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## 890 QuickStart Manual

890SD (Standalone) Drives  
Frames E & F with STO SIL3/PLe  
HA501030U000 Issue 5

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climate control  
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filtration  
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# 890

# Quickstart Manual

## 890SD (Standalone) Drive Frames E & F with STO SIL3/PLe

HA501030U000 Issue 5

### 1) **What is Safe Torque Off (STO)?**

It is an electronic means of preventing the 890 drive from delivering torque and power to its connected motor. The 890 drive contains this feature as standard. It is a two channel, hardware implemented system. It has the highest possible safety rating for a variable speed drive. It is certified by BGIA, the German Trades Association for Industrial Safety, to Performance Level e (PLe) for a category 3 implementation to EN ISO 13849-1 with an equivalent Safety Integrity Level 3 (SIL 3).

All STO connections are made at terminal block X11.

### 2) **Where Could STO be Used?**

In safety control schemes for safety ratings up to category 3 PLe or SIL3. To replace expensive but less reliable drive output contactors, including for emergency stop purposes. The 890 STO function can also be used to implement Safe Stop 1 (SS1).

### 3) **To Use the STO Function - What Should I Do Next?**

Read and observe all the requirements in the STO chapter 6 of the Engineering Reference Manual, use the appropriate standards and risk assessments.

### 4) **Replacing a NON STO Drive OR the STO Function is Not Required - What Should I Do Next?**

Simply disable the STO function by Linking –

**X11/01 and X11/03 to X14/03 (24V) and separately link X11/02 OR X11/04 to X14/04 (0V).**

The rest of this quick start manual then applies.

### 5) **On Start Up the MMI Displays “ \*\*\*Tripped\*\*\* SAFE TORQUE OFF” or on a 6511 MMI “ <sup>A</sup>STO ” . Why?**

Because no connections to X11/01 OR X11/03, they are at 0V, the STO feature has been enabled i.e. failed safe. Simply disable the STO feature by fitting the links described in item 4) above.

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# Safety

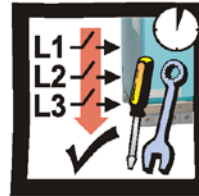
**IMPORTANT** Please read this information *BEFORE* installing the equipment.



This manual is for anyone installing, operating and servicing this unit.



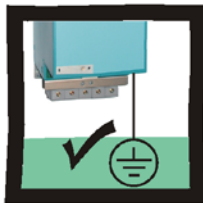
You must be technically competent to install and operate this unit.



Before working on the unit, isolate the mains supply from terminals L1, L2 and L3 and wait 3 minutes.



Disconnect the unit from circuits when doing high voltage resistance checks.



The unit must be **permanently earthed** due to the high earth leakage current.



The drive motor must be connected to an appropriate safety earth.



Electrostatic discharge sensitive parts : observe static control precautions.



Copy existing 890 parameters to any replacement 890 unit

## Hazards to Personnel

### WARNING!

This equipment can endanger life through rotating machinery and high voltages. Failure to observe the following will constitute an **ELECTRICAL SHOCK HAZARD**.

Metal parts may reach a temperature of 70 degrees Centigrade in operation.

Before working on the equipment, ensure isolation of the mains supply from terminals L1, L2 and L3. The equipment contains high value capacitors which discharge slowly after removal of the mains supply. Wait for at least 3 minutes for the dc link terminals (DC+ and DC-) to discharge to safe voltage levels (<50V). Measure the DC+ and DC- terminal voltage with a meter to confirm that the voltage is less than 50V.

Do not apply external voltage sources (mains supply or otherwise) to any of the braking terminals (DBR+, DBR-, DC+, INT or EXT).

## Application Risk

The specifications, processes and circuitry described herein are for guidance only and may need to be adapted to the user's specific application.

Parker Hannifin Manufacturing Limited does not guarantee the suitability of the equipment described in the Manual for individual applications.

---

## Risk Assessment

Under fault conditions, power loss or other operating conditions not intended, the equipment may not operate as specified. In particular:

- The motor speed may not be controlled
- The direction of rotation of the motor may not be controlled
- The motor may be energized

If the STO feature of the 890 drive is to be used, the user must undertake a risk assessment for the application. The user must then verify that their design, which includes the 890 drive, satisfies the Performance Level (PL) or Safety Integrity Level (SIL) required by the risk assessment.

Under no circumstances must the STO feature be used without first reading and fully understanding chapter 6 (Safe Torque Off) of the Engineering Reference Manual. All safety warnings therein must be observed.

---

## Accessibility

All live power terminals are IP20 rated only, since the equipment is intended to be installed within a normally-closed cubicle or enclosure, which itself requires a tool to open.

---

## Protective Insulation

- All control and signal terminals are SELV, i.e. protected by double insulation. Ensure all wiring is rated for the highest system voltage.

**NOTE** *Thermal sensors contained within the motor must be single/basic insulated.*

- All exposed metalwork in the Drive is protected by basic insulation and bonding to a safety earth.

---

## RCDs

Not recommended for use with this product. Where their use is mandatory, use only Type B RCDs (EN61009).

---

## Caution

This is a product of the restricted sales distribution class according to IEC 61800-3. It is designated as “professional equipment” as defined in EN61000-3-2. Permission of the supply authority shall be obtained before connection to the low voltage supply.

---

# Introduction

The 890SD Standalone Drive is designed for speed control of standard ac 3-phase motors.

- Control it remotely using configurable analogue and digital inputs and outputs.
- Control it locally using the 6901 Keypad.
- Use the Design System Explorer Configuration Tool (DSE 890) to give access to parameters, diagnostic messages, trip settings and application programming.
- Fit Options to the unit to give serial communications and closed loop speed control.

**IMPORTANT:** *Motors used must be suitable for Inverter duty.*

## About this QuickStart

**This QuickStart will:**

- Familiarise you with the terminals and operation of the unit.
  - Provide **\*basic** installation details and a quick set-up procedure.
  - Show you how to Autotune the drive and start the motor.
- \* *Because the 890 is a system product and we have no knowledge of your application, we detail the quickest way to power-up the drive using a simple earthing scheme with minimal control wiring. Refer to the full Engineering Reference Manual for items not covered in this QuickStart.*

**Provided with every 890 unit is a :**

- Quickstart
- 890 Installation Kit and instruction leaflet
- 6901 Keypad
- Customer-ordered Options

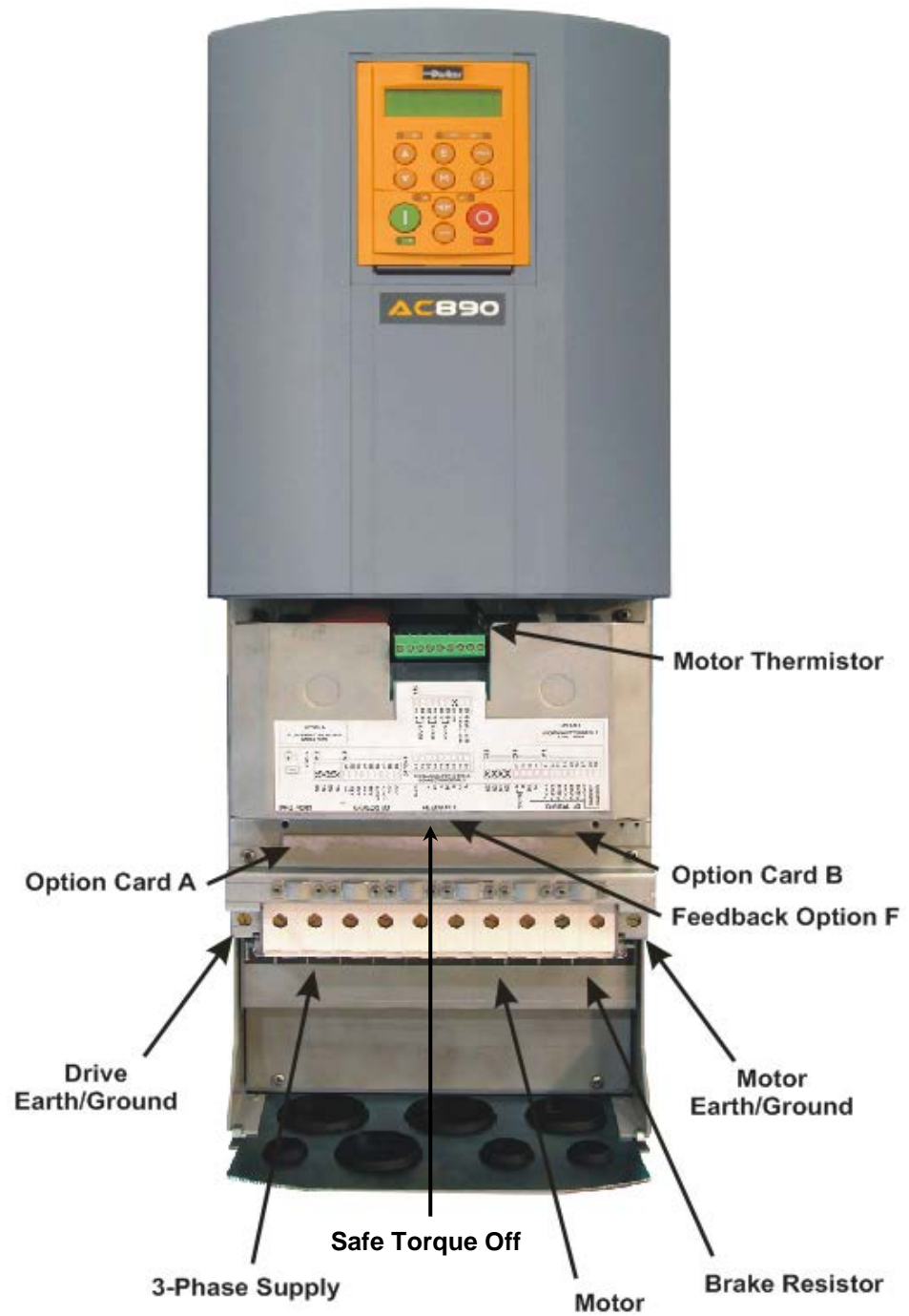
**This QuickStart assumes that:**

- You are a qualified technician with experience of installing this type of equipment.
- You are familiar with the relevant standards and Local Electric Codes (which take precedence).
- You have read and understood the Safety information provided at the front of this QuickStart.
- You realise that this guide contains only basic information and that you may need to refer to the Engineering Reference Manual to complete your installation.
- You are not using the Safe Torque Off (STO) feature of this product and that you will disable it as instructed in this QuickStart manual.  
Safety Note – Use of the STO feature requires full compliance with the STO chapter 6 of the Engineering Reference Manual to which the user must first refer.



