



# High Force Manifold System

LOOKING TO GET MORE OUT OF YOUR PRESSES?  
TIRED OF DOWNTIME?

DESIGN HYSON'S NEWEST NITRO-DYNE® SYSTEM INTO YOUR NEXT TOOL  
AND WATCH PRODUCTIVITY AND PERFORMANCE IMPROVE SIGNIFICANTLY!



# Advantages of Nitro-Dyne High Force 150 Bar 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 reliable part quality.**

Manifold systems are rugged and never tire, providing consistent force for repeatable performance time after time.

## **Low pressure rise for improved part formability.**

This manifold system is typically designed with a 20% pressure rise compared to gas spring systems with pressure rise of 65% over the stroke of the system. The low pressure rise in manifolds allows for better material flow and reduced part tearing.

## **Low pressure rise for optimal press utilization and reduced press maintenance.**

The low pressure rise and compact height of the manifold system improves press utilization by generating less tonnage increase throughout the press stroke, dramatically reducing reverse tonnage into the press which can accelerate press wear.

## **More force in less space for improved die design and lower construction costs.**

Manifold systems designed to 150 bar (2175 psi) generate more force while maintaining close cylinder locations. Standardized plate thicknesses and cylinder pass lines yield the most compact manifold height on the market as well as simplify die review and changes.



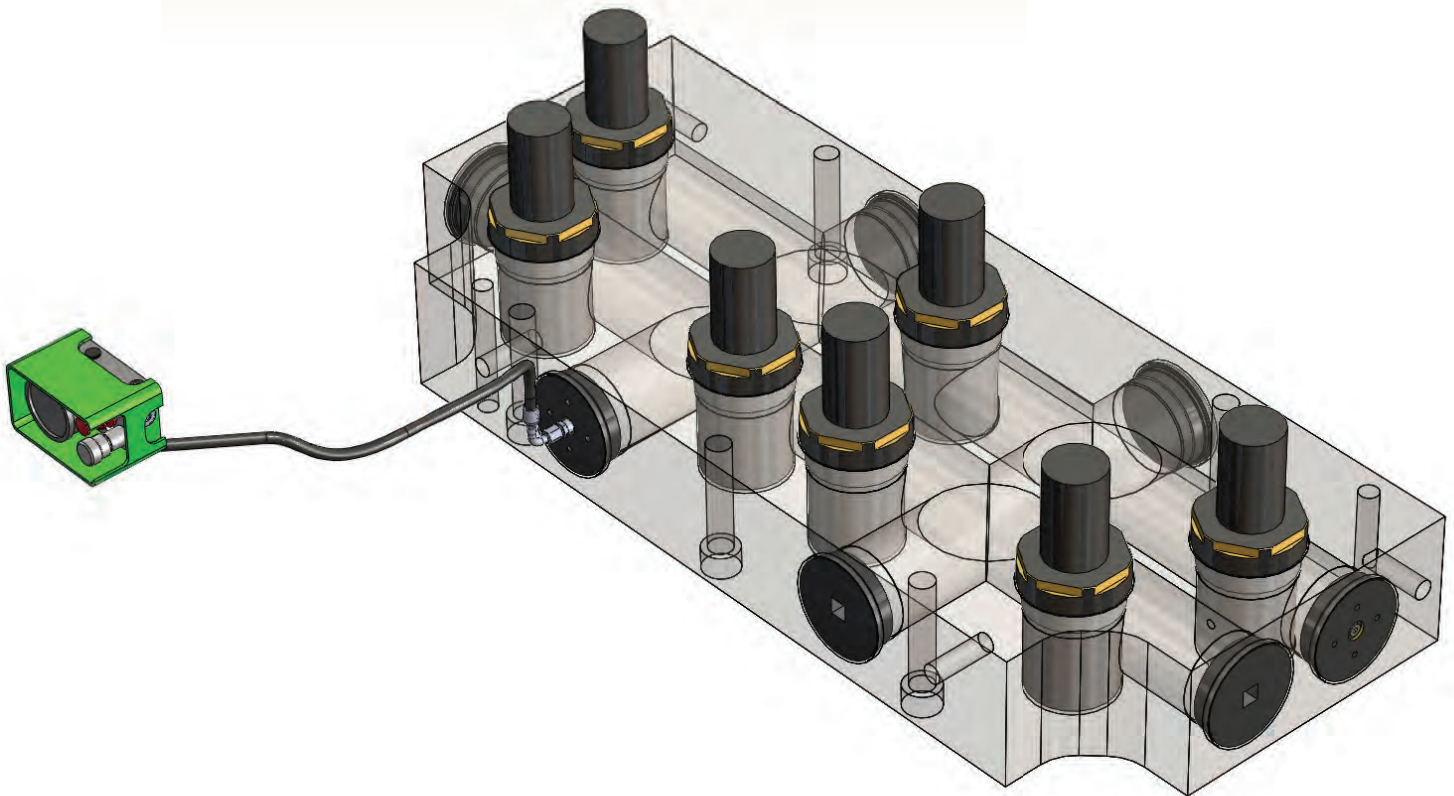
*We specialize in precision manufacturing of critical components with expertise in milling, turning and sealing technologies.*



