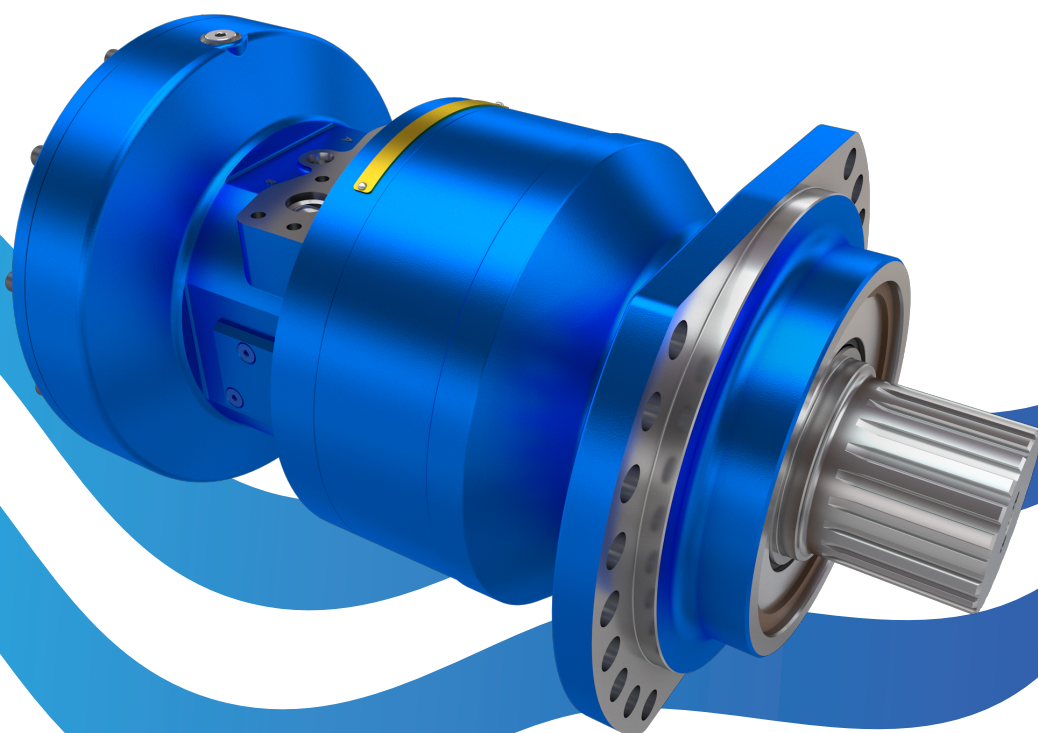


XJ40

RADIAL PISTON MOTOR



You are at the **centre**
of everything we do



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ABOUT US

Rotary Power specialises in the design, development and manufacture of hydraulic motors and pumps.

With a history dating back over 50 years, we understand the exacting and demanding requirements of today's hydraulic applications.

Operating from 18,000 sq. m. of purpose built manufacturing facilities, based in the North East of England and Bangalore, India, we continue to invest in the latest CNC machinery, automation and testing facilities. We have a clear focus on continuous improvement in lean cellular manufacturing. These facilities, alongside our European and US operations, offer sales, service and production support for the entire Rotary Power product range. A worldwide network of distribution partnerships provide additional support all over the world.

OUR BUSINESS

We recognise the importance of developing partnerships with our customers. That's why we offer flexibility in design, delivery and service to meet our customer's requirements.

Partnerships with our supply chain are key to Rotary Power's success and allow us to deliver excellent service in order to exceed expectations.

OUR PEOPLE

People are at the centre of everything we do. As an innovative engineering and manufacturing business we take recruitment and career development very seriously.

As part of the British Engines Group, we operate a training and development programme that maintains a strong focus on in-house manufacturing and a commitment to local employment. Our apprenticeship and graduate schemes provide the opportunity to develop and nurture engineering talent from an early stage.

OUR FUTURE

Whether in product design or internal processes and systems, our engineers are actively encouraged to develop new ideas within design and manufacturing. This ensures that we are at the forefront of customer and sector led innovation, whilst continuously improving our business.

Our team of in-house design engineers invest time into understanding our customer's application and work with them to deliver value added solutions, customised to their application.



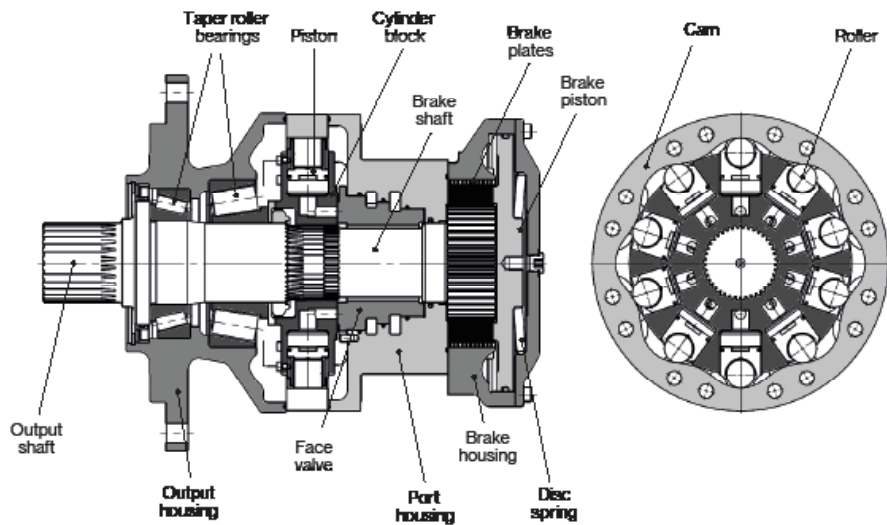
XJ RANGE

The XJ range of hydraulic motors offer displacements from 260 to 5,010 cc/rev. The XJ05 is the smallest of the range with displacements from 260 to 565 cc/rev, complemented by the larger XJ20 and XJ40 motors extending the displacement range to 2,505 and 5,010 cc/rev.

The XJ motor has a range of features and options designed to suit your specific application:

- Radial piston, multi-stroke operation
- Modular design
- Two speed options
- Parking brake options
- Freewheel capability
- Multiple mounting arrangements
- 350 bar continuous pressure
- Fast delivery options

The motor is designed with a rotating cylinder block connected to the drive shaft, which is mounted in taper roller bearings within the motor housing. This offers a high radial and axial load carrying capacity.



The pistons are located radially within the bores of the cylinder block. When oil is fed under pressure through the face valve and into the cylinder block, the pistons attempt to move outwards. The rollers react on the incline of the cam profile and this action produces rotation of the cylinder block.

The rate of flow to the motor will determine the speed at which the piston moves out against the cam ring and consequently the rotational speed of the motor. Once the power stroke is complete, the pistons return into the bore by the action of the reverse cam slope, ready for the next pressure cycle.

With units operating all over the world in a variety of applications including industrial, mobile and marine, the XJ range offers real application options for the future.

PRODUCT FEATURES

Fluids	HL; HLP to DIN 51524 Other specified fluids are possible.
Normal operating viscosity range	20 to 200 cSt
Maximum intermittent viscosity range	10 to 2,000 cSt
Normal operating temperature range	+15° to +70° C [+59°F to +158°F]
Maximum intermittent temperature range	-20° to +80° C [-4°F to +176°F]
Fluid cleanliness	NAS 1638 class 9 / ISO code 18/15

FIRST DISPLACEMENT

Displacement option	A	B	C	D	E
Geometric displacement (cc/rev) [in³/rev]	3,332 [203.3]	3,768 [229.9]	4,184 [255.3]	4,602 [280.8]	5,010 [305.7]
Specific torque (Nm/bar) [lbf.ft/psi]	53.0 [2.6]	60.0 [3.0]	66.6 [3.4]	73.2 [3.8]	79.8 [4.0]
Max. continuous speed (rpm)	100	90	85	80	70
Max. continuous power (kW) [hp]	110 [147.5]	110 [147.5]	110 [147.5]	110 [147.5]	110 [147.5]
Max. continuous pressure (bar) [psi]	350 [5,076]	350 [5,076]	350 [5,076]	350 [5,076]	350 [5,076]
Max. pressure (bar)* [psi]	450 [6,527]	450 [6,527]	450 [6,527]	450 [6,527]	450 [6,527]

SECOND DISPLACEMENT

Displacement option	A	B	C	D	E
Geometric displacement (cc/rev) [in³/rev]	1,666 [101.7]	1,884 [115]	2,092 [127.6]	2,301 [140.4]	2,505 [152.8]
Specific torque (Nm/bar) [lbf.ft/psi]	26.5 [1.4]	30 [1.6]	33.3 [1.8]	36.6 [2.0]	39.9 [2.0]
Max. continuous speed (rpm)	125	115	110	100	85
Max. continuous power (kW) preferred direction [hp]	73 [97.9]	73 [97.9]	73 [97.9]	73 [97.9]	73 [97.9]
Max. continuous power (kW) non-preferred direction [hp]	55 [73.8]	55 [73.8]	55 [73.8]	55 [73.8]	55 [73.8]
Max. continuous pressure (bar) [psi]	350 [5,076]	350 [5,076]	350 [5,076]	350 [5,076]	350 [5,076]
Max. pressure (bar)* [psi]	450 [6,527]	450 [6,527]	450 [6,527]	450 [6,527]	450 [6,527]

*Maximum values should only be applied for a small portion of the duty cycle.



