



# Low Voltage Mobile Drives

## MC Series

### Quick Start Manual

PVD 3667e\_GB



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## MC Drive Series - Information



It is the responsibility of the user to ensure end product compliance with all European requirements. The user, through its own analysis and testing, is solely responsible for making the final selection of the system and components and assuring that all performance, endurance, maintenance, safety and warning requirements of the application are met. The user must analyze all aspects of the application, follow applicable industry standards, and follow the information concerning the product in the current product catalogue and in any other materials provided from Parker Hannifin Corporation or its subsidiaries or authorized distributors.



## Table of Content

|  |           |
|--|-----------|
| <b>MC DRIVE SERIES - INFORMATION .....</b>       | <b>2</b>  |
| <b>1. INTRODUCTION .....</b>                     | <b>4</b>  |
| 1.1. PRODUCT DESCRIPTION.....                    | 4         |
| 1.2. PRODUCT FEATURES .....                      | 4         |
| 1.3. PART NUMBER .....                           | 5         |
| 1.4. SOFTWARE.....                               | 6         |
| <b>2. MCC.....</b>                               | <b>8</b>  |
| 2.1. OVERVIEW .....                              | 8         |
| 2.2. DIMENSIONS (MM).....                        | 9         |
| 2.3. CONNECTOR WIRING.....                       | 9         |
| <b>3. MCD.....</b>                               | <b>10</b> |
| 3.1. OVERVIEW .....                              | 10        |
| 3.2. DIMENSIONS (MM).....                        | 11        |
| 3.3. CONNECTOR WIRING.....                       | 11        |
| <b>4. MCE &amp; MCF.....</b>                     | <b>12</b> |
| 4.1. OVERVIEW MCE.....                           | 12        |
| 4.2. OVERVIEW MCF.....                           | 13        |
| 4.3. DIMENSIONS MCE & MCF (MM).....              | 14        |
| 4.4. CONNECTOR WIRING MCE & MCF .....            | 14        |
| <b>5. TYPICAL WIRING .....</b>                   | <b>15</b> |
| <b>APPENDIX A HIGH CURRENT CONNECTIONS .....</b> | <b>16</b> |
| <b>APPENDIX B LOW CURRENT CONNECTIONS.....</b>   | <b>18</b> |

## 1. INTRODUCTION

### 1.1. Product Description

Parker's MC Series Mobile Inverter range provides high performance and functionality in a compact package for mobile motor control applications from 24 to 96 VDC. Compatible with multiple asynchronous motor manufacturers, the MC series settings can be optimized with supplied configuration software. Each inverter provides system control capabilities such as analogue and digital inputs and outputs, contactor coil drivers and proportional valve drivers.

### 1.2. Product Features

- Advanced field oriented vector control
- Auto-configuration of typical induction motors
- High efficiency cold plate heat sink design
- High frequency MOSFET power stages
- IP 65 protection class
- Motor temp sensor input
- Encoder supply output (5V)
- Auxiliary supply (+5V, +12V)
- AB encoder input
- Dual, configurable throttle inputs
- Configurable CAN communication
- Parker IQAN compatible
- Ability to control vehicle control tasks separately from motor control
- 5 configurable coil drive outputs
- 2 configurable digital outputs
- 2 Analogue inputs
- 6 Digital inputs



### 1.3. Part Number

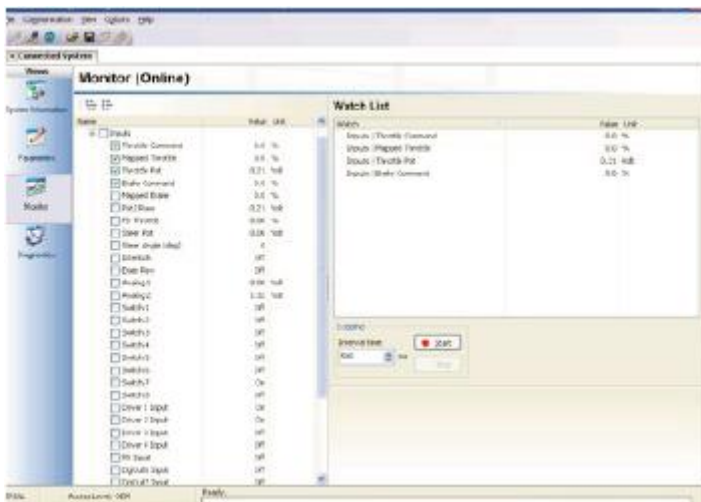
|   |   |   |   |    |   |      |   |    |   |    |
|---|---|---|---|----|---|------|---|----|---|----|
| 1 | 2 | 3 |   | 4  |   | 5    |   | 6  |   | 7  |
| M | C | C | - | 02 | - | 0200 | - | 01 | - | 00 |

