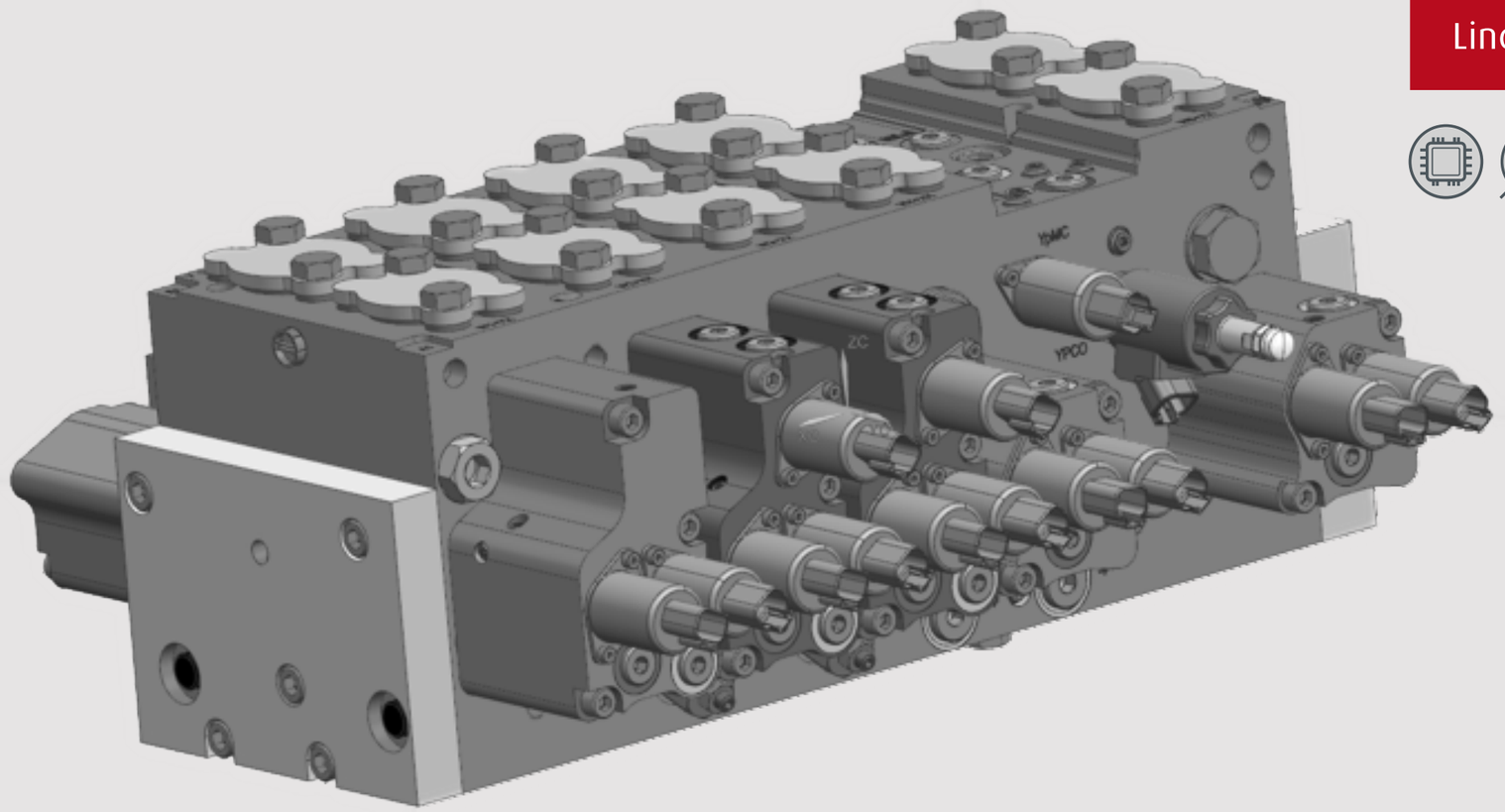
VW 22/18 M5-03.
Monoblock control valve for open circuit operation.

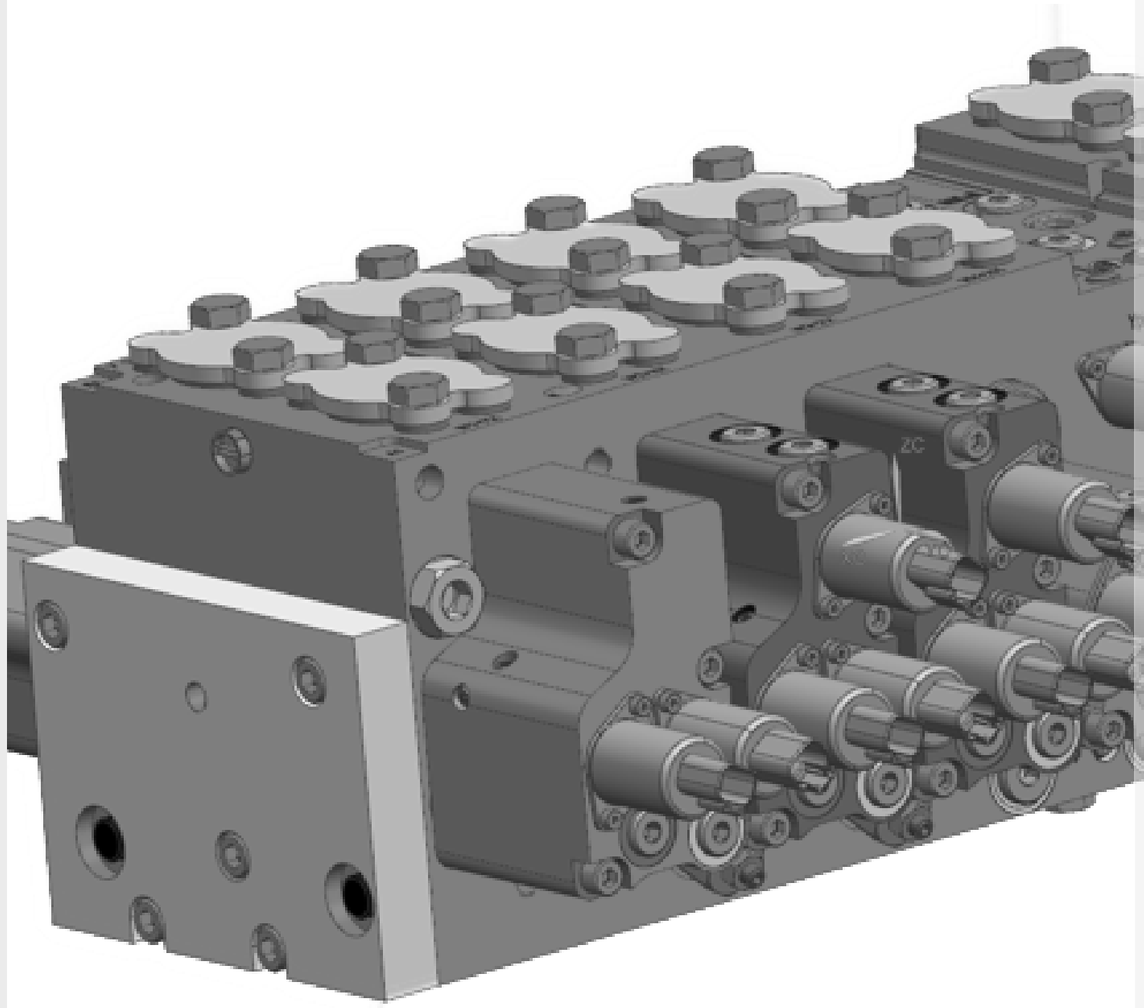
Linde Hydraulics

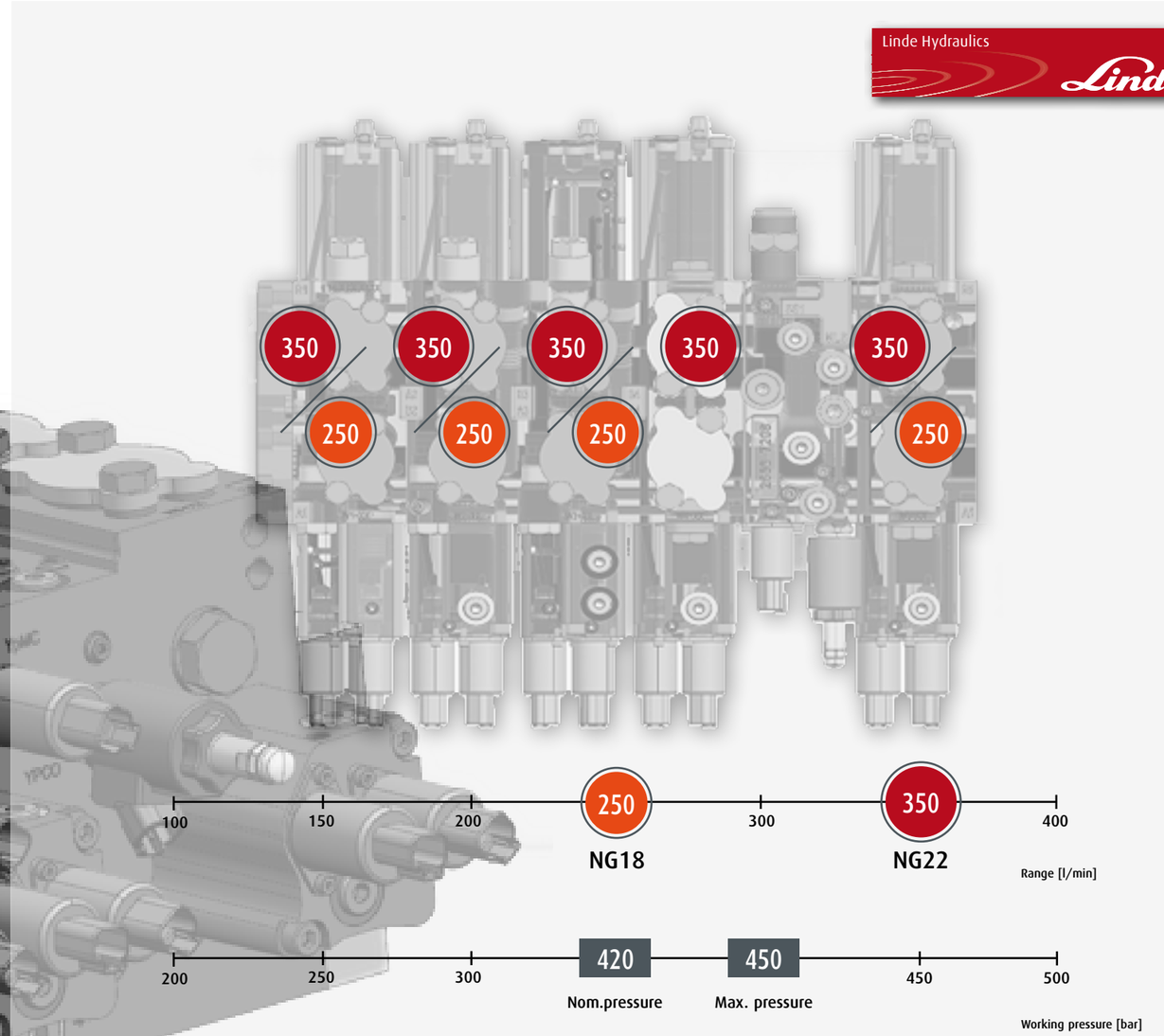
LHY 04/2021



VW 22/18 M5-03.

Our Product at a glance.





Integrated pressure compensators (application-oriented range of post-comp & pre-comp in sandwich valves available)	Extreme precision in all control functions and customized performance with modular system
Regeneration - from Rod to Head	Increased speed of actuator
Floating function	Reduced wear of the equipment & smooth work flow
Boom/Lift - Regeneration (from Head to Rod)	Integrated anti-cavitation function
Multifunctional valve (sandwich valve)	A large number of tools with different characteristics can be used
Anti-drift function	Reliable parking position of the function (unlimited)
Integrated and adaptable make-up function	Demand oriented make-up flow and shortened warm-up period
Pressure relief section with integrated return flow management	Very compact dimensions, no additional components required
Easy adjustment of maximum flow and pressure relief valve	Flexible use in context with various auxiliary functions
Electric or hydraulic control	Characteristic can be determined freely by hardware software

VW 22/18 M5-03.

Full Range of Functions.
Overview.

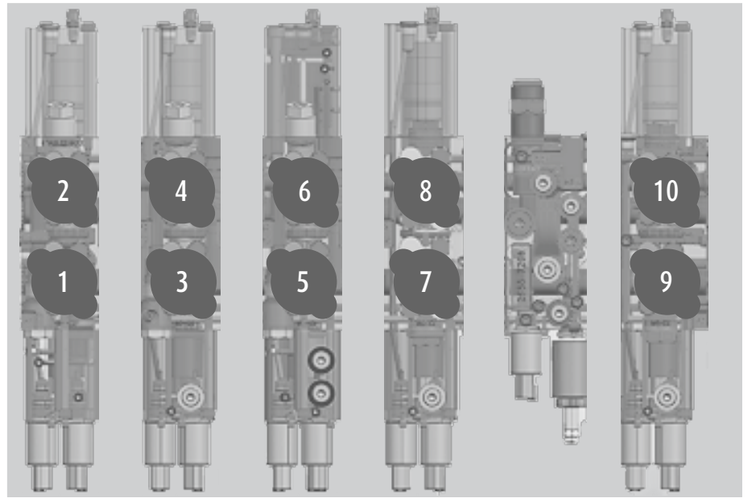
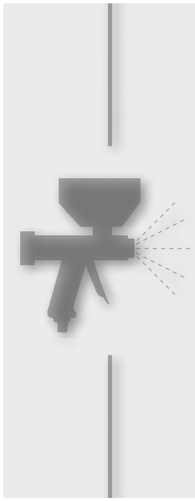
Linde Hydraulics

In the following you can see the maximum configuration of the VW 22/18 M5-03.

