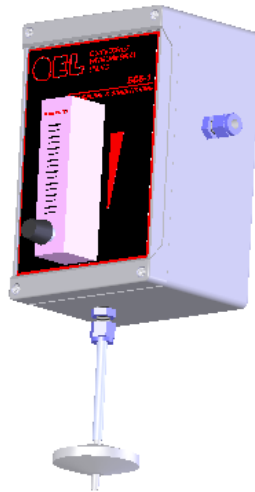


SCS-1

**ONE CHANNEL
SAMPLING & CONDITIONING SYSTEM**



**INSTALLATION
OPERATION AND MAINTENANCE
MANUAL**

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READ BEFORE OPERATING

All individuals who have or will have the responsibility of using, maintaining, or servicing this product must carefully read this manual. The product will perform as designed only if it is used, maintained, and serviced in accordance with the manufacturer's instructions.

1. General Information

1.1 Description

The SCS-1 one channel sampling and conditioning system provides the ability to check for the presence of potentially hazardous atmospheres in a remote area or confined space. The SCS-1 is composed of a motorized pump with a clogging monitor and a water detector, a precision flow meter with direct reading scales and a replaceable in-line disk air filter. The entire electronic circuit including the pump and power supply is housed in a NEMA 4X enclosure to enable the SCS-1 to work in harsh environments. The SCS-1 is suitable for continuous operation.

In the normal working mode the pump LED will be constantly ON and the fault LED will be OFF.

The pump will be shut down when clogging is detected in the sample tube. The fault LED will be turned ON to report a fault. The buzzer and pump LED will alternate on and off at a 50% duty cycle to indicate the clogging fault. Once the clogging is removed, the pump will be automatically switched ON again in 5 to 30 seconds.

The onboard water detector will protect the analysis instrument from water damage. The pump will be shut down when water is detected in the sample tube. The fault LED will be turned ON to report a fault. The buzzer and pump LED will be at double-tap intermittent to indicate that water is detected. Once the water is removed, the pump will be automatically switched ON again in 5 to 30 seconds.

A purge function is included in the SCS-1 to clear water from the sample line. When SW1-8 is switched ON, the purge is enabled. The pump will begin running whether water is detected or not. **The analysis instrument must be disconnected from the sample line prior to purging water from the line. Factory default is SW1-8: OFF – Purge disabled.**

Clogging detection can be set to either high or low sensitivity by SW1-7. When SW1-7 is switched ON, high sensitivity is selected. If the flow rate is lower than 0.2LPM, the pump will be shut off and a clogging fault will be reported. When the SW1-7 is switched OFF, low sensitivity is selected. If the flow rate is lower than 0.1LPM, the pump will be shut off and a clogging fault will be reported. **Factory default is SW1-7: OFF - low sensitivity.**

The onboard SPST safe-fail relay will be actuated when any fault is detected. The relay can be set to latching by SW1-6: ON. Switching SW1-6 to the OFF position can reset the latched relay. It will also set the relay to unlatched mode, which means the relay will be actuated when a fault is detected and de-actuated when no fault is detected. **Factory default is SW1-6: OFF - non-latch relay mode.**

The SCS-1 is able to be connected to an M-Controller or Q4-Controller via the RS-485 network as a sensor node. The M-Controller or Q4-Controller can monitor the SCS-1 working status. When the SCS-1 is working normally the reading is 0. When the SCS-1 detects a fault the reading is 9999.

