# DW4D2400H221-00 - Controller

## Installation instructions

Refer to installation use and maintenance manual for more information.

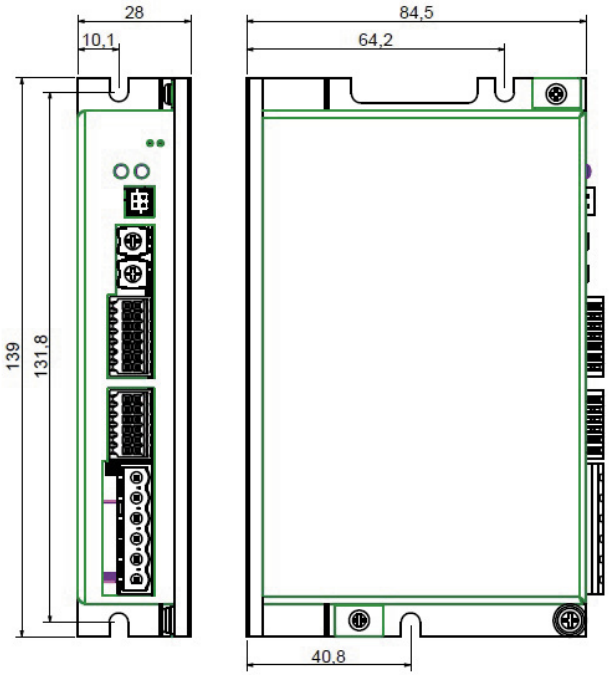
## BLDC motor drive technical data

Platino
BLDC - SERVO - DRIVES

- *DC power supply: 12 ÷ 48 Vdc*
- *DC logic supply: 12 ÷ 48 Vdc (optional and not isolated)*
- *Phase current: up to 10Arms (28Apeak for 5s)*
- *Motor power: up to 400W*
- *Chopper frequency: ultrasonic 40KHz*
- *Protections against: over current, over/under voltage, overheating, short circuit between motor phase-to-phase and phase-to-ground*
- *EtherCAT communication interfaces*
- *Encoder input (not isolated): 5V Differential (RS422) or 5V Single-Ended (TTL/CMOS) incremental encoder*
- *Hall input (not isolated): 5V Single-Ended (TTL/CMOS) hall effects*
- *Service SCI interface for programming and real time debugging*
- *4 digital inputs (opto-coupled)*
- *3 digital outputs (opto-coupled)*
- *Dimensions: 139 x 84,5 x 28 mm (without connectors)*
- *Protection degree: IP20*
- *Pollution degree: 2*
- *Category C3 following standard EN 61800-3*
- *Working temperature 5°C ÷ 40°C; Storage temperature -25°C ÷ 55°C*
- *Humidity: 5% ÷ 85% not condensing*