Weight of motor without oil

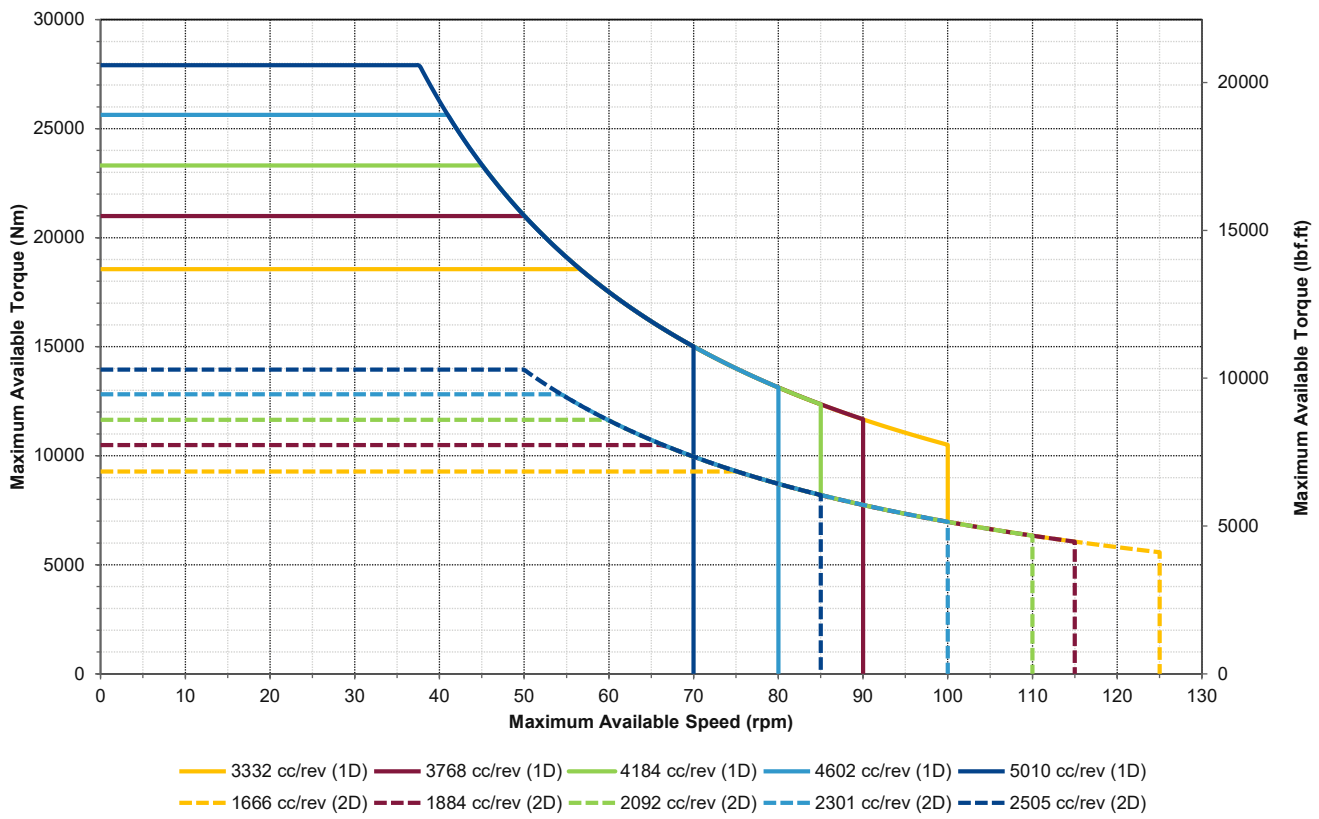


Sizes are listed in mm, inches shown in brackets

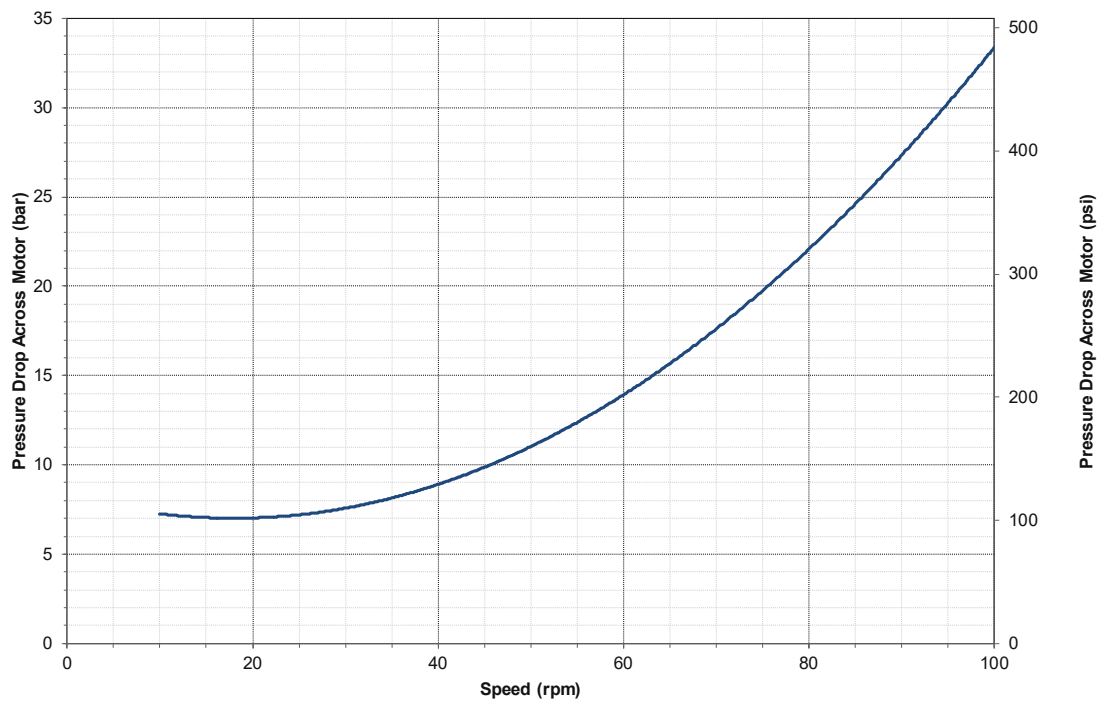


QUICK SELECTION DIAGRAM

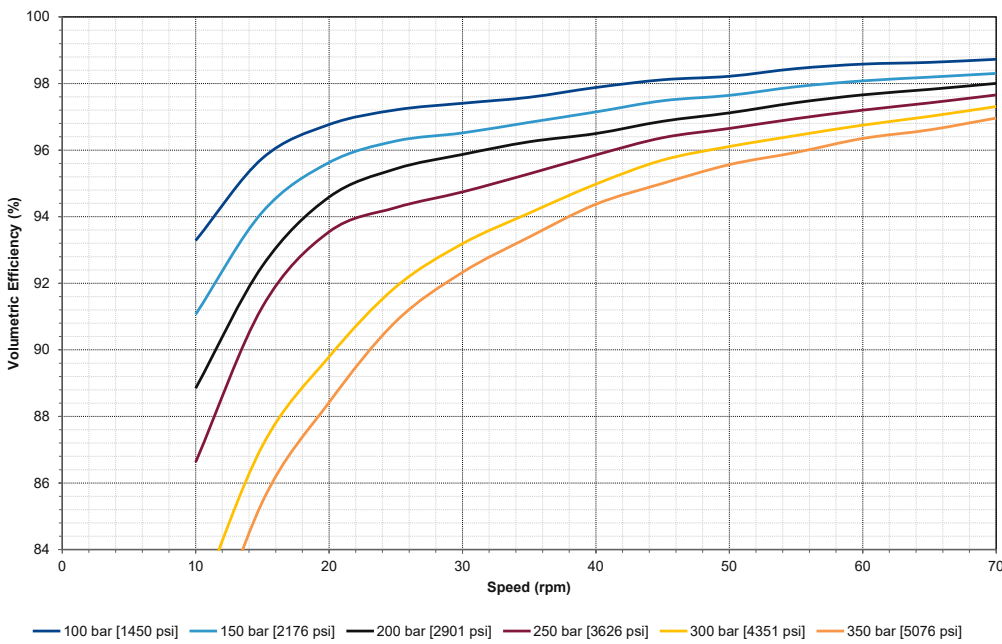
Based on your torque and speed requirements, the diagram below can be used to help determine which cam size best suits your application. Shown for both maximum displacement (1D) and minimum displacement (2D), the diagram outlines the limits of the motor based on its continuous power rating.



NO LOAD PRESSURE DROP

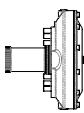
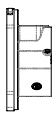
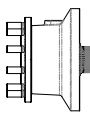


VOLUMETRIC EFFICIENCY



All performance graphs plotted for maximum displacement (5,010 cc/rev) using ISO46 fluid at 50°C.

MOTOR ORDER CODE



PRODUCT
01

CAM
02

03

04

05

06

07

08

09

10

11

12

REAR BRAKE
13

14

15

16

SPECIALS
17

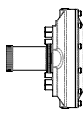
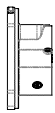
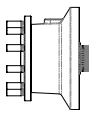
DESIGN
18

XJ40

00

A2

PRODUCT		
01	XJ40	Radial piston motor
CAM - DISPLACEMENT		
02	A	3,332 cc/rev
	B	3,768 cc/rev
	C	4,184 cc/rev
	D	4,602 cc/rev
	E	5,010 cc/rev
FRONT MODULE - CASE STYLE		
03	T	Torque unit
	S	Shaft motor front case flange
	W	Wheel motor no case flange
FRONT MODULE - OUTPUT SHAFT		
04	N	No shaft (torque unit DIN 5480 N85 x 2 x 30 x 41 x 9H spline)
	C	Keyed shaft - Ø100
	E	Splined shaft DIN 5480 - W120 x 5 x 30 x 22 7h
	Q	Wheel output 10 off, Ø335 PCD, Ø280 spigot
	T	Wheel output 8 off, Ø275 PCD, Ø220 spigot
FRONT MODULE - OUTPUT FITTINGS		
05	N	None (torque unit or shaft motor)
	A	Wheel flange with M22 x 1.5p studs fitted
	B	Wheel flange with M22 x 1.5p studs and nuts fitted
	F	Wheel flange with Ø22 through holes
	G	Wheel flange with Ø24 through holes
	H	Wheel flange with M22 x 1.5p tapped holes
FRONT MODULE - SHAFT SEAL CONFIGURATION		
06	1	Standard
	2 (WHEEL MOTORS ONLY)	Mechanical face seal
FRONT MODULE - FRONT BRAKE		
07	N	No brake (standard)



PRODUCT
01

CAM
02

03

04

05

06

07

08

09

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11

12

REAR BRAKE
13

14

15

16

SPECIALS
17

DESIGN
18

XJ40

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A2

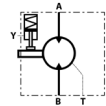
PORT MODULE - MOUNTING FLANGE		
08	N	No flange (torque units and shaft motors)
	L	Lug fixing flange (wheel motors only)
PORT MODULE - SPEED AND ROTATION		
09	1R	Single speed - flow port A = CW rotation
	1L	Single speed - flow port A = ACW rotation
	RA	Two speed (Ratio 2:1) - flow port A = CW preferred rotation
	LA	Two speed (Ratio 2:1) - flow port A = ACW preferred rotation
PORT MODULE - HYDRAULIC CONNECTIONS (SEE PAGE 21 FOR PORT DESIGNATIONS)		
10	0	No port block
	1	ISO 6162 DN 32 (M12 fixing holes). All other ports SAE J514 (standard)
	4	ISO 6162 DN 19. All other ports ISO 9947-1 (2 speed wheel motors with small lug flange only)
PORT MODULE - ADDITIONAL CIRCUIT VALVING		
11	N	None
	B	Purge and relief valve with standard orifice (1.5 mm)
PORT MODULE - SPEED SENSOR		
12	N	None
	S	Speed sensor port in port housing (M12 x 1.0p)
	U	Speed sensor port in port housing (incl. sensor and connector)
REAR BRAKE		
13	N	None
	P	"P" parking brake (21 kNm)
OPTIONS		
14 15 16	0	None
	A	Strengthened port housing cover with side drain port
	B	Face valve with round porting
	G	Special paint (specify RAL number)
	P	Shaft-up vent port
	V	Viton seal material
SPECIALS		
17	00	Specials (Rotary Power specified)
DESIGN SERIES		
18	A2	Design series (Rotary Power specified)

TORQUE UNIT SINGLE SPEED OPTION

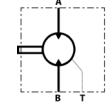
PRODUCT	CAM	FRONT MODULE					PORT MODULE					REAR BRAKE	OPTIONS			SPECIALS	DESIGN
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
XJ40		T	N	N	1	N	N		1	N	N					00	A2

(For models shown below)