|                        |                                  |                           |
|------------------------|----------------------------------|---------------------------|
| <b>1</b>               | <b>Inverter family</b>           |                           |
|                        | M                                | Mobile inverter           |
| <b>2</b>               | <b>Control module build</b>      |                           |
|                        | C                                | Low voltage               |
| <b>3</b>               | <b>Frame size</b>                |                           |
|                        | C                                |                           |
|                        | D                                |                           |
|                        | E                                |                           |
|                        | F                                |                           |
| <b>4</b>               | <b>Maximum operating voltage</b> |                           |
|                        | 02                               | 24 VDC                    |
|                        | 03                               | 36 VDC                    |
|                        | 04                               | 48 VDC                    |
|                        | 08                               | 80 VDC                    |
|                        | 09                               | 96 VDC                    |
| <b>5</b>               | <b>Peak current ratings</b>      |                           |
| 24 VDC Nominal Voltage | 0180                             | 180 A – MC series Frame C |
|                        | 0250                             | 250 A – MC series Frame C |
|                        | 0350                             | 350 A – MC series Frame D |
| 36 VDC Nominal Voltage | 0400                             | 400 A – MC series Frame E |
|                        | 0500                             | 500 A – MC series Frame E |
|                        | 0650                             | 650 A – MC series Frame F |
|                        | 0800                             | 800 A – MC series Frame F |
| 48 VDC Nominal Voltage | 0200                             | 200 A – MC series Frame C |
|                        | 0275                             | 275 A – MC series Frame D |
|                        | 0350                             | 350 A – MC series Frame D |
|                        | 0450                             | 450 A – MC series Frame E |
|                        | 0550                             | 550 A – MC series Frame E |
|                        | 0650                             | 650 A – MC series Frame F |
| 80 VDC Nominal Voltage | 0175                             | 175 A – MC series Frame C |
|                        | 0250                             | 250 A – MC series Frame D |
|                        | 0350                             | 350 A – MC series Frame E |
|                        | 0450                             | 450 A – MC series Frame F |
|                        | 0550                             | 550 A – MC series Frame F |
|                        | 0650                             | 650 A – MC series Frame F |
| 96 VDC Nominal Voltage | 0550                             | 550 A – MC series Frame F |
|                        | 0650                             | 650 A – MC series Frame F |
| <b>6</b>               | <b>Branding</b>                  |                           |
|                        | 01                               | Parker branded            |
| <b>7</b>               | <b>Special options</b>           |                           |
|                        | 00                               | E version with PMAC       |
|                        | 02                               | E version without PMAC    |

## 1.4. Software

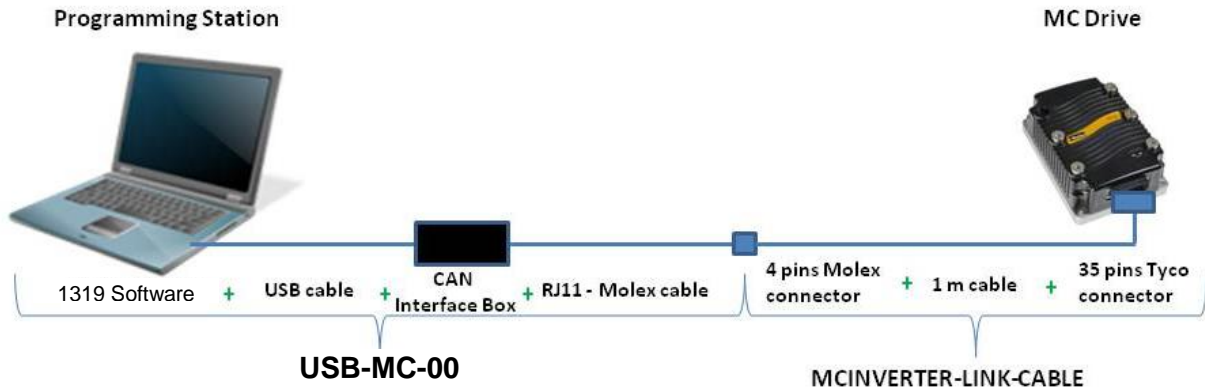
### MC Configuration Manager Software

- PC-based programming
- System monitoring
- System diagnostics
- Adjust system variables and programmable parameters
- Online or offline use
- Windows XP/Vista/7 compatible
- Includes USB adaptor





To be able to configure an MC Inverter, a software and connecting devices are required as shown hereunder (1319 at the moment).  
 Its part number is **USB-MC-00**.

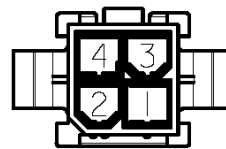


To connect the 1319 to the MC inverter, a specific cable is required.  
 It is made with a 35 pins Tyco connector on one side to be connected to the inverter and with a 4 pins Molex connector to be connected with the 1319 on the other.  
 Parker is proposing such a cable that is 1m long : **MCINVERTER-LINK-CABLE**.  
 In case of other length requirements, you will find hereunder the different components required to make such a cable :

Side 35 pins Tyco connector : Plug Housing : 776164-1 } Part Number LA502886  
 (see Appendix B) Pins : 770520-3  
 Crimp Plier : 58529-1  
 Crimp tool : 58529-2

Side 4 pins Molex : Plug Housing : 39-01-2046  
 Pin : 39-00-0082  
 Crimp Plier : 63819-0900

|   |              |
|---|--------------|
| 1 | RX           |
| 2 | Ground       |
| 3 | TX           |
| 4 | +12V (100mA) |



