

Hydraulic Pump Drives

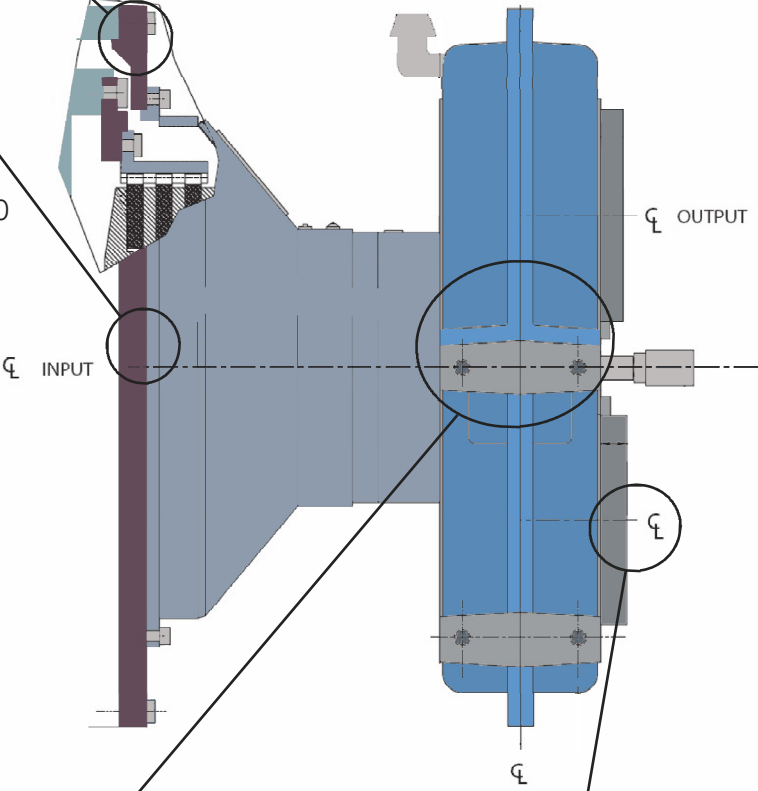
Features

S314 Model Superclutch with 48 Gearbox
shown with 0 - 1 flywheel housing adapter
And 18 - 14 flywheel adapter

Special Flywheel and housing adapters available

Clutched Drive

Air or Oil actuated dry disc clutch
Available in flywheel sizes #3 to #0
Clutch sizes from 11" - 18"
No pilot bearing



Gear Unit

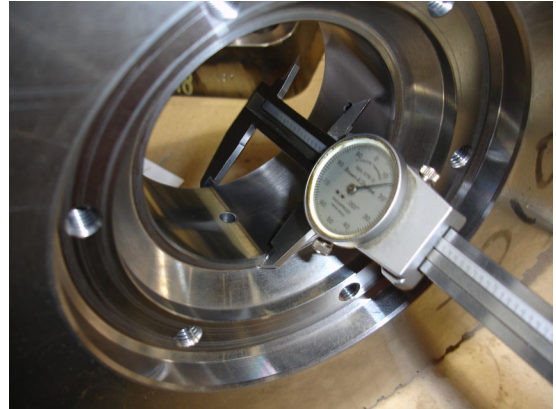
Ductile Iron Housing
Carburized Gears & large bearings for long service life
Wide range of gear ratios available
8 gear units to choose from for applications from 1 - 8
outputs from 50 to 1000 HP

Outputs

SAE Outputs available from B
to F including BB and CC

About Us

Smith Berger Marine Inc. has acquired Marco, a leader in the supply and support of the industrial & marine industries with over 60 years of experience.



At our manufacturing facility adjacent to Fisherman's Terminal in Seattle we produce Hydraulic Pump Drives & Clutches for Industrial, Marine & Mobile applications. Fishing Equipment for the Longline, Crab & Purse Seine Fisheries & Powerblocks used in the diving and salvage industries.

Our manufacturing experience & commitment to quality have produced a line of Hydraulic Pump Drives second to none in durability, quality and innovation.



We encourage special application requests.
Please contact us with your requirements.

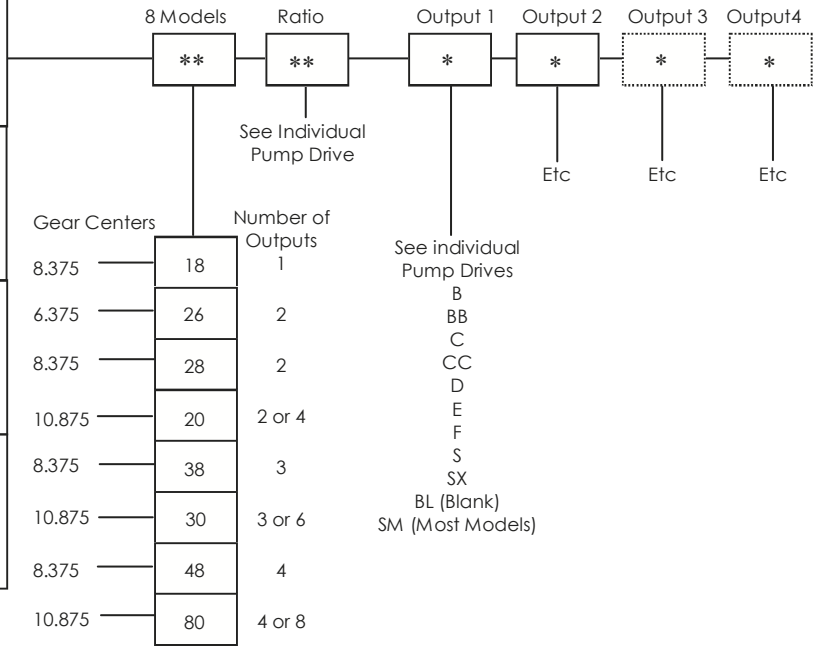
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Model Code

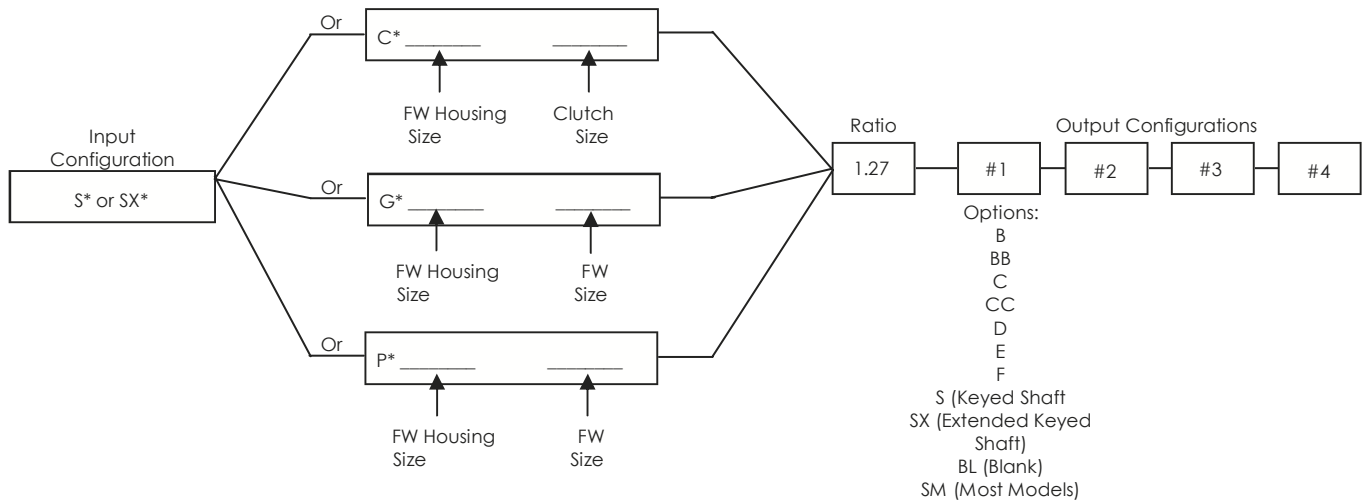
5 Input Choices

Clutched Drive C	FW Housing Size	FW Size	Clutch Size *	See Page 9 For available Configurations *A=Air actuation H=Hyd actuation
	0	11	S211A or H	
	1		S311A or H	
	2	14	S214A or H	
	3		S314A or H	
4	18	S318A or H		
Direct Drive Gear G	FW Housing Size	FW Size		See Page 10 For available Configurations Also available in extended Versions "GX"
	0	18		
	1	14		
	2	11		
	3	10		
4				
Direct Drive Plate P	FW Housing Size	FW Size		See Page 11 For available Configurations Also available in extended Versions "PX"
	0	18		
	1	14		
	2	11		
	3			
Standard Keyed Shaft S				See Page 12 For available Configurations
Extended Keyed Shaft SX				See Page 12 For available Configurations



Procedure:

1. Provide information shown on application work sheet (page 6).
2. With help from MARCO. Select basic model number (page 5).
3. Select input configuration. See pages 8 -11.
4. Selection available ration for the individual model.
5. Select the outputs required. See pages 16-17.



Example: C48-1-S314A-1.27U-C-C-C-C ——— Clutched model 48. #1 Flywheel Housing. 14 Inch Fly wheel, with 14 inch 3 plate clutch (Air Actuated). 1.27 Up Ratio with all SAE C Outputs.

S48-1.27U-C-C-C-C ——— Same as above except direct drive keyed shaft input

Easy Selection Guide

Pump Drive Selection procedure.

All Units are Limited by Input Load, Input Speed, Output Load and Heat. *

- 1) Check total Input loading for desired configuration (HP per 100 RPM).
- 2) Check Maximum input speed (RPM) for your selected ratio.
- 3) Determine Output Speed, then check each output loading in HP Per 100 RPM at "Output Speed".
- 4) For continuous duty, check maximum thermal rating of unit. This is the maximum power the unit can transmit continuously without external cooling.

