HYDRA-SENTINEL

AUTOMATIC CHLORINE SHUTDOWN SYSTEMS

DUAL PNEUMATIC CONTROL

HS12A8V16 & HA13A8V16

ISSUE 1

INSTALLATION & OPERATION MANUAL

IMPORTANT INFORMATION

The equipment described in this manual is designed to be used in conjunction with Liquefied Chlorine Gas, which can be hazardous to the safety of personnel. It is imperative that persons employed in the vicinity of a Chlorine Installation be given an appropriate level of training in Cl_2 safety practices and are aware of the location of safety equipment. Wall charts and handbooks are available from the chlorine supplier that will assist to communicate safe practice in the storage and handling of chlorine.

The Shutdown System is designed as an additional line of defence to an approved safety plan. Its purpose is to automatically shut down the plant if a CL_2 leak has been detected.

Under no circumstances should personnel enter a Chlorine Store without appropriate training and personal protective equipment (PPE) including self-contained breathing apparatus (S.C.B.A.) after detection of a chlorine leak, regardless of whether or not a shutdown system has been installed.

Hydramet has a policy of continuous improvement that is reflected in ongoing changes in design. These may not be immediately incorporated in your copy of the Operating Manual. If in doubt, please contact Hydramet quoting the system's serial number.

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INTRODUCTION

The Hydra-Sentinel is an automatic isolation device for chlorine cylinders and drums for use in areas such as water and wastewater treatment plants. It is intended to shut the primary isolation valves on these containers in the event a significant chlorine leak is detected by independent leak detection hardware. Its principal purpose is the protection of plant and equipment from accelerated corrosion caused by chlorine escape while the installation is unmanned. It is also intended to supplement and enhance the protection against exposure to chlorine gas afforded to operating personnel and the public after a leak has occurred. The Hydra-Sentinel is not intended to prevent leaks from occurring in the first place.

Caution:

Hydra-Sentinel is a supplement to, not a substitute for, an approved emergency response plan related to chlorine leaks.

SYSTEM OVERVIEW

The Hydra-Sentinel is an automatic shutdown system designed and developed to provide a means to automatically shut down single or multiple chlorine containers (cylinders or drums), primarily in response to a chlorine leak at an unattended installation.

The basis of design assures that the system will remain operable under adverse conditions and specifically loss of mains power and/or loss of plant air (if plant air is in use).

As such the primary considerations include:

- Pneumatic operation – Compressed air is supplied from one (1) of the following options
    - "G" size Compressed air or nitrogen cylinders allocated specifically for this function – This includes a pressure regulator suitable for compressed air or nitrogen (Standard Hydra-Sentinel to a maximum of 8 actuator arms).
    - Air Receiver Package – For sites with existing plant air (Standard Hydra-Sentinel to a maximum of 8 actuator arms).
    - Full Air Service Package – This includes a reciprocating air compressor and receiver (Standard Hydra-Sentinel to a maximum of 8 actuator arms).
- The system operates from an integral battery supply, which is continually on charge when mains power (240VAC) is available.
- The system has the ability to be inhibited from shutting down during container change procedures.

Note:

Systems that require more than 8 actuator arms will require multiple pneumatic control panels. Each control panel must have an air supply with the capacities detailed above.

CONSTRUCTION

The system includes the following key components:

- Electrical control panel – incorporating PLC, output relays, battery and charge circuit.
- Pneumatic control panel – incorporating 5 port solenoid valve, air pressure switch, gauge and emergency shutdown push button.
- Quantity of actuator arms (up to 8) as required by the installation.

The panels are designed to be wall mounted.

Compressed air is supplied from one (1) of the following options

- "G" size Compressed air or nitrogen cylinders allocated specifically for this function – This includes a pressure regulator suitable for compressed air or nitrogen (Standard Hydra-Sentinel to a maximum of 8 actuator arms).
- Air Receiver Package – For sites with existing plant air. The package includes a 58 litre air receiver tank, pressure regulator with auto drain filter (reducing plant air pressure to 600kPa), check & pressure relief valves (Standard Hydra-Sentinel to a maximum of 8 actuator arms).
- Full Air Service Package – This includes a reciprocating air compressor with a 58 litre air receiver tank, pressure regulator with auto drain filter (reducing the air compressor pressure to 600kPa), pressure switch and pressure relief valve (Standard Hydra-Sentinel to a maximum of 8 actuator arms).

Each arm is arranged for direct clamping to a chlorine container valve, or to the chlorine vacuum regulator's connection yoke, dependent on the chlorine systems configuration at the site.

Note:

Systems that require more than 8 actuator arms will require multiple pneumatic control panels. Each control panel must have an air supply with the capacities detailed above.

Electrical Control Panel

Includes PLC for sequence control of shutdown actuators, indicators for system status and alarm conditions, back-up battery and charge control circuit.

Supplied from 240VAC single phase supply.

A 12VDC strobe light is located on the top of the control panel for indication of system "Inhibit".

Figure 1 – Electrical Control Panel

Air Supply & Pneumatic Control Panel

Air supplied from one (1) of the previously stated packages with the air pressure set at 600kPa.

There are (3) air connections on the underside of the panel (1 x air in, 2 x air out to actuators). The panel includes a 5 port solenoid valve (12VDC), air pressure switch, pressure gauge and an emergency shutdown push button.

Figure 2 – Pneumatic Control Panel

Shutdown Actuator Arm

There are four (4) standard actuator arms

HSA18 - Chlorine Cylinder Yoke Mount.
Components include:

- Yoke mounting bracket and clamp screw
- Pneumatic cylinder
- Clevis connection
- Uni-directional ratchet assembly

Figure 3 – HSA18 – Yoke Mount Arm, Chlorine Cylinder

HSA28 - Chlorine Drum Yoke Mount.
Components include:

- Yoke mounting bracket and clamp screw
- Pneumatic cylinder
- Clevis connection
- Uni-directional ratchet assembly
- Ratchet retainer and locknut

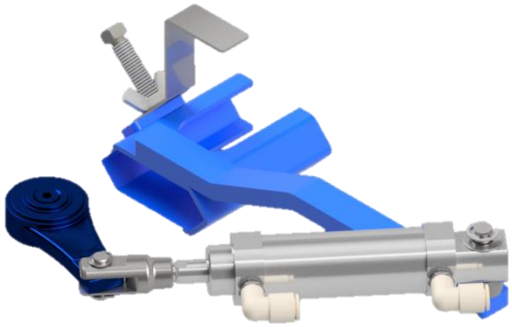

Figure 4 – HSA28 – Yoke Mount Arm, Chlorine Drum

HSA38 - Chlorine Cylinder Valve Mount.
Components include:

- Valve mounting bracket and clamp screw
- Pneumatic cylinder
- Clevis connection
- Uni-directional ratchet assembly

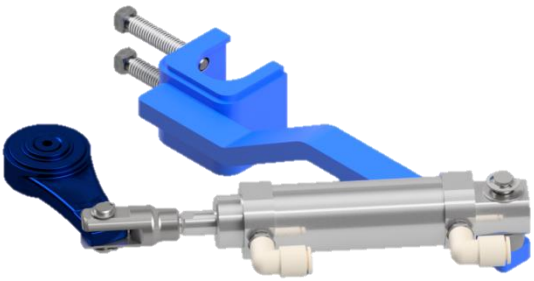

Figure 5 – HSA38 – Valve Mount Arm, Chlorine Cylinder

HSA48 - Chlorine Drum Valve Mount.
Components include:

- Valve mounting bracket and clamp screw
- Pneumatic cylinder
- Clevis connection
- Uni-directional ratchet assembly
- Ratchet retainer and locknut

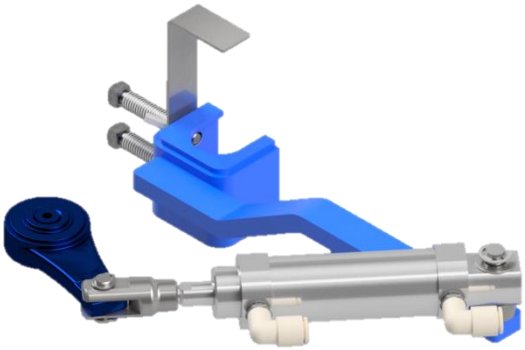

Figure 6 – HSA48 – Valve Mount Arm, Chlorine Drum

TECHNICAL DATA

Enclosure Rating:	Electrical Control Panel	IP65
	Pneumatic Control Panel	IP56
Operating Temperature:		-10°C to +50°C continuous (Excluding Strobe Light)
Humidity:		0 to 99%, Non-condensing
Power:		240VAC, 50Hz, 30 Watts
Distance Actuator Arm to Controller:		20 metres maximum
Contact Rating:		5 Amp at 250VAC, Resistive
Battery Backup:		12VDC, 4 Amp hour (4 hours minimum)
Compressed Air Supply	- Flowrate (L/min):	12 L/min (ANR) per actuator
	- Flowrate per cycle:	20 L/cycle (ANR) per actuator (1 cycle = 50 strokes)
	- Pressure:	600 kPa to 700 kPa
	- Low Pressure:	400 kPa
	- Conditioning:	0.3 micron filter with auto drain and oil mist separator.

MECHANICAL INSTALLATION

Pneumatic Control Panel Location

For ease of installation the pneumatic control panel is pre-mounted to a 340mm x 340mm x 10mm PVC panel. The panel does not have any pre-drilled holes to allow for installation flexibility. Mount the pneumatic control panel to a wall as close as possible to the chlorine cylinders or drums connected for service in a location allowing ease of access for testing and maintenance.

Air Supply Location

Locate the compressed air supply adjacent (or as close as possible) to the pneumatic control panel and secure. If the "Full Air Service Package" is involved it is recommended that the reciprocating air compressor be located outside of the chlorine store. If it is not possible or practical to locate the reciprocating air compressor outside, air supply to the compressor should be sourced from outside of the chlorine store.

Actuator Arm Assembly Installation

With the valves closed on the chlorine drums or cylinders connected for service, fit the actuator arm assemblies to either the valve or yoke connection.

> Note:
>
> Mounting of actuator arm assemblies must be done with the chlorine drum or cylinder valves closed (refer to the connection disconnections procedures in section 3 of this manual).

Flexible Air Line Installation

Connect the 8mm flexible air line tubing to the outlet of the air supply package and then to the "AIR IN" port on the pneumatic panel. Refer to figure 7 below.

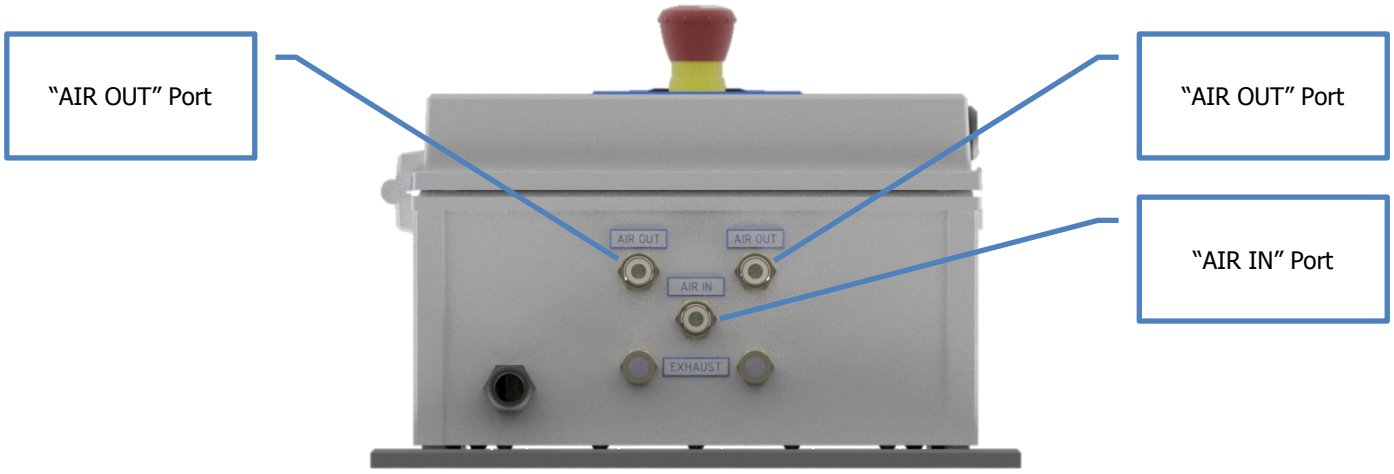

Figure 7 – Pneumatic Control Panel, Air Line Connections

Connect 8mm flexible air lines to the remaining "AIR OUT" ports on the pneumatic control panel. Refer to figure 7 above. Then run the flexible air lines to the actuator arm assemblies on the chlorine drums or cylinders connected for service to a maximum distance of 20m from the pneumatic control panel. Use the 8mm "Tee" connectors for multiple actuator arm assemblies up to a maximum of 8 actuator arms. Refer to figures 8, 9 & 10 below.

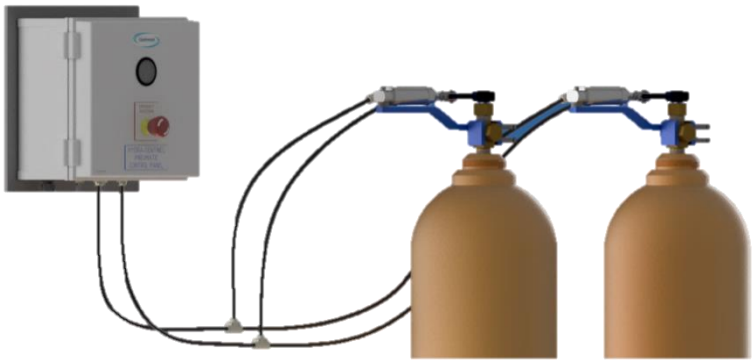

Figure 8 – Typical 2 Chlorine Cylinder Valve Mount Arrangement

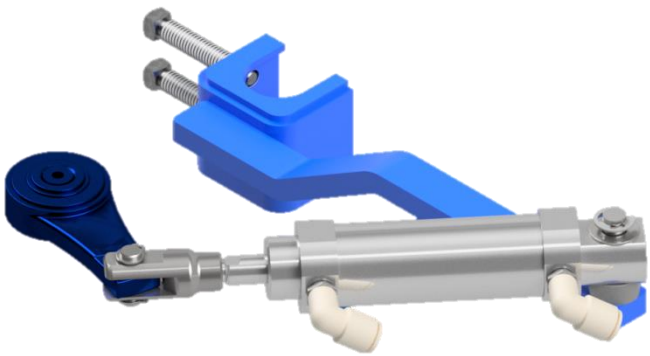

Figure 9 – HSA38 – Valve Mount Arm, Chlorine Cylinder

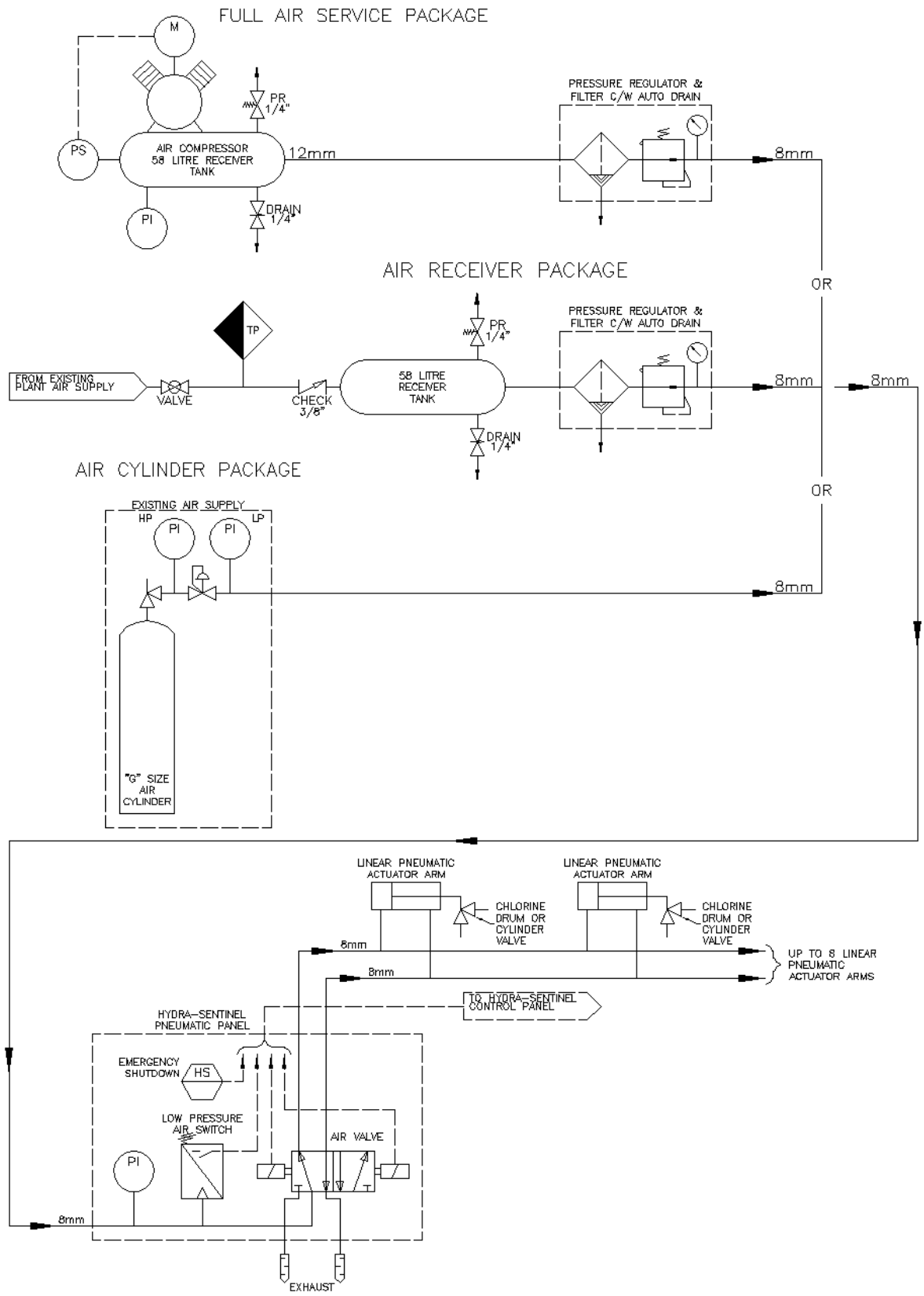

Figure 10 – Piping & Instrument Diagram (P&ID)

ELECTRICAL INSTALLATION

Electrical Control Panel Location

Whilst the electrical control panel's IP65 enclosure is suitable for location within a chlorine store if absolutely necessary, it is recommended that it be located within a room or building not used for the storage of chlorine containers, such as a control room or a chlorinator room.