# Designing a Nitro-Dyne High Force 150 Bar Manifold System

*A solid product begins with engineering and design. With the following basic information, our engineers can design a system to meet your application requirements.*

- Maximum area available: length, width, thickness, overall height of manifold
- Cylinder working stroke required
- Force required
- Number of pressure points
- Special features such as mounting holes, dowel holes, keyways, pockets, scrap chutes, etc.
- Location of control panel
- CAD file





# Designing a Nitro-Dyne High Performance 150 Bar Manifold System

## Step One – Force

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

**Example:** 400kN 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 and what the maximum charge pressure might be for the design. To accommodate variances in part thickness, tensile strength, and die wear, build in more force than required.

### Cylinder Choices

Cylinder Model	Force @ 125 bar Charge Pressure (kN)	Force @150 bar Charge Pressure (kN)
MOR® 5200	43.7	52.4
MOR 7700	64.4	77.3
MOR 10700	89.1	106.9

**Example:** The system design has the capability for 445kN at 125 bar of maximum charge pressure, slightly more force than the 400kN required. Seven MOR 7700 cylinders provide good pressure point distribution with the necessary tonnage at 125 bar charge pressure.

## Step Three – Cylinder Stroke

Pad travel dictates stroke length. Standard strokes for cylinders are in metric increments. Choose the stroke length that will not be exceeded by the actual working stroke.

**Example:** The travel of the pad is 80 mm so the proper cylinder stroke for this application is 100 mm, resulting in a cylinder choice of MOR 7700X100.

## Step Four – 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. 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.

$SV = \text{number of cylinders} \times \text{work stroke of cylinders (mm)} \times \text{effective piston area of cylinders (mm}^2\text{)}$

Cylinder Model	Effective Piston Area
MOR 5200	3494 mm <sup>2</sup>
MOR 7700	5153 mm <sup>2</sup>
MOR 10700	7130 mm <sup>2</sup>

**Example:**  $SV = 7 \times 80 \text{ mm} \times 5153 \text{ mm}^2$   
 $SV = 2,885,680 \text{ mm}^3$

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

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

**Example (for a 15% pressure rise):**

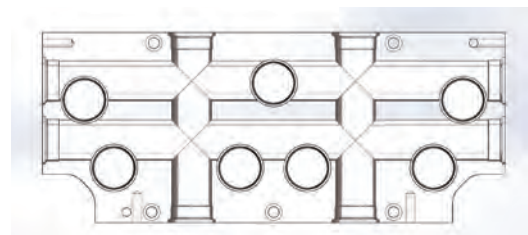
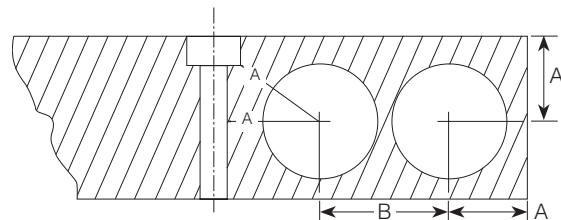
Total Volume =  $SV \times PF$

Total Volume =  $2,885,680 \text{ mm}^3 \times 6.66 = 19,218,629 \text{ mm}^3$

Convert the Total Volume into linear millimeters of drilling.

$\text{Linear millimeters drilling} = \frac{\text{Volume required}}{\text{Area of drilled hole}}$

Plug	Thread Size	Area of Drilled Hole	Hole Dia.	A	B	Max. Drilling Depth (1 way)
NF-771-100	M100-2	7126 mm <sup>2</sup>	95.25 mm	76.2 mm	239.7 mm	1829 mm



**Example:** For a plate measuring 150 mm X 450 mm X 1100 mm, the diameter volume hole is 95.25 mm and the area of drilled hole is 7126 mm<sup>2</sup>.