Example:

200 HP input @ 2100 RPM continuous.
Output Speed of 3000 RPM with C2 output & standard keyed shaft input.

Example: Model # S18-1.44U-C2

② INPUT SPEED
THIS RATIO GIVES PROPER OUTPUT SPEED: $1.44 \times 2100 = 3024$ RPM
MAXIMUM INPUT SPEED FOR THIS RATIO = 2300 RPM, OKAY

④ HEAT
MAX INPUT IS 200 HP.
UNIT RATES 225 CONTINUOUS HP
MODEL S-18-1.44U-C2 IS GOOD SELECTION

CONTINUOUS THERMAL RATING: 225 HP		
RATIO U=UP (INCREASING) D=DOWN (DECREASING)	MAXIMUM INPUT SPEED (RPM)	MAXIMUM OUTPUT HP/100 RPM ● OUTPUT SPEED
1-1	2700	20
1.13U, 1.13D	2550, 2900	19, 21
1.27U, 1.27D	2400, 3100	18, 23
1.44U, 1.44D	2300, 3300	16, 24
1.64U, 1.64D	2200, 3500	15, 24
1.87U, 1.87D	2100, 3900	14, 26
2.14U, 2.14D	1950, 4250	12, 27
2.47U	1800	11
2.88U	1550	9
3.4U	1300	7
4.08U	1100	6

③ OUTPUT LOAD
ACTUAL OUTPUT SPEED IS $2100 \times 1.44 = 3024$ RPM
MAX OUTPUT GEAR BOX RATING = $16 \times 30.24 = 480$ HP
ONLY 200 HP IS REQD.

① INPUT LOAD
INPUT REQ: $200/21 = 9.5$ HP/100 RPM
OKAY: THE BOX RATES 51 HP/100 RPM.

MODEL 18 RATING CHART

* Ratings may vary depending on application and service.

Application Worksheet

HYDRAULIC PUMP DRIVE APPLICATION WORKSHEET

DATE _____

CUSTOMER COMPANY NAME _____

CUSTOMER CONTACT NAME _____

CUSTOMER CONTACT PH/FX/EMAIL _____

PLEASE ANSWER AND RETURN TO SMITH BERGER or Contact us at 206-764-4650

ENGINE SPEED (RPM) _____

ENGINE HP _____

TOTAL OUTPUT FLOW REQUIRED (GPM) _____

MAX CONTINUOUS POWER _____

SYSTEM RELIEF PRESSURE (PSI) _____

PUMP DISPLACEMENT(S) (CUBIC INCH/REV) _____

PUMP SPEED (RPM) _____

ENGINE MAKE AND MODEL _____

FRONT OR FLYWHEEL MOUNT HPD _____

SAE HOUSING AND FLYWHEEL SIZE _____

CLUTCH OR DIRECT DRIVEN _____

IF CLUTCHED, AVAILABLE ACTUATING AIR OR OIL PRESSURE

(PSI) _____ SAE PUMP MOUNT/SHAFT

SIZE(S) _____ ADDITIONAL

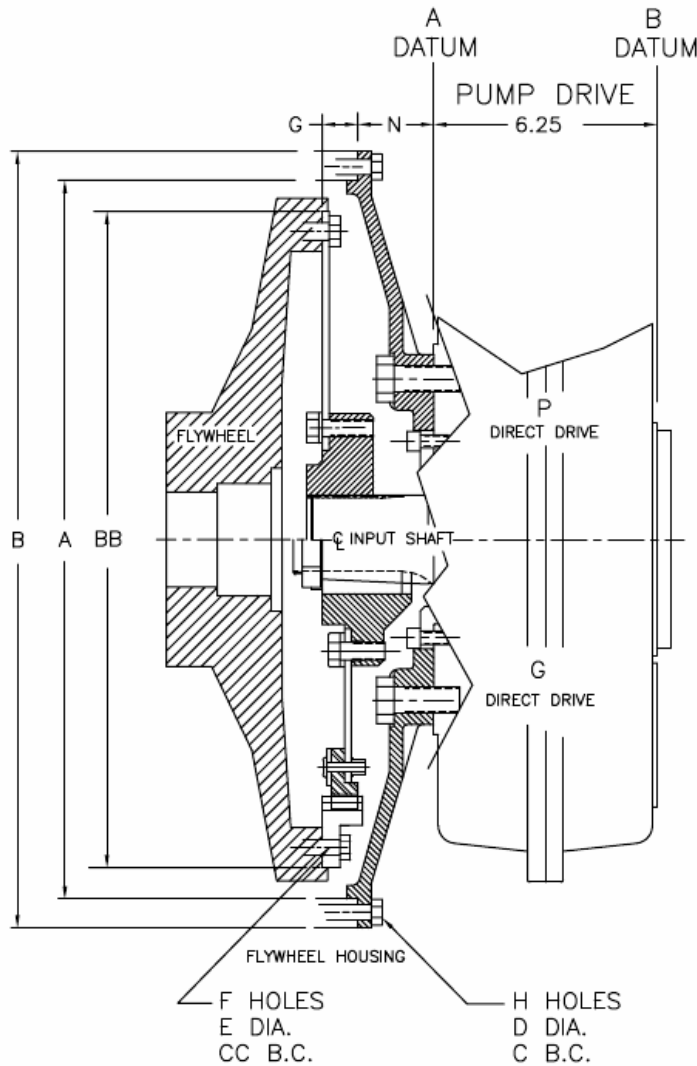
NOTES _____

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Input Specifications

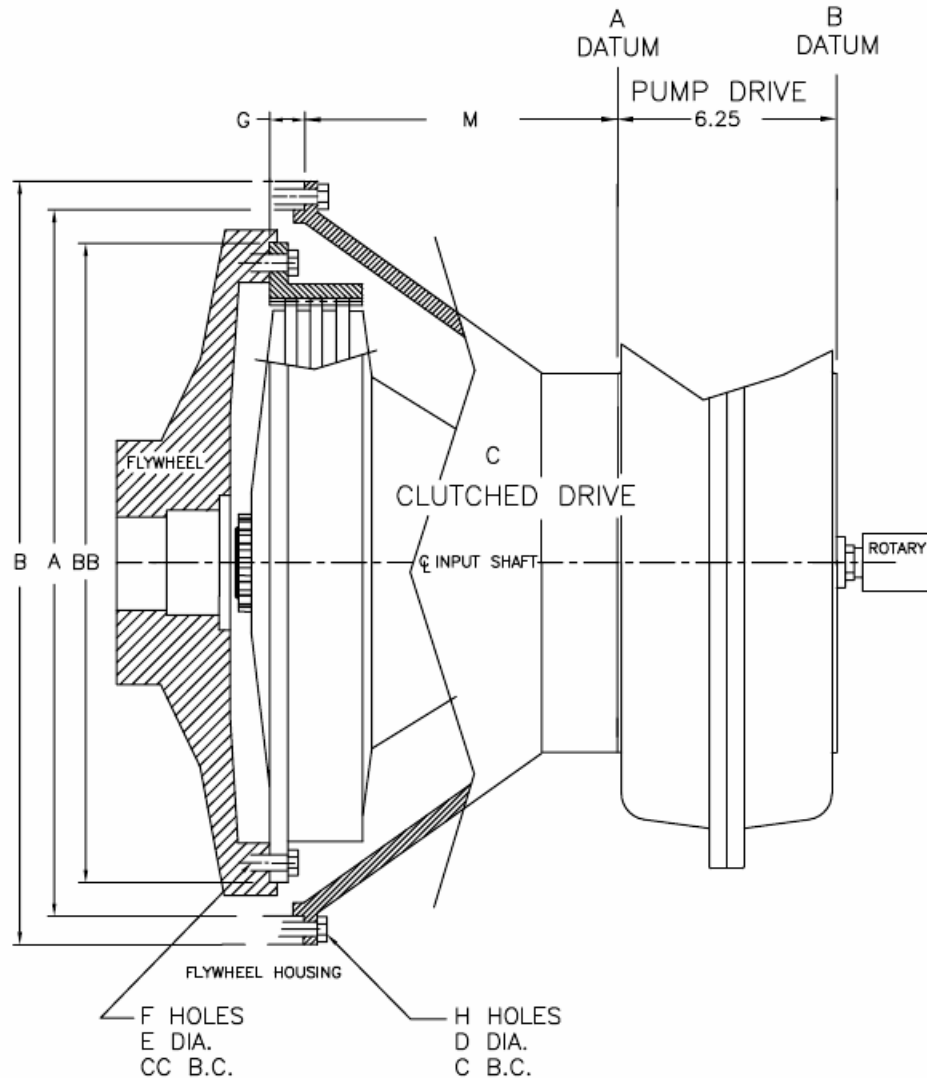
Connecting to Flywheel



CONFIGURATION	A	B	C	D	E	F	G	H	N	BB	CC
0-G18/P18	25.50	28.00	26.75	9/16	11/16	6	.62	16	2.18	22.50	21.37
0-G14/P14	25.50	28.00	26.75	9/16	9/16	8	1.00	16	2.18	18.375	17.25
1-G14/P14	20.125	21.75	20.87	1/2	9/16	8	1.00	12	2.12	18.375	17.25
1-G11/P11	20.125	21.75	20.87	1/2	7/16	8	1.56	12	2.12	13.875	13.125
2-G11/P11	17.625	19.25	18.37	7/16	7/16	8	1.56	12	1.5	13.875	13.125
3-G11/P11	16.125	17.75	16.87	7/16	7/16	8	1.56	12	1.5	13.875	13.125
4-G10/P10	14.25	15.87	15.00	7/16	7/16	8	2.12	12	1.5	12.375	11.62