Under **«Nominal sizes»** you can find an overview of the available sizes per section and the corresponding flow.

The paragraph **«Controls»** shows the avalable types of controls depending on each section group.

Under **«Options»** you will find the available functionalities depending on the section and also partly referring to the ports (numbered from 1 to 22) in the figure. In addition, you will find information about possible corrosion protection and painting.

	End plate	Section group 2 0 to 3 Sandwicch sections	Section group 0 (Monoblock incl. Pressure Relief Section) 5 sections						Section group 1 0 to 3 sections			End plate	Surface treatment
													
Nominal sizes VW 22 NG 22 Max. volume flow [l/min]		250	350	350	350	350	Pressure relief section	350 250	250	250	250		
Nominal sizes VW 18 NG 18 Max. volume flow [l/min]		250	250	250	250			250	250	250	250		
Controls		Electro-hydraulical Hydraulical	Electro-hydraulical Hydraulical						Electro-hydraulical Hydraulical				
Options		Standard function (pre-compensated / post-compensated) exchangeable port relief valves	Anti Drift (at port 1)	Anti Drift (at port 3)	Anti Drift (at port 5)	Anti Drift (at port 7)	Load sense cut-off Load sense bleed Primary pressure relief Tank check valve Cooler check valve	Anti Drift (at port 9)	Standard function (pre-compensated / post-compensated) exchangeable port relief valves				Corrosion protection: Primer / Paint
		Standard function (pre-compensated / post-compensated) exchangeable port relief valves incl. lowering throttle valve	Boom/Lift - Regeneration (from port 1 to 2)	Boom/Lift - Regeneration (from port 3 to 4)	Boom/Lift - Regeneration (from port 5 to 6)	Boom/Lift - Regeneration (from port 7 to 8)		Boom/Lift - Regeneration (from port 9 to 10)	Standard function (pre-compensated / post-compensated) exchangeable port relief valves incl. lowering throttle valve				oxide red, RAL 3009 /
		Multifunctional valve (Integrated Anti-Drift valve + Return-bypass valve +Remote pressure control)	Regeneration - from Rod to Head (from port 1 to 2)	Regeneration - from Rod to Head (from port 3 to 4)	Regeneration - from Rod to Head (from port 5 to 6)	Regeneration - from Rod to Head (from port 7 to 8)		Regeneration - from Rod to Head (from port 9 to 10)	Multifunctional valve (Integrated Anti-Drift valve + Return-bypass valve +Remote pressure control)				jet black, RAL 9005 /
		Swing control valve (flow priorization + Torque/Pressure control)		Float function	Float function	Float function		Float function	Swing control valve (flow priorization + Torque/Pressure control)				traffic grey B, RAL 7043 /
						Standard function (post-compensated) Adjustable port relief valve Pressure controlled return flow tank bypass		Standard function (post-compensated) Adjustable port relief valve Pressure controlled return flow tank bypass					traffic grey B, RAL 7043 / jet black, RAL 9005
													traffic grey B, RAL 7043 / slate grey, RAL 7015

VW 22/18 M5-03.

Monoblock Functions.
Boom/Lift-Regeneration.

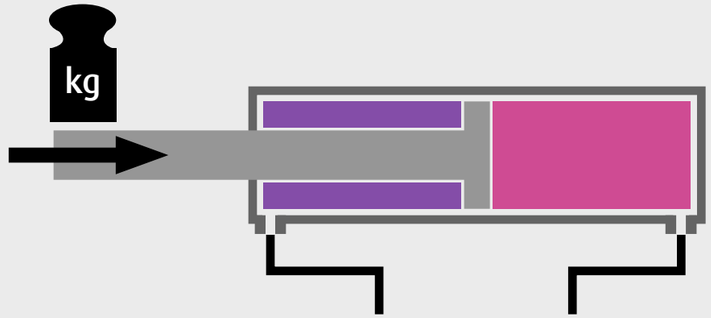
The boom/lift-regeneration is employed for lifting functions, such as the boom of the excavator or lift of the wheeled loader.

When the boom is elevated, the weight force of the whole attachement (e.g. boom, stick and bucket in context of an excavator) continuously acts on the lifting cylinder of the boom. This force would compress the cylinder even without the help of the pump. However, to enable a fast lowering process, a high flow is required on the rod side. If the flow is too low, the cylinder tends to cavitate.

The boom/lift-regeneration utilizes the weight force during lowering and partially redirects the oil flow from the return flow of the lift cylinder to the opposite side. In this way, the flow required here is already provided to a large degree without any pump effort. In addition, the tendency to cavitation is eliminated. The flow saved in this process is thus directly available for other functions.

Advantages

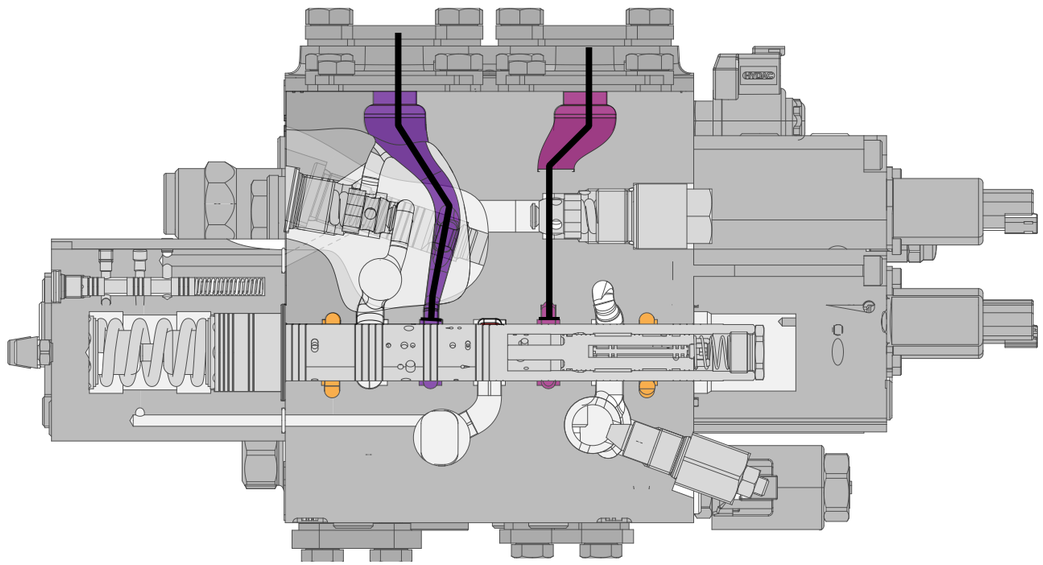
>> Reduced pump flow required/reduced energy required
>> No cavitation at boom/lift-cylinder
>> Higher dynamic of the whole application



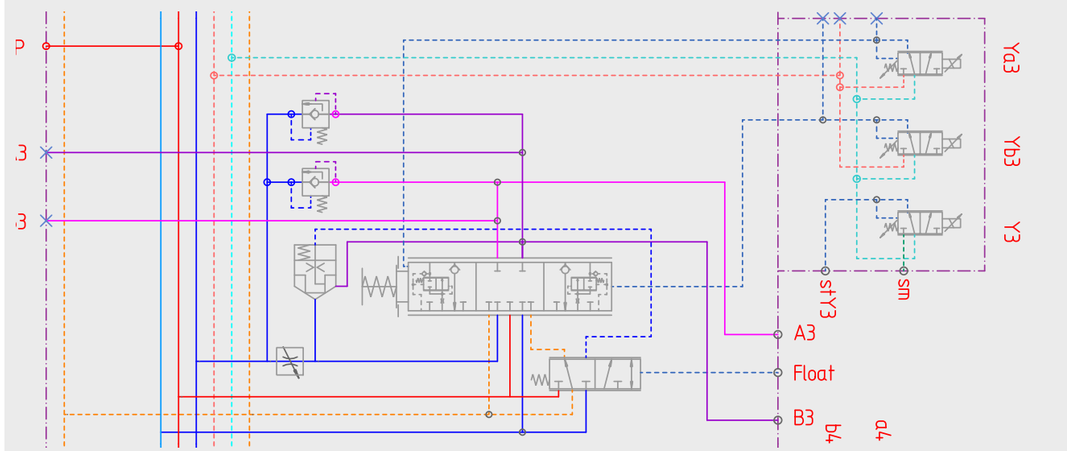
Functionality (Interactive and explained step-by-step)

1. Boom is lifted | **2. Boom is being lowered** | **3. Boom is touching the ground**

1.1 Boom is lifted.
1.2 Control spool is centered and both ports are closed.
1.3 Check valve is closed.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

Linde Hydraulics

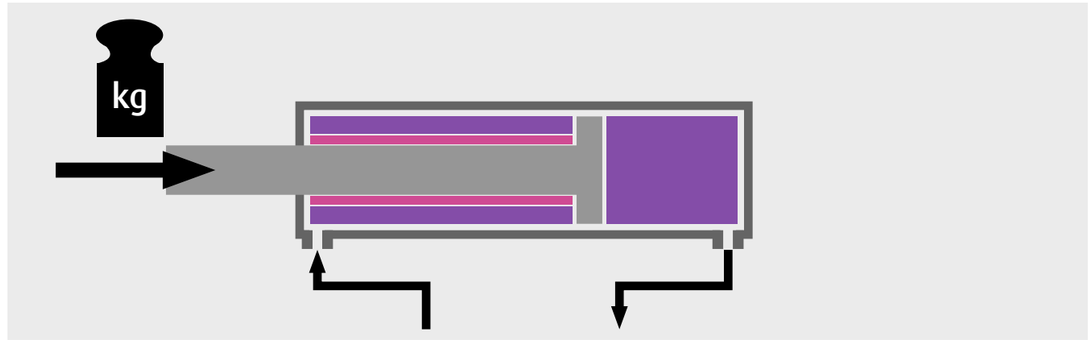
The boom/lift-regeneration is employed for lifting functions, such as the boom of the excavator or lift of the wheeled loader.

When the boom is elevated, the weight force of the whole attachement (e.g. boom, stick and bucket in context of an excavator) continuously acts on the lifting cylinder of the boom. This force would compress the cylinder even without the help of the pump. However, to enable a fast lowering process, a high flow is required on the rod side. If the flow is too low, the cylinder tends to cavitate.

The boom/lift-regeneration utilizes the weight force during lowering and partially redirects the oil flow from the return flow of the lift cylinder to the opposite side. In this way, the flow required here is already provided to a large degree without any pump effort. In addition, the tendency to cavitation is eliminated. The flow saved in this process is thus directly available for other functions.

Advantages

>> Reduced pump flow required/reduced energy required
>> No cavitation at boom/lift-cylinder
>> Higher dynamic of the whole application



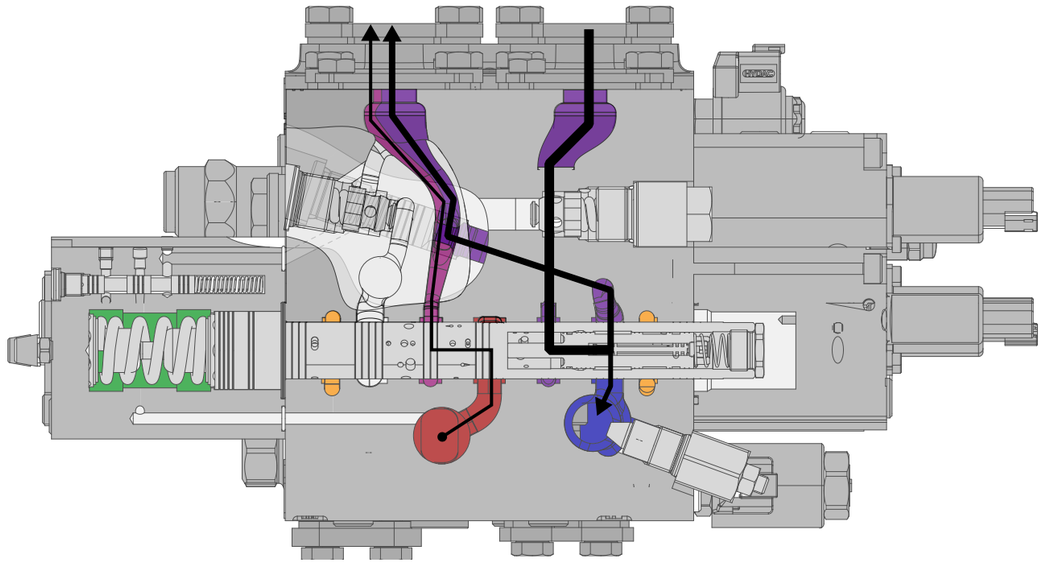
Functionality (Interactive and explained step-by-step)