 162 kg [357 lb] with P brake

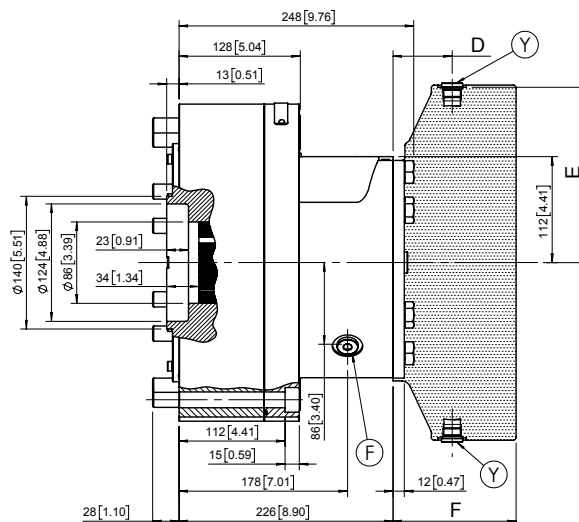
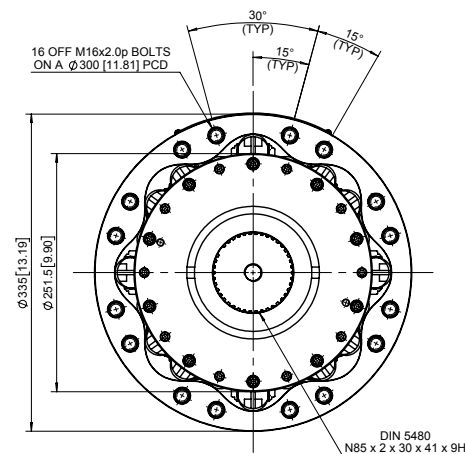
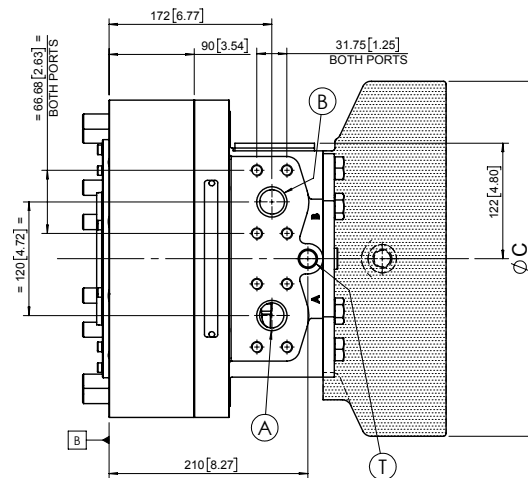
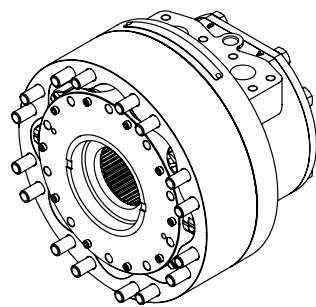


 88 kg [194 lb] without brake



Rotor spline
DIN 5480: N85 x 2 x 30 x 41 x 9H

Other spline options available, contact us for more information.
See page 21 for hydraulic connection options.

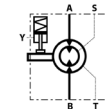


TORQUE UNIT TWO SPEED OPTION

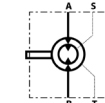
PRODUCT	CAM	FRONT MODULE					PORT MODULE					REAR BRAKE	OPTIONS			SPECIALS	DESIGN
01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18
XJ40		T	N	N	1	N	N		1	N	N					00	A2

(For models shown below)

 169 kg [373 lb] with P brake

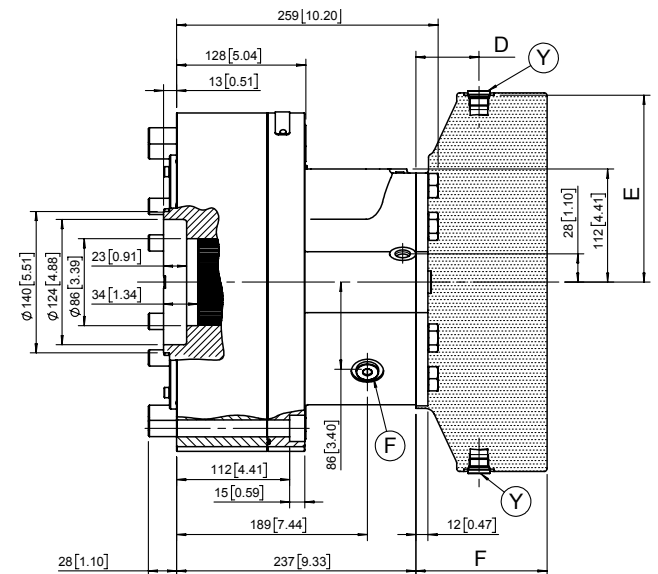
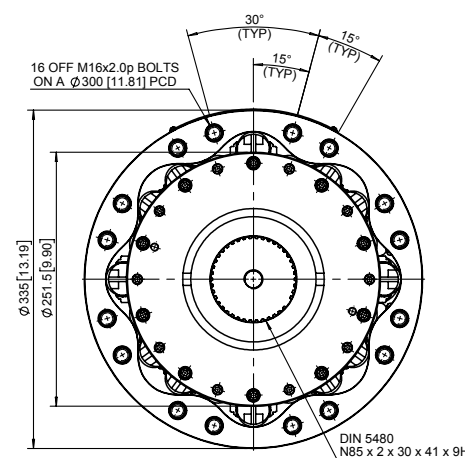
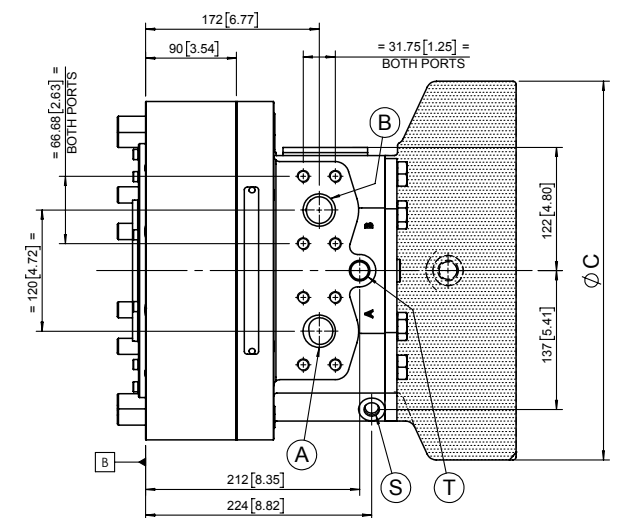
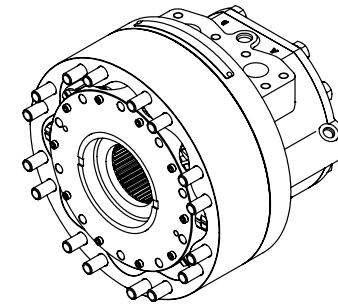


 95 kg [209 lb] without brake



Rotor spline
DIN 5480: N85 x 2 x 30 x 41 x 9H

Other spline options available, contact us for more information.
See page 21 for hydraulic connection options.



SHAFT MOTOR
SINGLE SPEED WITH SPLINE

PRODUCT 01	CAM 02	FRONT MODULE 03 04 05 06 07					PORT MODULE 08 09 10 11 12				REAR BRAKE 13	OPTIONS 14 15 16			SPECIALS 17	DESIGN 18
XJ40		S	E	N	1	N	N		1	N	N				00	A2

(For models shown below)

kg

238 kg [525 lb] with P brake

kg

164 kg [362 lb] without brake

Option	Rated holding torque	C	D	E	F	Weight
P	21 kNm [14,488 lbf.ft]	Ø375 [14.764]	59 [2.323]	185 [7.283]	142 [5.591]	74 kg [163 lb]

See page 21 for hydraulic connection options.

SHAFT MOTOR
TWO SPEED WITH SPLINE

PRODUCT 01	CAM 02	FRONT MODULE 03 04 05 06 07					PORT MODULE 08 09 10 11 12				REAR BRAKE 13	OPTIONS 14 15 16			SPECIALS 17	DESIGN 18
XJ40		S	E	N	1	N	N		1	N	N				00	A2

(For models shown below)