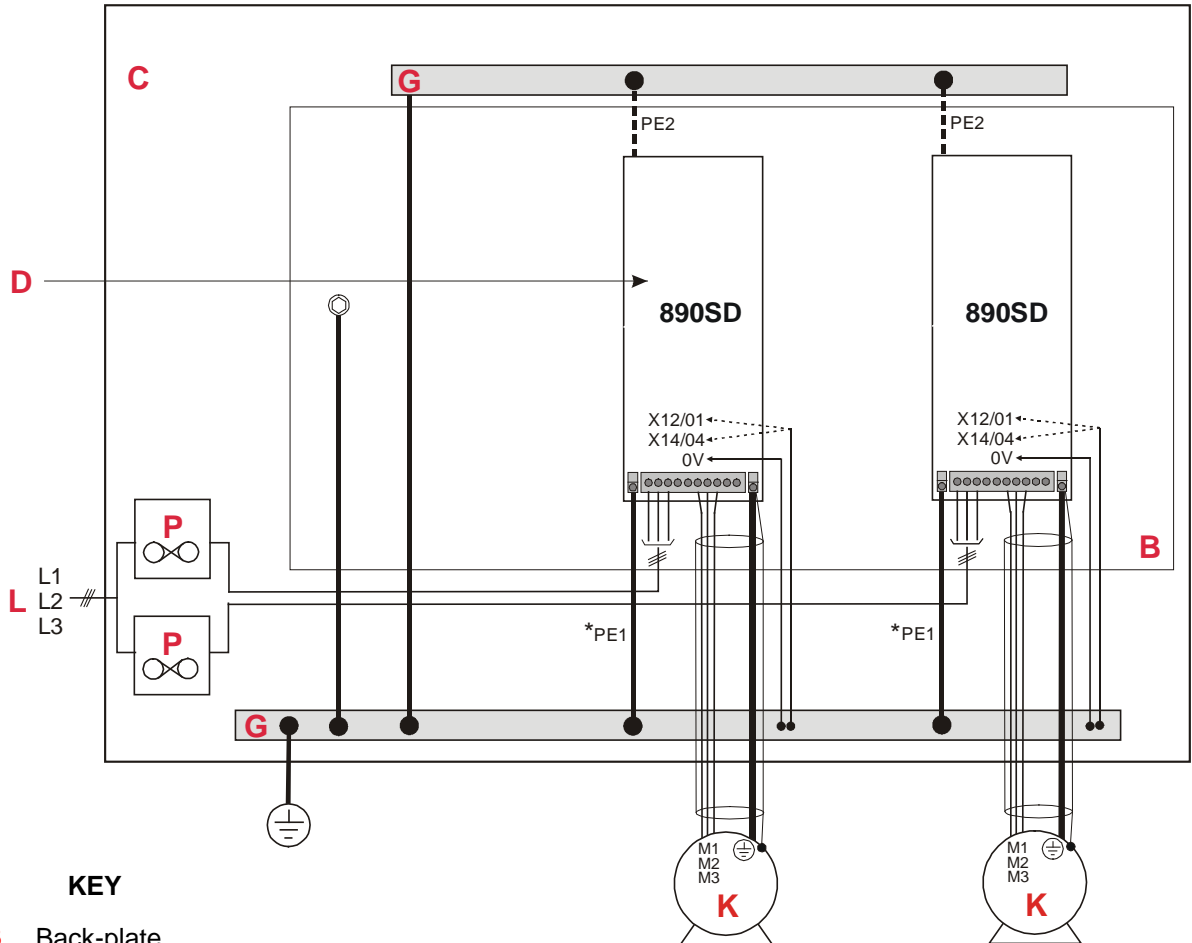
# Overview

## 890SD (Frame E illustrated)



# Installation

A simplified installation is shown below. This installation is **not** EMC compliant. For European installations and countries with EMC legislation refer to the 890 Engineering Reference Manual, Appendix C.



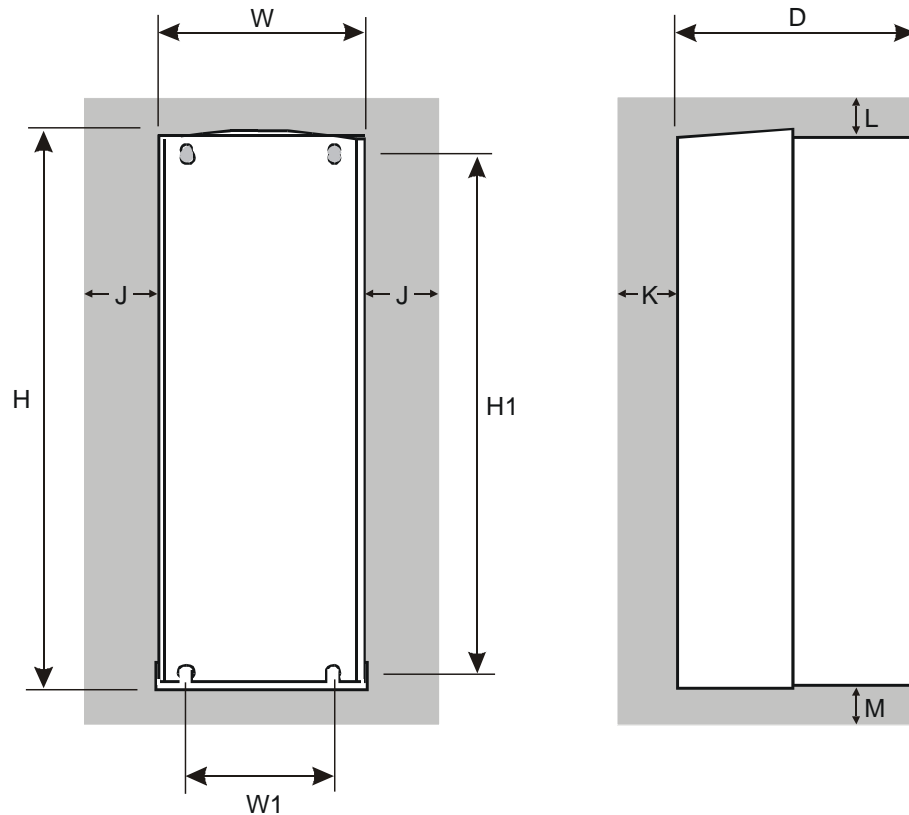
## KEY

- B** Back-plate
- C** Cubicle
- D** Control Wiring terminals
- G** Supply Protective Earth/Ground
- K** Motor (M1, M2, M3)
- L** 3Ø Power Supply Cable (L1, L2, L3)
- P** Fuse or circuit breaker

### \* Permanent Earthing

The unit must be **permanently earthed** according to EN 50178: For permanent earthing, one conductor, PE1, of >10mm<sup>2</sup> cross-section is required; or two individual incoming protective earth conductors, PE1 & PE2, of <10mm<sup>2</sup> cross-section. Each earth conductor must be suitable for the fault current according to EN 60204.

# Mounting Dimensions



The units must be installed in a cubicle. Mount the drive using the keyholes and slots.

| Models         | Maximum Weight:<br>kg/lbs | H               | H1              | W               | W1             | D               | Air Clearance |           |             |             | Fixings           |
|----------------|---------------------------|-----------------|-----------------|-----------------|----------------|-----------------|---------------|-----------|-------------|-------------|-------------------|
|                |                           |                 |                 |                 |                |                 | J             | K         | L           | M           |                   |
| <b>Frame E</b> | 32.5/72                   | 668.6<br>(26.3) | 630.0<br>(24.8) | 257.0<br>(10.1) | 150.0<br>(5.9) | 312<br>(12.3)   | 0<br>(zero)   | 25<br>(1) | 70<br>(2.8) | 70<br>(2.8) | Use M6<br>fixings |
| <b>Frame F</b> | 41/90.4                   | 720.0<br>(28.3) | 700.0<br>(27.6) | 257.0<br>(10.1) | 150.0<br>(5.9) | 355.0<br>(14.0) | 0<br>(zero)   | 25<br>(1) | 70<br>(2.8) | 70<br>(2.8) | Use M6<br>fixings |

All dimensions are in millimeters (inches)

## Ventilation

The drive gives off heat during normal operation. Mount it to allow free flow of air through the ventilation slots and heatsink. The mounting surface must be normally cool. Maintain the minimum air clearances. Clearances are additive when mounting two 890 units together. Ensure heat from adjacent equipment is not transmitted. Maintain the clearance requirements of other equipment.

