

# Sirius Digital Servo Drivers

Revision: 0.19

July 24, 2014

| version | date | author                | description                      | fw version |
|---------|------|-----------------------|----------------------------------|------------|
| 0.18    |      | Marco Trentarossi     | first deploy                     | DRV0-00.39 |
| 0.19    |      | Francesco Trentarossi | FCC / Industry Canada Statements | DRV0-00.39 |

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# Chapter 1

## General information

### 1.1 Introduction

Motor control solution products:

- Sirius Digital Servo Drivers
- Fully configurable firmware to use
  - Brushless motors
  - Stepper motors
  - DC motors
- Winloader - Application updater
- Motor Control - Setup software

## Chapter 2

# Hardware MOH

### 2.1 Operational description

#### 2.1.1 MOH

Sirius MOH is a compact servo driver. It can operate in position, speed or torque control mode, driving brushless DC or AC motors, stepper or brushed DC motors.

It can be used in network or stand alone environments. Standard feedback is provided by Hall sensors and incremental encoders. It can be configured, tested and be driven from a PC via serial TTL connection.

Our drivers communicate using CANOpen protocol and up to 127 drivers can be hooked up to the master in a CAN network. As a CAN node it can operate in position profile mode, speed mode and torque mode.

MOH can operate in conjunction with an external positioner in torque, speed or position mode. Speed reference input operates from 0 to 5 volts.

Four different hardware configurations are available.

## 2.2 Product images

### 2.2.1 MOH

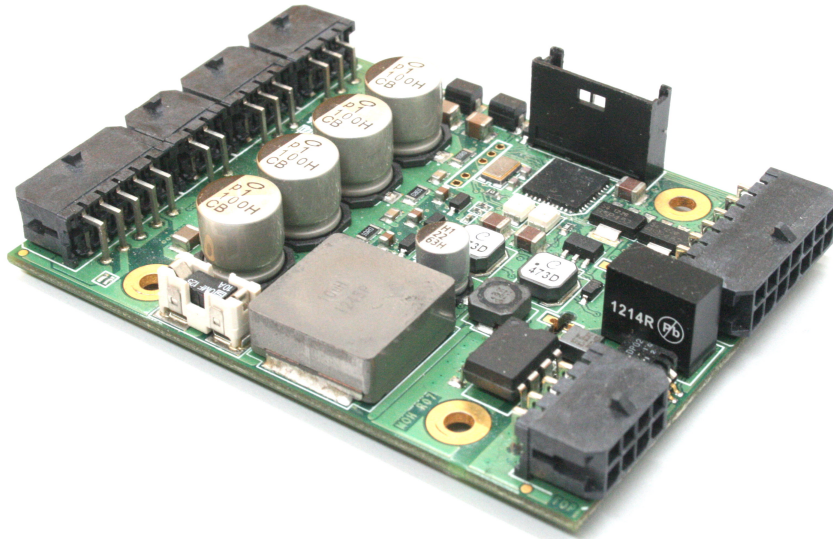


Figure 2.1: MOH-D

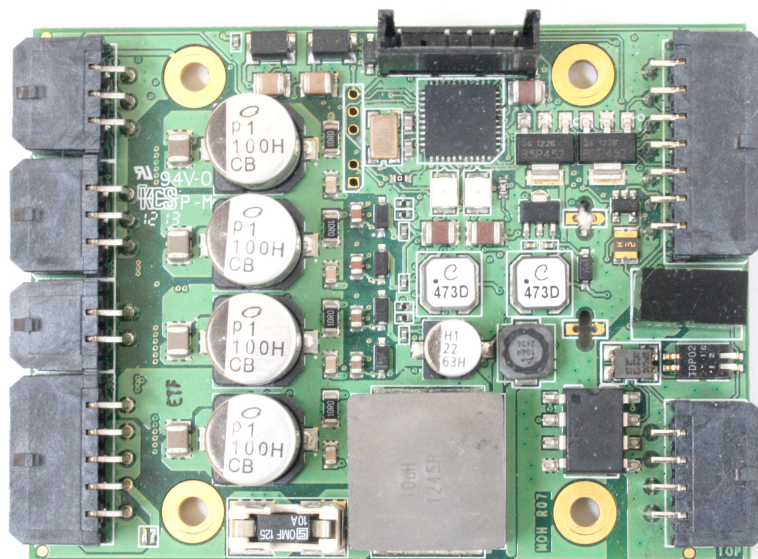


Figure 2.2: MOH-D

## 2.3 Configurations

|                        | <i>MOH-A</i> | <i>MOH-B</i> | <i>MOH-C</i> | <i>MOH-D</i> | <i>U.M.</i> |
|------------------------|--------------|--------------|--------------|--------------|-------------|
| <b>CAN</b>             | -            | -            | ✓            | ✓            | -           |
| <b>ETHERNET</b>        |              |              |              |              |             |
| <b>MAXIMUM CURRENT</b> | 10           | 20           | 10           | 20           | A           |
| <b>NOMINAL CURRENT</b> | 5            | 10           | 5            | 10           | A           |
| <b>VDC</b>             | 20-55        | 20-55        | 20-55        | 20-55        | V           |

## 2.4 Specifications

### 2.4.1 Output power

|                         | <i>MOH-A,C</i> | <i>MOH-B,D</i> | <i>U.M.</i> |
|-------------------------|----------------|----------------|-------------|
| <b>Peak current *</b>   | 10             | 20             | A           |
| <b>Constant current</b> | 5              | 10             | A           |
| <b>Peak power *</b>     | 480            | 960            | W           |

\* these limits are due to Molex Microfit connectors

### 2.4.2 Input power

|                         | <i>MOH-A,C</i> | <i>MOH-B,D</i> | <i>U.M.</i> |
|-------------------------|----------------|----------------|-------------|
| <b>Input voltage</b>    | 20-55          | 20-55          | V           |
| <b>Peak current</b>     | 10             | 20             | A           |
| <b>Constant current</b> | 5              | 10             | A           |

### 2.4.3 Digital Control

| <i>MOH-A,B,C,D</i>             |                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------|
| <b>Control loops</b>           | Current, speed, position. 100% digital control loops                                       |
| <b>Sampling frequency</b>      | Speed and current loops at 20 kHz (50us), position loop 1kHz (1ms), stepper/brush DC 40kHz |
| <b>Commutation</b>             | FOC (field-oriented control) sinusoidal, step/microstepping                                |
| <b>Modulation</b>              | Center-weighted PWM with space-vector modulation, full bridge                              |
| <b>Minimum load inductance</b> | 200 uH line-line                                                                           |

2.4.4 PWM output

|               | Brushless                                      | Stepper/Brush DC                           | U.M. |
|---------------|------------------------------------------------|--------------------------------------------|------|
| Type          | 3-phase mosfet inverter<br>centered 20 kHz PWM | double H bridge<br>40kHz PWM microstepping | -    |
| PWM frequency | 20k                                            | 40k                                        | Hz   |

PWM CONFIGURATION

The possible configurations are shown below.

In fig. 2.3 two coils are controlled independently so it is possible to control individual bipolar stepper motors.

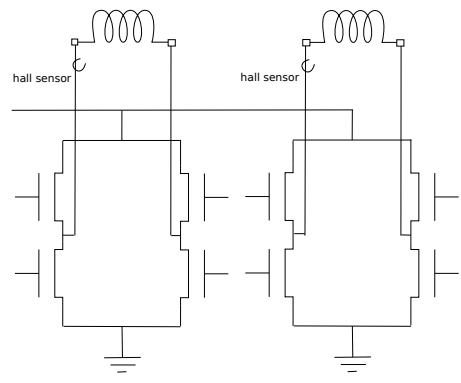


Figure 2.3: Double H bridge

In fig. 2.4 are driven the coils of a three-phase motor and a braking resistor. This configuration allows control of brushless motors. The third current is calculated by difference from the other two.