Input Specifications

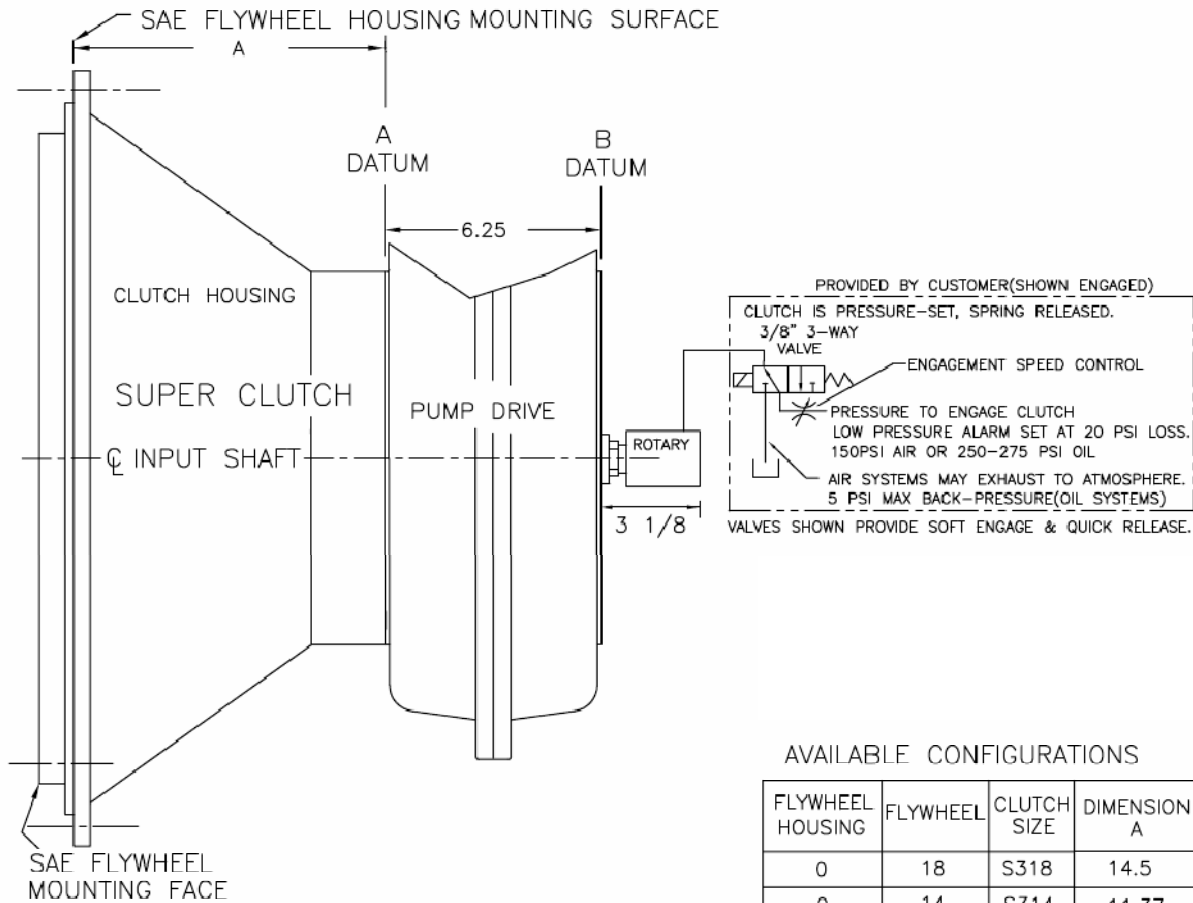
Connecting to Flywheel Housing



CONFIGURATION	A	B	C	D	E	F	G	H	M	BB	CC
00-S321	31.00	34.75	33.50	9/16	11/16	12	0	16		26.50	25.25
0-S318	25.50	28.00	26.75	9/16	11/16	6	.62	16	14.5	22.50	21.37
0-S314/S214	25.50	28.00	26.75	9/16	9/16	8	1.00	16	11.37	18.375	17.25
1-S314/S214	20.125	21.75	20.87	1/2	9/16	8	1.00	12	11.37	18.375	17.25
1-S311/S211	20.125	21.75	20.87	1/2	7/16	8	1.56	12	9.0	13.875	13.125
2-S311/S211	17.625	19.25	18.37	7/16	7/16	8	1.56	12	9.0	13.875	13.125
3-S311/S211	16.125	17.75	16.87	7/16	7/16	8	1.56	12	9.0	13.875	13.125
4-S310	14.25	15.87	15.00	7/16	7/16	8	2.12	12		12.375	11.62

Standard Available Inputs

Clutched Drive C



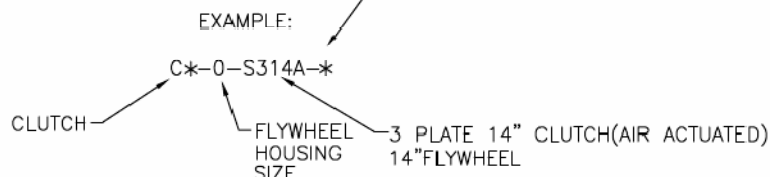
AVAILABLE CONFIGURATIONS

FLYWHEEL HOUSING	FLYWHEEL	CLUTCH SIZE	DIMENSION A
0	18	S318	14.5
0	14	S314	11.37
1	14	S314	11.37
1	14	S214	11.37
1	11.5	S311	9.0
2	11.5	S311	9.0
3	11.5	S311	9.0
2	11.5	S211	9.0
3	11.5	S211	9.0

CLUTCH INPUT CAPACITY

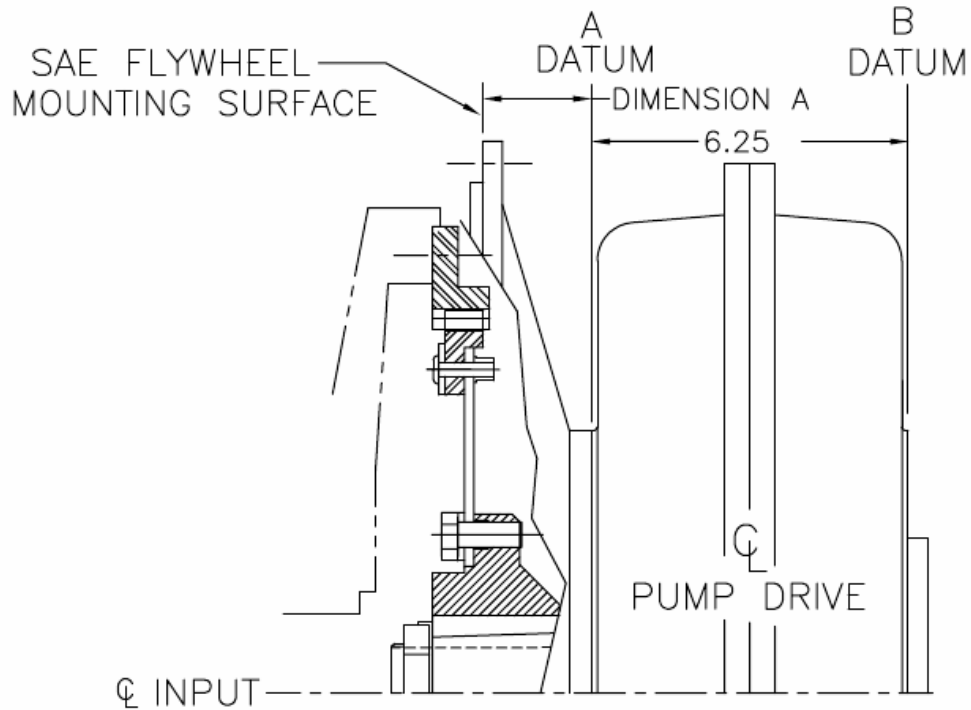
MAX INPUT SPEED RPM	150 PSI AIR OR 250-275 PSI OIL				
	S211 HP/100 RPM	S311 HP/100 RPM	S214 HP/100 RPM	S314 HP/100 RPM	S318 HP/100 RPM
2400	22*	33*	31*	46*	65*

*MAXIMUM TRANSMITTED HORSEPOWER
CONSULT MARCO FOR SERVICE FACTOR



Standard Available Inputs

Direct Drive G



AVAILABLE CONFIGURATIONS

FLYWHEEL HOUSING	FLYWHEEL	DIMENSION A
0	14	2.18
0	18	2.18
1	14	2.12
1	11.5	2.12
2	11.5	1.5
3	11.5	1.5
4	10	1.5

EXAMPLE: G^*-1-14

DRIVE GEAR → G^* ← FLYWHEEL HOUSING

← 1 ← FLYWHEEL

← 14 ← FLYWHEEL HOUSING

MAX INPUT RATING:

10 FW=14 HP/100 RPM

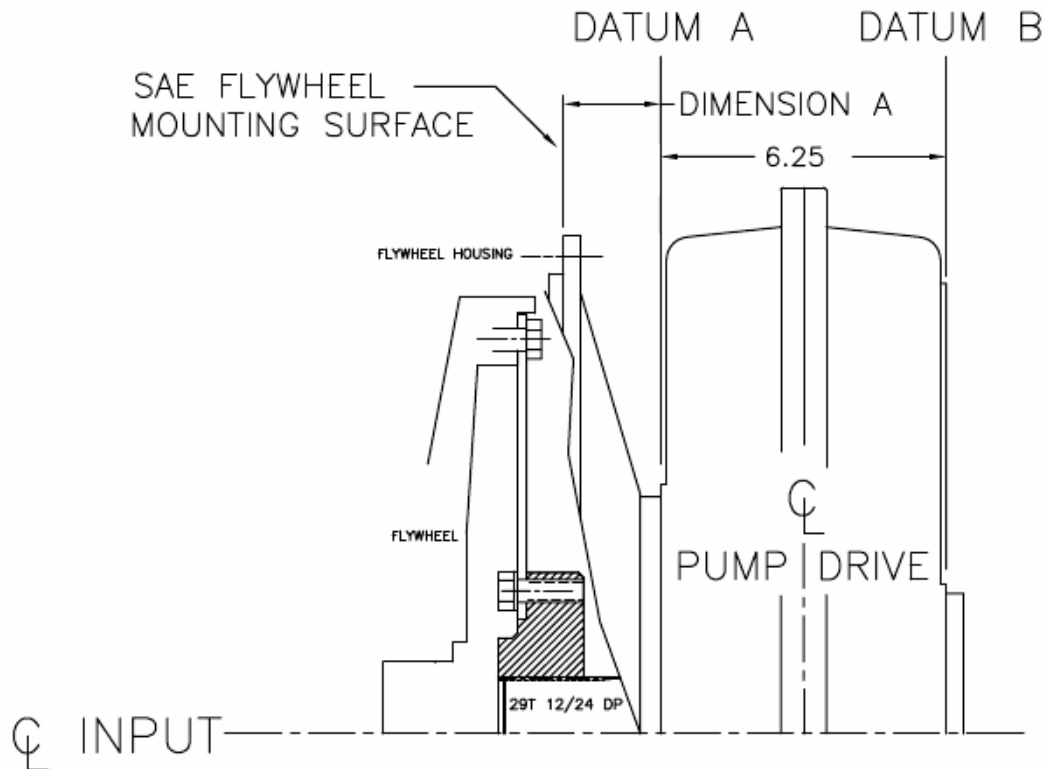
11.5FW=17 HP/100 RPM

14 FW=31 HP/100 RPM

18 FW=40 HP/100 RPM

Standard Available Inputs

Direct Drive P



AVAILABLE CONFIGURATIONS

FLYWHEEL HOUSING	FLYWHEEL	DIMENSION A
0	18	2.18
0	14	2.18
1	14	2.12
1	11	2.12
2	11	1.50
3	11	1.50

EXAMPLE:

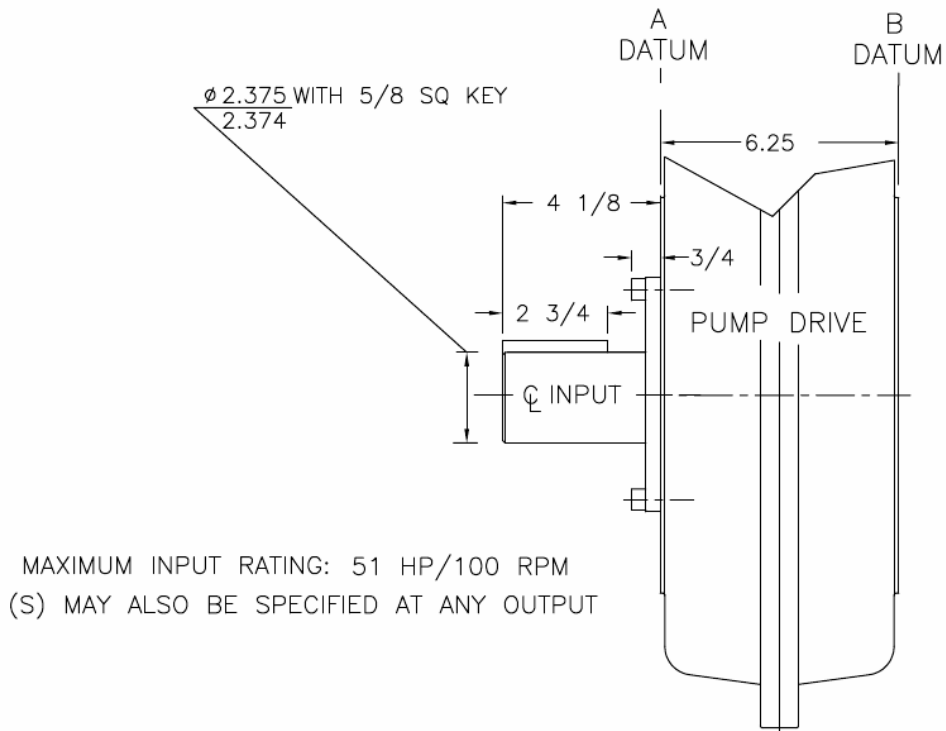
P*-1-14-*

THIS DIRECT DRIVE SELECTION WILL COUPLE TO #1 FLYWHEEL HOUSING AND 14 INCH FLYWHEEL

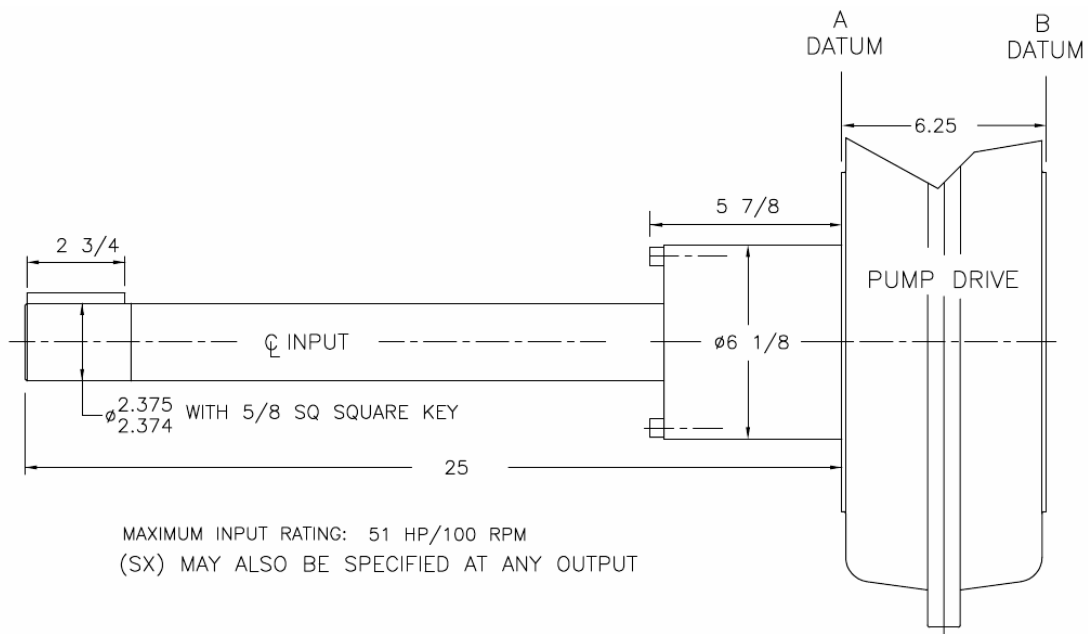
MAXIMUM INPUT RATING: 51 HP/100 RPM

Standard Available Inputs

Direct Drive S Standard Keyed Shaft



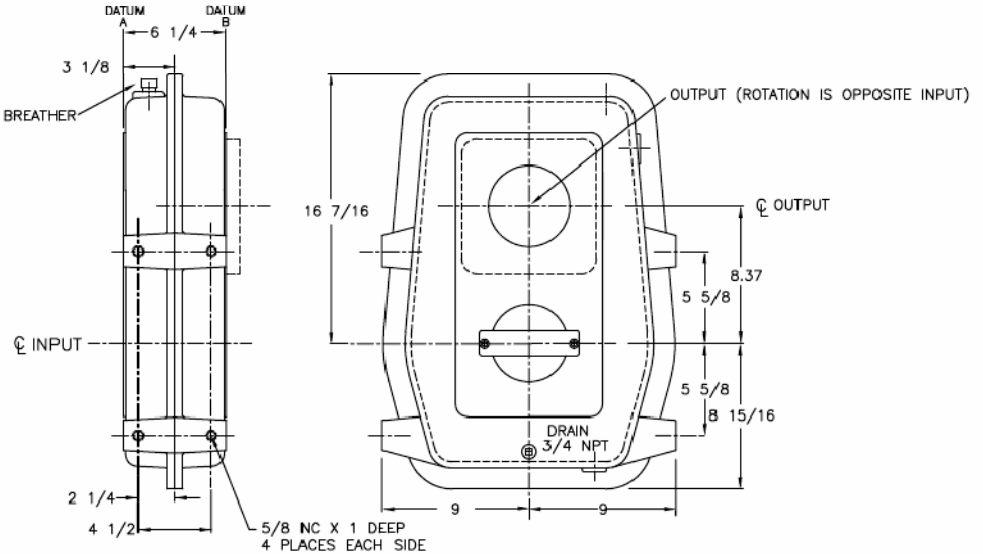
Direct Drive SX Extended Keyed Shaft



Small One & Two Pump Drives

CONTINUOUS THERMAL RATING: 225 HP

RATIO U=UP (INCREASING) D=DOWN (DECREASING)	MAXIMUM INPUT SPEED (RPM)	MAXIMUM OUTPUT HP/100RPM ⊙ OUTPUT SPEED
1:1	2700	20
1.13U,1.13D	2550,2900	19,21
1.27U,1.27D	2400,3100	18,23
1.44U,1.44D	2300,3300	16,24
1.64U,1.64D	2200,3500	15,24
1.87U,1.87D	2100,3900	14,26
2.14U,2.14D	1950,4250	12,27
2.47U	1800	11
2.88U	1550	9
3.4U	1300	7
4.08U	1100	6

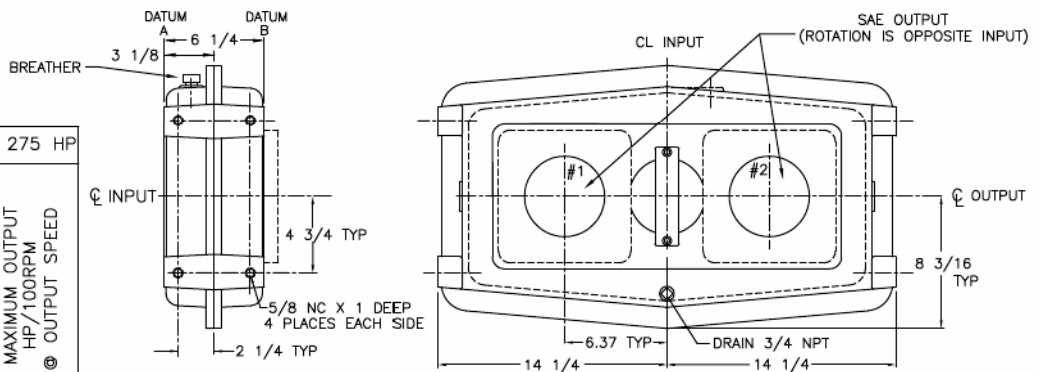


Model 18

One output with 8.37 Gear Centers

CONTINUOUS THERMAL RATING: 275 HP

RATIO U=UP (INCREASING) D=DOWN (DECREASING)	MAXIMUM INPUT SPEED (RPM)	MAXIMUM OUTPUT HP/100RPM ⊙ OUTPUT SPEED
1:1	3500	13
1.17U,1.17D	3300,3900	12,14
1.38U,1.38D	3100,4200	11,15
1.63U,1.63D	2750,4500	10,16
1.94U	2300	8
2.33U	1900	7
2.85U	1550	6
3.16U	1400	5



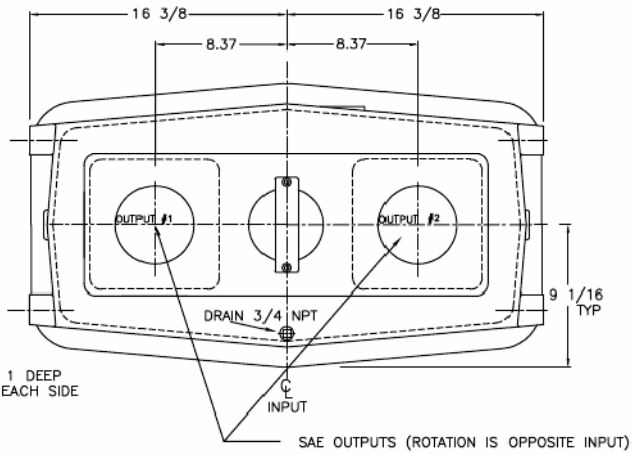
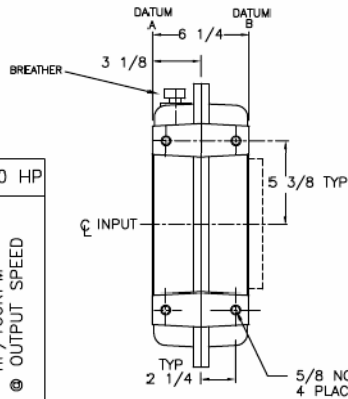
Model 26

