



Vehicle Hydraulic PTO's and Systems



POWERED BY HYDRAULICS

About This Guide

Thanks for downloading this guide. The main idea of this guide is to offer you more information about hydraulic power take-offs and things that they enable. In other words, this guide includes information about hydraulic systems as well. You can find answers to the most common questions about hydraulic PTOs and hydraulic systems that we have confronted in the last 30 years. The topics of this guide are important to know when you are considering purchasing the hydraulic system to your vehicle.

Firstly, we talk a little about what are the strengths of hydraulics and the benefits of hydraulic equipment. Then we talk about the things you should know when you are considering buying a hydraulic system.

Then we dive deeper into the world of hydraulics. The guide covers the vehicle PTOs and hydraulic systems. The hydraulic system is explained component by component.

Lastly, the guide helps to take the next step towards the possibilities of hydraulic equipment.

Welcome aboard!

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Why Hydraulics?

You have probably read our blog post about hydraulic PTO's. The post can be found on our website by [clicking this link](#). After reading that, you know what is a hydraulic power take-off. The hydraulics is a reliable, flexible, and handy way to transfer a lot of power. The hydraulic power is easy to transfer any place in the vehicle via flexible piping. That's why hydraulics has been in use for a long time in machinery like in excavators. In the case of vehicles, you can use the engine of the vehicle for powering up pieces of equipment. In other words, you can get more out of your vehicle.

For example, a van that is equipped with hydraulic equipment can benefit the users of it in many ways. Like in the picture below, the van can be equipped with multiple pieces of hydraulic equipment. This van has a hydraulic compressor and hydraulic generator. Therefore, the user of the van is self-sufficient in compressed air and electricity. In daily usage, the user will save money and time because the user does not need to waste time searching for electricity sockets on site. Likewise, with a compressor, you can use pneumatic tools wherever you are. The hydraulic equipment is always where your vehicle is.

You can see a DYNASET HK Hydraulic Piston Compressor (A) on the left side and DYNASET HG Hydraulic Generator (B) on the right side of the load space. Also, the hydraulic oil reservoir (C), hydraulic oil cooler (D), and DYNASET HMW Hydraulic Modular Valve System (E) can be spotted from this picture.



The Benefits of the Hydraulic Equipment

The pieces of hydraulic equipment are often significantly smaller than the other technologies. That's because they are powered by the hydraulic system. This makes them great for onboard installations because they will not take much space.

For example, the hydraulic generator can be up to 95 percent smaller than the equivalent diesel generator. That is because hydraulic generator does not have its own engine like diesel generators have. The hydraulic generator produces electricity by using the hydraulic power that is created by the carrier vehicle's engine via hydraulic pump. This hydraulic power production is explained later in this guide. In environmentally vice, this means that there is no extra combustion engine tied to the generator. At the same time, the carrier vehicle becomes more versatile.

Another good example of hydraulic equipment is the hydraulic power washer. An approximately brick-sized pump provides enough water pressure and flow for basic power washing applications. Even sandblasting and water cutting are possible applications for with DYNASET HPW Hydraulic Power Washers.

▼ Power washing with a DYNASET HPW Hydraulic Power Washer. The power washer is installed to a tank truck.



Another important difference to traditional options is cooling. The hydraulic equipment can be cooled with the hydraulic oil more or less. Hydraulic screw compressors for example can be cooled 100 % via hydraulic oil. That is because the hydraulic oil is cooled in the system's hydraulic oil cooler. In the case of generators, the cooling ability of the hydraulic oil makes it possible to install into tight places because the overheating problem is solved with hydraulic oil flow. A hydraulic generator needs much less air space than traditional generators. It means that the generator itself won't take that much space in the vehicle.



The cooling effect of the hydraulic oil makes the pieces of hydraulic equipment great for in-vehicle installations. In this van, you can spot DYNASET HKR Hydraulic Screw Compressor (A) on the left side and DYNASET HWG Hydraulic Welding Generator (B) on the right side under the shelf. As you can see, these pieces of hydraulic equipment take very little space from the load-space.

The world has also many kinds of hydraulic tools available. Hydraulic tools are basically hand tools that use hydraulic power as their power source. The markets have hydraulic grinders, saws, hydraulic breakers, and many other reliable hydraulic tools available.

Did You Know?

Multiple pieces of hydraulic equipment make the vehicle more versatile.

What Do You Need To Consider?

You just have to describe what you have planned to do with your vehicle. The designers of the hydraulic system can that way choose the needed components and types of these components, and calculate the required hydraulic power and other attributes. It means that each hydraulic system is tailored to meet your needs. This makes sure that you get the system of your needs.

The Concept of PTO

A power take-off or PTO is a way to deliver the mechanical power of the engine for external usage. For example, in the back of a farm tractor, this can be seen as a rotating axle. This rotation gets its power from the tractor's engine.

The hydraulic power take-off means that this mechanical power is transformed into liquid power aka hydraulic power.

So, the power take-off is connected to a hydraulic pump that creates hydraulic oil flow and pressure. There are many types of PTOs. However, the most common ones in vehicles are belt-drive PTO and transmission PTO.

