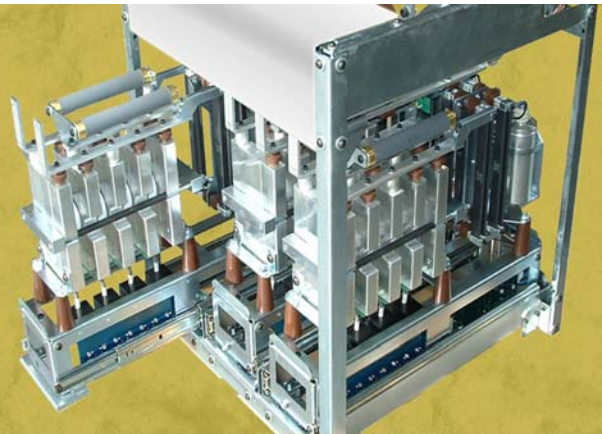


# PRODUCT

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## G U I D E

### MVS SERIES SOFT STARTERS



**AUCom**

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## Section 1

## Introduction

### Chapter 1

### Caution Statements



This symbol is used throughout this manual to draw attention to topics of special importance to the installation and operation of MVS Series soft starters.

Caution Statements cannot cover every potential cause of equipment damage but can highlight common causes of damage. It is the installer's responsibility to adhere to all instructions in this manual, to follow good electrical practice and to seek advice before operating this equipment in a manner other than as described in this manual.

- Ensure that the soft starter is completely isolated from the power supply before attempting any work on the unit.
- Entry of metal swarf into the cabinet can cause equipment failure.
- Do not apply voltage to the control input terminals. These are active 24 VDC inputs and must be controlled with potential free circuits.
- Ensure contacts or switches operating the control inputs are suitable for low voltage, low current switching (ie gold flash or similar).
- Ensure cables to the control inputs are segregated from AC power and control wiring.
- Some electronic contactor coils are not suitable for direct switching with PCB mount relays. Consult the contactor manufacturer/ supplier to see if this is advisable.
- Do not connect power factor correction capacitors to the output of MVS soft starters. If static power factor correction is employed, it must be connected to the supply side of the soft starter.

The examples and diagrams in this manual are included solely for illustrative purposes. The information contained in this manual is subject to change at any time and without prior notice. In no event will responsibility or liability be accepted for direct, indirect or consequential damages resulting from the use or application of this equipment.



#### **WARNING - ELECTRICAL SHOCK HAZARD**

MVS soft starters contain dangerous voltages when connected to line voltage. Only a competent electrician should carry out the electrical installation. Improper installation of the motor or the soft starter may cause equipment failure, serious injury or death. Follow this manual, the National Electrical Code (NEC<sup>®</sup>) and local safety codes.



#### **SHORT CIRCUIT**

MVS soft starters are not short circuit proof. After severe overload or short circuit, the operation of the soft starter should be fully tested.



#### **GROUNDING AND BRANCH CIRCUIT PROTECTION**

It is the responsibility of the user or person installing the soft starter to provide proper grounding and branch circuit protection according to the National Electrical Code (NEC<sup>®</sup>) and local safety codes.

## Chapter 2      **General Description**

---

### 2.1      **Overview**

The MVS Series provides compact and robust soft start solutions for control of medium voltage motors. MVS soft starters provide a complete range of motor and system protection features and have been designed for reliable performance in the most demanding installation situations.

Each MVS soft starter comprises two elements:

- a power assembly
- a controller module

The power assembly and controller module are supplied as a pair and share the same serial number. Care should be taken during installation to ensure the correct controller and power assembly are used together.

Each MVS is also supplied with two fibre-optic cables, to connect the controller module to the power assembly, and three non-conduction resistor assemblies, allowing the soft starter to be tested with a low-voltage motor (< 500 VAC).

### 2.2      **About This Document**

This document describes the features of MVS soft starters. This document has been designed to give engineers a general overview of the functionality of the MVS.

### 2.3      **Feature List**

#### **Starting**

- Constant current
- Current ramp

#### **Stopping**

- Coast to stop
- Soft stop

#### **Protection**

- Under/ Overvoltage
- Mains frequency
- Phase sequence
- Shorted SCR
- Motor overload (thermal model)
- Instantaneous overcurrent
- Ground fault
- Undercurrent
- Current Imbalance
- Motor thermistor
- Excess start time
- Power circuit
- Auxiliary trip

#### **Interface**

- Remote control inputs  
(3 x fixed, 2 x programmable)
- Relay outputs  
(3 x fixed, 3 x programmable)
- Analog output  
(1 x programmable)
- Serial port

#### **Human Interface**

- Multi-language display
- Starter status LEDs
- Event log (99 positions, date and time stamped)
- Trip log (8 positions, date and time stamped)
- Counters (starts, hours-run, kWh)
- Metering (current, voltage, power factor, kWh)
- User-programmable metering screen
- Multi-level password protection

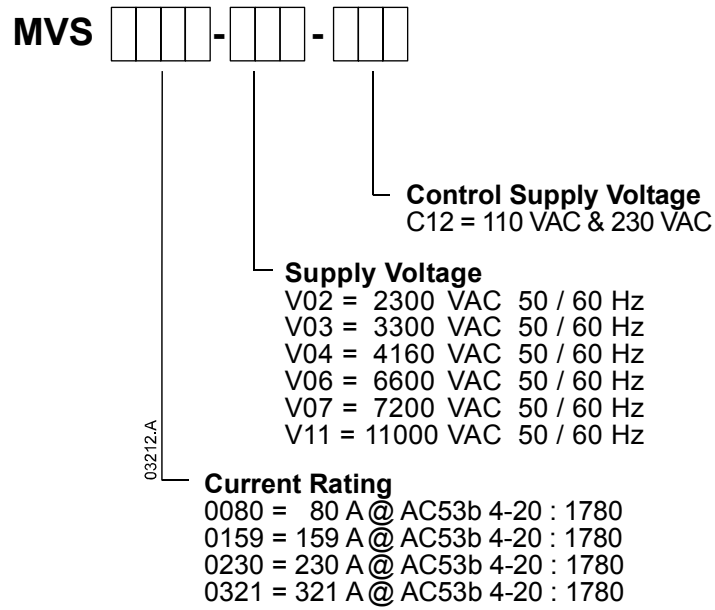
#### **Power Connection**

- 80 A to 321 A, nominal
- 2300 VAC to 11000 VAC

#### **Accessories (optional)**

- Modbus RTU Interface
- Profibus Interface
- DeviceNet Interface
- Synchronous motor control
- PC Software
- Overvoltage protection
- Control supply transformer

2.4 Part Number Format



# INTRODUCTION: SPECIFICATIONS

## Chapter 3 Specifications

### 3.1 Current Ratings

(At 1000 m.)

#### Two starts per hour

	3.5-15 : 1785		4.0-20 : 1780		4.0-30 : 1770		5.0-30 : 1770		5.0-60 : 1740	
	40 °C	50 °C	40 °C	50 °C	40 °C	50 °C	40 °C	50 °C	40 °C	50 °C
MVS0080	96	91	80	74	72	66	59	55	46	42
MVS0159	190	177	159	147	143	132	117	109	91	84
MVS0230	282	261	230	213	201	185	165	152	121	111
MVS0321	393	363	321	296	279	257	229	211	168	154

#### Three starts per hour

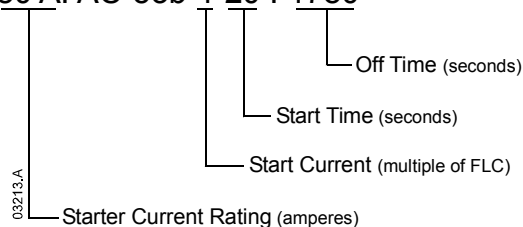
	4.0-20 : 1180		4.0-30 : 1170		5.0-30 : 1170		5.0-60 : 1140	
	40 °C	50 °C	40 °C	50 °C	40 °C	50 °C	40 °C	50 °C
MVS0080	73	68	65	60	53	49	40	37
MVS0159	146	135	129	119	106	98	79	73
MVS0230	207	190	175	162	144	132	101	93
MVS0321	288	265	244	225	200	184	141	129

#### Four starts per hour

	4.0-20 : 880		4.0-30 : 870		5.0-30 : 870		5.0-60 : 840	
	40 °C	50 °C	40 °C	50 °C	40 °C	50 °C	40 °C	50 °C
MVS0080	68	63	59	54	48	45	35	33
MVS0159	136	125	117	108	96	89	70	65
MVS0230	188	173	157	144	129	118	88	81
MVS0321	262	241	218	200	179	164	122	112

#### AC53b Utilisation Category Format

80 A: AC-53b 4-20 : 1780



**Starter Current Rating:** The full load current rating of the soft starter given the parameters detailed in the remaining sections of the utilisation code.

**Start Current:** The maximum available start current given the parameters detailed in the remaining sections of the utilisation code.

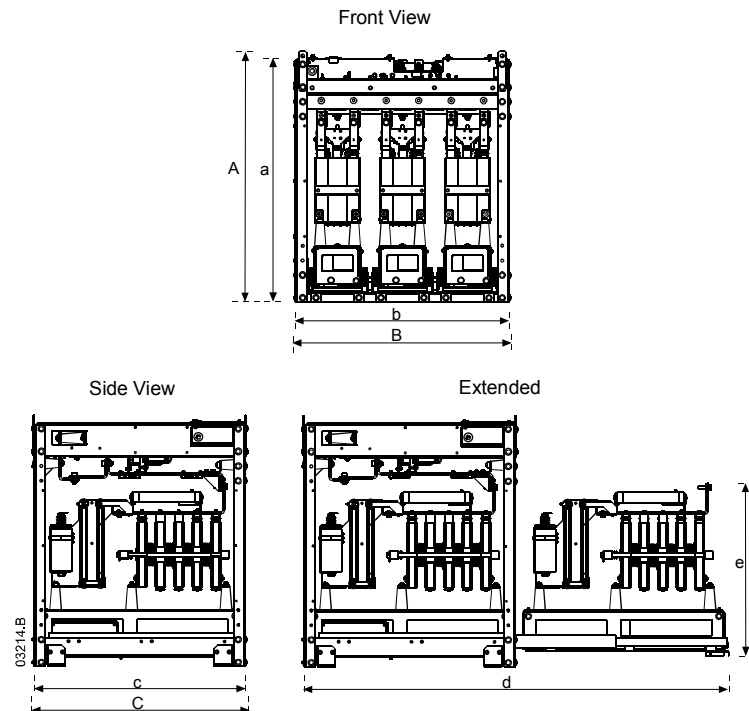
**Start Time:** The maximum available start time given the parameters detailed in the remaining sections of the utilisation code.

**Off Time:** The minimum allowable time between the end of one start and the beginning of the next start given the parameters detailed in the remaining sections of the utilisation code.

Contact your local supplier for ratings under operating conditions not covered by the above ratings charts.

3.2 Dimensions and Weights

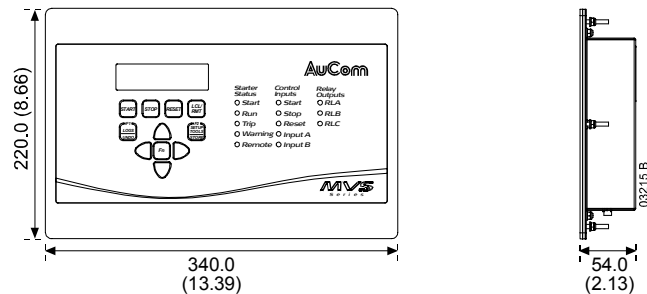
Power Assembly



	A	B	C	a	b	c	d	e	Weight
	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	kg (lb)
MVSxxx-V02	772	669	667	750	658	650	1302	531	165
MVSxxx-V03	(30.4)	(26.3)	(26.3)	(29.5)	(25.9)	(25.6)	(51.3)	(20.9)	(363.8)
MVSxxx-V04									
MVSxxx-V06	832	875	817	810	864	800	1559	551	217
MVSxxx-V07	(32.8)	(34.5)	(32.2)	(31.9)	(34.0)	(31.5)	(61.4)	(21.7)	(478.4)
MVSxxx-V11	Contact your local supplier for details.								

Controller

The MVS Controller is suitable for use with all MVS soft starters.



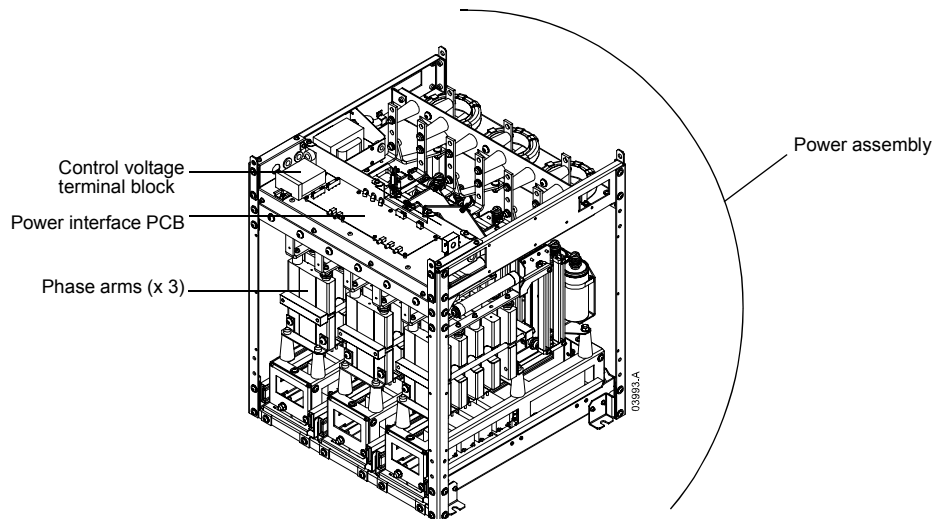
mm (inch)

Weight: 2.1 kg (4.63 lb)



# INTRODUCTION: SPECIFICATIONS

## 3.3 Key Components



## 3.4 General Technical Data

<b>Supply</b>	
<b>Mains Voltage</b>	
MVSxxxx-V02-xxx .....	3 x 2300 VAC (± 10%)
MVSxxxx-V03-xxx .....	3 x 3300 VAC (± 10%)
MVSxxxx-V04-xxx .....	3 x 4160 VAC (± 10%)
MVSxxxx-V06-xxx .....	3 x 6600 VAC (± 10%)
MVSxxxx-V07-xxx .....	3 x 7200 VAC (± 10%)
MVSxxxx-V11-xxx .....	3 x 11000 VAC (± 10%)
<b>Control Voltage</b>	
MVSxxxx-xxx-C12 .....	110 VAC to 130 VAC (+ 10% / - 15%) or 220 VAC to 240 VAC (+ 10% / - 15%)
All models .....	500 VA, single phase
Mains Frequency .....	45 Hz to 66 Hz
<b>Rated Insulation Voltage</b>	
MVSxxxx-V02-xxx .....	11450 VAC
MVSxxxx-V03-xxx .....	11450 VAC
MVSxxxx-V04-xxx .....	11450 VAC
MVSxxxx-V06-xxx .....	16800 VAC
MVSxxxx-V07-xxx .....	18200 VAC
MVSxxxx-V11-xxx .....	TBA
<b>Rated Impulse Withstand Voltage (BIL) - Overvoltage Category III</b>	
MVSxxxx-V02-xxx ~ MVSxxxx-V07-xxx .....	45 kV
MVSxxxx-V11-xxx .....	TBA
Form Designation .....	Bypassed semiconductor motor starter form 1
<b>Control Inputs</b>	
Start (Terminals C23, C24) .....	24 VDC, 8 mA approx
Stop (Terminals C31, C32) .....	24 VDC, 8 mA approx
Reset (Terminals C41, C42) .....	24 VDC, 8 mA approx
Input A (Terminals C53, C54) .....	24 VDC, 8 mA approx
Input B (Terminals C63, C64) .....	24 VDC, 8 mA approx
Motor Thermistor (Terminals B4, B5)	



### NOTE

All control inputs are potential free. Do not apply external voltage to these inputs.

