DynaPak Gas Sampler

SYSTEM SUPPORT MANUAL

DP-2000

OPTIONS: N, L, D, F, K, R, X, J, H

YZ® SYSTEMS

An Ingersoll Rand Business

DP-2000
Instruction & Operating Manual

Version: 10-2025

DP-2000 Table of Contents

Section 1: First Things To Know About The DynaPak

How to Use this Manual

The DP-2000 Operations Manual is a step-by-step guide containing the procedures needed to work with the DP-2000 System.

The DynaPak System Series of samplers implement the most advanced technology available in the industry. It is recommended that the technicians working with the DynaPak Systems study the manual prior to initiating work on the system for the first time.

Typographic Conventions

To aide in readability, this manual uses several typographic conventions. References to illustrations, photographs, and other related content will appear in italicized text along with the location of where to find the item in the manual. Digital versions of the manual, available in Adobe Acrobat™ PDF format, will be highlighted further in blue italic text indicating the copy retains a hyperlink to the referenced item.

Measurement units are listed in italic parenthesis text following their US standard equivalent. As an example, for defining a distance, 15′ (4.5 meters), is how the text will appear throughout the manual.

Items that require action, for example the pressing of a key for programming the controller, will feature the action item in sentence case Bold Text followed in normal text by the item such as, the Up Arrow key or Main Power switch.

Getting Help

This manual provides solutions to typical questions about the DP-2000 system. If the answer can not be found within this manual, contact YZ Systems at:

For Technical Support: 1-281-362-6500
1-800-NJEX-HELP
(1-800-653-9435)
Email: techsupport@yzsystems.com

When calling, have this manual close at hand. Whether calling or writing, please include in your communique the following information:

- The serial number of the DynaPak System and the version number of this manual. The serial number is located on the inside of the enclosure door. The version number of this manuals located at the bottom of each page.
- A description of the problem and, if applicable the actions of the technical personnel when the problem occurred.

Section 1: First Things To Know About The Dynapak

Operation Specifications

Maximum Output:	5,760 cc/day* (5.76 liters/day)
Maximum Operating Pressure:	1,500 psig (103 Bar (g))
Pump Displacement:	0 - .4 cc/Stroke
Operating Temp Range:	0˚ to 140˚F. (-17˚C to 60˚C)
Flow Signal:	Pulse (Dry Contact or Voltage Pulse)

Theory of Operation

The DynaPak 2000 Sampler is a pipeline mounted system which uses the pneumatically operated, positive displacement DynaPak 2000 pump, the YZ filter/regulator and a low power solenoid valve to obtain gas samples. The 2000 provides below modes of operation:

Time-based Sampling:

- In this mode of operation, the 2000 extracts a gas sample from the pipeline at regular time intervals. The volume of the sample is set by the operator using the volume adjustment feature of the DP-2000 pump. The solenoid strokes the pump each time it is energized by the customer. Energizing the solenoid valve allows actuation gas to stroke the DP-2000 pump. The rate at which this occurs is a function of operator input. The modes are used to set the off time interval. The number of times the solenoid output is activated is recorded by the onboard LCD stroke indicator.

Section 1: First Things To Know About The Dynapak

System Accessories

1. **DuraSite,** portable DOT approved constant pressure sample vessels. Available in 150, 300, 500, 800, and 1000 cc sizes.
2. **SC-Spun Vessel,** portable DOT approved (1800 psi maximum working pressure), sample vessels. Available in 300, 500, and 1000 cc sizes.
3. **KK-1, KK-2, & KK-3,** carrying cases for DuraSites that meet DOT requirements for transporting portable sample vessels.
4. **1/4″ stainless steel tubing Dielectric Isolator Union,** these should be installed in every tubing line that attaches the sampler to the pipeline in any manner. For example the supply gas, product connection to the system, and differential pressure switch connections. (P/N A1-0182).
5. **LinkPlus** provides a direct link between the DynaPak, and your sample vessel, providing a gauge, vessel isolation valve, and excess pressure protection.
6. **YZ BackRack vessel trays** are available for direct support mounting of a sample vessel tray to the back of the Dynapak. Limited to SC-300 & SC-500 Vessels.

NOTE: A complete line of sampling accessories ranging from sample probes to sample vessels is available through YZ. Please contact your local representative:

Technical Support (T): 1-281-362-6500
1-800-NJEX-HELP
(1-800-653-9435)
Email: techsupport@yzsystems.com

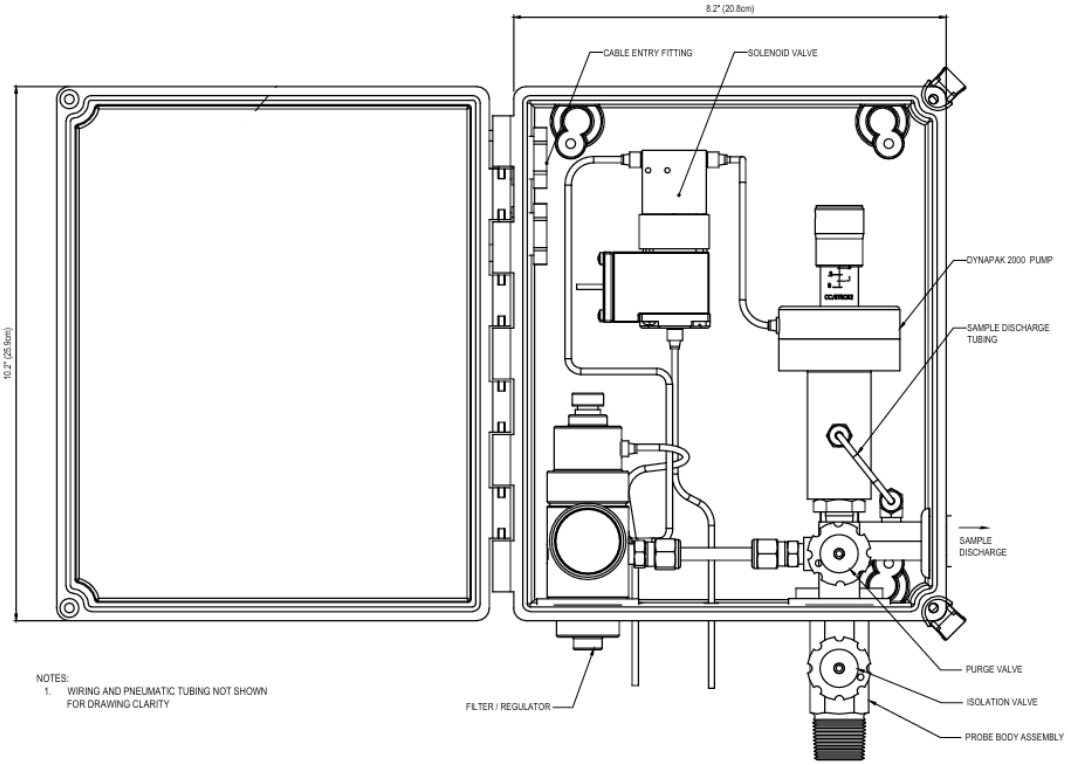
Section 2: System Installation

Standard System Components

Standard primary components of the DynaPak 2000 include the following:

- **System Enclosure:** Houses the Sample Pump, Filter Regulator, Solenoid, and Controller.
- **Sample Pump:** Probe mounted, pneumatically actuated DP-2000 Sample Pump.
- **Filter Regulator:** Stainless Steel regulator capable of reducing pressure from line pressure of up to 1500 psi down to system supply pressures in one step.
- **Low Power Solenoid:** The solenoid strokes the pump each time it is energized by the customer. Energizing the solenoid valve allows actuation gas to stroke the DP-2000 pump.
- **Probe Body Assembly:** Provides direct mount connection to the pipeline.

Figure 1



The customer must provide proper intrinsically safe signal to solenoid. The Pneumatrol solenoid is certified as follows:

Pneumatrol Ltd. BB5 4WZ, UK
TYPE EP000/ia/FM
Intrinsically Safe for Cl I II III Div 1
Gr. A B C D E F G hazardous locations in accordance with Entity requirements.
Pmax 2.98W Vmax 35V Imax 300mA Tamb max 65ºC.
Ci=0 Li=0 Installations shall be in accordance with Control Drawing AV4987.
Substitution of components may void approval

EU Type Examination Certificate CML 17ATEX2046X
Issue 4

II 1 D
Ex ia IIC T6...T5 Ga

IECEx CML 17.0030X
Ex ia IIC T6..T5 Ga

See Pneumatrol control drawing in Appendix, Page 26.