**4CKTS.**

bottom view

## 2. MCC

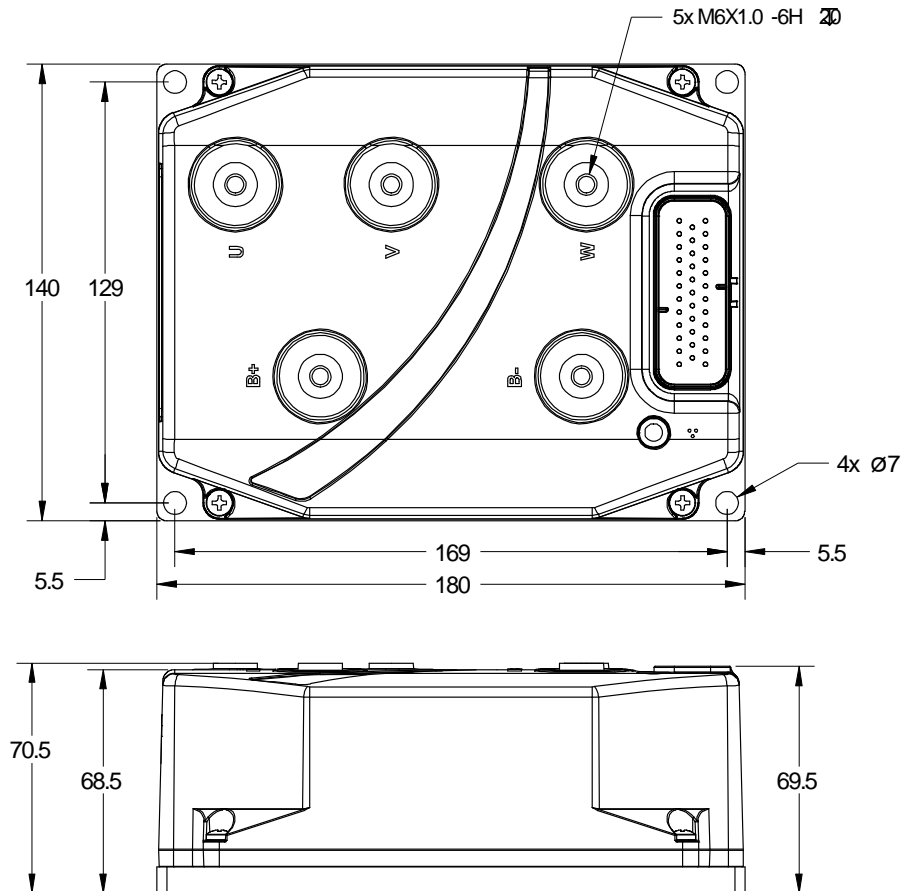
### 2.1. Overview



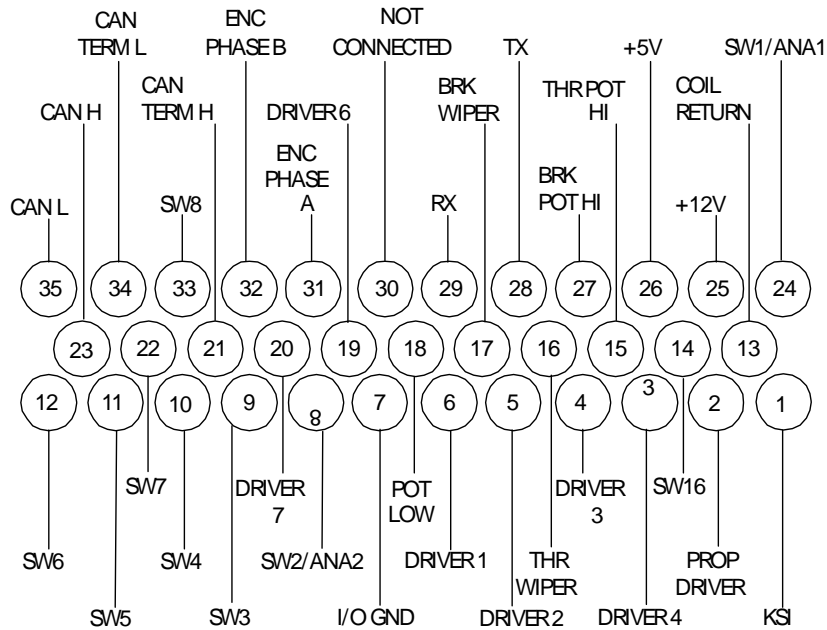
| PART NUMBER       | Supply Voltage | Output Current (1 hour) | Max.Current (2 min) | Weight (kg) |
|-------------------|----------------|-------------------------|---------------------|-------------|
| MCC-02-0180-01-02 | 24VDC          | 90A                     | 180A                | 1.7         |
| MCC-02-0250-01-02 | 24VDC          | 125A                    | 250A                | 1.7         |
| MCC-04-0200-01-02 | 36/48VDC       | 100A                    | 200A                | 1.7         |
| MCC-08-0175-01-02 | 48/80VDC       | 80A                     | 175A                | 1.7         |



