
4.1.11 INVERT I12	NO, YES	-	NO	rw	4133	-	-	-	-
4.1.12 INVERT I13	NO, YES	-	NO	rw	4134	-	-	-	-
4.1.13 INVERT I14	NO, YES	-	NO	rw	4135	-	-	-	-
4.2 DIGITAL OUTPUT									
4.2.1 INVERT O1	NO, YES	-	NO	rw	4136	-	-	-	-
4.2.2 INVERT O2	NO, YES	-	YES	rw	4137	-	-	-	-
4.2.3 INVERT O3	NO, YES	-	NO	rw	4138	-	-	-	-
4.2.4 INVERT O4	NO, YES	-	NO	rw	4139	-	-	-	-
4.2.5 INVERT O5	NO, YES	-	NO	rw	4140	-	-	-	-
4.2.6 INVERT O6	NO, YES	-	NO	rw	4141	-	-	-	-
4.2.7 INVERT O7	NO, YES	-	NO	rw	4142	-	-	-	-
4.2.8 INVERT O8	NO, YES	-	NO	rw	4143	-	-	-	-
4.3 ANALOG INPUT									
4.3.1 ANALOG INPUT AI1									
4.3.1.1 SCALE	+/- 300	%	100.00	rw	4144	-	-	-	-
4.3.1.2 OFFSET	+/- 50	%	0.00	rw	4145	-	-	-	-
4.3.1.3 TYPE INPUT	0/+10V, -10/+10V	-	0/+10V	rw	4146	-	-	-	-
4.3.2 ANALOG INPUT AI2									
4.3.2.1 SCALE	+/- 300	%	100.00 %	rw	4147	-	-	-	-
4.3.2.2 OFFSET	+/- 50	%	0.00 %	rw	4148	-	-	-	-
4.3.2.3 TYPE INPUT	0/+10V, -10/+10V, 0/20mA, 4/20mA	-	4/20mA	rw	4149	-	-	-	-
4.3.3 ANALOG INPUT AI3									
4.3.3.1 SCALE	+/- 300	%	100.00 %	rw	4150	-	-	-	-
4.3.3.2 OFFSET	+/- 50	%	0.00 %	rw	4151	-	-	-	-
4.3.3.3 TYPE INPUT	0/+10V, -10/+10V	-	-10/+10V	rw	4152	-	-	-	-
4.3.4 ANALOG INPUT AI4									
4.3.4.1 SCALE	+/- 300	%	100.00 %	rw	4153	-	-	-	-
4.3.4.2 OFFSET	+/- 50	%	0.00 %	rw	4154	-	-	-	-
4.3.4.3 TYPE INPUT	0/+10V, -10/+10V	-	0/+10V	rw	4155	-	-	-	-
4.3.5 ANALOG INPUT AI5									
4.3.5.1 SCALE	+/- 300	%	100.00 %	rw	4156	-	-	-	-
4.3.5.2 OFFSET	+/- 50	%	0.00 %	rw	4157	-	-	-	-
4.3.5.3 TYPE INPUT	0/+10V, -10/+10V	-	0/+10V	rw	4158	-	-	-	-
4.3.6 ANALOG INPUT AI6									
4.3.6.1 SCALE	+/- 300	%	100.00 %	rw	4159	-	-	-	-
4.3.6.2 OFFSET	+/- 50	%	0.00 %	rw	4160	-	-	-	-
4.3.6.3 TYPE INPUT	0/+10V	-	0/+10V	rw	4161	-	-	-	-
4.3.7 ANALOG INPUT AI7									
4.3.7.1 SCALE	+/- 300	%	100.00 %	rw	4162	-	-	-	-
4.3.7.2 OFFSET	+/- 50	%	0.00 %	rw	4163	-	-	-	-
4.3.7.3 TYPE INPUT	0/+10V	-	0/+10V	rw	4164	-	-	-	-
4.3.8 ANALOG INPUT AI8									
4.3.8.1 SCALE	+/- 300	%	100.00 %	rw	4165	-	-	-	-
4.3.8.2 OFFSET	+/- 50	%	0.00 %	rw	4166	-	-	-	-
4.3.8.3 TYPE INPUT	0/+10V	-	0/+10V	rw	4167	-	-	-	-
4.3.9 ANALOG INPUT AI9									
4.3.9.1 SCALE	+/- 300	%	100.00 %	rw	4168	-	-	-	-
4.3.9.2 OFFSET	+/- 50	%	0.00 %	rw	4169	-	-	-	-
4.3.9.3 TYPE INPUT	0/+10V	-	0/+10V	rw	4170	-	-	-	-
4.4 ANALOG OUTPUT									
4.4.1 OUTPUT VARIABLES									
4.4.1.1 MOTOR CURRENT %	+/- 100.00	%	var.	ro	2078	-	-	-	-
4.4.1.2 SET SPEED F %	+/- 100.00	%	var.	ro	2079	-	-	-	-
4.4.1.3 MOTOR SPEED %	+/- 100.00	%	var.	ro	2080	-	-	-	-
4.4.1.4 MOTOR SPEED F %	+/- 100.00	%	var.	ro	2081	-	-	-	-
4.4.1.5 MOTOR TORQUE %	+/- 300.00	%	var.	ro	2082	-	-	-	-
4.4.1.6 MOTOR TORQUE F %	+/- 300.00	%	var.	ro	2083	-	-	-	-
4.4.1.7 REMOTE SET 1 %	+/- 100.00	%	var.	ro	2084	-	-	-	-
4.4.1.8 REMOTE SET 2 %	+/- 100.00	%	var.	ro	2085	-	-	-	-
4.4.1.9 REMOTE SET 3 %	+/- 100.00	%	var.	ro	2086	-	-	-	-
4.4.1.10 REMOTE SET 4 %	+/- 100.00	%	var.	ro	2087	-	-	-	-
4.4.2 ANALOG OUTP. AO0									
4.4.2.1 VAR DISPLAY	1 - 10	-	1	rw	4171	-	-	-	-
4.4.2.2 SCALE	+/- 300.00	%	100.00 %	rw	4172	-	-	-	-
4.4.2.3 OFFSET	+/- 10.00	%	0.00 %	rw	4173	-	-	-	-
4.4.2.4 TYPE OUTPUT	DIRECT, ABS	-	DIRECT	rw	4174	-	-	-	-

**** See Chapt.15 Inverter coding.**

To store parameter in eeprom sum 10000 at the ID MODBUS RAM (dec) address.