<b>Outputs</b>	
Relay Outputs .....	10 A @ 250 VAC/ 360 VA 10 A @ 30 VDC resistive
Main Contactor (Terminals 13, 14) .....	Normally Open
Bypass Contactor (Terminals 23, 24) .....	Normally Open
Run Output/ PFC (Terminals 33, 34) .....	Normally Open
Output Relay A (Terminals 43, 44) .....	Normally Open
Output Relay B (Terminals 51, 52, 54) .....	Changeover
Output Relay C (Terminals 61, 62, 64) .....	Changeover
Analog Output (Terminals B10, B11) .....	0-20 mA or 4-20 mA

<b>Environmental</b>	
Degree of Protection	
Power Assembly .....	IP00
Controller .....	IP54/ NEMA 12
Operating Temperature .....	- 10 °C to + 60 °C
Storage Temperature .....	- 25 °C to + 55 °C - 25 °C to + 70 °C (< 24 hours)
Humidity .....	5% to 95% Relative Humidity
Pollution Degree .....	Pollution Degree 3
Vibration .....	Designed to IEC 60068 Test Fc Sinusoidal 4 Hz to 13.2 Hz: ± 1 mm displacement 13.2 Hz to 200 Hz: ± 0.7 g

<b>EMC Emission</b>	
Equipment Class (EMC) .....	Class A
Conducted Radio Frequency Emission .....	10 kHz to 150 kHz: < 120 - 69 dB µV 0.15 MHz to 0.5 MHz: < 79 dB µV 0.5 MHz to 30 MHz: < 73 dB µV
Radiated Radio Frequency Emission .....	0.15 MHz to 30 MHz: < 80-50 dB µV/m 30 MHz to 100 MHz: < 60-54 dB µV/m 100 MHz to 2000 MHz: < 54 dB µV/m
This product has been designed for Class A equipment. Use of the product in domestic environments may cause radio interference, in which case the user may be required to employ additional mitigation methods.	

<b>EMC Immunity</b>	
Electrostatic Discharge .....	6 kV contact discharge, 8 kV air discharge
Radio Frequency Electromagnetic Field .....	80 MHz to 1000 MHz: 10 V/m
Fast Transients 5/50 ns (main and control circuits) .....	2 kV line to earth, 1 kV line to line
Surges 1.2/50 µs (main and control circuits) ..	2 kV line to earth, 1 kV line to line
Voltage dip and short time interruption .....	5000 ms (at 0% nominal voltage) (safe shutdown)

<b>Short Circuit</b>	
Rated short-circuit current, symmetrical, fused (Class E2)	
MVSxxxx-V02-xxx ~ MVSxxxx-V07-xxx .....	48 kA
MVSxxxx-V11-xxx .....	TBA

<b>Heat Dissipation (Steady State)</b>	
Power Assembly (SCRs bypassed) .....	20 W approx
Controller .....	10 W approx

<b>Standards Approvals</b>	
C✓ .....	EMC requirements
UL/ C-UL .....	UL 508, UL 347
CE .....	EMC EU Directive
Marine .....	pending

### Section 2

## Installation

### Key Features

The MVS offers several special functions to ensure safe and simple installation and configuration.

#### Comprehensive Simulations

The MVS offers software-based simulation functions to check all aspects of operation, including starting and stopping, protection mechanisms and signal inputs and outputs. The simulations are accessed via the Commissioning Menu.

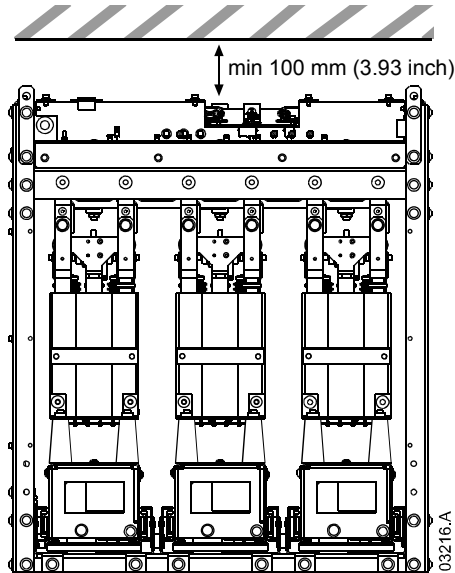
#### Low Voltage Test Mode

The low voltage test mode lets commissioning staff check the soft starter's electrical configuration safely, without requiring access to specialised medium voltage equipment. The MVS can start and stop a small three-phase motor, testing associated equipment such as contactors and relays.

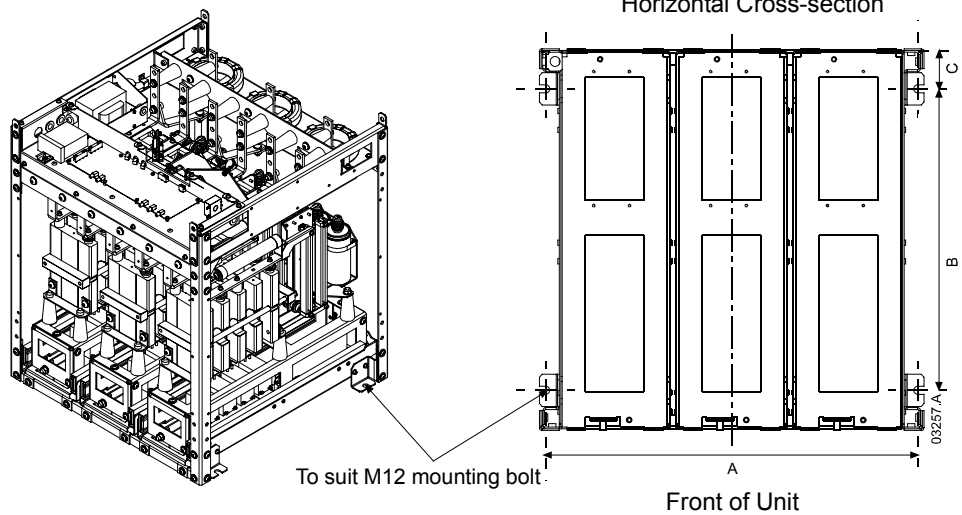
Chapter 4 Installation

4.1 Mounting Instructions - Power Assembly

All MVS models have an IP00 rating and must be installed inside an enclosure. The power assembly should be installed with 100 mm clearance above for isolation. No clearance is required below or at the sides.



The power assembly is mounted in place using four M12 bolts. One bolt is required through each corner at the base of the unit, tightened to a torque of 40 Nm. Individual phase arms are secured within the frame using three M10 bolts, tightened to a torque of 17 Nm.

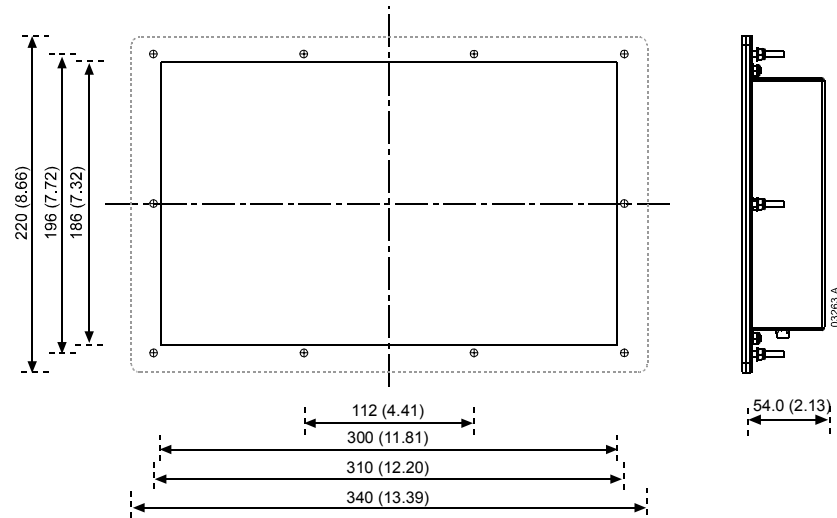


	<b>A</b> mm (inch)	<b>B</b> mm (inch)	<b>C</b> mm (inch)
MVSxxxx-V02	636	513	68.5
MVSxxxx-V03	(25.04)	(20.20)	(2.70)
MVSxxxx-V04			
MVSxxxx-V06	842	663	68.5
MVSxxxx-V07	(33.15)	(26.10)	(2.70)
MVSxxxx-V11	Contact your local supplier.		

# INSTALLATION: INSTALLATION

## 4.2 Mounting Instructions - MVS Controller

The MVS Controller can be secured in place with ten M4 nuts, affixed to the studs on the back of the controller.



To mount the controller, make a 186 mm x 300 mm cutout at the desired mounting location. Ensure adequate clearance (54 mm) is available behind the mounting location.

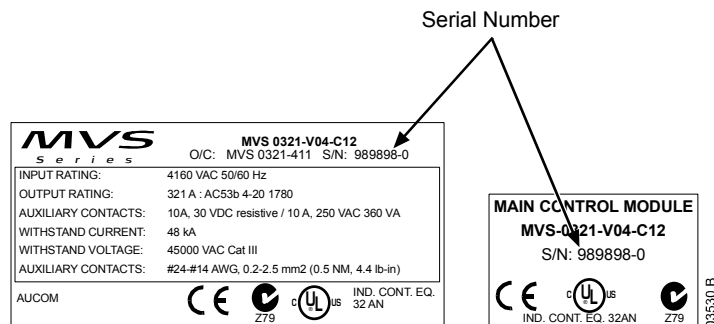
Drill 5 mm holes to accommodate the studs on the controller. Fit the controller through the cutout and tighten the nuts onto the studs.



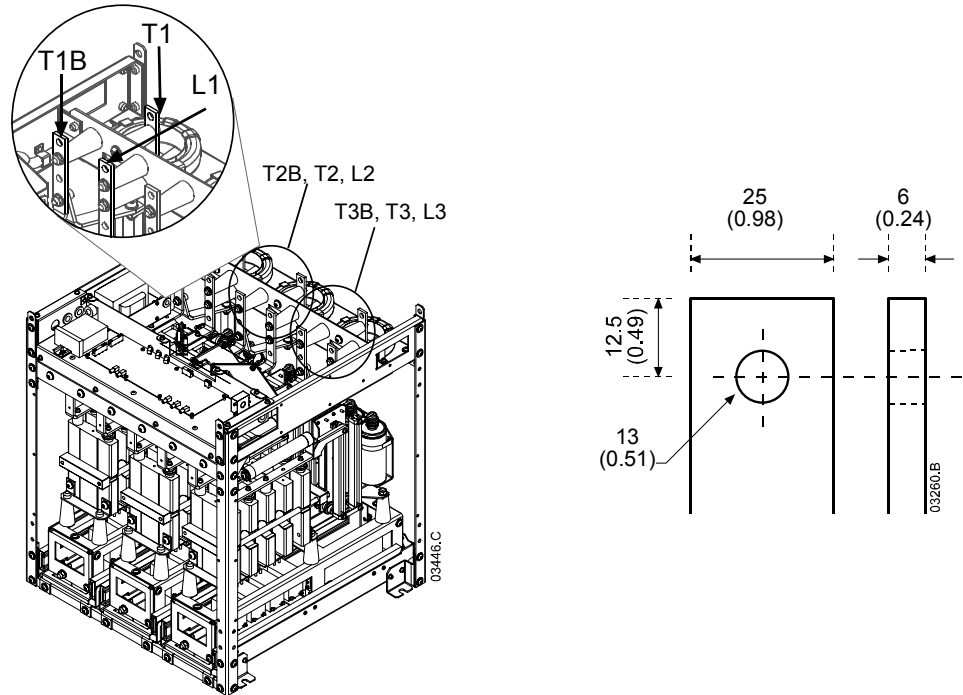
### NOTE

Before installation, always ensure that you are using the correct controller for the soft starter. This can be checked by comparing the serial number on the back of the controller with the serial number on the front of the power assembly.

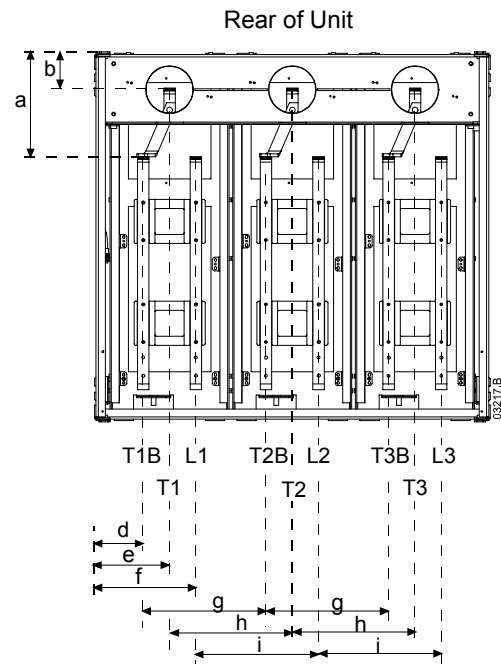
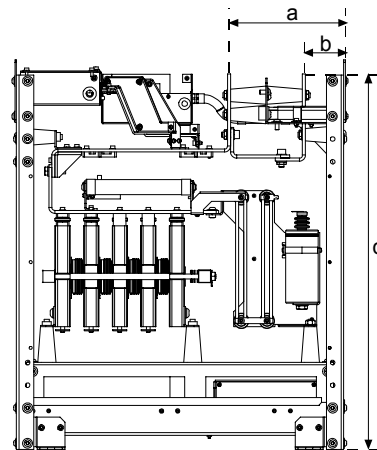
### Serial number



4.3 Power Terminations



The correct tightening torque depends on the termination being used - refer to the manufacturer's specifications for details.

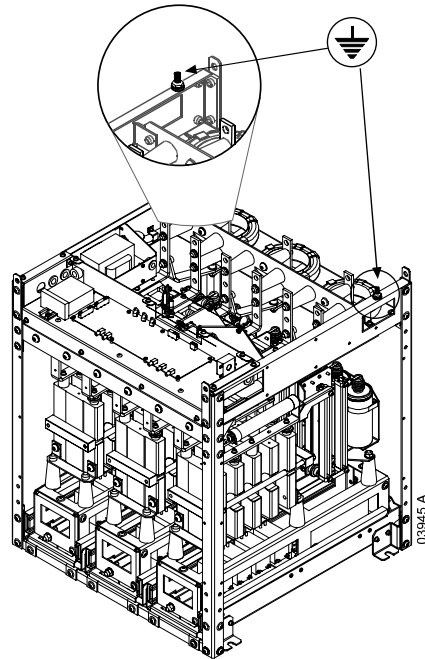


	a mm (inch)	b mm (inch)	c mm (inch)	d mm (inch)	e mm (inch)	f mm (inch)	g mm (inch)	h mm (inch)	i mm (inch)
MVSxxxx-V02	228 (8.98)	79 (3.11)	744 (29.29)	79 (3.11)	129 (5.08)	179 (7.05)	200 (7.87)	200 (7.87)	200 (7.87)
MVSxxxx-V03									
MVSxxxx-V04									
MVSxxxx-V06	228 (8.98)	79 (3.11)	804 (31.65)	107 (4.19)	164 (6.46)	222 (8.72)	268 (10.55)	268 (10.55)	268 (10.55)
MVSxxxx-V07									
MVSxxxx-V11	Contact your local supplier for measurements for MVSxxxx-V11.								

# INSTALLATION: INSTALLATION

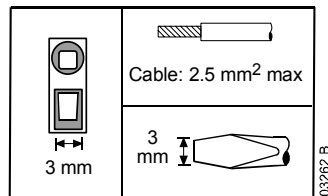
## 4.4 Earth Terminations

An earth stud is located on each side of the power assembly, at the rear of the unit.