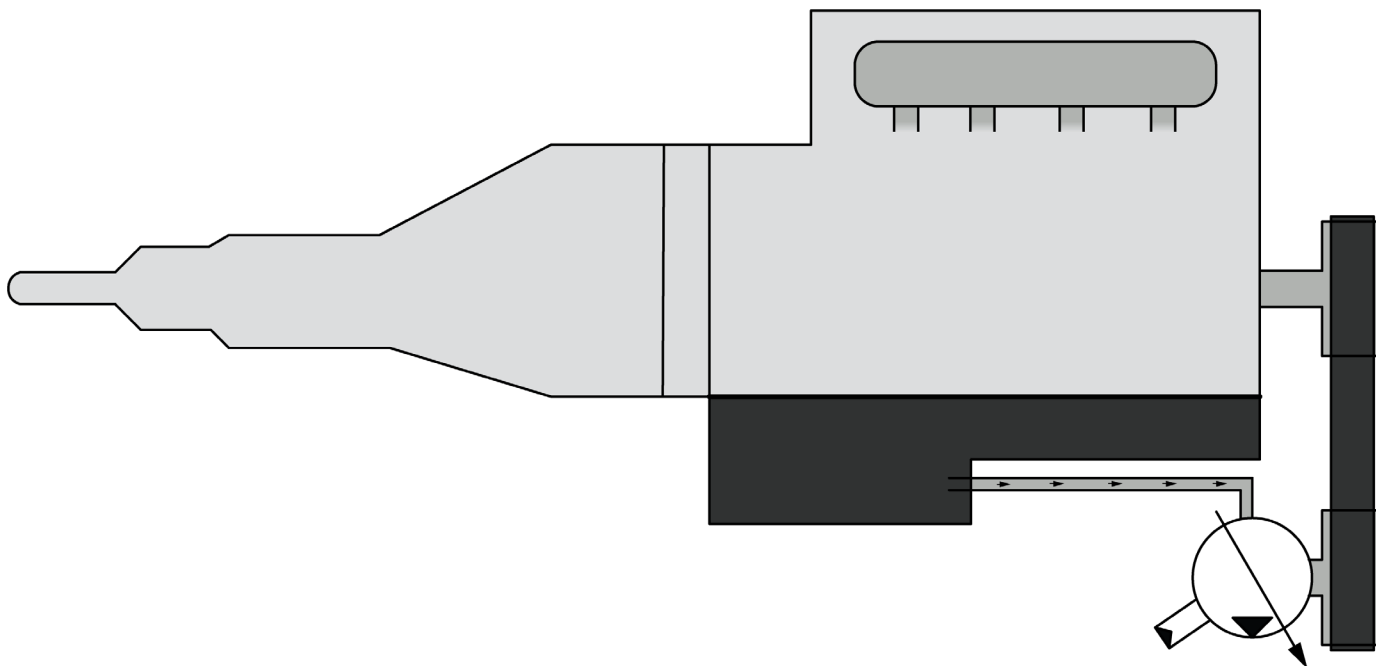
Did You Know?

The hydraulic system can be installed to any vehicle varying from small mowers to huge dumper trucks. We know a case where even a moped car had a hydraulic system.



Belt-Drive PTO

The belt-drive hydraulic PTO means that the power of the engine is taken via a belt from the crankshaft. In the picture, you can see the belt wheel of the crankshaft on the right side of the picture and the hydraulic pump below the engine. Vehicles' need some programming that makes the usage of PTO possible and DYNASET personel can do this for you.



▲ Picture of a belt-drive PTO that is connected to a hydraulic pump.

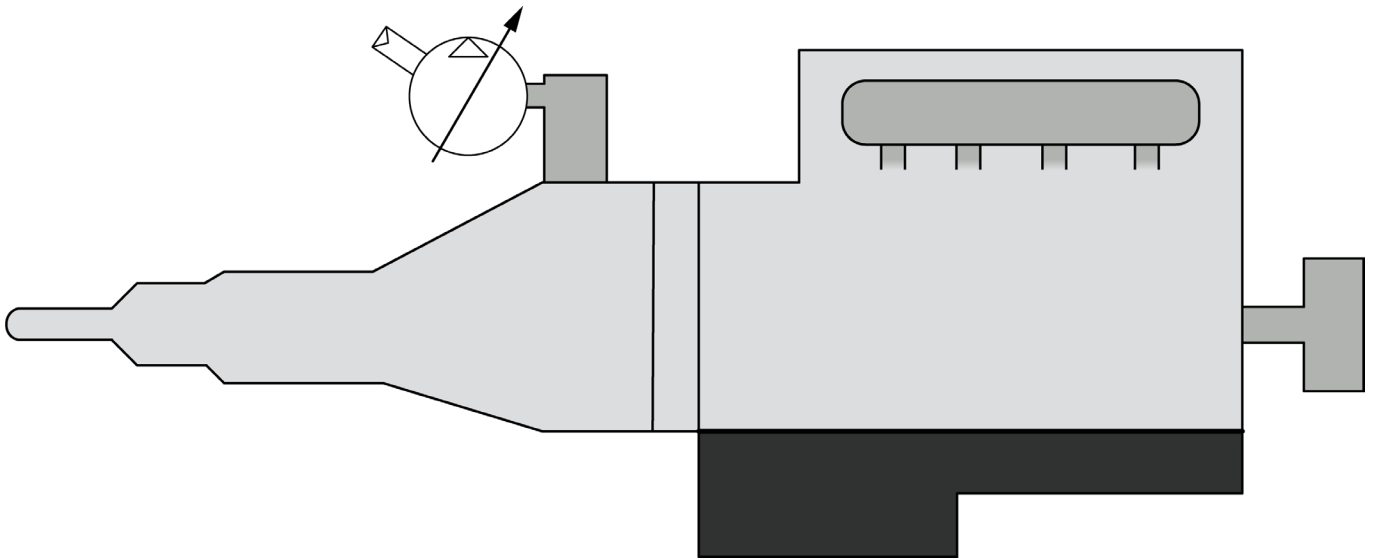
The strength of belt-drive PTO is that it can be used during the driving if it is equipped with a variable displacement hydraulic pump. The pump types are explained more accurately later in this guide. Because of that, it is suitable for climate-controlled transports for example. Another example of applications of this type of PTO is a road marking vehicle which uses hydraulic power during driving for painting. This type of PTO can be installed basically to any vehicle.

Did You Know?

The belt-drive PTO can be installed basically to any vehicle.

Transmission PTO

Another option is the transmission PTO. The possibility of this type of PTO is often presented in the list of accessories when you are buying a new vehicle. Also, the vehicle needs programming which makes the PTO usage possible. This can also be found from the list of accessories. We highly recommend choosing these accessories if your new vehicle is going to have a hydraulic system.



▲ Picture of a transmission PTO that is connected to a hydraulic pump.

The transmission PTO means that the vehicle itself has a PTO option on the gearbox. The transmission PTO and hydraulic pump is connected to the gearbox in the picture above. So, the PTO is installed to a SAE or DIN-type attaching point that is on the gearbox. The hydraulic pump uses it as a source of mechanical power. This kind of PTO cannot be used during driving so the vehicle needs to be stationary when the PTO is on. When this type of PTO is turned on, the gearbox directs the power to the PTO and hydraulic pump.