For ease of installation the control panel is pre-mounted to a 440mm x 340mm x 10mm PVC panel. The panel does not have any pre-drilled holes to allow for installation flexibility. Mount the control panel to a wall in a location allowing ease of access for testing and maintenance.

Electrical Control Panel Connections

The electrical control panel is supplied as standard with a 3m 240VAC flexible lead and plug; however, this may be replaced with fixed 240VAC wiring if desired.

Field wiring required for the shutdown system includes connection of a customer supplied 0.5mm^2 (minimum) one (1) pair instrument cable between a normally closed contact on the chlorine leak detector and terminals on the Hydra-Sentinel electrical control panel.

Below are two (2) tables of remote input and output terminals (excluding interconnection between the electrical control panel and the pneumatic control panel).

Remote Input Terminals		
Input	**Terminals**	
Remote Shutdown (N/C external push button etc.)	1	2
Leak Detected (N/C input from leak detector)	3	4

Table 1 – Remote Input Terminals

Note:
Inputs are fail safe and must be bridged out if not used.

Output Terminals			
Output	**Terminals**		
	Com	**N/O**	**N/C**
Power Fail Alarm	5	6	7
Shutdown Alarm	8	9	10
Low Voltage Alarm	11	12	13
Low Air Pressure Alarm	14	15	16
Inhibit Mode Active	17	18	19

Table 2 – Output Terminals

Note:

As all alarms are fail-safe the table above indicates the output relays in their powered state (e.g. no faults or alarms)

Electrical Control Panel & Pneumatic Control Panel Interconnections

The electrical control panel and pneumatic control panels are connected using a customer supplied 0.5mm^2 (minimum) four (4) pair instrument cable. The terminal connections are detailed in table 3 below.

Electrical Control Panel & Pneumatic Control Panel Interconnections					
Function		Terminals			
		Control Panel		Pneumatic Control Panel	
Pneumatic Panel 1	Remote Shutdown (Emergency Shutdown)	21	22	21	22
	Solenoid 1 (5 port solenoid valve)	23	24	23	24
	Solenoid 2 (5 port solenoid valve)	25	26	25	26
	Low Air Pressure (Pressure Switch)	27	28	27	28
Pneumatic Panel 2	Remote Shutdown (Emergency Shutdown)	29	30	29	30
	Solenoid 1 (5 port solenoid valve)	31	32	31	32
	Solenoid 2 (5 port solenoid valve)	33	34	33	34
	Low Air Pressure (Pressure Switch)	35	36	35	36

Table 3 – Electrical Control Panel & Pneumatic Control Panel Interconnections

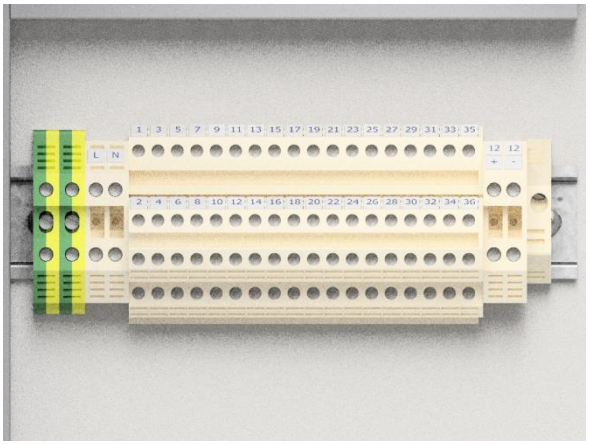

Figure 11 – Electrical Control Panel Terminals

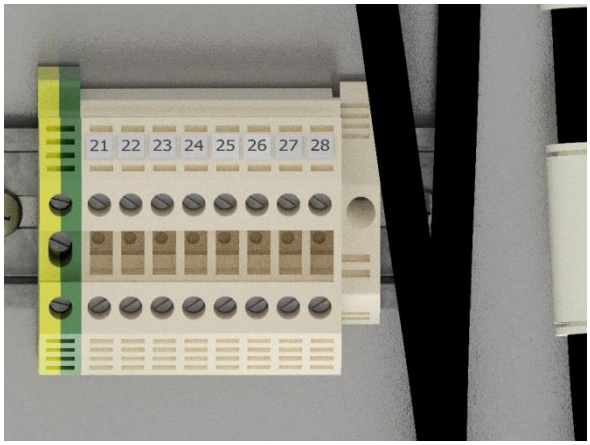

Figure 12 – Pneumatic Control Panel 2 Terminals

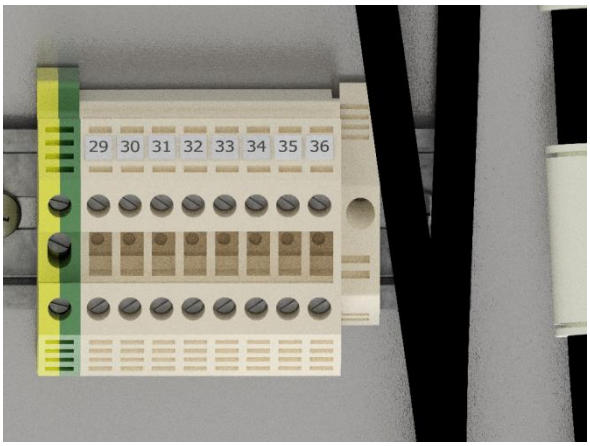

Figure 13 – Pneumatic Control Panel 2 Terminals

Note:

Refer to Section 6 of this manual for electrical control schematic drawings.

Electrical Control Panel & Pneumatic Control Panel Cable Entries

Both the electrical control panel and the pneumatic control panel have pre-installed 20mm cable glands for the 240VAC power supply and interconnecting instrument cables. The electrical control panel has an additional 20mm cable gland for the leak detector input cable entry. Additional cable entries can be added on the bottom of the enclosures for input or output instrument cables to meet other site specific requirements. If top entry is required, this must be done with care on the top of the enclosures either side of the strobe light to ensure that the power supply, relays, backup battery charge circuit board and backup battery are not damaged.

Figure 14 – Electrical Control Panel Cable Entries

Figure 15 – Pneumatic Control Panel Cable Entry

OPERATION

Determining the Model of Hydra-Sentinel

There are two (2) standard models of Hydra-Sentinel electrical control panels which operate slightly different from each other. The two standard models are HS12A8V16 and HS13A8V16. The easiest way to determine which model is applicable is that the HS12A8V16 has the red & white warning label and the model number is the first 8 characters of the serial number located in the lower left corner of the internal swing door as shown below in figures 15 and 17. The HS13A8V16 has no warning label and the model number is the first 8 characters of the serial number located in the lower left corner of the internal swing door as shown below in figures 16 and 18.

Figure 16 – Front View – HS12A8V16

Figure 17 – Front View – HS13A8V16

Figure 18 – Serial No. – HS12A8V16

Figure 19 – Serial No. – HS13A8V16

Theory of Operation

Operation of the system is normally initiated by a conventional chlorine detector, (with single or multiple sensors), which may be existing, supplied separately with the system or as part of the system. The system is also designed to allow an input from two (2) remote shutdown pushbuttons (or similar). One (1) shutdown pushbutton is integral with the pneumatic control panel and the other is an optional input. A contact opening (breakage of the circuit) at this input will initiate immediate actuation of all container shutdown actuators.

Other means of initiation may be as a result of the system operational integrity being at risk.

These integrity inputs include:

- Loss of air supply – Shutdown will be initiated if the supply air pressure (normally set at 600kPa) falls to 400kPa.
- System supply voltage (13.2VDC) – Shutdown will be initiated if the battery supply voltage falls below 11.2VDC

Notes:

HS12A8V16

Inputs from low voltage and low air pressure are **NOT** configured in this system to initiate immediate shutdown. Only output alarms are initiated and available to permit remote notification.

HS13A8V16

Inputs from low voltage and low air pressure are configured in this system to initiate immediate shutdown. Output alarms remain available to permit remote notification.

These inputs activate an electronic module that generates pulsed signals that alternately power a pair of solenoids. The solenoids operate a pneumatic 5 port solenoid valve that delivers pulses of compressed air to drive a reciprocating linear piston actuator(s) held by a bracket or arm clamped to the body of the primary isolation valve on the chlorine container. This piston is attached via a connecting rod to a ratchet spanner fitted to the square stem of the valve. When operated, the ratchet action of the spanner closes the primary isolation valve on the chlorine container.

Note:

The ratchet arrangement is configured to operate only in one direction, closing. This device cannot automatically open container valves.

The module incorporates a watchdog facility which initiates an alarm on detecting electronic malfunctions of the module, or low voltage in the battery supply.

Electrical Control Panel Basic Layout

The internal layout of the electrical control panel is as shown in figure 19 below.

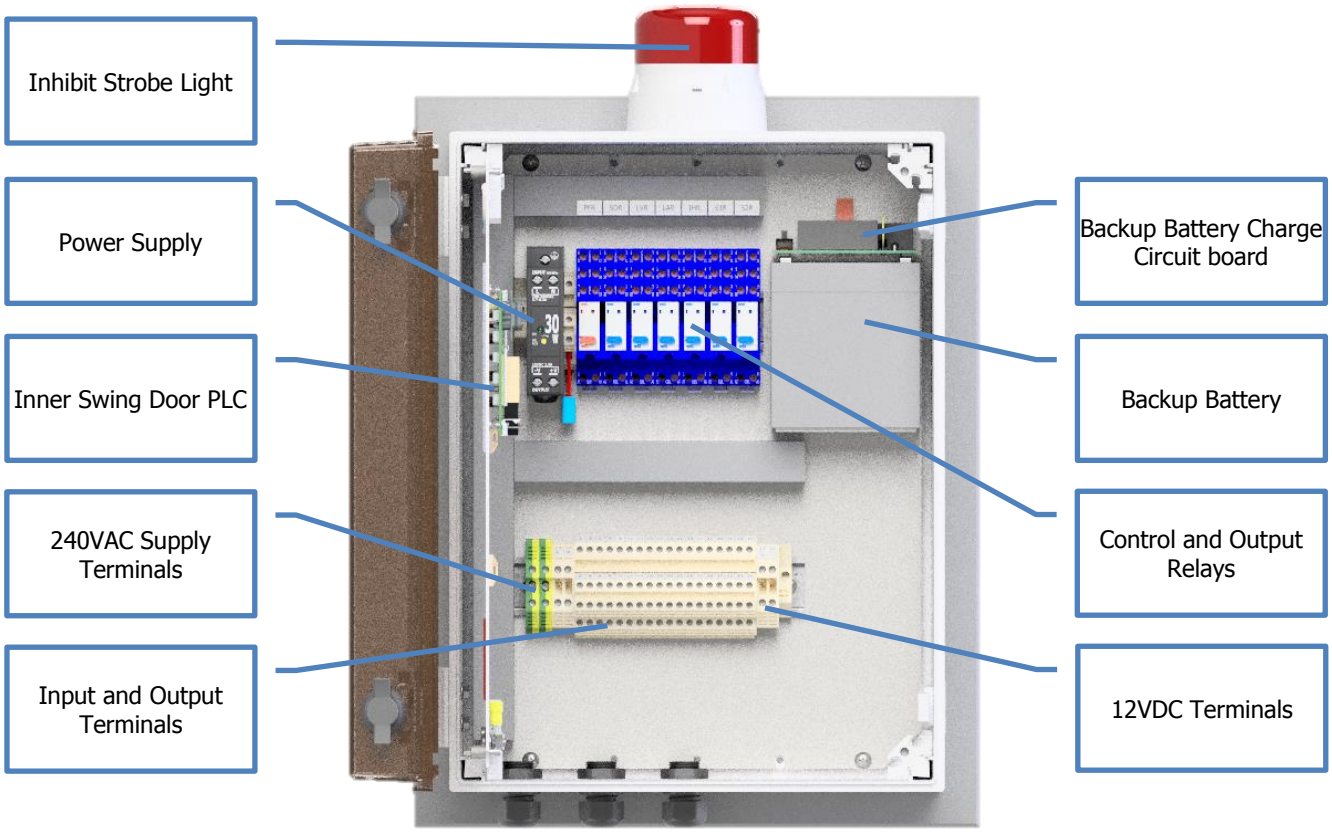

Figure 20 – Electrical Control Panel Internal Layout

Electrical Control Panel Basic Functions & Indications

The electrical control panel has a PLC mounted to the inner swing door and has a basic display and pushbuttons accessible with the external polycarbonate door open. The PLC has eight (8) indicator LED's and three (3) pushbuttons with the functions as shown in figure 20 below.

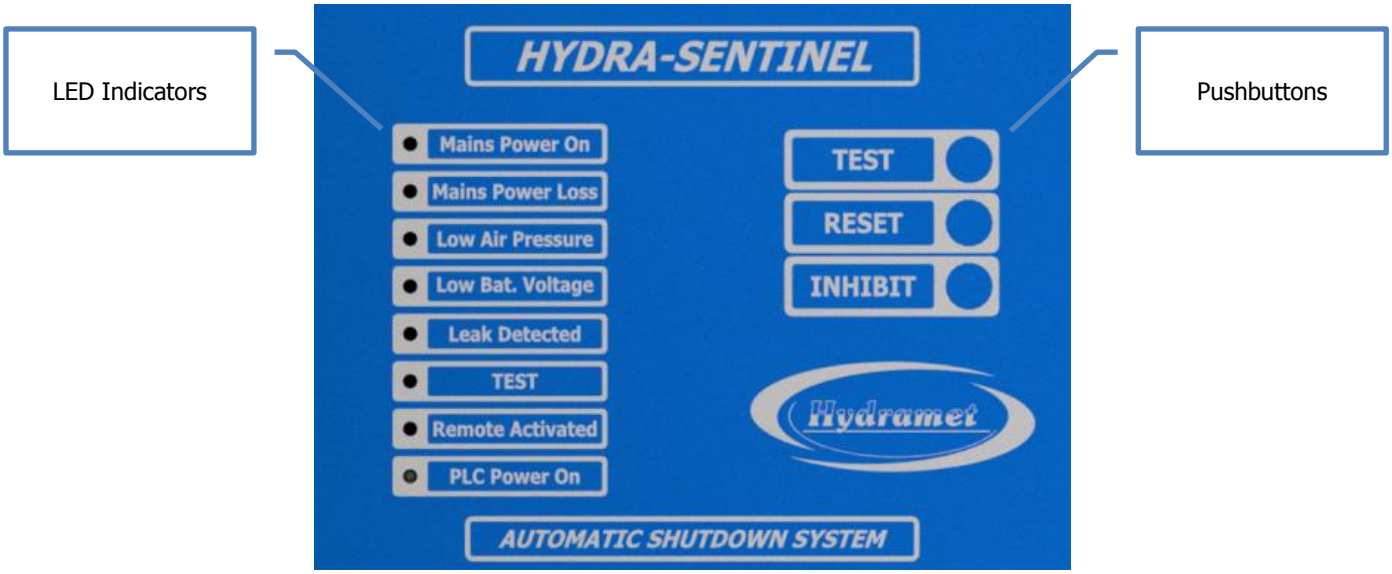

Figure 21 – PLC Facia Layout

Function		Indication
Pushbuttons	Test Button	Red test LED, flashing when initiated.
	Reset Button	Any Indications are reset providing no alarm(s) exist or have been remedied.
	Inhibit Button	All red LED's (except "Mains Power On") flash and the strobe light on the top of the enclosure illuminates when initiated.
Indicator LED's	Mains Power On	Red LED, solid when power available.
	Mains Power Loss	Red LED, flashes when mains power is lost.
	Low Air Pressure	Red LED, flashes when air pressure is low.
	Low Bat. Voltage	Red LED, flashes when battery voltage is low.
	Leak Detected	Red LED, flashes when a leak has been detected (by the leak detector).
	TEST	Red LED, flashing when test button initiated.
	Remote Activated	Red LED, flashing when Remote Activation initiated.
	PLC Power On	Green LED, solid when 12V DC is available.

Table 4 – PLC Facia Pushbuttons & Indicators

Electrical Control Panel Pushbutton Functions

"TEST" Pushbutton

The "TEST" pushbutton is a system function test that is typically used for commissioning or testing of the system without initiation and/or an alarm from the leak detector. Initiating the "TEST" function will result in a complete system shutdown and the "SHUTDOWN ALARM" relay output is activated. Once the system has completed its cycle it is reset by pushing the "RESET" pushbutton.

"RESET" Pushbutton

The "RESET" pushbutton is used for resetting the entire system including any relay outputs following any system shutdown initiated by either an actual leak detection event or a remote shutdown being activated. The "RESET" function is also used for re-initiating the system that has been inhibited by the "INHIBIT" pushbutton.

The "RESET" function will only reset the system if all external alarms/inputs have been cleared.

"INHIBIT" Pushbutton

The "INHIBIT" pushbutton is used for completely inhibiting the system during container disconnection/connection procedures to prevent the system operating even if a small amount of chlorine gas is released from the connection (e.g. from between the container valve and the auxiliary valve). The "INHIBIT" function can also be used for preventing the system from being initiated for other activities such as leak detector testing during which activation of the shutdown system may not be desired and/or required.

When the "INHIBIT" function is initiated all the red LED indicators (except for the "Mains Power On" LED) will flash, the red strobe light on the top of the control panel will illuminate and an "INHIBIT MODE ACTIVE" relay output will also be activated. This relay output can be used to provide indication to a control room or a SCADA system.

The inhibited system can be reset at any time by pressing the "RESET" pushbutton, which stops all red LED indicators flashing, turns off the red strobe light and resets the "INHIBIT MODE ACTIVE" relay. The "INHIBIT" function is automatically overridden after 2 hours to prevent the system from being otherwise idle should the "RESET" function not be performed following a container disconnection/connection procedure, a leak detector test, or due to operator error.

Note:

The TEST and INHIBIT pushbuttons must be depressed for at least ½ a second to initiate.

Electrical Control Panel Relay Outputs

The electrical control panel's five (5) output relays offer voltage free contact outputs. The relays are powered on under normal conditions making them fail-safe. In the event of an alarm or a failure, the relays lose their power providing a change of state. The following are the available relay outputs.

"POWER FAIL ALARM"

The "POWER FAILURE ALARM" relay de-energises on the loss of 240VAC mains supply to the electrical control panel. The system will still function from the 12VDC battery backup.