kg

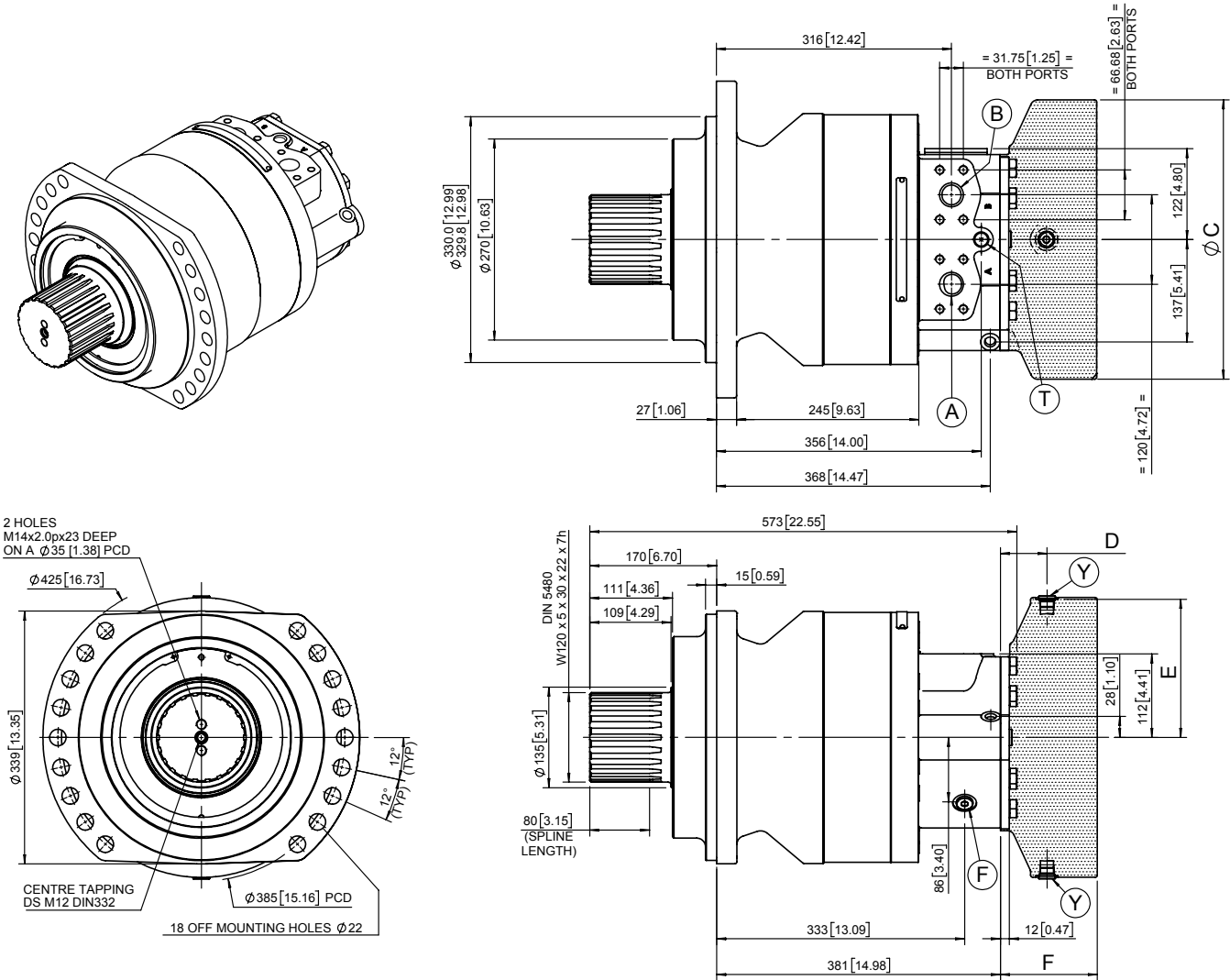
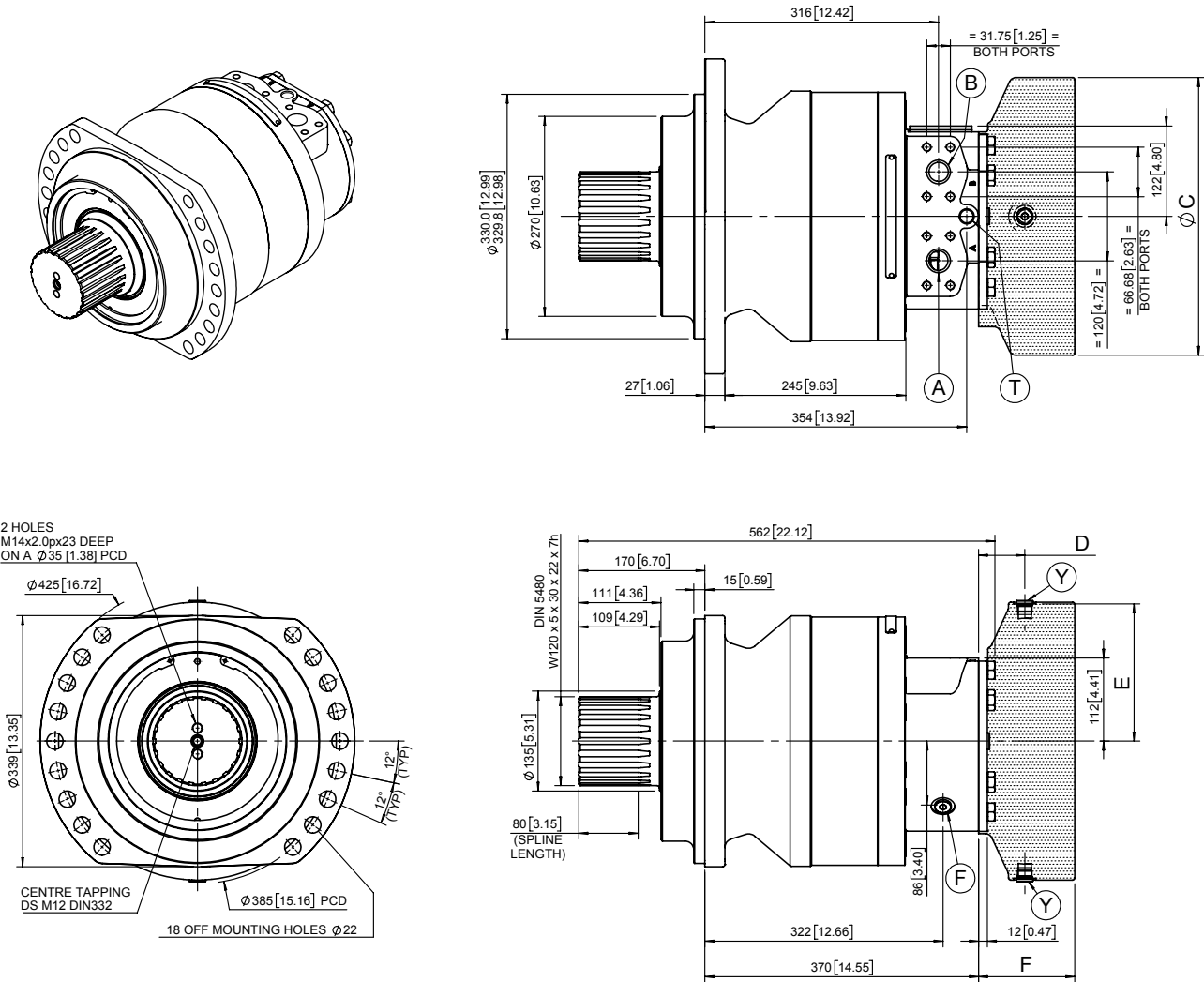
245 [540 lb] with P brake

kg

171 kg [377 lb] without brake

Option	Rated holding torque	C	D	E	F	Weight
P	21 kNm [14,488 lbf.ft]	Ø375 [14.764]	59 [2.323]	185 [7.283]	142 [5.591]	74 kg [163 lb]

See page 21 for hydraulic connection options.

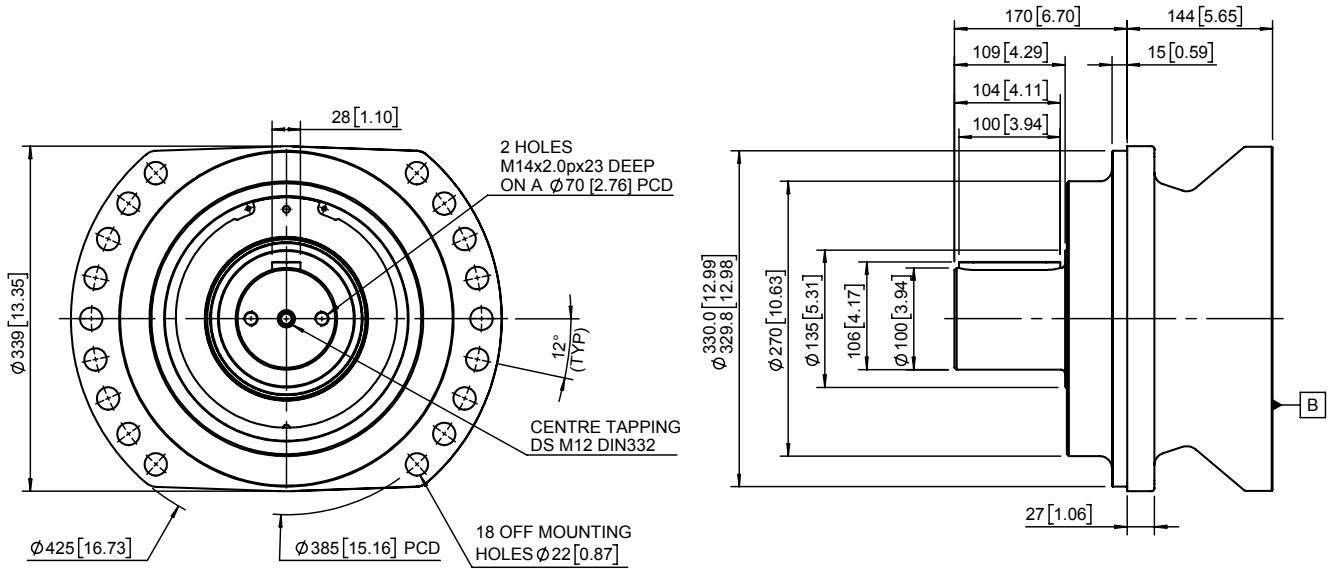


SHAFT MOTOR
OUTPUT OPTIONS

PRODUCT 01	CAM 02	FRONT MODULE 03 04 05 06 07					PORT MODULE 08 09 10 11 12				REAR MODULE 13	OPTIONS 14 15 16			SPECIALS 17	DESIGN 18
XJ40															00	A2

