# *QUIXDrive*

## Size 0 Single phase and three-phases

Manuale istruzione - Instruction manual
Manuel d'instruction - Handbuch
Manual de Instrucciones

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Antes de la instalación, de la conexión, puesta en servicio y control del inverter, leer atentamente el capítulo relativo a las instrucciones de seguridad.

# Sommario - Contents - Sommaire - Inhalt - Sumario

## Introduction

**The QUIXDrive Inverters** allow an efficient and flexible control of motor speed. In this way, the asynchronous motor can be used in a wider range of applications.
The modern control systems allow a significant reduction of noise compared to the older inverters.

The QuixDrive is made of two different models:

- **QUIXDrive_F** single-phase and 3-phases, simple speed controller
- **QUIXDrive_V** single-phase and 3-phases, with a torque vector control

Noise disappearance:
The noiseless operation of the inverter is due to a proper method of creating the waveform of the voltage that supplies the motor.

Continuity of operation in power failure state:
In case of temporary power failure, the QUIXDrive inverter stops and starts again, and keeps the preset control characteristics without having to stop the motor.

Easy operation with the extractable keypad:
The functioning interface is made of a panel consisting of four keys, one display with four 7-segment digits and three leds.
The display and the keys allow you to change all the inverter parameters so as to make it suitable to all applications.
The display also shows the controlled values, e.g. frequency or current, and the error codes in case of improper operation.

Serial connection:
Besides being controlled from panel, the QUIXDrive inverter can be easily remote controlled and programmed through serial connection by means of a proper communication protocol.
However, the run, stop, speed reversal and change operations are performed, as usual, through terminal board.

The QUIXDrive_V inverter supplies high torques at low revolution numbers without discontinuity thanks to the current automatic control. It assures a safe start of the motor.

## General safety instructions

Throughout the text, the following **Danger symbols** indicate paragraphs containing particular instructions that must be carefully read so as to assure safety conditions to users:

This warns the user about the presence of a dangerous voltage. It indicates the presence of High Voltage conditions that can cause serious damages or even death.

This indicates a general danger or very important operation notes.

**Warnings**

- Electrical devices can represent a **risk source for personnel safety.** It is therefore necessary to know all usage methods and unit control devices perfectly before using the machine.

- The machine should then be used by skilled personnel only, aware of the installation and operation rules, in compliance with the safety and protection standards, and able to interpret all danger warnings.
  The capacitors contained in the machine have dangerous high voltages. After cutting power off, you should wait at least 5 minutes before performing any operation.
  With stopped motor, dangerous voltages can be present on the entire power terminal board:
  terminals **L1, L2, L3, U, V, W.**

- In particular adjustment programming conditions, after a power failure, the machine could start automatically.

**Notes on Responsibilities**

The unit is designed for motor speed control only. Do not use it for other applications.
The manufacturer is not responsible for damages deriving from improper use or installation or inadeguate ambient conditions, as well as for damages due to improper rated values.
Nor will, the manufacturer be responsible for consequential or accidental damages.

No intervention has to be perfomed on parts inside the machine: when installing, just remove the terminal board cover panel. Any tampering or use of spare parts or other parts not supplied by the manufacturer, besides making the warranty void, may cause damages and/or serious accidents.

The technical data contained in this manual are to be considered correct at printout time. The manufacturer, however, reserves the right to change, without notice, both the contents and the technical data of the product.

**Product description**

The **QUIXDrive** inverters are converters with D.C. intermediate circuit. When connected with a common single or threephase mains, they produce a threephase, variable-frequency, A.C. voltage, used to control the speed of three-phase asynchronous motors.

The control circuit has a properly programmed microprocessor.

The control keyboard allows the user to easily and quickly enter any parameter necessary for the required working conditions.

The three-phase, variable frequency, alternate voltage, controlled by microprocessor, is delivered to the motor through a power module which uses the most recent IGBT technology.
The use of microprocessor, IGBT technology and modulation frequency programming, assures an extremely accurate and silent operation.

The software, properly developed for power electronics, allows an accurate and quick control of motor speed, start and stop times which can be independently adjusted, and other operation conditions:

- Speed control via the current adjustment according to the load, thus allowing the automatic adjustment to the process. (available in the QUIXDrive_V version).
- Automatic boost that allows a safe start of the motor by acting on the torque as a function of the load. Presence of high torques and rotation evenness at very low frequencies too. (available in the QUIXDrive_V version).
- Direct current braking, with programmable duration and value, allowing a comfortable motor stop.
- Presence of a PID-type inner regulator, which can be freely configured, to control the motor speed and/or torque.
- Presence of a standard series line, with programmable transmission modes, to remote program and/or control the converter.

Further, the unit is provided with a programmable relay output and an analog output that indicates, through selection, the trend of the main values of the inverter.

**Guide to the choice**

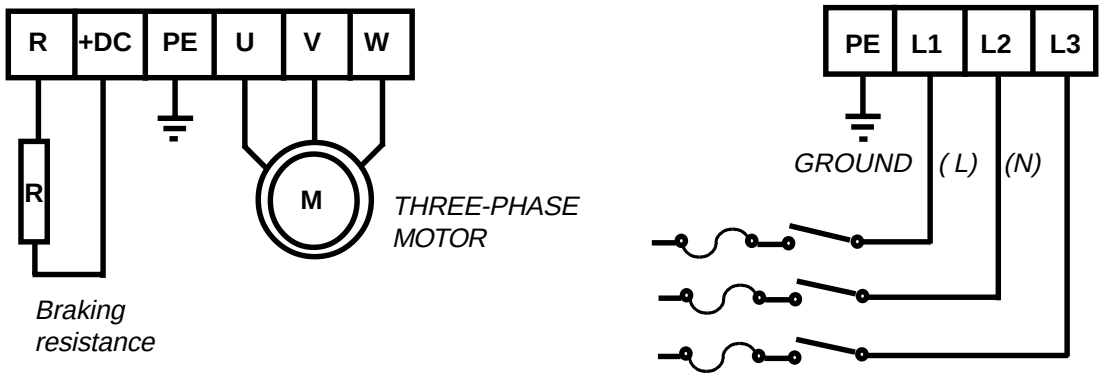
| Model | Input voltage | Inverter power | Rated output current | Current absorbtion per phase | Motor power | Inverter dissipated power | Minimum braking resistor | Weight |
|---|---|---|---|---|---|---|---|---|
| | (Vac) | (kVA) | (A) | (A) | (kW) | (W) | (Ohm) | (kg) |
| QUIX.-2M-0004 | 220 V - 15% | 1,0 | 2,2 | 4,5 | 0,37 | 25 | 100 | 1,5 |
| QUIX.-2M-0007 | 240 V + 10% | 1,6 | 3,9 | 8,0 | 0,75 | 45 | 100 | |
| QUIX.-2M-0011 | 50 / 60 Hz | 2,2 | 5,5 | 11,0 | 1,1 | 60 | 100 | |
| QUIX.-2M-0015 | single phase | 2,9 | 7,0 | 14,0 | 1,5 | 80 | 50 | |
| QUIX.-2T-0004 | 220 V - 15% | 1,0 | 2,2 | 2,5 | 0,37 | 25 | 50 | |
| QUIX.-2T-0007 | 240 V + 10% | 1,6 | 3,9 | 4,4 | 0,75 | 45 | 50 | |
| QUIX.-2T-0011 | 50 / 60 Hz | 2,2 | 5,5 | 6,8 | 1,1 | 60 | 50 | |
| QUIX.-2T-0015 | 3-phases | 2,9 | 7,9 | 7,0 | 1,5 | 80 | 50 | |

Protection degree **IP 20**

<table>
<tr><td>Input voltage</td><td colspan="5">single-phase, 220/240 V, tolerance -15%+10%; frequency from 47 Hz to 63 Hz.</td></tr>
<tr><td rowspan="3">Output</td><td>voltage</td><td colspan="4">three-phase from 0V to input voltage.</td></tr>
<tr><td>frequency</td><td colspan="4">from 0.1 to 480 Hz; resolution 0.1 Hz (0,01 Hz if set via serial line).<br>(switching frequency : from 1kHz to 18 kHz, programmable).</td></tr>
<tr><td>current</td><td colspan="4">continuous output: nominal current of the inverter type .<br>overload capacity : to 150% for 30" every 20'.</td></tr>
<tr><td>accel./decel.</td><td colspan="2">acceleration time: 0.01" to 9999"<br>deceleration time: 0.01" to 9999"<br>" S " characteristic: 0.0" to 10.0"</td><td colspan="2">via the terminal board it is possible to select up to 4 previously programmed ramp torques</td></tr>
<tr><td>Environment conditions</td><td colspan="5">ambient temp.: from 0°C to +40°C (temperture close to the inverter);<br>storage temp.: from -20°C to +60°C<br>ventilation: self or forced cooling according to the power; free of dust or corrosive gases<br>humidity: from 20% RH to 90% RH, non-condensing<br>installation: max. 2000 meters on the sea level (for higher levels, the features have to be derated)<br>protection degree: IP 20</td></tr>
<tr><td rowspan="4">External connections</td><td rowspan="2">Inputs</td><td>Digital optoisolated NPN or PNP</td><td>Operation signals</td><td colspan="2">start ( forward run ),<br>direction ( reverse run ),<br>external alarm (the action is programmable).<br><br>2 other signals selectable between:<br>alarm reset; frequency selector: F1, F2, F3; ramp selector: T1, T2; inverter enabling; d.c. braking enable; start or d.c. braking; flying restart.</td></tr>
<tr><td>Analog</td><td>Frequency reference</td><td colspan="2">selectable according to the voltage: 0/10V , -10V/+10V or to the current: 0/20 mA with programmable gain and offset</td></tr>
<tr><td rowspan="2">Outputs</td><td rowspan="2">Indications</td><td>Relay</td><td colspan="2">configurable for: alarm, inverter, frequency, ramp condition etc.</td></tr>
<tr><td>Analog</td><td colspan="2">0/10V: programmable gain and offset; the signal value can be proportional to: frequency, voltage, output current or torque, cos φ or output power.</td></tr>
<tr><td>Serial</td><td colspan="2">RS-485</td><td colspan="2">2-wire operation: max. 32 inverters can be parallel-connected; the transmission parameters are programmable; it can be used to replace the keyboard panel</td></tr>
<tr><td>Protections</td><td colspan="5">limits: overcurrent, overvoltage, undervoltage (with programmable threshold), inverter overtemperature; inverter overload, motor overload (QUIX_V), braking resistance overload, inner fuse cutoff, phase to phase and phase to ground shortcircuit, error in the values of the stored parameters.</td></tr>
<tr><td>Standard functions</td><td colspan="5">programmable V/f characteristic, slip compensation (QUIX_V), autoreset (programmable intervention time and retry number), jump frequency, upper and lower frequency limits, flying restart (QUIX_V), power "dips" prevention (QUIX_V), PID regulator, motor stall (QUIX_V) or inverter fault prevention, overmodulation, potentiometer function.</td></tr>
</table>

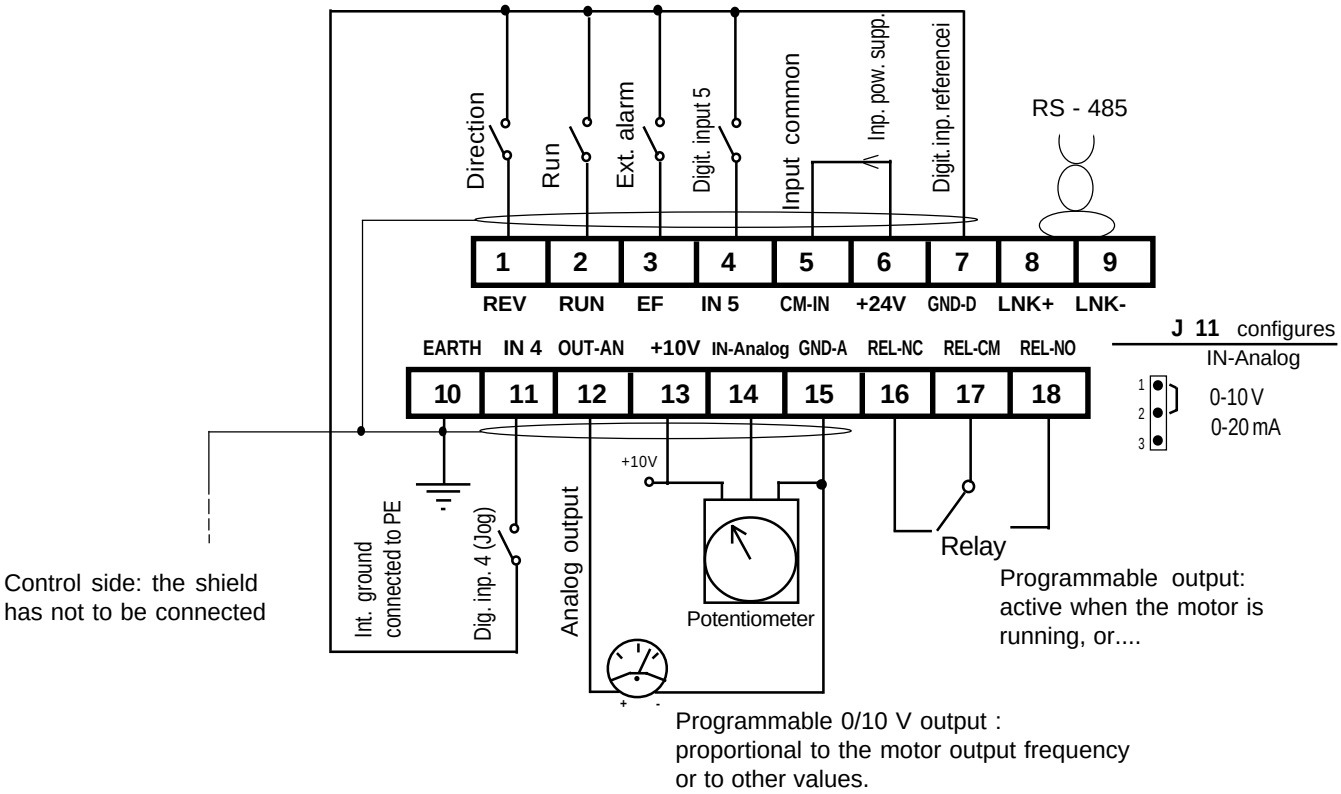
**(QUIX_V) : available in the QUIXDrive_V version**

***Power section***




POWER SUPPLY:
Single-phase (L, N) 220V (-15%) ...240V (+10%), 50/60Hz +/- 2Hz
3-phases (L1, L2, L3) 220V (-15%) ...240V (+10%), 50/60Hz +/- 2Hz

***Control section***




Note: voltage input can be used as main speed reference or auxiliary input with the meaning of P47

## Power connections

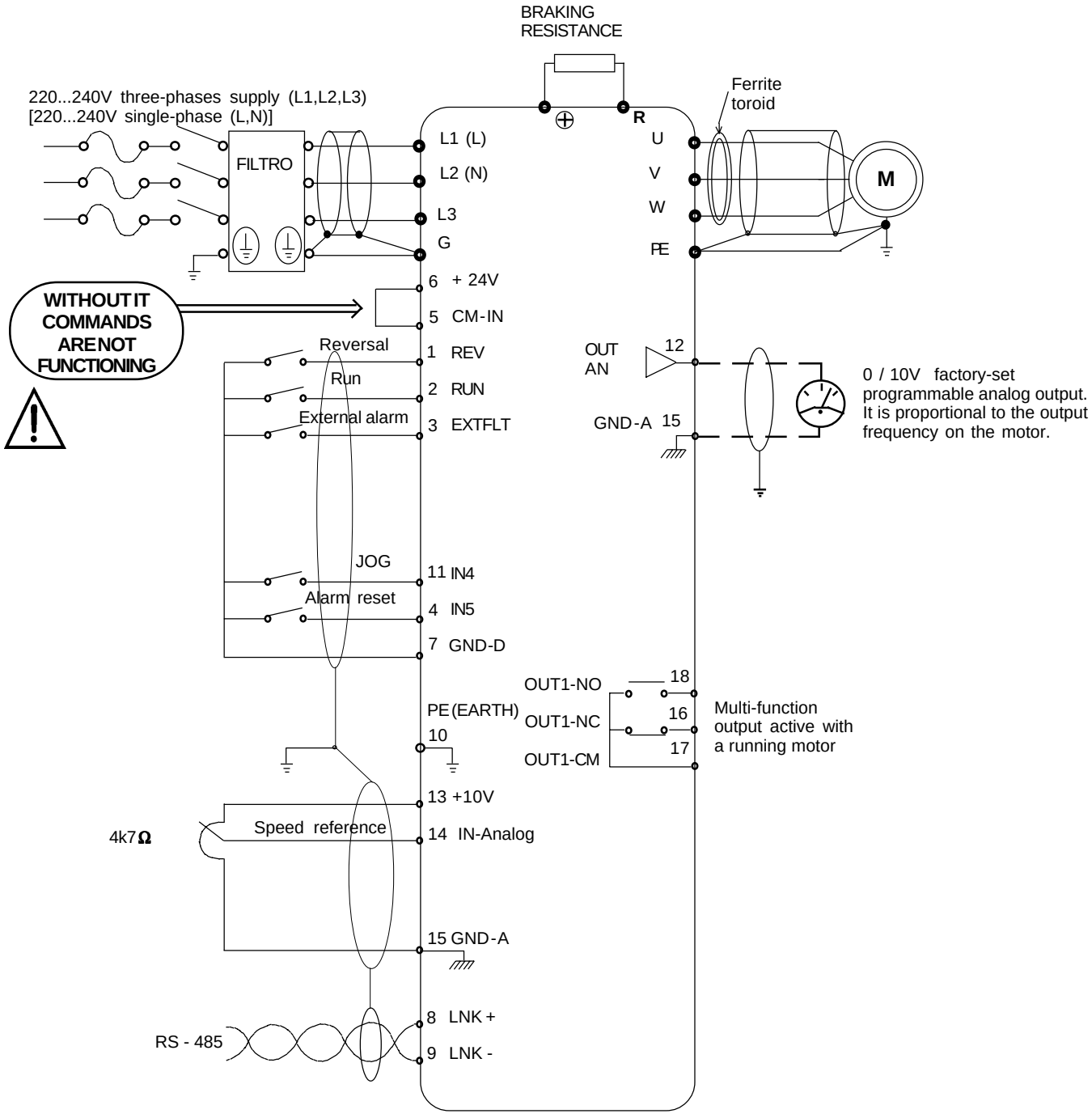
| TERMINALS | FUNCTION |
|---|---|
| **PE** | GROUND CONNECTION |
| **L1 (L)**<br>**L2 (N)**<br>**L3** | MAINS POWER SUPPLY: 220...230V SINGLE-PHASE (L, N),<br>220...230V THREE-PHASES (L1, L2, L3) |

| | |
|---|---|
| **R** | BRAKING RESISTANCE |
| **+DC** | Positive of the d.c. circuit |
| **PE** | POWER GROUND |
| **U**<br>**V**<br>**W** | THREE-PHASE OUTPUT<br>(TO THE MOTOR) |