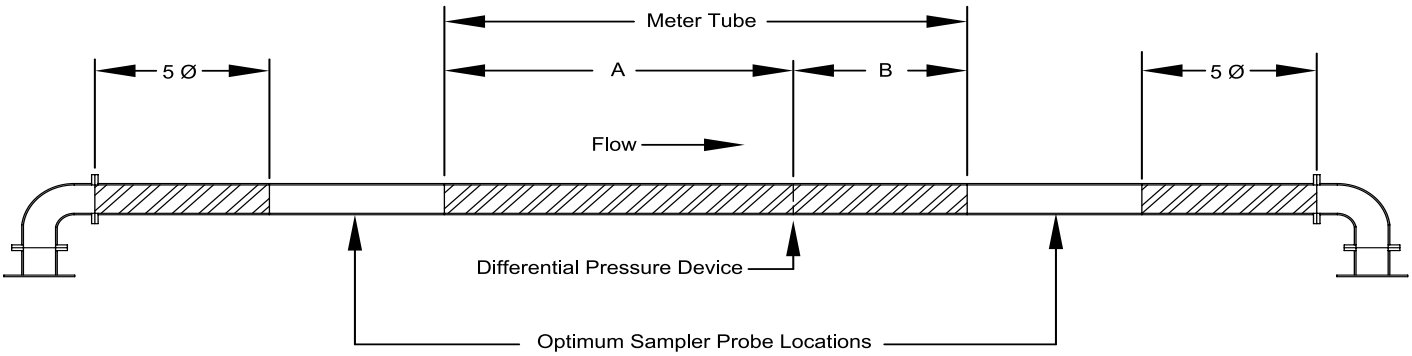
Section 2: System Installation

Standard Mounting Location

The sampler should be a minimum of five pipe diameters from any device which could cause aerosols or significant pressure drops.

The sampler should not be located within the defined meter tube region (AGA 3 manual). A= The number of unobstructed, straight pipe diameters upstream (see AGA – 3 manual). B= the number of unobstructed, straight pipe diameters downstream (see AGA - manual).

Figure 2



A= The number of unobstructed, straight pipe diameters upstream (see AGA – 3 manual). B= The number of unobstructed, straight pipe diameters downstream (see AGA – 3 manual).

Section 2: System Installation

Standard System Connections

- The DynaPak 2000 requires a 3/4” FNPT pipeline connection.
- The DynaPak 2000 sampler should be mounted vertically in a horizontal run of the pipeline.
- The end of the sampler probe should penetrate the center 1/3rd of the pipeline.
- The end of the sample probe should be cut parallel to the pipeline.
- Before applying pipeline pressure to the DynaPak 2000, ensure that the isolation valve and purge valve are good.
- After pipeline pressure has been applied to the sampler, check the probe body/pipeline connection using a liquid leak detector.

CAUTION: Overtightening of valves can result in damage to the valve components which might result in the valve stem being screwed out of the probe body. This, of course, results in product at pipeline pressure being vented continually through this port until this section of the pipeline is shut in. DynaPak valves are of soft seat design and should only be closed or opened with fingers. Wrenches should never be used. If a valve will not seal off with finger tight operation the valve should have maintenance performed to allow proper operation of the valve.

NOTE: At temperatures below 32˚ F (0˚C), conditioning of the actuation gas supply may be required. Where the actuation gas supply has a high water content and/or a low hydrocarbon dew point, additional actuation gas filtration or heating of the actuation gas supply may be necessary. Bottled nitrogen gas can also be used during cold operating conditions to avoid condensation in the actuation gas supply line. In addition, operation at extreme temperatures will affect seal and diaphragm performance. To prolong the service of seals and diaphragm, adequate heat should be provided to maintain an operating environment above 32˚ F (0˚C).

Figure 3

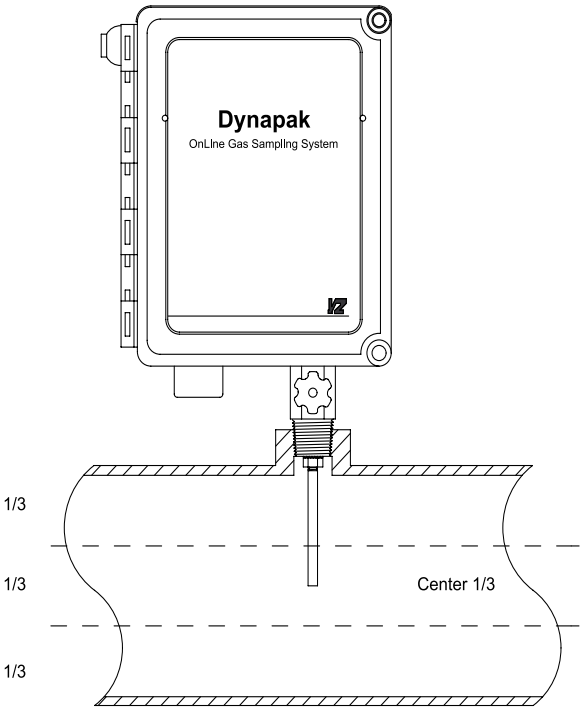
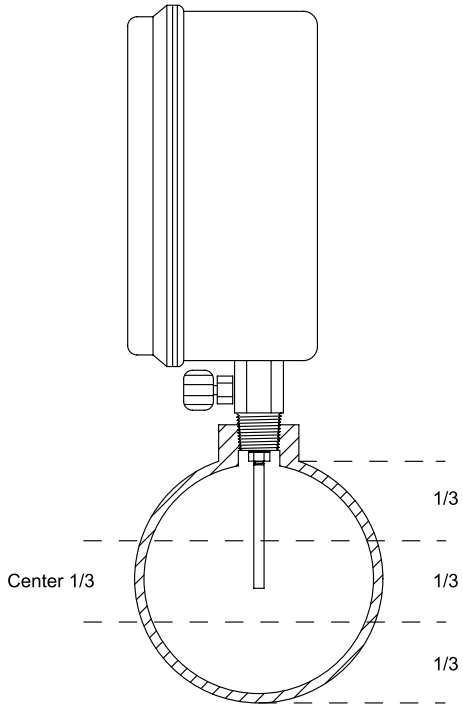


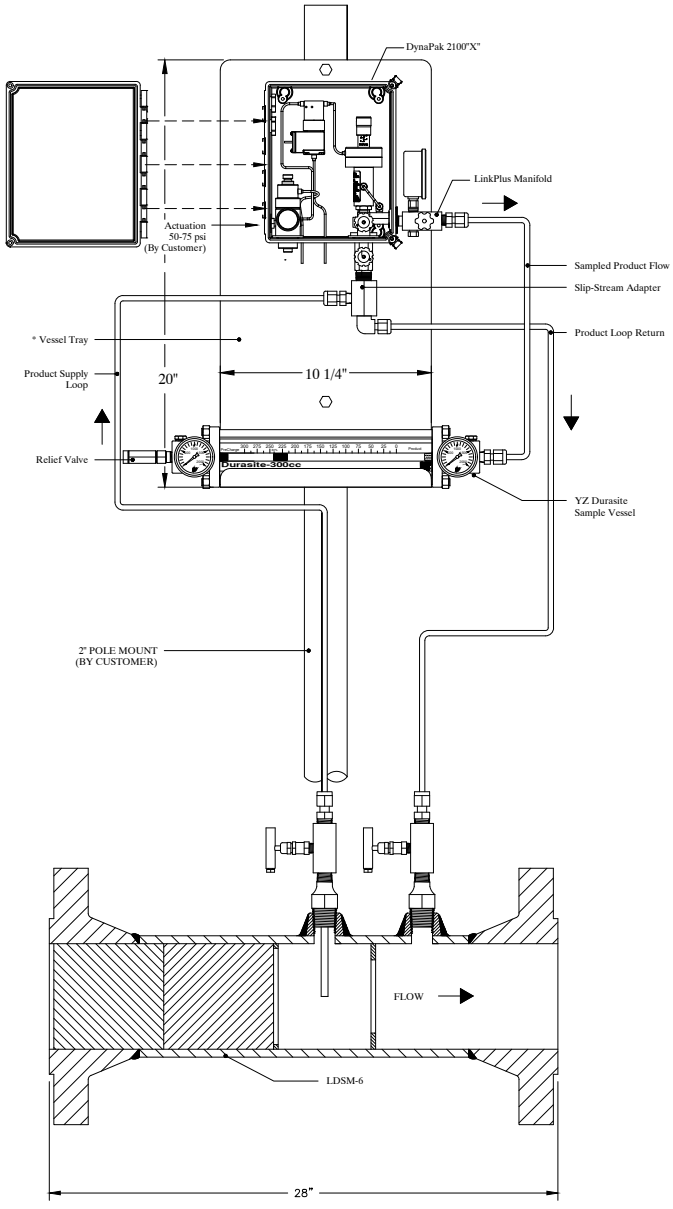
Figure 4



Section 2: System Installation

Standard System Connections - with Optional Slipstream kit

- Mount the DP-2000 with slipstream kit on a vertical 2” pole.
- Connect the slipstream adapter to the pipeline product supply and product return connections as shown in the diagram.
- Connect the actuation gas supply (50-75 psi) to the actuation gas connection located on the left side of the sampler.
- Connect the sample out connection to the sample vessel.
- Wire the customer connection to the flow inputs.
- Before applying pipeline pressure to the DynaPak 2000, ensure that the product supply valve is closed.
- After pipeline pressure has been applied to the sampler, check the probe body/pipeline connection using a liquid leak detector.



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Section 3: Sample Vessel Installation

Variable Pressure / Constant Volume Cylinders

Spun cylinders may be installed in a horizontal position on the DynaPak BackRack vessel rack. Avoiding traps in the line, install stainless steel tubing and fittings from the sample discharge port of the sampler to the product end of the sample cylinder.

300cc and 500cc spun cylinders may also be installed in a vertical position. Piping from the sampler discharge port to the sample vessel should be arranged so that liquid traps are not created.

Variable Volume / Constant Pressure cylinder

The free floating piston cylinder (DuraSite), figure 13 on page 25, may be installed in a horizontal position on an optional vessel rack. Free floating piston cylinders should NOT be installed on the DynaPak BackRack vessel rack.

