

DynaPak Liquid Sampler

S Y S T E M S U P P O R T M A N U A L

DP-3000

OPTIONS: N, K, R, J, H

DP-3000

INSTRUCTION & OPERATING

MANUAL

Version: 11-2025

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SECTION 1: FIRST THINGS TO KNOW ABOUT THE DYNAPAK

How to Use this Manual

The DP-3000 Operations Manual is a step-by-step guide containing the procedures needed to work with the DP-3000 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-3000 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 communicate 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 3000 Sampler is a pipeline mounted system which uses the pneumatically operated, positive displacement DynaPak 3000 pump, the YZ filter/regulator and a low power solenoid valve to obtain gas samples. The 3000 provides below modes of operation:

Time-based Sampling:

- In this mode of operation, the 3000 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-3000 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-3000 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

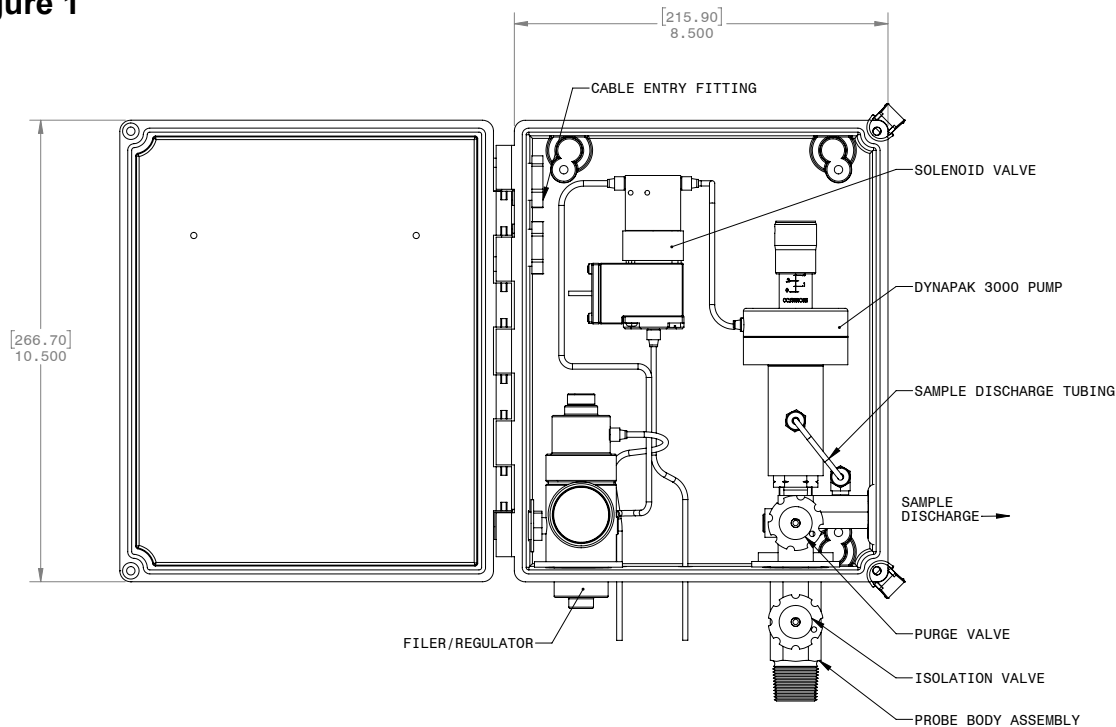
SECTION 2: SYSTEM INSTALLATION

Standard System Components

Standard primary components of the DynaPak 3000 include the following:

- **System Enclosure:** Houses the Sample Pump, Filter Regulator, Solenoid, and Controller.
- **Sample Pump:** Probe mounted, pneumatically actuated DP-3000 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:** Provides interface between the filter/regulator, and the Pump Pneumatic actuation.
- **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 CI 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 65°C.

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 27](#).

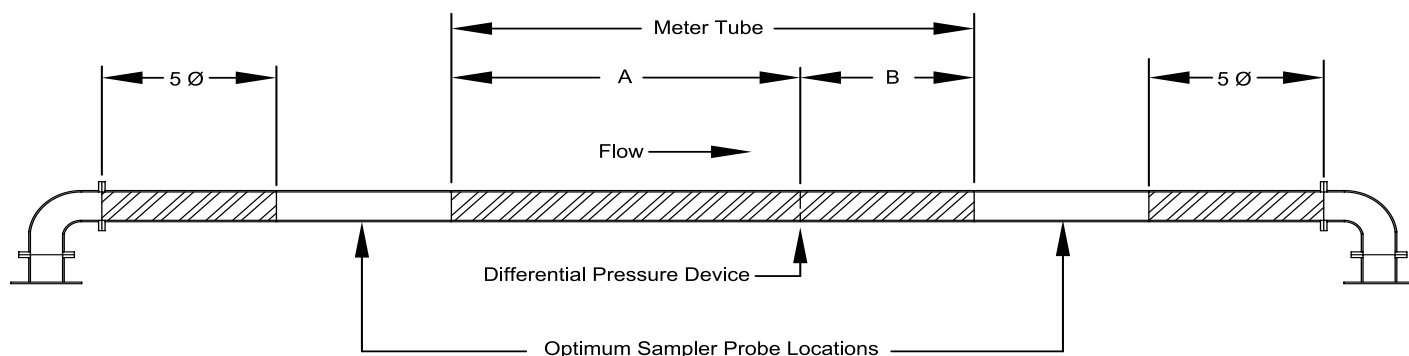
SECTION 2: SYSTEM INSTALLATION

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 3000 requires a 3/4" FNPT pipeline connection.
- The DynaPak 3000 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 3000, 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