1.2 Specifications

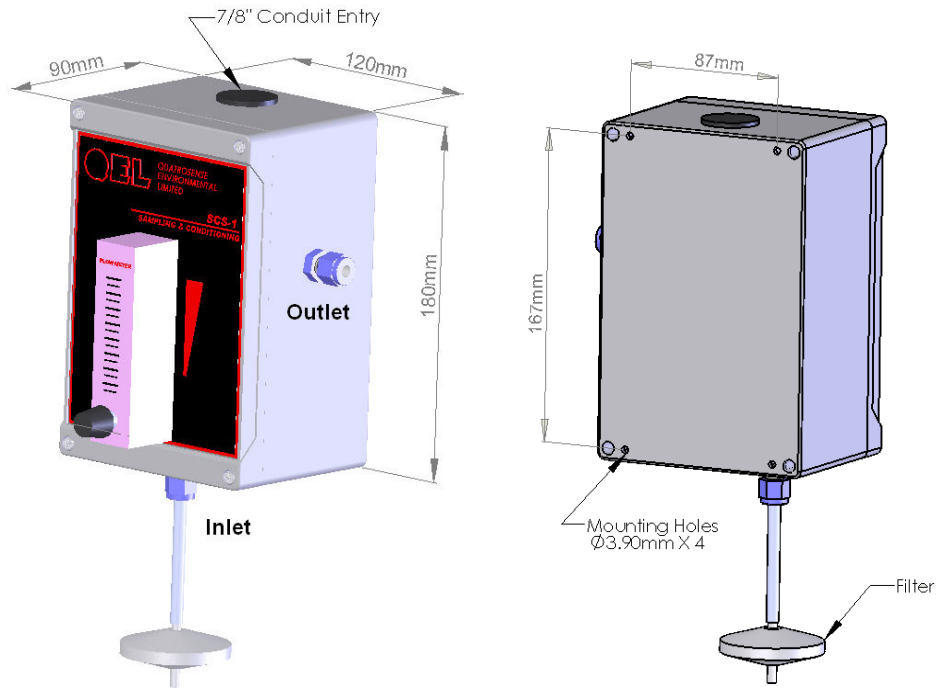
Input Power:	24VDC nominal, range 18 to 30VDC 24VAC nominal, range 15 to 24VAC 50/60HZ Max. 150mA at 24V
Fuse:	F1: 750mA Polyswitch Polyswitch device resets after the fault is cleared and power to the circuit is removed Must be CSA/UL approved.
Flow Rate:	0 – 1.0 LPM
Flowmeter Accuracy:	5% of full scale
Max. Pressure:	4.0 PSI (0.275bar)
Max. Vacuum:	-4.0 PSI (-0.275bar)
Protection:	<ul style="list-style-type: none"> • Clogging detection • Water detection
Panel Indicators:	4 status LED's <ul style="list-style-type: none"> • RS-485 TX status (Green) • RS-485 RX status (Green) • Pump Status (Green) • Fault Status (Red)
Relay:	Fail-Safe Relay, SPST <ul style="list-style-type: none"> • 1.0A maximum at 30 VDC (resistive load) • 0.3A maximum at 125VAC (resistive load)
Buzzer:	80 db at 10cm, 2700HZ <ul style="list-style-type: none"> • Water detected: double-tap intermittent

- Clogging detected: intermittent 50% duty cycle

Output Signal:	RS-485 with OptoMux protocol Available Controller: M-Controller, Q4-Controller
Inlet and Outlet Tube Fittings:	End Connection Size: 1/4 inch End Connection Type: Swagelok® tube fitting Suitable for 1/4 inch Tube OD
Enclosure Rating:	IP66 & NEMA 4, 4X, 12 & 13 ratings UL listed 508 listed (File # E65324)
Operating Temperature:	10°C to 50°C
Ambient Humidity:	95 % for temperatures up to 31 °C Decreasing linearly to 80 % at 40 °C
Storage Temperature:	0°C to 70°C
Enclosure Size:	180mm(7.9inch) X 120mm(4.7inch) X 90mm(3.5inch)
Weight:	Less than 1.5lbs (0.680 kg)

2. Installation

2.1 SCS-1 Physical Dimensions



2.2 Mounting and Wiring

NOTE: The SCS-1 may be mounted in any position as long as ease of access is maintained. Mounting hole size is shown above.

2.2.1 Location Condition

Although the SCS-1 is exceptionally tough and strong the installation should not be exposed to strong chlorine atmospheres or solvents such as benzene, acetone, carbon tetrachloride, etc. The mounting position should be free of excessive vibration since it may prevent the flowmeter from operating properly.

The SCS-1 must be mounted in a vertical position with the inlet connection at the bottom and outlet at the right side.

2.2.2 Inlet Piping Run:

It is good practice to approach the SCS-1 inlet with as few elbows and restrictions as possible. The length of inlet piping makes little difference for normal pressure fed installations. The inlet piping should be as short and open as possible. This will allow operation near atmospheric pressure and thereby insure the accuracy of the device.

