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IMPORTANT NOTE

It is essential, to ensure conformity with the standard, that the user of the Expo Telektron System observe the following instructions:

Please refer to the standard for detailed requirements and definitions.

References to clauses in the standard are in italics

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Section 0 Description and principle of operation

All Expo Telektron pressurization systems provide

- a) a method of pressurizing a Pressurized Enclosure (PE) while at the same time compensating for any leakage, together with
- b) a method of Purging the enclosure before power is turned on to remove any flammable gas that may have entered the enclosure while it was unpressurized.

All systems have the following two major items:

- A **Control Unit (CU)** containing as a minimum, for "Y" and "Z" Pressurization, a dust/water filter, Flow Control Valve (FCV), Minimum Pressure and Purge Flow sensing devices, a "Pressurized"/"Alarm" indicator and an output signal showing whether the PE pressure is satisfactory or not.

Type "X" Pressurization Control Units, in addition, have a fully automatic Purging controller with a Purge timer and electrical power switch interlock.

- A **Relief Valve (RLV)** fitted to the Pressurized Enclosure (PE) to provide a means of limiting the maximum pressure experienced by the PE during operation. The RLV model number has a suffix giving the diameter of the valve aperture (in millimetres) e.g. .cs (Carbon Steel) or .ss (Stainless Steel). All RLVs incorporate a metal foam Spark Arrestor to prevent sparks being ejected from the PE through the RLV aperture. The Relief Valve design is patented.

CFHP systems with a Continuous Flow of air after purging have a calibrated Outlet Orifice which can be either be within the Relief Valve (suffix .cf) or a separate item type SA** or SAU**.

Model LC and CFHP Expo Telektron systems are covered by this manual. They are described on the following paragraphs.

0.1 "Leakage Compensation" systems, Model LC

A Leakage Compensation system, Model LC, after the initial purging time has no deliberate continuous flow. The Pressurised Enclosure (PE) is built as leak tight as possible and the LC system merely tops up for any enclosure leakage. The system provides an initial high flow of purging air which leaves the PE through the Relief Valve. After the initial purging has been completed the control Unit changes over to Leakage Compensation mode and the Relief Valve closes. The only flow thereafter is the flow through the "Leakage Compensation Valve" (LCV) which is adjusted so that the flow is just enough to compensate for any leakage from the Pressurized Enclosure (PE). Hence the term "Leakage Compensation". In consequence the system is much more economical to operate than a "Continuous Flow" system.

The Purging Flow rate is monitored by a separate "Purge Flow Sensor" located in the Control Unit which detects the back pressure caused by the purge flow rate through the RLV Spark Arrestor. The Spark Arrestor is calibrated during manufacture so that the back pressure at the desired Purge Flow rate is known. The Purge Flow Sensor is set to operate when that back pressure is exceeded. The output from the Flow Sensor is indicated on the Control Unit and on "X" Pressurization systems, used to operate the automatic purge timer. Both Enclosure Pressure and Purge Flow have to be correct before the Purge Timer can start.

0.2 "Continuous Flow after High Purge" Model CFHP system

The CFHP Control Unit is identical to the LC version. The difference is in the provision of one or more fixed outlet orifices to provide a deliberate "leak" at a known flow rate. The Outlet Orifice is pre-calibrated so that the pressure drop at the desired flow rate is known. The Minimum Pressure Sensor within the Control Unit will be

set to the same value as the pressure drop. When the PE pressure exceeds the calibrated pressure the Continuous Flow must be taking place.

There are three ways of providing this calibrated Outlet Orifice in current production. Please consult the system specification sheet to determine which has been supplied. The choice:

- Type SAU** where the Outlet Orifice disk is removable and can be easily changed by the user to give different flow rates according to the size of the Pressurized Enclosure and the available air supply capacity. (** denotes the metric thread size of the SAU body)
- Type SA** where the orifice size is fixed and the way to change the flow rate is either to change the setting of the Minimum Pressure Sensor or to replace the SA with one of another size. (** denotes the nominal thread size of the SA body)
- For low flow rates, the Outlet Orifice may be incorporated within the Relief Valve making use of the

existing metal foam Spark Arrestor. The Relief Valve will then have a suffix /CF**, where ** is the orifice size in millimetres.