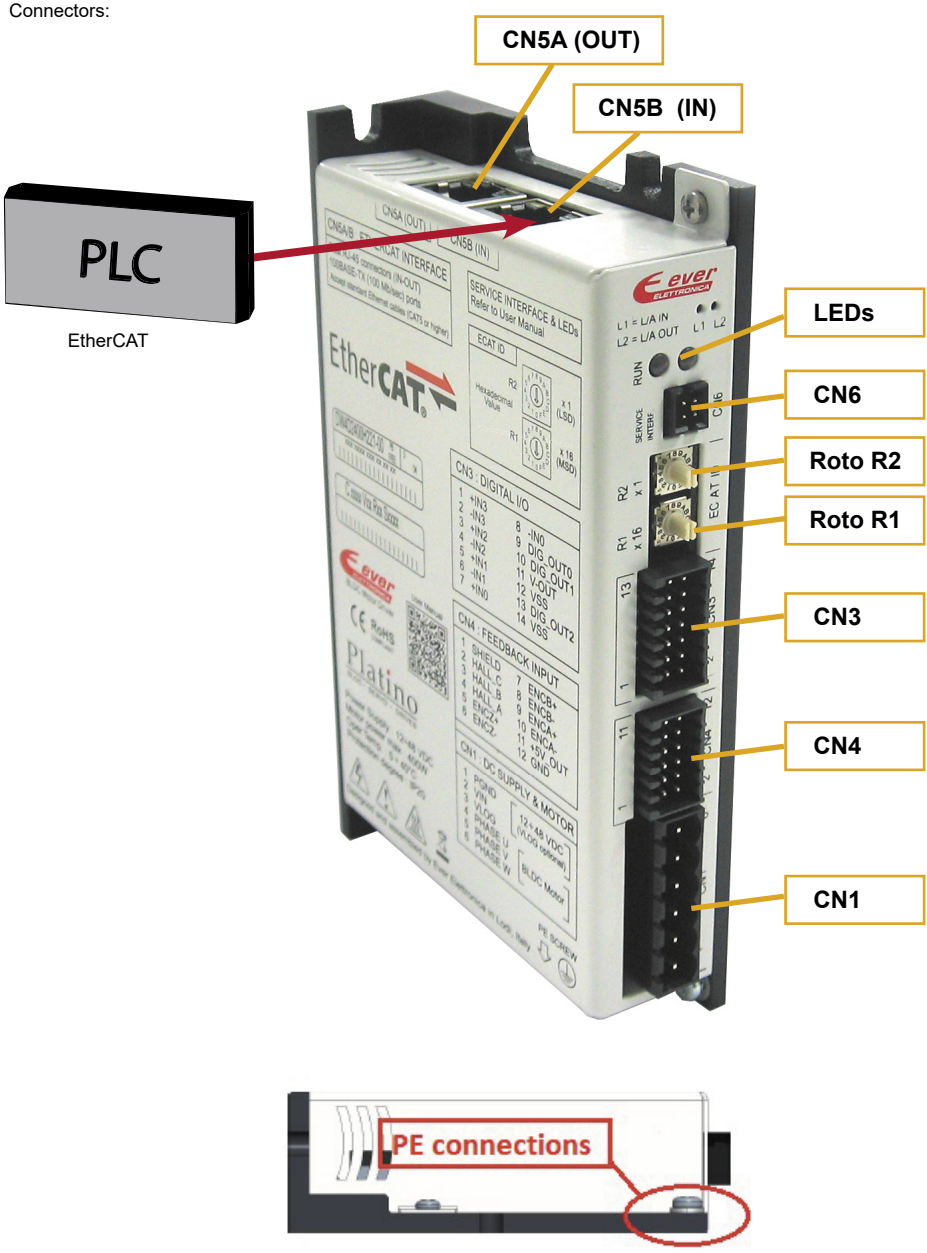
EtherCAT®

## Mechanical data



## System connections

Connectors:



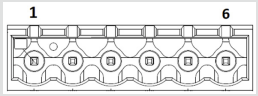

***Power and Logic supplies are not isolated but they have common reference inside the drive.***

# System connection

**CN1: DC Power supply and Motor**

6 positions, pitch 5.08mm, PCB header connector

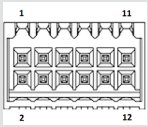
| | | | |
|---|---|---|---|
| CN1.1 | PGND | PWR_IN | Negative DC power supply input |
| CN1.2 | VIN | PWR_IN | Positive DC power supply input |
| CN1.3 | VLOG | PWR_IN | Positive DC logic supply input |
| CN1.4 | U | PWR_OUT | Motor output phase U |
| CN1.5 | V | PWR_OUT | Motor output phase V |
| CN1.6 | W | PWR_OUT | Motor output phase W |