1. Boom is lifted

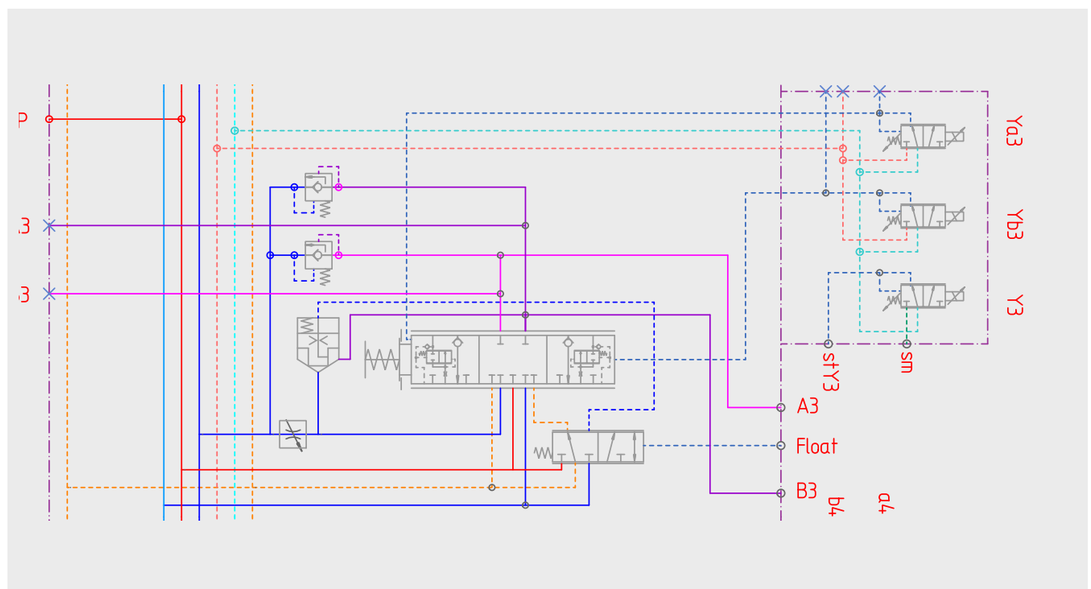
2. Boom is being lowered

3. Boom is touching the ground

2.1 Control spool directs the flow from head to tank and from pump to rod.
2.2 Return flow throttle restricts the return flow during flow back into tank.
2.3 The build-up upstream of the return throttle directs the flow to the check valve.
2.4 The check valve is opened.
2.5 The return is now offered to the rod side.
2.6 The pump supplies the rod as well, but with reduced flow.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

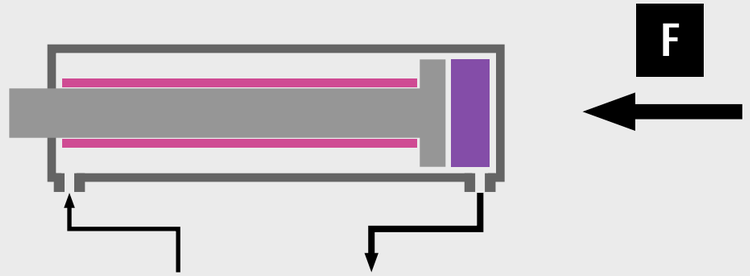
The boom/lift-regeneration is employed for lifting functions, such as the boom of the excavator or lift of the wheeled loader.

When the boom is elevated, the weight force of the whole attachement (e.g. boom, stick and bucket in context of an excavator) continuously acts on the lifting cylinder of the boom. This force would compress the cylinder even without the help of the pump. However, to enable a fast lowering process, a high flow is required on the rod side. If the flow is too low, the cylinder tends to cavitate.

The boom/lift-regeneration utilizes the weight force during lowering and partially redirects the oil flow from the return flow of the lift cylinder to the opposite side. In this way, the flow required here is already provided to a large degree without any pump effort. In addition, the tendency to cavitation is eliminated. The flow saved in this process is thus directly available for other functions.

Advantages

>> Reduced pump flow required/reduced energy required
>> No cavitation at boom/lift-cylinder
>> Higher dynamic of the whole application



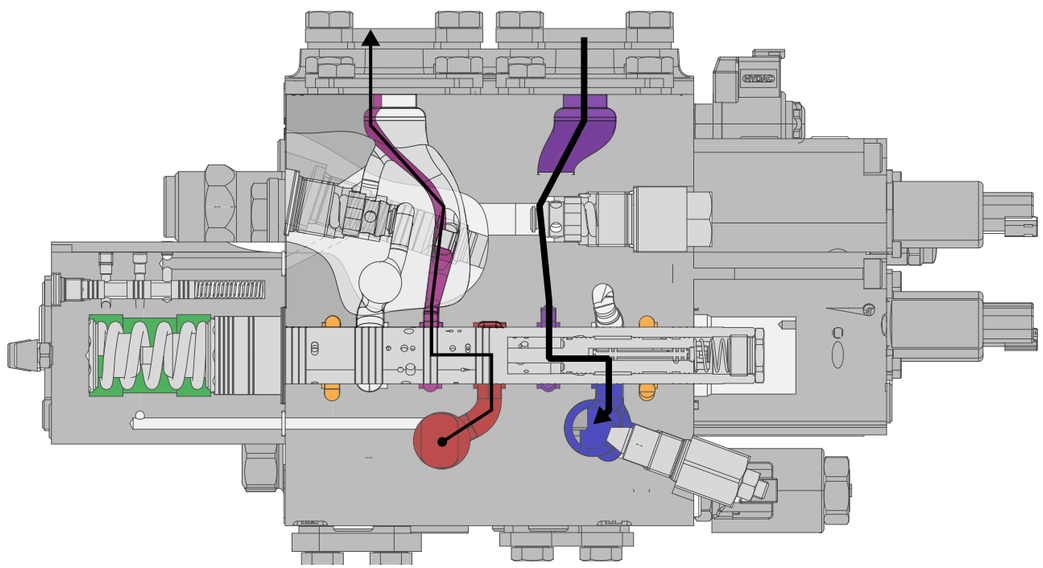
Functionality (Interactive and explained step-by-step)

1. Boom is lifted

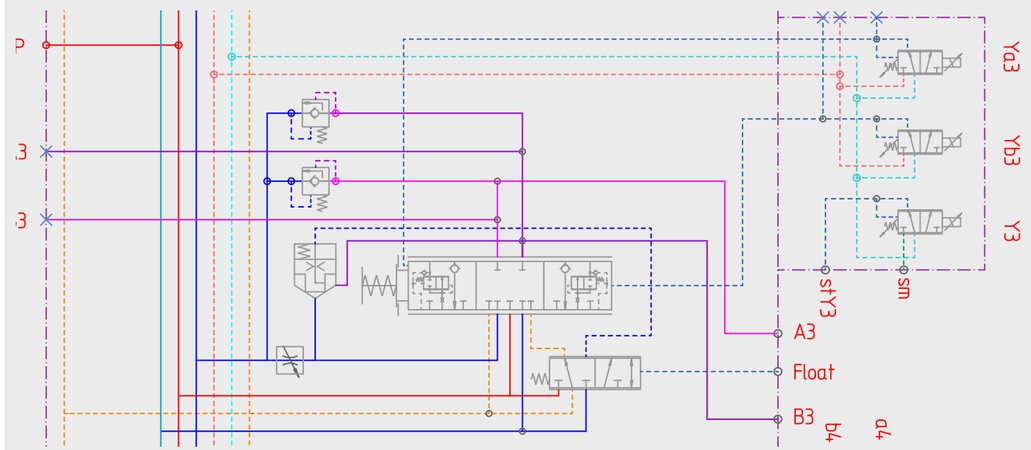
2. Boom is being lowered

3. Boom is touching the ground

3.1 Control spool directs the flow from head to tank and from pump to rod.
3.2 Pressure drops before the return throttle because the cylinder slows down considerably and the oil flow is reduced.
3.3 The pressure on rod side is increasing significantly.
3.4 The check valve is closed.
3.5 Cylinder is retracting more slowly and lifts the excavator partially off the ground.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

The anti-drift function is used in lifting functions when a specific position must be secured and guaranteed to be held for a longer period of time. For instance, in the crane operation of an excavator or wheeled loader.

In conventional control valves, the spool is used to control the flow rate. Due to the spool clearance of the control spool, very sensitive as well as highly dynamic movements can be realized at the actuator. On the other hand, this also means that a certain amount of leakage is inevitable due to the operating principle. Thus, after a function has come to a standstill, a slight leakage loss has to be cosidered from the time of shutdown - an unchanging position can not be guaranteed.

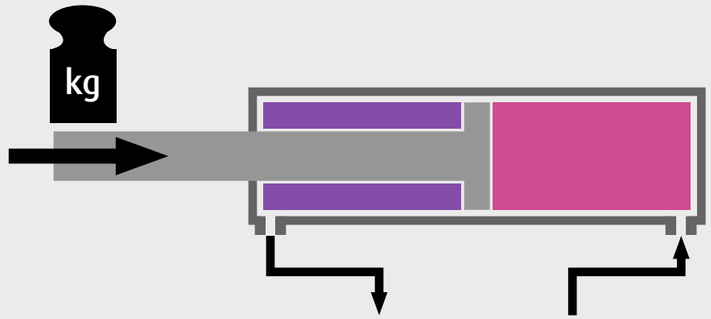
The anti-drift function prevents precisely this leakage loss with the aid of an additional valve. This valve is located between the spool and the actuator and ensures a tight seal depending on the control of the section. The pressure conditions of the actuator and the installation position of the anti-drift valve define the location of the anti-drift function within the valve. For example, when lifting a stick in excavator applications, the rod side of the cylinder is pressurized. In order to prevent drifting from the lifting position, the valve must therefore be installed on rod side. In the case of lifting a boom, on the other hand, a reversed connection is usually required here due to the applied pressure on the head side.

When the valve closes, the prevailing pressure now acts on the valve and, in addition to actuating the valve, presses it into its seat and reinforces the sealing effect. This is also referred to as a seat-tight or leakage-free shutoff. In this way, the pressure and thus the corresponding position of the function can be maintained almost indefinitely, which is particularly important during installation works with the aid of the crane function or when the application is shut down for a longer period of time. However, if the valve section is now pressurized on the pump side, the valve opens as a regular check valve - this way, even repeated or continued lifting of the load is jerk-free and can be controlled extremely sensitively.

For lowering the stick again, the anti-drift valve is also controlled over the pilot control. The anti-drift valve now opens and re-establishes a connection between the port and the control spool. This process is already completed before the control spool begins to move out and now takes control of the actuator again. In this way, the lowering procedure as well can be controlled very sensitively and precisely.

Advantages

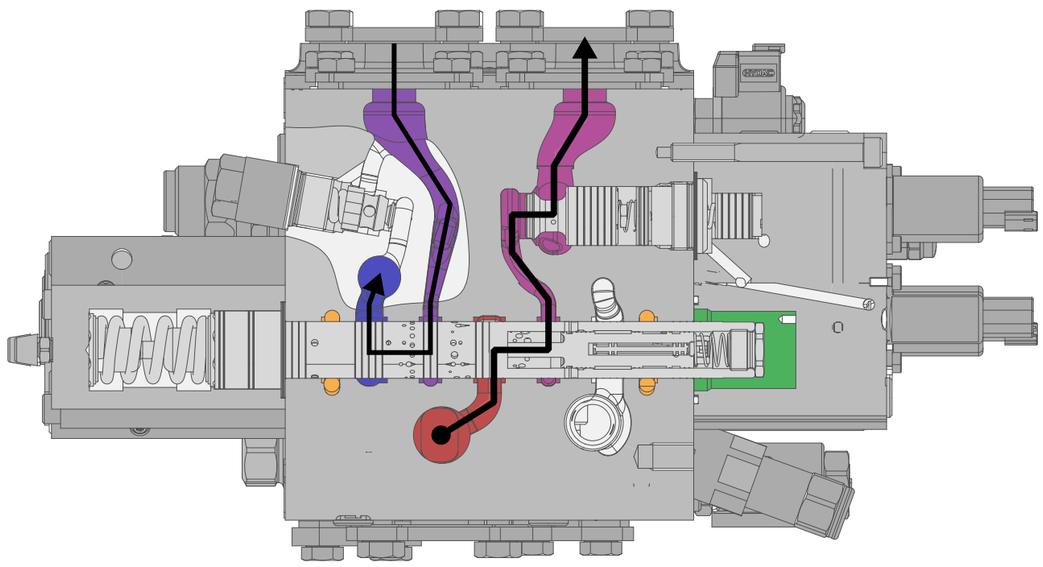
>> Guranteed position of the function (unlimited)
>> High accuracy when working with crane function



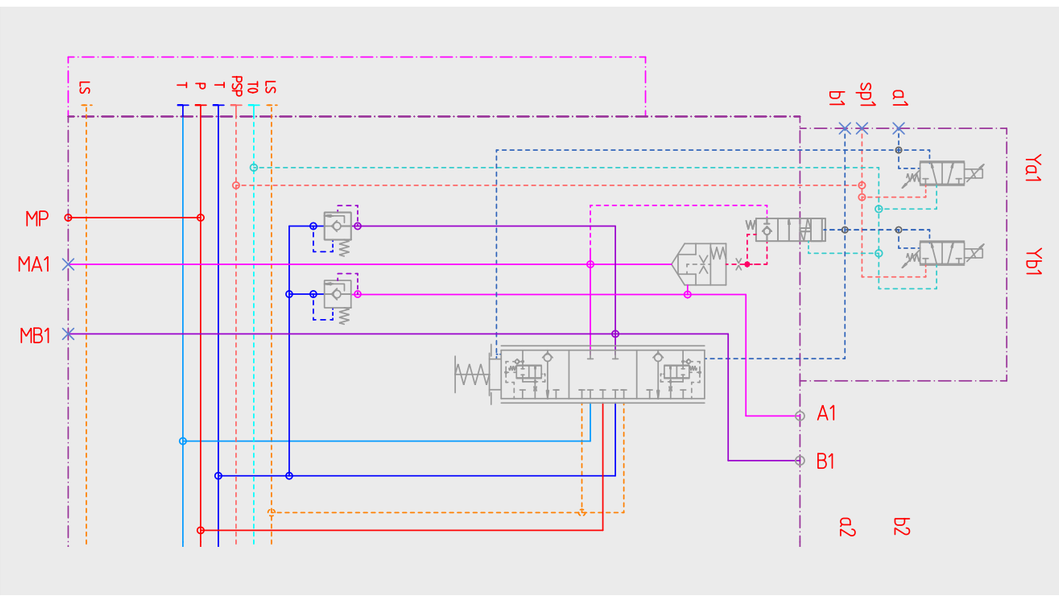
Functionality (Interactive and explained step-by-step)

1. Bucket is being closed | **2. Bucket is closed** | **3. Bucket is being opened**

1.1 Control spool directs the flow from pump to rod.
1.2 The preliminary stage of the anti-drift valve is inactivated.
1.3 The main stage of the anti-drift valve is inactivated/closed.
1.4 The pump pressure acts against the closed valve and lifts it out of its seat.
1.5 The flow passes the anti-drift valve.
1.6 The retracting cylinder is lifting the stick.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

Monoblock Functions.
Anti-Drift.