PARAMETER	RANGE min - max	Um	PRESET DEFAULT	Access type	ID MODBUS RAM (dec)	ID CAN RAM (hex)	ID PROFIBUS RAM (dec)	ID MODBUS TCP/IP ** RAM (dec)	
								M30 module (M)	M40 module (G)
4.4.3 ANALOG OUTP. AO1									
4.4.3.1 VAR DISPLAY	1 - 10	-	3	rw	4175	-	-	-	-
4.4.3.2 SCALE	+/- 300.00	%	100.00 %	rw	4176	-	-	-	-
4.4.3.3 OFFSET	+/- 10.00	%	0.00 %	rw	4177	-	-	-	-
4.4.3.4 TYPE OUTPUT	DIRECT, ABS	-	DIRECT	rw	4178	-	-	-	-
4.4.4 ANALOG OUTP. AO2									
4.4.4.1 VAR DISPLAY	1 - 10	-	3	rw	4179	-	-	-	-
4.4.4.2 SCALE	+/- 300.00	%	100.00 %	rw	4180	-	-	-	-
4.4.4.3 OFFSET	+/- 10.00	%	0.00 %	rw	4181	-	-	-	-
4.4.4.4 TYPE OUTPUT	DIRECT, ABS	-	DIRECT	rw	4182	-	-	-	-
4.4.5 ANALOG OUTP. AO3									
4.4.5.1 VAR DISPLAY	1 - 10	-	5	rw	4183	-	-	-	-
4.4.5.2 SCALE	+/- 300.00	%	100.00 %	rw	4184	-	-	-	-
4.4.5.3 OFFSET	+/- 10.00	%	0.00 %	rw	4185	-	-	-	-
4.4.5.4 TYPE OUTPUT	DIRECT, ABS	-	DIRECT	rw	4186	-	-	-	-
5 SERIAL COMUNICAT									
5.1 ENABLE MODBUS	DISABLE, ENABLE	-	DISABLE	rw	258	-	-	-	-
5.2 MODBUS CONFIG									
5.2.1 PROTOCOL	MODBUS, ROWAN	-	MODBUS	rw	4187	-	-	-	-
5.2.2 ADDRESS	1 - 247	-	2	rw	4188	-	-	-	-
5.2.3 BAUD RATE	1200, 2400, 4800, 9600, 19200, 38400, 57600, 76800, 115200	-	9600	rw	4189	-	-	-	-
5.2.4 PARITY	NONE, EVEN, ODD	-	NONE	rw	4190	-	-	-	-
5.2.5 BIT STOP	1 - 2	-	1	rw	4191	-	-	-	-
5.2.6 RESET ERR. COUNT	NO, YES	-	NO	rw	601	-	-	-	-
5.2.7 INACTIVITY TIME	0.00 - 30.00	-	30.00	rw	602	-	-	-	-
5.3 ANYBUS CONFIG									
5.3.1 ANYBUS ADDRESS	0 - 250	-	0	rw	4192	-	-	-	-
5.3.2 CYCLIC CONFIG									
5.3.2.1 PZD1 READ	0 - 250	-	0	rw	4193	-	-	2048	2048
5.3.2.2 PZD2 READ	0 - 250	-	0	rw	4194	-	-	2049	2049
5.3.2.3 PZD3 READ	0 - 250	-	0	rw	4195	-	-	2050	2050
5.3.2.4 PZD4 READ	0 - 250	-	0	rw	4196	-	-	2051	2051
5.3.2.5 PZD5 READ	0 - 250	-	0	rw	4197	-	-	2052	2052
5.3.2.6 PZD6 READ	0 - 250	-	0	rw	4198	-	-	2053	2053
5.3.2.7 PZD7 READ	0 - 250	-	0	rw	4199	-	-	2054	2054
5.3.2.8 PZD8 READ	0 - 250	-	0	rw	4200	-	-	2055	2055
5.3.2.9 PZD1 WRITE	0 - 250	-	0	rw	4201	-	-	0	0
5.3.2.10 PZD2 WRITE	0 - 250	-	0	rw	4202	-	-	1	1
5.3.2.11 PZD3 WRITE	0 - 250	-	0	rw	4203	-	-	2	2
5.3.2.12 PZD4 WRITE	0 - 250	-	0	rw	4204	-	-	3	3
5.3.2.13 PZD5 WRITE	0 - 250	-	0	rw	4205	-	-	4	4
5.3.2.14 PZD6 WRITE	0 - 250	-	0	rw	4206	-	-	5	5
5.3.2.15 PZD7 WRITE	0 - 250	-	0	rw	4207	-	-	6	6
5.3.2.16 PZD8 WRITE	0 - 250	-	0	rw	4208	-	-	7	7
5.3.3 ETHERNET CONFIG									
5.3.3.1 DHCP Option	DISABLE, ENABLE	-	DISABLE	rw	4224	-	-	-	-
5.3.3.2 IP Field 1	0 - 255	-	0	rw	4225	-	-	-	-
5.3.3.3 IP Field 2	0 - 255	-	0	rw	4226	-	-	-	-
5.3.3.4 IP Field 3	0 - 255	-	0	rw	4227	-	-	-	-
5.3.3.5 IP Field 4	0 - 255	-	0	rw	4228	-	-	-	-
5.3.3.6 NETMASK Field 1	0 - 255	-	0	rw	4229	-	-	-	-
5.3.3.7 NETMASK Field 2	0 - 255	-	0	rw	4230	-	-	-	-
5.3.3.8 NETMASK Field 3	0 - 255	-	0	rw	4231	-	-	-	-
5.3.3.9 NETMASK Field 4	0 - 255	-	0	rw	4232	-	-	-	-
5.3.3.10 GATEWAY Field 1	0 - 255	-	0	rw	4233	-	-	-	-
5.3.3.11 GATEWAY Field 2	0 - 255	-	0	rw	4234	-	-	-	-
5.3.3.12 GATEWAY Field 3	0 - 255	-	0	rw	4235	-	-	-	-
5.3.3.13 GATEWAY Field 4	0 - 255	-	0	rw	4236	-	-	-	-
5.4 IN LOCAL RUN	REMOTE, I2 -14, ENABLE	-	REMOTE	rw	4237	-	-	-	-
PARAMETRI 100									
100.1 MOT CONTROL TYPE	V/F_INDUCT, VECT_SyRM	-	VECT_SyRM	rw	100	203A	72	5024	5264
100.2 RESET LAST FAULT	NO, YES	-	NO	rw	101	-	-	-	-
100.3 MENU OPERATOR	DEFAULT, BLOCK, OPERATOR, OP_BLOCK	-	DEFAULT	rw	4209	-	-	-	-
100.4 PAR.99 BLOCK	NO, YES	-	NO	rw	102	-	-	-	-
100.5 APPLICATION	SPEED, AXIS, REGUL, GEN_AFE, CUSTOM1, WINDER	-	SPEED	rw	103	203B	73	5040	5280
100.6 SETUP									
100.6.1 RESTORE SETUP	DEFAULT, SETUP_1, SETUP_2	-	DEFAULT	rw	4210	-	-	-	-
100.6.2 ENABLE RESTORE	NO, YES	-	NO	rw	4211	-	-	-	-
100.6.3 SAVE SETUP	SETUP_1, SETUP_2	-	SETUP_1	rw	4212	-	-	-	-
100.6.4 ENABLE SAVE	NO, YES	-	NO	rw	4213	-	-	-	-
100.6.5 IN START RESTORE	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4214	-	-	-	-
100.6.6 IN RESTORE SETUP	REMOTE, I2..I14, ENABLE	-	REMOTE	rw	4215	-	-	-	-
100.6.7 TYPE RESTORE	FULL, QUICK	-	FULL	rw	4216	-	-	-	-
100.6.8 Copy KEY >> INV	0 - 100	-	0	rw	4217	-	-	-	-
100.6.9 Copy INV >> KEY	0 -100	-	0	rw	4218	-	-	-	-
100.7 ALARM SETUP									
100.7.1 ALARM PROG IN	NO, YES	-	YES	rw	4219	-	-	-	-
100.7.2 ALARM PROG OUT	NO, YES	-	YES	rw	4220	-	-	-	-

** Vedi Cap.15 codifica degli Azionamenti (Bus di Campo).

These tables are uselful when new functions of the inverter are assigned to the inverter INPUT/OUTPUT resources and it is necessary to verify that the same hasnt been previousely programmed for another function. When any assignation in each buffer areas (WORKING, SETUP1, SETUP2) is changed, it is better to write this information in these tables, in order to have the real assignations outlook and to prevent command problems. An alarm system is enabled in default mode, in which the FAULT flashing light warns in case of assignation of a resource already in use (see paragraph **Function assignation to INPUT/OUTPUT resources** in Chapter 13 or Chapter 14 **INVERTER FAULTS AND ALARMS**).