"SHUTDOWN ALARM"

The "SHUTDOWN ALARM" relay de-energises upon activation from an input such as leak detected or a remote shutdown initiation (e.g. emergency shutdown pushbutton being pressed). The pressing of the "TEST" pushbutton will also de-energise the relay.

"LOW VOLTAGE ALARM"

The "LOW VOLTAGE ALARM" relay de-energises on low battery voltage (11.2VDC and below) while the unit is running off the backup battery (e.g. during and extended power failure).

> Note:
>
> HS13A8V16 models will initiate a system shutdown due to a "Low Voltage Alarm" condition, which will also de-energise the "SHUTDOWN ALARM" relay.

"LOW AIR ALARM"

The "LOW AIR ALARM" relay de-energises on low air pressure (400kPa and below).

> Note:
>
> HS13A8V16 models will initiate a system shutdown due to a "Low Air Alarm" condition, which will also de-energise the "SHUTDOWN ALARM" relay.

"INHIBITED MODE ACTIVE"

The "INHIBITED MODE ACTIVE" relay de-energises when the "INHIBIT" pushbutton is pressed to inhibit the system for container disconnection/connection procedures or for leak detector test procedures, etc.

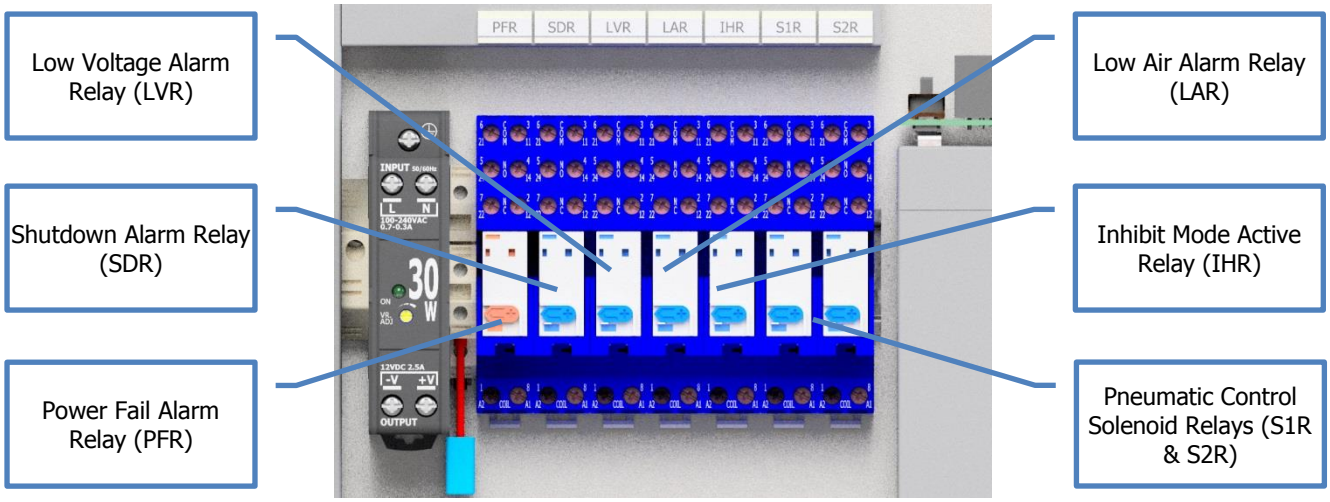

Figure 22 – Electrical Control Panel Relay Layout

Universal Power Supply

The electrical control panel utilises a 12VDC 30W switch mode power supply with overcurrent/overvoltage protection. The input voltage to the power supply module is 100 – 240VAC, 50/60Hz that automatically adjusts to the correct input voltage.

Figure 23 – 30W Power Supply

The output of the power supply is regulated at 13.2VDC, which is pre-set by the voltage adjustment on the front of the module. The DC output terminals connect to the control system and the external battery backup system. This voltage permits float charging of the 12VDC sealed lead acid battery for automatic shutdown system back-up power.

The 30W power supply modules are rated for 2.5A output, but they will deliver higher current for periods of time. The control system which includes the relays and PLC etc. draws approximately 190mA. The external battery back-up unit can draw up to 750mA for a few hours if the battery is deeply discharged, which will drop sharply as the battery approaches full charge. The strobe light will draw approximately 140mA when activated.

The power supply overcurrent protection operates when the output current exceeds 105% of the rated current. Overload protection is then triggered and the output voltage starts decreasing. When the output current returns within the rated range, the overload protection function is automatically cleared. The overvoltage protection operates when the output voltage of the power supply rises to 120% or more of the rated value whereby the output voltage will shut off. The only way to restore power is via a manual reset, which requires turning of the AC supply to the system for approximately 1 minute then turning the AC supply back on again.

Mounting of power supply modules is achieved by clipping them to a standard 35 x 7.5 mm DIN rail. A spring loaded clip holds the power supply module to the rail and is used for mounting and removal. From the front, the clip is seen as a blue loop at the bottom of the power supply module. To remove from a rail, place a small screwdriver into the opening in the blue loop and pull outward until the power supply module releases from the rail. Reverse the procedure to mount the power supply module.

Note:

The power supply module is sealed and the seal should never be broken. Never attempt to disassemble or service the power supply module. Service on this module should only be done by a qualified service technician familiar with the circuit design and equipped with the proper service equipment. Severe electrical shock may result from touching internal components with input power applied.

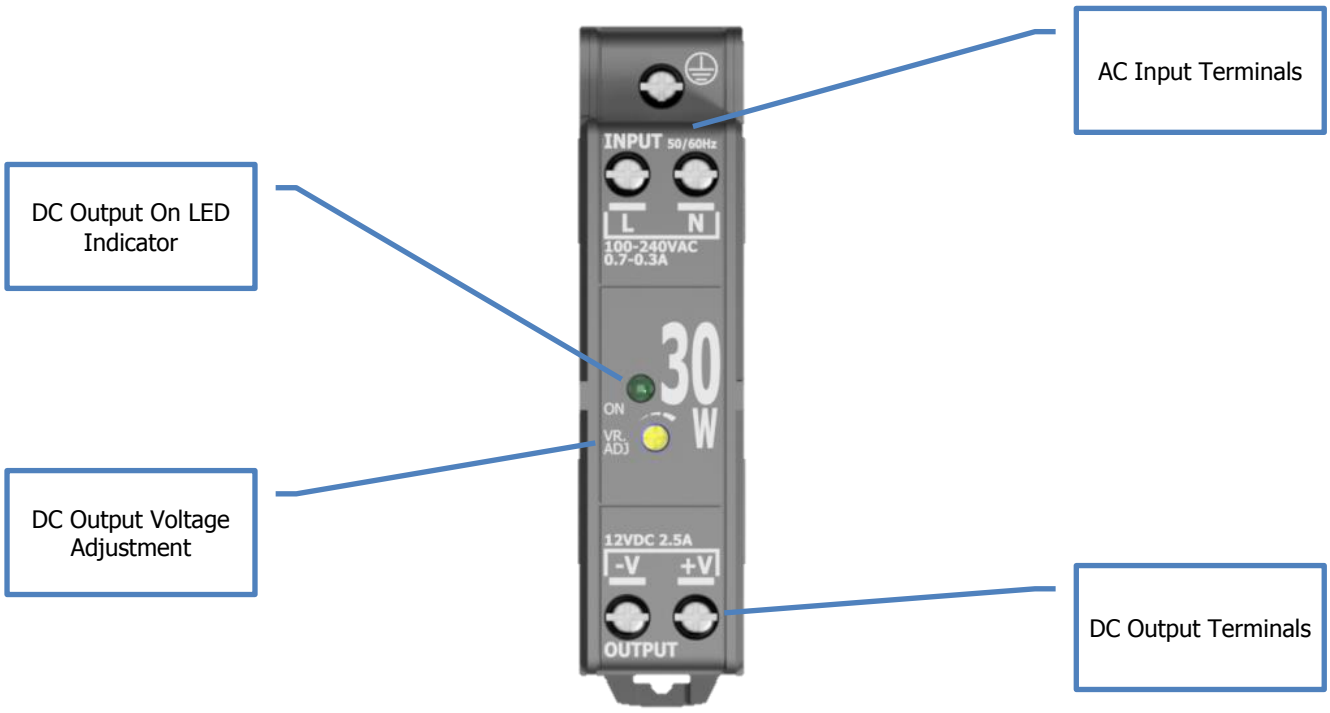

Figure 24 – 30W Power Supply Terminal Connections

Battery Back-Up

Battery back-up for the Hydra-Sentinel electrical control panel includes a 12 volt 4 ampere-hour sealed lead acid battery and a back-up battery charge circuit board. The battery is held in place by 2 cable ties on a specifically designed bracket at the top right hand side of the electrical control panel. The back-up battery charge circuit board is mounted directly to the battery terminal posts.

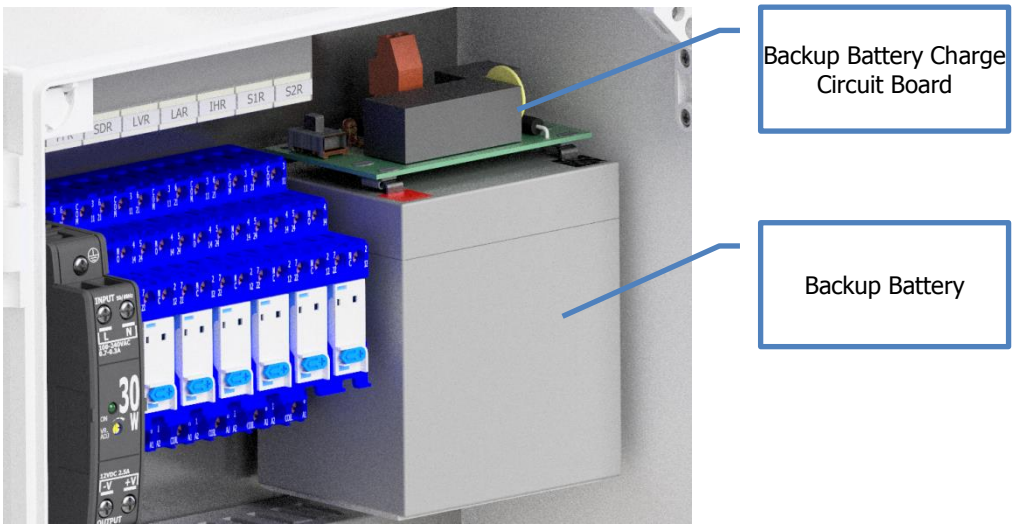

Figure 25 – Battery Back-up Component Locations

Electrical connection is made between the battery back-up, battery back-up circuit board and the power supply module via the wiring loom. The battery back-up circuit board connections to the battery are not polarity sensitive as far as the connection to the battery is concerned. In the event a non OEM battery is utilised it may be that its terminals are an opposite polarity. If the red LED is illuminated the polarity is incorrect. This is corrected by changing the position of the polarity switch located next to the red LED as shown below in figure 25. With the red LED not illuminated the polarity is correct.

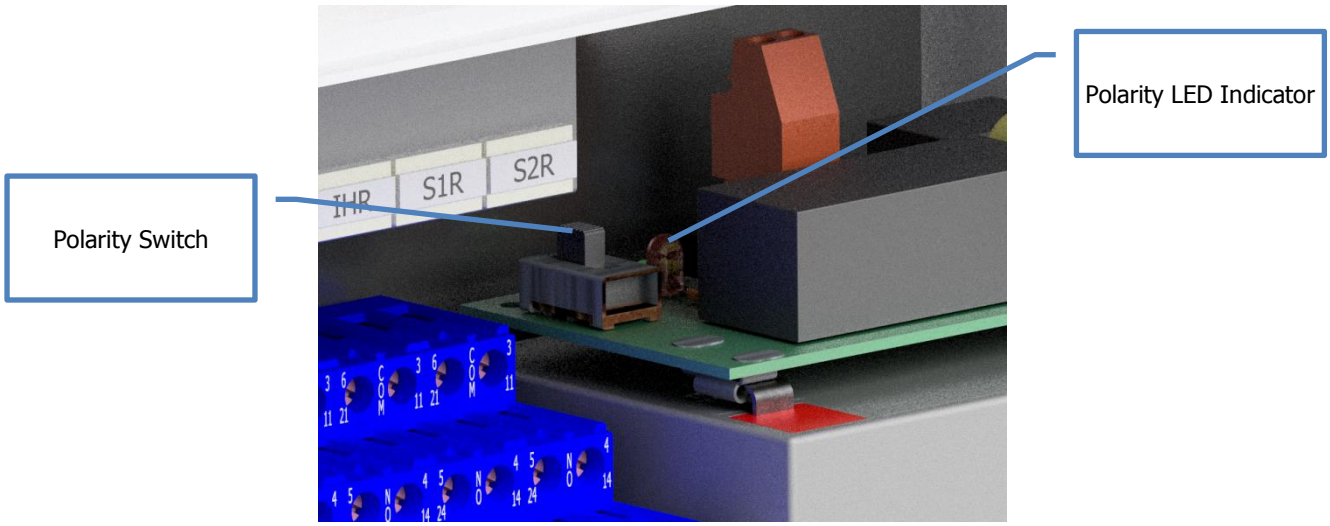

Figure 26 – Back-up Battery Charge Circuit Board

Battery Back-Up Operation

When power is applied from the power supply module, a relay on the battery back-up circuit board energises and places the battery back-up into operation. There are no other user adjustments in the battery back-up unit other than the polarity switch located next to the polarity indicating LED. If the battery is not fully charged, the power supply will begin supplying charge current to the battery, and will float charge the battery as long as the power supply is on.

Should the power supply loose its input power, the battery back-up will immediately supply power to the control system without interruption. The battery back-up is capable of providing back-up for a minimum period of 4 hours, but the back-up period is typically much longer.

The battery circuit board serves two functions. First, it regulates the charging current to the battery to a maximum of 0.75 amps. This prevents possible damage to the battery due to an excessively high charge current. Secondly, it isolates the battery from the shutdown system when the battery voltage falls below 10VDC. This is done through a relay and protects the battery against damage caused by very deep discharge.

The isolation relay that protects against deep discharge will also protect the battery against an external short circuit of the wires connected to it. If a short occurs the relay will immediately open, protecting the battery and limiting the current that the battery will deliver.

Pneumatic Control Panel Basic Layout

The basic layout of the pneumatic control panel is as shown in figure 26 below.

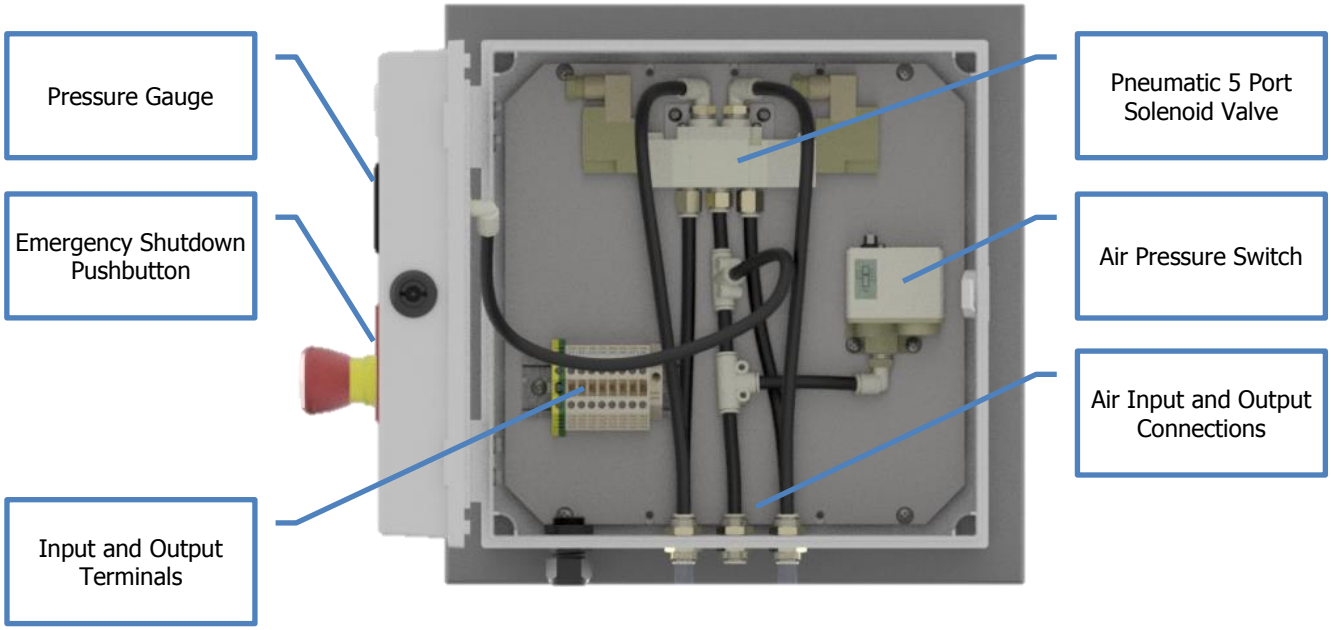

Figure 27 – Pneumatic Control Panel Internal Layout

Pneumatic Control Panel Emergency Pushbutton

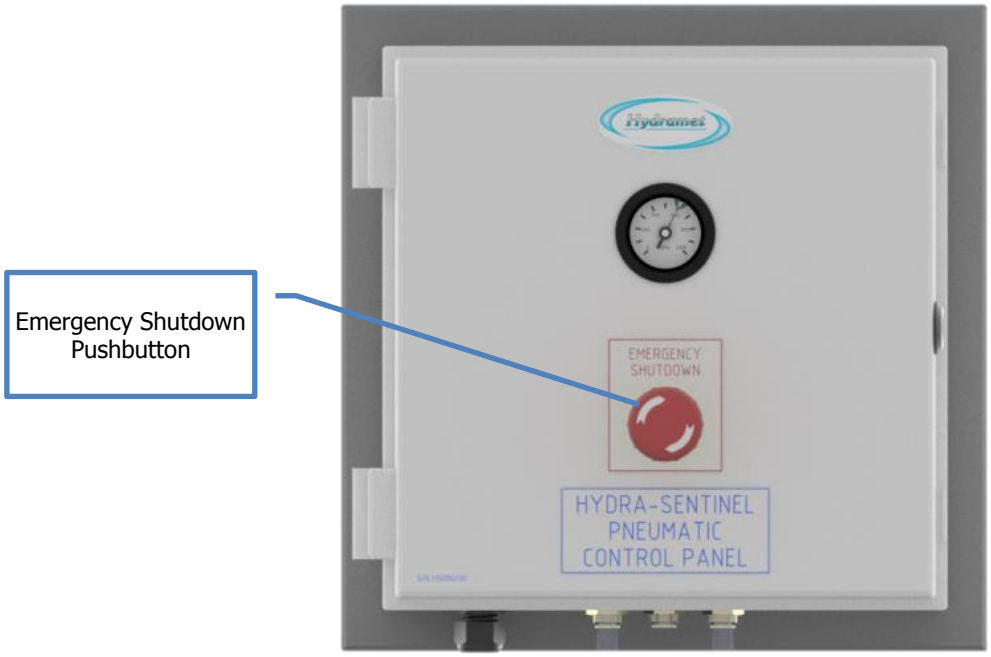

Figure 28 – Pneumatic Control Panel Front View

As the electrical control panel is typically located in a location other than the container store/area and the pneumatic control panel is typically located in the container store/area, the pneumatic control panel is fitted with an "EMERGENCY SHUTDOWN" pushbutton (latching normally closed). Pressing of the "EMERGENCY SHUTDOWN" pushbutton will immediately initiate a shutdown sequence.

