

Fixed Displacement Radial Piston Staffa Motor HMB Series



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Date	Revision	Changes
01/01/2019	MYK5849-HMB-data- sheet-A4-REV-21	Original
12/12/2024	M200112.24-HMB	 Removal of FM3 FM4 and F3 F4 Valve housing Replaced with SM and SFM valve housing

HMB Series

Fixed Displacement Radial Piston Hydraulic Motor

■ General Descriptions

The Kawasaki Staffa range of high torque low speed fixed displacement radial piston hydraulic motors consists of 13 frame sizes ranging from the HMB030 to HMB500. Capacity ranges from 188 to 8,000 cc/rev.

The rugged, well proven design incorporates high efficiency combined with good breakout torque and smooth running capability. Various features and options are available including, on request, mountings to match competitors' interfaces.

The Kawasaki Staffa range also includes dual and triple displacement motors. To obtain details of these product ranges please refer to datasheet M-2002/03.17 and M-2005/12.17

■ Features

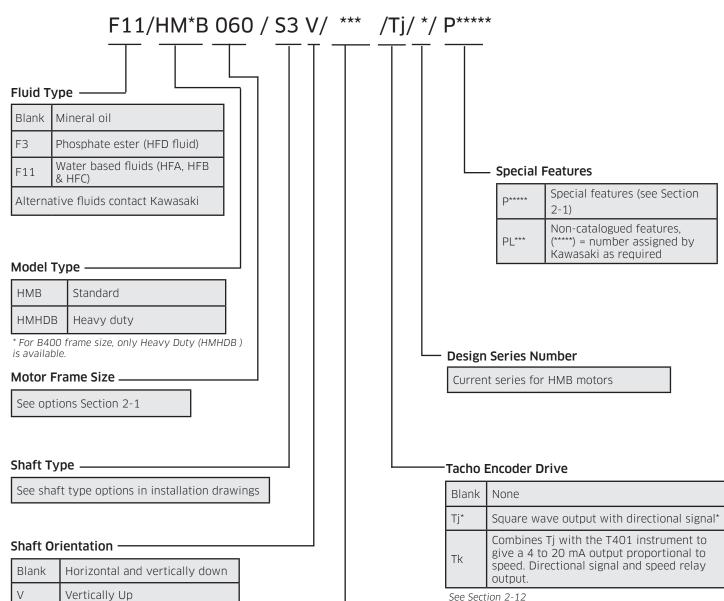
- Rugged, reliable, proven design
- Unique hydrostatic balancing provides minimum wear and extended life
- High volumetric and mechanical efficiency



- Capacities range from 188 to 8,000cc/rev
- Large variety of shaft and porting options
- Output torque up to 25,250Nm
- Wide range of mounting interfaces available
- Alternative displacements also available

Ordering Code

1-1 Model Coding



See Section 2-12

Main Port Connections

Not available for frame size.

1-1 Model Coding

Special Features Suffix

/ P

Shaft Seal Enhancements -

А	High pressure shaft seal
В	Improved shaft seal life
С	High pressure shaft seal & im- proved shaft seal life
0	None

See Section 2-12 for details

External Protection -

В	Marine-specification primer paint
D	Unpainted
Е	Marine Specification Cylinder Heads
F	Marine spec Cylinder Heads + Marine specifi- cation paint HP20
G	Marine spec Cylinder Heads + Carboline grey paint
0	None

See Section 2-12 for details **Installation Features**

А	Drain port adaptor x 1
В	Drain port adaptor x 2
С	Φ21 mm mounting holes
D	Φ22 mm mounting holes
Е	Φ21 mm mounting holes & Drain port adaptor x 1
F	Φ21 mm mounting holes & Drain port adaptor x 2
G	Φ22 mm mounting holes & Drain port adaptor x 1
Н	Φ22 mm mounting holes & Drain port adaptor x 2
0	None

See Section 2-11 for details

- Valve Enhancements

А	Improved cavitation resistance
В	Anti-clockwise
С	Thermal shock resistance
D	Improved caviation resistance & anti-clockwise
E	Improved cavitation resistance & thermal shock resistance
F	Anti-clockwise & thermal shock resistance
G	Improved cavitation resistance & anti-clockwise & thermal shock resistance
0	None

See Section 2-12 for details

Performance Enhancements

А	Increased starting torque
0	None

See Section 2-12 for details

Technical Information

2-1 Performance Data



Rating definitions

Continuous rating

For continuous duty the motor must be operating within each of the maximum values for speed, pressure and power.

Intermittent rating

Operation within the intermittent power rating (up to the maximum continuous speed) is permitted on a 15% duty basis, for periods up to 5 minutes maximum.

Intermittent max pressure

Intermittent max pressure: 300bar.

This pressure is allowable on the following basis:

- a) Up to 50rpm 15% duty for periods up to 5 minutes maximum.
- b) Over 50rpm 2% duty for periods up to 30 seconds maximum.

Static pressure to DNV rules 405bar (DNV-GL-RU-Ship Part 4) - except HMB030 motors.



Limits for fire resistant fluids

Fluid Type	Continuous Pressure (bar)	Intermittent Pressure (bar)	Max Speed (rpm)	Model Type
HFA 5/95 oil-in-water emulsion	130	138	50% of limits of mineral oil	All models
HFB 60/40 water-in-oil emulsion	138	172	As for mineral oil	All models
HFC water glycol	103	138	50% of limits of mineral oil	All models
	207	300	As for mineral oil	НМВ030
HFD Phosphate Ester	250	300	As for mineral oil	HMB045 to HMHDBB400 inc.
	190	227	As for mineral oil	НМВ500

2-1 Performance Data

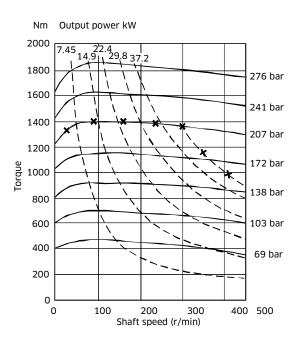
Specifications

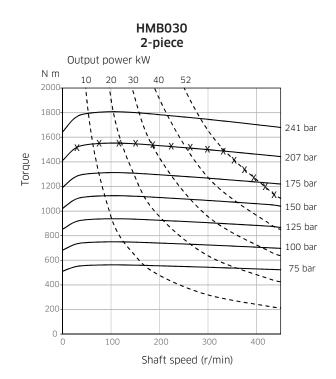
Motor Type	Geometric displacement (cc/rev)	Average actual running torque (Nm/bar)	Max. continuous speed (rpm)	Max. continuous output power (kW)	Max. continuous pressure (bar)	Max. intermittent pressure (bar)
HMB030 (HMB010 replacement)	188	2.30	500	18	207	250
НМВ030	442	6.56	450	42	207	250
HMB030 (FM3)	492	7.31	450	52	207	250
HMB045	740	10.95	400	60	250	300
НМВ060	983	14.5	300	80	250	300
НМВ080	1,344	19.9	300	100	250	300
HMB100	1,639	24.3	250	110	250	293
HMB125	2.050	20.00	220	100	250	300
HMHDB125	2,050	30.66	220	100	250	300
HMB150	2,470	36.95	220	115	250	300
HMHDB150	2,470	30.33	220	113	230	300
HMB150 (FM3)	2,470	36.95	168	115	250	300
HMB200	3,087	46.07	175	130	250	300
HMHDB200	3,067	40.07	1/3	130	230	300
HMB200 (FM3)	3,087	46.07	135	130	250	300
HMB270	4 2 4 0	63.79	125	1.40	250	300
HMHDB270	4,310	03./9	125	140	250	300
HMB325	5,310	79.4	100	140	250	300
HMHDB325	5,510	73.4	100	140	230	300
HMHDB400	6,800	101	120	190	250	300
HMB500	8,000	114	100	170	190	227

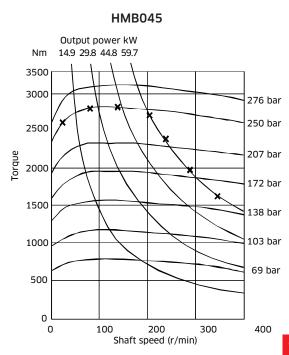
Output Torque Curves

These torque curves indicate the maximum output torque and power of a fully run-in motor for a range of pressures and speeds when operating with zero outlet pressure on Mineral Oil of 50cSt (232 SUS) viscosity. High return line pressures will reduce torque for a given pressure differential. - x - x - x - y - ycontinuous rating envelope.

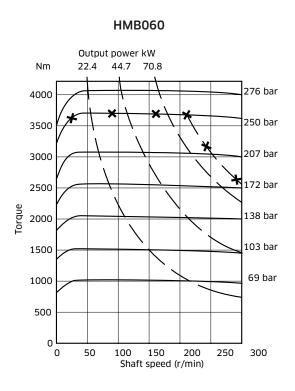
HMB030





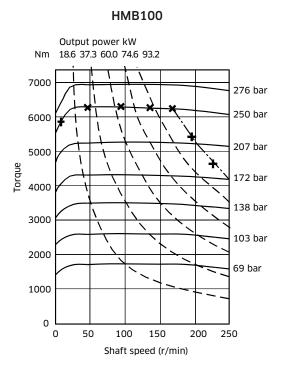


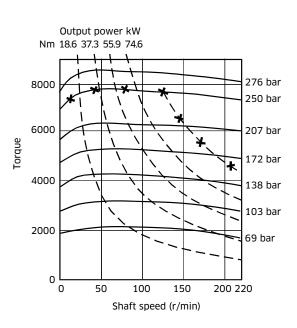
Output Torque Curves (cont)



Output power kW 18.6 37.5 56 74.6 93.2 Nm 6000 293 bar 276 bar 5000 250 bar 207 bar 4000 Torque 172 bar 3000 138 bar 2000 103 bar 69 bar 1000 0 50 100 150 200 250 300 Nm Shaft speed (r/min)

HMB080

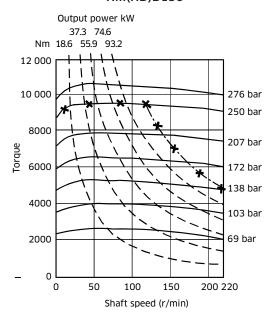




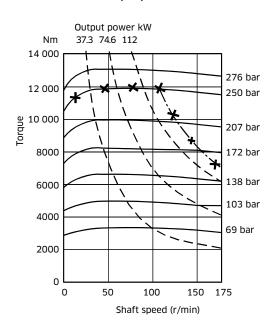
HM(HD)B125

Output Torque Curves (cont)

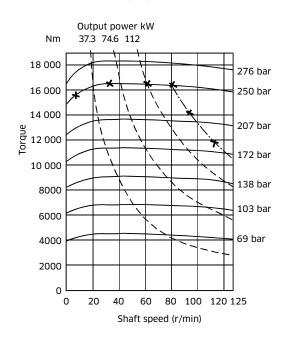
HM(HD)B150



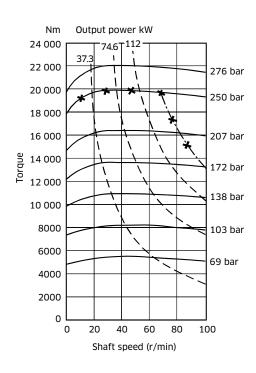
HM(HD)B200



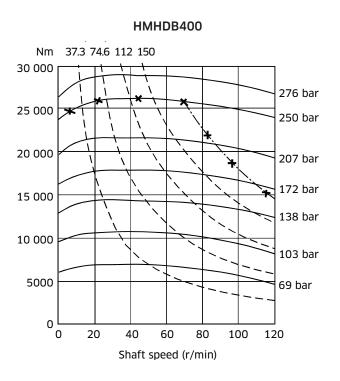
HM(HD)B270

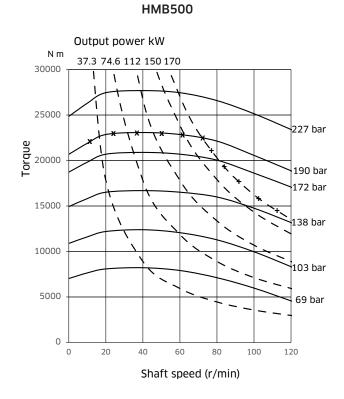


HM(HD)B325



Output Torque Curves (cont)





2-2 Volumetric Efficiency Data

Motor Type	Geometric Displacement	Zero Speed Constant	Speed Constant	Creep Speed Constant	Crankcase Leakage Constant
НМВ	cc/rev	K ₁	K ₂	K ₃	K ₄
HMB030	442	1.04	57.67	2.47	0.59
2-piece HMB030	492	1.15	51.80	2.35	0.59
HMB045	740	1.92	43.36	2.71	1.76
HMB060	983	1.72	29.91	2.35	1.88
HMB080	1,344	1.71	21.62	1.84	1.84
HMB100	1,639	1.63	19.90	1.41	1.88
HM(HD)B125	2,050	2.06	11.45	1.24	1.35
HM(HD)B150	2,470	1.62	9.98	1.00	1.39
HM(HD)B200	3,087	2.53	14.99	0.78	1.39
HM(HD)B270	4,310	3.17	21.16	0.68	1.80
HM(HD)B325	5,310	3.14	18.21	0.55	1.80
HMHDB400	6,800	4.06	10.18	0.53	2.35
HMB500	8,000	9.247	78.247	1.739	5.797

Fluid Viscosity	Viscosity Factor
cSt	Kv
20	1.58
25	1.44
30	1.30
40	1.10
50	1.00
60	0.88

Qt (total leakage) $= [K_1 + n/K_2] \times \Delta P \times Kv \times 0.005$ I/minCreep speed $= K_3 \times \Delta P \times Kv \times 0.005$ rpmCrankcase leakage $= K_4 \times \Delta P \times Kv \times 0.005$ I/min ΔP = differential pressurebarn= speedrpm

The motor volumetric efficiency can be calculated as follows:

Example:

HMB200 motor with displacement of 3.087 l/rev.