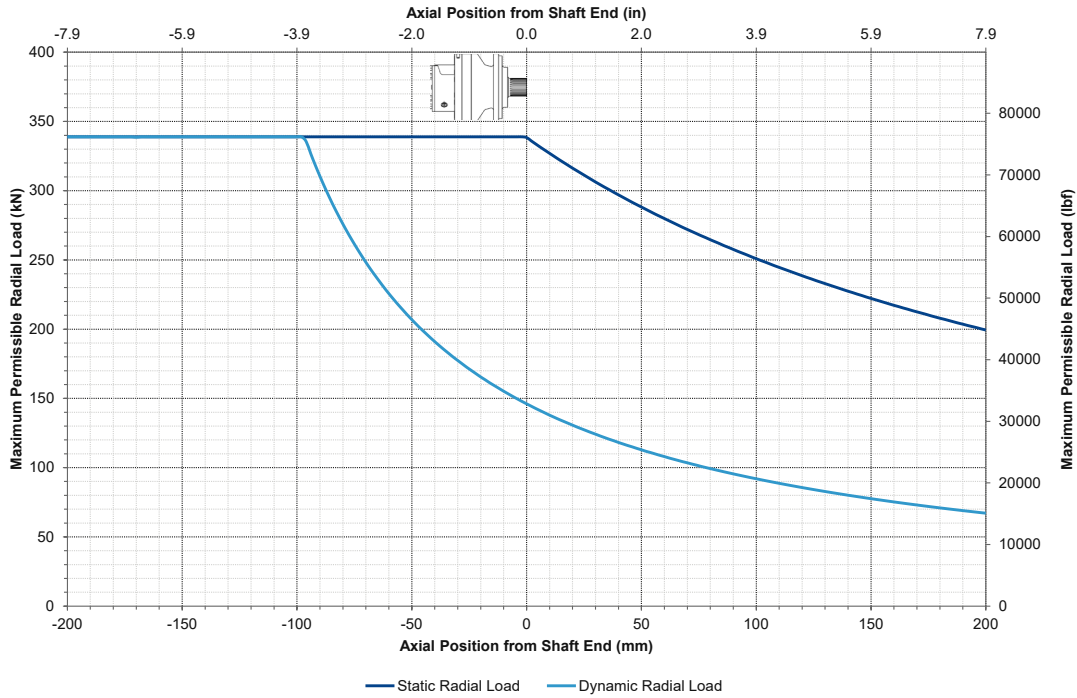
XJ40 HOUSING - KEYED OUTPUT

FRONT MODULE				
03	04	05	06	07
S	C	N	1	N

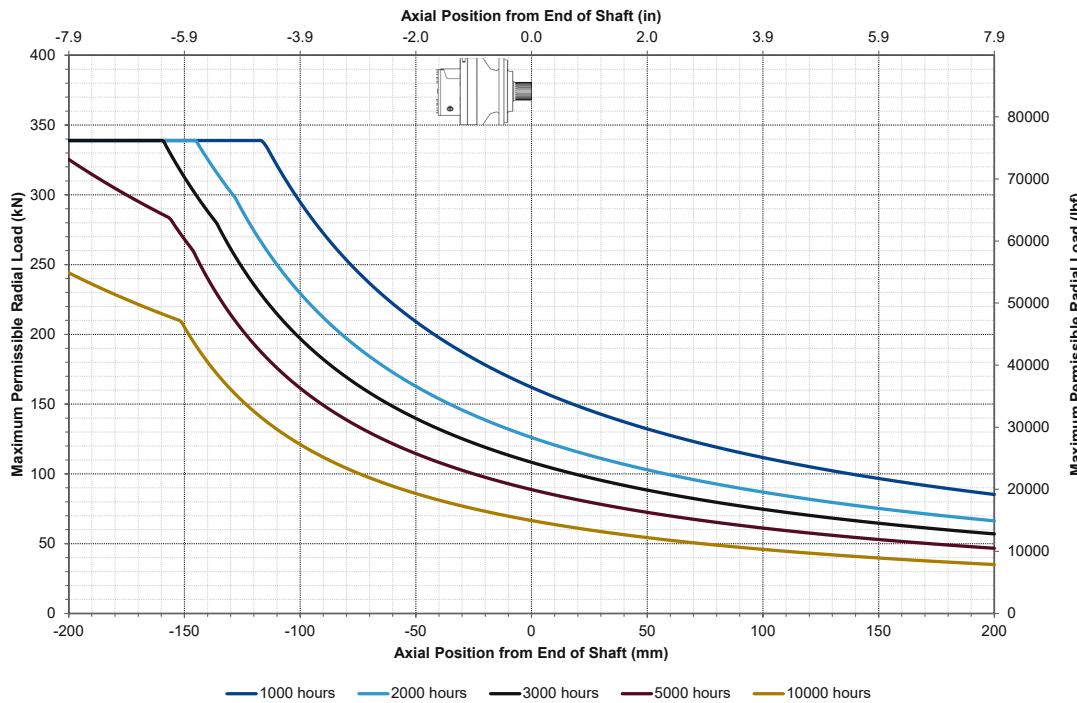


NOTE: TORQUE UNIT BEYOND FACE [B] IS
AS PER MAIN DRAWINGS

SHAFT MOTOR
PERMISSIBLE DYNAMIC AND STATIC RADIAL LOAD



SHAFT MOTOR
L10 LIFE AT 150 BAR, 35 RPM



$$\text{New life (hours)} = \frac{\text{plotted speed (rpm)} \times \text{plotted life (hours)}}{\text{desired speed (rpm)}}$$

Contact us for alternative cycle duties.
All data is based on the standard spline motor output shaft, option E.
All data is based on theoretical calculations.

WHEEL MOTOR
SINGLE SPEED OPTION

PRODUCT
01

CAM
02

FRONT MODULE
03 04 05 06 07

PORT MODULE
08 09 10 11 12

REAR BRAKE
13

OPTIONS
14 15 16

SPECIALS
17

DESIGN
18

XJ40

W

Q

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(For models shown below)

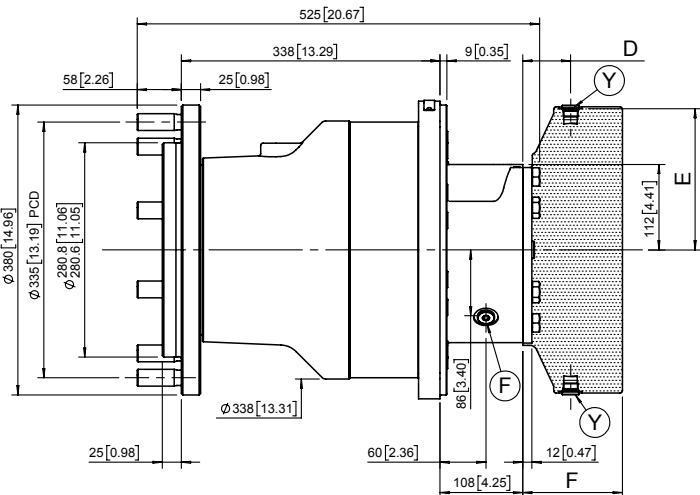
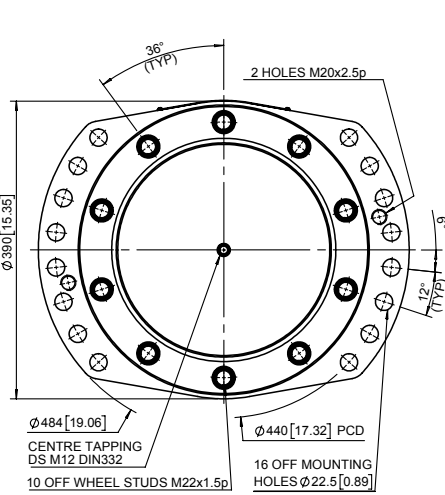
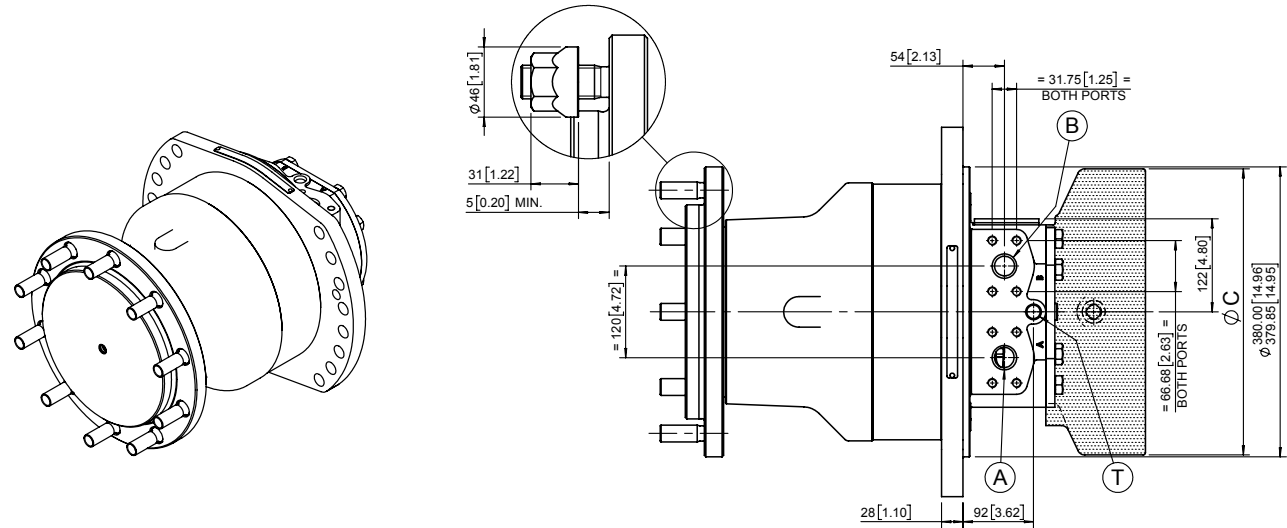
 264 kg [582 lb] with P brake

 190 kg [419 lb] without brake

See page 21 for hydraulic connection options.

Option	Rated holding torque	C	D	E	F	Weight
P	21kNm [14,488 lbf.ft]	Ø375 [14.764]	59 [2.323]	185 [7.283]	142 [5.591]	74 kg [163 lb]

Option	Output fittings
A	M22 x 1.5p wheel studs (standard)
B	M22 x 1.5p wheel studs with nuts fitted
F	Ø22 through holes
G	Ø24 through holes
H	M22 x 1.5p tapped holes



WHEEL MOTOR
TWO SPEED OPTION

PRODUCT
01

CAM
02

FRONT MODULE
03 04 05 06 07

PORT MODULE
08 09 10 11 12

REAR BRAKE
13

OPTIONS
14 15 16

SPECIALS
17

DESIGN
18

XJ40

W

Q

N

N

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1

N

N

00

A2

(For models shown below)

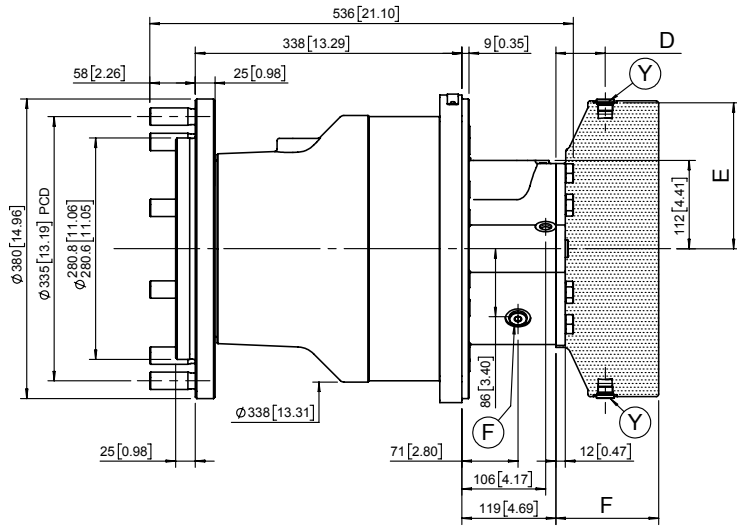
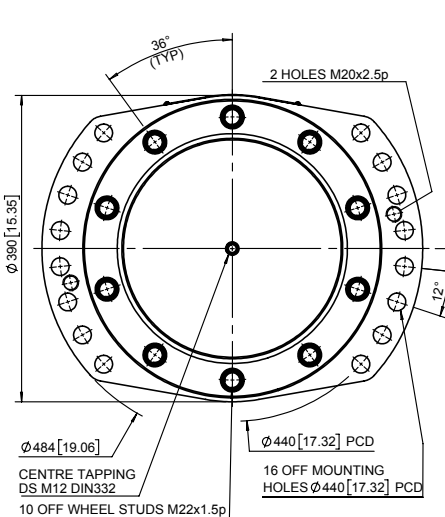
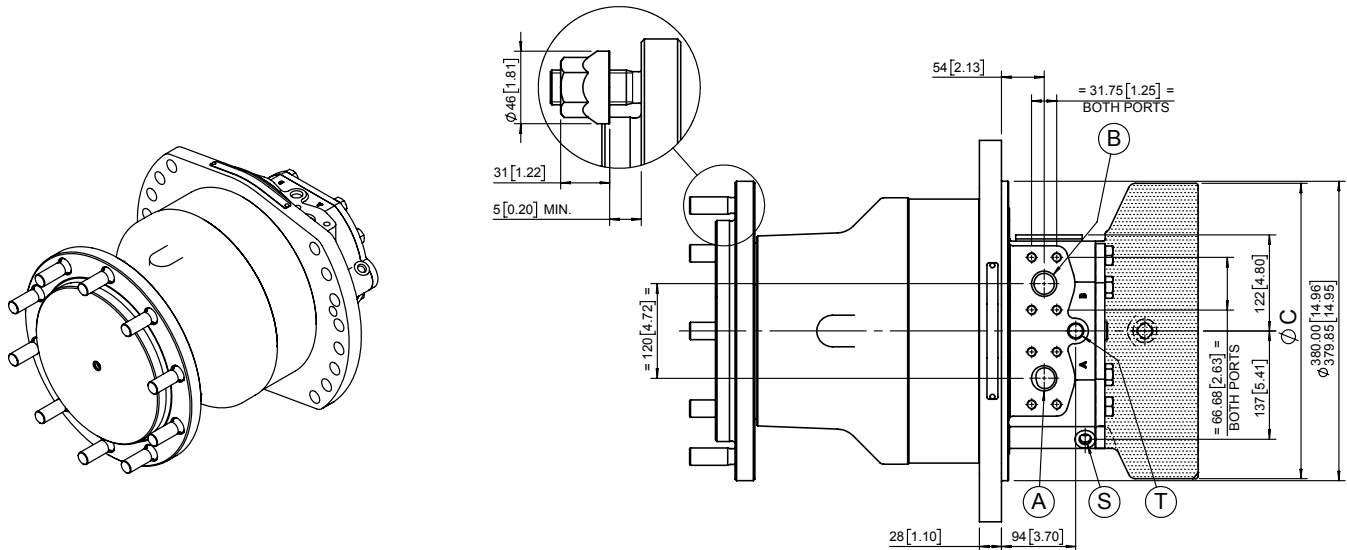
 271 kg [597 lb] with P brake

 197 kg [434 lb] without brake

See page 21 for hydraulic connection options.