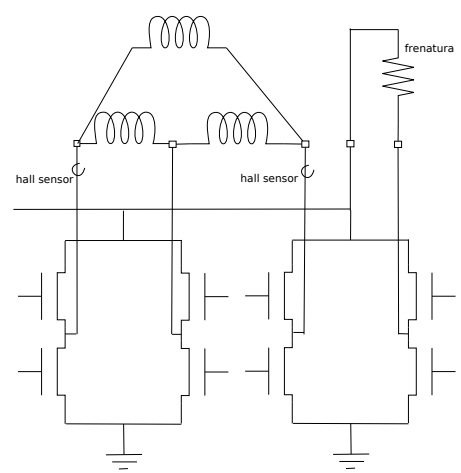


Figure 2.4: Three-phase bridge

### 2.4.5 Inputs

|                   | <i><b>MOH-A,B</b></i>                        | <i><b>MOH-C,D</b></i>        |
|-------------------|----------------------------------------------|------------------------------|
| <b>CANopen</b>    | -                                            | Position and homing profiles |
| <b>Speed</b>      |                                              | 0-5V                         |
| <b>TTL serial</b> | Position, speed, torque, and homing profiles |                              |

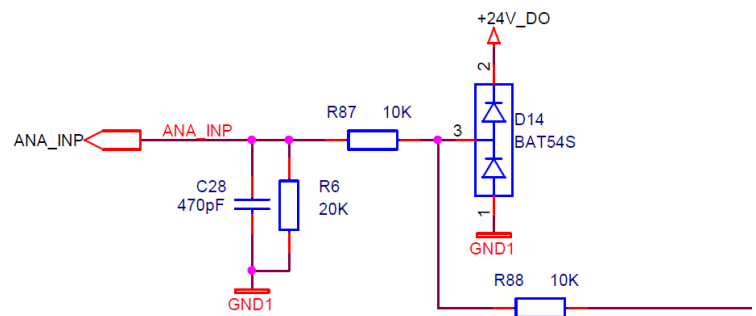


Figure 2.5: analog inputs

## 2.4.6 Digital inputs

| <i>MOH-A,B,C,D</i>         |                                                                              |
|----------------------------|------------------------------------------------------------------------------|
| <b>Number, type</b>        | 3, not insulated, programmable                                               |
| <b>Inputs</b>              | active from 24V with RC filter                                               |
| <b>Logical levels</b>      | Vin-LO < 5.6V, Vin-HI > 13V                                                  |
| <b>MS (IN1,2)</b>          | 2 inputs @ 22us RC                                                           |
| <b>MS (IN0)</b>            | 1 input @ 22us RC with the possibility of reading through interrupt (homing) |
| <b>Current consumption</b> | 10mA @ 24V                                                                   |

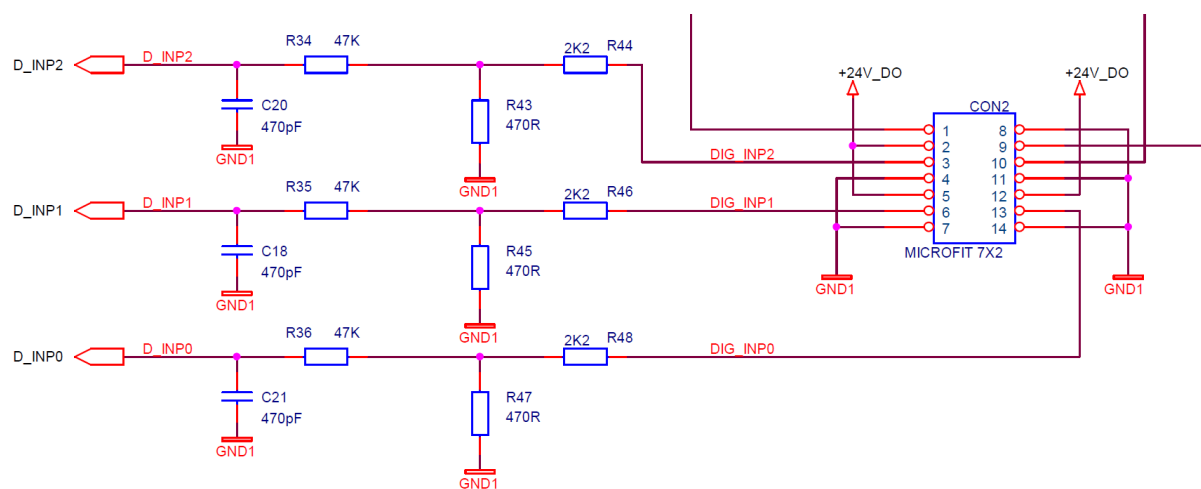


Figure 2.6: MS inputs

## 2.4.7 Digital outputs

|                            | <i><b>MOH-A,B,C,D</b></i>            |
|----------------------------|--------------------------------------|
| <b>Number, type</b>        | 2, not insulated, programmable       |
| <b>(OUT0,1)</b>            | Current-sourcing MOSFET at 24V (PNP) |
| <b>Current consumption</b> | 200mA with PTC protection            |

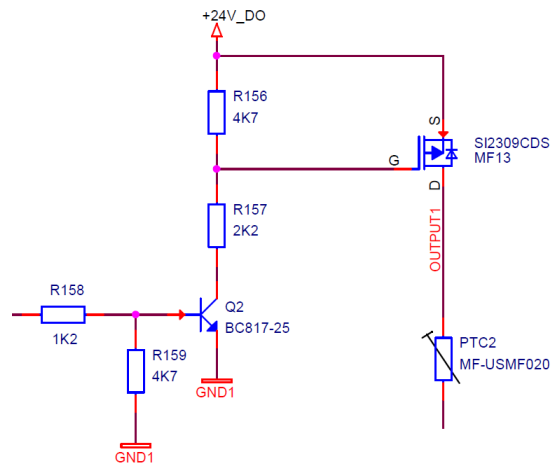


Figure 2.7: Outputs

### 2.4.8 UART port

| <i>MOH-A,B,C,D</i> |                                                                             |
|--------------------|-----------------------------------------------------------------------------|
| Signals            | RX, TX, GND                                                                 |
| Modes              | full-duplex, serial port for motor control and setup, 115200 - 1250000 baud |
| Protocol           | Binary                                                                      |

### 2.4.9 CAN port

|                   | <i>MOH-A,B</i> | <i>MOH-C,D</i>                                                        |
|-------------------|----------------|-----------------------------------------------------------------------|
| Signals           | -              | CANH, CANL, GND                                                       |
| Insulation        | -              | Optically insulated power and interface circuits +5 Vdc CAN           |
| Format            | -              | conforming to the CAN V2.0b physical layer for high speed connections |
| Data              | -              | in accordance with CANopen CIA DS301                                  |
| Address selection | -              | dip-switch configurable                                               |
| Stub              | -              | 121 ohm selectable                                                    |

### 2.4.10 Encoder port

|              | <i>MOH-A,B</i> | <i>MOH-C,D</i>         |
|--------------|----------------|------------------------|
| Signals      | -              | A, B, X                |
| Levels       | -              | 5V                     |
| Frequency    | -              | 4MHz (post quadrature) |
| Power supply | -              | 5V @ 400mA             |

### 2.4.11 Digital Halls

| <i>MOH-A,B,C,D</i> |                                                        |
|--------------------|--------------------------------------------------------|
| Type               | single ended digital, electrical phase-shifted by 120° |
| Levels             | U, V, W                                                |
| Frequency          | 10kHz                                                  |
| Power supply       | 5V @ 400mA                                             |