Speed 60rpm Differential pressure 200bar Fluid viscosity 50 cSt

Total leakage = $(K_1 + n/K_2) \times \Delta P \times K_V \times 0.005$ I/min

= (2.53+60/14.99) x 200 x 1 x 0.005 = 6.53

= 96.6%

2-3 Shaft Power Calculation

Example

Firstly, to find the maximum differential pressure ΔP at rated speed:

Select the rated shaft power (W) for the motor from the performance data table (in Section 2-1). This is presented in kilowatts so must be converted to watts (x1000).

Then also take the actual average running torque in N m/bar (T_o) and the rated shaft speed in rpm (n).

$$W = \frac{T_o \cdot \Delta P \cdot 2\pi \cdot n}{60}$$

Or to find maximum ΔP then use:

$$\Delta P = \underline{60 \cdot W}$$

$$2\pi \cdot T_0 \cdot n$$

HMB270 Example:

Rated shaft power, W (W): 140,000 Average actual running torque, T_o (Nm/bar): 63.79 Rated shaft speed, n (rpm): 125

$$\Delta P = \frac{60 \times 140,000}{2\pi \times 63.79 \times 125}$$

 $\Delta P = 167 \text{ bar (max.)}$

Secondly, to find the maximum speed at rated pressure (using the same information as before):

$$n = 60.W$$

$$2\pi \cdot T_0 \cdot \Delta F$$

Rated pressure (bar): 250

$$n = 60 \times 140,000$$
$$2\pi \times 63.79 \times 250$$

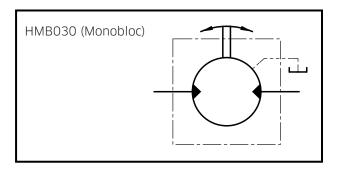
n = 83rpm (max.)

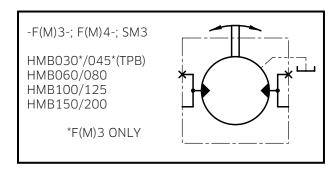
In summary, operating the motor within its shaft power limit, at rated speed, would give a maximum pressure of 167 bar, and operating the motor at rated pressure, would give a maximum speed of 83rpm.

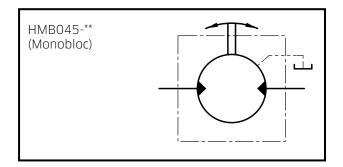
Notes

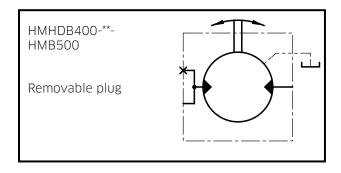
- 1) The maximum calculated speed is based on a rated inlet pressure of 250bar.
- 2) The maximum shaft power is only allowable if the motor drain temperature remains below 80°C.
- **3)** The maximum calculated differential pressure assumes that the low pressure motor port is less than 30bar.

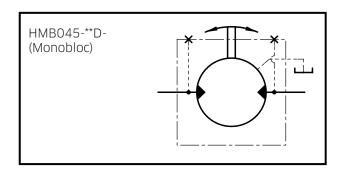
2-4 Functional Symbols

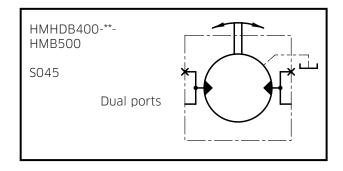












2-5 Stress Limits

When applying large external radial loads, consideration should also be given to motor bearing lives (see Section 2-6).

Motor Frame Size	Shaft Types	Maximum External Radial Bending Moment [Nm]
HMB030	P, S & Z	2,400
HMB045	P, S & Z	3,240
HM060, 080 & 100	P, S, Z & T	5,500
HMB125, 150 & 200	P1, S3, S4, Z3, & T	6,600
HMHDB125, 150, 200	S5, Z5 & P2	12,750
HMB270 & 325	P1, S3, Z3 & T	7,500
HMHDB270 & 325	P2, S5 & Z5	15,900
HMHDB400	P, S & Z	16,200
HMB500	P, S & Z	16,200

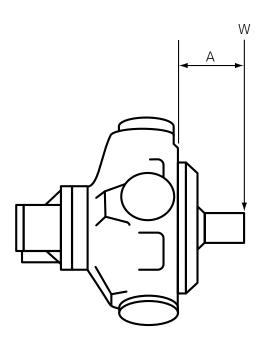
Example:

Determine the maximum radial shaft load of a HMB080 motor:

Radial load offset, A = 100mm

Maximum radial load, W = 5,500 (see table)/100

= 55kN (5,607 kg)



A = Distance from mounting face to load centre (mm)

W = Side load (N)

NOTE:

The offset distance A is assumed to be greater than 50mm. Contact Kawasaki if this is not the case.

2-6 Bearing Life Notes

Consideration should be given to the required motor bearing life in terms of baring service life. The factors that will determine bearing life include:

- 1) Duty cycle time spent on and off load
- 2) Speed
- 3) Differential pressure
- 4) Fluid viscosity
- 5) External radial shaft load
- 6) External axial shaft load

NOTE:

A heavy duty HM(HD)B motor can be ordered to further improve bearing life. Consult Kawasaki for a detailed bearing life calculation.

2-7 Circuit and Application Notes



Starting torque

The starting torques shown on the graphs in Section 2-1 are average and will vary with system parameters.



Low Speed Operations

Minimum operating speeds are determined by the hydraulic system and load conditions (load inertia, drive elasticity, etc.) Recommended minimum speeds are shown below:

Model Type	rpm
HMB030	5
HMB045	6
HMB060/080/100	3
HM(HD)B/125/150/200	3
HM(HD)B270/325	2
HMHDB400/HMB500	2

High Back Pressure

When both inlet and outlet ports are pressurised continuously, the lower port pressure must not exceed 70 bar at any time.

NOTE: High back pressure reduces the effective torque output of the motor.



Soost Pressure

When operating as a motor the outlet pressure should equal or exceed the crankcase pressure. If pumping occurs (i.e. overrunning loads) then a positive pressure, "P", is required at the motor ports. Calculate "P" (bar) from the operating formula Boost Formula P= 1+N2 x V2 + C

Where P is in bar, N = motor speed (rpm), V = motor displacement (cc/rev), C = crankcase pressure (bar) and K=a constant from the table below:

Motor	Porting	Constant (K)
HMB030	Standard - Monobloc	3.7 x 10°
ПІМІВОЗО	F(M)3 SM3	7.5 x 10°
HMB045	Standard - Monobloc	1.3 x 10 ¹⁰
NIVIBU45	F(M)3 SM3	1.6 x 10 ¹⁰
HMB060, HMB080 & HMB100	F(M)3 SM3	1.8 x 10 ¹⁰
HM(HD)B125, HM(HD)B150 &	FM(3) SM3	4.0 x 10 ¹⁰
HM(HD)B200	FM(4)	8.0 x 10 ¹⁰
HM(HD)B270 & HM(HD)B325	FM(4)	7.2 x 10 ¹⁰
HMHDB400 & HMB500	SO4 SO45	7.2 x 10 ¹⁰

2-7 Circuit and Application Notes (cont)

The flow rate of oil needed for the make-up system can be estimated from the crankcase leakage data (see Section 2-1 for calculation method). Allowances should be made for other system losses and also for "fair wear and tear" during the life of the motor, pump and system components.



Cooling Flow

Operating within the continuous rating does not require any additional cooling.

For operating conditions above "continuous", up to the "intermittent" rating, additional cooling oil may be required. This can be introduced through the spare crankcase drain ports.

Consult Kawasaki about such applications.



Motorcase pressure

With the standard shaft seal fitted, the motor casing pressure should not exceed 3.5bar.

NOTES

- 1) The casing pressure at all times must not exceed either the motor inlet or outlet pressure.
- 2) High pressure shaft seals are available for casing pressures of: 10bar for all remaining frame sizes.
- **3)** Check installation dimensions for maximum crankcase drain fitting depth.



For trouble free operation the motor's crankcase pressure must always be lower than both of the motor port pressures:

> $P_{case} < P_{in}$ and $P_{case} < P_{out}$

Hydraulic Fluids

Dependent on motor (see model code fluid type - Section 1-1) suitable fluids include:

- a) Antiwear hydraulic oils
- **b)** Phosphate ester (HFD fluids)
- c) Water glycols (HFC fluids)
- d) 60/40% water-in-oil emulsions (HFB fluids)
- e) 5/95% oil-in-water emulsions (HFA fluids)
- f) Antiwear environmentally acceptable lubricants (EALs)

Some fluids require a reduction in pressure and speed limits. Please see table in Section 1-1.

Viscosity limits when using any fluid except oil-in-water (5/95) emulsions are:

Max. off load: 2,000cSt (9270 SUS) Max. on load: **150cSt** (695 SUS) Optimum: **50cSt** (232 SUS) Minimum: 25cSt (119 SUS)



Temperature limits

Ambient min. -30°C (-22°F) Ambient max. +70°C (158°F)

Max. operating temperature range.

Mineral oil Water containing **Min** -20°C (-4°F) +10°C (50°F) +54°C (130°F) **Max.** +80°C (175°F)

NOTE: To obtain optimum services life from both fluid and hydraulic systems components, a fluid operating temperature of 40°C is recommended.

2-7 Circuit and Application Notes (cont)



Mineral oil recommendations

The fluid should be a good hydraulic grade, nondetergent mineral oil. It should contain anti-oxidant, antifoam and demulsifying additives. It must contain antiwear or extreme pressure (EP) additives. Automatic transmission fluids and motor oils are not recommended.



Biodegradable Fluid Recommendations

Well-designed environmentally acceptable lubricants (EALs) may be used with Staffa motors. The EAL must be designed for use in hydraulic systems and have a synthetic ester base. Additives should be as listed for mineral oils, above. The performance of EALs with hydraulic systems vary widely and so checks for seal compatibility, copper alloy compatibility, oxidation resistance and lubrication properties should be carried out before selecting an EAL. For help with EALs please contact Kawasaki.



Filtration

Full flow filtration (open circuit), or full boost flow filtration (closed circuit) to ensure system cleanliness to ISO4406 code 22/18/13 or cleaner.



Noise levels

The airborne noise level is less than 66.7dB(A) DIN & dB(A) NFPA through the continuous operating envelope. Where noise is a critical factor, installation resonances can be reduced by isolating the motor by elastomeric means from the structure and the return line installation. Potential return line resonances originating from liquid borne noise can be further attenuated by providing a return line back pressure of 2 to 5bar.



Polar moment of intertia and mass table

Motor Frame Size	Polar Moment of Intertia (kg m²) (Typical data)	Mass (kg) (Approx. all models)		
HMB030	0.0150	73		
HMB045	0.0470	120		
HMB060	0.0500	144		
HMB080	0.0600	144		
HMB100	0.0760	144		
HMB125	0.2200	217		
HMB150	0.2500	265		
HMB200	0.2700	265		
HMB270	0.4900	420		
HMB325	0.5000	429		
HMHDB400 - S04	0.5400	481		
HMHDB400 - S045	0.5400	510		
HMB500	0.5400	510		

2-8 Motor Operation at Low Temperature

When operating the motor at low temperature consideration should be given to the fluid viscosity. The maximum fluid viscosity before the shaft should be turned is 2,000cSt. The maximum fluid viscosity before load is applied to the motor shaft is 150cSt.

If low ambient temperature conditions exist, then a crankcase flushing flow of at least 5 I/min should be applied to the motor during periods when the motor is not in use.

The shaft seal temperature limits for both medium and high pressure applications are shown in the table below.

	Non-operating temperature limits	Minimum operating temperature
Standard pressure shaft seal	below minus 40°C and above 100°C	minus 30°C
High pressure shaft seal	below minus 30°C and above 120°C	minus 15°C

All seals are very brittle below minus 40°C and are likely to break very easily and due to their sluggish response may not provide a 100% leak free condition.

It should be noted that the maximum continuous operating temperature within the motor crankcase is plus 80°C.

2-9 Freewheeling Notes

All Staffa motors can be used in freewheeling applications.

In all circumstances it is essential that the motor is unloaded (A and B ports connected together) and that the circuit is boosted.

The required boost pressure is dependent on both the speed and displacement conditions.

It should be noted that for HMB series motors, to achieve freewheel, large flows will have to re-circulate around the motor.