Option	Rated holding torque	C	D	E	F	Weight
P	21kNm [14,488 lbf.ft]	Ø375 [14.764]	59 [2.323]	185 [7.283]	142 [5.591]	74 kg [163 lb]

Option	Output fittings
A	M22 x 1.5p wheel studs (standard)
B	M22 x 1.5p wheel studs with nuts fitted
F	Ø22 through holes
G	Ø24 through holes
H	M22 x 1.5p tapped holes



WHEEL MOTOR
OUTPUT OPTIONS

PRODUCT
01

XJ40

CAM
02

FRONT MODULE

03

04

05

06

07

W

1

N

N

PORT MODULE

08

09

10

11

12

REAR BRAKE

13

OPTIONS

14

15

16

SPECIALS

17

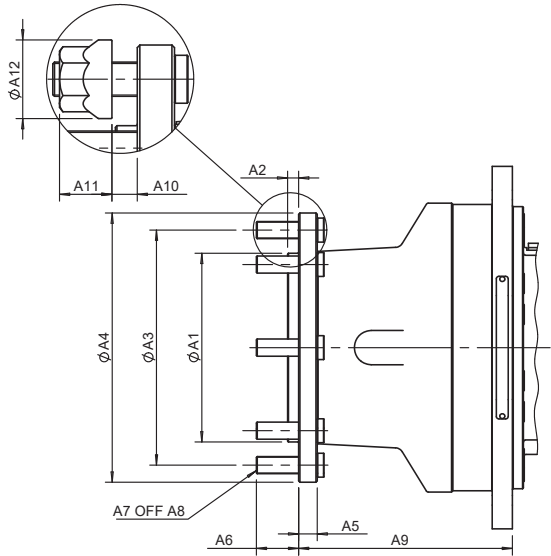
00

DESIGN

18

A2

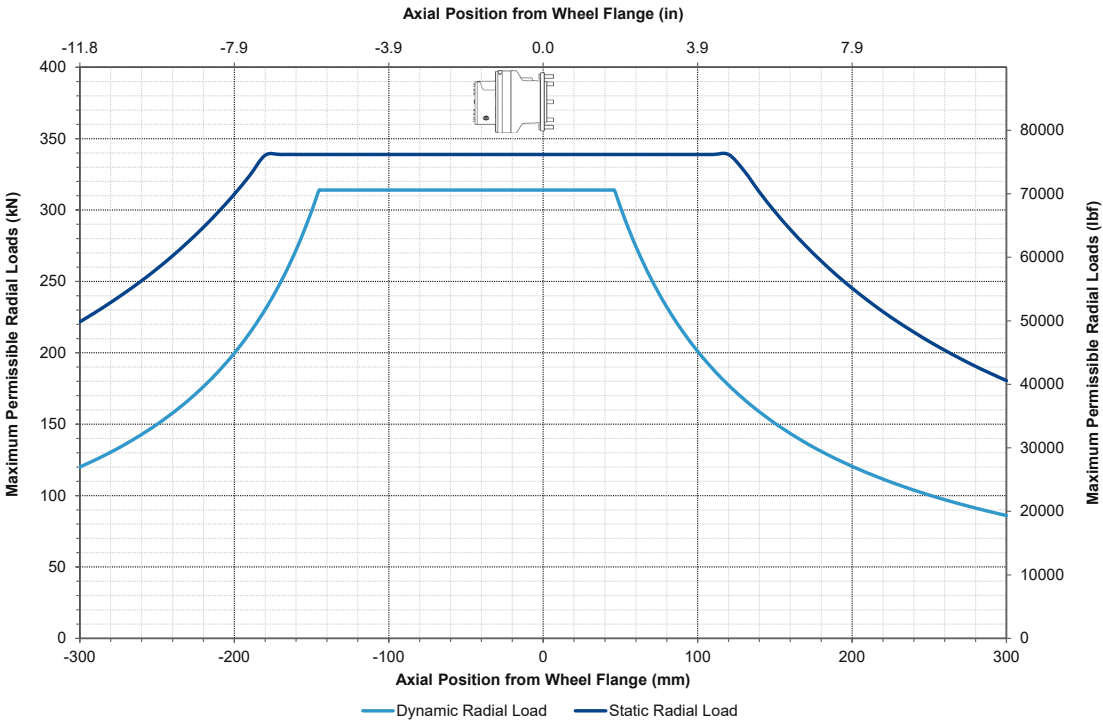
(For models shown below)



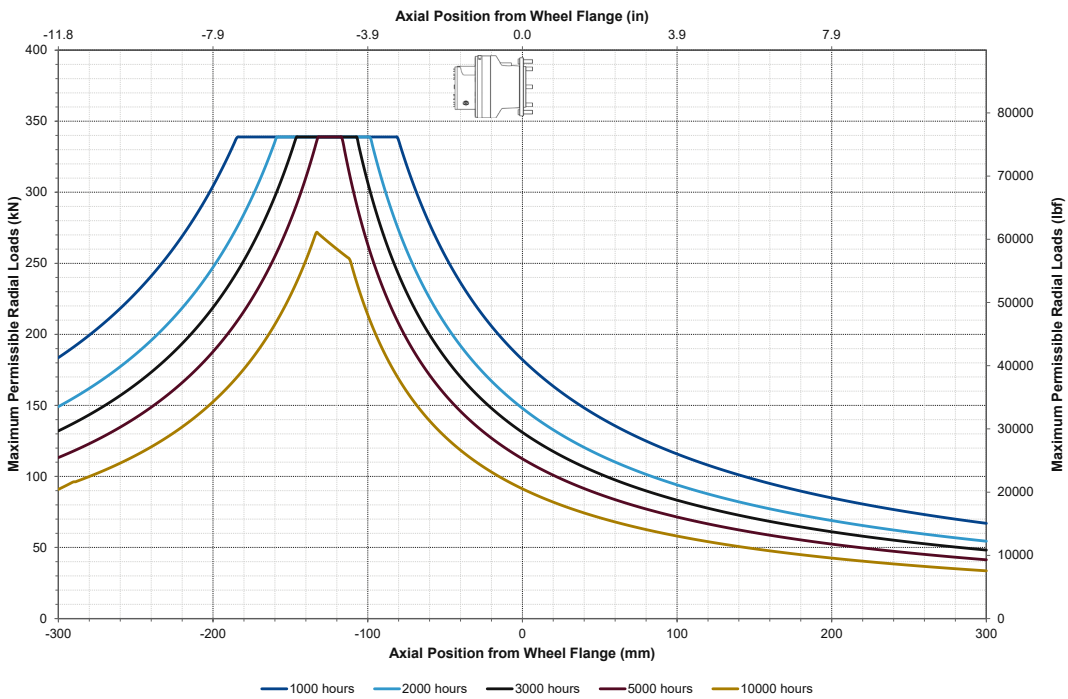
WHEEL MOTOR - OUTPUT SHAFT

Option	Type	A1	A2	A3	A4	A5	A6	A7	A8	A9	A10 (min)	A11	A12
T	XJ20 housing	Ø220 [8.66]	13 [0.51]	Ø275 [10.83]	Ø315 [12.40]	22 [0.87]	50 [1.97]	8	M20 x 1.5p Ø22 [0.86]	300 [11.81]	5 [0.20]	26 [1.02]	Ø43 [1.69]
Q	XJ40 housing	Ø280 [11.02]	25 [0.98]	Ø335 [13.19]	Ø280 [11.02]	25 [0.98]	58 [2.28]	10	M22 x 1.5p Ø24 [0.95]	338 [13.29]	5 [0.20]	31 [1.22]	Ø46 [1.81]

WHEEL MOTOR
PERMISSIBLE DYNAMIC AND STATIC RADIAL LOAD



WHEEL MOTOR
L10 LIFE AT 150 BAR, 42.5 RPM



New life (hours) = $\frac{\text{plotted speed (rpm)} \times \text{plotted life (hours)}}{\text{desired speed (rpm)}}$

Contact us for alternative cycle duties.
All data is based on the standard wheel motor output shaft, option Q.
All data is based on theoretical calculations.

PARKING BRAKES

[illegible]

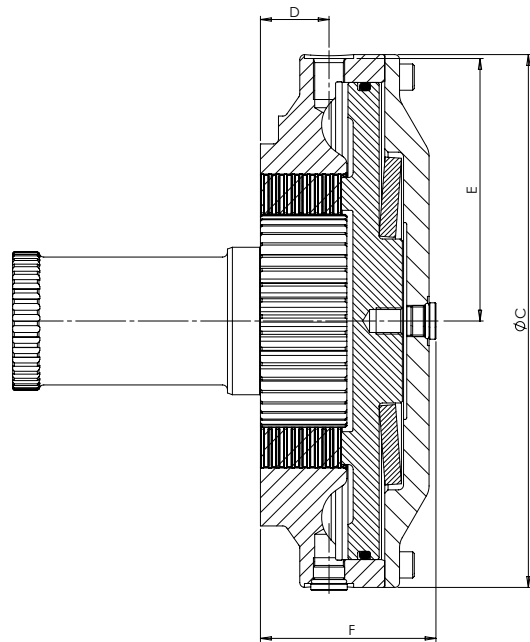
Option	Rated holding torque	C	D	E	F	Weight
P	21 kNm [14,488 lbf.ft]	Ø375 [14.764]	59 [2.323]	185 [7.283]	142 [5.591]	74 kg [163 lb]

The XJ40 multi-disc parking brake is a spring applied, hydraulic release, fail safe brake designed to be used with XJ40 motors in static situations.

The multi-disc brake has a modular design which ensures it can be connected to any variant of the XJ40 motor.

The brake has two hydraulic release ports, one at the top of the housing and one at the bottom. The brake can be manually released by removing the plug in the cover and using an M20 screw to pull the piston back.

P BRAKE



Brake static capacity when new	21 kNm [15,483 lbf.ft]
Static capacity after ten dynamic uses	16.1 - 18.3 kNm ⁽¹⁾ (²)(³) [11,925 - 13,474 lbf.ft] ⁽¹⁾ (²)(³)
Volume to fill	1,200 cc [73.2 in ³]
Volume to fully release brake	300 cc [18.3 in ³]
Min. pressure to fully release brake	20 bar [290 psi]
Max. acceptable pressure	30 bar [435 psi]
Time to release brake	< 0.5 seconds ⁽⁴⁾ (⁵)
Time to engage brake	< 1 second ⁽⁴⁾ (⁵)
Emergency release fitting	M20 torqued to 350 Nm [M20 torqued to 258 lbf.ft]
Weight	74 kg [163 lbs]

- (1) Do not run in brake, wearing the plates will reduce the static capacity.
 - (2) Dynamic use of the brake is not recommended and should only be used in emergency situations.
 - (3) The disc pack should be replaced after ten dynamic uses.
 - (4) Times may vary depending on fluid viscosity and valves used.
 - (5) During low temperature applications, flushing the brake housing is recommended to maintain a constant oil viscosity.
- All data is based on ISO46 fluid at 50°C/122°F. If a different fluid will be used, please consult Rotary Power.