## Environmental Conditions

Operating ambient temperature  
Enclosure rating

0°C to 45°C (32°F to 113°F)  
IP20 – UL(cUL) Open type

Atmosphere

Dust free, non flammable, non-corrosive, <85% humidity,  
non-condensing

# 890SD Frame E Power Connections

**5** Connect motor leads to M1/U, M2/V, M3/W.  
Maximum wire sizes::

**Frame E:** 50mm<sup>2</sup>/1AWG (without crimp)  
70mm<sup>2</sup>/ 1/0AWG (with crimp)

- Connect the earth/ground wire from the terminal box of the motor directly to the earth/ground terminal.

Maximum wire sizes:

**Frame E:** 50mm<sup>2</sup>/1AWG (without crimp)  
70mm<sup>2</sup>/ 1/0AWG (with crimp)

- If not using shielded cable, run motor leads in an enclosed metal conduit bonded to the drive at one end and the motor at the other.

**7** Connect the 3-phase supply.  
Maximum wire sizes:

**Frame E:** 50mm<sup>2</sup>/1AWG (without crimp)  
70mm<sup>2</sup>/ 1/0AWG (with crimp)

**8** Connect the brake resistor.  
Maximum wire sizes:

**Frame E:** 50mm<sup>2</sup>/1AWG (without crimp)  
70mm<sup>2</sup>/ 1/0AWG (with crimp)

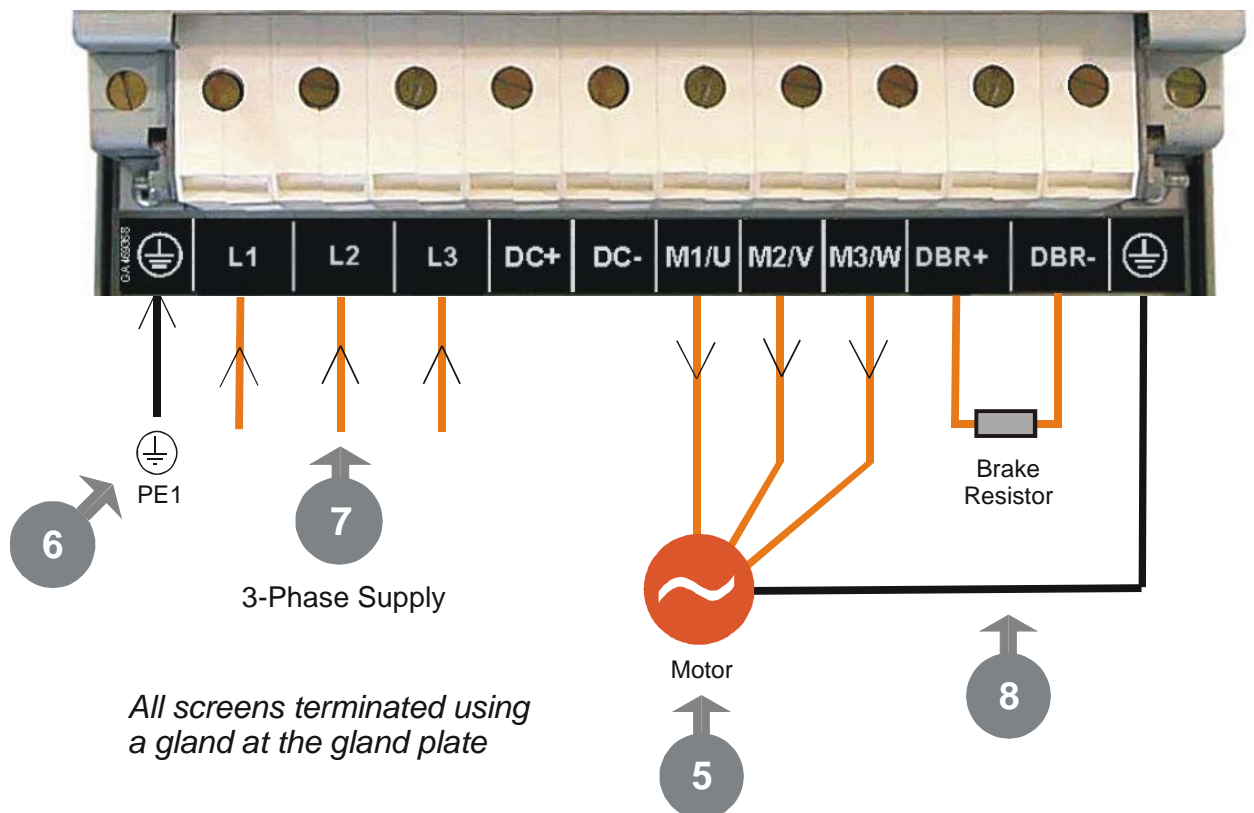
- An External Braking Resistor is optional. Connect it between DBR+ and DBR- for high inertial loads.

*DO NOT* apply external voltage sources (mains supply or otherwise) to the braking terminals.

We recommend using a thermal overload switch to protect the braking circuit.

**6** Connect the earth/ground wire to the earth/ground terminal.  
Maximum wire sizes:

**Frame E:** 50mm<sup>2</sup>/1AWG (without crimp)  
70mm<sup>2</sup>/ 1/0AWG (with crimp)



# 890SD Frame F Power Connections

- 5** Connect motor leads to M1/U, M2/V, M3/W.  
Maximum wire sizes::  
Frame F: 95mm<sup>2</sup>/ 4/0AWG (without crimp)  
95mm<sup>2</sup>/ 4/0AWG (with crimp)
- Connect the earth/ground wire from the terminal box of the motor directly to the earth/ground terminal.  
Maximum wire sizes:  
Frame F: 95mm<sup>2</sup>/ 4/0AWG (without crimp)  
95mm<sup>2</sup>/ 4/0AWG (with crimp)
  - If not using shielded cable, run motor leads in an enclosed metal conduit bonded to the drive at one end and the motor at the other.

- 6** Connect the earth/ground wire to the earth/ground terminal.  
Maximum wire sizes:  
Frame F: 95mm<sup>2</sup>/ 4/0AWG (without crimp)  
95mm<sup>2</sup>/ 4/0AWG (with crimp)

- 7** Connect the 3-phase supply.  
Maximum wire sizes:  
Frame F: 95mm<sup>2</sup>/ 4/0AWG (without crimp)  
95mm<sup>2</sup>/ 4/0AWG (with crimp)

- 8** Connect the 115 or 220Vac auxiliary supply for the internal fans to AUX 1 and AUX 2 (in any order).

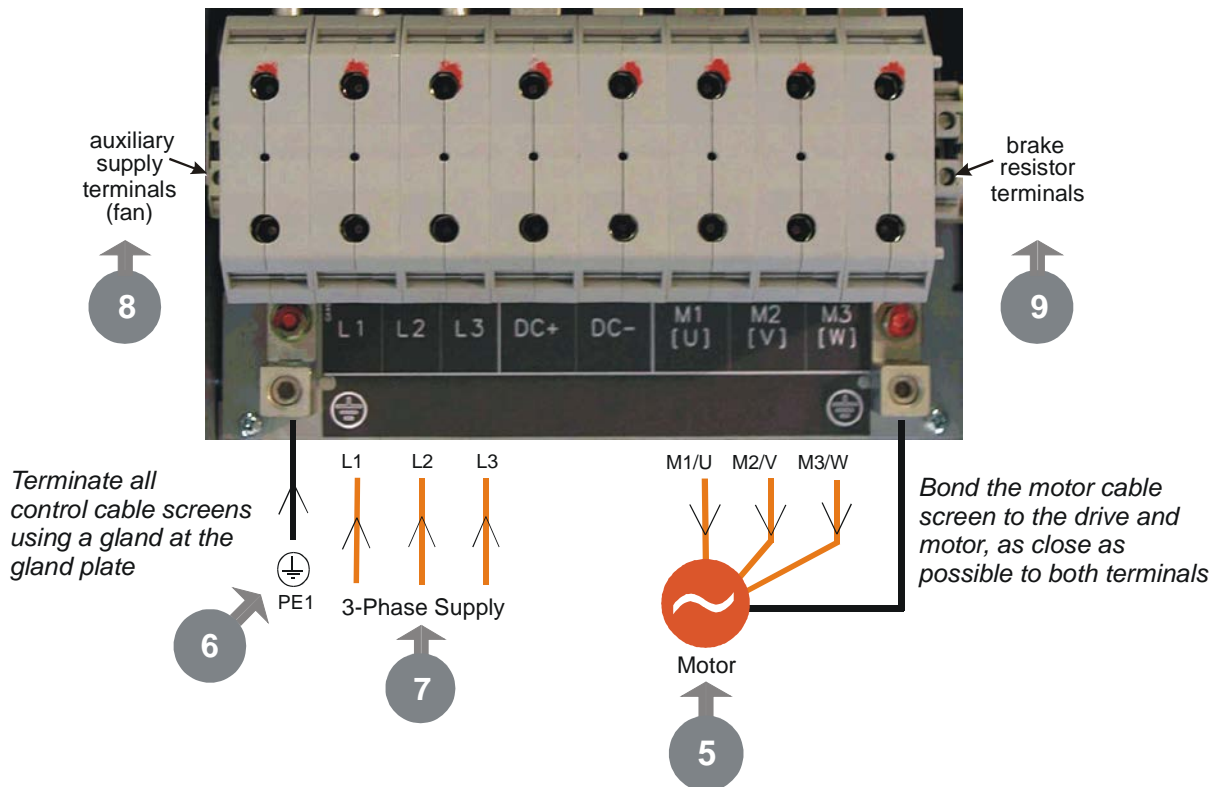
See block 5 of the Model Number:  
1F = 115Vac, 2F = 220Vac.