The Leakage Compensation Valve in the CU is opened sufficiently to provide enough air both to compensate for any accidental leakage as well as provide the Continuous Flow through the outlet orifice. In this way a high flow rate is provided during the initial purge period which is thereafter reduced to the desired Continuous Flow rate. Even if the PE had no accidental leakage there would still be a flow from the outlet orifice.

A continuous flow of air can be necessary where the PE has equipment that needs cooling or where there is a possible source of flammable gas inside the PE which needs dilution.

The purge time is based on the initial Purge Flow rate.

If the same flow rate is needed (or is acceptable) both during and after purging a Model CF (Continuous Flow) system is more economical.

Section 1 Installation of the system

1.1 Installation of the Expo Telektron LC and CFHP Systems

.1 The Expo Telektron system should be installed either directly on or close to the Pressurized Enclosure (PE). If not installed on the PE it should be as close as possible. It should be installed so that the system indicators may be readily observed

.2 All parts of any system carry a common serial number. If installing more than one system, ensure that this commonality is maintained on each installation.

.3 Any tubing, conduit and fittings used to connect to the PE should be metallic, or, if non-metallic, conform to the local codes for flammability ratings. No valve may be fitted in any tube connecting the Expo Telektron system to the PE.

.4 If the purge exhaust is required to be discharged into a non-classified area the ducting shall conform to:

2-6.1 Discharge of the protective gas

.5 The user or manufacturer of the PE shall determine the volume of the PE, the necessary purging volume, and the time to be allowed for purging using the Expo Telektron system purging flow rate chosen. It is the user's responsibility to verify or enter this data on the PE and/or Expo Telektron system name plate. Ask Expo Telektron if in doubt.

Example calculations:

a) If the PE external dimensions give a volume of 20 cubic feet, and the PE is NOT a motor, multiply the volume by four to get the Purging Volume i.e. 80 cubic feet. Divide the Purging Volume by the purge rate e.g. 32 cubic feet per minute, and round up to the next even minute above, i.e. 4 minutes.

b) If the PE is a motor, multiply the volume by ten to get the Purging Volume. In this case the Purging time would be 8 minutes.

.6 If the PE contains an internal source of release of flammable gas or vapour, the procedures for assessment of the release as given in Chapter 6 of NFPA496 shall be observed. The user must verify that the specification of the Expo Telektron system e.g. pressures, continuous flow (dilution) rate and type of protective gas are correct for the specific application. If an inert protective gas is required the Expo Telektron Control Unit can be specified to have Compressed Air for the control logic and Inert Gas for the protective gas to minimise Inert Gas consumption.

.7 More than one PE can be protected by a single system. If PEs are connected and purged in "series" e.g. "Daisy Chained", the Outlet Orifice must be fitted on the last enclosure with the Purge Inlet to the first enclosure. The bore and length of the tube or conduit used to interconnect the enclosures is critical and will determine the maximum pressure experienced by the first enclosure in the series. Advice on sizing can be obtained from your Expo Telektron systems sales office. The test pressure for all the enclosures should be 3 times the pressure inside the first enclosure when purging is taking place.

If PEs are to be connected in parallel each enclosure must have its own outlet Relief Valve, Purge Flow Sensor and Pressure Sensor. System "Models" can be mixed e.g. Model LC for one enclosure and Model CF for another. An example would be a Gas Chromatograph instrument. Expo Telektron systems with this facility have option code "TW".

1.2 Quality and installation of the Pressurizing air or inert gas supply

.1 The source of the compressed air must be in a non-classified area. Inert gas may be used as an alternative to compressed air.

.2 Unless a supply shut-off valve has been specially fitted within the Expo Telektron system, a valve with the same, or larger, thread size as the Expo Telektron inlet

fittings shall be fitted externally and, for "Y" and "Z" Pressurization systems, be provided with a suitable nameplate, see clause:

2-8.2 Enclosures that can be isolated from the gas supply

2-11.4 "Warning-Protective gas supply valve"

.3 The tubing and fittings used must conform to 1.1.2 above.