DIRECTION OF SHAFT ROTATION

[illegible]

PORT MODULE - SPEED AND ROTATION

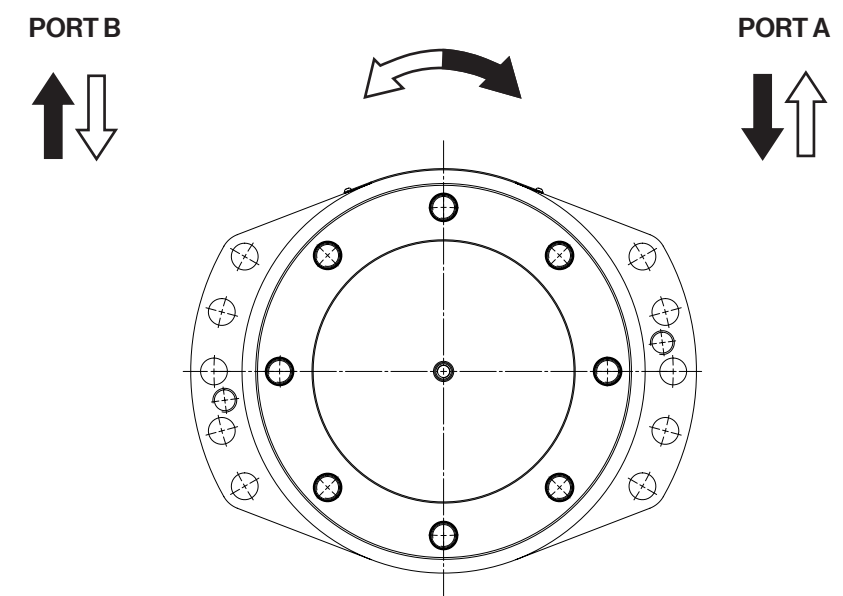
1R	Single speed - flow to port A = CW rotation
1L	Single speed - flow to port A = ACW rotation
RA	Two speed (Ratio 2:1) - flow to port A = CW preferred rotation
LA	Two speed (Ratio 2:1) - flow to port A = ACW preferred rotation

The XJ motor code defines the starting direction of the motor. This is selected by the customer to best suit their application needs.

The starting direction is based on flow being supplied to port A. A single speed motor can have its starting direction reversed by supplying flow to port B.

In two speed motors, pressurising port A is preferred as this prevents the motor from recirculating high pressure oil when shifted into second displacement. It is important to select the correct starting direction of a two speed motor to ensure optimum performance in the required direction.

DIRECTION OF SHAFT ROTATION VIEWED FROM THE SHAFT END



HYDRAULIC CONNECTIONS

The diagram illustrates the connection between the PORT MODULE and the technical specifications table. The PORT MODULE is shown at the top with ports 01 through 19. Port 01 is labeled 'PRODUCT' and contains 'XJ40'. Port 02 is labeled 'CAM'. Ports 03 through 07 are labeled 'FRONT MODULE'. Ports 08 through 12 are labeled 'PORT MODULE'. Port 13 is labeled 'REAR BRAKE'. Ports 14 through 16 are labeled 'OPTIONS'. Port 17 is labeled 'SPECIALS' and contains '00'. Port 18 is labeled 'DESIGN' and contains 'A2'. Port 19 is labeled 'PORT'. A line connects the PORT MODULE (ports 08-12) to the 'Power supply' section of the table. Another line connects the 'Drain' section to the 'Speed change' section. A third line connects the 'Speed change' section to the 'Flushing' section. A fourth line connects the 'Flushing' section to the 'Parking brake' section.

	Power supply	Drain	Speed change	Flushing	Parking brake
Port	A	B	T	S	Y
1	ISO 6162 DN 32 (M12 fixing holes)	1/2" SAE J514 (3/4"-16 UNF)	3/8" SAE J514 (9/16"-18 UNF)	1/2" SAE J514 (3/4"-16 UNF)	1/2" SAE J514 (3/4"-16 UNF)
4*	ISO 6162 DN 19	M22x1.5	M22x1.5	M22x1.5	M16x1.5

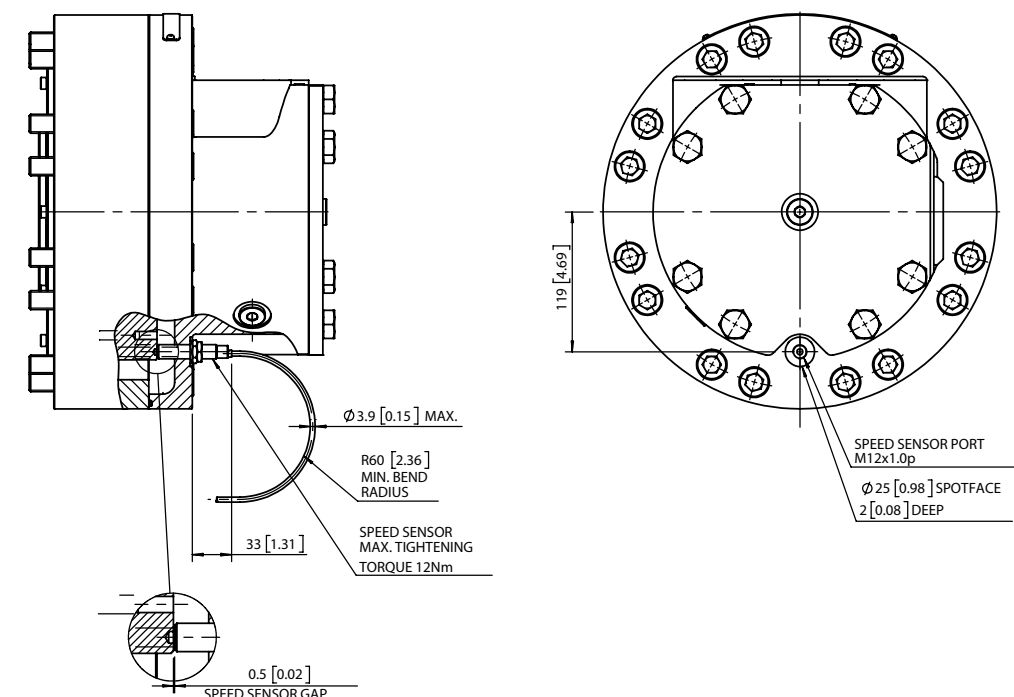
* 2 speed wheel motors only

Max. pressures	bar [psi]	450 [6,527]	6 [90]	40 [580]	6 [90]	30 [435]
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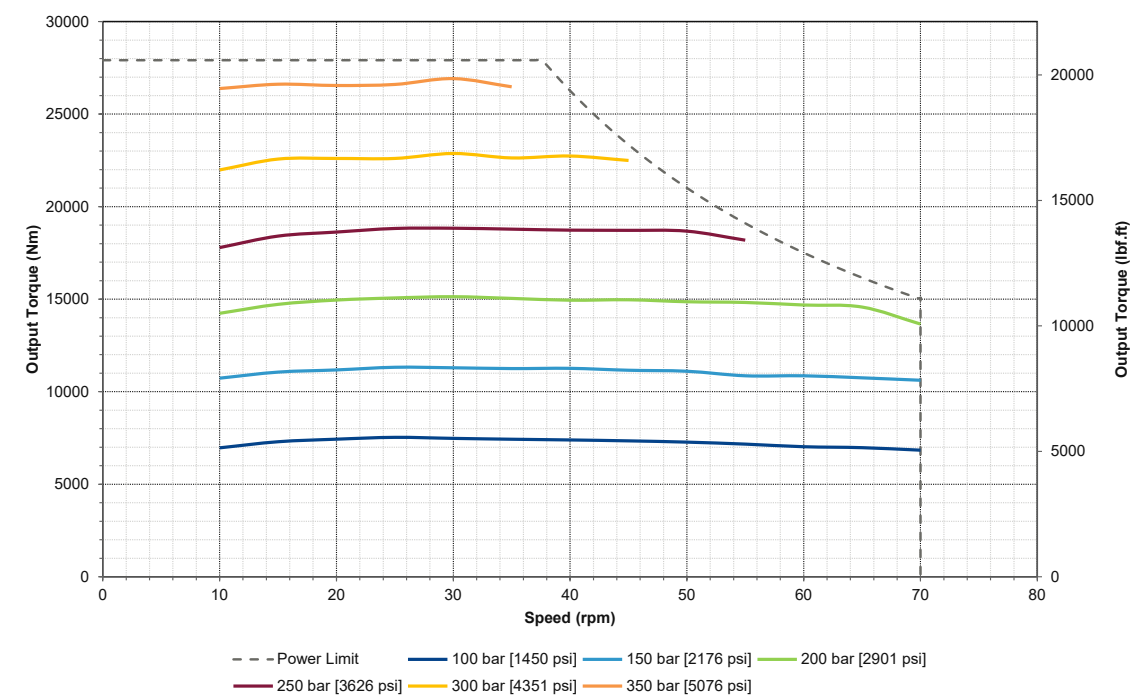
EXTRA OPTIONS
SPEED SENSOR

This sensor provides a square wave signal used to calculate motor speed. Note that the sensor target is constructed using a modified XJ40 rotor. Integrating the sensor target into the rotor allows the envelope of the motor to remain consistent with standard sizes.

