

# Zenith® Pumps B-9000 Series Gear Pumps

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A New Generation  
of Metering Pump.



Precise, Pulseless, Repeatable  
Performance In Chemical  
Metering Applications



# B-9000 Series

Zenith's B-9000 Series precision metering pumps utilize rotary, external spur gears which dispense an exact volume of fluid per shaft revolution (cc/rev).

Precision ground and lapped construction and alignment dowels allow for close control of operating clearances. This ensures precise, pulseless, and repeatable flow under varying process conditions.

Integrated closed loop speed control and a compact motor driver system maintain set point speeds to .01% and also accept automated interfaces.

The B-9000 Series is constructed of 440C stainless steel which provides excellent wear resistance (hardness 54 R<sub>C</sub>) and corrosion resistance for most chemical processes. The pump offers increased uptime while minimizing

maintenance due to its simple design of only three moving parts.

The B-9000 Series is a new generation of Zenith's traditional B-Series metering pump. While maintaining precise flow characteristics, its optimum gear design reduces bearing loads, extending speed capability. The pump allows direct piping and shaft engagement. A single mechanical shaft seal eliminates sealing concerns. The pump complies with European Community and DIN standards.

For years, engineers have relied on Zenith Pumps to provide precision fluid handling solutions for their most difficult pumping applications. Zenith gear pumps can be found wherever *precise, pulseless, and repeatable metering* of fluids is required.

## Benefits

### High Accuracy

Stable, repeatable flows are assured even under varying conditions of temperature, viscosity, and pressure.

### Minimum Pulsation

Unique design offers virtually pulseless flow without valves or flexible elements to hinder performance.

### Low Cost of Ownership

With only three moving parts and 400 series stainless steel construction, the pump provides corrosion resistance for most chemical processes, and it is through hardened to 54 R<sub>C</sub> or better for maximum life.

### Precision Construction

Ground and lapped components allow for operating clearances to .00015" and provide high volumetric efficiency.

### Active Flowmeter Concept

Unparalleled mechanical precision, combined with the closed loop set point accuracy, ensures an exact volume per revolution without expensive flow meters.

### Experience

Zenith has over 70 years of application experience with engineers available 24 hours a day to support your precision fluid metering needs.

## Applications


**The B-9000 Series pumps are ideal for metering in such applications as:**

Dyes	Water Treatments	Cosmetics	Inks	Coatings
Perfumes	Viscose	Fuels	Urethanes	Lubricants
Adhesives	Flavorings	Resins	Catalysts	Pharmaceuticals
Polymers	Paints/Varnishes	Oils	Vitamins	Detergents
Emulsions	Defoamers	Inhibitors	Additives	Many others

# Selection

The following are general selection guidelines and should be confirmed with the factory or authorized representative. Varying conditions of flow rate, pressure, and viscosity may require selection assistance for successful operation.

### Selection Steps:

- 1) Chose the appropriate chart based on differential pressure (discharge-inlet pressure in psi).
- 2) Select the maximum flow rate desired (cc/min) on the vertical axis and the maximum viscosity (cp) at *process temperature and under shear conditions* on the horizontal axis. The point of intersection will correspond to a pump capacity (cc/rev), speed reducer reduction ratio, and motor horsepower. Points of intersection to the left of  (11:1 reducer) represent a 6:1 reducer. Points to the right represent a 21:1 reducer.
- 3) Review the pump selected in Step 2 for minimum flow rate capability. Calculate the Minimum Flow Rate for the pump selected as follows:

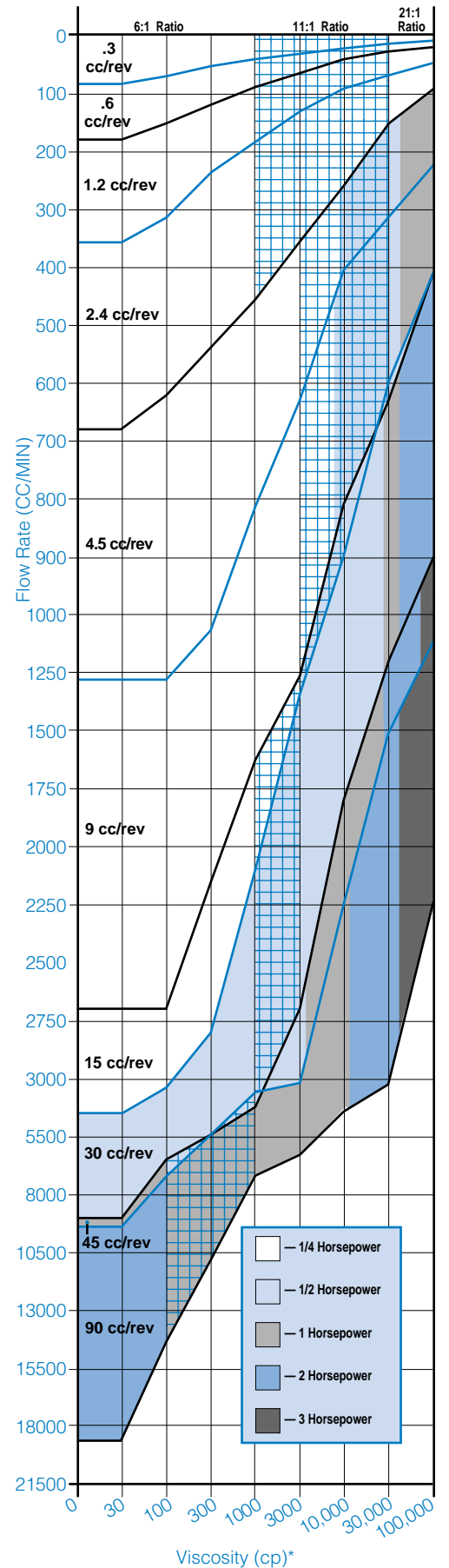
$$\text{Min Flow Rate (cc/min)} = \frac{\text{Pump Capacity (cc/rev)} \times 1800 \text{ rpm}}{(\text{Reduction Ratio}) \times 20 \text{ Turndown Ratio}}$$

If the desired minimum flow rate is equal to or greater than the minimum flow rate calculated, have your selection confirmed prior to ordering.

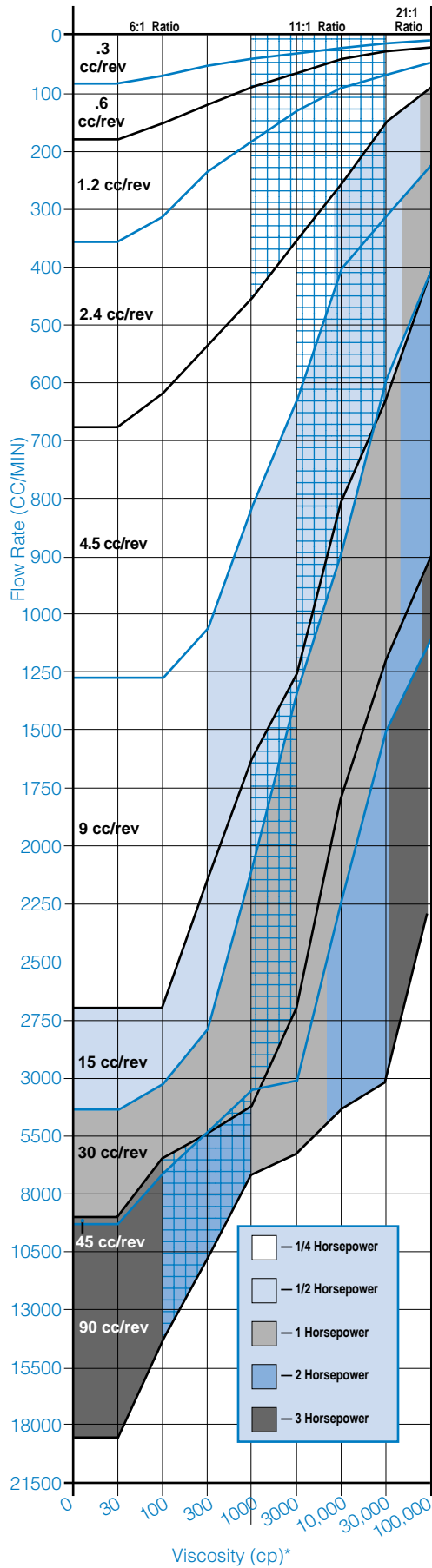
4) If the desired minimum flow rate is less than the minimum flow rate calculated, have the application data for pressure, flow range, and viscosity under shear conditions reviewed by the factory or an authorized representative for the appropriate selection.