.4 The following clauses from NFPA 496:1993 shall be observed:

2-4.1 The quality and contamination of the protective gas

2-4.1.1 Type of protective gas

2-4.2 Piping for the protective gas

2-4.3 Air compressor intake in a non-classified location

2-4.4 Compressor intake line requirements

2-4.5 Compressor power supply requirements

1.3 Provision and installation of Alarm devices

.1 Expo Telektron systems have a Minimum Pressure Sensor set to a pressure of at least 0.1" w.c. (0.25mb). When the PE pressure is above this set point the Sensor produces a positive "Pressurized" signal. This is displayed on a Red/Green indicator fitted on the Expo Telektron system and can also be used to operate an electrical contact for a remote "Alarm". The pneumatic signal may be supplied either

a) to an electrical pressure operated switch (Option Code /IS) suitable for an Intrinsically Safe circuit in accordance with Expo Telektron drawing EP80-2-11, (or for a Non-Incendive circuit in Division 2), or

b) to a bulkhead fitting where it is available to the user (Option Code /PO). It can then be used to operate an external electrical switch either local e.g. explosionproof, or remote in a non-classified area.

When the enclosure pressure falls below the set point of the Sensor the "Pressurized" signal is removed, i.e. the absence of the signal indicates a "Alarm" ("Pressure Failure") condition. The user must make use of this external alarm facility in accordance with NFPA496 :1993 requirements if the system "Alarm" indicator is not located in a place where it can be readily observed.

Example: The "Pressurized" signal can be used to produce an "Alarm" action by means of a conventional "pressure switch" set to operate at around 15psi (1 bar). The "Pressurized" signal from the Control Unit at 30psi (2 bar) or more will hold the switch in the operated position until the CU detects a low pressure in the Pressurized Enclosure and removes the "Pressurized" signal. The Alarm switch will reset and its contacts can be used to operate a remote electrical alarm.

If the switch is located in the hazardous area it must either be part of an Intrinsically Safe circuit, or be suitably protected e.g. explosionproof. The pressure switch should be IS or explosionproof even if it is fitted within the Pressurized Enclosure.

Expo Telektron tip: Exception: For a "Z Purge" system fitted in a Division 2 area a non-classified switch inside the PE can be used to operate a remote Alarm provided its electrical supply comes from within the PE (i.e. NOT PROVIDING DRY CONTACTS). When the PE is in use the Alarm can operate normally in response to the pneumatic signal from the CU with option /PO. When the PE is switched off there is no need for an alarm! Ask for the circuit diagram.

The Alarm switch can also be located in a nearby non-classified location. To get the best response time the switch should be as close as possible to the CU and the maximum length of tubing between the CU and the Alarm switch should not exceed 150 feet (30m) unless "Quick Exhaust Valves" are used (please ask for help). See clauses:

2-3.2 Device to warn of pressure failure or cut off the power automatically

2-3.3 Protective gas supply failure alarm required

For "Y" and "Z" Pressurizing systems:

2-8.3 If an alarm is used ...

2-8.4 If an indicator is used...

.2 No valves may be fitted between the Expo Telektron system and the alarm switch.

1.4 Power supplies and their isolation

.1 All power entering the PE shall be provided with a means of isolation. This requirement also applies to any external power sources which are connected to "dry contacts" or "volt-free contacts" within the PE.

Exception: Power to Intrinsically Safe, or other apparatus which is already suitable for the location need not be isolated by the Expo Telektron system.

Expo Telektron Tip: It is much better to fit dry or volt-free contacts in the non-classified area or inside an explosionproof box rather than inside the PE. Please ask Expo Telektron about "MiniPurge Interface Units" (MIU).

In the case of "X" Pressurization, the isolation of the power must be controlled by the Expo Telektron system using the "Purge Complete" pneumatic signal to operate a "Power Switch" in a similar manner to that described in 1.3.1 above.

In the case of "Y" or "Z" Pressurization the power may be controlled manually by the user by the use of local isolating switch.

.2 The electrical installation shall conform to the local codes and the following clauses from NFPA496:1993

2-4.6 Power supplies for "double pressurized" installations

2-10.1 Power Cutoff Switch to de-energize all circuits not approved for Division 1 on failure of the protective gas supply.

Exception: The power may remain connected for a short period if immediate cutoff could result in a more hazardous condition and if audible and visual alarms are provided in a constantly attended location.

