PUMP Brief

Hydraulic Pump Division

AS-0015

Gold Cup Solution Series: Part 1

Basic Hydraulic Circuits

Many define a hydrostatic circuit as a pump and motor working in closed configuration. This is true for applications that require a rotary motion at various torques and speeds; however we should not forget linear motion, covered in Part 2 – Basic Cylinder Circuits.

The many advantages of closed circuit systems include:

- Dynamic braking of a load without adding additional heat
- Wide range of control options from manual to electro-hydraulic
- Accurate control of speed and force
- Smaller hydraulic reservoir (space and fluid requirements)
- Fewer components required in the system (fewer leak points, easier assembly)

We can build the circuit in many ways using many different pump combinations. Our pump portfolio can be understood as:

P*P
Variable displacement closed circuit pumps with built-in boost and servo.

P*X
Variable displacement closed circuit pumps with built-in boost and servo, with a rear mounting flange to mount an additional pump (torque limitations).

P*S
Variable displacement closed circuit pumps with built-in boost and servo, with a rear mounting flange to mount an additional pump (torque limitations) with the hot oil shuttle valve built onto the pump.

P*R
Variable displacement closed circuit pump with no servo or boost pumps included. These have a rear mounting flange capable of mounting a pump of equal size or smaller up to the maximum power of the front pump.

P*L
Variable displacement closed circuit pump with no servo or boost pumps included. These have a rear mounting flange capable of mounting a pump of equal size or smaller up to the maximum power of the front pump, with the hot oil shuttle valve built onto the pump.

P*F
Fixed displacement pumps.

P*V
Open circuit pumps from P6V–P14V (98-229 cc/rev).

Parker also offers a range of axial piston motors in fixed or variable configuration from M6–M30 (98–500 cc/rev).

All of the components shown in the attached circuit IMG-0016 other than 2, 4 and 5 could be included in the pump!

If we consider the attached circuit as a stand-alone system, we need some basic information to size components such as filters, coolers, boost pump, etc.

For example, if we consider the following requirements:

- Electric motor speed – 1,480 RPM
- Torque required – 1,994 NM @ motor
- Speed of motor – 700 to 1,560 RPM
- Motor required = M24F-3N1D (403.2 cc/rev), (623NM/100Bar)
- Pump required = P30P-2R1B-9A2-B00-3 (501.5 cc/rev)

A basic rule for closed circuits is that the cooling required for the circuit should be 25–30% of system flow. In this example, 1,560 x 403 = 629 l/min, therefore a cooling flow of 157–189 l/min is required. Because it is not possible to get this flow from the internal boost/servo pump, an additional pump is required (T6CM-B22 (70.3 cc/rev)).

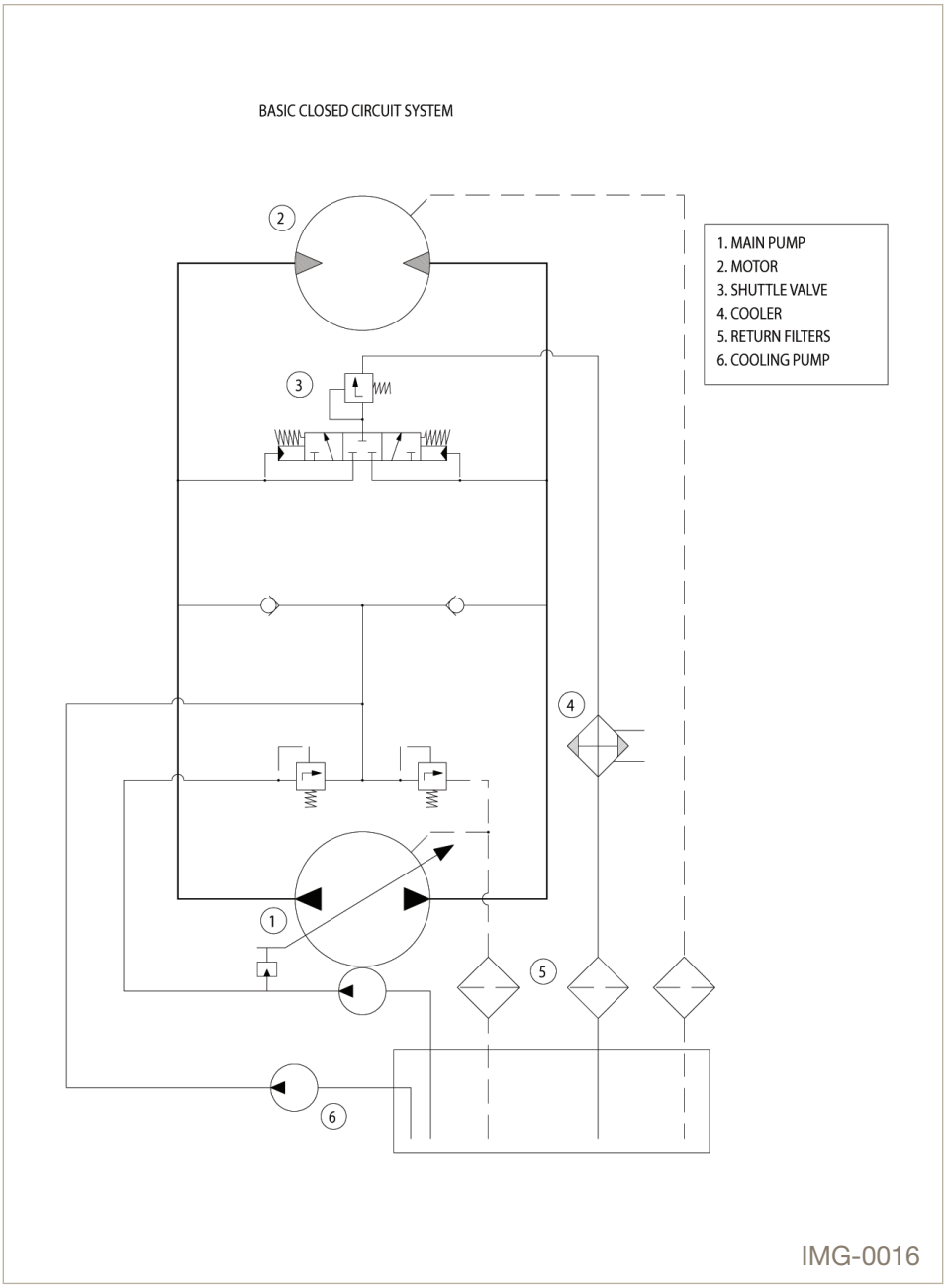
This gives us the required information to size the electric motor, cooler, tank, boost pump and filters.