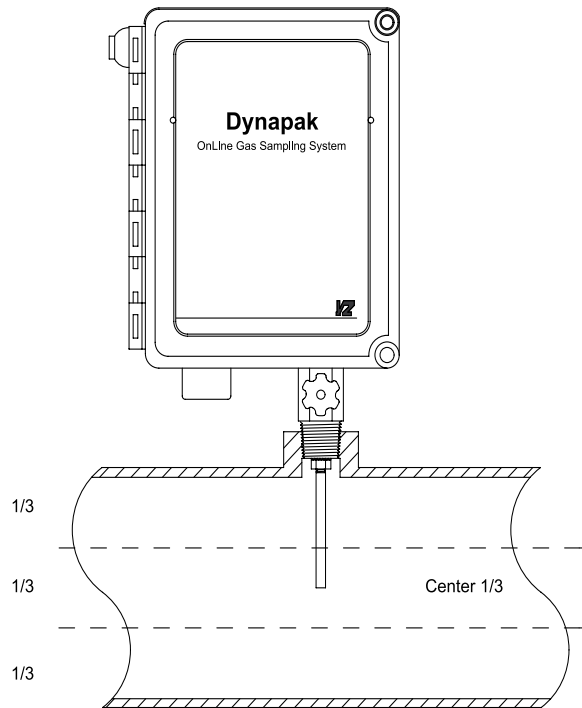
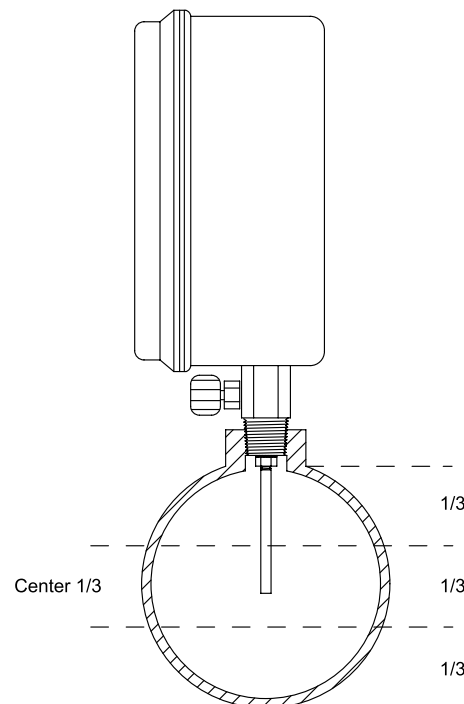


Figure 4

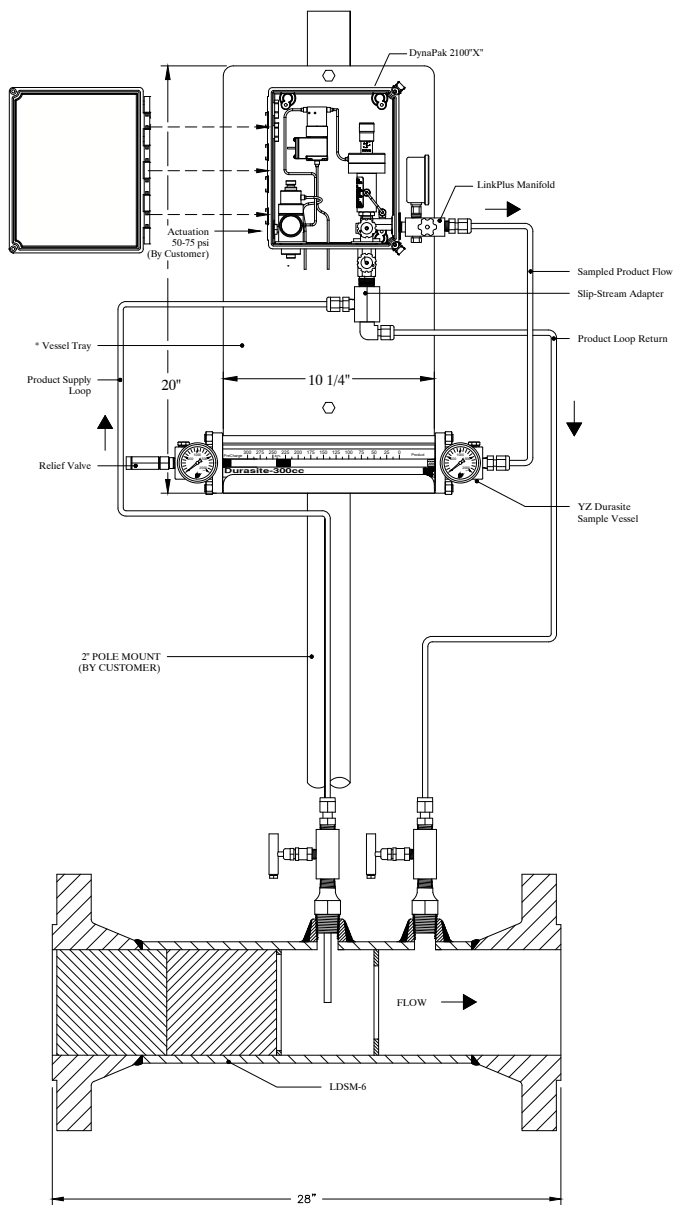


SECTION 2: SYSTEM INSTALLATION

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.

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.



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 24](#), 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 6: PROGRAMMING FOR PROPORTIONAL TO FLOW OPERATION

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

Number of turns open on pump stroke knob	Sample pump displacement 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.