**CN4: Feedback input**

12 positions, pitch 2.54mm double row, PCB header connector

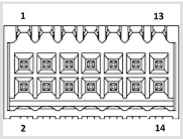
| | | | |
|---|---|---|---|
| CN4.1 | SHIELD | / | Cable shield connection |
| CN4.2 | HALL_C | DIG_IN | Hall effect signbal C input |
| CN4.3 | HALL_B | DIG_IN | Hall effect signbal B input |
| CN4.4 | HALL_A | DIG_IN | Hall effect signbal A input |
| CN4.5 | ENCZ+ | DIG_IN | Encoder Zero input positive |
| CN4.6 | ENCZ- | DIG_IN | Encoder Zero input negative |
| CN4.7 | ENCB+ | DIG_IN | Encoder phase B input positive |
| CN4.8 | ENCB- | DIG_IN | Encoder phase B input negative |
| CN4.9 | ENCA+ | DIG_IN | Encoder phase A input positive |
| CN4.10 | ENCA- | DIG_IN | Encoder phase A input negative |
| CN4.11 | +5V | PWR_OUT | +5Vdc power supply output |
| CN4.12 | GND | PWR_OUT | Negative side supply |




**CN3: Digital inputs/outputs**

14 positions, pitch 2.54mm double row, PCB header connector

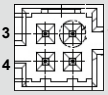
| | | | |
|---|---|---|---|
| CN3.1 | +B0_IN3 | DIG_IN | Digital input B0_IN3 positive side |
| CN3.2 | -B0_IN3 | DIG_IN | Digital input B0_IN3 negative side |
| CN3.3 | +B0_IN2 | DIG_IN | Digital input B0_IN2 positive side |
| CN3.4 | -B0_IN2 | DIG_IN | Digital input B0_IN2 negative side |
| CN3.5 | +B0_IN1 | DIG_IN | Digital input B0_IN1 positive side |
| CN3.6 | -B0_IN1 | DIG_IN | Digital input B0_IN1 negative side |
| CN3.7 | +B0_IN0 | DIG_IN | Digital input B0_IN0 positive side |
| CN3.8 | -B0_IN0 | DIG_IN | Digital input B0_IN0 negative side |
| CN3.9 | B0_OUT0 | DIG_OUT | PNP digital output B0_OUT0 |
| CN3.10 | B0_OUT1 | DIG_OUT | PNP digital output B0_OUT1 |
| CN3.11 | V-OUT | PWR_IN | 24Vdc supply for digital output |
| CN3.12 | VSS | PWR_IN | Negative input supply for digital outputs |
| CN3.13 | B0_OUT2 | DIG_OUT | PNP digital output B0_OUT2 |
| CN3.14 | VSS | PWR_IN | Negative input supply for digital outputs |




**CN6: Service SCI interface**

4 positions, pitch 2mm double row, PCB header connector

| | | |
|---|---|---|
| CN6.1 | TX/RX | Transmit / Receive Line |
| CN6.2 | $\overline{DE}$/RE | Drive Enable Negated / Receive Enable |
| CN6.3 | +5V | +5V power out |
| CN6.4 | GND | DNG power out |

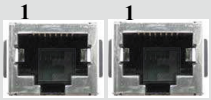


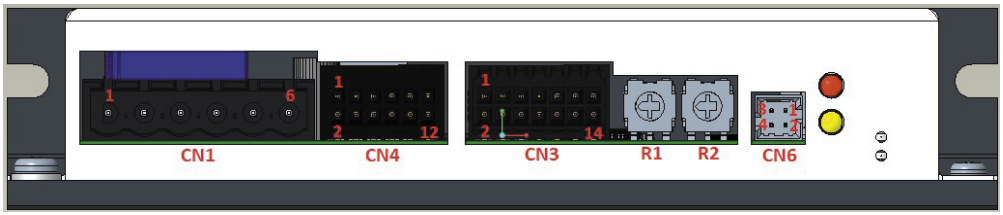

***This connection is only possible with hardware and software provided by Ever.***

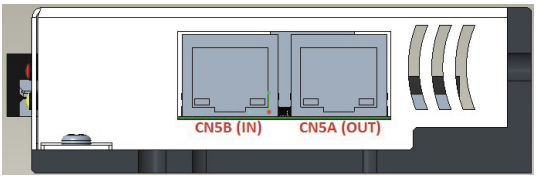
**CN5A and CN5B: EtherCAT interface**

RJ45, 8 positions shielded, PCB header connector

Dual RJ45 connectors (IN-OUT)
100BASE-TX (100Mb/sec) ports
Accept standard Ethernet cable (CAT5 or higher)



