

Amalgen

Model 6963

Solid State Reversing Motor Starter
Manual Revision B



Model 6963-10 shown

1 Scope

This manual applies to Model 6963 Solid State Motor Starter. The manual covers application, installation and operation of the motor starter. The information in this manual covers both 208VAC (L-L) and 415VAC (L-L). Starters are available in current ratings of 10A and 30A in both voltages.

2 Applicable documents

Block diagram	6963-0 Rev A	
Schematic	Logic 6963-11c	Rev C
	Logic 6963-12c	Rev C
	Power 6963pwr_b	Rev B
	Both schematics include Mods 1&2	

3 Specification

Design type	5 SCR static switch with control electronics All 3 phases switched in forward & reverse	
Mains voltage	Model 6963-xx	208VAC 3-wire
	Model 6963A-xx	415VAC 3-wire
	Mains frequency	50-400Hz
	OTHER VOLTAGES AVAILABLE ON REQUEST	
Load current	Model 6963-10	10 Amp
	Model 6963-30	30 Amp
Surge current (internal limit)	10 Amp models	1000 Amp
	30 Amp models	1800 Amp
	I ² t rating of fuse	10kA ² s and 20kA ² s res.
Ambient temperature	Inside rack	10C to 60C
	Model 6963 is convection cooled	
Mounting	Standard 19" rack 4U high	
	Unit weight	9kg
AC connections	3 phase 3-wire input	
	3 phase 3-wire output	
Control connection	24VDC logic connected via DB37 connector	
Available functions	Local	Open/close
	Remote	Open/close
		Override open/override close
	Brake	Adjustable DC injection brake
	Interlock	Prevents incorrect operation from simultaneous open/close inputs
Local/remote	Mode select	

4 Product description

4.1 Application

Model 6963 is primarily designed for valve control where a 3-phase motor is used to open and close valves or dampers in flow control applications. The control unit uses combination logic and does not rely on stored program or edge triggered devices in critical parts of the circuit. Because of the reliability of the product it may be used in situations where maintenance time must be a very short.

4.2 Functional description

The 6963 Motor Starter is a solid state reversing 3-phase motor starter, with a static switch and control unit. It connects a 3-phase motor to AC mains directly, in forward or reverse phase rotation depending on the control signals from the user interface. The user interface is optically isolated and accepts 24VDC signals from relays or open collector logic.

The control unit has two modes of operation: Local and Remote:
In local mode, Open and Close may be controlled directly from the “Local” control signals

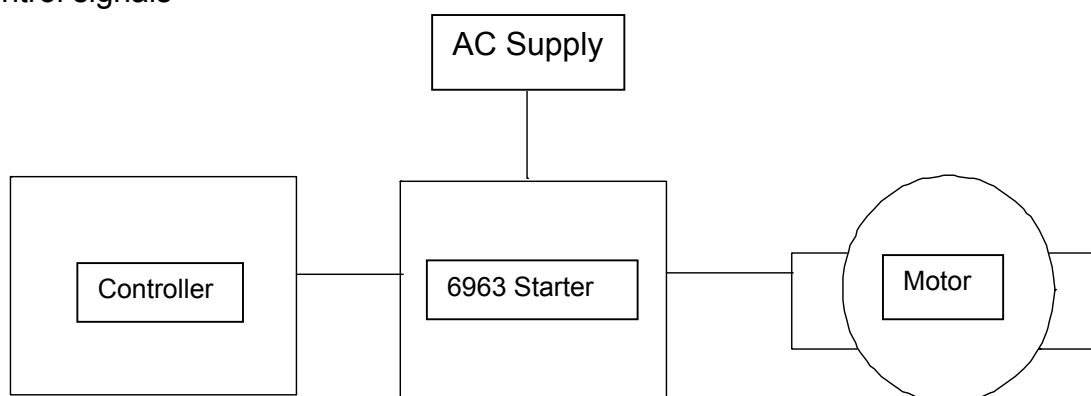


Figure 1
General application of Solid State Motor Starter

In remote mode, the motor starter has Open and Close signal from the user in the same way as Local, but with Override facility on Open and Close. For both Local and Remote modes, logic will stop the motor on limit or on torque depending on connection and jumper setting. No motor operation will occur if the user defined thermal overload input or thermistor/thermostat input is active.

