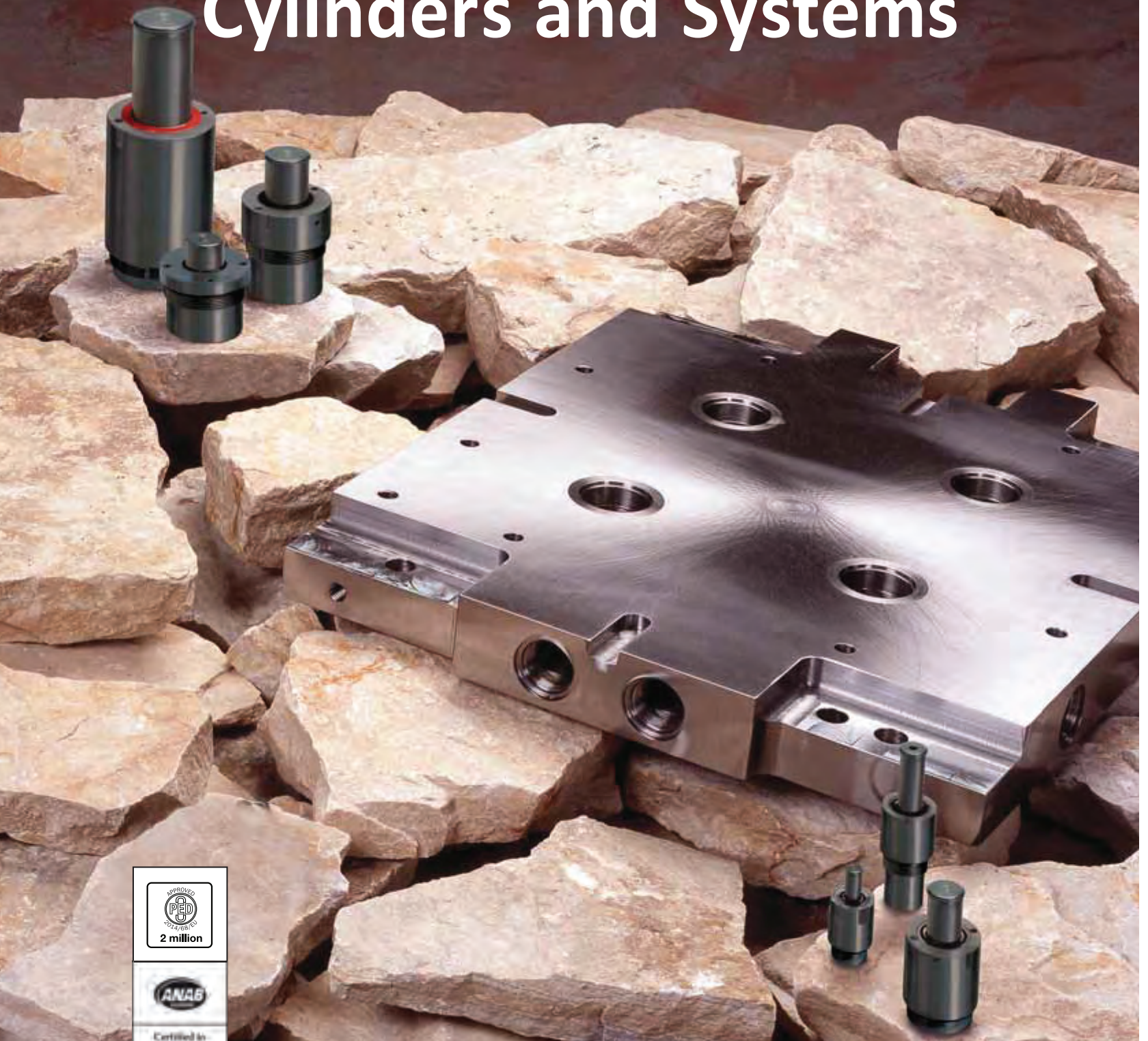


Nitro-Dyne[®] XP Manifold Cylinders and Systems

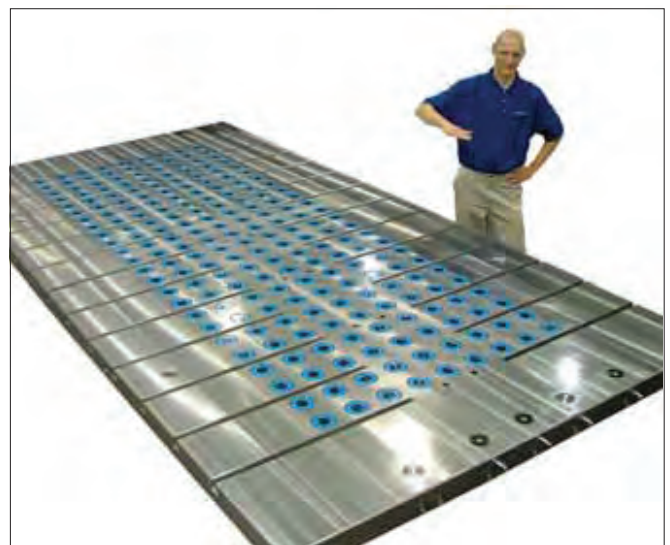
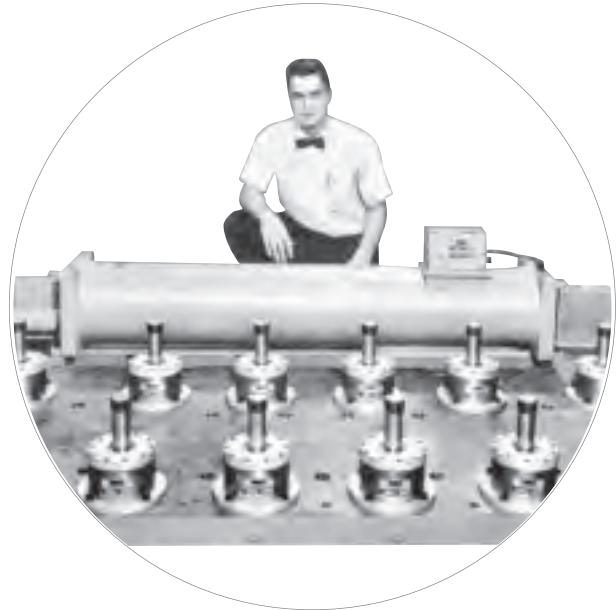


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HYSON
Metal Forming Solutions™

Introduction

Table of Contents	Page
Introduction.....	1
Advantages of Manifold Systems.....	2
Advantages of HYSON Manifold Systems.....	4
Manifold System Design.....	6
Designing a Standard Manifold.....	7
Designing a High Pressure Manifold.....	9
Additional Design Considerations.....	12
Choosing a Manifold Cylinder.....	13
MOR.....	14
MORD.....	16
TSB.....	18
SB 6X.75-BW.....	20
SB.....	21
MOR 400.....	22
Port Plugs.....	23
Control Panels.....	25
Modular Control Panel.....	27
Compression Tank.....	27
Pressure Monitors.....	27
Hoses and Fittings.....	28



General Information

In 1964, we delivered our first manifold system to a customer who chose it for its consistent force with every stroke, force adjustability, reduced die set-up time, and efficient use of presses.

Throughout the almost 50 years that followed, we have continued to help customers get the most value from their stamping operations with a variety of Nitro-Dyne[®] XP manifold systems.

Advantages of Nitrogen Manifold Systems

The industry's emphasis on increased productivity and lean manufacturing makes the use of manifold systems even more important today. Nitro-Dyne manifold systems offer a variety of advantages compared to other systems. It's all about force!

Consistent Force for Consistent Quality Parts

Manifold systems are rugged and never tire, providing consistent force for repeatable performance time after time. Mechanical springs fatigue, affected by stroke rate, heat and lubrication, impacting part quality.

Balanced Force for Improved Part Quality, Reduced Scrap, Increased Uptime

Manifold systems provide balanced force on the pressure pad unlike air cushions that experience uneven pad pressure if the cushion is off-center loaded. Air cushions also require counterbalance pins.

More Force in Less Space for Cost Savings on Die Construction and Operation

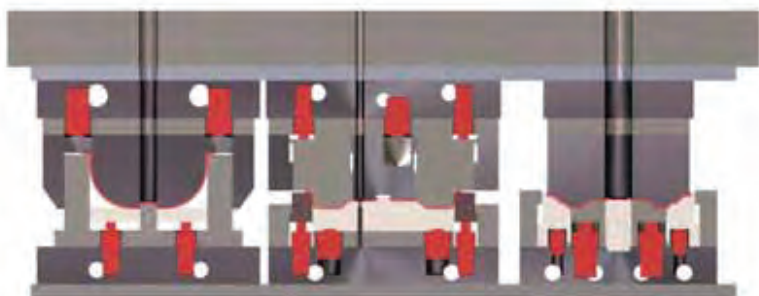
A single 2.5 ton cylinder with a one-inch stroke replaces eight 2 inch X 8 inch mechanical springs, saving costs in the original die construction. The consumable die springs also need to be replaced, adding costs and downtime.



Full Force on Contact for Higher Productivity

Manifold systems provide full force on contact, unlike mechanical springs that require preload. And manifold cylinders can stroke to 12 inches for additional versatility.

Blank & Draw Station



Lower Force Increase for Better Part Quality, Longer Performance Life

Manifold systems are designed with a 10%-15% pressure rise so the force increase that occurs between contact and die closed is minimal for good quality parts. Self-contained gas springs typically exhibit a 65% force increase that in some applications can lead to part tearing. This lower pressure rise also results in lower operating temperatures that add to the longevity of cylinders and systems.

Advantages of Nitrogen Manifold Systems

Easy Force Adjustability for Reduced Downtime and Maintenance

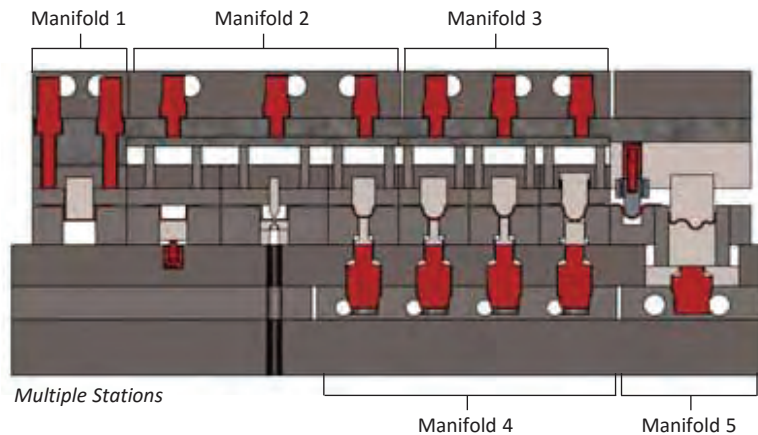
Within the manifold system, the cylinders share a common reservoir, allowing the end user to adjust the pressure up or down as necessary depending on material tensile strength or thickness. The adjustment takes place while the die is still in the press instead of shutting down operations and pulling the die to change mechanical springs. This is even more important when you have multiple stations with varying stroke lengths and pressure requirements.

Faster Set-up for Maximum Production Time

Manifold systems require none of the valves, compressors and other complex connections that air cushions do, so set-up is faster leaving more time for actual production.

Press Versatility for More Efficient Operations

Manifold cylinder systems are inserted directly in the die and move with the die from press to press for more efficient and cost-effective operations.



Fewer Leak Points for Reduced Maintenance and Downtime

A manifold system is a self-contained plate with no external hoses or fittings, while a hoses gas spring system has many potential leak points hard to detect while mounted in the die.

Choosing the Best System for Your Operations

Selecting the most efficient and effective cylinder system for your operation is not always simple, and often the lowest initial cost option is more expensive in the long run. Check out the chart below and contact the Hyson engineered products experts to ensure you get the optimum system for your needs.