The anti-drift function is used in lifting functions when a specific position must be secured and guaranteed to be held for a longer period of time. For instance, in the crane operation of an excavator or wheeled loader.

In conventional control valves, the spool is used to control the flow rate. Due to the spool clearance of the control spool, very sensitive as well as highly dynamic movements can be realized at the actuator. On the other hand, this also means that a certain amount of leakage is inevitable due to the operating principle. Thus, after a function has come to a standstill, a slight leakage loss has to be cosidered from the time of shutdown - an unchanging position can not be guaranteed.

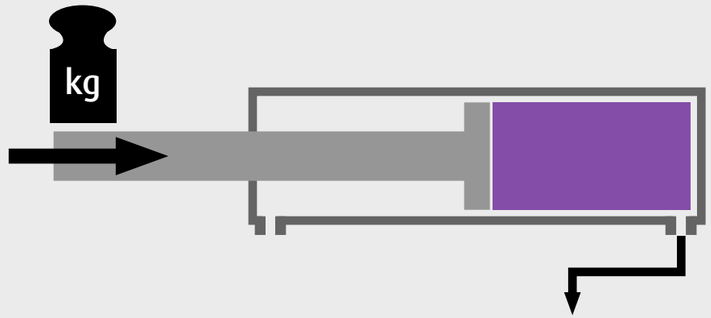
The anti-drift function prevents precisely this leakage loss with the aid of an additional valve. This valve is located between the spool and the actuator and ensures a tight seal depending on the control of the section. The pressure conditions of the actuator and the installation position of the anti-drift valve define the location of the anti-drift function within the valve. For example, when lifting a stick in excavator applications, the rod side of the cylinder is pressurized. In order to prevent drifting from the lifting position, the valve must therefore be installed on rod side. In the case of lifting a boom, on the other hand, a reversed connection is usually required here due to the applied pressure on the head side.

When the valve closes, the prevailing pressure now acts on the valve and, in addition to actuating the valve, presses it into its seat and reinforces the sealing effect. This is also referred to as a seat-tight or leakage-free shutoff. In this way, the pressure and thus the corresponding position of the function can be maintained almost indefinitely, which is particularly important during installation works with the aid of the crane function or when the application is shut down for a longer period of time. However, if the valve section is now pressurized on the pump side, the valve opens as a regular check valve - this way, even repeated or continued lifting of the load is jerk-free and can be controlled extremely sensitively.

For lowering the stick again, the anti-drift valve is also controlled over the pilot control. The anti-drift valve now opens and re-establishes a connection between the port and the control spool. This process is already completed before the control spool begins to move out and now takes control of the actuator again. In this way, the lowering procedure as well can be controlled very sensitively and precisely.

Advantages

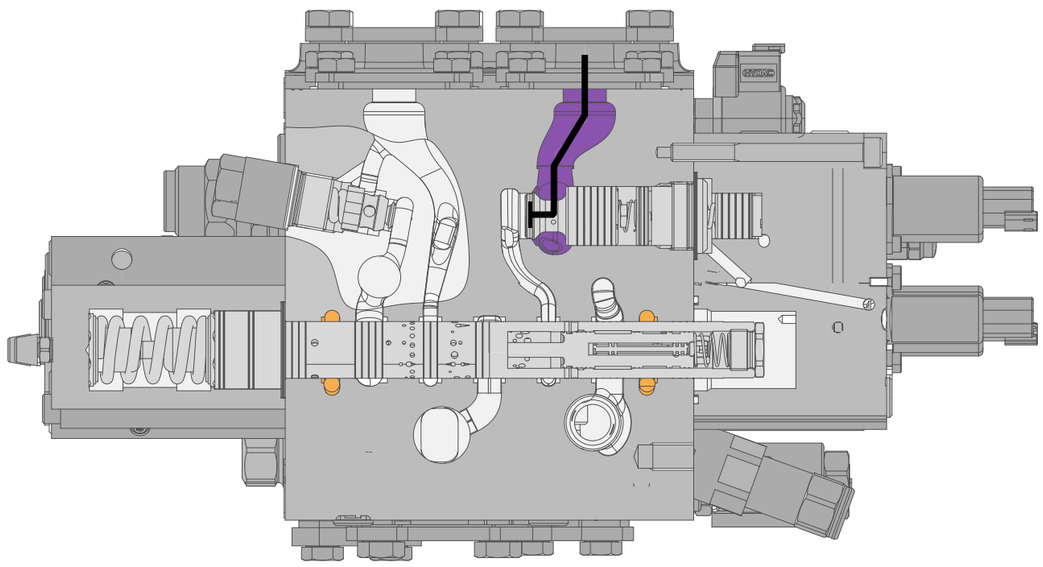
>> Guranteed position of the function (unlimited)
>> High accuracy when working with crane function



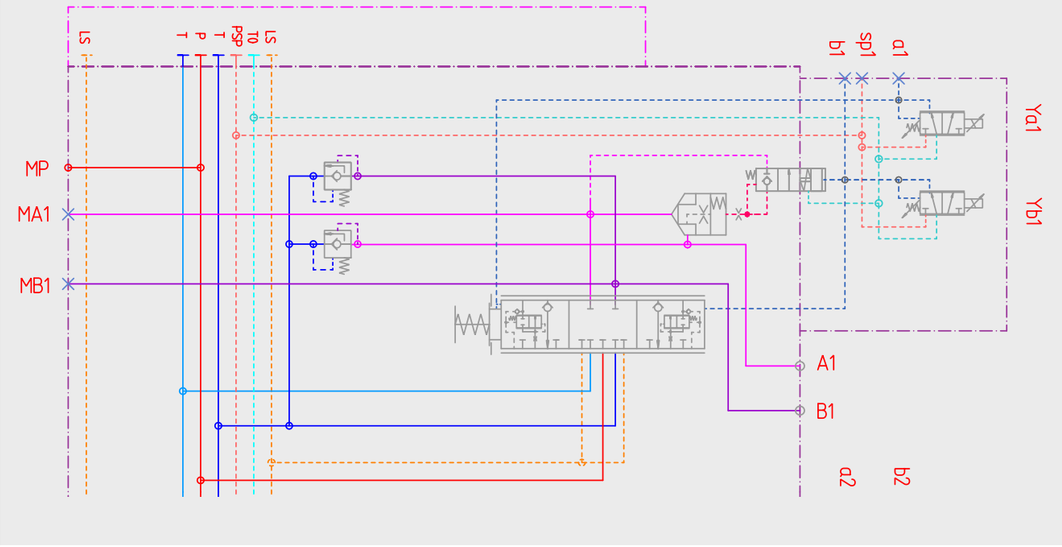
Functionality (Interactive and explained step-by-step)

1. Bucket is being closed | **2. Bucket is closed** | **3. Bucket is being opened**

2.1 The control spool is centered and all ports are closed.
2.2 The pilot stage of the anti-drift valve is not activated.
2.3 The main stage of the anti-drift valve is not activated and closed.
2.4 The pressure applied by the load presses the main stage of the anti-drift valve into its seat and seals leakage-free.
2.5 The cylinder is held in position.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

The anti-drift function is used in lifting functions when a specific position must be secured and guaranteed to be held for a longer period of time. For instance, in the crane operation of an excavator or wheeled loader.

In conventional control valves, the spool is used to control the flow rate. Due to the spool clearance of the control spool, very sensitive as well as highly dynamic movements can be realized at the actuator. On the other hand, this also means that a certain amount of leakage is inevitable due to the operating principle. Thus, after a function has come to a standstill, a slight leakage loss has to be cosidered from the time of shutdown - an unchanging position can not be guaranteed.

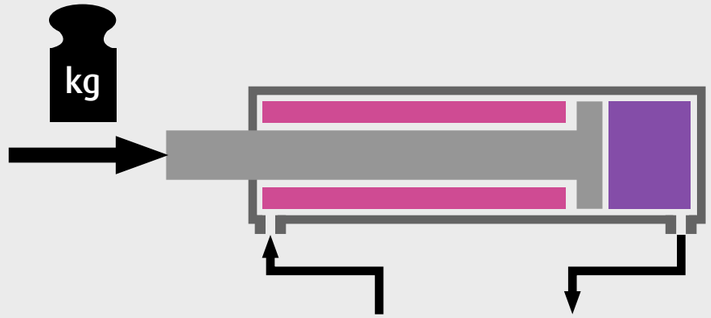
The anti-drift function prevents precisely this leakage loss with the aid of an additional valve. This valve is located between the spool and the actuator and ensures a tight seal depending on the control of the section. The pressure conditions of the actuator and the installation position of the anti-drift valve define the location of the anti-drift function within the valve. For example, when lifting a stick in excavator applications, the rod side of the cylinder is pressurized. In order to prevent drifting from the lifting position, the valve must therefore be installed on rod side. In the case of lifting a boom, on the other hand, a reversed connection is usually required here due to the applied pressure on the head side.

When the valve closes, the prevailing pressure now acts on the valve and, in addition to actuating the valve, presses it into its seat and reinforces the sealing effect. This is also referred to as a seat-tight or leakage-free shutoff. In this way, the pressure and thus the corresponding position of the function can be maintained almost indefinitely, which is particularly important during installation works with the aid of the crane function or when the application is shut down for a longer period of time. However, if the valve section is now pressurized on the pump side, the valve opens as a regular check valve - this way, even repeated or continued lifting of the load is jerk-free and can be controlled extremely sensitively.

For lowering the stick again, the anti-drift valve is also controlled over the pilot control. The anti-drift valve now opens and re-establishes a connection between the port and the control spool. This process is already completed before the control spool begins to move out and now takes control of the actuator again. In this way, the lowering procedure as well can be controlled very sensitively and precisely.

Advantages

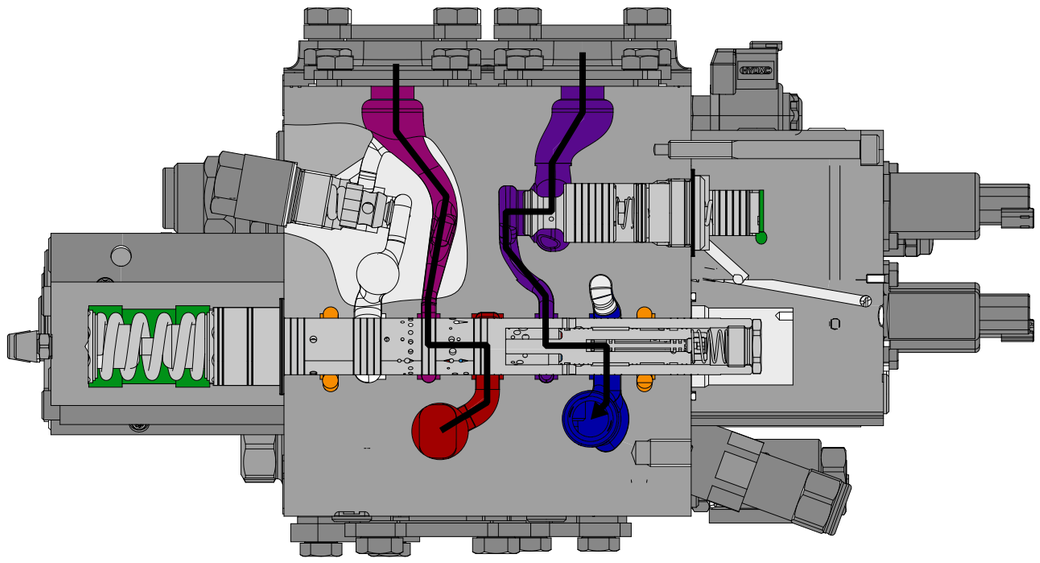
>> Guranteed position of the function (unlimited)
>> High accuracy when working with crane function



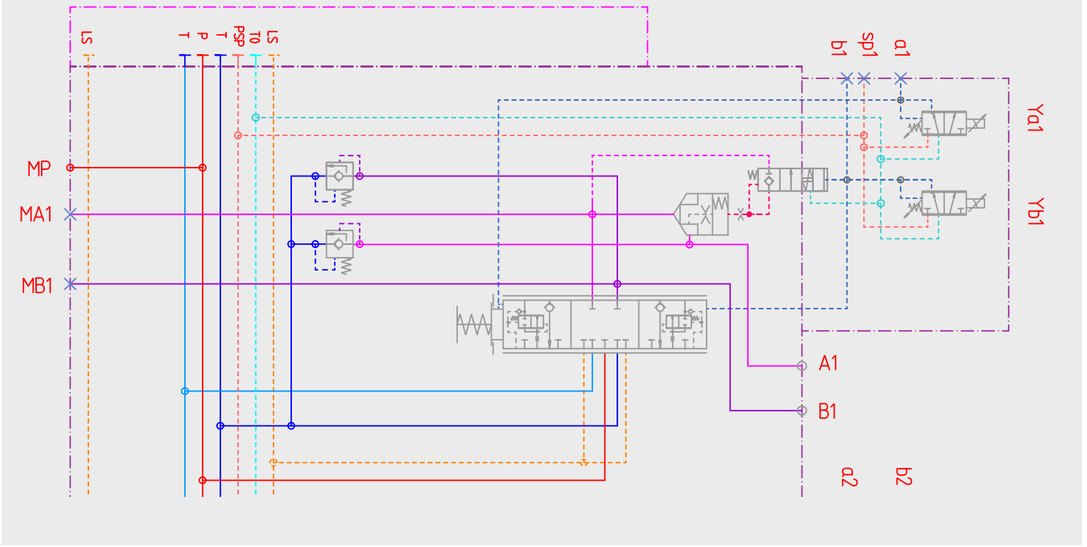
Functionality (Interactive and explained step-by-step)

1. Bucket is being closed | **2. Bucket is closed** | **3. Bucket is being opened**

3.1 The pilot valves are being controlled.
3.2 The control spool is still centered and all ports are closed.
3.3 The pilot stage of the anti-drift valve is activated.
3.4 The main stage of the anti-drift valve is being activated and lifts off the seat.
3.5 The port is connected directly with the control spool due to the open anti-drift valve.
3.6 The control spool starts again to control the flow from port to tank.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

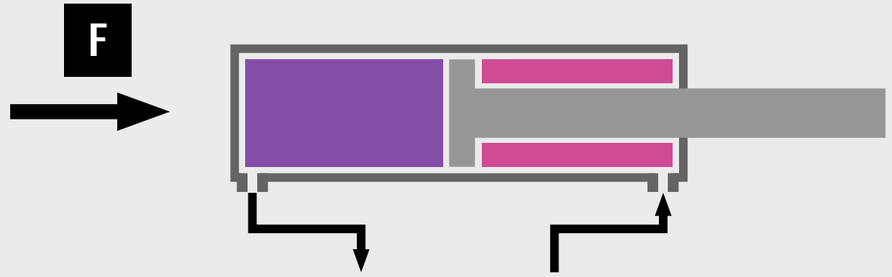
The Rod-to-head-regeneration is used for cylinder functions with high flow and high actuator speed at a simultaneously low pressure level, such as the excavator's stick.

