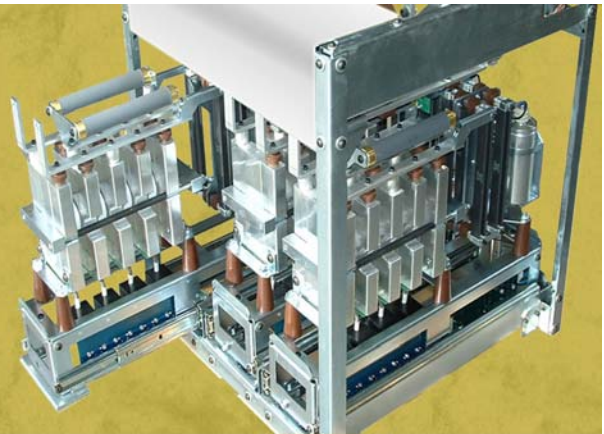


PRODUCT

G U I D E

MVS SERIES SOFT STARTERS



AUCom

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CAUTION STATEMENTS

Section 1

Caution Statements



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

Caution Statements cannot cover every potential cause of equipment damage but can highlight common causes of damage. It is therefore 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 detailed in this manual.

- Ensure that the MVS 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/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 the MVS. If static power factor correction is employed, it must be connected to the supply side of the MVS.

The examples and diagrams in this manual are included solely for illustrative purposes. Users are cautioned that 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 or indirect or consequential damages resulting from the use or application of this equipment.



WARNING – ELECTRICAL SHOCK HAZARD

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



GROUNDING AND BRANCH CIRCUIT PROTECTION

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



SHORT CIRCUIT

The MVS is not short circuit proof. Therefore, after severe overload or short circuit, the operation of the starter should be fully tested.

Section 2

General Description

2.1 Overview

The MVS Series provides compact and robust soft start solutions for control of medium voltage motors. MVS Series 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.

The MVS soft starter comprises two elements:

- a power assembly, which varies between different models (depending on mains voltage and current rating)
- a controller module, which is common to all models

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.

2.2 Feature List

Starting

- Constant Current
- Current Ramp
- Torque Control

Stopping

- Soft Stop

Protection

- Under/Overvoltage
- Supply Frequency
- Phase Sequence
- Shorted SCR
- Motor Overload (Thermal Model)
- Electronic Shearpin
- Ground Fault
- Undercurrent
- Phase Imbalance
- Motor Thermistor
- Excess Start Time
- Power Circuit
- Auxiliary Trip

Interface

- Remote Control Inputs (3 x fixed, 2 x programmable)
- Relay Outputs (3 fixed, 3 x programmable)
- Analogue Output (1 x programmable)
- Serial Output (1 x RS485)

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

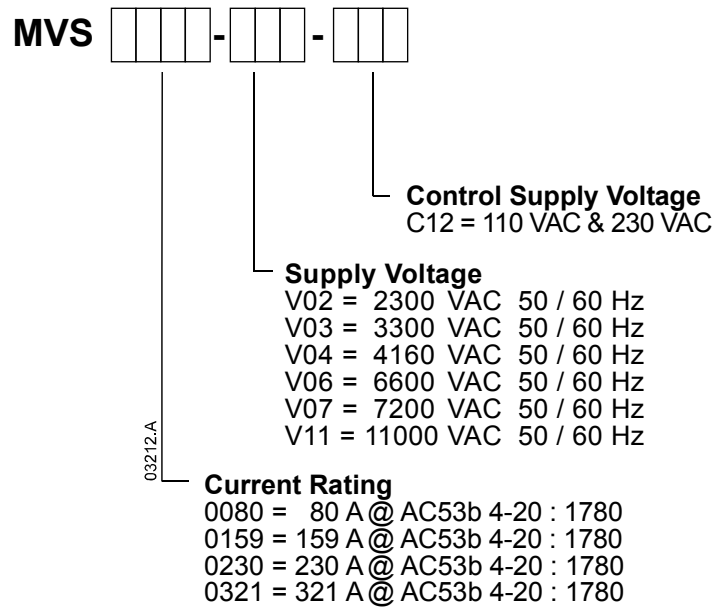
- 80 A to 321 A, nominal
- 2300 VAC to 11000 VAC

Accessories (optional)

- RTD Interface
- Modbus RTU Interface
- Profibus Interface
- DeviceNet Interface
- Synchronous Motor Control
- PC Software
- Remote Operator
- Overvoltage Protection
- MV Control Supply Transformer

GENERAL DESCRIPTION

2.3 Type Codes



Section 3 Specifications

3.1 Current Ratings

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
MVS-0080-xxx	96	91	80	74	72	66	59	55	46	42
MVS-0159-xxx	190	177	159	147	143	132	117	109	91	84
MVS-0230-xxx	282	261	230	213	201	185	165	152	121	111
MVS-0321-xxx	393	363	321	296	279	257	229	211	168	154

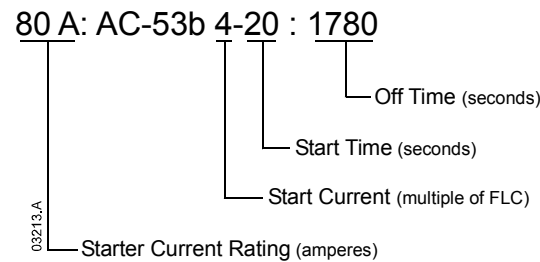
Three starts per hour

	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
MVS-0080-xxx	73	68	65	60	53	49	40	37
MVS-0159-xxx	146	135	129	119	106	98	79	73
MVS-0230-xxx	207	190	175	162	144	132	101	93
MVS-0321-xxx	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
MVS-0080-xxx	68	63	59	54	48	45	35	33
MVS-0159-xxx	136	125	117	108	96	89	70	65
MVS-0230-xxx	188	173	157	144	129	118	88	81
MVS-0321-xxx	262	241	218	200	179	164	122	112

AC53b Utilisation Category Format



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.

