



SVM100 & SVM200

Installation, Operation & Maintenance Manual

Please ensure that this publication is thoroughly read and understood

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It is essential that the SVM (Smart Valve Monitor), settings are checked for compatibility with the process and control system requirements before being put into service. Please read this publication before proceeding

When Rotork Fluid Systems personnel or nominated agents are contracted to carry out site commissioning and / or acceptance, documentation of commissioned SVM configuration can be made available for customer records.

This manual provides instruction on:

- Electrical operation.
- Preparation and installation.
- Commissioning.
- Troubleshooting.
- Sales & Service.

Visit our web site at www.rotork.com for more information on the Rotork Fluid Systems SVM and other Rotork actuator ranges.

1.0 Health & Safety

This manual is produced to enable a competent user to install, commission and maintain a Rotork Fluid Systems SVM system.

The electrical installation, maintenance and use of these SVM units should be carried out in accordance with the National Legislation and Statutory Provisions relating to the safe use of this equipment, applicable to the site of installation.

For the UK: Electricity at Work Regulations 1989 and the guidance given in the applicable edition of the "IEE Wiring Regulations" should be applied. Also the user should be fully aware of his duties under the Health and Safety Act 1974.

For the USA: NFPA70, National Electrical Code ® is applicable.

The mechanical installation should be carried out as outlined in the manual and also in accordance with relevant standards such as British Standard Codes of Practice. If the SVM has nameplates indicating that it is suitable for installation in Hazardous Gas Areas then the SVM is suitable for use in Zone 1 and Zone 2 explosive atmospheres only. It should not be installed in atmospheres where gases are present with an ignition temperature less than 85°C (T6), unless indicated differently on the SVM nameplate.

Any test instruments applied to the SVM should be of equivalent certification. The electrical installation, maintenance and the use of the SVM should be carried out in accordance with the code of practice relevant for that particular Hazardous Gas Area certification.

No inspection or repair should be undertaken unless it conforms to the specific Hazardous Gas Area certification requirements. Under no circumstances should any modification or alteration be carried out on the SVM as this could invalidate the conditions under which its certification was granted.

Access to live electrical conductors is forbidden in the hazardous area unless this is done under a special permit to work, otherwise all power should be isolated and the SVM unit moved to a non-hazardous area for repair or attention.

Only persons competent by virtue of their training or experience should be allowed to install, maintain and repair Rotork Fluid Systems SVM units. Work undertaken must be carried out in accordance with instructions in the manual. The user and those persons working on this equipment should be familiar

with their responsibilities under any statutory provisions relating to the Health and Safety of their workplace.

The SVM unit is designed only for use with Rotork Fluid Systems SVM Analysis software and the Rotork Fluid Systems supplied Pocket PC.

The data produced by the SVM system is only an indication of the performance of a valve. For advice on the performance of safety valves and their operating parameters contact the valve manufacturer.

WARNING: Please read these instructions carefully **BEFORE** this instrument is installed or maintained. The SVM unit is intended for use with safety instrumented systems only. Ensure that precautions are taken during the installation and that all relevant safety procedures are adhered to. Misuse or poor installation of this equipment may cause inadvertent trips of the safety system.

Enclosure Materials

SVM100: Aluminium (Cast - LM25)

SVM200: Aluminium

The user must ensure that the operating environment and any materials surrounding the SVM unit cannot lead to a reduction in the safe use of, or the protection afforded by, the SVM unit. Where appropriate the user must ensure the SVM unit is suitably protected against the operating environment.

Should further information and guidance relating to the safe use of the Rotork Fluid Systems SVM range be required, it will be provided on request.

Products manufactured by Rotork Fluid Systems do not present a hazard to health under normal conditions of storage, distribution and use, provided that good industrial and hygiene procedures are followed.

2.0 Storage

If your SVM unit cannot be installed immediately then store it in a dry place until you are ready to connect incoming cables.

If the SVM100 has to be installed but cannot be cabled it is highly recommended that any plastic transit cable entry plugs are replaced with a suitable metal plug.

Rotork Fluid Systems cannot accept responsibility for deterioration caused on site once the covers are removed.

Every Rotork Fluid Systems SVM unit has been fully tested before leaving the factory to give years of trouble free operation, providing it is correctly commissioned, installed and sealed.

Do not store in temperatures outside of the normal operating temperatures. As stated on data label.

3.0 System Overview

3.1 Acronyms used

SVM:	Smart Valve Monitor
ESD:	Emergency Shutdown
ESDV:	Emergency Shutdown Valve
DCS:	Distributed Control System
PDA:	Personal Digital Assistant (Pocket PC)
IR:	Infra-Red
LED:	Light Emitting Diode
BB:	Black Box Supply (Auxiliary Supply)

3.2 Terminology used

Normally Energised:	The Solenoid Valve requires energising to move the actuator away from the Fail Safe position.
Normally De-Energised:	The Solenoid Valve requires de-energising to move the actuator away from the Fail Safe position.

3.3 Introduction

The SVM system performs the following two functions:

- 1) The primary function of the SVM system is to perform partial stroke testing to allow the operator to prove the functionality of the final elements of the ESD system. This can be initiated either remotely or locally to the Process Valve.
- 2) The secondary function of the SVM system is as a diagnostic tool that allows the operator to diagnose the performance of all the final elements and thus predict impending failures to enhance the maintenance activities.

SVM hardware can be installed in the field (SVM100 – Hazardous Area) or remotely (SVM200 – Safe Area) to the monitored valve. The SVM Server software is capable of control, test and diagnostic coverage of individual or multiple SVM 100 / 200 hardware units.

The SVM Server software application is a core element in the SVM range of products aimed at optimising plant safety integrity levels. The Performance of valve / actuator installations can be periodically scrutinised to enhance planned maintenance activities, extend full closure intervals and subsequently reduce production downtime.

The SVM100 can also be used with the SVM PDA to initiate tests and manage test data. Upload of information to the Server software enables project TAG data to be securely managed and reviewed for performance monitoring, fault diagnosis and preventive maintenance. Although not essential, installation out of direct sunlight is preferred when operating with the PDA.

4 Installing an SVM unit

4.1 Installation of Pressure Transducer

The pressure transducer monitors the falling pressure in the actuator as the process valve closes to provide diagnostic information required by the SVM. It must be mounted between the actuator and the controlling solenoid valve. This is the only essential sensor that is required, however the SVM system can also function with an optional position transmitter if necessary.

The pressure transducer can be fitted on a 'T' connection with no degradation of performance.

The pressure transducer used should be a 'Gauge' not 'Absolute' type, with the following specification:

- Supply: 24Vdc
- Output Signal: 4-20mA (2 wire) for zero to full scale pressure
- Accuracy: $\pm 0.5\%$ of full scale pressure
- Response: 1kHz or 1ms

4.2 Installation with Pneumatic Actuators

The pressure transducer must be mounted between the actuator and controlling solenoid valve and as close to the pneumatic actuator as possible to achieve the optimum performance (dimension 'X' should be considerably less than 'Y'). If quick exhaust valves are required for the operation of the actuator then the pressure transducer must be located on the actuator side of these valves in the same manner.

The length of dimension 'Z' has no effect on the performance of the SVM system. However, if the volume of air in the tubing of 'Z' becomes comparable to that of the actuator cylinder then the speed of operation will decrease.

For double acting actuators the pressure transducer should be installed on the 'pressure to open' side of the actuator in the same manner as for single acting actuators.