As a sum up, the hydraulic PTO is a combination of hydraulic pump and PTO. Further, the PTO is a kind of starting point of a hydraulic system because the hydraulic pump transforms the mechanical power into liquid power.

Let's dive a little deeper into the hydraulic system.

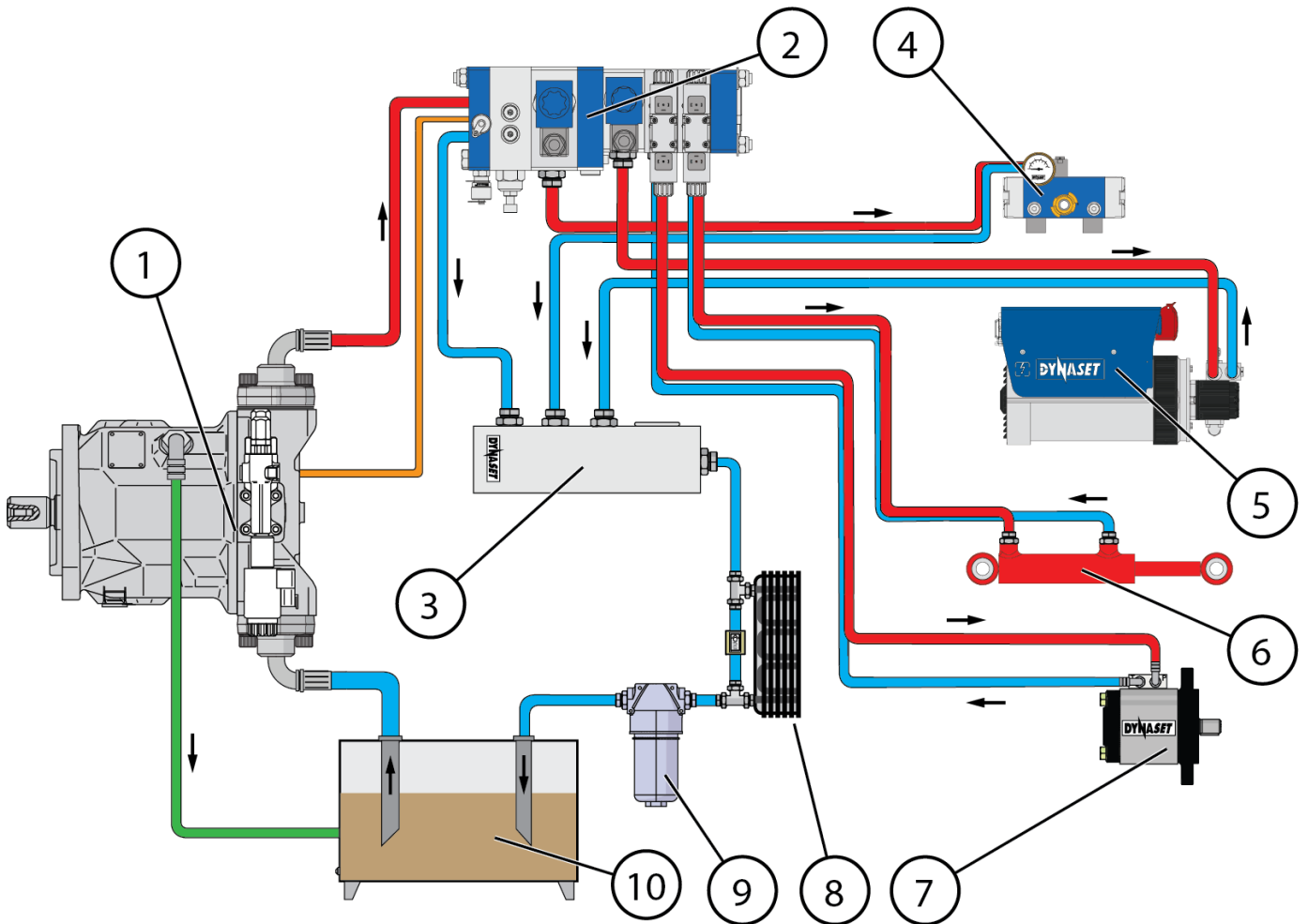
Did You Know?

Most of the new vans and trucks can be equipped with the option of a transmission PTO in the factory. Check the accessories list of the vehicle model carefully.

Hydraulic System

One kind of hydraulic system can be seen in the picture below. There are two types of hydraulic systems which are open circuit hydraulic system and closed circuit hydraulic system. The system in the picture is an open circuit hydraulic system. This guide won't cover closed circuit systems because the open circuit systems are more common in vehicle installations. The pump (no. 1) is one of the five main components of the hydraulic system. The other main components are piping (colored lines), hydraulic equipment (no. 4, 5, & 7) hydraulic oil cooler (no. 8), and hydraulic oil reservoir (no. 10). The other numbered parts are explained later in this guide.

- 1. Hydraulic Pump
- 2. Valves
- 3. Tank block
- 4. Hydraulic Power Washer (Piece of Hydraulic Equipment)
- 5. Hydraulic Generator (Piece of Hydraulic Equipment)
- 6. Hydraulic Cylinder (Hydraulic Tool)
- 7. Any Piece of Hydraulic Equipment
- 8. Hydraulic Oil Cooler
- 9. Hydraulic Oil Filter
- 10. Hydraulic Oil Reservoir