DIGITAL INPUTS ASSIGNATION PARAMETERS	DEFAULT SETUP	WORKING SETUP	SETUP 1	SETUP 2
ASSIGNATION PARAMETERS FOR ALL APPLICATIONS				
100.6.5 IN START RESTORE	REMOTE			
100.6.6 IN RESTORE SETUP	REMOTE			
1.5.9.8 MIN SPEED UNLOCK	REMOTE			
1.6.7 IN ENABLE ENC 2	REMOTE			
1.9.6.2 IN RUN - SPEED	REMOTE			
1.9.7 IN RESET FAULT	REMOTE			
1.10.5 IN DX ENABLE LIM	REMOTE			
1.10.6 IN SX ENABLE LIM	REMOTE			
1.10.8 IN + TORQUE	REMOTE			
1.10.9 IN - TORQUE	REMOTE			
1.10.17 IN EN TORQ. FIL	REMOTE			
ASSIGNATION PARAMETERS FOR SPEED APPLICATION				
3.1.1.2 IN STOP SPEED	I2			
3.1.1.3 IN REVERSE SPEED	ENABLE			
3.1.2.4 IN1 SPEED MAX	REMOTE			
3.1.2.5 IN2 SPEED MAX	REMOTE			
3.1.4.2 IN ENABLE MANUAL	REMOTE			
3.1.4.3 IN JOG+	REMOTE			
3.1.4.4 IN JOG-	REMOTE			
3.1.5.2 IN INCREASE MOT	REMOTE			
3.1.5.3 IN DECREASE MOT	REMOTE			
3.1.6.8 IN1 SPEED	I3			
3.1.6.9 IN2 SPEED	I4			
3.1.6.10 IN3 SPEED	REMOTE			
3.1.7.4 IN1 ACC	I5			
3.1.7.5 IN2 ACC	REMOTE			
3.1.8.4 IN1 DEC	I6			
3.1.8.5 IN2 DEC	REMOTE			

DIGITAL INPUTS ASSIGNATION PARAMETERS	DEFAULT SETUP	WORKING SETUP	SETUP 1	SETUP 2
ASSIGNATION PARAMETERS FOR ALL APPLICATIONS				
1.9.4 OUT RUN	O3			
1.9.5 OUT FAULT	O2			
1.9.6.3 OUT MEC. BRAKE	REMOTE			
1.10.12 OUT TORQUE THRES	REMOTE			
1.11.3 OUT CUR THRESHOL	REMOTE			
1.15.9 OUT RESTART END	REMOTE			
ASSIGNATION PARAMETERS FOR SPEED APPLICATION				
3.1.3.3 OUT THRESHOLD1	O1			
3.1.3.6 OUT THRESHOLD2	REMOTE			
3.1.10.2 OUT ENABLE MOT 1	REMOTE			
3.1.10.3 OUT ENABLE MOT 2	REMOTE			

DIGITAL INPUTS ASSIGNATION PARAMETERS	DEFAULT SETUP	WORKING SETUP	SETUP 1	SETUP 2
ASSIGNATION PARAMETERS FOR ALL APPLICATIONS				
1.10.2 TORQUE SOURCE	AI3			
ASSIGNATION PARAMETERS FOR SPEED APPLICATION				
3.1.1.1 SPEED SOURCE	AI1			

HOW TO CUSTOMIZE THE KEYBOARD DISPLAYS

At inverter start, DISPLAY STATUS is displayed, concerning one of the 10 default variables drawn from 2.1 DISPLAY VARIABLE menu. These displays may be changed with other variables available in 2.1 DISPLAY VARIABLE menu or with those of the enabled application, by selecting them by the ten 2.2 DEFAULT DISPLAY menu parameters. For the personalization description, see paragraph **DISPLAY STATUS DESCRIPTION** at the beginning of Chapter 10.

HOW TO CUSTOMIZE THE KEYBOARD SETUPS

When the keyboard is remoted to use it as setup terminal, it is advised to use the OPERATOR function, which customizes BASIC DATA menu by selecting thoses parameters that are necessary to the operator. This way by pressing PROGRAM key, the operator can access directly to the setups he is interested in, without scrolling the complete menu.

For the personalization description, see paragraph **BASIC DATA menu in OPERATOR MODE description** at the beginning of Chapter 10.

HOW TO BLOCK THE PARAMETERS ACCESS

Enter 100. parameters menu.

- By setting par.100.3 OPERATOR MENU, the following blocking operations are possible:

  - par.100.3= **BLOCK**; only the 5 default displays can be selected by the keyboard and it is not possible to enter any parameter programming by PROGRAM key.

  - par.100.3= **OP_BLOCK**; the 5 default displays can be selected by the keyboard and it is possible to enter BASIC DATA parameters in OPERATOR mode (customized basic setups) programming by PROGRAM key.

- By setting par.100.4 PAR.99 BLOCK= YES, it is possible to block the access to standard parameters, both in manual and in serial mode.

INPUT/OUTPUT resources function assignation

Caution !

When commands are assigned to digital/analog inputs and to digital outputs in the same application, it is necessary to verify that the same hasnt been previousely used in other functions, because this might cause functioning problems. An alarm system is enabled in default mode, in which the FAULT flashing light warns in case of assignation of a resource already in use and the alarm reason is displayed in **var.2.1.50 INVERTER ALARM**:

- If the same digital input is assigned in two or more parameters, the fault light starts flashing and **PROG_IN** string is displayed in **var.2.1.50 INVERTER ALARM**.

- If the same digital output is assigned in two or more parameters, the fault light starts flashing and **PROG_OUT** string is displayed in **var.2.1.50 INVERTER ALARM**.

In case of alarm, it is necessary to check where I/O have already been assigned; to make this easier, see the table in Chapter 13 **I/O RESOURCES ASSIGNATION PARAMETERS SUMMARY TABLES**; these tables show all I/O resources assignation parameters and their default setups (it is advised to write all new assignations as well).

In different applications it is possible to use the same resources; e.g. I5 input can be used both in speed control application (par.100.5 APPLICATION= SPEED), and in position control application (par.100.5 APPLICATION= AXIS), since they are never active at the same time.