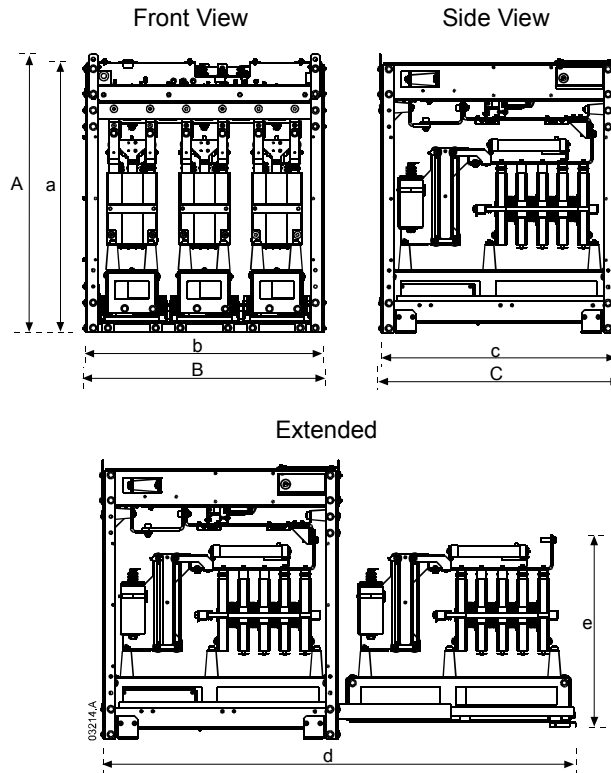
Off Time: The minimum allowable time between the end of one start and the beginning of the next start given the parameters detailed in the remaining sections of the utilisation code.

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

SPECIFICATIONS

3.2 Dimensions and Weights

Power Assembly

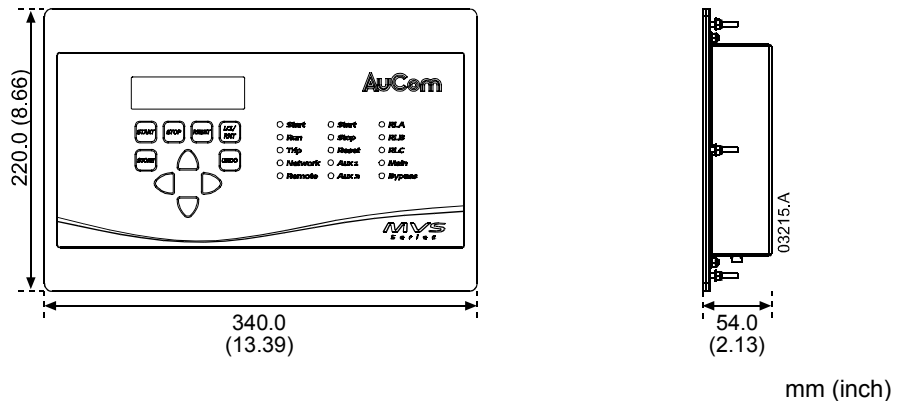


	A mm (inch)	B mm (inch)	C mm (inch)	a mm (inch)	b mm (inch)	c mm (inch)	d mm (inch)	e mm (inch)	Weight kg (lb)
MVS- xxxx-V02	772 (30.39)	669 (26.34)	667 (26.26)	750 (29.53)	658 (25.91)	650 (25.59)	1302 (51.26)	531 (20.91)	165 (363.76)
MVS- xxxx-V03									
MVS- xxxx-V04									
MVS- xxxx-V06	832 (32.76)	875 (34.45)	817 (32.17)	810 (31.89)	864 (34.02)	800 (31.50)	1559 (61.38)	551 (21.69)	217 (478.40)
MVS- xxxx-V07									

Please contact your local supplier for dimensions for MVS-xxxx-V11.

Controller

The MVS controller is suitable for use with all models in the MVS Series.



Weight: 2.1 kg (4.63 lb)

3.3 General Technical Data

Supply	
Mains Supply Voltage	
MVSxxx-V02-xxx	3 x 2300 VAC (± 10%)
MVSxxx-V03-xxx	3 x 3300 VAC (± 10%)
MVSxxx-V04-xxx	3 x 4160 VAC (± 10%)
MVSxxx-V06-xxx	3 x 6600 VAC (± 10%)
MVSxxx-V07-xxx	3 x 7200 VAC (± 10%)
MVSxxx-V11-xxx	3 x 11000 VAC (± 10%)
Control Supply Voltage	
MVSxxx-xxx-C12	110 VAC to 130 VAC (+ 10% / - 15%) or 220 VAC to 240 VAC (+ 10% / - 15%)
Supply Frequency	45 Hz to 66 Hz
Rated Insulation Voltage	
MVSxxx-V02-xxx	4200 VAC
MVSxxx-V03-xxx	4200 VAC
MVSxxx-V04-xxx	4200 VAC
MVSxxx-V06-xxx	6600 VAC
MVSxxx-V07-xxx	7200 VAC
MVSxxx-V11-xxx	11000 VAC
Rated Impulse Withstand Voltage (BIL)	
MVSxxx-V02-xxx	23300 VAC Cat III (1.2/ 50 µs at 2000 m)
MVSxxx-V03-xxx	23300 VAC Cat III (1.2/ 50 µs at 2000 m)
MVSxxx-V04-xxx	23300 VAC Cat III (1.2/ 50 µs at 2000 m)
MVSxxx-V06-xxx	36700 VAC Cat III (1.2/ 50 µs at 2000 m)
MVSxxx-V07-xxx	40000 VAC Cat III (1.2/ 50 µs at 2000 m)
MVSxxx-V11-xxx	xx VAC Cat III (1.2/ 50 µs at 2000 m)
Form Designation	Bypassed semiconductor motor starter form 1
Control Inputs	
Start (Terminals C23, C24)	Active 24 VDC, 8 mA approx
Stop (Terminals C31, C32)	Active 24 VDC, 8 mA approx
Reset (Terminals C41, C42)	Active 24 VDC, 8 mA approx
Programmable Input A (Terminals C53, C54)	Active 24 VDC, 8 mA approx
Programmable Input B (Terminals C63, C64)	Active 24 VDC, 8 mA approx
Motor Thermistor (Terminals B4, B5)	
Outputs	
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 31, 32, 34)	Changeover
Programmable Relay Output A (Terminals 43, 44)	Normally Open
Programmable Relay Output B (Terminals 51, 52, 54)	Changeover
Programmable Relay Output C (Terminals 61, 62, 64)	Changeover
Analogue Output (Terminals B10, B11)	4-20 mA