- 9** Connect the brake resistor.  
Maximum wire sizes:  
Frame F: 95mm<sup>2</sup>/ 4/0AWG (without crimp)  
95mm<sup>2</sup>/ 4/0AWG (with crimp)

- An External Braking Resistor is optional. Connect it between DBR+ and DBR- for high inertial loads.

*DO NOT* apply external voltage sources (mains supply or otherwise) to the braking terminals.

We recommend using a thermal overload switch to protect the braking circuit.



# 890SD Control Connections

## A Speed Reference

- Connect a 10kΩ potentiometer at terminal block X12 (Analog I/P 3)
- High (CW): terminal X12/08
- Wiper: terminal X12/04
- Low (CCW): terminal X12/01
- Connect the shield to earth/ground

OR

- External 2-wire speed reference between terminals X12/01(-) and X12/04(+)
- Connect the shield to earth ground

## B Sequencing

- Connect volt-free contacts as required
- RUN (maintained contact) terminal X14/03 and terminal X15/02

## C Thermistor

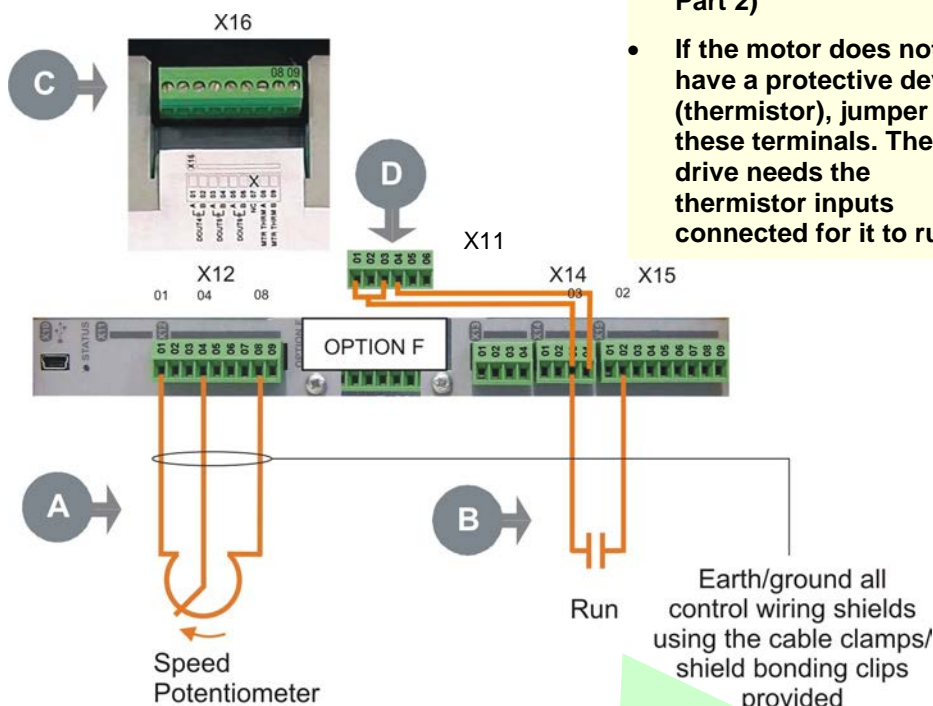
- Connect motor thermal switch or thermistor to terminals X16/08 & X16/09. Drive will trip when the thermal switch opens, or when the thermistor resistance exceeds 4kΩ maximum (PTC Type A : IEC 34-11 Part 2)
- If the motor does not have a protective device (thermistor), jumper these terminals. The drive needs the thermistor inputs connected for it to run.

## Analog

- SPEED FEEDBACK  
10V = ±100% speed at terminal X12/0 6
- TORQUE FEEDBACK  
10V = ±200% torque at terminal X12/07
- ANALOG COMMON  
0V at terminal X12/0 1

## Digital

- DRIVE HEALTH  
Relay dry contact (24V rated) at terminal X14/01 and terminal X14/02
- RUNNING  
24V sourcing output at terminal X15/08
- ZERO SPEED  
24V sourcing output at terminal X15/09
- DIGITAL COMMON  
0V at terminal X14/04



## D Safe Torque Off

To disable STO:

- Connect X14/03 to X11/01 and X11/03
- Connect X14/04 to X11/04

To use the STO feature the user must read and fully understand chapter 6 of the Engineering Reference Manual.

The control terminals will accept a single wire of size 1.5mm<sup>2</sup>/16AWG. For two wires per terminal, use smaller gauge wire such as 0.5mm<sup>2</sup>/22AWG.

This is a basic connection diagram.

For more detailed information on control connections, refer to Appendix B.

# 890SD Feedback Connections

This section is only for closed loop vector and induction servo applications. Skip this page if there is no encoder or resolver mounted on the motor.

## Incremental Pulse Encoders

The default settings for the drive are for 2048 line, quadrature, incremental pulse encoders with differential outputs operating from a 10VDC supply.

- Z channel (Marker pulse) connections are not necessary for running the drive, but inputs are provided for positioning and servo applications. The supply voltage to the encoder is set in the Quick Setup menu. Range 10 VDC to 20 VDC



### OPTION F Terminal Block

|    |            |
|----|------------|
| 01 | Shield     |
| 02 | Supply -   |
| 03 | Supply +   |
| 04 | Channel Z/ |
| 05 | Channel Z  |
| 06 | Channel B/ |
| 07 | Channel B  |
| 08 | Channel A/ |
| 09 | Channel A  |

### Use the Keypad to set the following options:

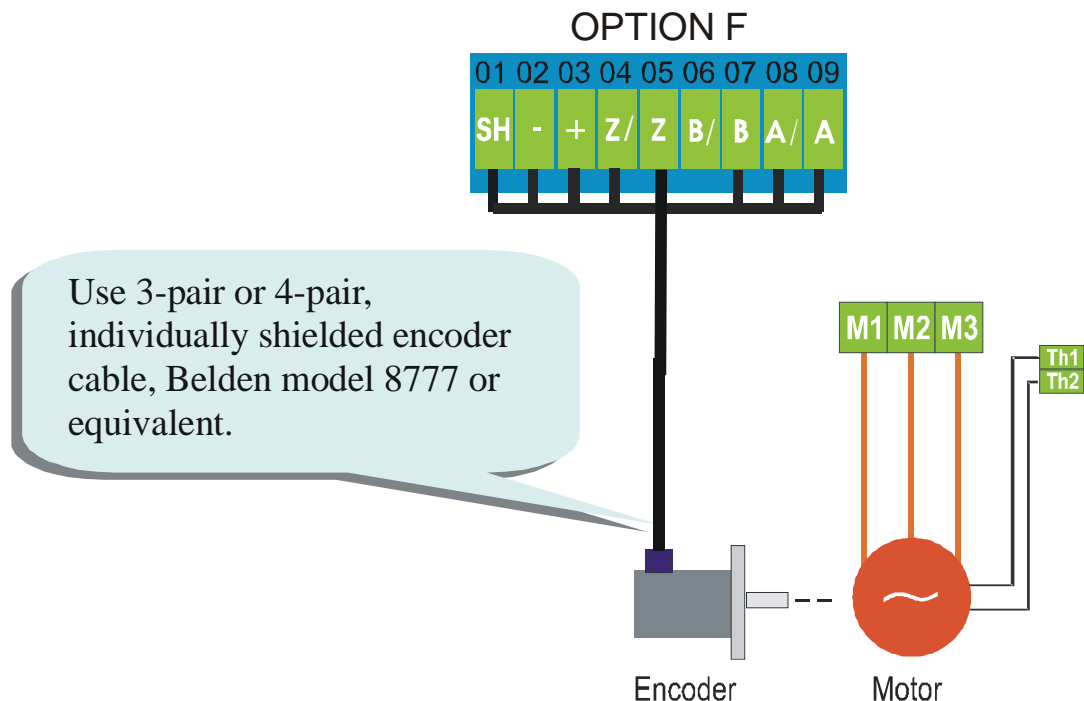
Supply Voltage - PULSE ENC VOLTS

Number of lines per revolution - ENCODER LINES parameter

\* Encoder direction - ENCODER INVERT

\* Used to match the encoder direction to the motor direction. When TRUE, changes the sign of the measured speed and the direction of the position count. It is necessary to set up this parameter when in CLOSED-LOOP VEC mode, as the encoder direction must be correct for this mode to operate.

Using other types of encoders requires the 890 DSE Configuration Tool and the setting of other parameters. Refer to the 890 Engineering Reference Manual for details of these parameters.