Two outputs with 6.37 Gear Centers

Large Two Pump Drives

CONTINUOUS THERMAL RATING: 550 HP

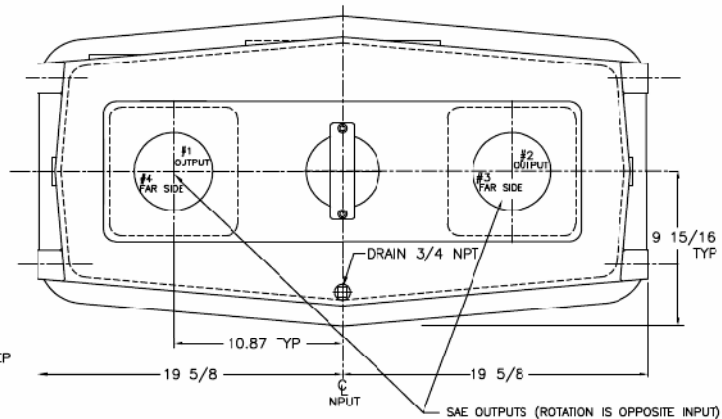
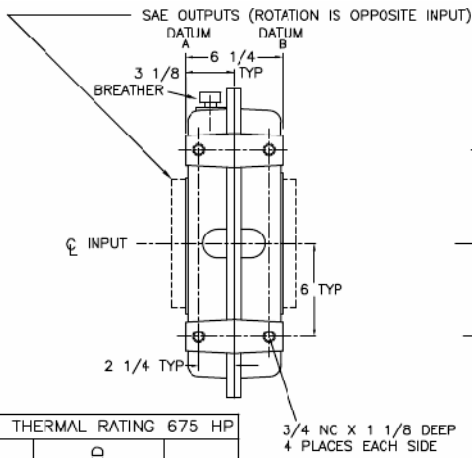
RATIO U=UP (INCREASING) D=DOWN (DECREASING)	MAXIMUM INPUT SPEED (RPM)	MAXIMUM OUTPUT HP/100RPM @ OUTPUT SPEED
1:1	2700	20
1.13U,1.13D	2550,2900	19,21
1.27U,1.27D	2400,3100	18,23
1.44U,1.44D	2300,3300	16,24
1.64U,1.64D	2200,3500	15,24
1.87U,1.87D	2100,3900	14,26
2.14U,2.14D	1950,4250	12,27
2.47U,2.47D	1800,4500	11,27
2.88U	1550	9
3.4U	1300	7
4.08U	1100	6



Model 28
Two outputs with 8.37 Gear Centers

CONTINUOUS THERMAL RATING 675 HP

RATIO U=UP (INCREASING) D=DOWN (DECREASING)	MAXIMUM INPUT SPEED (RPM)	MAXIMUM OUTPUT HP/100RPM @ OUTPUT SPEED
1:1	2000	27
1.10U,1.10D	1900,2100	26,29
1.21J,1.21D	1800,2200	25,30
1.32J,1.32D	1800,2400	23,31
1.46J,1.46D	1700,2500	22,32
1.61U,1.61D	1600,2600	21,33



1 RATING IS FOR OUTPUT PAIR (FOR EXAMPLE OUTPUTS #1AND#4 COMBINED OR #2 AND#3 COMBINED)

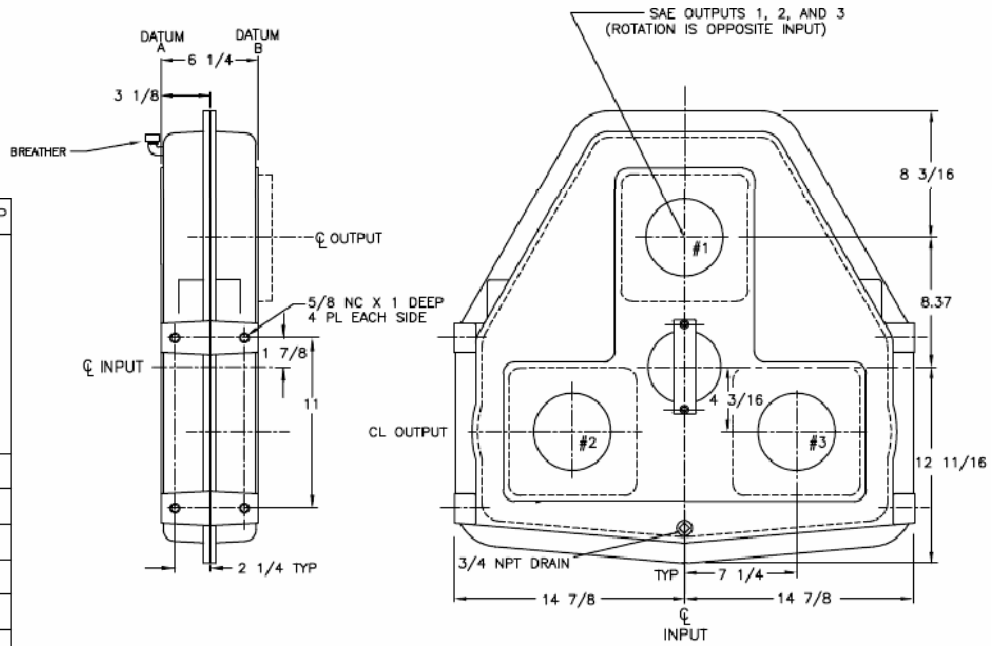
WHEN OUTPUTS ON #3 AND #4 ARE REQUIRED, ONLY S AND SX MAY BE USED AT INPUT

Model 20
Two or four outputs with 10.87 Gear Centers

Large Three Pump Drive

CONTINUOUS THERMAL RATING: 550 HP

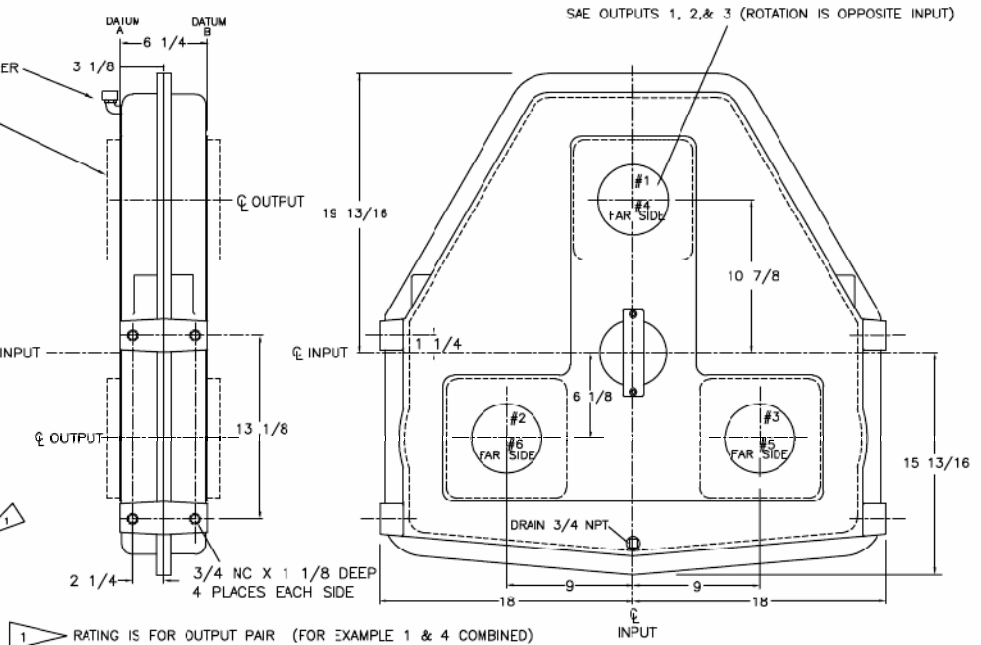
RATIO U=UP (INCREASING) D=DOWN (DECREASING)	MAXIMUM INPUT SPEED (RPM)	MAXIMUM OUTPUT HP/100RPM @ OUTPUT SPEED
1:1	2700	20
1.13U,1.13D	2550,2900	19,21
1.27U,1.27D	2400,3100	18,23
1.44U,1.44D	2300,3300	16,24
1.64U,1.64D	2200,3500	15,24
1.87U,1.87D	2100,3900	14,26
2.14U,2.14D	1950,4250	12,27
2.47U	1800	11
2.88U	1550	9
3.4U	1300	7
4.08U	1100	6



Model 38
Three outputs with 8.37 Gear Centers

CONTINUOUS THERMAL RATING 925 HP

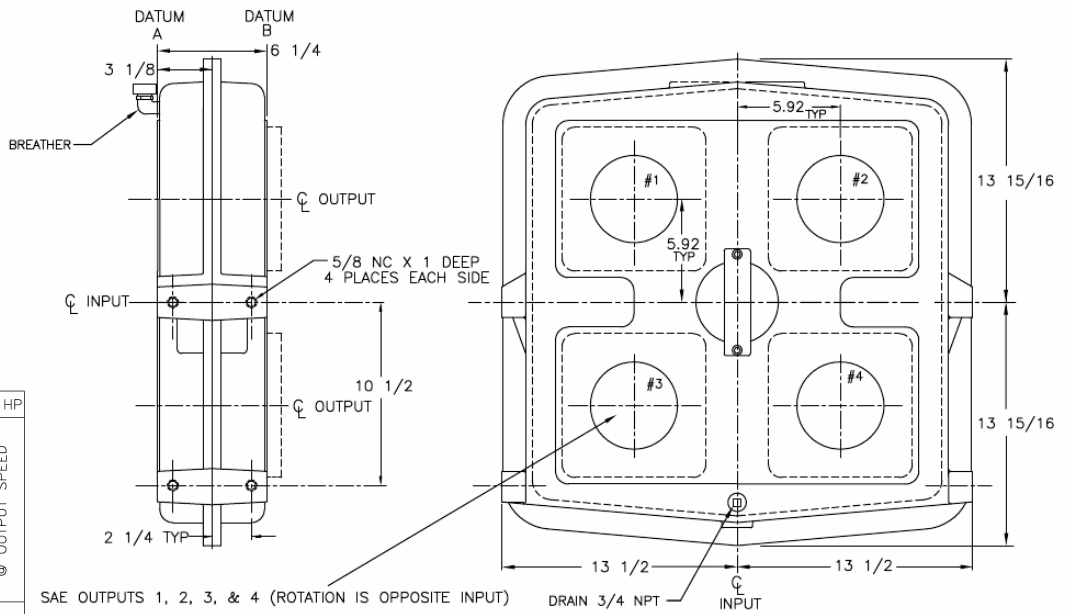
RATIO U=UP (INCREASING) D=DOWN (DECREASING)	MAXIMUM INPUT SPEED (RPM)	MAXIMUM OUTPUT HP/100RPM @ OUTPUT SPEED
1:1	2000	27
1.10U,1.10D	1900,2100	26,29
1.21U,1.21D	1800,2200	25,30
1.32U,1.32D	1800,2400	23,31
1.46U,1.46D	1700,2500	22,32
1.61U,1.61D	1600,2600	21,33



