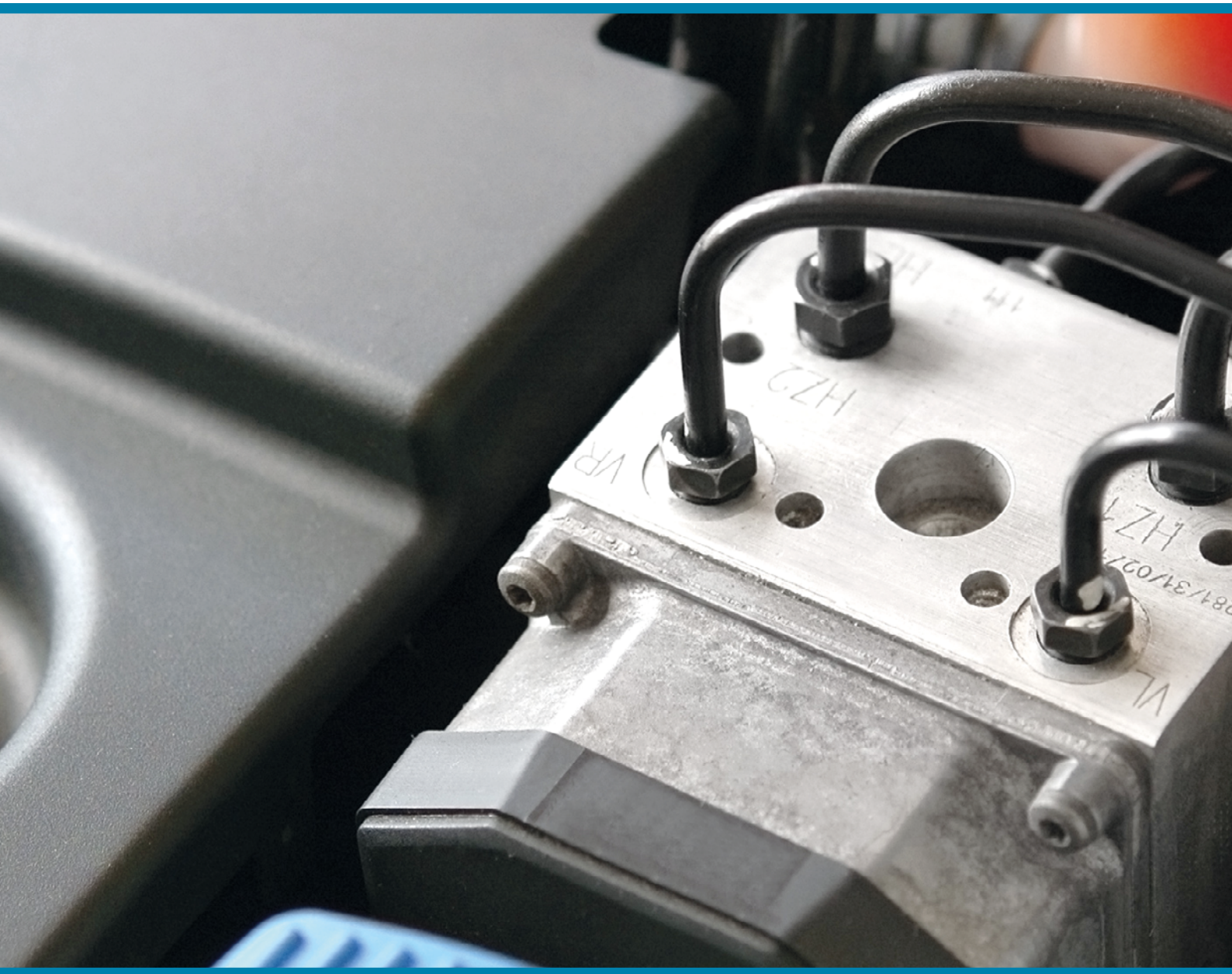
WANDFLUH
Hydraulics + Electronics

Quality products for demanding applications



BRAKE **SYSTEMS**

SOLUTIONS **SINCE 1946**

APPLICATIONS **BRAKE SYSTEMS**

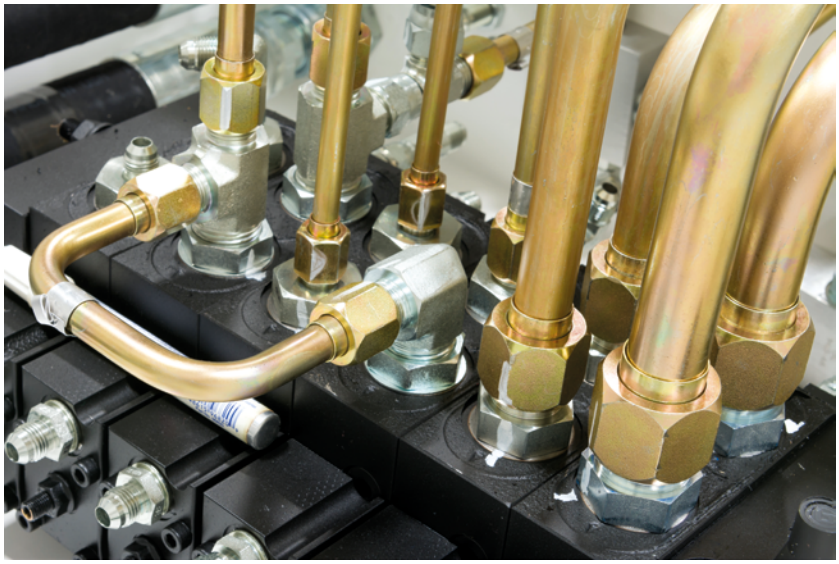
In many mechanical drives, vehicles and machines, brakes are a crucial safety element. Their reliability and longevity are decisive for the security and quality of the complete system.

Brake systems ensure the controlled deceleration and secure standstill of a complete system respectively of its moving components. As security-relevant elements, they have to meet very high requirements. These depend on the particular range of applications. Brake systems thus have to be designed specifically for the intended service surroundings.

Hydraulically actuated brakes are particularly suited when high yet sensitively controlled braking forces have to be exerted within tight spatial limits. For applications with especially high safety requirements - e.g. for vehicles or cableways – brake systems with additional equipment such as redundant valves and switching position monitoring are deployed.

For wind generators, hydraulically actuated brake systems are used for the azimuth orientation and fixing. Especially in the case of high wind speeds, the system must feature the ability to be turned out of the wind and be brought to a standstill in a controlled way in order to avoid damage to the gearbox and the generator.

Also in the case of stationary machines such as in the manufacturing process of textiles, brake systems play a decisive role. In these applications, fast-turning drums have to be decelerated within milliseconds without the textile thread to become entangled or even to get ripped apart.



Typical application areas for hydraulic brake systems are, among others:

- Rail vehicles
- Mobile work machines
- Winches
- Wind generators
- Material lifts
- Textile machines
- Cableways
- Cranes

BRANCHES **REQUIREMENTS**

Brake systems have to ensure a fast, reliable and controlled braking action. In order to fulfil these requirements, the designer has to take into account a number of guidelines. A decisive prerequisite for a sensitive control is that the hydraulic action on the brake system itself is exerted as linearly as possible and with a small hysteresis.