**Note:** Chart grid not uniform  
\* at process temperature and under shear conditions

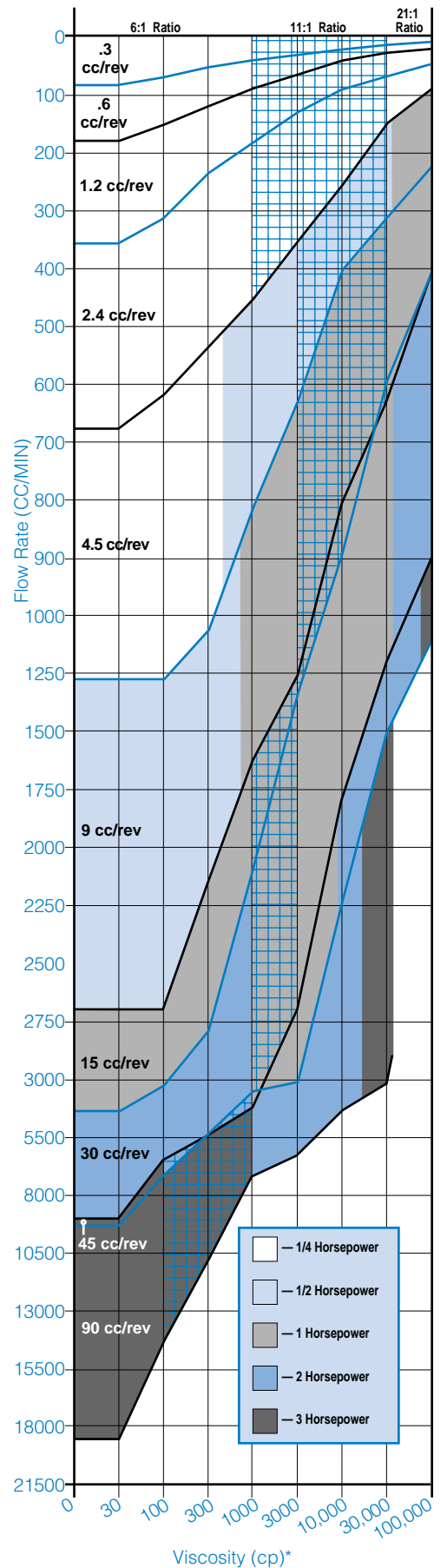
Differential Pressure ≤ 250 psi/18 Bar



Differential Pressure ≤ 500 psi/35 Bar



Differential Pressure ≤ 1000 psi/70 Bar



# Specifications

Other pump and system options are available. Please consult factory or your local representative.

## Standard Pump Head:

Type: Precision ground rotary external spur gear

Pump Speeds: .3-30cc 300 rpm maximum  
45-90cc 200 rpm maximum

Inlet Pressure: 300 psi (20 Bar) maximum

Outlet Pressure: 1000 psi (70 Bar) maximum

Temperature: 300°F (150°C) maximum

Seal: Single mechanical seal 316SS construction, carbon vs. ceramic seats with Viton elastomers

Required Torque:

$$\text{Torque (in-lb)} = (K_1 \Delta P) + (K_2 N \mu / 100,000)$$

$$\text{Torque (nm)} = (K_3 \Delta P) + (K_4 N \mu / 100,000)$$

- $K_1$  = Constant from chart
- $N$  = Pump speed (rpm)
- $\Delta P$  = Differential pressure (psi)
- $K_2$  = Constant from chart
- $\mu$  = Viscosity (cP)
- $K_3$  = Constant from chart
- $K_4$  = Constant from chart

## Standard Motor Driver Assembly:

Variable Speed 1/4 to 3 hp, DC motor, C-face flange mount, 1800 rpm maximum, totally enclosed