2.2.3 Outlet or Discharge Piping:

As on the inlet, discharge piping should be at least as large as the SCS-1 connection. In addition, the piping should be as short and open as possible. This will allow operation of the flow tube at near atmospheric pressure and insure the accuracy of the device.

2.2.4 Cabling

Approved NEMA 4X cable conduit and conduit connectors should be used to ensure a safe and reliable installation. Check the local wiring code for more information. Make sure all conduit connectors are screwed in tight and that they are not coming in contact with any bare conductors.

You may drill an additional access hole into the NEMA 4X enclosure. The access hole should be drilled on the side of the enclosure.

Warning: Be sure to look inside the unit prior to drilling so that there is sufficient clearance for the hole and fitting that you are using. Seal the conduit to prevent foreign material from entering the enclosure.

Terminal blocks TB1 and TB2 (see next page drawing) accept 12 AWG to 24 AWG wire, Use 16 AWG or 18 AWG wire for power supply wires in long wiring runs.

2.2.5 Connectors

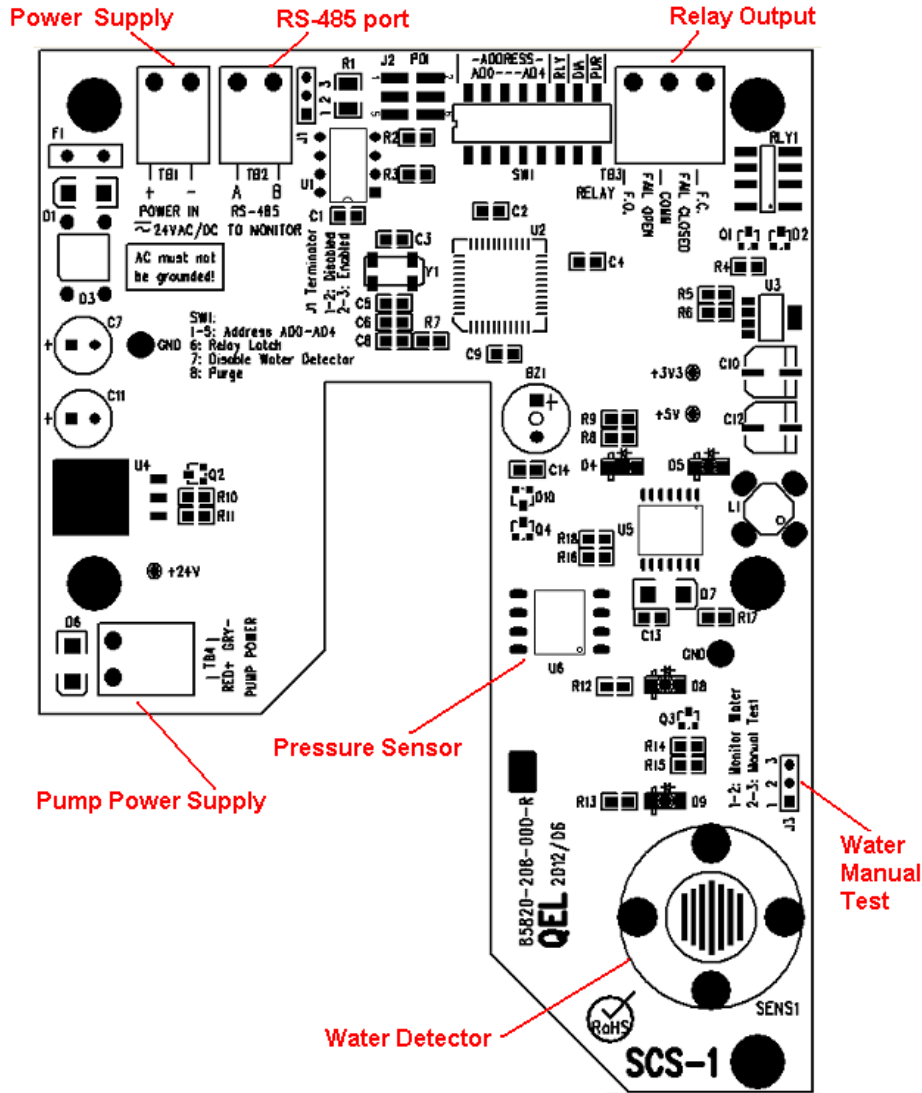
Make sure to observe wiring to the correct terminal blocks.