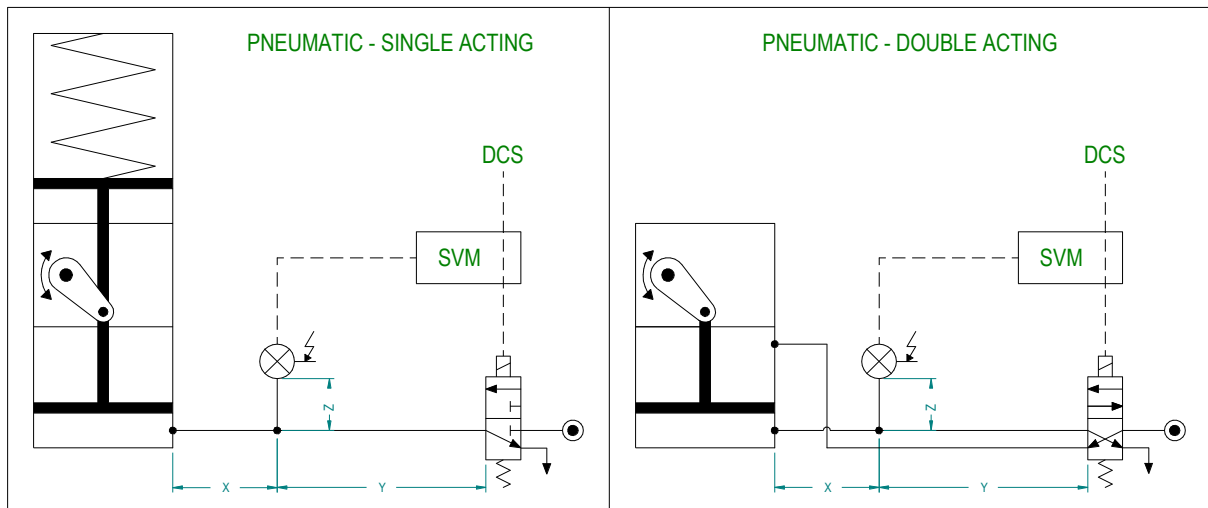


Fig. 1

4.3 Installation with Hydraulic Actuators

The pressure transducer must be mounted between the actuator and controlling solenoid valve, but the ratio of 'X' and 'Y' is not important as hydraulic fluid is non-compressible. This means that the pressure transducer can be mounted remotely from the actuator if the controlling solenoid valve is also remote.

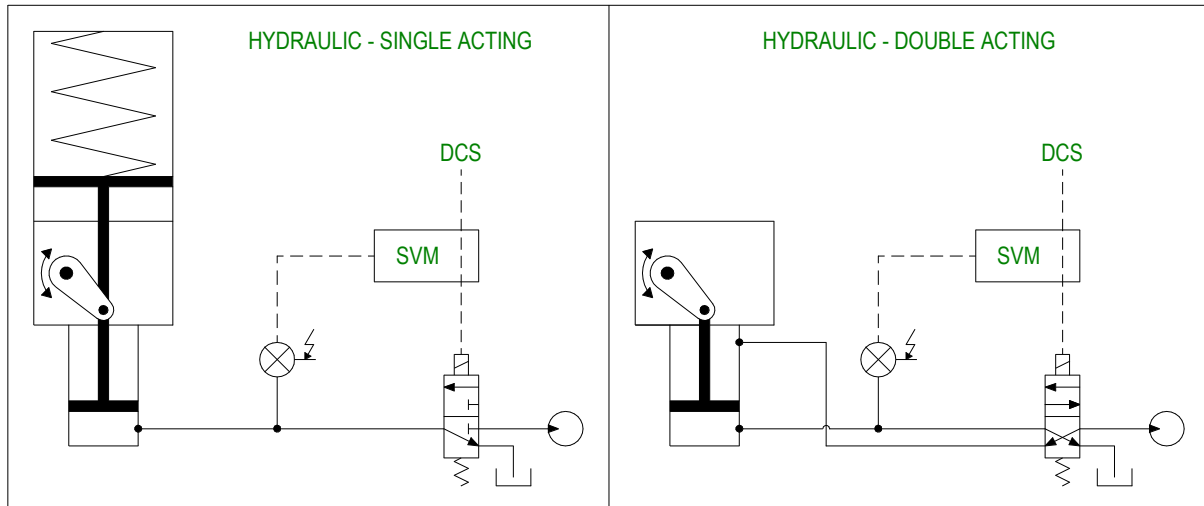


Fig. 2

5.0 Cable Connections

WARNING: Ensure all power supplies are isolated before removing the SVM covers.

Check that the power supply voltage is 24Vdc.

5.1 Earth / Ground Connections

SVM100: A M6 earth stud is located adjacent to the conduit entries for attachment of an external protective earth strap. An internal earth is also provided on the Termination PCB, however it must not be used as the protective earth connection.

SVM200: A M6 earth stud is located on the rear of the enclosure on the left hand side. There is also a earth terminal available on the 32-way connector.

The following points should be observed:

- Any installed system should only have one route to ground (i.e. multiple grounding points should not be used).
- The BB supply (0V) and the ESD supply (0V) should be referenced to the same point. This may, or may not be ground.
- If the SVM power supply is floating with respect to ground then for single SVM systems it can be grounded at the pressure transducer, or for multiple SVM systems (i.e. a rack mount) grounded in the center point (i.e. the mounting rack).
- For the pressure and position inputs, screened and twisted pair cabling should be used to reduce noise pickup due to long cable lengths. The screen on the cable should be made off to the ground point on the SVM unit and not the transducer unless that is to be used as a ground for the system.
- Sensitive signals (such as the pressure and position) should not be routed next to power or solenoid driver lines where possible this can cause noise to be injected into the lines where long cable runs are used.

5.2 Removing the Enclosure Cover

SVM100: Using a 6mm Allen key loosen the twelve screws evenly. Do not attempt the lever off the cover with a screwdriver as this may damage the flamepath. The surface of the machined / threaded flamepaths between the cover and body must be protected from scratches or damage during installation. Any such damage can destroy the validity of the enclosure.

SVM200: The cover does not need to be removed for wiring to the unit.

5.3 Cable Entry

SVM100: Only appropriate certified Explosion-Proof entry adaptors, cable glands or conduit may be used in hazardous locations. Remove any red plastic transit plugs. Make cable entries appropriate to the cable type and size. Ensure that threaded adaptors, cable glands or conduit are tight and fully waterproof. Seal used cable entries with steel or brass threaded plugs. In hazardous areas an appropriately certified threaded blanking plug must be used.

SVM200: There are 32-way and 4-way connectors supplied into the back of the enclosure for making all terminations.

5.4 Connecting to Terminals

SVM100: Refer to the wiring diagram inside the enclosure cover to identify the functions of terminals. All connections are made into the removable connectors (CN1, 2, 3, 4, 9 & 10 if required). When all connections are made, ensure the connector securing screws are tight and that the wiring diagram is replaced in the enclosure compartment.

SVM200: There are 32-way and 4-way connectors supplied into the back of the enclosure for making all terminations. There is also a separate RS232 connector on the front panel and a RS485 connector on the rear panel.

5.5 Replacing the Enclosure Cover

SVM100: Ensure that the gasket sealant (a tube of Hylomar PL32/M is supplied in the enclosure), is applied to the flame path of the enclosure before replacing the cover. This will ensure a rating of IP66 is achieved (the enclosure is rated IP54 without Hylomar).

The joint surfaces are to be dry, clean and grease free. Apply a thin film uniformly to both the body and cover joint faces and allow the solvent to evaporate so that the Hylomar jointing compound is dry. Fit the cover and secure all the bolts. No cover screws should be omitted. Care must be taken not to damage the joint faces as this may invalidate the certification. Surplus Hylomar may be removed with a light application of Hylomar solvent 184.

Should the Hylomar joint be damaged when the enclosure is opened for maintenance or repair purposes, the IP rating will be invalidated. In this event the faces should be cleaned by using Hylomar solvent 184 and the above procedure observed.

6.0 Commissioning

The SVM electronics assembly consists of four PCB's, which are referred to as the Mezzanine, Processor, Main and Termination PCB.