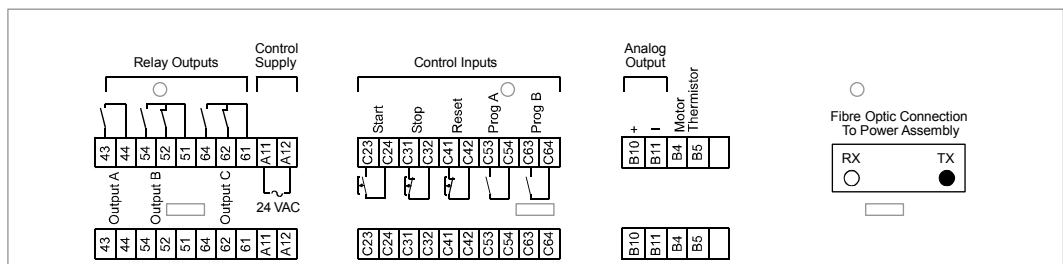
## 4.5 Control Terminations

On the control voltage terminal block, control wiring is secured in place by 3 mm spring terminals. Use a screwdriver to open the terminal clamp, then insert the wire into the terminal cage. Release the clamp by removing the screwdriver.



## 4.6 Terminal Block (MVS Controller)

Terminations on the MVS Controller use plug-in terminals. Unplug the terminal blocks, complete the wiring, then re-plug the terminal blocks into the controller.



**Chapter 5****Power Circuits**

---

**5.1 Overview**

MVS soft starters are designed to operate as part of a system including other components. A main contactor and bypass contactor are required in all installations. The following additional components may also be required:

- main isolator/ earth switch
- R Rated protection fuses
- power factor correction
- line inductors
- transient/ overvoltage protection
- control supply transformer

**5.2 Main Contactor**

The MVS must always be installed with a main contactor. Select a contactor with an AC3 rating greater than or equal to the full load current rating of the connected motor.

The main contactor is associated with terminals L1, L2, L3 on the supply side of the soft starter. The coil is associated with output terminals 13, 14 of the MVS (refer to *Diagram 1: Standard Power Circuit Configuration* on page 16).

To ensure that the potentially dangerous medium voltage area is isolated from the low voltage control area, power is supplied to the main contactor coil from the control voltage terminal block (refer to *Diagram 4: Internal Wiring* on page 21).

**5.3 Bypass Contactor**

The MVS must always be installed with a bypass contactor. Select a contactor with an AC1 rating greater than or equal to the full load current rating of the connected motor.

The bypass contactor is associated with terminals L1, L2, L3 on the supply side of the soft starter, and bypass terminals T1B, T2B, T3B on the motor side. The coil is associated with output terminals 23, 24, and the auxiliary Normally Open contact is associated with input terminals C73, C74 of the soft starter (refer to *Diagram 1: Standard Power Circuit Configuration* on page 16).

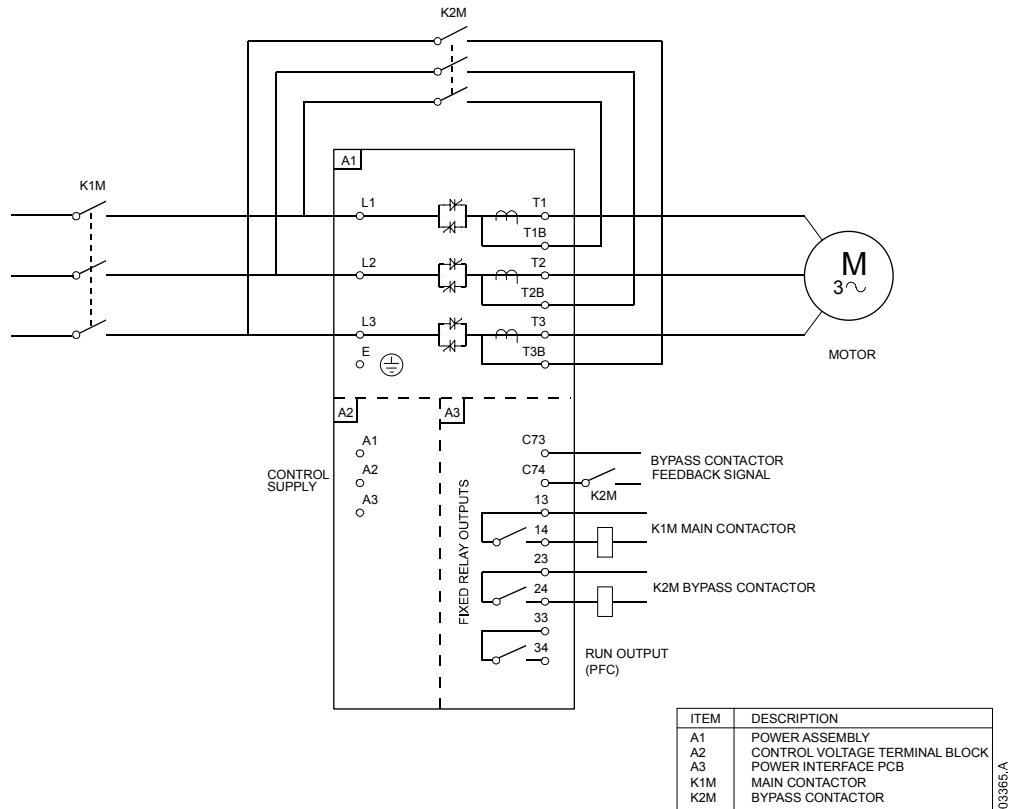
To ensure that the potentially dangerous medium voltage area is isolated from the low voltage control area, power is supplied to the bypass contactor coil from the control voltage terminal block (refer to *Diagram 4: Internal Wiring* on page 21).



# INSTALLATION: POWER CIRCUITS

Diagram 1: Standard Power Circuit Configuration

MVS power circuit including main and bypass contactors.



## 5.4 Main Isolator/ Earth Switch

A main isolator/ earth switch can be connected on the supply side of the main contactor (refer to *Diagram 2: Complete Power Circuit Configuration* on page 18).



### CAUTION

The main isolator/ earth switch should only be operated when the motor is not running.

## 5.5 R Rated Protection Fuses

If specified, R Rated protection fuses can be installed on the supply side of the soft starter to provide Type 2 coordination and short circuit protection for the motor branch circuit. The appropriate fuse should be selected from the table below, based on the motor's rated full load current.

This recommendation is based on two starts per hour (equally spaced) and maximum ambient operating temperature of 40 °C. Consult your local supplier for operating conditions not covered by these charts.

**Fuse ratings:**

Motor Rated FLC	4.0-20:1780	4.0-30:1770	5.0-30:1770	5.0-60:1740
70 A	4R	4R	4R	5R
100 A	5R	5R	6R	9R
130 A	6R	6R	9R	9R
150 A	9R	9R	9R	12R
170 A	9R	9R	12R	12R
200 A	12R	12R	12R	18R
230 A	12R	12R	18R	18R
300 A	18R	18R	18R	24R
390 A	18R	18R	24R	24R

**Fuse type code formats:**

	System Voltage 2.3 kV	System Voltage 3.3 ~ 4.2 kV	System Voltage 6 ~ 7.2 kV
Ferraz	A240Rrr	A480Rrr-1	A072xxDxRO-rr
Bussmann	JCK-x-rr	JCL-x-rr	JCR-x-rr

rr = R rating of the fuse

x = physical format of the fuse (select according to installation requirements)

**Examples:**

6R fuse for 2.3 kV: A240R6R or JCK-A-6R

12R fuse for 3.3 kV: A480R12R-1 or JCL-B-12R

18R fuse for 6.6 kV: A072B1DARO-18R or JCR-B-18R

## 5.6 Power Factor Correction

Power factor correction capacitors should be selected based on the motor data and the required final power factor.

If power factor correction capacitors are being used, select a contactor according to the required kVAR. The contactor must be connected on the supply side of the soft starter. The power factor correction capacitor contactor coil is associated with output terminals 33, 34 of the soft starter's power interface PCB.

To ensure that the potentially dangerous medium voltage area is isolated from the low voltage control area, power is supplied to the power factor correction capacitor contactor coil from the control voltage terminal block (refer to *Diagram 4: Internal Wiring* on page 21).



**NOTE**

The capacitor bank must be fed from the supply side of the soft starter.

## 5.7 Line Inductors

Line inductors are required if the cable run between the soft starter and the motor is greater than 200 m. Line inductors should be installed outside the panel, between the soft starter output (terminals T1, T2, T3) and the motor. Contact your local supplier for selection details.

## 5.8 Transient/ Overvoltage Protection

Overvoltage protection should be installed if there is a risk of high transients at the installation. If required, use the optional Overvoltage Protection Kit. Contact your local supplier for details.

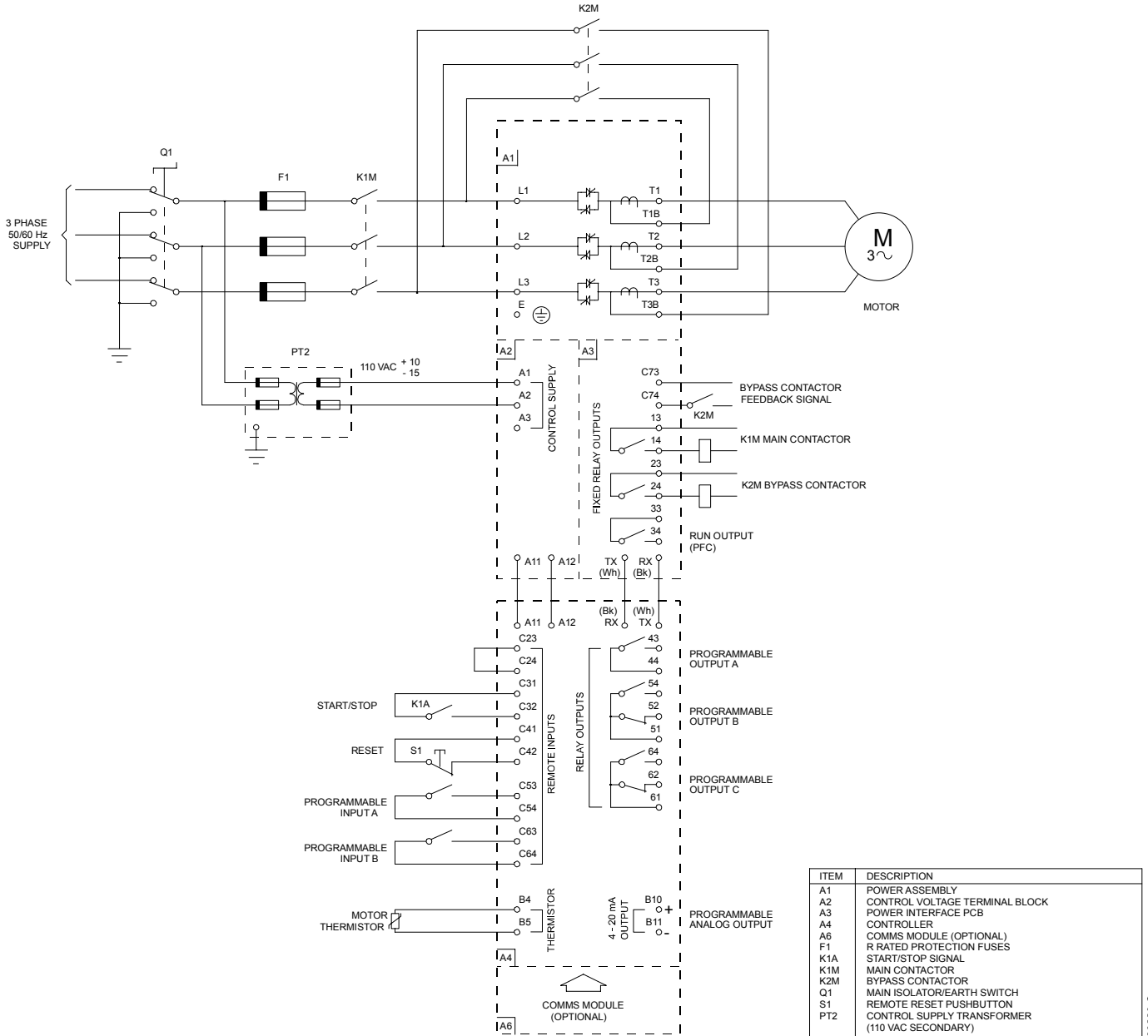
# INSTALLATION: POWER CIRCUITS

## 5.9 Control Supply Transformer

The MVS requires a low voltage control supply (110~130 VAC or 220~240 VAC). If low voltage is not available, a transformer is required. Use a transformer with primary voltage matching the mains voltage, and secondary voltage of 110 VAC. Use a single phase 500 VA transformer with protection fuses on both the primary and secondary sides (refer to *Diagram 2: Complete Power Circuit Configuration* on page 18).

*Diagram 2: Complete Power Circuit Configuration*

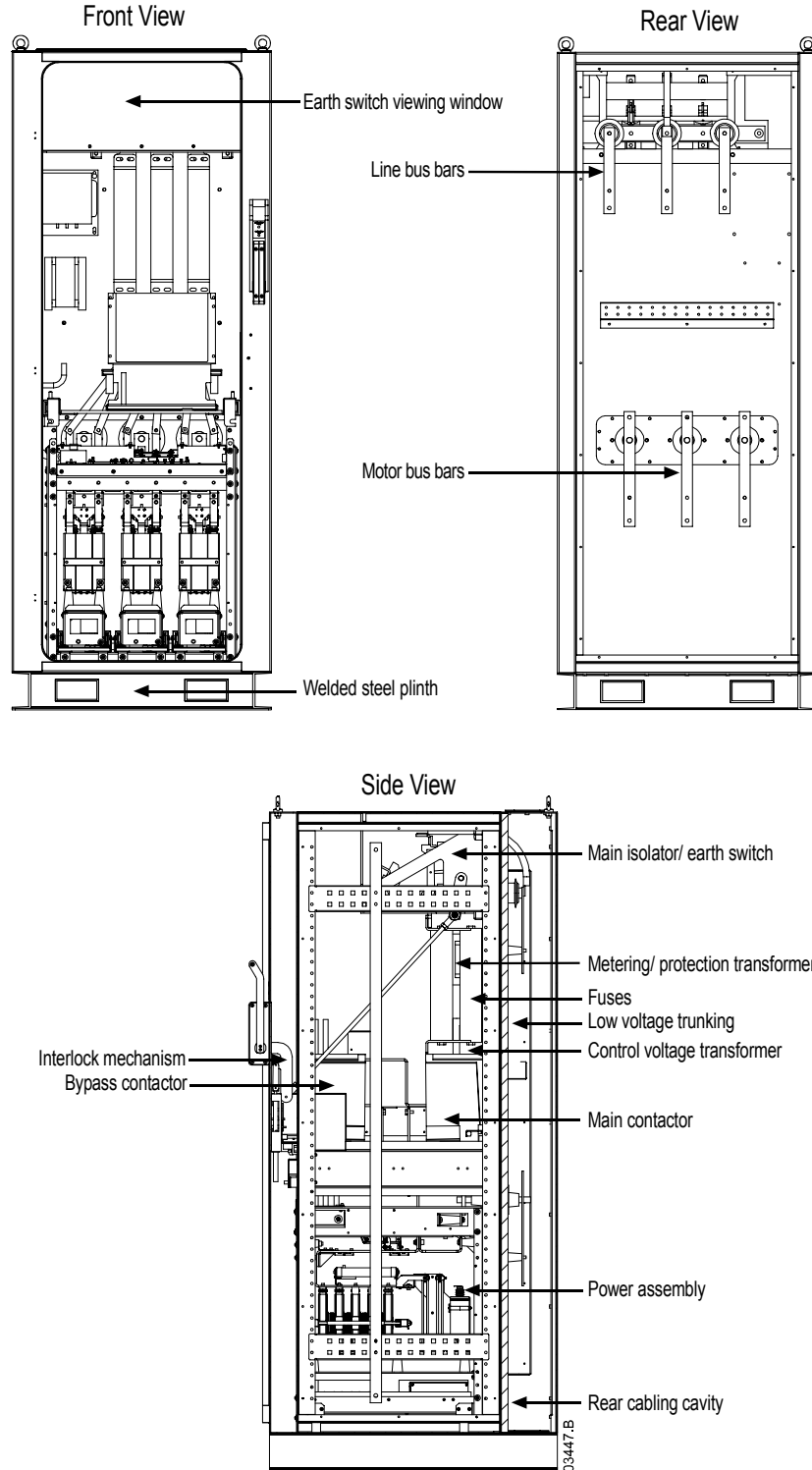
*MVS power circuit with main contactor, bypass contactor, main isolator/ earth switch, R Rated fuses and control supply transformer. Configured for two-wire start/ stop control.*



**5.10 Enclosures**

MVS soft starters can be installed easily into standard enclosures to provide a complete motor control cabinet. The compact size of the power assembly leaves room for auxiliary equipment to be installed.