Note: Incorrect wiring to any of the terminals of the SCS-1 could cause permanent damage to the unit, which is not covered by the warranty. Incorrect wiring could also cause fire, electric shock, or bodily injury. Please observe the polarity on all connections.

Warning: Disconnect the main supply when changing any of the wiring to the unit. Do not touch sensitive components on the circuit card to prevent static discharge damage to the unit.

2.2.6 Power Supply Connection

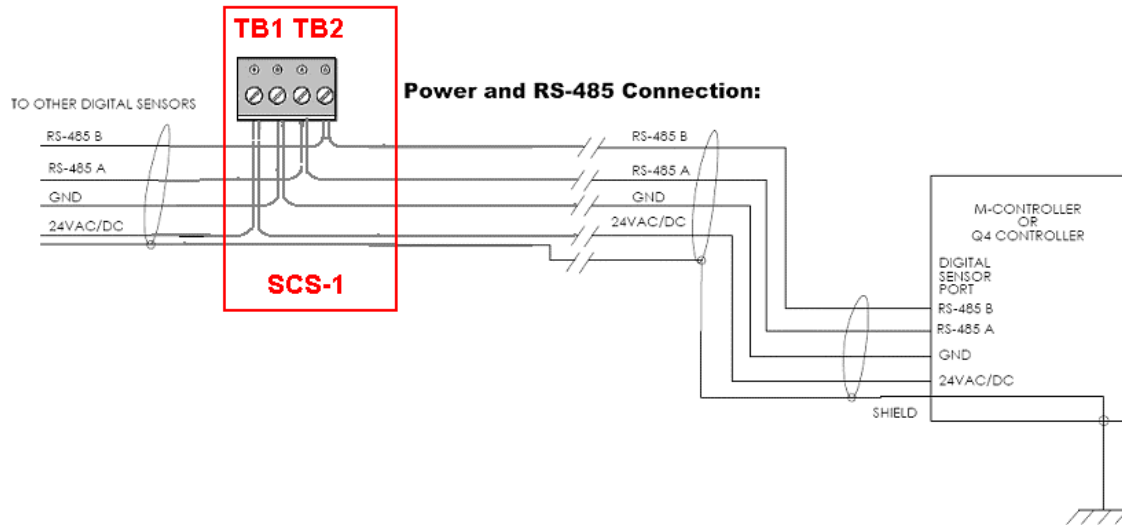
The SCS-1 operates on 24VAC 50/60HZ or 24VDC. There are no selections required by the user to select the input power. The input power is connected to the Power Supply Board using Terminal Block TB1 located inside the unit.



SCS-1 Power Supply Board Installation

Note: The SCS-1 Common/Power Supply Negative is not connected to Chassis Safety Ground.

2.2.7 RS-485 Connection



2.2.8 RS-485 Terminator

The terminator on each end of the RS485 run is designed to match the electrical impedance characteristic of the twisted pair wire and will prevent signal echoes from corrupting the data on the line. The terminator should be enabled on BOTH ends of the RS485 run. Short and medium length ModBus/485 runs can operate without the terminating resistor. Longer runs may require the terminating resistors. But adding terminator dramatically increases power consumption.

The SCS-1 supplies this resistor on the main board and it is chosen using jumper J1.

J1 1-2: Terminator Disabled / OFF (default)

J1 2-3: Terminator Enabled / ON

2.2.9 RS-485 Driver Replacement

RS-485 lines in heavy industrial environments are sometimes subjected to magnetic disturbances causing sufficient inducted power surges to damage the driver integrated circuit (IC). This IC (designated U1) is socketed on the circuit card for ease of replacement in the field.

3. Function and Configuration

3.1 System Initialization

Before power it up, the flow meter should be set properly to avoid clogging alarm. The flow meter should be adjusted to fully close first by turning the knob clockwise direction, then follow two turns counterclockwise direction. Once the pump is constantly working, adjust the flow meter to your flow rate. **NOTE: Fully opened flow meter will cause clogging alarm too.**

When the SCS-1 is turned on it initializes hardware and software. During the initialization procedure the buzzer will emit short beeps.