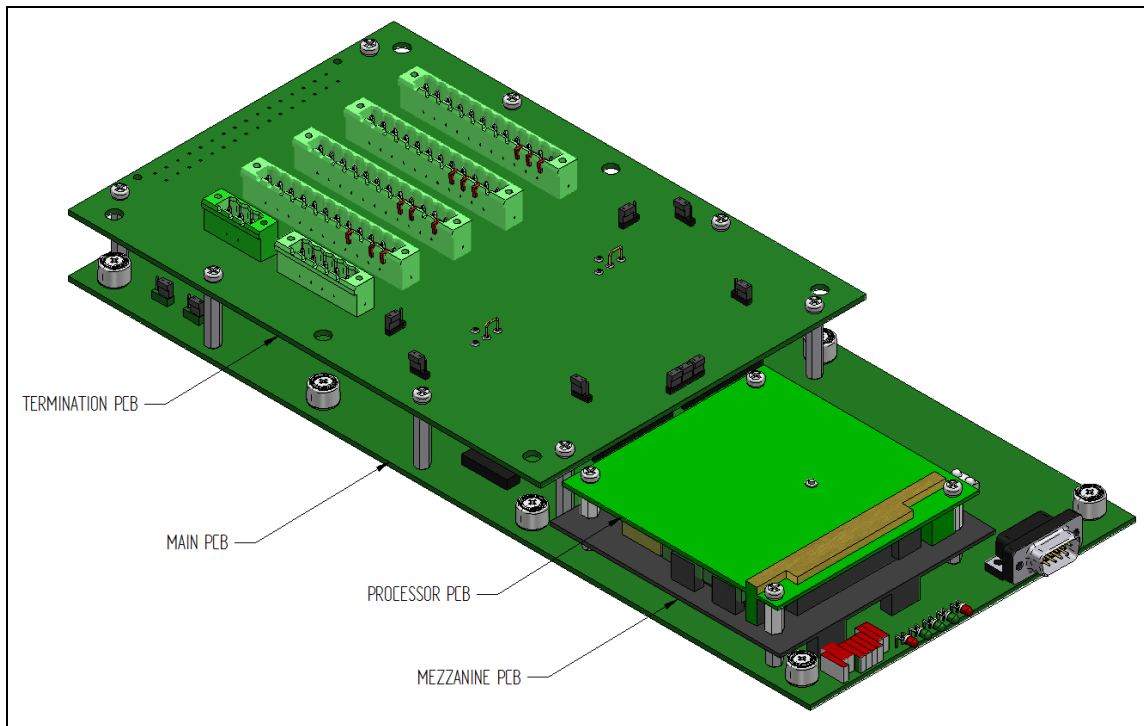


Fig. 3

Unless otherwise stated at the time of ordering, all SVM's will be delivered with the Links fitted in the default state, as indicated in Fig. 5 & 6.

The block diagram below illustrates the main types of connection made to the SVM hardware.

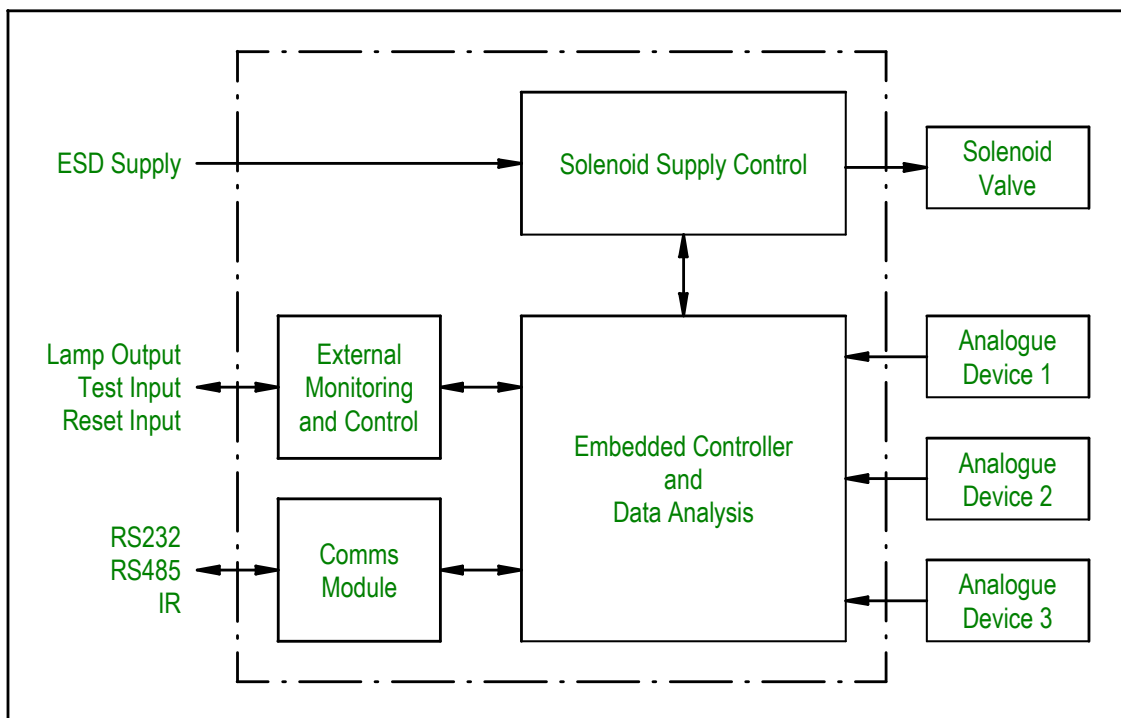


Fig. 4

6.1 SVM Inputs / Outputs

Description	Direction (wrt SVM)	SVM100	SVM200
Not used	-	01	-
Not used	-	02	-
Not used	-	03	-
Not used	-	04	-
Not used	-	05	-
Not used	-	06	-
Emergency Shutdown Supply 1 (Earth)	-	07	A2/A30/A32
Emergency Shutdown Supply 1 (-ve)	Input	08	C6
Emergency Shutdown Supply 1 (+ve)	Input	09	C8
Solenoid Valve 1 (Earth)	-	10	A2/A30/A32
Solenoid Valve 1 (+ve)	Output	11	C4
Solenoid Valve 1 (-ve)	Output	12	C2
Test Switch 1 (-ve)	Input	13	1 (4-Way)
Test Switch 1 (+ve)	Input	14	4 (4-Way)
Reset Switch 1 (-ve)	Input	15	2 (4-Way)
Reset Switch 1 (+ve)	Input	16	3 (4-Way)
Analogue Input 2 (Earth)	-	17	A2/A30/A32
Analogue Input 2 (+ve)	Input	18	A4
Analogue Input 2 (Signal)	Input	19	A6
Analogue Input 2 (-ve)	Input	20	A8
Pass / Fail Lamps (Earth)	-	21	A2/A30/A32
Pass Lamp (-ve)	Output	22	-
Fail Lamp (-ve)	Output	23	-
Pass / Fail Lamps (+ve)	Output	24	C10
Analogue Input 3 (Earth)	-	25	A2/A30/A32
Analogue Input 3 (Signal)	Input	26	A26
Analogue Input 3 (+ve)	Input	27	A24
Analogue Input 1 (Earth)	-	28	A2/A30/A32
Analogue Input 1 (-ve)	Input	29	A22
Analogue Input 1 (Signal)	Input	30	A20
Analogue Input 1 (+ve)	Input	31	A18
DCS Status (Earth)	-	32	A2/A30/A32
DCS Fail Contact (Com)	Output	33	A10
DCS Fail Contact (N/O)	Output	34	A12
DCS Pass Contact (Com)	Output	35	A14
DCS Pass Contact (N/O)	Output	36	A16
Test Switch 2 (-ve)	Input	37	-
Test Switch 2 (+ve)	Input	38	-
Reset Switch 2 (-ve)	Input	39	-
Reset Switch 2 (+ve)	Input	40	-
Not used	-	41	-
Not used	-	42	-
Emergency Shutdown Supply 2 (Earth)	-	43	A2/A30/A32
Emergency Shutdown Supply 2 (-ve)	Input	44	C22
Emergency Shutdown Supply 2 (+ve)	Input	45	C24
Solenoid Valve 2 (Earth)	-	46	A2/A30/A32
Solenoid Valve 2 (+ve)	Output	47	C18
Solenoid Valve 2 (-ve)	Output	48	C20

RS485 (A)	Output	49	C26
RS485 (B)	Output	50	C28
RS485 (Isolated Ground)	-	51	A28
RS485 (X)	Output	52	C30
RS485 (Y)	Output	53	C32
Black Box Supply (Earth)	-	54	C16
Black Box Supply (-ve)	Input	55	C14
Black Box Supply (+ve)	Input	56	C12

6.1.1 Black Box Supply

Black Box mode will only operate with normally energised systems.

