Installation, Operating and Maintenance Instructions - FD Series Units

General

These units may be used as Pump Pulsation Dampers, Pipeline Surge Absorbers, Thermal Expansion Compensators or Accumulators and all operate by having a compressible gas on one side of a separating membrane, the other side being connected to the liquid line, used correctly they are totally safe and will give many years of reliable service.

Safety

As with all hydro-pneumatic products great care should be exercised when handling and charging this type of equipment and should only be carried out by trained personnel, as they contain energy in the form of compressed gas.

It is essential to read and understand the CA-7 Charging Instructions before any maintenance work is carried out.

UNDER NO CIRCUMSTANCES PRE-CHARGE WITH OXYGEN DUE TO THE RISK OF EXPLOSION

It is however perfectly acceptable for pressures below 7 bar to pre-charge using air pressure from an airline, foot or handpump, and Nitrogen from a high pressure cylinder above this. (Refer to CA-7 Charging Instructions)

Unless otherwise specified in your purchase order, a small amount of silicon grease will be used to lubricate the rubber components during assembly at the factory, please check that this will not effect the process or the liquid being handled.

When provided lifting eyes or lugs should be used for lifting the unit.

Suitable safety devices must be provided :

1. To protect the unit from overpressurisation in the event of the liquid line pressure exceeding the design pressure of the unit i.e. pressure relief valve, burst disc.
2. Where a risk of fire exists that would cause the gas pre-charge pressure to rise above the design pressure the unit should be protected via the on site deluge system or a suitable safety device must be fitted to the gas side of the unit i.e. fusible plug or burst disc.
3. Should the unit be fitted with a heating jacket or trace heated measures must be taken to restrict the heat input to protect the unit from overpressurisation as in (1) (2) above.
4. It is the responsibility of the user to establish a written scheme of examination for the vessel in line with local and statutory regulations for their safe operation. In drawing up the scheme of examination particular consideration should be given to condition monitoring of the membrane, internal and external surfaces of the pressure envelope that may be effected by corrosion, erosion or abrasion.
5. Where equipment is installed in potentially explosive atmospheres do not allow dust layers to build up on the equipment. The process fluid temperature shall not exceed the ignition temperature of the dust.
6. The maximum operating temperature of this equipment must not exceed the design temperature stamped on the Vessel or Vessel Nameplate, this is not to be confused with the temperature rating shown on the label for compliance with the ATEX Directive.

Storage

Units must be stored in such a way as to prevent mechanical damage to the shell and branch connections, if the unit is to be put into storage for a period of more than 6 months it is advisable to release its gas pre-charge, however where units have a pre-charge exceeding 320 bar g the gas pressure should be released when it is put into storage for a period more than 2 weeks.

Store away from extremes of temperature the seals may be manufactured from elastomers which may suffer degradation at temperatures below minus 10°C or above 90°C.

If the unit has been in use prior to storage then the diaphragm should be removed and cleaned of any process fluid.

Spares Kits should be stored in a dark place in their original packaging away from:-

1. Extremes of temperature
2. Direct sources of heat.
3. Humid conditions which may cause condensation.
4. Equipment generating ozone ie. Mercury and high voltage equipment.
5. It is recommended that contact between rubbers of different compositions be avoided.

Prior To Installation

- Check the correct connection has been supplied.
- Ensure that the maximum working pressure and temperature to which the unit may be subjected does not exceed the working pressure and temperature marked on the unit. If for any reason the working pressure of the unit cannot be ascertained, then check with our works quoting the serial number on the unit.
- Check that the unit is pre-charged. Units are usually supplied already pre-charged this would normally be marked on the unit. If installation is taking place within 3-4 months of original supply then it should not need checking. If the unit has not been supplied precharged or only has a nominal 'transit' precharge (often 1 bar) then pre-charging should be carried out in accordance with relevant Flowguard pre-charging instructions. As a general guide pre-charge pressure should be as follows.
- **Pump Discharge and Suction Dampers** -80% of minimum operating or minimum suction pressure at working temperature. If the precharge of any of your units is significantly different to this or if you have any other queries regarding precharge then contact our works by telephone or fax quoting the serial number.

- All units are tested in our works before shipment and traces of test fluid may still be present inside the unit. Test fluid is normally water / water oil emulsion. If these traces of fluid are likely to cause any problems when mixed with your process fluid then the units must first be flushed out at system pressure.

Mounting

Generally units should be mounted in a vertical position either way up. Most units below size 50 however, can be successfully mounted in a horizontal position. Single ported dampers should be fitted on a 'Tee' as close as practicable to the pump, keeping the length of the branch as short as possible, the longer the branch the less effective the damper will be.

NOTE: Unless stated otherwise on the order, we have made no allowances for supporting the damper. The installer should support the damper and pipework in such a manner as to prevent excessive loadings or stresses on the vessel and branches.