System Selection

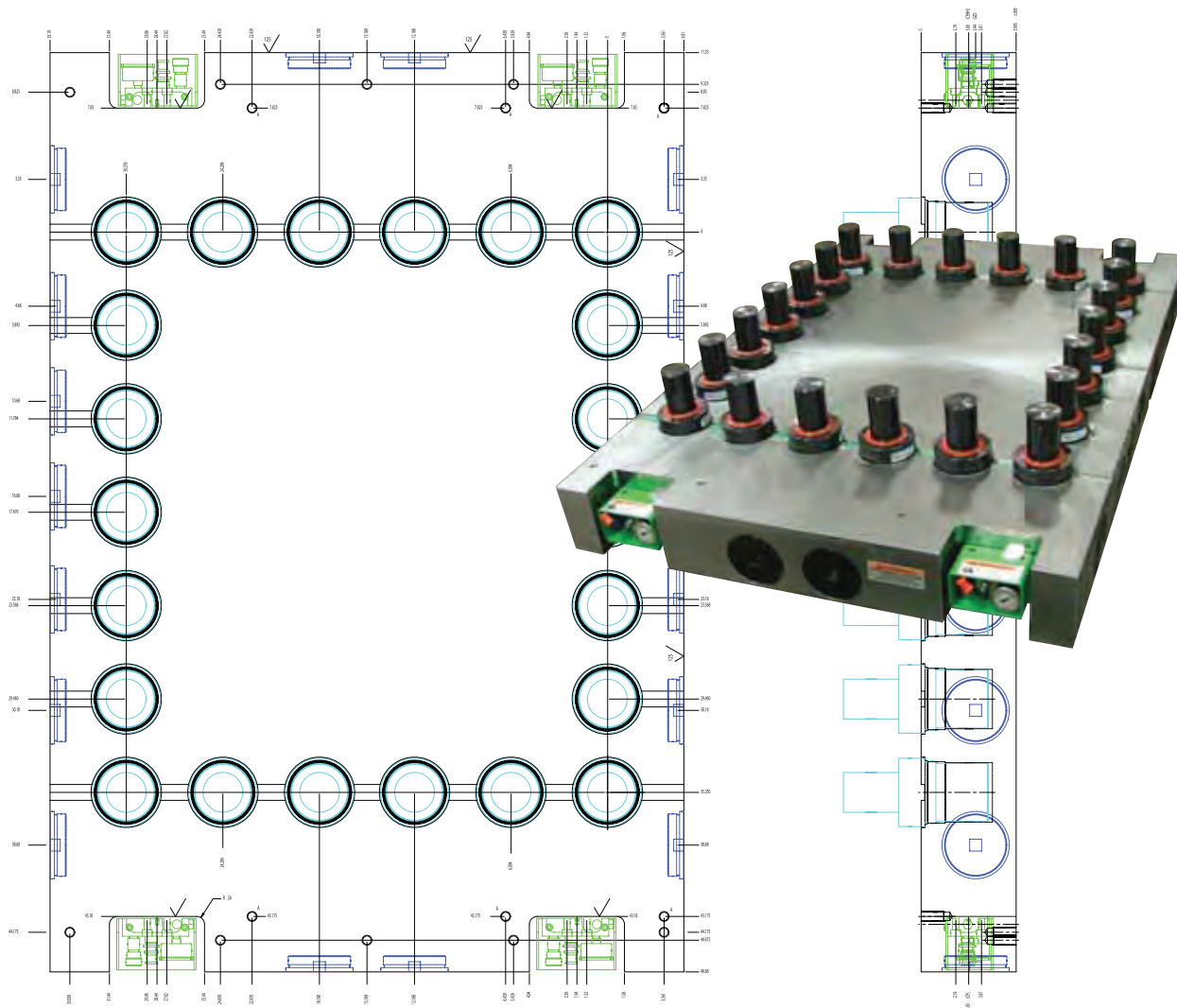
Operation Requirement	Nitro-Dyne Manifold System	Mechanical Die Spring	Nitrogen Gas Spring	Hose System	Air Cushion
Consistent Force	Yes	No	Yes	Yes	No
Balanced Force	Yes	No	Yes	Yes	No
High Tonnage/Small Space	Yes	No	Yes	Yes	No
Full Contact Force	Yes	No	Yes	Yes	Yes
Force Adjustability In-Press	Yes	No	No	Yes	Yes
Low Pressure Rise	Yes	No	No	No	No
Low Heat Generation	Yes	Yes	No	No	No
Minimum Leak Points	Yes	N/A	Yes	No	No
Low Initial Cost	No	Yes	Yes	Yes	No
Low Cost Die Assembly	Yes	No	No	No	No
Maximum Production Time	Yes	No	No	No	No

Advantages of HYSON Nitrogen Manifold Systems

And there are no better nitrogen manifold systems available today than Nitro-Dyne XP systems from HYSON Metal Forming Solutions

HYSON offers standard 1500 psi and high pressure 2000 psi manifold systems, both available with patented Dyne-A-Lube® dynamic lubrication for long life and continuous performance. We offer a wide range of cushion systems as well.

A solid product begins with engineering and design, and continues through manufacturing, inspection and delivery. HYSON's experience in manifold engineering can make the design process easy and cost effective. With basic information about your application



Advantages of HYSON Nitrogen Manifold Systems

and requirements, our engineers use the latest SolidWorks software to put together a system to maximize your productivity and savings.

All Nitro-Dyne XP nitrogen manifold systems are manufactured in our Brecksville, Ohio facility where we specialize in the precision machining of these



components with expertise in milling, turning and other technologies. A 16-point inspection and testing process follows for quality assurance.

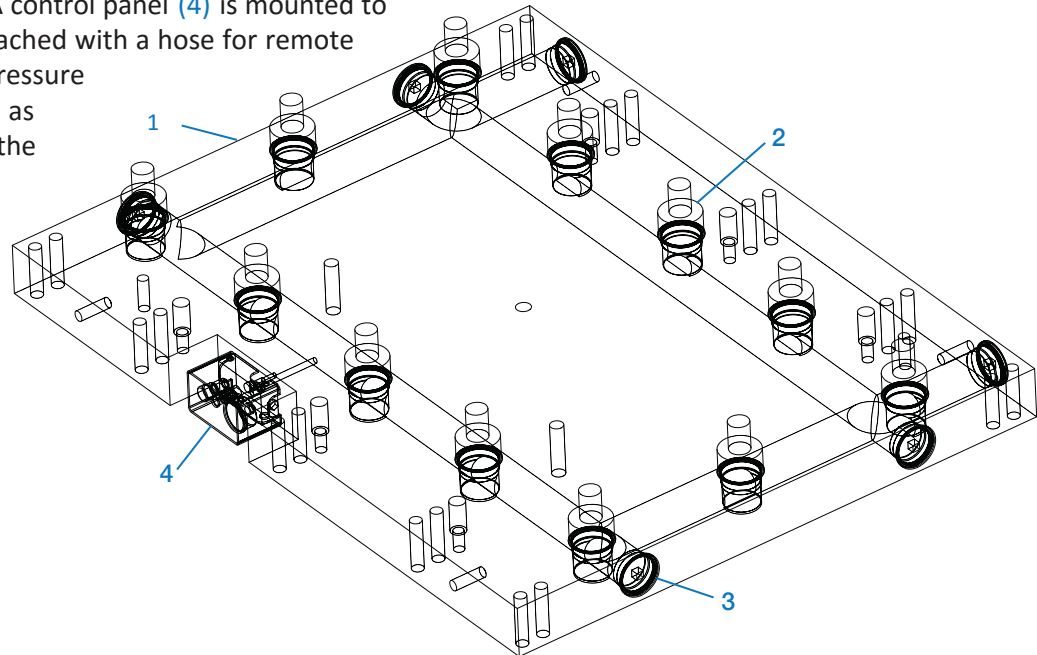
On-time delivery is the top priority of our Lean Enterprise System, and we are focused on smooth product flow from the receipt of the order through shipment, working to reduce lead times and provide high quality products that contribute to long-running, trouble-free operations.

We stand behind our nitrogen manifold systems as we do all our products, and our trained and seasoned Customer Service Department and Regional Sales Managers are available to answer your questions and find solutions to any issues you experience.



Manifold System Design

The typical manifold incorporates a metal plate, cylinders and control panel. The manifold plate (1) is machined to hold cylinders in place and act as a reservoir for nitrogen gas. Cylinders (2) are located wherever force is needed, threaded into the plate and sealed by an O-ring. The cylinders are connected by passages through which the nitrogen gas travels (3). A control panel (4) is mounted to the manifold plate or attached with a hose for remote operation. Reading the pressure within the system as well as charging and exhausting the system are accomplished through the control panel.



Save time and money and let our Engineered Products group design the most cost effective and efficient manifold system for you. We can turn around a quote quickly, often within 24 hours. Here is the information we need to expedite your quotation:

Maximum area available: length, width, thickness, overall height with cylinders fully extended

Cylinder working stroke and preferred usable stroke

Tonnage required

Maximum number of cylinders

Allowable pressure rise from initial contact to end of work stroke

Special features: mounting holes, dowel holes, key ways, pockets, scrap chutes, etc.

Location of control panel: recessed in plate or remote-hosed to plate

Press speed (Strokes Per Minute-SPM)

Use of drawing lubricants, i.e. can die be flooded with lubricants?

Annual production levels

CAD drawing or hand-drawn sketch with data points

If you choose to design the system yourself, step-by-step guides follow for designing both standard 1500 psi and high pressure 2000 psi systems.

Designing a Standard 1500 psi System

Step One – Force

Determine how much force is needed to form, hold, strip or draw the part.

Example: 15 tons of force is required for a conventional draw of a rectangular part.

Step Two – Cylinder Quantity

Determine how many pressure points are needed to distribute the pressure evenly across the pad. To accommodate variances in part thickness, tensile strength, and die wear, build in more force than required.

Example: The system design has the capability for 20 tons, more than the 15 tons required.

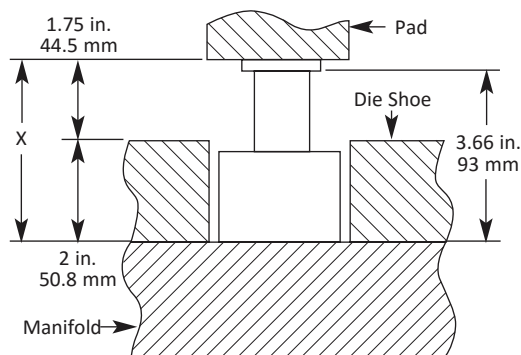
Cylinder Choices	Quantity Needed
1/2 ton	40
1 ton	20
2.5 tons	8
4 tons	5
6 tons	4

Eight 2.5 ton cylinders provide a good pressure point distribution with the necessary tonnage.

Step Three – Cylinder Stroke

Pad travel dictates stroke length, and standard strokes for most cylinder types are in one-half-inch increments. Choose the stroke length that will not be exceeded by the actual working stroke. **Example:** The travel of the pad is 1-3/4 inches so the proper cylinder stroke for this application is 2 inches.

Step Four – Cylinder Profile



Measurement from the bottom of the shoe to the bottom of the pad in the die-open position is known as the “X” dimension. Choose a cylinder that closely matches this dimension, remembering that the cylinder should be always protected from overstroking.

Example: The appropriate cylinder choice is the MORD 2.5 X 2 inch stroke.

Step Five – Pressure Rise/Volume Holes

Controlled material flow is needed in conventional draw dies with cylinders maintaining constant force throughout the stroke. This type of system is usually designed with a 10%-20% pressure rise, while other systems can use a higher pressure rise.

Determine the volume requirements, and therefore the length and diameter of the drilled holes, by calculating the Swept Volume (SV), the amount of nitrogen displaced from the cylinders during the stroke.

Effective Piston Area

Cylinder Tonnages	Effective Piston Area	
1/2 Ton	5.03 cm ²	0.78 in. ²
1 Ton	11.40 cm ²	1.77 in. ²
2.5 Ton	22.20 cm ²	3.44 in. ²
4 Ton	34.90 cm ²	5.42 in. ²
6 Ton	51.50 cm ²	7.98 in. ²

SV = number of cylinders X work stroke of cylinders X effective piston area of cylinders

Example: $SV = 8 \times 1.75 \times 3.44 \text{ in.}^2$
 $SV = 48.16 \text{ in.}^3$

Calculate the total manifold volume by multiplying the Swept Volume by pressure rise.

Desired Pressure Rise	Pressure Rise Factor (PF)
10%	SV X 10
15%	SV X 6.66
20%	SV X 5

Example (for a 10% pressure rise):

Total Volume = SV X PF

Total Volume = 48.16 in.³ X 10 = 481.6 in.³

Designing a Standard 1500 psi System

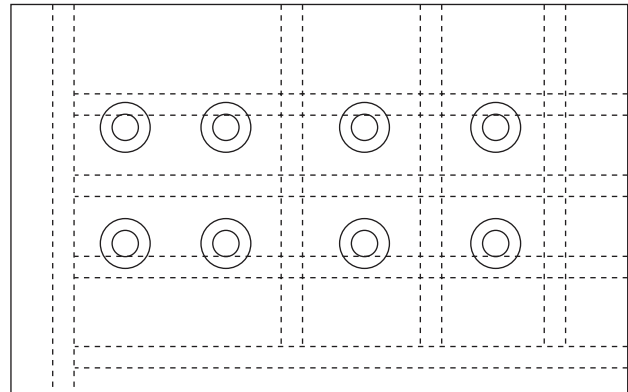
Convert the Total Volume into linear inches of drilling.

$$\text{Linear Inches Drilling} = \frac{\text{Volume required}}{\text{Volume per inch of drilled hole}^*}$$

***Note:** when shut height allows, design the system with a thicker manifold plate and reduce the number and length of drilled holes to reduce costs.