To reset the system after an "EMERGENCY SHUTDOWN" sequence requires unlatching of the "EMERGENCY SHUTDOWN" pushbutton by twisting it in a clockwise direction and allowing it to release outwards. Thereafter the "RESET" pushbutton can be pressed on the electrical control panel to return the system to its normal functional condition (ready state).

SYSTEM OPERATIONAL PROCEDURES

For the purpose of this procedure, there are three (3) key elements which must be considered in the operation of the system.

- Procedure to be followed when changing chlorine drums or cylinders
- Procedure to be followed when testing the shutdown system
- Procedure for attending to an installation after a shutdown has occurred.

Important Notes

- The shutdown system will immediately initiate closure of all connected containers on detection of a chlorine leak (Typically at a level of 5ppm). This shutdown action includes the rapid reciprocating action of all pneumatic cylinders connected to the system.

Caution:

It is important that the actuators are not being hand held when this occurs, as it presents a potential hazard or injury.

- The shutdown system is intended as a site safety feature to shut off all chlorine supply at the source should a leak or system integrity fault occur.

Caution:

Inadvertent shutdown of the chlorine supply at water and wastewater treatment plants will generally result in unacceptable plant operating conditions. Overall plant procedures and operation methods should always be considered as a priority when shutdown system testing or maintenance is taking place.

- In the case of chlorine system's drawing from a drum's liquid phase valve it is likely that liquid chlorine will be locked between two (2) closed valves if a shutdown occurs. This liquid lock is typically between the container valve and the manifold mounted automatic sequence valve. The potential over pressure condition that results from this liquid lock is catered for by the inclusion of a liquid line pressure relief system fitted between the (2) valves.

  Whilst no personal or system hazard is created by this event, it is important to be aware of the situation and remedy the condition at the soonest opportunity.

- When changing drums or cylinders it is possible that a small amount of chlorine gas may be released from the connection (e.g. from between the container valve and the auxiliary valve). This minor release in some circumstances may be detected by the chlorine leak detector. If the level of leak is sufficient, a shutdown event will be triggered if the shutdown system is switched on and operating normally. This will result in all connected drums being isolated.

Note:

As this is typically an unacceptable condition, the operation of the shutdown system should always be inhibited whenever a container change is in progress.

Procedure for Initial Connection of Shutdown System Actuators

- Confirm that actuator air lines are connected and assemblies are located adjacent to each chlorine container – **NOT FITTED** – clear of any obstructions
- Confirm that the 240VAC power to the electrical control panel is isolated at the supply (circuit breaker etc.).
- At the air supply package, confirm that all connections have been made through to the pneumatic control panel.
- Charge the air supply package with air and ensure the system is charged to 600kPa.
- Confirm there are no leak alarms on the connected leak detector(s).
- Reinstate the 240VAC supply to the electrical control panel.
- Confirm the red "Mains Power On" LED and the green "PLC Power On" LED are illuminated – all other indicators should be off.

The system is now in a ready state, and all inputs are in a safe condition.

Before proceeding with connection of the actuators, it is important to inhibit any unforeseen actuator operation that may be initiated by chlorine detection, or remote input initiation, during the operation.

Initial Connection – Valve Mount

1. At the electrical control panel, press and hold the "INHIBIT" pushbutton for at least ½ a second. There will be a short "beep" and all the red LED's will flash and the red strobe light will illuminate.
2. This will inhibit any actuator operation.
3. If possible, close all container valves.
4. Fit all shutdown actuators to the relevant container valve(s). Ensure that the actuator clamping screws are tight.
5. If any container valves were closed re-open as per the following.
    a. Carefully crack open the container valve for 1 to 2 seconds, then shut it again. This will admit a small amount of chlorine to the coupling. Check for leaks using an ammonia puffer bottle.
    b. If no leaks are detected, open the container valve 1¼ turns and check again for leaks using an ammonia puffer bottle.
6. Fit the ratchet head over the valve spindle. Extend or retract the cylinder arm as necessary to align the ratchet splines with the valve spindle.
7. For drum applications, locate the ratchet retainer over the ratchet head then secure with the clamping wing nut. Ensure that all air lines are clear of any moving parts. The actuator arm is now ready.
8. Repeat for all other containers.
9. At the electrical control panel briefly press the "RESET" pushbutton. There will be a short "beep" and all the red LED's and the red strobe light will turn off.
10. Confirm the red "Mains Power On" LED and the green "PLC Power On" LED are illuminated.
11. The system is now in a ready condition and will shut down all of the container valves if a leak occurs or a remote input is initiated.

Initial Connection – Yoke Mount

Caution:

As the yoke mount actuator clamps directly to the pressure connection there is potential for a chlorine gas leak. For this reason it is important that the container valves be closed whenever fitting or removing a yoke mounted actuator arm.

1. At the electrical control panel, press and hold the "INHIBIT" pushbutton for at least ½ a second. There will be a short "beep" all the red LED's will flash and the red strobe light will illuminate.
2. This will inhibit any actuator operation.
3. Close all container valves.
4. Fit all shutdown actuators to the relevant container valve(s) and re-open as follows.
    a. Slide the yoke mount actuator arm onto the yoke. Once the actuator arm is completely onto the yoke, tighten the clamp bolt.
    b. Retighten the vacuum regulator yoke clamp.
    c. Carefully crack open the container valve for 1 to 2 seconds, then shut it again. This will admit a small amount of chlorine to the coupling. Check for leaks using an ammonia puffer bottle.
    d. If no leaks are detected, open the container valve 1¼ turns and check again for leaks using an ammonia puffer bottle.
5. Fit the ratchet head over the valve spindle. Extend or retract the cylinder arm as necessary to align the ratchet splines with the valve spindle.
6. For drum applications, locate the ratchet retainer over the ratchet head then secure with the clamping wing nut. Ensure that all air lines are clear of any moving parts. The actuator arm is now ready.
7. Repeat for all other containers.
8. At the electrical control panel briefly press the "RESET" pushbutton. There will be a short "beep" and all the red LED's and the red strobe light will turn off.
9. Confirm the red "Mains Power On" LED and the green "PLC Power On" LED are illuminated.
10. The system is now in a ready condition will shut down all of the containers valves if a leak occurs or a remote input is initiated.

Procedure for Chlorine Container Change (Valve Mount)

Note:

This procedure relates to changing of chlorine containers that are fitted with valve mount shutdown actuators.

Disconnecting a Container with Valve Mount Actuator Arms

1. At the electrical control panel, press and hold the "INHIBIT" pushbutton for at least ½ a second. There will be a short "beep" and all the red LED's will flash and the red strobe light will illuminate.

   This will inhibit any actuator operation.
2. If a drum application, loosen the wing nut that is securing the ratchet retainer enough to remove the ratchet head from the valve.
3. Remove the ratchet head from the valve and allow it to hang clear of the valve and flexible connection.
4. Shut the container valve (valve closes in a clockwise direction).
5. Shut the valve on the flexible connection and shut the isolation valve on the fixed pipe work.
6. Remove the automatic shutdown system actuator arm from the container valve.
7. Using two spanners (to avoid twisting the flexible connection) carefully crack open the coupling. Allow a short time for the small amount of chlorine in the coupling to disperse then check for leaks using an ammonia puffer bottle.
8. If no leakage is detected, disconnect the coupling.
9. Replace the cap nut ensuring that the fibre wad is in place inside the cap. Tighten with a spanner.
10. Replace the valve protection cap, tag the container empty and return the container to your supplier.

Note:

Repeat steps 2 to 10 above as required for additional containers.

Connecting a Container with Valve Mount Actuator Arms

1. Ensure that the container is correctly positioned to avoid excessive stretching or twisting of the flexible coupling pipe.
2. Remove the valve protective cap and carefully remove the valve security seal (shrink wrapped bag).
3. Check that the valve spindle is still closed.
4. Carefully slacken the valve outlet cap nut 2-3 turns and test with the ammonia puffer bottle. If no leaks are detected remove the cap.
5. Ensure that the valve outlet coupling faces are clean and that the old lead/fibre washer has been removed.
6. Fit a new lead/fibre washer to the coupling and do up the connection by hand (to avoid cross threading).
7. Tighten the coupling using a second spanner to prevent the flexible connection being twisted.
8. Carefully crack open the container valve for 1 to 2 seconds (all other valves are still closed) then shut it again. This will admit a small amount of chlorine to the coupling. Check for leaks using an ammonia puffer bottle.
9. If no leaks are detected open the container valve 1¼ turns and check again for leaks.
10. Crack-open the valve on the flexible connection and shut it again. Repeat Steps 8 and 9 above. Do the same for any other valves on the line checking all joints and valves for leakage.
11. Attach the actuator arm to the selected valve and tighten the clamp screws.
12. Fit the ratchet head over the valve spindle. Extend or retract the cylinder arm as necessary to align the ratchet splines with the valve spindle.
13. For drum applications, locate the ratchet retainer over the ratchet head then secure with the clamping wing nut.
14. Ensure all air lines are clear of any moving parts. The actuator arm is now ready.

Note:

Repeat steps 1 to 14 above as required for additional containers.

15. At the electrical control panel briefly press the "RESET" pushbutton. There will be a short "beep" and all the red LED's and the red strobe light will turn off.
16. Confirm the red "Mains Power On" LED and the green "PLC Power On" LED are illuminated.
17. The system is now in a ready condition and will shut down all of the container valves if a leak occurs or a remote input is initiated.

Note:

By working in this methodical fashion you avoid the danger of a major leak simply because you will find any leak while there is only a small amount of chlorine in the system.

Procedure for Chlorine Container Change (Yoke Mount)

Note:

This procedure relates to changing of chlorine containers that are fitted with yoke mount shutdown actuators.

Disconnecting a Container with Yoke Mount Actuator Arms

1. At the electrical control panel, press and hold the "INHIBIT" pushbutton for at least ½ a second. There will be a short "beep" and all the red LED's will flash and the red strobe light will illuminate.

   This will inhibit any actuator operation.
2. If a drum application, loosen the wing nut that is securing the ratchet retainer enough to remove the ratchet head from the valve.
3. Remove the ratchet head from the valve and allow it to hang clear of the valve and flexible connection.
4. With the chlorinator running, shut the container valve (valve closes in a clockwise direction).
5. Wait until the ball float drops to the bottom on the rotameter. Turn off the chlorinator or isolate the vacuum line.
6. Remove the yoke mounted actuator arm from the vacuum regulator on the chlorine container to be changed. Set this aside in a location that will not impede the drum/cylinder change operation, and will not allow damage to occur during the operation.
7. Carefully loosen the coupling without removing the vacuum regulator then check for leaks using an ammonia puffer bottle.
8. If no leakage is detected remove the vacuum regulator from the empty container.
9. Replace the cap nut ensuring that the fibre wad is in in place inside the cap. Tighten with a spanner.
10. Replace the valve protection cap, tag the container empty and return the container to your supplier.

Note:

Repeat steps 2 to 10 above as required for additional containers.

Connecting a Container with Yoke Mount Actuator Arms

1. Ensure that the container is correctly positioned to avoid excessive stretching or twisting of the flexible tubing.
2. Remove the valve protective cap and carefully remove the valve security seal (shrink wrapped bag).
3. Check that the valve spindle is still closed.
4. Carefully slacken the valve outlet cap nut 2-3 turns and test with the ammonia puffer bottle. If no leaks are detected remove the cap.
5. Ensure that the valve outlet coupling faces are clean and that the old lead/fibre washer has been removed.
6. Fit a new lead/fibre washer to the coupling, fit the vacuum regulator and tighten up the connection using the valve key.
7. Slide the yoke mount actuator arm onto the yoke. Once the actuator arm is completely onto the yoke tighten the clamp bolt. Re-tighten the vacuum regulator yoke clamp.
8. Crack open the container valve for 1 to 2 seconds then close. Check with the ammonia puffer bottler for chlorine leaks around the container valve.
    a. If there is a gas leak, turn on the chlorinator to draw gas out of the coupling and repeat Steps 4 to 8 of the disconnection procedure. Check the faces of the container valve and vacuum regulator. Fit a new washer and repeat Step 8 above.
    b. If no leaks are detected open the container valve 1¼ turns and check again for leaks. Place the vacuum regulator into either the standby or operating position. Check the operation of the chlorinator.
9. Fit the ratchet head over the valve spindle. Extend or retract the cylinder arm as necessary to align the ratchet splines with the valve spindle.
10. Locate the ratchet retainer over the ratchet head and, if a drum application, secure with the clamping wing nut.
11. Ensure all air lines are clear of any moving parts. The actuator arm is now ready.

> Note:
>
> Repeat steps 1 to 11 above as required for additional containers.

12. At the electrical control panel briefly press the "RESET" pushbutton. There will be a short "beep" and all the red LED's and the red strobe light will turn off.
13. Confirm the red "Mains Power On" LED and the green "PLC Power On" LED are illuminated.
14. The system is now in a ready condition and will shut down of the container valves if a leak occurs or a remote input is initiated.

> Note:
>
> By working in this methodical fashion you avoid the danger of a major leak simply because you will find any leak while there is only a small amount of chlorine in the system.

PROCEDURE FOR SHUTDOWN SYSTEM TESTING

The shutdown system is a safety device intended to minimise risk within a chlorine system. As such, the system should be tested on a monthly basis, with results and comments logged in an appropriate manner.

Additionally, it is a requirement of Australian Standards AS/NZS 2927:2001, that chlorine leak detectors be tested on a weekly basis.

Caution:

Operation of the shutdown system will cause closure and isolation of all connected chlorine containers that are fitted with shutdown actuators. All operators should be fully aware of this and the impact on plant operations should it occur.

It may be appropriate in some instances to remove actuators from duty/online chlorine containers to ensure that chlorination processes are not affected by system testing.

Caution:

After every operation of the shutdown system, inhibit the electrical control panel, check and re-tighten the actuator arm clamping screw(s) and regulator yoke clamping screw, as necessary;

If a chlorine leak is detected during these checks carry out the appropriate chlorine container change procedure to remedy the leak.

Cylinder & Drum Yoke Mount Actuator Arm Assemblies

1. Actuator arm attachment – clamping actuator assembly to yoke.
2. Yoke attachment - connecting regulator to container valve.

This procedure is critical to ensure that leaks do not eventuate due to loose mechanical connections that can occur over time during routine test procedures and/or normal operation.

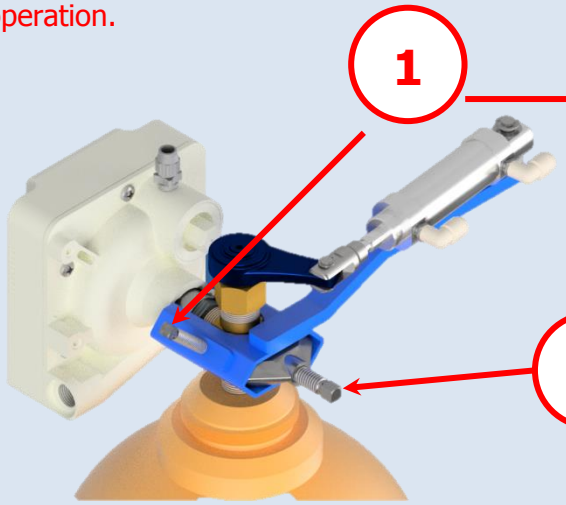

Figure 29 – Cylinder Yoke Mount Actuator

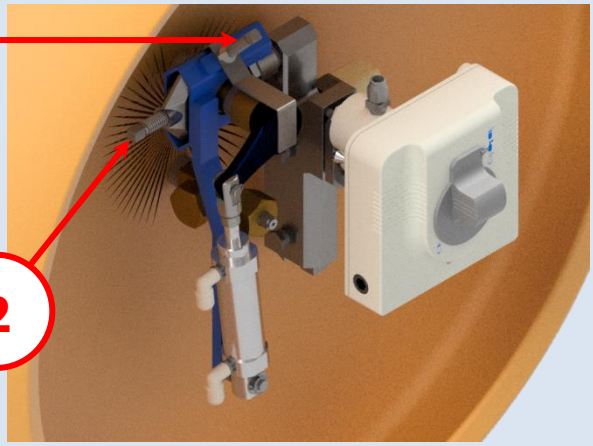

Figure 30 – Drum Yoke Mount Actuator

Cylinder & Drum Yoke Mount Actuator Arm Assemblies

3. Actuator arm attachment – clamping actuator assembly to container valve.

This procedure is critical to ensure that leaks do not eventuate due to loose mechanical connections that can occur over time during routine test procedures and/or normal operation.