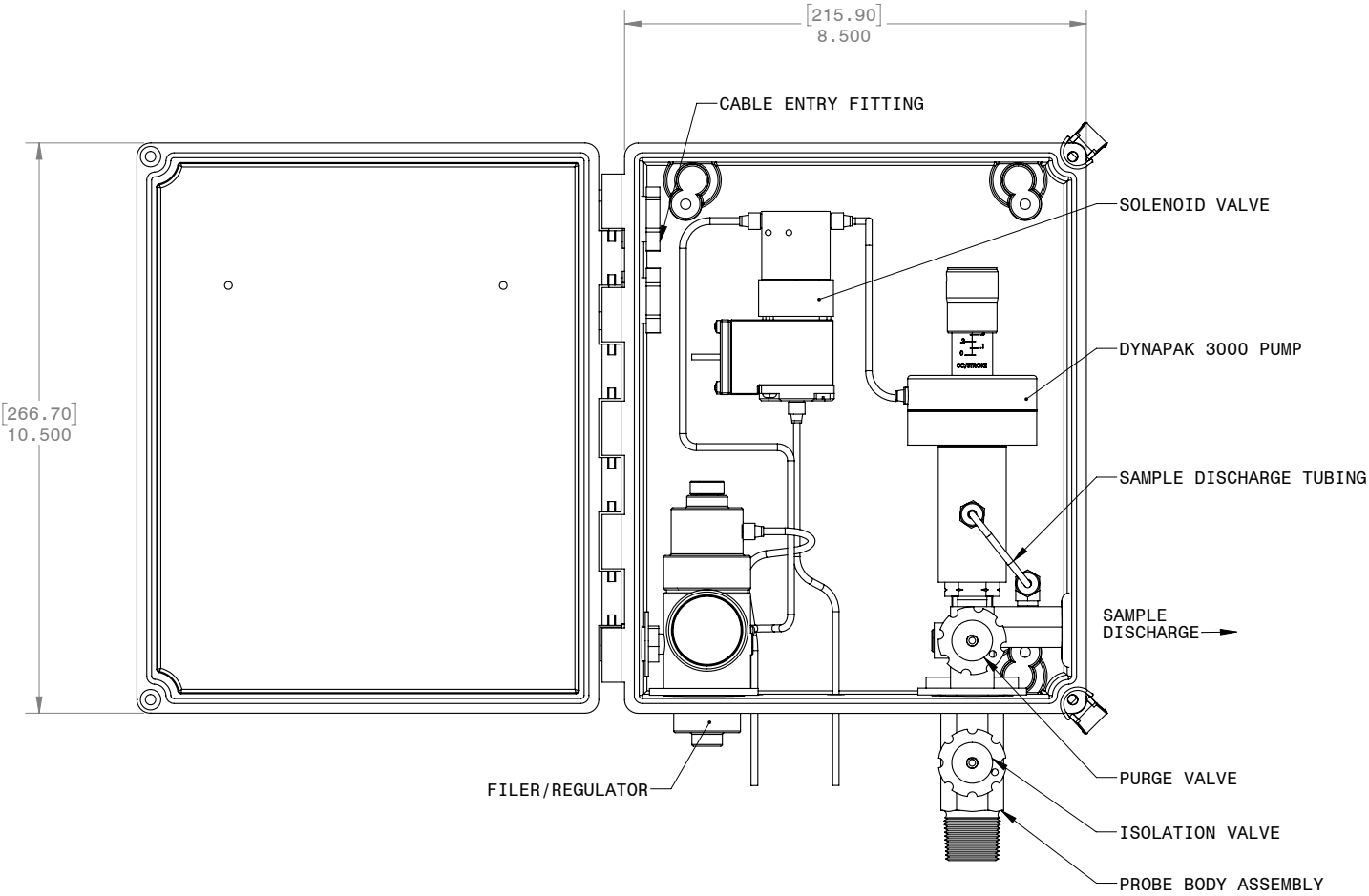
Sample pump displacement per stroke	Number of turns open on the pump volume knob
.1cc	3
.2cc	6
.4cc	12

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-3000 Sample Pump

DP-3000 Sample Pump, [refer to Appendix, page 17 & 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 17 & 18](#), located on the top of the DP-3000 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 22](#), 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
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)

- 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

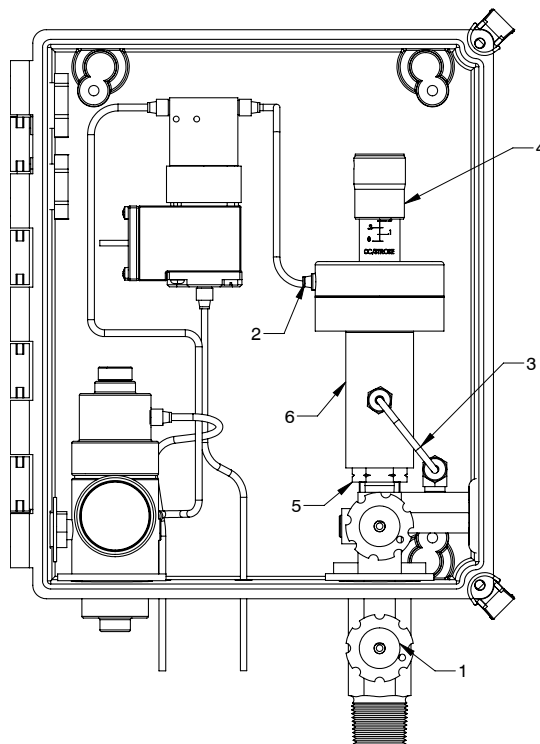
Part #	Description	Recommended Quantity
D3-0115	DP-3000 pump seal replacement kit	1
D3-0116	Filter Regulator repair kit	1
A4-0036	Solenoid	1

SECTION 7: SYSTEM MAINTENANCE

Cleaning and Lubricating the DP 3000 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

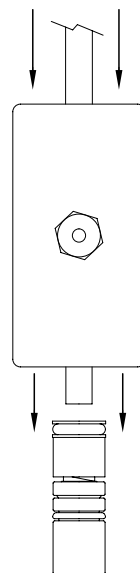
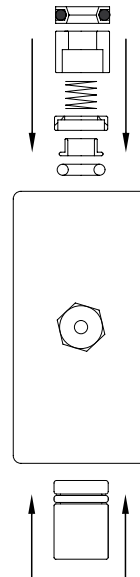