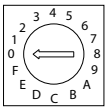



## Roto-Switches settings

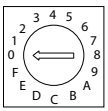
| EtherCAT ID Selection (Hexadecimal Value) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **R1 x 16 (MSD)** | **0** | **0** | **0** | **0** | **...** | **2** | **2** | **...** | **F** | **F** |
| **R2 x 1 (LSD)** | **0** | **1** | **2** | **3** | **...** | **C** | **D** | **...** | **E** | **F** |
| **ECAT-ID #** | **SW settings (default)** | **1** | **2** | **3** | **...** | **44** | **45** | **...** | **254** | **255** |

R1 (MSD): Most Significant Digit that must by multiplied per 16.
R2 (LSD): Least Significant Digit that must by multiplied per 1.
Example: 5C
R1 = 5 ----> 5x16 = 80
R2 = C ---> 12x1 = 12
EtherCAT ID = 92

**x 16 (MSD) R1**




**x1 (LSD) R2**



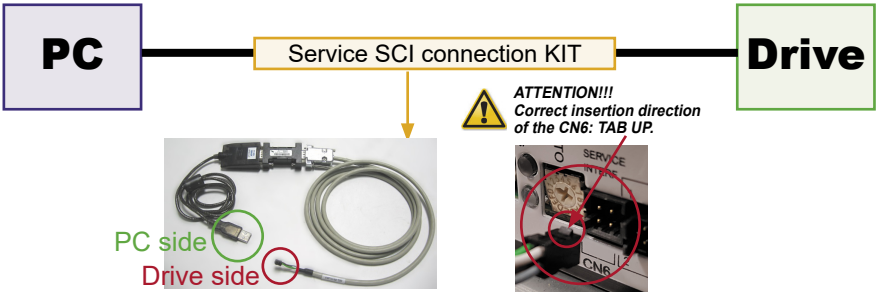

## Working Status (Led)

| | Visualization status | | Description |
|---|---|---|---|
| **1** | ○ | **Green OFF** | Bus status **'Init'** |
| **2** | ● | **Green ON** | Bus status **'Operational'** |
| **3** | ○ | **Green Blinking** | Bus status **'Pre-Operational'** |
| **4** | ○ | **Green Single Flash** | Bus status **'Safe-Operational'** |
| **5** | ● | **Blue ON** | Error: connect with Service SCI kit and check with software |
| **6** | ● ● | **Blue ON**<br>**Yellow ON** | Drive in boot mode. A new firmware should be downloaded to drive. |
| **7** | ● ○ | **Blue ON**<br>**Red Blinking (200ms)** | Initialiazation phase. Should last few seconds. While in this condition the drive is not fully operational |
| **8** | ● | **Yellow ON** | Missing setting of $I_{nominal}$ |
| **9** | ○ | **Yellow Blinking (500 ms)** | Warning: connect with Service SCI kit and check with software |
| **10** | ● | **Red ON** | Protection: Motor is in open phase condition |
| **11** | ○ | **Red Blinking (200ms)** | Current protection |
| **12** | ● ○ | **Red ON (1 sec) +**<br>**Yellow 1 Blink** | Under/Over voltage protection |
| **13** | ● ○ ○ ○ | **Red ON (1 sec) +**<br>**Yellow 3 Blink** | Thermal protection |
| **14** | ● ○ ○ ○ ○ | **Red ON (1 sec) +**<br>**Yellow 4 Blink** | Motor feedback error |
| **15** | ● ○ ○ ○ ○ ○ ○ | **Red ON (1 sec) +**<br>**Yellow 6 Blink** | Motor current regulation is out of range |
| **16** | ● ○ ○ ○ ○ ○ ○ ○ | **Red ON (1 sec) +**<br>**Yellow 7 Blink** | eePLC User Protection (generated by setting bit #0 of eePLC_User_Settings) |