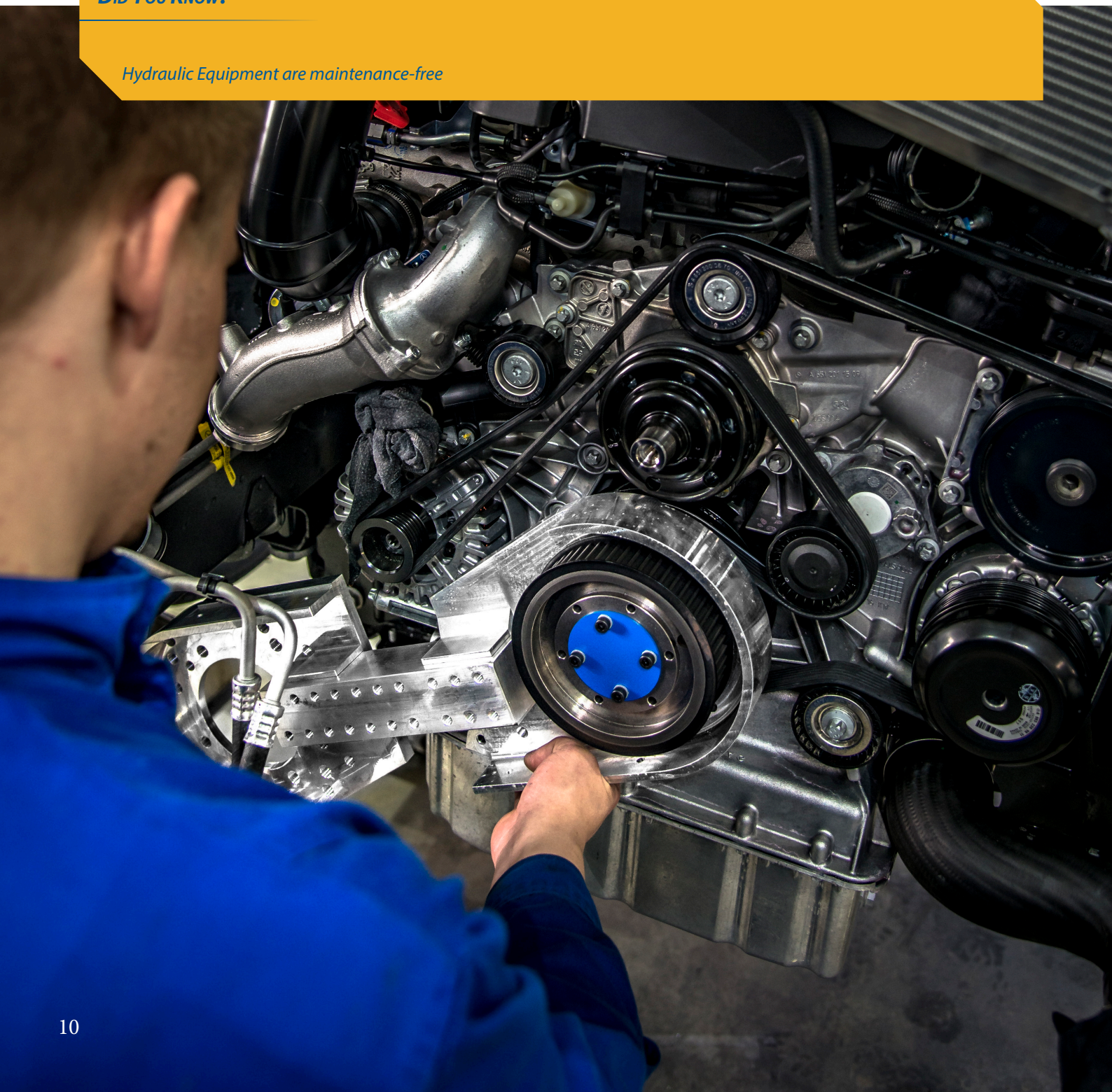


The piping is used for the hydraulic oil transfer. The piping includes two main lines, which are called a pressure line (red line) and tank line (blue line). The pressure line is the line where the pressurized hydraulic oil flows. The tank line is the way that the hydraulic oil gets back to the pump. There are also two more lines in the picture, orange and green ones, but we cover them later in this guide.

As you can see, the hydraulic system doesn't have starting nor ending point. On the other hand, the hydraulic pump creates the hydraulic power and that is why we start from there.

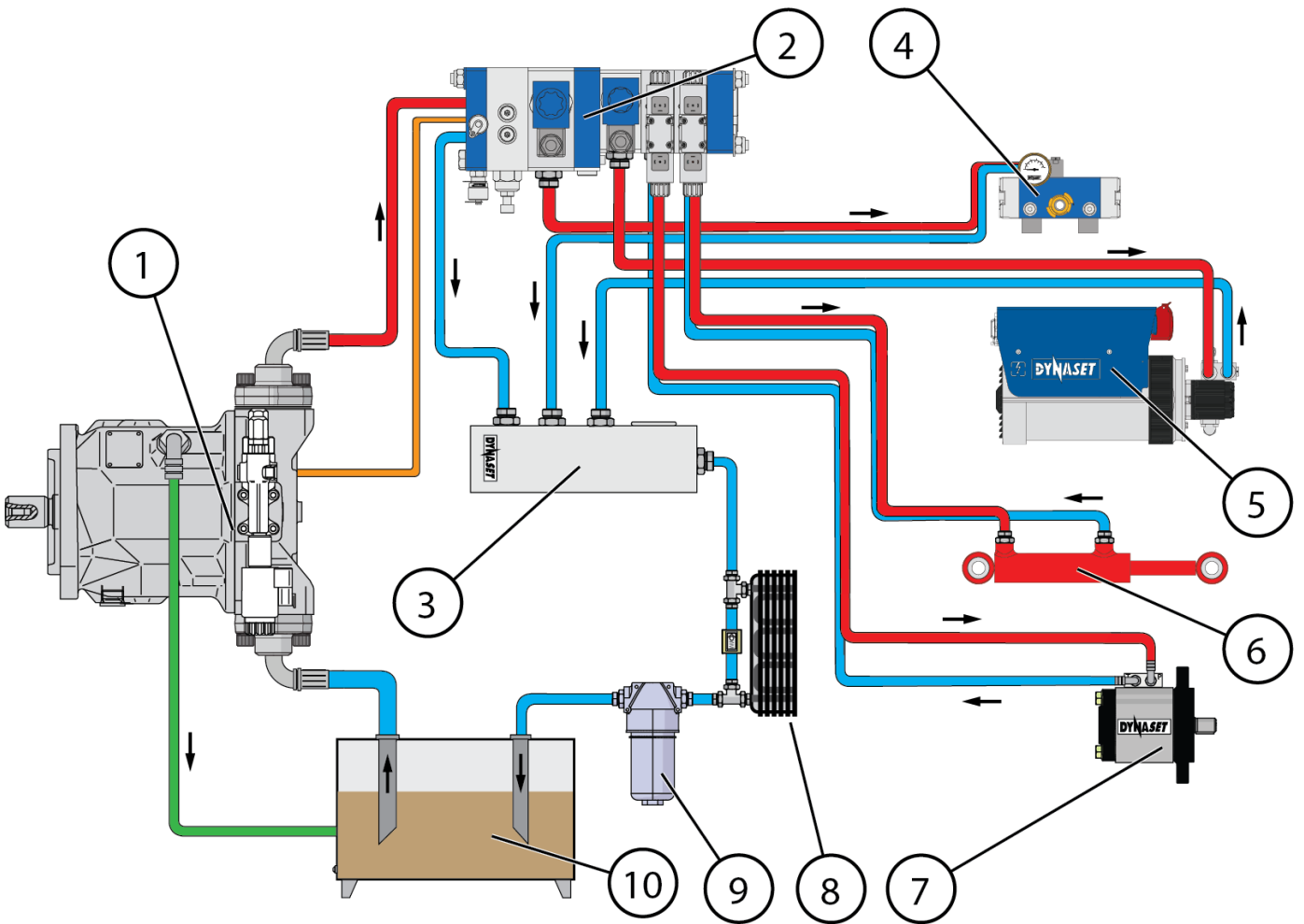
Did You Know?