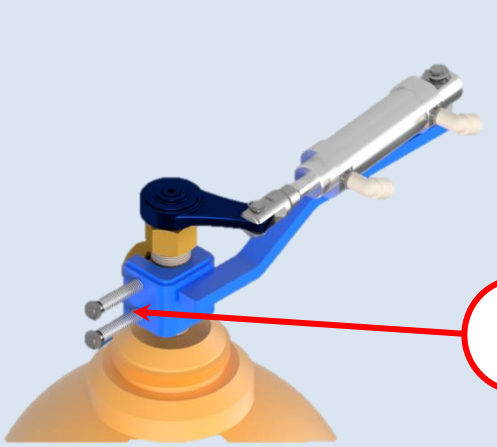

Figure 31 – Cylinder Valve Mount Actuator

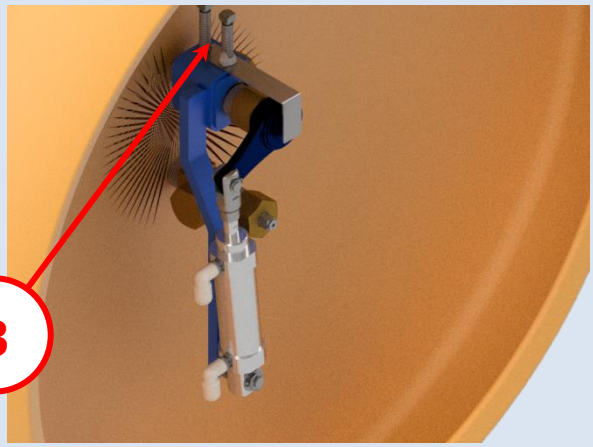

Figure 32 – Drum Valve Mount Actuator

Shutdown System Testing

The following test procedure is based on the system being connected and in its normal functional condition (ready state).

Note:

Remove actuators from any chlorine container that is not to be closed. Place these in a clear location that will not allow damage to occur during the operation as these, once removed, will also actuate.

Yoke mounted actuator arms require the chlorine container valve to be closed briefly to remove the actuator arm.

1. At the electrical control panel, press and hold the "INHIBIT" pushbutton for at least ½ a second. There will be a short "beep" and all the red LED's will flash and the red strobe light will illuminate.

   This will inhibit any actuator operation.
2. Shut the container valve (valve closes in a clockwise direction).
3. Remove the yoke mounted actuator arm from the vacuum regulator on the chlorine container. Set this aside in a location that will not allow damage to occur during the operation.
4. Retighten the vacuum regulator yoke clamp.
5. Crack open the container valve for 1 to 2 seconds, then close. Check with an ammonia puffer bottle for chlorine leaks around the container valve.
6. If no leaks are detected, open the container valve 1¼ turns and check again for leaks. Place the vacuum regulator into either the standby or operating position. Check the operation of the chlorinator.
7. At the electrical control panel briefly press the "RESET" pushbutton. There will be a short "beep" and all the red LED's and the red strobe light will turn off.

System Test

1. Press the "TEST" pushbutton.
2. System initiates a shutdown sequence (isolates chlorine container valves).
3. Test LED indicator flashes (On/Off) during operation and flashes faster when shutdown sequence is complete.
4. Check output (to remote monitor) if applicable.
5. On completion of successful test, depress the "RESET" pushbutton once.
6. The test LED indicator will then turn off.
7. Press the "INHIBIT" pushbutton for at least ½ a second.
8. There will be a short "beep" and all the red LED's indicators will flash and the red strobe light will illuminate.
9. Remove the ratchet head from the valve and allow it to hang clear of the valve and flexible connection.

Note:

If a yoke mounted arm check and re-tighten the clamping actuator assembly to the yoke and then the vacuum regulator yoke clamp.

10. Crack open the container valve for 1 to 2 seconds then close. Check with the ammonia puffer bottle for chlorine leaks around the container valve.
11. If no leaks are detected open the container valve 1¼ turns and check again for leaks. Place the vacuum regulator into either the standby or operating position. Check the operation of the chlorinator. If a leak is detected refer to the connection/disconnection procedures.
12. Fit the ratchet head over the valve spindle. Extend or retract the cylinder arm as necessary to align the ratchet splines with the valve spindle.
13. If a drum application, locate the ratchet retainer over the ratchet head and secure with the clamping wing nut.
14. Ensure all air lines are clear of any moving parts. The actuator arm is now ready.

Note:

Repeat steps 9 to 14 above as required for additional containers.

15. At the electrical control panel briefly press the "RESET" pushbutton. There will be a short "beep" and all the red LED indicators and the red strobe light will turn off.
16. Confirm the red "Mains Power On" LED indicator and the green "PLC Power On" LED indicator are illuminated.

Power Loss

1. Power LED indicator should be on (Electrical Control Panel).
2. All other LED indictors should be off (Electrical Control Panel) except the PLC power LED indicator (Green).
3. Turn off the power at the power supply isolator or circuit breaker feeding the shutdown system.
4. Power LED indicator should go off.
5. Power loss LED indicator should flash (Unit now running on battery).
6. Check output (to remote monitor) if applicable.

Note:

HS12A8V16

Unit does not shut down due to this condition.

HS13A8V16

Unit does not shut down due to this condition until the battery voltage drops below 11.2VDC.

7. Turn the power back on at the supply isolator.
8. Power LED indicator on again (Steady).
9. Power loss LED indicator is off.
10. System is now returned to its normal functional condition (ready state).

Low Air Pressure Test

1. At the compressed air supply, reduce the pressure to 400kPa (or slightly below).

Note:

The airline between the air supply and the inlet of the pneumatic control panel will require bleeding.

2. Low air pressure LED indicator flashes (On/Off) during operation and flashes faster when shutdown complete.
3. Check output (to remote monitor) if applicable.

Note:

HS12A8V16

Unit does not shut down due to this this condition.

HS13A8V16

Unit does not shut down due to this condition until the air pressure drops below 400kPa.

4. Test OK - adjust air pressure to 600kPa (Wait 2-5 seconds).
5. Depress "RESET" pushbutton once.
6. Low air pressure LED indicator is off.

Note:

If the unit is a model HS13A8V16 that has shutdown then complete the following.

7. Press the "INHIBIT" pushbutton for at least ½ a second.
8. There will be a short "beep" and all the red LED's indicators will flash and the red strobe light will illuminate.
9. Remove the ratchet head from the valve and allow it to hang clear of the valve and flexible connection.

Note:

If a yoke mounted arm is in use check and re-tighten the clamping actuator assembly to the yoke and then the vacuum regulator yoke clamp.

10. Crack open the container valve for 1 to 2 seconds then close. Check with an ammonia puffer bottle for chlorine leaks around the container valve.
11. If no leaks are detected open the container valve 1¼ turns and check again for leaks. If applicable, place the vacuum regulator into either the standby or operating position. Check the operation of the chlorinator. If a leak is detected refer to the connection/disconnection procedures.
12. Fit the ratchet head over the valve spindle. Extend or retract the cylinder arm as necessary to align the ratchet splines with the valve spindle.
13. Locate the ratchet retainer over the ratchet head and if a drum application secure with the clamping wing nut.
14. Ensure all airlines are clear of any moving parts. The actuator arm is now ready.

Note:

Repeat steps 9 to 14 above as required for additional containers.

15. At the electrical control panel briefly press the "RESET" pushbutton. There will be a short "beep" and all the red LED indicators and the red strobe light will turn off.
16. Confirm the red "Mains Power On" LED indicator and the green "PLC Power On" LED indicator are illuminated.

Controlled Leak Detector Test

1. Use a gas generator or dry calcium hypochlorite to produce/simulate a gas leak.
2. Hold near sensor (DO NOT splash or spray on sensor).
3. Leak detected – After 10 seconds, leak detected LED indicator flashes (On/Off) during operation and flashes faster when shutdown sequence is complete.
4. System shuts down.
5. On completion of successful test, reset the leak detector (all lights off and indicating zero).
6. Depress "RESET" pushbutton once.
7. Leak detected LED indicator is off.
8. Press the "INHIBIT" pushbutton for at least ½ a second.
9. There will be a short "beep" and all the red LED's indicators will flash and the red strobe light will illuminate.
10. Remove the ratchet head from the valve and allow it to hang clear of the valve and flexible connection.

Note:

If a yoke mounted arm is in use check and re-tighten the clamping actuator assembly to the yoke and the vacuum regulator yoke clamp.

11. Crack open the container valve for 1 to 2 seconds then close. Check with an ammonia puffer bottle for chlorine leaks around the container valve.
12. If no leaks are detected open the container valve 1¼ turns and check again for leaks. If applicable, place the vacuum regulator into either the standby or operating position. Check the operation of the chlorinator. If a leak is detected refer to the connection/disconnection procedures.
13. Fit the ratchet head over the valve spindle. Extend or retract the cylinder arm as necessary to align the ratchet splines with the valve spindle.
14. Locate the ratchet retainer over the ratchet head and if a drum application secure with the clamping wing nut.
15. Ensure all air lines are clear of any moving parts. The actuator arm is now ready.

Note:

Repeat steps 10 to 15 above as required for additional containers.

16. At the electrical control panel briefly press the "RESET" pushbutton. There will be a short "beep" and all the red LED indicators and the red strobe light will turn off.
17. Confirm the red "Mains Power On" LED indicator and the green "PLC Power On" LED indicator are illuminated.

CAUTION:

Testing of chlorine sensors will eventuate in alarms, unless they are inhibited.

Action After Shutdown Has Occurred

When attending an installation after a shutdown has occurred, it is important to assess the electrical control panel to determine what caused the shutdown event to occur.

Site specific operating procedures including all essential safety information relating to the installation work health safety (WHS) requirements, including relevant PPE etc., should be followed.

1. Check and correct fault or initiating input (Chlorine leak alarm, low air pressure, low voltage or remote input).
2. Confirm that no chlorine leaks are apparent.
3. Depress "RESET" pushbutton once.
4. Leak detected LED indicator is off.
5. Press the "INHIBIT" pushbutton for at least ½ a second.
6. There will be a short "beep" and all the red LED's indicators will flash and the red strobe light will illuminate.
7. Remove the ratchet head from the valve and allow it to hang clear of the valve and flexible connection.

> Note:
>
> If a yoke mounted arm is in use check and re-tighten the clamping actuator assembly to the yoke and the vacuum regulator yoke clamp.

8. Crack open the container valve for 1 to 2 seconds then close. Check with an ammonia puffer bottle for chlorine leaks around the container valve.
9. If no leaks are detected open the container valve 1¼ turns and check again for leaks. If applicable, place the vacuum regulator into either the standby or operating position. Check the operation of the chlorinator. If a leak is detected refer to the connection/disconnection procedures.
10. Fit the ratchet head over the valve spindle. Extend or retract the cylinder arm as necessary to align the ratchet splines with the valve spindle.
11. Locate the ratchet retainer over the ratchet head and if a drum application secure with the clamping wing nut.
12. Ensure all air lines are clear of any moving parts. The actuator arm is now ready.

> Note:
>
> Repeat steps 7 to 12 above as required for additional containers.

13. At the electrical control panel briefly press the "RESET" pushbutton. There will be a short "beep" and all the red LED indicators and the red strobe light will turn off.
14. Confirm the red "Mains Power On" LED indicator and the green "PLC Power On" LED indicator are illuminated.

MAINTENANCE & INSPECTION

The Chlorine Shutdown System is a supplementary safety device and should be considered as such in respect of maintenance and inspection.

Routine Maintenance

A monthly test log book is provided with each unit to maintain a record of condition and tests performed.

Additional to the log book tests the following checks and operations should be performed.

- Check actuator arm assemblies (including ratchet assembly and pneumatic cylinder) for signs of wear and corrosion.
- Check actuator arm assemblies (including ratchet assembly and pneumatic cylinder) for free movement.
- Bleed moisture from compressed air receivers (if applicable).
- Check condition of airline tubing and connectors.
- Check the operation of all LED indicators and the function of the inhibit strobe light.
- Check the function of alarms and outputs signals as applicable.

Removing Unit from Service

The low voltage drop-out relay on the battery back-up unit is energised as soon as power is applied to the power supply module. Once energised, the coil current is supplied from the power supply module initially, but will be supplied from the battery if power is removed from the power supply module, or if the back-up battery circuit board is disconnected (orange connector unplugged) from the control circuit. If the system is started up for testing and then shut down, the battery back-up relay should be de-energised manually, otherwise the relay coil will continue to drain the battery until the 10 volt level is reached (deep drain protection level). This will shorten the life of the battery and the battery will be discharged when the system is next started up.

To de-energise the relay, isolate the power supply to the control panel and then slide the back-up battery circuit board off the battery terminals until the relay coil drops out (there will be an audible click), and then slide it back on again. As soon as the battery connection is broken, the relay coil will drop out and will not energise until power is again applied to the power supply module. This procedure is recommended any time that the system is removed from service.

Battery Replacement

The effective life of the battery is normally three years but may be reduced subject to operating ambient conditions. It is recommended that the battery be replaced every year as the unit is a supplementary safety device.

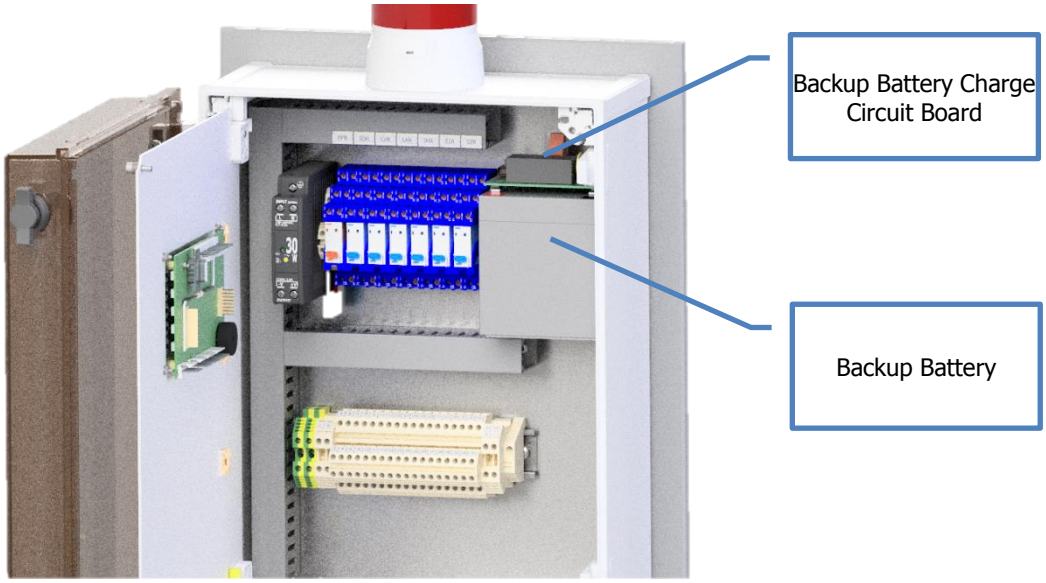

Figure 33 – Backup Battery Location

Notes:

The backup battery is secured in place using two (2) 370mm black cable ties (not shown in figure 32 above), it is important to replace these cable ties when replacing the back-up battery.

The battery back-up charge circuit board connections to the battery are not polarity sensitive as far as the connection to the battery is concerned. If the red LED is illuminated the polarity is incorrect. This is corrected by changing the position of the polarity switch located next to the red LED. With the red LED not illuminated the polarity is correct.

ELECTRICAL CONTROL PANEL – PARTS LISTING

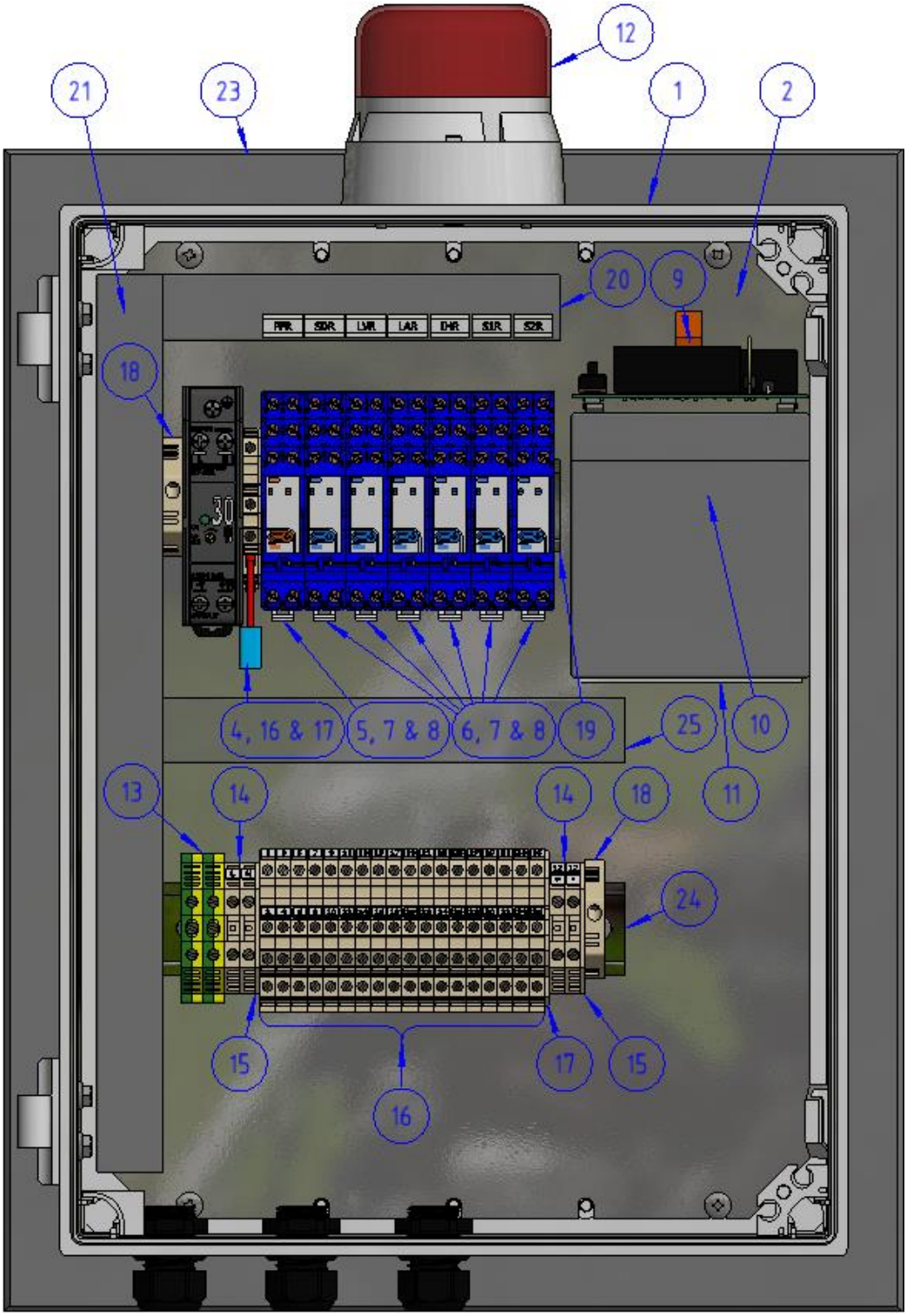

Figure 34 – Electrical Control Panel Internal Components Layout

Note:

Refer to table 5 below for part listings.