## Control connections

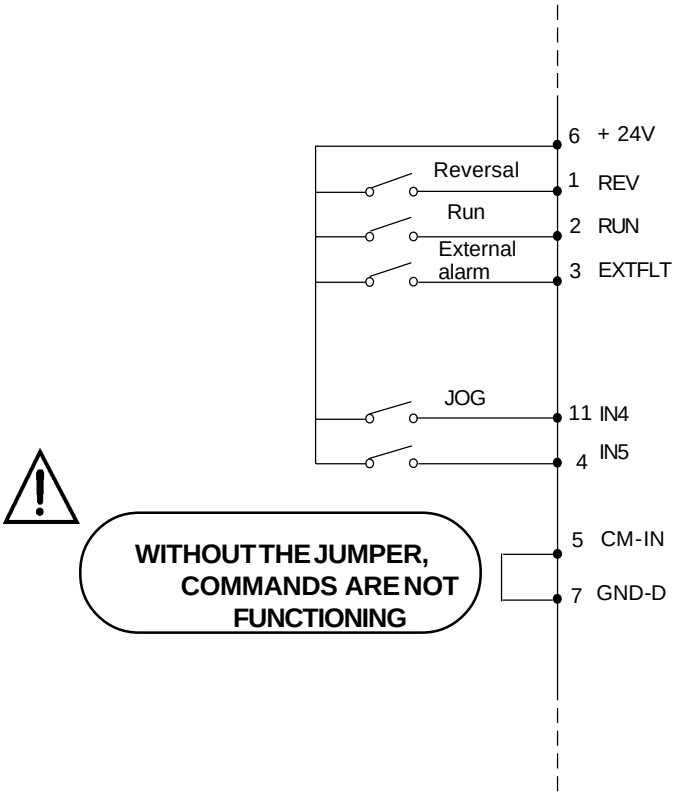
| TERMINALS | N. | FUNCTION | | | SIGNAL TYPE |
|---|---|---|---|---|---|
| REV | 1 | Reversal | Se **b-00=1:** | Backward run | Optical couplers: 24 V, 6 mA |
| RUN | 2 | Run | | Forward run | |
| EXTFLT | 3 | Alarm from outside | | | |
| IN5 | 4 | Configurable digital input | | **P-43** | |
| CM-IN | 5 | Digital input common | | | |
| +24 V | 6 | Aux. power supply for digit. inputs | | | 24 V +/- 5% 300 mA |
| GND-D | 7 | Reference ground for digit. inputs | | | |
| LNK+ | 8 | **RS-485** serial line inputs | | | |
| LNK - | 9 | | | | |
| EARTH | 10 | Ground connection | | | |
| IN4 | 11 | Configurable digit. input | | **P-42** | Optical coupler: 24 V, 6 mA |
| OUT-AN | 12 | Configurable anal. output | | **P-48** | 0 - 10 V $R_{load\ min}$ = 2 kOhm |
| +10V | 13 | Potentiometer voltage for speed ref. | | | 10 V +/-5% 10 mA |
| IN-Analog | 14 | Anal. input for speed ref. (J 11) | | | 0 - 10 V or + / - 10 V Ri = 20 kohm; 0 - 20 mA Ri = 250 ohm |
| GND-A | 15 | Common for analog input/output circuit | | | |
| OUT1-NC | 16 | Contacts of the configurable output relay | | **P-44** | 120 V ac with 0.5 A or 24 V dc with 1 A |
| OUT1-CM | 17 | | | | |
| OUT1-NO | 18 | | | | |

**Connections**

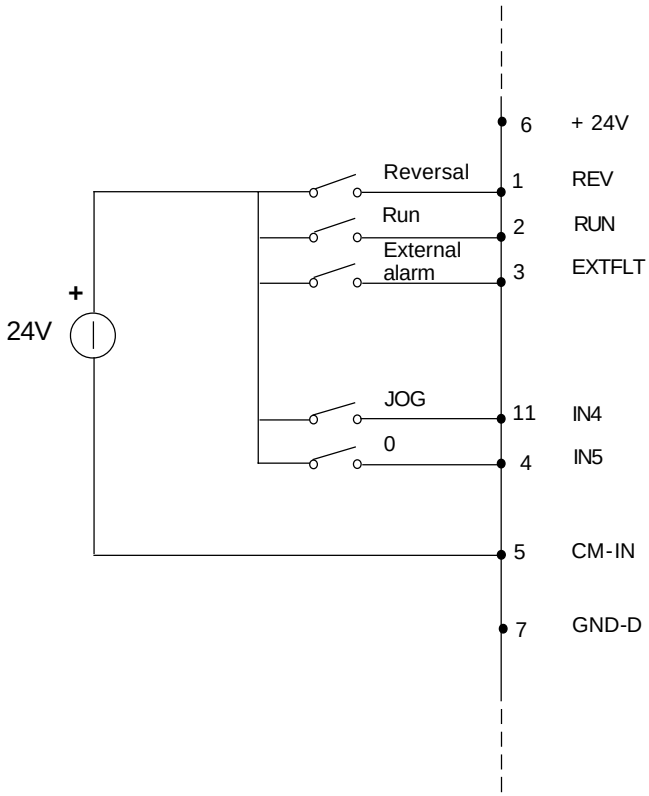



**NOTE :** The connections stated for the control keys are the most common solution for a NPN control. Other examples are given on the following page.

**Connections for PNP controls:**




**Connections for controls which are opto-isolated from the inverter:**



**INSTALLATION GUIDELINES**

In order to obtain a safe operation of the unit, assembly and start-up should be performed by skilled personnel only, according to the general regulations concerning safety conditions when working with high currents or voltages.

## • Mechanical installation

Removal of the heat produced by the inverter is performed by ventilating with natural air flow, in low power models, and by means of fan in all other models.

When assembling, leave a space of at least 40 mm. from the sides and, on the heatsink side, 150 mm. above and below the inverter, so as to assure a free circulation of the cooling air. In case of stacking of more units, leave a vertical space of at least 300 mm. between them.

The site should assure the ventilation air is free from dust or corrosive gases, otherwise a regular cleaning of the cooling surfaces must be performed. Avoid, in any case, the condensation of the sprayed fluids. The ambient humidity should never exceed 90%.

In working conditions, the temperature inside the cabinet should never exceed **40° C**. If it should, it will be necessary to perform a derating of the unit or a forced ventilation so as to avoid air stagnation.

**Warning:** When calculating the overall dimensions, also consider the space required for installation of anti-noise filters.

## • Electrical installation

The inverters are designed to operate in an industrial environment where high levels of electro-magnetic disturbance (EMI) must be expected. Good installation practice usually ensure trouble-free operation, however it is suggested that a good ground connection and RFI filters should be used. The RFI filters ensure a reduction of radiated or conducted interference when the inverter is in a interference sensible environment. The instructions on the following page show how to perform the wiring in order to be in compliance with the EMC norms.

In order to connect the inverter, just remove the cover which protects the power and control terminal boards; it can be removed by acting on the clip placed on the front upper side of the cover itself.

The **QUIXDrive** series is foreseen for a single-phase or three-phases 220/240V power supply.

As for the power supply cables, we recommend to use two or three-wire shielded cables where the ground cable is external and parallel to the shield; their dimensions must follow the values listed on page 10.

The same cable can be used for motor connection too. The cable length should never exceed **30 m**. If it should, use additional inductances, series-connected with cables, to balance the parasitic capacities. In this case, a reduction of motor voltage can be noticed.

**Warning:** The inverter power supply must be protected by means of fuses or automatic switches. Make sure the cables are properly connected and, in particular, check that the ground connection is correctly locked.

In case of shielded power supply cables, ground connect the shield on both sides.
The power cables must be kept separate from the signal cables. The standards require the use of separate raceways.
For control cables, use a shielded cable with a section of at least 0.5 $mm^2$. The **shield** should be connected to the **terminal 10** on drive side only.
For connection of reference signals or serial line, use twisted cables.
Connect spark quenching units in parallel to relay coils, solenoid valves, remote control switches located near the unit, as suggested on the following table:

| REMOTE CONTROL SWITCH OR SOLENOID VALVE | | CHARACTERISTICS OF SPARK QUENCHING UNIT | |
|---|---|---|---|
| 220 V, 240 V | >30 A | 0.5uF + 100Ohm 1/2 W | 250 V |
| 220 V, 240 V | <30 A | 0.1uF + 100Ohm 1/2 W | 250 V |

**Warning:** The failure protection circuit towards earth must **ONLY** protect the inverter against failures towards earth, occurring on the motor cable or on the motor itself. It is **NOT** designed to protect people who accidentally touch the motor or the corresponding supplying cable.

**It is forbidden:** to connect PFC devices to output terminals between inverter and motor;
to connect capacitors between output terminals or output terminals and earth;

**Note:** It is not advisable to connect remote control switches to output terminals between inverter and motor if, while their functioning phase, both the motor and the inverter are running.

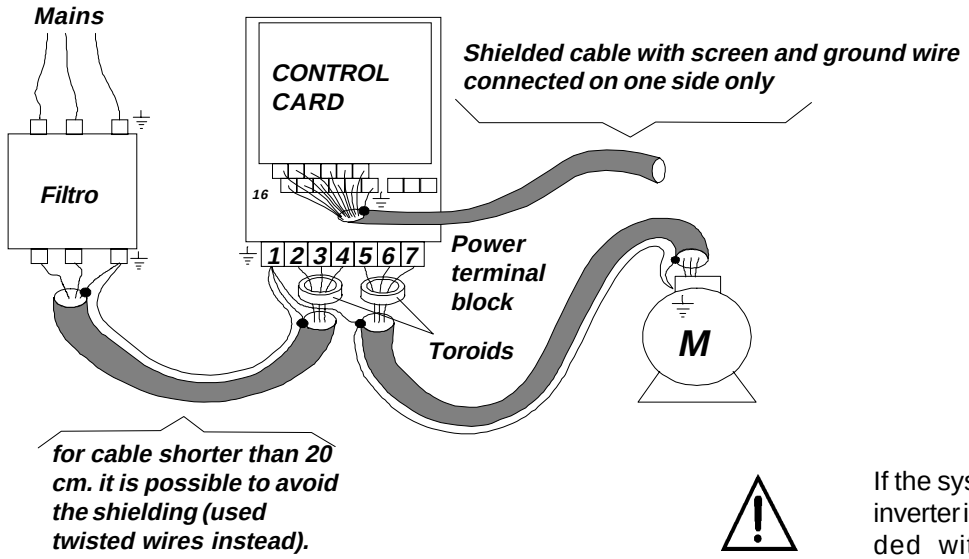
**Wiring - Protections - Cables**

**NB.: To connect the inverter it is necessary to conform to the following indications:**

1 - As for the power connections, the shielding must include only the two power conductors; the ground wire, **which is obligatory,** must be external to the shield and run parallel to it.
2 - Both the inverter side and the motor or filter side of the shield must be grounded.
3 - The ferrite toroid must be put on the inverter side of the cable in a way to cover the part of the cable uncovered from the shield.
4 - The power cables must be kept separated from the signal cables; it is forbidden to install power and signal cables in the same conduit or duct. It is important to hold motor wiring as far as possible from the power supply wiring.
5 - Use high quality motors, with low parasitic capacities towards ground.

The input filter increases leak currents towards ground; so it is advisable use a overcurrent switch with a tripping current not lower than 100 mA .

**The figure shows the wiring method in compliance with the stated standards by using an external filter.**




If the system where the inverter is installed is provided with **overcurrent switch,** this one should be calibrated for a tripping **current not lower than** 100 mA and for a time not lower than 0.1 sec. Furthermore, it must be able to support high frequency disturbance events.

***Protections and cable sections***

| Model | Line current | Suggested line fuse (Jean Muller type) | Code | Min. section Power supply and motor cables |
|---|---|---|---|---|
| | (A) | | | ($mm^2$) |
| QUIX.-2M-0004 | 4,5 | GRD2-10 | F4D13 | 1,5 |
| QUIX.-2M-0007 | 9,0 | GRD2-16 | F4D14 | 1,5 |
| QUIX.-2M-0011 | 12,0 | GRD2-20 | F4D15 | 3,0 |
| QUIX.-2M-0015 | 16,0 | GRD2-25 | F4D16 | 4,0 |
| QUIX.-2T-0004 | 2,5 | GRD2-6 | F4D12 | 1,5 |
| QUIX.-2T-0007 | 5,0 | GRD2-10 | F4D13 | 1,5 |
| QUIX.-2T-0011 | 8,0 | GRD2-16 | F4D14 | 1,5 |
| QUIX.-2T-0015 | 9,0 | GRD2-16 | F4D14 | 2,5 |

The stated cable section is the minimum one when the length is not higher than 30 m.
In this way the losses are limited and the power drops do not exceed 5% of the power supply voltage as specified by the EN60204-1 norms.

## Operation

**WARNING** **Before turning the inverter on, make sure the cover is locked in position. After each turning off, wait 3 minutes before opening the unit so as to allow the capacitors to discharge.**

For safety reasons, at power on or after a reset due to an alarm, the inverter is factory-preset not to start even with run control in active state. To start the motor, you should set the control first to OFF and then to ON (this safety precaution can be intentionally cancelled through **b-03** parameter).

- **Turning on**

The inverter is not provided with an ON/OFF switch. This operation is performed by appliying the mains voltage. After voltage application, the inverter performs a test.
If an error is encountered during this test, the display will show the message C Err

The display, consisting of four 7-segment digits, shows both letters and numbers. When turned on, it shows the output frequency value ( 00 Hz if the motor is stopped).

The inverter is factory-preset to control three-phase asynchronous motors which operate with voltages and currents having values corresponding to the inverter size.

- **Run**

1 - Connect a 4.7 kOhm potentiometer for the speed reference(terminals 13,14,15 )
2 - Power supply the digital inputs ( terminal 5) with +24V. If the inputs have not to be isolated, it is possible to use the power supply available on the terminal 6.
3 - Connect two contacts for forward and backward run control (terminals 2, 1, and 7/8 ) as shown on page 6.
4 - Close the run contact to start the motor . The motor is started at the frequency selected through the preset ramp (default P-05= 5 seconds).

**WARNING** If the factory - preset values should be modified to adapt the inverter to the application, it can be made through the control panel where the actual values can be displayed, then modified, and then permanently stored.
**In case it is needed, the default values can be reset via the C02 function**

- **Stop**

To stop the motor, act as follows:
- Disable the run control. In this way, the motor is stopped with factory-preset ramp (P-06= 5 seconds from max. frequency to 0 Hz).
- Or set to zero the speed reference potentiometer, so that the user has control over the motor stop.
**Caution: in this case the motor, even though it is stopped, is still under voltage.**

- **The motor does not start**

If after enabling the run control, the motor does not start, first check that the connections shown on the previous pages have been performed, then check that the factory-preset parameters meet the motor characteristics.
The parameter check is performed by using the keypad: press the **M** key until the P menu appears **,** then, throung the ⇑, ⇓ keys select the code of the parameter with the value to be checked and press the **E** key to read its value. The data of the motor rating characteristics are important; they can be set via the parameters P-01, P-02, P-09, P-11, P-12.