After Installation

- Ensure that the charging valve cap is hand tight. This cap contains a seal that is the main defence against loss of gas through the charging valve core. The valve core, a non return valve, which prevents gas loss in the short term, can leak over a long period.
- Using soapy water (50% washing up liquid is ideal) check the charging valve, charging valve cap and the whole vessel end for any signs of gas leakage. This is best done with the unit at normal working pressure but it is usually effective if carried out at precharge pressure.
- If a pressure gauge is fitted to the pump watch the needle closely when the pump is first switched on. As pressure builds up the flickering of the needle due to pulsations should cease or be considerably reduced as the precharge is reached. In the absence of the correct precharge checking device this is a reasonably accurate way of checking the precharge.

Maintenance

Pulsation Dampers need very little maintenance. The gas precharge should be checked periodically to ensure that no leakage has taken place, using charging kit CA7. It should be noted that when checking the pressure, a small amount of nitrogen is released from the vessel into the charging assembly and its connecting hose. This will cause the reading to be slightly low.

Any small losses in precharge pressure may also be due to temperature variations. If small losses are detected the pressure should be topped up. If, however, losses are significant or persistent the cause of the leak should be ascertained and a repair affected.

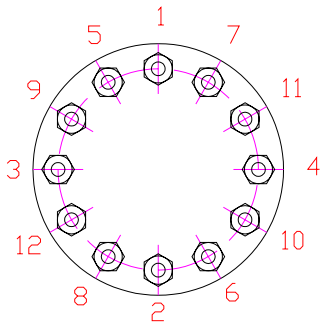
Extreme caution should be exercised during disassembly when the vessel has been used on corrosive or toxic substances as, even after flushing small amounts of fluid may remain, particularly if the diaphragm is punctured.

Disassembly

- Prior to disassembly ensure that the unit is isolated from the process line or the process line is depressurised and drained down.
- Release the gas pre-charge using a suitable charging assembly (see leaflet CA7).
- Remove charging valve.
- Remove the bolting and split the Upper and Lower Shell to remove the diaphragm and seal. On high pressure FD units the Upper and Lower Shell may be held together by a Threaded Retaining Ring which must be removed using a peg spanner, additional bolting is provided to compress the main 'O' Ring seal which must also be removed before the Upper and Lower Shell can be split and the diaphragm removed.
- Remove the Button from the Diaphragm.

Reassembly

- It is recommended that all 'O' Ring Seals are replaced each time the damper is re-assembled.
- Fit the original Button and replacement seals to the Diaphragm.
- **Bolted Construction.** Place the Upper Shell on a bench with the internal surfaces uppermost, the 'O' Ring Seal should be located into its groove and the Diaphragm placed on top so that the detent at the edge of the Diaphragm is located over the seal.
- Place the Lower Shell on top of the Diaphragm and replace the Bolting, tighten each opposite bolt finger tight in the sequence shown below, continue to tighten each bolt one turn at a time following the same sequence until the torque settings detailed below are reached.
- **Threaded Ring Construction**. Place the Lower Shell on a bench with the internal surfaces uppermost, the Diaphragm should be located into its recess and the 'O' Ring Seal placed on top so that the Seal sits in the detent at the edge of the Diaphragm.
- Locate the Upper Shell into the Lower ensuring that the bolt holes are aligned.
- Fit the bolting and tighten each opposite bolt finger tight in the sequence shown below, continue to tighten each bolt one turn at a time following the same sequence until the torque settings detailed below are reached. At this point the Diaphragm and 'O' Ring Seal will be fully compressed.
- Apply a ceramic anti-gauling compound to Threaded Ring and assemble, tighten hand tight using a peg spanner.
- **On no account use the Threaded Ring to compress the Diaphragm and 'O' Rings as this will cause the threads to gall.**
- Replace the Charging Valve and Re-Charge damper as detailed in CA-7 Charging Instructions.
- Dampers which may be subjected to high compression ratios may be furnished with a cushion fluid on the gas side of the diaphragm. The volume of fluid to be used is normally 25% of the nominal volume. The fluid used should be compatible with the system fluid in order to avoid any problems in the event of diaphragm failure.



TORQUE SETTINGS FOR BOLTING

	M8	M10	M12	M16	M20	M24
Nm	18	35	61	152	296	513
FT/LB	13	26	45	112	218	378

NOTE: TORQUE FIGURES STATED ABOVE ARE BASED ON THE THREADS BEING LUBRICATED WITH OIL OR GREASE

Basic Accessories and spares

Description	Part Number
Standard 1215 stainless steel charging valve – BSP thread	SK-CV-1215/B
Standard 1215 stainless steel charging valve – UNF thread	SK-CV-1215/U
Peg Spanner for removal of Threaded Retaining Rings	SK.TL.PSR

FLOWGUARD
Watford Bridge, New Mills,
High Peak, SK22 4HJ, England
Tel: +44 (0) 1663 745976
Fax: +44 (0) 1663 742788
E-Mail: Info@flowguard.com

1. Approvals

Prepared By: A. Hay Title: Works Manager Date: 13 May 2007 .

Reviewed By: G. Lowndes Title: Senior Design Engineer Date: 8 June 2007 .

Approved By: G. Lowndes Title: Senior Design Engineer Date: 8 June 2007 .