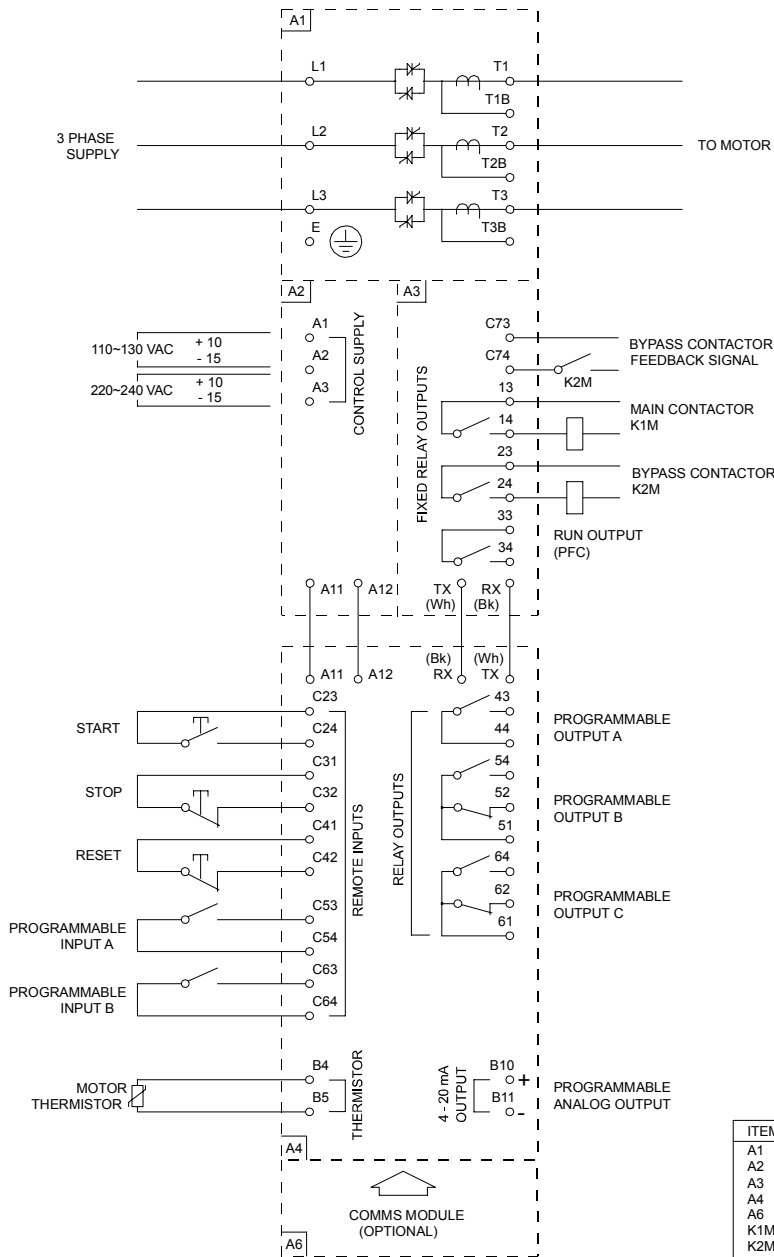
The power assembly should be mounted at the bottom of the enclosure, and the MVS Controller can be mounted on the front panel. The diagrams below illustrate one possible configuration for installation.



## Chapter 6 Control Circuits

### 6.1 Electrical Schematic

Diagram 3: Electrical Schematic

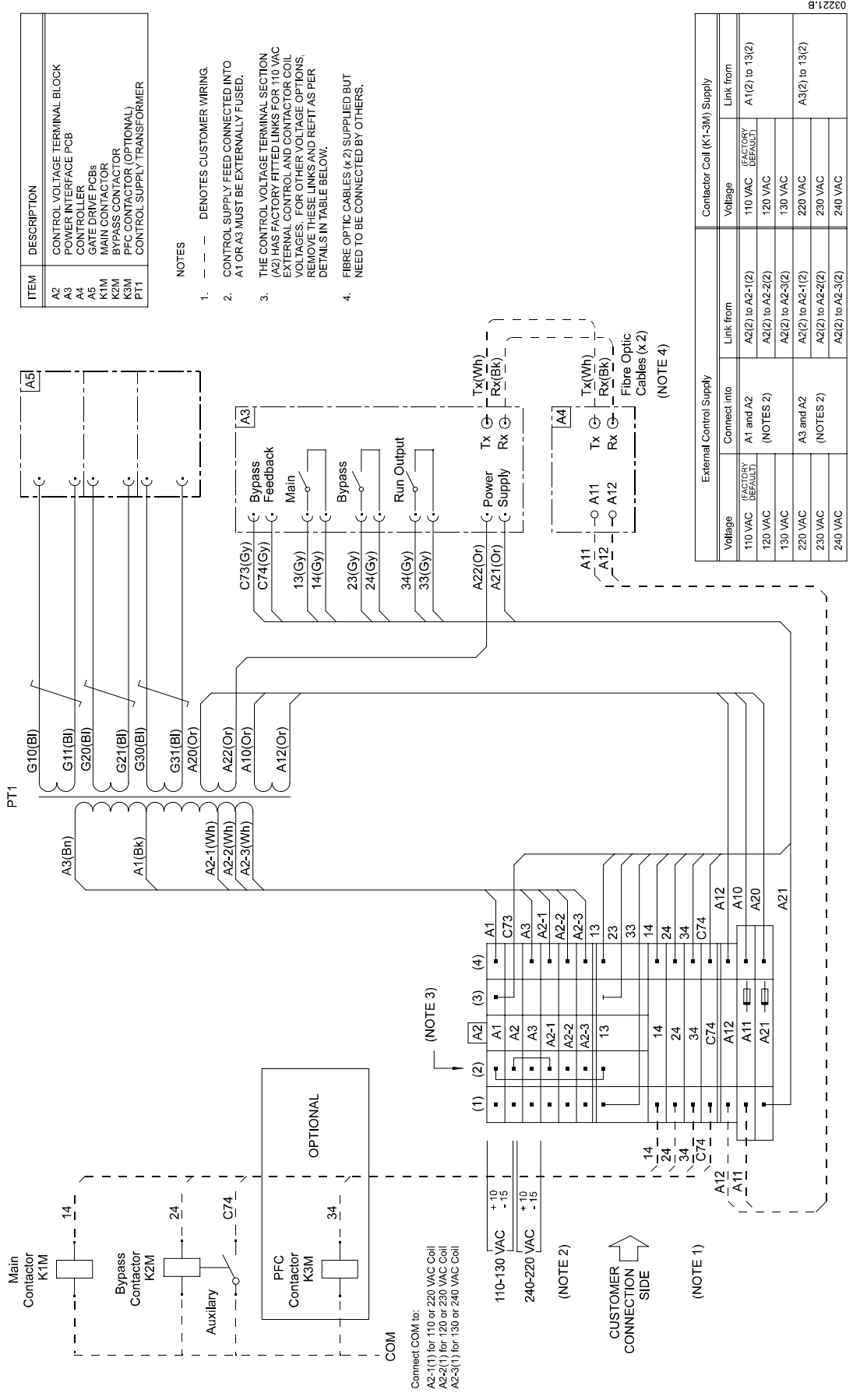


ITEM	DESCRIPTION
A1	POWER ASSEMBLY
A2	CONTROL VOLTAGE TERMINAL BLOCK
A3	POWER INTERFACE PCB
A4	CONTROLLER
A6	COMMS MODULE (OPTIONAL)
K1M	MAIN CONTACTOR
K2M	BYPASS CONTACTOR

03222.B

6.2 Internal Wiring

Diagram 4: Internal Wiring



# INSTALLATION: CONTROL CIRCUITS

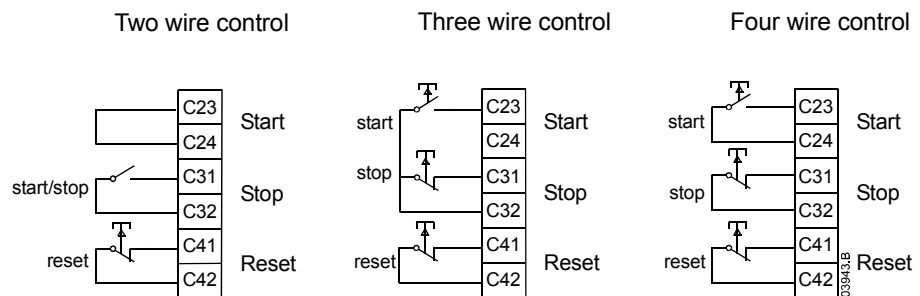
## 6.3 Control Wiring

The soft starter's operation can be controlled in three ways:

- using the buttons on the MVS Controller
- via remote inputs
- via a serial communication link

The <LCL/RMT> button controls whether the MVS will respond to local control (via the MVS Controller) or remote control (via the remote inputs). Serial communication is always enabled in local control mode, and can be enabled or disabled in remote control mode (refer to parameter 4-B).

The MVS has three fixed inputs for remote control. These inputs should be controlled by contacts rated for low voltage, low current operation (gold flash or similar).



### CAUTION

Do not apply voltage to the control input terminals. These are active 24 VDC inputs and must be controlled with potential free circuits.

Ensure cables to the control inputs are segregated from AC power and control wiring.



### CAUTION

The <STOP> button on the MVS Controller is always enabled. When using two-wire remote control, the soft starter will restart immediately if the remote start input is still active.

MVS soft starters offer programming and simulation features specifically designed to make commissioning safe and easy.

### 7.1 Simulation Tools

Software simulation functions allow the MVS to be tested without a motor connected, to confirm that the soft starter's control circuits are operating correctly. There are three simulation modes available:

- Run simulation: simulates a motor starting, running and stopping to confirm that the soft starter has been installed correctly.
- Protection simulation: simulates activation of each protection mechanism to confirm that the soft starter is responding correctly in each situation.
- Signalling simulation: simulates output signalling to confirm that outputs are operating correctly.

For details of the simulation functions, refer to *Commissioning Menu: Simulation Tools* on page 30.

### 7.2 Low Voltage Test Mode

The MVS can be connected to a low voltage motor ( $\leq 500$  VAC) for testing. This allows the user to thoroughly test the soft starter and its associated power and control circuits. The low voltage test mode provides a means of testing the soft starter's configuration without requiring a full medium voltage test facility. To perform the low voltage test, one non-conduction resistor assembly must be connected to each phase arm (three resistor assemblies are supplied with the soft starter).

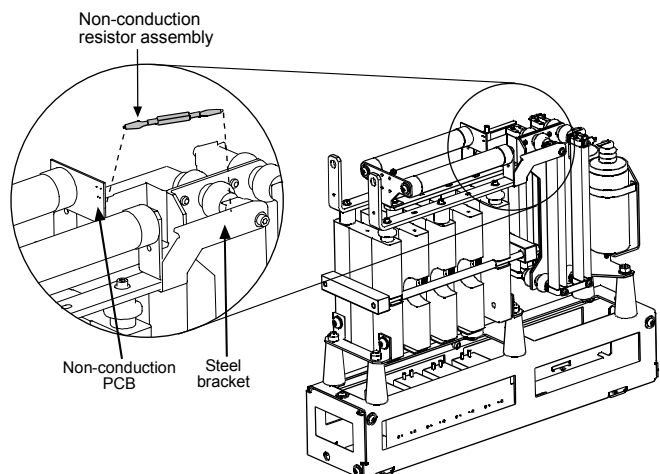
During the low voltage test, the soft starter's input, output and protection settings can be tested. Low voltage mode is not suitable for testing soft starting or soft stopping performance.

To operate the MVS in low voltage test mode:

1. Isolate the soft starter from the motor and the mains supply.
2. Connect one non-conduction resistor assembly to each phase arm.

**For V02, V03 and V04 units:**

Clip one end of the resistor assembly to the plated hole on the non-conduction PCB. The non-conduction PCB is located at the top of the phase arm, behind the long round grading resistor (on the left hand side when viewed from the front). Clip the other end of the resistor assembly to any point on the steel bracket behind the other grading resistor.

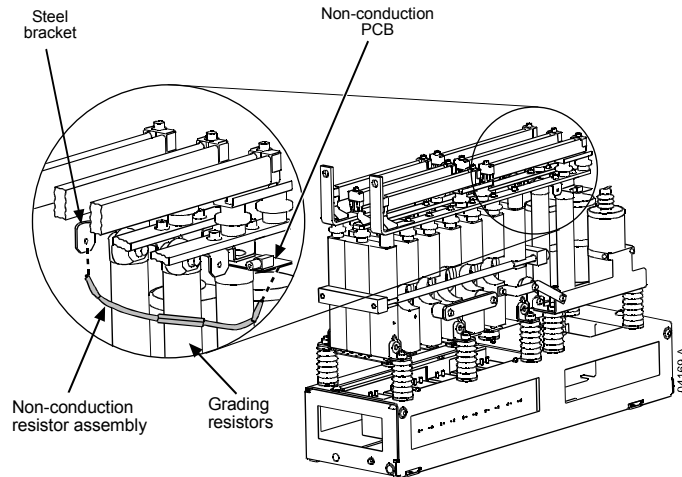




## INSTALLATION: SETUP TOOLS

### For V06 and V07 units:

Clip one end of the resistor assembly to the plated hole on the non-conduction PCB. The non-conduction PCB is located on the side of the phase arm, at the top of the long round grading resistor (on the right hand side when viewed from the front). There is a small steel bracket just in front of the PCB. Pass the other end of the resistor assembly through the phase arm, in front of the three grading resistors, and clip it to the steel bracket in front of the grading resistor on the other side of the phase arm (this bracket looks the same as the bracket in front of the non-conduction PCB).



3. Connect T1, T2, T3 of the soft starter to a three phase motor with full load current greater than 5 A. Connect L1, L2, L3 of the soft starter to three phase mains supply with voltage less than 500 VAC (frequency 50 Hz or 60 Hz).
4. Set parameter 1-A *Motor Full Load Current* to the value shown on the motor name plate. Set parameters 3-U *Oversvoltage Level* and 3-W *Undersvoltage Level* to suit the low voltage mains supply.
5. Switch on control and mains supply, and use the MVS to start the motor. The start command can be sent from the MVS Controller or via the remote input. Monitor the soft starter's display and verify the line voltage readings.
6. Stop and restart the motor several times to confirm correct and consistent operation.
7. When testing is complete, isolate the soft starter from the mains supply. Disconnect the soft starter from the motor and mains voltage, then remove control voltage. Remove the non-conduction resistor assembly from each phase arm.



### WARNING

After low voltage mode testing, ensure that the non-conduction resistor assembly is removed from each phase arm before connecting the soft starter to a medium voltage motor. If the non-conduction resistor assemblies remain on the phase arms, the soft starter may suffer severe damage.

## Section 3

**Operation****Key Features**

MVS soft starters offer several special functions to ensure ease of use and to provide optimal motor control in all environments and applications.

**Dual Parameter Set**

The MVS can be programmed with two separate sets of operating parameters. This allows the soft starter to control the motor in two different starting and stopping configurations.

The secondary motor settings (parameter groups 12 and 13) are ideal for slip-ring motors, dual speed motors, or conventional (squirrel-cage) motors which may start in two different conditions (such as loaded and unloaded conveyors).

**NOTE**

MVS soft starters are not suitable for controlling two separate motors. The secondary parameter set should only be used for a secondary configuration of the primary motor.