Hydraulic Equipment are maintenance-free



Hydraulic Pumps

There are two types of pumps: fixed displacement and variable displacement pumps. These pump types have their own characteristics. Fixed displacement pumps create a fixed amount of oil flow per revolution. In the case of variable displacement pumps, the amount of the oil flow per revolution can be adjusted considering the hydraulic oil flow demand of the system. The adjustment is done with a pump's load-sensing valve which senses the load of the hydraulic system. The line of this valve is illustrated in the orange-colored line in the picture. The pumps have also a drain line that is drawn in green. This line is mainly for the lubrication of the pump.



The right pump type is chosen by the type of usage. As a rule of thumb, we might say that the variable displacement pump is better in the cases where the vehicle has more than one piece of hydraulic equipment. This type of hydraulic pumps can be used during driving. The fixed displacement pump is cheaper option and possible solution when the vehicle has only one piece of hydraulic equipment.

There are also many different pump models but the function of them considering the hydraulic system is the same. The pump model that is used in the most of the vehicle installations is a piston pump. The internet has many good videos if you want to dig deeper the operating principle of piston pumps. Knowing the idea of the hydraulic pumps is in this case more important than the structure of the pump itself so we don't cover that in this guide.

In the case of vehicles, the high RPM of the vehicle's engine could be a problem for hydraulic pumps. Thankfully, DYNASET Hydraulic Pumps have the ability to work in such conditions. Actually, in the field of hydraulic pumps, this is our specialty. This ability makes it possible to install hydraulic systems in normal commercial vehicles safely. In practice, it means that with our technology the pumps can handle the high RPM of the vehicle engine.

The hydraulic oil reservoir (no. 10) is the source of this oil and the pump gets the hydraulic oil from it. This happens because the pump creates a negative pressure to the tank line. This negative pressure makes the oil flow into the pump.

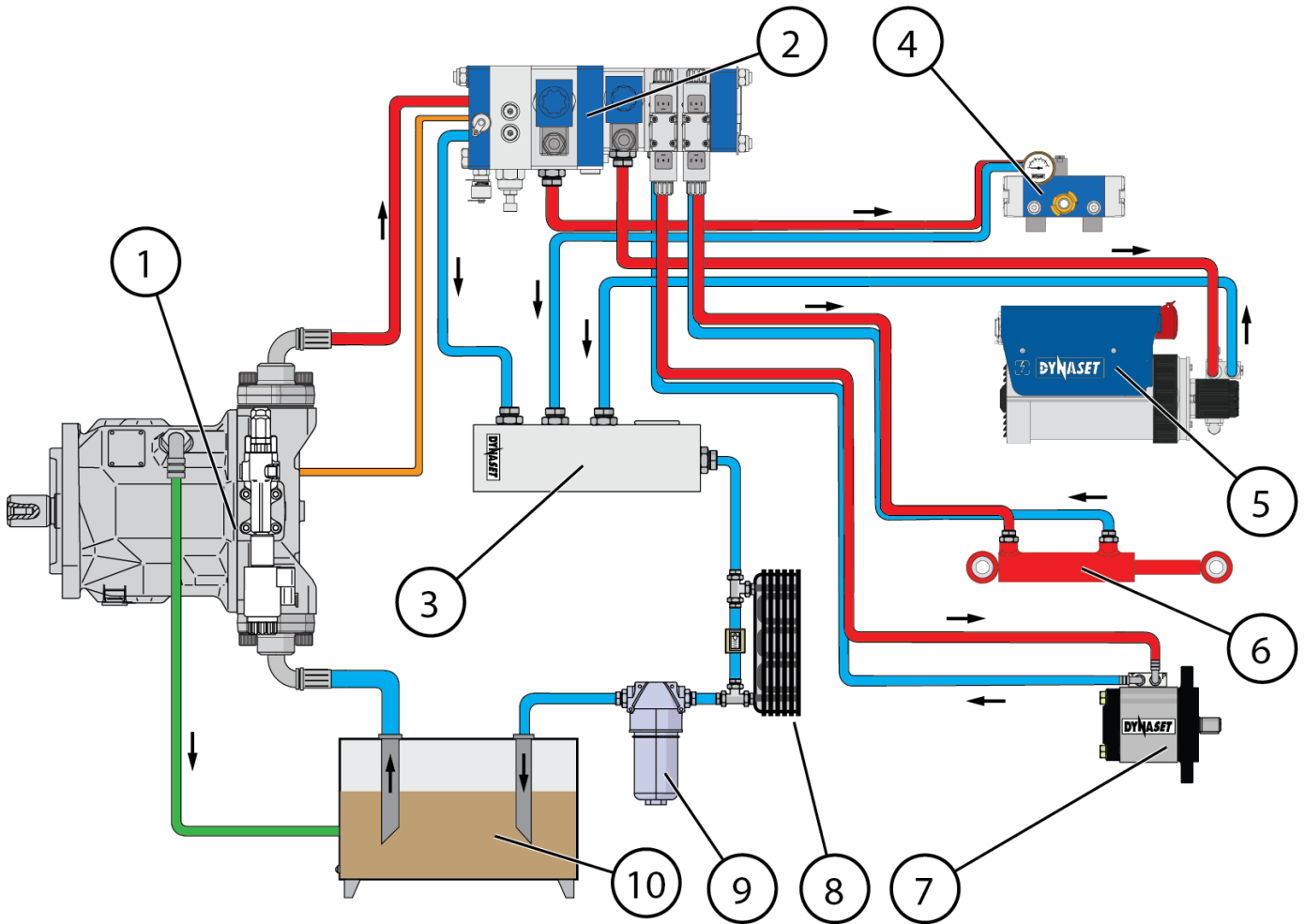
Did You Know?