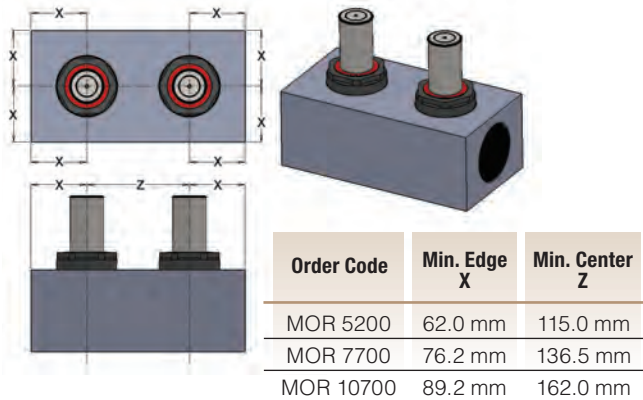
$\frac{19,218,629 \text{ mm}^3}{7126 \text{ mm}^2} = 2697 \text{ linear mm of drilling required}$

Drills include: 2 holes 1100 mm long and 2 holes 450 mm long resulting in 3100 mm total length.

# Design Considerations

## Cylinder Location

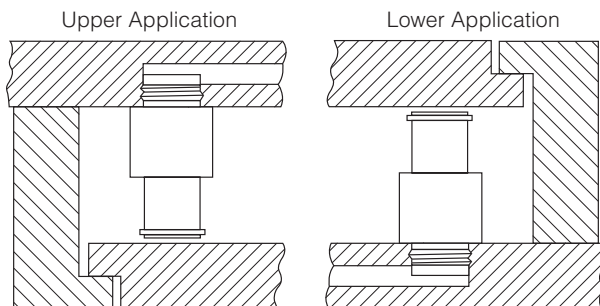
Using the chart below, locate cylinders for the manifold with a minimum distance between the cylinders and plate edge.



## Handling Holes

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

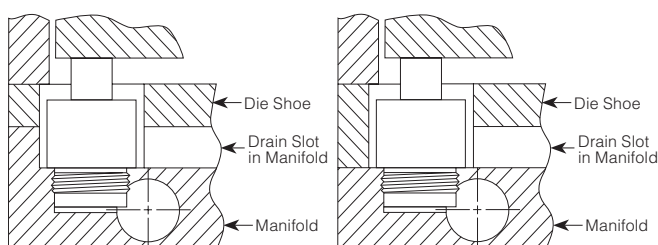
## Design with Die Open Clearance



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

Manifolds require a minimum clearance of .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.

## Drain Slots

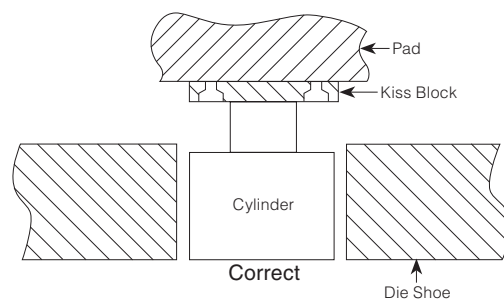
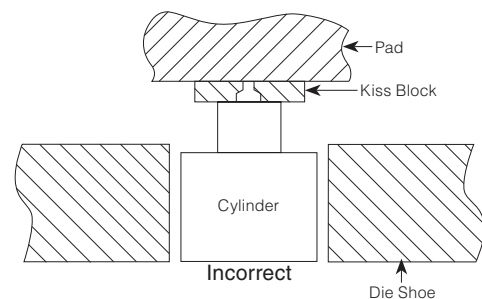


In most die designs, cylinders are placed through a pocket in the die shoe or subplate in the die. This pocket can fill with draw lubricants, metal chips and/or cleaning solvents that submerge the cylinder and shorten the life of the system.

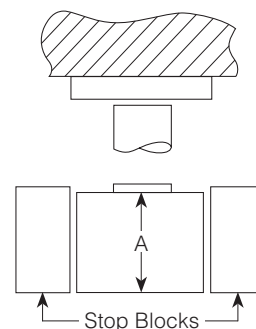
To prevent this, install drainage slots in each cylinder pocket. They should be of sufficient size to prevent blockage, and because the size of the drain slots or drain holes depend on the number of cylinders connected by one slot/hole.