The SVM system is capable of offering enhanced monitoring capabilities by automatically recording full closures of the actuator / valve whether intentional or spurious. This allows the user to take credit for all shutdown events when assessing the SIL verification of a safety system.

The SVM operates deriving power normally from the ESD supply it is monitoring. However, an auxiliary supply can be used to ensure constant operation or to run the system in BB mode.

When in BB mode, should the ESD supply controlling the solenoid valve drop, causing the actuator / valve to close. The BB system can start recording the full closure for the specified time taken for the valve to close (set during the commissioning process, see section 6.2 for details). In the event of a shutdown (planned or unplanned), this information is then held within the SVM unit until it is connected to the Server Software for the data to be downloaded. (Note: this is only available when connecting the SVM directly to the Server Software – i.e. RS232 or RS485 communication is being used).

After a BB event has been recorded the system should be connected to, and the event downloaded, priming it for the next run. If this doesn't happen the SVM will record the next run, and the second BB event will be queued in the SVM waiting for the previous to be downloaded. Any more tests will be ignored.

Once the SVM has stored a black box event it will prohibit another partial stroke test from being initiated (full closure tests can be run and will overwrite any stored black box test), until the data has been downloaded.

The description above outlines the black box recording behaviour when only one ESD line drops low, should two ESD signals need to be monitored for when they drop then this can be enabled by altering LK19.

See the Server Software manual for retrieving the BB information.

6.1.2 Emergency Shutdown Supply 1 and 2

These inputs are powered from the Plant ESD system that would normally feed directly to the solenoid valve(s). The return path of this supply is disconnected by the SVM during a partial stroke test of the valve. ESD input 1 is the default connection for single solenoid valve applications.

ESD input 1 provides the power to Solenoid Valve output 1.

ESD input 2 provides the power to Solenoid Valve output 2.

ESD inputs 1 and 2 can be connected together to provide power to Solenoid Valve outputs 1 and 2 from only one supply.

6.1.3 Solenoid Valve 1 and 2

Connections to the actuator solenoids are made using these terminals. Solenoid Valve Output 1 is the default connection for single solenoid applications.

6.1.4 Reset Switch 1 and 2

The SVM system cannot function with manual reset solenoid valves as these will latch during the partial stroke test causing the valve to close. However, this function can be provided by the SVM system to ensure that the required functionality is maintained. The solenoid valve must be replaced with an auto-reset solenoid. The solenoid valves must be reset before a partial stroke can be performed.

To configure the SVM for manual reset a normally open switch must be connected between the appropriate terminals. A normally open contact is required to be set closed to reset the solenoid supply. (see section 6.2.5 and 6.2.7 for link settings).

The voltage that will be shorted across the reset terminals is 24Vdc.

SVM100: Two sets of reset terminals are available and both perform the same operation.

SVM200: One set of reset terminals are available.
There is also a reset button fitted to the front panel of the enclosure that can be used if required.

6.1.5 Test Switch 1 and 2

Once the SVM unit has been commissioned and the Actuator / Valve is in the correct state, then a partial stroke test can be conducted by either using the Server software or installing a normally open switch, connected between the appropriate terminals. The terminals need to be closed, and then opened. The action of disconnecting the terminals initiates the test.

The voltage that will be shorted across the test terminals is 24Vdc.

SVM100: Two sets of test terminals are available and both perform the same operation.

SVM200: One set of test terminals are available.

6.1.6 Pass / Fail Lamps

A configured SVM system provides control panel 'lamp' status voltages. The lamp supply is limited to 500mA, at 24VDC and the indicator return signals can sink up to 120mA each.

Lamps are to be connected to the 24V fused lamp supply and the pass and fail connections used to sink this through the lamps. The lamp functions are as follows;

Lamp status		Function
Pass	Fail	
ON (sink provided)	OFF	Test Result – PASS
OFF	ON (sink provided)	Test Result – FAIL
ON (sink provided)	ON (sink provided)	Test Result - PASS with warning
OFF	OFF	<ol style="list-style-type: none"> 1. Test in progress (for configured system) 2. The default condition for an un-configured system and after an ESD event has occurred. 3. No test run (seen after a power cycle of the electronics)

6.1.7 DCS Pass / Fail

In addition to the lamp indicator outputs, there are voltage free contacts provided for test status feedback. These contacts are normally closed and opened to indicate status as follows:

Contact status		Function
Pass	Fail	
OPEN	CLOSED	Test Result – PASS
CLOSED	OPEN	Test Result – FAIL
OPEN	OPEN	Test Result - PASS with warning
CLOSED	CLOSED	<ol style="list-style-type: none"> 1. Test in progress (for configured system) 2. The default condition for an un-configured system and after an ESD event has occurred. 3. No test run (seen after a power cycle of the electronics)

6.1.8 Analogue input 1

This input can be configured by using LK5 and LK22 (found on the main PCB) for use with either a 0-10V or a 4-20mA input. The link settings below show these options.

Link Settings		Sensor Input Type
LK5	LK22	
1-2	1-2	0 - 10V
2-3	2-3	4 - 20mA

NOTE: It is very important to ensure that both link positions are configured to the same position, failure to do this could cause damage to the SVM. As default this input comes configured as a 0 - 10V channel that can be used to connect to an auxiliary sensor.

6.1.9 Analogue input 2

This channel is a dedicated 0–10Vdc channel and is typically used for a position transmitter. This channel is available on the termination PCB on terminals 26 and 27.

6.1.10 Analogue input 3

This channel is a dedicated 4-20mA channel, this is typically used for a pressure sensor. This channel is available on the termination PCB on terminals 18, 19 and 20.

6.2 Link Configuration on the Termination PCB

Details of the links on the Termination PCB are given below:

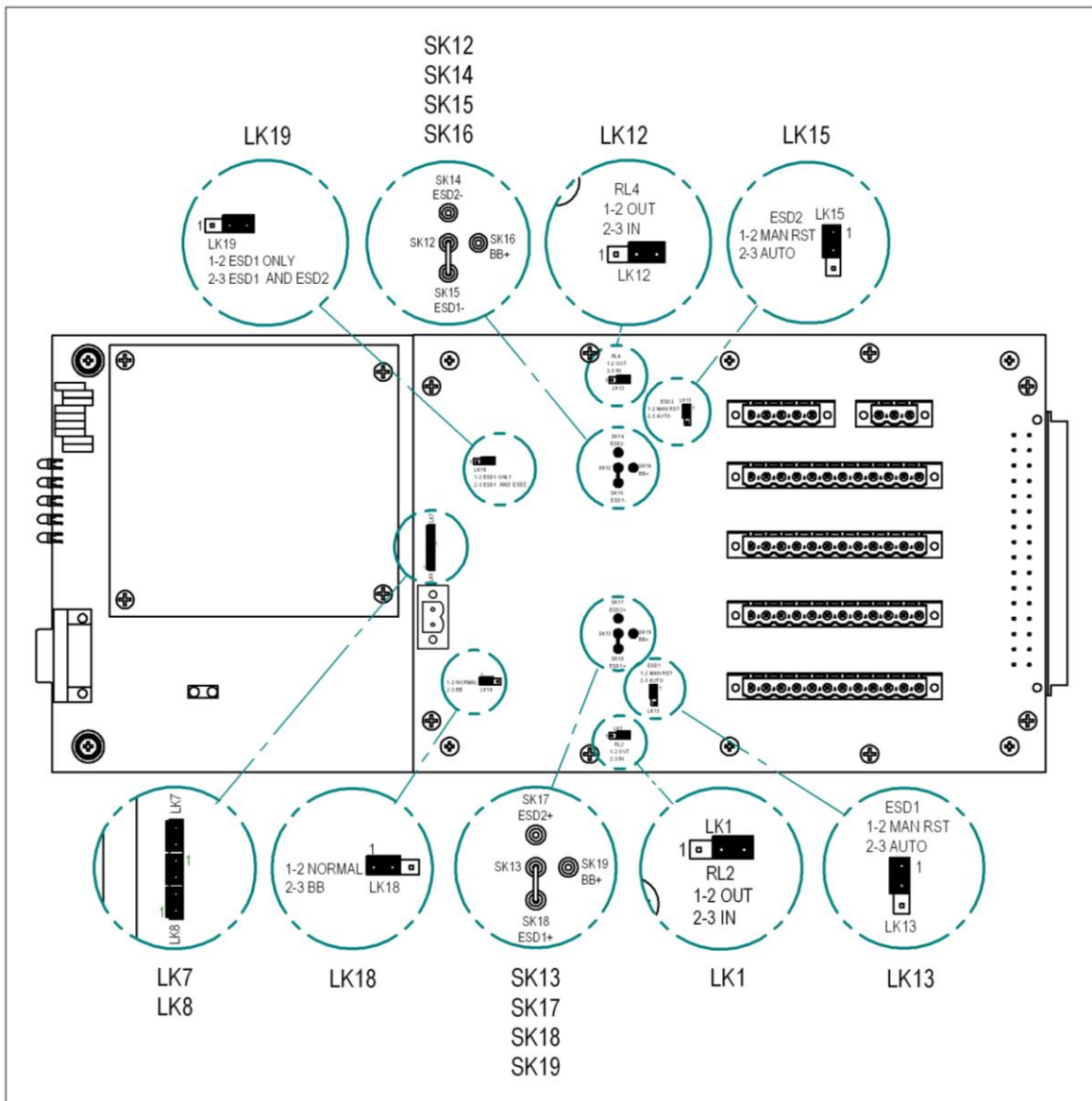


Fig. 5

6.2.1 Will the Black Box function be used? (see section 6.3.1 for details)

Link on pins 1 and 2 on LK18: Normal operation: the SVM will not start to record when the ESD supply drops out.

Link on pins 2 and 3 on LK18: BB operation: the SVM will start to record when the ESD supply (see section 6.13), drops out. The SVM must also be powered from the BB supply (see section 6.12).

6.2.2 What supply is being used to power the SVM?

Link on SK12 and SK16: The SVM will be powered from the BB supply.
 Link on SK13 and SK19:

Link on SK12 and SK15: The SVM will be powered from the ESD1 supply.
 Link on SK13 and SK18:

Link on SK12 and SK14: The SVM will be powered from the ESD2 supply.
 Link on SK13 and SK17:

This is also summarised in the table below.

Power Source	Negative Link Setting	Positive Link Setting
Black Box (Auxiliary supply)	SK12 – SK16	SK13 – SK19
ESD1	SK12 – SK15	SK13 – SK18
ESD2	SK12 – SK14	SK13 – SK17

NOTE: It is very important to ensure that both link positions are configured to the same position, failure to do this could cause damage to the SVM.

6.2.3 When should the Black Box function start to record?

Link on pins 1 and 2 of LK19: When set in BB mode, should the SVM start to record when ESD1 and ESD2 drops out.

Link on pins 2 and 3 of LK19: When set in BB mode, should the SVM start to record when ESD1 drops out only.

6.2.4 What type of Solenoid Valve is fitted to Solenoid Valve 1 output?

Link on pins 1 and 2 on LK1: SOL1 needs to be energised to trip (e.g. energised to close the actuator and de-energised for the actuator to open).

Link on pins 2 and 3 on LK1: SOL1 needs to be de-energised to trip (e.g. de-energised to close the actuator and energised for the actuator to open).

6.2.5 How is Solenoid Valve 1 to be reset?

This option allows the user to select if the plant is to automatically come back on line once the ESD system is reset, or if operator intervention is required prior to opening the actuator.

Link on pins 1 and 2 on LK13: When the ESD1 supply is switched on to the SVM, a manual reset switch will be required to be made for SOL1 to change state.

Link on pins 2 and 3 on LK13: When the ESD1 supply is switched on to the SVM, it will automatically change the state of SOL1.

The SVM cannot be used with manual reset solenoid valves. These must be replaced with auto-reset solenoid valves and then the reset function will be performed by the SVM if manual reset is required.

6.2.6 What type of Solenoid Valve is fitted to Solenoid Valve 2 output?

Link on pins 1 and 2 on LK12: SOL2 needs to be energised to trip (e.g. energised to close the actuator and de-energised for the actuator to open).

Link on pins 2 and 3 on LK12: SOL2 needs to be de-energised to trip (e.g. de-energised to close the actuator and energised for the actuator to open).

6.2.7 How is Solenoid Valve 2 to be reset?

This option allows to user to select if the plant is to automatically come back on line once the ESD system is reset, or if operator intervention is required prior to opening the actuator.

Link on pins 1 and 2 on LK15: When the ESD2 supply is switched on to the SVM, a manual reset switch will be required to be made for SOL2 to change state.

Link on pins 2 and 3 on LK15: When the ESD2 supply is switched on to the SVM, it will automatically change the state of SOL2.

The SVM cannot be used with manual reset solenoid valves. These must be replaced with auto-reset solenoid valves and then the reset function will be performed by the SVM if manual reset is required.

Spare links (these connectors have no function) are fitted to LK7 and LK8.

6.3 Link Configuration on the Main PCB

Details of the links on the main PCB are given below:

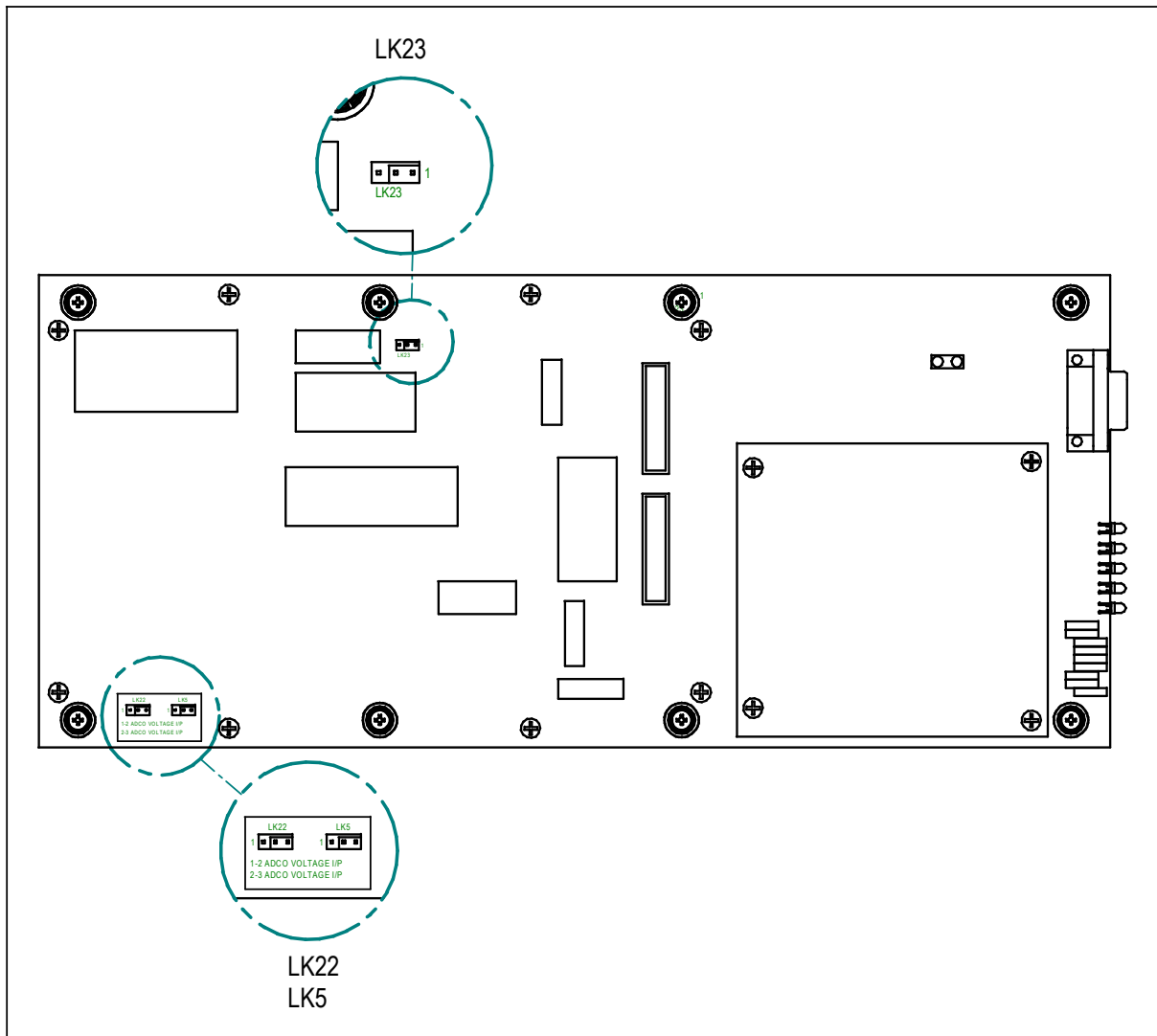


Fig. 6

6.3.1 LK23

This link has no function

6.3.2 LK5 & LK 22 (Analogue input 1)

See Section 6.3.8.

6.4 SVM Status LED's

When power is applied to the SVM it will take approximately 20-30secs for the processor to boot up. Once this is done all five LED's will flash. You cannot connect to the SVM with the Server software until the processor has booted up correctly.

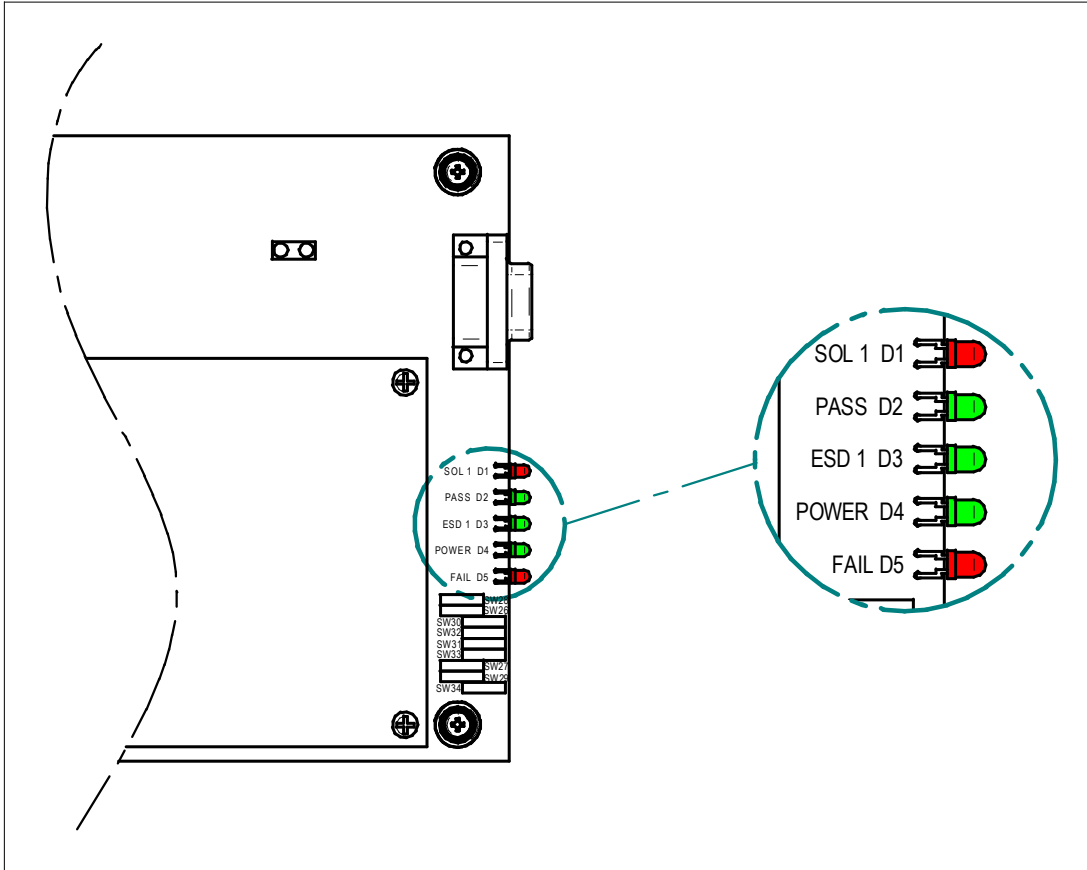


Fig. 7

LED		Function when LED is lit	Colour
D1	SOL	Solenoid de-energised	Red
D2	PASS	Result from the last partial stroke test carried out	Green
D3	ESD 1	ESD 1 power energised	Green
D4	POWER	SVM power energised	Green
D5	FAIL	Result from the last partial stroke test carried out	Red

7.0 Communication Options

The data communications system used is a proprietary Rotork protocol that uses asynchronous data at 19200bps. This is then transferred over the selected medium, RS485 for remote connections or RS232 / IRDA options for local connection and data retrieval.

The type of communication is configured from the switch settings on the Main board, these configurations are shown below.