It is possible to assign the same input (analog/digital) or output (only digital) to different functions, but they must not clash with each other; in this case it is necessary to disable the multiple assignation alarm as follows:

If digital inputs multiple assignation is necessary, you must disable the alarm by setting **par.100.7.1 ALARM PROG IN= NO**.

If digital outputs multiple assignation is necessary, you must disable the alarm by setting **par.100.7.2 ALARM PROG out= NO**.

e.g. I5 input can select both a fixed acceleration ramp by par.3.1.7.4 IN1 ACC= I5 and a fixed deceleration ramp by par.3.1.8.4 IN1 DEC= I5.

On the contrary, analog outputs assignation is univocal and it is performed by selecting among the possible variables from 4.4.1 OUTPUT VARIABLES. E.g. If you want to assign AO0 analog output variable nr 1 in var.4.4.1.1 MOTOR CURRENT%, par.4.4.2.1 VAR DISPLAY= 1 must be setup.

Motor manual rotation test by the keyboard

Motor rotation commands by the keyboard are possible only at active RUN (I1 ON).

In standard setup, the test can be performed directly by BASIC DATA menu and in any case by 1.4 TEST MANUAL menu.

Rotation speed is set by par.1.4.1 TEST MANU SPEED, while rotation is set by UP and DOWN keys.

For a complete description of the test, see paragraph **1.4.1 TEST MANUAL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Speed external regulation modes and speed reversing command

By par.3.1.1.1 SPEED SOURCE the following regulation modes can be selected:

- **REMOTE**= Regulation from a value transmitted in serial mode by 300 address control variable.
SPEED REFERENCE SETUP IN SERIAL MODE.
At inverter start, if no value is transmitted, the set is 0.
See enclosure: **Instruction Manual INVERTER SERIES 400 SERIAL TRANSMISSION**.

- **AI1...AI5**= Speed regulation by the selected analog input.
100% from the (+/-10VDC) input corresponds to the value set in par.1.3.1 MAX MOTOR SPEED, while the signal polarity determines the motor rotation direction, both in scalar and in vector control**; in case of bidirectional regulation by +/-10Vdc, it is advised to set par.1.3.2 MIN MOTOR SPEED= 0rpm, in order to avoid irregular functioning by analog reference at 0Vdc.** Default speed can be regulated in monodirectional way by AI1 input with par.3.1.1.1 SPEED SOURCE= **AI1** and par.4.3.1.3 TYPE INPUT= **0/+10V**.
For bidirectional regulation, set par.4.3.1.3 TYPE INPUT= **-10V/+10V**.

- **MOTOPOT**= Speed regulation by 2 increase/decrease motopotentiometer-type digital inputs.
Digital inputs must be programmed in par.3.1.5.1 and 3.1.5.2.

- **OPERATOR**= Speed setup by the keyboard by par.3.1.9.2 SET MAN OPERATOR
Each regulation is limited to the max. value set in par.1.3.1 MAX MOTOR SPEED.
To enable the speed reversing command, assign one digit input to par. 3.1.1.3 IN REVERSE SPEED (Note: always verify that it is not already been assigned, see chapt. 13).

For a complete parameters description, see paragraph **3.1.1. SPEED COMMANDS menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Jog manual commands enabling by digital inputs

As for JOG function, 3 digital inputs must be enabled:

Digital input for JOG+ and JOG- commands activation in par.3.1.4.2 IN ENABLE MANUAL;

Digital input for JOG+ command (positive rotation direction, counterclockwise from shaft side) in par.3.1.4.3 IN JOG+;

Digital input for JOG- command (negative rotation direction, clockwise from shaft side) in par.3.1.4.4 IN JOG-.

JOG speed can be set in par.3.1.4.1 MANUALSPEED.

For a complete setups description, see paragraph **3.1.4 MANUAL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Motor current thresholds

It is possible to set a motor current threshold and to assign it a digital output.

Threshold setups (CURRENT THRESHOLD) are:

Par.1.11.1 CURRENT THRESHOLD= threshold level

Par.1.11.2 THRESHOLD DELAY= intervention delay

Par.1.11.3 OUT CUR THRESHOL= output assignation.

For a complete parameters description, see paragraph **1.11. CURRENT CONTROL menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Motor speed thresholds

It is possible to set 2 motor speed thresholds and to assign them digital outputs.

The first threshold setups (THRESHOLD1) are:
Par.3.1.3.1 SPEED THRESHOLD1= threshold level
Par.3.1.3.2 THRESHOLD1 DELAY= intervention delay
Par.3.1.3.3 OUT THRESHOLD1= output assignation.
The second threshold setups (THRESHOLD2) are:
Par.3.1.3.4 SPEED THRESHOLD2= threshold level
Par.3.1.3.5 THRESHOLD2 DELAY= intervention delay
Par.3.1.3.6 OUT THRESHOLD2= output assignation.
For a complete parameters description, see paragraph **3.1.3. SPEED THRESHOLD menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Max. speed limits selection by digital inputs

By binary combination of 2 digital inputs to be enabled, 3 max. speed limits can be selected.

If no selection is performed, the basic limit set in par.1.3.1 MAX MOTOR SPEED remains enabled.

For a complete description of this function and its related setups, see paragraph **3.1.2. SPEED MAX menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Fixed speed sets selection by digital inputs

By binary combination of 3 digital inputs to be enabled, 7 fixed speed sets can be selected.

If no selection is performed, the basic limit set in par.3.1.1.1 SPEED SOURCE remains enabled.

For a complete description of this function and its related setups, see paragraph **3.1.6. FIXED SPEED menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Speed set acceleration ramps selection by digital inputs

By binary combination of 2 digital inputs to be enabled, 3 acceleration ramps can be selected.

If no selection is performed, the basic limit set in par.1.2.1 RAMP ACCEL TIME remains enabled.

For a complete description of this function and its related setups, see paragraph **3.1.7. FIXED ACC. RAMPS menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Speed set deceleration ramps selection by digital inputs

By binary combination of 2 digital inputs to be enabled, 3 deceleration ramps can be selected.

If no selection is performed, the basic limit set in par.1.2.2 RAMP DECEL TIME remains enabled.

For a complete description of this function and its related setups, see paragraph **3.1.8. FIXED DEC. RAMPS menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Automatic change of ramp depending on the motor speed set

By setting par.1.2.5 FUNC. CHANGE RAMP=YES. It is useful, for example, for commanding compressors; in this case, in fact, it is useful starting with a very low ramp up to a certain speed then, rapidly accelerating; this is to limit high current peaks when there is a cold start.
For a complete description of this function and its related setups, see paragraph.**1.2.5 FUNC. CHANGE RAMP menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

"S" Ramps on speed set

By setting par.1.2.3 ENABLE S RAMP =YES. It is useful to avoid mechanical stress when there are fast stops; when commanding lifts, it joins the fast speed to the slow speed for bringing softly near to the exit floor; the joining level can be set by par.1.2.4 ROUNDING FILTER.
For a complete description of this function and its related setups, see paragraph.1.2.3 ENABLE S RAMP menu parameters description***1.2. SPEED RAMP"*** in Chapter 10 PARAMETERS AND DISPLAYS.

Reaction to voltage dips

In case of power supply line voltage dips, the inverter can be programmed to perform 2 different reactions:

- RUN stop under a BUSDC limit.
- attemp to avoid the machine block by speed decreasing.