Note: TOL (thermal overload) input to the controller can be defeated by user to suit specific applications.

4.3 User connections

To use the 6963 Motor Starter, AC is connected to AC mains and motor, and logic is connected (via DB37 connector). These connections are all available when the unit is installed in a 19" rack. The AC mains connection is 208 or 415 VAC 3-phase 3-wire. Motors connect directly to the controller. Connections are summarised in the table below.

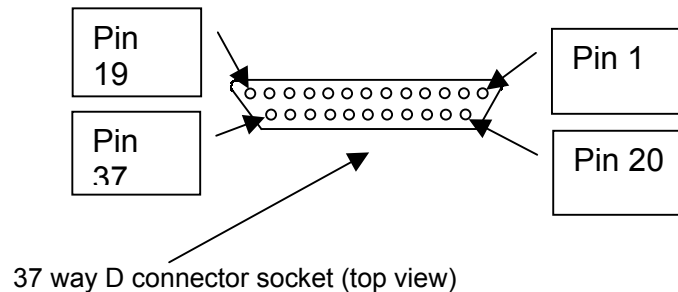
SOLID STATE STARTER USER CONNECTIONS

Connection	Method of connection	Comment
3-wire AC input	Terminal block marked AC input	Starter does not use neutral
Motor	Terminal block marked AC output	Motor does not use neutral
Logic for control Including Mains failure	DB37 connector	Pairs of wires connect to master controller SEE TABLE FOR DETAILS
Earth	Screw earth wire to Earth Point mounted between AC wiring terminal blocks	Screw size is 5mm.

Note:

High = Logic 1 = +24 VDC

Low = Logic 0 = 0 VDC



External connection has to be done with a 37 pins D male connector.

Figure 2
Solid State Starter D Connector Pin Locations

SOLID STATE STARTER CONTROL SIGNALS
(Circuit board designation PL2)

Pin number	Description	Designation
1	TOL not operated	I1
2	ACT TSTAT not operated	I2
3	OPEN L/S not operated	I3
4	OPEN TORQUE sw not operated	I4
5	CLOSE L/S not operated	I5
6	CLOSE TORQUE sw not operated	I6
7	REMOTE NOT SELECTED	I7
8	LOCAL OPEN cmd	I8
9	LOCAL CLOSE cmd	I9
10	DCS OPEN cmd	I10
11	OVERRIDE OPEN	I11
12	DCS CLOSE cmd	I12
13	OVERRIDE CLOSE	I13
14	Fault switch – mains fail	Normally Open
15	Fault switch – mains fail	Common
16	Fault switch – mains fail	Normally Close
17	Not used	
18	Not used	
19	Not used	
20	TOL not operated	RETURN
21	ACT TSTAT not operated	RETURN
22	OPEN L/S not operated	RETURN
23	OPEN TORQUE sw not operated	RETURN
24	CLOSE L/S not operated	RETURN
25	CLOSE TORQUE sw not operated	RETURN
26	REMOTE NOT SELECTED	RETURN
27	LOCAL OPEN cmd	RETURN
28	LOCAL CLOSE cmd	RETURN
29	DCS OPEN cmd	RETURN
30	OVERRIDE OPEN	RETURN
31	DCS CLOSE cmd	RETURN
32	OVERRIDE CLOSE	RETURN
33	Not used	
34	Not used	
35	Not used	
36	Not used	
37	Not used	

4.4 Safety

There is no fusing inside Model 6963. Fuses or circuit breakers must be provided in the AC supply.