# Drive Start-up

## Before Applying Power:

- Read the Safety section at the front of the QuickStart.
- Ensure that all local electric codes are met.
- Check for damage to equipment.
- Check for loose ends, clippings, filings, drilling swarf etc. lodged in the drive and system.
- Check all external wiring circuits of the system - power, control, motor and earth connections.
- Ensure that unexpected rotation of the motor in either direction will not result in damage, bodily harm or injury. Disconnect the load from the motor shaft, if possible.
- Check the state of the Motor Thermistor and Brake Resistor connectors. Check external run contacts are open. Check external speed setpoints are all at zero.
- Ensure that nobody is working on another part of the system which will be affected by powering up.
- Ensure that other equipment will not be adversely affected by powering up.
- Check motor stator connections are correctly wired for Star or Delta as necessary for drive output voltage.
- Check that the STO feature has been disabled. See page 11 of this Quickstart Manual.
- DANGER: some motors are not suitable for use with STO. Refer to chapter 6 of the Engineering Reference Manual for full details.

**If all connections have been checked, it is time to POWER-UP the drive**

## Drive Set-up

Appendix A contains information about the 6901 keypad menus and parameter names.

## Selecting Defaults

On first power-up the AC890 prompts whether to load default parameter values for 50Hz or 60Hz. Select either 50Hz or 60Hz then press M then UP to confirm the choice.

## Motor Data

Before attempting to set up the drive, you will need some motor information. This is found on the motor nameplate. The information you will need is listed below:

- Base Volts
- Base frequency
- Base RPM
- Full load amps
- No load amps (mag current)
- Connection (star or delta)



# Quick Setup Parameters

The following is a list of the Quick Setup parameters you must check before starting the drive. Set only the ones marked with "x" in the table below, under the intended mode of operation.

|                 |   | V/Hz | SV | Vector |
|-----------------|---|------|----|--------|
| Control Mode    | Select the intended operating mode              | x    | x  | x      |
| Max Speed       | Motor RPM at full process speed                 | x    | x  | x      |
| V/F shape       | Usually Linear. Choose fan curve only for fans  | x    |    |        |
| Motor Current   | Motor full load current from motor nameplate    | x    | x  | x      |
| Motor Base Freq | Motor nameplate frequency                       | x    | x  | x      |
| Motor Voltage   | Motor nameplate voltage                         | x    | x  | x      |
| Nameplate RPM   | Motor nameplate RPM                             | x    | x  | x      |
| Motor Poles     | See Note  |      | x  | x      |
| Pulse Enc Volts | Set between 10-20V to match encoder             |      |    | x      |
| Encoder Lines   | Pulses per Revolution of encoder                |      |    | x      |
| Encoder Invert  | Changes polarity of encoder feedback            |      |    | x      |
| Autotune Enable | Drive will Autotune if started                  |      | x  | x      |
| Mag Current     | Enter the No-Load Amps from the motor nameplate | x    | x* | x*     |

\* if performing a Stationary Autotune.

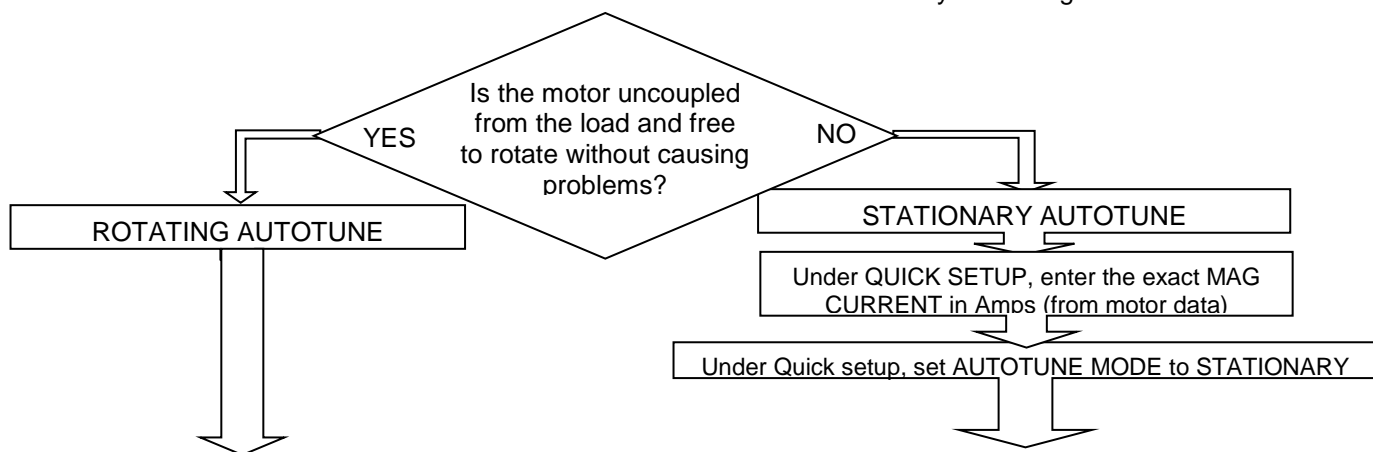
**NOTE** Some of the parameters are product code dependent, that is, they are different for each frame size and power rating. For example, the unit will be set for either 50Hz or 60Hz operation:

**Motor Poles for 60Hz** 2 poles = 3600 rpm, 4 poles = 1800 rpm, 6 poles = 1200 rpm  
**Motor Poles for 50Hz** 2 poles = 3000 rpm, 4 poles = 1500 rpm, 6 poles = 1000 rpm

## Autotune

This section is only for operating in Sensorless or Closed-loop Vector modes. If the drive is in V/Hz mode, Autotune is unnecessary and will not Enable.

- Ensure that MAX SPEED is greater than NAMEPLATE RPM for a successful autotune.
- In the QUICK SETUP menu, set AUTOTUNE ENABLE to TRUE.
- On the 890CD keypad select LOCAL mode. Set SETPOINT (LOCAL) to 0.0%.
- Press the green RUN button. The drive will begin autotuning. The drive will stop without errors if autotune is successful.
- Go to SYSTEM::SAVE CONFIG::APPLICATION and UP arrow to save your settings.



# Running in Local

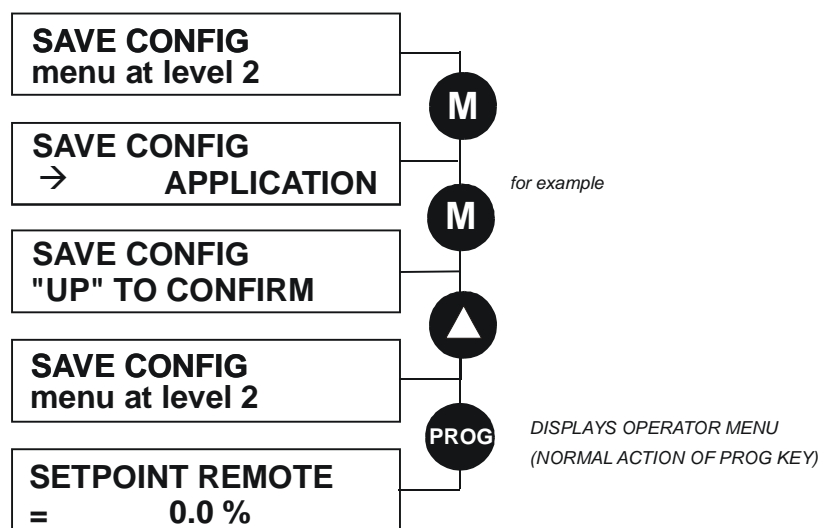
- On the keypad select LOCAL mode. The display will show the Local Setpoint : 0.0%
- Use the UP arrow to set a Local Setpoint, say 20%.
- Press the green RUN button. The motor will accelerate to the desired speed and maintain it. Adjust RAMP ACCEL TIME in Quick Setup to the desired level.
- Press the red STOP button. The motor will decelerate to a stop. Adjust RAMP DECEL TIME in Quick Setup to desired level. If the drive trips on Overvoltage, extend the RAMP DECEL TIME or connect a braking resistor. Refer to the 890 Engineering Reference Manual.

Go to SYSTEM::SAVE CONFIG::APPLICATION and UP arrow to save your settings Values are stored during power-down.

# Running in Remote

- On the keypad select REMOTE mode. The display will show the remote Setpoint : ?.?% (The value displayed depends on the external speed reference).
- Dial in a speed setpoint using the Speed potentiometer until the display reads 20%.
- Start the drive by closing the Start contact between terminal X14/03 and terminal X15/02. The motor will accelerate to the desired speed and maintain it. Adjust RAMP ACCEL TIME in Quick Setup to the desired level.
- Open the Start contact. The motor will decelerate to a stop. Adjust RAMP DECEL TIME in Quick Setup to desired level. If the drive trips on Overvoltage, extend the RAMP DECEL TIME or connect a braking resistor. Refer to the 890 Engineering Reference Manual.

Go to SYSTEM::SAVE CONFIG::APPLICATION and UP arrow to save your settings Values are stored during power-down.



# Appendix A: Using the 6901 Keypad

The 6901 keypad has a two-line backlit LCD display with units and symbols. It can be used to setup and configure the 890 in plain language. It can also be used to operate the drive in Local mode from its Start and Stop buttons, Jog and reverse.