This will require a large recirculating valve and consideration of circuit cooling as the motor will be generating a braking torque.

It is for these reasons that HMC, HPC or HMF series motors are the preferred option for freewheeling applications.

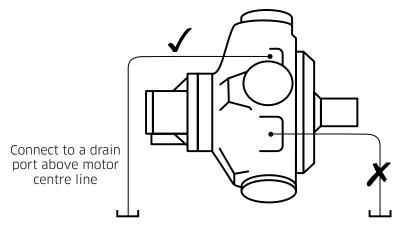
See catalogues M-2002/03.17, M-2003/03.17 and M-2005/12.17 for details.

2-10 Crankcase Drain Connections



Motor axis - horizontal

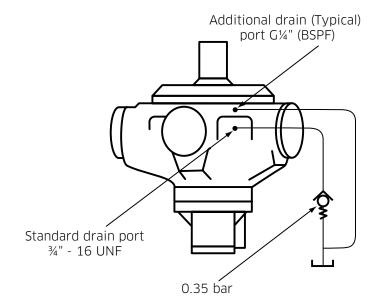
The recommended minimum pipe size for drain line lengths up to approx. 5m is 12.0mm (½") bore. Longer drain lines should have their bore size increased to keep the crankcase pressure within limits





Motor axis - vertical shaft up

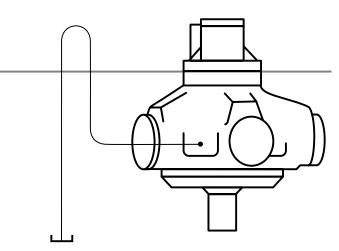
Specify "V" within the model code for extra drain port, G¼" (BSPF). Connect this port into the main drain line downstream of a 0.35bar check valve to ensure good bearing lubrication. The piping arrangement must not allow syphoning from the motorcase. (refer to installation drawing for details).





Motor axis - vertical shaft down

The piping, from any drain port, must be taken above the level of the motorcase to ensure good bearing lubrication. The arrangement must not allow syphoning from the motorcase.



2-11 Installation Data



Spigot

The motor should be located by the mounting spigot on a flat, robust surface using correctly sized bolts.

The diametrical clearance between the motor spigot and the mounting must not exceed 0.15mm. If the application incurs shock loading, frequent reversing or high speed running, then high tensile bolts should be used, including one fitted bolt.



Bolt Torque

The recommended torque wrench setting for bolts is as follows:

M12	97 +/- 7Nm
M14	160 +/- 21Nm
M18	312 +/- 14 Nm
M20	407 +/- 14 Nm
M24	690 +/- 27 Nm
½" UNF	97 +/- 7 Nm
%" UNF	265 +/- 14 Nm
¾" UNF	393 +/- 14 Nm
1"	810 +/- 27 Nm



Shaft Coupling

Where the motor is solidly coupled to a shaft having independent bearings the shaft must be aligned to within 0.13mm TIR.



End of Motor Life

The motor unit must be completely empty upon disposal. It must be disposed of according to national regulations and safety information for the disposal of hydraulic fluids

All individual parts of the motor unit must be recycled. Separate the motor unit parts according to: cast iron, steel, aluminium, non-ferrous metal, electronic waste, plastic, and seals.

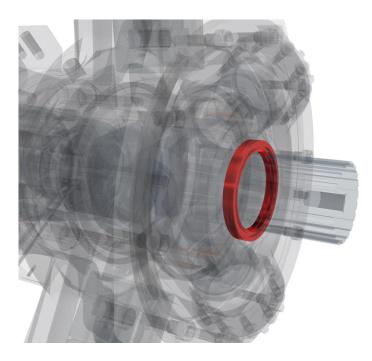
2-12 Special Features

Feature	Section	HMB 030	HMB 030 -F(M)3 HMB 030 -SM3	HMB 045	HMB 045 - F(M)3 HMB 045 - SM3	HMB 060/ 080	HMB 100	HM(HD)B 125	HM(HD)B 150/ 200	НМ(HD)В 270	HM(HD)B 325	HMHDB 400	HMB 500
High Pressure Shaft Seal	2-12	•	•	•	•	•	•	•	•	•	•	•	•
Improved Shaft Seal Life	2-12	•	•	•	•	•	•	•	•	•	•	•	•
Improved Cavitation Resistance	2-12	0	•	0	•	•	•	•	•	•	•	•	•
Increased Starting Torque	2-12	•	•	•	•	•	•	•	•	•	•	•	0
Anti-clock- wise Rotation	2-12	•	•	•	•	•	•	•	•	•	•	•	•
Thermal Shock Resistance	2-12	0	•	0	•	•	•	•	•	•	•	•	0
Drain Port Adaptor - ½" BSPP	2-12	•	•	•	•	•	•	•	•	•	•	•	•
Φ21mm Mounting Holes	2-12	0	0	0	0	•	•	•	•	•	•	•	•
Φ22mm Mounting Holes	2-12	0	0	0	0	•	•	•	•	•	•	•	•
Marine- specification Primer Paint	2-12	•	•	•	•	•	•	•	•	•	•	•	•

- Available
- O Not available

If a motor is to be ordered with any special features listed, please contact Kawasaki.

High Pressure Shaft Seal



Description:

- > 10bar rated
- > Recommended for cold climates
- > Rugged aluminium construction

Technical Information

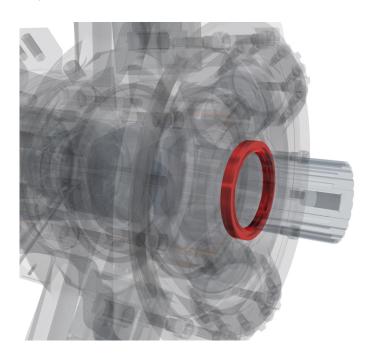
Where crankcase pressure will be higher than 3.5 bar, the high pressure shaft seal should be selected.

Case pressure	≤ 10bar
Non-operating temperature limits	Below -30°C and above 120°C
Minimum operating temperature	-15°C
Maximum operating temperature	80°C
Minimum viscosity	2,000cSt
Maximum viscosity	150cSt

Applicable to:

HMB 030	HMB 030 -F(M)3/ SM3	HMB 045	HMB 045 -F(M)3/ SM3	HMB 060/ 080	HMB 100	HM(HD)B 125	HM(HD)B 150/200	HM(HD)B 270	HM(HD)B 325	HMHDB 400	HMB 500
•	•	•	•	•	•	•	•	•	•	•	•

Improved Shaft Seal Life



Description:

- > Stainless steel sleeve prevents corrosion
- > Improved wear resistance
- > Recommended for corrosive environments

Technical Information

A well-established method of increasing rotary seal life in corrosive environments is to fit a thin-walled, stainless steel sleeve to the rotating shaft to provide a corrosion-resistant, wear-resistant counterface surface for the seal to run against. All HMB motors can be fitted with such sleeves upon request.

Sleeve material	A304/301 Stainless Steel
Sleeve surface finish	R _a 0.25 to 0.5µm (10 to 20µin)

Applicable to:

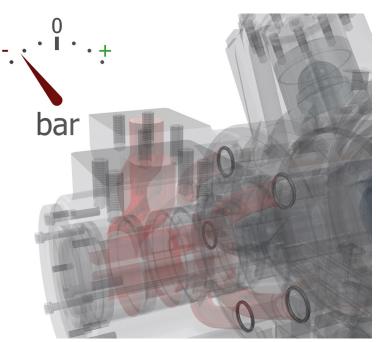
HMB 030	HMB 030 -F(M)3/ SM3	HMB 045	HMB 045 -F(M)3/ SM3	HMB 060/ 080	HMB 100	HM(HD)B 125	HM(HD)B 150/200	HM(HD)B 270	HM(HD)B 325	HMHDB 400	HMB 500
•	•	•	•	•	•	•	•	•	•	•	•



Improved Cavitation Resistance

Description:

- > Recommended for overunning applications
- > Protects against seal damage for short periods of operation in vacuum inlet conditions.



Cavitation can occur due to many different factors. Although it is not possible to make the HMB motor resistant to cavitation, certain features can be added to improve the motor's resistance to short periods of lost port pressure.

In applications where the HMB motor can be driven (like a pump) a risk arises that insufficient fluid will be provided to maintain a positive pressure at both main ports of the motor causing cavitation. The results of extended running at these conditions can be catastrophic to the motor's function.

The improved cavitation resistance feature should be considered where:

- Overrunning conditions may occur (load driving the motor)
- Loss of main port pressure while motor is rotating

NOTE:

This feature comes as standard on monobloc HMB motors (HMB030, HMB045).

Applicable to:

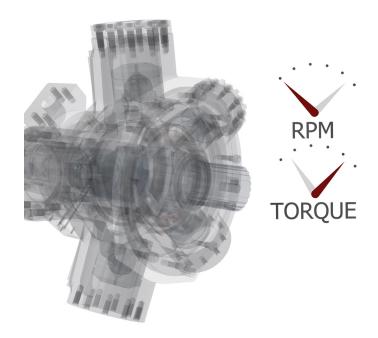
HMB 030	HMB 030 -F(M)3/ SM3	HMB 045	HMB 045 -F(M)3/ SM3	HMB 060/ 080	HMB 100		HM(HD)B 150/200	HM(HD)B 270	HM(HD)B 325	HMHDB 400	HMB 500
0	0	0	•	•	•	•	•	•	•	•	•



♦ Increased Starting Torque

Description:

- > Optimised for high break-out torque
- > Recommended for low speed operation
- > Improved service life for low speed applications

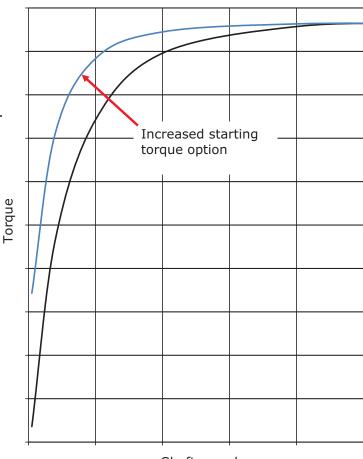


Technical Information

If an application demands the drive motor be run at speeds of less than 10 rpm for most of the duty cycle, or involves frequent start/stop or forward/reverse operation, the Staffa HMB motor range has it covered.

By optimising the HMB motor's design for low speeds, it is possible to increase the break out torque and low speed mechanical efficiency performance.

All figures given in Section 2-1 Performance Data are still valid when selecting this feature.



Shaft speed



Increased Starting Torque (cont)

Volumetric Performance

In order to achieve increased torque at low speeds the volumetric characteristics of the motor performance are changed.

When calculating leakage and volumetric efficiency use the constants shown here in place of those given for the standard motor in Section 2-1.

Motor Type	Geometric Displacement	Zero Speed Constant	Speed Constant	Creep Speed Constant	Crankcase Leakage Constant
	cc/rev	K1	К2	К3	К4
HMB030	442	8.62	51.80	17.54	8.06
HMB030 2-piece	492	8.51	57.67	19.37	8.06
HMB045	740	3.93	43.36	12.80	9.23
HMB060	983	9.19	29.91	9.95	9.35
HMB080	1,344	9.18	21.62	7.39	9.31
HMB100	1,639	9.10	19.90	5.97	9.35
HM(HD)B125	2,050	9.53	11.45	4.88	8.82
HM(HD)B150	2,470	9.09	9.98	4.02	8.86
HM(HD)B200	3,087	10.00	14.99	3.20	8.86
HM(HD)B270	HM(HD)B270 4,310		21.16	3.11	12.26
HM(HD)B325	5,310	13.60	18.21	2.52	12.26
HMHDB400	6,800	19.00	10.18	2.73	17.29

Applicable to:

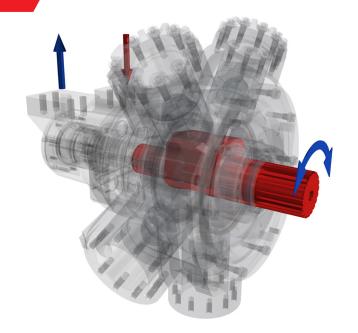
HMB 030	HMB 030 -F(M)3/ SM3	HMB 045	HMB 045 -F(M)3/ SM3	HMB 060/ 080	HMB 100	HM(HD)B 125	HM(HD)B 150/200		HM(HD)B 325	HMHDB 400	HMB 500
•	•	•	•	•	•	•	•	•	•	•	0



Anti-Clockwise Rotation

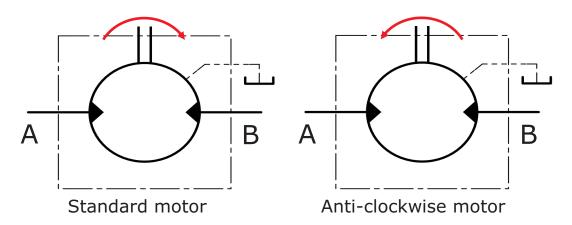
Description:

- > Reduce installation complexity
- > Standardise equipment designs



Technical Information

All HMB motors can be specified with an anti-clockwise rotation valve configuration. All performance and volumetric characteristics remain unchanged.