If, for instance, in the case of an excavator the operator uses the stick for fast and light motions, the full pump flow would be required in conventional systems. If additional functions were also in use, they would inevitably be slowed down.

The rod-to-head regeneration avoids exactly this effect and eliminates the need for a high pump flow. In the example of the stick function, the return flow of the rod side gets redirected to the head side when the cylinder is being extended. Thus, the pump now only has to provide the differential flow between the rod and the head. Any additional pump flow that exceeds this quantity now has a positive effect on the moving speed of the cylinder. That way, substantially more dynamic movements are possible with simultaneously less pump effort and imbalances within the system. Once the load on the stick increases, the regeneration is switched off automatically.

Advantages

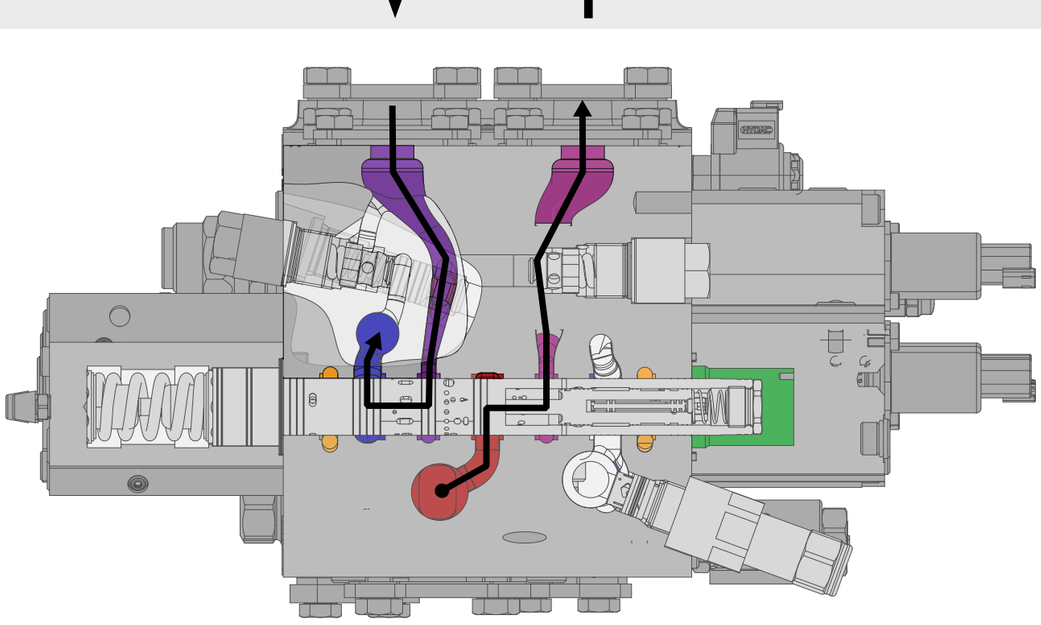
>> Higher movement speeds
>> Higher dynamic of the function and the whole application
>> Reduced pump flow required/reduced energy required
>> No cavitation at the cylinder



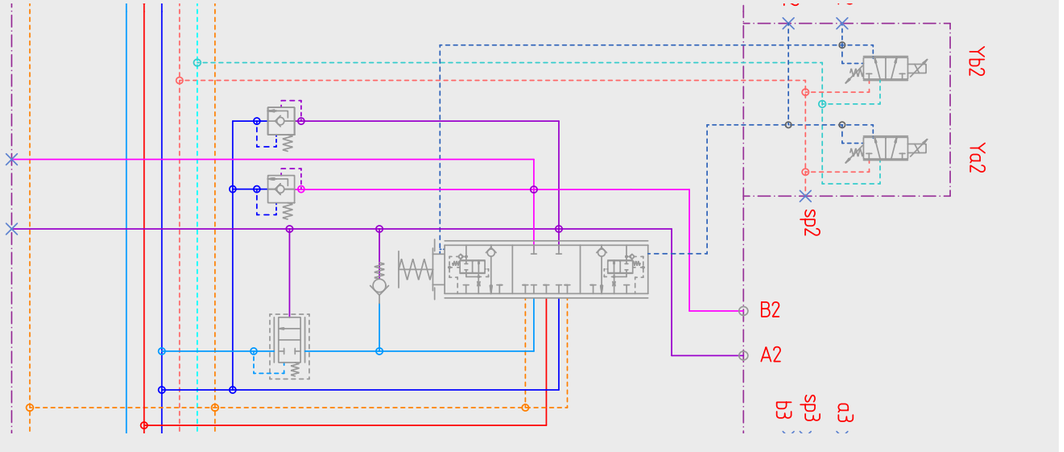
Functionality (Interactive and explained step-by-step)

1. Stick is being moved out | **2. Stick is being moved in** | **3. Stick is digging**

1.1 The control spool directs the flow from pump to rod and head to tank.
1.2 The check valve is closed.
1.3 The cylinder is being retracted.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

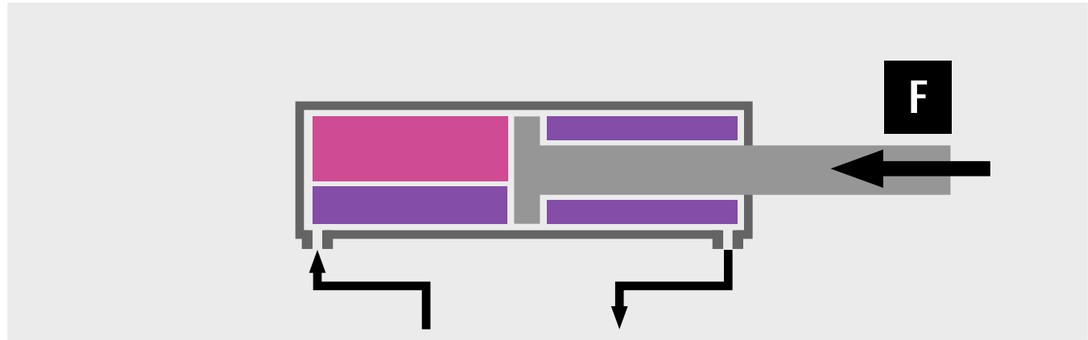
The Rod-to-head-regeneration is used for cylinder functions with high flow and high actuator speed at a simultaneously low pressure level, such as the excavator's stick.

If, for instance, in the case of an excavator the operator uses the stick for fast and light motions, the full pump flow would be required in conventional systems. If additional functions were also in use, they would inevitably be slowed down.

The rod-to-head regeneration avoids exactly this effect and eliminates the need for a high pump flow. In the example of the stick function, the return flow of the rod side gets redirected to the head side when the cylinder is being extended. Thus, the pump now only has to provide the differential flow between the rod and the head. Any additional pump flow that exceeds this quantity now has a positive effect on the moving speed of the cylinder. That way, substantially more dynamic movements are possible with simultaneously less pump effort and imbalances within the system. Once the load on the stick increases, the regeneration is switched off automatically.

Advantages

>> Higher movement speeds
>> Higher dynamic of the function and the whole application
>> Reduced pump flow required/reduced energy required
>> No cavitation at the cylinder



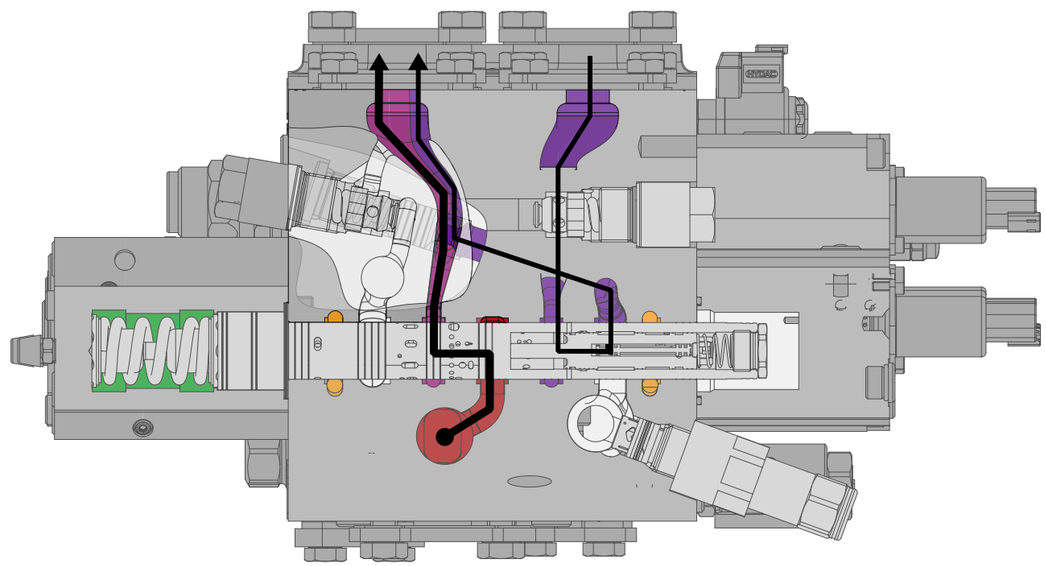
Functionality (Interactive and explained step-by-step)

1. Stick is being moved out

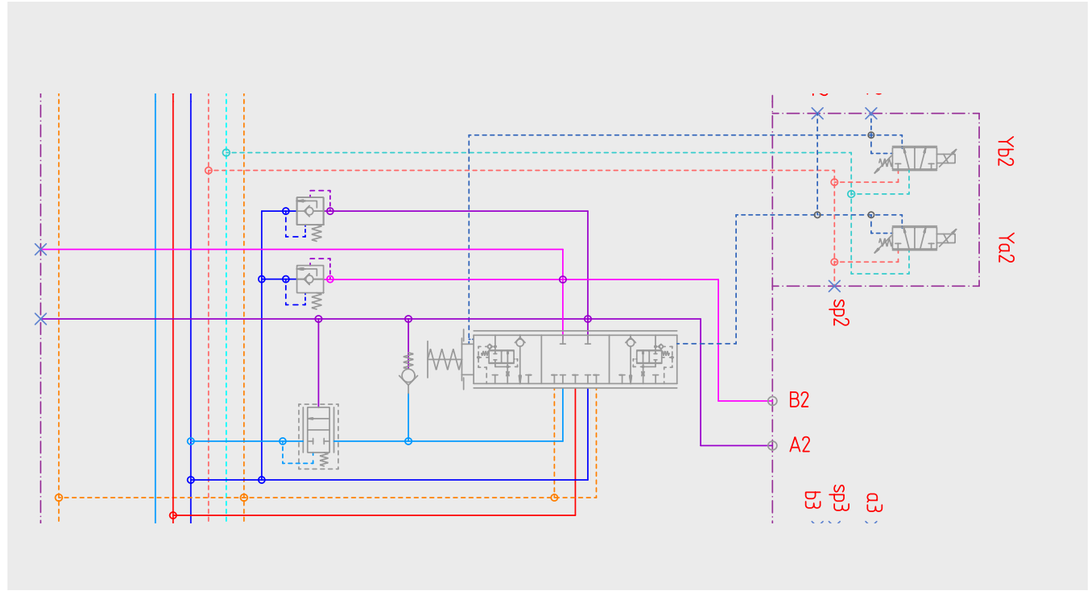
2. Stick is being moved in

3. Stick is digging

2.1 The control spool directs the flow from pump to head and rod to tank.
2.2 The return flow tank valve is closed and forces the return flow from rod over to the opposite side to the head side.
2.3 The check valve is opened.
2.4 The flow to the head is a combination of pump and return flow.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

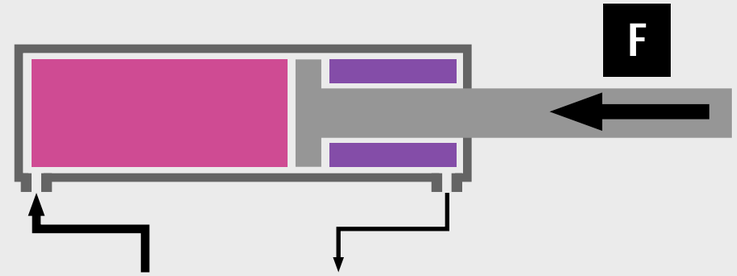
The Rod-to-head-regeneration is used for cylinder functions with high flow and high actuator speed at a simultaneously low pressure level, such as the excavator's stick.