Figure 8

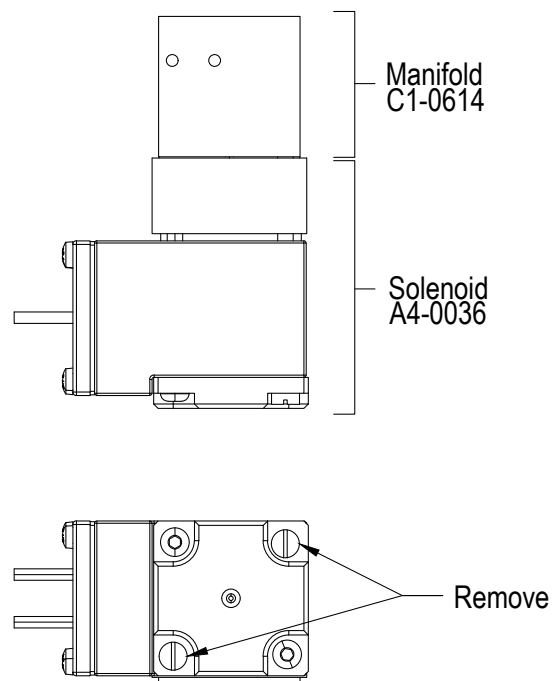


SECTION 7: SYSTEM MAINTENANCE

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

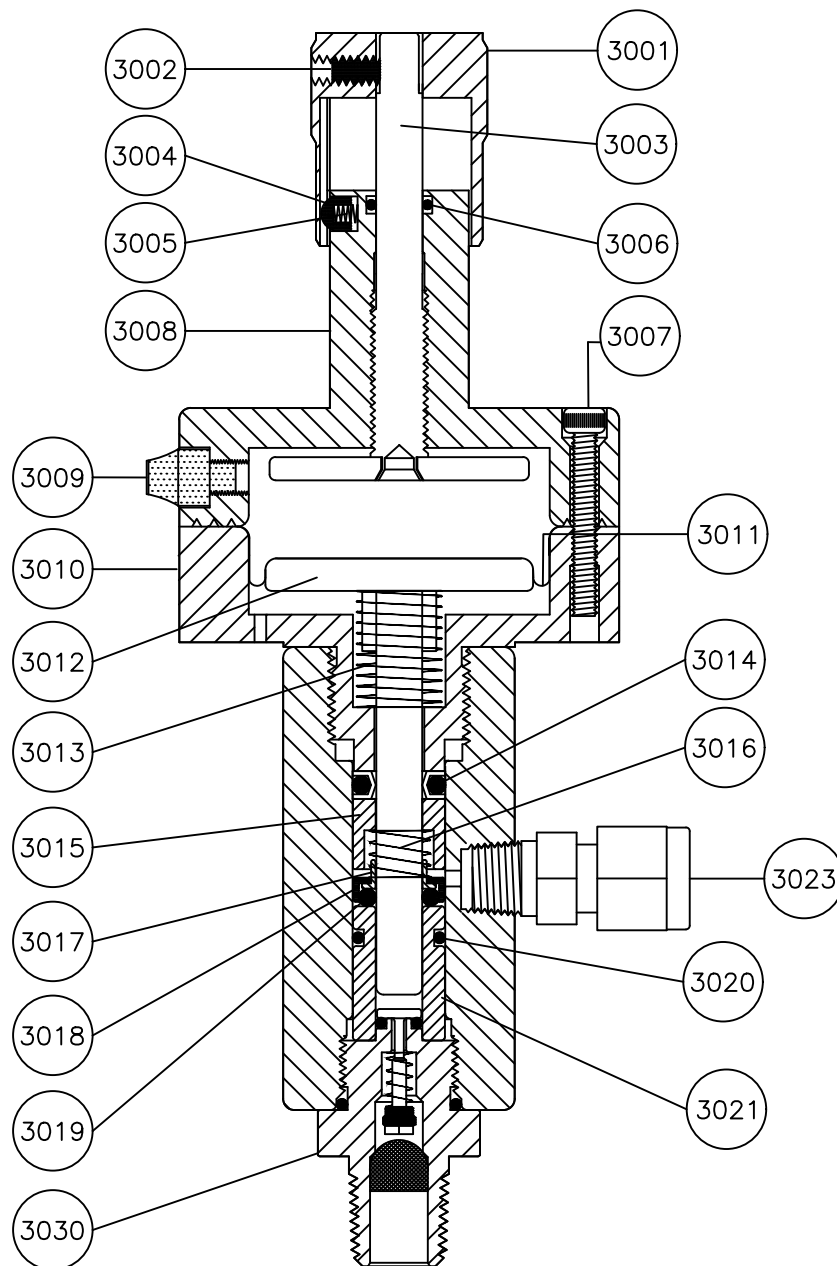
Figure 9



APPENDIX:

DynaPak 3000 Pump, Assembled View

Figure 10



* - DP-3000 Pump Seal Kit - P/N D3-0002

APPENDIX:

DynaPak 3000 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 BDY/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
B1-0113	DP 3000 CPL DSCH CHECK BUSHING	1	3018
A5-1108-90D	O-RING -108 VITON (90D)	1	3019
A5-1012	OR -012 VITON,V75	1	3020
B1-0047	DP SS BODY BUSHING	1	3021
40061	TUBE CONN 1/8TUBE X 1/8NPT 316	1	3023
B1-0037+	DP 3000 INLET CV ASSY (STD)	1	3030

APPENDIX:

DynaPak Pump Options

The standard 3000 pump comes with a stainless steel pump bushing and 90 durometer O-rings in 2 key positions. The two following options may be requested for the 3000 pump.

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

- Use the standard 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 D3-0115K seal kit.