Decisive features of brake systems:

CONTROL

In order to achieve a controllable braking action, a steadily changeable braking force is a crucial factor.

SPEED

The response time of the hydraulic valve used as an actuator has to be short for the brake effect to set in fast.

SAFETY

In order to secure an all-time reliable functioning of the system, its components have to meet stringent requirements.

EFFICIENCY

The amount of energy released has to be minimized in order to avoid high temperatures in the hydraulic system.

LONGEVITY

Hydraulic brake systems are made of modern high performance materials for high durability and low maintenance.

COMPACTNESS

Hydraulic brakes distinguish themselves by their high power density. This makes compact dimensions and space saving solutions possible.

Modern hydraulic brake systems are actuated using proportional valves. These are equipped with solenoids exactly controlling spool positions and thus hydraulic pressures, resulting in a linear increase of the braking force. Such systems are often fitted with proportional pressure valves. Increasingly, closed control circuits are used with proportional throttles and the corresponding electronics. In order to ensure good controllability of the system, these valves have small hysteresis, and their linearity can be precisely adjusted. Their frequent use in accumulator unloading systems makes small leakage and pilot oil volumes of hydraulic valves mandatory. In spring-loaded brake systems, a pressure relief down to nearly zero bar is of prime importance to prevent the brake from dragging.

HYDRAULIC **BRAKE SYSTEMS**

Brake systems are either active or passive. Operational brakes are often designed as active systems. Safety brakes are always passive systems whose braking action is activated by spring forces. For both types, there are a number of different hydraulic control method. Controlled hydraulic solutions are realised using pressure relief or pressure reducing valves. In the case of closed hydraulic pressure controls either pressure relief valves or throttle valves are used. For both cases, electronics optimised for the valves is a crucial factor.