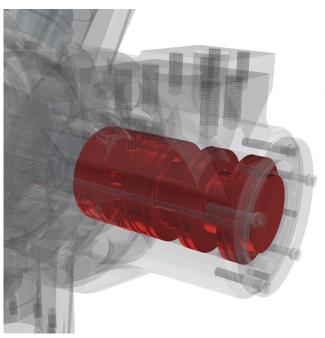


Applicable to:

HMB 030	HMB 030 -F(M)3/ SM3	HMB 045	HMB 045 -F(M)3/ SM3	HMB 060/ 080	HMB 100	HM(HD)B 125	HM(HD)B 150/200		HM(HD)B 325	HMHDB 400	HMB 500
•	•	•	•	•	•	•	•	•	•	•	•



Thermal Shock Resistance





Description:

- > Recommended for cold climates
- > Optimised for start-up in freezing temperatures
- > Engineered for total peace of mind

Technical Information

Starting up a cold system with warm hydraulic fluid is a known cause of heavy wear and potential seizure of hydraulic machinery. To minimise this potential risk, the HMB motor can be configured to combat thermal shocks to give complete peace of mind when operating in very cold climates.

Volumetric Performance

In order to provide thermal shock resistance the volumetric characteristics of the motor performance are changed. When calculating leakage and volumetric efficiency use the constants shown in Section 2-12 in place of those given for the standard motor in Section 2-1.

All figures given in Section 2-1 Performance Data are still valid when selecting this feature.

Note:

When operating at low temperature, consideration must be given to the guidance notes in Section 2-8 Motor Operation at Low Temperature.

Thermal Shock Resistance (cont)

Motor Type	Geometric Displacement	Zero Speed Constant	Speed Constant	Creep Speed Constant	Crankcase Leakage Constant
	cc/rev	K1	К2	К3	К4
HMB060	983	3.72	29.91	4.39	1.88
HMB080	1,344	3.71	21.62	3.32	1.84
HMB100	1,600	3.63	19.90	2.63	1.88
HM(HD)B125	2,050	4.41	11.45	2.21	1.35
HM(HD)B150	2,470	3.97	9.98	1.81	1.39
HM(HD)B200	3,087	4.88	14.99	1.43	1.39
HM(HD)B270	4,310	5.52	21.16	1.23	1.80
HM(HD)B325	5,310	5.49	18.21	0.99	1.80
HMHDB400	6,800	6.41	10.18	0.88	2.35

Applicable to:

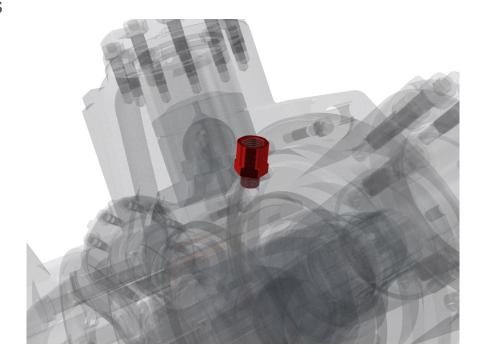
HMB 030	HMB 030 -F(M)3/ SM3	HMB 045	HMB 045 -F(M)3/ SM3	HMB 060/ 080	HMB 100	HM(HD)B 125	HM(HD)B 150/200		HM(HD)B 325	HMHDB 400	HMB 500
0	0	0	•	•	•	•	•	•	•	•	0



Drain Port Adaptors

Description:

- > Improves manufacturing logistics
- > Motor supplied ready for connection to ½" BSPP male fitting



Technical Information

Motor Type	Adaptor Supplied
HMB030	%" BSP to ½" BSPP
HMB045	%" BSP to ½" BSPP
HMB045-F(M)3/SM3	34" UNF 2B to 1/2" BSPP
НМВ060	¾" UNF 2B to ½" BSPP
HMB080	34" UNF 2B to 1/2" BSPP
HMB100	¾" UNF 2B to ½" BSPP
HM(HD)B125	34" UNF 2B to 1/2" BSPP

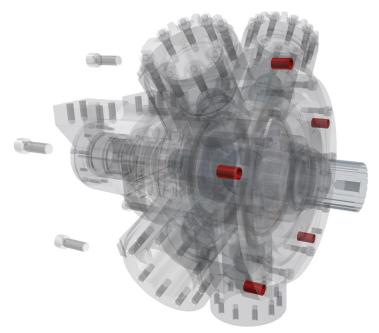
Motor Type	Adaptor Supplied
HM(HD)B150	34" UNF 2B to 1/2" BSPP
HM(HD)B200	34" UNF 2B to 1/2" BSPP
HM(HD)B270	¾" UNF 2B to ½" BSPP
HM(HD)B325	34" UNF 2B to 1/2" BSPP
HMHDB400	34" UNF 2B to 1/2" BSPP
HMB500	¾" UNF 2B to ½" BSPP

One or two drain adaptors can be supplied.

Applicable to:

HMB 030	HMB 030 -F(M)3/ SM3	HMB 045	HMB 045 -F(M)3/ SM3	HMB 060/ 080	HMB 100	HM(HD)B 125	HM(HD)B 150/200	HM(HD)B 270	HM(HD)B 325	HMHDB 400	HMB 500
•	•	•	•	•	•	•	•	•	•	•	•

Mounting Hole Diameter



Description:

- > Matching mounting holes to bolts
- > Φ21mm and Φ22mm options available

Technical Information

In different markets, different bolt standards are adopted which may not be best suited to the standard Φ 20mm mounting hole diameter on the HMB motors. To give a correct fit and optimum installation, Φ 21mm or Φ 22mm holes can be selected on larger frame sizes.



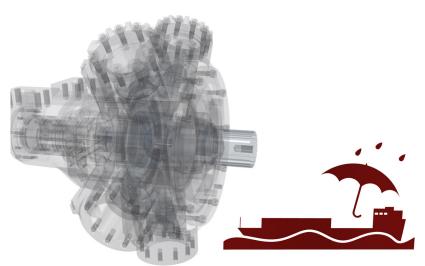


Applicable to:

HMB 030	HMB 030 -F(M)3/ SM3	HMB 045	HMB 045 -F(M)3/ SM3	HMB 060/ 080	HMB 100	HM(HD)B 125	HM(HD)B 150/200	HM(HD)B 270	HM(HD)B 325	HMHDB 400	HMB 500
0	0	0	0	•	•	•	•	•	•	•	•



Marine Specification Primer Paint



Description:

- > Improves corrosion and water resistance of the finishing system
- > Excellent adhesion strength
- > Recommended for marine applications

Technical Information

Colour	Red oxide
Type	Single pack epoxy etching primer
Standard	BS 3900 part A 8
Dry film thickness	> 12µm

Applicable to:

HN 03	HMB 030 -F(M)3/ SM3	HMB 045	HMB 045 -F(M)3/ SM3	HMB 060/ 080	HMB 100	HM(HD)B 125	HM(HD)B 150/200		HM(HD)B 325	HMHDB 400	HMB 500
	•	•	•	•	•	•	•	•	•	•	•

Tj speed sensor with Tk readout option

Tj Speed Sensor Technical Specification

The Tj speed sensor is a hall effect dual channel speed probe that can provide feedback of both speed and direction.

Signal Outputs: Square wave plus directional signal

Power Supply: 8 to 32V @ 40mA

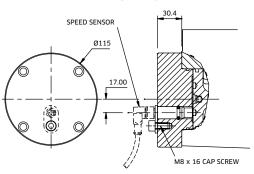
Protection class: IP68

Output frequency: 16 pulses/revolution

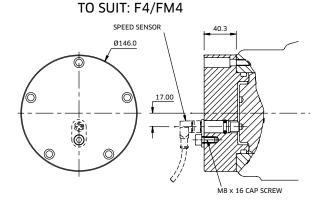


Installation Details

TO SUIT: F3/FM3/SM3



'Ti'



Kem

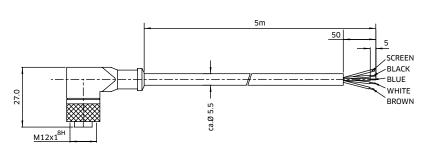
0 × 0 ns

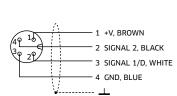
Tk Output Module

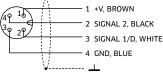
The Tk option consists of the Tj speed sensor together with the optional T401 output module.

The addition of the T401 module provides a software configured single channel tachometer and relay with a 0/4-20mA analogue current output.

The software and calibration cable is also provided.







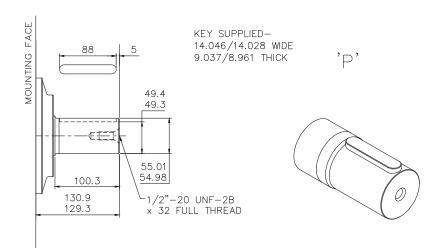
NOTES

Dimensions

3-1 HMB030



Monobloc - 'P', 'S' and 'Z' Shafts



SPLINE DATA

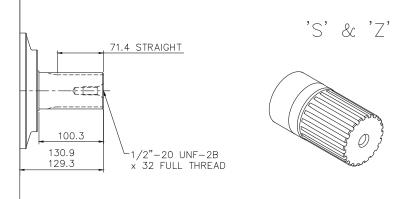
'S' TO BS 3550 (ANSI B92.1 CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE 30° PRESSURE ANGLE NUMBER OF TEETH 17 PITCH 8/16 MAJOR DIAMETER 56.41/56.28

FORM DIAMETER 50.703 MINOR DIAMETER 50.07/49.60

PIN DIAMETER 6.096

DIAMETER OVER PINS 62.985/62.931

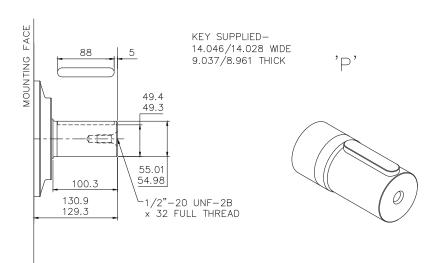
DIN 5480, W55 X 3 X 17 X 7h



3-1 HMB030 (cont)



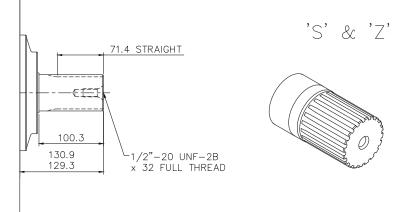
2 Piece - 'P', 'S' and 'Z' Shafts



SPLINE DATA

'S' TO BS 3550 (ANSI B92.1 CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE 30° PRESSURE ANGLE NUMBER OF TEETH 17 8/16 PITCH 56.41/56.28 50.703 MAJOR DIAMETER FORM DIAMETER MINOR DIAMETER 50.07/49.60 PIN DIAMETER 6.096 DIAMETER OVER PINS 62.985/62.931

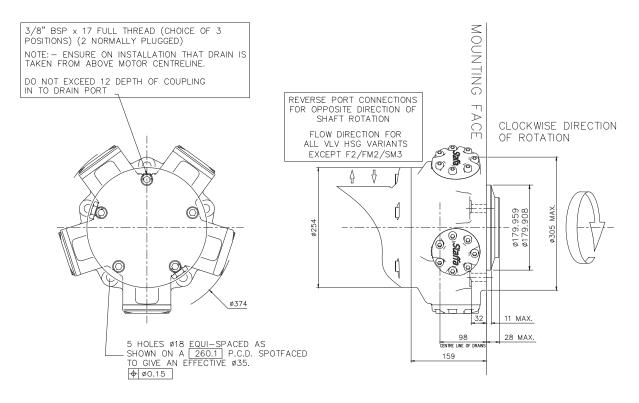
DIN 5480, W55 X 3 X 17 X 7h



3-1 HMB030 (cont)



2 Piece - Installation



3-1 HMB030 (cont)



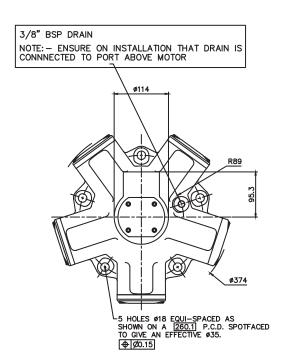
Monobloc - Side Port Installation

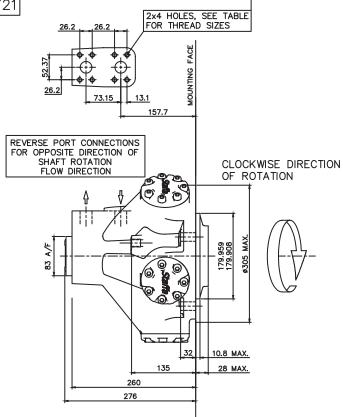
2 PORTS Ø25 TO SUIT SAE CODE 61, 1" NOM. SPLIT FLANGE

PORT FLANGE BOLT TAPPING SIZE -3/8"-16 UNC-2B X 16 FULL THREAD DEPTH FM: M10 X P1.5 X 16 FULL THREAD DEPTH

EXAMPLE FOR MODEL CODE.