***Note : Drive could be considered in a correct status if leds Red, Yellow and Blue are all OFF. In general:***
***- Led Blue indicates a software internal fault or a non-operative condition***
***- Led Red indicates an alarm or a drive protection***
***- Led Yellow indicates a warning***

## Service SCI connection

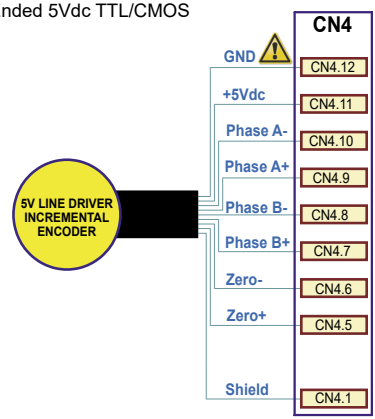
***This connection is only possible with hardware and software provided by Ever.***
***Kit code: DW4_SERV00-SL.***

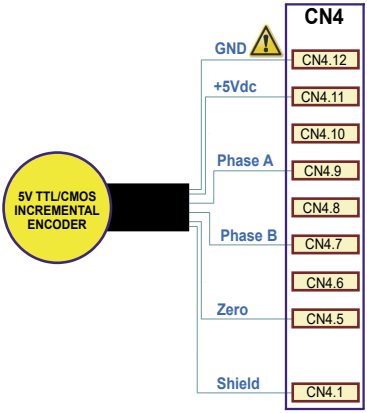



## Encoder input connection

Electrically NOT-isolated digital inputs:
- Differential 5Vdc that meet the RS422 standard
- Single-Ended 5Vdc TTL/CMOS

**N.B. Maximum supply cuttent of the 5V is 100 mA.**



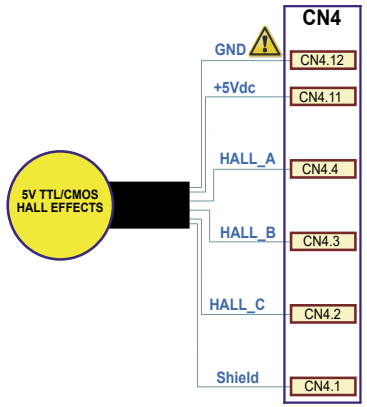




***GND is internally in common with power ground, this is potentially dangerous. Take all necessary measures to avoid possible contacts in the final installation.***

## Hall effects input connection

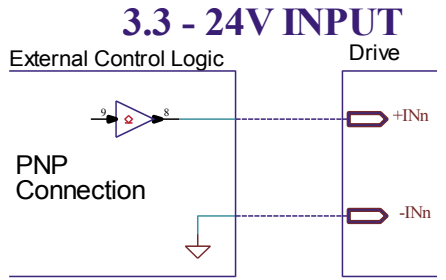
Electrically NOT-isolated digital inputs: Single-Ended 5Vdc TTL/CMOS

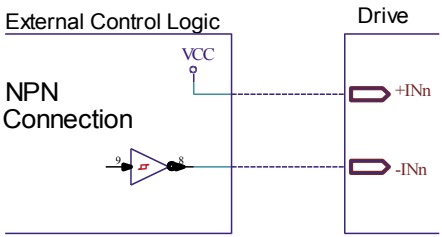
**N.B. Maximum supply cuttent of the 5V is 100 mA.**