Hydraulic equipment is often smaller than the traditional options. That's because they get their operating power from the hydraulic system.



Valves

The hydraulic oil flows into valves (no. 2). DYNASET HMV Hydraulic Modular Valve System can be seen in the picture. This system is a sandwich-like valve block that contains the needed valve “slices”. It means that the each slice of this block is one valve. Thanks to this design the valve system is extremely compact and cost-effective. The modular valve system reduces risk of breakdown because the system reduces the number of hoses and pipes. The valves that are selected to it depends on the requirements of the system. And the requirements of the system depends on the customer’s needs.



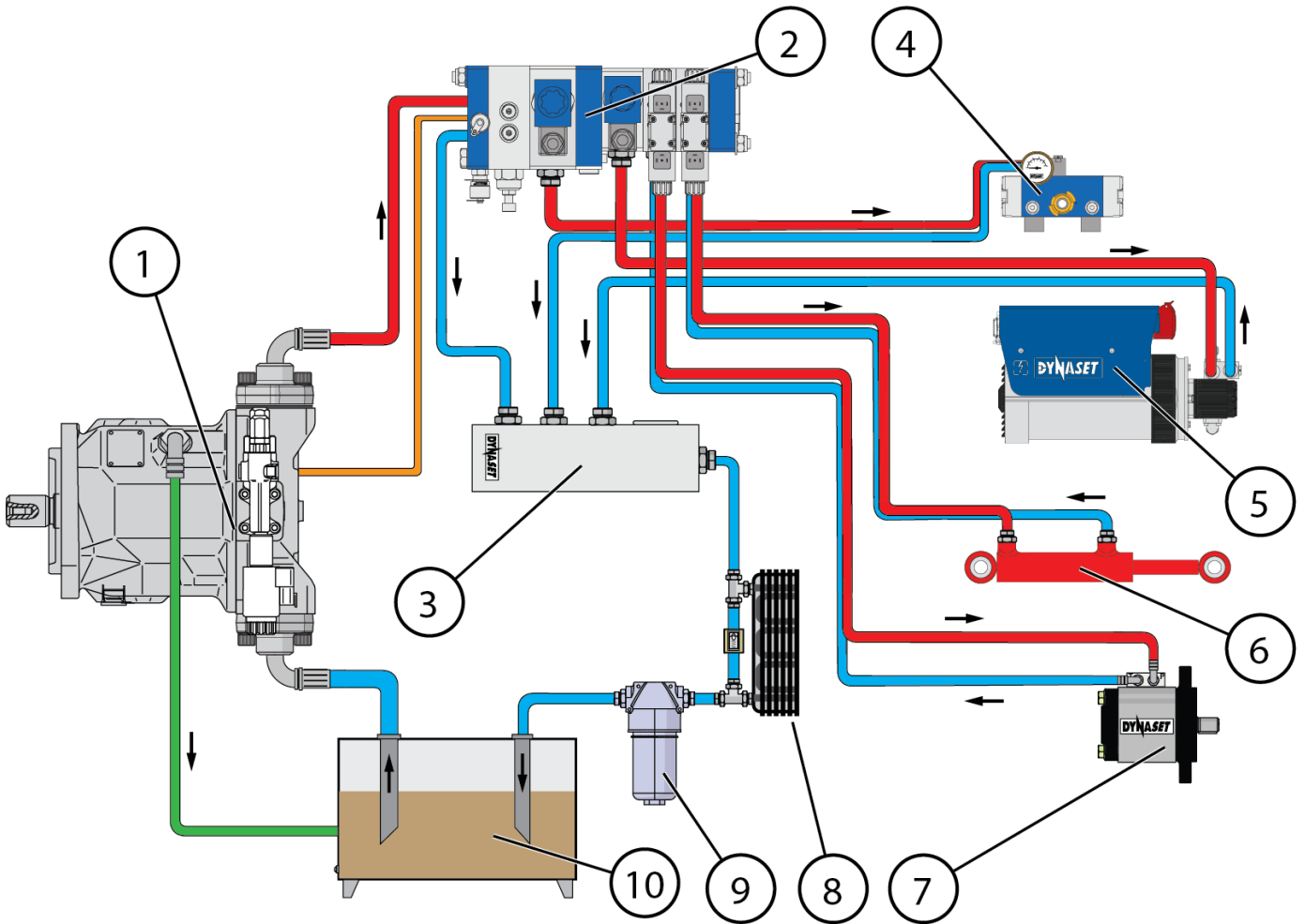
With this valve system, the hydraulic oil flow is easily controllable with different types of valves. The possibility to control the hydraulic oil flow makes it possible to control the equipment and tools that are connected to the system. So you can turn on pieces of equipment, add the pressure of a power washer, and such via valves. In practice, the HMV distributes the incoming oil flow for different pieces of equipment.

In addition, we provide a special valve which is called called DYNASET Priority Valve. This valve makes sure that the chosen piece of hydraulic equipment works as intended in all circumstances. This is important because some hydraulic equipment needs a more accurate flow rate.