**To display the Software Version and Voltage Rating:**

Press **E** repeatedly to display the Welcome Screen

Press **M** to return to the Menus

**To Start in Local Mode:**

Press **I**

**To Stop in Local Mode:**

Press **O**

|                     |                         |                                |                             |                          |
|---------------------|-------------------------|--------------------------------|-----------------------------|--------------------------|
| <b>Menus :</b>      | <b>E</b> exit a menu    | <b>M</b> sub-menu or parameter | <b>▲</b> scroll up          | <b>▼</b> scroll down     |
| <b>Parameters :</b> | <b>E</b> exit parameter | <b>M</b> make writable         | <b>▲</b> previous parameter | <b>▼</b> next parameter  |
| <b>Edit</b>         | <b>E</b> stop editing   | <b>M</b> show PREF (hold)      | <b>▲</b> increment value    | <b>▼</b> decrement value |

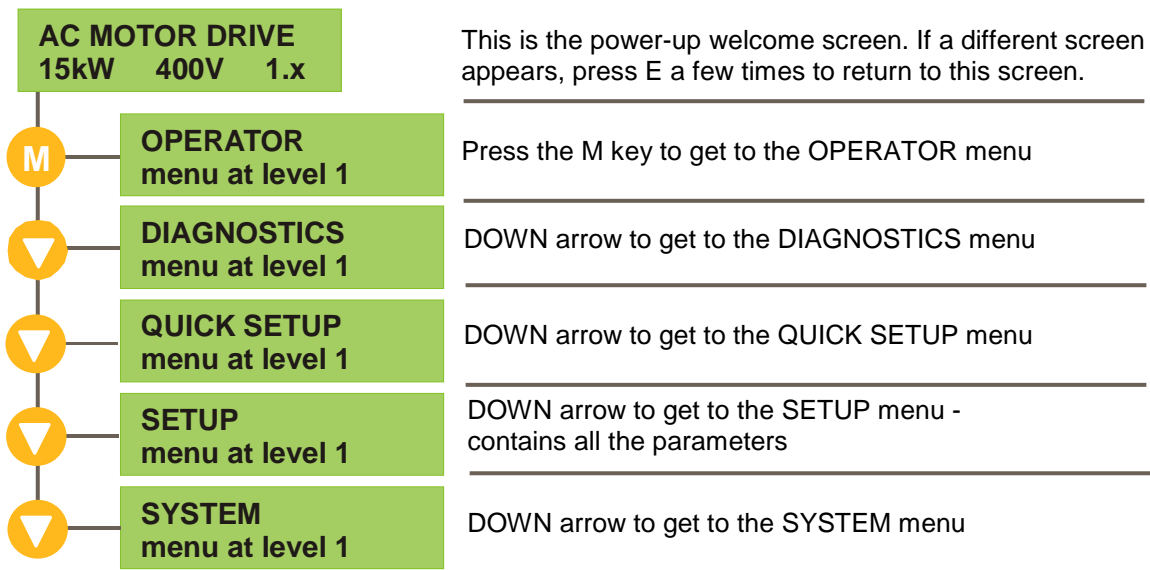
## To change Operating Mode:

From power-up, the keypad displays the Software Version, and then times-out to show the Remote Setpoint.

| Mode            | Action   |
|-----------------|--|
| Remote to Local | Toggle between modes using the L/R key <b>L/R</b><br>SEQ and REF LEDs are On when in Local   |
| Local to Remote | Toggle between modes using the L/R key <b>L/R</b><br>SEQ and REF LEDs are Off when in Remote |

# The Menu Structure

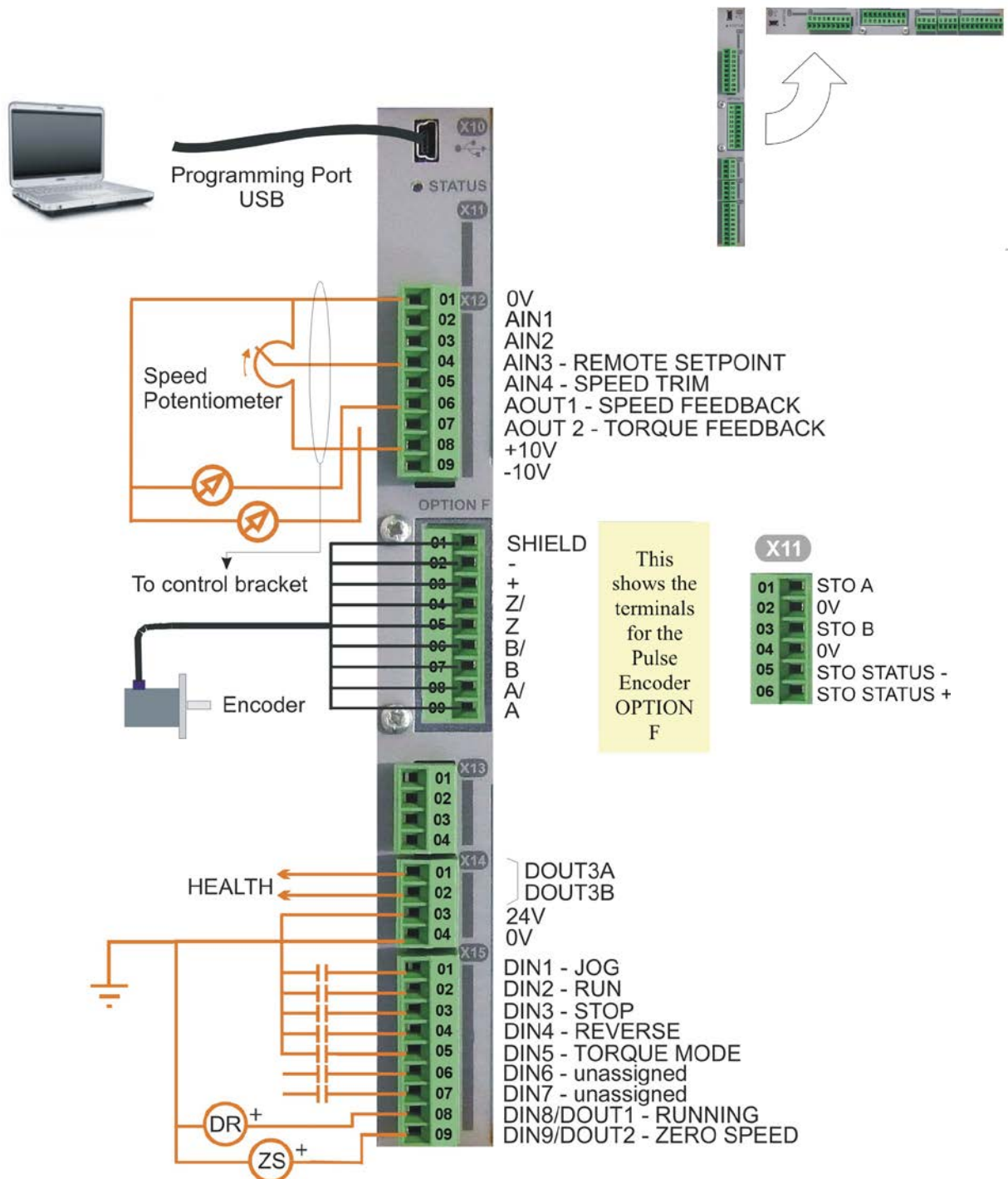
The main menus are shown below. Each menu contains parameters.



**NOTE** Refer to the Engineering Reference Manual for a list of available parameters.

# Appendix B: Analog and Digital I/O

The terminal function names apply to the factory shipping configuration. These terminals may have different functions if the configuration has been modified using DSE.

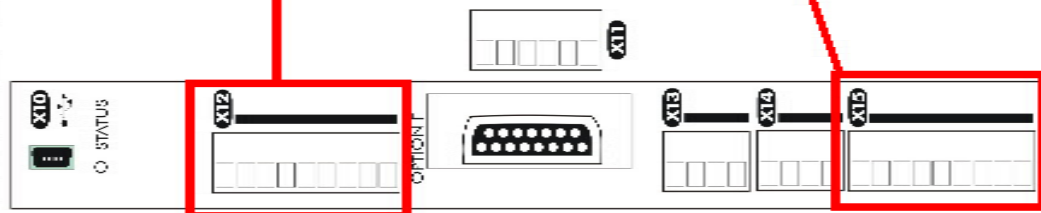


# 890SD Control Terminals

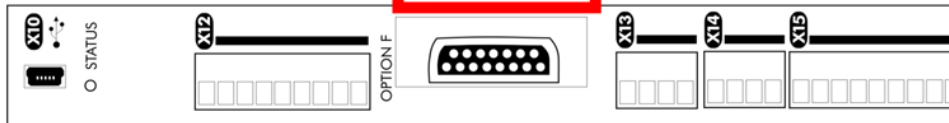
## 890SD Control Terminals


The terminal function names apply to the factory shipping configuration. These terminals may have different functions if the configuration has been modified using DSE.