WITH PRESSURE RELIEF

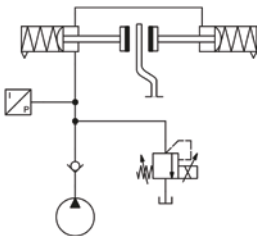
By means of a proportional pressure relief valve, the pressure within the cylinder is adjusted to the required braking force. Additionally, the pressure in the brake system is monitored using a pressure sensor. Usually, these are direct operated controlled valves with compact dimensions and short response times. In the case of active systems, reverse hydraulic valves have usually to be selected. Inverse valves are spring loaded and adjusted to the maximum pressure value in a deenergised condition. This maximum value can be adjusted by means of an adjustment screw.

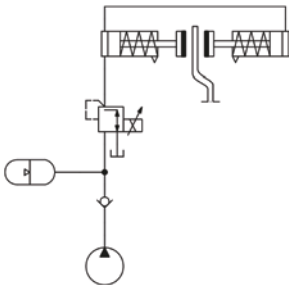
WITHPRESSUREREDUCINGVALVES

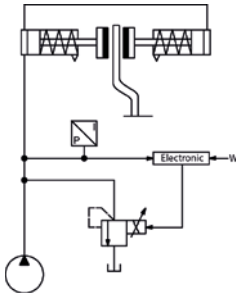
By means of a proportional pressure reducing valve, the cylinder pressure is adjusted to the required braking force. The output pressure of the control valves is decoupled from the input pressure. Therefore higher input pressures do not play any role with respect to the brake pressure. Such systems are often selected for the accumulator unloading operations in order to achieve as long standstill intervals of the motor pump unit as possible. In the case of proportional control valves, only low leakages must occur. For active systems, a reverse valve function usually are required.

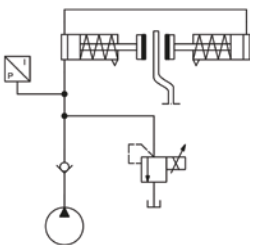
WITH ELECTRONIC PRESSURE CONTROL

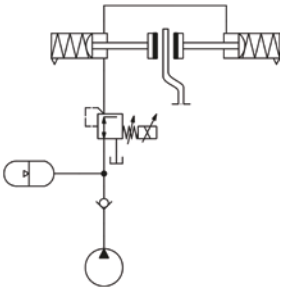
As an actuator, a proportional pressure relief valve is used. By means of a pressure sensor, the brake pressure is fed back into the electronics which compare the feedback value and the command value. As an alternative, the control can be realised using two proportional throttles, one positioned in the pressure line and the other one in the tank line. Proportional throttles distinguish themselves by their high speeds as well as by an enhanced flexibility with respect to the optimized adjustment of the controller.

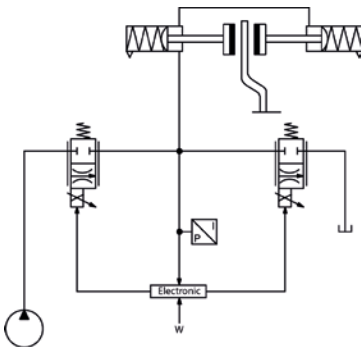












VALVE **TECHNOLOGY**

Depending on the brake system, different sizes of proportional valves are required. For tight space conditions, small, compact, direct operated valves have been developed. For large systems, pilot operated valves are used. In order to meet the different requirements, more than 20 variants of valves are available for the selection of the most suitable valve. The available bandwidth ranges from valves with low maximum output pressure to models with a maximum output pressure of 450 bar. Likewise, the flows can vary between some 100 ml/min up to 40 l/min.