## 2.2. Dimensions (mm)



## 2.3. Connector wiring



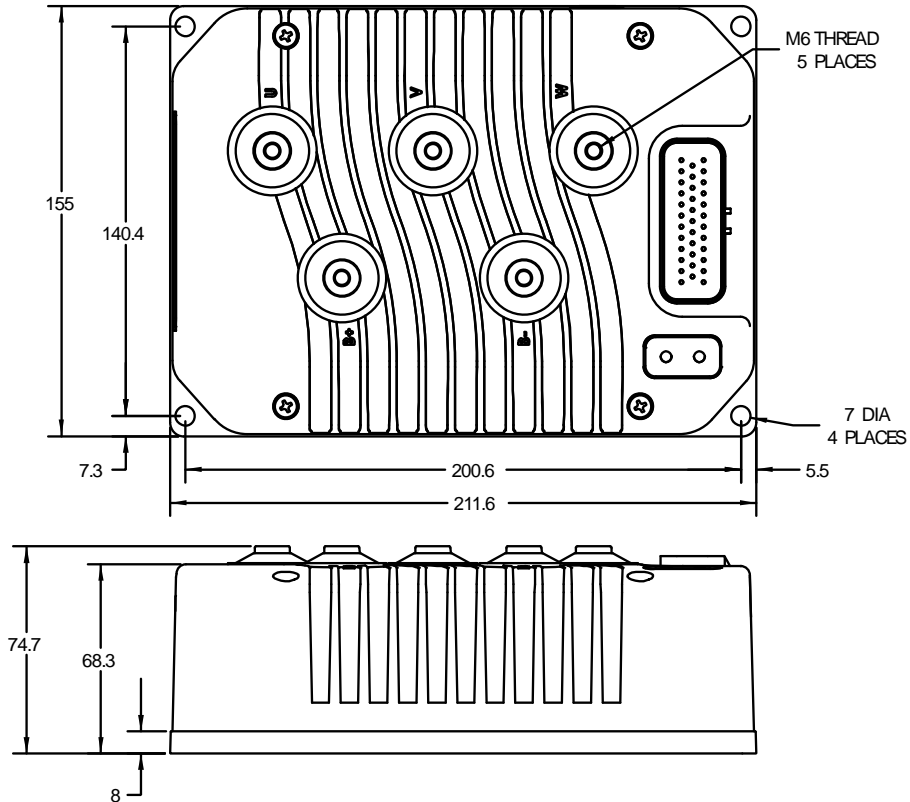
## 3. MCD

### 3.1. Overview

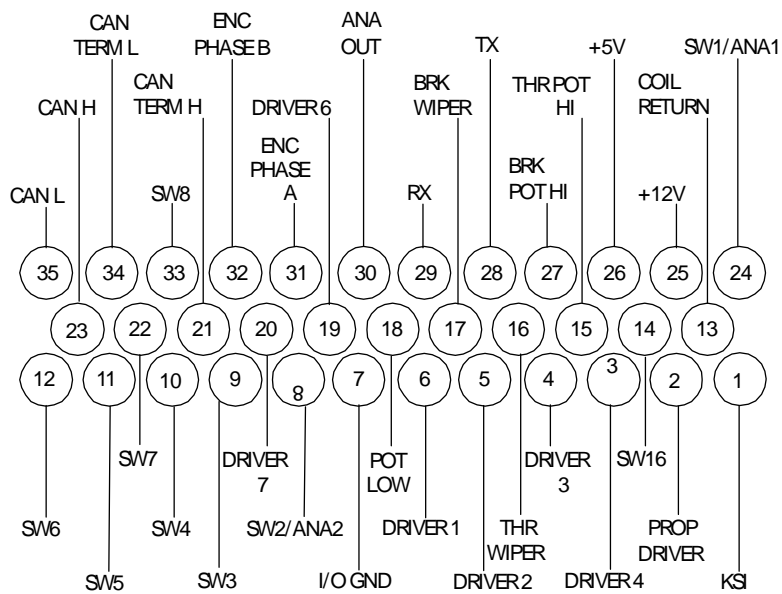


| PART NUMBER       | Supply Voltage | Output Current (1 hour) | Max.Current (2 min) | Weight kg |
|-------------------|----------------|-------------------------|---------------------|-----------|
| MCD-02-0350-01-02 | 24VDC          | 175A                    | 350A                | 2.8       |
| MCD-04-0275-01-02 | 36/48VDC       | 140A                    | 275A                | 2.8       |
| MCD-04-0350-01-02 | 36/48VDC       | 175A                    | 350A                | 2.8       |
| MCD-08-0250-01-02 | 48/80VDC       | 110A                    | 250A                | 2.8       |

### 3.2. Dimensions (mm)



### 3.3. Connector wiring



## 4. MCE & MCF

### 4.1. Overview MCE



| PART NUMBER       | Supply Voltage | Output Current (1 hour) | Max.Current (2 min) | Weight kg |
|-------------------|----------------|-------------------------|---------------------|-----------|
| MCE-03-0400-01-02 | 24/36VDC       | 175A                    | 400A                | 4.1       |
| MCE-03-0500-01-02 | 24/36VDC       | 240A                    | 500A                | 4.1       |
| MCE-04-0450-01-02 | 36/48VDC       | 205A                    | 450A                | 4.1       |
| MCE-04-0550-01-02 | 36/48VDC       | 250A                    | 550A                | 4.1       |
| MCE-08-0350-01-02 | 48/80VDC       | 100A                    | 350A (1 min)        | 4.1       |