SPECIFICATIONS

Environmental

Degree of Protection	
Power Assembly	IP00
Controller	IP54 / NEMA 12
Motor Controller Panel (optional)	designed to IP54 / NEMA 12
Operating Temperature	- 10 °C to + 60 °C
Storage Temperature	- 25 °C to + 55 °C
Humidity	5% to 95% Relative Humidity
Pollution Degree	Pollution Degree 3
Vibration	IEC 60068 Test Fc Sinusoidal
	4 Hz to 13.2 Hz: ± 1 mm displacement
	13.2 Hz to 200 Hz: ± 0.7 g

EMC Emission

Equipment Class (EMC)	Class A
Conducted Radio Frequency Emission	10 kHz to 150 kHz: < 120 - 69 dB μ V
	0.15 MHz to 0.5 MHz: < 79 dB μ V
	0.5 MHz to 30 MHz: < 73 dB μ V
Radiated Radio Frequency Emission	0.15 MHz to 30 MHz: < 80-50 dB μ V/m
	30 MHz to 100 MHz: < 60-54 dB μ V/m
	100 MHz to 2000 MHz: < 54 dB μ V/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.

EMC Immunity

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 μ s (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)

Short Circuit

Rated short-circuit current	
MVSxxx-V02-xxx	68 kA
MVSxxx-V03-xxx	68 kA
MVSxxx-V04-xxx	68 kA
MVSxxx-V06-xxx	XX kA
MVSxxx-V07-xxx	XX kA
MVSxxx-V11-xxx	XX kA

Heat Dissipation (Steady State)

Power Assembly (SCRs bypassed)	20 W approx
Controller	10 W approx

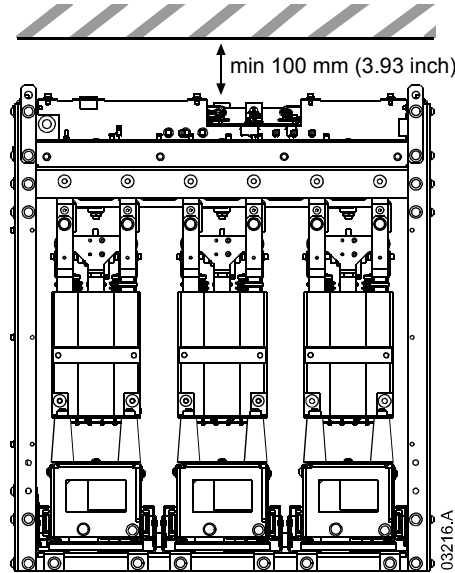
Standards Approvals

C✓	EMC requirements
UL / C-UL	UL 508, UL 347
CE	EMC EU Directive
Marine	pending

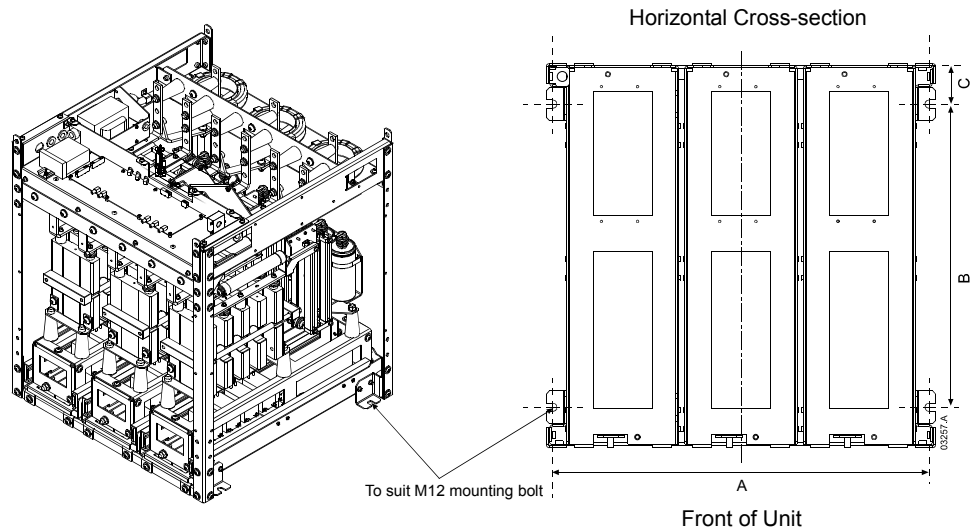
Section 4 Installation

4.1 Mounting Instructions – Power Assembly

All models in the MVS Series 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 MVS 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.