Install 1/8″ tubing from the sample discharge port of the manifold to the product end of the vessel. Avoid traps in this line.

LinkPlus: Install the optional LinkPlus directly into the sample discharge port of the sampler. Use stainless steel tubing and fittings to connect the LinkPlus outlet to the product end of the sampler cylinder.

Section 4: Sampler Setup

1. Calculate the sampling rate using the following 30 day chart:

Number of turns open on pump stroke knob	Sample pump displace-ment per stroke	Sample cylinder volumes			Sample rate (minutes)
		1000 cc	500 cc	300 cc	
3	**.100**	**4**	**9**	**15**	
6	**.200**	**9**	**18**	**30**	
9	**.300**	**13**	**27**	**45**	
12	**.400**	**18**	**36**	**60**	

2. Adjust the pump volume adjustment knob to the value used in the calculation in Step 1.

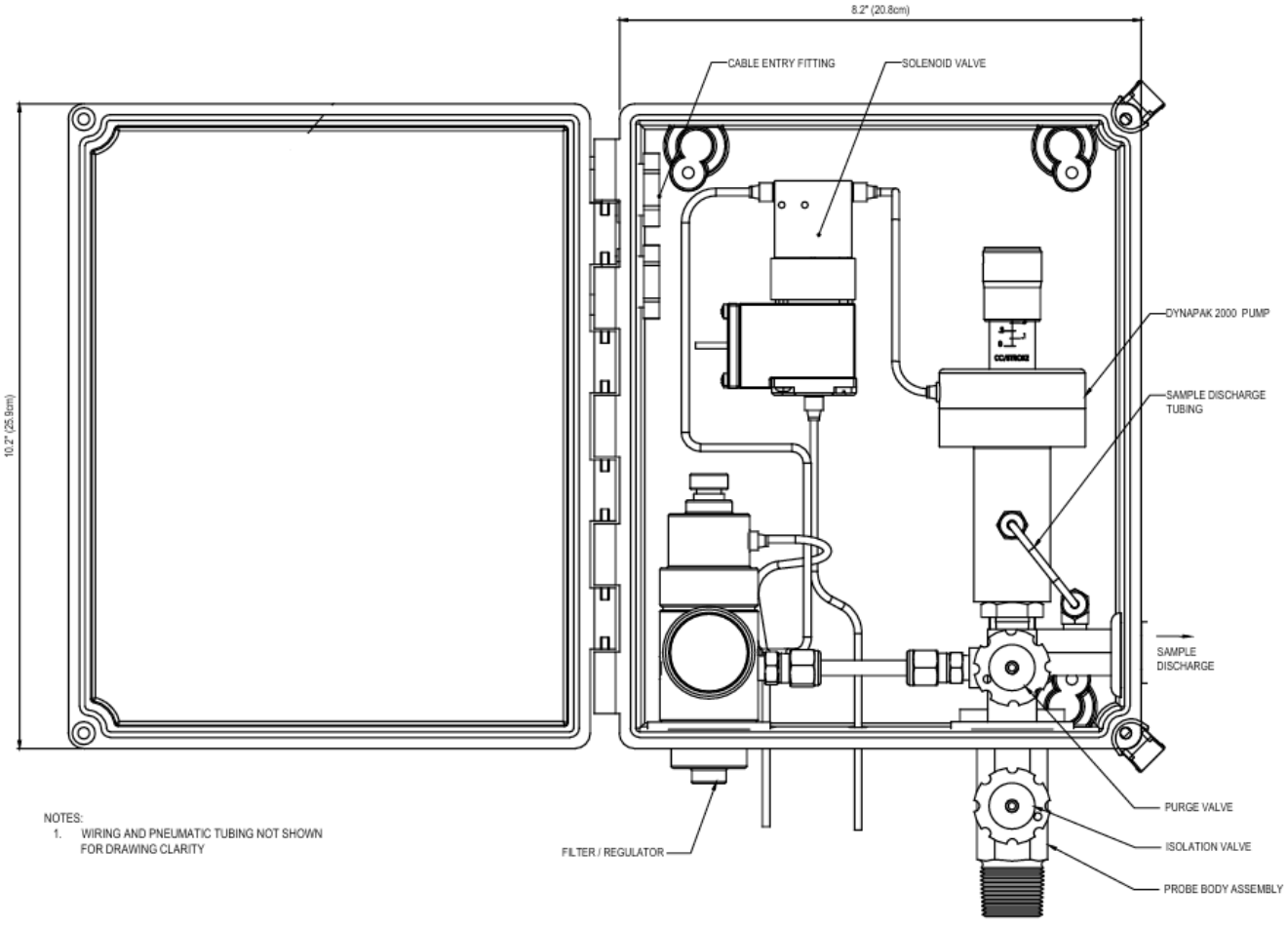
Sample pump displacement per stroke	Number of turns open on the pump volume knob
.1cc	3
.2cc	6
.4cc	12

Section 5: Mechanical System

Overview

The DynaPak mechanical system as shown below is composed of the sample pump, and filter regulator. These components of the system are shown here and described in the following pages.

Figure 5



Section 5: Mechanical System

DP-2000 Sample Pump

DP-2000 Sample Pump, refer to Appendix, page 18, is a positive displacement plunger pump. It's robust design provides for dependable sampling service, while also providing a simple to maintain pump, with few internal components. The pump has an adjustable displacement of .1 to .4 cc per stroke. The set displacement may be viewed at the volume adjustment knob, refer to Appendix, page 18, located on the top of the DP-2000 pump. Adjustment is simple. Turn the volume adjustment knob clockwise to increase the pump volume displacement per stroke, or turn the volume adjustment knob counter clockwise to decrease the pump volume displacement per stroke. Final control of the volume of sample to be gathered during the sample cycle period, is achieved by the controller.

This pump has internal pressure balancing capabilities that allows the pump to function properly when the pipeline pressure is greater than the sample vessel pressure, or when the sample vessel pressure is greater than the pipeline pressure.

Each time the pump strokes, product previously captured in the pump chamber is forced towards the sample cylinder. As the pump plunger returns to a resting state a new fresh sample is captured in the pump. Once the pump completes its stroke, the cycle is ready to begin again.

Filter Regulator

The DynaPak Filter Regulator, refer to Appendix, page 23, is a stainless steel filtered regulator to supply the supply gas required to actuate the sample pump. It is capable of providing actuation pressure from pipeline pressures to required actuation pressures in a single dependable step.

Maintenance is minimal, but is certainly dependant on gas quality. Should the gas supplied to the filter regulator require significant filtration, replacement of the filter may be more frequent than normal, refer to System Maintenance, page 13.

Section 6: System Operation

Preparing for System Operation

1 When all of the tubing connections have been completed, close the purge valve on the front of the sampler probe body. Open the sample probe supply valve to allow pipeline pressure into the sampler. Check all connections using a liquid leak detector.

2 Adjust the filter/regulator from the following ranges.

Pipeline Pressure	Actuation Pressure
25 psig (1.72 Bar) to 50 psig (3.5 Bar)	Available Pipeline Pressure
50 psig (3.5 Bar) to 700 psig (48 Bar)	50 psig (3.5 Bar)
Over 700 psig (48 Bar)	65 psig (4.5 Bar)

3 Turn the stroke adjustment knob on the top of the pump counterclockwise to set the pump displacement at .4 cc/stroke.

4 Utilizing the customer supplied control function initiate stroking of the actuation solenoid at a rapid rate until pipeline pressure plus is achieved at the sample discharge.

5 Allow the sampler to operate until the pipeline pressure plus 100 psi (6.9 Bar) is achieved at the sample discharge.

6 Push the system to OFF position as shown.

7 Check all connections from the sampler discharge to the connection on the sampler using a liquid leak detector.

8 If no leaks are found, the pump and tubing should be considered tested and functional.

Section 7: System Maintenance

Preventative Maintenance Schedule

A preventative maintenance program serves to anticipate maintenance issues prior to waiting until the system requires service. Like changing the oil & filters in an automobile, by choosing to service the various parts and operation in the Sampling System at regular intervals, the technician can perform the maintenance service when desired, rather than when required, such as in the middle of night.

The key is to perform maintenance before it is required. The preventative maintenance schedule implemented should consider the application of the sampler. Many of these considerations include: the weather environment; the condition of, the actuation gas, the product condition and quality, and the pump stroke frequency. All of these issues must be considered when establishing a preventative maintenance schedule.

Recommended Maintenance Schedule
Monthly Inspection

- Verify system pressure
- Check for leaks
- Test the system for leaks each time a fitting or connection has been made.

Semi-Annual Inspection

- Clean and lubricate the sample pump
- Check the filter element, and replacing as necessary.

Annual Inspection

- Rebuild pump
- Test the Sampler System performance and service, as needed.