### 2.4.12 Motor connections

| <i>MOH-A,B,C,D</i>    |                                                                                            |
|-----------------------|--------------------------------------------------------------------------------------------|
| <b>U, V, W phases</b> | three-phase PWM or 2 H bridges output, ungrounded.                                         |
| <b>Braking</b>        | dout(0).out can be configured as a brake without the needing of an external flyback diode. |

### 2.4.13 Status Lights

| <i>MOH-C,D</i>    |                                                      |
|-------------------|------------------------------------------------------|
| <b>CAN status</b> | Red and green lights, in accordance with CAN DR303-3 |

### 2.4.14 Protections

| <i>MOH-A,B,C,D</i>                  |                       |
|-------------------------------------|-----------------------|
| <b>I<sup>2</sup>T current limit</b> | direct current        |
| <b>HV undervoltage</b>              | HV < 18V programmable |

### 2.4.15 Mechanical and environmental

|                    | <i>MOH-A</i>                                             | <i>MOH-B</i> | <i>MOH-C</i> | <i>MOH-D</i> |
|--------------------|----------------------------------------------------------|--------------|--------------|--------------|
| <b>Dimensions</b>  | 75.7 x 54 mm                                             |              |              |              |
| <b>Height</b>      | 16.5 mm                                                  | 16.5 mm      | 16.5 mm      | 16.5 mm      |
| <b>Weight</b>      | 47 g                                                     | 53 g         | 52 g         | 57 g         |
| <b>Temperature</b> | Operativity from 0 to +45 °C, Storage from -40 to +85 °C |              |              |              |
| <b>Umidity</b>     | 0 to 95%, non condensing                                 |              |              |              |
| <b>Cooling</b>     | Heatsink or inducted airflow                             |              |              |              |

### 2.4.16 Conformance

| <i>MOH-A,B,C,D</i> |                                                                   |
|--------------------|-------------------------------------------------------------------|
| <b>CE</b>          | CE compliant                                                      |
| <b>61000_6_4</b>   | Generic standards - Emission Standard for industrial environments |
| <b>61000_6_2</b>   | Generic standards - Immunity for industrial environments          |
| <b>RoHS</b>        | RoHS Compliant                                                    |

## 2.5 Lights

There are two leds to indicate the status of the drivers.

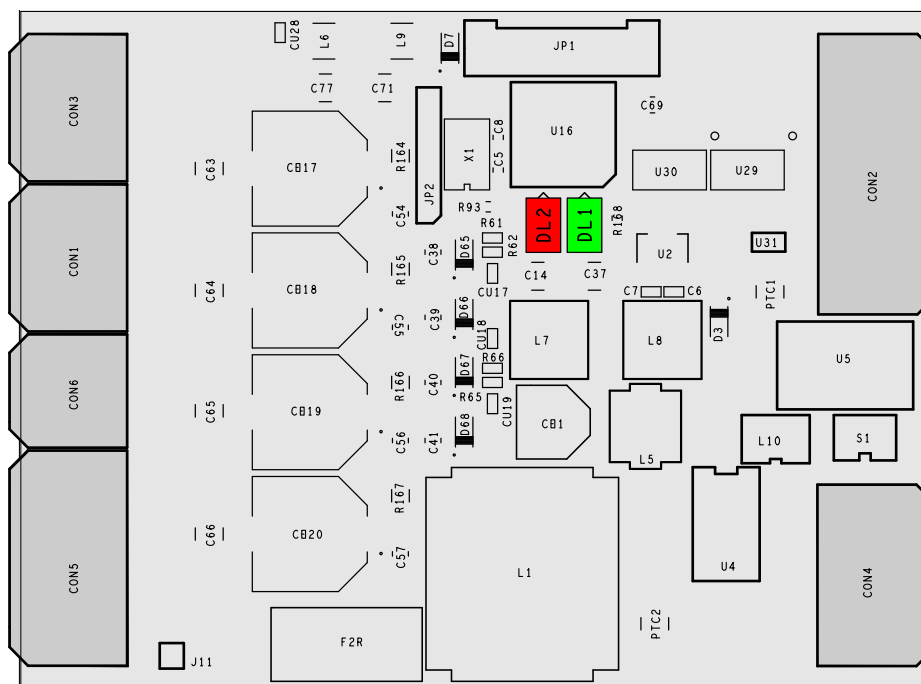
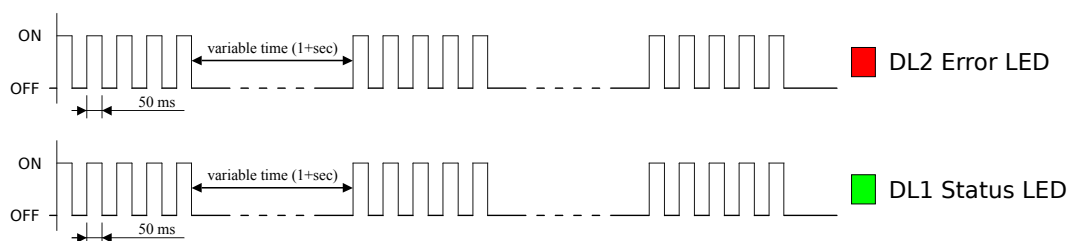


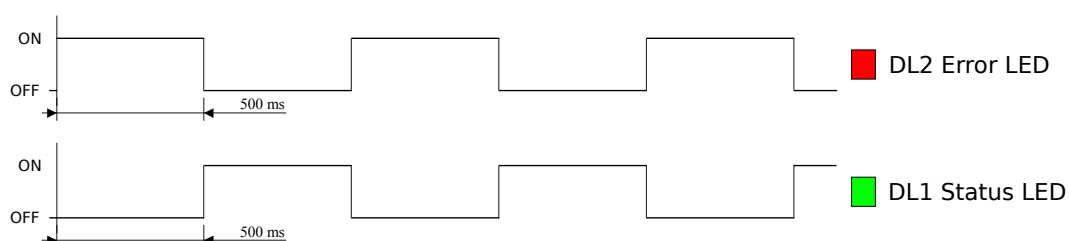
Figure 2.8: Lights position

The specifications of lights during operation of the device reflect what indicated in the document CiA DR 303-3 v1.2. In addition, two custom conditions have been defined

### Corrupted or not installed application



### Configuration parameters not found



## 2.6 Selectors

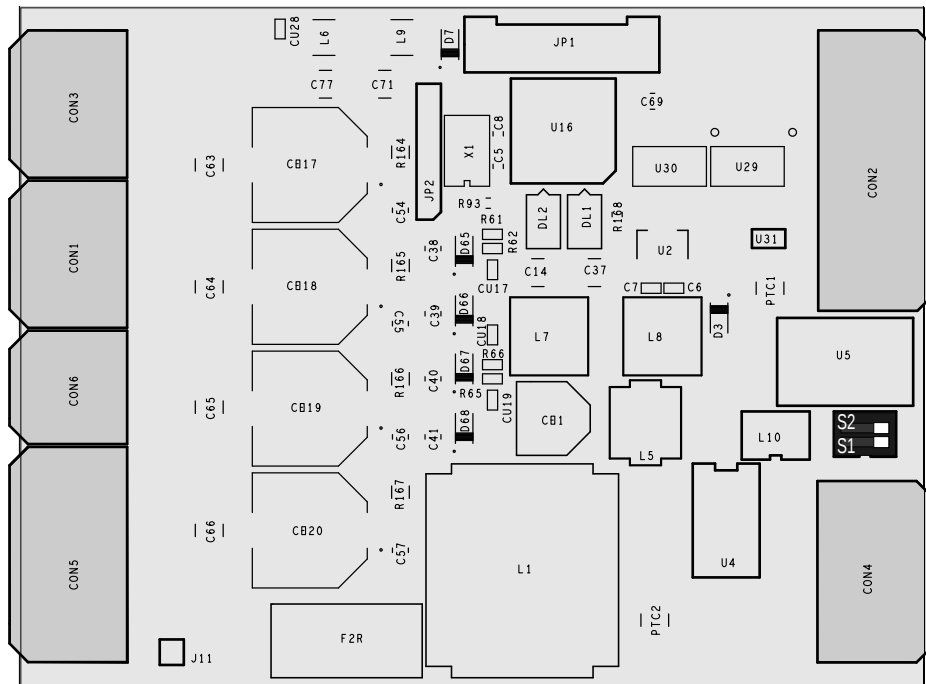


Figure 2.9: Position of selectors

| Selector | Description                    |
|----------|--------------------------------|
| s1       | Optional user defined function |
| s2       | CAN terminating resistor       |