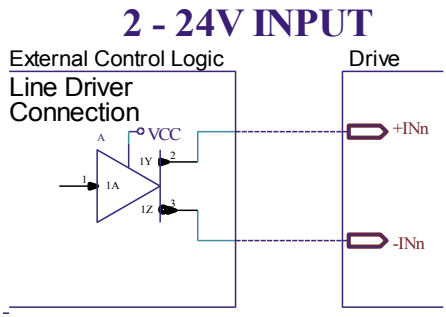



***GND is internally in common with power ground, this is potentially dangerous. Take all necessary measures to avoid possible contacts in the final installation.***

Differential PNP, NPN and Line Driver type.




| Standard Digital Inputs (B0_IN0 and B0_IN1) | | | |
|---|---|---|---|
| **Characteristics** | **MIN.** | **MAX.** | **Unit** |
| Supply voltage | 2 (1) | 24 | Vdc |
| Inputs frequency | -- | 10 | kHz |
| Threshold switching voltage | 1.61 (1) | -- | Vdc |
| Current at 2 Vdc (1) | -- | 2.53 | mA |
| Current at 3.3 Vdc | -- | 5.84 | mA |
| Current at 5 Vdc | -- | 6.28 | mA |
| Current at 24 Vdc | -- | 8.75 | mA |

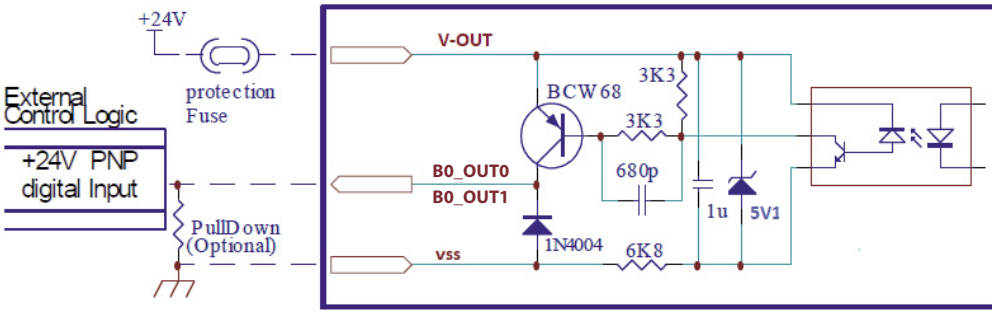
| High-Speed Digital Inputs (B0_IN2 and B0_IN3) | | | |
|---|---|---|---|
| **Characteristics** | **MIN.** | **MAX.** | **Unit** |
| Supply voltage | 2 (1) | 24 | Vdc |
| Inputs frequency | -- | 500 | kHz |
| Threshold switching voltage | 1.61 (1) | -- | Vdc |
| Current at 2 Vdc (1) | -- | 2.53 | mA |
| Current at 3.3 Vdc | -- | 5.84 | mA |
| Current at 5 Vdc | -- | 6.28 | mA |
| Current at 24 Vdc | -- | 8.75 | mA |

***(1) N.B.: it's recommended to use 2 Vdc digital inputs only in differential Line-Driver configuration to have more noise immunity.***