.3 Many Expo-Telektron Mini-X-Purge and Super-Mini-Purge systems can be retrofitted in the field by the user to have an "Alarm Only" action on pressure or flow failure. It is then the responsibility of the user to de-energize the protected equipment as soon as possible.

.4 The Power (cutoff) Switch must be approved for the location or located in a non-classified area.

.5 No valves are permitted between the Power switch and the Expo Telektron system.

.6 For "X" Pressurization, the PE door shall have fasteners that can be opened only by the use of a tool or key. Otherwise the following clauses from NFPA 496:1993 apply:

3-5.2 Door switch interlock

3-5.2.1 Approved for Division 1

Note: The door switch provided with the Expo Telektron system (when requested) is pneumatic or electric.

1.5 Marking

.1 The Expo Telektron system carries a nameplate giving specification data such as serial and models numbers, Pressure Sensor settings, flow rates and purge

time. The same data is also given in the specification sheet accompanying the system.

.2 Other marking required by the standard includes:

2-11.1 Pressurized Enclosure

"WARNING - PRESSURIZED ENCLOSURE

This enclosure shall not be opened unless the area is known to be free of flammable materials or unless all devices within have been de-energized"

3-3 Start-up Markings

"Power shall not be restored after the enclosure has been opened until the enclosure has been purged for ___minutes at a flow rate of ___."

Expo Telektron note: It is understood that Clause 2-11.1 requires the de-energization of all devices that are not suitable for the hazard e.g. devices that are not Explosionproof or Intrinsically Safe. An explosionproof anti-condensation heater for example would not have to be de-energized.

.3 If Inert Gas is used as the Protective Gas and a risk of asphyxiation exists, a suitable warning plate should be fitted to the PE.

Section 2 Operation of the system

2.1 Initial Commissioning

.1 Check that the system has been installed in accordance with Section 1 of this manual.

.2 Disconnect the supply pipe from the inlet to the Expo Telektron system and blow it through for at least 5 seconds per foot of length (15sec/metre) to remove any debris, oil and condensation.

.3 Connect a temporary pressure gauge or liquid manometer to the PE or Expo Telektron system Pressure Test Point (on the system chassis - 4mm OD nylon tube).

2.2 Commissioning Leakage Compensation (LC) and Continuous Flow High Purge (CFHP) "X" Purge systems.

(see 2.6 for LC and CFHP "Y" and "Z" Purge systems)
On LC and CFHP "X" Purge systems proceed as follows:

.1 Open the Leakage Compensation Valve (LCV) to about 50% of its travel.

.2 Open the supply shutoff valve SLOWLY and allow the PE pressure to rise until the Relief Valve (RLV) opens. Check that the RLV opens at or below the figure specified in the documentation. Repeat the test several times.

.3 Open the supply shutoff valve fully and the purging flow will start.

.4 Check that the internal logic gauge reads 30psi (2bar). If not, adjust the logic pressure regulator to suit (lift the red ring to unlock the knob first)

.5 At this time the "Pressurized indicator should be green and the "Purging" indicator should be amber. If the amber indicator remains black the flow through the Relief Valve is below the minimum for which the Flow Sensor has been calibrated. Check the air supply pressure at the inlet to the Control Unit while purging is taking

place. It must be above the minimum specified. The larger Super-Mini-Purge system has a built-in gauge on the filter for this purpose.

.6 On LC and CFHP "X" purge systems the purge timer will start as soon as the "Purging" indicator turns amber. Check that the time delay between the indicator turning amber and the application of power to the PE is not less than the minimum time required to purge the PE. Times in excess of the minimum are permitted and a tolerance of +20% is normally acceptable. If the time is too short it must be adjusted accordingly. Two types of Purge Timer control are currently in production:

a) The original system has a single timer reservoir and a black rotary timer control where the OUTER BODY of the timer restrictor is turned counter-clockwise to increase the time setting. (DO NOT adjust the central screw!) The setting is quite sensitive (logarithmic) and only small adjustments (e.g. one scale division) should be made between repeated timing checks unless the time is much too short. As a guide the following table can be used for Mini and Sub-Mini-X-Purge systems. (Multiply by 3 for Super-Mini)