## 2.7 Connectors

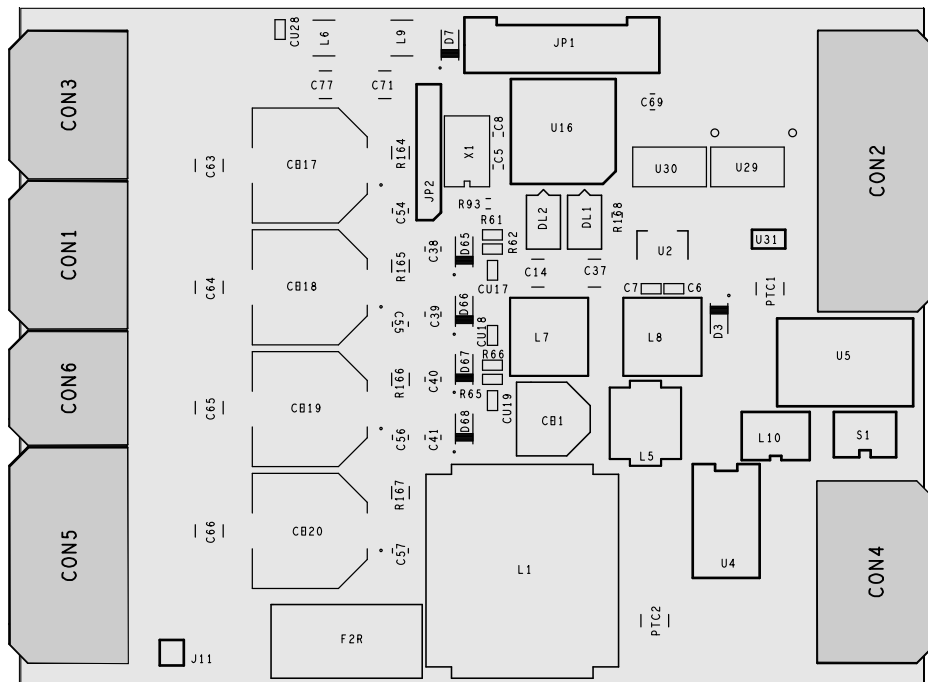


Figure 2.10: MOH-D Connectors

### 2.7.1 CON1 - Hall sensors connector

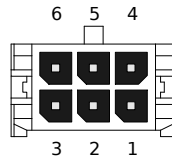


Figure 2.11: MICROFIT 3.0 430450600

| <i>pin</i> | <i>name</i> | <i>type</i> | <i>description</i>      |
|------------|-------------|-------------|-------------------------|
| 1          | 5V          | OUT         | 5V sensors power supply |
| 2          | reference   | -           | 5V common reference     |
| 3          | reference   | -           | 5V common reference     |
| 4          | hallA       | IN          | hall sensor A           |
| 5          | hallB       | IN          | hall sensor B           |
| 6          | hallC       | IN          | hall sensor C           |

\* CON3 is not present on MOH-A and MOH-B models. In this case it is possible to configure and use CON1 as encoder connector

### 2.7.2 CON2 - I/O connector

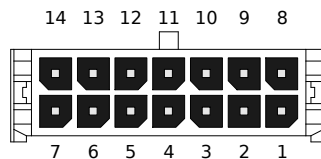


Figure 2.12: MICROFIT 3.0 430451400

| <i>pin</i> | <i>name</i> | <i>type</i> | <i>description</i>                               |
|------------|-------------|-------------|--------------------------------------------------|
| 1          | AI          | IN          | analog input                                     |
| 2          | 24V         | OUT         | 24V digital input 2                              |
| 3          | DI_2        | IN          | digital input2                                   |
| 4          | reference   | -           | common reference digital input 2                 |
| 5          | 24V         | OUT         | 24V digital input 1                              |
| 6          | DI_1        | IN          | digital input 1                                  |
| 7          | reference   | -           | common reference digital input1                  |
| 8          | reference   | -           | common reference analog input / digital output 1 |
| 9          | DO_1        | OUT         | digital output 1                                 |
| 10         | DO_0        | OUT         | digital output 0                                 |
| 11         | reference   | -           | common reference digital output 0                |
| 12         | 24V         | OUT         | 24V digital input 0                              |
| 13         | DI_0        | IN          | digital input 0                                  |
| 14         | reference   | -           | common reference digital input 0                 |

### 2.7.3 CON3 - Encoder connector

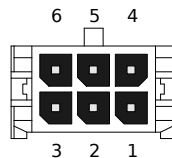


Figure 2.13: MICROFIT 3.0 430450600

| <i>pin</i> | <i>name</i> | <i>type</i> | <i>description</i>      |
|------------|-------------|-------------|-------------------------|
| 1          | 5V          | OUT         | 5V encoder power supply |
| 2          | reference   | -           | 5V common reference     |
| 3          | reference   | -           | 5V common reference     |
| 4          | SA          | IN          | A signal                |
| 5          | SB          | IN          | B signal                |
| 6          | SC          | IN          | C signal (index)        |

\* CON3 is not present on MOH-A and MOH-B models.

## 2.7.4 CON4 - CANopen connector

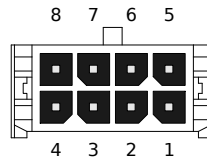


Figure 2.14: MICROFIT 3.0 430450800

| <i><b>pin</b></i> | <i><b>name</b></i> | <i><b>type</b></i> | <i><b>description</b></i> |
|-------------------|--------------------|--------------------|---------------------------|
| 1-5               | CH+                | IN/OUT             | CAN high                  |
| 2-6               | CH-                | IN/OUT             | CAN low                   |
| 3-7               | CAN<br>reference   | -                  | 0V CAN reference          |
| 4-8               | CAN<br>reference   | -                  | 0V CAN reference          |

\* Questo connettore è presente solo nei modelli MOH-C e MOH-D

### 2.7.5 CON5 - Power supply connector

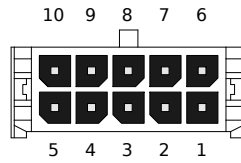


Figure 2.15: MICROFIT 3.0 430451000

| <i>pin</i> | <i>name</i>    | <i>type</i> | <i>description</i>          |
|------------|----------------|-------------|-----------------------------|
| 1          | reference      | -           | 24V common reference        |
| 2          | 24V logic      | IN          | logic circuits power supply |
| 3          | ground         | -           | ground                      |
| 4          | 24V power      | IN          | main power supply           |
| 5          | brake resistor | OUT         | brake resistor              |
| 6          | reference      | -           | 24V common reference        |
| 7          | 24V logic      | IN(OUT)     | logic circuits power supply |
| 8          | ground         | -           | ground                      |
| 9          | 24V power      | IN(OUT)     | main power supply           |
| 10         | 24V res brake  | OUT         | brake resistor reference    |