ELECTRICAL CONTROL PANEL COMPONENTS			
ITEM	**DESCRIPTION**	**QTY**	**DESIGNATION**
1	ENCLOSURE – 300 X 400 X 180	1	–
2	BASE PLATE	1	–
3	POWER SUPPLY – 12VDC 15W	1	–
4	CAPACITOR	1	–
5	POWER FAILURE RELAY – 240VAC	1	PFR
6	ALARM & CONTROL RELAYS – 12VDC • SHUTDOWN RELAY • LOW VOLTAGE ALARM RELAY • LOW AIR ALARM RELAY • INHIBIT RELAY • SOLENOID 1 RELAY • SOLENOID 2 RELAY	6	 SDR LVR LAR IHR S1R S2R
7	RELAY BASE	7	–
8	RELAY RETAINER – SUPPLIED WITH RELAY BASE	7	–
9	CIRCUIT BOARD – BATTERY BACK UP	1	–
10	BATTERY	1	–
11	BATTERY SUPPORT BRACKET	1	–
12	INHIBIT ACTIVE RED STROBE LIGHT	1	–
13	TERMINAL – EARTH	2	–
14	TERMINAL – STANDARD	4	–
15	TERMINAL – STANDARD END PLATE	2	–
16	TERMINAL – DOUBLE	19	–
17	TERMINAL – DOUBLE END PLATE	2	–
18	TERMINAL – END CLAMP	3	–
19	DIN RAIL – STANDARD 150mm LONG	1	–
20	CABLE DUCT – PVC, NARROW SLOT, 150mm LONG	1	–
21	CABLE DUCT – PVC, NARROW SLOT, 340mm LONG	1	–
22	CABLE GLAND – 20mm	3	–
23	PVC PANEL – 440 X 340 X 10	1	–
24	DIN RAIL – STANDARD 175mm LONG	1	–
25	CABLE DUCT – PVC, NARROW SLOT, 175mm LONG	1	–

Table 5 – Electrical Control Panel Components

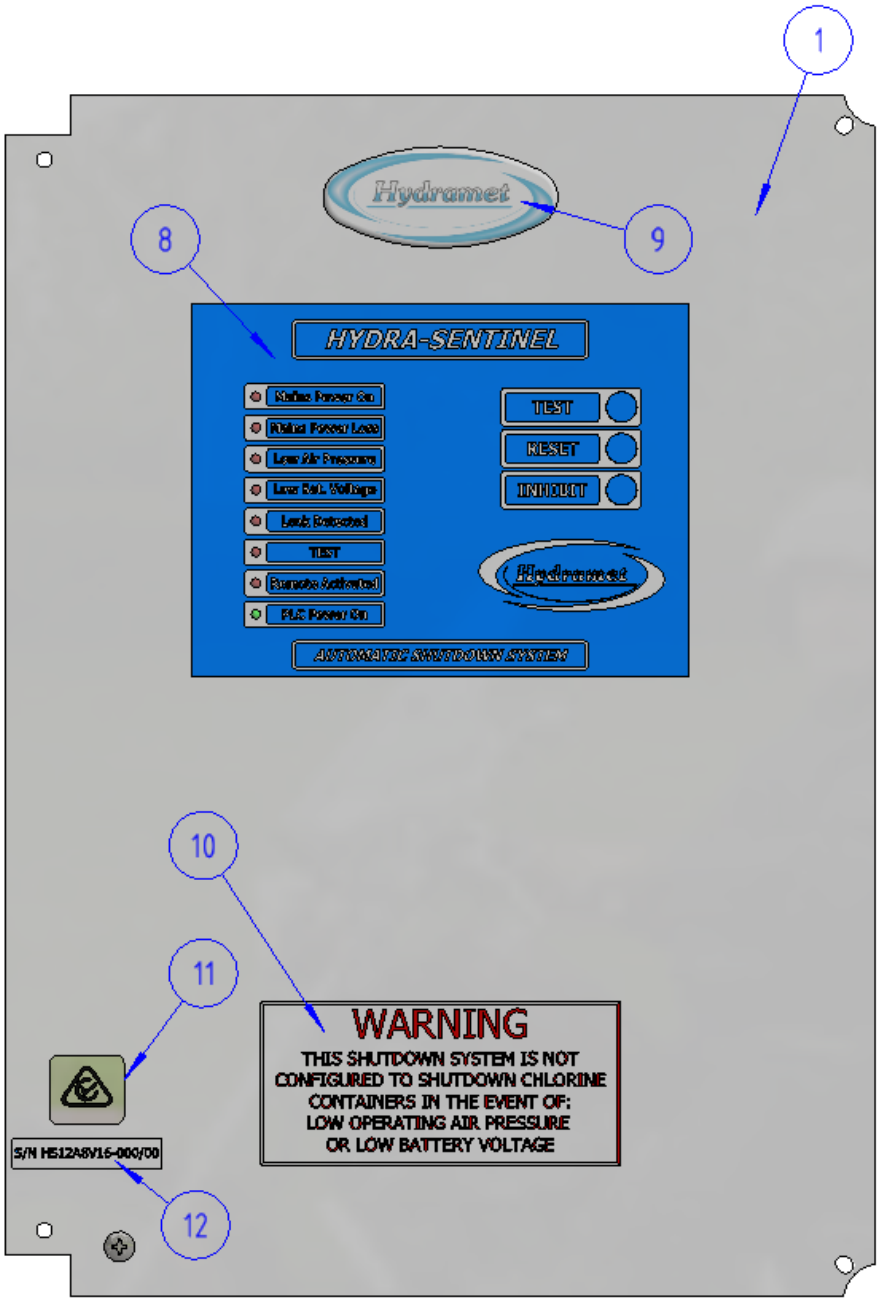

Figure 35 – Swing Door Outer Components Layout

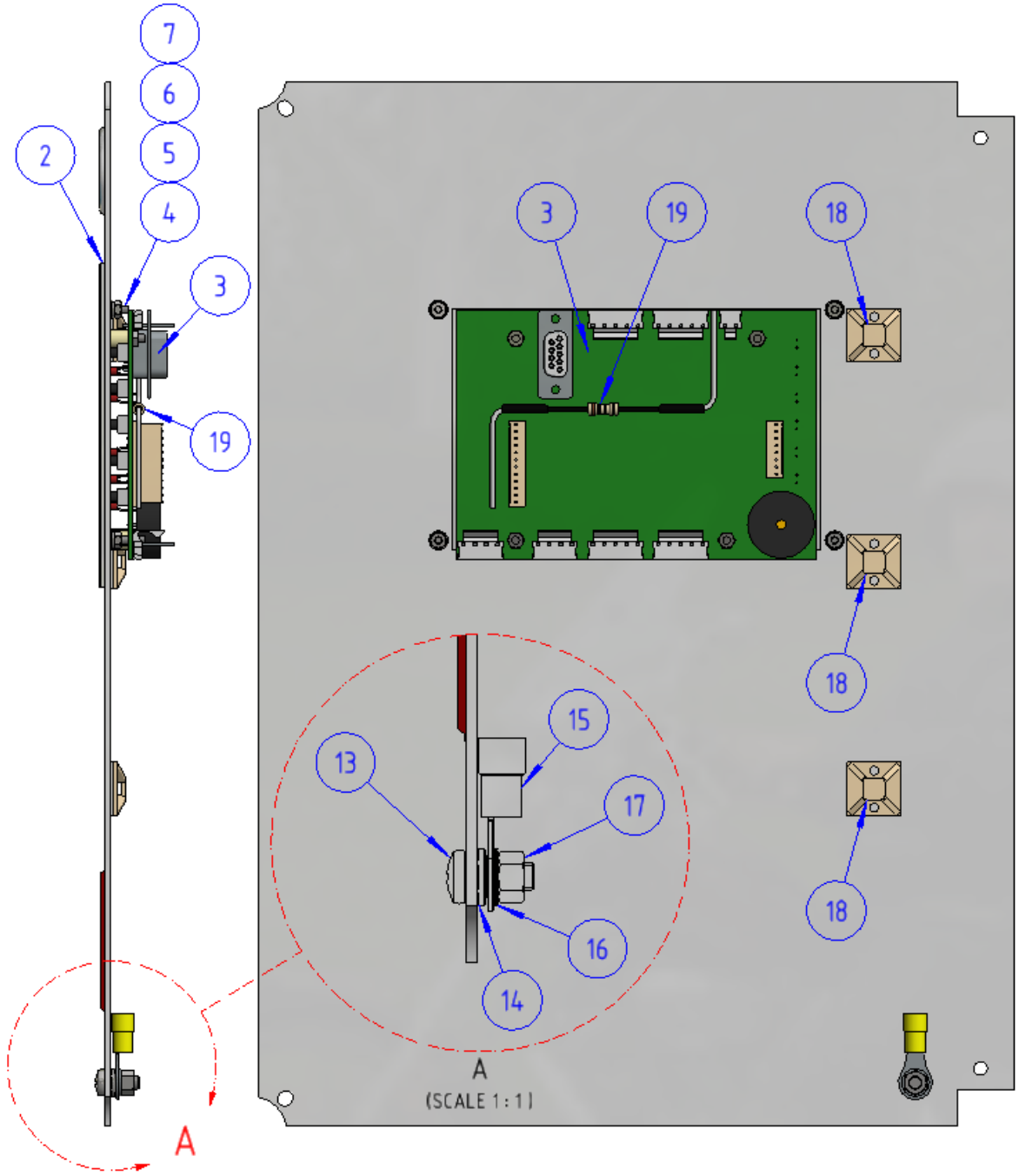

Figure 36 – Swing Door Internal Components Layout

Note:

Refer to table 6 below for part listings.

ELECTRICAL CONTROL PANEL SWING DOOR COMPONENTS		
ITEM	**DESCRIPTION**	**QTY**
1	INNER SWING DOOR	1
2	PLC MOUNTING PLATE	1
3	PLC - WITH OPERATOR INTERFACE	1
4	SCREW - M3 X 0.5 X 10mm, C/S, STAINLESS STEEL	4
5	WASHER - M3, FLAT, STAINLESS STEEL	4
6	WASHER - M3, SPRING, STAINLESS STEEL	4
7	NUT - M3 X 0.5, STAINLESS STEEL	4
8	FACIA - POLYCARBONATE	1
9	LABEL - HYDRAMET LUSTA-CAL LOGO BADGE OVAL	1
10	LABEL – WARNING ** MODEL HS12A8V16 ONLY**	1
11	LABEL - REGULATORY COMPLIANCE MARK	1
12	LABEL - SERIAL NUMBER	1
13	SCREW - M5 X 0.8 X 10mm, P/H, ZINC PLATED	1
14	WASHERS - EARTH DOOR WASHER SZ CONTACT M5	1
15	CRIMP LUG - YELLOW, RING TERMINAL, 6mm STUD	1
16	WASHER - M5, FLAT	1
17	NUT - M5 X 0.8	1
18	TIE MOUNT - 19 X 19, SELF-ADHESIVE	3
19	RESISTOR – 100KΩ 1W	1

Table 6 – Electrical Control Panel Swing Door Components

PNEUMATIC CONTROL PANEL – PARTS LISTING

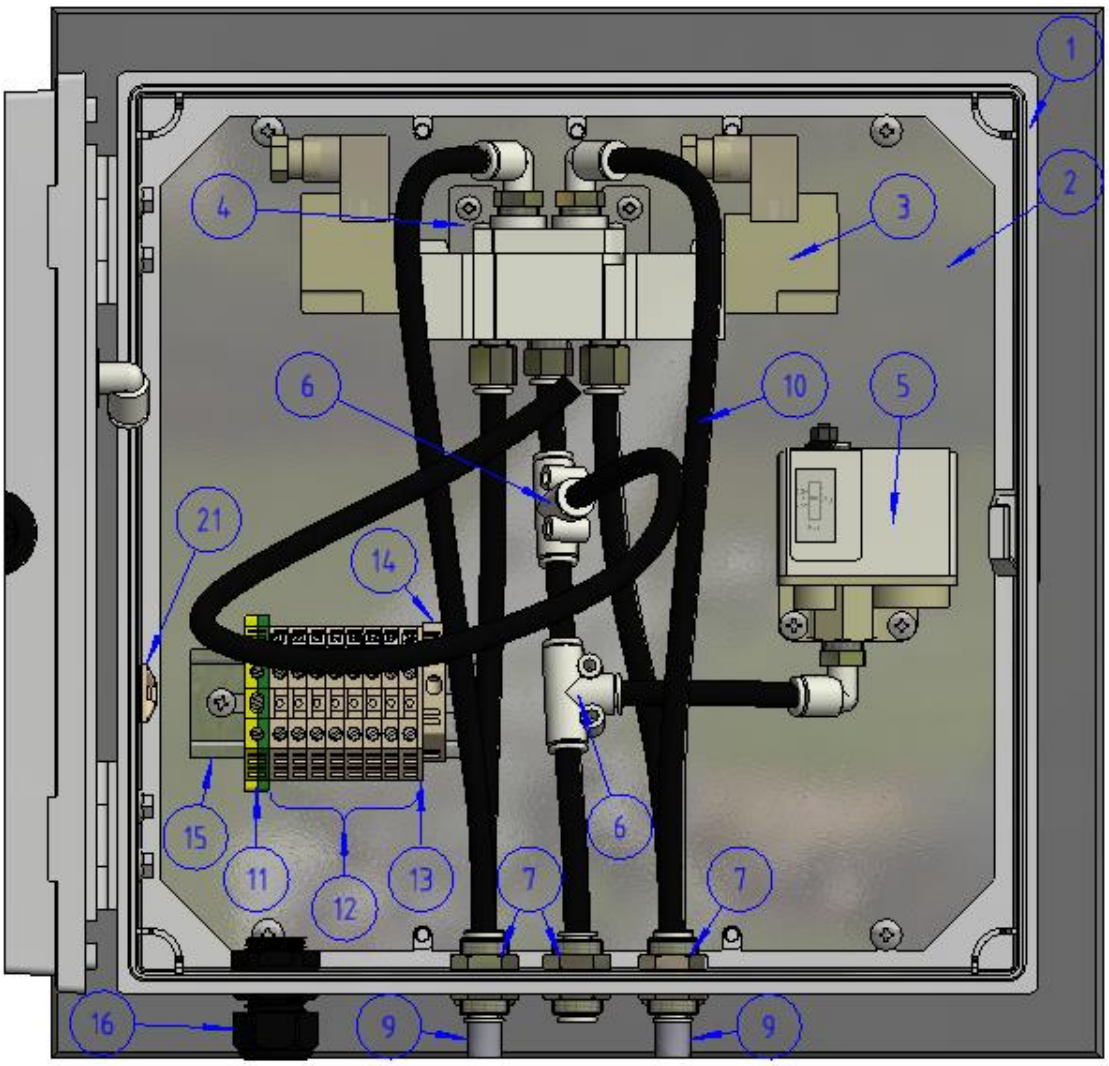

Figure 37 – Pneumatic Control Panel Internal Components Layout

Note:

Refer to table 7 below for part listings.

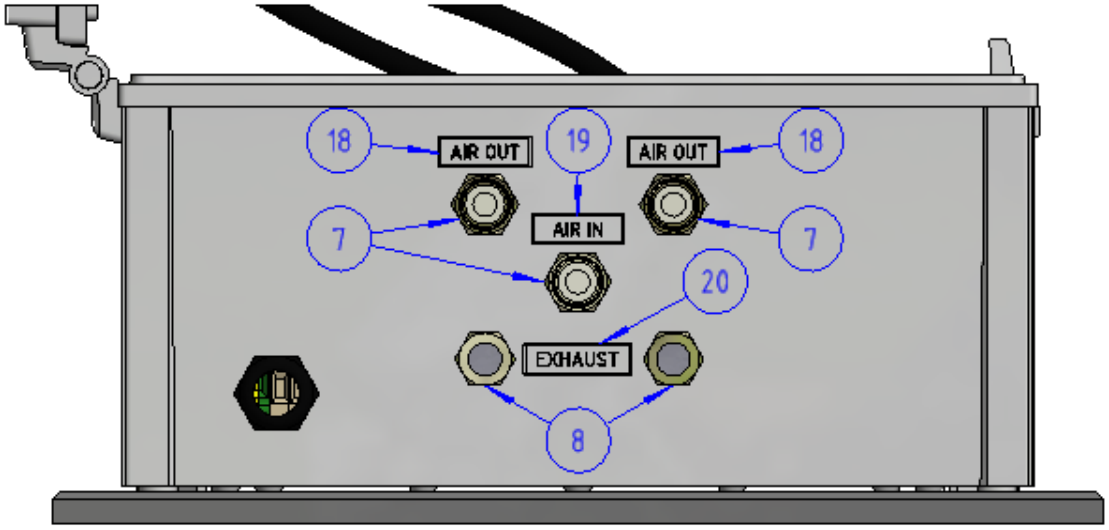

Figure 38 – Pneumatic Control Panel External Component Layout

Note:

Refer to table 7 below for part listings.