SIDE ENTRY MOTORCASE - HMB030/P/FM/21

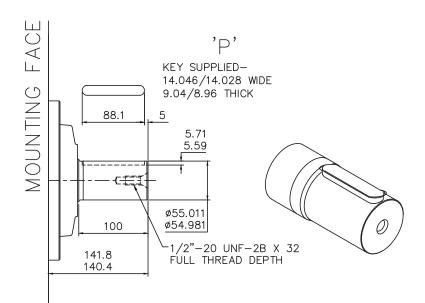




3-2 HMB045



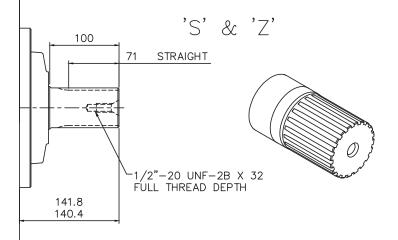
Monobloc - 'P', 'S' & 'Z' Shafts



SPLINE DATA

'S' TO BS 3550 (ANSI B92.1 CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE 30° NUMBER OF TEETH 17 **PITCH** 8/16 MAJOR DIAMETER 56.41/56.29 FORM DIAMETER 50.703 50.06/49.60 MINOR DIAMETER PIN DIAMETER 6.096 DIAMETER OVER PINS 62.984/62.931

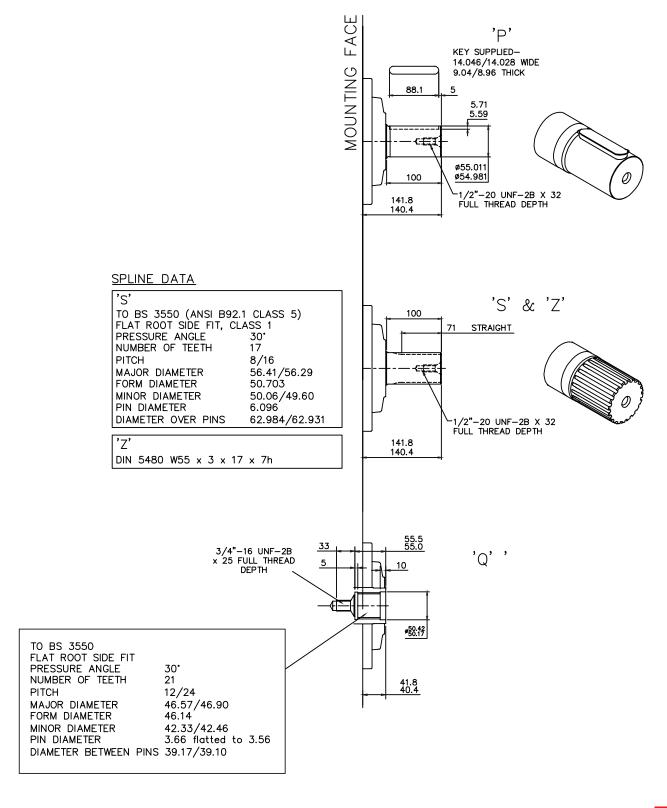
DIN 5480 W55 \times 3 \times 17 \times 7h



3-2 HMB045 (cont)

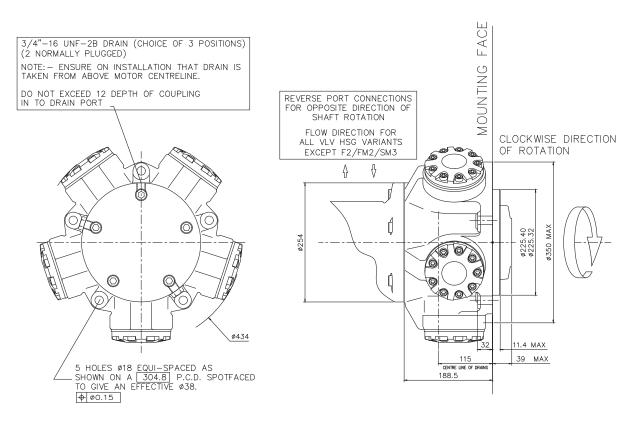


4 2 Piece - 'P', 'S', 'Z' & Q Shafts

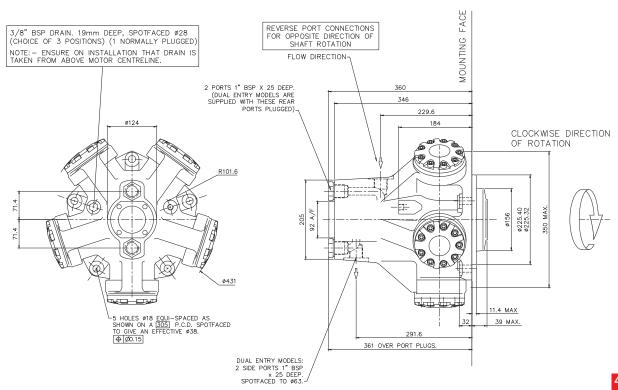


3-2 HMB045 (cont)

2 Piece - Installation



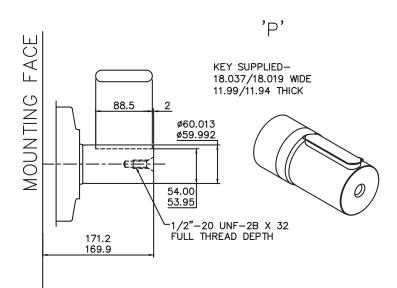
Monobloc - Installation



3-3 HMB060/080



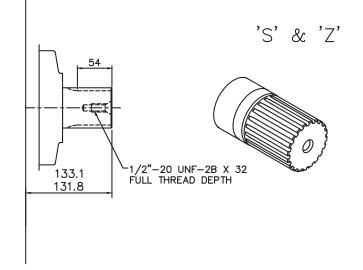
'P', 'S' & 'Z' Shafts



SPLINE DATA

'S' TO BS 3550 (ANSI B92.1 CLASS 5) FLAT ROOT SIDE FIT, CLASS 1
PRESSURE ANGLE 30° PRESSURE ANGLE NUMBER OF TEETH 14 PITCH 6/12 MAJOR DIAMETER 62.553/62.425 FORM DIAMETER 55.052 MINOR DIAMETER 54.084/53.525 PIN DIAMETER 8.128 DIAMETER OVER PINS 71.593/71.544

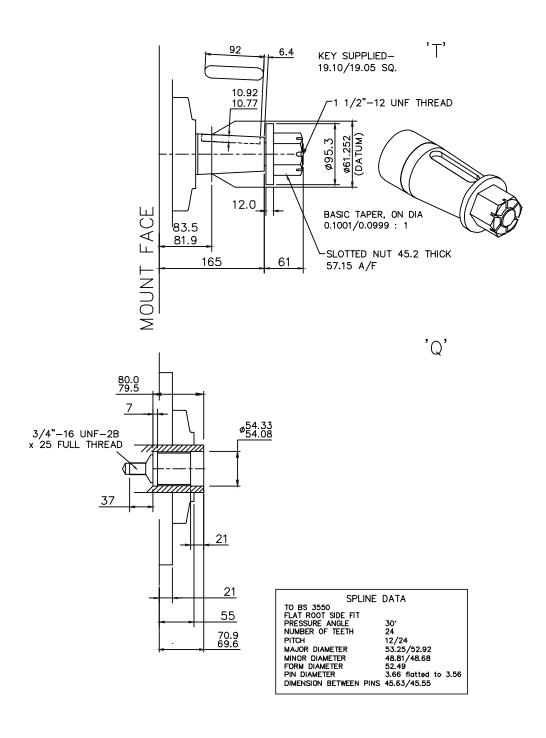
DIN 5480 W70 x 3 x 30 x 22 x 7h



3-3 HMB060/080 (cont)

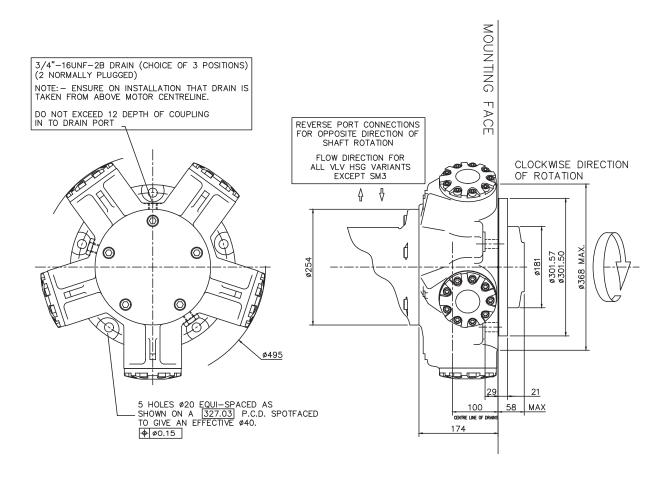


T' & 'Q' Shafts



3-3 HMB060/080 (cont)

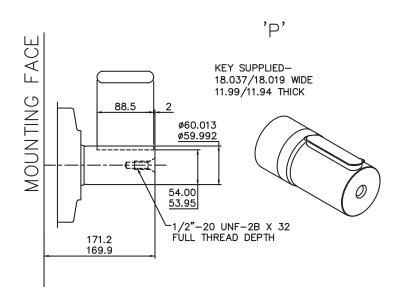




3-4 HMB100



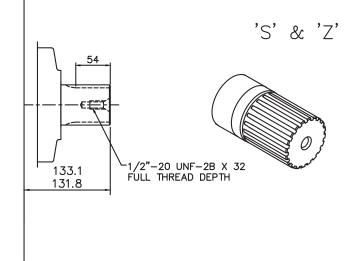
'P', 'S' & 'Z' Shafts



SPLINE DATA

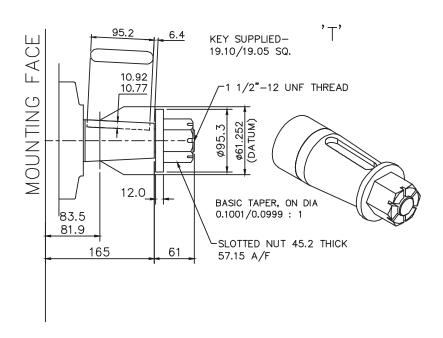
TO BS 3550 (ANSI B92.1 CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE 30° NUMBER OF TEETH 14 PITCH 6/12 MAJOR DIAMETER 62.553/62.425 FORM DIAMETER 55.052 MINOR DIAMETER 54.084/53.525 PIN DIAMETER 8.128 DIAMETER OVER PINS 71.593/71.544

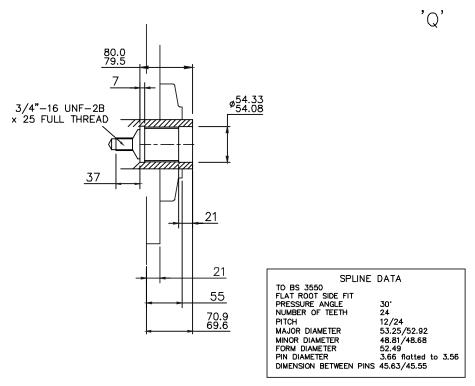
'Z' DIN 5480 W70 x 3 x 30 x 22 x 7h



3-4 HMB100 (cont)

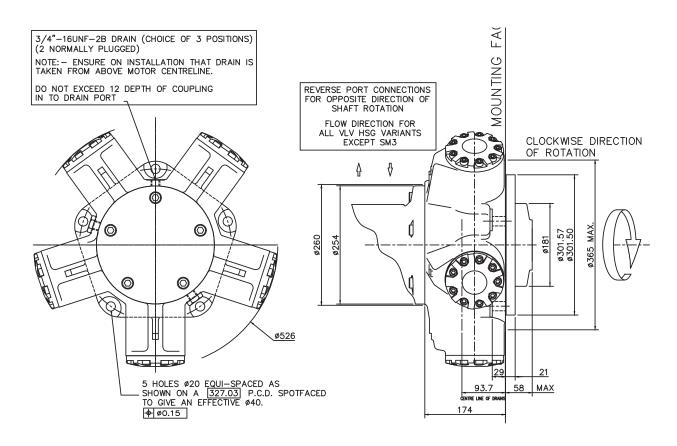
T' & 'Q' Shafts





3-4 HMB100 (cont)

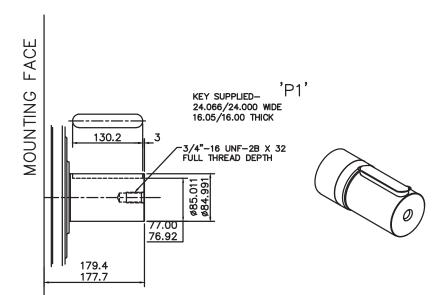
Installation



3-5 HM(HD)B125



HMB125 - 'P1', 'S3', 'S4' & 'Z3' Shafts

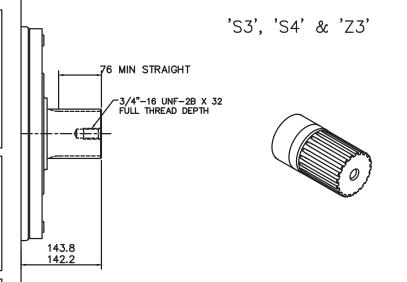


SPLINE DATA

'S3' TO BS 3550 (ANSI B92.1, CLASS 5)
FLAT ROOT SIDE FIT, CLASS 1
PRESSURE ANGLE 30°
NUMBER OF TEETH 20 **PITCH** 6/12 MAJOR DIAMETER 87.953/87.825 FORM DIAMETER 80.264 MINOR DIAMETER 79.485/78.925 PIN DIAMETER 8.128 DIAMETER OVER PINS 97.084/97.030