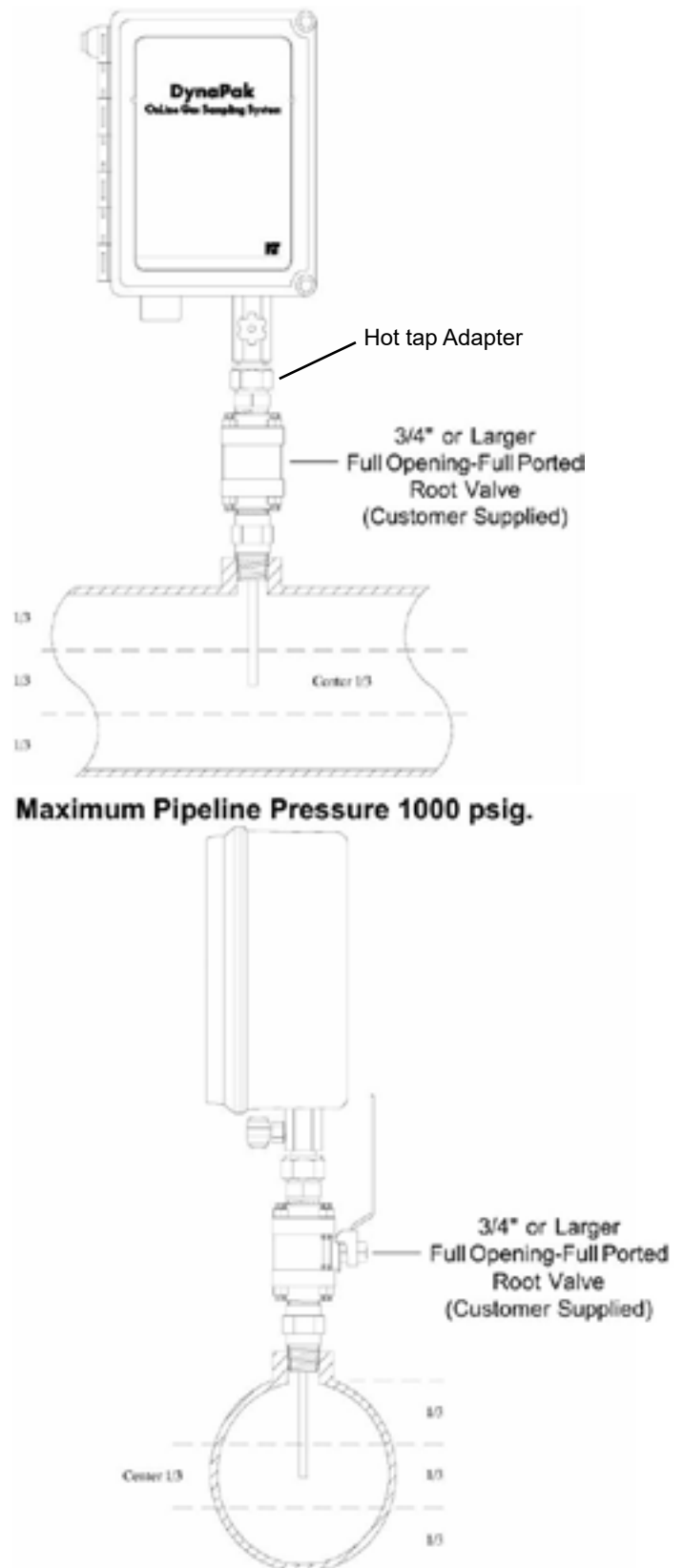
1/2" NPT Probe – Option J

- Choosing Option J simply replaces the standard 3/4" NPT probe connection with a 1/2" NPT probe connection body.

APPENDIX:

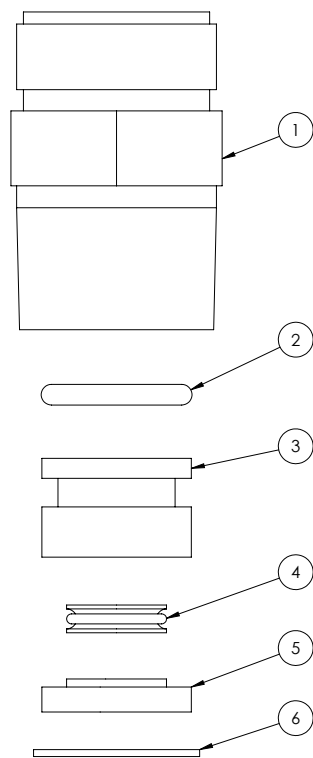
Hot Tap Configuration – Option “H”

- 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).

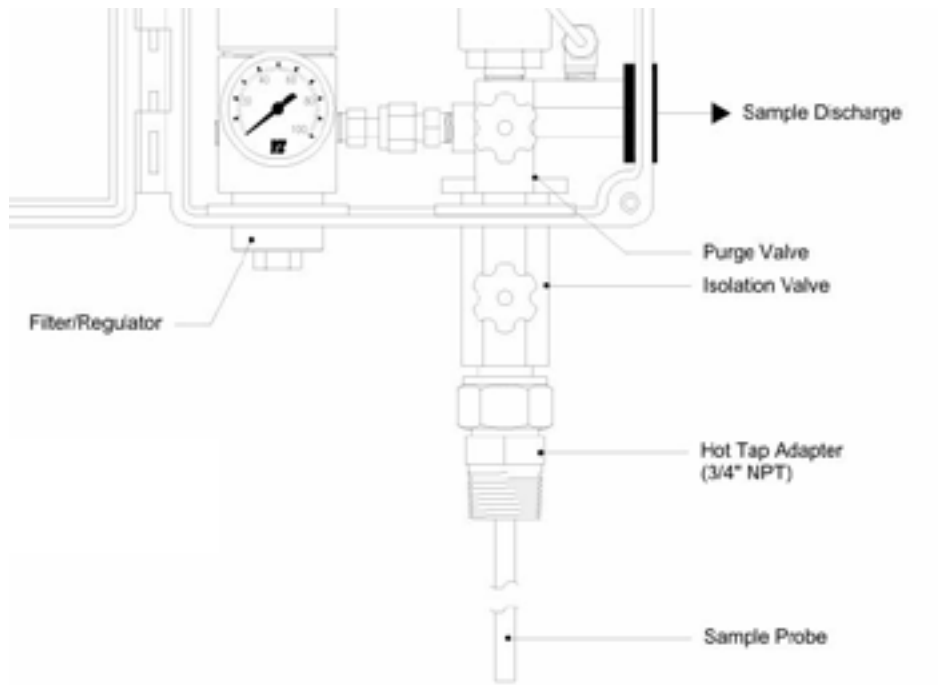


APPENDIX:

Hot Tap Configuration – Option “H”