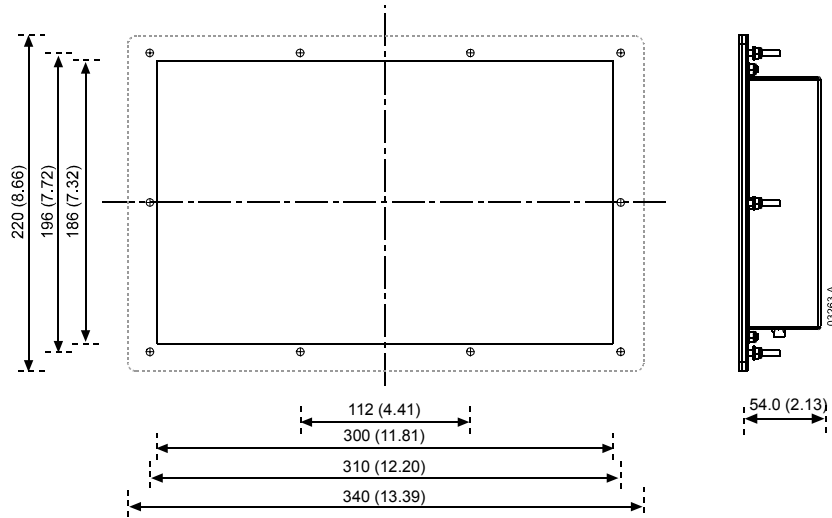


	A mm (inch)	B mm (inch)	C mm (inch)
MVS-xxxx-V02	636	513	68.5
MVS-xxxx-V03	(25.04)	(20.20)	(2.70)
MVS-xxxx-V04			
MVS-xxxx-V06	842	663	68.5
MVS-xxxx-V07	(33.15)	(26.10)	(2.70)

INSTALLATION

4.2 Mounting Instructions – Controller

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



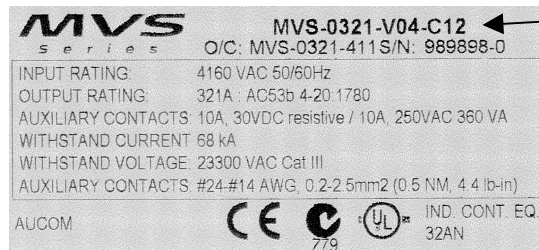
To mount the controller, make a 186 mm x 300 mm cutout at the desired mounting location. Ensure adequate clearance (54 mm) is available behind the mounting location.

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



NOTE

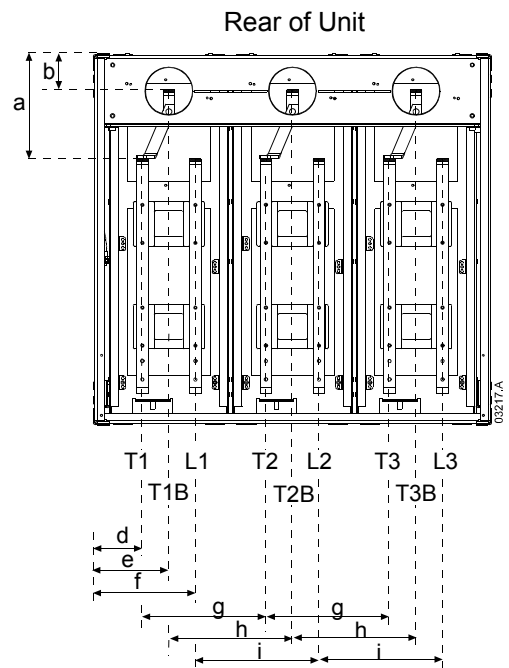
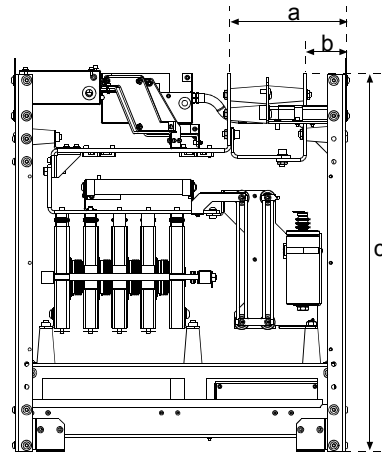
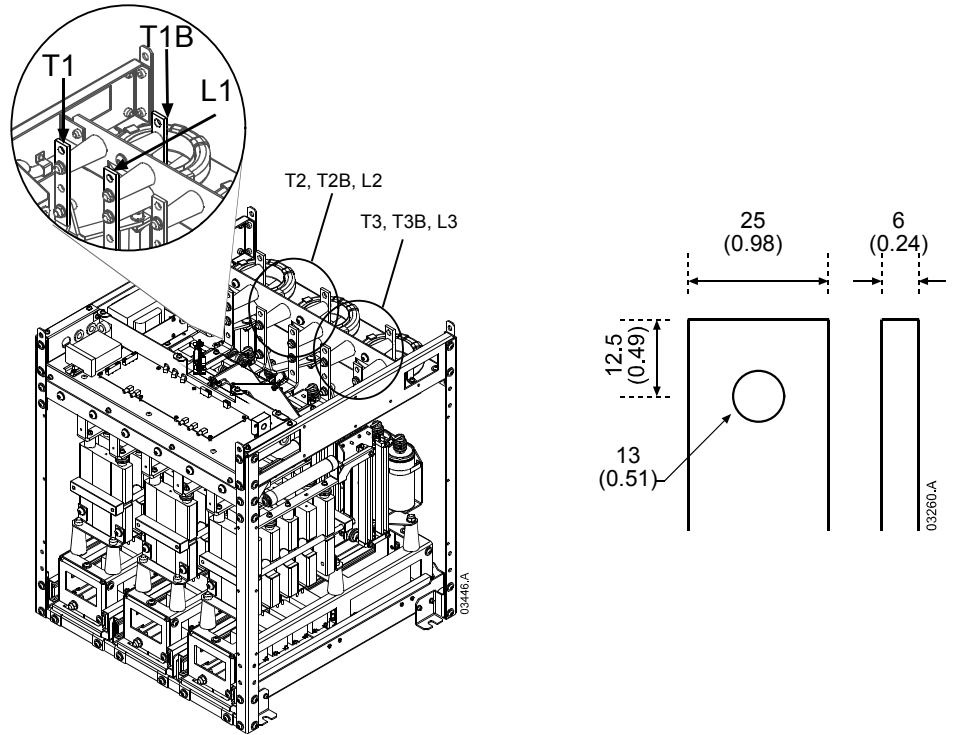
Before installation, always ensure that you are using the correct controller for the starter. This can be checked by comparing the serial number on the back of the controller with the serial number on the front of the power assembly.