As you can see in the picture, the HMV Hydraulic Modular Valve System has its own output for each piece of hydraulic equipment. The valves make sure that each piece of hydraulic equipment works as intended. Our engineers will help you to get the right valves to your system.

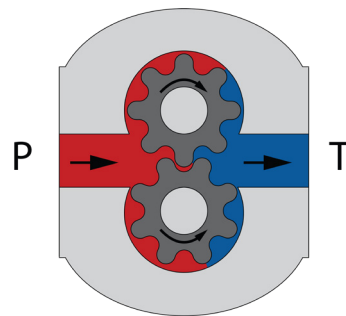
Hydraulic Equipment and Tools

The piece of equipment uses the power of the hydraulic oil flow for operating. The way that they use the hydraulic oil flow depends on the piece of equipment. Some pieces of equipment (no. 5, 7) has a motor that spins with the power of the flow and pressure.



Let's see how the motor works in the context of the hydraulic generator (no. 5) The red color implicates the pressure line. The pressure and flow make the cogwheels spin. One of these cogwheels is connected to the axle. The axle is connected to the generator which produces electricity because of the spinning. So, the pressure line transfers the hydraulic power to the equipment. At the same time, the line switches from the pressure line to the tank line (blue line) because the pressure is used for running the motor.

Operating principle of the hydraulic motor. The hydraulic oil flow is pumped into the hydraulic motor through the pressure line. The hydraulic oil flow and pressure is running the motor. The hydraulic oil flow is led back to the hydraulic oil tank through the return line.



For example, the hydraulic generator (no. 5) has a hydraulic motor. The pressure and tank line are connected to the motor's pressure/tank-block. This block directs the oil flow and pressure into the motor. The motor runs the alternator which converts the mechanical energy to electricity. As a result, the generator starts to produce electricity. In other words, the motor transforms hydraulic power back to mechanical power while the pump transforms mechanical power into hydraulic power.

Like said, the way of transformation depends on the piece of hydraulic equipment. The hydraulic power washer (no. 4) uses the hydraulic oil flow to create high-pressure liquid by patented DYNASET structure.

How about hydraulic tools (no. 6)? The same lines, pressure and tank lines, are connected to the tool directly. For the tools, you will need hydraulic quick couplers. The couplers have own coupler for pressure and tank line. A pressure line quick coupler can be seen in the picture below.

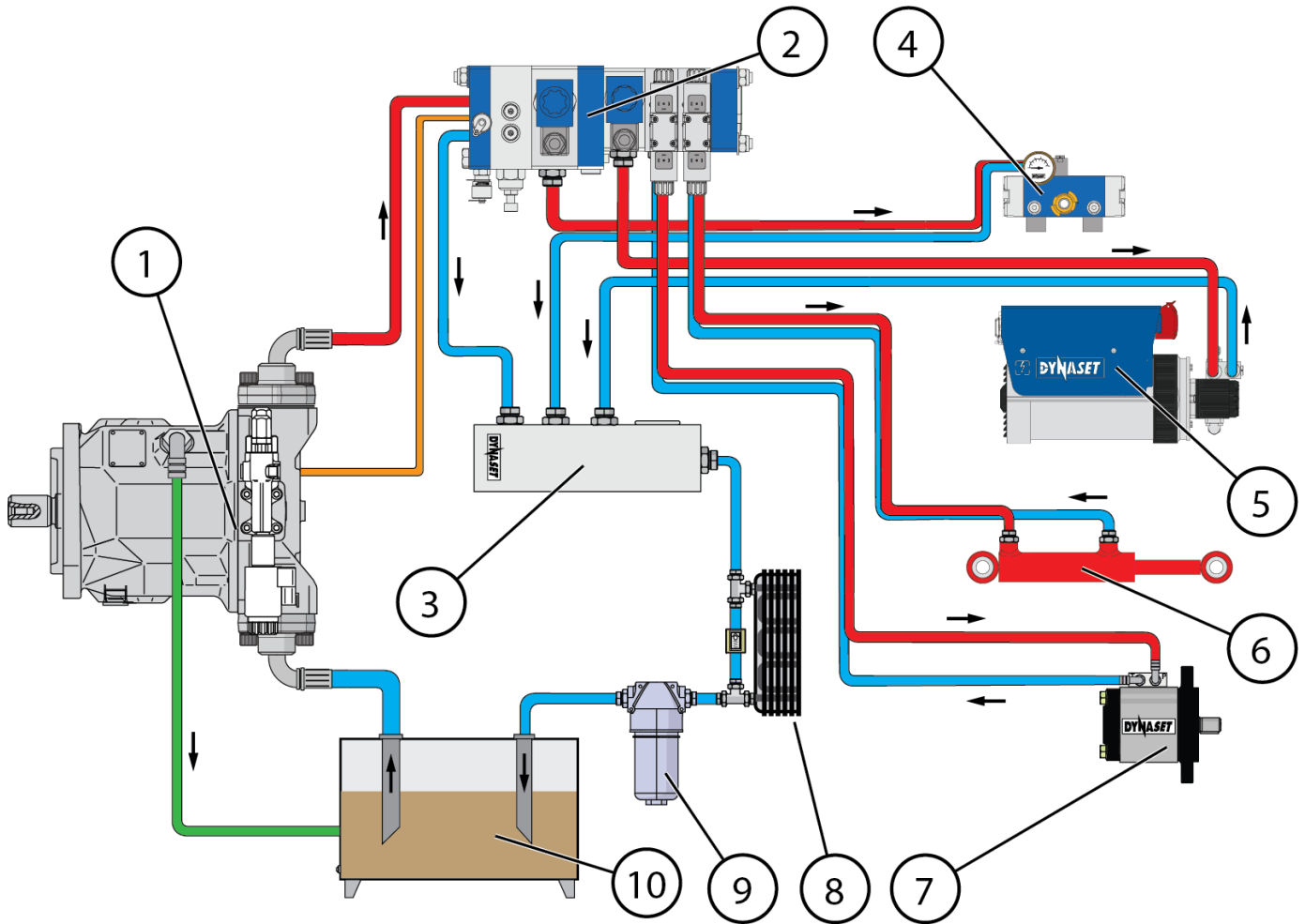
The tools have their own ways to use hydraulic power. This depends on the tool, so we do not dive too deep into that. One example of these kinds of tools is a hydraulic cylinder (no 6). The cylinder gets its power from the hydraulic system's outputs. It can be used for lifting tasks for example.

