WHY ARE HYDRAULIC MANIFOLDS SO FUNDAMENTAL?

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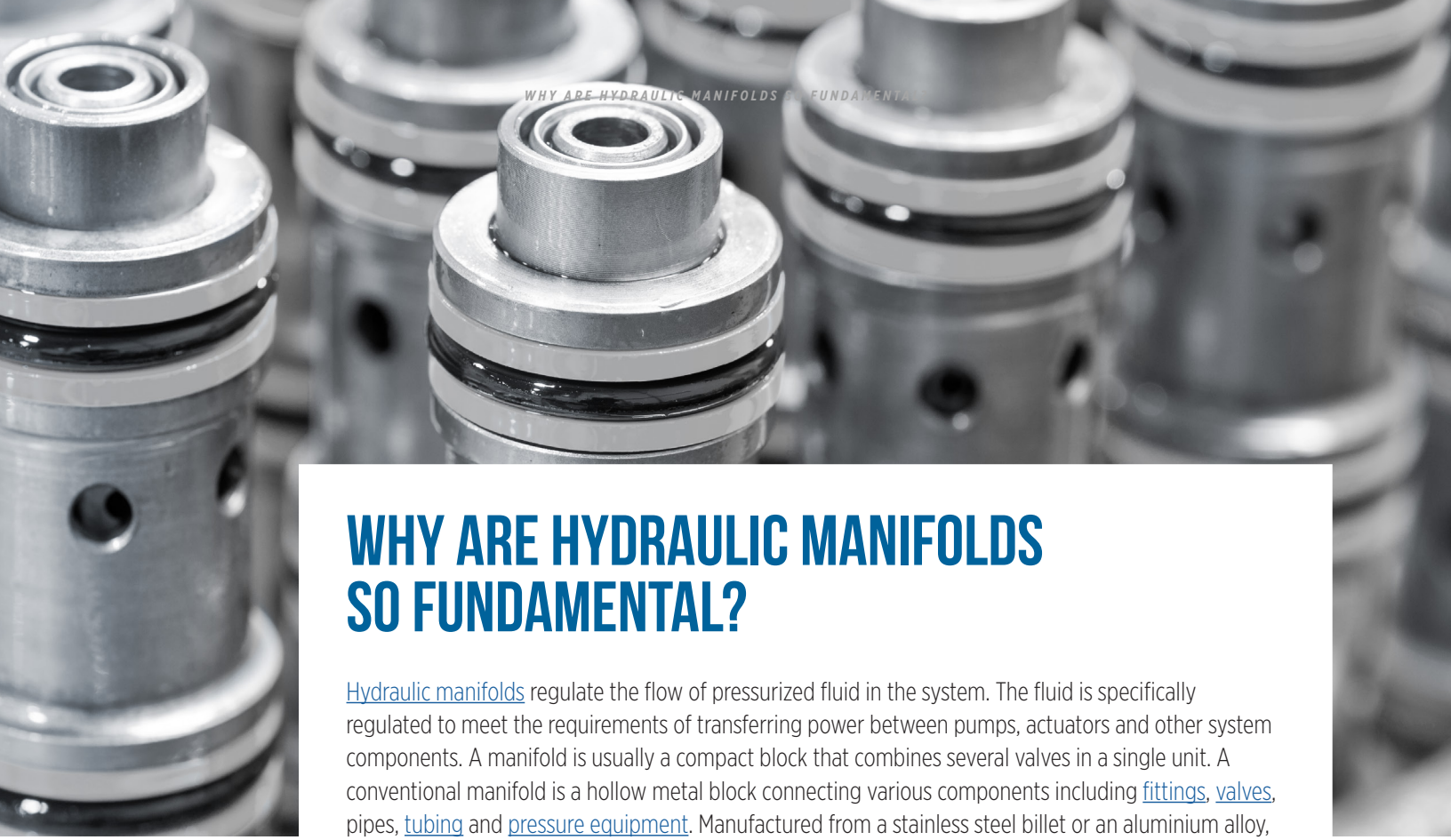


WHY ARE HYDRAULIC MANIFOLDS SO FUNDAMENTAL?

Hydraulic manifolds regulate the flow of pressurized fluid in the system. The fluid is specifically regulated to meet the requirements of transferring power between pumps, actuators and other system components. A manifold is usually a compact block that combines several valves in a single unit. A conventional manifold is a hollow metal block connecting various components including fittings, valves, pipes, tubing and pressure equipment. Manufactured from a stainless steel billet or an aluminium alloy, manifolds are machined to size and then drilled to create flow paths.

Flow in the manifold is controlled by hydraulic cartridge valves that direct pressure to operate components such as hydraulic cylinders or motors. Cartridge valves, also known as logic elements or 2/2-way valves, provide directional pressure and serve as flow and check valve controls. These cartridge valves are used in applications that require leak free control and high flow rates. Their compact design is required for use in hydraulic manifolds to serve many mobile and industrial equipment.