**Customisable Protection**

The MVS offers comprehensive protection to ensure safe operation of the motor and soft starter. The protection characteristics can be customised extensively to match the exact requirements of the installation.

**Advanced Thermal Modelling**

Intelligent thermal modelling allows the soft starter to predict whether the motor can successfully complete a start. The MVS uses information from previous starts to calculate the motor's available thermal capacity, and will only permit a start which is predicted to succeed.

**Comprehensive Event and Trip Logging**

The MVS has a 99-place event log to record information on soft starter operation. A separate trip log stores detailed information about the last eight trips.

**Informative Feedback Screens**

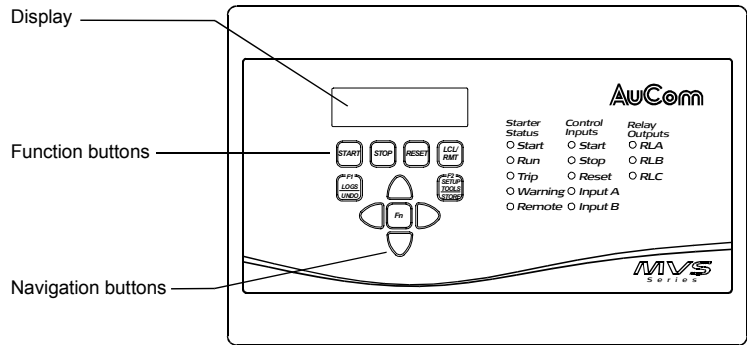
A large-format screen allows the MVS to display important information clearly. Comprehensive metering information, details of starter status and last start performance allow easy monitoring of the starter's performance at all times.

Chapter 8 User Interface

8.1 MVS Controller

The MVS Controller provides a complete user interface for interacting with MVS soft starters.

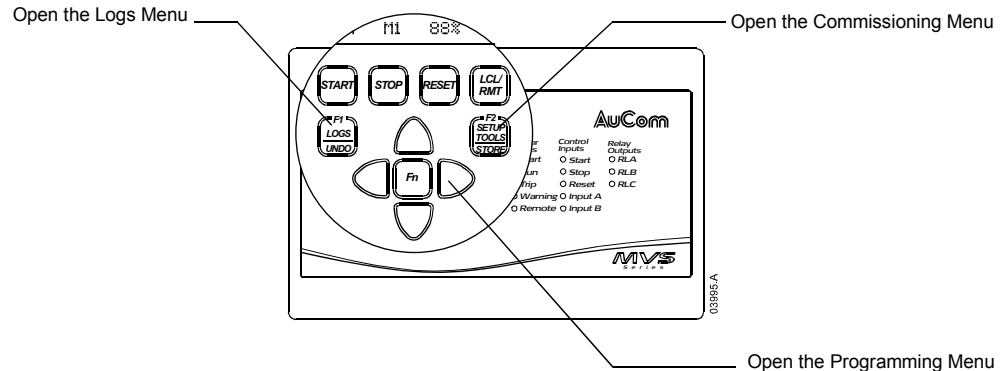
The MVS Controller has four navigation buttons and seven function buttons which are used to control the motor, access operating information, and program the soft starter.



8.2 Menus

Configuration and control of the soft starter is managed via the MVS Controller. Information is arranged in three menus:

- The Programming Menu provides access to all programmable parameters. The Programming Menu is accessed by pressing the ► button while viewing the metering screens.
- The Commissioning Menu provides access to tools which assist setup when the soft starter is deployed. The Commissioning Menu is accessed by pressing the <SETUP TOOLS> button while viewing the metering screens.
- The Logs Menu provides viewing access to the Event and Trip Logs and the soft starter's performance counters. The Logs Menu is accessed by pressing the <LOGS> button while viewing the metering screens.



Navigation



NOTE

The menus can only be accessed from the metering screens. You cannot open a menu from inside another menu.

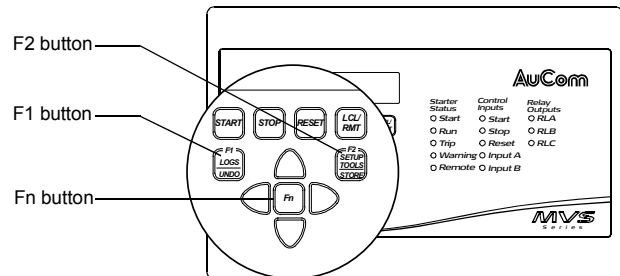
Use the ▲ and ▼ buttons to scroll through the items in a menu.

To view the items in a sub-menu, press the ► button. To close the sub-menu and return to the previous level, press ◀.

**Menu Shortcuts**

The MVS Controller offers keyboard shortcuts for fast access to commonly used parameters. Use parameters 11-B and 11-C (*F1* and *F2 Pushbutton Function*) to select the shortcut target.

To use the shortcuts, press the **<FN>** button and either the **<F1>** (**<LOGS>**) or **<F2>** (**<SETUP TOOLS>**) button at the same time.



**Altering Parameter Values**

To change a parameter value, scroll to the appropriate parameter in the Programming Menu and press the **▶** button to enter edit mode.

- To alter the parameter value, use the **▲** and **▼** buttons. Pressing the **▲** or **▼** button once will increase or decrease the value by one (1). If the button is held for longer than five seconds, the value will increase or decrease at a faster rate.
- To save changes, press the **<STORE>** button. The value shown on the display will be saved and the MVS Controller will return to the parameter list.
- To cancel changes, press the **<UNDO>** button. The MVS Controller will return to the currently saved setting.
- To end edit mode, press the **◀** button. The MVS Controller will return to the parameter list and any unsaved changes will be lost.

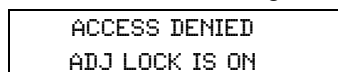
You can access the Programming Menu at any time, including while the soft starter is running. Any changes to the start profile take effect after the next start. All other changes take effect immediately.

**8.3 Security**

**Adjustment Lock**

You can lock the Programming Menu to prevent users from altering parameter settings. When the adjustment lock (parameter 20-B) is on, users have read-only access to view parameter values in the Programming Menu, and the Commissioning Menu is not available.

If a user attempts to change a parameter value or access the Commissioning Menu, an error message is displayed:



Authorised users can unlock the Programming Menu using parameter 20-B.

**Security Access Code**

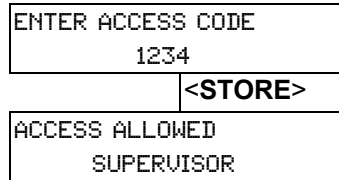
In addition to the adjustment lock, critical parameters in the Programming Menu (parameter group 20 and higher) are protected by a four-digit security access code, preventing unauthorised users from viewing or modifying parameter settings.

When a user attempts to open parameter group 20, the MVS Controller prompts for an access code. If the code that is entered matches the stored access code,

## OPERATION: USER INTERFACE

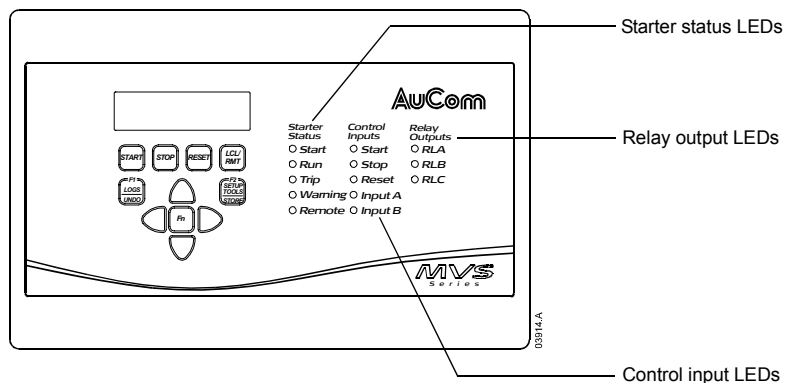
access is permitted. The security access code is requested once for the programming session, and authorisation continues until the user closes the menu.

To enter the security access code, use the ◀ and ▶ buttons to select a digit, and the ▲ and ▼ buttons to change the value. When all four digits match your access code, press <STORE> to submit the access code. The MVS Controller will display an acknowledgement message before continuing.



### 8.4 LEDs

The MVS Controller has 13 LEDs for at-a-glance monitoring of starter status.



The Starter Status LEDs report the operating status of the soft starter:

- The Start LED is on while the starter is starting, running or stopping.
- The Run LED is on while the starter is running.
- The Trip LED is on when a trip has occurred.
- The Warning LED is on while a warning is active.
- The Remote LED is on when remote mode is selected.

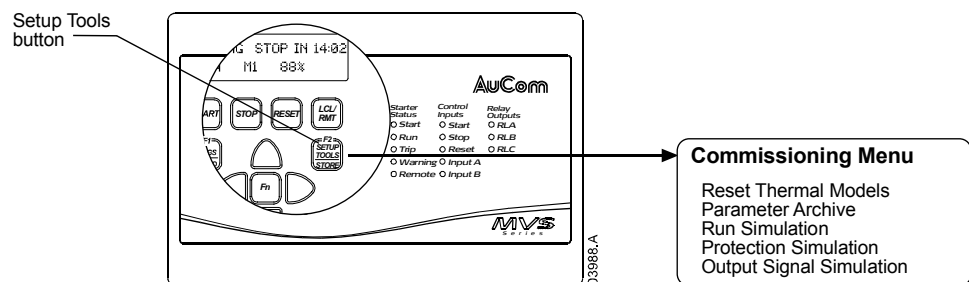
The Control Input LEDs activate when a signal is present at the corresponding control terminals.

The Relay Output LEDs activate when the corresponding output relay is active.

### 8.5 Commissioning Menu

The Commissioning Menu provides access to commissioning and testing tools.

To open the Commissioning Menu, press the <SETUP TOOLS> button while viewing the metering screens.



To navigate through the Commissioning Menu:

- to scroll the next or previous item, press the ▲ or ▼ button
- to open an item for viewing, press the ► button
- to return to the previous level, press the ◀ button
- to close the Commissioning Menu, press the <SETUP TOOLS> button.



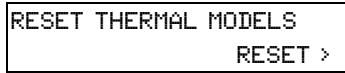
**NOTE**

The Commissioning Menu is only available if the Programming Menu is unlocked (parameter 20-B *Adjustment Lock* is set to Off).

**Thermal Model Reset**

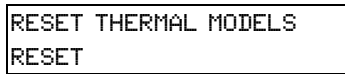
The soft starter's advanced thermal modelling software monitors the motor's performance during each start and throughout the running cycle. This allows the soft starter to calculate the motor's temperature and ability to start successfully at any time.

The soft starter's thermal model can be reset if required.



In order to reset the thermal model, press the ► button. At the confirmation prompt, press <STORE> to confirm or <UNDO> to cancel the action. Cancelling the action returns to the Commissioning Menu.

When the thermal model has been reset, the screen will briefly display a confirmation message, then return to the previous screen.



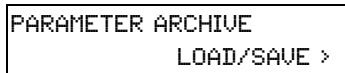
**Parameter Archive**

The parameter archive menu allows users to:

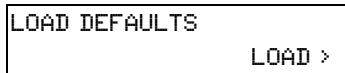
- restore the MVS to factory default settings
- save the current parameter settings to an internal file
- reload parameter settings from an internal file

The MVS can store two separate user-defined files.

1. To select a parameter archive function, scroll to the Parameter Archive screen in the Commissioning Menu then press the ► button.



2. Use the ▼ button to select the desired function.



The options are:

- Load defaults
  - Load user set 1
  - Load user set 2
  - Save user set 1
  - Save user set 2
3. When the screen shows the required function, press the ► button. The MVS will prompt for confirmation.



- Press **<STORE>** to confirm or **<UNDO>** to cancel the action. Cancelling the action returns to the previous screen.

When the action has been completed, the display will briefly confirm success then return to the main status screen.



**NOTE**

The default values saved in user set 1 and user set 2 are the same as the default values for each parameter.

**Simulation Tools**

Software simulation functions allow the user to test the soft starter's operation without applying voltage to the motor. This allows the user to test control circuits and associated equipment. There are three simulation modes available:

- Run simulation: simulates a motor starting, running and stopping to confirm that the soft starter has been installed correctly.
- Protection simulation: simulates activation of each protection mechanism to confirm that the soft starter is activating correctly in each situation.
- Signalling simulation: simulates output signalling to confirm that outputs are operating correctly.

The simulation tools can be accessed via the Commissioning Menu. Press the **<SETUP TOOLS>** button then use the **▼** button to scroll through the menu to the required simulation.

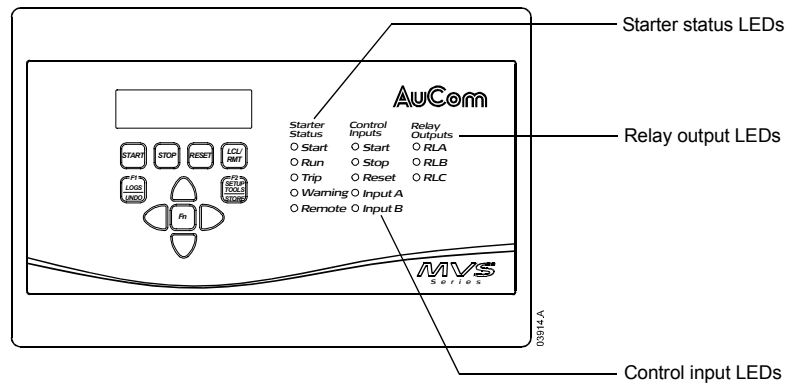


**NOTE**

The simulation tools are only available if the Programming Menu is unlocked (parameter 20-B *Adjustment Lock* is set to Off).

• **Run Simulation**

The MVS Controller allows the user to simulate a motor starting, running and stopping, in order to confirm that the soft starter and any auxiliary switchgear have been installed correctly. Feedback is provided via the display and the status LEDs.



The run simulation provides a safe method of confirming that the installation is operating as expected. The simulation is particularly useful to confirm the correct configuration of the main and bypass contactors, fibre-optic controls and programmable outputs.

The simulation can be terminated at any time by pressing the **<UNDO>** button. The MVS Controller will return to the Commissioning Menu.



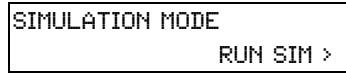
**NOTE**

During the simulation, no pre-start checks are made and the soft starter must be disconnected from mains voltage. The MVS Controller must be connected to the low voltage control supply.

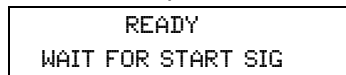
The simulation is only available when the soft starter is in Ready state.

To activate the run simulation:

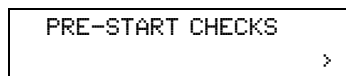
1. Open the Commissioning Menu and select Run Simulation.



2. To enter the run simulation, press the ► button.

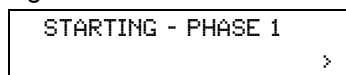


3. Press the <START> button.



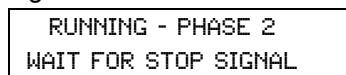
The soft starter will perform its pre-start checks. If parameter 5-D (*Output Relay A Functionality*) is set to Main Contactor, the Relay A LED on the MVS Controller activates.

4. Press the ► button to proceed to the next stage of the simulation. The MVS simulates starting.



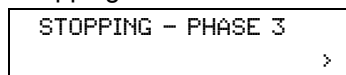
The Start LED activates on the MVS Controller and the Phase 1 firing LED blinks on the power interface PCB.

5. Press the ► button to proceed to the next stage of the simulation. The MVS simulates running.



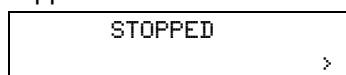
The bypass contactor closes and the Run LED activates on the MVS Controller. The Phase 2 firing LED blinks on the power interface PCB. If parameter 5-G (*Output Relay B Functionality*) is set to Run, the Relay B LED on the MVS Controller activates.

6. Press the <STOP> button to proceed to the next stage of the simulation. The MVS simulates stopping.



The bypass contactor opens and the Run and Relay B LEDs on the MVS Controller turn off. The Phase 3 firing LED blinks on the power interface PCB.