Tank size is typically five times the size of the pump, in our example, 190 liters/min (70.3 + 58.3 = 128.6 cc/rev), 190 x 5 = 950 liters.

Cooler and shuttle valve filter should be capable of handling a minimum of 190 l/min (total flow of boost pump and internal pump(s)); filters are normally sized at 10 micron absolute.

Case drain filter for pump = minimum 190 l/min.

Case drain filter for motor = minimum 28 l/min.



Electric motor size = 340 KW (320 Bar*629/600 + 14 Bar*190/600) @ 100% efficiency = 340 KW. Assuming 85% overall efficiency, electric motor should be approximately 400 KW.

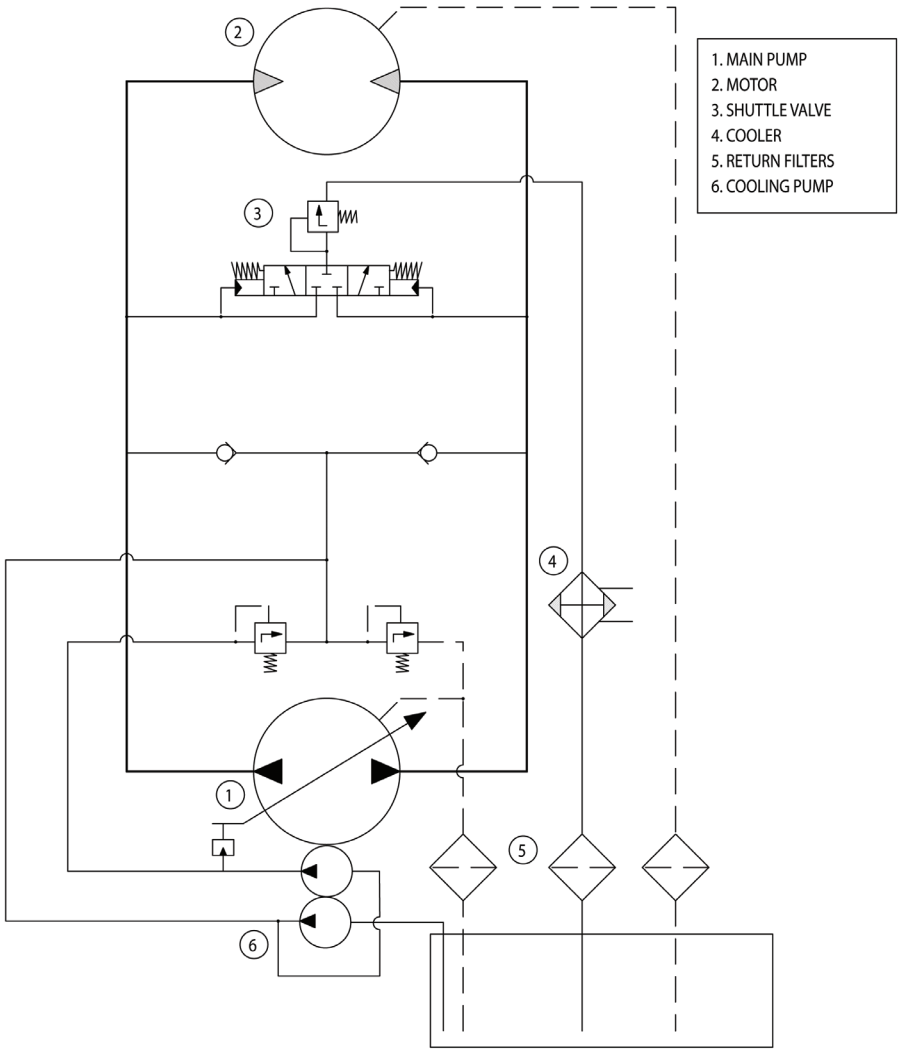
Thus our pump would be a P30P-2R1B-9A2-B00-3.

To make this more compact, use fewer components to be more cost-effective. Consider a P30S-2R1B-9A2-B00-3B1-M2 (with a T6CM-B22 on the rear). This would mean that the shuttle valve and additional vane pump for cooling could all be included with the pump (*see IMG-0017 on page 3*).

Support

What's your closed circuit question? Call the Technical Support Team at **937.644.3915** or contact **pumptechsupport@parker.com** for assistance.

P24/30S Pump with aux boost



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