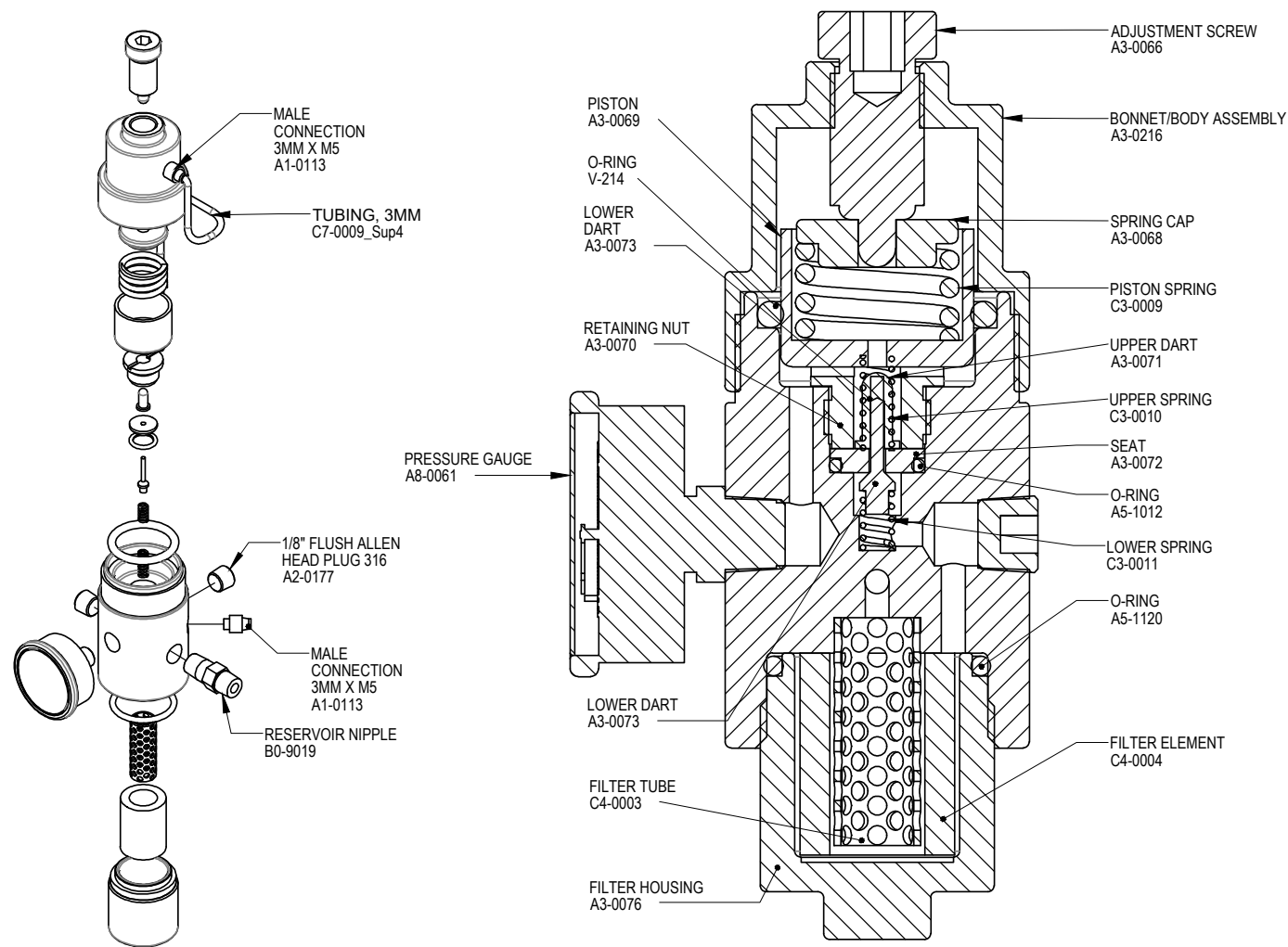
BILL OF MATERIALS			
BUBBLE NUMBER	PART NO.	DESCRIPTION	QTY
1	B1-0031	DP HOT TAP FITTING	1
2	A5-1113	O-RING - 113	1
3	A7-0009	DP HOT TAP UPPER BUSHING	1
4	A6-0018	SEAL - 202	1
5	A7-0010	DP HOT TAP LOWER BUSHING	1
6	C3-0802	SNAP RING, 3/4" INT.	1



APPENDIX:

YZ Filter/Regulator Assembled

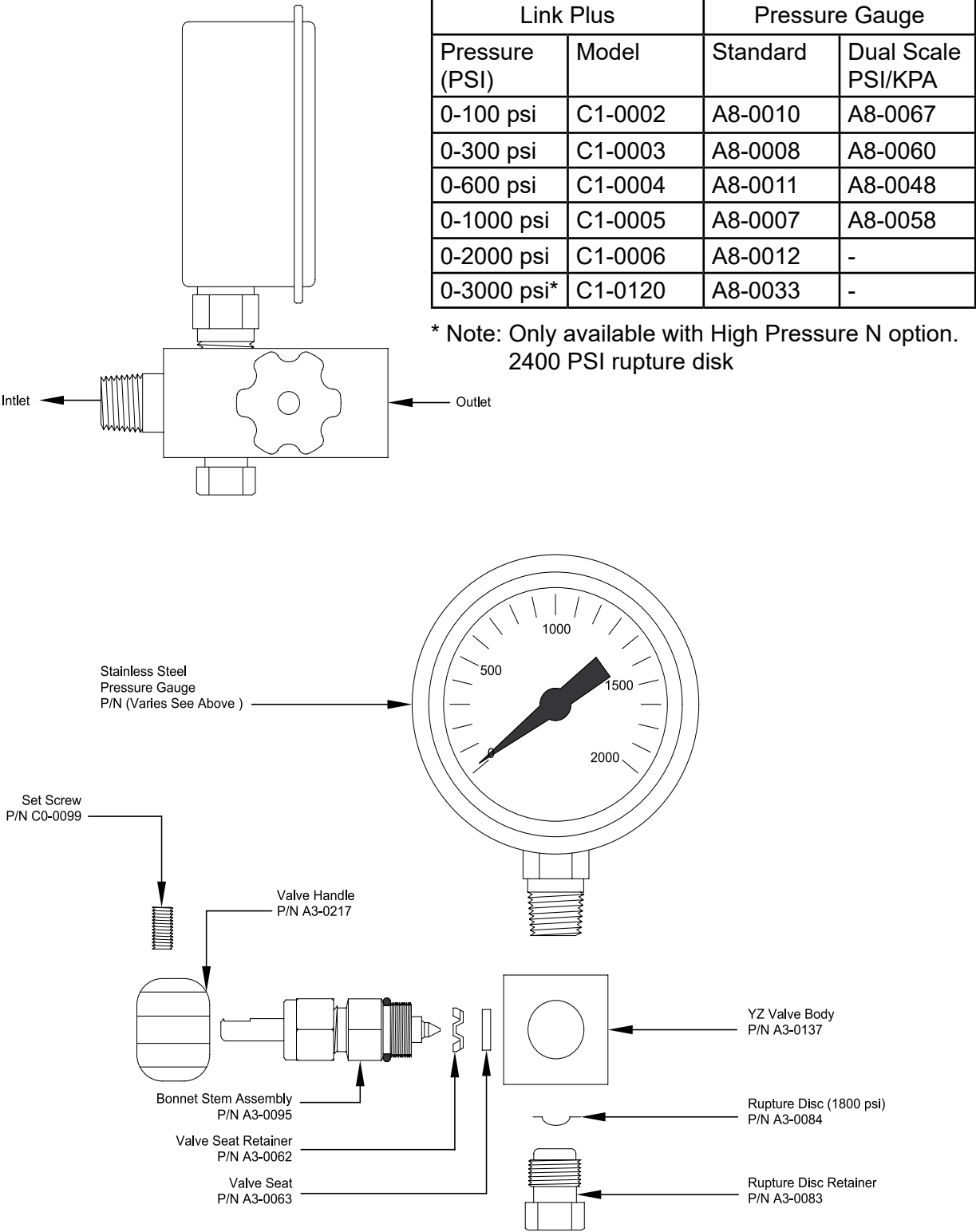
Figure 11



APPENDIX:

Link Plus

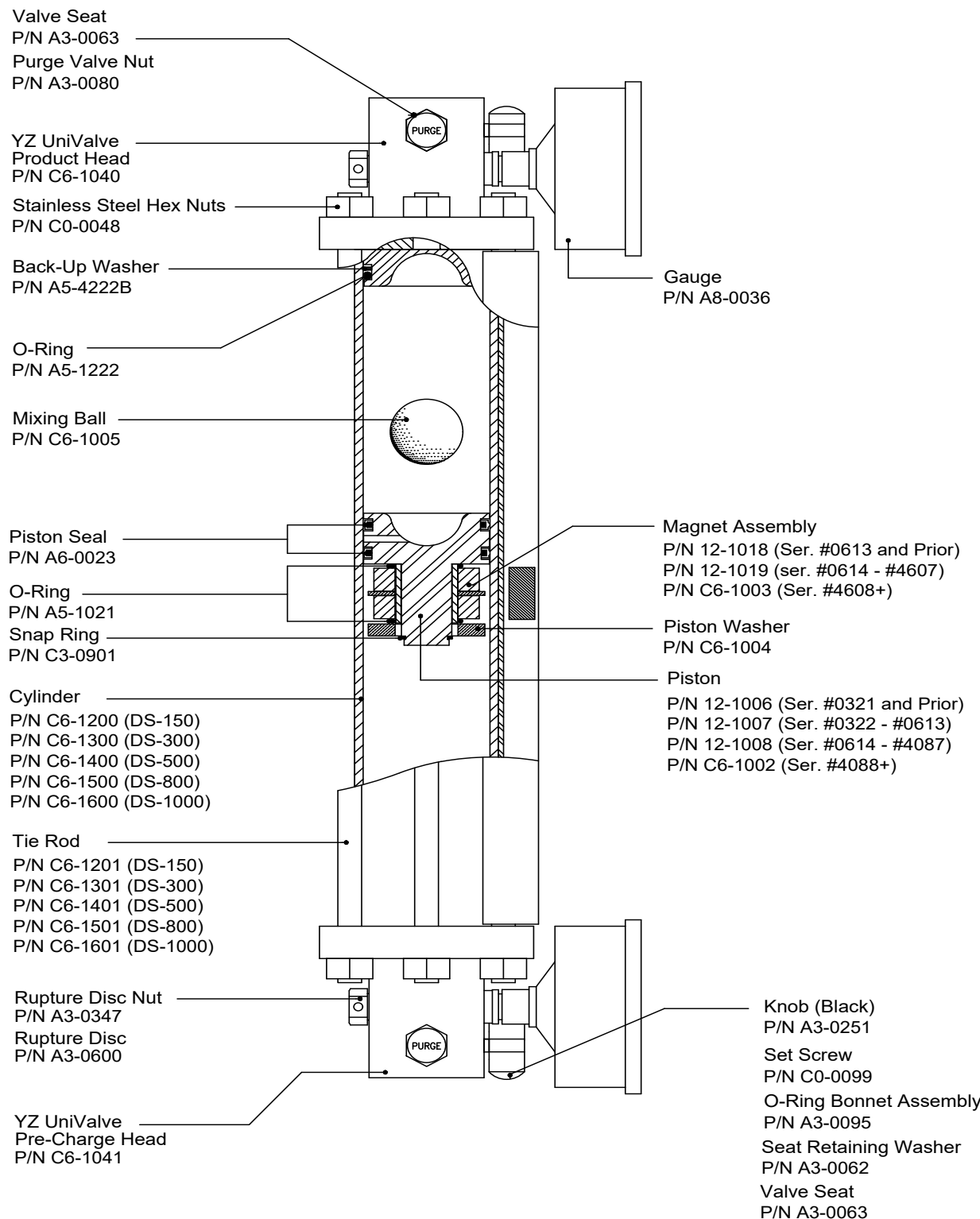
Figure 12



APPENDIX:

Durasite Sample Vessel

Figure 13



Pump Control Document

THIS CONTROL DOCUMENT COVERS THE FOLLOWING YZ SYSTEMS PUMPS:

LVO 6000 SERIES
DYNAPAK 2000 AND 3000 SERIES
CYCLONE MLS-4400

THE PUMPS LISTED ABOVE HOLD THE FOLLOWING APPROVALS:

Ex h IIC T4 Ga

 $-20^{\circ}\text{C} \leq T_{\text{amb}} \leq +60^{\circ}\text{C}$

IECEX ETL 24.0005X
ETL24ATEX0371X
ITS24UKEX0799X



NOTES:

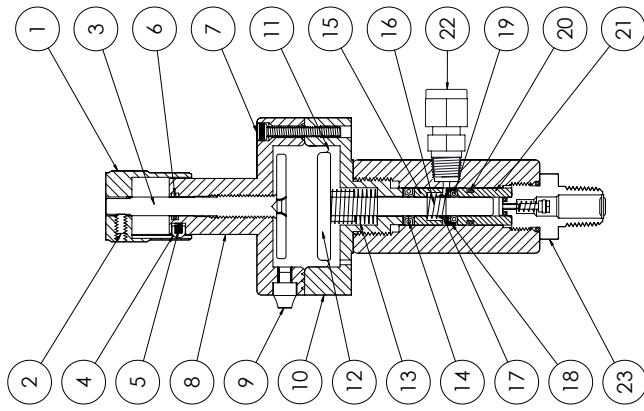
1. ~~EX~~ SCHEDULE DRAWING - DO NOT MODIFY WITHOUT AGENCY APPROVAL.