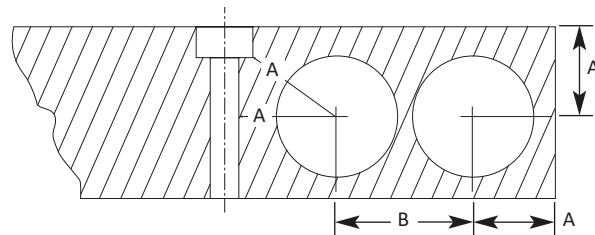
Example: For a plate measuring 2-1/2 in. X 80 in. X 48 in., the largest diameter volume hole is 1-1/2 in. Volume per linear inch of drilling is 1.767 in.³.

$$\frac{481 \text{ in.}^3}{1.767 \text{ in.}^3} = 272 \text{ Linear Inches Drilling}$$



4 holes	45 in. long	180 linear inches
3 holes	25 in. long	75 linear inches
1 hole	30 in. long	30 linear inches
		<u>285 linear inches</u>

From the Volume Hole Drilling chart that follows, identify the largest volume hole for the plate thickness.



Standard Manifold Volume Hole Drilling

Plugs	Thread Size	Area/Linear Inch	mm in.	Hole Diameter	A	B	Suggested Plate Thickness*	Max. Drilling Depth (1 Way)
NF-771-4	7/16-20	.71 cm ² .110 in. ²	mm in.	9.53 0.375	9.53 0.375	18.75 0.738	51 2.00	584 23
NF-771-5	1/2-20	.97 cm ² .151 in. ²	mm in.	11.13 0.438	10.31 0.406	22.22 0.875	51 2.00	584 23
NF-771-8	3/4-16	2.18 cm ² .338 cm ²	mm in.	16.60 0.656	14.30 0.563	30.96 1.219	51 2.00	483 19
NF-771-10	7/8-14	2.85 cm ² .442 in. ²	mm in.	19.05 0.750	15.88 0.625	34.93 1.375	51 2.00	1092 43
NF-771-12	1-1/16-12	4.46 cm ² .691 in. ²	mm in.	23.83 0.938	19.05 0.750	42.06 1.656	51 2.00	1092 43
NF-771-14	1-3/16-12	5.71 cm ² .886 in. ²	mm in.	26.97 1.062	22.45 0.884	46.05 1.813	51 2.00	1092 43
NF-771-16	1-5/16-12	7.15 cm ² 1.108 in. ²	mm in.	30.18 1.188	23.83 0.938	50.80 2.000	57 2.25	1092 43
NF-771-20	1-5/8-12	11.40 cm ² 1.767 in. ²	mm in.	38.10 1.500	26.97 1.062	58.75 2.313	64 2.50	1143 45
NF-771-24 & NF-771-M47	1-7/8-12	15.52 cm ² 2.405 in. ²	mm in.	44.45 1.750	31.75 1.250	60.33 2.375	70 2.75	1194 47
NF-771-M63	M63-2	27.75 cm ² 4.301 in. ²	mm in.	59.44 2.340	39.70 1.563	76.20 3.000	89 3.50	1829 72
NF-771-32	2-1/2-12	28.58 cm ² 4.430 in. ²	mm in.	60.33 2.375	39.70 1.563	76.20 3.000	89 3.50	1829 72
NF-771-82	M82-2	48.51 cm ² 7.518 in. ²	mm in.	78.59 3.094	53.98 2.125	95.25 3.750	114 4.50	1524 60
NF-771-100	M100-2	71.26 cm ² 11.045 in. ²	mm in.	95.25 3.750	63.50 2.500	111.25 4.380	133 5.25	1829 72

* Drilling patterns can affect plate thickness.

Designing a High Pressure 2000 psi System

Step One – Force

Determine how much force is needed to form, hold, strip or draw the part.

Example: 15 tons of force is required for a conventional draw of a rectangular part.

Step Two – Cylinder Quantity

Determine how many pressure points are needed to distribute the pressure evenly across the pad. To accommodate variances in part thickness, tensile strength, and die wear, build in more force than required.

Example: The system design has the capability for 20 tons, more than the 15 tons required.

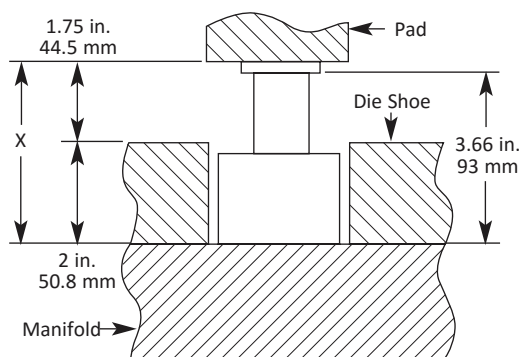
Cylinder Choices	Quantity Needed
3/4 ton	26
1.5 tons	13
3 tons	7
5 tons	4
8 tons	3

Four 5.0 ton cylinders provide a good pressure point distribution with the necessary tonnage.

Step Three – Cylinder Stroke

Pad travel dictates stroke length, and standard strokes for most cylinder types are in one-half-inch increments. Choose the stroke length that will not be exceeded by the actual working stroke. **Example:** The travel of the pad is 1-3/4 inches so the proper cylinder stroke for this application is 2 inches.

Step Four – Cylinder Profile



Measurement from the bottom of the shoe to the bottom of the pad in the die-open position is known as the “X” dimension. Choose a cylinder that closely matches this dimension, remembering that the cylinder should be always protected from overstroking.

Example: The appropriate cylinder choice is the MORD 5000 X 2 inch stroke.

Step Five – Pressure Rise/Volume Holes

Controlled material flow is needed in conventional draw dies with cylinders maintaining constant force throughout the stroke. This type of system is usually designed with a 10%-20% pressure rise, while other systems can use a higher pressure rise.

Determine the volume requirements, and therefore the length and diameter of the drilled holes, by calculating the Swept Volume (SV), the amount of nitrogen displaced from the cylinders during the stroke.

Effective Piston Area

Cylinder Tonnages	Effective Piston Area
3/4 Ton	5.03 cm ² 0.78 in. ²
1.5 Ton	11.40 cm ² 1.77 in. ²
3 Ton	22.20 cm ² 3.44 in. ²
5 Ton	34.90 cm ² 5.42 in. ²
8 Ton	51.50 cm ² 7.98 in. ²

$SV = \text{number of cylinders} \times \text{work stroke of cylinders} \times \text{effective piston area of cylinders}$

Example: $SV = 4 \times 1.75 \times 3.44 \text{ in.}^2$
 $SV = 24.08 \text{ in.}^3$

Calculate the total manifold volume by multiplying the Swept Volume by pressure rise.

Desired Pressure Rise	Pressure Rise Factor (PF)
10%	SV X 10
15%	SV X 6.66
20%	SV X 5

Example (for a 10% pressure rise):

Total Volume = SV X PF

Total Volume = 24.08 in.³ X 10 = 240.8 in.³

Designing a High Pressure 2000 psi System

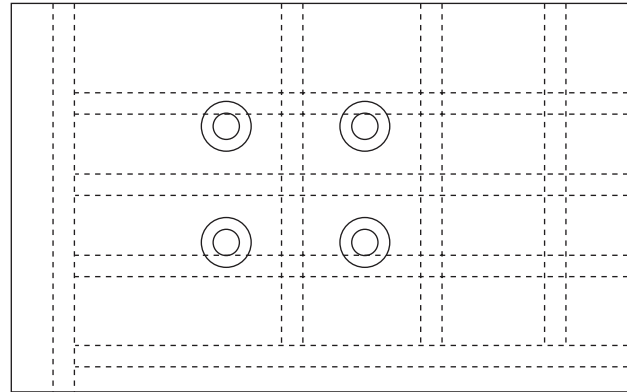
Convert the Total Volume into linear inches of drilling.

$$\text{Linear Inches Drilling} = \frac{\text{Volume required}}{\text{Volume per inch of drilled hole}^*}$$

***Note:** when shut height allows, design the system with a thicker manifold plate and reduce the number and length of drilled holes to reduce costs.

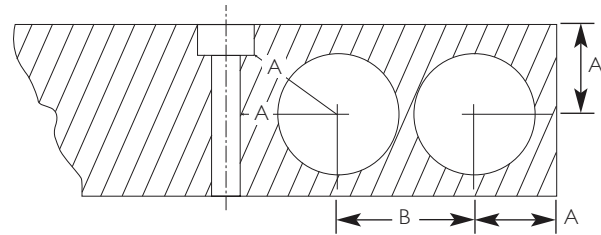
Example: For a plate measuring 2-1/2 in. X 80 in. X 48 in., the largest diameter volume hole is 1-1/2 in. Volume per linear inch of drilling is 1.767 in.³.

$$\frac{240.8 \text{ in.}^3}{1.767 \text{ in.}^3} = 136 \text{ Linear Inches Drilling}$$



4 holes	22 in. long	88 linear inches
3 holes	10 in. long	30 linear inches
1 hole	18 in. long	18 linear inches
		<u>136 linear inches</u>

From the Volume Hole Drilling chart that follows, identify the largest volume hole for the plate thickness.



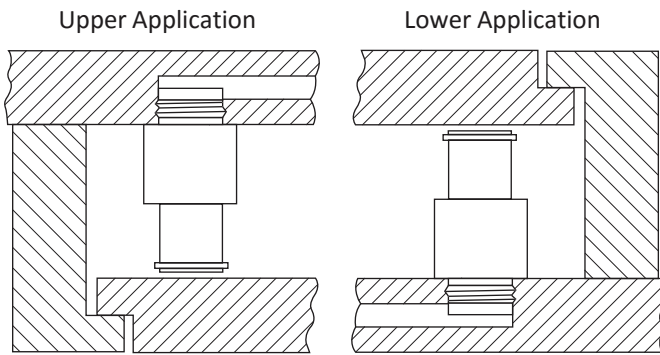
High Pressure Manifold Volume Hole Drilling

Plugs	Thread Size	Area/ Linear Inch	mm in.	Hole Diameter	A	B	Suggested Plate Thickness*	Max. Drilling Depth (1 Way)
NF-771-4	7/16-20	.71 cm ² .110 in. ²	mm in.	9.53 0.375	9.40 0.37	19.05 0.750	51 2.00	584 23
NF-771-5	1/2-20	.97 cm ² .151 in. ²	mm in.	11.13 0.438	10.41 0.41	22.23 0.875	51 2.00	584 23
NF-771-8	3/4-16	2.18 cm ² .338 cm ²	mm in.	16.60 0.656	15.24 0.60	30.96 1.219	51 2.00	483 19
NF-771-10	7/8-14	2.85 cm ² .442 in. ²	mm in.	19.05 0.750	17.53 0.69	34.93 1.375	51 2.00	1092 43
NF-771-12	1-1/16-12	4.46 cm ² .691 in. ²	mm in.	23.83 0.938	21.34 0.84	42.06 1.656	51 2.00	1092 43
NF-771-14	1-3/16-12	5.71 cm ² .886 in. ²	mm in.	26.97 1.062	23.62 0.93	46.05 1.813	51 2.00	1092 43
NF-771-16	1-5/16-12	7.15 cm ² 1.108 in. ²	mm in.	30.18 1.188	25.91 1.02	50.80 2.000	57 2.25	1092 43
NF-771-20	1-5/8-12	11.40 cm ² 1.767 in. ²	mm in.	38.10 1.500	31.75 1.25	60.33 2.375	67 2.62	1143 45
NF-771-24 & NF-771-M47	1-7/8-12	15.52 cm ² 2.405 in. ²	mm in.	44.45 1.750	36.32 1.43	69.85 2.750	76 3.00	1194 47
NF-771-M63	M63-2	27.75 cm ² 4.301 in. ²	mm in.	59.44 2.340	48.01 1.89	88.90 3.500	95 3.75	1829 72
NF-771-32	2-1/2-12	28.58 cm ² 4.430 in. ²	mm in.	60.33 2.375	61.98 2.44	114.30 4.500	95 3.75	1829 72
NF-771-82	M82-2	48.51 cm ² 7.518 in. ²	mm in.	78.59 3.094	76.20 3.00	114.30 4.500	124 4.88	1524 60
NF-771-100	M100-2	71.26 cm ² 11.045 in. ²	mm in.	95.25 3.750	76.20 3.00	136.53 5.375	152 6.00	1829 72

* Drilling patterns can affect plate thickness.