1 RATING IS FOR OUTPUT PAIR (FOR EXAMPLE 1 & 4 COMBINED)
WHEN OUTPUTS ON #4, #5 AND #6
ARE REQUIRED, ONLY 5 AND 6
MAY BE USED AT INPUT

Model 30
Three or six outputs with 10.87 Gear Centers

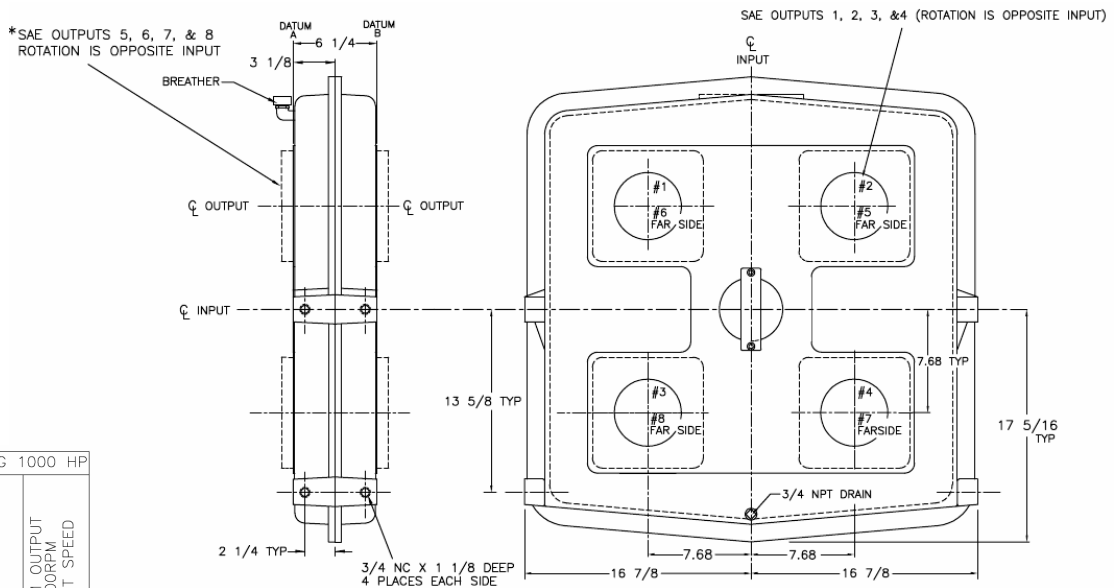
Large Four Pump Drives



CONTINUOUS THERMAL RATING: 525 HP

RATIO U=UP (INCREASING) D=DOWN (DECREASING)	MAXIMUM INPUT SPEED (RPM)	MAXIMUM OUTPUT HP/100RPM @ OUTPUT SPEED
1:1	2700	20
1.13U,1.13D	2550,2900	19,21
1.27U,1.27D	2400,3100	18,23
1.44U,1.44D	2300,3300	16,24
1.64U,1.64D	2200,3500	15,24
1.87U	2100	14
2.14U	1950	12
2.47U	1800	11
2.88U	1550	9
3.4U	1300	7
4.08U	1100	6

Model 48
Four outputs with 8.37 Gear Centers



CONTINUOUS THERMAL RATING 1000 HP

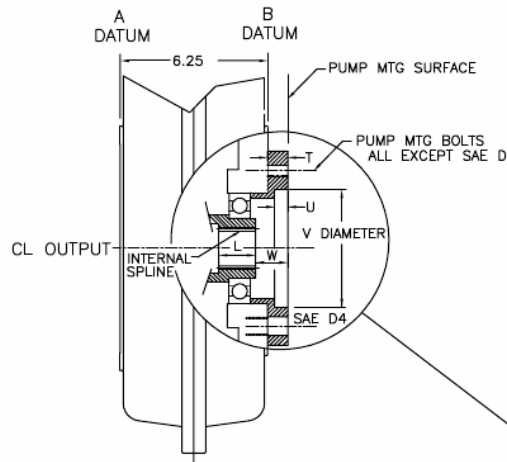
RATIO U=UP (INCREASING) D=DOWN (DECREASING)	MAXIMUM INPUT SPEED (RPM)	MAXIMUM OUTPUT HP/100RPM @ OUTPUT SPEED
1:1	2000	27
1.10U,1.10D	1900,2100	26,29
1.21U,1.21D	1800,2200	25,30
1.32U,1.32D	1800,2400	23,31
1.46U,1.46D	1700,2500	22,32
1.61U,1.61D	1600,2600	21,33

1 RATING IS FOR OUTPUT PAIR (FOR EXAMPLE OUTPUTS #1AND#6 COMBINED)

*WHEN OUTPUTS ON #5,#6,#7 ARE REQUIRED, ONLY S AND SX MAY BE USED AT INPUT

Model 80
Four or Eight outputs with 10.87 Gear Centers

Standard Available Outputs

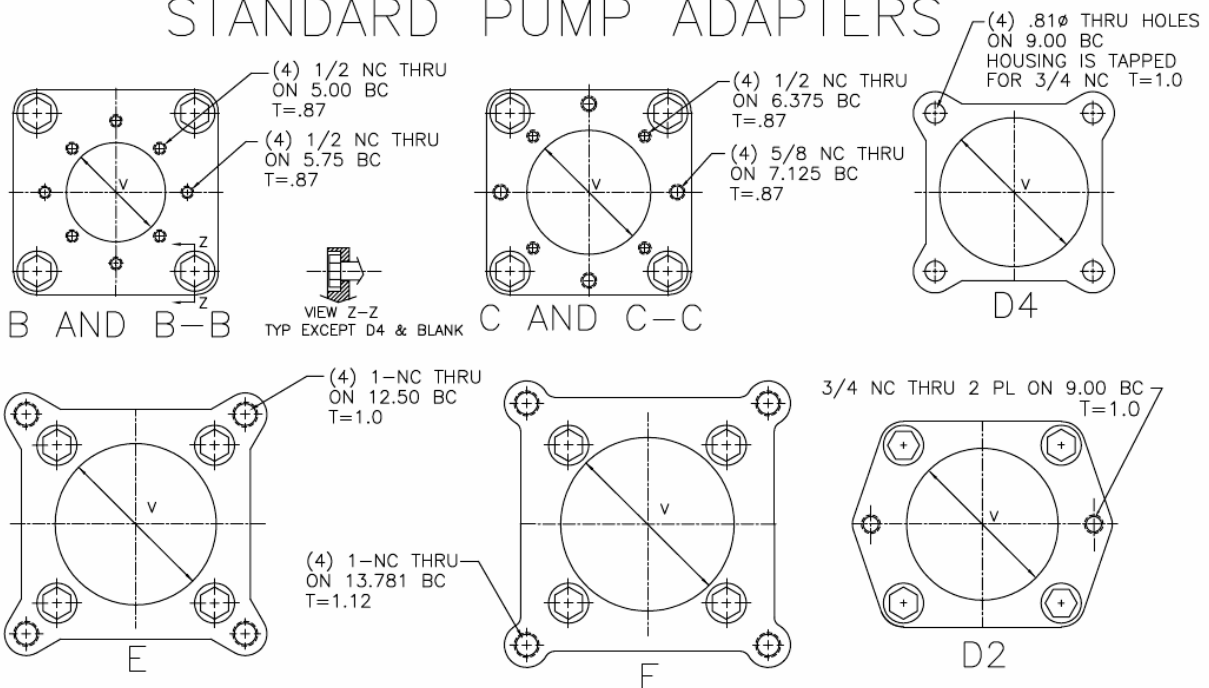


STANDARD AVAILABLE OUTPUTS

INTERNAL SPLINE	PUMP MTG BOLTS	L	W	V DIA.	U _{MIN.}	T _{NOMINAL}	SAE MOUNT
13T 16/32 DP	SAE 2 BOLT AND 4 BOLT	1.8	.62	4.001/4.003	.40	.87	B
15T 16/32 DP	SAE 2 BOLT AND 4 BOLT	1.8	.62	4.001/4.003	.40	.87	B-B
14T 12/24 DP	SAE 2 BOLT AND 4 BOLT	2.0	.43	5.001/5.003	.56	.87	C
17T 12/24 DP	SAE 2 BOLT AND 4 BOLT	2.0	.43	5.001/5.003	.56	.87	C-C
23T 16/32 DP	SAE 2 BOLT	1.6	1.5	6.001/6.003	.56	1.0	D2
13T 8/16 DP	(4) .81 DIA THRU ON 9 BC*	1.6	1.5	6.001/6.003	.56	1.0	D4
13T 8/16 DP	SAE 2 BOLT AND 4 BOLT	1.6	1.5	6.501/6.503	.65	1.0	E
15T 8/16 DP	SAE 2 BOLT AND 4 BOLT	1.6	1.81	7.001/7.003	.65	1.12	F
						.48	BLANK