Scale No:	2	3	4	5	6	7	8
Minutes:	0.8	1.5	2	3.5	6	12	20

b) The alternative system uses a pneumatic incremental timer which is adjusted by fully opening or closing one or more of five screwdriver-operated valves, arranged in a block on the control logic manifold – see GA Drawing. The opening of each valve incrementally provides a fixed number of minutes of purging time as in the following table

Valve:	1	2	3	4	5
Minutes:	2	4	8	8	16

Thus for a 12 minute purge time, valves 2 and 3 would be open and the others closed. For twenty-four minutes, 4 and 5 would be open and the others closed. **At least one valve must always be open and the screws must be at the appropriate limit of travel.**

.7 After the power has been turned on by the Control Unit, the Purging Valve will close and the air flow into the enclosure will be controlled by the Leakage Compensation valve (LCV). The initial setting of 50% open may be too high or too low. It should now be adjusted to set the PE pressure and leakage.

There are three possible situations:

a) Air continues to come out through the RLV Spark Arrestor after power has been turned on in considerable quantity. The LCV is much too far open and the air flow is holding the RLV open continuously. (Note: Some CFHP systems have a deliberate but modest "Continuous" air flow through the RLV in normal operation; do not confuse this flow rate with that caused by excessive setting of the LCV.) Close the LCV slowly observing the manometer or gauge (see item 2.3 above). The PE pressure will start to fall as the flow decreases but eventually the RLV will close and the pressure rise again. At this point the Relief Valve may start to open intermittently as the PE pressure rises to the point where the RLV recloses and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV. Proceed now to b) below:

b) If the Relief Valve is opening intermittently the LCV is slightly too far open. Observe the manometer or gauge. When the RLV opens the enclosure pressure falls quickly to the point where the RLV recloses and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV and shows that it is working correctly.

Then continue to close the LCV until the cycling stops and the enclosure pressure starts to fall. Carefully adjust the LCV until the PE pressure is approximately 50% of the RLV opening pressure and stable. This pressure may be around 2"w.c.(5mb) and will be the "normal working pressure".

We recommend that the setting of the Minimum Pressure Sensor is checked at this time. Note the position of the LCV knob. (A pencil mark placed on the knob at "12 o'clock" can be used). Slowly lower the PE pressure by closing the LCV further counting the number of turns from the "normal working pressure" position. Note the pressure at which the "Pressurized" indicator turns red and check that it is not lower than the figure given in the documentation. Check also the "Alarm" electrical contacts (if fitted).

As soon as the "Pressurized" indicator turns red, the enclosure power will be switched off (see also .8 below) and the system will start to repurge.

While it is re-purging return the LCV to its "Normal working pressure" position so that, at the end of purging the enclosure pressure should immediately settle down at the correct "normal" pressure. Finally re-adjust the LCV if necessary.

c) If, at the end of purging, the PE pressure falls below the Minimum Pressure Sensor setting the LCV is not

open far enough. The system will start to purge again. While it is purging open the LCV fully and check the enclosure for leakage. This time, at the end of purging, the enclosure should stay pressurized and the Relief Valve action be as in a) or b) above. It is likely that there is significant leakage from the enclosure and attempts to reduce the leakage will be time well spent.

CFHP systems are intended to have a Continuous Flow through the enclosure. The Continuous Flow may emerge through the RLV, in which case the RLV will have a "CF" in its model number. Other CFHP systems will have a separate Outlet Orifice/Spark Arrestor and air can be felt emerging through this aperture whenever the enclosure is pressurized.

.8 Some "X" Purge LC and CFHP systems can have the "Action on Pressure Failure" (normally "Alarm and Trip") adjusted by the user to become "Alarm Only" in accordance with NFPA496 Clause 2-10.1, exception; please contact your Expo Teletron Sales office for further details.

2.3 Commissioning Leakage Compensation (LC) and Continuous Flow/High Purge (CFHP) "Y" and "Z" systems.

On LC and CFHP "Y" and "Z" Purge systems proceed as follows:

.1 Open the supply shutoff valve.

.2 Adjust the Leakage Compensation Valve (LCV) so that the enclosure pressure rises to the point where the "Pressurized" indicator turns green.

.3 Continue to raise the PE pressure until the Relief Valve (RLV) opens. Check that the RLV opens at or below the figure specified in the documentation. Repeat the test several times.