Additional Design Considerations

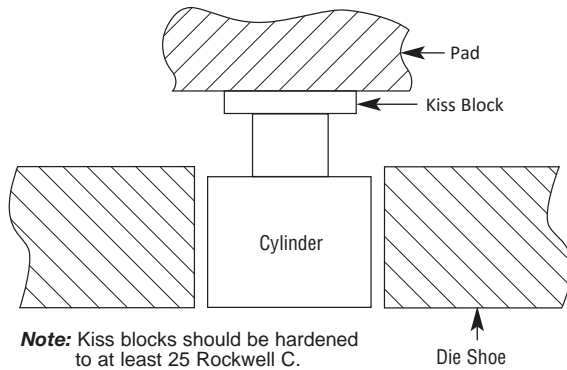
Design with Die Open Clearance



Note: The weight of the pad is not enough to preload the cylinders.

Manifolds require a minimum clearance of .010 inch (.254 mm) in the die to allow the nitrogen cylinders to come to a full, open position. In an upper application, the clearance occurs between the end of the cylinder rod and the pad. In a lower application, the clearance is between the pad and its retainer system.

Avoid Special Length Piston Rods

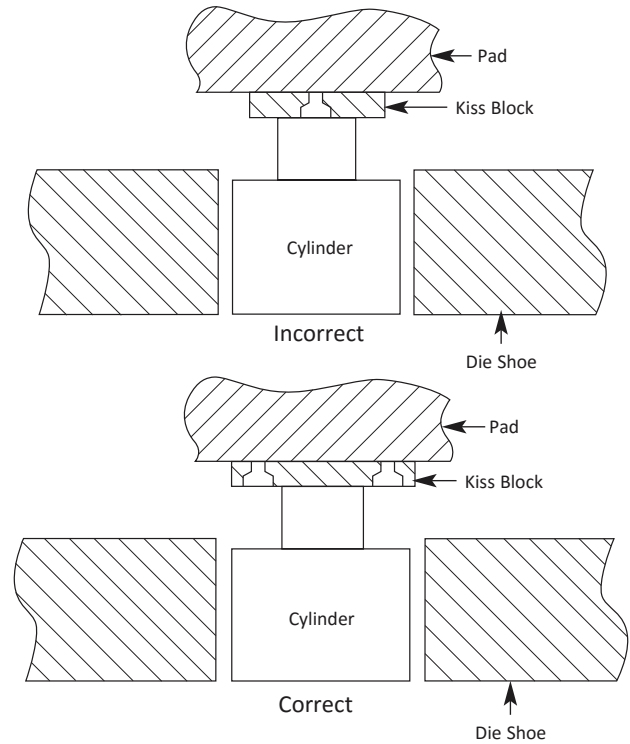


Note: Kiss blocks should be hardened to at least 25 Rockwell C.

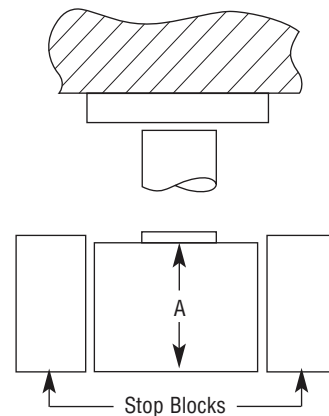
If the height of a standard nitrogen cylinder does not match the distance to the back of the pad, we recommend using kiss blocks to make up the height difference. Another alternative is to counter-bore the cylinders into the manifold. Cylinders with special length piston rods are custom orders and require longer delivery times.

Piston Rod Contact Surfaces

It is essential that the nitrogen cylinder's piston rod make contact with a flat surface. Never put the piston rod against a counterbored hole, rough casting or bolt.



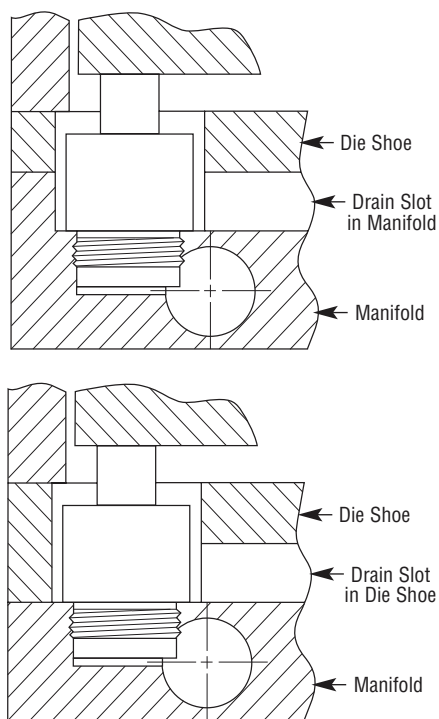
Stop Blocks



Use stop blocks to prevent cylinder damage in the event that the pad is overstroked. The stop block should be equal to or greater than the "A" dimension on the cylinder.

Additional Design Considerations

Drain Slots



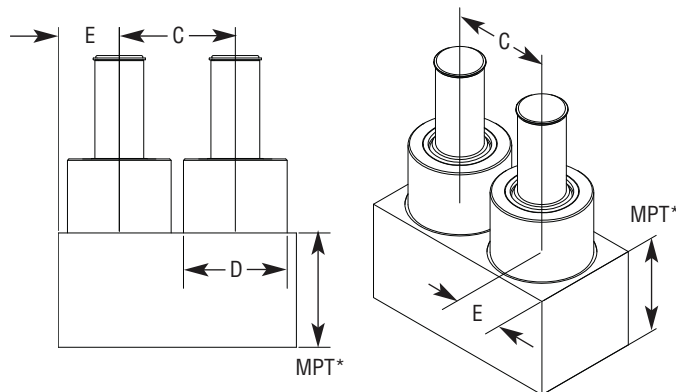
In most die designs, cylinders are placed through a pocket in the die shoe or subplate in the die. This pocket can fill with draw lubricants, metal chips and/or cleaning solvents that submerge the cylinder and shorten the life of the system.

To prevent this, install drainage slots in each cylinder pocket. They should be of sufficient size to prevent blockage, and because the size of the drain slots or drain holes depend on the number of cylinders connected by one slot/hole, please contact HYSON for assistance.

Handling Holes

Every manifold should have handling holes so the system can be installed, turned and serviced without damaging the nitrogen cylinders.

Cylinder Location



Using the charts that follow, locate cylinders for the standard 1500 psi manifold or the high pressure 2000 psi manifold with a minimum distance between the cylinders and plate edge.

Standard 1500 psi

Cylinder Tonnage	Cylinder Diameter D	Minimum Ctr. Distance C	Minimum Edge Distance E
1/2 Ton	41 mm 1.60 in.	51 mm 2.00 in.	24 mm 0.94 in.
1 Ton	54 mm 2.12 in.	60 mm 2.38 in.	32 mm 1.25 in.
2.5 Ton	70 mm 2.75 in.	76 mm 3.00 in.	40 mm 1.56 in.
4 Ton	90 mm 3.56 in.	95 mm 3.75 in.	54 mm 2.13 in.
6 Ton	109 mm 4.31 in.	114 mm 4.45 in.	64 mm 2.50 in.

High Pressure 2000 psi

Cylinder Tonnage	Cylinder Diameter D	Minimum Ctr. Distance C	Minimum Edge Distance E
3/4 Ton	41 mm 1.60 in.	51 mm 2.00 in.	26 mm 1.02 in.
1.5 Ton	54 mm 2.12 in.	70 mm 2.75 in.	37 mm 1.43 in.
3 Ton	70 mm 2.75 in.	89 mm 3.50 in.	48 mm 1.89 in.
5 Ton	90 mm 3.56 in.	115 mm 4.50 in.	62 mm 2.44 in.
8 Ton	109 mm 4.31 in.	137 mm 5.38 in.	77 mm 3.00 in.

* Minimum Plate Thickness

Choosing a Manifold Cylinder

HYSON's nitrogen manifold cylinders are available in a wide variety of diameters, tonnages, profiles, strokes and heights to meet your stamping requirements.



SB 2.5 X 1.0

MOR 2.5 X 1.0

MOR 400 X 1.0

TSB 2.5 X 1.0

MORD 2.5 X 1.0

MOR

The cylinder used most often in basic nitrogen systems. This taller cylinder extends beyond the surface of the manifold plate for applications where shut height is not an issue.

MORD

A shorter cylinder for applications where space is at a premium. Often vertical die height can be saved using a MORD profile cylinder. Installed in a thick manifold, the cylinder sleeve extends deep to allow the piston to stroke into the plate.

MOR 400

Our most compact manifold cylinder, ideal for low tonnage operations. Often used as a lifter or when higher speeds are required.

TSB

A low body profile cylinder for applications where shut height is very limited. The TSB requires less die shoe machining for cylinder body clearance and shallower pockets if counterbored in the manifold.

SB 6X.75-BW *

A short-stroke compact cylinder designed to provide high force in applications where die space or press shut height is very limited. This is a venting cylinder, used in relatively clean environments and usually in upper die applications

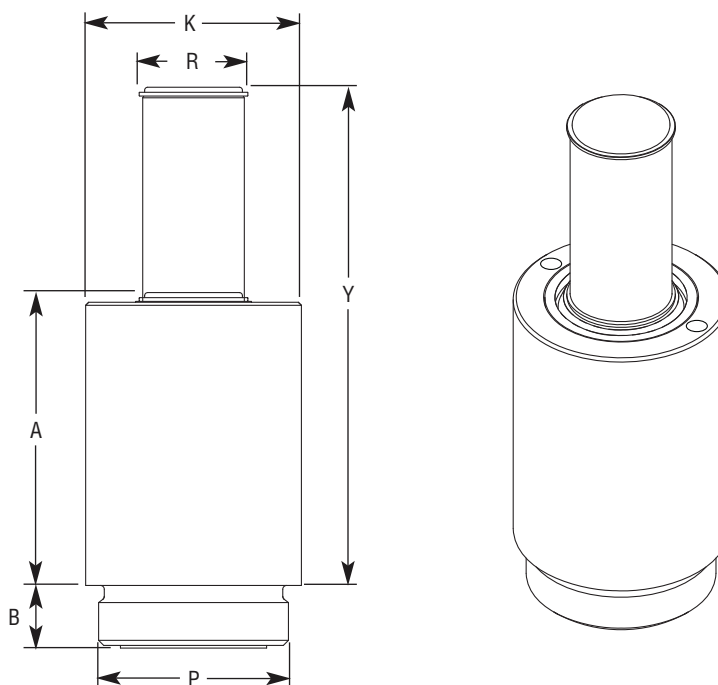
SB

A short height cylinder for short stroke applications. Designed originally for stripper pad operations, the cylinder profile allows for minimal clearance and weight when manifolds are mounted in upper stripping dies.

*Not Pictured

Manifold Cylinders

MOR



Dimensional Information-MOR

1500 psi Manifold Model/Size	2000 psi Manifold Model/Size	Effective Piston Area	Std. Stroke Lengths	K	P	R	B
MOR .5 1/2 ton	MOR 750 .75 ton	.789 in. ² 5.07 cm ²	4.00 in. 102 mm	1.60 in. 41 mm	1-5/16-12	0.85 in. 22 mm	0.88 in. 22 mm
MOR 1 1 ton	MOR 1500 1.5 ton	1.77 in. ² 11.40 cm ²	5.00 in. 127 mm	2.12 in. 54 mm	1-7/8-12	1.08 in. 27 mm	0.72 in. 18 mm
MOR 2.5 2.5 ton	MOR 3000 3 ton	3.45 in. ² 22.26 cm ²	6.00 in. 152 mm	2.75 in. 70 mm	2-1/2-12	1.38 in. 35 mm	1.0 in. 25 mm
MOR 4 4 ton	MOR 5000 5 ton	5.41 in. ² 34.92 cm ²	7.00 in. 178 mm	3.56 in. 90 mm	M82X2	1.86 in. 47 mm	1.25 in. 32 mm
MOR 6 6 ton	MOR 8000 8 ton	7.98 in. ² 51.50 cm ²	8.00 in. 203 mm	4.31 in. 109 mm	M100X2	2.51 in. 64 mm	1.25 in. 32 mm

Note: Additional stroke lengths available. Contact Inside Sales at Orders@HysonSolutions.com.