### 2.7.6 CON6 - Motor connector

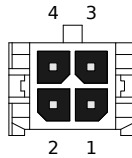


Figure 2.16: MICROFIT 3.0 430450400

| <i>pin</i> | <i>name</i> | <i>type</i> | <i>description - three-phase<br/>(brushless)</i> | <i>description - double<br/>single-phase (stepper)</i> |
|------------|-------------|-------------|--------------------------------------------------|--------------------------------------------------------|
| 1          | B           | OUT         | brake resistor                                   | H2-                                                    |
| 2          | U           | OUT         | U phase                                          | H1+                                                    |
| 3          | W           | OUT         | W phase                                          | H2+                                                    |
| 4          | V           | OUT         | V phase                                          | H1-                                                    |

## FCC Statement

*Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

*Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

---

## Industry Canada statement

*This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:*

- 1. this device may not cause interference, and*
- 2. this device must accept any interference, including interference that may cause undesired operation of the device.*

*Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :*

- 1. l'appareil ne doit pas produire de brouillage, et*
- 2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

CAN ICES-3 (A)/NMB-3(A)

## Chapter 3

# Hardware MQA

### 3.1 Operational description

#### 3.1.1 MQA

Sirius MQA is a compact servo driver. It can operate in position, speed or torque control mode, driving brushless DC or AC motors, stepper or brushed DC motors.

It can be used in network or stand alone environments. Standard feedback is provided by Hall sensors and incremental encoders. It can be configured, tested and be driven from a PC via serial TTL connection.

Our drivers communicate using CANOpen protocol and up to 127 drivers can be hooked up to the master in a CAN network. As a CAN node it can operate in position profile mode, speed mode and torque mode.

MOH can operate in conjunction with an external positioner in torque, speed or position mode. Speed reference input operates from 0 to 5 volts.

Sirius MQA has the same characteristics of the MOH series but has an Ethernet communication interface on which it is possible to use the CANopen protocol.

Two different hardware configurations are available.

MQA is mechanically compatible with the MOH series, with which it shares the pitch of the mounting holes and the dimensions of the printed circuit board.

## 3.2 Product images

### 3.2.1 MQA

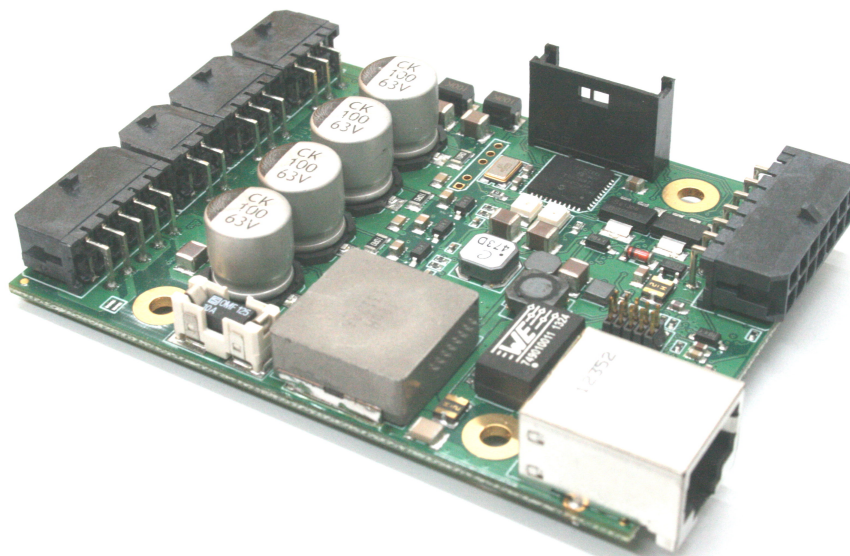


Figure 3.1: MQA-D

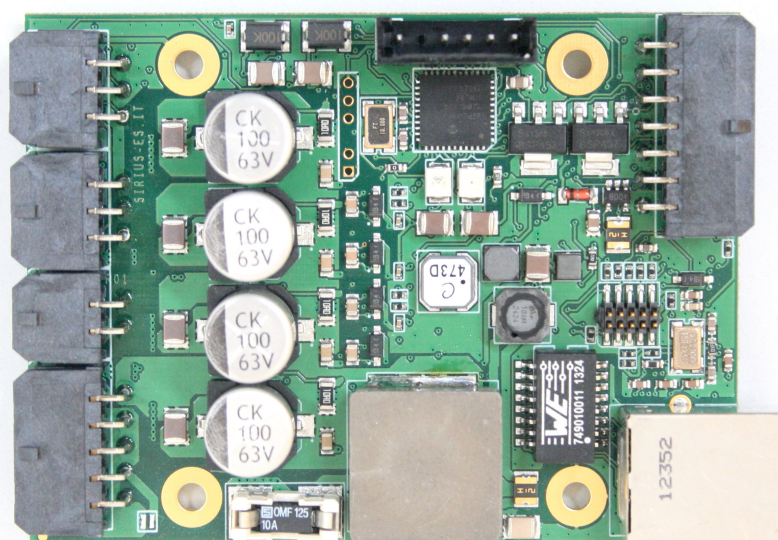


Figure 3.2: MQA-D

### 3.3 Configurations

|                        | <i><b>MQA-C</b></i> | <i><b>MQA-D</b></i> | <i><b>U.M.</b></i> |
|------------------------|---------------------|---------------------|--------------------|
| <b>CAN</b>             |                     |                     | -                  |
| <b>ETHERNET</b>        | ✓                   | ✓                   |                    |
| <b>MAXIMUM CURRENT</b> | 10                  | 20                  | A                  |
| <b>NOMINAL CURRENT</b> | 5                   | 10                  | A                  |
| <b>VDC</b>             | 20-55               | 20-55               | V                  |

### 3.4 Specifications

#### 3.4.1 Output power

|                         | <i><b>MQA-C</b></i> | <i><b>MQA-D</b></i> | <i><b>U.M.</b></i> |
|-------------------------|---------------------|---------------------|--------------------|
| <b>Peak current *</b>   | 10                  | 20                  | A                  |
| <b>Constant current</b> | 5                   | 10                  | A                  |
| <b>Peak power *</b>     | 480                 | 960                 | W                  |

\* these limits are due to Molex Microfit connectors

#### 3.4.2 Input power

|                         | <i><b>MQA-C</b></i> | <i><b>MQA-D</b></i> | <i><b>U.M.</b></i> |
|-------------------------|---------------------|---------------------|--------------------|
| <b>Input voltage</b>    | 20-55               | 20-55               | V                  |
| <b>Peak current</b>     | 10                  | 20                  | A                  |
| <b>Constant current</b> | 5                   | 10                  | A                  |

#### 3.4.3 Digital control

| <i><b>MQA-C,D</b></i>          |                                                                                            |
|--------------------------------|--------------------------------------------------------------------------------------------|
| <b>Control loops</b>           | Current, speed, position. 100% digital control loops                                       |
| <b>Sampling frequency</b>      | Speed and current loops at 20 kHz (50us), position loop 1kHz (1ms), stepper/brush DC 40kHz |
| <b>Commutation</b>             | FOC (field-oriented control) sinusoidal, step/microstepping                                |
| <b>Modulation</b>              | Center-weighted PWM with space-vector modulation, full bridge                              |
| <b>Minimum load inductance</b> | 200 uH line-line                                                                           |

### 3.4.4 PWM Outputs

|               | <i>Brushless</i>                               | <i>Stepper/Brush DC</i>                    | <i>U.M.</i> |
|---------------|------------------------------------------------|--------------------------------------------|-------------|
| Type          | 3-phase mosfet inverter<br>centered 20 kHz PWM | double H bridge<br>40kHz PWM microstepping | -           |
| PWM frequency | 20k                                            | 40k                                        | Hz          |

#### PWM CONFIGURATION

The possible configurations are shown below.