PRESSURE REDUCING VALVES

MDPPM16

The small, compact solution

P max.: 40 bar
Q max.: 6 l/min
Size: M16 cavity

MGPPM16

The compact solution for higher brake pressures

P max.: 100 bar
Q max.: 6 l/min
Size: M16 cavity

MPPPU10

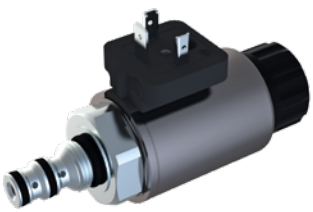
The solution for larger brake cylinders

P max.: up to 350 bar
Q max.: 20 l/Min
Size: UNF 7/8-14 cavity

MQPPM22

For fast movements of large brake cylinders

P max.: up to 350 bar
Q max.: 40 l/min
Size: M22 cavity



MDPPM16

PRESSURE RELIEF VALVES

BDPPM18

The small, compact solution

P max.: 315 bar
Q max.: 8 l/min
Size: M18 cavity

BDPPM22

The solution for large brake cylinders

P max.: up to 350 bar
Q max.: 25 l/min
Size: M22 cavity

BSPPM22

For high brake pressures, seat tight execution

P max.: up to 450 bar
Q max.: 2 l/min
Size: M22 cavity

BDPPM22_W

THROTTLE VALVES

DNPPM18 / DOPPM18

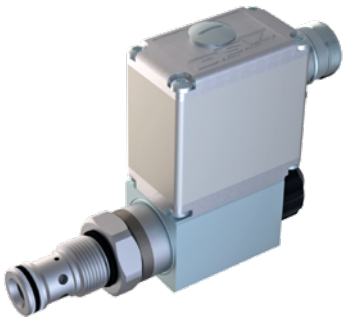
The small, compact solution

P max.: 250 bar
Q max.: 12 l/min
Size: M18 cavity

DNPPM22 / DOPPM22

For fast movements of large brake cylinders

P max.: 350 bar
Q max.: 25 l/min
Size: M22 cavity



D_PPM22_ME

Control system	Pressure relief	Pressure reducing	Electronic control
Pressure accuracy	■■□□□	■■■□□	■■■■■
Space conditions	■■■■■	■■■■□	■■□□□
Costs	■■■■■	■■■■□	■■□□□
Tightness	■■■■□	■■□□□	■■■□□
Response times and hysteresis	■■■□□	■■■□□	■■■■■

ELECTRONIC DEVICES

The control of proportional valves is made using electronic control devices. These control the solenoid current in the valve. Through pulse width modulation with a superimposed dither signal, a very sensitive control of the valve with a small hysteresis is ensured. Our control devices are equipped with microprocessors. This enhances their functionality as well as their flexibility for use in different control systems. The various electronic devices feature amplifying and control functionalities with an optional fieldbus interface for easy connection to superordinate controls.

Decisive prerequisites for an optimum electronic control of the pressure are high-end signal processing and control of the solenoids. Three different electronic control variants are available. A user-friendly parametrising and diagnosis software facilitates adjusting the parameters of the valve and the PID controller.

SNAP-ON MODULE SD7

Digital electronic controller for the control of maximum 2 solenoids for installation in control cabinets.

The inputs and outputs can be freely assigned. This allows an optimised utilisation of existing hardware and enables a flexible adaptation to the application even without programming knowledge.

Parameter adjustments are stored in a non-volatile memory and are thus immediately available after switching on the control system.

Instead of an analogue interface, for all types a fieldbus interface can be used (Profibus DP, CANopen, J1939 or HART). Apart from the 24 VDC execution, also a 12 VDC version is available.

ON-BOARD ELECTRONICS DSV

This digital controller module for the control of maximum 2 solenoids is mounted directly onto the solenoid. The "Digital Smart Valve" features digital electronics in an extremely small space, making it the most compact design currently available on the market. These solutions have been designed especially for demanding applications in block constructions solutions for stationary as well as mobile systems. The plug-and-play valves distinguish themselves by simple commissioning. The easy replacement facilitates fast repairs and thus short downtimes. Control can be made either by analogue signals or via a CAN fieldbus.

MOBILE ELECTRONICS MD2

The digital amplifier and controller module MD2 for maximum 8 solenoids was especially developed for the control of hydraulic valves under extreme ambient conditions. This device is suitable for use in conditions where moisture, vibrations, higher temperatures or fluctuating voltage supplies might occur. Thanks to its large voltage supply tolerance range (8...32VDC), the MD2 can be flexibly integrated into various systems.

The module features digital inputs and outputs as well as high-powered PWM outputs for the control of solenoid valves. Its digital inputs can easily process FM or PWM signals. Instead of an analogous interface, the MD2 is also available with a CAN fieldbus interface.

The MD2 is the ideal solution when several brake systems have to be controlled by a single electronic circuit board.