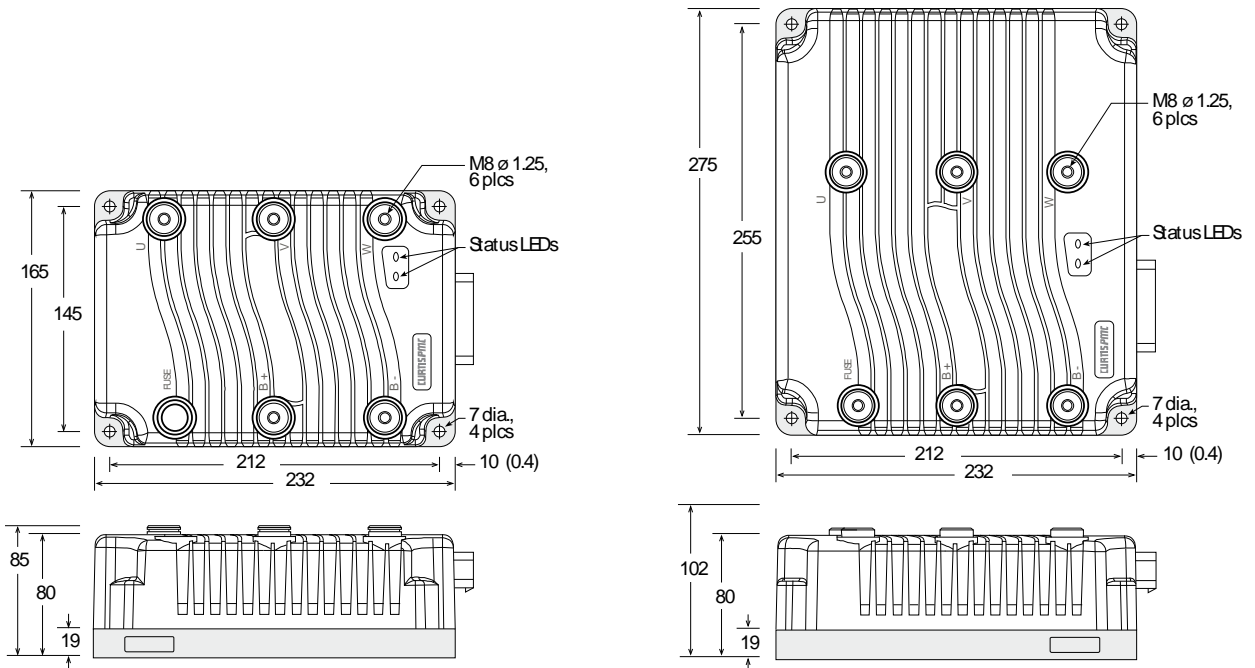
## 4.2. Overview MCF

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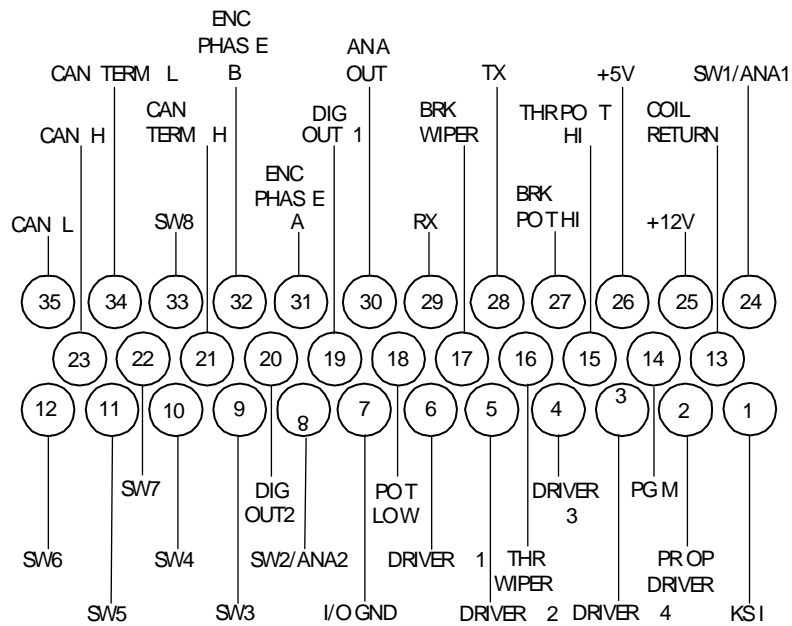


| PART NUMBER       | Supply Voltage | Output Current (1 hour) | Max.Current (2 min) | Weight kg |
|-------------------|----------------|-------------------------|---------------------|-----------|
| MCF-03-0650-01-02 | 24/36VDC       | 300A                    | 650A                | 6.8       |
| MCF-03-0800-01-02 | 24/36VDC       | 355A                    | 800A                | 6.8       |
| MCF-04-0650-01-02 | 36/48VDC       | 295A                    | 650A                | 6.8       |
| MCF-08-0450-01-02 | 48/80VDC       | 155A                    | 450A                | 6.8       |
| MCF-08-0550-01-02 | 48/80VDC       | 190A                    | 550A                | 6.8       |
| MCF-08-0650-01-02 | 48/80VDC       | 195A                    | 650A (1min)         | 6.8       |
| MCF-09-0550-01-02 | 72/96VDC       | 175A                    | 550A                | 6.8       |
| MCF-09-0650-01-02 | 72/96VDC       | 200A                    | 650A                | 6.8       |