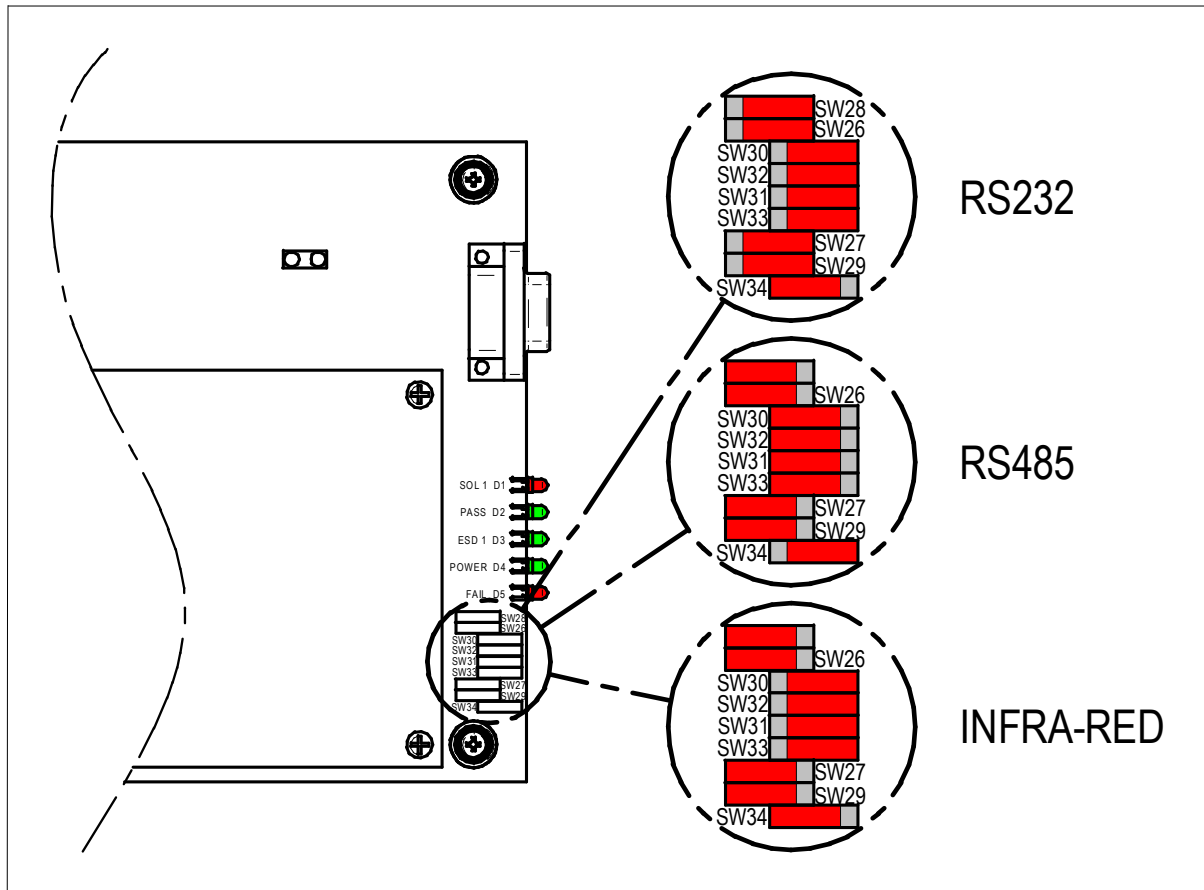


Fig. 8

The table below also shows the communication switch settings

Function	Switch Settings (Main PCB)								
	SW34	SW29	SW27	SW33	SW31	SW32	SW30	SW26	SW28
RS232	1-2	2-3	2-3	2-3	2-3	2-3	2-3	2-3	2-3
RS485	2-3	1-2	1-2	1-2	1-2	1-2	1-2	1-2	1-2
IR	1-2	1-2	1-2	2-3	2-3	2-3	2-3	1-2	1-2

Position 1-2 is pushed away from the PCB edge, position 2-3 is pushed towards the PCB edge.

SVM100: To access these switches the cover needs to be removed.

SVM200: To access these switches the data label on the front of the enclosure needs to be removed.

7.1 RS232

SVM100: The RS232 connector is not accessible due to the position of the Main board in the enclosure.

SVM200: The RS232 socket is protruding from the front panel on the enclosure. This is for local control using a 9 pin D-type 'null modem' cross-over female to female cable.

Pin number	Function	Signal direction (wrt SVM)	Electrical spec.
1	-	-	-
2	Receive Data	Input	RS232 / V28
3	Transmit Data	Output	RS232 / V28
4	-	-	-
5	Signal Ground	None	0V
6	-	-	-
7	RTS	Output	RS232 / V28
8	CTS	Input	RS232 / V28
9	-	-	-

7.2 RS485

SVM100: The RS485 connections are made with screw terminals on the Termination board.

SVM200: The RS485 socket is protruding from the back panel on the enclosure. There are also terminals on the 32-way connector.

Pin number	Function	Signal direction (wrt SVM)	Electrical spec.
1	-	-	-
2	-	-	-
3	TX/RX - A	Bi-directional	RS485
4	-	-	-
5	-	-	-
6	-	-	-
7	-	-	-
8	TX/RX - B	Bi-directional	RS485
9	-	-	-

Data is presented as RS485 signalling over 2 wires. A dedicated wired connection is required to interface with SVM Server software on a PC serial port with RS485 adaptor to an individual, or a network of remote SVM units.

Up to 32 remote devices can be supported without the use of RS485 repeater units.

7.3 Infra-Red

SVM100: A PDA (installed with the SVM PDA software), is required to communicate with a PCB mounted transceiver on the Main board through the enclosure window.

SVM200: The IR option is not available.

8.0 Maintenance

Every SVM unit has been fully tested before despatch to give years of trouble-free operation providing it is installed, sealed and commissioned in accordance with the instructions given in this publication.

Covers should not be removed for routine inspection as this may be detrimental to the future reliability of the actuator.

All electrical power supplies to the SVM must be isolated before any maintenance or inspection is carried out.

Electrical supplies must be isolated before SVM covers are removed.

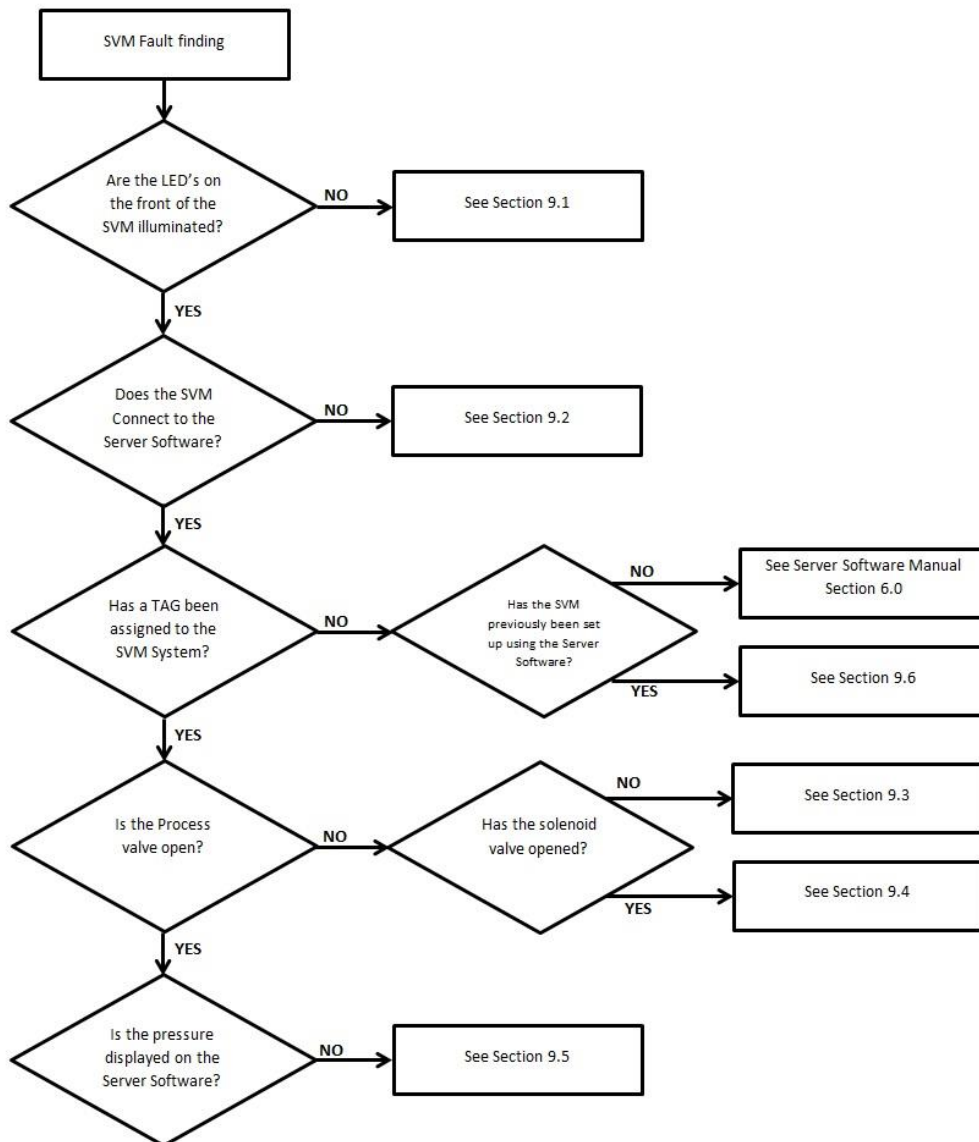
Routine maintenance on the SVM100 should include the following:

- External parts of the enclosure should be periodically cleaned to ensure dust deposits are not allowed to accumulate.
 - Check flamepaths / threads on enclosure body and lid for signs of corrosion on an annual basis.
 - Ensure the procedure in Section 5.2 is followed if the cover is removed and Section 5.5 for replacing it.
-

9.0 Troubleshooting

Beware that an SVM100 may be located in a hazardous area. Opening the cover to the SVM may require a specific work permit, refer to on site procedures before opening any cover's.