Serial number



4.3 Power Terminations



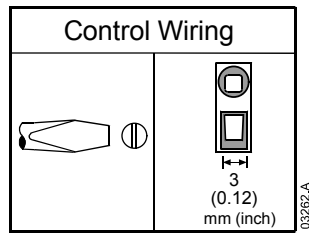
	a	b	c	d	e	f	g	h	i
	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
MVS-xxxx-V02	228	79	744	79	129	179	200	200	200
MVS-xxxx-V03	(8.98)	(3.11)	(29.29)	(3.11)	(5.08)	(7.05)	(7.87)	(7.87)	(7.87)
MVS-xxxx-V04									
MVS-xxxx-V06	228	79	804	107	164	222	268	268	268
MVS-xxxx-V07	(8.98)	(3.11)	(31.65)	(4.19)	(6.46)	(8.72)	(10.55)	(10.55)	(10.55)

Please contact your local supplier for measurements for MVS-xxxx-V11.

INSTALLATION

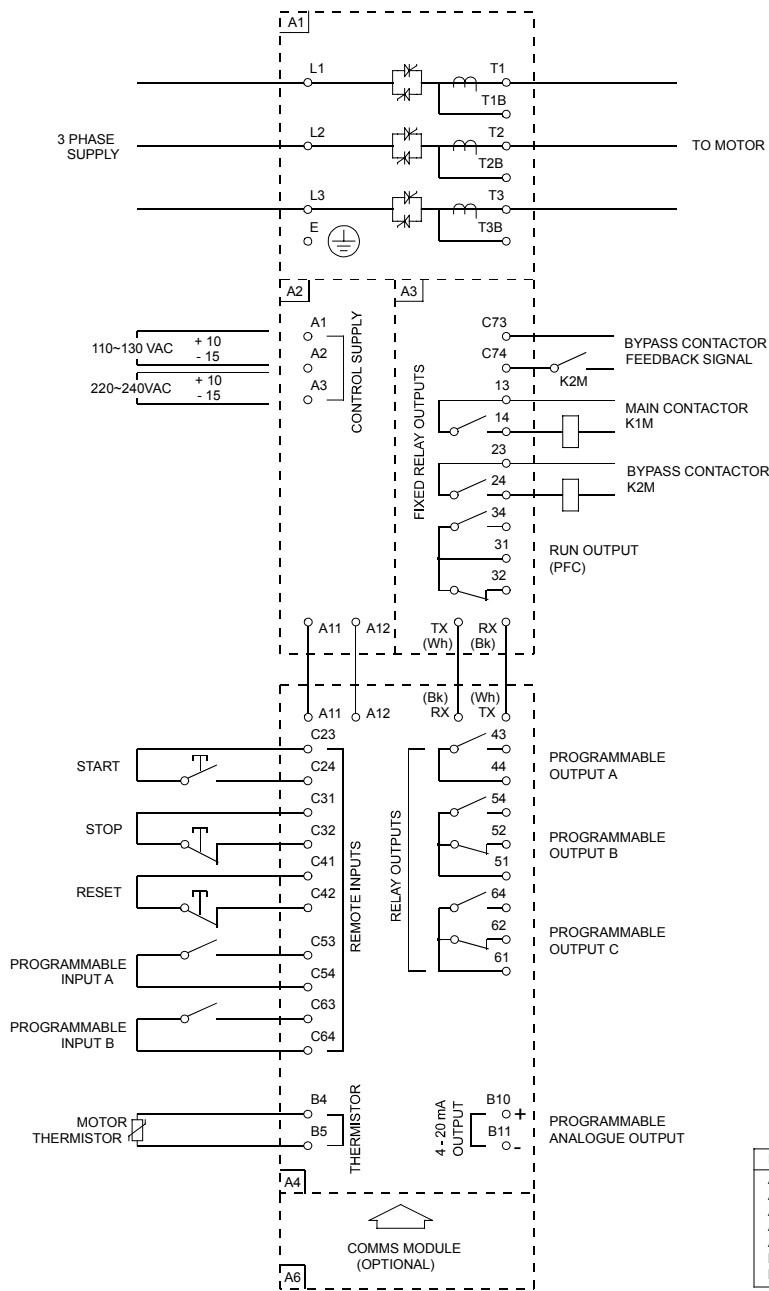
4.4 Control Terminations

Control wiring is secured in place by 3 mm spring terminals.