- **Caption of the function leds mounted behind the front cover**

**yellow : POWER**
**green : RUN**
**red : ALARM**

**Control panel**

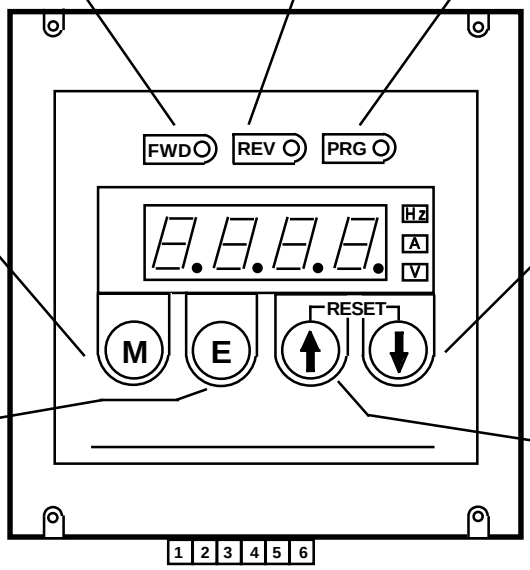
## ● Remotable auxiliary keyboard [code : QUIX-TST]

The keyboard is connected to the inverter with an hexapolar cable (max 2m) whose shield is ground connected on the inverter side

**Green Led:** forward run **(*)**

**Green Led:** backward run **(*)**

**Yellow Led:** If flashing, the change has **not** been stored permanently



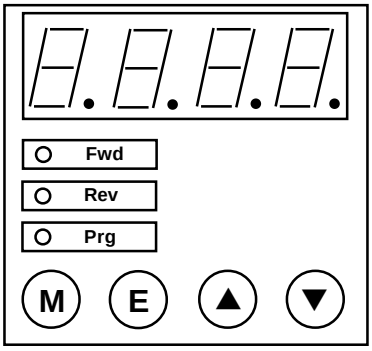

**M**enu selection key: It allows to scroll through the parameter sets: **d-xx, F-xx, P-xx, b-xx, C-xx**

**Decrease Key:**
- it selects the parameter inside a menu
- it decreases the parameter value

**E**nter key**:**
- it goes to the Selected Parameter
- **Confirmation of the set value**

**Decrease Key:**
- it selects the parameter inside a menu
- it increases the parameter value

## ● Removable keyboard [code QUIXF-TST]:




The Leds and the Keys of the Extractable Keypad have the same meaning and perform the same functions of the Auxiliary Keyboard, with exception of the indication of the unit of measures.

**Caution:** the changes made to parameter values have an immediate effect but are not automatically stored. The storage is performed through the **C- 00** control**.**

**(*) NOTE:** the **flashing of Green Leds** indicates the action of the motor stall or inverter fault prevention.

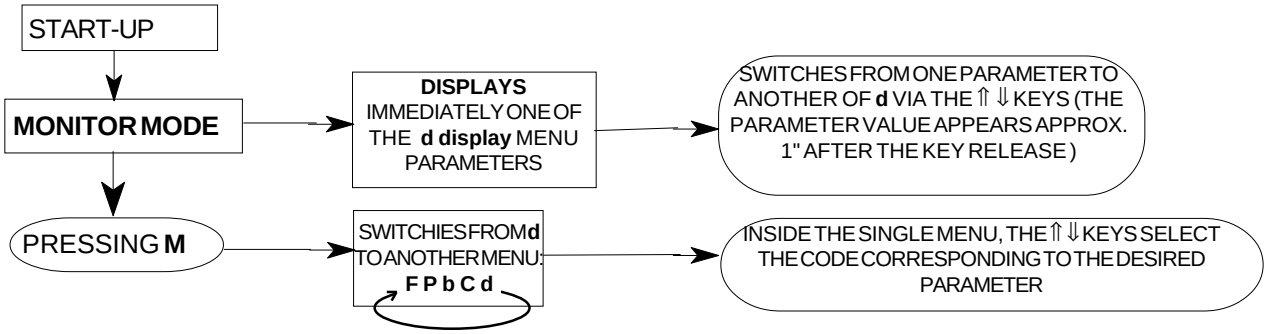
- **The display** is used to show both letters and numbers, e.g.:

  **P-xx** means: **P** = letter indicating the selected menu
  **xx** = numeric code indicating the parameter progressive number
  **xxx.x** means: number, also decimal, indicating the value of the selected parameter

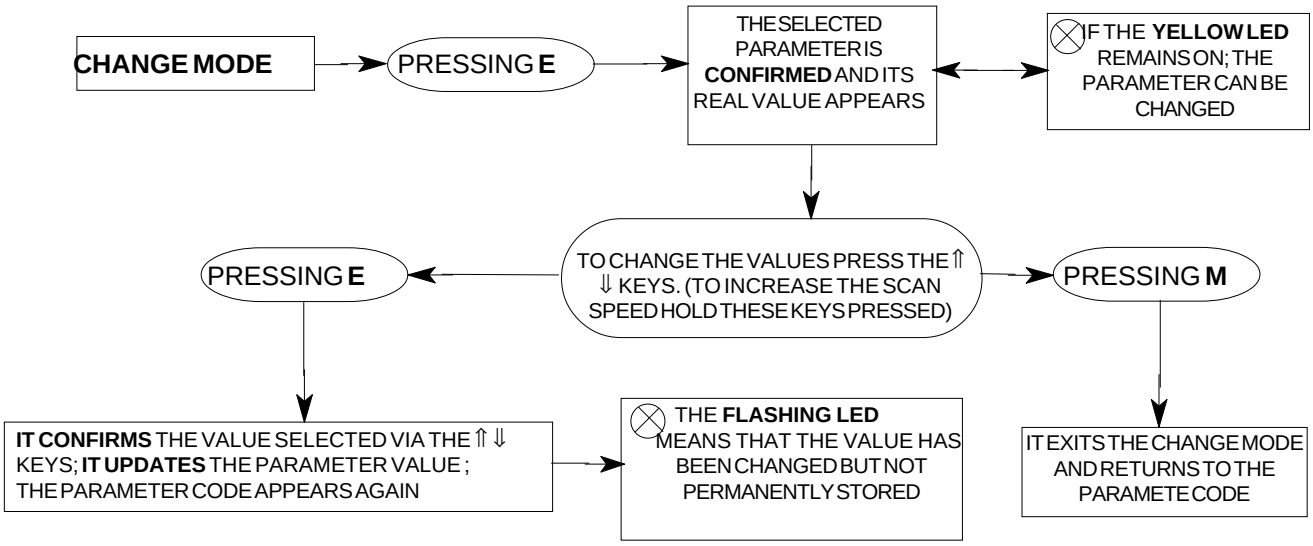
- The parameter sets, or **MENUS,** have the following meaning:

  **d-xx** menu of the read-only parameters ( display )
  **F-xx** menu of the read/write parameters of the terminal board selectable frequencies
  **P-xx** menu of the read/write parameters
  **b-xx** menu of the read/write parameters, ON/OFF type ( they can be changed with a stopped motor only)
  **C-xx** menu of control-type parameters

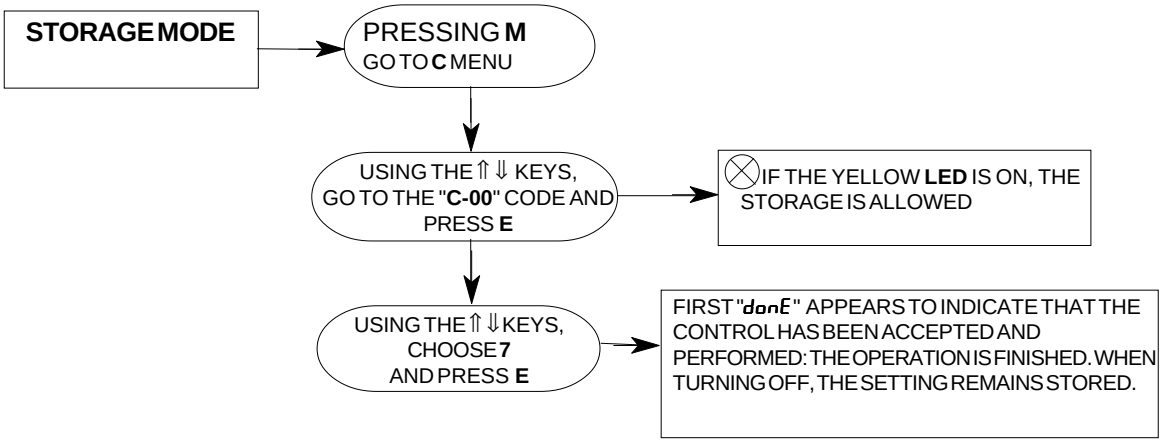
At the start-up, the control panel enters the MONITOR mode thus allowing to read the values assumed by the **d** parameters. The chart shows how to switch from one menu to the other and how to act on the parameters inside the menus.




To **CHANGE** a parameter value: **DISPLAY** the corresponding code, then confirm via the **E** key as stated by the following chart:




Act as follows to **STORE permanently** the performed changes:



**Changing the parameters**

- **Procedure for a parameter change:**

Let us assume we turn the inverter on and we want to change the value of the max. working frequency from 50 Hz (factory-preset value) to 100 Hz.

At start-up: ..... ON DISPLAY 00

1 - Press **M** repeatedly until the **P** menu is displayed**:** ..... ON DISPLAY P-00

2 - Through the ⇑ ⇓ keys select the code **01** ..... ON DISPLAY P-01
and press **E**;
the value of the **P-01** parameter is displayed (max. frequency) ..... ON DISPLAY 500

3 - Note the state of PRG LED (page 13): if it is permanently lit, the parameter can be modified. Press ⇑ to increase the number, ⇓ to decrease it;
(if the key is held down, the digit scan speed is increased).
Now, press ⇑ till the display shows **100.0** ..... ON DISPLAY 1000
Press **E** to confirm and enable the value;
(the parameter is displayed again)..... ON DISPLAY P-01

**NOTE*:* In this way, the value of max. frequency has been changed, but not stored in a permanent way (Yellow LED is flashing).**

4 - Press **M** until the **C** menu is displayed; through the ⇑ ⇓ keys select the code **00**; ..... ON DISPLAY C-00
press **E** to confirm the selection;
the PRG LED, if permanently lit, indicates the storage enabling.
Through the⇑ ⇓ keys enter the code **7** ..... ON DISPLAY 7
Press **E** to confirm the value;
the message "donE" is displayed for 2 seconds to confirm the operation..... ON DISPLAY donE
The storage operation is completed.

## Parameter display:

At the start-up the inveter enters the monitor mode: the **d MENU** is active, which allows to read the values acquired by the different unit of measures, as stated in the table; first, the output frequency parameter is displayed. The same action is obtained by selecting the **d MENU** via the **M** key.
To facilitate the commissioning, the parameters, which can be modified, are divided into three groups or levels. Whether the parameters of a given level (accessibility) can be changed or not depends on the presetting of the **P-20** parameter:

P-20=1 → 1st level (factory setting)
P-20=2 → 2nd level
P-20=3 → 3rd level

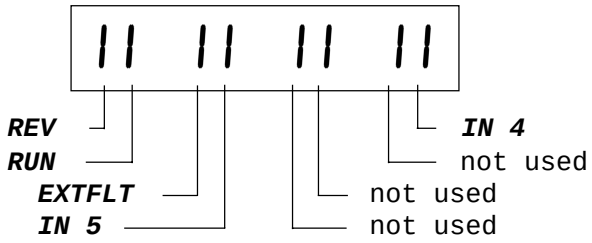
| CODE | DESCRIPTION | CHANGE RANGE | UNIT | PRESET VALUE |
|---|---|---|---|---|
| d-00 | output frequency | 0.1 Hz | | |
| d-01 | reference frequency | Fmin.to Fmax. | 0.1 Hz | |
| d-02 | output current (rms) (QUIX_V) | | 0.1 A | |
| d-03 | output voltage (rms) | | 1 V | |
| d-04 | continuous voltage (dc) | | 1 V | |
| d-05 | output speed **(d-00)*(P-16)** | | 0.01 / 1 | |
| d-06 | reference speed **(d-01)*(P-16)** | | 0.01 / 1 | |
| d-07 | cos φ (QUIX_V) | | 0.01 | |
| d-08 | power (QUIX_V) | | 0.01 Kw | |
| d-09 | inverter overload (100% = alarm threshold) (QUIX_V) | | 0.1 % | |
| d-10 | motor overload (100% = alarm threshold) (QUIX_V) | | 0.1 % | |
| d-11 | braking resistance overload (100% = alarm threshold) | | 0.1 % | |
| d-12 | last alarm memory | to reset the alarms use the C-03 control | | |
| d-13 | second to last alarm memory | | | |
| d-14 | third to last alarm memory | | | |
| d-15 | fourth to last alarm memory | | | |
| d-16 | digital input state | 11 11 11 11 | each vertical segment corresponds to an input or output state, as shown in the table on next page | |
| d-17 | digital output state | | | |
| d-18 | / | | | |
| d-19 | / | | | |
| d-20 | / | | | |
| d-21 | / | | | |
| d-22 | pid reference | | 0.1 % | |
| d-23 | pid feedback | | 0.1 % | |
| d-24 | pid error | | 0.1 % | |
| d-25 | pid integral component | | 0.1 % | |
| d-26 | pid output | | 0.1 % | |
| d-27 | inverter rated current | | 0.1 A | |
| d-28 | software version | xx.xx | | |
| d-29 | identification code (config. file) | xxxx | | |
| d-30 | display test | all segments are on | | |

**(QUIX_V) : parameter available in the QUIXDrive_V version**

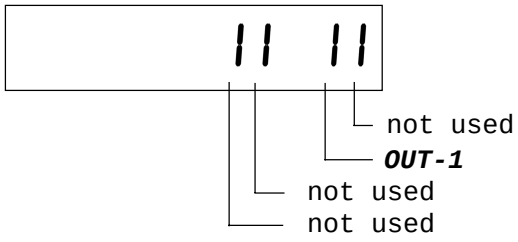
**I/o digital state**

NOTE.: Each segment, when lit, indicates that the corresponding input or output are active

**- Inputs:**




**- Outputs:**



**Parameters quick guide**

**F menu:** it sets and/or reads the frequencies that can be selected through the terminal board

| CODE | DESCRIPTION | RANGE | UNIT | PRESET VALUE | PAGE |
|---|---|---|---|---|---|
| F-00 | Reference frequency 0 | 0.0 / 480.0 | 0.1 Hz | 0.0 | 22 |
| F-01 | Reference frequency 1 | " " | " " | " " | " |
| F-02 | Reference frequency 2 | " " | " " | " " | " |
| F-03 | Reference frequency3 | " " | " " | " " | " |
| F-04 | / | | | | |
| F-05 | / | | | | |
| F-06 | / | | | | |
| F-07 | / | | | | |
| F-08 | Jogging frequency | " " | " " | 1.0 | 24 |

**C menu:** it sets and executes some controls: to execute them, select value **7** and confirm via **E.**

| CODE | PERFORMED ACTION |
|---|---|
| C-00 | Permanent storage of all parameters (*) |
| C-01 | Recall of previously stored parameters (the currently used parameters are replaced by the previously stored ones) (*) |
| C-02 | Recall of the factory-set parameters (the storage depends on the operator's choice) (*) |
| C-03 | Zero setting of the alarm memory |
| C-04 | Recall and storage of the parameters contained in the external programming key **[from key to Inv.]** (*) |
| C-05 | Storage of the inverter parameters on the external programming key **[from Inv. to key]** |
| C-06 | Measure of motor phase resistance and corresponding initialization of parameter **P - 12** (page 25) (QUIX_V)(*) |

**(QUIX_V) : parameter available in the QUIXDrive_V version**

**Caution:** all parameters or part of them can be write-protected through **P - 19** parameter;
In case of a non-authorized modification attempt or with a running motor, the following message will be displayed: Prot .
**NOTE: All parameters, which are not listed in the tables, are reserved for future developments; as a consequence, they must be always set to 0.**

| PARAMETER | VAL | PERFORMED ACTION |
|---|---|---|
| P - 19 | **0** | no protection |
| P - 19 | **1** | **F non-protected parameters,** the others are protected |
| P - 19 | **2** | ***all parameters are protected*** |
| P - 19 | **3** | no protection; storage possibility with running motor too; **not recommended** |

**NOTE: The sign (*) means that the controls can not be executed with running motor**

For safety reasons the **P** parameters, which can be changed, are divided into three groups or levels. Whether the parameters of a given level (accessibility) can be changed or not depends on the presetting of the **P-20** parameter**:**

P-20=1 → 1st level (factory setting)
P-20=2 → 2nd level
P-20=3 → 3rd level

**P menu:** it sets all the values of the inverter parameters; they are divided into three groups or LEVELS; their access depends on the code ( 1, 2, 3 ) set via the **P - 20** parameter.