7. Press the ► button to proceed to the next stage of the simulation. The MVS returns to the stopped state.



The main contactor opens and all LEDs turn off.

8. Press the ► button to terminate the simulation and return to the Commissioning Menu.



- **Protection Simulation**

The MVS Controller allows the user to simulate activation of each protection mechanism, in order to confirm that the soft starter is responding to each situation correctly.



**NOTE**

During the simulation, no pre-start checks are made and the soft starter must be disconnected from mains voltage. The MVS Controller must be connected to the low voltage control supply.

The simulation is only available when the soft starter is in Ready state.

The protection simulation allows the user to confirm that protection events are being reported correctly on the display and across the communication network.

To activate the protection simulation:

1. Open the Commissioning Menu and select Protection Simulation.

```
SIMULATION MODE
PROTECTION SIM >
```

2. Press the ► button to open the protection list. The display will indicate the first simulation in the list.

```
CURRENT IMBALANCE
SIMULATE >
```

3. Use the ▲ and ▼ buttons to select a protection to simulate. The following protection conditions are available to simulate:

- Motor overload
- Undercurrent
- Instantaneous overcurrent
- Current imbalance
- Mains frequency
- Auxiliary trip A
- Auxiliary trip B
- Motor thermistor
- Excess start time
- Starter communication failure
- Battery/ Clock failure
- SCR temperature model
- Network communication failure
- Ground fault
- Overvoltage
- Undervoltage
- Time-overcurrent

4. Hold down the ► button to simulate the selected protection. The simulation will continue as long as the button is held down. The soft starter's response depends on the protection class setting (parameter group 21).

```
TRIPPED
CURRENT IMBALANCE
```

Release the ► button to end the simulation. Use ▲ or ▼ to select another simulation, or press ◀ to return to the Commissioning Menu.



**NOTE**

If the protection class is set to Trip, reset the soft starter before simulating another protection. If the protection class is set to Warning or Log, no reset is required.

• **Signalling Simulation**

The MVS Controller allows the user to simulate output signalling in order to confirm that the outputs are operating correctly.



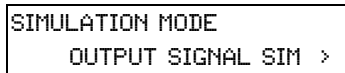
**NOTE**

During the simulation, no pre-start checks are made and the soft starter must be disconnected from mains voltage. The MVS Controller must be connected to the low voltage control supply.

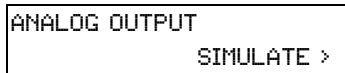
The simulation is only available when the soft starter is in Ready state.

To activate the signalling simulation:

1. Open the Commissioning Menu and select Signalling Simulation.



2. Press the ► button to open the simulation list. The display will indicate the first simulation in the list.

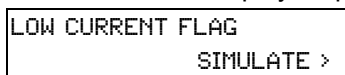


3. Use the ▲ and ▼ buttons to select a simulation. The following signals are available to simulate:

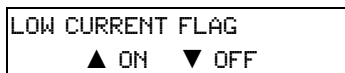
- Analog output
- Low current flag <sup>1</sup>
- High current flag <sup>1</sup>
- Motor temperature flag <sup>1</sup>
- Relay A
- Relay B
- Relay C

<sup>1</sup> To test the flags, set an output relay (parameters 5-A to 5-C) to the appropriate function and monitor the relay's behaviour.

4. Once the required simulation is displayed, press ► to confirm the selection.



5. Press the ▲ button to start the simulation. Pressing the ▼ button stops the signal.

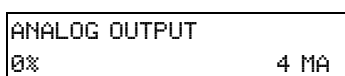


While the signal is being simulated, the display will indicate On. While the signal is not being simulated, the display will indicate Off.

6. Once the simulation is complete, press ◀ to return to the simulation list. Press ▲ or ▼ to select another simulation, or press ◀ again to return to the Commissioning Menu.

**Analog Output Simulation**

The analog output simulation uses the ▲ and ▼ buttons to change the analog output current at terminals B10, B11 of the MVS Controller.



Attach an external current measuring device to terminals B10, B11 of the MVS Controller. Use the ▲ or ▼ button to adjust the percentage value in the lower left hand corner of the display. The current measuring device should indicate the same level of current as shown at the lower right corner of the display.

## OPERATION: USER INTERFACE

### 8.6 Programming Menu

The Programming Menu provides access to programmable parameters.

To open the Programming Menu, press the ► button while viewing the metering screens.

Items in the Programming Menu are grouped into sets of related parameters. Use the ▲ and ▼ buttons to move between parameters groups and between the parameters in each group.

The security access code must be entered to access parameters in parameter group 20 or higher.

Parameter Group	Parameters
Primary Motor Settings	1-A Motor Full Load Current 1-B Motor Maximum Start Time 1-C Motor Locked Rotor Current 1-D Motor Service Factor
Start/Stop Modes-1	2-A Start Mode 2-B Current Limit 2-C Current Ramp – Initial Start Current 2-D Current Ramp – Start Ramp Time 2-E Kickstart Current Level 2-F Kickstart Duration 2-G Excess Start Time 2-H Stop Mode 2-I Soft Stop Ramp Time
Protection Settings	3-A Undercurrent Level 3-B Undercurrent Trip Delay 3-C Instantaneous Overcurrent Level 3-D Instantaneous Overcurrent Trip Delay 3-E Current Imbalance Level 3-F Current Imbalance Trip Delay 3-G Phase Sequence 3-H Mains Frequency Trip Mode 3-I Mains Frequency Trip Range 3-J Mains Frequency Trip Delay 3-K Restart Delay 3-L Restart Temperature Check 3-M Auxiliary Trip A – Mode 3-N Auxiliary Trip A – Delay 3-O Auxiliary Trip A – Enable Delay 3-P Auxiliary Trip B – Mode 3-Q Auxiliary Trip B – Delay 3-R Auxiliary Trip B – Enable Delay 3-S Ground Fault Level 3-T Ground Fault Trip Delay 3-U Overvoltage Level 3-V Overvoltage Trip Delay 3-W Undervoltage Level 3-X Undervoltage Trip Delay
Inputs	4-A Local/Remote Control 4-B Serial Control – Remote Mode 4-C Input A Functionality 4-D Input B Functionality

## OPERATION: USER INTERFACE

Outputs	5-A Low Current Flag 5-B High Current Flag 5-C Motor Temperature Flag 5-D Output Relay A – Functionality 5-E Output Relay A – On Delay 5-F Output Relay A – Off Delay 5-G Output Relay B – Functionality 5-H Output Relay B – On Delay 5-I Output Relay B – Off Delay 5-J Output Relay C – Functionality 5-K Output Relay C – On Delay 5-L Output Relay C – Off Delay 5-M Analog Output A – Functionality 5-N Analog Output A – Range 5-O Analog Output A – Adjustment (maximum) 5-P Analog Output A – Adjustment (minimum) 5-Q Mains Reference Voltage
Auto-Stop	6-A Auto-Stop Mode 6-B Auto-Stop Time
Slip-Ring Motor Setup	9-A Primary Motor Ramp Configuration 9-B Secondary Motor Ramp Configuration 9-C Slip-Ring Rotor Resistance Contactor Time 9-D Slip-Ring Conduction Retardation
HMI Settings	11-A Language 11-B F1 Pushbutton Function 11-C F2 Pushbutton Function 11-D Programmable Screen – Top Left 11-E Programmable Screen – Top Right 11-F Programmable Screen – Bottom Left 11-G Programmable Screen – Bottom Right
Secondary Motor Settings	12-A Motor Full Load Current
Start/Stop Modes-2	13-A Start Mode 13-B Current Limit 13-C Current Ramp – Initial Start Current 13-D Current Ramp – Start Ramp Time 13-E Kickstart Current Level 13-F Kickstart Duration 13-G Excess Start Time 13-H Stop Mode 13-I Stop Ramp Time
Time-Overcurrent Protection	16-A Time-Overcurrent Level 16-B Time-Overcurrent Curve 16-C Time-Overcurrent Reset Time 16-D <i>Reserved</i>
Restricted Parameters	20-A Security Access Code 20-B Parameter Lock 20-C Emergency Mode 20-D Motor Current Calibration 20-E Voltage Calibration 20-F Main Contactor Time 20-G Bypass Contactor Time

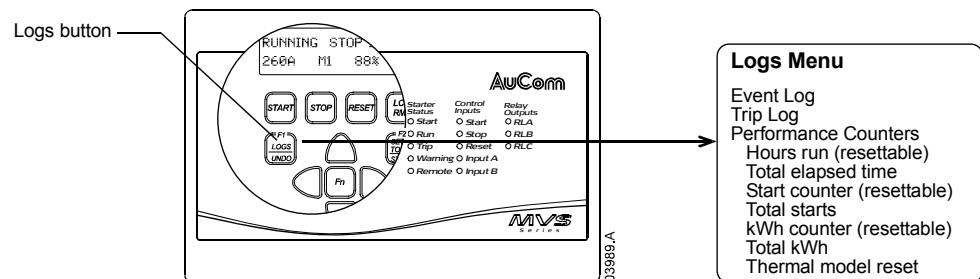
Protection Classes	21-A Overload
	21-B Undercurrent
	21-C Instantaneous Overcurrent
	21-D Current Imbalance
	21-E Mains Frequency
	21-F Auxiliary Trip A
	21-G Auxiliary Trip B
	21-H Motor Thermistor
	21-I Excess Start Time
	21-J Starter Communications Timeout
	21-K Battery/Clock Fail
	21-L SCR Temperature Model
	21-M Network Communications Timeout
	21-N Ground Fault
	21-O Overvoltage
	21-P Undervoltage
	21-Q <i>Reserved</i>
	21-R <i>Reserved</i>
	21-S Time-Overcurrent

You can access the Programming Menu at any time, including while the soft starter is running. Any changes to the start profile take effect after the next start. All other changes take effect immediately.

**8.7 Logs Menu**

The Logs Menu provides information on events, trips and performance.

To open the Logs Menu, press the <LOGS> button while viewing the metering screens.



To navigate through the Logs Menu:

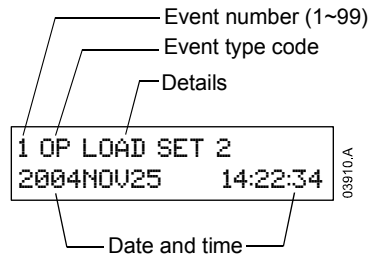
- to open an individual log for viewing, press the ► button.
- to scroll through the entries in each log, press the ▲ and ▼ buttons. Individual logs do not scroll around from the end to the beginning of the log.
- to return to the previous level, press the ◀ button.
- to close the Logs Menu, press the <LOGS> button.

**Event Log**

The event log stores time-stamped details of the starter's 99 most recent events (actions, warnings and trips). Event 1 is the most recent and event 99 is the oldest stored event.

To view items in the event log, press the ► button from the main event log screen. Use the ▲ and ▼ buttons to navigate through the log and view events. To close the log and return to the main display, press ◀.

The event log stores a brief description of each event. When viewed, the top line shows event number, description and type; the bottom line shows the date and time stamp for the event.



Different details are recorded depending on the nature of the event.

Type Code	Event Type	Details
	Protection	XXXXXXXXXXXXX Y XXXXXXXXXXXXX = protection name Y = protection type T – trip W – warning L – log only
CTRL PWR	Control Power	OFF – power removed RESTORE – power restored
OP	Operation	LOAD DEFAULTS = restore default settings LOAD SET 1 = load stored parameter set 1 LOAD SET 2 = load stored parameter set 2 RESET THERMAL = reset thermal model RESET HRS RUN = reset hours run counter RESET STARTS = reset starts counter RESET KWH = reset kWh counter SAVE SET 1 = save user parameter set 1 SAVE SET 2 = save user parameter set 2 SET TIME = set date/ time clock SIM PROTECT = protection simulation SIM RUN = run simulation SIM SIGNAL = signalling simulation
PROG	Programming	XX-X Y ZZZ XX-X = parameter number Y = number of adjacent parameters adjusted ZZZ = command source LCL – local pushbuttons SRL – serial connection
RESET	Reset	LCL – reset via local pushbuttons RMT – reset via remote inputs SRL – reset via serial connection

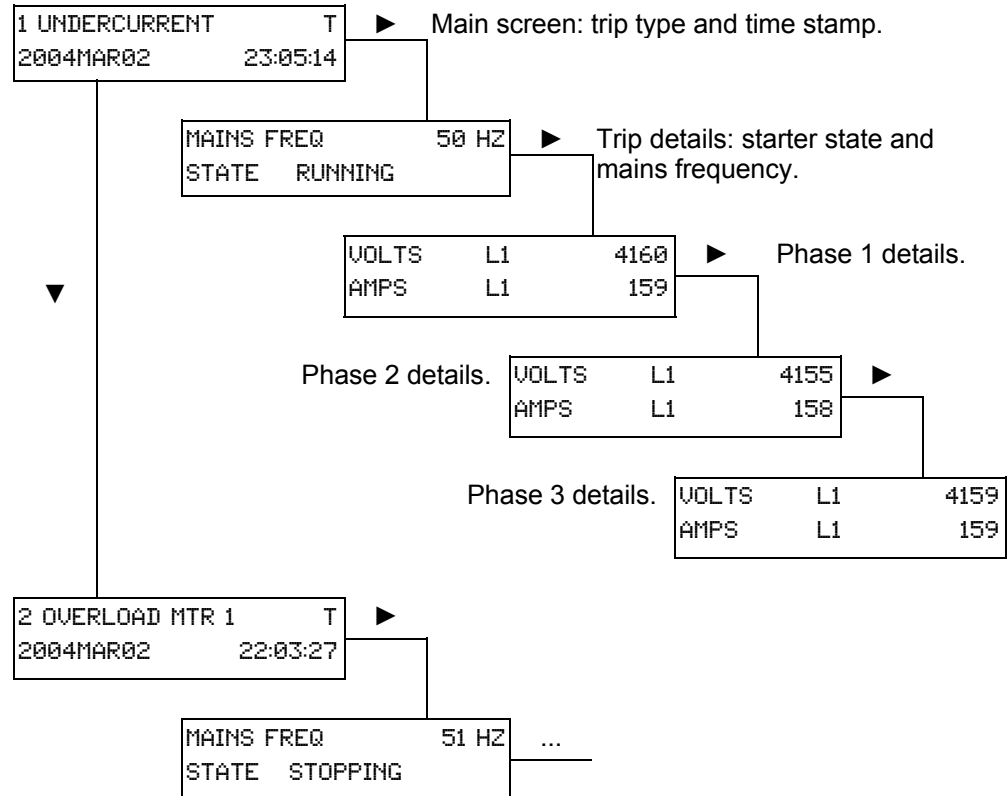
# OPERATION: USER INTERFACE

START	Start	<p>WWW XXX Y Z</p> <p>WWW = command source  LCL – local controller  RMT – remote inputs  SRL – serial connection</p> <p>XXX = start time (seconds)  Y = parameter set  1 = primary motor settings  2 = secondary motor settings</p> <p>Z = start type  N = normal  E = emergency</p>
STOP	Stop	<p>XXX YYY</p> <p>XXX = command source  LCL – local pushbuttons  RMT – remote inputs  SRL – serial connection</p> <p>YYY = stop mode  CST – coast to stop  SFT – soft stop</p>

## Trip Log

When the MVS trips, details of the trip cause and starter state are recorded in the trip log.