Below is a flow diagram to aid fault finding. For assistance with the Server Software refer to the separate manual.



9.1 Power

Check that the SVM is correctly powered, two green status LED's (D3 & D4) should be illuminated. Refer to section 6.4 for further information.

If both LED's are not lit:-

- i. Refer to the wiring diagram and check that all the connections are correctly made to the SVM.
- ii. Check the supply to the SVM, ensure that the SVM is being supplied with 24Vdc. A minimum of 287mA is required to power the SVM & a pressure transducer.
- iii. If the SVM is being used in Black Box mode then two separate supplies are needed, a power supply for the SVM and a power supply for the solenoid valve (ESD supply). See section 6.1.1 for more details.

- iv. Check the links on the SVM termination board are correct. See section 6.2 for details on the link settings.

9.2 Communication

There are three methods of communicating with the SVM. Using a PC with a RS232 or RS485 communication port or via Infra Red using a hand held PDA.

The communication method is selected using nine switches mounted to the SVM PCB. Refer to section 7.0 for more details.

Allow approximately 30 sec's for the SVM to 'boot-up' from powering up the system before attempting to connect to the SVM. When the SVM has successfully booted-up all the LED's will briefly flash.

If the Server Software on a PC fails to communicate with the SVM:-

- i. Check the correct COM port has been selected. Refer to the separate Server Software manual for further information.
- ii. Check the wiring between the PC and the SVM is the correct type and is wired correctly, to the SVM.

Connecting via RS232:-

- i. Check the switch settings on the main PCB are set correctly. See section 7.0
- ii. Check the serial cable is a 9-pin D-type 'null-modem' cross-over female to female cable. The cable must connect to the SVM via the 9-pin D-type connector on the front of the SVM.

NOTE: RS232 is not accessible for the SVM100.

Connecting via RS485:-

- i. Check the switch settings on the main PCB are set correctly. See section 7.0
- ii. Check the serial cable is a 9-pin D-type cable.
- iii. Check the RS485 interface wiring, TX/RX A to A, TX/RX B to B.
- iv. When connecting to a specific SVM ensure that the correct RS485 ID is being used. Refer to the separate Server Software manual for further information.

Connecting via Infra Red:-

- i. Check the switch settings on the main PCB are set correctly. See section 7.0
- ii. The PDA is supplied mounted to a bracket specifically aligned for the Infra Red transmitter and receiver. Check the PDA is correctly mounted on to the bracket on the SVM100.
- iii. Check the bracket has not been damaged or twisted.
- iv. Check there is nothing obscuring the window inside the SVM enclosure i.e. wire loops.

9.3 Solenoid Valve

The SVM utilises 1 or 2 solenoid valves to operate the actuator opening or closing the process valve. The following guide assumes that the solenoid valves are 'normally closed'. The solenoid valves can be set to open automatically upon powering up the SVM or require a manual reset using a reset set switch.

If the solenoid valve fails to open:-

- i. Check the connection from the SVM to the solenoid valve(s), refer to the wiring diagram.
- ii. Check the supply to the solenoid valve is the correct voltage and the correct polarity of the supply.
- iii. Press the Reset button on the front of the SVM200 or a remotely mounted push button (Manual reset systems only).
- iv. Check that the ESD supply is present. The ESD LED (D3) will be illuminated when the ESD signal is present.
- v. Check the links on the termination board. See Section 6.2
- vi. Recreate the 'Tag' ensuring the valve type is set correctly i.e. normally open or normally closed. See separate Server Software manual for details.

For 'normally open' solenoid valves there will only be a supply to the solenoid valve during a partial stroke or full stroke test.

9.4 Process Valve

If the process valve fails to open:-

- i. Press the Reset button on the front of the SVM200 or a separate button if fitted. (Manual reset systems only)
- ii. Check the actuator system pressure.

9.5 Inputs

As a minimum the SVM requires a pressure transducer. A position potentiometer may be fitted for reference only. If the SVM does not receive a signal from the pressure transducer the SVM will not perform a partial stroke test.

Pressure transducer:-

- i. Check the pressure on the Server Software correlates to the system pressure.
- ii. Check the wiring from the SVM to the pressure transducer.
- iii. Check the links on the main board are set to the correct type of transducer. See section 6.3
- iv. Recreate the 'Tag' ensuring the correct inputs are selected.

9.6 Restoring a Tag

If the SVM is powered off whilst processing a partial stroke test it can sometimes drop its tag to prevent it from being corrupted. The Tag can be restored using the server software if the SVM unit has been set up previously (please see server software manual for more information). To restore the tag click:-

SVM: Write Data: Restore Tag

10.0 Environmental

End user advice on disposal at end of life of the product

Subject	Definition	Remarks / Examples	Hazardous	Recyclable	EU Waste Code	Disposal
Electrical & Electronic Equipment	PCB's	All Products	Yes	Yes	20 01 35	Use specialist recyclers
	Wire	SVM200	Yes	Yes	17 04 10	
Metals	Aluminium	All Products	No	Yes	14 04 02	Use licensed recyclers
	Stainless Steel	SVM100	No	Yes	17 05 05	

In all cases check local authority regulation before disposal

11.0 Weights

SVM100: 19kg

SVM200: 2.3kg (for Single unit)
3.0kg (for Dual unit)

12.0 Approvals

Refer to the nameplate for unit specific approval details

SVM100: European – Hazardous Area

ATEX (94/9/EC) II 2 G D, EEx d IIB T6
Temperature: -40°C to +75°C

SVM200: Indoor use in a Safe Area only.

13.0 Nameplate Information

SVM100: Rotork Label on Cover

Model No.:	Full SVM model code. See data sheet for explanation of model code.
Serial No.:	Always have this to hand if contacting Rotork for assistance.
Wiring Diagram:	The wiring diagram gives details of the SVM terminal numbers for the incoming cables.
Supply Voltage:	Compare this with the power supply available on site.
Tag No.:	The customers reference no. will be shown here if required.
Cable Entries:	The number, thread and size details for the cable glands.
Unit weight:	Weight of the SVM assembly.

SVM100: JCE Label on Main Body

Explosionproof Certification:	Details of certification when installed in hazardous environments.
Model No.:	For enclosure only.
Serial No.:	For enclosure only.
Operating Temperature:	For full SVM assembly.
Year of Manufacture:	For enclosure only.
Max Power Dissipation:	For full SVM assembly.

SVM200:

Model No.:	Full SVM model code. See data sheet for explanation of model code.
Serial No.:	Always have this to hand if contacting Rotork for assistance.
Tag No.:	The customers reference no. will be shown here if required.

14.0 Rotork Sales and Service

If your Rotork SVM has been correctly installed and sealed, it will give years of trouble-free service.

Should you require technical assistance or spares, Rotork guarantees the best service in the world. Contact your local Rotork representative or the factory direct at the address on the nameplate, quoting the SVM type and serial number.

A full listing of our worldwide sales and service network is available on our website at www.rotork.com

ATTENTION: Red plastic plugs in conduit entries are for transit only. For long term protection fit suitable metal plugs.

ATTENZIONE: Ltappi in plastica rossa per l'entrata cavi sono solo temporanei. Per una protezione permanente prego sostituirli con appositi tappi metallici.

ATENCION: Los tapones rojos de plastico en las entradas de cable son unicamente para transporte. Para proteccion permanente colocar tapones metalicos apropiados.

ACHTUNG: Die roten plastikstopfen sind nur für den transport geeignet. Für dauerhaften schutz sind diese gegen geeignete blindstopfen auszütuschen.

ATTENTION: Les bouchons plastiques assurent une protection temporaire. Pour une protection definitive utiliser des bouchons metalliques.

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As we are continually developing our products, the design of the SVM is subject to change without notice. The latest product and technical information is available at our website: www.rotork.com.

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