| CODE | DESCRIPTION | RANGE | UNIT | PRESET VALUE | | PAGE |
|---|---|---|---|---|---|---|
| | **Level 1** | | | | | |
| P-00 | reference setting | 0 - 4 ; 9 | 1 | 0 | | 22 |
| P-01 | maximum frequency | 50.0 - 480.0 | 0.1 Hz | 50.0 | (*) | " |
| P-02 | maximum output voltage | (P-72) - (**) | 1 V | (**) | (*) | 23 |
| P-03 | V/F characteristic type | 0 - 4 | 1 | 1 | (*) | " |
| P-04 | torque boost at low revolutions (boost) | 0 - 30 | 1% di (P-02) | 3 | | " |
| P-05 | acceleration time 1 | 0.01 - 9999 | 0.01 / 0.1 / 1 s | 5.0 | | 24 |
| P-06 | deceleration time 1 | 0.01 - 9999 | 0.01 / 0.1 / 1 s | 5.0 | | " |
| P-07 | "S" curve characteristic ( S ) | 0.0 - 10.0 | 0.1 s | 0,0 | | " |
| P-08 | modulation frequency | 0 - 7 | 1 | 5 | (*) | " |
| P-09 | motor rated current (QUIX_V) | (20% -150%)Inom | 0.1 A | Inom | | 25 |
| P-10 | motor thermal constant (QUIX_V) | 1 - 120 | 1 min. | 20 | | " |
| P-11 | rating of motor cos φ (QUIX_V) | 0.01 - 1.00 | 0.01 | (**) | | " |
| P-12 | motor stator resistance (QUIX_V) | 0.0 - 25.0 | 0.1 ohm | 0,0 | | " |
| P-13 | motor efficiency (QUIX_V) | 0 - 100% | 1 | 100 | | " |
| P-14 | min. frequency (offset) for frequency analog reference | -480 /+480 | 1 Hz | 0 | | 22 |
| P-15 | gain for frequency analog reference | 0.00 - 9.99 | 0.01 | 1.00 | | " |
| P-16 | conversion constant **( *** )** | 0.01 - 99.99 | 0.01 | 1.00 | | 15 |
| P-17 | display message setting at start-up (value of **d-xx**) | 0 - 30 | 1 | 0 | | |
| P-19 | parameter protection code | 0 - 3 | 1 | 0 | | |
| P-20 | programming level | 1 - 3 | 1 | 1 | | |
| | **Level 2** | | | | | |
| P-21 | acceleration time 2 | 0.01 - 9999 | 0.01 / 0.1 / 1 s | 5.0 | | 24 |
| P-22 | deceleration time2 | 0.01 - 9999 | 0.01 / 0.1 / 1 s | 5.0 | | " |
| P-23 | acceleration time 3 | 0.01 - 9999 | 0.01 / 0.1 / 1 s | 5.0 | | " |
| P-24 | deceleration time 3 | 0.01 - 9999 | 0.01 / 0.1 / 1 s | 5.0 | | " |
| P-25 | acceleration time 4 / jogging accel. time | 0.01 - 9999 | 0.01 / 0.1 / 1 s | 5.0 | | " |
| P-26 | deceleration time 4 / jogging decel. time | 0.01 - 9999 | 0.01 / 0.1 / 1 s | 5.0 | | " |
| P-27 | resolution for accel. / decel. ramps | 0=0.01s 1=0.1s 2=1s | 1 | 1 | | " |
| P-28 | DC braking level | 0 - 100 | 1% di Inom | 0 | | 29 |
| P-29 | frequency for DC braking enabling | 0.0 / 480.0 | 0.1 Hz | 0.0 | | " |
| P-30 | DC braking time at start | 0.0 - 60.0 | 0.1 s | 0.0 | | " |
| P-31 | DC braking time at stop | 0.0 - 60.0 | 0.1 s | 0.0 | | " |
| P-32 | slip compensation (QUIX_V) | 0.0 - 25.0 | 0.1 % | 0.0 | | 26 |
| P-33 | time constant of slip compensation (QUIX_V) | 0.0 - 10.0 | 0.1 s | 0.1 | | " |
| P-34 | jump frequency 1 | 0.0 / 480.0 | 0.1 Hz | 0.0 | | 24 |
| P-35 | jump frequency 2 | 0.0 / 480.0 | 0.1 Hz | 0.0 | | " |
| P-36 | jump amplitude | 0.0 - 100.0 | 0.1 Hz | 0.0 | | " |
| P-37 | output frequency upper limit | (P-38) - 110 | 1% di (P-01) | 100 | | " |
| P-38 | output frequency lower limit | 0 - (P-37) | 1% di (P-01) | 0 | | " |
| P-39 | / | | | | | |
| P-40 | / | | | | | |
| P-41 | / | | | | | |
| P-42 | IN4 input configuration | 0 - 17 | 1 | 4 | | 24/**27** |
| P-43 | IN5 input configuration | 0 - 17 | 1 | 0 | | " |

**NOTE: ( * ) the controls can be executed with stopped motor only ( ** ) the parameter values depend on the inverter size ( *** ) the coefficient allows to convert the frequency displayed in d-00 into output speed for P-05 and P06 (QUIX_V) : parameter available in the QUIXDrive_V version**

**P menu:**

| CODE | DESCRIPTION | RANGE | UNIT | PRESET VALUE | | PAGE |
|---|---|---|---|---|---|---|
| | **Level 2** | | | | | |
| P-44 | OUT-1: output configuration | 0 - 35 | 1 | 2 | (*) | 28 |
| P-45 | / | | | | | |
| P-46 | / | | | | | |
| P-47 | IN-analog : analog input configuration | 0 - 11 | 1 | 0 | | 33 |
| P-48 | analog output configuration | 0 - 17 | 1 | 0 | (*) | 29 |
| P-49 | analog output offset | -9.99 / +9.99 | 0.01 V | 0.00 | | " |
| P-50 | analog output gain | -9.99 / +9.99 | 0.01 | 1.00 | | " |
| P-51 | analog output time constant | 0.00 - 2.50 | 0.01 s | 0.00 | | |
| P-52 | / | | | | | 28 |
| P-53 | signalling frequency | 0.0 - 480.0 | 0.1 Hz | 0.0 | | " |
| P-54 | hysteresis amplitude related to **P-53** | 0.0 - 100.0 | 0.1 Hz | 0.5 | | 28 |
| P-55 | current limit for overload (QUIX_V) | 20 - 200 | 1%(mot.) | 110 | | " |
| P-56 | delay time for overload signalling (QUIX_V) | 0.1 - 25.0 | 0.1 s | 0.1 | | 31 |
| P-57 | autoreset time | 0.1 - 60.0 | 0.1 s | 5.0 | | " |
| P-58 | number of autoreset attempts | 1 - 250 | 1 | 1 | | |
| P-59 | / | | | | | |
| P-60 | / | | | | | |
| P-61 | / | | | | | 28 |
| P-62 | ohmic value of the braking resistance | 1 - 250 | 1 ohm | (**) | | " |
| P-63 | braking resistance power | 10 - 2500 | 10 W | (**) | | " |
| P-64 | braking resistance thermic constant | 5 - 1250 | 5 s | (**) | | 32 |
| P-65 | input setting by serial line enabling | 0 - 255 | 1 | 0 | | " |
| P-66 | output setting by serial line enabling | 0 - 15 | 1 | 0 | | " |
| P-67 | serial line configuration | 0 - 19 | 1 | 1 | | " |
| P-68 | serial line address | 0 - 99 | 1 | 0 | | " |
| P-69 | response delay time on serial line | 0 - 250 | 1 ms | 1 | | 23 |
| | **Level 3** | | | | | |
| P-70 | basic frequency | (P-71) - 480.0 | 0.1 Hz | 50.0 | (*) | " |
| P-71 | V / F intermediate frequency | 0 - (P-70) | 0.1 Hz | 25.0 | (*) | " |
| P-72 | V / F intermediate voltage | 0 - (P-02) | 1 V | (**) | (*) | " |
| P-73 | ramp start/stop frequency | 0 - 25.0 | 0.1 Hz | 0.0 | (*) | " |
| P-74 | output voltage reduction | 0 - 100 | 1%(P02) | 100 | | 26 |
| P-75 | undervoltage threshold | 40 - 80 | 1%(P02) | 70 | (*) | " |
| P-76 | max. time of short mains blackout (QUIX_V) | 0.1 - 25.0 | 0.1 s | 1.0 | (*) | 25 |
| P-77 | accel. current limit for f<f_base (QUIX_V) | 20 - 200 | 1%(Inom) | 170 | | " |
| P-78 | accel. current limit for f>f_base (QUIX_V) | 20 - 200 | 1%(Inom) | 170 | | " |
| P-79 | current limit at constant speed (QUIX_V) | 20 - 200 | 1%(Inom) | 170 | | 26 |
| P-80 | current limit for motor pickup (QUIX_V) | 20 - 200 | 1%(Inom) | 120 | | " |
| P-81 | demagnetization time | 0.01 - 10.00 | 0.01 s | (**) | | 25 |
| P-82 | decel. speed to prevent stall at constant speed (QUIX_V) | 0.1 - 25.0 | 0.1 s | 1.0 | | 26 |
| P-83 | frequency scan time during motor pickup (QUIX_V) | 0.1 - 25.0 | 0.1 s | 1.0 | | 23/26 |
| P-84 | voltage reset time | 0.1 - 25.0 | 0.1 s | 0.2 | | 25 |
| P-85 | tolerance at constant speed | 0.1 - 25.0 | 0.1 Hz | 0.5 | | " |
| P-86 | ramp end delay/constant speed | 0.1 - 25.0 | 0.1 s | 1.0 | | |
| P-87 | magnetization current compensation gain (QUIX_V) | 0 - 100 | 1 | 0 | | |
| P-88 | magnetiz. current compens. time constant (QUIX_V) | 0 - 3 | 1 | 0 | | 32 |
| P-89 | reception time out ( serial communication ) [off if 0,0] | 0.0 - 25.0 | 0.1 | 0.0 | | |

**NB. : ( * ) the controls can be executed with stopped motor only; ( ** ) the values depend on the inverter size.**
**(QUIX_V) : parameter available in the QUIXDrive_V version**

## P menu:

| CODE | DESCRIPTION | | RANGE | UNIT | PRESET VALUE | | PAGE |
|---|---|---|---|---|---|---|---|
| | **Livello 3** | | | | | | |
| P-90 | PID reference | | 0,0 - 100,0 | 0,1 % | 0,0 | | 30 |
| P-91 | PID max. positive error | | 0,1 - 100,0 | 0,1 % | 5,0 | | " |
| P-92 | PID max. negative error | | 0,1 - 100,0 | 0,1 % | 5,0 | | " |
| P-93 | PID updating time | | 0,00(=0,005s) - 2,50 | 0,01 s | 0,00 | | " |
| P-94 | proportional term gain | set 1 | 0,00 - 99,99 | 0,01 | 0,00 | | " |
| P-95 | integral action time | set 1 | 0,00 - 99,99 | 0,01 | 99,99 | | " |
| P-96 | derivative action time | set 1 | 0,00 - 99,99 | 0,01 | 0,00 | | " |
| P-97 | proportional term gain | set 2 | 0,00 - 99,99 | 0,01 | 0,00 | | " |
| P-98 | integral action time | set 2 | 0,00 - 99,99 | 0,01 | 99,99 | | " |
| P-99 | derivative action time | set 2 | 0,00 - 99,99 | 0,01 | 0,00 | | " |

**NOTE : ( * ) the controls can be executed with stopped motor only; ( ** ) the values depend on the inverter size.**

## b menu:

It sets the values of ON / OFF parameters; they are divided into three groups, or LEVELS, their access depends on the code ( 1, 2, 3 ) set via the **P - 20** parameter. **They all can be modified with stopped motor only**

| CODE | DESCRIPTION | RANGE | UNIT | PRESET VALUE | | PAGE |
|---|---|---|---|---|---|---|
| | **Level 1** | | | | | |
| b-00 | run/reversal input configuration | 0=RUN/REV | 1=FWD/REV | 0 | | 24 |
| b-01 | stop mode | 0=in ramp | 1=coast | 0 | | 27 |
| b-02 | reversal enabling | 0=off | 1=on | 1 | | " |
| b-03 | protection | 0=off | 1=on | 1 | | " |
| b-04 | reference input reversal | 0=off | 1=on | 0 | | 22 |
| b-05 | current input | 0=0/20mA | 1=4/20mA | 1 | | 22 |
| b-06 | enabling of motor overload protection (QUIX_V) | 0=off | 1=on | 1 | | 25 |
| b-07 | motor type (QUIX_V) | 0=standard | 1=servoventilated | 0 | | " |
| b-08 | configuration of external alarm input | 0=NO(nor. open) | 1=NC(nor.closed) | 0 | | 27 |
| b-09 | external alarm tripping mode | 0=alarm/lock | 1=inverter disabl. | 0 | | " |
| b-10 | external alarm detection mode | 0=always | 1=run only | 0 | | " |
| | **Level 2** | | | | | |
| b-11 | autoreset handling in case of external alarm | 0=off | 1=on | 0 | | " |
| b-12 | autoreset enabling | 0=off | 1=on | 0 | | 27/31 |
| b-13 | enabling of autoreset attempt limitation | 0=off | 1=on | 0 | | 31 |
| b-14 | enabling of autoreset of auto zero-setting attempts | 0=off | 1=on | 0 | | " |
| b-15 | autoreset alarm contact | 0=off | 1=on | 1 | | 31 |
| b-16 | voltage reduction tripping mode | 0=always | 1=con. sp. only | 0 | | 23 |
| b-17 | enabling of momentary overload control (QUIX_V) | 0=off | 1=on | 0 | | 26 |
| b-18 | tripping mode of momentary overload control (QUIX_V) | 0=always | 1=con. sp. only | 0 | | " |
| b-19 | enabling of momentary overload alarm (QUIX_V) | 0=off | 1=on | 0 | | " |
| b-20 | enabling of braking resistance overload protection | 0=off | 1=on | 0 | | 28 |
| b-21 | / | | | | | |
| b-22 | / | | | | | |
| b-23 | / | | | | | |
| | **Level 3** | | | | | |
| b-24 | stall prevention during acceleration (QUIX_V) | 0=off | 1=on | 1 | | 25 |
| b-25 | stall prevention at constant speed (QUIX_V) | 0=off | 1=on | 1 | | " |
| b-26 | stall prevention during deceleration | 0=off | 1=on | 1 | | " |
| b-27 | overvoltage prevention | 0=off | 1=on | 0 | | " |

 **(QUIX_V) : parameter available in the QUIXDrive_V version**

## b menu:

| CODE | DESCRIPTION | RANGE | UNIT | PRESET VALUE | PAGE |
|---|---|---|---|---|---|
| | **Level 3** | | | | |
| b-28 | prevention of short mains blackout (QUIX_V) | 0=off | 1=on | 0 | 26 |
| b-29 | motor pickup enabling (flying restart) (QUIX_V) | 0=off | 1=on | 0 | " |
| b-30 | scan start frequency for pickup control (QUIX_V) | 0=reference freq. | 1=max. freq. | 0 | " |
| b-31 | motor pickup at start-up (QUIX_V) | 0=off | 1=on | 0 | " |
| b-32 | automatic adjustment of output voltage | 0=off | 1=on | 1 | 23 |
| b-33 | dead times compensation (QUIX_V) | 0=off | 1=on | 1 | 24 |
| b-34 | automatic boost enabling (QUIX_V) | 0=off | 1=on | 0 | 26 |
| b-35 | / not used | | | | |
| b-36 | enabling of switching frequency reduction under 5 Hz | 0=off | 1=on | 0 | 24 |
| b-37 | enabling of undervoltage alarm storage | 0=off | 1=on | 1 | 31 |
| b-38 | overmodulation for f > f base (torque increase ) | 0=off | 1=on | | |
| b-39 | terminal board control enabling | 0=off | 1=on | 1 | |
| b-40 | PID regulator enabling | 0=off | 1=on | 0 | 27/30 |
| b-41 | regulator tripping mode | 0=running | 1=const. speed run | 0 | 30 |
| b-42 | / | | | | |
| b-43 | variable adjusted by PID regulator | 0=frequency | 1=voltage | 0 | 30 |
| b-44 | error sign reversal | 0=off | 1=on | 0 | " |
| b-45 | adjustment mode | 0=direct | 1=sum(feed/forw.) | 0 | " |
| b-46 | suppression of PID regulator positive output | 0=off | 1=on | 0 | " |
| b-47 | suppression of PID regulator negative output | 0=off | 1=on | 0 | " |
| b-48 | suppression of positive or negative integral term | 0=off | 1=on | 0 | " |
| b-49 | integral term initialization at start | 0=off | 1=on | 0 | " |
| b-50 | PID reference input switches | see following table | | 0 | " |
| b-51 | | | | 0 | " |
| b-52 | | | | 0 | " |
| b-53 | PID feedback input switches | see following table | | 1 | " |
| b-54 | | | | 0 | " |
| | | | | 0 | " |

**(QUIX_V) : parameter available in the QUIXDrive_V version**

| | feedback switches | | | | reference switches | | |
|---|---|---|---|---|---|---|---|
| | b-55 | b-54 | b-53 | | b-52 | b-51 | b-50 |
| | - | - | - | ref. frequency | 0 | 0 | 0 |
| / not used | 0 | 0 | 1 | / not used | 0 | 0 | 1 |
| / not used | 0 | 1 | 0 | / not used | 0 | 1 | 0 |
| In-Analog | 0 | 1 | 1 | In-Analog | 0 | 1 | 1 |
| / not used | 1 | 0 | 0 | REF-I | 1 | 0 | 0 |
| | - | - | - | parameter P-90 | 1 | 0 | 1 |
| | - | - | - | freq. after ramp | 1 | 1 | 0 |
| current | 1 | 0 | 1 | generator | - | - | - |
| torque | 1 | 1 | 0 | | - | - | - |
| power | 1 | 1 | 1 | | - | - | - |
| set to 0 | 0 | 0 | 0 | set to 0 | 1 | 1 | 1 |

Note: If IN-Analog is configured as voltage, it can be used as main frequency reference or auxiliary input (AUX-V) (depending on P47 setting)

**Function description:**

**Frequency reference**

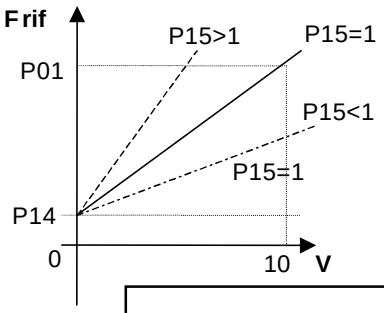
| PARAMETER | FUNCTION | RANGE [DEFAULT] | VALUE | DESCRIPTION | ASSOCIATED PARAMETERS |
|---|---|---|---|---|---|
| P-00 | Determines the inverter operation frequency | 0 - 4<br>[ 0 ]<br>the values 5,6,7,8 are not used | Each parameter value correspond to a different reference: | | |
| | | | 0 | analog input: **REF-V** (0/10V with 1-2 in J11; 0-20mA with 2-3) | P-01<br>P-14<br>P-15<br>b04 |
| | | | 1 | analog input: **REF-V** (-/+10V) - the polarity states the rotation direction | |
| | | | 2 | Analog input: **REF-I** (0/20mA [b-05=0] or 4/20mA [b-05=1] ) | |
| | | | 3 | it selects the frequency set by the **F-00** parameter | |
| | | | 4 | input from serial line with 0.01 Hz resolution | |
| | | | 9 | motorized potentiometer reference | |
| P-01 | Indicates the max. operation frequency | 50.0 - 480.0<br>[ 50,0 ] (Hz) | The set value is the full scale value for the analog inputs and for the variables of the F menu. | | |

When selecting the analog input, it is possible to change the formula that transforms the reference input signal into the motor supply frequency through the following parameters:

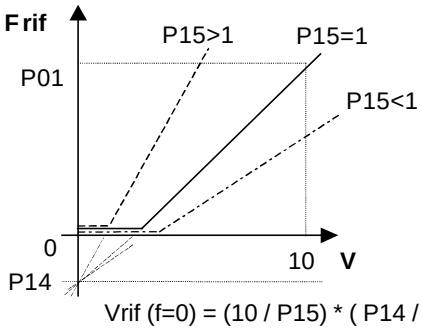
**P-14** determines the minimum frequency (offset); it can assume negative values too.
**P-15** it is a gain multiplicative factor G= P15* (P01-P14)/10.
**b-04** enables the formula reversal (a minimum signal corresponds to a maximum frequency).