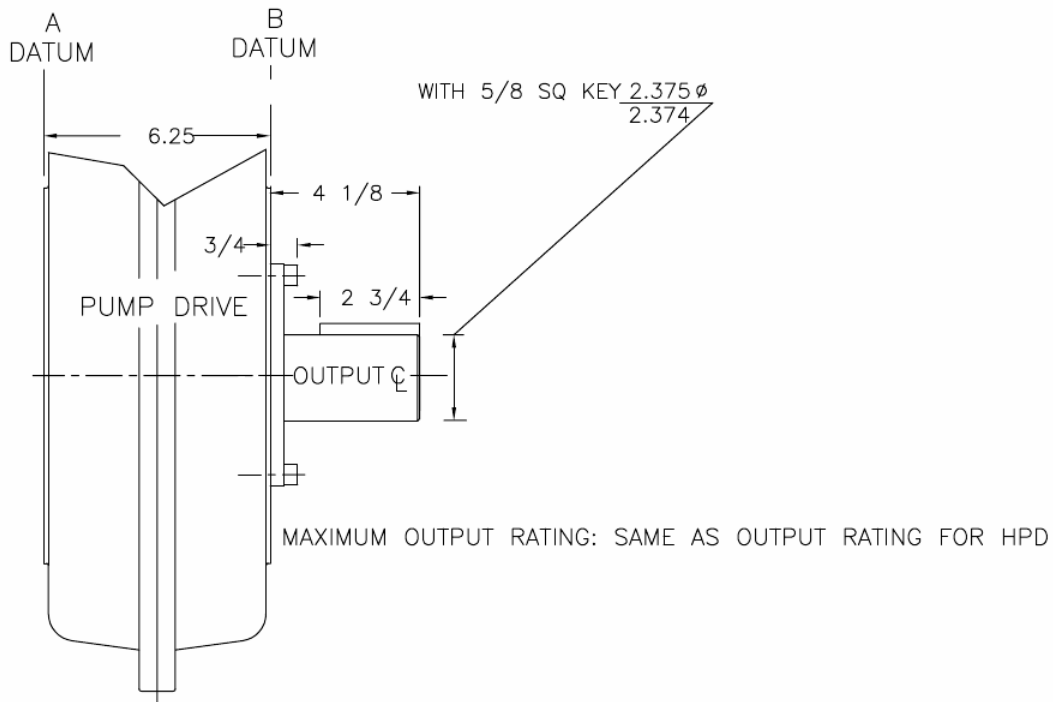
*HOUSING IS TAPPED FOR (4) 3/4 NC HOLES ON 9.00 BC (SEE D4 ADAPTER BELOW)

STANDARD PUMP ADAPTERS

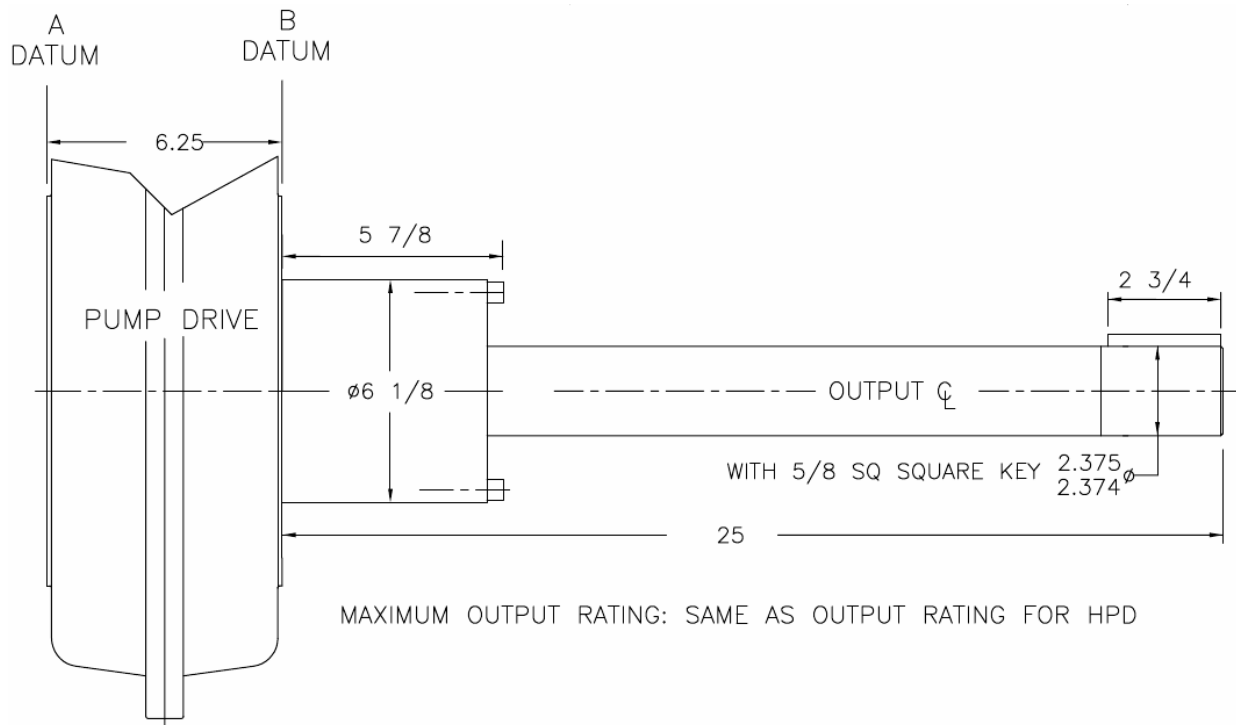


Standard Available Outputs

S Standard Keyed Shaft

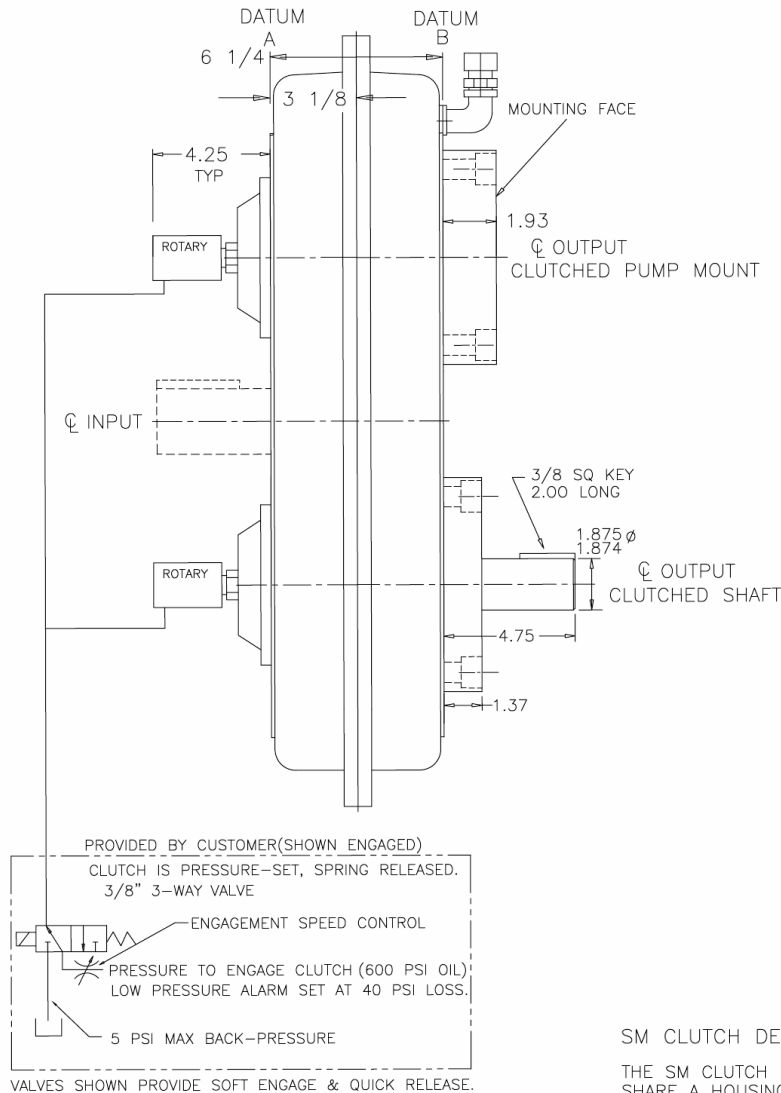


SX Extended Keyed Shaft

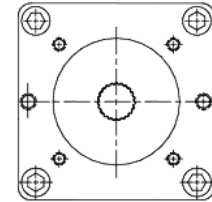


Optional SM Output Clutch

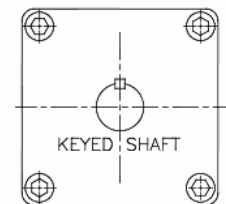
Available at any output on 8.375 and 10.875 Gear Centers



AVAILABLE CLUTCHED OUTPUT OPTIONS:
 SAE C2/C4-14T 12/24 PITCH (C)
 SAE CC2/CC4-17T 12/24 PITCH (CC)
 SAE C2/C4-23T 16/32 PITCH (SP)



STRAIGHT KEYED SHAFT (SH)



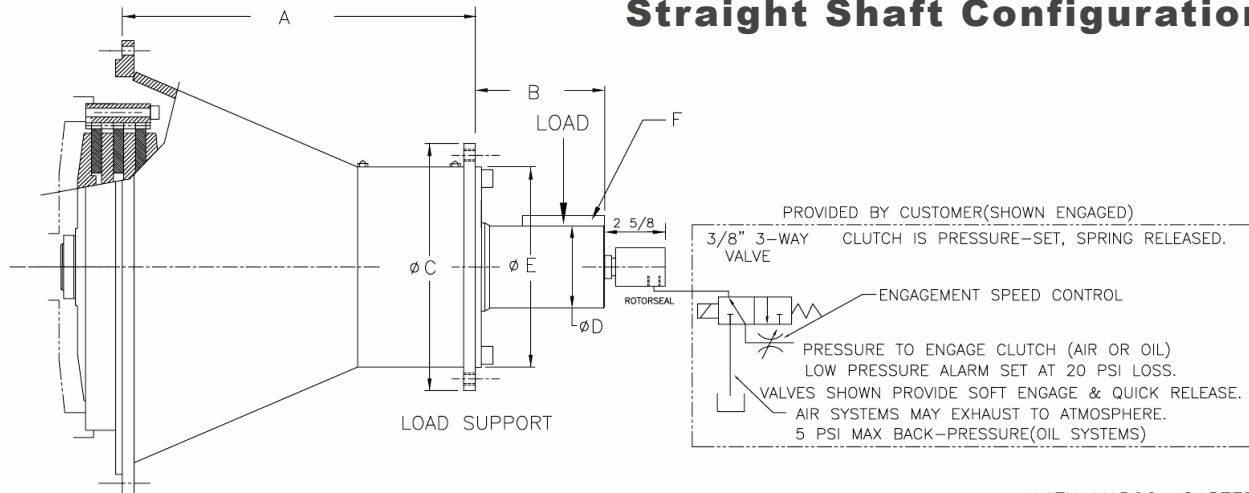
SM CLUTCH DESCRIPTION:

THE SM CLUTCH IS MULTI-DISC WITH WET SINTERED BRONZE PLATES THAT SHARE A HOUSING AND LUBE OIL WITH THE STANDARD PUMP DRIVE. THE DESIGN IS PRESSURE-BALANCED WITH NO THRUST IMPOSED ON ANY MEMBER. THE ROTARY FITTING IS SERVICED FROM THE EXTERIOR OF THE PUMP DRIVE. THE CLUTCH IS OIL ACTUATED, SPRING RELEASED, AND HAS THE CAPABILITY TO ENGAGE AT FULL SPEED, WITH PUMP UNLOADED, CLUTCHING THE INDIVIDUAL IDLING GEARS INSIDE THE PUMP DRIVE TO THE INDIVIDUAL OUTPUT SHAFTS. ONE OR ALL OF THE OUTPUTS CAN BE EQUIPPED WITH THE SM CLUTCH. OUTPUTS NOT EQUIPPED WITH THE SM CLUTCH HAVE THE STANDARD MODEL RATING. THE CLUTCHES CAN BE ENGAGED INDIVIDUALLY OR SIMULTANEOUSLY WITH THE PROPER CONTROL SYSTEM. THE PUMP DRIVE INPUT ARRANGEMENT MUST PROVIDE SPACE FOR THE ROTARY (CONSULT MARCO).

THE SM CLUTCH IS GENERALLY LIMITED TO 2500 RPM AND 12 HP/100 RPM (7500 LB-IN). CONSULT MARCO WHEN APPLICATION REQUIRES PEAK TORQUE AND SPEED.

PTO Drives

Straight Shaft Configurations

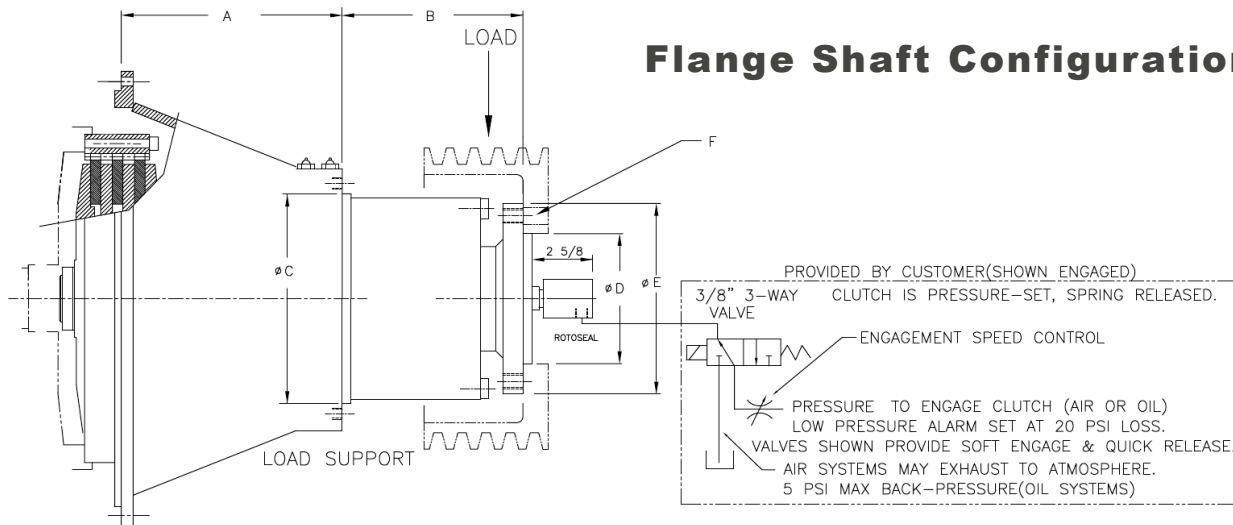


*WITH MARCO ADAPTERS

SIZE	OD&S DWG#	CAPACITY HP/100RPM	A	B	C	D	E	F	MAX SPEED RPM	AVAILABLE CONFIGURATIONS
S311	70049	33* 150PSI AIR 275PSI OIL	15	5.50	10.50	3.500 3.499	8.500 8.498	7/8X7/8 3.50 LG	2400	1-11, 2-11, 3-11, 1-14*
S314	70050	46* 150PSI AIR 275PSI OIL	15	5.50	10.50	3.500 3.499	8.500 8.498	7/8X7/8 3.50 LG	2400	0-14, 1-14, 0-18*
S318	70051	65* 150PSI AIR 250PSI OIL	20	7.50	11.50	4.250 4.248	9.000 8.998	1X1 5.00 LG	2200	0-18, 00-21*

*MAXIMUM TRANSMITTED HORSEPOWER
CONSULT MARCO FOR SERVICE FACTOR

Flange Shaft Configurations



*WITH MARCO ADAPTERS

SIZE	OD&S DWG#	CAPACITY HP/100RPM	A	B	C	D	E	F	MAX SPEED RPM	AVAILABLE CONFIGURATIONS
S311	70052	33* 150PSI AIR 275PSI OIL	9.37	7.63	8.875 8.873	5.500 5.498	8.00	(8)5/8NC ON 7.00 BC	2400	1-11, 2-11, 3-11, 1-14*
S314	70053	46* 150PSI AIR 275PSI OIL	9.37	7.63	8.875 8.873	5.500 5.498	8.00	(8)5/8NC ON 7.00 BC	2400	0-14, 1-14, 0-18*
S318	70054	65* 150PSI AIR 250PSI OIL	12.50	9.75	10.125 10.123	7.500 7.498	10.00	(10)5/8NC ON 9.00 BC	2200	0-18, 00-21*

*MAXIMUM TRANSMITTED HORSEPOWER
CONSULT MARCO FOR SERVICE FACTOR

Pump Drive Rating

CALCULATED GEAR AND BEARING LIFE CHANGE LINEARLY WITH CHANGE IN SPEED AND EXPONENTIALLY WITH CHANGE IN LOAD.

FOR EXAMPLE: DOUBLING THE SPEED WOULD RESULT IN HALVING THE LIFE, OR INCREASING THE LOAD ONLY 10% COULD RESULT IN HALVING THE LIFE.

BEARINGS

SINCE OPERATING CONDITIONS VARY GREATLY, THE CALCULATED MINIMUM L10* BEARING LIFE IS AS FOLLOWS:

1:1 RATIO, 2000 RPM @ MAXIMUM RATED OUTPUT POWER:

MODEL 26: 8000 HOURS L10
MODEL 18,28,38,48: 5000 HOURS L10
MODEL 20,30,80: 4500 HOURS L10

*THE AVERAGE BEARING LIFE WILL BE APPROXIMATELY 5 TIMES THE CALCULATED L10 LIFE. CYLINDRICAL ROLLER BEARINGS ARE ALSO AVAILABLE FOR EXTRA HEAVY DUTY APPLICATIONS.

GEARS

CALCULATED GEAR LIFE @ MAXIMUM RATED OUTPUT POWER:
TOOTH BENDING STRESS AND SURFACE CONTACT STRESS ARE LIMITED TO VALUES THAT THEORETICALLY WILL PROVIDE 2.4×10^9 CYCLES (20,000 HOURS @ 2000 RPM).

ACTUAL LIFE UNDER VARYING OPERATING CONDITIONS WILL VARY GREATLY FROM THE CALCULATED VALUES ABOVE.

Marco Global Inc. reminds users of its products and systems that their safe operation depends on use in compliance with engineering instructions provided with the order. Users are also reminded that safe operation depends on proper installation, operation and routine maintenance and inspection under prevailing conditions. It is further the responsibility of users to provide, install and maintain guards or safety devices which may be required by recognized safety standards of Occupational Safety and Health Act of 1970 and subsequent revisions.

Important Notice

Torsional Vibration Consideration

Correct mounting of HPD (hydraulic pump drive) and the required torsion analysis of the complete drive assembly are the responsibility of the purchaser. Disregarding drive system torsional compatibility could cause damage to the components in the drive train and result in failure. The torsional vibration analysis should be made by the engine builder, marine survey society, independent consultant, or other expert. Marco Global Inc, will have available mass elastic data on the items proposed or provided for incorporation in the torsional vibration analysis.

Warranty

Seller warrants the articles sold hereunder to be free from defects in material and workmanship and to conform to applicable specifications. THERE ARE NO WARRANTIES OF MERCHANTABILITY OR FITNESS WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF. Seller shall not be liable under any circumstances for consequential or incidental damages. Seller's liability for breach of warranty is limited solely to the replacement or repair, at Seller's option, of any article or part thereof which is proved to be other than as warranted.

All warranties of Seller shall expire six months from the date the article is placed into service or twelve months from the date the article is delivered by Seller and incorporated into any product or system with respect to the entire product or system including spare parts and/or accessories shall terminate upon termination of the period of warranty given by supplier or manufacturer. ALL WARRANTIES GIVEN BY SAID MANUFACTURER OR SUPPLIER REPLACE SELLER'S WARRANTIES AS TO THOSE ITEMS. No suit or action may be commenced, or claim made, upon any warranty made by Seller to Buyer unless commenced or made within 30 days of expiration of the applicable warranty period. All warranties of Seller are void and of no effect if any article or part thereof (1) is installed, used or serviced, otherwise than in conformity with Seller's applicable specification, manuals, bulletins or instructions, or (2) is or shall have been subjected to improper installation, misuse or neglect. Further, ALL ARTICLES OR PARTS THEROF FURNISHED BY BUYER OR ACQUIRED BY SELLER FROM OTHERS AT BUYER'S REQUEST AND /OR TO BUYER'S SPECIFICATIONS ARE SUPPLIED TO BUYER "AS IS".

Seller shall not be liable to Buyer or to users of any article or part supplied or installed by Seller for ordinary negligence from any cause whatsoever. If Seller's negligence is passive, and Buyer's is active, Buyer shall define and hold Seller harmless from any and all claims arising out of the installation, use, or operation of any items supplied by Seller based upon ordinary negligence.

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