After the warm-up procedure, if there are no errors, the pump LED is turned ON steady. If there is an error, the Fault LED will be turned ON, the buzzer and pump LED will be at 50% duty cycle to indicate clogging or the buzzer and pump LED will be at double-tap intermittent to indicate that water is detected.

3.2 RS-485 Indicators

When the SCS-1 is connected to an M-Controller or a Q4-Controller, the traffic of the communication can be monitored visually through the two RS-485 indicators. One is the RX LED, which indicates the data stream being received from the controller. The other is the TX LED, which indicates the data stream being sent out from the SCS-1.

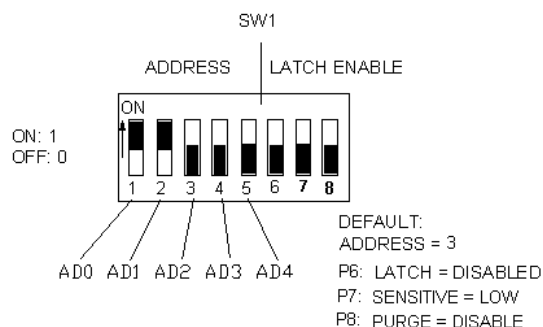
If the TX LED or the RX LED is always ON, that indicates a communication problem.

3.3 RS-485 Addressing

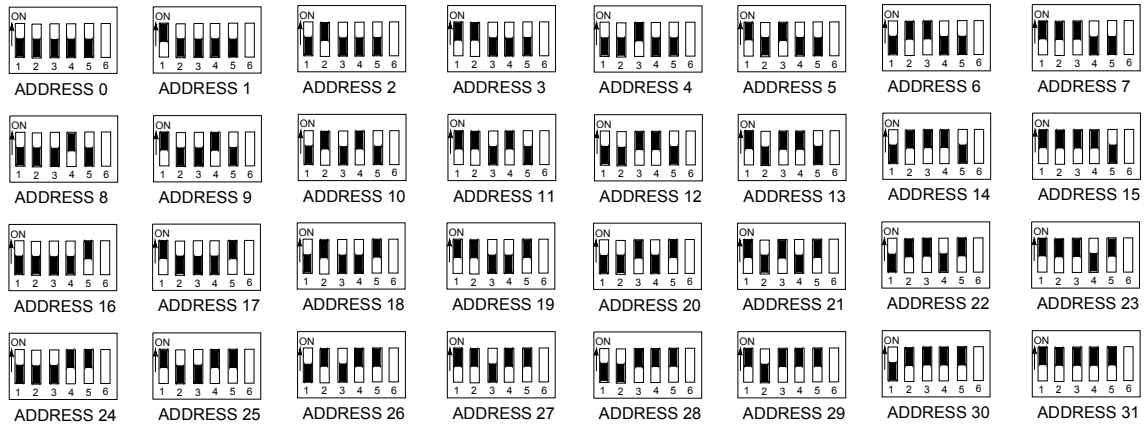
The digital sensor address range that the M-Controller supports is from 0 to 31.

The digital sensor address range that the Q4 Controller supports is from 0 to 3.

The SCS-1 RS-485 address can be defined from 0 to 31 by using SW1 positions 1 to 5. Position 6 is used to define the latch function for the relay. Position 7 is to define the clogging detection sensitivity. Position 8 is to enable the purge function.



Address 0 to Address 31:



SCS-1 Address Setting

3.4 Latch Function

SW1 position 6 = ON: Enable Latched Relay

SW1 position 6 = OFF: Disable Latched Relay (Factory default)

When the latch function is enabled, the fail-safe relay will always be actuated once any fault is detected. The relay will still be actuated even if the fault is removed. The relay status cannot be reset until the power is switched off or the SW1-6 is set to OFF.

When the latch function is disabled, the fail-safe relay will be actuated by any fault found and de-actuated by no fault found. It does not need to be manually reset.

Default is SW1-6: OFF (Disabled).

3.5 Clogging Detection

Clogging detection can be set to either high sensitivity or low sensitivity by SW1-7.

SW1 position 7 = ON: high sensitivity to clogging

SW1 position 7 = OFF: low sensitivity to clogging

In high sensitivity mode, if the flow rate < 0.2LPM, clogging is flagged.