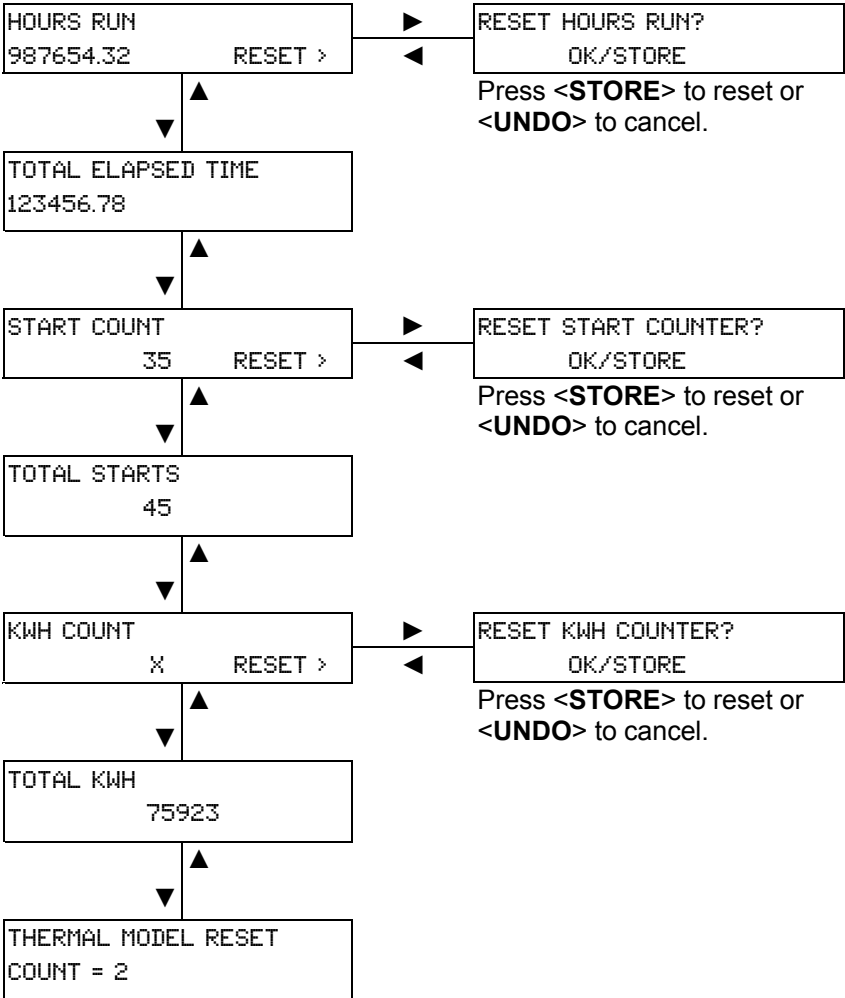
The trip log stores details of the eight most recent trip conditions. Trip 1 is the most recent and trip 8 is the oldest stored trip. The MVS stores information about the current and voltage on each phase when the trip occurred, and you can access details about each phase by using the ◀ and ▶ buttons. To access details of the next trip, use the ▲ and ▼ buttons. To close the log and return to the main display, press ◀.



**Performance Counters**

The performance counters store details of the starter's lifetime operation.

To view the information in each counter, use the ▼ button to scroll through the list. To reset a counter, press the ► button from the appropriate screen and press the <STORE> button to confirm the action.





9.1 Using the MVS to Control a Motor

To soft start the motor, press the <START> button on the MVS Controller or activate the Start remote input. The motor will start using the start mode selected in parameter 2-A.

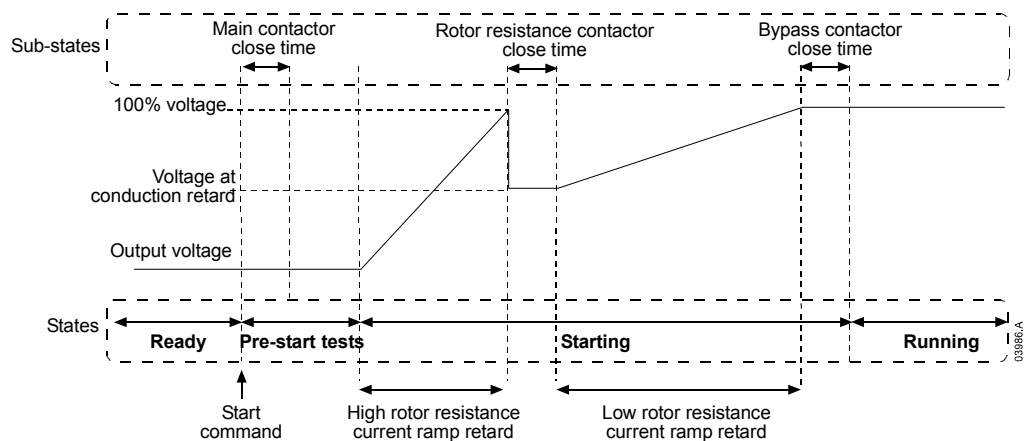
To soft stop the motor, press the <STOP> button on the MVS Controller or activate the Stop remote input. The motor will stop using the stop mode selected in parameter 2-H.

To emergency stop the motor using the soft starter, one of the programmable inputs (parameters 4-C and 4-D) must be configured for emergency stop. When the input is activated, the soft starter will remove power from the motor and open the main contactor. The motor will coast to stop.

To reset a trip on the soft starter, press the <RESET> button on the MVS Controller or open the Reset remote input.

9.2 Using the MVS to Control a Slip-Ring Motor

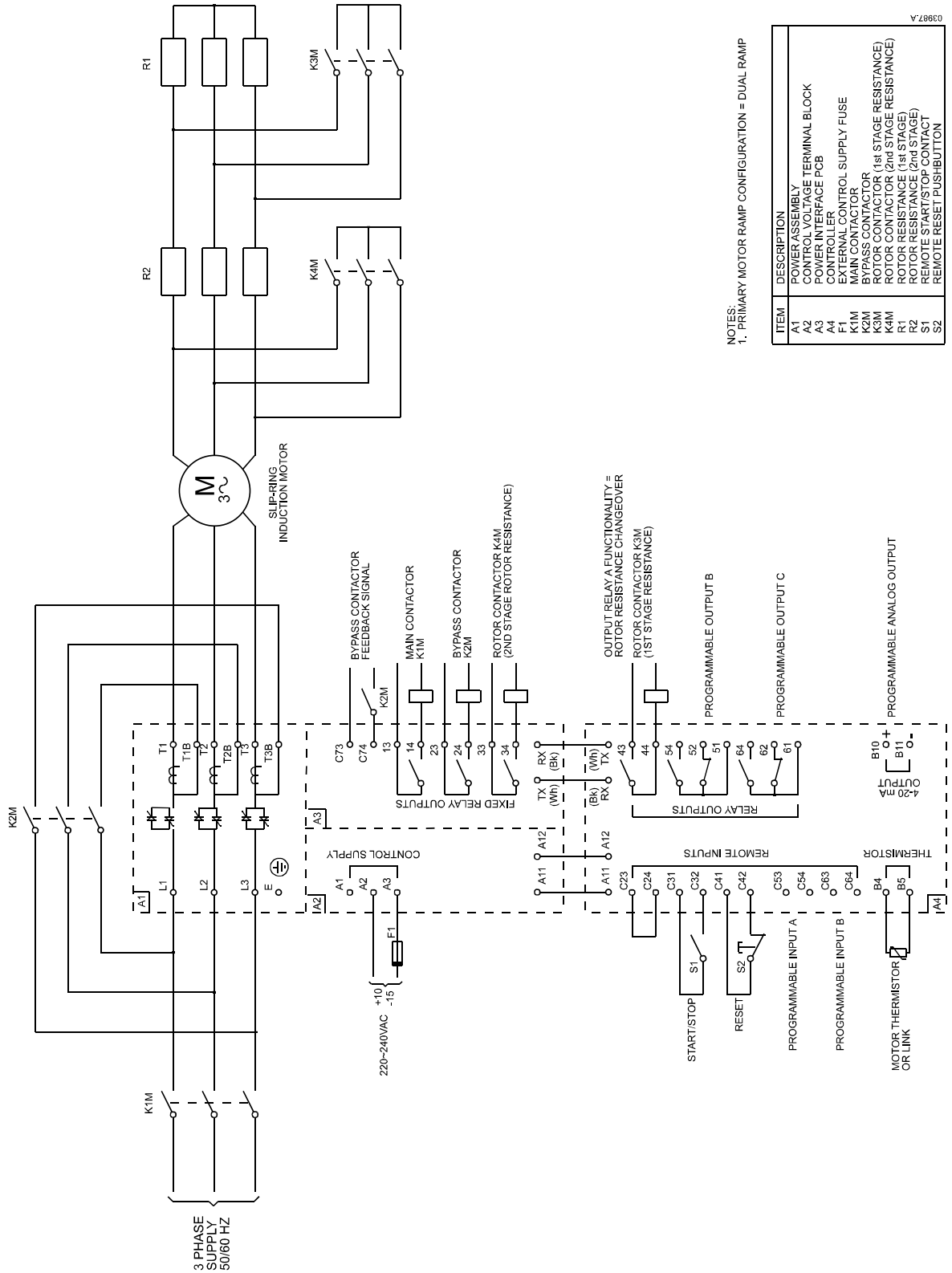
The MVS can be used to control a slip-ring motor, using rotor resistance.



In order to use the MVS with a slip-ring motor, set the following parameters:

- parameter 9-A or 9-B *Primary or Secondary Motor Ramp Configuration* must be set to dual ramp
- an output relay (parameters 5-D to 5-J) must be set to rotor resistance. Wire the relay to reduce the rotor resistance to provide suitable torque for the application.
- parameter 9-C *Slip-Ring Rotor Resistance Contactor Time* defines the time between the rotor resistance contactor closing and the start of the low resistance current ramp. Set a time which is:
  - long enough for the rotor resistance contactor to close
  - short enough for the motor to retain speed
- parameter 9-D *Slip-Ring Conduction Retard* defines the level of conduction at the start of the low resistance current ramp. Set a value which is:
  - low enough to avoid a current pulse
  - high enough for the motor to retain speed

Diagram 5: Slip-Ring Motor Connection



NOTES:  
1. PRIMARY MOTOR RAMP CONFIGURATION = DUAL RAMP

ITEM	DESCRIPTION
A1	POWER ASSEMBLY
A2	CONTROL VOLTAGE TERMINAL BLOCK
A3	POWER INTERFACE PCB
A4	CONTROLLER
F1	EXTERNAL CONTROL SUPPLY FUSE
K1M	MAIN CONTACTOR
K2M	BYPASS CONTACTOR
K3M	ROTOR CONTACTOR (1st STAGE RESISTANCE)
K4M	ROTOR CONTACTOR (2nd STAGE RESISTANCE)
R1	ROTOR RESISTANCE (1st STAGE)
R2	ROTOR RESISTANCE (2nd STAGE)
S1	REMOTE START/STOP CONTACT
S2	REMOTE RESET PUSHBUTTON

03987A

## 9.3 Motor, System and Soft Starter Protection Mechanisms

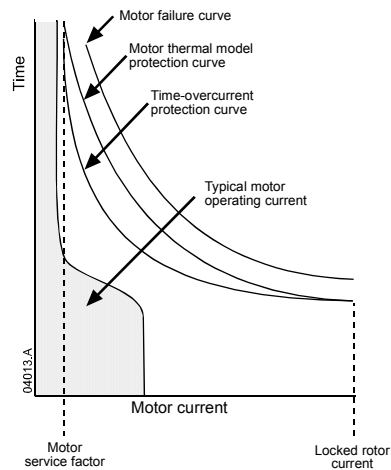
The MVS incorporates extensive protection features to ensure safe operation of the motor, system and soft starter. Most protection features can be customised to suit the installation. Use parameter group 3 to control the situation where the protections will activate and parameter group 21 to select the soft starter's response. The default response is to trip the soft starter.

## 9.4 Motor Overload Protection

The MVS offers two forms of motor overload protection:

- a motor thermal model that monitors the performance of the motor and calculates its status at all times. This protection is based on the motor information programmed in parameter group 1, and the thermal model adjusts itself according to the motor's recent operating history (including temperature rise from previous operation). This model provides finer motor protection than the time-overcurrent model, if the programmed motor information is accurate.
- a time-overcurrent model that calculates the motor's status according to a predefined performance curve. This method is based on IEEE standard C37.112-1996 (*Inverse-Time Characteristic Equations for Overcurrent Relays*) and provides similar protection to a relay. This model may suit users familiar with time-overcurrent protection models, but provides coarse motor protection.

The two methods offer similar kinds of protection and we recommend using only one of the two methods.



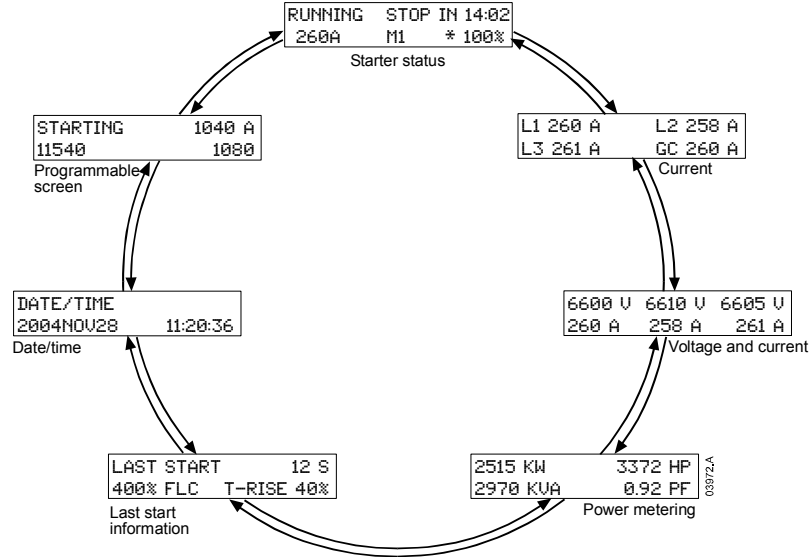
### NOTE

The soft starter can only be protected from short circuits by suitably selected R Rated fuses.

Chapter 10 Operating Feedback

10.1 Metering Screens

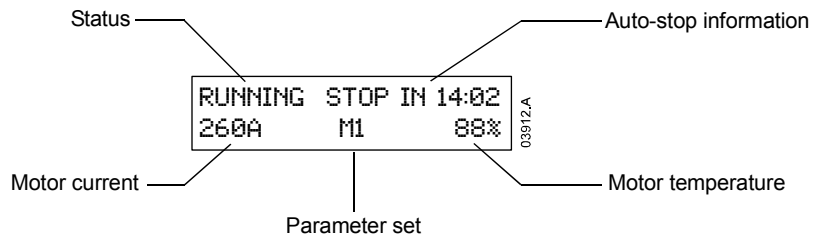
The MVS uses metering screens to display information on the soft starter's performance. Use the ▲ and ▼ buttons to move between metering screens.



Pressing the ► button while viewing the Date/Time screen lets the user set the date and time on the MVS Controller. Pressing the ► button at any other screen opens the Programming Menu.

10.2 Starter Status

The **starter status** screen shows real-time details of the starter's status, including current and temperature:



The information on the screen is arranged as follows:

- top left: status information (Ready, Starting, Running, Stopping or Tripped).
- top right: auto-stop information.
- bottom left: motor current (mean average of three phases).
- bottom centre: parameter set currently in use (primary (M1) or secondary (M2)).
- bottom right: motor temperature (based on the thermal model).

When the motor temperature approaches the trip level, the temperature will flash.

When the motor's thermal capacity will not permit a restart, an asterisk appears in front of the temperature.

When a warning occurs, the top line of the status screen alternates with the warning type. The lower line continues to display current and temperature information:

## OPERATION: OPERATING FEEDBACK

CURRENT IMBALANCE		
260 A	M1	88%

RUNNING	STOP IN 14:02
260 A	M1 88%

When a trip occurs, the status screen is replaced by details of the trip type:

TRIPPED
CURRENT IMBALANCE

When operating in Emergency Mode, the screen shows "Emergency Operation":

EMERGENCY OPERATION
260 A M1 88%

### 10.3 Current

The **current** screen shows real-time details of the ground current and the line current on each phase:

L1 260A	L2 258A
L3 261A	GC 1A

When current is not being measured, the display will show 0.

### 10.4 Voltage and Current

The **voltage and current** screen shows real-time line voltage and line current on each phase:

6600V	6610V	6605V
260A	258A	261A
L1	L2	L3

When the motor is not running, the display will show ---- in place of voltage and 0 A current.