SD7

DSV

MD2

INDIVIDUAL **SOLUTIONS**

Wandfluh is offering its customers a large number of individual solutions based on existing components. Together with the customer, the specific requirements are defined prior to the design of a product exactly matching these prerequisites. Thanks to the profound experience of our engineers and the flexibility of our manufacturing organisation, we achieve optimised solutions for your specific needs.

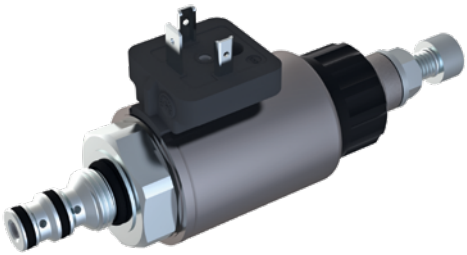
EXPLOSION PROTECTION

For equipment used in ambient conditions where explosive liquids or gases are present, special technologies are mandatory. This particularly applies to sectors such as the extraction or processing of oil and gas, but also in mines with dangerous dusts or gases explosion protection valve technology is required.

MQBPM22_M248

CORROSION PROTECTION

For valves operating in continuous contact with salt water, a salty atmosphere or extreme weather conditions, an enhanced corrosion protection is required to enhance their service life. For such applications, valves with a zinc-nickel coating (> 800 h salt spray test) or in stainless steel execution (AISI 3162) are available.



MDIPM16

LOWTEMPERATUREAPPLICATIONS

For application in cold conditions, valves in two low temperature executions are available

Z604 (-40 °C):

Suited sealings, partly adapted fitting tolerances

Z591 (-60 °C):

Special materials, special sealings, increased fitting tolerances

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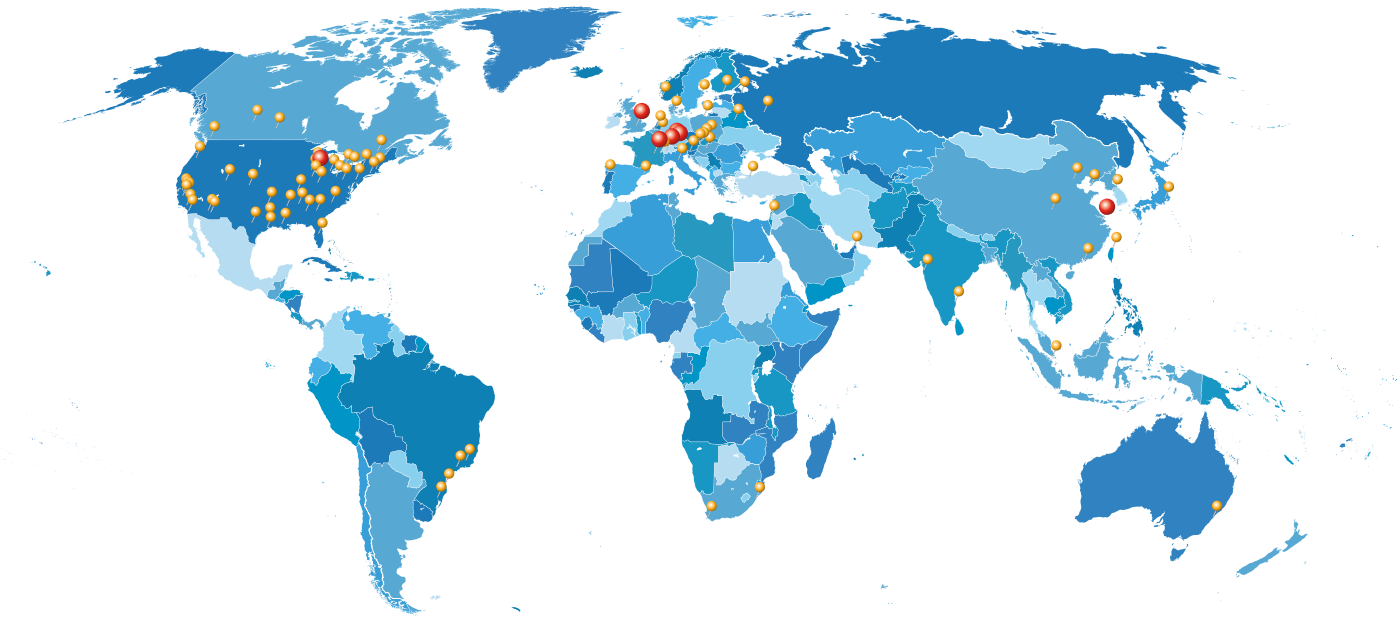

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