Recommended Spare Parts List

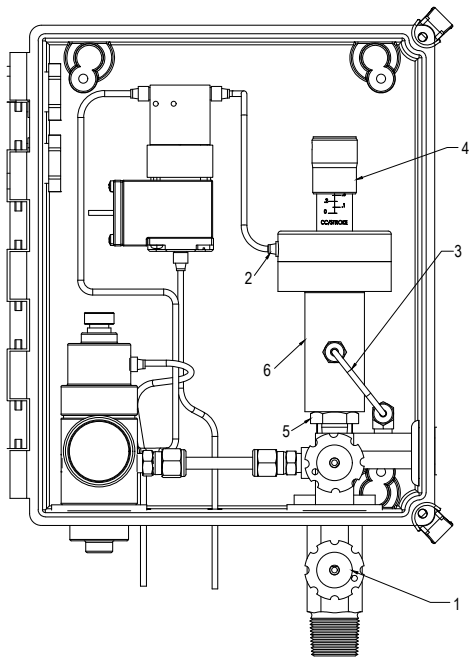
Part #	Description	Recommended Quantity
D3-0002	DP-2000 pump seal Replacement kit	1
D3-0003	Filter Regulator repair kit	1
A4-0036	Solenoid	1

Section 7: System Maintenance

Cleaning and Lubricating the DP 2000 Pump

- Close the isolation valve.
- Disconnect the plastic tubing from the solenoid valve to the pump diaphragm housing by depressing the tubing release sleeve on the diaphragm housing fitting while pulling out the tubing. It is not necessary to remove the fitting from the diaphragm housing.
- Remove the sample discharge (1/8″ stainless steel tubing) from the pump body.
- Screw the stroke adjustment knob all the way down to the 0 cc/stroke setting.
- *Unscrew the pump body by hand from the inlet check valve assembly. Separation at this point is recommended to maintain proper tubing location and alignment between the pump body and the probe body. Do not remove the inlet check valve body from the manifold unless cleaning is necessary. To replace the inlet check valve O-ring, carefully cut the O-ring off the head of the dart and stretch the new O-ring over the head of the dart using a light coat of the assembly grease.
- Remove the diaphragm housing from the pump body by unscrewing the diaphragm housing and carefully pulling the plunger out of the pump body. Inspect the plunger shaft for damage or wear. The diaphragm chamber houses the diaphragm, return spring, stroke adjustment screw and plunger assembly. The diaphragm chamber should not be disassembled unless one of these items needs replacing.

Figure 6



*Screw the stroke adjustment screw all the way down

Section 7: System Maintenance

- Remove the internal bushings and O-rings from the pump body by inserting a nonmetallic rod (larger than 1/4″, smaller than 1/2″) into the top of the pump body. Gently tap to remove all bushing and O-rings out the bottom of the pump body as shown.
- Clean and inspect all components. Replace if necessary.

IMPORTANT NOTE: Normal service generally requires only the replacement of the O-rings and seal. A seal repair kit (part number D3-0002) is available from YZ.

- Apply a light coat of non-soluble assembly grease on all O-rings, bushings, and the plunger shaft to prevent damage.
- Install the body bushing into the bottom of the pump body as shown.
- Insert all other bushings, springs, and O-rings in their respective sequence on the plunger shaft as shown.
- Carefully install assembly into the top of the pump body, and screw the actuator assembly onto the pump body. (Tighten firmly by Hand ONLY)
- Install the pump assembly on the inlet valve assembly. (Tighten firmly by Hand ONLY)
- Connect the 1/8″ stainless steel tubing to the pump body and 1/8″ plastic tubing to the diaphragm housing.
- Open the isolation valve.
- Adjust the stroke adjustment knob to its original setting.
- Pressure test the pump as previously described for proper operation.

Figure 7

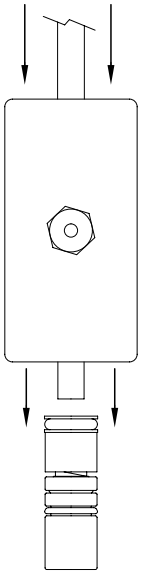
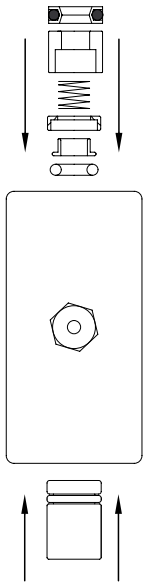


Figure 8



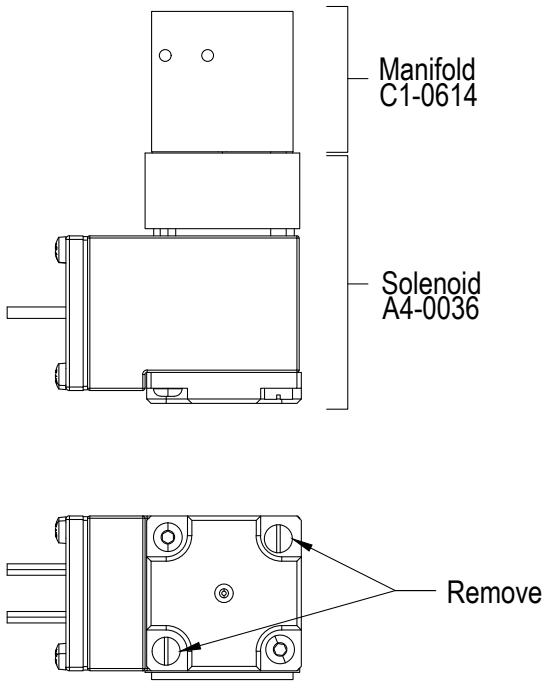
Section 7: System Maintenance

Solenoid Maintenance

- The solenoid assembly A4-0038 is made up of the solenoid A4-0036 and the manifold C1-0614. To replace the solenoid, remove only the two slotted head bolts as shown in figure. Removing any other screws to disassemble the solenoid voids the certification of the solenoid.

- For Technical Support: 1-281-362-6500
  1-800-NJEX-HELP
  (1-800-653-9435)
  Email: techsupport@yzsystems.com

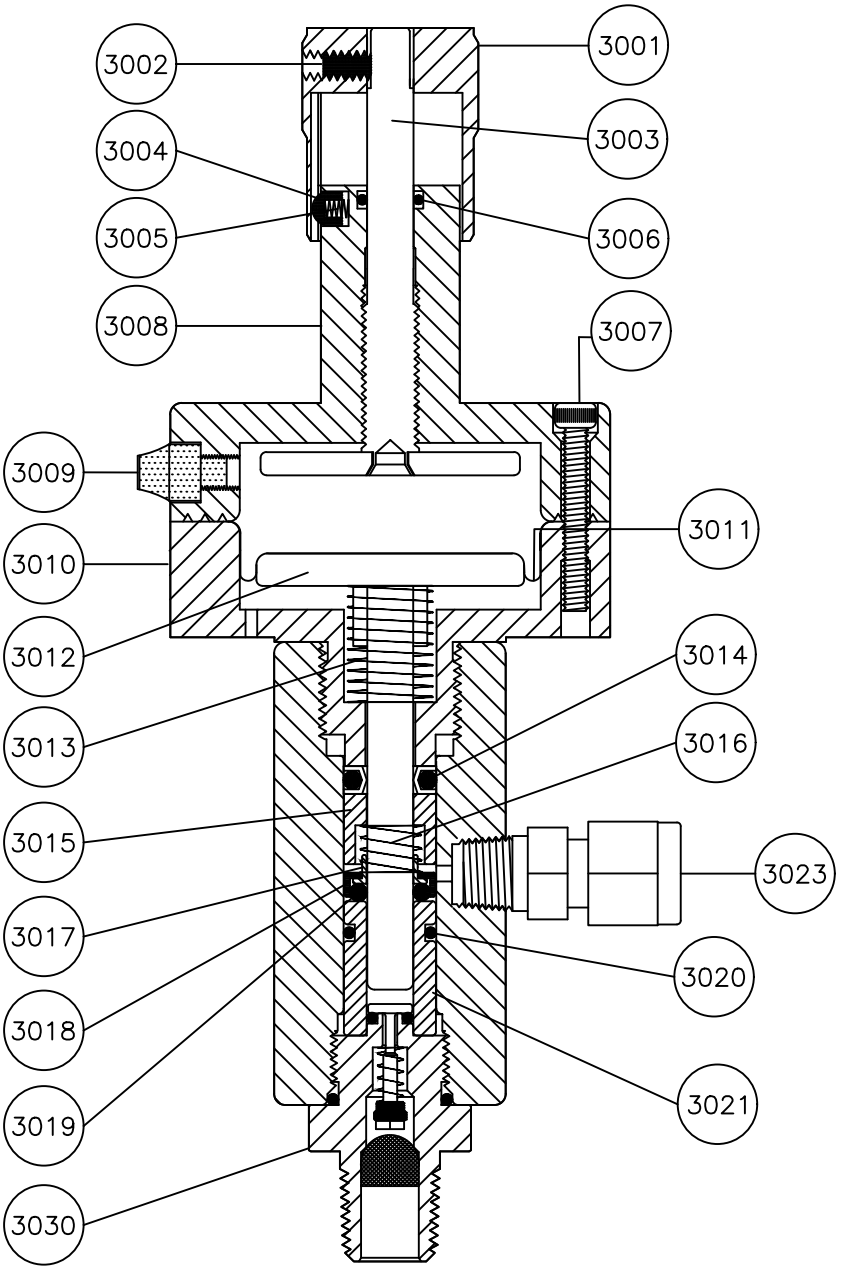
Figure 9



Appendix:

DynaPak 2000 Pump, Assembled View

Figure 10



* - DP-2000 Pump Seal Kit - P/N D3-0002

Appendix:

DynaPak 2000 Pump Parts List

Item Number	Description	Quantity	Bubble Seq No
B1-0002	VOLUME ADJUSTMENT KNOB BLACK	1	3001
C0-0096	10-24 X 1/4 SET SCREW SS	1	3002
B1-0004	DP STROKE ADJ SCREW ASSY	1	3003
B1-0030	DP VOLUME ADJUST DETENT	1	3004
C3-0005	DP VOL ADJ SPRING	1	3005
V-010	O-RING/VITON	1	3006
C0-0014	6-32 X 1 SHCS SS	6	3007
B1-0003	DP UPPER DIAPHRAGM HSG ANODIZE	1	3008
A1-0113	MCONN 3MM X M5 SS	1	3009
B1-0070	DP PUMP BODY/LOWER DIA HOU ASSY	1	3010
A6-0010	DP ACTUATION DIAPHRAGM	1	3011
B1-0007	DP PLUNGER ASSY	1	3012
C3-0006	NJEX CARTRIDGE SPRING / DP	1	3013
A6-0018	LUBRITHANE W/ VITON SKF P9068	1	3014
B1-0011	DP SPRING RETAIN BUSHING	1	3015
C3-0007	DP DISCHARGE CV SPRING	1	3016
B1-0013	DP DISCHARGE CV BUSHING	1	3017
B1-0014	DP DISCH CV BUSHING SLV	1	3018
A5-1108	O-RING -108 VITON, 75 DUROMETER	1	3019
A5-1012	OR -012 VITON,V75	1	3020
B1-0016	DP BODY BUSHING	1	3021
40061	TUBE CONN 1/8 TUBE X 1/8 NPT 316	1	3023
B1-0017+	DP 2000 INLET CV ASSY (STD)	1	3030

Appendix:

DynaPak Pump Options

High Pressure – Option N

- Larger diaphragm housing on sample pump (gold anodized appearance). MAWP 2350 PSIG.

- Unique replacement parts for this option are listed below:

Bubble No.	Part No.
3001	B1-0059
3008	B1-0054
3010	B1-0071
3011	A6-0106
3012	B1-0012

Pipeline Pressure	Actuation Pressure
Under 700 psig (48 Bar)	50 psig (3.5 Bar)
700 psig (48 Bar) to 1500 psig (103 Bar)	65 psig (4.5 Bar)
1500 psig (103 Bar) to 2160 psig (149 Bar)*	75 psig (5.2 Bar)

* Note: Only available with High Pressure N option. 2400 PSI rupture disk.

- Use the standard D3-0002 seal kit.

Low Pressure – Option L

- Modified inlet check assembly (lighter return spring) appropriate for line pressures of 10psig (0.69 Bar).

- Unique replacement parts for this option listed below:

Bubble No.	Part No.
3001	B1-0059

90 Durometer – Option D

- The option D uses 90 durometer O-rings in two key positions to provide enhanced durability and higher pressures.

- Use the D3-0115 seal kit.

Stainless Steel Body Bushing – Option F

- Option F replaces bushing material of construction from Delrin (standard) to stainless steel. This option is often ordered with Option D for 90 durometer O-rings.

- To order a replacement bushing:

Bubble No.	Part No.
3021	B1-0047

- F only, use the standard D3-0002 seal kit. FD use D3-0115 seal kit.

Severe Service – Option K

- Choosing option K changes the wetted seals to Chemraz and Teflon for superior material compatibility. This option also uses the stainless steel bushing.

- Use the D3-0002K seal kit.

1/2” NPT Probe – Option J

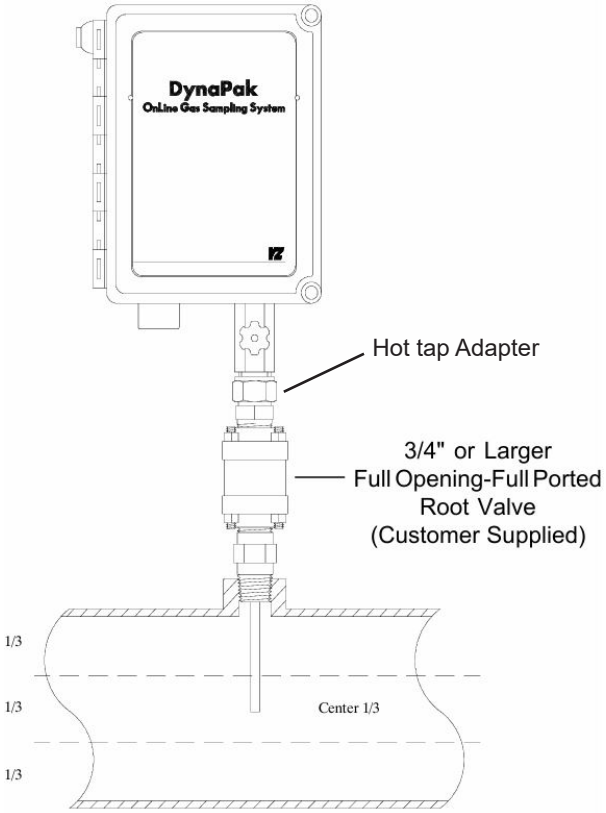
- Choosing Option J simply replaces the standard ¾” NPT probe connection with a ½” NPT probe connection body.

Appendix:

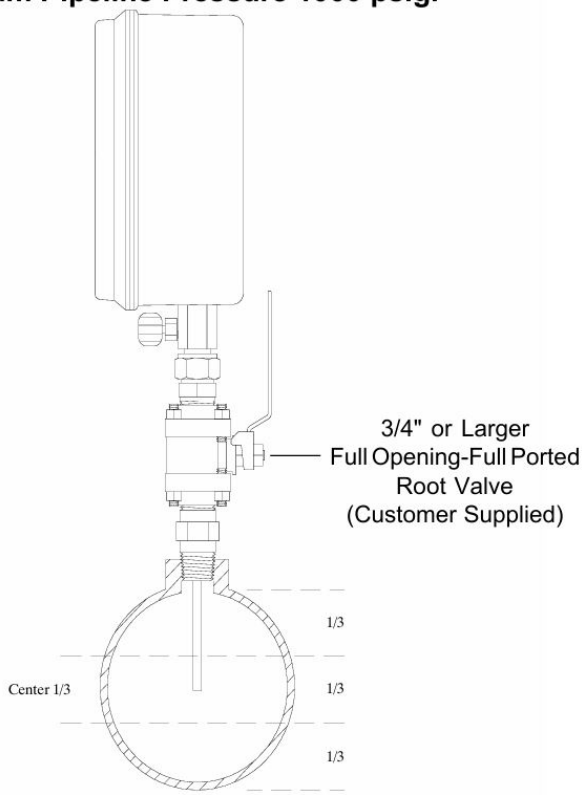
Hot Tap Configuration – Option “H”

- Choosing Option H attaches the Hot Tap Adapter Assembly to the Isolation valve as shown in Page 21.

- The Dynapak with Option H mounts directly to a (customer supplied) root valve on the pipeline. (The root valve connection facing the sampler must be 3/4” FNPT, and the valve must be 3/4” or larger full ported full opening valve.

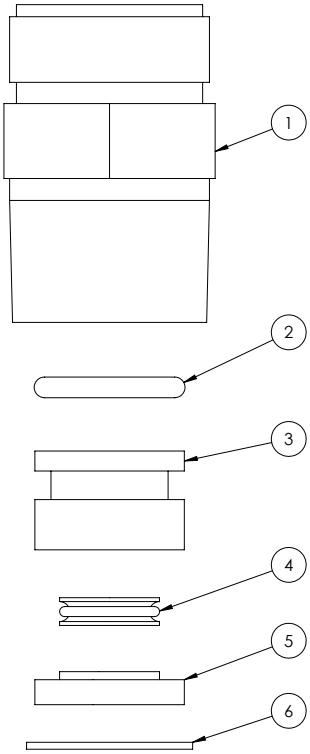


Maximum Pipeline Pressure 1000 psig.

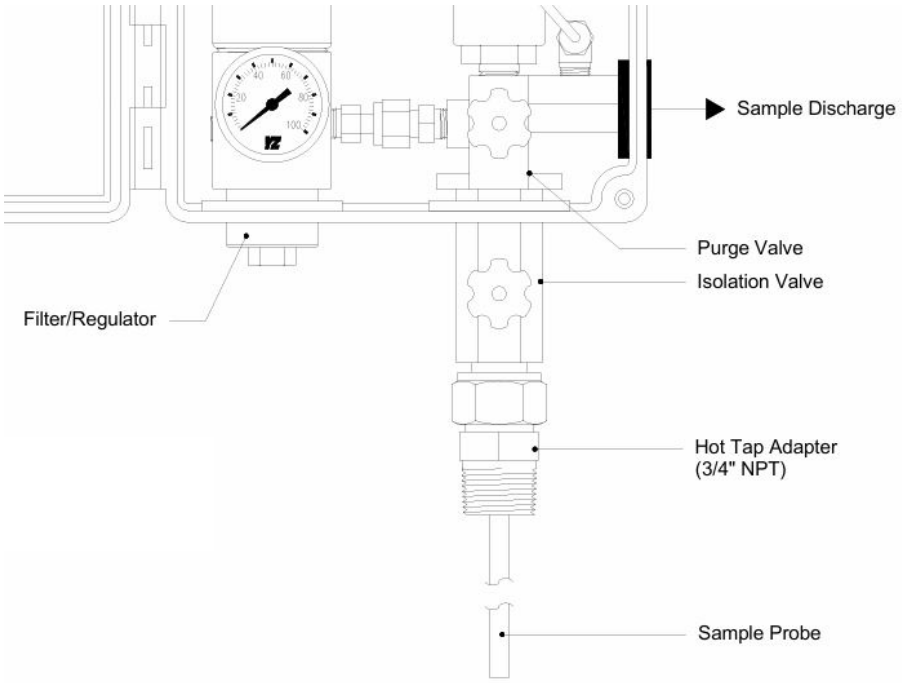


Appendix:

Hot Tap Configuration – Option “H”



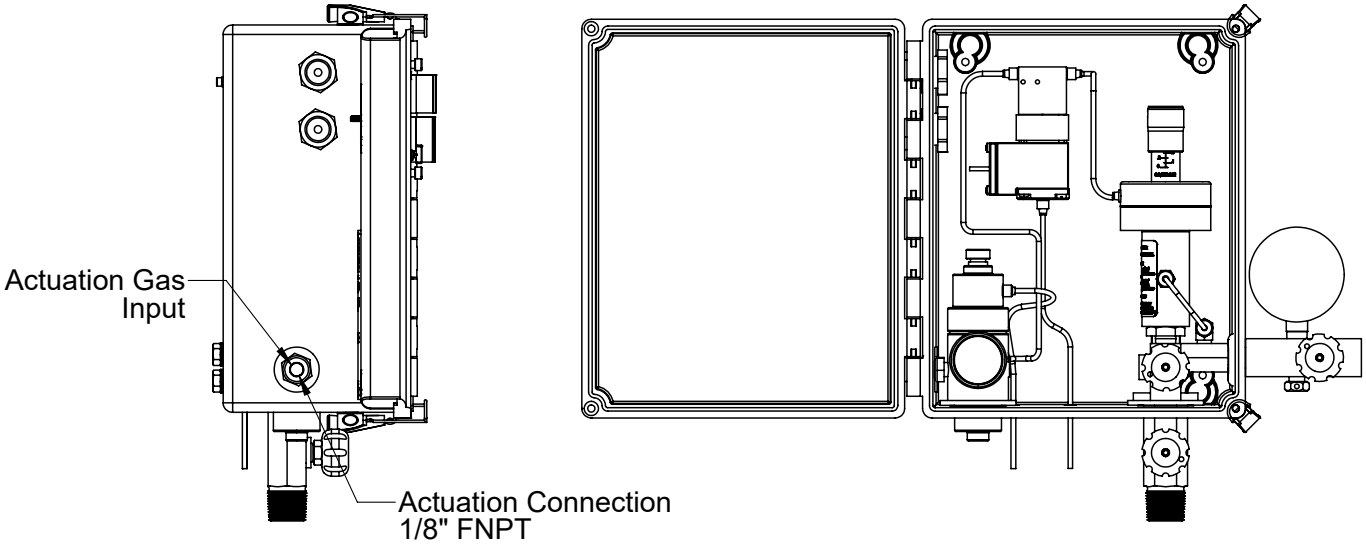
BILL OF MATERIALS			
BUBBLE NUMBER	PART NO.	DESCRIPTION	QTY
1	B1-0031	DP HOT TAP FITTING	1
2	A5-1113	O-RING - 113	1
3	A7-0009	DP HOT TAP UPPER BUSHING	1
4	A6-0018	SEAL - 202	1
5	A7-0010	DP HOT TAP LOWER BUSHING	1
6	C3-0802	SNAP RING, 3/4" INT.	1



Appendix:

External Actuation – Option “X”

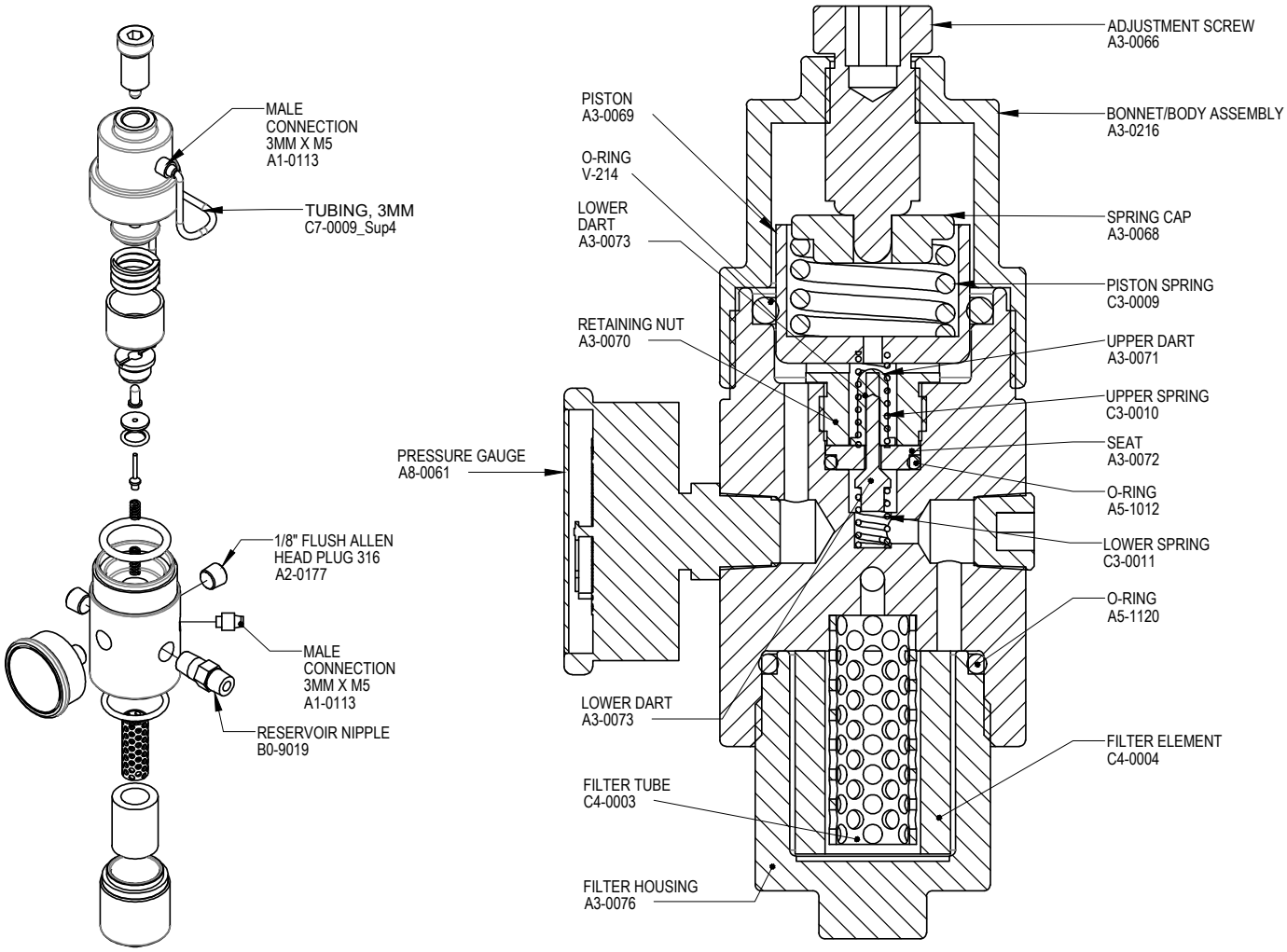
- The standard Dynapak system uses the line pressure coming into the pump to also actuate the pump. The external actuation option eliminates the connection from the pipeline pressure and instead provides a port for the customer to connect a separate clean gas supply to the actuation gas
- The external actuation gas may be bottled nitrogen or pressured clean, dry air. This option is common if the pipeline material is detrimental to the system, such as sour gas or has a high level of particulates. The external actuation also eliminates the exhaust of the pipeline product as part of the pump stroke process. The external actuation connection is 1/8” FNPT. See the diagram below.