### 10.5 Power Metering

The **power metering** screen shows details of total motor power, motor horsepower, motor active power and power factor.

2515 KW	3372 HP
2970 KVA	0.92 PF

### 10.6 Last Start Information

The **last start information** screen shows details of the most recent successful start:

- start duration (seconds)
- maximum start current drawn (as a percentage of motor full load current)
- calculated rise in motor temperature

LAST START 12 SEC
400 % 40% T-RISE

If data is not available from the last start, the display will show 0 for each field.

### 10.7 Date/Time

The **date/time** screen shows the current system date and time (24 hour format):

DATE/TIME
2004NOV22 11:20:36

To adjust the current date and time, press the ► button while viewing the Date/Time metering screen. Use the ◀ and ▶ buttons to select which part of the date or time to edit, and use the ▲ and ▼ buttons to change the value.

Pressing <STORE> from the seconds element stores the current value and returns to the metering screens. To return to the metering screens without saving changes, press the ◀ button repeatedly.

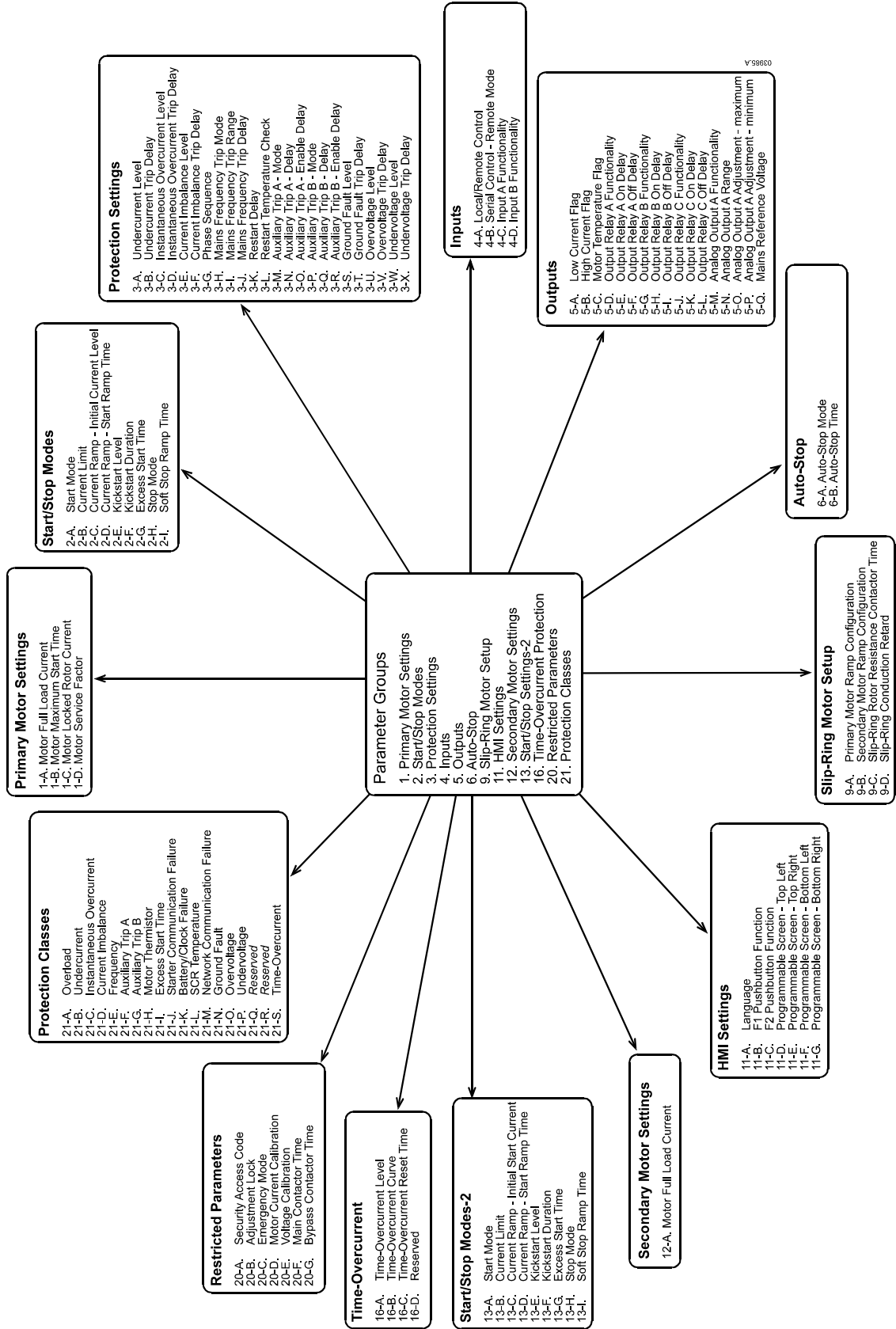
### 10.8 Programmable Screen

The **programmable screen** shows the information selected in parameters 11-D to 11-G.

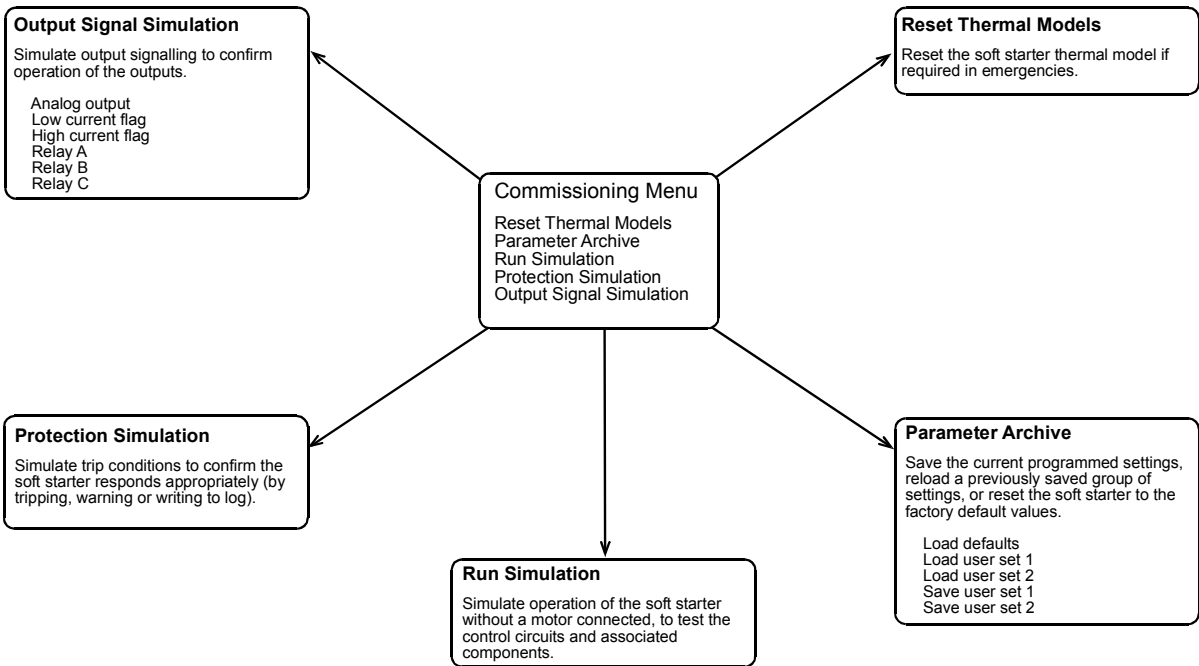
STARTING	1040A
11540	1000

The default settings are starter state, motor current, kWh and hours run.

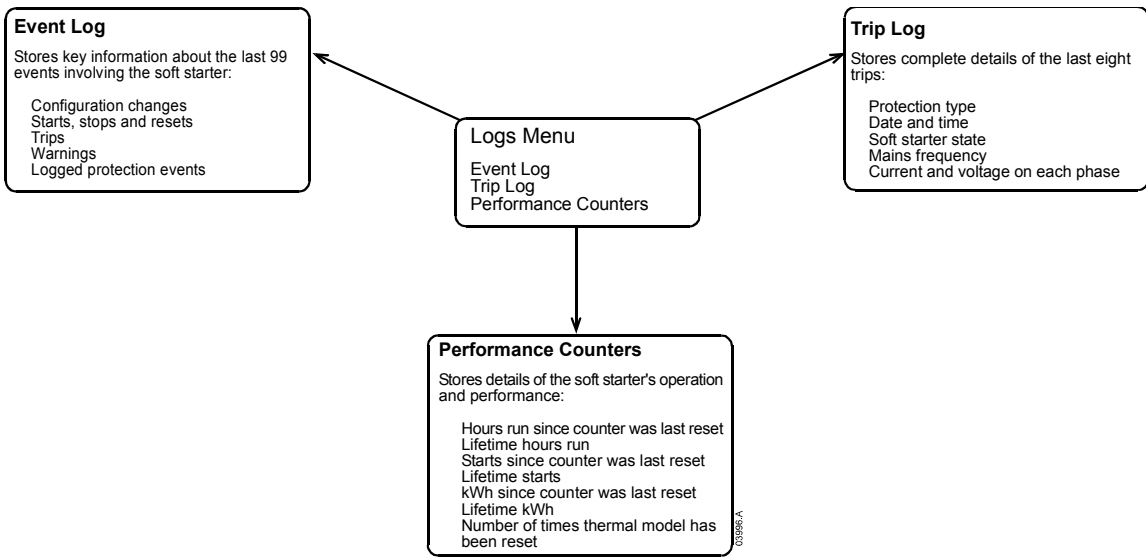
11.1 Programming Menu



11.2 Commissioning Menu



11.3 Logs Menu





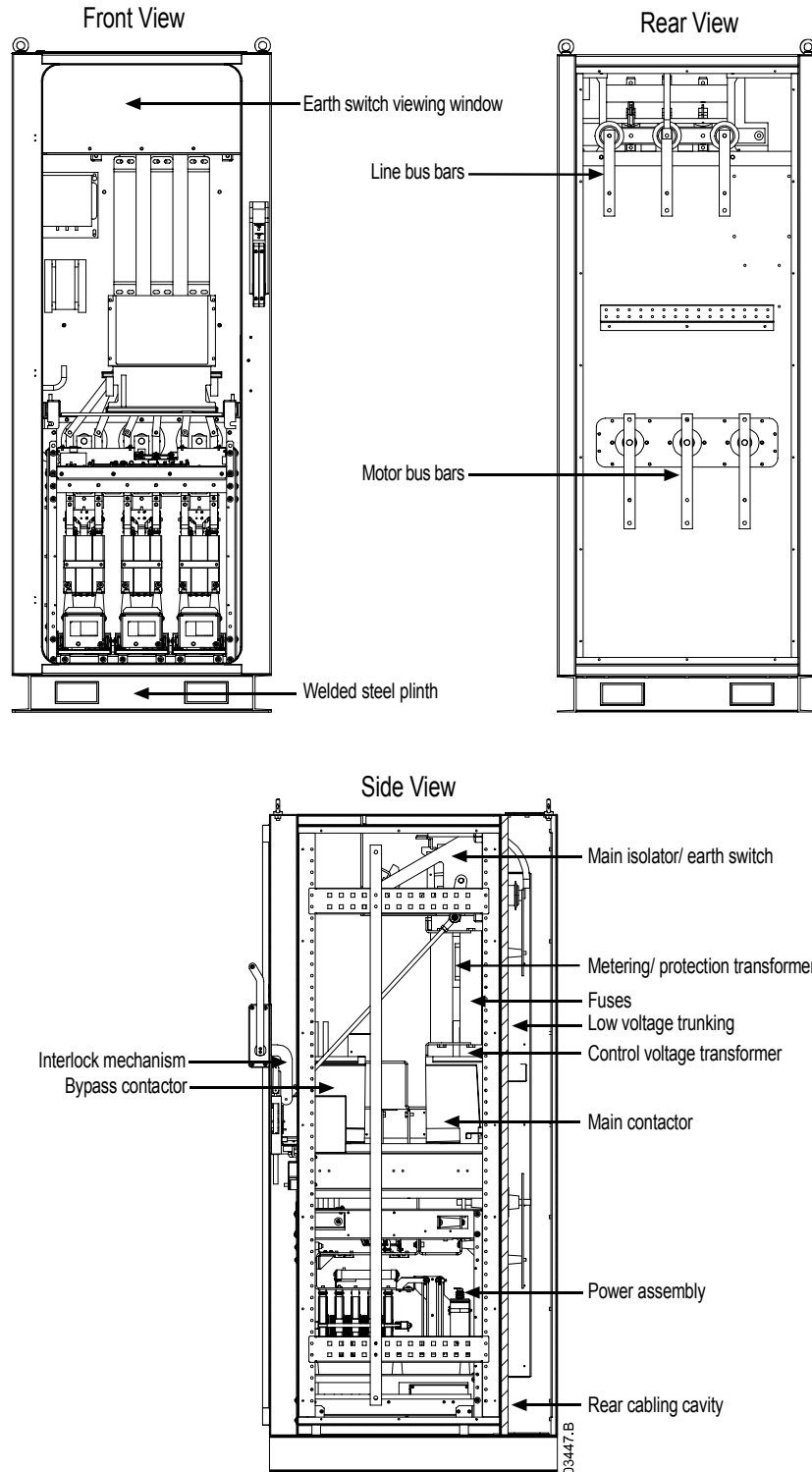
# APPENDIX: AUCOM ENCLOSURES

## Chapter 12

## AuCom Enclosures

MVS soft starters are optionally available in enclosed formats, with a wide range of installation configurations. Enclosures are available in IP32 and IP54 ratings (other ratings are available by negotiation).

Power input and output can be top or bottom entry and power input can be provided from either cables or top horizontal bus bars. The diagrams below illustrate one possible configuration for installation.



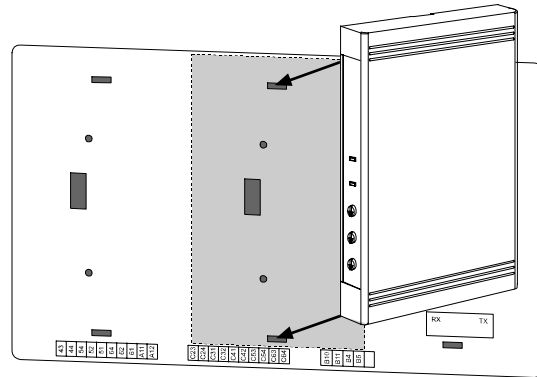
**Chapter 13****Accessories**

MVS Series soft starters are compatible with a range of accessories, allowing easy integration into a control network.

**13.1 Communication Interfaces**

MVS Series soft starters support network communication using the Profibus, DeviceNet and Modbus RTU protocols, via an easy-to-install communication interface.

Communication interfaces attach to the back of the MVS Controller:

**Modbus Interface**

Part Number: PIM-MB-01

The Modbus Interface enables control and monitoring via a Modbus RTU network. Refer to the Modbus Interface Instructions for further details.

**Profibus Interface**

Part Number: PIM-PB-01

The Profibus Interface enables control and monitoring via a Profibus network. Refer to the Profibus Interface Instructions for further details.

**DeviceNet Interface**

Part Number: PIM-DN-01

The DeviceNet Interface enables control and monitoring via a DeviceNet network. Refer to the DeviceNet Interface Instructions for further details.

## APPENDIX: ACCESSORIES

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### 13.2 PC Software

WinMaster is a purpose-designed software suite for control and monitoring of up to 99 soft starters. WinMaster is compatible with all AuCom soft starter ranges.

<b>Feature</b>	<b>CSX</b>	<b>CSXi</b>	<b>IMS2</b>	<b>MVS</b>
Operational Control (Start, Stop, Reset, Quick Stop)	●	●	●	●
Starter Status Monitoring (Ready, Starting, Running, Stopping, Tripped)	●	●	●	●
Performance Monitoring (Motor Current, Motor Temperature)		●	●	●
Upload Parameter Settings			●	●
Download Parameter Settings			●	●

To use WinMaster with the MVS, the soft starter must be fitted with a Modbus Interface (PIM-MB-01).

Refer to the WinMaster User Manual for further details.