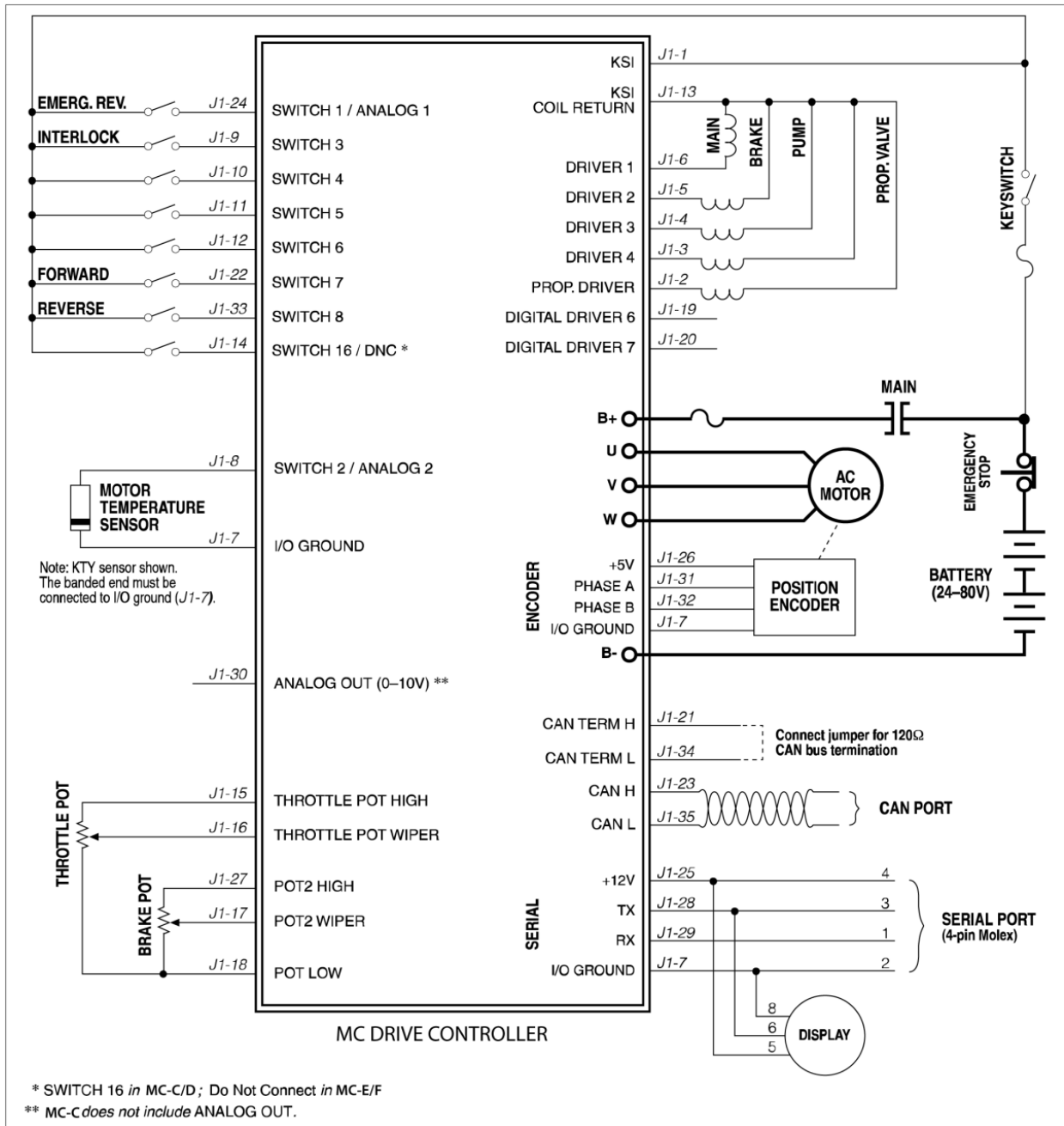
### 4.3. Dimensions MCE & MCF (mm)



### 4.4. Connector wiring MCE & MCF



## 5. TYPICAL WIRING



## APPENDIX A HIGH CURRENT CONNECTIONS

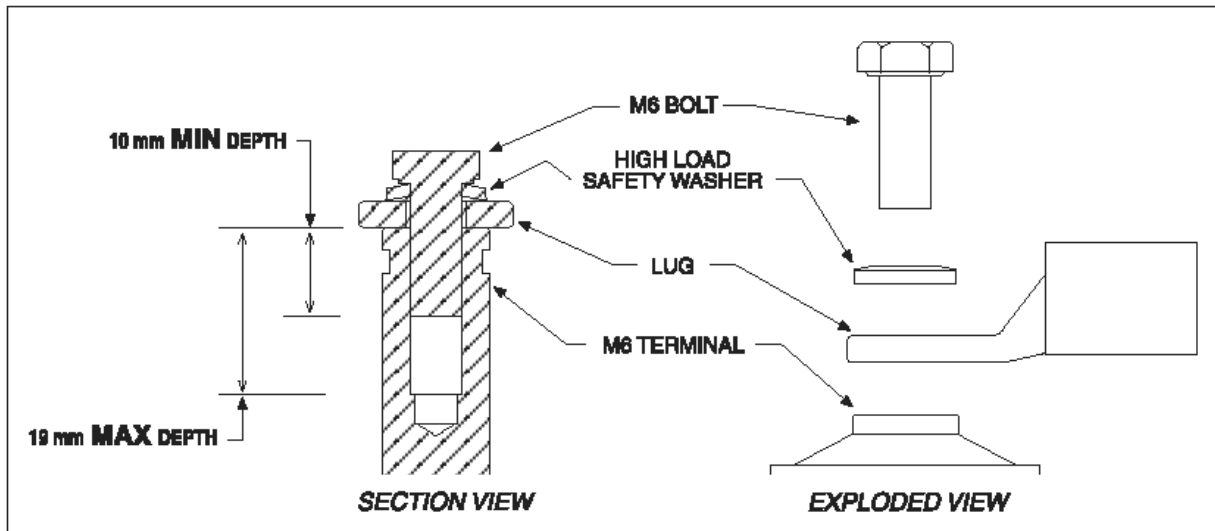
There are five high-current terminals, identified on the controller housing as **B+**, **B-**, **U**, **V**, and **W**.