**Example:** with P-00 = 1 the reference is the voltage analog signal type 0/10 V:

Direct formula: **b-04=0**




$$Frif = P14 + \left(\frac{(P01 - P14)}{10} * P15\right) * Vrif$$

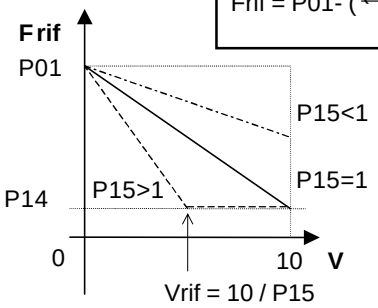



Vrif (f=0) = (10 / P15) * ( P14 / (P14 - P01 ))

Inverse formula: **b-04=1**

with **P14 > 0**

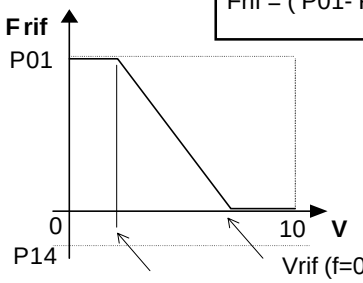
$$Frif = P01 - \left(\frac{(P01 - P14)}{10} * P15\right) * Vrif$$




Vrif = 10 / P15

with **P14 < 0**

$$Frif = (P01 - P14) - \left(\frac{(P01 - P14)}{10} * P15\right) * Vrif$$




Vrif (f=0) = 10 / P15

Vrif (f=P01) = (P14/(P14-P01)) * (10 / P15)

**In any case Frif is always limited between P-73 and P-01.**

By configuring the two digital inputs as frequency switches ( P42=1 and P 43=2), it is possible to recall the frequencies set via the **F** parameters:

| INPUTS | | DESCRIPTION |
|---|---|---|
| In SF1 | In SF2 | P-00 = 0 o P00 = 1 |
| 0 | 0 | the reference frequency is read by the analog input |
| 1 | 0 | the frequency reference is the frequency F-01 |
| 0 | 1 | the frequency reference is the frequency F-02 |
| 1 | 1 | the frequency reference is the frequency F-03 |

**NOTE.**
**in the table:**
**1 means closed contact,**
**0 means open contact;**
**a non-used input is considered as 0.**

## V / F characteristic

| PARAMETER | FUNCTION | RANGE [DEFAULT] | VALUE | DESCRIPTION | ASSOCIATED PARAMETERS |
|---|---|---|---|---|---|
| P-03 | Determines the voltage to be applied to the motor as a function of the frequency | 0 - 4 [ 1 ] | Each parameter value correspond to a different characteristic: | | |
| | | | 0 | user-defined characteristic | P-02 P-04 P-70 P-71 P-72 P-73 P-74 P-84 b-16 b-32 |
| | | | 1 | linear characteristic for 50 Hz motors | P-02 P-04 P-73 P-74 P-84 b-16 b-32 |
| | | | 2 | linear characteristic for 60 Hz motors | |
| | | | 3 | quadratic characteristic for 50 Hz motors | |
| | | | 4 | quadratic characteristic for 60 Hz motors | |

| PARAMETER | FUNCTION | RANGE [DEFAULT] | DESCRIPTION |
|---|---|---|---|
| P-70 | To customize the characteristic: **the change is possible only if P-03 = 0** | (P-71) - 480.0 [ 50.0 ] (Hz) | Selects the motor base frequency (rated); this frequency is associated to the motor max. voltage (max. V set via **P-02** and P74) . |
| P-71 | | 0 - (P-70) [ 25.0 ] (Hz) | Selects the intermediate frequency. |
| P-72 | | 0 - (P-02) [ (**) ] (V) | Selects the voltage applied to the motor as regards the intermediate frequency. |
| P-02 | Selects the max. voltage applied to the motor. Rating value of the motor V. | (P-72) - (**) (V) [ (**) ] | To make this value independent from the inverter supply voltage fluctuation enable the automatic adjustement function of the output voltage by setting **b-32=1**. In this case, the inverter can be supplied through a voltage higher than the motor rated one. If **b-32=0** then the voltage value set by P-02 must match the motor rated voltage. |
| P-04 | Increases the output voltage at 0 Hz (% of P-02) and the torque . | 0 - 30 [ 3 ] | The set voltage increase is added to the V/F characteristic in a decreasing way, until it is annulled at F= Fintermedia. (figure A) |
| P-73 | Selects the freq. applied to the motor at start. | 0 - 25.0 [ 0.0 ] (Hz) | It is the ramp begin frequency at the start and the ramp end frequency at the stop. |
| P-74 | Limits the voltage applied to the motor(% of P-02). | 0 - 100 [ 100 ] | The max. output voltage is limited to the value (**P-74***P-02**)/100. |
| b-16 | Controls the voltage reduction set by P-74 parameter. | 0=always; 1=con. speed only [ 0 ] | If **b-16=0** the reduction is always active; if **b-16=1** the reduction is not active during the ramps, so that the torque is completely available both in acceleration and deceleration state (figure B) |
| P-84 | States the max. speed of voltage change | 0.1 - 25.0 (s) [ 0.2 ] | Time needed to go from 0% to 100% of V and viceversa **NOTE : too short times cause excessive current peaks.** |

**[ (**) ] = The default value depends on the inverter size**.

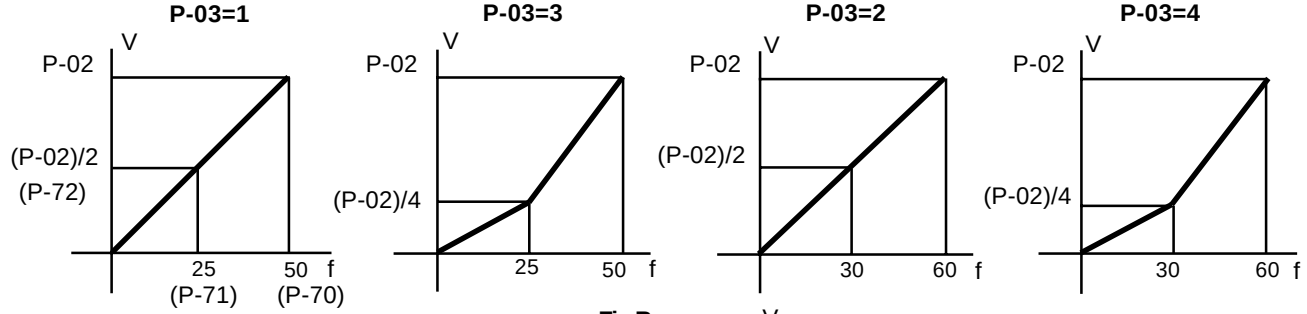



Fig.A

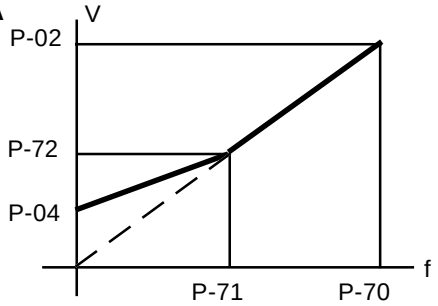
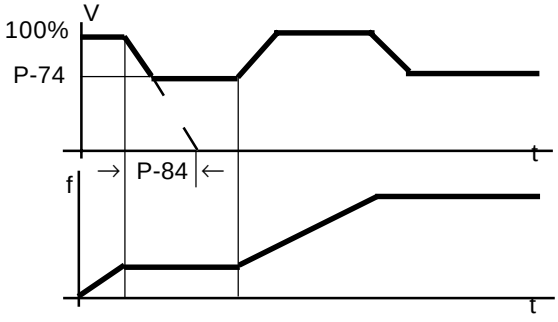



Fig.B



**Freq. jumps - Output freq. limitations - Jogging - Switching freq. - Accel./decel. ramps**

| PARAMETER | FUNCTION | RANGE [DEFAULT] | DESCRIPTION |
|---|---|---|---|
| P-34 | Jump frequency N. 1 | 0.0 - 480.0 [ 0.0 ] (Hz) | Particular inverter frequencies can cause mechanical vibrations. The parameters **P-34 P-35** and **P-36** set two frequency bands which are crossed during the ramp phase but which can not be accepted as a normal frequency. If Fref decreases inside a prohibited area, the inverter uses a frequency set at the limit of the area defined via P-36. Ex.: the interval of the N.1 freq. goes from (**P-34**)-(**P-36**) to (**P-34**)+(**P-36**). **To disable an interval set at 0 Hz the frequency of P-34 or P-35 The two intervals can overlap.** |
| P-35 | Jump frequency N. 2 | 0.0 - 480.0 [ 0.0 ] (Hz) | |
| P-36 | Frequency interval Δf on the left or right of the jump frequency | 0.0 - 100.0 [ 0.0 ] (Hz) | |
| P-37 | Upper limit of the output frequency (% of P-01) | (P-38) - 110 [ 100 ] | The output frequency can be limited independently of the maximum and minimum values defined by parameters **P-01** and **P-14**. The output frequency can exceed the maximum frequency set by **P-01** up to the max. value of 110%. This is done by using the slip compensation function or the speed feedback with the PID regulator. |
| P-38 | Lower limit of the output frequency (% of P-01) | 0 - (P-37) [ 0 ] | |
| b-00 | Selects the sequence followed by the **RUN** and **REV** togheter with the input **Ix-JOG** | 0 = off - 1 = on [ 0 ] | **JOGGING** is a run control to advance the motor by small amounts. It applies preset freq.to the motor via param. **F-08** with acc. and dec. ramps set via param. **P-25, P-26.** It does not allow DC current braking at startup or in stop condition If **b-00 = 0**: RUN = run, REV = reversal, and the input **Ix-JOG** handles the jogging control. If RUN and **Ix-JOG** are simult. enabled the first one enabled will override the other one. If **b-00 = 1**: RUN = forward run, REV = backward run, the **Ix-JOG** enables the jogging control that overrides the normal run control. |
| P-08 | Switching freq. selection (executable with stopped motor only) | 0 - 7 [ 5 ] | 0 = 1kHz; 1 = 2 kHz; 2 = 3 kHz; 3 = 6 kHz; 4 = 9 kHz; 5 = 12 kHz; 6 = 15 kHz; 7 = 18 kHz. High values of the switching frequency reduce or eliminate the electric "noise" generated by the motor; viceversa, low values give a higher rotation fluidity at low speed, especially if high torques are required. |
| b-33 | Dead time comp. | 0 = off - 1 = on [ 1 ] | Dead time compensation: it improves the torque and fluidity actions at low speed. |
| b-36 | It optimises the performance with low rev. if high switch. freq. are used. | 0 = off - 1 = on [ 0 ] | In case of output frequencies below 5 Hz, a 3 kHz switching frequency is automatically selected. |
| P-42 | It configures the IN4 input | 0-15 | In order to use IN 4 and IN 5 as ramp selectors, P-42 and P-43 must acquire the value 5 (selector In T1) and 6 (selector In T2). The input state combined to the selectors In T1 In T2 defines one of the four possible ramp couples |
| P-43 | They configure the IN 5 input | | |
| P-07 | It selects the ramp form | 0.0 = linear 0.1s - 10.0 s= " S " shaped ramp | |
| P-27 | It selects the resolution through which the ramp times are defined | 0 = 0.01 s - 99.99 s 1 = 0.1 s - 999.9 s 2 = 1 s - 9999 s [ 1 ] | |

| In T1 | In T2 | DESCRIPTION |
|---|---|---|
| 0 | 0 | accel./decel.ramp 1 (**P05** = accel. time -**P06** = decel. time) |
| 1 | 0 | accel./decel. ramp 2 (**P21** = accel.time -**P22** = decel. time) |
| 0 | 1 | accel./decel. ramp 3 (**P23** = accel. time -**P24** = decel. time) |
| 1 | 1 | accel./decel. ramp 4 (**P25** = accel. time -**P26** = decel. time) |

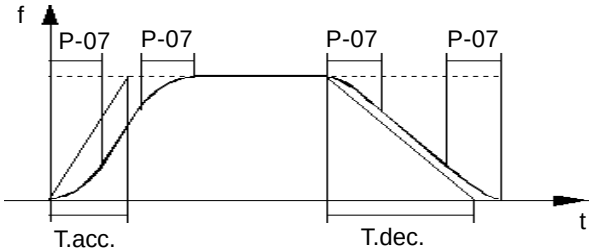
**Note:** a) **1**= closed contact; the controls not used are considered in **0** state**.**

b) When the jogging control **Ix-JOG** is active (page 28), the ramp pair 4 is automatically chosen. The acceleration and deceleration times are necessary to switch from zero Hz to the max. frequency, (P-01), and viceversa.

c) The modification of **P-27** can affect the values entered on **P-01, P-02, P-21, P-22, P-23, P-24, P-25, P-26** so these values must be rechecked.

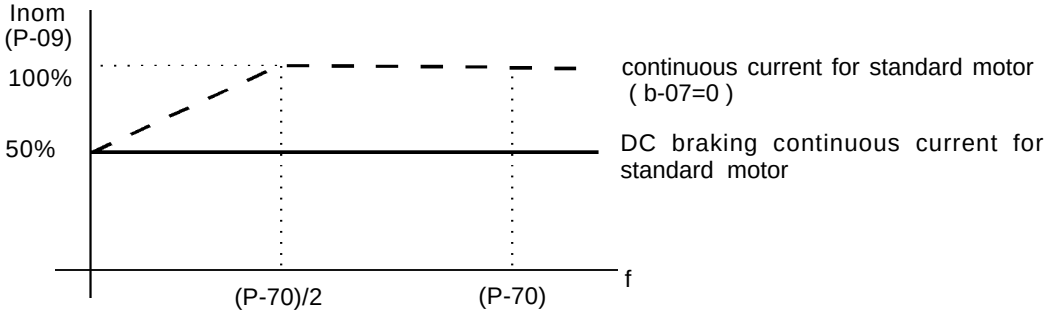
d)**The ramp extension can also be generated if the functions of motor stall and inverter lock are enabled. This actuation is signaled by a flashing GREEN LED and also on terminal board by properly programming OUT1.**