Maintenance Tools-MOR

Tonnage	Seal Kit	Face Spanner	Adjustable Spanner	Socket Wrench	Proper Torque
.5	20-100-7000	FS-482	----	SW-.5-Ton	100 ft. lbs.
1	20-150-7000	FS-100	HS-200	SW-1-Ton	220 ft. lbs.
2.5	20-209-7000	FS-300	HS-330	SW-2.5-Ton	350 ft. lbs.
4	20-262-7000	FS-434	HS-330	SW-4-Ton	800 ft. lbs.
6	20-319-7000	FS-330	HS-330	SW-6-Ton	800 ft. lbs.



Variable Dimensions with Stroke-MOR

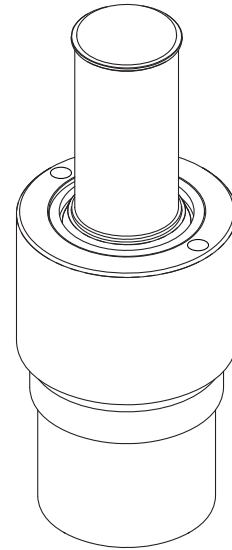
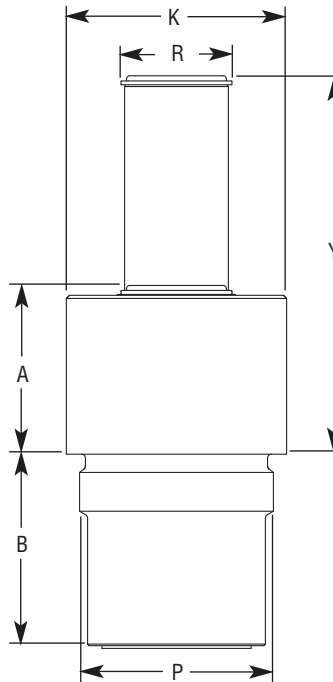
Stroke	MOR .5/750		MOR .5	MOR 750	MOR 1/1500		MOR 1	MOR 1500	MOR 2.5/3000		MOR 2.5	MOR 3000	MOR 4/5000		MOR 4	MOR 5000	MOR 6/8000		MOR 6	MOR 8000	
	Y	A	MPT*	MPT*	Y	A	MPT*	MPT*	Y	A	MPT*	MPT*	Y	A	MPT*	MPT*	Y	A	MPT*	MPT*	
0.25 in. 6 mm	1.16 29	0.91 23	1.75 44	1.88 48																	
0.50 in. 13 mm	1.66 42	1.16 29	1.75 44	1.88 48	1.91 48	1.41 36	1.75 44	1.94 49	1.91 48	1.41 36	2.00 51	2.18 55	1.91 48	1.41 36	2.00 51	2.25 57	1.91 48	1.41 36	2.50 64	2.88 73	
0.75 in. 19 mm	2.16 55	1.41 36	1.75 44	1.88 48	2.41 61	1.66 42	1.75 44	1.94 49	2.41 61	1.66 42	2.00 51	2.18 55	2.41 61	1.66 42	2.00 51	2.25 57	2.41 61	1.66 42	2.50 64	2.88 73	
1.00 in. 25 mm	2.66 68	1.66 42	1.75 44	1.88 48	2.91 74	1.91 49	1.75 44	1.94 49	2.91 74	1.91 49	2.00 51	2.18 55	2.91 74	1.91 49	2.00 51	2.25 57	2.91 74	1.91 49	2.50 64	2.88 73	
1.50 in. 38 mm	3.66 93	2.16 55	1.75 44	1.88 48	3.91 99	2.41 61	1.75 44	1.94 49	3.91 99	2.41 61	2.00 51	2.18 55	3.91 99	2.41 61	2.00 51	2.25 57	3.91 99	2.41 61	2.50 64	2.88 73	
2.00 in. 51 mm	4.66 118	2.66 68	1.75 44	1.88 48	4.91 125	2.91 74	1.75 44	1.94 49	4.91 125	2.91 74	2.00 51	2.18 55	4.91 125	2.91 74	2.00 51	2.25 57	4.91 125	2.91 74	2.50 64	2.88 73	
2.50 in. 64 mm	5.66 144	3.16 80	1.75 44	1.88 48	5.91 150	3.41 87	1.75 44	1.94 49	5.91 150	3.41 87	2.00 51	2.18 55	5.91 150	3.41 87	2.00 51	2.25 57	5.91 150	3.41 87	2.50 64	2.88 73	
3.00 in. 76 mm	6.66 169	3.66 93	1.75 44	1.88 48	6.91 176	3.91 99	1.75 44	1.94 49	6.91 176	3.91 99	2.00 51	2.18 55	6.91 176	3.91 99	2.00 51	2.25 57	6.91 176	3.91 99	2.50 64	2.88 73	
3.50 in. 89 mm	7.66 195	4.16 106	1.75 44	1.88 48	7.91 201	4.41 112	1.75 44	1.94 49	7.91 201	4.41 112	2.00 51	2.18 55	7.91 201	4.41 112	2.00 51	2.25 57	7.91 201	4.41 112	2.50 64	2.88 73	
4.00 in. 102 mm	8.66 220	4.66 118	1.75 44	1.88 48	8.91 226	4.91 125	1.75 44	1.94 49	8.91 226	4.91 125	2.00 51	2.18 55	8.91 226	4.91 125	2.00 51	2.25 57	8.91 226	4.91 125	2.50 64	2.88 73	
4.50 in. 114 mm					9.91 252	5.41 137	1.75 44	1.94 49	9.91 252	5.41 137	2.00 51	2.18 55	9.91 252	5.41 137	2.00 51	2.25 57	9.91 252	5.41 137	2.50 64	2.88 73	
5.00 in. 127 mm					10.91 277	5.91 150	1.75 44	1.94 49	10.91 277	5.91 150	2.00 51	2.18 55	10.91 277	5.91 150	2.00 51	2.25 57	10.91 277	5.91 150	2.50 64	2.88 73	
5.50 in. 140 mm									11.91 303	6.41 163	2.00 51	2.18 55	11.91 303	6.41 163	2.00 51	2.25 57	11.91 303	6.41 163	2.50 64	2.88 73	
6.00 in. 152 mm									12.91 328	6.91 176	2.00 51	2.18 55	12.91 328	6.91 176	2.00 51	2.25 57	12.91 328	6.91 176	2.50 64	2.88 73	
6.50 in. 165 mm													13.91 353	7.41 188	2.00 51	2.25 57	13.91 353	7.41 188	2.50 64	2.88 73	
7.00 in. 178 mm													14.91 379	7.91 201	2.00 51	2.25 57	14.91 379	7.91 201	2.50 64	2.88 73	
7.50 in. 191 mm																	15.91 404	8.41 214	2.50 64	2.88 73	
8.00 in. 203 mm																	16.91 430	8.91 226	2.50 64	2.88 73	

*Minimum Plate Thickness

All dimensions are nominal. Data shown are typical. Actual data for any particular unit may vary

Manifold Cylinders

MORD



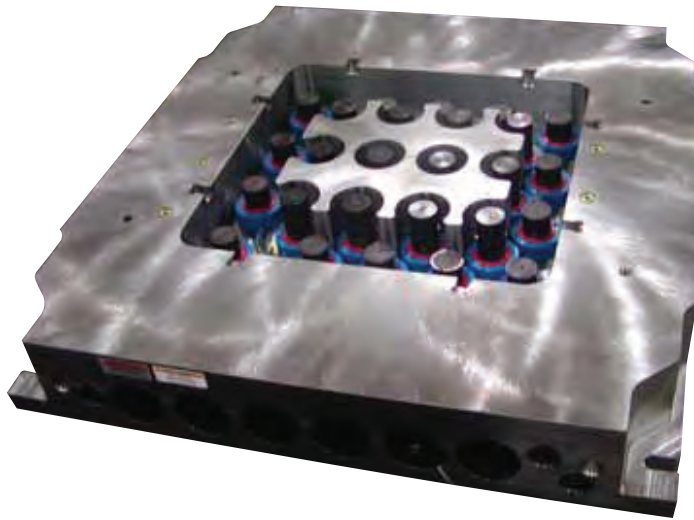
Dimensional Information-MORD

1500 psi Manifold Model/Size	2000 psi Manifold Model/Size	Effective Piston Area	Std. Stroke Lengths	K	P	R	A
MORD .5 1/2 ton	MORD 750 .75 ton	.789 in. ² 5.07 cm ²	4.00 in. 102 mm	1.60 in. 41 mm	1-5/16-12	0.85 in. 22 mm	1.66 in. 42 mm
MORD 1 1 ton	MORD 1500 1.5 ton	1.77 in. ² 11.40 cm ²	5.00 in. 127 mm	2.12 in. 54 mm	1-7/8-12	1.08 in. 27 mm	1.66 in. 42 mm
MORD 2.5 2.5 ton	MORD 3000 3 ton	3.45 in. ² 22.26 cm ²	6.00 in. 152 mm	2.75 in. 70 mm	2-1/2-12	1.38 in. 35 mm	1.66 in. 42 mm
MORD 4 4 ton	MORD 5000 5 ton	5.41 in. ² 34.92 cm ²	7.00 in. 178 mm	3.56 in. 90 mm	M82X2	1.86 in. 47 mm	1.66 in. 42 mm
MORD 6 6 ton	MORD 8000 8 ton	7.98 in. ² 51.50 cm ²	8.00 in. 203 mm	4.31 in. 109 mm	M100X2	2.51 in. 64 mm	1.66 in. 42 mm

Note: Additional stroke lengths available. Contact Inside Sales at Orders@HysonSolutions.com.

Maintenance Tools-MORD

Tonnage	Seal Kit	Face Spanner	Adjustable Spanner	Socket Wrench	Proper Torque
.5	20-100-7000	FS-482	----	SW-5-Ton	100 ft. lbs.
1	20-150-7000	FS-100	HS-200	SW-1-Ton	220 ft. lbs.
2.5	20-209-7000	FS-300	HS-330	SW-2.5-Ton	350 ft. lbs.
4	20-262-7000	FS-434	HS-330	SW-4-Ton	800 ft. lbs.
6	20-319-7000	FS-330	HS-330	SW-6-Ton	800 ft. lbs.