If, for instance, in the case of an excavator the operator uses the stick for fast and light motions, the full pump flow would be required in conventional systems. If additional functions were also in use, they would inevitably be slowed down.

The rod-to-head regeneration avoids exactly this effect and eliminates the need for a high pump flow. In the example of the stick function, the return flow of the rod side gets redirected to the head side when the cylinder is being extended. Thus, the pump now only has to provide the differential flow between the rod and the head. Any additional pump flow that exceeds this quantity now has a positive effect on the moving speed of the cylinder. That way, substantially more dynamic movements are possible with simultaneously less pump effort and imbalances within the system. Once the load on the stick increases, the regeneration is switched off automatically.

Advantages

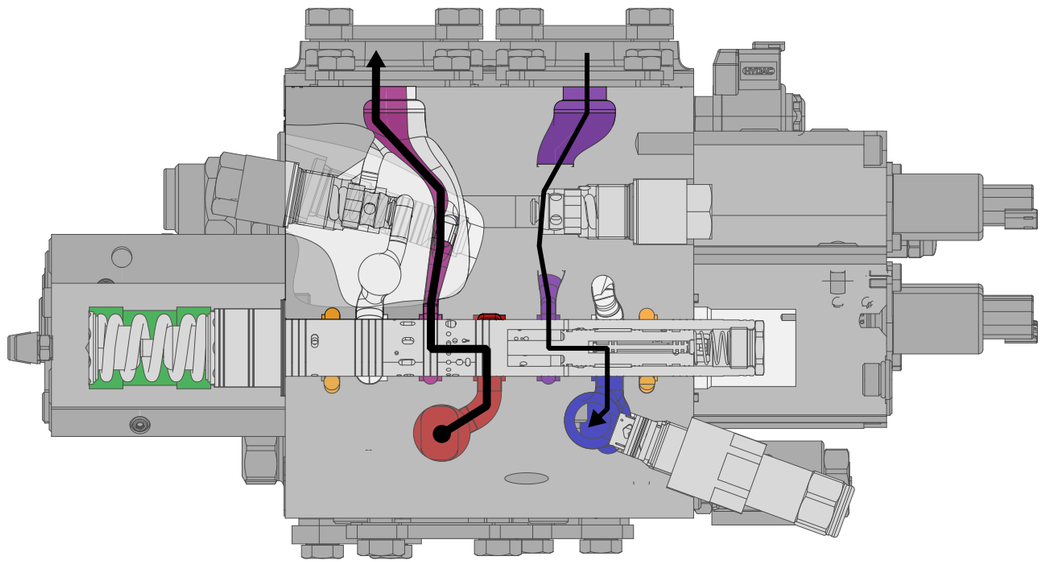
>> Higher movement speeds
>> Higher dynamic of the function and the whole application
>> Reduced pump flow required/reduced energy required
>> No cavitation at the cylinder



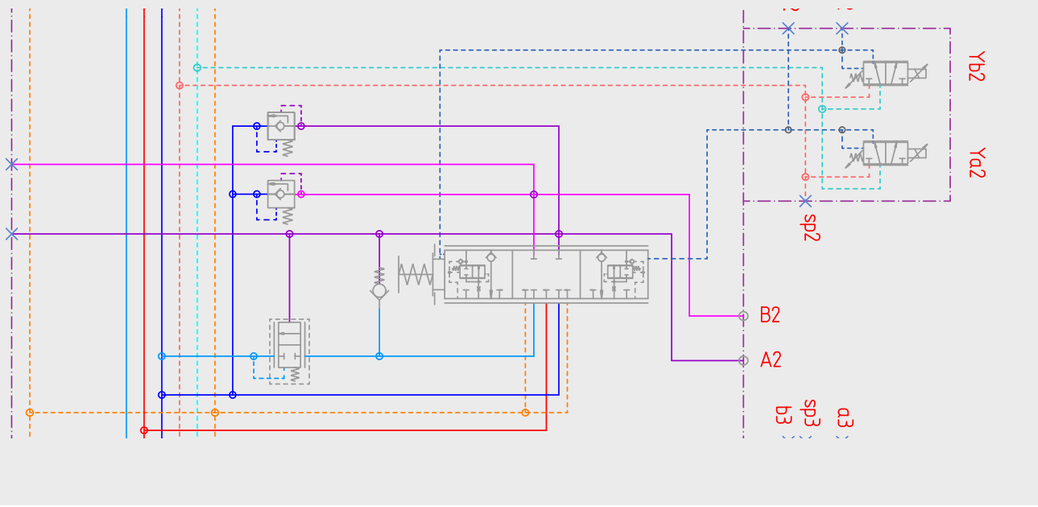
Functionality (Interactive and explained step-by-step)

1. Stick is being moved out | **2. Stick is being moved in** | **3. Stick is digging**

3.1 The control spool still directs the flow from pump to head and rod to tank.
3.2 The return flow tank valve is still closed and forces the return flow from rod over to the opposite side to the head side.
3.3 The check valve is opened.
3.4 The moment the stick is encountering an obstacle, the pressure on head side increases significantly.
3.5 The rising pressure causes opening of the return flow tank valve and let the flow pass to the tank.
3.6 The check valve is closing.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

Monoblock Functions.
Float Function.

Linde Hydraulics

The float function is mainly used in applications with excavating functions. Common examples are the lift and the bucket of a wheeled loader or the boom of an excavator.

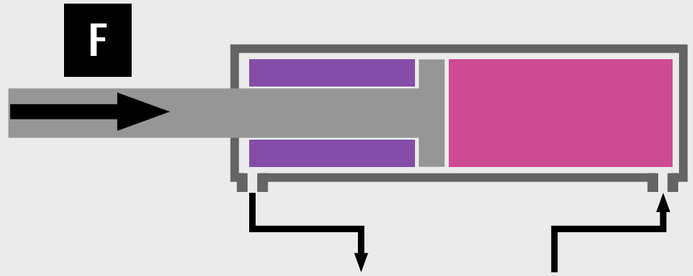
In conventional control valves, an actuator is continuously clamped in position. In this way, the function always counteracts external forces. In certain application it is desired, that a cylinder yields to external forces by enabling to be pulled out or pushed in. This is particularly important when either increased wear of the attachment on a hard surface or the damage of a sensitive surface by the attachment is to be avoided. A typical example is the unloading of bulk cargo on a ship where you would like to avoid damage to the deck.

In the context of control valves, the term «float» refers to the floating cylinder of a function that can be moved without resistance. This is achieved by connecting the head side of the cylinder conventionally by the operating “down” to tank via the spool. The lowering characteristics remains unchanged. The rod side is connected to the tank by unlocking the regeneration check valve via an external signal on the float pilot.

Following this procedure the function can be moved without significant resistance on the cylinder to ensure a smooth work flow and less wear of the the material.

Advantages

>> Smooth workflow
>> Less wear and tear
>> Less pumpflow required

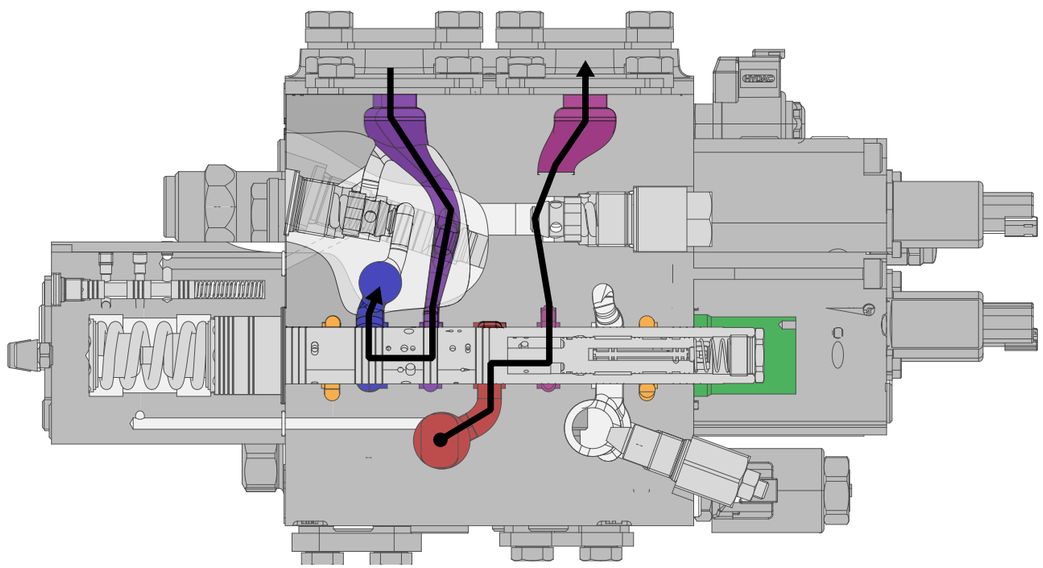


Functionality (Interactive and explained step-by-step)

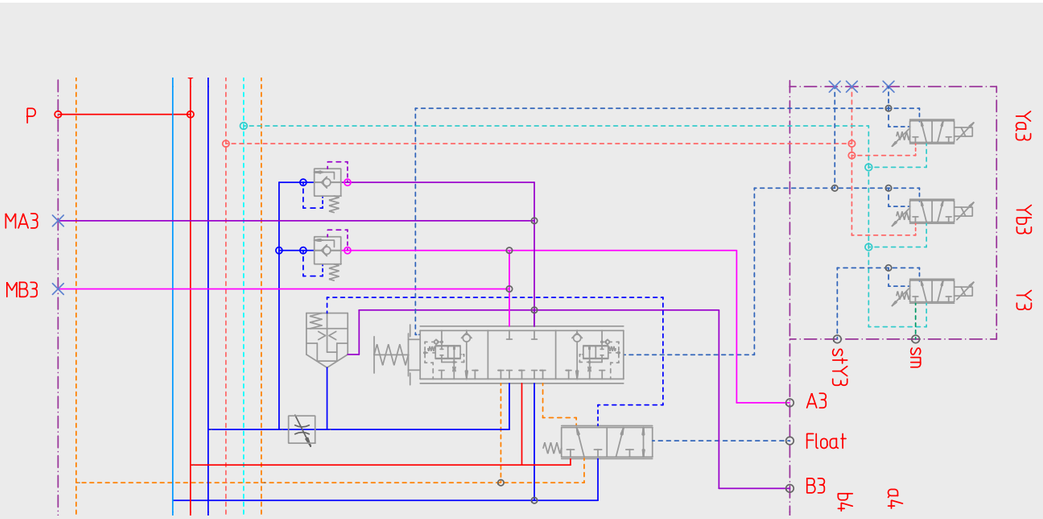
1. Bucket is being brought into position

2. Bucket is being used for clearing

1.1 The driver positions the bucket conventionally operating stick and boom.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

Monoblock Functions.
Float Function.

Linde Hydraulics

The float function is mainly used in applications with excavating functions. Common examples are the lift and the bucket of a wheeled loader or the boom of an excavator.

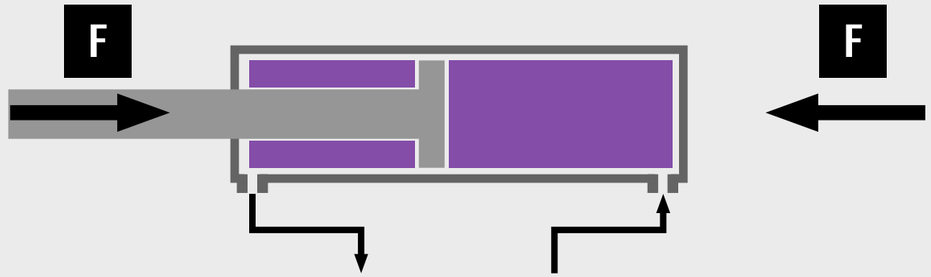
In conventional control valves, an actuator is continuously clamped in position. In this way, the function always counteracts external forces. In certain application it is desired, that a cylinder yields to external forces by enabling to be pulled out or pushed in. This is particularly important when either increased wear of the attachment on a hard surface or the damage of a sensitive surface by the attachment is to be avoided. A typical example is the unloading of bulk cargo on a ship where you would like to avoid damage to the deck.

In the context of control valves, the term «float» refers to the floating cylinder of a function that can be moved without resistance. This is achieved by connecting the head side of the cylinder conventionally by the operating “down” to tank via the spool. The lowering characteristics remains unchanged. The rod side is connected to the tank by unlocking the regeneration check valve via an external signal on the float pilot.

Following this procedure the function can be moved without significant resistance on the cylinder to ensure a smooth work flow and less wear of the the material.