Linear ramps and "S" shaped ramps



## Motor data setting - Motor thermal protection - Prevention of motor stall - inverter lock

| PARAMETER | FUNCTION | RANGE [DEFAULT] | DESCRIPTION |
|---|---|---|---|
| P-09 | Motor rated current ( from the rating) | (20% - 150%) Inom. [ Inom ] (A) | To take advantage of the inverter/motor system features, it is necessary to set the characteristics of the motor used, through the parameters. **P-10** can be calculated, (necessary only if the motor thermal protection function is enabled, par. **b-06**). The higher the value set, the higher the motor capacity of supporting currents higher than the rated one. The value of **P-12** represents the motor phase resistance in case of star connection, or 1/3 of the phase resistance in case of delta connection. To get the proper value of **P-12**, use the function **C-06:** - 1) Use **M** to select the **C** menu ..... ON DISPLAY: C-00 - 2) Use the ⇑, ⇓ keys to select the code C-06 ..... ON DISPLAY: C-06 and press **E:** the code **C-06** is displayed ..... ON DISPLAY: 0 - 3) Use the ⇑, ⇓ keys to select the code 07 ON DISPLAY: 7 and press **E:** the stator resistance is automatically measured. The display will confirm that the operation has been executed .(To see the measured value, read the value of P-12 that, if necessary, can be manually modified). |
| P-10 | Sets the motor thermic constant | 1 - (120) [ 20 ] (min) | |
| P-11 | Motor cos φ (obtained from the rating) | 0.01 - 1.00 [ (**) ] | |
| P-12 | Equivalent stator resistance | 0.0 - 25.0 [ 0.0 ] (Ω) | |
| b-06 | Enables the termal protection of the motor | 0 = off - 1 = on [ 1 ] | **0** = standard motor, not servo-ventilated, at low revolution number not able to support the rated current (derating), the continuous current of DC braking is reduced by 50% (the motor is able to support a continuous current that is 50% of the rated one). **1** = servo-ventilated motor;specify the type of motor used through parameter **b-07.**The level reached by the protection can be read in **d-10,** measured in % of the max. thermic overload allowed for the motor. When this level reaches 100%, the protection trips and the inverter is locked. |
| b-24 | Limits the acceleration current. | | Excessive current or voltage can cause motor stall or inverter lock conditions due to protections tripping.The aim of the parameter is to set thresholds that, when exceeded, trip some actions that limit currents and voltages: **b-24:** if the threshold programmed through **P-77** (in acceleration state and if **f<P-70**, constant torque zone), or through **P-78** (in acceleration state and if **f>P-70**, constant power zone) is exceeded, the ramp is stopped until the current remains over this threshold. **b-25:** if the threshold programmed through **P-79** is exceeded (constant speed operation) the output frequency is reduced at a rate controlled by **P-82;** as soon as I falls below the theshold the frequency start to increase with the selected ramp. **b-26:** the ramp is stopped when the voltage on filter capacitors is near the overvoltage threshold; when the V falls under the threshold the ramp starts again; **NOTE:** the function can be unable to prevent the inverter lock in case of high-inertia loads and short ramps. **b-27:** if the voltage on filter capacitors exceeds the overvoltage threshold, the output voltage is set to zero (corresponding to a coast-to-stop). As soon as the voltage reaches safety levels,a free rotation motor pickup is executed and the deceleration ramp is restarted. **NOTE: too short ramps can lock the inverter by overvoltage.** |
| b-25 | Limits the current at constant speed. | 0 = off - 1 = on [ 1 ] | |
| b-26 | Limits the voltage during deceleration . | 0 = off - 1 = on [ 1 ] | |
| b-27 | Prevents overvoltage. | 0 = off - 1 = on [ 1 ] | |
| P-77 P-78 P-79 | The parameters set the current threshold as a % of Inom | 0 = off - 1 = on [ 0 ] | |
| P-82 | Set the deceleration ramp when **b-25** is active | 20 - 200 [ 170 ] | |
| P-85 | Set max. ref. Df after wich start the ramp state. | 0.1 - 25 [ 0.5 ] ( Hz ) | The parameters allows to distinguish between the acceleration or deceleration state and the constant speed state . In fact, too short accel. ramps asregards the motor capacity, or slight reference variations, either intentional or not, does not mean the motor to be considered in constant acceleration or deceleration. The switching from one state to the other can be controlled through P-85, P-86: **P-85** set the indifference range to reference change as regards the constant speed; **P-86,** instead, set the time after which, starting from ramp completion, the motor is in constant speed state. |
| P-86 | Set the delay after wich the motor is considered in constant speed state. | 0.1 - 25 [ 1 ] ( s ) | |



## Slip compensation - Instantaneous overload signalling - Prevention of short mains blackout - Pickup of motor in free rotation (flying restart) - Automatic boost

| PARAMETER | FUNCTION | RANGE [DEFAULT] | DESCRIPTION |
|---|---|---|---|
| P-32 | Defines value of the motor rated slip (% ) s=(no-nnom)*100/no | 0.0 - 25.0 [ 0.0 ] | The parameters compensate for the motor speed reduction when increasing the applied load (slip), changing the inverter output frequency proportionally to the applied load. **Note**: a too quick response (**P-33** too short) can cause fluctuations in the output frequency. To obtain a good compensation properly set **P-09, P-11, P-12** and if the reference frequency is close to the maximum frequency, it is advisable to set on P-37 a value beyond 100% |
| P-33 | Compensation time constant | 0.0 - 10.0 [ 0.1 ] ( s ) | |
| b-17 | Enable the overload detection function | 0 = off - 1 = on [ 0 ] | The aim of the function which detects the overload is to signal or avoid excessive efforts on the load, causing the istantaneous locking of the inverter and the allarm signalling.<br>The threshold defined by **P-55** is in % of the motor rated load as obtained through parameters **P-09, P-11.**<br>The threshold exceeding can be signalled through terminal board by configuring the **Ox-GTT** output.<br>The parameter **P-12** must be accurately set too.<br>**P-56** Set how long the overload can exceed the tripping threshold before the signalling and the inverter lock functions are enabled |
| b-18 | Select when the detection function is active | 0=always - 1= con. speed [ 0 ] | |
| b-19 | Set the overload locked state | 0 = off - 1 = on [ 0 ] | |
| P-55 | Set the tripping level of the protection | 20 - 200 [ 110 ] ( % ) | |
| P-56 | Set the delay before the protection trip | 0.1 - 25.0 [ 0.1 ] ( s ) | |
| b-28 | Enables the prevention of short mains blackout | 0 = off - 1 = on [ 0 ] | The parameters avoid locking the inverter when a short mains blackout happens.The mains cut off is stated on the display and on the terminal board by configuring one of digital outputs **OUT1**.<br>**Note:on single phase inverter it is advisable to reduce the P-75 value to the minimum to prevent excessive start-up currents. Otherwise it is possible that the inverter locks by undervoltage.**<br>The alarm is always enabled if the voltage falls under a given value that depends on the inverter size; the tripping of the prevention function sets the output voltage to zero, (coast-to-stop). In this way, the filter capacitors are not completely discharged thus keeping the control logic active. As soon as the voltage exceeds the threshold (hysteresis of 6%), a pickup phase of motor in free rotation is performed, thus resetting the speed in force before the tripping. |
| P-75 | Determines the undervoltage protection tripping threshold | 40 - 80 [ 70 ] (% di P-02) | |
| P-76 | Set the max. duration of the short mains blackout before the alarm is enabled | 0.1 - 25.0 [ 1 ] ( s ) | |
| b-29 | Enables the tripping of the motor pickup | 0 = off - 1 = on [ 0 ] | The aim of the pickup function of motor in free rotation is to avoid too high start-up currents generated when, for some causes the inverter cuts the voltage to the motor, then a subsequent run command makes a start from zero Hz with the motor still rotating.<br>This function generates an initial frequency, **b-30**, equal to or higher than the motor one, by gradually increasing, **P-84**, the output voltage to 100 % and controlling that the current does not exceed a preset threshold set by **P-80**, (it is advisable that this value should be slightly higher than the current absorbed by the motor ) otherwise the output frequency would be reduced and the voltage would be limited.<br>The delay between the cut off of the motor voltage and when the motor pickup phase start can be controlled by **P-81** (demagnetization time)**.**<br>The motor is considered frequency-locked when a given frequency is reached so that, at full voltage, the current is under the threshold.The motor can then be accelerated or decelerated until the reference is reached.<br>**b-23** enables the use of a frequency obtained from an encoder as initial frequency for motor pickup.<br>The motor pickup function can be enabled through terminal board by configuring one of the inputs as **Ix-FLY** input. If the Ix-FLY input is active, every time the run control is pressed the motor pickup is performed. |
| b-30 | Selects the initial scanning frequency | 0=ref. freq. 1=max. freq. [ 0 ] | |
| b-31 | Enables the function with the first run control after startup | 0 = off - 1 = on [ 0 ] | |
| P-80 | Sets the max. current threshold during the motor pickup phase | 20 - 200 [ 120 ] (% di Inom) | |
| P-81 | Delay to activate the motor pickup function | 0.01 - 10.00 ( s ) | |
| P-83 | Sets the rate of change of the frequency during the lock search | 0.1 - 25.0 [ 1 ] ( s ) | |
| P-84 | Set the max. rate of change of the voltage | 0.1 - 25.0 [ 0.2 ] ( s ) | |
| b-34 | Enables the automatic boost. | 0 = off - 1 = on [ 0 ] | This function is an alternative to the voltage (and torque) boost obtained through parameter **P-04** (pag. 23).The output voltage is automatically increased as regards the motor and the connected load characteristics. The efficiency of the action depends on the accuracy applied when setting the parameters **P-09, P-11, P-12**.<br>If the programming phase is not performed in the right way, some oscillations may occur. |

## Programmable and non-programmable control inputs

| INPUT TERM.NO. | NAME | FUNCTION | | | | DESCRIPTION |
|---|---|---|---|---|---|---|
| 1 | REV | Se **b-00=0** | Run reversal | Se **b-00=1** | Back. run | Terminals 1, 2, 3, have pre-defined functions; the other five can be configured through parameter **P-42, P-43.**<br>If the forward and backward run controls are simultaneously executed **(b-00=1)** a stop control effect is generated: the rotation reversal is obtained by decelerating, with selected ramp, up to a zero frequency, then accelerating up to the preset reference frequency. |
| 2 | RUN | | Run | | For. run | |
| 3 | EXTFLT | Alarm coming from outside | | | | |
| 4 | IN5 | Configurable digital inputs | | | | |
| 11 | IN4 | | | | | |

Configuration of the configurable digital inputs via: **P-42** ( IN 4 ) and **P-43** ( IN 5 )**:**

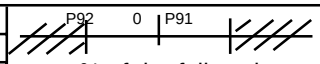
| PARAMETER VALUE | NAME | CONTROL DEFAULT STATE | PERFORMED ACTION | |
|---|---|---|---|---|
| **0** | In RES | Not active | Resets the alarms ( default function for **P-43** on the **IN 5** input) | **NOTE:** If no input is configured to enable (disable) a control, this control is automatically considered as active (inactive) as shown on the column DEFAULT STATE. |
| **1** | In SF1 | " | Reference frequency selectors as set by **F-xx** (page 17) | |
| **2** | In SF2 | " | | |
| **3** | / | / | must not be used | |
| **4** | In JOG | Not active | Jogging control ( default function for **P-42** on the **IN 4** input) | |
| **5** | In T1 | " | Acceleration/deceleration ramp selectors (page 24) | |
| **6** | In T2 | " | | |
| **7** | In DE | Active | Motor output enabling (if disabled, causes a coast-to-stop) | |
| **8** | In DD | Not active | Motor output disabling (if enabled, causes a coast-to-stop) | |
| **9** | In ENB | Active | D.C. braking enabling | |
| **10** | In DCB | Not active | D.C. braking control | |
| **11** | In FLY | Not active | Enables the motor pickup function in free rotation (flying restart) | |
| **12** | In INC | Active | Enables the ramp execution | |
| **13** | In DEC | Not active | Enables the ramp deceleration till zero Hz | |
| **14** | In PID | Active | PID regulator enabling | |
| **15** | In P12 | Not active | Selector of PID regulator coefficients | |
| **16** | In IM | " | Motorized potentiometer value increase | |
| **17** | In DM | " | Motorized potentiometer value decrease | |

The combined parameters, corresponding to single controls, are active through the following actions:

| PARAMETER | FUNCTION | VALUE [DEFAULT] | DESCRIPTION |
|---|---|---|---|
| b-01 | Sets stop condition | 0 | The control causes a ramp deceleration up to zero Hz |
| | | 1 [0] | The control cuts off the voltage to the motor so that it coasts-to-stop |
| b-02 | Enables motor reversal | 0 | Disables the control for motor rotation reversal |
| | | 1 [1] | Enables the control for motor rotation reversal |
| b-03 | Safety | 0 | The safety command for run control is disabled |
| | | 1 [1] | Enables the safety command for run control (*) |
| b-08 | Set the state of external alarm IN Set | 0 | Sets the input as normally open (N.O.).The contact closure generates the alarm state |
| | | 1 [0] | Sets the input as normally closed (N.C.).The opening generates the alarm state |
| b-09 | external alarm action | 0 | The alarm state caused by EXTFLT locks the inverter (released only through a reset) |
| | | 1 [0] | The alarm state caused by EXTFLT disables the motor while the control is active |
| b-10 | External alarm detection mode | 0 | Allows the inverter to detect the external alarm at any moment |
| | | 1 [0] | Allows the inverter to detect the external alarm only if the motor is running |
| b-11 | Extern. alarm reset management | 0 | If EXTFLT causes the inverter lock, a manual reset only can be executed |
| | | 1 [0] | If EXTFLT causes the inverter lock, an automatic reset can be executed if **b-12=1** |
| b-39 | Term. board control management | 0 | Ignores the controls from terminal board (except **EXTFLT**, **Ix-DE**, **Ix-DD**) |
| | | 1 [1] | Enables the control from terminal board |

**(*)** If the "Safety" command is active, the inverter, before starting, has to detect a switching from a non-active to an active state of the run command.

## Relay output (OUT-1) - Dynamic braking

| P-44 Value | Function name | Event displayed by the digital output ( active output ) | | | Notes |
|---|---|---|---|---|---|
| **0** | Out OK | Inverter in ready state | | | The available output on relay (OUT1) terminals 16,17,18 can be configured, via the meanings listed in the table, through the parameter **P-44**. **The output is active when the event listed in the table occurs.** |
| **1** | Out AL | Inverter in alarm state | | | |
| **2** | Out RUN | The motor is running | | | |
| **3** | Out STP | The motor is not running | | | |
| **4** | Out REV | Counter-clockwise rotation (in the opposite case, the output is not active) | | | |
| **5** | Out STD | Inverter in steady state (end of ramp) | | | |
| **6** | Out RMP | Ramp in progress | | | |
| **7** | Out EQF | Output frequency **=** programmed frequency **P-53,** with hysteresis **P-54** | | | |
| **8** | Out NEF | Output frequency **≠** programmed frequency **P-53**, with hysteresis **P-54** | | | |
| **9** | Out GTF | Output frequency **>** programmed frequency **P-53**, with hysteresis **P-54** | | | |
| **10** | Out LTF | Output frequency **<** programmed frequency **P-53**, with hysteresis **P-54** | | | |
| **11** | Out RN1 | Ramp end (disabled when the output freq. is **<** programmed freq. **P-53**) | | | |
| **12** | Out RN2 | Output frequency **<** programmed frequency **P-53** (disabled at ramp end) | | | |
| **13** | Out UV | Undervoltage with running motor (not depends from short mains blackout) | | | |
| **14** | Out GTT | Output torque **>** the torque set via **P-55** | | | |
| **15** | Out IL | In case of ramp extension for limitation of: | | current | |
| **16** | Out VL | | | voltage | |
| **17** | Out IVL | | | current or voltage | |
| **18** | Out FLY | When the motor pickup occurs | | | |
| **19** | Out BRK | The dynamic braking circuit is faulty | | | |
| **20** | Out CFI | The cos φ sign is negative | | | |
| **21** | Out ERP | the PID regulator error is | > (**P-91**) e < -(**P-92**) |   | |
| **22** | Out EPP | | > (**P-91**) | | |
| **23** | Out EPN | | < -(**P-92**) | as a % of the full scale | |
| **24** | Out ERP(*) | the PID regulator error is | > (**P-91**) e < -(**P-92**) | as a % of the full scale | **(*) Means that during start-up the outputs are inactive:** the outputs will be active not before that the PID regulator error comes into the tolerance limits at least once**.** |
| **25** | Out EPP(*) | | > (**P-91**) | | |
| **26** | Out EPN(*) | | < -(**P-92**) | | |
| 27 | Out ERV | not used | | | |
| 28 | Out EFW | | | | |
| 29 | Out EST | | | | |
| 30 | Out ERN | | | | |
| **31** | Out EF | States the intervention of external alarm | | | |
| **32** | Out EFN | Denied value of Out EF | | | |
| **33** | Out SIU | Detects the current signal in the U phase | | | |
| **34** | Out SIV | Detects the current signal in the V phase | | | |
| **35** | Out SIW | Detects the current signal in the W phase | | | |

## Dynamic braking

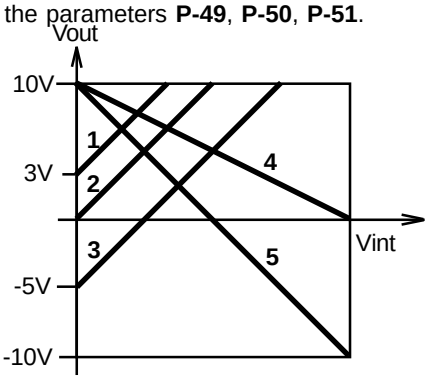
| Para meter | Function | Value [ Default] | Description |
|---|---|---|---|
| b-20 | Thermic protection of the braking resistor | 0 = off 1 = on [ 0 ] | **b-20=1** enables the thermic protection of the braking resistor**.** The protection efficiency depends on the accuracy of parameters **P-62, P-63, P-64.** The reached protection level can be displayed through parameter **d-11**,expressed in %. When the level reaches 100%, the protection locks the inverter. During the braking phase, in case of shortcircuit of the inner braking device, the corresponding signalling can be displayed through terminal board by properly configuring the **Ox-BRK** output. The only action to be performed in case of shortcircuit is to cut the inverter supply off. |
| P-62 | Ohmic value of the braking resistor (Ω) | 1 - 250 [ (**) ] | |
| P-63 | Resist. power of the braking resistor (W) | 10 - 2500 [ (**) ] | |
| P-64 | Thermic constant of the braking resistor (s) | 5 - 1250 [ (**) ] | **NOTE: The wiring terminals of the braking resistor are NOT short circuit PROTECTED or protected by improper value (lower than minimum expected) of the resistors used : in these cases the inverter will be permanently damaged.** |

## Analog output (OUT-AN ) - Direct current braking

| P-48 VALUE | TYPE AND MEANING OF THE ANALOG OUTPUT |
|---|---|
| **0** | Voltage proportional to the output frequency; full scale value set by **P-01**. |
| **1** | 10V-amplitude square wave with frequency equal to the output frequency. |
| **2** | 10V-amplitude square wave with frequency twice the output frequency. |
| **3** | Voltage proportional to the output current; the full scale value is twice the rated I. |
| **4** | Voltage proportional to the output voltage; full scale value set by **P-02**. |
| **5** | Analog voltage proportional to the output torque (positive only); the full scale value is twice the rated T. |
| **6** | Analog voltage proportional to the output torque (absolute value);the sign can be obtained by one of the digital outputs. |
| **7** | Analog voltage proportional to the output power (positive only); the full scale value is twice the motor rated power |
| **8** | Voltage proportional to the output power (absolute only);sign obtainable by one of the digital outputs; the full scale value is twice the motor rated power. |
| **9** | Voltage proportional to the output cos φ (only positive); the full scale value is 1 |
| **10** | Voltage proportional to the output cos φ (absolute value); the sign can be obtained by the digital output. |
| 11 | /not used |
| **12** | Voltage proportional to the reference frequency |
| **13** | Voltage proportional to the current in the U phase |
| **14** | Voltage proportional to the current in the V phase |
| **15** | Voltage proportional to the current in the W phase |
| **16** | Voltage proportional to the active current I*cos φ |
| **17** | Voltage proportional to the magnetizing current I*sen φ |

**NOTES**

The output voltage at terminal N.° 12 of the control terminal board can vary between 0 and 10V. The meaning assumed by this voltage depends on the value assigned to parameter **P-48.** The value of the voltage can be changed by properly programming the parameters **P-49**, **P-50**, **P-51**.