Magnetic pickup with 25 feet (7.6m) of sensor cable

Inline 6, 11, and 21 to 1 speed reducers, C-face

Low speed-flexible coupling, rigid baseplate, and coupling guard

Capacity cc/rev	K1/K2	K3/K4	Max. Torque (in-lbs/NM)
.3	.003/2.9	,0048/,328	90/10
.6	.006/3.0	,0095/,339	350/40
1.2	.012/3.1	,020/,350	350/40
2.4	.024/3.3	,038/,373	350/40
4.5	.045/10.0	,072/1,13	880/100
9	.09/12.0	,14/1,36	880/100
15	.15/24.0	,25/2,71	1100/125
30	.30/31.0	,48/3,50	1100/125
45	.45/60.0	,72/6,78	2400/275
90	.90/77.0	1,44/8,70	2400/275

## Standard System Speed Controller:

Accuracy: Zero accumulative error—follower format; .01% set speed—master format with 10 millisecond control loop update

### Power Requirements:

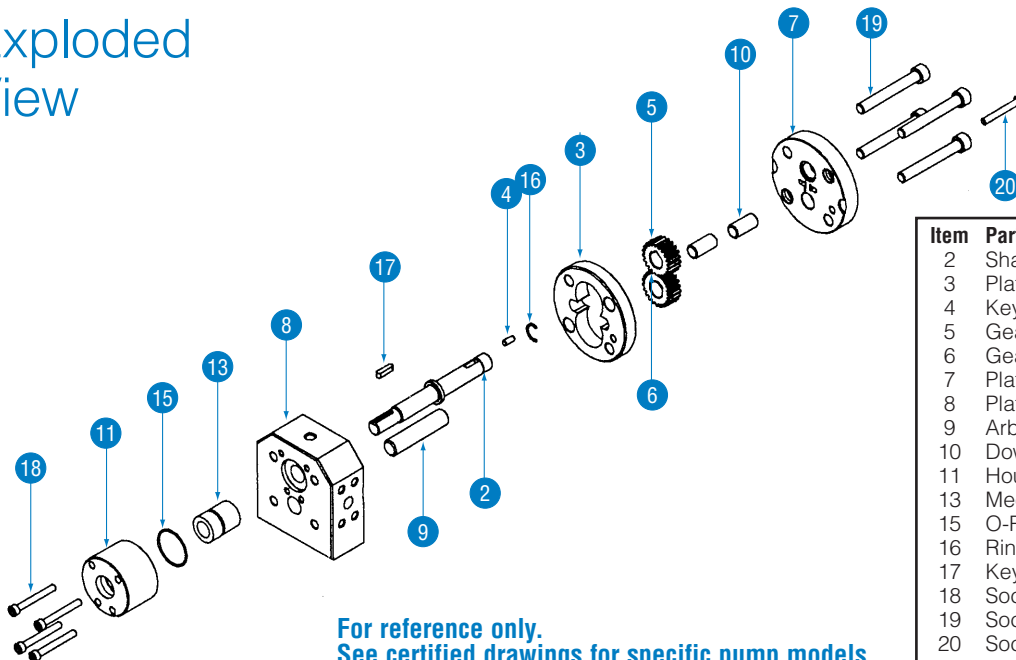
- 1/4 - 1/2hp = 115 VAC, 1 PH
- 1 - 3hp = 230 VAC, 1 PH
- 10% + 15% VAC, 50/60 Hz

Enclosure: NEMA 12 wall mount; 12" x 10" x 8" (304.8 x 254 x 203.2mm) cabinet with four mounting holes or chassis mount; 1/2 DIN

Engineering Units: Programmable display and setpoint values for various units

Computer Interface: Local or remote control, programming or monitoring with optional input and output capabilities