In both cases, voltage dips are counted in **var.2.1.45 POWER LOSS COUNT**;

For a complete description of this function and its related setups, see paragraph **1.8. POWER LOSS CNTR menu parameters description** in Chapter 10 PARAMETERS AND DISPLAYS.

Gestione del freno meccanico negli impianti di sollevamento (funzione LIFT)

CAUTION! This function is available only in closed loop speed control through an encoder (par.1.6.17 SENSORLESS CONTR = NO).

This function must be enabled by par.1.9.6.1 ENABLE MEC. BRAKE= YES. Moreover, it is necessary to:
- Assign an inverter digital output for brake command in par.1.9.6.3 OUT MEC. BRAKE.
- Enable the RUN disabling with deceleration ramp by setting par.1.9.1 SPEED STOP= YES.
- Set par.1.3.2 MIN MOTOR SPEED= 0.
- If necessary, enable the unblock fault status by RUN commands setting par.1.9.2I1 RESET FAULT= YES.The remaining parameters related to mechanical brake are in menu: 1.9.6 MECHANICAL BRAKE in Chapter 9.

STOP AND START CYCLES DESCRIPTION BY MECHANICAL BRAKE

Start cycle:
The start cycle begins by RUN enabling, which can be performed as follows:
- by I1 digital input (or serial flag) for one rotation direction
- by the digital input (or serial flag) assigned in par.1.9.6.2 IN RUN SPEED for the opposite rotation direction.

At RUN start, the timer set in par.1.9.6.6 DELAY START starts, exceeding which, brake is unblocked; At RUN start, a second timer starts, which can be set in par.1.9.6.7 DELAY RAMP START; at time over, the speed set starts the acceleration ramp up to the set value.
With set speed at 0, enables load controlling as mechanical brake does, so it is important to use DELAY RAMP START time to unblock the brake even if the motor is not rotating, this way limiting brake wear and tear. When the machine is started, the speed set is still 0 (with brake blocked); the set starts its acceleration ramp only after DELAY RAMP START time. To avoid that the speed ramp starts before that brake is unlocked se DELAY START lower than DELAY RAMP START.

Stop cycle:
When rate commands are disabled, the motor speed is set at 0 by the enabled deceleration ramp; as soon as the speed set reaches zero, brake is blocked, the count of the time set in 19.6.4 DELAY STOP begins and when this value is exceeded, RUN is disabled.

CAUTION! When RUN is stopped even if (I1 or IN RUN SPEED) commands are enabled, e.g. in case of fault, the brake blocks instantly, and at each internal flag reactivation of RUN command the mechanical brake START CYCLE is performed.

By mechanical brake set ENABLE_MEC._BRAKE= YES, it is possible to enable fault 10, encoder fault, in par. 1.9.6.11 SPEED FAULT_ENC. And 1.9.6.12 DELAY_FAULT_ENC.

CAUTION! The initial position identification procedure duration has to be considered setting the par.1.9.6.6 DELAY START and 1.9.6.7 DELAY RAMP START.

Torque control

The torque can be managed as follows:

- **TORQUE FIXED LIMITATION**, by par.1.10.1 MAX TORQUE.
  The limitation is always enabled, in absolute value for both torque signs, in all functions in menu 3. APPLICATIONS.
- **TORQUE EXTERNAL CONTROL**, by the source set in par.1.10.2 TORQUE SOURCE.
  As for this parameter, it is possible to choose among the following adjusting sources:

— **REMOTE** = regulation by a value transferred in serial mode by the control variable with 301 address: TORQUE REFERENCE IN SERIAL MODE SETUP.
At the inverter start, if no value is transmitted, the set is = 0.
See enclosure: Instruction Manual INVERTER SERIES 400 SERIAL TRANSMISSION.

— **AI1....AI5** = Torque adjusting by the selected analog input.
The input 100% (+/-10Vdc) corresponds to the value set in par.1.10.2 MAX TORQUE.

— **MOTOPOT** = Torque adjusting by 2 increase/decrease motopotentiometer-type digital inputs.
Digital inputs must be set in par.1.10.8 IN + TORQUE MOT and 1.10.9 IN - TORQUE MOT.

— **OPERATOR** = Torque adjustment by the keyboard by par.1.10.14 SET TORQ OPERAT.
(see paragraph **BASIC DATA menu description in OPERATOR mode**).
The max. torque adjusting corresponds to the value set in par.1.10.1 MAX TORQUE.

The external torque control is possible in the following ways:

EXTERNAL TORQUE LIMITATION IN ABSOLUTE VALUE
In this case, the torque is **limited** as max. value, without sign (only positive values), while the motor rotation direction is determined by the speed set source sign, selected in par.3.1.1.1 SPEED SOURCE.
(see MENU PARAMETERS DESCRIPTION 3.1.1 SPEED COMMANDS).
In this case, to enable the torque limitation it is necessary to:

— **Choose** a torque regulation source just for positive values:
e.g. AI3 analog input by par.1.10.2 TORQUE SOURCE = AI3 and par.4.3.3.3 TYPE INPUT = 0/+10V

— **Set** par.1.10.3 TORQUE CONTROL= **MAX_TORQ**

— **Set** inputs (or flags in serial mode) programmed in par.1.10.5 IN DX ENABLE LIM and 1.10.6 IN SX ENABLE LIM. Each input which has been activated enables the torque limitation separately for each rotation direction. Activate both inputs for torque limiting in any case.

EXTERNAL TORQUE SETUP WITH SIGN
In this case, the torque is **set** with its sign; the sign of the torque regulation source (positive and negative) determines the motor rotation direction, while speed is limited as max. value in par.1.3.1 MAX MOTOR SPEED or alternatively by max. speeds set in men 3.1.2 SPEED MAX; all further speed set sources are not enabled (e.g. STOP SPEED command is not enabled).
In this case, to enable the torque limitation it is necessary to:

— **Choose** a torque regulation source just for positive and negative values:
e.g. AI3 analog input by par.1.10.2 TORQUE SOURCE = **AI3** and par.4.3.3.3 TYPE INPUT = **-10V/+10V**

— **Set** par.1.10.3 TORQUE CONTROL = **SET_TORQ**

— **Set** par.1.10.5 IN DX ENABLE LIM = **ENABLE**.
This type of control is useful for applications where a torque bidirectional control is needed, as for PID load cell feedback external regulators.

For a complete description of torque control related setups, see paragraph **1.10. TORQUE CONTROL menu parameters description** in Chapter 9 PARAMETERS AND DISPLAYS.

Integrity Control for the encoder mounted in the motor axis

In closed loop speed vector control is basic the correct functioning encoder installed in the motor shaft, necessary for the speed and the position feedback.
If the inverter control doesn't find any counting on the ENCODER 1 input, in the presence of a speed reference, the motor could be rotate without control for a period time and in certains situations, create a several damage to the mechanic motion.
To prevent these situations is possible to activate (disable on the default setup) the encoder integrity control, as follow:
1) Activated the control with setup the par.1.9.6.11 SPEED FAULT ENC different from zero.
2) Setup the par.1.9.6.12 DELAY FAULT ENC the delay of FAULT10 intervention due the anomaly found from the encoder counting.