.4 Lower the PE pressure until the "Pressurized" indicator turns red. Check that the indicator turns red at or above the pressure specified in the documentation. Check the external alarm contacts (if fitted).

.5 Open the LCV again and set the PE pressure to a level around 50% of the RLV operating pressures. This "working" pressure is not critical. The "Pressurized" indicator should be green.

.6 Turn the Purge Control Valve "On". This will start the High Purge Flow and the "Purging" indicator should turn amber. If the "Purging" indicator remains black the flow through the outlet valve is below the minimum for which the Flow Sensor has been calibrated. Check the air supply pressure at the inlet to the Control Unit while purging is taking place. It must be above the minimum specified. (Super-Mini-Purge systems have a built-in gauge on the filter for this purpose.) If the supply pressure is correct and the "Purging" indicator does not turn amber, there is too much leakage from the Pressurized Enclosure. Find and fix the leaks!

"Purging" does not start until the indicator turns amber

.7 On LC and CFHP "Z" Purge systems the purge timing function is performed by the user. When the "Purging" indicator turns amber the Purge Flow is above

the minimum required and the purge time can start. The user must ensure that the time delay between the indicator turning amber and the application of power to the PE is not less than the minimum time required to purge the PE as shown on the PE or Expo Telektron system nameplate.

Never turn on the power without purging first unless you have proved that the interior of the PE is gas free and checked that the "Pressurized" indicator is green!

.8 After the purge time is completed the Purging Valve should be turned "Off". The High Purge Flow will cease and the air flow into the enclosure will then be controlled once again by the Leakage Compensation Valve (LCV) It should now be re-adjusted if necessary. The RLV should be closed and the enclosure pressure around 50% of the RLV opening pressure. If this is not so there are three possible situations:

a) Air continues to come out through the Spark Arrestor, after High Purge has been turned "Off", in considerable quantity. The LCV is much too far open and the air flow is holding the RLV open continuously. (Note: Some CFHP systems have a deliberate but modest "Continuous" air flow through the RLV in normal operation; do not Air continues to come out through the RLV Spark confuse this flow rate with that caused by the excessive opening of the LCV.) Close the LCV slowly observing the manometer or gauge (see item 2.3 above). The PE pressure will start to fall as the flow decreases but eventually the RLV will close and the pressure rise again. At this point the Relief Valve will start to open intermittently as the PE pressure rises to the point where it exceeds the RLV opening pressure. when the RLV opens the pressure will fall quickly to the point where the RLV recloses and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV. Proceed now to b) below:

b) If the Relief Valve is opening intermittently the LCV is slightly too far open. Observe the manometer or gauge.

When the RLV opens the enclosure pressure falls quickly to the point where the RLV recloses and the enclosure pressure starts to rise again. This is entirely normal for this type of RLV and shows that it is working correctly.

Continue to close the LCV until the cycling stops and the enclosure pressure starts to fall. Carefully adjust the LCV until the PE pressure is approximately 50% of the RLV opening pressure and stable. This pressure may be around 2" w.c. (5mb) and will be the "normal working pressure".

c) If, at the end of purging, the PE pressure falls below the Minimum Pressure Sensor setting the LCV is not open far enough. The LCV should be opened until the PE pressure is around the normal working pressure.

.9 CFHP systems are intended to have a Continuous Flow through the enclosure. The Continuous Flow may emerge through the RLV, in which case the RLV will have a "CF" in its model number. Other CFHP systems will have a separate Outlet Orifice/Spark Arrestor and air can be felt emerging through this aperture whenever the enclosure is pressurized.

.10 "Y" and "Z" purge systems do not control the enclosure power and it is the responsibility of the user to switch off the power whenever the enclosure pressure falls below the minimum permitted i.e. when the "Pressurized" indicator turns red.

2.4 Normal operation

.1 "X" Purge systems: Turn the air supply valve On or Off to start or stop the system, After this the Pressurizing and Purging sequence is entirely automatic.

.2 "Y" and "Z" Purge systems are started and stopped in the same way as "X" purge system but the user must close the Power Switch only after the enclosure has been pressurized and purged sufficiently to ensure that the interior of the enclosure is gas free. The power should be shut off as soon as possible after pressure failure. This is also the user's responsibility.