PNEUMATIC CONTROL PANEL COMPONENTS		
ITEM	**DESCRIPTION**	**QTY**
1	ENCLOSURE - 300 x 300 x 180	1
2	BASE PLATE	1
3	VALVE- SOLENOID, C/W FITTINGS	1
4	BRACKET - SOLENOID VALVE	1
5	PRESSURE SWITCH ASSEMBLY, C/W FITTING	1
6	FITTING - UNION TEE – 8mm OD TUBE	2
7	FITTING - BULKHEAD UNION – 8mm OD TUBE	3
8	FITTING - BULKHEAD FEMALE CONNECTOR – 8mm TUBE, 1/8" THREAD	2
9	SILENCER	2
10	TUBING - BLACK 8MM - AIR TUBING	2m
11	TERMINAL – EARTH	1
12	TERMINAL – STANDARD	8
13	TERMINAL – STANDARD END PLATE	1
14	TERMINAL – END CLAMP	1
15	DIN RAIL - STANDARD 100mm LONG	1
16	CABLE GLAND – 20mm	1
17	PVC PANEL - 340 X 340 X 10	1
18	LABEL - AIR OUT	2
19	LABEL - AIR IN	1
20	LABEL - EXHAUST	1
21	TIE MOUNT - 19 X 19, SELF-ADHESIVE	1

Table 7 – Pneumatic Control Panel Components

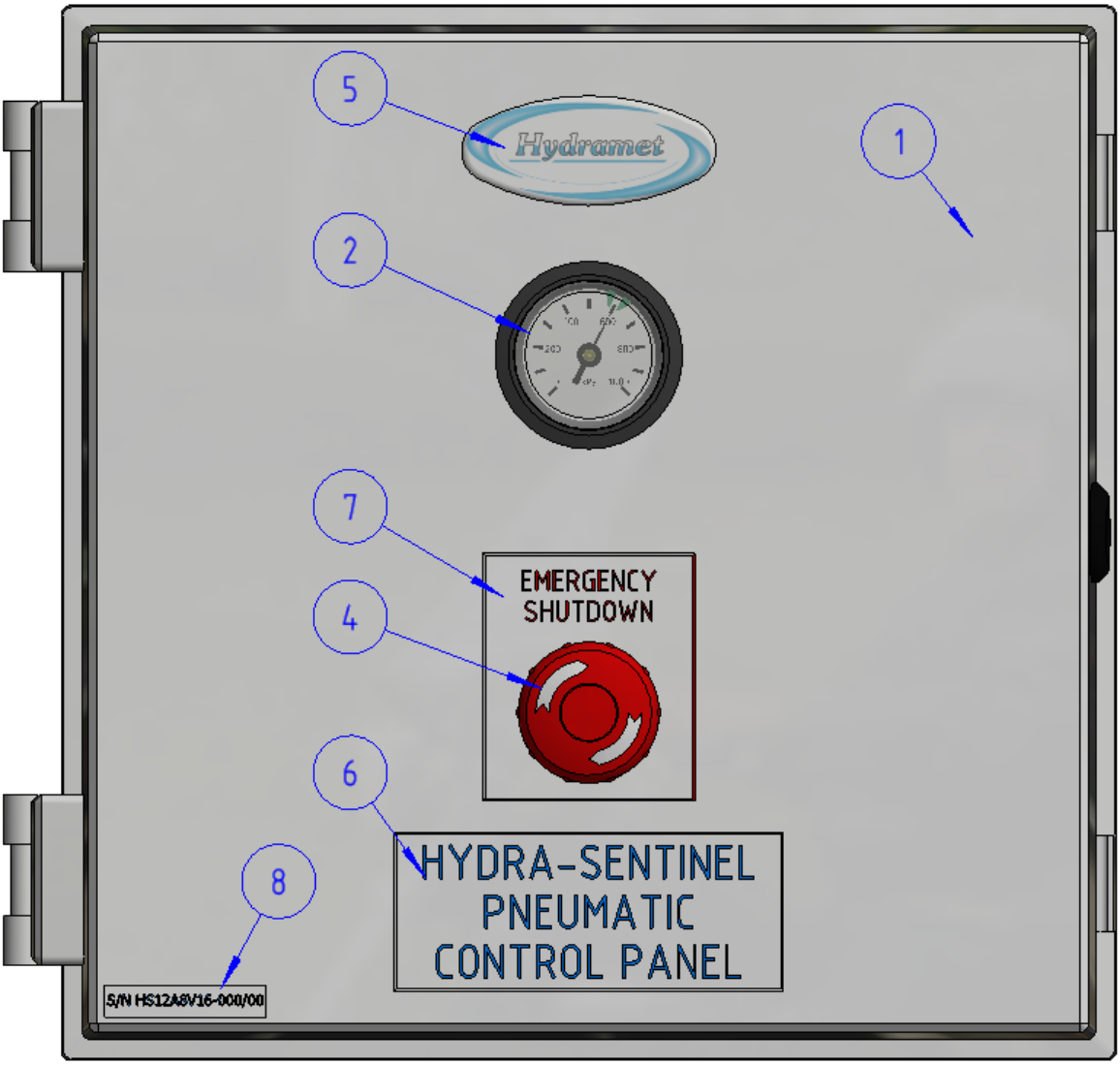

Figure 39 – Pneumatic Control Panel Door Outer Components Layout

Note: Refer to table 8 below for part listings.

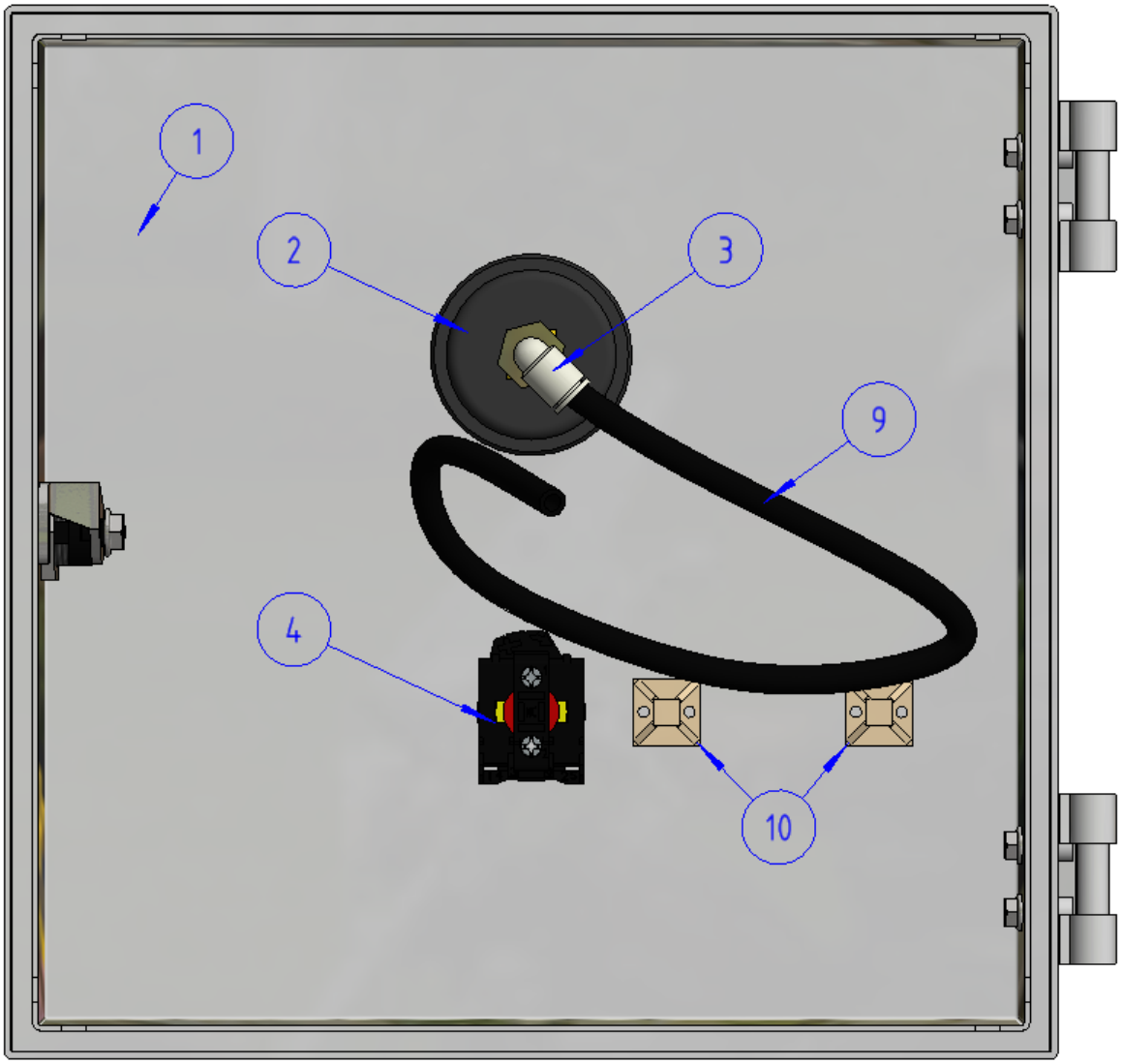

Figure 40 – Pneumatic Control Panel Door Inner Components Layout

Note:

Refer to table 8 below for part listings.

PNEUMATIC CONTROL PANEL DOOR COMPONENTS		
ITEM	**DESCRIPTION**	**QTY**
1	ENCLOSURE - 300 x 300 x 180	1
2	GAUGE - 0-1000 kPa - PANEL MOUNT	1
3	FITTING - FEMALE ELBOW - 8MM OD TUBE X 1/4" MALE THREAD	1
4	BUTTON - EMERGENCY SHUTDOWN	1
5	LABEL - HYDRAMET LUSTA-CAL LOGO BADGE OVAL	1
6	LABEL - PNEUMATIC CONTROL PANEL	1
7	LABEL - EMERGENCY SHUTDOWN	1
8	LABEL - SERIAL NUMBER	1
9	TUBING - BLACK 8mm - AIR TUBING	0.4m
10	TIE MOUNT - 19 X 19, SELF-ADHESIVE	2