In fig. 2.3 two coils are controlled independently so it is possible to control individual bipolar stepper motors.

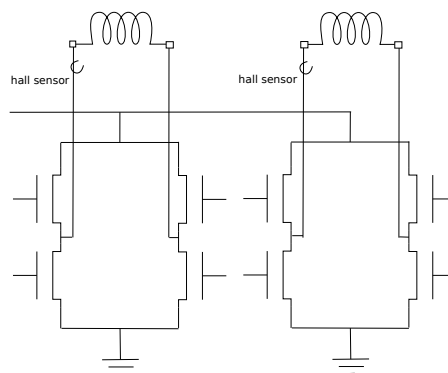


Figure 3.3:

In fig. 2.4 are driven the coils of a three-phase motor and a braking resistor. This configuration allows control of brushless motors. The third current is calculated by difference from the other two.

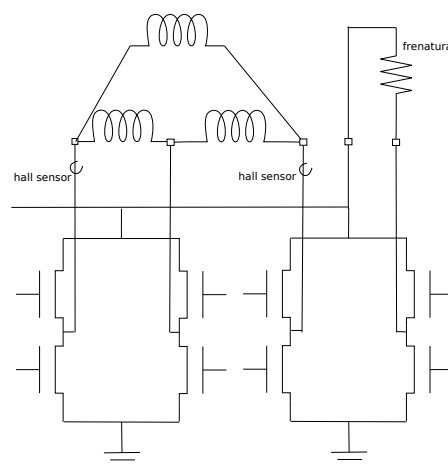


Figure 3.4: Three-phase bridge

3.4.5 Inputs

|                   | <i><b>MQA-C,D</b></i>                        |
|-------------------|----------------------------------------------|
| <b>CANopen</b>    | Position and homing profiles                 |
| <b>Speed</b>      | 0-5V                                         |
| <b>TTL serial</b> | Position, speed, torque, and homing profiles |

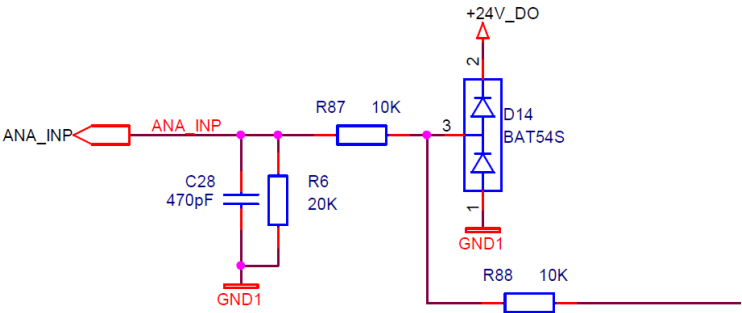


Figure 3.5: Analog inputs

### 3.4.6 Digital inputs

| <i>MQA-C,D</i>      |                                                                              |
|---------------------|------------------------------------------------------------------------------|
| Number, type        | 3, not insulated, programmable                                               |
| Inputs              | active from 24V with RC filter                                               |
| Logical levels      | Vin-LO < 5.6V, Vin-HI > 13V                                                  |
| MS (IN1,2)          | 2 inputs @ 22us RC                                                           |
| MS (IN0)            | 1 input @ 22us RC with the possibility of reading through interrupt (homing) |
| Current consumption | 10mA @ 24V                                                                   |

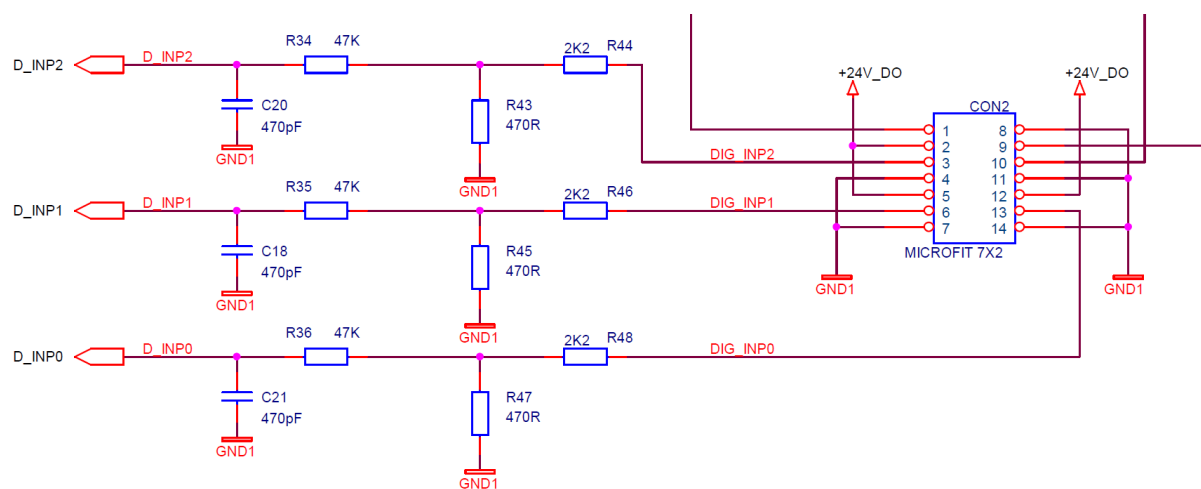


Figure 3.6: MS inputs

### 3.4.7 Digital outputs

| <i>MQA-C,D</i>      |                                      |
|---------------------|--------------------------------------|
| Number, type        | 2, not insulated, programmable       |
| (OUT0,1)            | Current-sourcing MOSFET at 24V (PNP) |
| Current consumption | 200mA with PTC protection            |

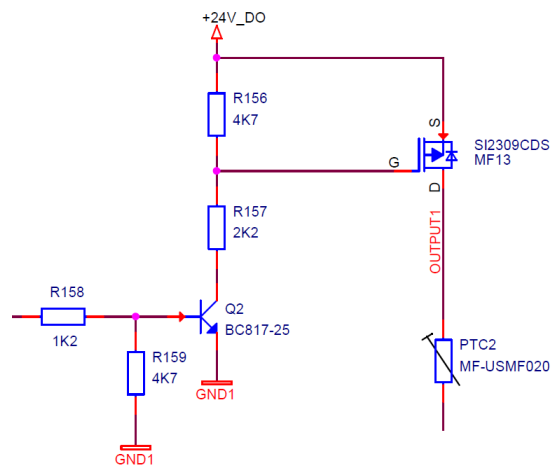


Figure 3.7: Outputs

### 3.4.8 UART port

| <i><b>MQA-C,D</b></i> |                                                                             |
|-----------------------|-----------------------------------------------------------------------------|
| <b>Signals</b>        | RX, TX, GND                                                                 |
| <b>Modes</b>          | full-duplex, serial port for motor control and setup, 115200 - 1250000 baud |
| <b>Protocol</b>       | Binary                                                                      |