- Analog I/O connector is X12
- Analog I/O resolution is 12 bit plus sign
- Digital I/O connector is X15
- Digital I/O is 24VDC, sourced, active high



| Terminal Name      | Range      | Description   |
|--------------------|------------|---|
| <b>ANALOG I/O</b>  |            |   |
| X12/01             | 0V         | 0V reference for analog I/O   |
| X12/02             | AIN1       | Analog Input 1<br>Configurable (default = diff I/P +)                       |
| X12/03             | AIN2       | Analog Input 2<br>Configurable (default = diff I/P -)                       |
| X12/04             | AIN3       | Analog Input 3<br>Configurable (default = remote setpoint I/P)              |
| X12/05             | AIN4       | Analog Input 4<br>Configurable (default = speed trim I/P)                   |
| X12/06             | AOUT1      | Analog Output 1<br>Configurable (default = speed feedback O/P)              |
| X12/07             | AOUT2      | Analog Output 2<br>Configurable (default = torque feedback O/P)             |
| X12/08             | +10V REF   | 10V reference for analog i/o. Load 10mA maximum                             |
| X12/09             | -10V REF   | 10V reference for analog i/o. Load 10mA maximum                             |
| <b>DIGITAL I/O</b> |            |   |
| X15/01             | DIN1       | Configurable Digital Input 1 (default = Jog)                                |
| X15/02             | DIN2       | Configurable Digital Input 2 (default = Run)                                |
| X15/03             | DIN3       | Configurable Digital Input 3 (default = Stop)                               |
| X15/04             | DIN4       | Configurable Digital Input 4 (default = Reverse)                            |
| X15/05             | DIN5       | Configurable Digital Input 5 (default = Torque mode)                        |
| X15/06             | DIN6       | Configurable Digital Input 6 (default = Unassigned)                         |
| X15/07             | DIN7       | Configurable Digital Input 7 (default = Unassigned)                         |
| X15/08             | DIN8/DOUT1 | Configurable Digital Input/output<br>(default : digital input = Running)    |
| X15/09             | DIN9/DOUT2 | Configurable Digital Input/output<br>(default : digital input = Zero Speed) |



| Terminal                     | Name           | Range                             | Description   |
|------------------------------|----------------|-----------------------------------|---|
| <b>SAFE TORQUE OFF (STO)</b> |                |                                   |   |
| X11/01                       | STO A          | To disable STO: connect to X14/03 |  <p>To use the STO feature, the user must read and fully understand chapter 6 (Safe Torque Off) of the Engineering Reference Manual.</p> |
| X11/02                       | STO 0V         | To disable STO: do not connect    |   |
| X11/03                       | STO B          | To disable STO: connect to X14/03 |   |
| X11/04                       | STO 0V         | To disable STO: connect to X14/04 |   |
| X11/05                       | STO STATUS -ve | To disable STO: do not connect    |   |
| X11/06                       | STO STATUS +ve | To disable STO: do not connect    |   |

# Appendix C: Electrical Ratings

## 890SD Frame E, 400V

Power Supply = 380-460V ±10%, 50/60Hz ±5%  
 Motor power, output current and input current must not be exceeded under steady state operating conditions. Input currents listed at 400Vac 50Hz, for kW ratings and 460Vac 60Hz for Hp ratings.

| Model Number (Europe)   | Catalog Number (North America) | Motor Power | Output Current (A) (note 1) | AC Input Current (A) | Heatsink Power Loss (W) | Total Power Loss (W) | Maximum Switching Frequency (kHz) | Input Bridge $I_{T}^2$ (A <sup>2</sup> s) | Brake Switch Peak Current (A) (note 2) |
|---|--------------------------------|-------------|-----------------------------|----------------------|-------------------------|----------------------|-----------------------------------|---|--|
| <b>FRAME E :</b> Prospective short circuit current 18kA.  |                                |             |                             |                      |                         |                      |                                   |   |  |
| <b>Constant Torque</b> (Output Overload Motoring 150% for 60s, 180% for 0.5s short term rating) |                                |             |                             |                      |                         |                      |                                   |   |  |
| 890SD/4/0073E/..  |                                | 37kW        | 73                          | 81                   | 730                     | 850                  | 3, 6                              | 18000                                     | 50                                     |
|   | 890SD/4/0073E/..               | 50Hp        | 73                          | 68                   | 730                     | 850                  | 3, 6                              | 18000                                     | 50                                     |
| 890SD/4/0087E/..  |                                | 45kW        | 87                          | 95                   | 880                     | 880                  | 3, 6                              | 18000                                     | 60                                     |
|   | 890SD/4/0087E/..               | 60Hp        | 87                          | 80                   | 880                     | 880                  | 3, 6                              | 18000                                     | 60                                     |
| <b>Quadratic Torque</b> (Output Overload Motoring 110% for 60s)                                 |                                |             |                             |                      |                         |                      |                                   |   |  |
| 890SD/4/0073E/..  |                                | 45kW        | 87                          | 95                   | 901                     | 1029                 | 3                                 | 18000                                     | 50                                     |
|   | 890SD/4/0073E/..               | 60Hp        | 87                          | 80                   | 901                     | 1029                 | 3                                 | 18000                                     | 50                                     |
| 890SD/4/0087E/..  |                                | 55kW        | 105                         | 110                  | 1094                    | 1242                 | 3                                 | 18000                                     | 60                                     |
|   | 890SD/4/0087E/..               | 75Hp        | 105                         | 95                   | 1094                    | 1242                 | 3                                 | 18000                                     | 60                                     |

Note 1: Up to the highest supply voltage that maintains shaft power less than the product power rating, for a typical induction motor. Derated for operation above this supply voltage.

Note 2: 20s maximum, 30% duty. DC link brake voltage: 750V



## 890SD Frame F, 400V

Power Supply = 380-460V ±10%, 50/60Hz ±5%

Motor power, output current and input current must not be exceeded under steady state operating conditions. Input currents listed at 400Vac 50Hz for kW ratings and 460Vac 60Hz for Hp ratings.

| Model Number (Europe)   | Catalog Number (North America) | Motor Power | Output Current (A) (note 1) | AC Input Current (A) | Heatsink Power Loss (W) | Total Power Loss (W) | Maximum Switching Frequency (kHz) | Input Bridge $I_t^2$ (A <sup>2</sup> s) | Brake Switch Peak Current (A) (note 2) |
|---|--------------------------------|-------------|-----------------------------|----------------------|-------------------------|----------------------|-----------------------------------|---|--|
| <b>FRAME F :</b> Prospective short circuit current 18kA.  |                                |             |                             |                      |                         |                      |                                   |   |  |
| <b>Constant Torque</b> (Output Overload Motoring 150% for 60s, 180% for 0.5s short term rating) |                                |             |                             |                      |                         |                      |                                   |   |  |
| 890SD/4/0105F/..  |                                | 55kW        | 105                         | 114                  | 920                     | 1220                 | 3                                 | 100,000                                 | 125                                    |
|   | 890SD/4/0105F/..               | 75Hp        | 100                         | 99                   | 900                     | 1130                 | 3                                 | 100,000                                 | 125                                    |
| 890SD/4/0145F/..  |                                | 75kW        | 145                         | 143                  | 1320                    | 1670                 | 3                                 | 100,000                                 | 136                                    |
|   | 890SD/4/0145F/..               | 100Hp       | 130                         | 124                  | 1200                    | 1500                 | 3                                 | 100,000                                 | 136                                    |
| 890SD/4/0156F/..  |                                | 90kW        | 180                         | 164                  | 1490                    | 1950                 | 3                                 | 100,000                                 | 136                                    |
|   | 890SD/4/0156F/..               | 125Hp       | 156                         | 148                  | 1340                    | 1780                 | 3                                 | 100,000                                 | 136                                    |
| 890SD/4/0180F/..  |                                | 110kW       | 180                         | 164                  | 1490                    | 1950                 | 3                                 | 100,000                                 | 136                                    |
|   | 890SD/4/0180F/..               | 150Hp       | 180                         | 169                  | 1670                    | 2180                 | 3                                 | 100,000                                 | 136                                    |
| <b>Quadratic Torque</b> (Output Overload Motoring 110% for 60s)                                 |                                |             |                             |                      |                         |                      |                                   |   |  |
| 890SD/4/0105F/..  |                                | 75kW        | 145                         | 143                  | 1400                    | 1670                 | 3                                 | 100,000                                 | 125                                    |
|   | 890SD/4/0105F/..               | 100Hp       | 125                         | 124                  | 1200                    | 1500                 | 3                                 | 100,000                                 | 125                                    |
| 890SD/4/0145F/..  |                                | 90kW        | 165                         | 164                  | 1580                    | 1950                 | 3                                 | 100,000                                 | 136                                    |
|   | 890SD/4/0145F/..               | 125Hp       | 156                         | 148                  | 1340                    | 1780                 | 3                                 | 100,000                                 | 136                                    |
| 890SD/4/0156F/..  |                                | 110kW       | 205                         | 195                  | 1800                    | 1950                 | 3                                 | 100,000                                 | 136                                    |
|   | 890SD/4/0156F/..               | 150Hp       | 180                         | 169                  | 1670                    | 2180                 | 3                                 | 100,000                                 | 136                                    |
| 890SD/4/0180F/..  |                                | 110kW       | 205                         | 195                  | 1800                    | 1950                 | 3                                 | 100,000                                 | 136                                    |
|   | 890SD/4/0180F/..               | 150Hp       | 180                         | 169                  | 1670                    | 2180                 | 3                                 | 100,000                                 | 136                                    |

Note 1: Up to the highest supply voltage that maintains shaft power less than the product power rating, for a typical induction motor.  
Derated for operation above this supply voltage.

Note 2: 20s maximum, 30% duty. DC link brake voltage: 750V

## 890SD Frame E, 500V

Power Supply = 380-500V  $\pm 10\%$ , 50/60Hz  $\pm 5\%$

Motor power, output current and input current must not be exceeded under steady state operating conditions. Input currents listed at 500Vac 50Hz for kW ratings.