In low sensitivity mode, if the flow rate < 0.1LPM, clogging is flagged.

When clogging is detected:

- the pump will be shut down
- the fault LED will be turned ON

- the pump LED will be at 50% duty cycle
- the buzzer will be at 50% duty cycle
- the gas reading will be 9999
- the relay will be actuated

Default is SW1-6: OFF (low sensitivity).

3.6 Water Detection

When water is detected:

- the pump will be shut down
- the fault LED will be turned ON
- the pump LED will be at double-tap intermittent
- the buzzer will be at double-tap intermittent
- the gas reading will be 9999
- the relay will be actuated

Water detection can be manually tested by shorting J3 pin2-3.

3.7 Purge

SW1 position 8 = ON: Purge function is enabled

SW1 position 8 = OFF: Purge function is disabled

A purge function is included in the SCS-1 to remove contaminant from the sample line. When SW1-8 is switched ON, the purge is enabled. The pump will keep running no matter the water is detected or not. **The analysis instrument must be disconnected from the sample line prior to purging water from the line.**

In the purge mode, the pump is still shut down when clogging is detected for pump protection.

Default is SW1-8: OFF (Purge Disabled).

3.8 Flowmeter Operation

To start the system, open the valve slowly to avoid possible damage. The control valve is turned clockwise to reduce flow, counter clockwise to increase flow. A nylon insert is provided in the threaded section of the valve stem to give a firm touch to the valve and to prevent change of setting due to vibration.

The performance of low range units used in air or gas applications may be affected by static electricity. Excessive static charge may cause the ball float to behave erratically or provide a false reading. To ensure the proper function of the unit, the application should be designed to minimize or dispel static electricity.

The standard technique for reading a Variable Area Flowmeter is to locate the highest point of greatest diameter on the float, and then align that with the theoretical center of the scale graduation. In the event that the float is not aligned with a grad, an extrapolation of the float location must be made by the operator as to its location between the two closest grads.

3.9 Filter Installation

Installing the in-line filter on the SCS-1 inlet fitting can minimize the possibility of dust contamination. The external in-line disk filter supplied with the SCS-1 must be installed using a 3-inch long piece of tubing and connected to the SCS-1 inlet fitting.

3.10 Maintenance

The material selection for each component has been made with consideration for long-term operation. The electric motors are permanently lubricated. A periodic or annual inspection of the air filter is recommended. Replace the filter if filter material appears dirty or clogged.

Ask QEL for replacement of Pump Assembly and Air Filter.

Pump Assembly: QEL SKU#: **85830-107-000**

Air Filter: QEL SKU#: **5500-0076**

WARRANTY STATEMENT

The information contained in this manual is based upon data considered accurate; however, no warranty is expressed or implied regarding the accuracy of this data. All QEL equipment is warranted against defects in material and workmanship for a period of two years from date of shipment with the following exceptions:

Electrochemical Sensors (Toxic) Six Months
Catalytic Sensors (Combustible) One Year

During the warranty period we will repair or replace, at our discretion, any components or complete units that prove, in our opinion, to be defective. We are not liable for consequential or incidental damage to auxiliary interfaced equipment.

A returned material authorization number should be obtained from the factory prior to returning any goods. All return shipments must be shipped freight prepaid and a copy of the maintenance records should accompany the unit concerned.

Warranty should be considered F.O.B. the factory. Labour and travel time are chargeable for any field site visits required for warranty work.

LIMITED LIABILITY

All QEL systems shall be installed by a qualified technician/electrician and maintained in strict accordance with data provided for individual systems in the form of installation/maintenance manuals. QEL assumes no responsibility for improper installation, maintenance, etc., and stresses the importance of reading all manuals. QEL shall not be responsible for any liability arising from auxiliary interfaced equipment nor any damage resulting from the installation or operation of this equipment.

QEL's total liability is contained as above with no other liability expressed or implied, as the purchaser is entirely responsible for installation and maintenance of systems.

This warranty is in lieu of all other warranties, expressed or implied, and no representative or person is authorized to represent or assume for QEL any liability in connection with the sales of our products other than that set forth herein.

NOTE: Due to on-going product development, QEL reserves the right to change specifications without notice and will assume no responsibility for any costs as a result of modifications.

For further information or assistance, contact:

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