### 3.4.9 CAN port

| <i><b>MQA-C,D</b></i>    |                                                                       |
|--------------------------|-----------------------------------------------------------------------|
| <b>Signals</b>           | CANH, CANL, GND                                                       |
| <b>Insulation</b>        | Optically insulated power and interface circuits +5 Vdc CAN           |
| <b>Format</b>            | conforming to the CAN V2.0b physical layer for high speed connections |
| <b>Data</b>              | in accordance with CANopen CIA DS301                                  |
| <b>Address selection</b> | dip-switch configurable                                               |
| <b>Stub</b>              | 121 ohm selectable                                                    |

### 3.4.10 Encoder port

| <i><b>MQA-C,D</b></i> |                        |
|-----------------------|------------------------|
| <b>Signals</b>        | A, B, X                |
| <b>Levels</b>         | 5V                     |
| <b>Frequency</b>      | 4MHz (post quadrature) |
| <b>Power supply</b>   | 5V @ 400mA             |

### 3.4.11 Digital Halls

| <i><b>MQA-C,D</b></i> |                                                        |
|-----------------------|--------------------------------------------------------|
| <b>Type</b>           | single ended digital, electrical phase-shifted by 120° |
| <b>Levels</b>         | U, V, W                                                |
| <b>Frequency</b>      | 10kHz                                                  |
| <b>Power supply</b>   | 5V @ 400mA                                             |

### 3.4.12 Motor connections

| <i><b>MQA-C,D</b></i> |                                                                                            |
|-----------------------|--------------------------------------------------------------------------------------------|
| <b>U, V, W phases</b> | three-phase PWM or 2 H bridges output, ungrounded.                                         |
| <b>Braking</b>        | dout(0).out can be configured as a brake without the needing of an external flyback diode. |

### 3.4.13 Status lights

| <i><b>MQA-C,D</b></i> |                                                      |
|-----------------------|------------------------------------------------------|
| <b>CAN status</b>     | Red and green lights, in accordance with CAN DR303-3 |

### 3.4.14 Protections

| <i><b>MQA-C,D</b></i>               |                       |
|-------------------------------------|-----------------------|
| <b>I<sup>2</sup>T current limit</b> | direct current        |
| <b>HV undervoltage</b>              | HV < 18V programmable |

### 3.4.15 Meccaniche e ambientali

|                    | <i><b>MQA-C</b></i>                                      | <i><b>MQA-D</b></i> |
|--------------------|----------------------------------------------------------|---------------------|
| <b>Dimensions</b>  | 79.5 x 54 mm                                             |                     |
| <b>Height</b>      | 16.5 mm                                                  |                     |
| <b>Weight</b>      | 50                                                       | 55 g                |
| <b>Temperature</b> | Operativity from 0 to +45 °C, Storage from -40 to +85 °C |                     |
| <b>Umidity</b>     | 0 to 95%, non condensing                                 |                     |
| <b>Cooling</b>     | Heatsink or inducted airflow                             |                     |

### 3.4.16 Conformance

| <i><b>MQA-C,D</b></i> |                                                                   |
|-----------------------|-------------------------------------------------------------------|
| <b>CE</b>             | CE compliant                                                      |
| <b>61000_6_4</b>      | Generic standards - Emission Standard for industrial environments |
| <b>61000_6_2</b>      | Generic standards - Immunity for industrial environments          |
| <b>RoHS</b>           | RoHS Compliant                                                    |

### 3.5 Lights

There are two leds to indicate the status of the drivers.

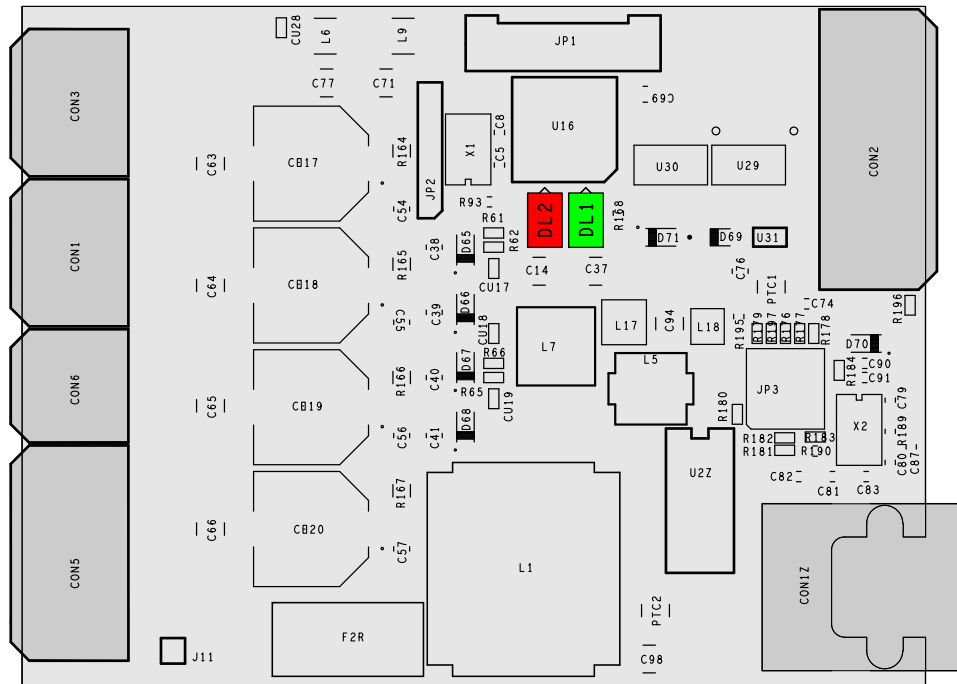
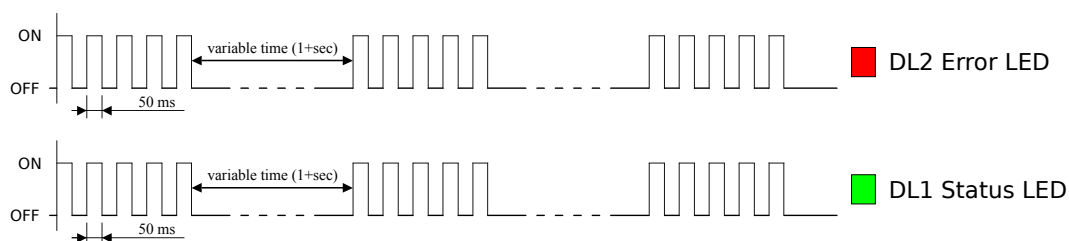


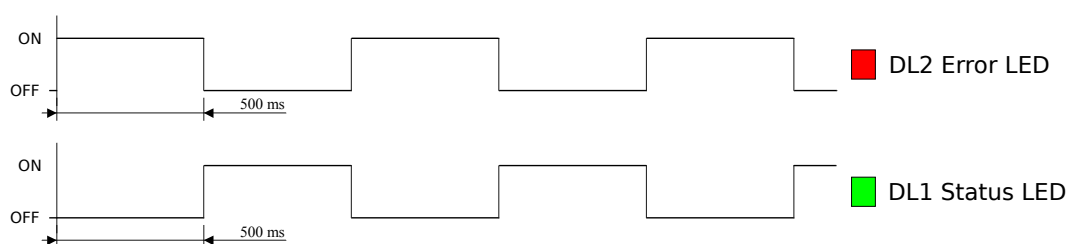
Figure 3.8: Lights position

The specifications of lights during operation of the device reflect what indicated in the document CiA DR 303-3 v1.2. In addition, two custom conditions have been defined