| Table 1 High Current Connections |                                 |
|----------------------------------|---------------------------------|
| TERMINAL                         | FUNCTION                        |
| <b>B+</b>                        | Positive battery to controller. |
| <b>B-</b>                        | Negative battery to controller. |
| <b>U</b>                         | Motor phase U.                  |
| <b>V</b>                         | Motor phase V.                  |
| <b>W</b>                         | Motor phase W.                  |

### Lug assembly: MCC and MCD models

Five aluminum M6 terminals are provided. Lugs should be installed as follows, using M6 bolts sized to provide proper engagement (see diagram):

- Place the lug on top of the aluminum terminal, followed by a high-load safety washer with its convex side on top. The washer should be a SCHNORR 416320, or equivalent.
- If two lugs are used on the same terminal, stack them so the lug carrying the least current is on top.
- Tighten the assembly to  $10.2 \pm 1.1$  N·m ( $90 \pm 10$  in-lbs).



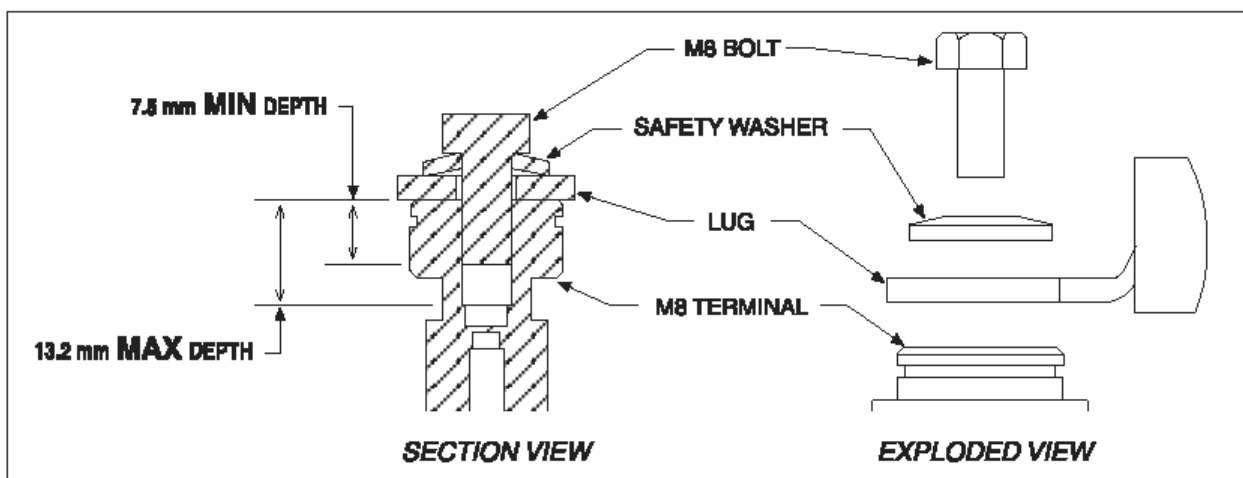


## Lug assembly: MCE and MCF models

Five brass M8 terminals are provided. Lugs should be installed as follows, using M8 bolts sized to provide proper engagement (see diagram):

- Place the lug on top of the terminal, followed by a safety washer with its convex side on top. The washer should be a SCHNORR 700800, or equivalent.
- If two lugs are used on the same terminal, stack them so the lug carrying the least current is on top.
- Tighten the assembly to  $9.6 \pm 0.9 \text{ N}\cdot\text{m}$  ( $85 \pm 8 \text{ in}\cdot\text{lbs}$ ).

Note: The terminals may rotate up to  $\pm 5^\circ$  in the cover.



## High current wiring recommendations: all models

### Battery cables (B+, B-)

These two cables should be run close to each other between the controller and the battery. Use high quality copper lugs and observe the recommended torque ratings. For best noise immunity the cables should not run across the center section of the controller. With multiple high current controllers, use a star ground from the battery **B-** terminal.

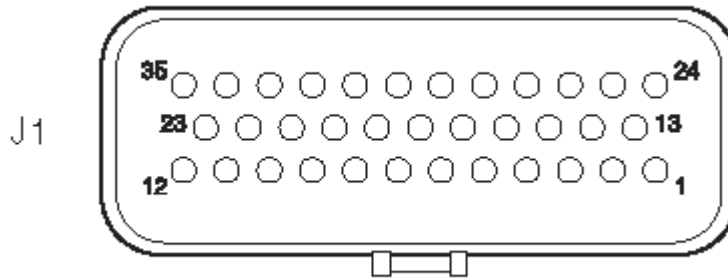
### Motor wiring (U, V, W)

The three phase wires should be close to the same length and bundled together as they run between the controller and the motor. The cable lengths should be kept as short as possible. Use high quality copper lugs and observe the recommended torque ratings. For best noise immunity the motor cables should not run across the center section of the controller. In applications that seek the lowest possible emissions, a shield can be placed around the bundled motor cables and connected to the **B-** terminal at the controller. Typical installations will readily pass the emissions standards without a shield. Low current signal wires should not be run parallel to the motor cables. When necessary they should cross the motor cables at a right angle to minimize noise coupling.