Variable Dimensions with Stroke-MORD

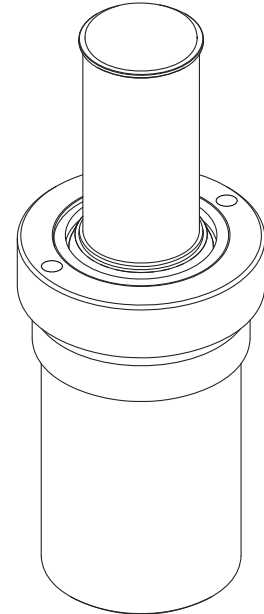
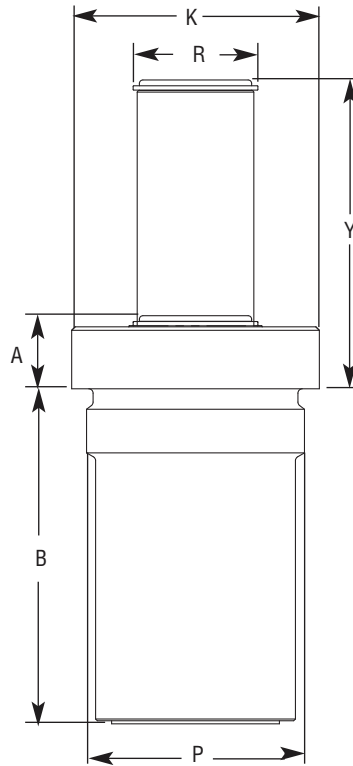
Stroke	MORD .5/750		MORD .5 750		MORD 1/1500		MORD 1 1500		MORD 2.5/3000		MORD 2.5 3000		MORD 4/5000		MORD 4 5000		MORD 6/8000		MORD 6 8000		
	Y	B	MPT*	MPT*	Y	B	MPT*	MPT*	Y	B	MPT*	MPT*	Y	B	MPT*	MPT*	Y	B	MPT*	MPT*	
0.25 in. 6 mm	1.91 48	0.59 15	1.75 44	1.88 48																	
0.50 in. 13 mm	2.16 55	0.59 15	1.75 44	1.88 48																	
0.75 in. 19 mm	2.41 61	0.63 16	1.75 44	1.88 48																	
1.00 in. 25 mm	2.66 68	0.88 22	1.75 44	1.88 48	2.66 68	0.97 25	1.75 44	1.94 49	2.66 68	1.25 32	2.00 51	2.18 55	2.66 68	1.50 38	2.50 64	2.75 70	2.66 68	1.50 38	2.50 64	2.88 73	
1.50 in. 38 mm	3.16 80	1.38 35	1.81 46	1.94 49	3.16 80	1.47 37	1.88 48	2.07 53	3.16 80	1.75 44	2.25 57	2.43 62	3.16 80	2.00 51	2.75 70	3.00 76	3.16 80	2.00 51	2.75 70	3.13 80	
2.00 in. 51 mm	3.66 93	1.88 48	2.31 59	2.44 62	3.66 93	1.97 50	2.38 60	2.57 65	3.66 93	2.25 57	2.75 70	2.93 74	3.66 93	2.50 64	3.25 83	3.50 89	3.66 93	2.50 64	3.25 83	3.63 92	
2.50 in. 64 mm	4.16 106	2.38 60	2.81 71	2.94 75	4.16 106	2.47 63	2.88 73	3.07 78	4.16 106	2.75 70	3.25 83	3.43 87	4.16 106	3.00 76	3.75 95	4.00 102	4.16 106	3.00 76	3.75 95	4.13 105	
3.00 in. 76 mm	4.66 118	2.88 73	3.31 84	3.44 87	4.66 118	2.97 75	3.38 86	3.57 91	4.66 118	3.25 83	3.75 95	3.93 100	4.66 118	3.50 89	4.25 108	4.50 114	4.66 118	3.50 89	4.25 108	4.63 118	
3.50 in. 89 mm	5.16 131	3.38 86	3.81 97	3.94 100	5.16 131	3.47 88	3.88 98	4.07 103	5.16 131	3.75 95	4.25 108	4.43 113	5.16 131	4.00 102	4.75 121	5.00 127	5.16 131	4.00 102	4.75 121	5.13 130	
4.00 in. 102 mm	5.66 144	3.88 98	4.31 109	4.44 113	5.66 144	3.97 101	4.38 111	4.57 116	5.66 144	4.25 108	4.75 120	4.93 125	5.66 144	4.50 114	5.25 133	5.50 140	5.66 144	4.50 114	5.25 133	5.63 143	
4.50 in. 114 mm					6.16 156	4.47 113.5	4.88 124	5.07 129	6.16 156	4.75 121	5.25 133	5.43 138	6.16 156	5.00 127	5.75 146	6.00 152	6.16 156	5.00 127	5.75 146	6.13 156	
5.00 in. 127 mm					6.66 169	4.97 126	5.38 137	5.57 141	6.66 169	5.25 133	5.75 146	5.93 151	6.66 169	5.50 140	6.25 159	6.50 165	6.66 169	5.50 140	6.25 159	6.63 168	
5.50 in. 140 mm									7.16 182	5.75 146	6.25 159	6.43 163	7.16 182	6.00 152	6.75 171	7.00 178	7.16 182	6.00 152	6.75 171	7.13 181	
6.00 in. 152 mm									7.66 195	6.25 159	6.75 171	6.93 176	7.66 195	6.50 165	7.25 184	7.50 191	7.66 195	6.50 165	7.25 184	7.63 194	
6.50 in. 165 mm										8.16 207	7.00 178	7.75 197	8.00 203	8.16 207	7.75 197	8.00 203	8.16 207	7.00 178	7.75 197	8.13 207	
7.00 in. 178 mm										8.66 220	7.50 191	8.25 210	8.50 216	8.66 220	7.50 191	8.25 210	8.50 216	8.66 220	7.50 191	8.25 210	8.63 219
7.50 in. 191 mm																		9.16 233	8.00 203	8.75 222	9.13 232
8.00 in. 203 mm																		9.66 245	8.50 216	9.25 235	9.63 245

*Minimum Plate Thickness

All dimensions are nominal. Data shown are typical. Actual data for any particular unit may vary

Manifold Cylinders

TSB is for replacement dies only.
For new die builds HYSO recommends MORD cylinders.



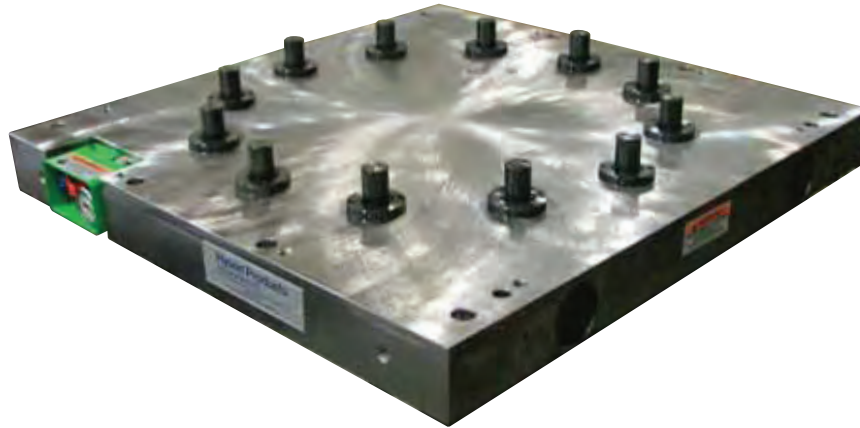
Dimensional Information-TSB

1500 psi Manifold Model/Size	2000 psi Manifold Model/Size	Effective Piston Area	Std. Stroke Lengths	K	P	R	A
TSB .5 1/2 ton	TSB 750 .75 ton	.789 in. ² 5.07 cm ²	4.00 in. 102 mm	1.60 in. 41 mm	1-5/16-12	0.85 in. 22 mm	0.66 in. 17 mm
TSB 1 1 ton	TSB 1500 1.5 ton	1.77 in. ² 11.40 cm ²	5.00 in. 127 mm	2.12 in. 54 mm	1-7/8-12	1.08 in. 27 mm	0.66 in. 17 mm
TSB 2.5 2.5 ton	TSB 3000 3 ton	3.45 in. ² 22.26 cm ²	6.00 in. 152 mm	2.75 in. 70 mm	2-1/2-12	1.38 in. 35 mm	0.66 in. 17 mm
TSB 4 4 ton	TSB 5000 5 ton	5.41 in. ² 34.92 cm ²	7.00 in. 178 mm	3.56 in. 90 mm	M82X2	1.86 in. 47 mm	0.66 in. 17 mm

Note: Additional stroke lengths available. Contact Inside Sales at Orders@HysonSolutions.com

Maintenance Tools-TSB

Tonnage	Seal Kit	Face Spanner	Adjustable Spanner	Socket Wrench	Proper Torque
.5	20-100-7000	FS-482	-----	SW-TNK .5	100 ft. lbs.
1	20-150-7000	FS-100	-----	SW-TNK 1	220 ft. lbs.
2.5	20-209-7000	FS-300	-----	SW-TNK 2.5	350 ft. lbs.
4	20-262-7000	FS-434	-----	SW-TNK 4	800 ft. lbs.



Variable Dimensions with Stroke-TSB

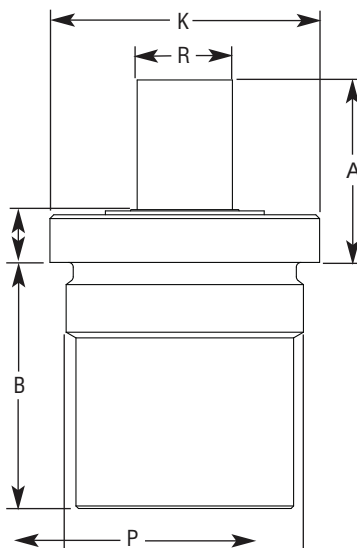
Stroke	TSB .5/750				TSB 1/1500				TSB 2.5/3000				TSB 4/5000				
	Y	B	MPT*	MPT*	Y	B	MPT*	MPT*	Y	B	MPT*	MPT*	Y	B	MPT*	MPT*	
0.25 in. 6 mm	0.91 23	1.13 29	1.75 44	1.88 48													
0.50 in. 13 mm	1.16 29	1.38 35	1.81 46	1.94 49	1.16 29	1.41 36	1.84 47	2.03 52	1.16 29	1.75 44	2.26 57	2.44 62	1.16 29	2.00 51	2.70 69	2.95 75	
0.75 in. 19 mm	1.41 36	1.63 41	2.06 52	2.19 56	1.41 36	1.66 42	2.09 53	2.28 58	1.41 36	2.00 51	2.51 64	2.69 68	1.41 36	2.25 57	2.95 75	3.20 81	
1.00 in. 25 mm	1.66 42	1.88 48	2.31 59	2.44 62	1.66 42	1.91 49	2.34 59	2.53 64	1.66 42	2.25 57	2.76 70	2.94 75	1.66 42	2.50 64	3.20 81	3.45 88	
1.50 in. 38 mm	2.16 55	2.38 60	2.81 71	2.94 75	2.16 55	2.41 61	2.84 72	3.03 77	2.16 55	2.75 70	3.26 83	3.44 87	2.16 55	3.00 76	3.70 94	3.95 100	
2.00 in. 51 mm	2.66 68	2.88 73	3.31 84	3.44 87	2.66 68	2.91 74	3.34 85	3.53 90	2.66 68	3.25 83	3.76 96	3.94 100	2.66 68	3.50 89	4.20 107	4.45 113	
2.50 in. 64 mm	3.16 80	3.38 86	3.81 97	3.94 100	3.16 80	3.41 87	3.84 97	4.03 102	3.16 80	3.75 95	4.26 108	4.44 113	3.16 80	4.00 102	4.70 119	4.95 126	
3.00 in. 76 mm	3.66 93	3.88 99	4.31 109	4.44 113	3.66 93	3.91 99	4.34 110	4.53 115	3.66 93	4.25 108	4.76 121	4.94 125	3.66 93	4.50 114	5.20 132	5.45 138	
3.50 in. 89 mm	4.16 106	4.38 111	4.81 122	4.94 125	4.16 106	4.41 112	4.84 123	5.03 128	4.16 106	4.75 121	5.26 134	5.44 138	4.16 106	5.00 127	5.70 145	5.95 151	
4.00 in. 102 mm	4.66 118	4.88 124	5.31 135	5.44 138	4.66 118	4.91 125	5.34 136	5.53 140	4.66 118	5.25 133	5.76 146	5.94 151	4.66 118	5.50 139	6.20 157	6.45 164	
4.50 in. 114 mm					5.16 131	5.41 137	5.84 148	6.03 153	5.16 131	5.75 146	6.26 159	6.44 164	5.16 131	6.00 152	6.70 170	6.95 177	
5.00 in. 127 mm					5.66 144	5.91 150	6.34 161	6.53 166	5.66 144	6.25 159	6.76 172	6.94 176	5.66 144	6.50 165	7.20 183	7.45 189	
5.50 in. 140 mm									6.16 156	6.75 171	7.26 184	7.44 189	6.16 156	7.00 178	7.70 196	7.95 202	
6.00 in. 152 mm									6.66 169	7.25 184	7.76 197	7.94 202	6.66 169	7.50 191	8.20 208	8.45 215	
6.50 in. 165 mm													7.16 182	8.00 203	8.70 221	8.95 227	
7.00 in. 178 mm													7.66 195	8.50 216	9.20 234	9.45 240	

*Minimum Plate Thickness

All dimensions are nominal. Data shown are typical. Actual data for any particular unit may vary

Manifold Cylinders

SB 6X.75-BW



Dimensional Information - SB6X.75-BW

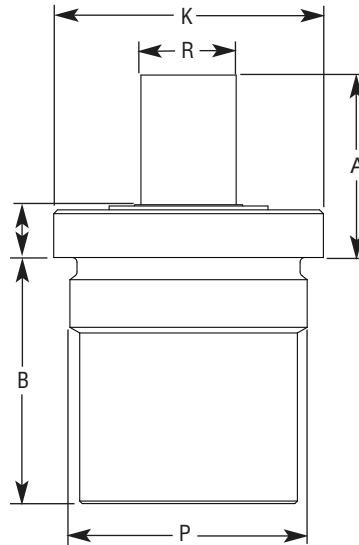
1500 psi Manifold Model/Size	2000 psi Manifold Model/Size	Effective Piston Area	K	P	R	A	B
SB 6x.75-BW 1 ton	SB 6000 6 ton	7.98 in. ² 11.40 cm ²	4.38 in. 111.3mm	3.70 in	1.87 in 19 mm	0.63 in. 11 mm	1.97 in. 50 mm

Maintenance Tools - SB6X.75-BW

Tonnage	Seal Kit	Face Spanner	Proper Torque
6	16-319-7000 BW	FS-300	800 ft. lbs.