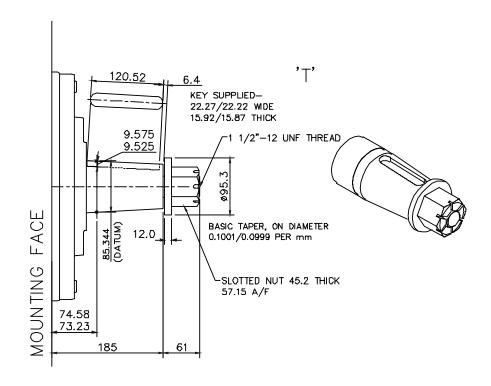
'S4' PRESSURE ANGLE NUMBER OF TEETH 20° 16 5/10 **PITCH** MAJOR DIAMETER 86.360/86.233 FORM DIAMETER 76.124 MINOR DIAMETER 74.93/72.39 PIN DIAMETER 8.636 DIAMETER OVER PINS 92.710/92.581

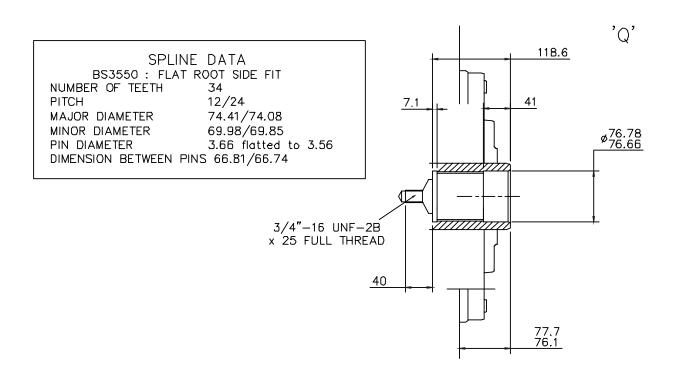
'Z3' DIN 5480 W85 x 3 x 27 x 7h





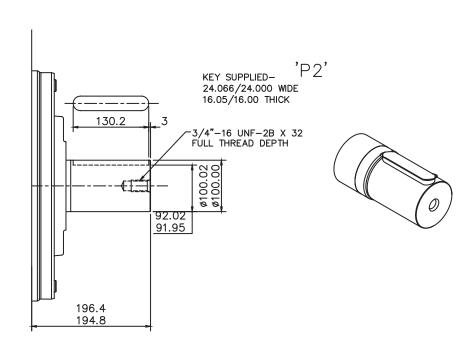
HMB125 - 'T' & 'Q' Shafts







♦ HMHDB125 - 'P2' Shafts





HMHDB125 - 'S5' & 'Z5' Shafts

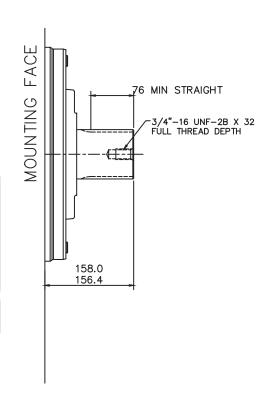
SPLINE DATA

'S5' PRESSURE ANGLE NUMBER OF TEETH 23 6/12 100.652/100.526 PITCH MAJOR DIAMETER FORM DIAMETER 92.939 MINOR DIAMETER 92.184/91.626 8.128

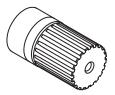
PIN DIAMETER DIAMETER OVER PINS 109.573/109.517

'Z5'

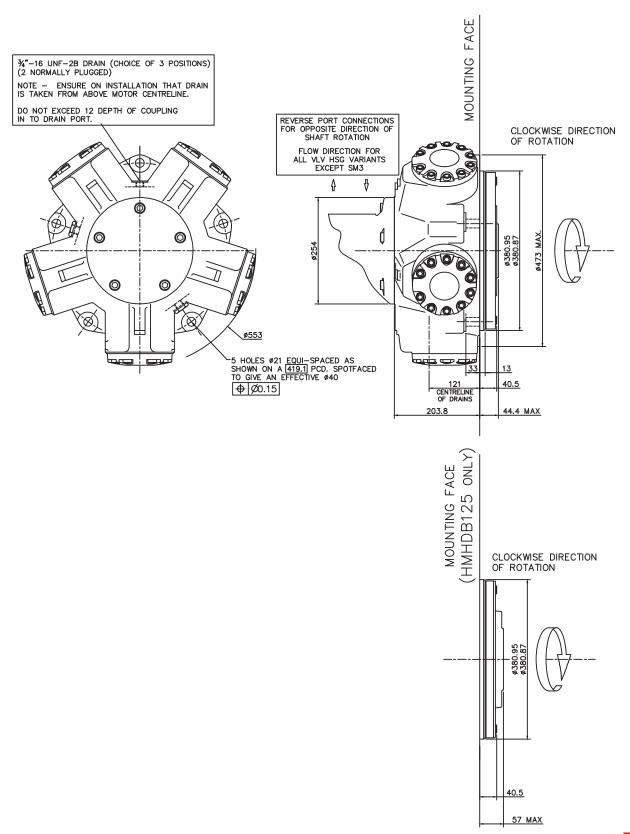
DIN 5480 W100 x 4 x 24 x 7h







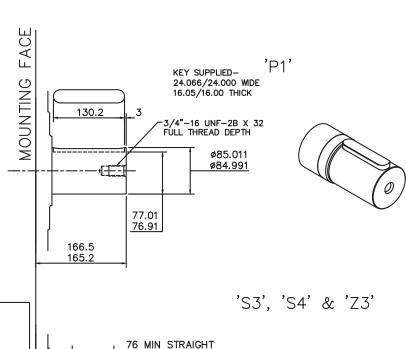




3-6 HM(HD)B150/200



HMB150/200 - 'P1', 'S3', 'S4' & 'Z3' Shafts



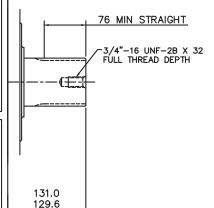
SPLINE DATA

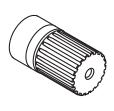
'S3' TO BS 3550 (ANSI B92.1, CLASS 5) FLAT ROOT SIDE FIT, CLASS 1
PRESSURE ANGLE
30°
NUMBER OF TEETH
20 PITCH 6/12 MAJOR DIAMETER 87.953/87.825 FORM DIAMETER 80.264

MINOR DIAMETER 79.485/78.925 PIN DIAMETER 8.128 DIAMETER OVER PINS 97.084/97.030

'S4' PRESSURE ANGLE NUMBER OF TEETH 20° 16 PITCH 5/10 MAJOR DIAMETER 86.360/86.233 FORM DIAMETER 76.124 MINOR DIAMETER 74.93/72.39 PIN DIAMETER 8.636 DIAMETER OVER PINS 92.710/92.581

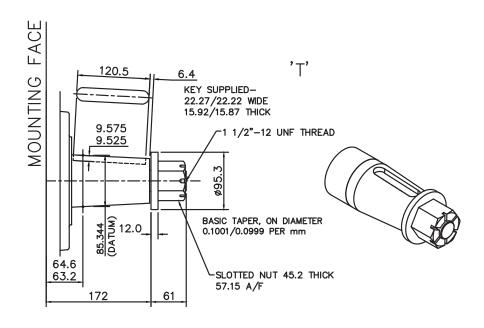
'Z3' DIN 5480 W85 x 3 x 27 x 7h





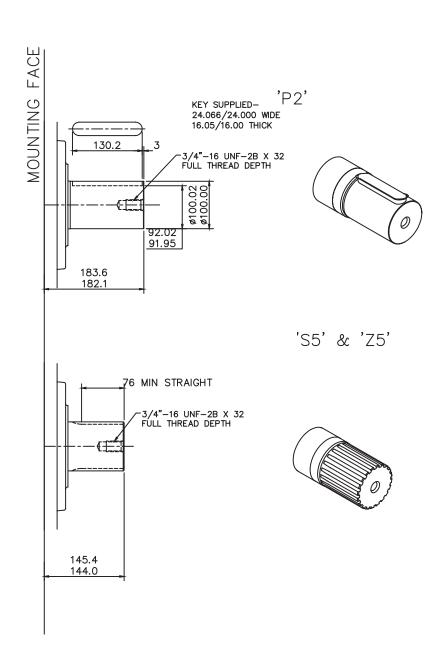


HMB150/200 - 'T' Shaft





HMHDB150/200 - 'P2', 'S5' & 'Z5' Shafts



SPLINE DATA

'S5'

PRESSURE ANGLE NUMBER OF TEETH 30° 23 6/12 PITCH

MAJOR DIAMETER 100.652/100.526 FORM DIAMETER 92.939 MINOR DIAMETER 92.184/91.626 8.128

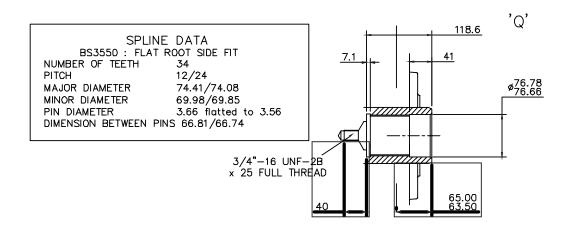
PIN DIAMETER
DIAMETER OVER PINS 109.573/109.517

'Z5'

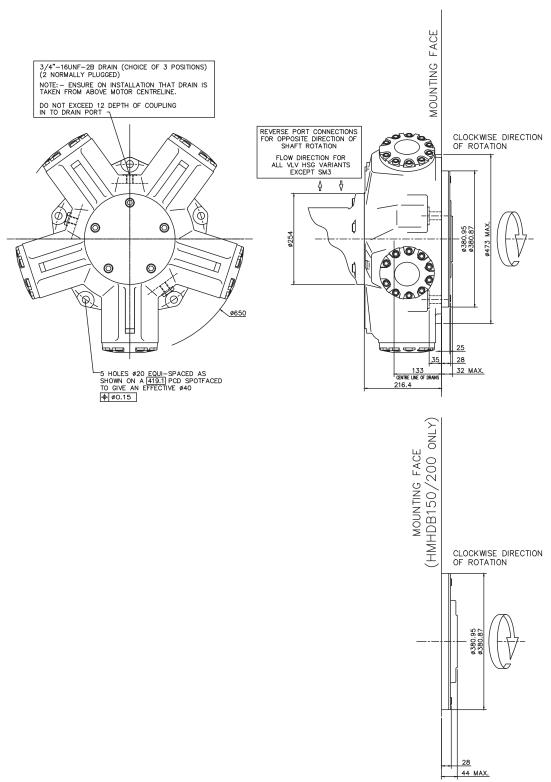
DIN 5480 W100 x 4 x 24 x 7h



HMHDB150/200 - 'Q' Shafts



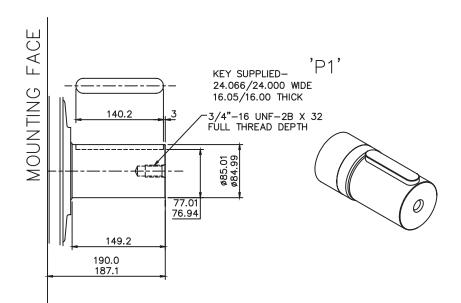




3-7 HM(HD)B270



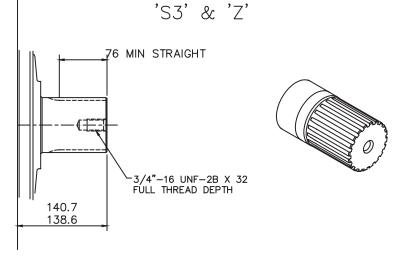
HMB270 - 'P1', 'S3' & 'Z' Shafts



SPLINE DATA

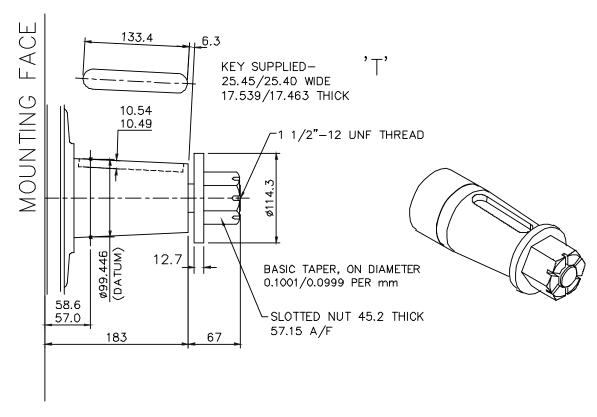
'S3' TO BS 3550 (ANSI B92.1, CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE 30° NUMBER OF TEETH 20 **PITCH** 6/12 MAJOR DIAMETER 87.953/87.825 FORM DIAMETER 80.264 MINOR DIAMETER 79.485/78.925 PIN DIAMETER 8.128 DIAMETER OVER PINS 97.084/97.030