Section 3 Maintenance of the system

The maintenance recommended for the system consists of the following items, supplemented by any additional local requirements imposed by the authority having jurisdiction.

3.1 Commissioning

The tests to be performed during commissioning are described in Section 2 of this manual. They include checking the opening pressure of the Relief Valve, the setting of the Minimum Pressure Sensor, the "Normal Working Pressure" of the enclosure and, for "X" purge systems, the setting of the purge timer.

3.2 Routine maintenance

.1 Expo Telektron recommend that the commissioning tests be performed again at least every six months. In addition the following checks are also recommended at that time:-

- Check the RLV and any other Spark Arrestors. Remove any debris or corrosion, or replace with a spare.
 - Check the condition of the air supply filter element. Clean or replace it as necessary.
- .2 At least every two years check the following additional items:
- The apparatus suitable for the Hazardous location
 - There are no unauthorised modifications
 - The source of air is uncontaminated
 - The interlocks and alarms function correctly
 - Approval labels are legible and undamaged
 - Adequate spares are carried
 - The action on pressure failure is correct

Section 4 Fault Finding – LC and CFHP systems

4.1 General If the system does not behave in the manner described above there is a fault. Some of the more likely faults are dealt with below. If a cure cannot be effected by following the procedure shown below please call Expo Telektron (24 hour answering) or your supplier for further assistance.

The system has been designed for ease of fault finding and many of the components fitted are plug-in or sub-base mounted. Check components by substitution only after establishing that such action is necessary. If the system is less than 12 months old, parts under warranty should be returned to Expo Telektron for investigation, with a full report of the fault and the system serial number.

NOTE: As with any pneumatic system the greatest enemies are water, oil and debris in the air supply. For this reason a dust and water filter is always fitted. But debris can enter from other sources and it is vital therefore that the procedures described in Section 21 is carried out before using the system for the first time, or following any disconnection of the pipework. Failure to perform this work may cause damage which will not be covered under warranty.

Fault Finding

NOTE: Before making the following checks verify that the main supply pressure is between 60 and 115 psi (4-8bar) at the Control Unit and, for X-Purge systems, the regulated pressure on the logic gauge is 30 psi (2 bar)

4.2 Minimum Pressure alarm is on continuously ("Pressurized" indicator is red)

Possible cause 1: The Pressurized Enclosure (PE) pressure is too low. Try increasing the setting of the Flow Control Valve (FCV) to raise the pressure in the PE.

Possible cause 2: Enclosure fault?

- Is the ACTUAL PE pressure below the setting of the Minimum Pressure Sensor? Check it with a manometer or gauge.
- Is there debris stuck on the face of the Relief Valve disk, perhaps held there because of the magnetic material?
- Has the PE door been closed and all conduit/cable glands sealed?
- Is the PE leaking too much?
- Has the pressure sensing tube been damaged?

Possible cause 3: System fault?

If checks in (a) above reveal that the PE is correct, the fault probably lies in the Control Unit. The basic operation of the Minimum Pressure Sensor can be checked by unscrewing the 2.4" (60mm) diameter diaphragm and, by using a finger, block the threaded hole in the top of the valve module. The valve should operate and the indicator turn green. If this works correctly and the enclosure pressure is above the setting of the Minimum Pressure

Sensor it is likely that the Pressure Sensor diaphragm needs recalibrating or replacing. (See below)

4.3 Relief Valve open (continuously or intermittently)

Possible cause 1: The PE pressure is too high.

The Leakage Compensation Valve (LCV) is too far open. Adjust the LCV as described in Section 2 above.

Possible cause 2: Debris on the RLV disk allowing air to leak from the valve. Remove the RLV cover and clean the valve disk. The disk and spring may be removed from the RLV without affecting the calibration.

4.4 "Purging" indicator will not turn amber during purging

Possible cause 1: Insufficient purging Flow due to inadequate air supply pressure. Check the air supply pressure at the inlet to the CU when flow is taking place. Excessive pressure drop in the supply pipe is a very common cause of this problem. The supply pipe must be at least as big as the CU inlet fitting, i.e. at least ½" NB (12mm).