4.5 Electrical Schematic

Diagram 1: Electrical Schematic

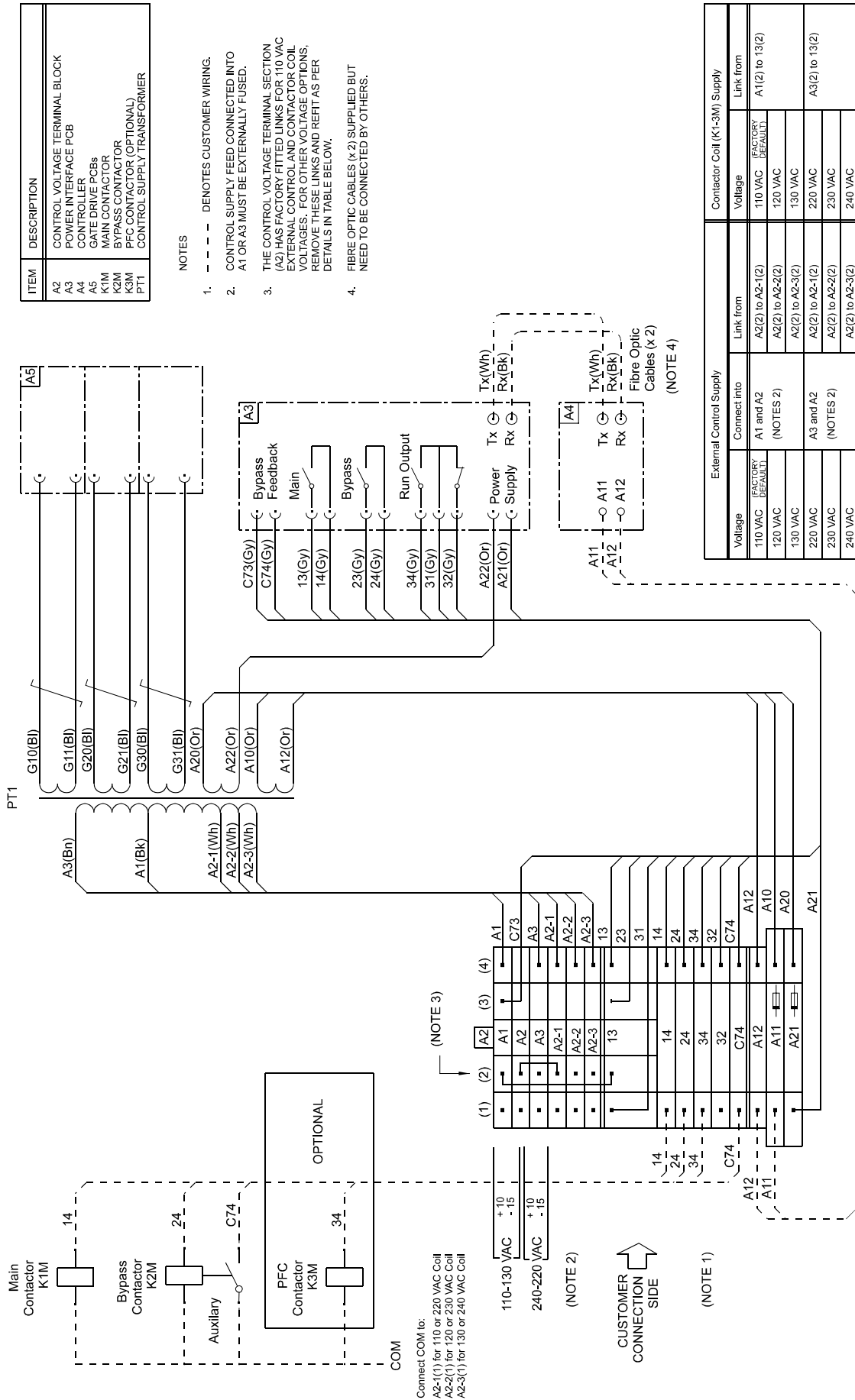


ITEM	DESCRIPTION
A1	POWER ASSEMBLY
A2	CONTROL VOLTAGE TERMINAL BLOCK
A3	POWER INTERFACE PCB
A4	CONTROLLER
A6	COMMS MODULE (OPTIONAL)
K1M	MAIN CONTACTOR
K2M	BYPASS CONTACTOR

03222.A

4.6 Internal Wiring

Diagram 2: Internal Wiring



03221.A

Section 5

Power Circuits

5.1 Overview

MVS 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 capacitor contactor
- line inductors
- transient / overvoltage protection
- medium voltage control supply transformer

Please refer to the schematic drawings on pages 12, 13, 15 and 17 for details.

5.2 Main Contactor

A main contactor is required in all MVS Series installations. The contactor should be selected such that the contactor's AC3 rating is 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 input side of the soft starter and the coil is associated with output terminals 13, 14 of the MVS (refer to Diagram 3).

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 2).

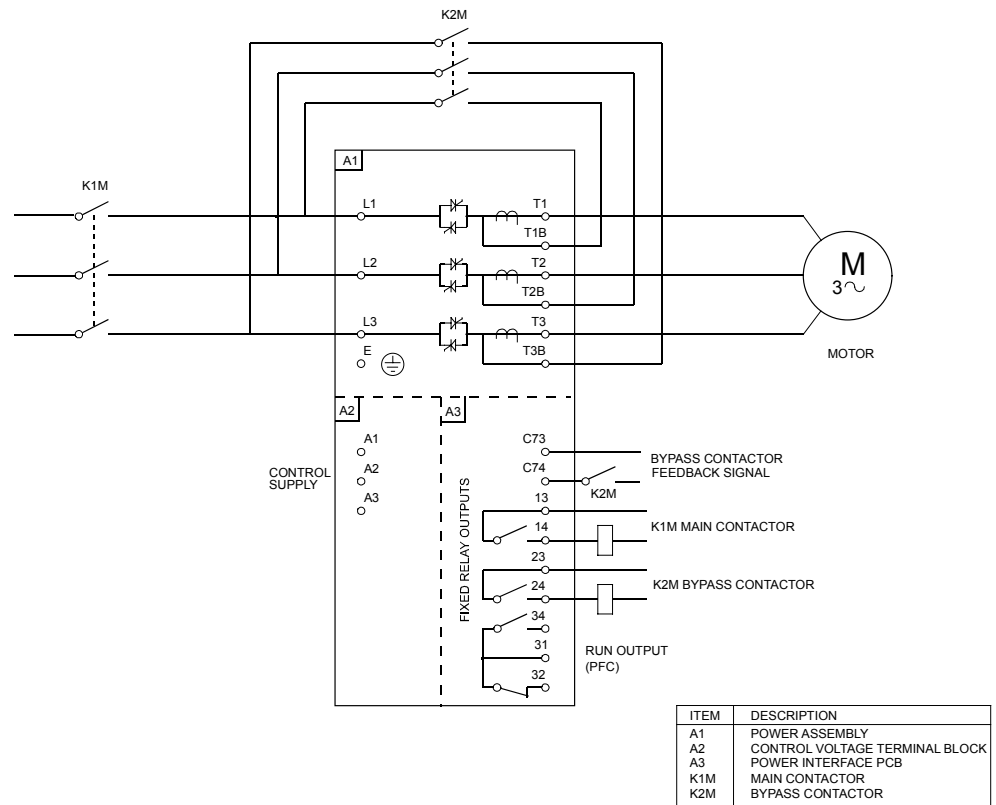
5.3 Bypass Contactor

A bypass contactor is required in all MVS Series installations. The contactor should be selected such that the contactor's AC1 rating is greater than or equal to the full load current rating of the connected motor.