500V unit full power ratings are only available at 500V. The unit can be operated between 380-500V supply voltage with reduced output power below 500V.

| Model Number (Europe)   | Catalog Number (North America) | Motor Power | Output Current (A) (note 1) | AC Input Current (A) | Heatsink Power Loss (W) | Total Power Loss (W) | Maximum Switching Frequency (kHz) | Input Bridge $I_t^2$ (A <sup>2</sup> s) | Brake Switch Peak Current (A) (note 2) |
|---|--------------------------------|-------------|-----------------------------|----------------------|-------------------------|----------------------|-----------------------------------|---|--|
| <b>FRAME E :</b> Prospective short circuit current 18kA.  |                                |             |                             |                      |                         |                      |                                   |   |  |
| <b>Constant Torque (Output Overload Motoring 150% for 60s, 180% for 0.5s short term rating)</b> |                                |             |                             |                      |                         |                      |                                   |   |  |
| 890SD/5/0073E/..  | -                              | 37kW        | 67                          | 69                   | 799                     | 911                  | 3, 6                              | 18000                                   | 46                                     |
| 890SD/5/0087E/..  | -                              | 45kW        | 79                          | 82                   | 957                     | 1083                 | 3, 6                              | 18000                                   | 55                                     |
| <b>Quadratic Torque (Output Overload Motoring 110% for 60s)</b>                                 |                                |             |                             |                      |                         |                      |                                   |   |  |
| 890SD/5/0073E/..  | -                              | 45kW        | 79                          | 82                   | 766                     | 894                  | 3                                 | 18000                                   | 46                                     |
| 890SD/5/0087E/..  | -                              | 55kW        | 98                          | 98                   | 930                     | 1078                 | 3                                 | 18000                                   | 55                                     |

Note 1: Up to the highest supply voltage that maintains shaft power less than the product power rating, for a typical induction motor. Derated for operation above this supply voltage.

Note 2: 20s maximum, 30% duty. DC link brake voltage: 820V

## 890SD Frame F, 500V

Power Supply = 380-500V ±10%, 50/60Hz ±5%

Motor power, output current and input current must not be exceeded under steady state operating conditions. Input currents listed at 500Vac 50Hz for kW ratings.

500V unit full power ratings are only available at 500V. The unit can be operated between 380-500V supply voltage with reduced output power below 500V.

| Model Number (Europe)   | Catalog Number (North America) | Motor Power | Output Current (A) (note 1) | AC Input Current (A) | Heatsink Power Loss (W) | Total Power Loss (W) | Maximum Switching Frequency (kHz) | Input Bridge $I_t^2$ (A <sup>2</sup> s) | Brake Switch Peak Current (A) (note 2) |
|---|--------------------------------|-------------|-----------------------------|----------------------|-------------------------|----------------------|-----------------------------------|---|--|
| <b>FRAME F : Prospective short circuit current 18kA.</b>  |                                |             |                             |                      |                         |                      |                                   |   |  |
| <b>Constant Torque (Output Overload Motoring 150% for 60s, 180% for 0.5s short term rating)</b> |                                |             |                             |                      |                         |                      |                                   |   |  |
| 890SD/5/0105F/..  | -                              | 55kW        | 100                         | 93                   | 900                     | 1130                 | 3                                 | 100,000                                 | 82                                     |
| 890SD/5/0145F/..  | -                              | 75kW        | 125                         | 118                  | 1200                    | 1500                 | 3                                 | 100,000                                 | 102                                    |
| 890SD/5/0156F/..  | -                              | 90kW        | 156                         | 140                  | 1340                    | 1780                 | 3                                 | 100,000                                 | 102                                    |
| <b>Quadratic Torque (Output Overload Motoring 110% for 60s)</b>                                 |                                |             |                             |                      |                         |                      |                                   |   |  |
| 890SD/5/0105F/..  | -                              | 75kW        | 125                         | 118                  | 1200                    | 1500                 | 3                                 | 100,000                                 | 82                                     |
| 890SD/5/0145F/..  | -                              | 90kW        | 156                         | 140                  | 1340                    | 1780                 | 3                                 | 100,000                                 | 102                                    |
| 890SD/5/0156F/..  | -                              | 110kW       | 180                         | 166                  | 1670                    | 2180                 | 3                                 | 100,000                                 | 102                                    |

Note 1:

Up to the highest supply voltage that maintains shaft power less than the product power rating, for a typical induction motor. Derated for operation above this supply voltage.

Note 2:

20s maximum, 30% duty. DC link brake voltage: 820V

# Appendix D: Compliance

A comprehensive guide to product compliance is available in the full product manual.

**Warning** Where there is a conflict between EMC and safety requirements personnel safety shall always take precedence.

Operation of this equipment requires detailed installation and operation instructions provided in the installation/operation manual intended for use on this product. This information should be retained with this device at all times.

**Caution:** This is a product of the restricted sales distribution class according to IEC 61800-3. It is designated as “professional equipment” as defined in EN61000-3. Permission of the supply authority shall be obtained before connection to the low voltage supply.

In a domestic environment this product may cause radio interference in which case supplementary mitigation measures may be required.

This equipment contains electrostatic discharge (ESD) sensitive parts. Observe static control precautions when handling, installing and servicing this product.

## EMC Emissions

Radiated Emissions comply with EN61800-3 category C1, C2 and C3 when installed in accordance with instructions in Chapter 4 / 5 refer to “mounting the unit”.

Conducted Emissions comply with EN61800-3 category C3 with no external filter and category C1 and C2 when fitted with specified external filter.

Immunity complies with the requirement of EN61800-3, for equipment intended for use in the second environment.

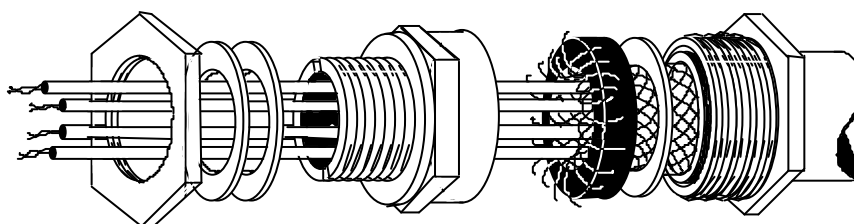
## EMC Connections

For compliance with the EMC requirements, the “0V/signal ground” is to be separately earthed. When a number of units are used in a system, these terminals should be connected together at a single, local earthing point.

Control and signal connections should be made with screened cables, with the screen connected only at the VSD end. However, if high frequency noise is still a problem, earth screen at the non VSD end via a 0.1µF capacitor.

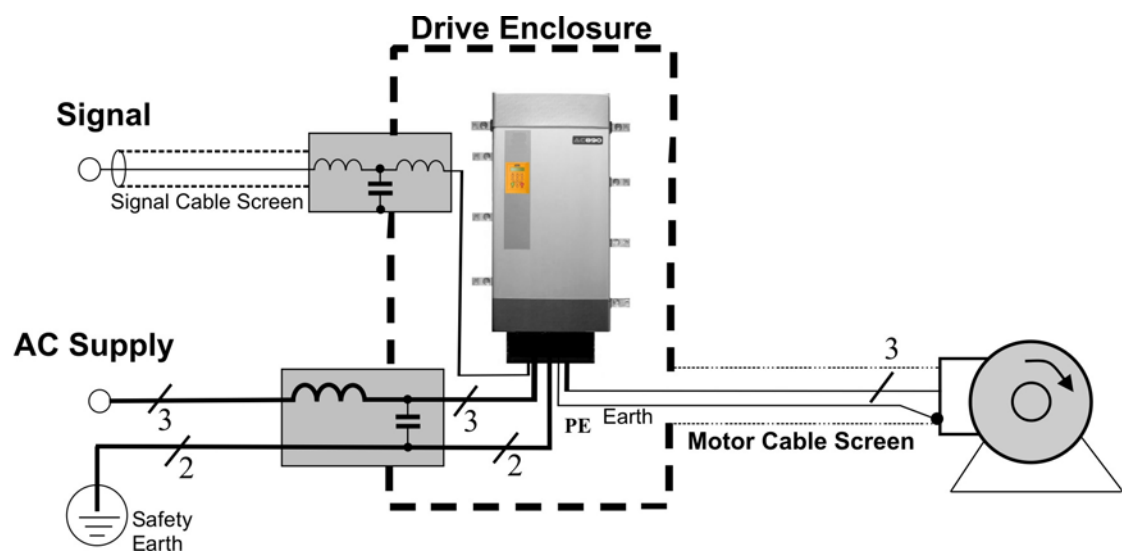
Note: Connect the control and signal screens (at the VSD end) to the VSD protective earth point, and not to the control board terminals.

Motor cables should have a 360° bond to ensure a low impedance connection, as per the figure below;



# Planning Cable Runs

- ◆ Use the shortest possible motor cable lengths.
- ◆ Use a single length of cable to a star junction point to feed multiple motors.
- ◆ Keep electrically noisy and sensitive cables apart. If this is not possible parallel cable runs should be separated by at least 0.25 meters, for runs longer than 10 meters, separation should be increased proportionally.
- ◆ Sensitive cables should cross noisy cables at 90°.
- ◆ Never run sensitive cables close or parallel to the motor, dc link and braking chopper circuit for any distance.
- ◆ Never run supply, dc link or motor cables in the same bundle as the signal/control and feedback cables, even if they are screened.
- ◆ Ensure EMC filter input and output cables are separately routed and do not couple across the filter.



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