▼ *The quick coupler that is on the right side is the pressure line, which comes from the pump. The tank line has the same kind of quick coupler in the vehicle. These kinds of quick couplers can be used for hydraulic tools for example.*



Tank block, Cooler, filter, and hydraulic oil reservoir

The hydraulic oil did its job for now because it has transferred the hydraulic power from the pump to the piece of equipment or to the tool. Now the hydraulic oil is lead from the different pieces of equipment and tools to a tank block (no. 3), which combines all the tank lines into one line.



Like all appliances from computer to a huge engine, also hydraulic system creates heat as a byproduct. That is why the hydraulic systems have a hydraulic oil cooler (no. 8). That is the fourth main component of the hydraulic system. The oil cooler has a frame with cooling fins and fan. The cooling fins heat up because the heat from the hydraulic oil is conducted to them. The cooling fins increase the surface area, which makes the air-cooling more effective. The fan blows air through these cooling fins. As a result, the temperature of the hydraulic oil drops when it goes through the cooler. As a cherry on the cake, this heat helps to keep the vans loadspace warmer. This is good ability especially in the northern countries.

Did You Know?

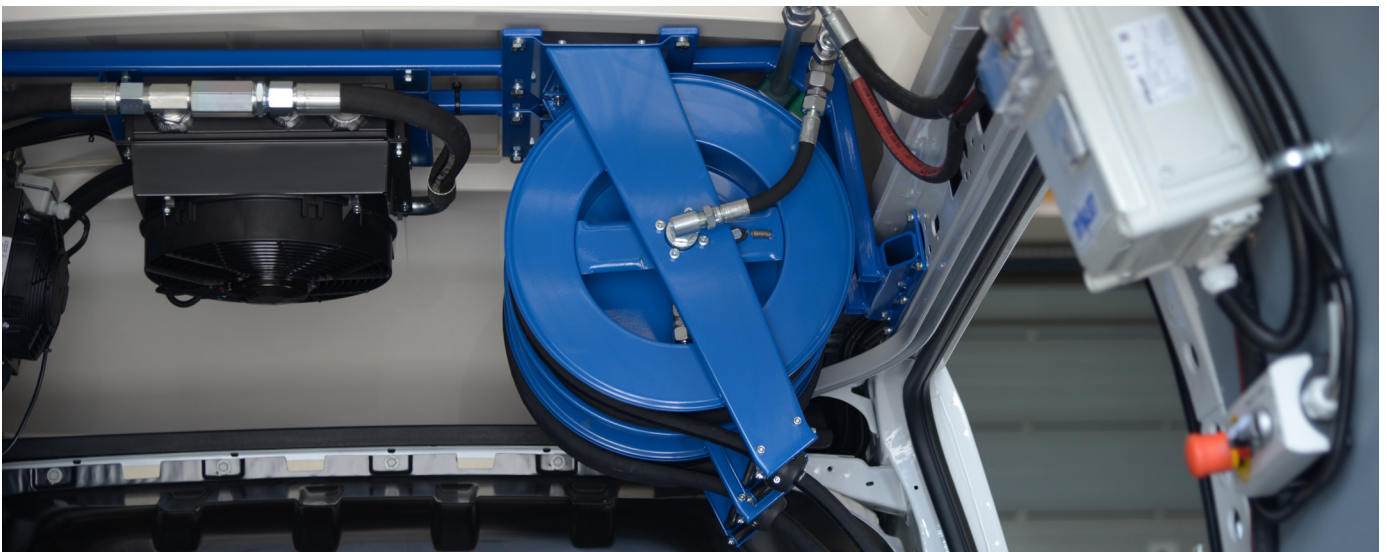
Pieces of hydraulic equipment are long-lasting because of their robust structure.



▲ Picture of a hydraulic oil cooler.

After the hydraulic oil cooler, the oil flows through the hydraulic oil filter (no. 9) back to the hydraulic oil reservoir (no. 10). The filter filters out impurities from the oil. The reservoir is a tank that is between the filter and the hydraulic pump. Like said before, the pump gets the needed hydraulic oil from this reservoir. So, the next round for the hydraulic oil can start!

▼ Hydraulic oil cooler mounted on the roof of the load space.



Did You Know?

The hydraulic oil flow can cool down the pieces of hydraulic equipment.

Is That it?

Now you know how the hydraulic system of the picture works. The principles are the same in different compositions of the hydraulic systems. It is important to know that every numbered item in the picture carries a lot of smaller details also but the main idea is more important than knowing the each piece technical data.

Although, it is important to know that the valves can be controlled in different ways. The system can have a control panel and remote control for example. Also, the cabin of the vehicle can be equipped with the controls of the hydraulic system. It all depends on your special need so the controls are tailored to meet your needs.



One version of hydraulic system's remote control. For example, the user can start the HPW Hydraulic High Pressure Water Pump with it remotely.

How To Go Forward?

Now you know the basics of the hydraulic PTO's and hydraulic systems. Hydraulics is the professional's choice for many situations and that's why it is so common in service vehicles. The pieces of hydraulic equipment are long lasting. That's why it is not rare that the pieces of equipment last longer than the vehicle itself. It means that the pieces of equipment are often re-installed into a new vehicle after the previous vehicle has come to the end of the road. The robust structure of the Dynaset hydraulic equipment makes them a reliable choice for professionals.

What is your application where you need hydraulic power? Tell it to us and our personnel will take care of your case. You will get a perfect hydraulic system for your vehicle with the help of our experts.

Remember, it is **completely free to send an inquiry to our sales!** The contact information can be found [by clicking this!](#)

Did You Know?

We publish a newsletter every other week! The letters includes useful news and tips about hydraulics.

Open the subscription site by clicking [this](#) or by reading the QR-code with your smartphone!





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MISSION

DYNASET improves productivity, efficiency, and versatility of customer's mobile machinery by producing electricity, power washing, and compressed air with equipment powered by hydraulics.



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