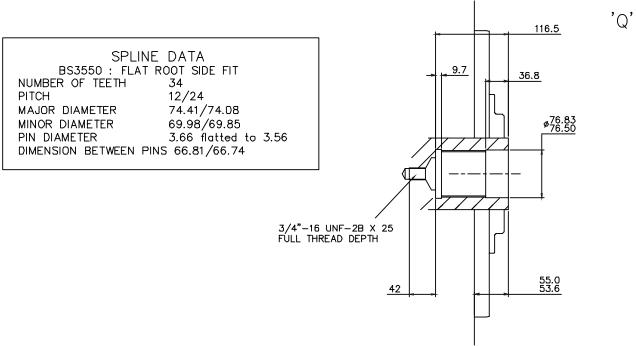
'Z' DIN 5480 W100 x 4 x 24 x 7h





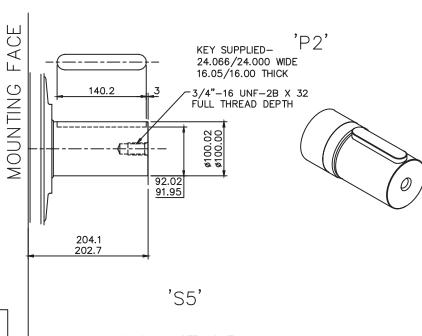
★ HMB270 - 'T' & 'Q' Shaft







+ HMHDB270 - 'P2' & 'S5' Shafts



SPLINE DATA

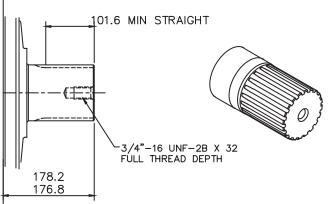
TO BS 3550 (ANSI B92.1, CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE 30° NUMBER OF TEETH 23

PITCH 6/12

MAJOR DIAMETER 100.653/100.526 FORM DIAMETER 92.939

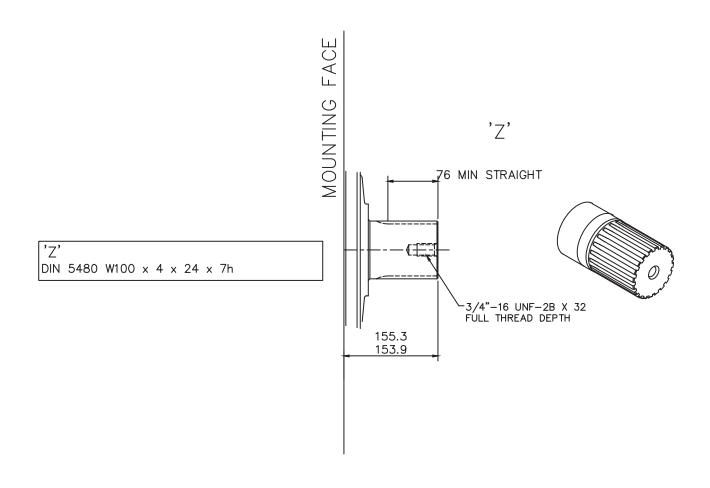
MINOR DIAMETER 92.184/91.625 PIN DIAMETER 8.128

DIAMETER OVER PINS 109.573/109.517

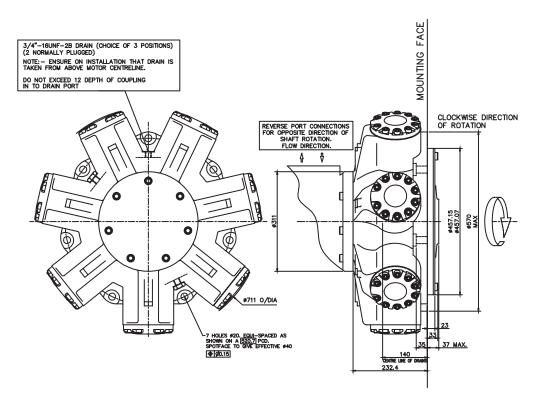


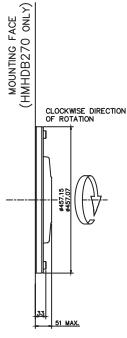


♦ HMHDB270 - 'Z' Shaft





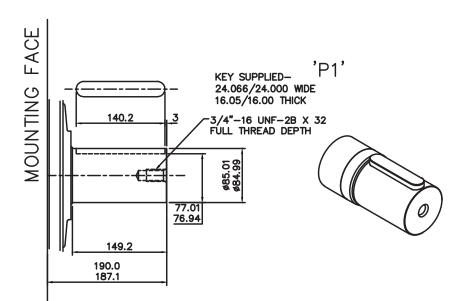




3-8 HM(HD)B325



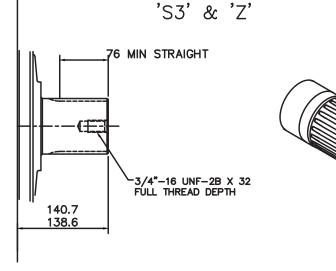
HMB325 - 'P1', 'S3' & 'Z' Shafts



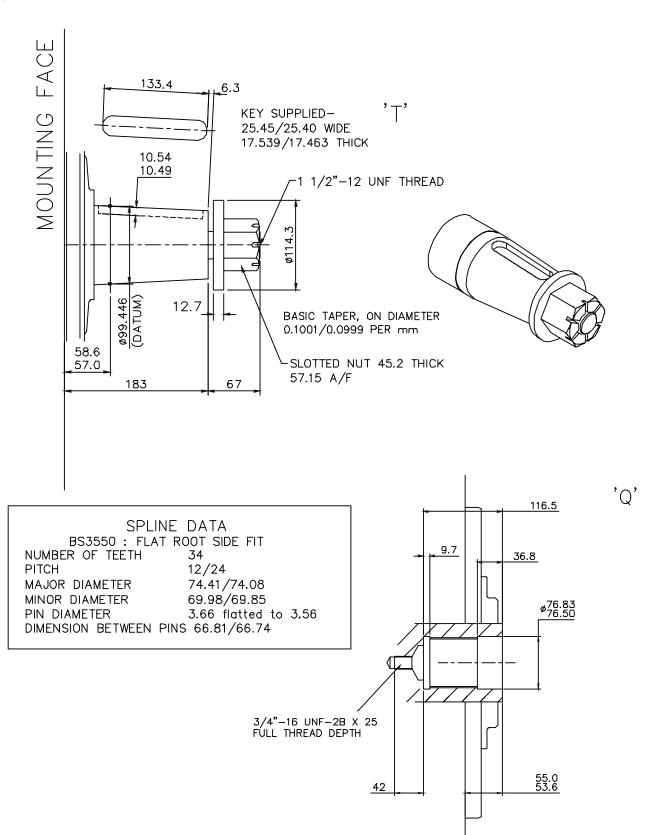
SPLINE DATA

TO BS 3550 (ANSI B92.1, CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE NUMBER OF TEETH 30° 20 **PITCH** 6/12 MAJOR DIAMETER 87.953/87.825 FORM DIAMETER 80.264 MINOR DIAMETER 79.485/78.925 PIN DIAMETER 8.128 97.084/97.030 DIAMETER OVER PINS

DIN 5480 W100 x 4 x 24 x 7h

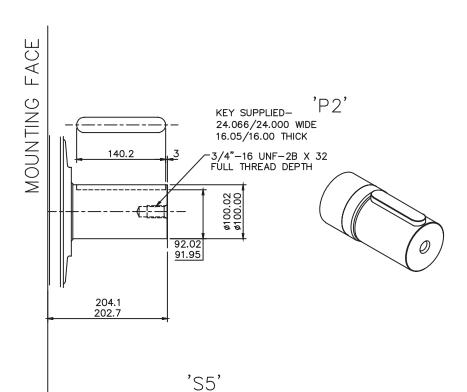


♦ HMB325 - 'T' & 'Q' Shaft





HMHDB325 - 'P2' & 'S5' Shafts



SPLINE DATA

'S3'

TO BS 3550 (ANSI B92.1, CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE 30° NUMBER OF TEETH 23 6/12 PITCH

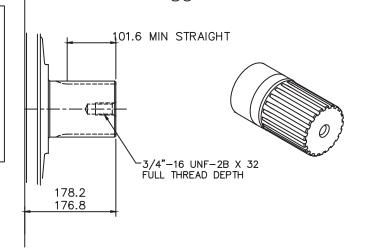
MAJOR DIAMETER 100.653/100.526

FORM DIAMETER 92.939

MINOR DIAMETER 92.184/91.625

PIN DIAMETER 8.128

DIAMETER OVER PINS 109.573/109.517





♦ HMHDB325 - 'Z' Shaft

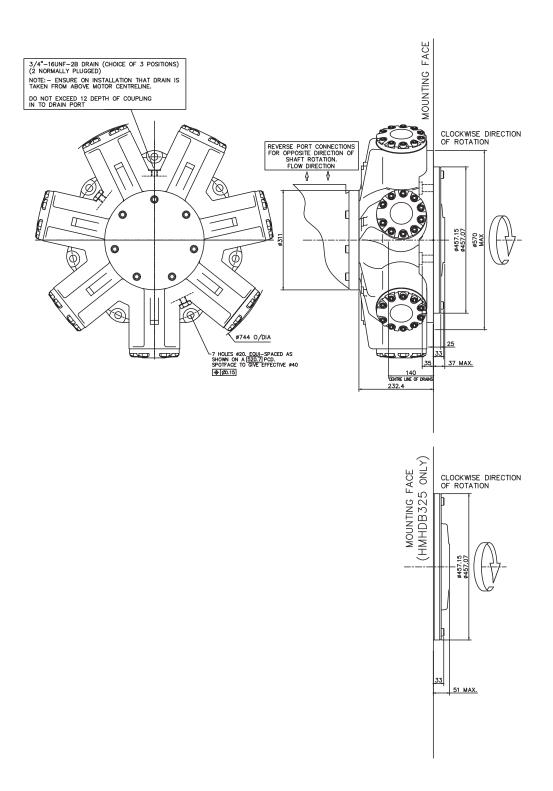
MOUNTING FACE

76 MIN STRAIGHT -3/4"–16 UNF–2B X 32 FULL THREAD DEPTH 155.3 153.9

'Z'

'Z' DIN 5480 W100 x 4 x 24 x 7h

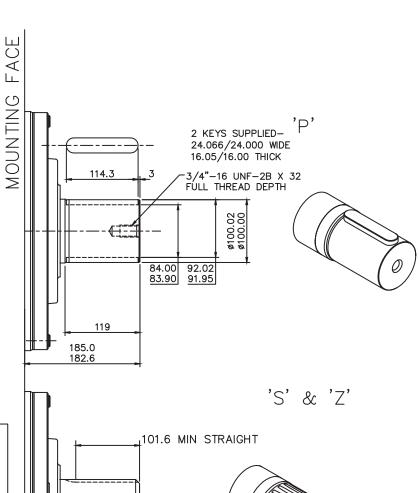
Installation



3-9 HMHDB400



'P', 'S' & 'Z' Shafts



SPLINE DATA

TO BS 3550 (ANSI B92.1, CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE NUMBER OF TEETH 30° 23 PITCH 6/12

MAJOR DIAMETER 100.653/100.526

FORM DIAMETER 92.939

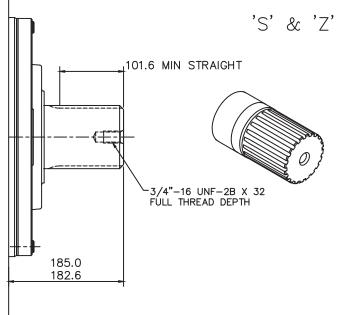
MINOR DIAMETER 92.184/91.625

PIN DIAMETER 8.128

DIAMETER OVER PINS 109.573/109.517

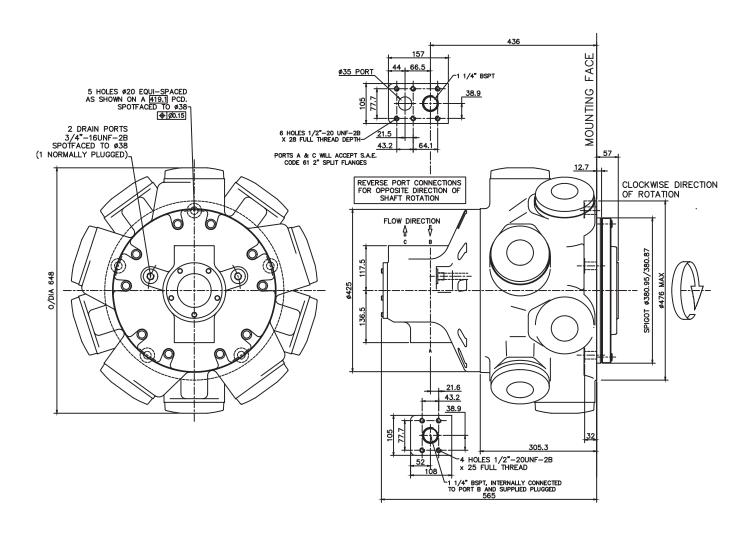
'Z'