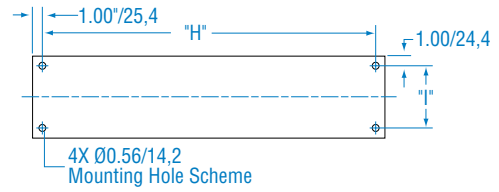
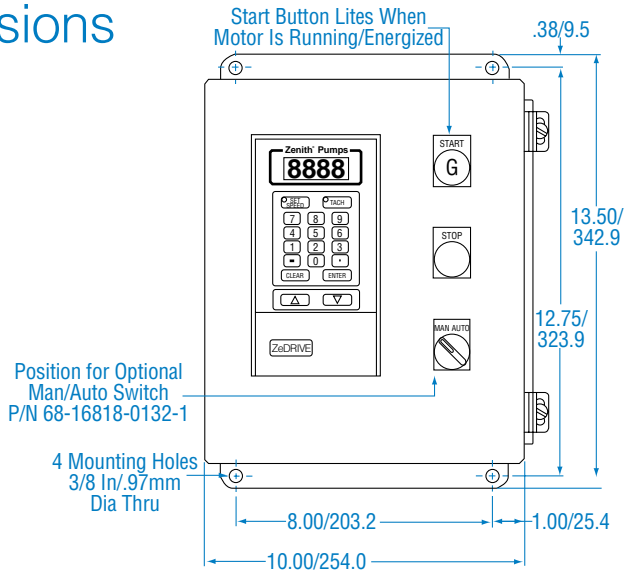
## Exploded View



For reference only.  
See certified drawings for specific pump models.

Item	Part Name	Qty
2	Shaft, Drive	1
3	Plate, Gear	1
4	Key, Round	1
5	Gear, Driving	1
6	Gear, Driven	1
7	Plate, Rear	1
8	Plate, Front	1
9	Arbor	1
10	Dowel, Hollow	2
11	Housing, Seal	1
13	Mechanical, Seal	1
15	O-Ring	1
16	Ring - Retaining	1
17	Key, Square	1
18	Socket Head Cap Screw	4
19	Socket Head Cap Screw	4
20	Socket Head Cap Screw	1

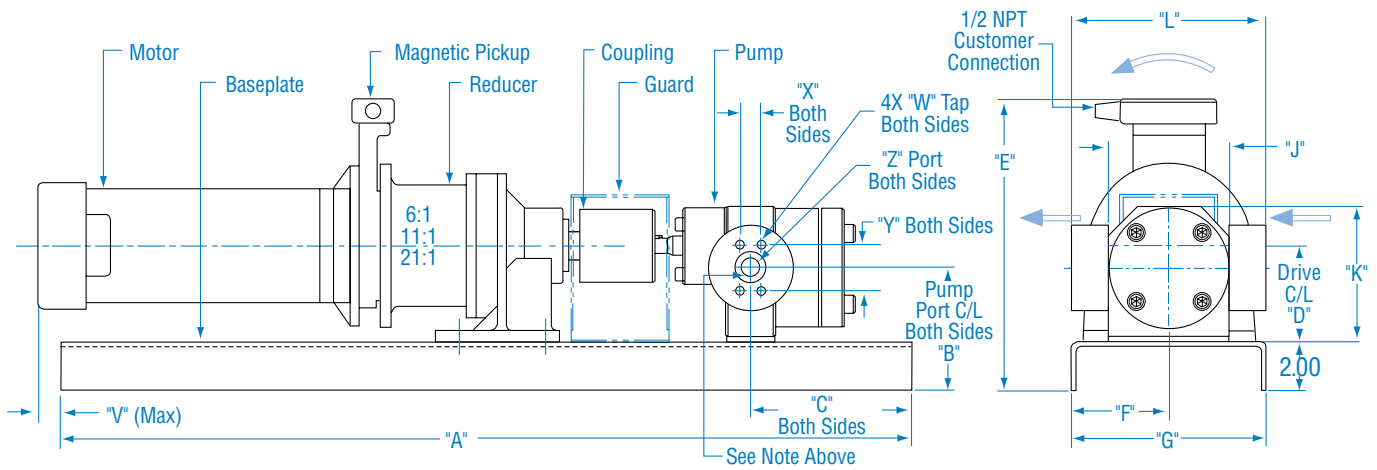
# Dimensions



**Notes:** 3-2.4 cc/rev pumps equipped with ISO 6149 M12 ports 4.5-90 cc/rev pumps have SAE Code 61, 4-bolt flanges with "Z" dia. nominal ports.