The bypass contactor is associated with bypass terminals T1B, T2B, T3B on the starter. The coil is associated with output terminals 23, 24, and the auxiliary Normally Open contact is associated with input terminals C73, C74 of the MVS (refer to Diagram 3).

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 2).

*Diagram 3: Standard Power Circuit Configuration
MVS starter installation with main and bypass contactors.*



POWER CIRCUITS

5.4 Main Isolator / Earth Switch

If specified, a main isolator/ earth switch can be connected upstream of the main contactor as shown in Diagram 4. The isolator interlocks the panel door to ensure personnel safety.

5.5 "R Rated" Protection Fuses

If specified, "R Rated" protection fuses can be installed on the input side of the 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.

Motor Rated FLC	System Voltage 2.3 kV	System Voltage 3.3 ~ 4.2 kV	System Voltage 6 ~ 7.2 kV
70 A	2R		
100 A	3R		
130 A	4R		
150 A	5R		
170 A	6R		
200 A	9R		
230 A	12R		
390 A	18R		
Ferraz type code	A240Rrr	A480Rrr-1	A072xxDxRO-rr
Bussmann type code	JCK	JCL	JCR-A, JCR-B

5.6 Power Factor Correction Capacitor Contactor

If power correction factor capacitors are being used, a contactor can be selected according to the required kVAr, and should be connected upstream of the MVS soft starter. The power factor correction capacitor contactor coil is associated with output terminals 31, 34 of the MVS (refer to Diagram 4).

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 2).



NOTE

The capacitor bank must be connected to the input side of the MVS soft starter.

5.7 Line Inductors

Line inductors are required if the cable run between the soft starter and the motor is more than 200 m. Line inductors should be installed outside the panel, and connected between terminals T1, T2, T3 of the soft starter and the motor.

5.8 Transient / Overvoltage Protection

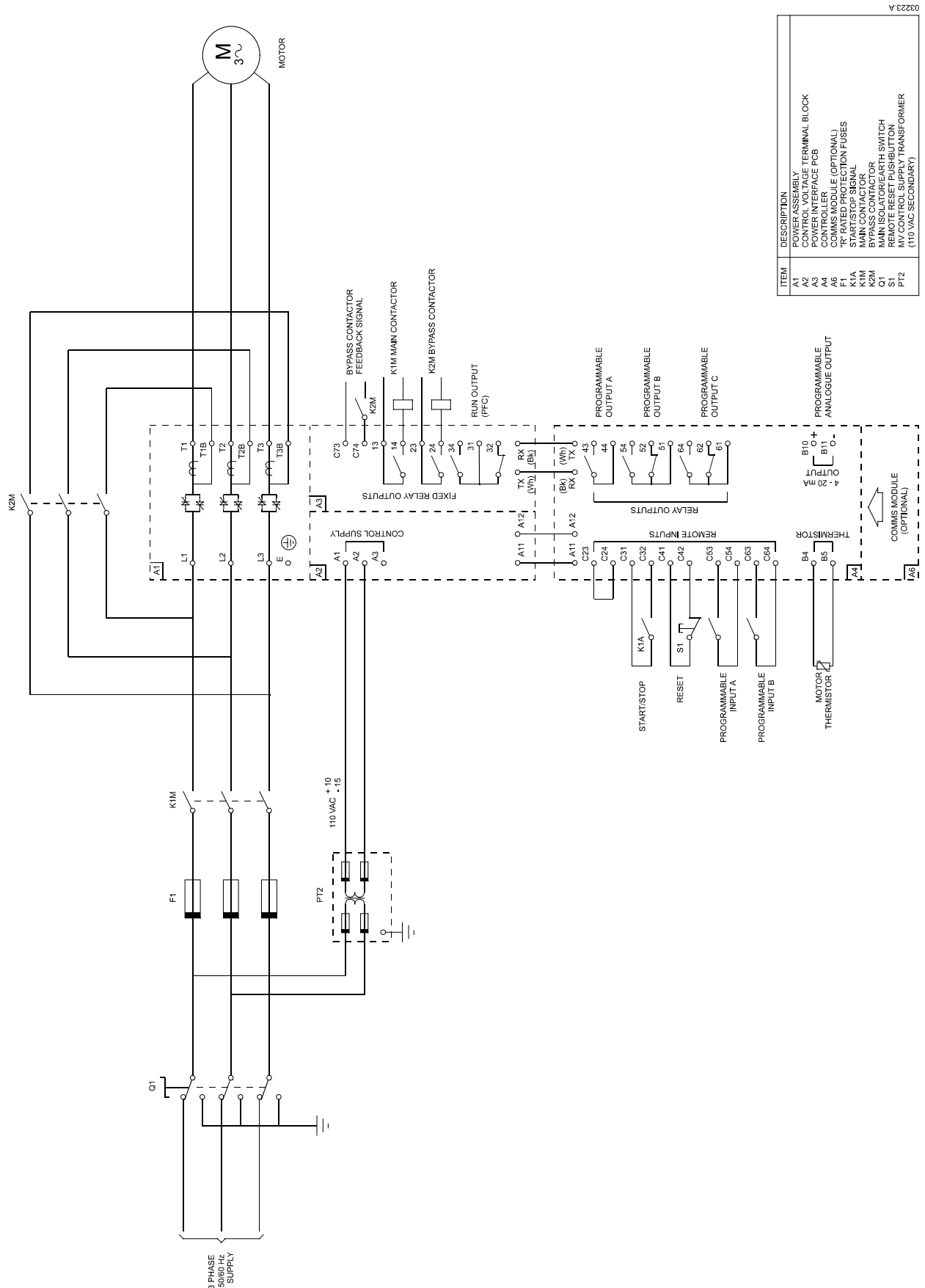
Overvoltage protection should be installed if there is a risk of high transients at the installation. If required, use the optional Overvoltage Protection Kit.