ATTENTION ! The control can't used:
- In the case of a system that contemplate as normal working the mechanic block of the motor to a predetermined torque. In this case the inverter will be generate the FAULT 10 (eg. winding and unwinding function in torque regulation with 800W application, positioning with mechanical stop in limited torque with 800A inverter, etc..)
- **As safety system for the people (no SIL level).**

Fault description and fault cause check

The inverter fault is indicated by the powering up of the FAULT fixed light on the keyboard and the powering off of the RUN light. If a digital output has been assigned to the inverter run by par.1.9.4 OUT RUN (default O3), this is disabled, even if the external RUN control is present with digital input I1.

If a digital output has been assigned to the inverter fault by par.1.9.5 OUT FAULT (default O2), this gets disabled. All inverter functions are brought back at RUN off.

In order to unserstand the cause of the inverter fault, it is necessary to enter menu 2.1 GENERAL VARIABLE and select var.2.1.16 LAST FAULT; in this variable the **fault nr** is displayed linked to the fault cause.

The displayed faults, as for operations common to all applications and SPEED application, are in table **FAULT LIST** on the following page. **Faults linked to applications different from SPEED are described in the manuals enclosed.**

Caution !

If the inverter is powered off after a fault, var.2.1.16 LAST FAULT is cleared; in this case, to understand the fault cause you must enter menu 2.3 FAULT HISTORY, where the most recent fault nr is displayed.

Inverter clearing after a Fault

In case of inverter fault, by FAULT light on the keyboard powered up, it is normally necessary to stop supplying the machine in order to reset the block. There are two possible procedures for clearing without turning the inverter off:

-By setting **par.1.9.2 I1 RESET FAULT= YES** when run is enabled by I1 digital input, the fault status is cleared automatically.

- By enabling serial flag or digital input control which is assigned in **par.1.9.7 IN RESET FAULT.**

Caution !

This function is not available if serious faults occur, for istance: FAULT nr4 SHORT IGBT MODUL, nr13 SHORT IGBT BRAKE and FAULT nr112, because this warnings imply turning off and technical inspection on the inverter.

Automatic restart after a fault

After some types of fault, it is possible to program the inverter so as it can start automatically at the set speed after a preset period of time.

The restart after a fault must be enabled by par.1.15.1 ENABLE= YES.

Four parameters (from 1.15.4 to 1.15.7) are available to set the fault nr after which the motor restart is wanted. When the inverter blocks because of one of these faults, after the period of time set in par.1.15.3 RESTART DELAY, the fault is cleared and the inverter starts again. The restart attempts nr is to be set in par.1.15.2 ATTEMPS; when the autorestart counter (var.2.1.36 COUNT AUTORESTART) reaches this value, the inverter blocks definitively for fault **nr 12, AUTORESTART FAULT** and the respective output is enabled, if it has been assigned before in **par.1.15.9 OUT RESTART END**; this particular output will be used to flag the final inverter block. Then, in order to reset the automatic restart function, it is necessary to power the inverter off and to supply it again; this way both the block condition and the autorestart counter are cleared.

However, the autorestart counter is cleared after the time period set in par.1.15.8 RESET TIME.

In order to verify the fault type, see the display variables group in FAULT HISTORY menu, which saved the last 10 faults occurred.

Caution !

This function is not enabled in case of faults nr 4 SHORT IGBT MODUL and nr 13 SHORT IGBT BRAKE, since those are serious damages, which must be checked immediately; to reset these faults it is necessary to power the inverter off and to power it up again, in order to clear the fault.

The fault reset function by RUN control (par.1.9.2 I1 RESET FAULT= YES) or by assigned control in par.1.9.7 RESET FAULT doesn't clear the autorestart counter, but only the restart delay time in par.1.15.3 RESTART DELAY.

See paragraph: **Menu parameters description 1.15 AUTORESTART** in Chapter 10 PARAMETERS AND VISUALISATIONS for a complete description of its related setups.

FAULTS LIST

LAST FAULT 2.1.16 1. — **MAX PEAK CURRENT**

DESCRIPTION:
The maximum board cut-out output current at U V W has been reached. The cut-out current is indicated in the "*SUMMARY TABLE OF POWER ELECTRICAL FEATURES FOR INVERTERS SERIES 800* " at chapt.4 TECHNICAL FEATURES
POSSIBLE CAUSES:
- Acceleration/deceleration ramps too short.
- Motor jammed.

POSSIBLE REMEDIES
- Lengthen the acceleration/deceleration ramps on set speed.
- Check the load on the motor and mechancial transmission.
- When using the V/F scalar control enable the rapid current limitation (consult the parameter menu 1.5.11 CURRENT LIMITS at chapt.9).

LAST FAULT 2.1.16 2. — **PHASE LOSS CONTROL**

DESCRIPTION:
The BUSDC voltage value is higher than the warning level.
POSSIBLE CAUSES:
- One power supply phase (L1,L2,L3) lack.

POSSIBLE SOLUTIONS
- Check the presence of all three-phase power supply line (L1,L2, L3).

LAST FAULT 2.1.16 4. — **SHORT IGBT MODUL**

DESCRIPTION:
There is a phase to phase or phase to ground short-circuit at the U V W output or strong or rapid overload on U V W output terminals
ATTENTION: Fault 4 detects a dangerous anomaly for the inverter. If a Fault 4 occurs, before restarting, analyze the possible causes and possible solutions described below.“Ignoring the meaning of Fault 4 and continuing to insistently restart despite the continuous occurrence of Fault 4 can lead to damage to the IGBT modules inside the inverter.
POSSIBLE CAUSES:
- Motor connections shorted - Motor winding insulation damaged - Damaged part of inverter power - strong or rapid overload.

POSSIBLE REMEDIES
Find the origin of the short-circuit as follows:
Power off the inverter and unhook the power wires at terminals U V W and then restore power:
- if the fault continues there is a problem in the inverter power drive that has to be repaired.
- if the fault disappears, first check the board to motor connections and then both the interwinding and ground insulation on the stator winding as well as the correctness of the parameter settings relating to the inverter-motor combination.

LAST FAULT 2.1.16 5. — **BUS DC OVERVOLTAGE**

DESCRIPTION:
The BUSDC voltage at terminals **F+** and **-** is over the maximum istantaneous value.
POSSIBLE CAUSES:
- Deceleration ramp is too short - Brake resistance is insufficient, connection is down or broken.

POSSIBLE REMEDIES
- Lengthen the deceleration ramp.
- Check the brake resistance and its connections are in perfect repair.
- Reduce the resistive level of the resistance according to the minimums indicated in the "*SUMMARY TABLE OF POWER ELECTRICAL FEATURES FOR INVERTERS SERIES 800*" at chapt.4 TECHNICAL FEATURES.

LAST FAULT 2.1.16 8. — **LINE OVERVOLTAGE**

DESCRIPTION:
The inverter power voltage at terminals L1- L2- L3 is over its maximum limit.
POSSIBLE CAUSES:
See description.

POSSIBLE REMEDIES
Control the supply power range for the inverter under its order code (see chapt.18 DRIVES CODINGS) and compare it with the mains specifications. If necessary replace the inverter with one with a more suitable power range.