The manifold also connects one or more block and bleed valves, also called shutoff valves. They serve to stop the flow of process media to a specific location in the system, typically for safety or maintenance, to allow access to an otherwise hazardous area by isolating the flow away from the system. These block and bleed manifolds ensure upstream fluids don't come into contact with downstream components.

Block and bleed valves are typically ball valves, incorporating bleed valves which can be ball or needle type. They direct flow from one component to interface with components such as gauges, pressure measurement transmitters and switches.

Different Types of Valve Manifolds

The role of manifolds is to measure and control four primary process variables:

- Flow rate
- Fluid level
- Differential and gauge pressure
- Temperature

The monitoring of system pressure is the most crucial of these processes, and it's imperative to know the difference between differential and gauge pressure. Simply put, differential pressure is the difference between two separate pressure measurements, while gauge pressure is the measurement above atmospheric pressure.

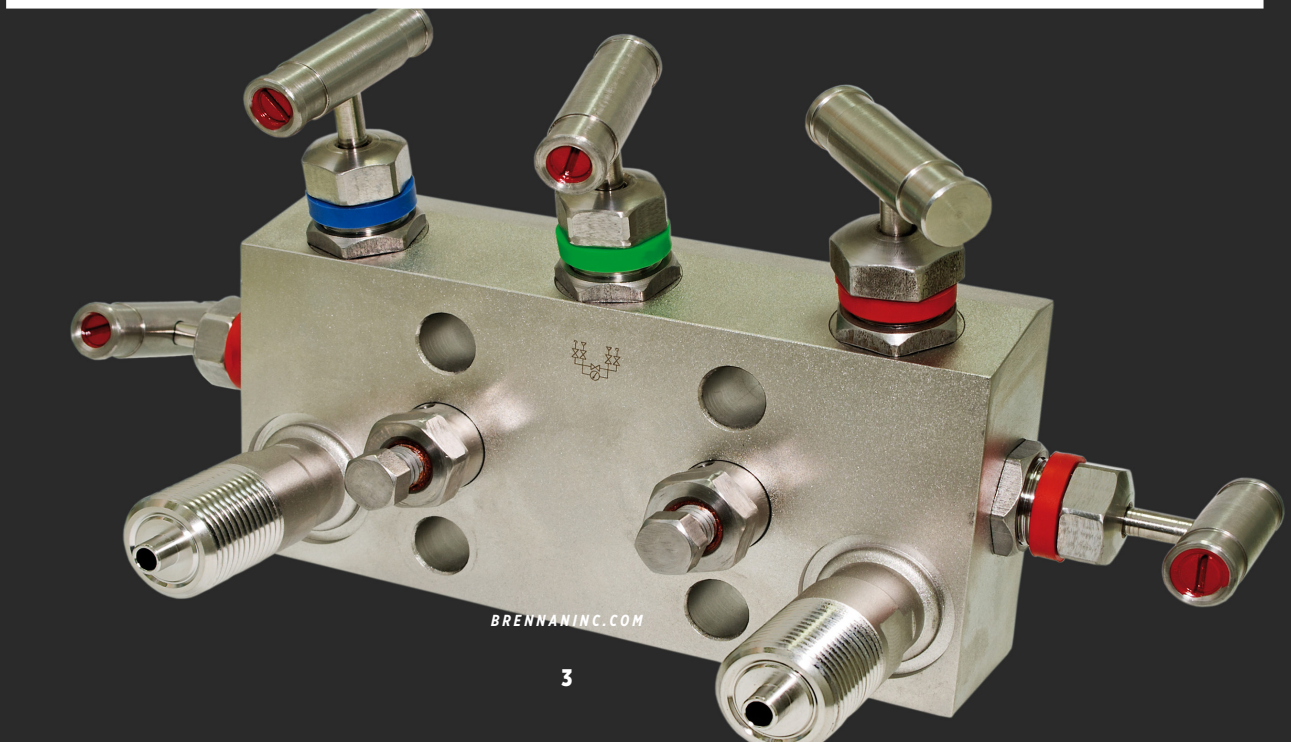
There are many different design configurations of valve manifolds, such as the most frequently used mono-block design, serving applications that require multiple valves in a single unit. This typical manifold has multiple ports for valve connections to calibration devices, measuring instruments and active system components. However, there are also modular-block designs that incorporate only one or two valves. The number and type of valve is determined by the application. Manifolds are typically designed as one of three different valve type configurations:

1. Two-valve manifolds incorporate a bleed or test valve and a block valve that serves the same purpose as a standard block and bleed valve.

2. Three-valve manifolds have an equalizer valve and two block valves, used to prevent instrument over-range by using differential pressure transmitters. This allows the transmitter to be isolated from the process line while conducting calibration and/or maintenance. Although they have three valves, there are actually four ports. Two ports are coupled to the differential pressure transmitter, while the other two connect process locations for measuring the differential pressure.

