TECHNICAL BULLETIN

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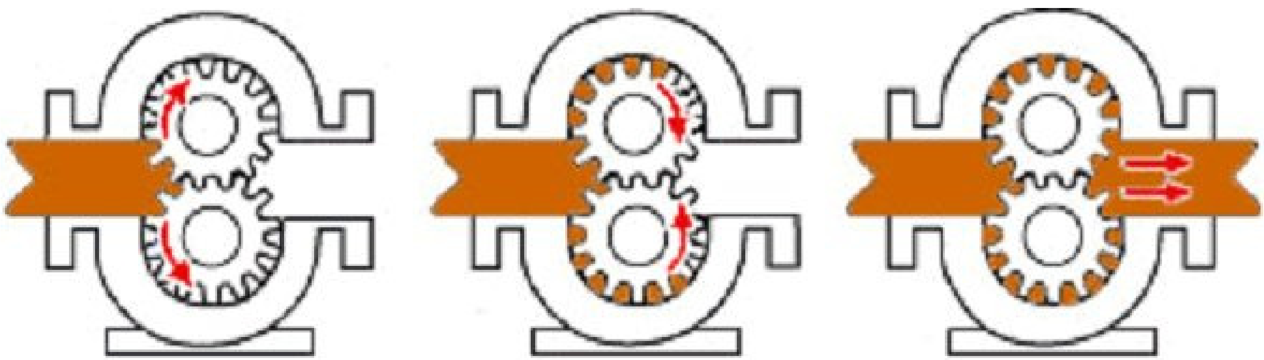
#1 How To Determine Gear Pump Flow And Displacement

Today we will be covering how to determine gear pump flow, and displacement.

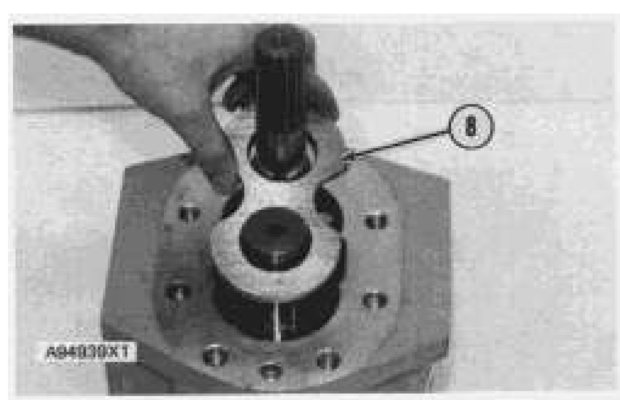
Let’s first cover how a gear pump works. The oil enters the gear pump from the (Inlet) tank and travels around the outside of the gear and forced out of the pressure port. **See IMG.1**

IMG.1



There are 2 each brass side pressure plates that are ¼” thick on both sides of the gear. These keep the oil retained in the teeth from the side. **See IMG.2,3**

IMG.2 **IMG.3**



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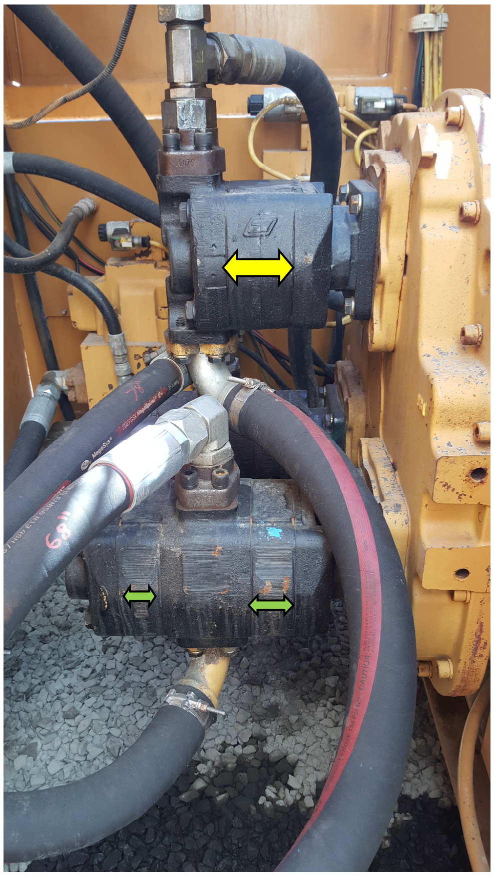
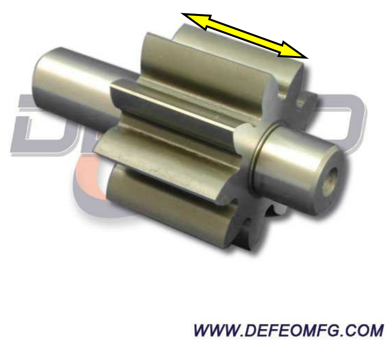
When you measure the pump section you will have to subtract ½” because of the two ¼” side pressure plates. Yellow arrow. **See IMG.4**



IMG.4

Looking at IMG.4, if the yellow arrow measures 2” the gear section is 1 ½”. **See IMG.5**

IMG.5



To figure out what gear section you have inside the pump you will need to know the model of pump that is being used.