Manifold Cylinders

SB



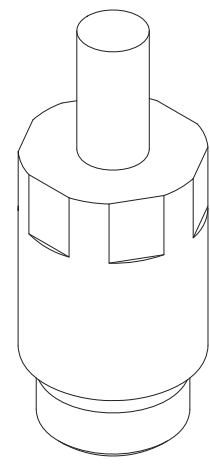
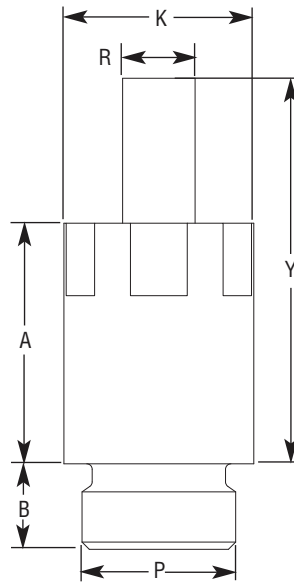
All SB 1, 2.5, and 4 ton cylinders in addition to SB 1500, 3000, 5000 and 8000 sizes will be considered special order, with a minimum order quantity of 8 pieces .

Seal kits for all SB products will continue to be available:

Cylinder	Seal Kit Order Number
SB-1 and SB-1500	16-150-7000
SB-2.5 and SB-3000	16-209-7000
SB-4 and SB-5000	16-262-7000
SB-6 and SB-8000	16-319-7000
SB-6-ST	16-319-7000-ST
SB-6X.75-BW	16-319-7000-BW

Manifold Cylinders

MOR 400



Dimensional Information-MOR 400

2000 psi Manifold Model/Size	Effective Piston Area	K	P	R	B
MOR 400	0.406 in. ²	1.307 in.	1-1/16-12	0.50 in.	0.59 in.
1/4 ton	2.62 cm ²	33 mm		13 mm	14 mm

Note: Additional stroke lengths available. Contact Inside Sales at Orders@HysonSolutions.com

Maintenance Tools-MOR 400

Tonnage	Seal Kit	Socket Wrench	Proper Torque
.25	20-072-7000	1-1/4 in. Deep Well Socket	80 ft. lbs.

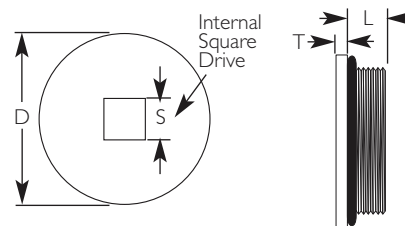
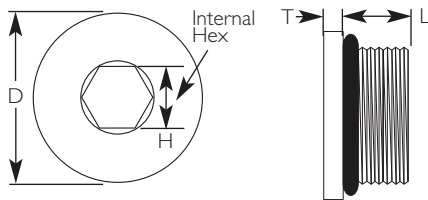
Variable Dimensions MOR 400

Stroke	Y	A	MPT*
0.50 in. 13 mm	1.66 42	1.16 30	1.00 25.4
0.75 in. 19 mm	2.16 55	1.41 36	1.00 25.4
1.00 in. 25 mm	2.66 68	1.66 42	1.00 25.4
1.50 in. 38 mm	3.66 93	2.16 55	1.00 25.4
2.00 in. 51 mm	4.66 118	2.66 68	1.00 25.4
2.50 in. 64 mm	5.66 144	3.16 80	1.00 25.4
3.00 in. 76 mm	6.66 169	3.66 93	1.00 25.4

*Minimum Plate Thickness

Port Plugs

STANDARD PLUGS



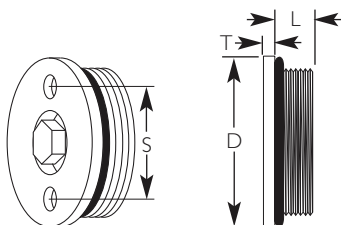
Part Number	Thread Size	O-Ring Part Number	H	D	T	L	S	Tool Needed
NF-771-4	7/16-20	NF-904	in. 0.19 mm 5	0.56 14	0.11 3	0.36 9		3/16 Hex Head Allen Wrench
NF-771-5	1/2-20	NF-905	in. 0.19 mm 5	0.63 16	0.11 3	0.36 9		3/16 Hex Head Allen Wrench
NF-771-8	3/4-16	NF-908	in. 0.31 mm 8	0.88 22	0.16 4	0.44 11		5/16 Hex Head Allen Wrench
NF-771-10	7/8-14	NF-910	in. 0.38 mm 10	1.00 25	0.16 4	0.50 13		3/8 Hex Head Allen Wrench
NF-771-12	1 1/16-12	15-075-4010	in. 0.56 mm 14	1.25 32	0.18 5	0.59 15		9/16 Hex Head Allen Wrench
NF-771-14	1 3/16-12	NF-914	in. 0.56 mm 14	1.38 35	0.18 5	0.59 15		9/16 Hex Head Allen Wrench
NF-771-16	1 5/16-12	NF-916	in. 0.63 mm 16	1.50 38	0.18 5	0.59 15		5/8 Hex Head Allen Wrench
NF-771-20	1 5/8-12	NF-920	in. mm	1.88 48	0.16 4	0.59 15	0.50 12.7	1/2 Sq. Drive Wrench
NF-771-24 NF-771-M47	1 7/8-12 M47 X 2	NF-924	in. mm	2.12 54	0.16 4	0.59 15	0.50 12.7	1/2 Sq. Drive Wrench
NF-771-32 NF-771-M63	2 1/2-12 M63 X 2	NF-932	in. mm	2.75 70	0.16 4	0.59 15	0.50 12.7	1/2 Sq. Drive Wrench
NF-771-82	M82 X 2	NF-982	in. mm	3.50 89	0.25 6	0.75 19	0.75 19.1	3/4 Sq. Drive Wrench
NF-771-100	M100 X 2	NF-9100	in. mm	4.25 108	0.25 6	0.75 19	0.75 19.1	3/4 Sq. Drive Wrench

All dimensions are nominal. Data shown are typical. Actual data for any particular unit may vary

PLUGS WITH RUPTURE DISC (1500 psi System)



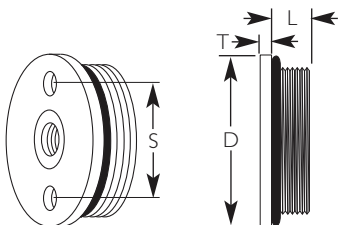
Part Number	D	T	L	S	Tool Needed
NF-771-20 RD	in. 1.88 mm 48	0.16 4	0.59 15	1.00 25	FS-418 Spanner Wrench
NF-771-24 RD	in. 2.12 mm 54	0.16 4	0.59 15	1.25 32	FS-200 Spanner Wrench
NF-771-32 RD	in. 2.75 mm 70	0.16 4	0.59 15	1.75 44	FS-100 Spanner Wrench
NF-771-82 RD	in. 3.50 mm 89	0.25 6	0.75 19	2.25 57	FS-300 Spanner Wrench
NF-771-100 RD	in. 4.25 mm 108	0.25 6	0.75 19	2.25 57	FS-300 Spanner Wrench



PLUGS WITH INTERNAL PORTS for 1/2-20 SAE Hose Connection



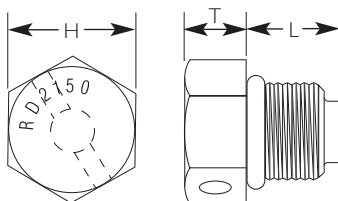
Part Number	D	T	L	S	Tool Needed
NF-771-20-5	in. 1.88 mm 48	0.16 4	0.59 15	1.00 25	FS-418 Spanner Wrench
NF-771-24-5	in. 2.12 mm 54	0.16 4	0.59 15	1.25 32	FS-200 Spanner Wrench
NF-771-32-5	in. 2.75 mm 70	0.16 4	0.59 15	1.75 44	FS-100 Spanner Wrench
NF-771-82-5	in. 3.50 mm 89	0.25 6	0.75 19	2.25 57	FS-300 Spanner Wrench
NF-771-100-5	in. 4.25 mm 108	0.25 6	0.75 19	2.25 57	FS-300 Spanner Wrench



RUPTURE DISC



Part Number	Thread Size	H	T	L	Tool Needed
RD-2150	7/16-20	in. 0.562 mm 14.3	0.274 6.9	0.415 10.5	9/16 Wrench



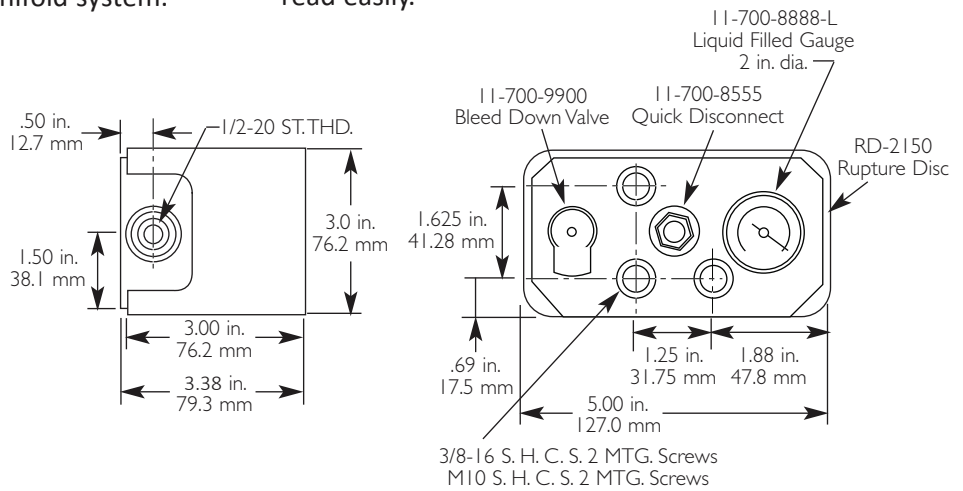
Standard Control Panels

Standard control panels contain all the necessary controls for reading, charging and exhausting nitrogen pressure in a 1500 psi manifold system.

Control panels should be mounted in an accessible location where the pressure gauge can be read easily.

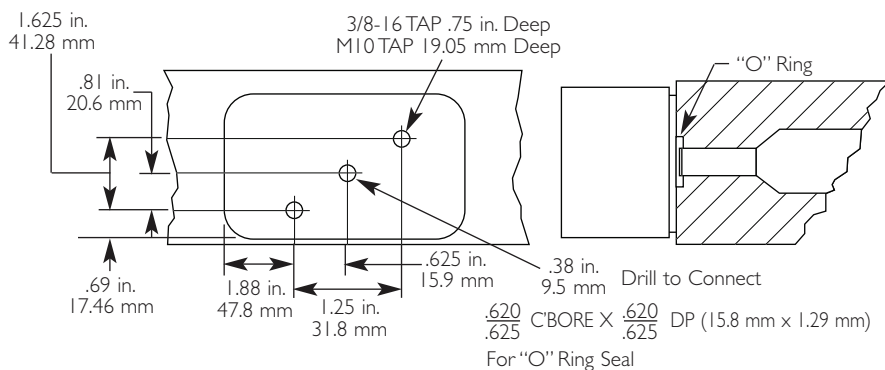
CP-1555

For remote connection to a manifold plate via an NH-250 hose.



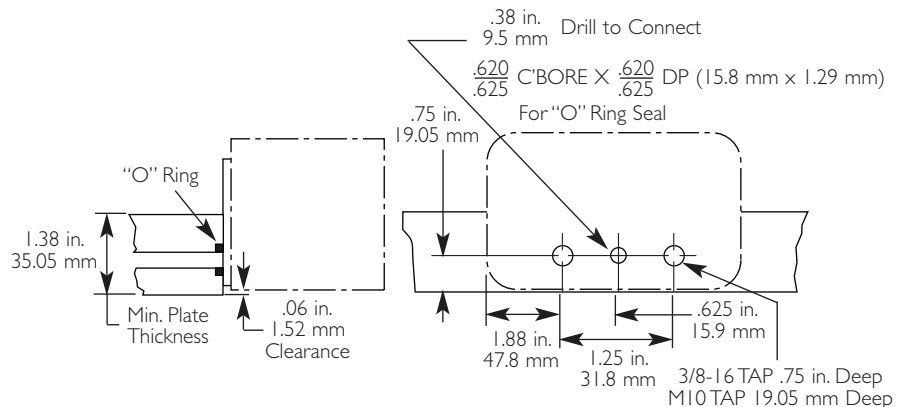
CPM-1555-M

For direct mounting to a finished manifold plate by an O-ring seal. Minimum manifold thickness required is 3 inches.



CPM-1555-E

For direct mounting to a finished manifold plate by an O-ring seal. Maximum manifold thickness required is 3 inches.