3. Five-valve manifolds also have an equalizer valve and two block valves, along with two other valves used for testing or venting. They are most frequently used in the measurement of differential pressure in multi-line applications. Five-valve manifolds are uniquely suited to block, equalize and vent two process connections, and can be used to calibrate the transmitter while remaining inline to the system.

Though not as widely used due to limited applications, there are also four-valve manifolds designed to be mounted directly to differential pressure transmitters using a flange connection.



Industry Applications for Hydraulic Manifolds

There are many applications for hydraulic manifolds in virtually every industry, including agricultural machinery, construction and other off-highway equipment, marine, material handling equipment, oil & gas and chemical processing.

OIL AND GAS INDUSTRY: Manifolds in oil & gas are used to transfer fluid from wells to test lines, allowing the fluid to run through designated ports from storage tanks to the production line. The manifold's flow limits are controlled by the above mentioned two, three, or five valve configurations. These may include ball, bleed or needle valves.

INDUSTRIAL CHEMICAL PROCESSING AND PLASTIC PROCESSING: These industries rely on air and steam header distribution manifolds to redirect air, liquid feed or single gas lines to multiple devices, as well as to relinquish condensation or contaminated fluid. They are also used to control the vent valve for diverting certain media away from the operation before it causes corrosion.

Air header distribution manifolds are specifically used to supply air from the compressor to actuators on pneumatic devices, such as pressure controllers, valve positioners and steam flow meters. They are used extensively in industrial chemical processing and plastic processing in low pressure applications up to 69 bar (1,000 psi).

CONSTRUCTION EQUIPMENT: A common application for manifolds in construction equipment is in a backhoe loader, where the manifold valves open and close to redirect the flow of hydraulic fluid to the front loader, boom and dipper arms of the front and back buckets. As the operator works the controls for any individual arm, the manifold diverts fluid pressure to that operation.

MATERIAL HANDLING: Cranes are the largest users of hydraulics in what's considered material handling. As an example, a base manifold assembly in a crane is used to support loads as heavy as 3,630 kg (8,000 lb.). Using that same manifold for larger cranes by simply adding another valve, we can change the flow from 30 litres (8 gallons) per minute to 57 litres (15 gallons) per minute, increasing the power capacity of the crane.

MARINE INDUSTRY: Hydraulics are found throughout marine applications, from automation and control systems to critical manifold valves and even deck equipment, where hydraulically powered equipment is used in lifts, winches and windlasses. The torque required for operating these heavy loads is significant, and the hydraulic systems in these applications provide extremely smooth, quiet and precise movement, which is very important on passenger lifts. Passenger and cargo lifts raise and lower heavy loads by utilizing hydraulic manifold pumps, cylinders, valves and motors.

CONCLUSION

Maintaining and directing pressure in a hydraulic system is the most important consideration when choosing a hydraulic manifold design. The required pressure of hydraulic fluid is the basis of manifold selection. Choosing a mono-block design provides multiple fluid passages and valves for the entire system, while a modular-block design uses only one or two valves to provide interconnection of fluid passages for the valve(s) and flow-through requirements.

Almost every hydraulic system uses manifolds. They serve as an integrated component for most valve functions in the system, including flow controls, directional valves, load holding valves, pressure controls and more. Manifolds may have cartridge valves that thread into the block, or DIN style cartridges used in extremely high flow applications. They may also incorporate surface mounted valves, such as compact D03 style, for high flow and high-pressure capability, or D05 that has a second "T" port for lower pressure drop. The choice of manifold design is critical for reducing the number of connections, therefore reducing potential leak points, decreasing weight and saving time and money when building the system.

Hydraulic manifolds provide a consolidated and logical layout for interconnection of assorted hydraulic valves. They regulate the flow of fluid in a circuit to control transfer of power between pumps and actuators for improving efficiency and reducing energy consumption.

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In business for 70 years, Brennan supplies customers worldwide with more than 120,000 standard and special hydraulic fittings, adapters and O-rings in sizes ranging from 1/16 to 3 inches. These include a wide choice of fitting and adapter types such as tube, O-ring face seal, instrumentation, metric bite type, push-to-connect, conversion and flareless bite type, as well as valves, clamps and swivels. Brennan products are stocked at strategically located, full-service distribution centers across North America, Europe and Asia.

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BRENNAN

CORPORATE HEADQUARTERS
6701 Cochran Road
Solon, Ohio 44139 USA

BRENNAN MANUFACTURING GROUP
26420 Century Corners Parkway
Cleveland, Ohio 44132 USA

PHONE: 440.248.1880
TOLL FREE: 888.331.1523
FAX: 440.248.7282

BRENNAN MANUFACTURING GROUP, CANADA
290 Courtney Park Drive East
Mississauga, Ontario – L5T 2S5

BRENNAN INDUSTRIES CHINA
NO 2, Xinfeng Road,
Langxia Town, Jinshan district,, Shanghai, China

BRENNAN MANUFACTURING GROUP, UK
Wigwam Lane
Hucknall Nottingham NG15 7SZ, UK

brennaninc.com