#### Corrupted or not installed application



#### Configuration parameters not found



### 3.6 Connections

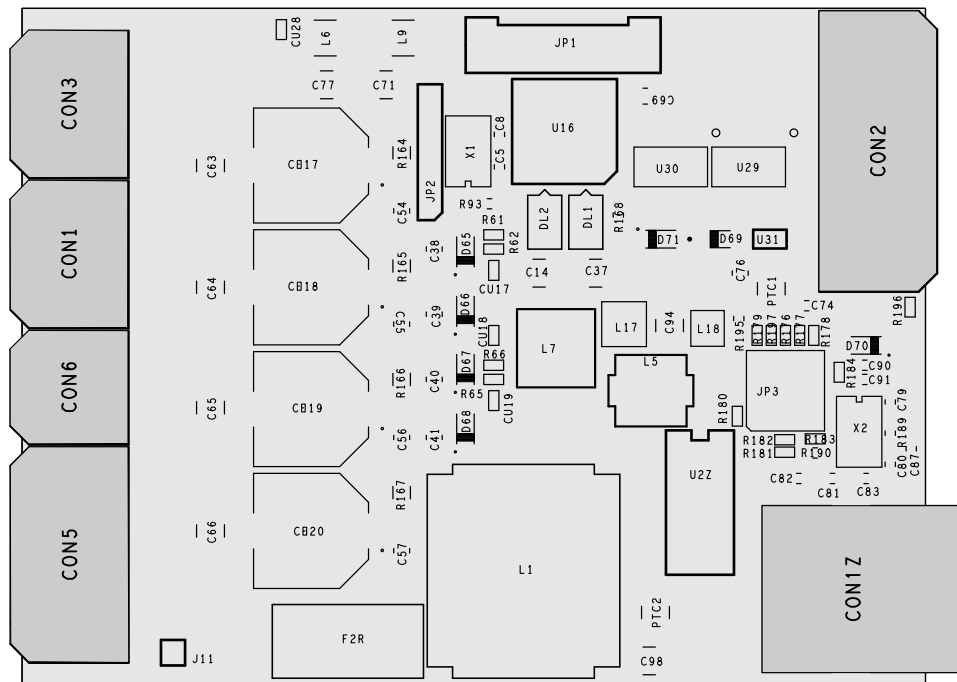


Figure 3.9: MQA-C/D connectors

### 3.6.1 CON1 - Hall sensors connector

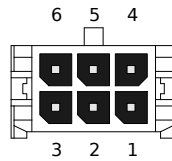


Figure 3.10: MICROFIT 3.0 430450600

| <i>pin</i> | <i>name</i> | <i>type</i> | <i>description</i>      |
|------------|-------------|-------------|-------------------------|
| 1          | 5V          | OUT         | 5V sensors power supply |
| 2          | reference   | -           | 5V common reference     |
| 3          | reference   | -           | 5V common reference     |
| 4          | hallA       | IN          | hall sensor A           |
| 5          | hallB       | IN          | hall sensor B           |
| 6          | hallC       | IN          | hall sensor C           |

### 3.6.2 CON2 - I/O connector

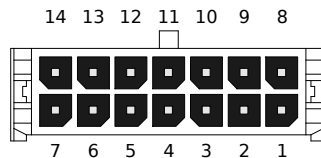


Figure 3.11: MICROFIT 3.0 430451400

| <i>pin</i> | <i>name</i> | <i>type</i> | <i>description</i>                               |
|------------|-------------|-------------|--------------------------------------------------|
| 1          | AI          | IN          | analog input                                     |
| 2          | 24V         | OUT         | 24V digital input 2                              |
| 3          | DI_2        | IN          | digital input2                                   |
| 4          | reference   | -           | common reference digital input 2                 |
| 5          | 24V         | OUT         | 24V digital input 1                              |
| 6          | DI_1        | IN          | digital input 1                                  |
| 7          | reference   | -           | common reference digital input1                  |
| 8          | reference   | -           | common reference analog input / digital output 1 |
| 9          | DO_1        | OUT         | digital output 1                                 |
| 10         | DO_0        | OUT         | digital output 0                                 |
| 11         | reference   | -           | common reference digital output 0                |
| 12         | 24V         | OUT         | 24V digital input 0                              |
| 13         | DI_0        | IN          | digital input 0                                  |
| 14         | reference   | -           | common reference digital input 0                 |

### 3.6.3 CON3 - Encoder connector

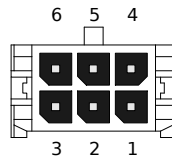


Figure 3.12: MICROFIT 3.0 430450600

| <i><b>pin</b></i> | <i><b>name</b></i> | <i><b>type</b></i> | <i><b>description</b></i> |
|-------------------|--------------------|--------------------|---------------------------|
| 1                 | 5V                 | OUT                | 5V encoder power supply   |
| 2                 | reference          | -                  | 5V common reference       |
| 3                 | reference          | -                  | 5V common reference       |
| 4                 | SA                 | IN                 | A signal                  |
| 5                 | SB                 | IN                 | B signal                  |
| 6                 | SC                 | IN                 | C signal (index)          |

### 3.6.4 CON5 - Power supply connector

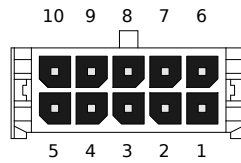


Figure 3.13: MICROFIT 3.0 430451000

| <i>pin</i> | <i>name</i>    | <i>type</i> | <i>description</i>          |
|------------|----------------|-------------|-----------------------------|
| 1          | reference      | -           | 24V common reference        |
| 2          | 24V logic      | IN          | logic circuits power supply |
| 3          | ground         | -           | ground                      |
| 4          | 24V power      | IN          | main power supply           |
| 5          | brake resistor | OUT         | brake resistor              |
| 6          | reference      | -           | 24V common reference        |
| 7          | 24V logic      | IN(OUT)     | logic circuits power supply |
| 8          | ground         | -           | ground                      |
| 9          | 24V power      | IN(OUT)     | main power supply           |
| 10         | 24V res brake  | OUT         | brake resistor reference    |

### 3.6.5 CON6 - Motor connector

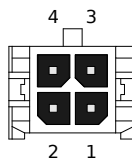


Figure 3.14: MICROFIT 3.0 430450400

| <i>pin</i> | <i>name</i> | <i>type</i> | <i>description - three-phase<br/>(brushless)</i> | <i>description - double<br/>single-phase (stepper)</i> |
|------------|-------------|-------------|--------------------------------------------------|--------------------------------------------------------|
| 1          | B           | OUT         | brake resistor                                   | H2-                                                    |
| 2          | U           | OUT         | U phase                                          | H1+                                                    |
| 3          | W           | OUT         | W phase                                          | H2+                                                    |
| 4          | V           | OUT         | V phase                                          | H1-                                                    |

### 3.6.6 CON12 - Ethernet connector

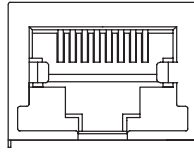


Figure 3.15: RJ45 Ethernet

| <i><b>pin</b></i> | <i><b>nome</b></i> | <i><b>tipo</b></i> | <i><b>descrizione</b></i> |
|-------------------|--------------------|--------------------|---------------------------|
| 1                 | TX +               | OUT                | Transmit data +           |
| 2                 | TX -               | OUT                | Transmit data -           |
| 3                 | RX +               | IN                 | Receive data +            |
| 4                 | NC                 | -                  | Not connected             |
| 5                 | NC                 | -                  | Not connected             |
| 6                 | RX -               | IN                 | Receive data +            |
| 7                 | NC                 | -                  | Not connected             |
| 8                 | NC                 | -                  | Not connected             |

## FCC Statement

*Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.*

*Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.*

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## Industry Canada statement

*This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:*

- 1. this device may not cause interference, and*
- 2. this device must accept any interference, including interference that may cause undesired operation of the device.*

*Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes :*

- 1. l'appareil ne doit pas produire de brouillage, et*
- 2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.*

CAN ICES-3 (A)/NMB-3(A)