Advantages

>> Smooth workflow
>> Less wear and tear
>> Less pumpflow required

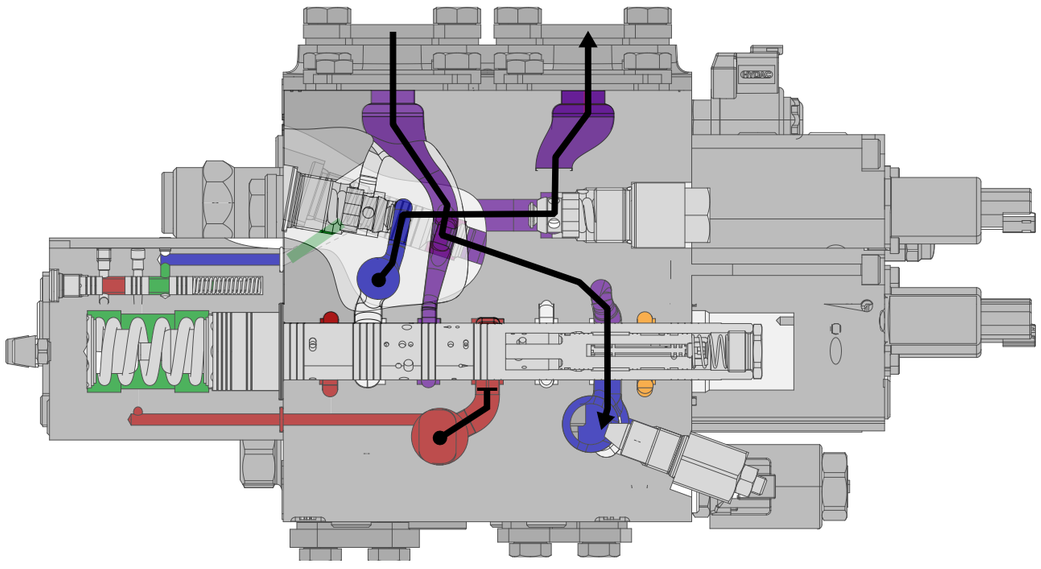


Functionality (Interactive and explained step-by-step)

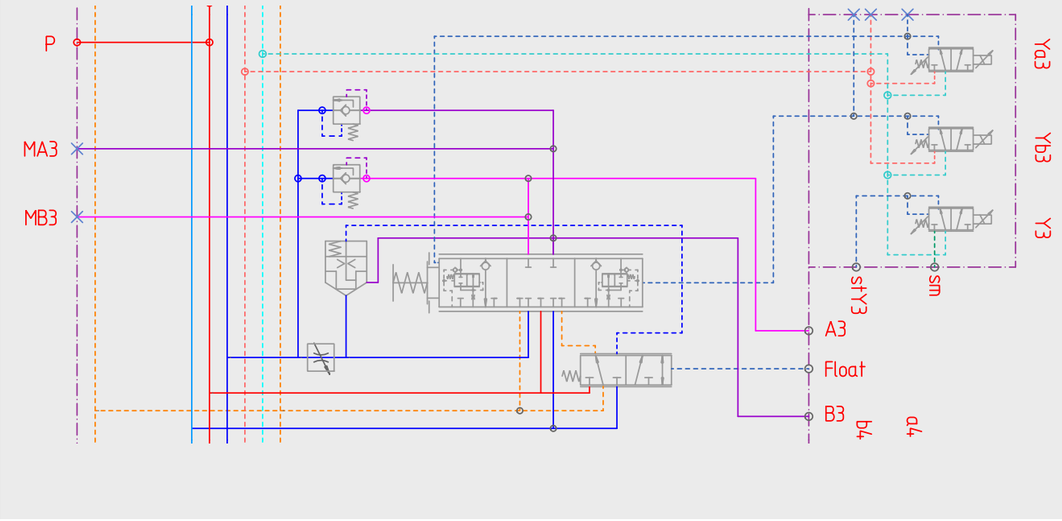
1. Bucket is being brought into position

2. Bucket is being used for clearing

2.1 Bucket is in position (behind bulk material).
2.2 Floating is activated by «Boom down» and «Float on» resulting in the attachement resting on the ground with its own weight.
2.3 Both work ports of the boom cylinder are connected to tank.
2.3 «Stick in» is piloted. The tip of the bucket moves towards the excavator driven by the stick cylinder and the boom cylinder freely follows the kinematic movement.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

Monoblock Functions.
Symmetrical section with return flow tank bypass.

Linde Hydraulics

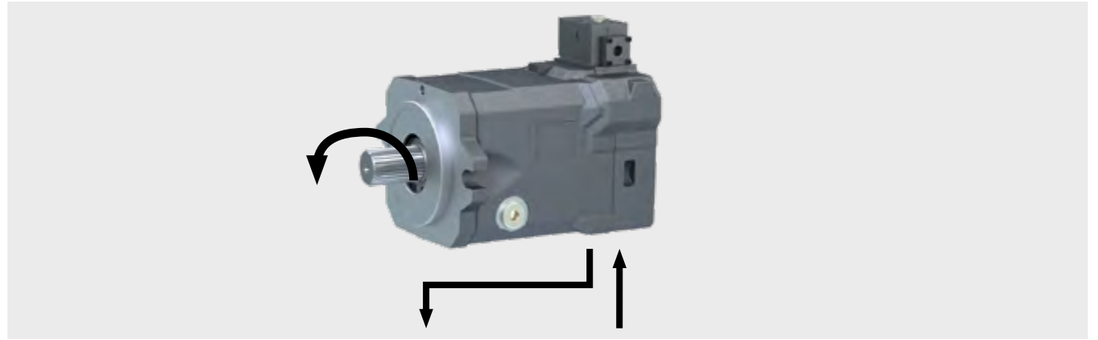
Symmetrical sections with return flow tank bypass are used when functions have the same characteristics in both directions and require high flows. An example of this are open-circuit travel drives for wheeled loaders or excavators.

In conventional control valves, the entire flow (consisting of the flow coming from the pump and the return flow to the tank) of a function has to pass through the control spool. In this way, a function can be controlled extremely sensitively and precisely in two directions. Although this fulfills a desired characteristic for many functions, it can have disadvantages for functions with high flow rates over a longer period of time. This becomes clear in the context of open-circuit travel drives. Particularly during longer runs or traveling at high speed, the high flow generates a back pressure upstream of the spool and thus a high power loss.

Since the spool does not perform any significant control function in the return flow of travel drives, the return flow tank bypass from Linde Hydraulics partially redirects the flow unhindered to the tank. This prevents back pressure upstream of the spool and significantly reduces power losses. This function is implemented via already known make-up valves. Depending on the prevailing pressure conditions, an additional pilot pin opens the make-up valve on the respective side. Based on this operating principle, this function is equally effective in both directions of travel. In order to ensure optimal use of this function, the tank pressure can also be reduced via the tank preload valve during steady-state traveling.

Advantages

>> Significantly reduced fuel consumption - especially during longer driving cycles at high speeds
>> Higher speeds possible
>> Significantly less power losses

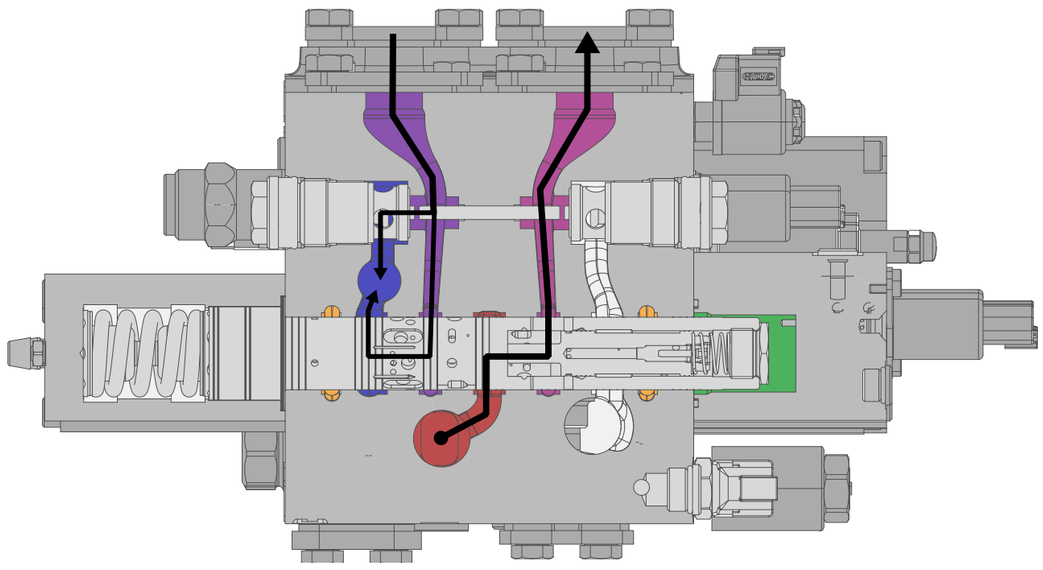


Functionality (Interactive and explained step-by-step)

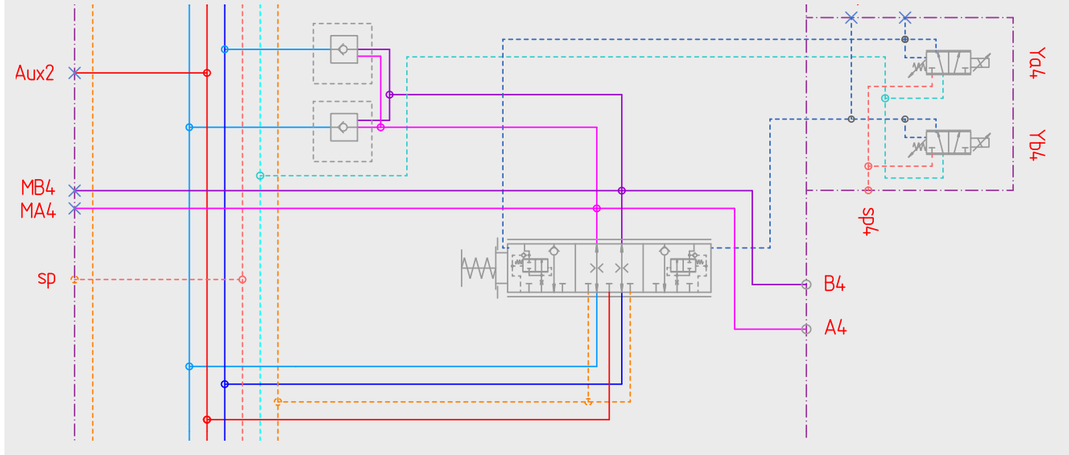
1. Traveling forward

2. Reversing

1.1 The pilot valves are being controlled.
1.2 The control spool directs the pump flow to port A and the return flow from port B to the the tank.
1.3 The pressure at port A increases significantly.
1.4 The pilot pin is being forced by the difference pressure to side B and opens the make-up valve.
1.5 The return flow passes by the control spool.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

Monoblock Functions.
Symmetrical section with return flow tank bypass.

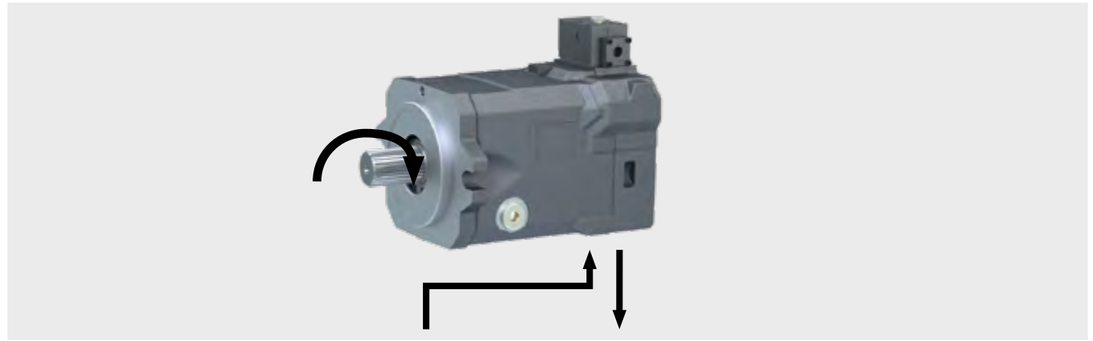
Symmetrical sections with return flow tank bypass are used when functions have the same characteristics in both directions and require high flows. An example of this are open-circuit travel drives for wheeled loaders or excavators.

In conventional control valves, the entire flow (consisting of the flow coming from the pump and the return flow to the tank) of a function has to pass through the control spool. In this way, a function can be controlled extremely sensitively and precisely in two directions. Although this fulfills a desired characteristic for many functions, it can have disadvantages for functions with high flow rates over a longer period of time. This becomes clear in the context of open-circuit travel drives. Particularly during longer runs or traveling at high speed, the high flow generates a back pressure upstream of the spool and thus a high power loss.

Since the spool does not perform any significant control function in the return flow of travel drives, the return flow tank bypass from Linde Hydraulics partially redirects the flow unhindered to the tank. This prevents back pressure upstream of the spool and significantly reduces power losses. This function is implemented via already known make-up valves. Depending on the prevailing pressure conditions, an additional pilot pin opens the make-up valve on the respective side. Based on this operating principle, this function is equally effective in both directions of travel. In order to ensure optimal use of this function, the tank pressure can also be reduced via the tank preload valve during steady-state traveling.