Super-MiniPurge systems with ¾" or 1" connections must have AT LEAST this internal diameter for supply and outlet tubing. Due to the high flows demanded from these large systems the need for adequate supply tubing is VITAL. If in doubt, or for long distances, install tubing that is at least 50% larger than the inlet size!

Possible cause 2: Excessive Pressurized Enclosure (PE) leakage. Check around the PE when flow is taking place. Any significant leakage must be cured. Has a Leakage Test been done? The total leakage should not exceed 10% of the Purge Flow Sensor setting. Check for leakage down the conduit through unsealed stopping boxes.

Possible cause 3: PE not strong enough. Repeat the PE pressure test. FM recommend that the PE is tested to three times the Relief Valve opening pressure e.g. 12"wc (30mb) for many systems. Has this been done?

Possible cause 4: The tubing from the RLV Flow Sensing point to the Purge Flow Sensor is not air-tight e.g. fitting nuts not tightened or tube damaged. Check and repair as necessary.

Possible cause 5: The Purge Flow Sensor is not operating correctly or out of calibration. The basic operation of the Purge Flow Sensor can be checked by unscrewing the 2.4" (60mm) diameter diaphragm and m by using a finger, block the threaded hole in the top of the valve module. The valve should operate and the indicator turn amber. If this works correctly and the flow through the Relief Valve is above the minimum required WITH THE RELIEF VAVLE COVER FIRMLY SECURED IN PLACE the Sensor diaphragm needs recalibrating or replacing.

4.5 System fails to switch power on after the purge time has elapsed? ("X"-Purge systems only)

Possible cause 1: Is power available? Is the power disconnect closed? Are the fuses or circuit breaker OK?

Possible cause 2: System fault? Timer not timed out?

- a) Has the "Purging" indicator been amber for the whole of the purge time?
- b) Is the logic pressure gauge at 30psi (2bar) $\pm 10\%$.
- c) Check the small indicator on the timer valve. When the timer has timed out it should return out when depressed.
- d) Is there pressure at the Power Switch output bulkhead and at the Power Switch itself? Is the Switch set at 15psi (1bar)?
- e) Is the pipe to the Power Switch airtight? The signal to the Power Switch bulkhead has a restrictor which limits the permissible leakage from the pipe.
- f) Note the timer setting. Reset the timer to the minimum available purging period (see Para. 2.2.6) and check operation on that purge time. If it works OK, increase the time progressively until either it is correct, or the system ceases to time out at all. In the latter case, there is an air leak in the timer circuit. (A leak in the timing circuit can cause the timer not to time out.) If possible establish the source of the leak with soapy water and retest the system. This will involve removing the chassis from the control unit – be sure this is the cause before starting the work. It is VERY unusual!!

Ensure that the timer is returned to its original setting and the purge time checked before putting the system back into service.

Possible cause 3: Faulty Power Switch. Check the operation of the Power Switch. It should close above 20psi (1.4 bar).

4.6 Pressure Sensor calibration. If it is decided that the Minimum Pressure Sensor or Purge Flow Sensor needs recalibrating it can either be returned to Expo Telektron for this service or it can be done by the user as follows:

Disconnect the pressure sensing pipe from the top of the diaphragm. (It is a "push-in" quick release fitting; firmly push inwards the collar surrounding the pipe where it enters the fitting, and then pull the pipe outwards while maintaining the pressure on the collar). Unscrew the 2.4" (60mm) diameter diaphragm housing from the top of the Sensor. Invert it and note the brass adjusting screw in the centre. Turning the screw inwards (clockwise) will lower the setting. It is likely that the screw will be very stiff due to the locking sealant. If the screw cannot be moved the application of gentle heat in the area of the brass screw can often help. **DO NOT OVERHEAT!**

4.7 Filter cleaning If the filter element needs cleaning the transparent bowl can be unscrewed and removed. The filter element also unscrews and can then be cleaned in soapy water. Do not use solvents on any part of the filter assembly.

Expo Telektron tip: It is sometime easier, if the bowl is very tight, to remove the filter by undoing the fitting that holes the filter into the Control Unit. On Sub-Mini-Purge systems it may be necessary to remove the Minimum Pressure Sensor diaphragm first.

Section 5 Annex of Options fitted

Refer to the annex of this manual for any options fitted as designated by the model code of the system

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