LAST FAULT
2.1.16 10.

FAULT ENCODER

DESCRIPTION:
Fault tripped in the vector control and only with the mechanical brake management enabled by **par.1.9.6.1 ENABLE MEC.BRAKE =YES**. The threshold is set in **par.1.9.6.11SPEED FAULT ENC** and **1.9.6.12 DELAY FAULT ENC**
POSSIBLE CAUSES:
- Encoder board connections down - encoder broken - motor cut-out by torque limiter.
POSSIBLE REMEDIES
- Check the inverter to encoder connections are in good order (ENCODER 1)
- Check the encoder is in working order. A typical method:
With the inverter drive off and no load on the motor, disengaged from the transmission, turn the shaft manually and check that **var.2.1.2 MOTOR SPEED** of the keypad displays the corresponding rotation speed.
- Check that the load is not too great or no parts are jammed.

LAST FAULT
2.1.16 11.

STALL FAULT

DESCRIPTION:
The output current at U V W is over the threshold in **par.1.14.2 CURRENT LIMIT**, for the time set at **par.1.14.1 STALL TIME**.
POSSIBLE CAUSES:
- Mechanical jam.
POSSIBLE REMEDIES
Disengage the motor from the transmission and check it operates correctly with no load. If the fault disappears, make sure nothing is jamming the mechanical transmission or the load is not excessive.

LAST FAULT
2.1.16 12.

AUTO-RESTART FAULT

DESCRIPTION:
The maximum number of autorestarts after a fault has been reached, as set in **par.1.15.2 ATTEMPTS**.
The number of autorestarts performed is displayed in the variable **2.1.36 COUNT AUTORESTART.**
POSSIBLE CAUSES:
See description
POSSIBLE REMEDIES
Control the last 10 faults in menu 2.3 FAULT HISTORY and take appropriate action.

LAST FAULT
2.1.16 13.

SHORT IGBT BRAKE

DESCRIPTION:
There is a short-circuit in the brake resistance connection at terminals F and F+ or resistance value too low.
POSSIBLE CAUSES:
- Resistance connections shorted - Brake resistance shorted - Internal inverter brake module shorted - excessively low ohmic resistance value.
POSSIBLE REMEDIES
Find the origin of the short-circuit as follows:
Power off the inverter and unhook the brake resistance terminals F and F+ and then restore power:
- if the fault continues there is a problem in the internal inverter module that has to be repaired.
- if the fault disappears, first check the board to resistance connections and then the brake resistance.

LAST FAULT
2.1.16 14.

OVERTEMPERATURE

DESCRIPTION:
The inverter heatsink is over 80°C.
POSSIBLE CAUSES:
- Ambient temperature over 50°C - Inverter fans (if mounted on model) are not operating efficiently or obstructed.
POSSIBLE REMEDIES
- Control the ambient temperature of the inverter housing, if it is over 50°C the cooling system for the cabinet has to be uprated so the temperature drops within the working range.
- Check that the inverter fans operate efficiently (if mounted on model) and that the air flow is not obstructed. Naturally the inverter has to have been correctly mounted with the hot air being exhausted upwards as indicated in chapt.5 MECHANICAL INSTALLATION.

LAST FAULT 2.1.16	15.	FIRMWARE ERROR

DESCRIPTION:
The inverter has been programmed with an incompatible firmware.
POSSIBLE CAUSES:
See description
POSSIBLE REMEDIES:
Contact the Rowan Elettronica Technical Office.

LAST FAULT 2.1.16	16.	CAN C401 ERROR

DESCRIPTION:
Internal communication error in the inverter boards.
POSSIBLE CAUSES:
See description
POSSIBLE REMEDIES:
Contact the Rowan Elettronica Technical Office.

LAST FAULT 2.1.16	17.	OVER SPEED

DESCRIPTION:
The motor speed (displayed by par. 2.1.46 ENCODER SPEED) is over the maximum operating limit set by par. **1.3.1 MAX MOTOR SPEED** (active fault with encoder 1 connected only).
POSSIBLE CAUSES:
In torque control of 6-8 poles: if the torque sign (+ or -) is different from the speed sign.
POSSIBLE REMEDIES:
Contact the Rowan Elettronica Technical Office.

LAST FAULT 2.1.16	18.	NOMINAL OVERLOAD BRAKING
LAST FAULT 2.1.16	19.	5 SEC OVERLOAD BRAKING

DESCRIPTION:
Faults 18, 19 both indicate overloading of the brake resistance connected to terminals F and F+.
POSSIBLE CAUSES:
Deceleration ramps too short and frequent - Motor brake torque too high (e.g. unwinders).
POSSIBLE REMEDIES
- Increase the deceleration ramp time
- Limit the motor brake torque.
- Increase the brake resistance power

LAST FAULT 2.1.16	20.	INVERTER OVERLOAD I^2 for 3s	200 ÷ 250% of the maximum output I inverter
LAST FAULT 2.1.16	21.	INVERTER OVERLOAD I^2 for 30s	150 ÷ 175% of the maximum output I inverter
LAST FAULT 2.1.16	22.	INVERTER OVERLOAD I^2 for 300s	110% of the maximum output I inverter
LAST FAULT 2.1.16	23.	INVERTER OVERLOAD In for 300s	overload upper to 110% continuous for 300s

DESCRIPTION:
Faults 20, 21, 22, 23 all indicate overloading of the inverter output at terminals U V W.
POSSIBLE CAUSES:
- Frequent start-stopping with short ramps - the motor is not compatible with the inverter ID plate data.
POSSIBLE REMEDIES:
- Limit the starts and stops and lengthen the acc/dec ramps.
- Adapt the motor power and inverter size.

LAST FAULT 2.1.16	25.

5 CONSECUTIVE FAULT 4

DESCRIPTION:
Indicates that FIVE consecutive faults number 4 has occurred.
Caution ! the Fault 25 shows a drive dangerous conditions, it indicates that five consecutive short circuits has occurred. To reset the Fault 25 act on the par. 100.2 RESET LAST FAULT, the Fault 25 will be stored on the HIstory Fault memory. Ignore the Fault 4 and Fault 25 could damage the IGBT modules of the inverter.
To analyze the **Possible Fault Causes** and **Possible Remedies** refer to Fault 4 description.

LAST FAULT 2.1.16	30.

MOTOR OVERLOAD I² for 30s 200% of parameter 1.1.2

LAST FAULT 2.1.16	31.

MOTOR OVERLOAD I² for 300s 140% of parameter 1.1.2

LAST FAULT 2.1.16	32.

MOTOR OVERLOAD In for 300s 110% of parameter 1.1.2 continuous for 300s

DESCRIPTION:
Faults 30, 31, 32 all indicate overloading of the motor connected to inverter terminals U V W.
POSSIBLE CAUSES:
- Excessive load - Frequent start-stopping with short ramps - High friction in the mechanical transmittion.
POSSIBLE REMEDIES:
- Check the parameter settings in menu **1.1 INV/MOTOR DATA** and the real load on the motor
- Limit the starts and stops and lengthen the acc/dec ramps.
- Control the mechanical transmission.

LAST FAULT 2.1.16	33.