Advantages

>> Significantly reduced fuel consumption - especially during longer driving cycles at high speeds
>> Higher speeds possible
>> Significantly less power losses

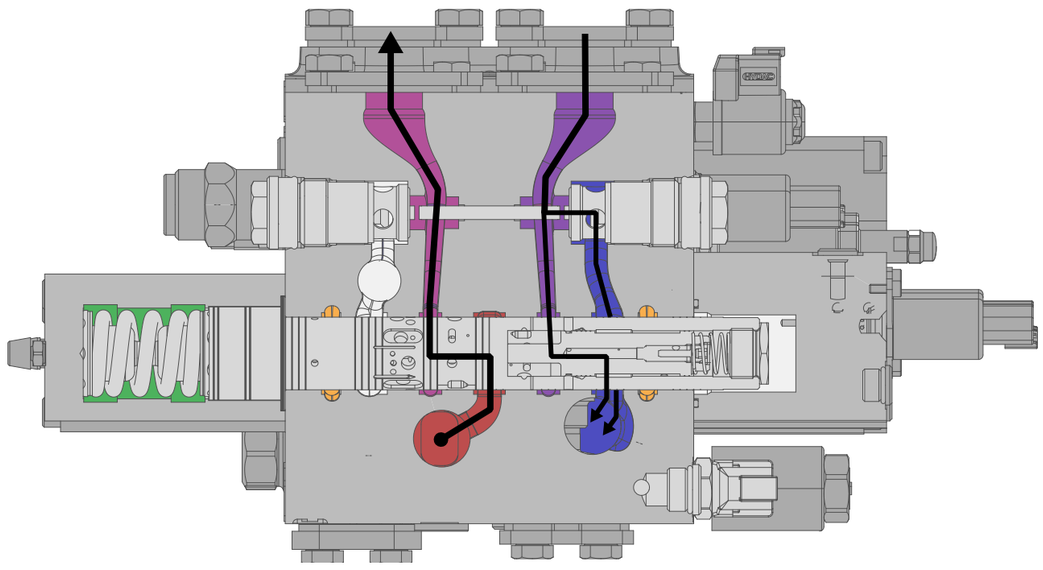


Functionality (Interactive and explained step-by-step)

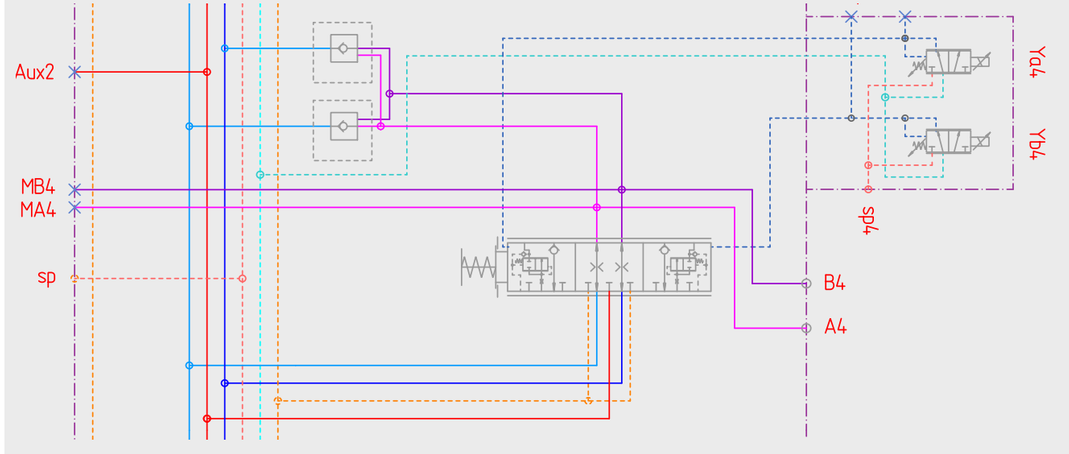
1. Traveling forward

2. Reversing

2.1 The pilot valves are being controlled.
2.2 The control spool directs the pump flow to port B and the return flow from port A to the the tank.
2.3 The pressure at port B increases significantly.
2.4 The pilot pin is being forced by the difference pressure to side A and opens the make-up valve.
2.5 The return flow passes by the control spool.



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

Monoblock Functions.
LS-Cut-Off | LS-Bleed | Primary pressure relief valve.

Linde Hydraulics

In order to achieve the highest possible demand-based and thus efficient control of functions, it is absolutely essential for control valves to respond as dynamically as possible to the operating status of the system and thus to manage the interaction between the requirements of the respective function and the output to be provided by the pump.

The challenges involved in this task include the possible variety of different functional characteristics, the effect of external forces and a wide range of oil temperature. Should, for example, the relevant pressure or flow be too low, a function cannot be performed or can only be performed insufficiently; if the pressure or flow is set too high, this will result in power loss or even failure of the function.

Load Sense Cut-off

This valve limits the maximum requested working pressure of the pump. Due to its position in the load sense line, it limits the maximum pressure by releasing pressure to the tank. It is available in a single- and two-stage (350 bar and 300/350 bar), as well as in a proportionally controllable versions (0-350 bar).

Based on the function of a hammer, for example, a proportionally controlled LS cut-off can be used to set the maximum load sense pressure of 200 bar system-wide in order to meet the requirements of the hammer with a reduced pressure level. After this function has been used, the LS pressure can be raised again to meet the requirements of the other functions.

Load Sense Bleed

In addition to limiting the highest possible load sense pressure, it is also obligatory for demand-oriented operation that the prevailing pressure in the LS line always corresponds to the real required pressure. If the previously high pressure is not reduced in a defined manner, the LS line of the pump will reflect an «outdated» signal that generally tends to be higher. The pump then performs accordingly more than neccessary - until the real pressure is reached again. In conventional systems, this delay can take up to a few minutes, especially during the warm-up period with high viscosity hydraulic oil. This effect is particularly noticeable after performing functions with very high pressure requirements.

In order to counteract this effect, the VW22/18 M5-03 is equipped with a 2-way flow control valve. It reduces the LS pressure over a constant small flow. In this way, the pressure in the load sensing line matches the actually required pressure in a highly dynamic manner and the pump only provides the actually required output.

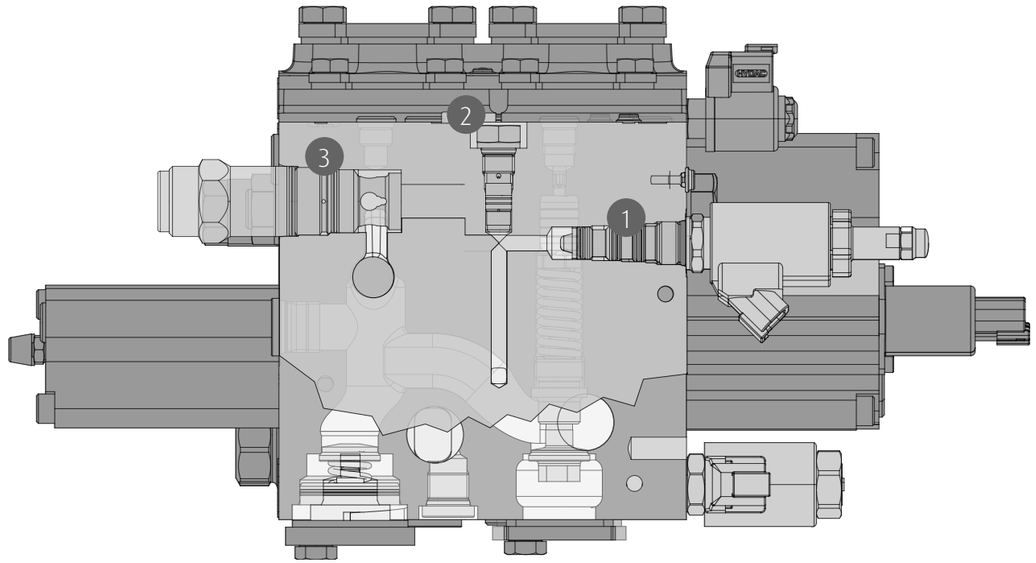
Primary Pressure Relief

Once the pump pressure has been defined and limited via load sensing, the pressure provided by the pump must also be limited and the system protected against pressure peaks. For this reason, the primary pressure relief valve is located in the flow from the pump to control valve - this reliably limits the maximum pressure in this section in the event of pump malfunction or external influences and protects the system from damage. When the permissible maximum pressure is exceeded, this valve opens and releases the pressure to the tank until the pressure falls below the maximum pressure again.

Advantages (LS cut-off/LS-Bleed/Pr. Pressure rel.)

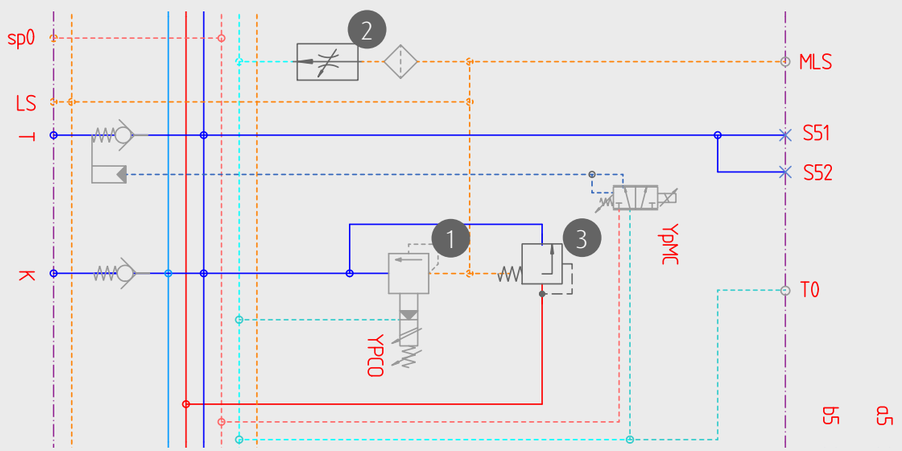
>> Less energy/fuel consumption
>> Less power losses
>> Less noise emissions (pump)
>> Lower noise emissions due to high idle speed
(if LS signal is used for diesel control)
>> Reliable protection against damage due to overpressure
>> Less wear of the equipment due to an appropriate pressure level

Components



1. Load Sense Cut-off (LS cut-off)
2. Load Sense Bleed valve
3. Primary pressure relief valve

Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing



VW 22/18 M5-03.

The combination of tank and cooler check valve consists of two independent valves which perform common tasks in interaction with each other. Located in the return flow, their scope of functions comprises 2 areas:

>> Splitting of the return flow to the tank and cooler in accordance with the actual operating condition.
>> Control of the tank preload, tailored to the respective operating condition.

In conventional control valves, this is often realized as external module, whereas in the VW22/18 M5-03 it is integrated space-savingly in the lower area of the pressure relief section.

Tank check valve

The tank check valve directs part of the return flow directly to the return filter and tank. It is available either as a check valve (9 bar opening pressure) or as a controllable check valve (from 9 to 5 bar opening pressure).

During the warm-up period, the hydraulic oil should circulate within the system without being cooled as far as possible until it reaches the optimum operating temperature and viscosity in order to ensure that all functions are available with their required responsivness. The tank check valve, which can be controlled down, performs the thermostat function here. At the beginning of the warm-up period, it supports the return flow mainly going directly to the tank due to its low opening pressure of 5 bar. When the operating temperature has been reached, the opening pressure is raised towards 9 bar again. The increased back pressure now supports the flow through the cooler (which in turn only requires an opening pressure of 5 bar).

In the case of functions with a permanently high return flow, it is imperative for the most efficient operation that the return flow is routed to the tank as unhindered as possible (see also «Symmetrical section with return flow tank bypass»). Since an oil cooler represents a higher resistance in the oil flow due to its inherent principle - the aim in this operating status is also to route the return flow primarily to bypass the cooler. In the case of a travel drive, the tank check valve is modulated down accordingly during steady-state travel. During deceleration, the opening pressure is modulated up again. This procedure enables a significant reduction of flow losses.

In contrast to the above-mentioned operating modes, the remaining operating modes primarily aim to achieve the best possible tank preload in order to ensure cavitation-free valve functions.

Cooler check valve

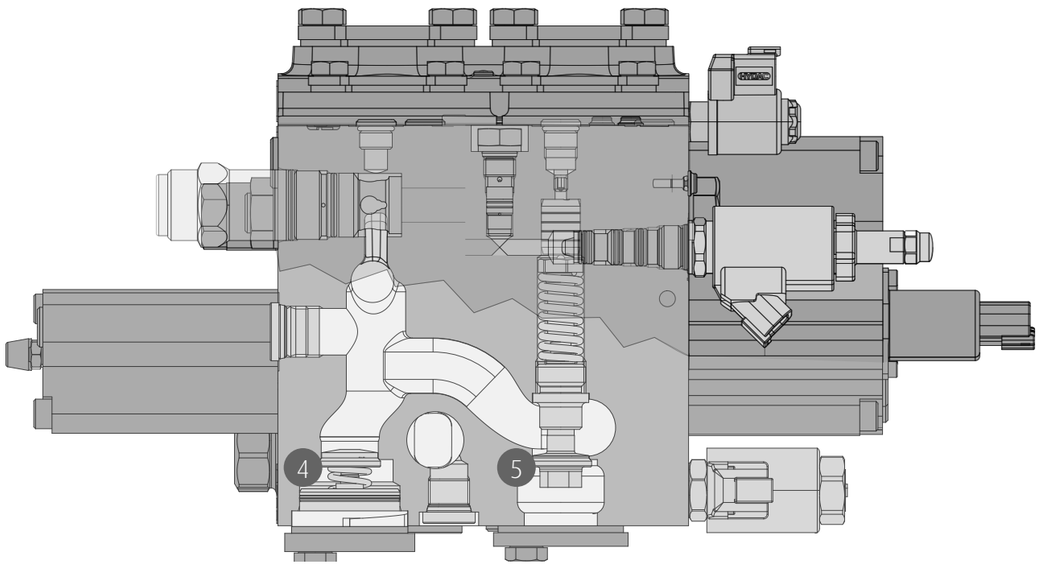
The cooler check valve directs part of the return flow to the cooler, from where it is then cooled before it reaches the tank. It is designed as a check valve (5 bar opening pressure). While this valve preloads the cooler with a fixed value, the rate of flow from the return is mainly influenced by the setting of the tank check valve. Since this counterpart of the cooler check valve is predominantly opened with a higher pressure, it also predominantly favors a higher rate of the return flow being directed through the cooler.

Advantages (Tank/Cooler check valve)

>> Shortened warm-up period due to thermostatic function
>> Less power losses due to low back pressure
>> No additional components due to integrated check valves

Components

4 Cooler check valve
5 Tank check valve



Signalization	Flow
●	Pump >> Control spool
●	Control spool >> Function
●	Function >> Control spool
●	Control spool >> Tank
●	Control pressure
●	Load Sensing