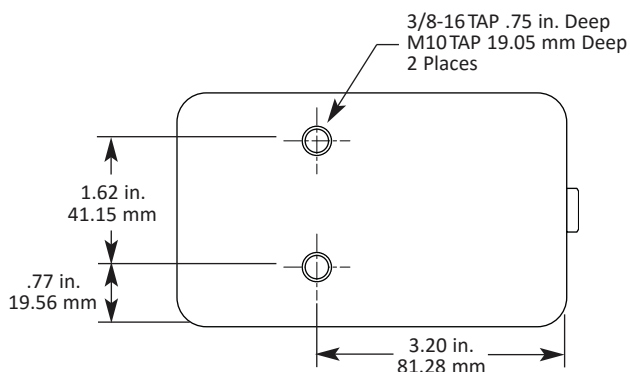
High Pressure Control Panels

High pressure control panels contain all the necessary controls for reading, charging and exhausting nitrogen pressure in a 2000 psi manifold system.

Control panels should be mounted in an accessible location where the pressure gauge can be read easily.

CP N2 LG

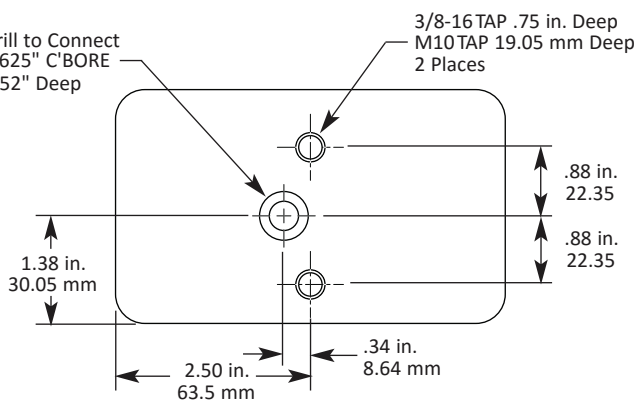
For remote connection to a manifold plate via an ORH hose.



NOTE: For -5 applications, an NF-1000-5-G1/8 service fitting is required.

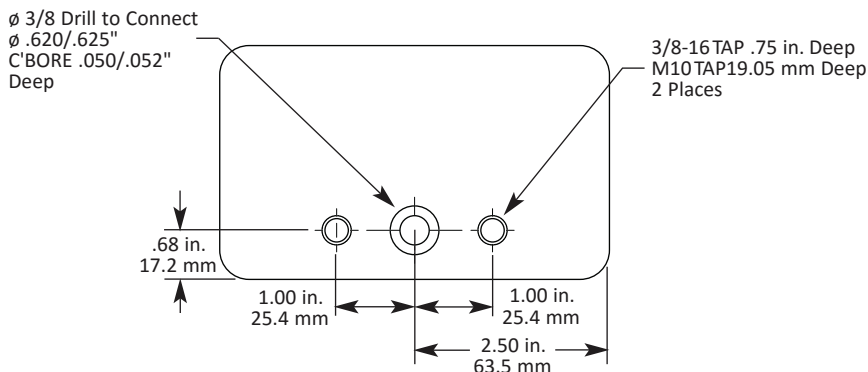
CPM-2000-M

For direct mounting to a finished manifold plate by an O-ring seal. Minimum manifold thickness required is 3 inches.

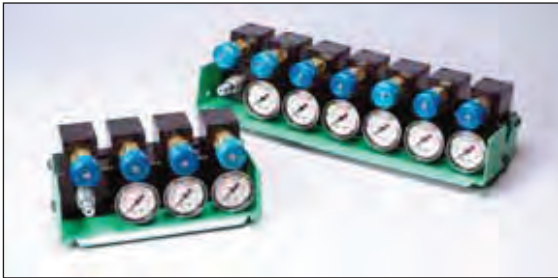


CPM-2000-E

For direct mounting to a finished manifold plate by an O-ring seal. Maximum manifold thickness required is 3 inches.



MODCP Modular Control Panel



The MODCP Modular Control Panel conveniently controls up to six manifold systems from one central control unit. Each module can read pressure, add or bleed pressure as needed,

MODCP Dimensional Information

Model/Size	No. of Modules	Length (L)		Ctr-to-Ctr on M6 Mounting Holes (SD)	
		mm	in.	mm	in.
MODCP	2	133.5	5.26	44.5	1.75
	3	178.0	7.01	89.0	3.50
	4	222.5	8.76	133.5	5.26
	5	267.0	10.51	178.0	7.01
	6	311.5	12.26	222.5	8.76

as if each manifold had its own control panel. Each module features a 5000 psi/345 bar gauge that is easy to read as well as three port locations for piping flexibility.

ST Compression Tank



The ST Compression Tank acts as a reservoir for the "Swept Volume" of the nitrogen gas forced from the cylinders when they are stroked. This compact, modular tank is designed

ST Compression Tank Dimensional Information

Part Number	Standard Volume		Standard Overall Length		Number of Ports on Each Face
	cm ³	in. ³	mm	in.	
ST-50-HP	819	50	244	9.61	6 each 3/4-16 1 face 7/16-20 1 face 7/16-14
ST-100-HP	1639	100	311	12.23	
ST-160-HP	2622	160	390	15.36	
ST-200-HP	3278	200	443	17.46	
ST-320-HP	5244	320	603	23.73	
ST-460-HP	7540	460	789	31.06	
ST-730-HP	11963	730	1149	45.25	

Note: For other volumes, add 20 in.³ for every 10-inch increase in overall length.

for pressure to 2175 psi/150 bar. It features multiple ports on each end for increased flexibility and a rupture disc plug for added safety.

Pressure Monitors

Automatic Pressure Monitors monitor nitrogen gas pressure in manifold cylinder systems. If the pressure drops below a

preset lower limit, a warning light alerts the press operator and the monitor can be wired to shut down the press automatically.



APM-3000

Pressure range: 200-3000 psi (14-206 bar)

Supplied with: 15 foot hose and female quick disconnect (Part No.11-770-2700).

Connection: Brad Harrison mini-charge receptacle connector with 10 amp output.



APM-5800

Use with 11-770-2700 quick disconnect to connect to inlet valve on Hyson control panel. Available with 1/4 NPT thread (APM-5800) or G 1/4 thread (APM-5800-G 1/4).

Pressure range: 0-5800 psi (0-400 bar).

Supplied with: Cable and protective cover.

Connection: 4-wire connection.

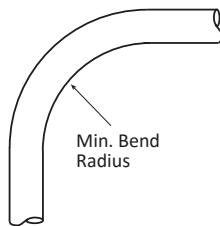
All dimensions are nominal. Data shown are typical. Actual data for any particular unit may vary

Hoses and Fittings

Hose assemblies can be used to connect manifolds to each other, to connect a remote control panel, or to connect a compression tank. The following hoses

and fittings are ideal for standard 1500 psi manifold systems. For high pressure 2000 psi manifold systems, contact HYSON's Engineered Products Group.

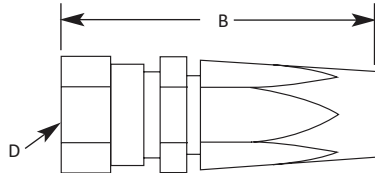
HOSE



The thermoplastic hose features an abrasion-resistant cover with fiber braid reinforcement for added strength. Designed for factory pre-assembled or reusable fittings, its maximum working pressure is 1500 psi/103 bar.

Hose Part No.	Hose I.D.	Hose O.B.	Minimum Bend Radius
NH-250	0.25 in. 6 mm	0.47 in. 12 mm	2.50 in. 64 mm
NH-375	0.38 in. 10 mm	0.63 in. 16 mm	4.00 in. 102 mm
NH-500	0.50 in. 13 mm	0.81 in. 21 mm	5.50 in. 140 mm

HOSE SWIVEL FITTING Female 37° J.I.C. Flare



This fitting mounts to the end of each hose.

Hose Swivel Part No.	Hose Part No.	A (Thread)	B	Hex D
NHF-5	NH-250	1/2-20	2.24 in. 57 mm	0.62 in. 15.7 mm
NHF-8	NH-375	3/4-16	2.88 in. 73 mm	0.87 in. 20.6 mm
NHF-10	NH-500	7/8-14	3.37 in. 86 mm	1.00 in. 25.4 mm

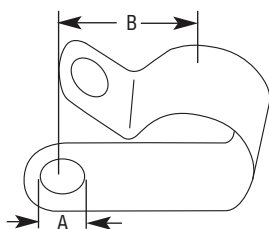
HOSE GUARD



The hose guard provides protection where hose lines are subjected to abrasion, kinking or other damage.

Hose Guard Part No.	Hose Part No.	Hose Guard I.D.
HG-5	NH-250	0.57 in. 15 mm
HG-8	NH-375	0.75 in. 19 mm
HG-10	NH-500	0.875 in. 22 mm

HOSE CLAMPS

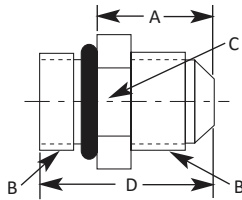


The hose clamps hold the hose in place to avoid twisting, minimize hose chafing, and provide support where long lengths of hose are used.

Hose Clamp Part No.	Hose Part No.	Hole A Diameter	B*
HC-5	NH-250	0.20 in. 5.1 mm	0.50 in. 13 mm
HC-8	NH-375	0.20 in. 5.1 mm	0.62 in. 16 mm
HC-10	NH-500	0.20 in. 5.1 mm	0.81 in. 21 mm

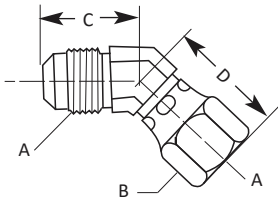
*B is the distance from the center of the hose to the center of the hole.

STRAIGHT FITTING Male 37° J.I.C. Flare



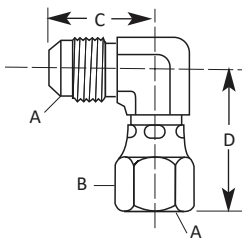
Fitting Part No.	Hose Part No.	A	B (Thread)	C (Hex)	D
NF-1000-5	NH-250	0.87 in. 22 mm	1/2-20	0.62 in. 15.7 mm	1.23 in. 31 mm
NF-1000-8	NH-375	1.04 in. 26 mm	3/4-16	0.88 in. 22.4 mm	1.48 in. 38 mm
NF-1000-10	NH-500	1.20 in. 30 mm	7/8-14	1.00 in. 25.4 mm	1.70 in. 43 mm

45° ELBOW SWIVEL NUT



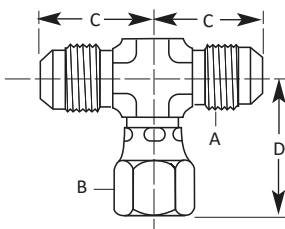
Fitting Part No.	Hose Part No.	A (Thread)	B (Hex)	C	D
SN-4500-5	NH-250	1/2-20	5/8 in.	0.77 in. 20 mm	1.00 in. 25.4 mm
SN-4500-8	NH-375	3/4-16	7/8 in.	0.98 in. 25 mm	1.28 in. 33 mm
SN-4500-10	NH-500	7/8-14	1 in.	1.11 in. 28 mm	1.44 in. 37 mm

90° ELBOW SWIVEL NUT



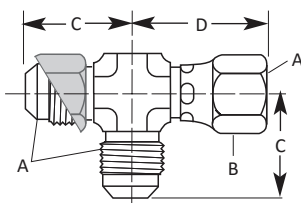
Fitting Part No.	Hose Part No.	A (Thread)	B (Hex)	C	D
SN-2000-5	NH-250	1/2-20	5/8 in.	0.95 in. 24 mm	1.06 in. 27 mm
SN-2000-8	NH-375	3/4-16	7/8 in.	1.25 in. 32 mm	1.38 in. 35 mm
SN-2000-10	NH-500	7/8-14	1 in.	1.45 in. 37 mm	1.62 in. 41 mm

BRANCH TEE SWIVEL NUT



Fitting Part No.	Hose Part No.	A (Thread)	B (Hex)	C	D
SN-3000-5	NH-250	1/2-20	5/8 in.	0.95 in. 24 mm	1.06 in. 27 mm
SN-3000-8	NH-375	3/4-16	7/8 in.	1.25 in. 32 mm	1.38 in. 35 mm
SN-3000-10	NH-500	7/8-14	1 in.	1.45 in. 37 mm	1.62 in. 41 mm

RUN TEE SWIVEL NUT



Fitting Part No.	Hose Part No.	A (Thread)	B (Hex)	C	D
SN-3300-5	NH-250	1/2-20	5/8 in.	0.95 in. 24 mm	1.06 in. 27 mm
SN-3300-8	NH-375	3/4-16	7/8 in.	1.25 in. 32 mm	1.38 in. 35 mm
SN-3300-10	NH-500	7/8-14	1 in.	1.45 in.	1.62 in.



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