DIN 5480 W100 x 4 x 24 x 7h



3-9 HMHDB400 (cont)

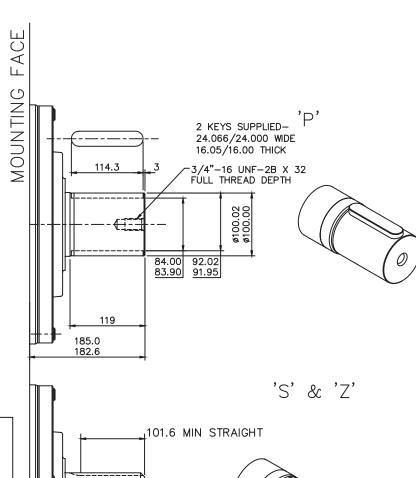




3-10 HMB500



'P', 'S' & 'Z' Shafts



SPLINE DATA

<u>'S'</u>

TO BS 3550 (ANSI B92.1, CLASS 5) FLAT ROOT SIDE FIT, CLASS 1 PRESSURE ANGLE 30°

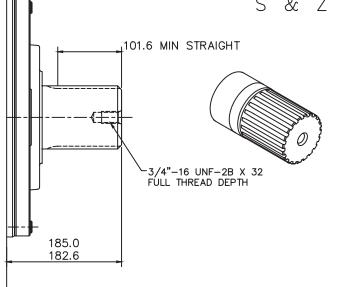
PRESSURE ANGLE NUMBER OF TEETH 23 6/12 **PITCH**

MAJOR DIAMETER 100.653/100.526 FORM DIAMETER 92.939 MINOR DIAMETER 92.184/91.625

PIN DIAMETER 8.128

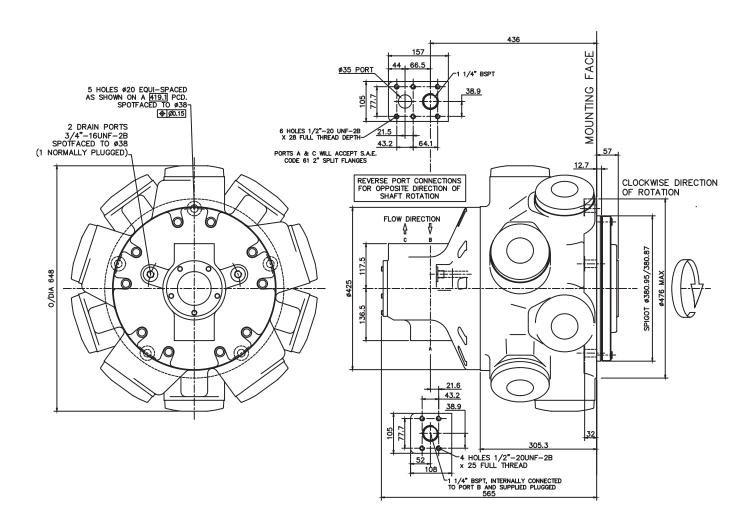
109.573/109.517 DIAMETER OVER PINS

DIN 5480 W100 x 4 x 24 x 7h



3-10 HMB500 (cont)

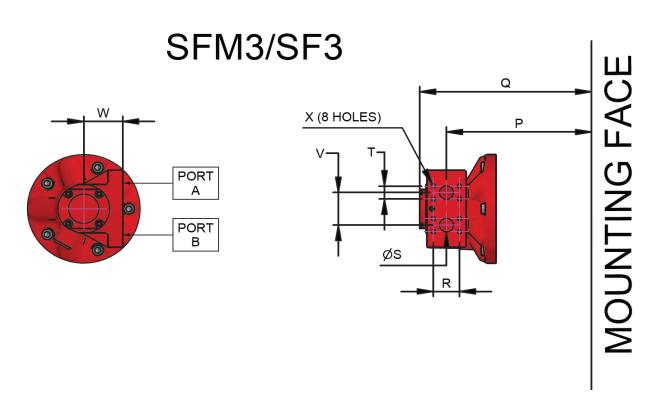




3-11 Preferred Hydraulic Connections

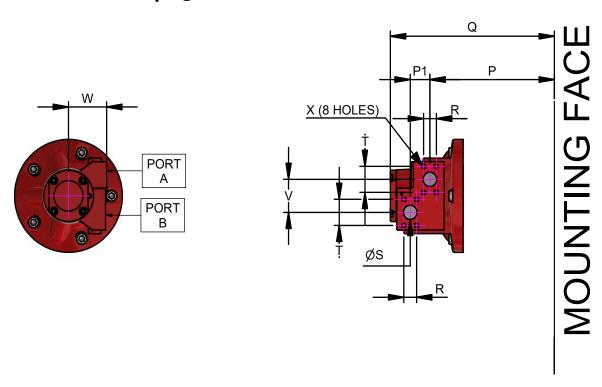
SAE Connections

MODEL				1 1/4"		/SFM3' 61 SAE P	orts		
	ØS	V	Т	R	W	X(SF3)	X(SFM3)	Р	Q
НМВОЗО								271	331
HMB045		32 76	30.2			7/16"-14 UNC-2B x	M12 x 1.75 x 27 FULL THREAD DEPTH	300	360
HMB060/080/100	32			58.7	87.1	27 FULL THREAD DEPTH		286	346
HMB125									
HMB150/200								328	388

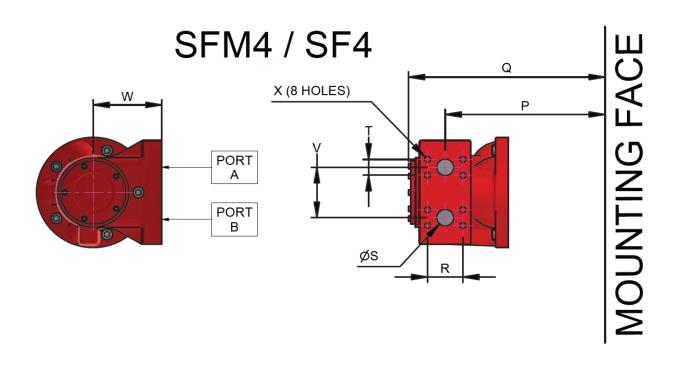


MODEL		'F3/FM3' 1 ¼" SAE Bolt Flanges										
	ØS	V	Т	R	W	X(F3)	X(FM3)	Р	P1	Q		
HMB030								238		331		
HMB045						7/16"-14 UNC-2B x	M12 x P1.75	267.5		360		
HMB060/080/100	31.75	74	58.7	30.2	87	27 FULL THREAD DEPTH	X 27 FULL THREAD DEPTH	253	46.5	345		
HMB125								283		375		
HMB150/200								295		388		

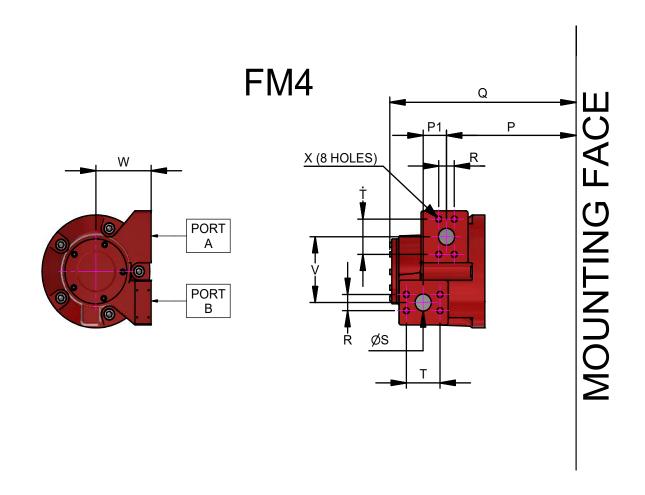
F3/FM3



MODEL			1		SF4/SF ode 62	M4' SAE Port	S				
	ØS	V	Т	R	W	X(SF4)	X(SFM4)	Р	Q		
HMB045								330	413		
HMB060/080/100	38.1	116	36.5	79.4	154	5/8"-11 UNC-2B x 35	M16 x 2.0 x 35	316	399		
HMB125	30.1	50.1	33.1	110	30.3	7 3.4	134	FULL THREAD DEPTH	FULL THREAD		
HMB150/200							DEPTH	358	441		



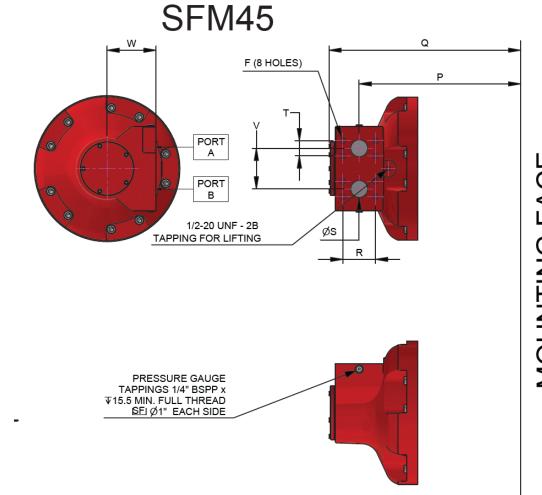
MODEL				1 ½		FM4' Bolt Flan	ges			
I III I	ØS	V	Т	R	W	X(F4)	X(FM4)	Р	P1	Q
HMB100								266	321	399
HMB125	38.1	148	79.4	36.5	130	5/8"-11 UNC-2B x 35	M16 x P2 x 35	296	351	429
HMB150/200	30.1	140	73.4	30.5		FULL THREAD DEPTH	FULL THREAD DEPTH	308	363	442
HMB27/325					174			324	379	460



3-11 Preferred Hydraulic Connections (cont)

SAE Connections - HMHDB400/500

MODEL	'SFM45' 2" Code 62 SAE Ports										
	ØS	V	Т	R	W	F	Р	Q			
HM(HD)B400/500	50	120	44.5	96.8	145	M20 x 2.5 x 38 FULL THREAD DEPTH	478	567			

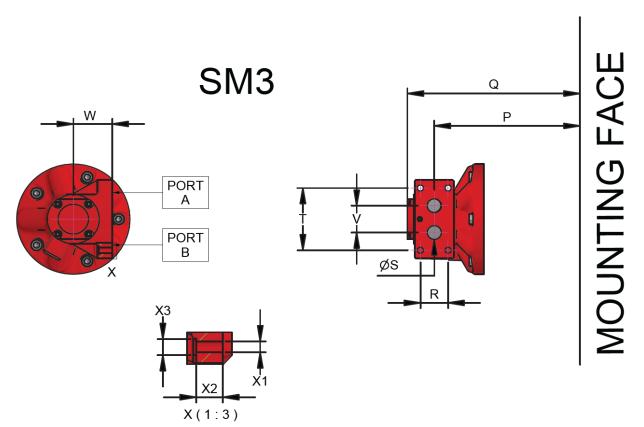


MOUNTING FACE

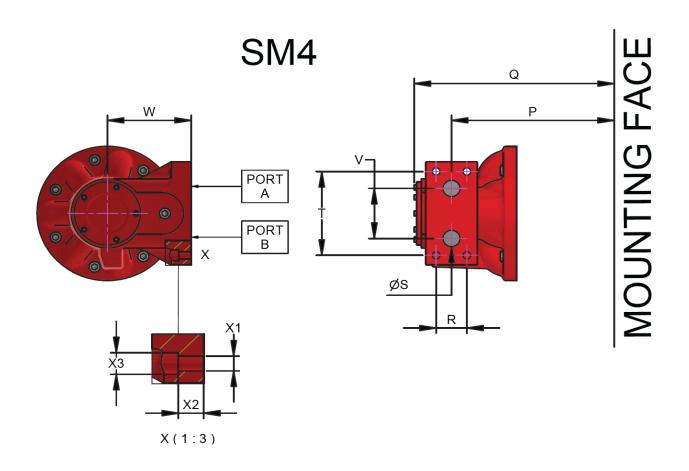
3-11 Preferred Hydraulic Connections (cont)

Manifold connections

MODEL	"SM3" MODEL 1 1/4" Ports for Bolt-On Manifold									
	ØS	V	Т	R	W	Р	Q	X1	X2	Х3
HMB030						270.5	332			
HMB045						300	360			
HMB060/080/100	32	76	143	62	87.1	286	346	14	20	30
HMB125						315	375			
HMB150/200						358	440			



MODEL		'SM4' 1 ½" Ports for Bolt-On Manifold											
	ØS	V	Т	R	W	Р	Q	X1	Х2	Х3			
HMB045						331	413						
HMB060/080/100					154	316	399						
HMB125	38	116	194	68		345	428						
HMB150/200						358	441						
HMB270/325					185	377	459						



Conversion Table

Press	ure
bar	PSI
1	14.5
Flo	w
l/min	gal/min
1	0.264 US
1	0.219 UK
Leng	gth
mm	inch
25.4	1
Torq	ue
Nm	lbf ft
1	1.737
Pow	er
kW	hp
1	1.341
Ma	SS
kg	lb
1	2.2

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Tel: +82-55-286-5551 Website: www.flutek.co.kr

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Data sheet:M200112.24-HMB