## 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

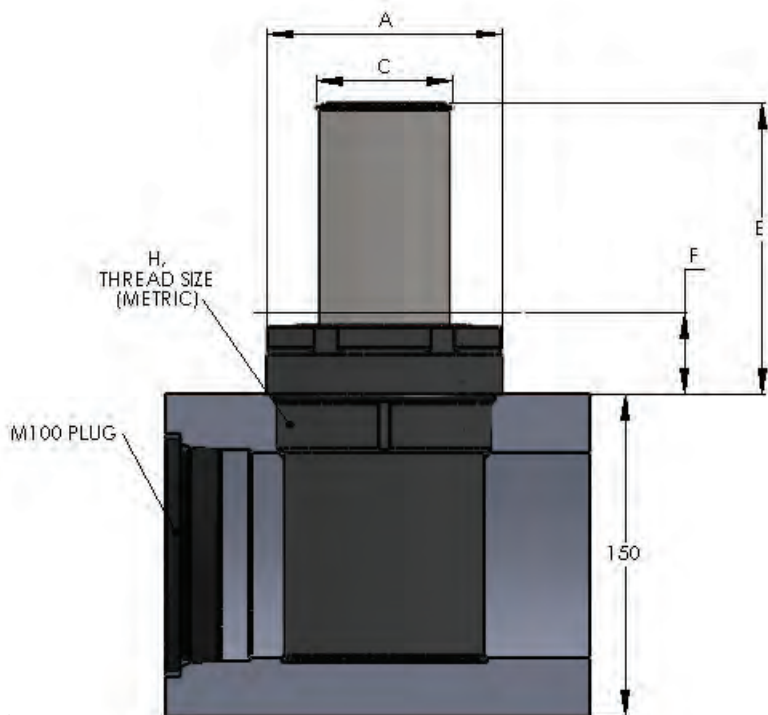


Use stop blocks to prevent cylinder damage in the event that the pad is overstroked. The stop block should be equal to or greater than the "A" dimension on the cylinder.

# Cylinder Specifications



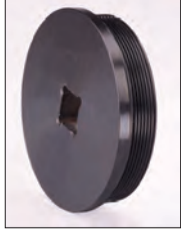
External hex for easy installation and removal.



## Dimensional Information

Part Number	Contact Force @ 150 Bar (2175 PSI)	Contact Force @ 125 Bar (1812 PSI)	Stroke	A	C	E	F	H
	(kN)	(kN)	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
MOR 5200 X 100	52.4	43.7	100	90.4	47.5	135	35	M82 X 2
MOR 5200 X 125			125			185	60	
MOR 5200 X 160			160			255	95	
MOR 5200 X 200			200			335	135	
MOR 7700 X 100	77.3	64.4	100	109.5	64	135	35	M100 X 2
MOR 7700 X 125			125			185	60	
MOR 7700 X 160			160			255	95	
MOR 7700 X 200			200			335	135	
MOR 7700 X 250			250			435	185	
MOR 10700 X 100	106.9	89.1	100	130	75.6	135	35	M120 X 2
MOR 10700 X 125			125			185	60	
MOR 10700 X 160			160			255	95	
MOR 10700 X 200			200			335	135	
MOR 10700 X 250			250			435	185	

## Plugs



NF-771-M100



NF-771-M100 RD



NF-771-M100-G1/8

Part Number	Description	Thread Size	O-Ring Part Number	Required Torque (N*m)	Torque Tool Part Number
NF-771-M100	Standard plug	M100 X2	NF-9100	1085	3/4" square drive
NF-771-M100 RD	Plug with rupture disc				FS-300
NF-771-100-G1/8	Plug with internal port for hose connection				FS-300

## Control Panel and Hose Connection



CP-N2 LG EO M10  
For remote connection

Hose System	Control Panel	Pressure Monitor
E024	CP-N2 LG EO M10	DPM-3000

Refer to Hyson Nitrogen Gas Spring Hose System Components Catalog for complete listing of EO24 hose connections.

## Seal Kits

Cylinder Model	Seal Kit Part Number
MOR 5200	20-262-7000
MOR 7700	20-319-7000
MOR 10700	20-375-7000

## Maintenance Tools



Part Number	Cylinder Model	Socket Size	Required Torque (N*m)	Square Drive Size
SW-5200	MOR 5200	3 1/4"	885	1"
SW-7700	MOR 7700	M100	1085	1"
SW-10700	MOR 10700	4 3/4"	1290	1"



**[www.HysonSolutions.com](http://www.HysonSolutions.com)**  
**[Orders@HysonSolutions.com](mailto:Orders@HysonSolutions.com)**

USA Headquarters • 10367 Brecksville Road • Brecksville, OH 44141 • 800-876-4976 • +1 440-526-5900

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