Table 8 – Pneumatic Control Panel Door Components

ELECTRICAL CONTROL AND PNEUMATIC CONTROL PANEL ELECTRICAL DRAWINGS

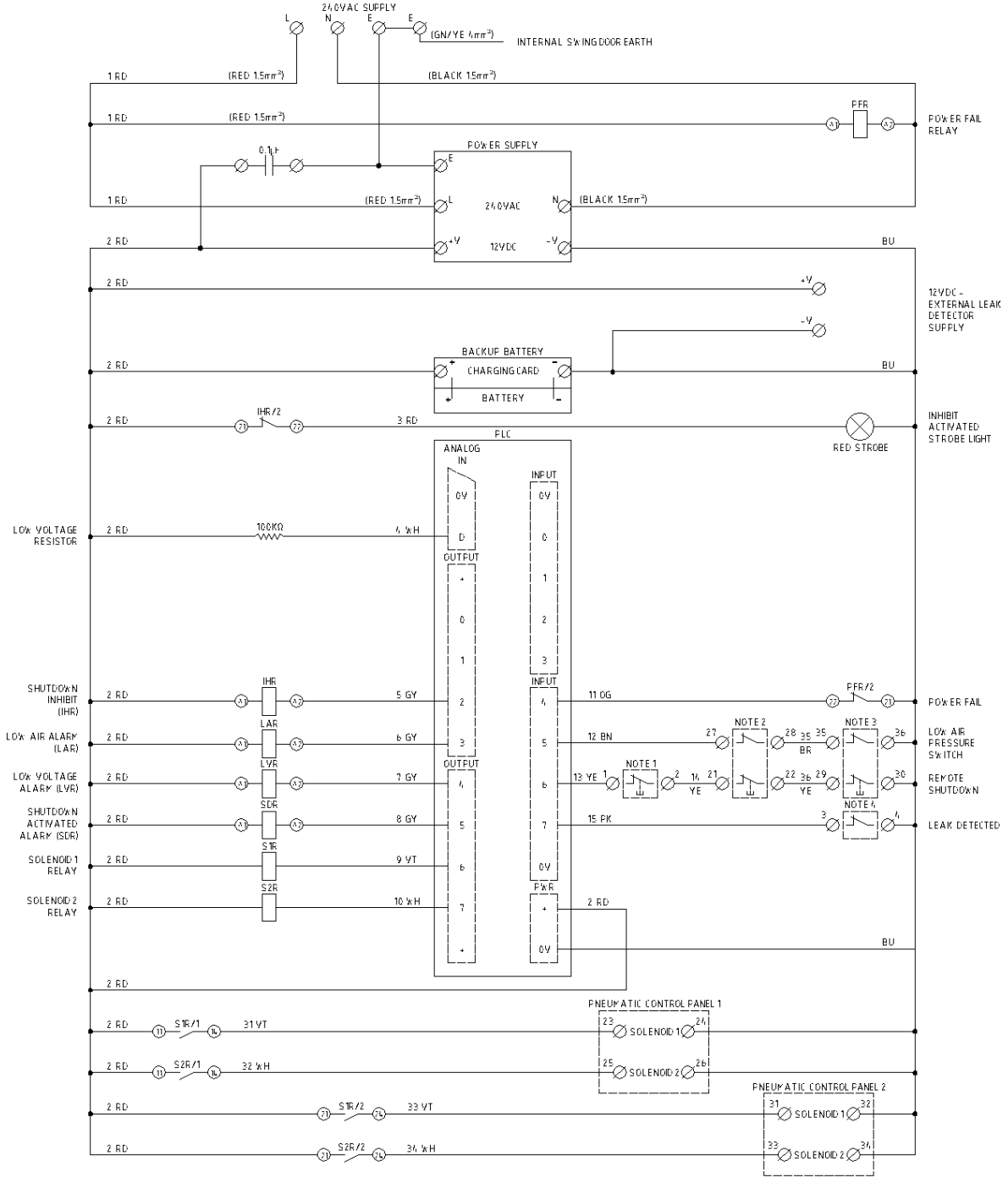

Figure 41 – Electrical Control Panel

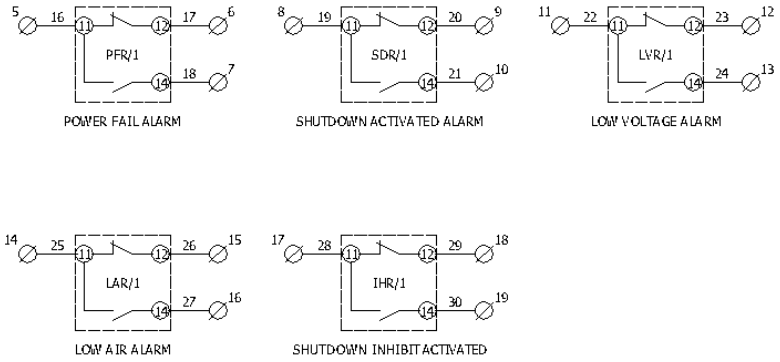

Figure 42 – Electrical Control Panel Relay Outputs

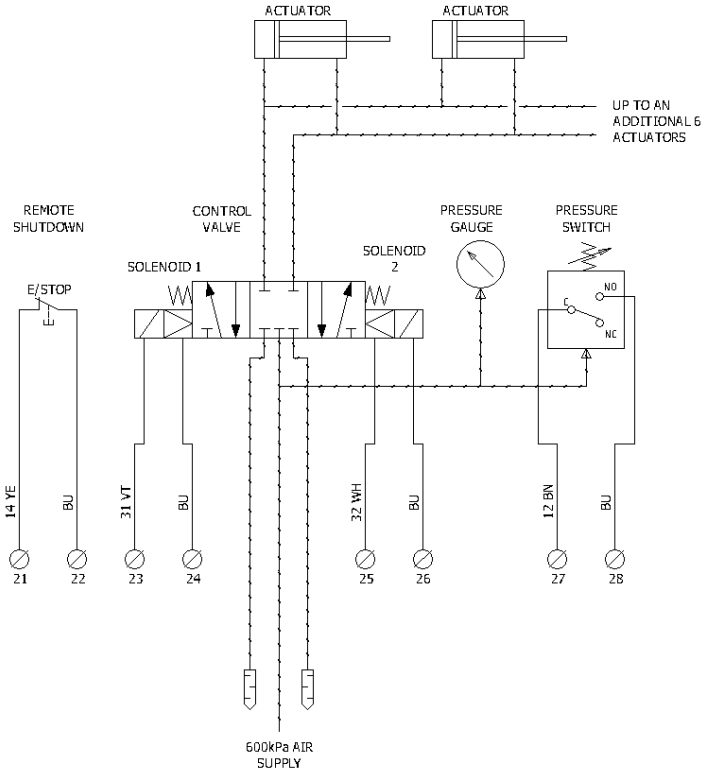

Figure 43 – Pneumatic Control Panel 1

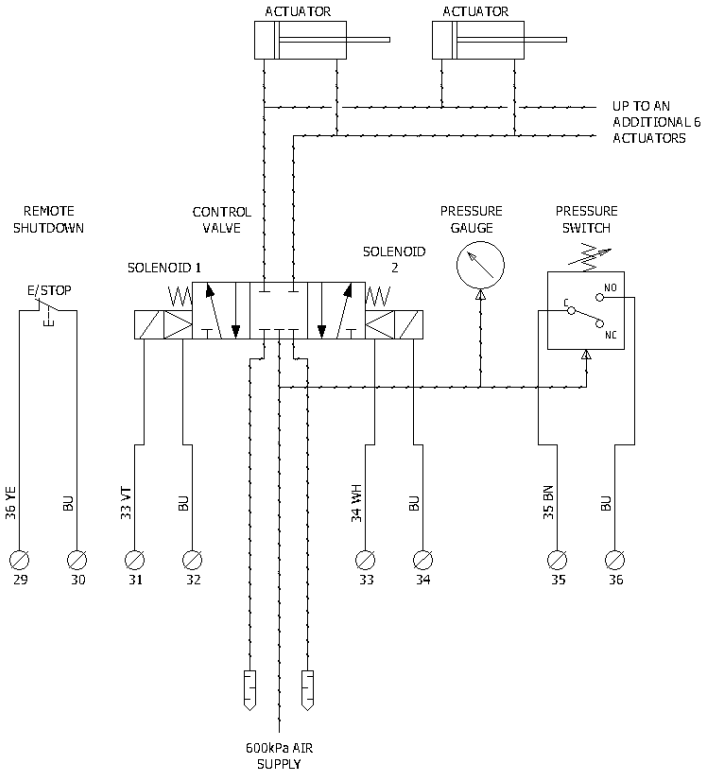

Figure 44 – Pneumatic Control Panel 2

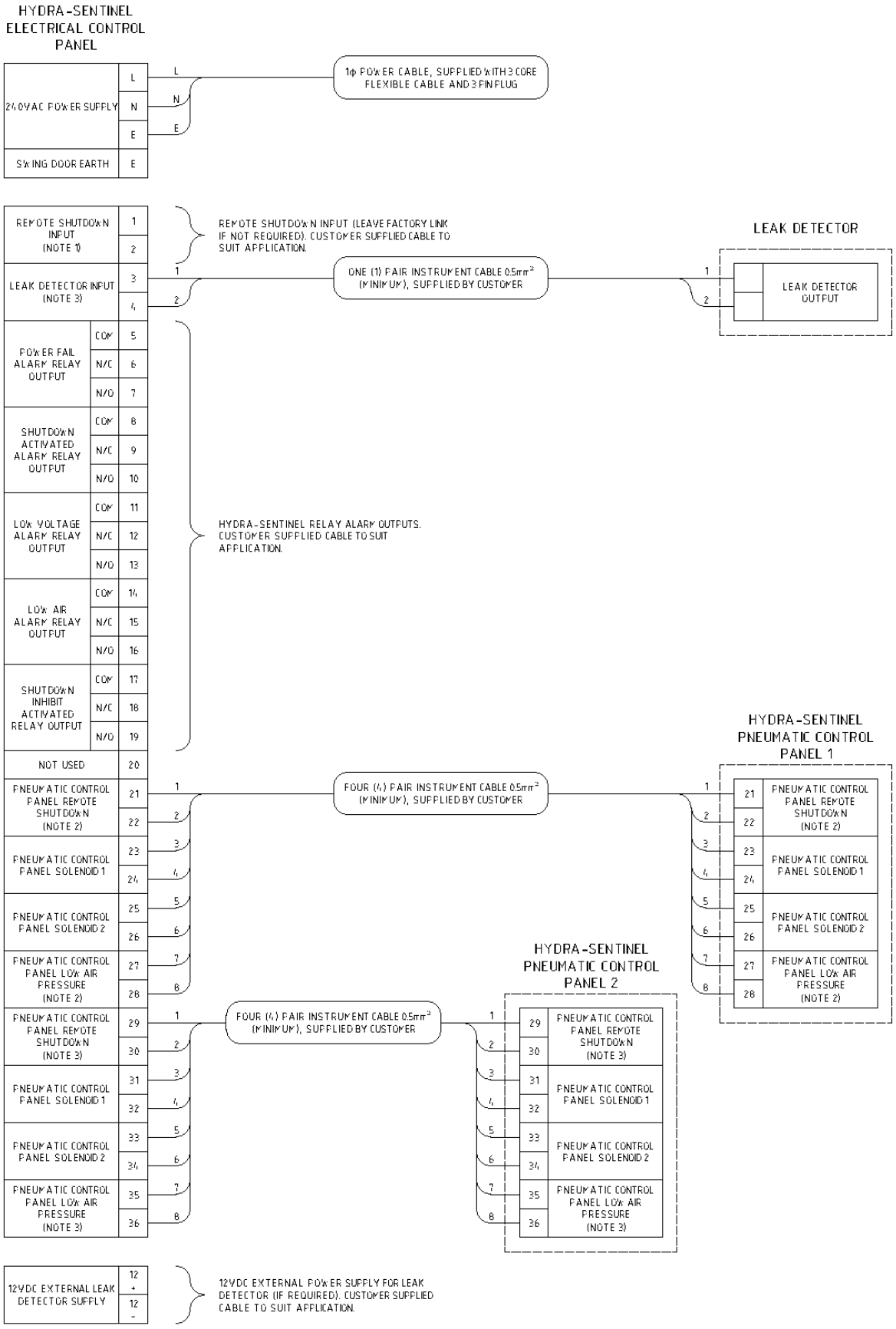

Figure 45 – Interconnection Diagram

Notes

1. Remote shutdown terminals 1 & 2 (N/C external push button). Link if not required.
2. Pneumatic control panel 1 remote shutdown push button & low pressure switch (located within panel). Remote shutdown terminals 21 & 22 (N/C latching push button) and low pressure terminals 27 & 28.
3. Pneumatic control panel 2 remote shutdown push button & low pressure switch (located within panel). Remote shutdown terminals 29 & 30 (N/C latching push button) and low pressure terminals 35 & 36.
4. Terminals 3 & 4 leak detected (N/C input from leak detector opens on detection of a leak).
5. Four (4) pair instrument cable 0.5mm² (minimum) from electrical control panel to each pneumatic control panel. Supplied by customer.
6. All control wiring in panel 0.5mm² cable, unless otherwise nominated.
7. All relay output wiring is white 0.5mm² cable.

ACTUATOR ARMS – PARTS LISTING

HSA18 – Yoke Mount Arm, Chlorine Cylinder

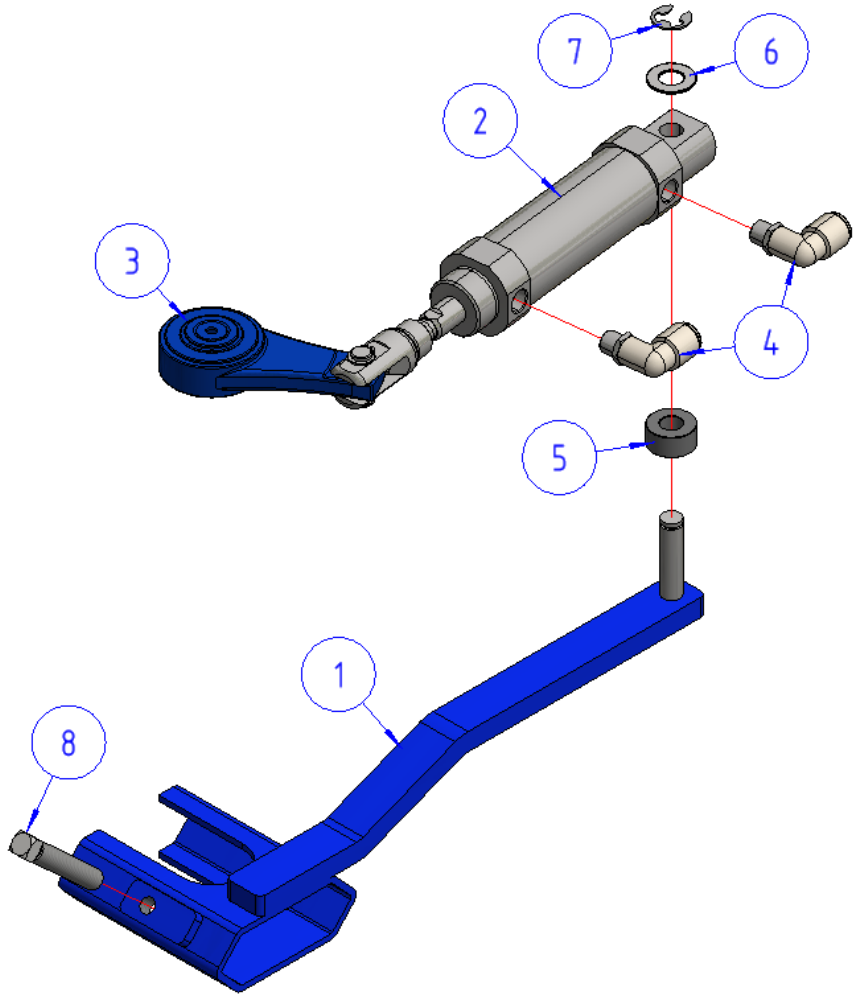

Figure 46 – HSA18 – Yoke Mount Arm, Chlorine Cylinder

HSA18 – YOKE MOUNT ARM, CHLORINE CYLINDER – COMPONENTS		
ITEM	**DESCRIPTION**	**QTY**
1	YOKE MOUNT ARM (POWDER COATED)	1
2	PNEUMATIC CYLINDER	1
3	RATCHET HEAD C/W CLEVIS	1
4	FITTING - MALE ELBOW - 8MM OD TUBE X 1/8 INCH MALE THREAD	2
5	SPACER – PVC	1
6	WASHER - 316SS	1
7	E-CLIP	1
8	CLAMP SCREW	1

Table 9 – HSA18 – Yoke Mount Arm, Chlorine Cylinder – Components

HSA28 – Yoke Mount Arm, Chlorine Drum

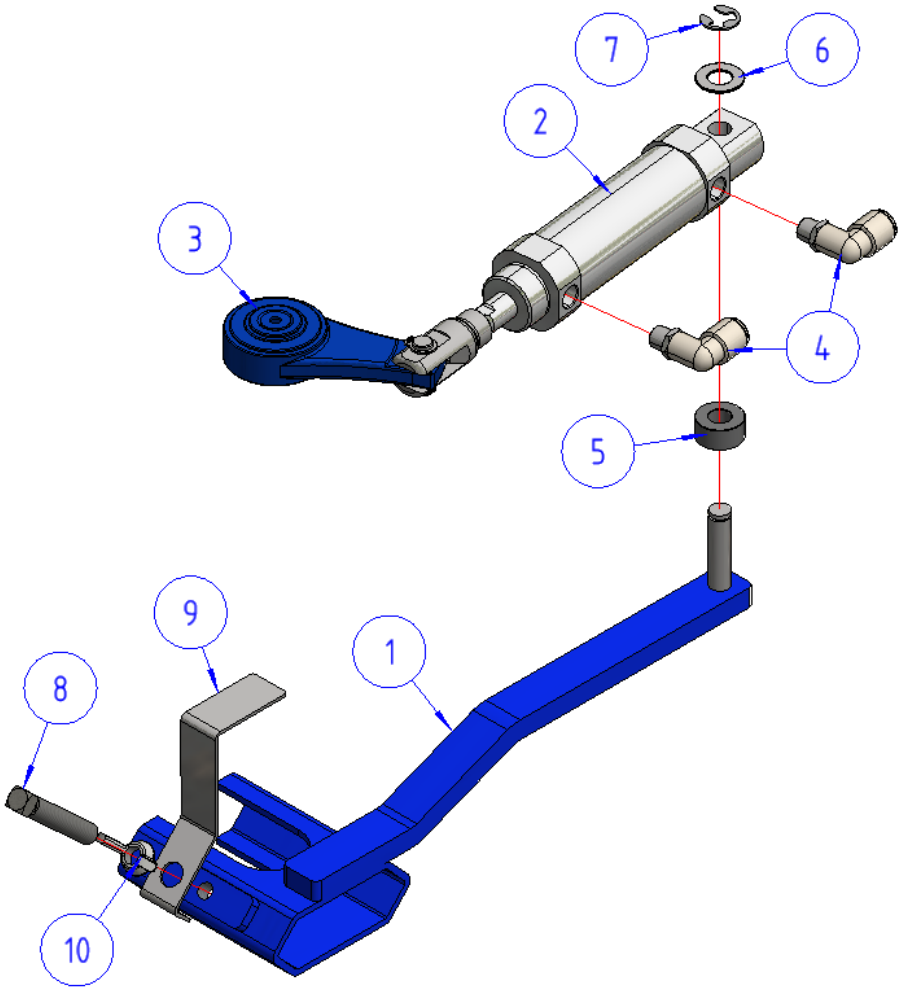

Figure 47 – HSA28 – Yoke Mount Arm, Chlorine Drum

HSA28 – YOKE MOUNT ARM, CHLORINE DRUM – COMPONENTS		
ITEM	**DESCRIPTION**	**QTY**
1	YOKE MOUNT ARM (POWDER COATED)	1
2	PNEUMATIC CYLINDER	1
3	RATCHET HEAD C/W CLEVIS	1
4	FITTING – MALE ELBOW – 8MM OD TUBE X 1/8 INCH MALE THREAD	2
5	SPACER – PVC	1
6	WASHER – 316SS	1
7	E-CLIP	1
8	CLAMP SCREW	1
9	RATCHET HEAD RETAINER – YOKE MOUNT	1
10	NUT – STEEL WING NUT	1

Table 10 – HSA28 – Yoke Mount Arm, Chlorine Drum – Components

HSA38 – Valve Mount Arm, Chlorine Cylinder

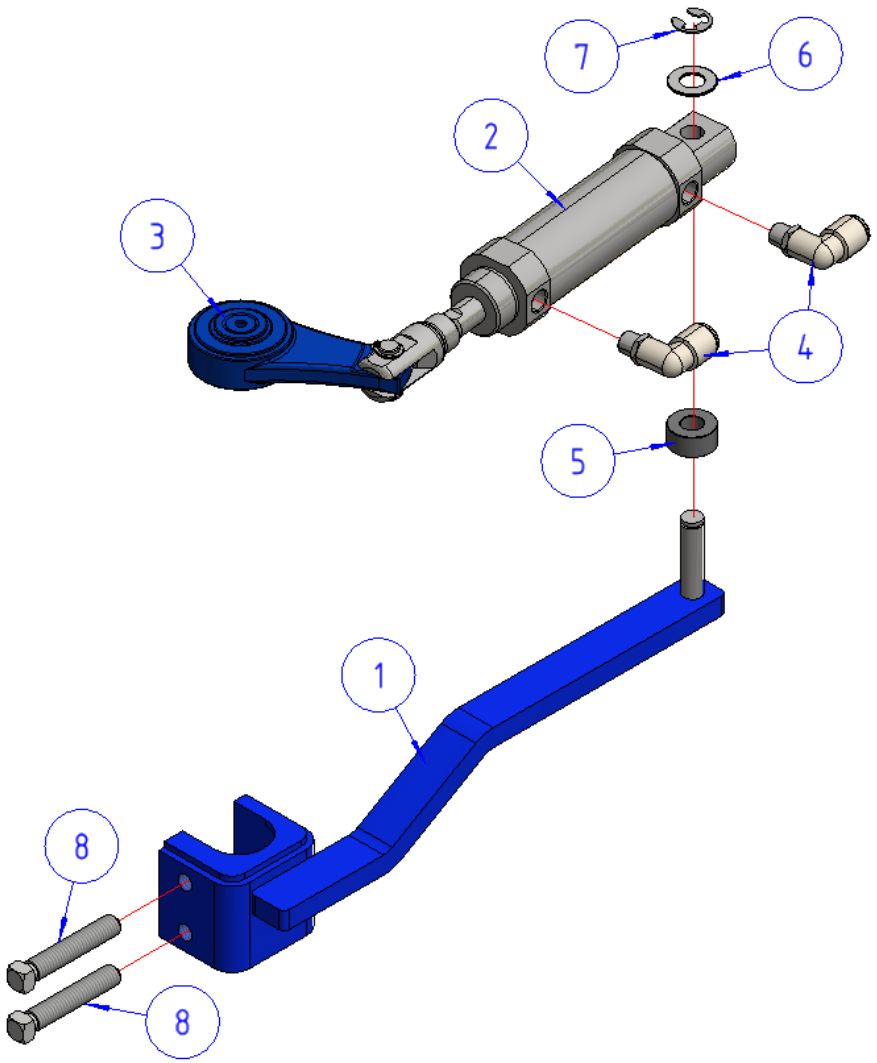

Figure 48 – HSA38 – Valve Mount Arm, Chlorine Cylinder

HSA38 – VALVE MOUNT ARM, CHLORINE CYLINDER – COMPONENTS		
ITEM	**DESCRIPTION**	**QTY**
1	VALVE MOUNT ARM (POWDER COATED)	1
2	PNEUMATIC CYLINDER	1
3	RATCHET HEAD C/W CLEVIS	1
4	FITTING - MALE ELBOW - 8MM OD TUBE X 1/8 INCH MALE THREAD	2
5	SPACER – PVC	1
6	WASHER - 316SS	1
7	E-CLIP	1
8	CLAMP SCREW	2

Table 11– HSA38 – Valve Mount Arm, Chlorine Cylinder – Components

HSA48 – Valve Mount Arm, Chlorine Drum

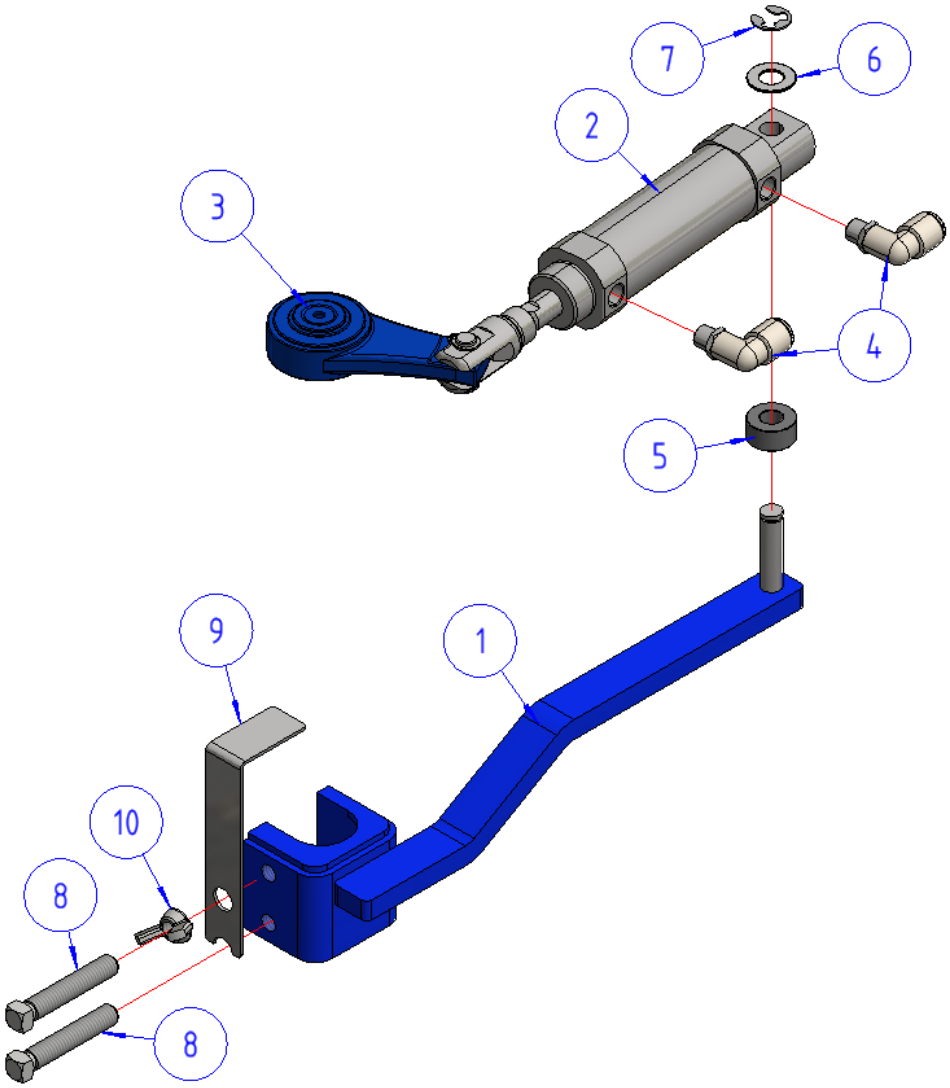

Figure 49 – HSA48 – Valve Mount Arm, Chlorine Drum

HSA48 – VALVE MOUNT ARM, CHLORINE DRUM – COMPONENTS		
ITEM	**DESCRIPTION**	**QTY**
1	VALVE MOUNT ARM (POWDER COATED)	1
2	PNEUMATIC CYLINDER	1
3	RATCHET HEAD C/W CLEVIS	1
4	FITTING – MALE ELBOW – 8MM OD TUBE X 1/8 INCH MALE THREAD	2
5	SPACER – PVC	1
6	WASHER – 316SS	1
7	E-CLIP	1
8	CLAMP SCREW	2
9	RATCHET HEAD RETAINER – VALVE MOUNT	1
10	NUT – STEEL WING NUT	1

Table 12– HSA48 – Valve Mount Arm, Chlorine Drum – Components

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