NPT female adapter options available. See column "L" below for dimensions.

\* indicates with adaptors



System/Dim.	"A"	"B"	"C"	"D"	"E"	"F"	"G"	"H"	"I"	"J"	"K"	"L"	"V"	"W"	"X"	"Y"	"Z"	NEMA IEC
1/4 hp, 3-2.4 cc/rev	26.00	5.42	3.93	3.94	11.94	4.00	8.00	24.00	6.00	2.76	2.95	4.2*	N/A	N/A	N/A	N/A	1/4 NPT*	56C
	660,4	137,7	99,8	100,1	303,3	101,6	203,2	609,6	152,4	70	75	107*	N/A	N/A	N/A	N/A	6,1	71
1/4 hp, 4.5, 9 cc/rev	26.00	5.49	3.77	3.94	11.94	4.00	8.00	24.00	6.00	3.94	4.13	6.63*	N/A	M8 x 12 DP	0.69	1.50	1/2 NPT*	56C
	660,4	139,5	95,8	100,1	303,3	101,6	203,2	609,6	152,4	100	105	169*	N/A	M8 x 12 DP	17,5	38,1	12,7	71
1/2 hp, 4.5, 9 cc/rev	35.00	5.28	7.61	3.94	11.94	4.00	8.00	33.00	6.00	3.94	4.13	6.63*	N/A	M8 x 12 DP	0.69	1.50	1/2 NPT*	56C
	889	134,1	193,3	100,1	303,3	101,6	203,2	838,2	152,4	100	105	169*	N/A	M8 x 12 DP	17,5	38,1	12,7	71
1/2 hp, 15, 30 cc/rev	35.00	5.02	6.63	3.94	11.94	4.00	8.00	33.00	6.00	5	5.31	7.50*	N/A	M10 x 22 DP	0.87	1.87	3/4 NPT*	56C
	889	127,5	168,4	100,1	303,3	101,6	203,2	838,2	152,4	127	135	191*	N/A	M10 x 22 DP	22,1	47,5	19,1	71
1 hp, 15, 30 cc/rev	35.00	5.02	6.63	3.94	11.94	4.00	8.00	33.00	6.00	5	5.31	7.50*	0.96	M10 x 22 DP	0.87	1.87	3/4 NPT*	56C
	889	127,5	168,4	100,1	303,3	101,6	203,2	838,2	152,4	127	135	191*	24,4	M10 x 22 DP	22,1	47,5	19,1	80
2 hp, 15, 30 cc/rev	40.00	6.47	7.10	5.38	13.38	5.00	10.00	38.00	8.00	5	5.31	7.50*	N/A	M10 x 22 DP	0.87	1.87	3/4 NPT*	145TC
	1016	164,3	180,3	136,6	339,9	127	254	965,2	203,2	127	135	191*	N/A	M10 x 22 DP	22,1	47,5	19,1	90
1 hp, 45, 90 cc/rev	35.00	6.14	5.55	5.38	13.38	4.00	8.00	33.00	6.00	6.89	7.09	9.89*	0.96	M12 x 24 DP	1.19	2.31	1 1/4 NPT*	56C
	889	156	141	136,7	339,9	101,6	203,2	838,2	152,4	175	180	252*	24,4	M12 x 24 DP	30,2	58,7	31,8	80
2 hp, 45, 90 cc/rev	40.00	6.14	6.05	5.38	13.38	5.00	10.00	33.00	8.00	6.89	7.09	9.89*	N/A	M12 x 24 DP	1.19	2.31	1 1/4 NPT*	145TC
	1016	156	153,7	136,7	339,9	127	254	838,2	203,2	175	180	252*	N/A	M12 x 24 DP	30,2	58,7	31,8	90
3 hp, 45, 90 cc/rev	40.00	6.14	6.05	5.38	13.38	5.00	10.00	33.00	8.00	6.89	1.09	9.89*	6.9	M12 x 24 DP	1.19	2.31	1 1/4 NPT*	184TC
	1016	156	153,7	136,7	339,9	127	254	838,2	203,2	175	180	252*	175,3	M12 x 24 DP	30,2	58,7	31,8	112M

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