Appendix:

YZ Filter/Regulator Assembled

Figure 11



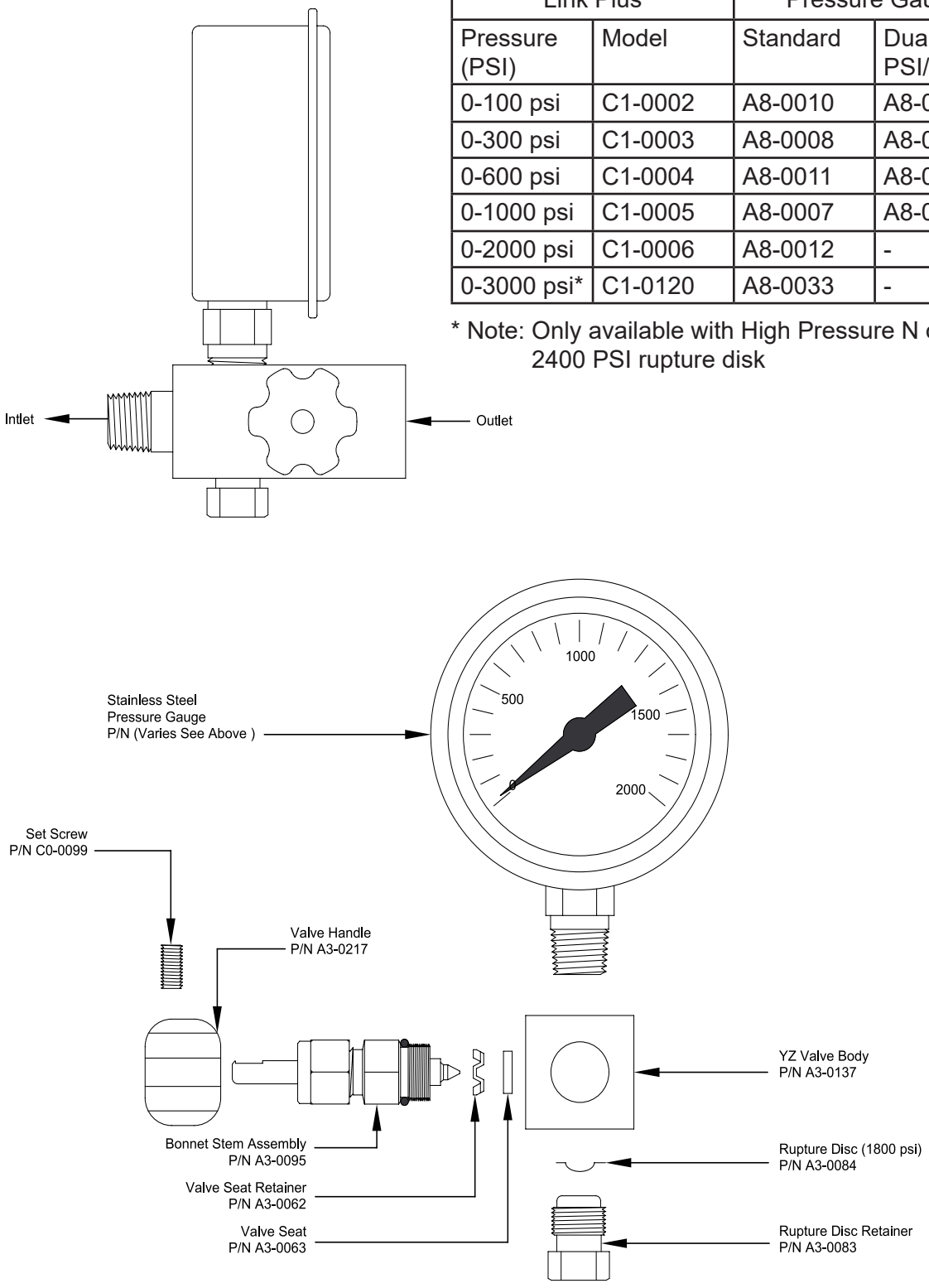
Appendix:

Link Plus

Figure 12

Link Plus		Pressure Gauge	
Pressure (PSI)	Model	Standard	Dual Scale PSI/KPA
0-100 psi	C1-0002	A8-0010	A8-0067
0-300 psi	C1-0003	A8-0008	A8-0060
0-600 psi	C1-0004	A8-0011	A8-0048
0-1000 psi	C1-0005	A8-0007	A8-0058
0-2000 psi	C1-0006	A8-0012	-
0-3000 psi*	C1-0120	A8-0033	-

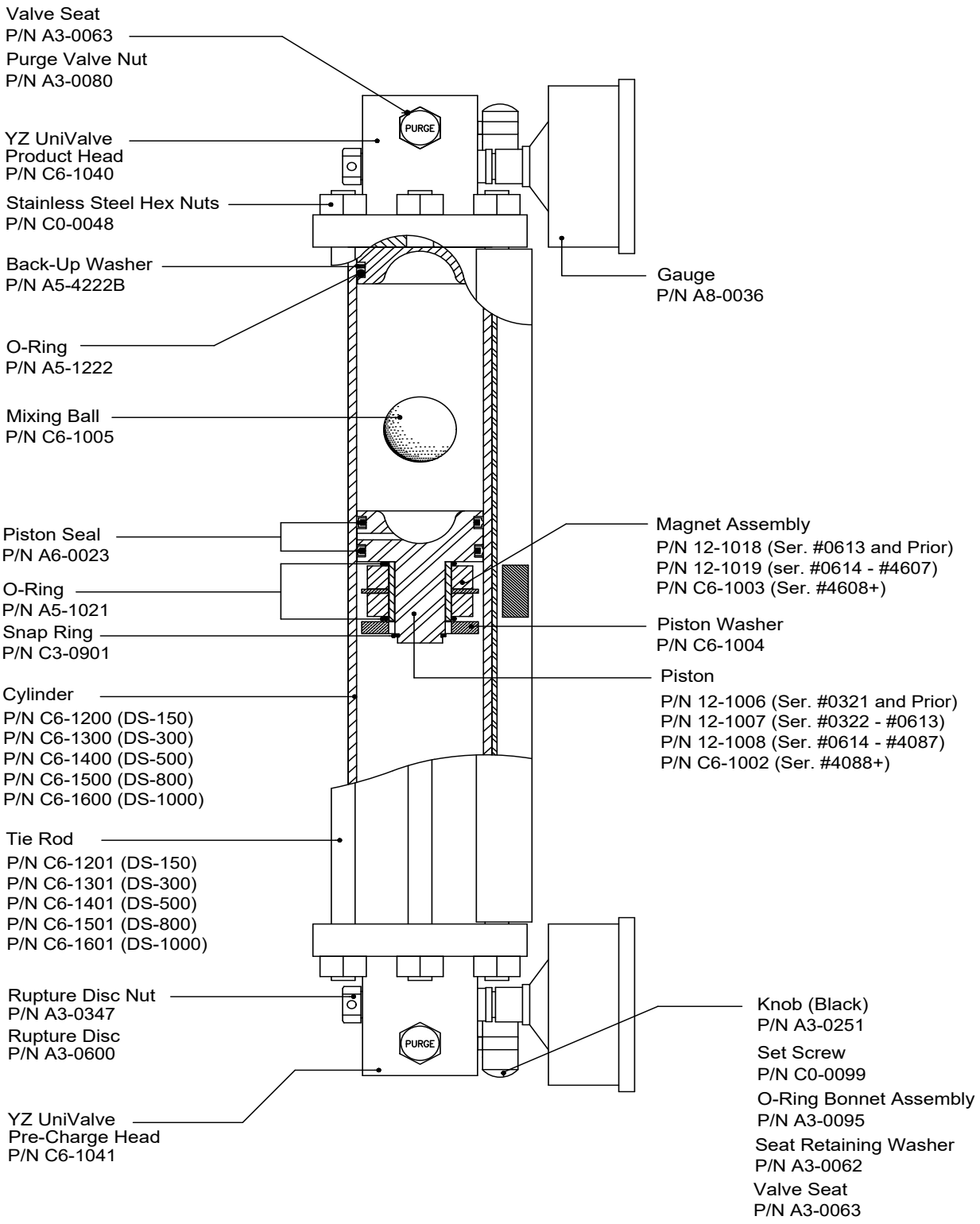
* Note: Only available with High Pressure N option.
2400 PSI rupture disk



Appendix:

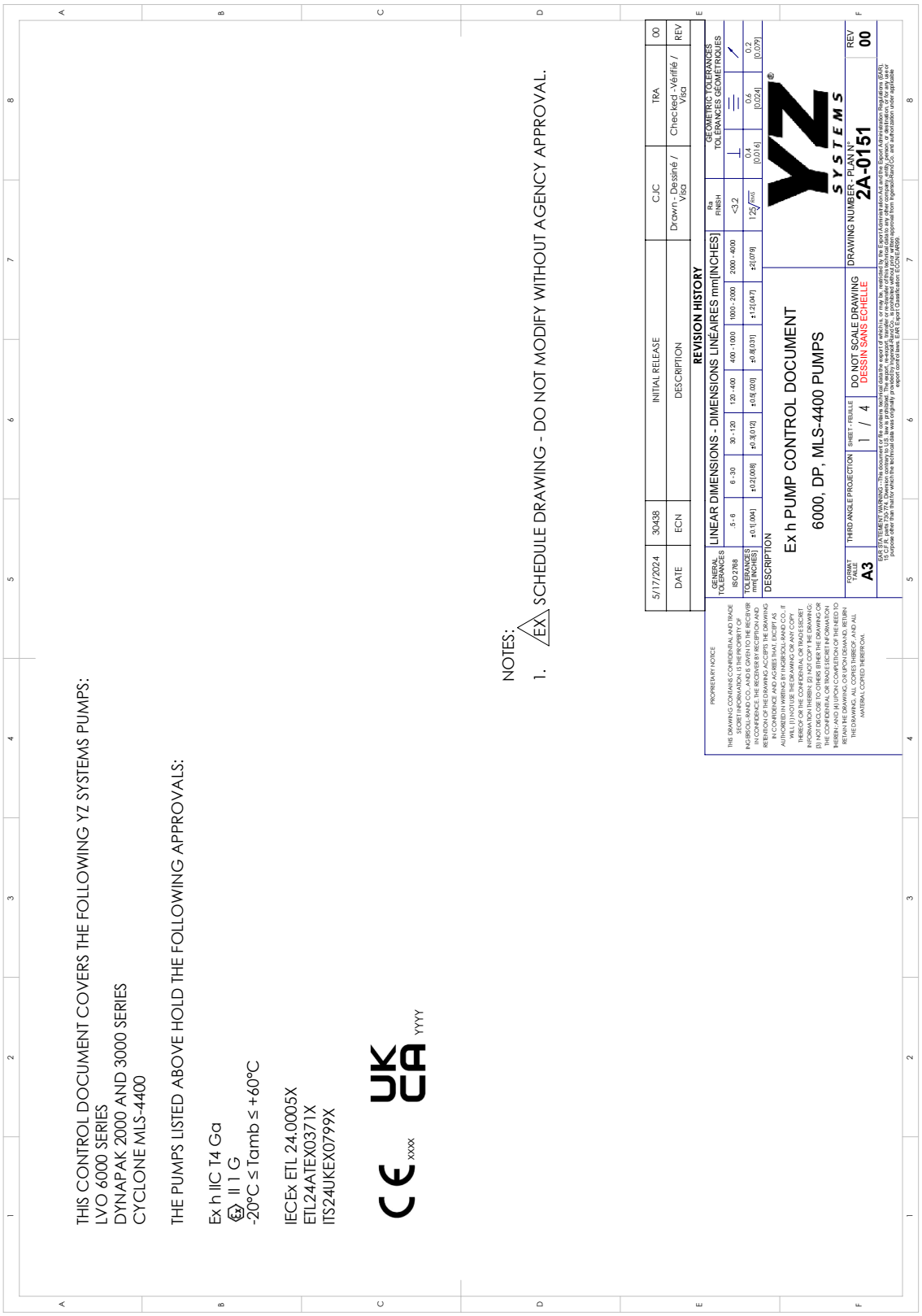
Durasite Sample Vessel

Figure 13



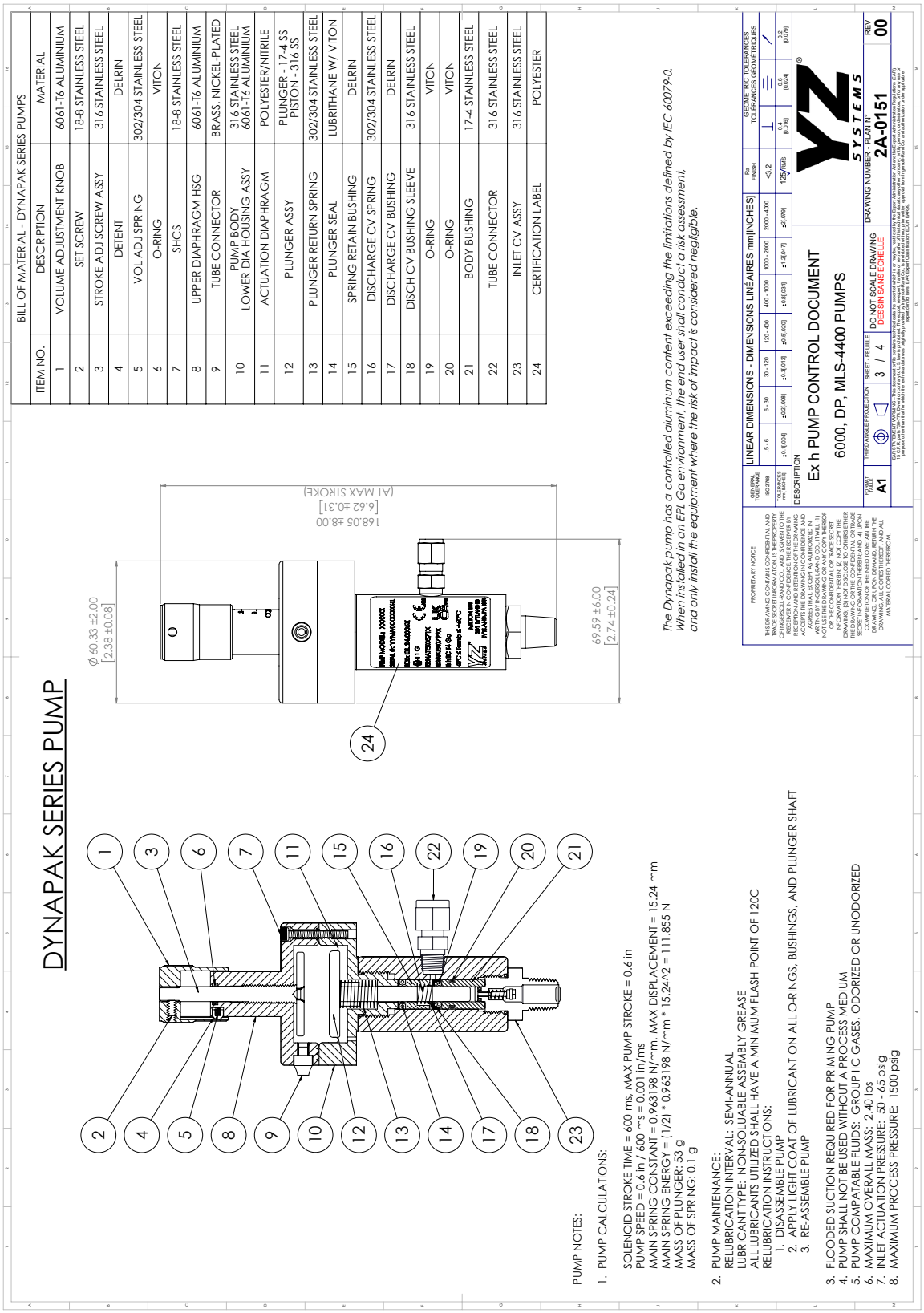
Appendix:

Pump Control Document



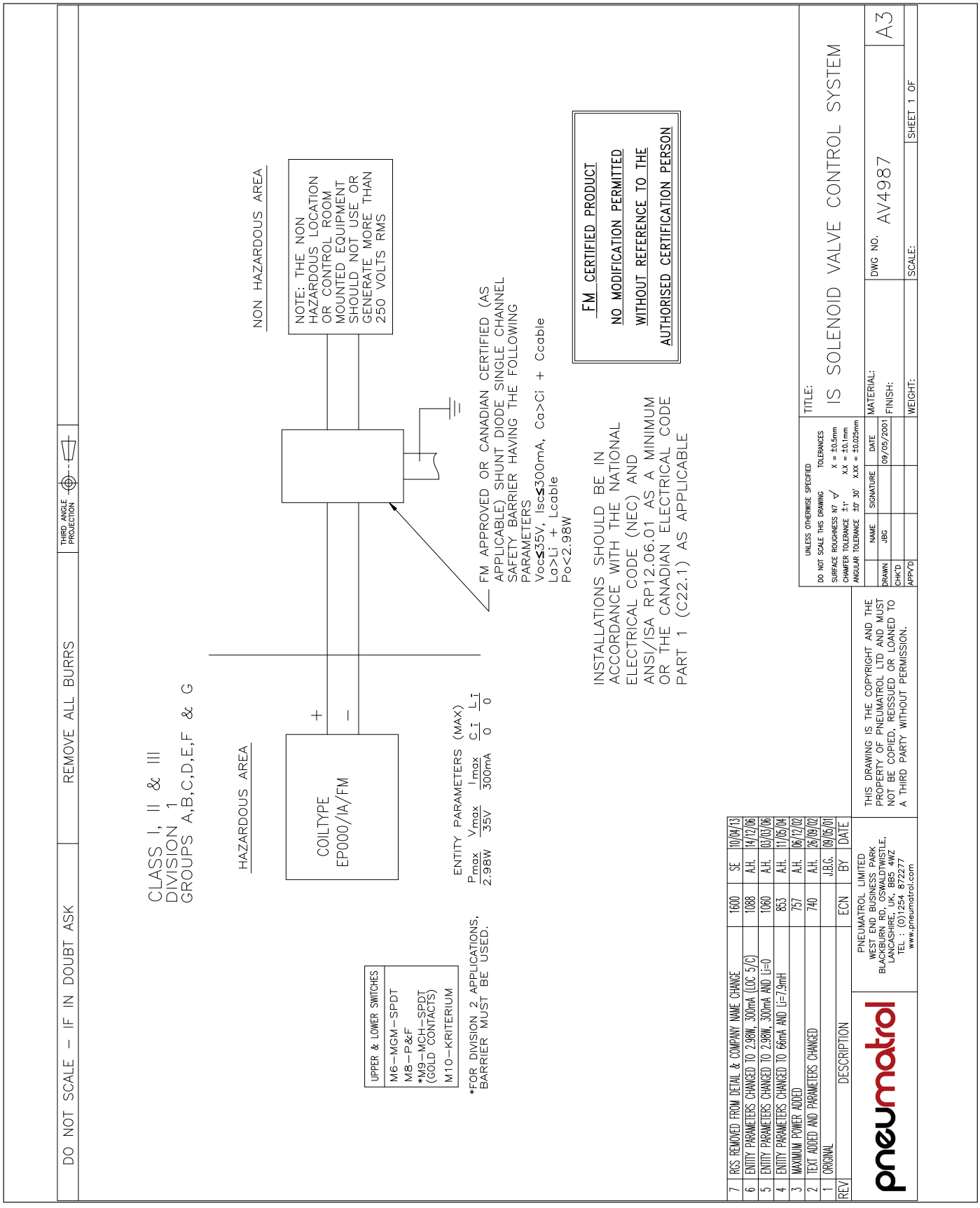
Appendix:

Pump Control Document



Appendix:

Solenoid Valve Control Drawing



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