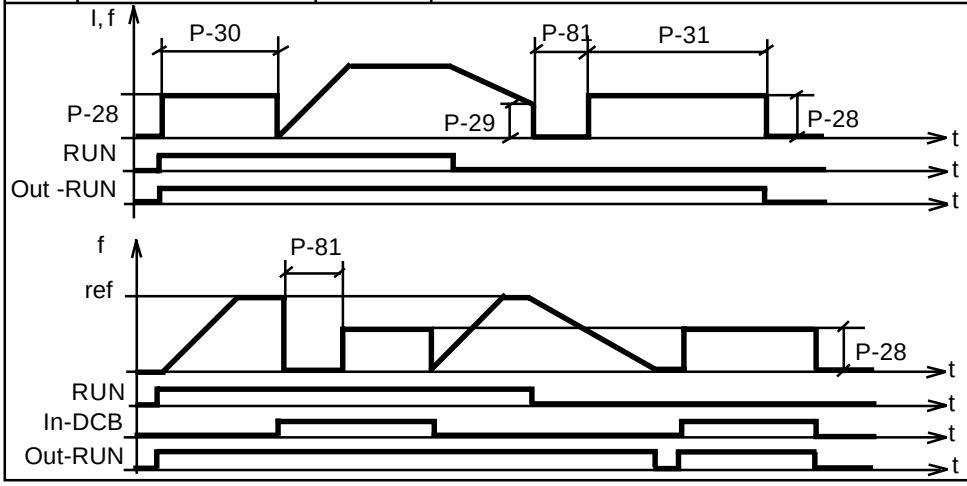



**1:** offset (**P-49**) = 3; gain (**P-50**) = 1
**2:** offset (**P-49**) = 0; gain (**P-50**) = 1
**3:** offset (**P-49**) = -5; gain (**P-50**) = 1
**4:** offset (**P-49**) = 10; gain (**P-50**) = -1
**5:** offset (**P-49**) = 10; gain (**P-50**) = -2

| PARA METER | FUNCTION | VALUE [DEFAULT] |
|---|---|---|
| P-49 | Adds a variable offset to the signal chosen by **P-48** | - 9,99 / +9,99 [ 0,00 ] ( V ) |
| P-50 | Controls the gain of the analog output | - 9,99 / +9,99 [ 1,00 ] |
| P-51 | Changes the time constant of the analog output filter | 0,00 / 2,50 [ 0,00 ] ( s ) |

$$Vout = 10 \left[ \left( \frac{Sint}{Sfsc} \right) (\textbf{P-50}) + (\textbf{P-49}) \right]$$

| PARA METER | FUNCTION | VALUE [DEFAULT] | DESCRIPTION |
|---|---|---|---|
| P-28 | D.C. braking level (% of P-09) | 0 - 100 [ 0 ] | Defines the D.C. value expressed in % of **P-02** from which the value of the braking current depends. |
| P-29 | Limit frequency below which the braking is forced (Hz) | 0,0 / 480,0 [ 0,0 ] | Defines the frequency below which the decel. ramp is locked and the braking current is forced. Before forcing the current, Vout is set to zero for a time defined by parameter **P-81** (demag. time). |
| P-30 | Set the braking duration at start-up (s) | 0,0 / 60,0 [ 0,0 ] | Defines the braking duration at start-up; if **P-30 = 0** → no braking is made at startup. |
| P-31 | Set the braking duration in stop phase (s) | 0,0 / 60,0 [ 0,0 ] | Determines the braking duration in stop phase; if **P-31 = 0** → no braking is made in stop phase. |




The aim of D.C. braking is to keep the motor locked in a fixed position, it is not an alternative to the ramp deceleration. The D.C. braking consist in forcing a direct current that depends from the voltage set by **P-28** and the electrical characteristics of the motor into a motor phase.
With D.C. braking, the deceleration time is shorter than in case of coast to stop. Sometimes, at start-up, it may be useful to lock the motor for a preset time before starting the acceleration ramp.
The function can also be enabled or disabled through terminal board by configuring one of the programmable inputs (**Ix-ENB**) as a control.
It is always possible to force a direct current on the motor, independently of the values assumed by the parameters, by configuring one of the terminal board programable inputs (**Ix-DCB**) as control of D.C. braking.
During the D.C. braking, at parameter **d-00** the display shows the message " **dcb** " instead of the frequency.

## PID regulator

| PARA METER | FUNCTION | VALUE [DEFAULT] | DESCRIPTION |
|---|---|---|---|
| b-40 | PID regulator enabling | 0 = off 1 = on [ 0 ] | The regulator is active with running motor only. |
| b-41 | Disables the regulator in ramp phase | 0=off 1=on [ 0 ] | **1** interrupts the regulator action during the ramp phase. |
| b-42 | / | | |
| b-43 | Select the controlled parameter | 0=frequency 1=voltage [ 0 ] | **0:** the regulator controls the output frequency; full scale value defined by **P-01**; **1:** controls the output voltage; full scale value defined by **P-02**; |
| b-44 | Reverts the error sign | 0 = off 1 = on [ 0 ] | The sign of the error signal between reference and feedback is reversed (and the adjustment effect too). |
| b-45 | Regulation mode | 0=direct 1=sum (feed/forw) [ 0 ] | **1:**the reg. output is added to the freq. reference value or to the voltage value provided by the V/F characteristic; **0:** the output act as set by **b-43**. |
| b-46 | Suppress the regulator positive output | 0 = off 1 = on [ 0 ] | Limits the regulator output in the positive direction; **0** allows the output to assume positive values too. |
| b-47 | Suppress the regulator negative output | 0 = off 1 = on [ 0 ] | Limits the regulator output in the negative direction; **0** allows the output to assume negative values too. |
| b-48 | Suppress the integral term | 0 = off 1 = on [ 0 ] | Allows the integral term to match the limits set to the output by **b-46** and **b-47.** |
| b-49 | Initialisation of the integral term at start-up | 0 = off 1 = on [ 0 ] | Allows the initialization by means of the run control. **NOTE:** this could cause a very slow response of the regulator, even with high gains. |
| P-90 | PID reference (%) | 0.0 - 100.0 [ 0.0 ] | The reference value is derived through the setting of the selector parameters shown on the following table. |
| P-91 | PID maximum positive error (%) | 0.1 - 100.0 [ 5.0 ] | Defines the max. positive excursion of the regulator error expressed in % of the full scale value. |
| P-92 | PID maximum negative error (%) | 0.1 - 100.0 [ 5.0 ] | Defines the max. negative excursion of the regulator error expressed in % of the full scale value |
| P-93 | PID update time(s) | 0.00(=0.005s) - 2.50 [ 0.00 ] | Defines the regulator update time. |
| P-94 | Proportional term gain Kp1 | 0.00 - 99.99 [ 0.00 ] | set N. 1 |
| P-95 | Integral action time Ti1 | 0.00 - 99.99 [ 99.99 ] | |
| P-96 | Derivative action time Td1 | 0.00 - 99.99 [ 0.00 ] | |
| P-97 | Proportional term gain Kp2 | 0.00 - 99.99 [0.00 ] | set N. 2 |
| P-98 | Integral action time Ti2 | 0.00 - 99.99 [ 99.99 ] | |
| P-99 | Derivative action time Td2 | 0.00 - 99.99 [ 0.00 ] | |

The regulator enabling and the coefficients selection can be made through terminal control board by configuring two out of the five control inputs as **Ix-PID** and **Ix-P12** input respectively:
**Ix-PID = 1** the PID regulator is controlled from the terminal board.
**Ix-P12 = 1** selects the coefficient set N. 1; **0** refers to set 2.
When enabling the regulator or changing the coefficients set, the integral term is used according to the present output and coefficients, by taking into account possible limits applied to the output and to the integral term; this avoid sudden output changes ("bumpless" operation).
If the coefficient change occurs when the error is significant, the system response speed is affected by the integral action weight, as the proportional and derivative term weight is compensated by the integral term.
A max. tolerance interval can be defined for the error that, if exceeded, actuates a signalling available on the terminal board by properly configuring one of the digital output **OUT1.**
The error tolerance control is enabled when the error falls within the preset interval for the first time (P91 and P92 ) such a condition can be displayed via P46= 21,22, 23. During start-up transient (that is: not before the regulator error falls within the tolerance limits at least once), it is possible to disable the outputs through **P-46** value 24, or 25, or 26. The possible sign reversal made by setting **b-44=1** has no importance for tolerance control.
The out-of-tolerance signalling available on the digital outputs can be enabled when exceeding one of the two limits (**Ox-ERP**), or the positive (**Ox-EPP**) or negative (**Ox-EPN**) limit only.
To facilitate the parameters setting, the following items can be displayed:

| | |
|---|---|
| reference signal: | code **d-22** on display, |
| feedback signal: | code **d-23,** " |
| error: | code **d-24**, " |
| integral component: | code **d-25**, " |
| output: | code **d-26,** " |

**NOTE:** The integral term is set to zero if the integral action time is set to the max. value, i.e. 99.99. The derivative term is null if the derivative action time is set to zero.

| | feedb. switches | | |
|---|---|---|---|
| | b-55 | b-54 | b-53 |
| set at 0 | **0** | 0 | 0 |
| / | 0 | 0 | 1 |
| / | 0 | 1 | 0 |
| REF-V | **0** | 1 | 1 |
| REF-I | **1** | 0 | 0 |
| I out (10V=2*Inom) | **1** | 0 | 1 |
| T out (10V=2*Tnom) | **1** | 1 | 0 |
| P out (10V=2*Pnom) | **1** | 1 | 1 |

| | ref. switches | | |
|---|---|---|---|
| | b-52 | b-51 | b-50 |
| ref. frequency | 0 | 0 | 0 |
| / | 0 | 0 | 1 |
| / | 0 | 1 | 0 |
| REF-V | 0 | 1 | 1 |
| REF-I | 1 | 0 | 0 |
| **P - 90** parameter | 1 | 0 | 1 |
| freq. downstr.r. gen. | 1 | 1 | 0 |
| set at 0 | 1 | 1 | 1 |

## Reset - Autoreset - Protections and alarms

| FUNCTION | DESCRIPTION |
|---|---|
| **Reset** | **Operation to be executed when the inverter is in alarm state. Three possibilities are available:**<br>a) Keyboard reset:<br>simultaneously press the ⇑ and ⇓ keys; the action will have effect when the keys are released.<br>b) Terminal board reset:<br>it can only be performed if one of the programmable control inputs has been configured as **Ix-RES**. In this case, the reset operation is enabled when switching from active to inactive control.<br>c) Cut the inverter supply off<br>wait until it is completely off, supply the inverter again. |
| **Autoreset** | As an alternative to manual reset, this function allows an automatic restart in case of lock due to protection tripping. It can only be enabled if the lock is due to: overcurrent, overvoltage, undervoltage, momentary overload, external alarm (**b-11**) and is controlled by the parameters defined on the following table: |

| PARAMETER | FUNCTION | VALUE [DEFAULT] | DESCRIPTION |
|---|---|---|---|
| b-12 | Autoreset enabling | 0 = off 1 = on [0] | In case of lock, it automatically restarts the inverter. |
| b-13 | Enable autoreset attempts limitation | 0 = off 1 = on [0] | Allows to limit the number of attempts made by the inverter to execute the autoreset. |
| b-14 | Enable the automatic set at zero the number of attempts | 0 = off 1 = on (10min.) [0] | Sets to zero the number of attempts performed, if no further locks occur within 10 min. |
| b-15 | Set the state of the alarm contact during the autoreset. | 0 = off 1 = on [1] | During autoreset, it disables the lock signalling contacts on the terminal board if allowed, through parameter setting, to perform the alarm function. |
| P-57 | Delay to start the autoreset function (s) | 0.1 - 60.0 [5] | Defines the time, as regards the lock enabling moment, after which the autoreset (restart) is executed. |
| P-58 | Set the max. number of restart attempts | 1 - 250 [1] | Sets the max. number of restart attempts after which the inverter remains in lock state. To restart, execute a manual reset. |

| CODE ON DISPLAY | FUNCTION | DESCRIPTION | CODE |
|---|---|---|---|
| C .Err | **Full lock** | Configuration memory error. It is enabled at inverter startup if the configuration memory is not working properly. To avoid this, try to turn the inverter off and restart it after some minutes. | |
| P .Err | | Parameter memory error. It is enabled if the memory contains inconsistent parameters. Causes: accidental loss of parameters (turning off during storage phase), memory failure. In case of accidental loss: turn the inverter off and restart it after some minutes. The factory-preset parameters will be stored. | |
| EF | **Lock that can be reset** ( alarm contact enabling and storage of alarm type, the display is flashing) | External protection: enabled by the EXTFLT input on terminal board. Autoreset can be enabled only if parameter **b-11=1.** | 1 |
| OC | | Overcurrent protection: enabled when the output current exceeds, even momentary, the max. allowed threshold to protect the inverter. It signals shortcircuits between phases and to ground too. | 2 |
| OU | | Overvoltage protection: enabled when the voltage at the filter capacitor ends exceeds the max. programmed threshold to protect the inverter. | 3 |
| UU | | Undervoltage protection: enabled when the voltage at the filter capacitor ends falls below the min. threshold programmed to avoid troubles due to torque reduction. Autoreset is allowed. If **b-37=0**, the alarm storage is disabled. | 4 |
| OH | | Overtemperature protection: enabled when the heat sink temperature exceeds the max. threshold programmed to protect the inverter. Autoreset is not allowed. | 5 |
| OL I | | Inverter overload protection: enabled when the direct current exceeds the max. threshold for the max. allowed time (**IxT**) to protect the inverter. Autoreset is not allowed. | 6 |
| OLn | | Motor overload protection: enabled when the direct current exceeds the max. threshold for the max. allowed time ($I^2xT$), to protect the motor. The levels and times depend on setting of the motor characteristic data. Autoreset is not allowed. | 7 |
| OLr | | Braking resistor overload protection: enabled when the power dissipated by the braking resistor exceeds the max. threshold for the max. allowed time. The levels and times depend on setting of the resistor characteristic. Autoreset is not allowed. | 8 |
| Ot | | Protection for momentary motor overload: it is active, after enabling (**b-17=1**), when the torque delivered by the motor exceeds the programmed level for the preset time, to protect the connected mechanical parts or the worked material. | 9 |
| FU | | Fuse breakage protection: enabled in case of inner fuse breakage. Autoreset is not allowed. | 11 |