## APPENDIX B LOW CURRENT CONNECTIONS

All low power connections are made through a single 35-pin connector. The connector will accept 20 to 16 AWG wire with a 1.7 to 2.7mm diameter thin-wall insulation.

The 35 individual pins are characterized in Table 2.



### Low current wiring recommendations

#### Motor encoder (Pins 31, 32)

All four encoder wires should be bundled together as they run between the motor and controller logic connector. These can often be run with the rest of the low current wiring harness. The encoder cables should not be run near the motor cables. In applications where this is necessary, shielded cable should be used with the ground shield connected to the I/O ground (pin 7) at only the controller side. In extreme applications, common mode filters (e.g. ferrite beads) could be used.

#### CAN bus (Pins 21, 23, 34, 35)

It is recommended that the CAN wires be run as a twisted pair. However, many successful applications at 125 kBaud are run without twisting, simply using two lines bundled in with the rest of the low current wiring. CAN wiring should be kept away from the high current cables and cross it at right angles when necessary.

#### All other low current wiring

The remaining low current wiring should be run according to standard practices. Running low current wiring parallel to the high current wiring should always be avoided, and cross it at right angles when necessary.



Table 2.

| PIN | NAME              | DESCRIPTION  |
|-----|-------------------|--|
| 1   | KS                | Keyswitch input. Provides logic power for the controller and power for the coil drivers.   |
| 2   | Prop. Driver      | Proportional driver. This is a coil driver with current control capability typically used for a proportional valve on a hydraulic manifold. Can also be used as a digital input. |
| 3   | Driver 4          | Generic driver #4; can also be used as a digital input. Has low frequency PWM capabilities.  |
| 4   | Driver 3          | Generic driver #3; can also be used as a digital input. Has low frequency PWM capabilities. Typically used for pump contactor.   |
| 5   | Driver 2          | Generic driver #2; can also be used as a digital input. Has low frequency PWM capabilities and a slightly higher current rating. Typically used for electromagnetic brake.       |
| 6   | Driver 1          | Generic driver #1; can also be used as a digital input. Has low frequency PWM capabilities. Typically used for main contactor.   |
| 7   | I/O Ground        | Input and output ground reference.   |
| 8   | Switch 2 Analog 2 | Can be used as generic switch input #2 or as generic analog input #2. Typically used as the motor temperature analog input.  |
| 9   | Switch 3          | Generic switch input #3. Typically used as the interlock switch.   |
| 10  | Switch 4          | Generic switch input #4.   |
| 11  | Switch 5          | Generic switch input #5.   |

| PIN | NAME               | DESCRIPTION  |
|-----|--------------------|--|
| 12  | Switch 6           | Generic switch input #6.   |
| 13  | Coil Return        | This is the coil return pin (at B+ potential) for all the contactor coils.   |
| 14  | Switch 16/ DNC     | In the 1234, this is generic switch input #16. In the 1236 and 1238, Do Not Connect.   |
| 15  | Throttle Pot High  | Pot high connection for a 3-wire throttle pot.   |
| 16  | Throttle Pot Wiper | Pot wiper connection for the throttle pot.   |
| 17  | Pot2 Wiper         | Pot wiper connection for the brake pot.  |
| 18  | Pot Low            | Common pot low connection for the throttle and brake pots.   |
| 19  | Digital Out 6      | An open collector digital output. Can also be used as a digital input.   |
| 20  | Digital Out 7      | An open collector digital output. Can also be used as a digital input.   |
| 21  | CAN Term H         | High connection for the CAN termination jumper.  |
| 22  | Switch 7           | Generic switch input #7. Typically used as the Forward switch.   |
| 23  | CANH               | CAN bus high.  |
| 24  | Switch 1 Analog 1  | Can be used as generic switch input #1 or as generic analog input #1. Typically used for emergency reverse switch (if applicable). |
| 25  | +12V Out           | Unregulated low power +12V output.   |
| 26  | +5V Out            | Regulated low power +5V output.  |
| 27  | Pot2 High          | Pot high connection for a 3-wire brake pot.  |



| PIN | NAME            | DESCRIPTION  |
|-----|-----------------|--|
| 28  | Serial TX       | Serial transmit line for display or flash update.              |
| 29  | Serial RX       | Serial receive line for flash update.                          |
| 30  | Analog Output * | Low power, low frequency 0–10V analog output.                  |
| 31  | Encoder A       | Quadrature encoder input phase A.                              |
| 32  | Encoder B       | Quadrature encoder input phase B.                              |
| 33  | Switch 8        | Generic switch input #8. Typically used as the Reverse switch. |
| 34  | CAN Term L      | Low connection for the CAN bus termination jumper.             |
| 35  | CANL            | CAN bus low.   |

\* Pin 30 not connected on MCC controllers.