Due to the method of power connection, model 6963 Motor Starter should be installed in limited access locations where personnel are instructed in electrical safety.

The unit must be earthed using the earth point provided.

For protection of operator and connected control equipment, the 6963 Motor Starter uses optically isolated control inputs. Failure of AC mains or the 6963 is provided by isolated relay contacts. All isolated signals connect via the DB37 connector on the front panel.

The control logic has interlocks on all inputs to prevent simultaneous Open and Close operation. This prevents an effective short circuit from phase to phase.

Resistors are built into the AC supply wiring to limit fault current, should a failure occur.

Rating of all components is generous. The 10 Amp models can withstand 40 Amp load for short periods. The 30 Amp models can withstand 100 Amp load for short periods. Heatsinking of the power components is adequate for rated loads.

4.5 Voltage Input

The 6963 Motor Starter can operate over a range of +20% to –20% of rated mains voltage. Note that low voltage operation may lead to high current and increased temperature in motors.

Model 6963 performs well under brown-out or power outage conditions. If mains voltage falls to a low level (50% of normal), then drive for the solid state switches will be removed.

4.6 Installation

Mounting of Model 6963 requires a standard 19" rack. Height is 5U and air circulation in the rack should be sufficient for convection cooling of the Motor Starter. The unit mounts to the rack using 4 bolts.

Power connection for Model 6963 is via two terminal blocks on the side of the unit – one for the motor and one for the load. Wiring size and type should comply with appropriate regulations

Fusing is not provided in the unit, so therefore the installation must include a suitable circuit breaker or fuse (see specifications).

Data connection is via a 37 way D-connector. Data wiring does not need to be shielded, and can be up to 5 metre in length.

Limit and torque switches are selected by the user (see below).

Sensor type	Where connected
Limit switches	Fitted to valve gate to indicate fully open or shut position.
Torque switches	Fitted to shafts of motors to determine if valve has reached overtorque limit from open or close.
TOL	Prevents operation at high current
Thermostat	Prevents operation at high temperature of motor