Note: code 10 is not used

## Serial line

**DESCRIPTION**

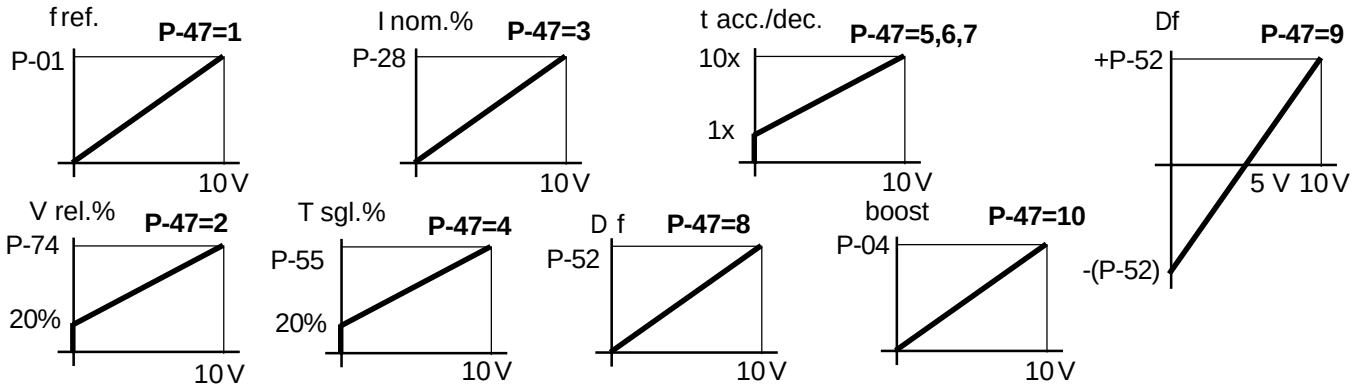
The inverter can communicate with a remote controller through a RS-485 2-wire serial line. In this case, the inverter behaves like a "slave", i.e. it answers on special controller request only (master). Up to 32 inverters can be parallel connected with addresses set between 1 and 99 through **P - 68**.
The address **99** is a specialized one since it is expected that it will be used when it is necessary to send a code to all inverters simultaneously; in this case the reception of the code is assured to all inverters regardless of the individual address, the acknowledgement will be made only from the inverter with address 99.
The serial line allows to read and write all the parameters, forcing the various controls by replacing the keyboard or the terminal board, or forcing the I/O as in a PLC. The parameters involved are:

| PARAMETER | FUNCTION | VALUE [DEFAULT] | DESCRIPTION |
|---|---|---|---|
| P-65 | Enables the input control via serial line | 0 - 255 [ 0 ] | The parameter value is a decimal equivalent of the current value of the 8 bit input register **SX8** (see the serial comunication handbook) |
| P-66 | Enables the output control via serial line | 0 - 15 [ 0 ] | The parameter value is a decimal equivalent of the current value of the 8 bit ooutput register **SX8** (see the serial comunication handbook) |
| P-67 | Defines the transmission param. | 0 - 19 [ 1 ] | See the following table |
| P-68 | Assign an address to each inverter | 0 - 99 [ 0 ] | Assign the unique address between 0 - 99 to each inverter |
| P-69 | Set the response delay time of the inverter | 0 - 250 [ 1 ] ( ms ) | The delay time between the receipt of the comand and the emission of the answer |
| b-39 | Enables the terminal board control | 0 = off 1 = on [ 1 ] | The scope of the parameter is to disable the control of the inverter from the terminal board to avoid conflicts with the serial line. |
| P-89 | Serial link time-out | 0,0-25,0 [ 0,0 ] | If set at 0,0 it disables the function |

| P-67 VALUE | BAUD RATE | DATA BIT | PARITY | STOP BIT | P-67 VALUE | BAUD RATE | DATA BIT | PARITY | STOP BIT |
|---|---|---|---|---|---|---|---|---|---|
| 0 | 9600 | 7 | even | 1 | 10 | 2400 | 7 | no | 2 |
| 1 | 9600 | 7 | odd | 1 | 11 | 2400 | 8 | no | 1 |
| 2 | 9600 | 7 | no | 2 | 12 | 1200 | 7 | even | 1 |
| 3 | 9600 | 8 | no | 1 | 13 | 1200 | 7 | odd | 1 |
| 4 | 4800 | 7 | even | 1 | 14 | 1200 | 7 | no | 2 |
| 5 | 4800 | 7 | odd | 1 | 15 | 1200 | 8 | no | 1 |
| 6 | 4800 | 7 | no | 2 | 16 | 19200 | 7 | even | 1 |
| 7 | 4800 | 8 | no | 1 | 17 | 19200 | 7 | odd | 1 |
| 8 | 2400 | 7 | even | 1 | 18 | 19200 | 7 | no | 2 |
| 9 | 2400 | 7 | odd | 1 | 19 | 19200 | 8 | no | 1 |

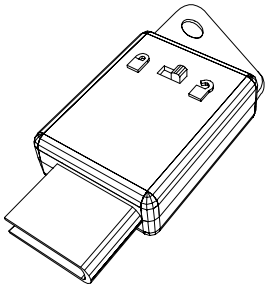
**Auxiliary analog input ( AUX-V ) - Analog output (OUT-AN )**

| P-47 VALUE | ACTION PERFORMED | |
|---|---|---|
| 0 | No action | **Note**:The action generated by the analog voltage, variable from 0 and 10 V, applied to terminal 14 depends on the value assigned to parameter **P-47.** |
| 1 | Frequency reference (active if **InSF1**=on, **InSF2**=off); the frequency changes in a linear way from 0 Hz to **P-01**. | |
| 2 | Adjusts the output voltage reduction by a proportional value ranging between 20% and **P-74**. | |
| 3 | Adjusts the braking direct current, whose level proportionally changes between 0 and **P-28**. | |
| 4 | Sets the torque threshold; the threshold value proportionally changes between 20 and **P-55**. | |
| 5 | Extension factor of acceleration/deceleration ramps; proportionally changes between 1 and 10. | |
| 6 | Extension factor of acceleration ramps only; proportionally changes between 1 and 10. | |
| 7 | Extension factor of deceleration ramps only; proportionally changes between 1 and 10. | |
| 8 | Changes the frequency reference in a positive way only: to the reference is added a frequency that proportionally changes between 0 and **P-52**.. | |
| 9 | Changes the frequency reference: to the reference is added a frequency that proportionally changes between **-P-52** and **+P-52**. | |
| 10 | Adjusts the boost level; the level proportionally changes between 0 and **P-04**. | |
| 11 | Gain of the frequency reference ( **In-Analog**) | |



*ACCESSORIES*

***Programming key* [ code QUIXPRG ]**



The programming key device allows to transfer parameters from and to the QUIXDrive inverter or between inverters.
The data are stored in a $E^2$PROM type memory, so battery backup is not necessary.
The switch put on the key upper front side allows to protect the stored data against possible writing procedures. To copy the data from an inverter to the key or viceversa the keypad panels are used.

***Programming key: Use method***

***- Parameter transmission from the key to the inverter:***

- plug the key into the suitable connector ( see page 36)
- select, via the keypad, the **C - 04** parameter**,** choose the code **7** and press **E**

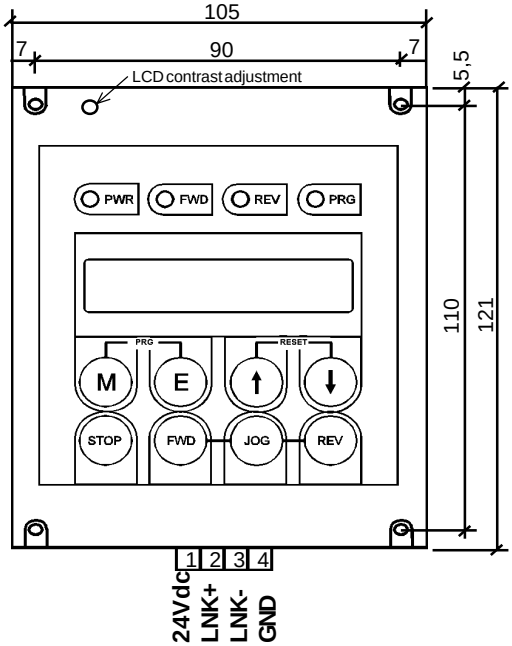
If the key contains invalid parameters, the factory-preset parameters will be used and the message " Err", will be displayed for 4 sec. Otherwise, data will be permanently stored and the confirmation message " donE" will be displayed for 2 sec.

***- Parameter transmission from the inverter to the key:***

- plug the key into the suitable connector ( see page 36)
- select, via the keypad, the **C - 05** parameter**,** choose the code **7** and press **E**

If the key is write-protected, the control is interrupted and the message " oFF" is displayed for 4 sec. Otherwise, the inverter parameters are stored on the key and, at the end of the operation, the message " donE" will be displayed for 2 sec. to confirm the operation.

***Remote terminal* [ code QUIXREM ]**




The remote terminal allows the connection to the inverter, QUIXDrive single phase series, through a 2-wire RS 485 serial line with a programmable Baud Rate.
The serial connection allows the remote terminal to control up to 32 inverter.
The remote terminal supply needs +8/+24 Vdc, available on the terminal board .
Operator interface :

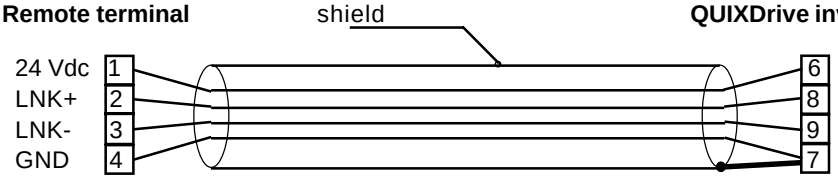
- 16 character LCD alphanumeric display, possibly backlighted.
- 8 keys to program and control the inverter. The STOP, FWD, JOG, and REW keys performs the direct operation of run and stop of an inverter enabled to do so.
- 4 signalling Led .

A 4-wire terminal block is provided to link the remote terminal to inverters .

(For the detailed instructions see the specific handbook)

- ***Wiring the Remote Terminal:***

Correspondence between the terminals of the Remote Terminal and those of the inverter control circuit:




The inverter and remote terminal factory-preset parameters are in a position to grant the correct link working.

The QUIXDrive inverters are designed in accordance to all provisions of the **89 / 336 / EEC Directive** and **CE** Marking requirements.

The aim of the Directive is to avoid the products causing harmful interference and, at the same time, to ensure that the products will perform adequately and safely under electromagnetic interference.

The QUIXDrive inverters are electrical equipments designed to control the speed of A.C. motors and they can be installed in cabinets or inside a machinery.

The QUIXDrive inverters can be powered by an industrial AC mains source or by a residential one, but the inverter is not to be considered as a household tool; therefore it cannot be installed near other household appliances.

The end user is responsible, when installing the inverter, for the compliance with the EMC directives.

If the indicated prevention measures are implemented, the inverter can be normally installed withouth problems concerning EMI.

Standard or norms which QUIXDrive inverters are compliant to:

**- Immunity**

| | | | | | |
|---|---|---|---|---|---|
| **IEC 801 - 2** | electrostatic discharge | 8 kV contact<br>14 kV in air | **IEC 1000 - 4 - 3** | high frequency EM fields | 10 V/m |
| | | | **IEC 1000 - 4 - 5** | surge phase to phase | 1 kV |
| **IEC 801 - 4** | burst on power supply cables | 4 kV 5 kHz | | surge phase to ground | 2 kV |
| | burst on control cables (capacitive coupling) | 2 kV 5 kHz | **IEC 1000 - 4 - 8** | 50 Hz EM field | 200 A/m |
| **IEC 801 - 4** | burst on connection cables keyboard QUIX-TST, QUIX-REM (capacitive coupling) | 2 kV 5 kHz | | | |

**- High frequency emissions**

**- Voltage disturbance on power supply cables:**

The inverters belonging to the QUIX V (all versions) and QUIX F (versions QUIXF-2M-....-A) series are supplied with an internal filter according to the **EN 55011 (CISPR11) class A** in the frequency range 150 kHz ÷ 30 MHz.

The compliance to the **EN 55011 (CISPR11) class B** requires:
a) the use of an external filter (see table) to be connected in series to power supply the cables
b) the connections between inverter-motor, and inverter-supply system must be shielded
c) a toroid must be put on each cable

**- EM emitted disturbance:**

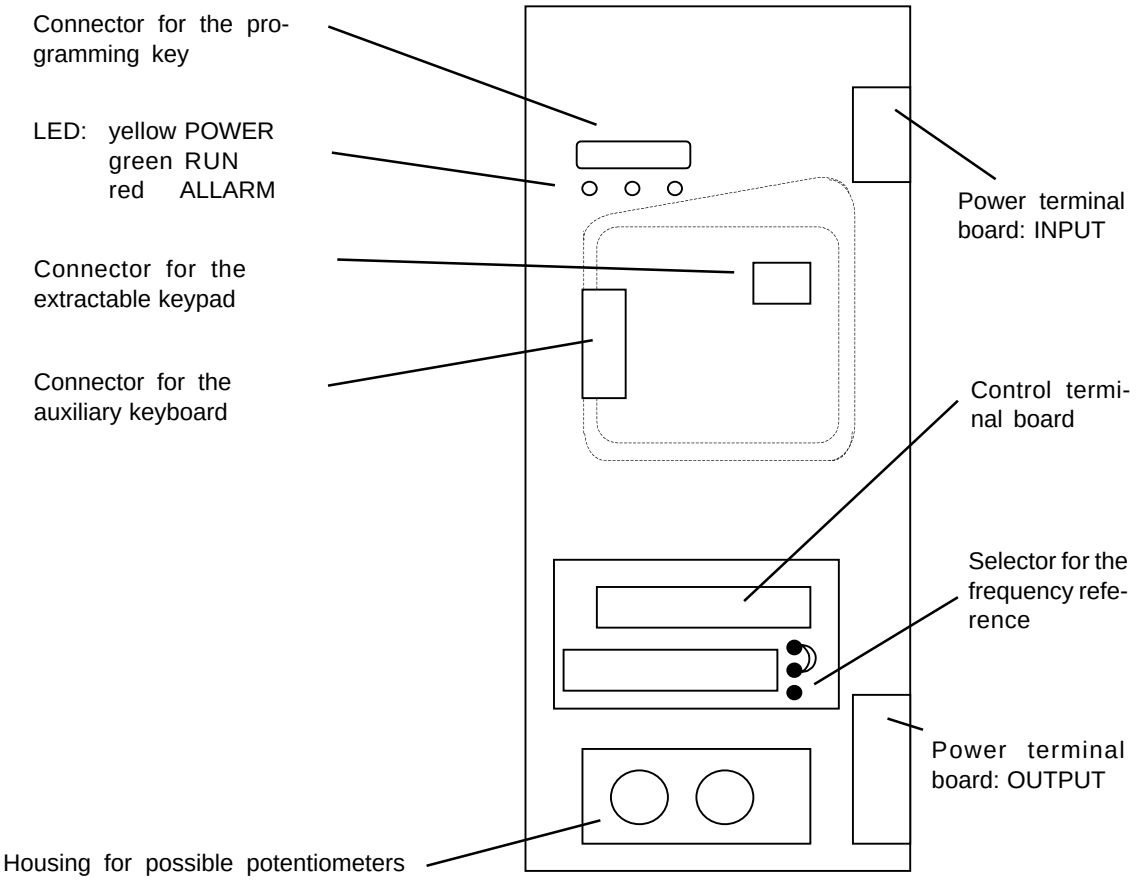
As for this parameter:

- those devices with an internal filter (versions : QUIXF-2M-....-A , QUIXV-2M-....) are compliant to **EN 55011 (CISPR11) group 1 class A** in the following frequency range: 30 MHz, 1 GHz.

- the devices supplied with an external filter (see table) are compliant to **EN 55011 (CISPR11) group 1 class B** in the following frequency range: 30 MHz, 1 GHz.

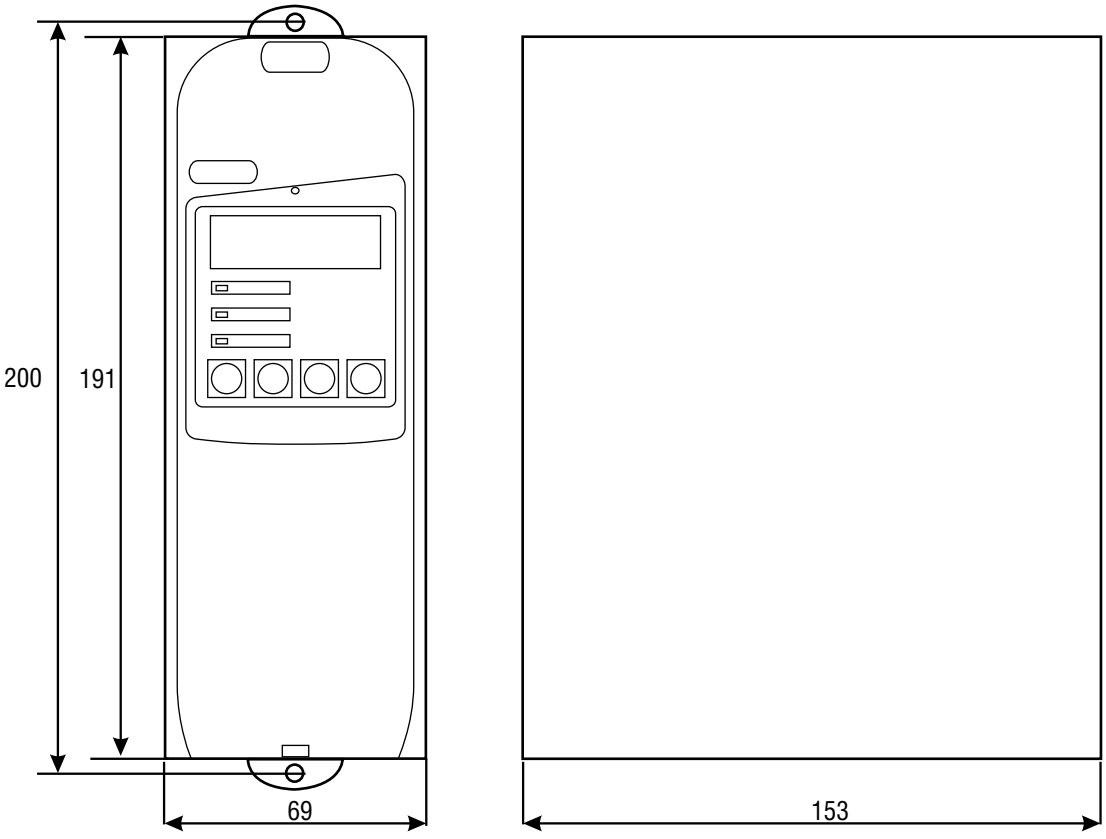
| Model | Filter | |
|---|---|---|
| | Type | Code |
| QUIX..-2M-0004 | FF 0,75-Q2 | S6F42 |
| QUIX..-2M-0007 | FF 0,75-Q2 | S6F42 |
| QUIX..-2M-0011 | FF 1,5-Q2 | S6F43 |
| QUIX..-2M-0015 | FF 2,2-Q2E | S6F47 |
| QUIX..-2T-0004 | FF 0,75-Q3E | S6F51 |
| QUIX..-2T-0007 | FF 4,0-Q3E | S6F52 |
| QUIX..-2T-0011 | FF 4,0-Q3E | S6F52 |
| QUIX.-.2T-0015 | FF 4,0-Q3E | S6F52 |

## Identification of the different installation sections




## External dimensions

(values in mm)



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