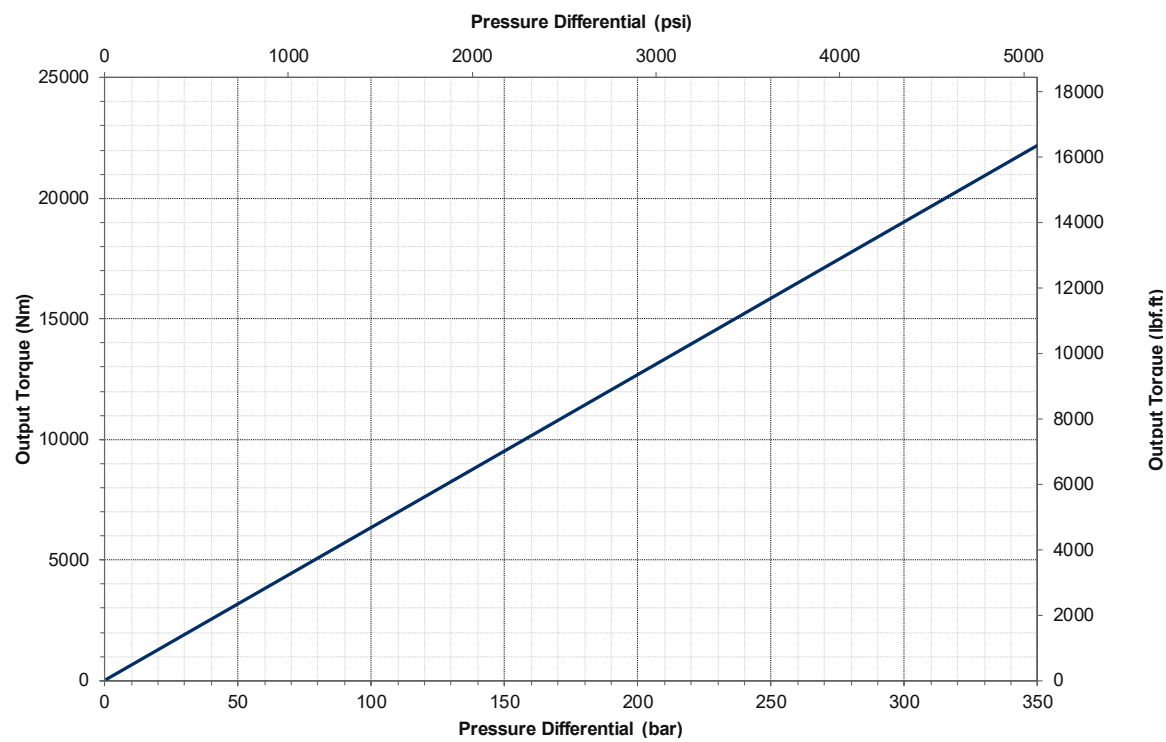
Sensor type	Differential hall effect speed sensor
Rotary Power part number	W949000005
Supply voltage	8 – 32 VDC
Current consumption	- Max. without load: 15 mA - Max. with load: 30 mA
Plug type	AMP 282105-1, 3 pins - Integrated cable and connector only - Cable length (including connector): 350 mm ± 20 mm
Signal output	- Square wave - Push-pull outputs: I_{max} = ± 20 mA - With pull-up resistor (for R=560 Ohm): U_{low} < 2.5V, U_{high} > 0.95 * U_{supply} - With pull-down resistor (for R=560 Ohm): U_{low} < 0.1V, U_{high} > U_{supply} - 4.0 V
Frequency range	5 Hz – 20 kHz
Standard number of pulses per revolution	60
Operating temperature	-40°C to +125°C [-40°F to +257°F]
Protection rating	- Sensor head: IP68 - Cable outlet: IP67



TORQUE OUTPUT

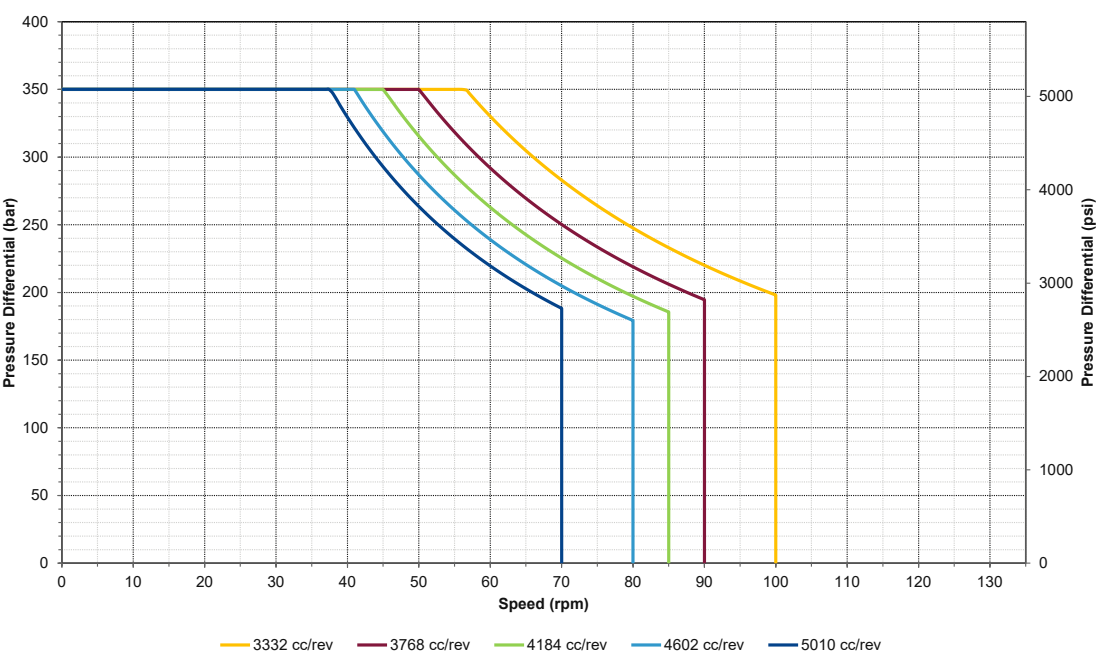


STARTING TORQUE
MAX. AVAILABLE TORQUE AT ZERO RPM

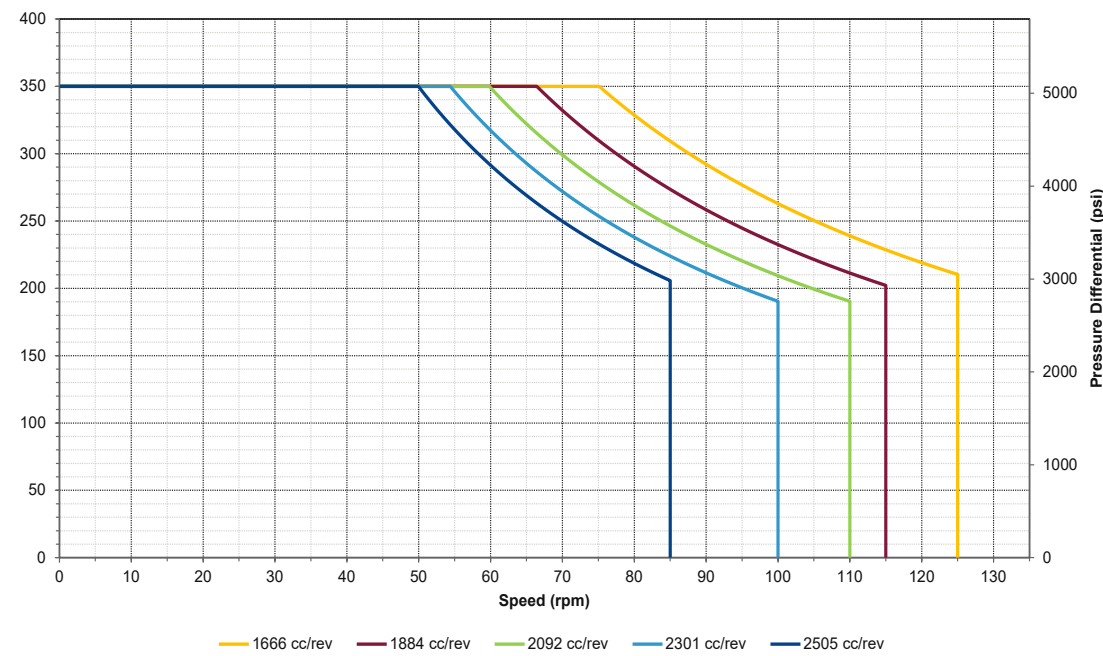


All performance graphs plotted for maximum displacement (5,010 cc/rev) using ISO46 fluid at 50°C.

POWER ENVELOPE
SINGLE SPEED 110KW MAX. CONTINUOUS POWER



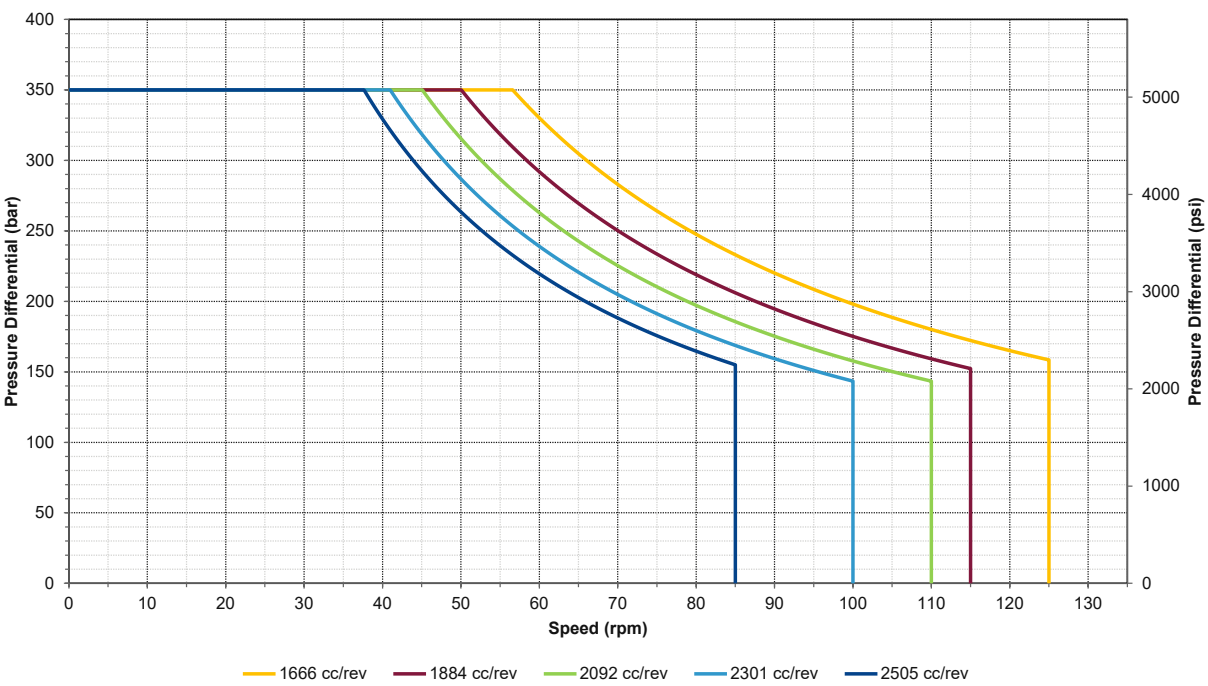
POWER ENVELOPE
TWO SPEED 73KW MAX. CONTINUOUS POWER
MIN. DISPLACEMENT - PREFERRED DIRECTION



POWER ENVELOPE

TWO SPEED 55KW MAX CONTINUOUS POWER

MIN. DISPLACEMENT - NON PREFERRED DIRECTION



CALCULATIONS

Output torque (Nm) =

Motor displacement (cc) x delta pressure (bar) x η_m

20π

Flow (lpm) =

Motor displacement (cc) x rotational speed (rpm)

1000 x η_v

Output power (kW) =

Output torque (Nm) x rotational speed (rpm)

9,550

Where:
η_m = Mechanical efficiency
η_v = Volumetric efficiency

For approximate estimates of performance use:
η_m = 0.95
η_v = 0.95

CONVERSIONS

Nm → lbf.ft = x 0.7376

N → lbf = x 0.2248

bar → psi = x 14.5038

cc → in³ = x 0.061

lpm → U.S. gpm = x 0.2641

kW → hp = x 1.341

kg → lb = x 2.2046

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