# Digital outputs connection

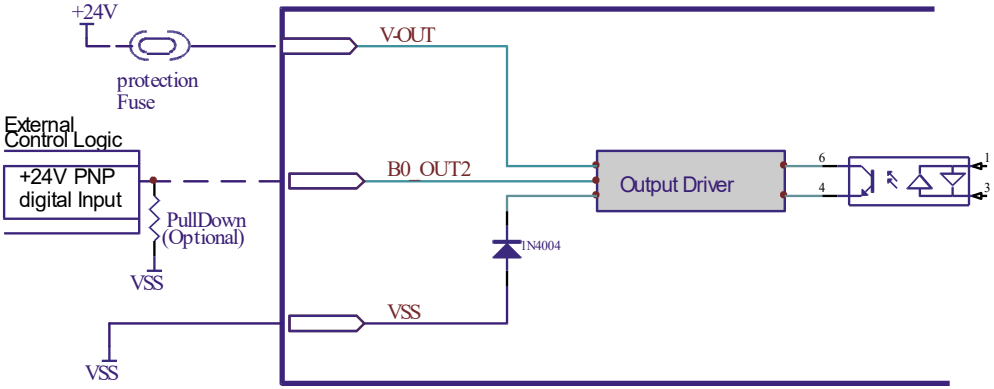
## B0_OUT0 and B0_OUT1

PNP with $V_{OUTmax}$ = 24 Vdc, $I_{OUTmax}$ = 100 mA, $F_{max}$ = 250 kHz.




## B0_OUT2

PNP with $V_{OUTmax}$ = 24 Vdc, $I_{OUTmax}$ = 1.3A, $F_{max}$ = 250 Hz.



## Mating connectors

| Connector | Description |
|---|---|
| CN1 | Phoenix 1758830 |
| CN3 | Dinkle 0156-1B14-BK |
| CN4 | Dinkle 0156-1B12-BK |
| CN5A / CN5B | RJ45, 8 positions Ethernet standard cables (CAT5 or higher) |

## Section of the cables

| Function | Cable | |
|---|---|---|
| | Minimum | Maximum |
| Power supply and PE | 0.5 mm² (AWG20) | 2.5 mm² (AWG12) |
| Motor outputs | 0.5 mm² (AWG20) | 2.5 mm² (AWG12) |
| Feedback / encoder input | 0.14 mm² (AWG26) | 0.5 mm² (AWG20) |
| Inputs and Outputs | 0.14 mm² (AWG26) | 0.5 mm² (AWG20) |
| EtherCAT interfaces | Ethernet standard cables (CAT5 or higher) | |

## Verify the installation

- Check all connection: power supply and inputs/outputs.
- Make sure all settings right for the application.
- Make sure the power supply is suitable for the drive.
- If possible, remove the load from the motor shaft to avoid that wrong movements cause damage.
- Enable the current to the motor and verify the applied torque.
- Enable a movement of some steps and verify if the rotation direction is the desired one.
- Disconnect the power supply, connect the load on the motor and check the full functionality.

## Analysis of malfunctions

***When any of the following situations occur, the drive is placed in a fault condition.***

| DEFECT | CAUSE | ACTION |
|---|---|---|
| Intervention of the themal protection. | Can be caused by a heavy working cycle or a high current in the motor. | Improve the drive cooling by a natural or fan air flow. Consider to use a motor with a higher torque vs current rating. |
| Intervention of the current protection. | Short circuit on the motor powering stage(s) of the drive. | Check motor windings and cables to remove the short circuits replacing faulty cables or motor if necessary. |
| Intervention of the over/under voltage protection | Supply voltage out of range. | Check the value for the supply voltage. |
| Open phase motor protection. | Motor windings to drive not proper connection. | Check motor cables and connections to the drive. |

***When any of the following situations occur, the drive doesn't work and isn't placed in an error condition.***

| DEFECT | CAUSE | ACTION |
|---|---|---|
| Noisy motor movement with vibrations. | Can be caused by a lack of power supply to a phase of the motor or a poor regulation of the winding currents. | Check the cables and connections of the motor and/or change the motor speed to avoid a resonance region. |
| The external fuse on the power supply of the drive is burned. | Can be caused by a wrong connection of the power supply. | Connect the power supply correctly and replace the fuse. |
| At high speed, the motor torque is not enough. | Can be due to a 'self-limitation' of motor current and torque. | Increase the motor current (always within the limits), increase the supply voltage, change motor connection from series to parallel. |

**Ever Motion Solutions**
Via del Commercio, 2/4 - 9/11
Loc. San Grato Z. I
26900 - L O D I - Italy
Phone +39 0371 412318 - Fax +39 0371 412367
email:infoever@everelettronica.it
web: www.everelettronica.it