MOTOR PTC OVERTEMPERATURE

DESCRIPTION:
Motor PTC which is connected by AI4 analogic input (terminal nr.9) has detected overheating.
POSSIBLE CAUSES: - The motor is in overload - Motor ventilator is off - PTC is interrupted.
POSSIBLE REMEDIES: Check the connection - Check the actual motor load - Check cooling functioning / efficiency. To by-pass the PTC put par. 1.1.9 MOTOR PTC AI4 = 10.00V.

LAST FAULT 2.1.16	40.

LOST COMMUNICATIONS

DESCRIPTION:
Problems with the RS485 serial communications. No communications have been transmitted for longer than the time set at **par.5.2.7 INACTIVITY TIME**.
POSSIBLE CAUSES: - Serial connection at terminals 50 -51 is down
POSSIBLE REMEDIES: Check the connection - Contact the Rowan Elettronica Technical Office.

LAST FAULT 2.1.16	50.

"STATIC" AUTOTUNING PROCEDURE FAILED

DESCRIPTION:
The "static" autotuning procedure (par.1.7.5 ENABLE AUTO TUN = STATIC) it was canceled cause it determined setup values untrusted.
POSSIBLE CAUSES: Motor power too high for this procedure.
POSSIBLE REMEDES: Use the "on movement" autotuning procedure (par.1.7.5 ENABLE AUTO TUN = DYNAMIC).

LAST FAULT 2.1.16	80.

Incompatibility eeprom key: Product code, Firmware version, Hardware version.

LAST FAULT 2.1.16	81.

Incompatibility eeprom key: Product code, Firmware version.

LAST FAULT 2.1.16	82.

Incompatibility eeprom key: Product code, Hardware version.

LAST FAULT 2.1.16 83.	Incompatibility eeprom key: Product code.
LAST FAULT 2.1.16 84.	Incompatibility eeprom key: Firmware version, Hardware version.
LAST FAULT 2.1.16 85.	Incompatibility eeprom key: Firmware version.
LAST FAULT 2.1.16 86.	Incompatibility eeprom key: Hardware version

DESCRIPTION:
All faults from 80 to 86 show incompatibility problems of the C411S eeprom key with the inverter at the moment of the command by par.100.6 Copy KEY>>INV =37 and forbid the parameters transferring into the inverter.
POSSIBLE CAUSES:
- See description by numerical code.
POSSIBLE REMEDIES
- Contact the Rowan Elettronica technical dept.

Alarm status description

When the FAULT light on the keyboard **flashes** the inverter is communicating an alert condition, this may not cause an immediate shutdown. The RUN light will remain on and the inverter functions will operate normally.

Control the cause of the alarm at **par.2.1.50 INVERTER ALARM**.

Any alarms on display, as for operations common to all applications and the SPEED application, are given in the **ALARM LIST** table below. **Alarms linked to applications different from SPEED are described in the specific manuals.**

ALARM LIST

INVERTER ALARM 2.1.50 NONE	NONE

INVERTER ALARM 2.1.50 CAP_LIFE	CAP_LIFE

DESCRIPTION:
The BUSDC capacity is at its maximum working hours recommended for safe operation. The inverter requires servicing by Rowan Elettronica

INVERTER ALARM 2.1.50 PROG_IN	PROG_IN

DESCRIPTION:
Several functions have been assigned to the same digital input (see chapt. 13 *I/O RESOURCES ASSIGNATION PARAMETERS SUMMARY TABLES)*. To disable the alarm set **par.100.7.1 ALARM PROG IN=NO**

INVERTER ALARM 2.1.50 PROG_OUT	PROG_OUT

DESCRIPTION:
Several functions have been assigned to the same digital output (see chapt.13 *I/O RESOURCES ASSIGNATION PARAMETERS SUMMARY TABLES*). To disable the alarm set **par.100.7.2 ALARM PROG OUT=NO**

INVERTER ALARM 2.1.50 STO_OPEN	STO_OPEN

DESCRIPTION:
Detection of supply interrupt on the inverter driver section. In the inverter with STO function, will be present on opening of the contacts between the clamps STO1 and STO2. When this allarm is active the RUN is inhibited.

For the alarm AXIS_LIM, consult the AXIS specific application manual: MANU.400A.
For the alarms COILDMIN, COILDMAX, CELLMAX, DANC UP, BREAK, consult the WINDER specific application manual: MANU.400W.

INVERTERS ORDER CODE

Code : **C800 X / 1 . A . P . 05 . NN . NN . N**

ACTIVE APPLICATIONS (to be identified on the inverter by the nr on the right of the full stop, in var.2.1.38 FIRMWARE VERSION)

A	var. 2.1.38 = 3XXX01.XX	Active application: SPEED (vector speed control) / AXIS (positioner / electric axis)
R	var. 2.1.38 = 3XXX02.XX	Active application: SPEED (vector speed control) / REGULATOR (P/I control)
W	var. 2.1.38 = 3XXX05.XX	Active application: SPEED (vector speed control) / WINDER (winding-unwinding system)
F	var. 2.1.38 = 3XXX06.XX	Active application: SPEED (vector speed control) / AXIS (positioner / electric axis + cutting die function)

RELEASE HARDWARE

FUNZIONE "STO"

S = WITH STO FUNCTION
N = WITHOUT STO FUNCTION

CUSTOMIZATION DIGITS

NN = NO CUSTOMIZATION

OPTIONAL EXPANSION CARD with I/O and FIELD BUS

Inputs / Outputs	Field bus
N = card without I/O **A** = card with I/O: - 1 line driver encoder - 2 zero input encoder - 8 digital inputs - 5 digital outputs - 5 analog inputs **B** = scheda con I/O: - 1 line driver encoder - 2 zero input encoder - 4 digital inputs - 2 digital outputs - 2 analog inputs	**N** = nessuno **P** = PROFIBUS DPV1 - M30 **C** = CANOPEN - M30 **M** = MODBUS TCP/IP - M30 **E** = ETHERCAT - M40_V.1.0.8 **F** = PROFINET - M30 **G** = MODBUS TCP/IP - M40 **H** = PROFINET - M40
NN = no expansion card	

ENCODERS SUPPLY

05 = 5Vdc ENCODERS, CLAMPS OUTPUT 38-39 and 44-45 = +5Vd
12 = 12Vdc ENCODERS, CLAMPS OUTPUT 38-39 and 44-45 = +12Vdc
24 = 12Vdc ENCODERS, CLAMPS OUTPUT 38-39 and 44-45 = +12Vdc

POWER SUPPLY VOLTAGE (50/60Hz)

Power supply voltage for inverters from /P to /3,5	Power supply voltage for inverters from /5 to /G
D = 220/240VAC **P** = 380/460 VAC **M** = 220/240 VAC SINGLE PHASE **N** = 500 VAC	**D** = 220/240VAC **E** = 380/400/415 VAC **O** = 440/460 VAC **W** = 690 VAC

DRIVE POWER SIZES

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

Eeprom key oredr code

Code : **C411S . A**

RELEASE HARDWARE

The **POSITIONER** function available for the C800A series has the specific manual **MANU.400A**.
Available on request sending an email to info@rowan.it**.**

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