5.9 Medium Voltage Control Supply Transformer

The control supply for the MVS soft starter should usually be provided as a low voltage supply (110~130 VAC or 220~240 VAC). If this is not possible, a control supply transformer will be required. A transformer should be selected 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 primary and secondary side (refer to Diagram 4).

Diagram 4: Complete Power Circuit Configuration

MVS Starter installation with main contactor, bypass contactor, isolator/earth switch, fuses and medium voltage control supply transformer. Configured for two-wire start/stop control.



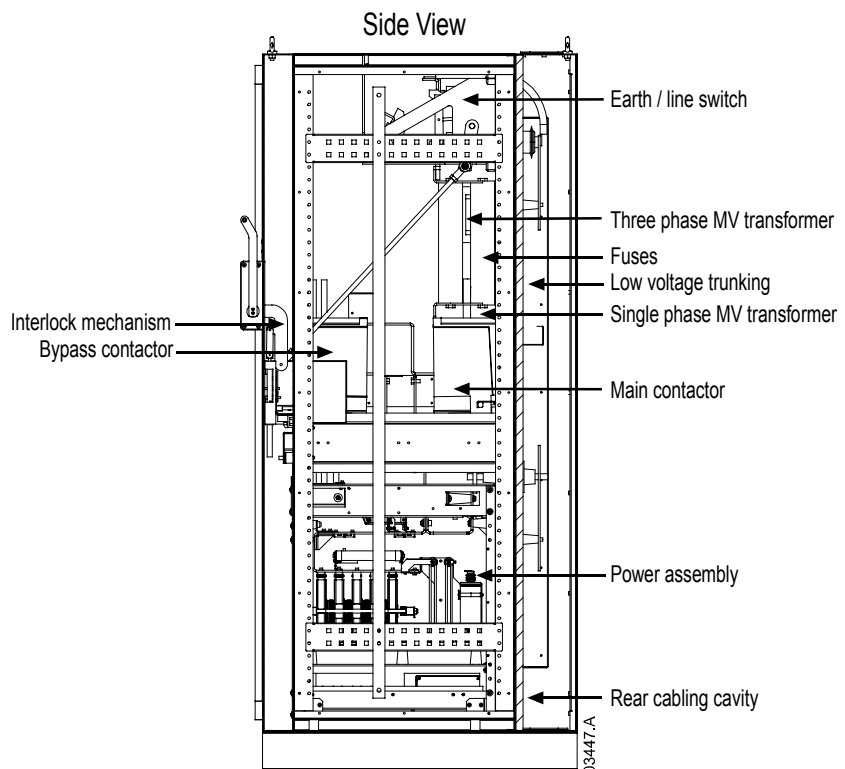
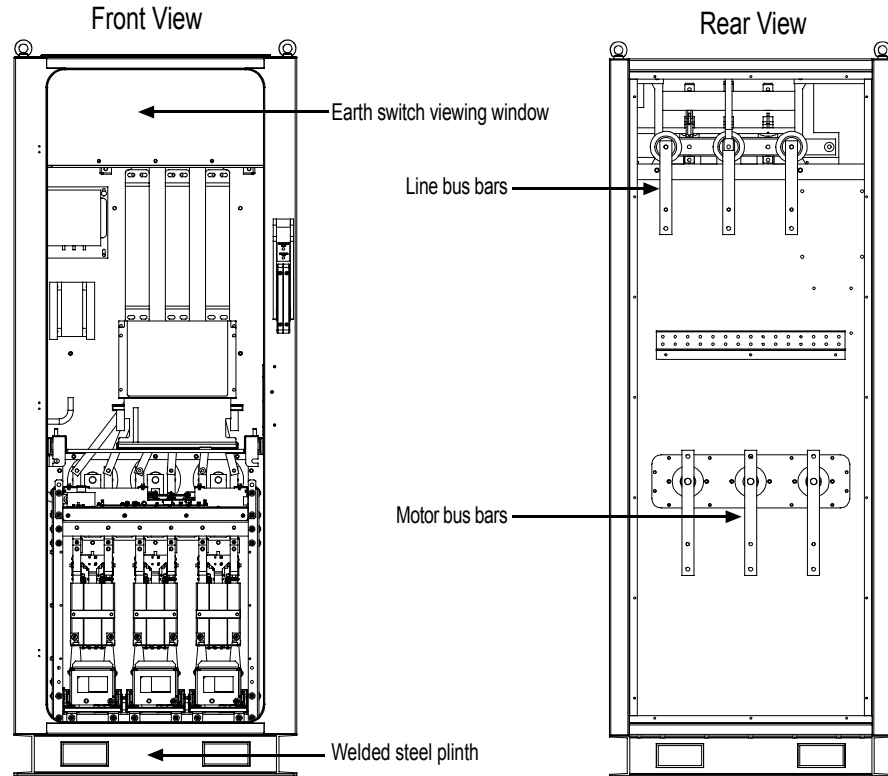
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Section 6 Application Examples

6.1 Installation into a Panel

The MVS panel permits a wide range of installation configurations. 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.



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