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<div>REVISION HISTORY</div>																																																																																																				
GENERAL TOLERANCES		LINEAR DIMENSIONS - DIMENSIONS LINÉAIRES mm(INCHES)			PERMANENT FEATURES - CARACTÉRISTIQUES PERMANENTES																																																																																															
ISO 2768		5-6	6-30	30-120	120-400	400-1000	1000-2000	2000-4000	4000-8000	8000-16000	16000-32000	32000-64000	64000-128000	128000-256000	256000-512000	512000-1024000	1024000-2048000	2048000-4096000	4096000-8192000	8192000-16384000	16384000-32768000	32768000-65536000	65536000-131072000	131072000-262144000	262144000-524288000	524288000-1048576000	1048576000-2097152000	2097152000-4194304000	4194304000-8388608000	8388608000-16777216000	16777216000-33554432000	33554432000-67108864000	67108864000-134217728000	134217728000-268435456000	268435456000-536870912000	536870912000-1073741824000	1073741824000-2147483648000	2147483648000-4294967296000	4294967296000-8589934592000	8589934592000-17179869184000	17179869184000-34359738368000	34359738368000-68719476736000	68719476736000-137438953472000	137438953472000-274877906944000	274877906944000-549755813888000	549755813888000-1099511627776000	1099511627776000-2199023255552000	2199023255552000-4398046511104000	4398046511104000-8796093022208000	8796093022208000-17592186044416000	17592186044416000-35184372088832000	35184372088832000-70368744177664000	70368744177664000-140737488355328000	140737488355328000-281474976710656000	281474976710656000-562949953421312000	562949953421312000-1125899906842624000	1125899906842624000-2251799813685248000	2251799813685248000-4503599627370496000	4503599627370496000-9007199254740992000	9007199254740992000-18014398509481984000	18014398509481984000-36028797018963968000	36028797018963968000-72057594037927936000	72057594037927936000-144115188075855872000	144115188075855872000-288230376151711744000	288230376151711744000-576460752303423488000	576460752303423488000-1152921504606846976000	1152921504606846976000-2305843009213693952000	2305843009213693952000-4611686018427387904000	4611686018427387904000-9223372036854775808000	9223372036854775808000-18446744073709551616000	18446744073709551616000-36893488147419103232000	36893488147419103232000-73786976294838206464000	73786976294838206464000-147573952589676412928000	147573952589676412928000-295147905179352825856000	295147905179352825856000-590295810358705651712000	590295810358705651712000-1180591620717411303424000	1180591620717411303424000-2361183241434822606848000	2361183241434822606848000-4722366482869645213696000	4722366482869645213696000-9444732965739290427392000	9444732965739290427392000-18889465931478580854784000	18889465931478580854784000-37778931862957161709568000	37778931862957161709568000-75557863725914323419136000	75557863725914323419136000-151115727451828646838272000	151115727451828646838272000-302231454903657293676544000	302231454903657293676544000-604462909807314587353088000	604462909807314587353088000-1208925819614629174706176000	1208925819614629174706176000-2417851639229258349412352000	2417851639229258349412352000-4835703278458516698824704000	4835703278458516698824704000-9671406556917033397649408000	9671406556917033397649408000-19342813113834066795298816000	19342813113834066795298816000-38685626227668133590597632000	38685626227668133590597632000-77371252455336267181195264000	77371252455336267181195264000-154742504910672534362390528000	154742504910672534362390528000-309485009821345068724781056000	309485009821345068724781056000-618970019642690137449562112000	618970019642690137449562112000-1237940039285380274899124224000	1237940039285380274899124224000-2475880078570760549798248448000	2475880078570760549798248448000-4951760157141521099596488896000	4951760157141521099596488896000-9903520314283042199193977792000	990352031428304219919397779

APPENDIX:

Pump Control Document

DYNAPAK SERIES PUMP



PUMP NOTES:

1. PUMP CALCULATIONS:

SOLENOID STROKE TIME = 600 ms, MAX PUMP STROKE = 0.6 in

PUMP SPEED = 0.6 in / 600 ms = 0.001 in/ms

MAIN SPRING CONSTANT = 0.963198 N/mm, MAX DISPLACEMENT = 15.24 mm

$$\text{MAIN SPRING ENERGY} = (1/2) * 0.963198 \text{ N/mm} * 15.24^2 = 111.855 \text{ N}$$

MASS OF PLUNGER: 53 g

MASS OF SPRING: 0.1 g

2. PUMP MAINTENANCE:

RELUBRICATION INTERVAL: SEMI-ANNUAL

LUBRICANT TYPE: NON-SOLUBLE ASSEMBLY GREASE

ALL LUBRICANTS UTILIZED SHALL HAVE A MINIMUM FLASH POINT OF 120C

RELUBRICATION INSTRUCTIONS:

1. DISASSEMBLE PUMP

2. APPLY LIGHT COAT OF

3. RE-ASSEMBLE PUMP

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3. FLOODED SUCTION REQUIRED FOR PRIMING PUMP

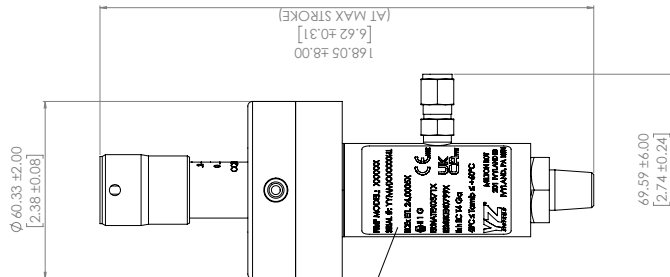
4. PUMP SHALL NOT BE USED WITHOUT A PROCESS MEDIUM

5. PUMP COMPATIBLE FLUIDS: GROUP 1

6. MAXIMUM OVERALL MASS: 2.40 lbs

7. INLET ACTUATION PRESSURE: 50 - 65 psig

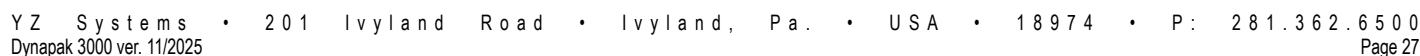
8. MAXIMUM PROCESS PRESSURE: 1500 psig



The Dynapak pump has a controlled aluminum content exceeding the limitations defined by IEC 60079-0. When installed in an EPL Ga environment, the end user shall conduct a risk assessment, and only install the equipment where the risk of impact is considered negligible.

[illegible]

Solenoid Valve Control Drawing





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