We generally use a P465 model pump for our 4500 P.S.I. hydraulic circuits. We are accustomed to using the pump code as the call out. **See IMG.6 Chart.** If you measure a P465 pump at a 2” outside section like in IMG.4, it would be a code (15) and have a displacement of 5.4 cubic inches. **See IMG.6 Chart. (The cubic inches is how much oil the pump will put out with 1 rotation.)**

We can now measure all the drive pump sizes and combine them to figure out what the displacement is for the drive circuit. As an example, a 765 P/U paired with a 200-6 vibro has 4 each (15)’s and 1 each (7) size drive pumps that are the P465 model.

We know that a (15) is 5.4 cubic inches and a (7) is 2.7 cubic inches by using **IMG.6 Chart**

See the below math on how to add the pumps together.

5.4 X 4 = 21.6 + 2.7 = 24.3 cubic inches total.

We now now that we have 24.3 cubic inches' total volume for our drive pumps.

The pump drive on the 765 P/U is a 1:1 gear ratio. The max engine R.P.M. is 2050.

We can know figure out the GPM that the P/U puts out. Using the **IMG.6 Chart** formula for Pump Output (GPM). **See IMG.6 Orange Arrow.**

See the math formula below for the 765 P/U.

Pump Output (GPM)

$$\frac{2050 \text{ X } 24.3}{231} = 215.65 \text{ GPM}$$

Above we can see that a 765 P/U running at 2050 R.P.M. with a standard configuration of drive pumps will produce 215.65 GPM.

We will be addressing how pump efficiency comes into play with this formula in an upcoming technical bulletin.

IMG. 6 Chart on next page.

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DISPLACEMENT (d) PUMP/MOTOR

PUMP MODEL SERIES		15H 15X	30 31	50/51 25X	37X	75 76	125	P315	P330	P350	P365	P415	P430	P450	P465
DISPLACEMENT (d) PER IN. OF GEAR WIDTH		1.37 in^3/Rev	1.97 in^3/Rev	2.55 in^3/Rev	3.00 in^3/Rev	4.10 in^3/Rev	6.47 in^3/Rev	1.24 in^3/Rev	1.97 in^3/Rev	2.55 in^3/Rev	3.60 in^3/Rev	1.24 in^3/Rev	1.97 in^3/Rev	2.55 in^3/Rev	3.60 in^3/Rev
MAXIMUM RECOMMENDED PRESSURE		2000–2500 PSI	2500–3000 PSI	2000–3000 PSI	2000 PSI	2500–3000 PSI	2500 PSI	3000–3500 PSI	3000–3500 PSI	3000–3500 PSI	3000–3500 PSI	4000–4500 PSI	4000–4500 PSI	4000–4500 PSI	4000–4500 PSI
GEAR SIZE	CODE	d	d	d	d	d	d	d	d	d	d	d	d	d	d
1/2	(05)	.685	.985	1.275	1.500	2.050	3.230	.620	.985	1.275	1.800	.620	.985	1.275	1.800
3/4	(07)	1.027	1.470	1.912	2.250	3.070	4.850	.930	1.470	1.912	2.700	.930	1.470	1.912	2.700
1	(10)	1.370	1.970	2.550	3.000	4.100	6.470	1.240	1.970	2.550	3.600	1.240	1.970	2.550	3.600
1-1/4	(12)	1.712	2.460	3.187	3.750	5.120	8.080	1.550	2.460	3.187	4.500		2.460	3.187	4.500
1-1/2	(15)	2.050	2.950	3.820	4.500	6.150	9.700	1.860	2.950	3.820	5.400				5.400
1-3/4	(17)	2.397	3.440	4.460	5.250	7.170	11.320	2.170	3.440	4.460	6.300		19		
2	(20)	2.740	3.940	5.100	6.000	8.200	12.940	2.480	3.940	5.100	7.200				
2-1/4	(22)			5.730	6.750	9.220	14.550			5.730	8.100				
2-1/2	(25)			6.375	7.500	10.250	16.170			6.375	9.000				
2-3/4	(27)					11.275									
3	(30)				9.000	12.300									

GENERAL FORMULAS

MOTOR SPEED (R.P.M.)	MOTOR TORQUE IN INCH POUNDS	PUMP OUTPUT (GPM)	PUMP INPUT (HP reqd.)
Speed $= \frac{231 \times GPM}{d} =$ RPM	$\frac{PSI \times d \times Efficiency}{2\pi} = T$	$\frac{RPM \times d}{231} =$ GPM	$\frac{GPM \times PSI}{1714 \times Eff.} =$ HP
HORSEPOWER $\frac{TORQUE\ (in.lbs.) \times RPM}{63025} =$ HP	FLOW RATE THRU PIPING $\frac{.3208 \times GPM}{AREA\ (PIPE\ I.D.)} = V$	"D" SERIES = 2.36 PER 1" OF GR	

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