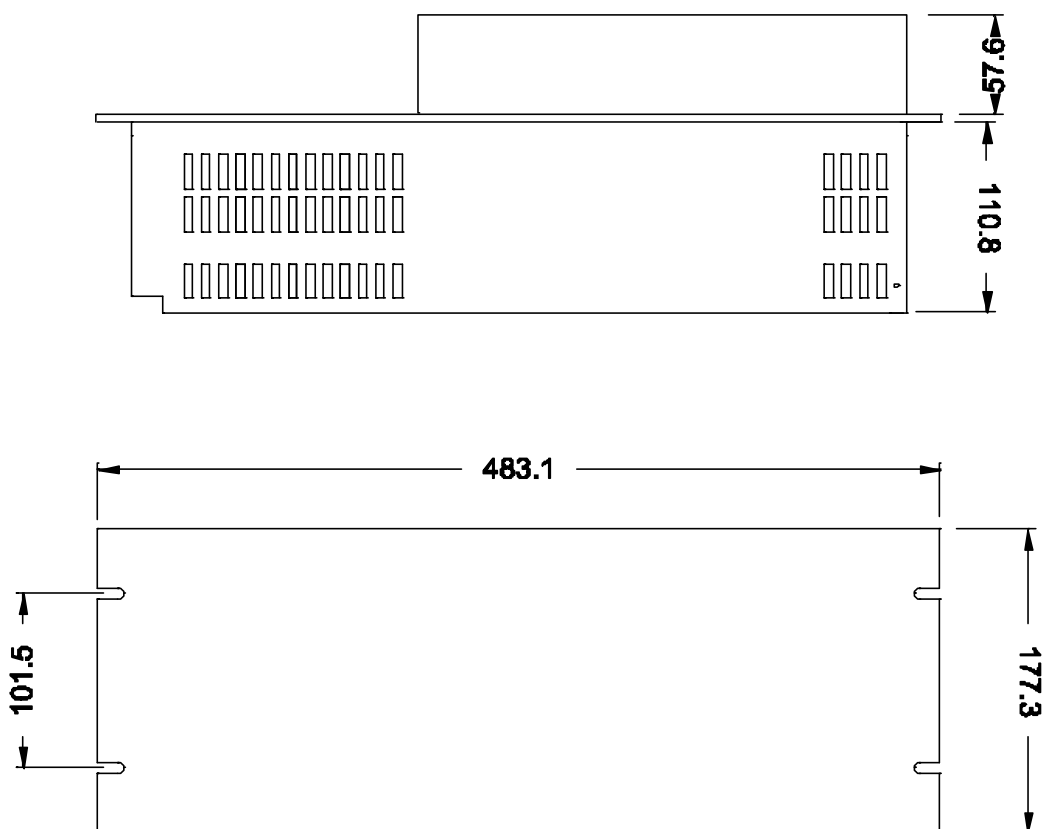


Figure 3
Dimensions of the Motor Starter for installation

4.7 Operation

Local mode gives the operator access to Open and Close. Movement ceases when limit switch or torque switch is activated.

Remote mode is the normal mode of operation. The controller can open or close the valve, with the option of overriding the command. When override is selected, Close is dominant.

Brake occurs after each open or close operation (except for immediate change of direction). The brake applies DC to the motor for a short time. The

amount of braking is adjustable and can be removed through change of links on the control PCB.

Torque stop and Limit stop. These stop the motor when a pre-determined limit is reached. The next operation must be in the opposite direction. Some applications will not require 2 switches so a link on the PCB can make a single input stop the motor.

4.7.1 Settings for control PCB

The control PCB can be set up for differing applications. These are set out in the Table below.

JP1 Thermal Overload		
Link position	Function	Comment
1-2 (top 2 pins)	Thermostat switch stops motor. Ignores Thermal Actuator	Setting ex factory
2-3 (lower pins)	Both actuator and thermostat signals disable motor drive	Motor is prevented from operating in both forward and reverse
JP2 Open Stop Control		
Link position	Function	Comment
1-2 (top 2 pins)	Both limit switch and torque switch will stop motor	Setting ex factory
2-3 (lower pins)	Open limit is controlled by torque switch. Ignores Open Limit Switch	Setting for torque open only
JP3 Close Stop Control		
Link position	Function	Comment
1-2 (top 2 pins)	Both limit switch and torque switch will stop motor	Setting ex factory
2-3 (lower pins)	Close limit is controlled by torque switch. Ignores Close Limit Switch	Setting for torque close only

Setting for no brake operation.

LK3 & LK4		
Both links in 1-2 position (left side)	Brake function is ON	Setting ex factory
Both links in 2-3 position (right side)	Brake function is OFF	Both links must be changed to remove the brake function. Note: setting VR1 fully clockwise also disables brake
VR1	Fully counter clockwise – maximum brake	Ex factory setting
	Fully clockwise – minimum brake	

4.8 Improvements for Mod 2

The original motor starter has been improved to prevent cross conduction of the static switch when brake mode is selected. There are several improvements as described below.

- Very fast repetition of OPEN/CLOSE commands can cause malfunction of the motor starter. This is because the finite time it takes for the SCRs to complete a conduction cycle, and the fixed time allocated to braking of the motor. Very fast repetition of commands is now detected and blocked.
- Braking pulse trigger signals now have additional filtering to prevent noise on the AC supply and the back EMF of motors from interfering with the brake function.
- Brake time has been reduced to around 250mSec but still has the same effect. Intensity remains adjustable.

The combined effect of these changes is for the motor starter to be capable of operation with electrically dirty power, and any combination and speed of command signals. The result is very little chance of false tripping of circuit breakers or blowing fuses, even under adverse conditions.