DENISON CALZONI
Radial Piston Motor
Type MRD, MRDE, MRV, MRVE

RCOa 2401/03.03

DENISON CALZONI

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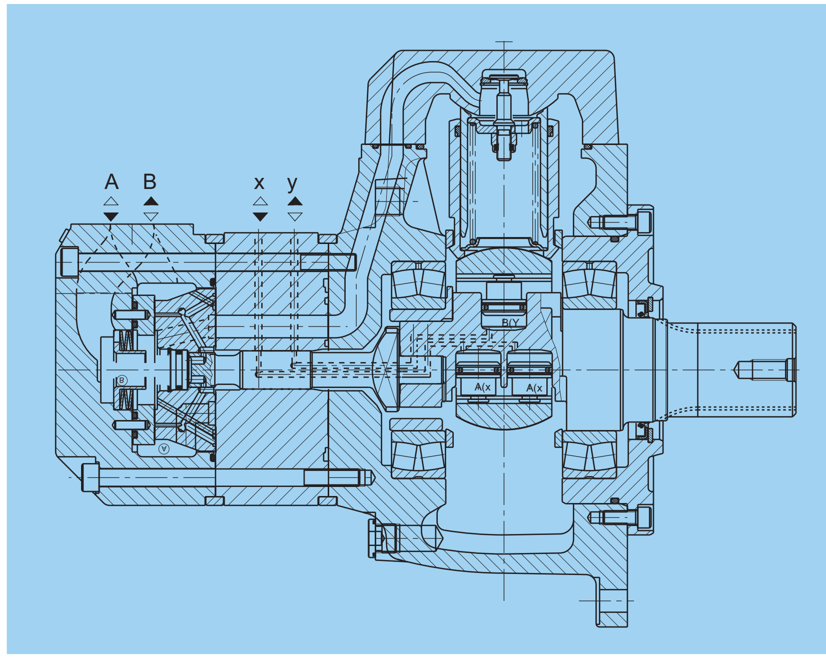
GENERAL CHARACTERISTICS



CONSTRUCTION Radial piston motor with dual displacement ”MRD - MRDE” and variable displacement ”MRV - MRVE”

TYPE MRD; MRDE; MRV; MRVE

MOUNTING Front flange mounting

CONNECTION Connection flange (See page 40)

MOUNTING POSITION Any (please note the installation notes on page 44)

BEARING LIFE See page 26

DIRECTION OF ROTATION Clockwise, anti-clockwise - reversible

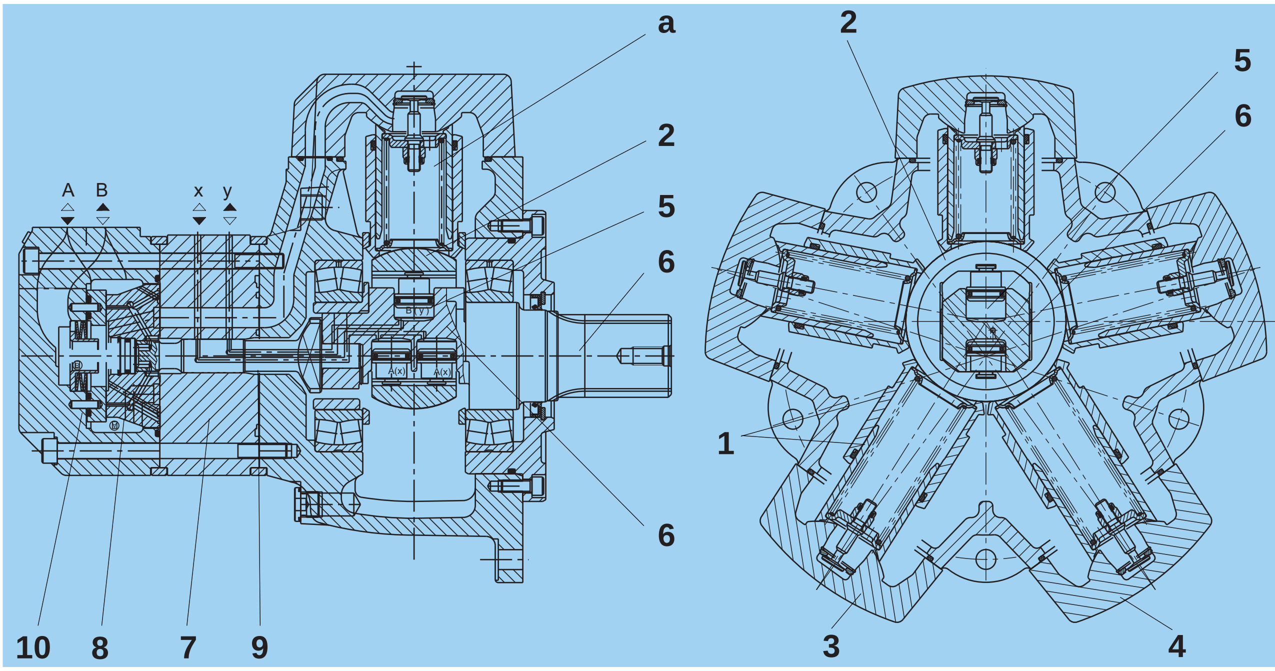
FLUID HLP mineral oils to DIN 51 524 part 2; Fluid type HFB, HFC and Bio-fluids on enquiry. FPM seals are required with phosphorous acid-Ester (HFD)

FLUID TEMPERATURE RANGE From -22 °F to 176 °F (– 30° to + 80° °C)

VISCOSITY RANGE [1)] From 85 to 4635 SUS (18 to 1000 mm^2/s): Recommended operating range 141 to 230 SUS (30 to 50 mm^2/s)(see fluid selection on page 8)

FLUID CLEANLINESS Maximum permissible degree of contamination of fluid NAS 1638 Class 9. We therefore recommend a filter with a minimum retention rate of $ß_{10} \geq 75$.
To ensure a long life we recommend class 8 to NAS 1638.
This can be achieved with a filter, with a minimum retention rate of $ß_5 \geq 100$.

1) For different valves of viscosity please contact DENISON Calzoni



MRD-MRDE
FUNCTIONAL DESCRIPTION

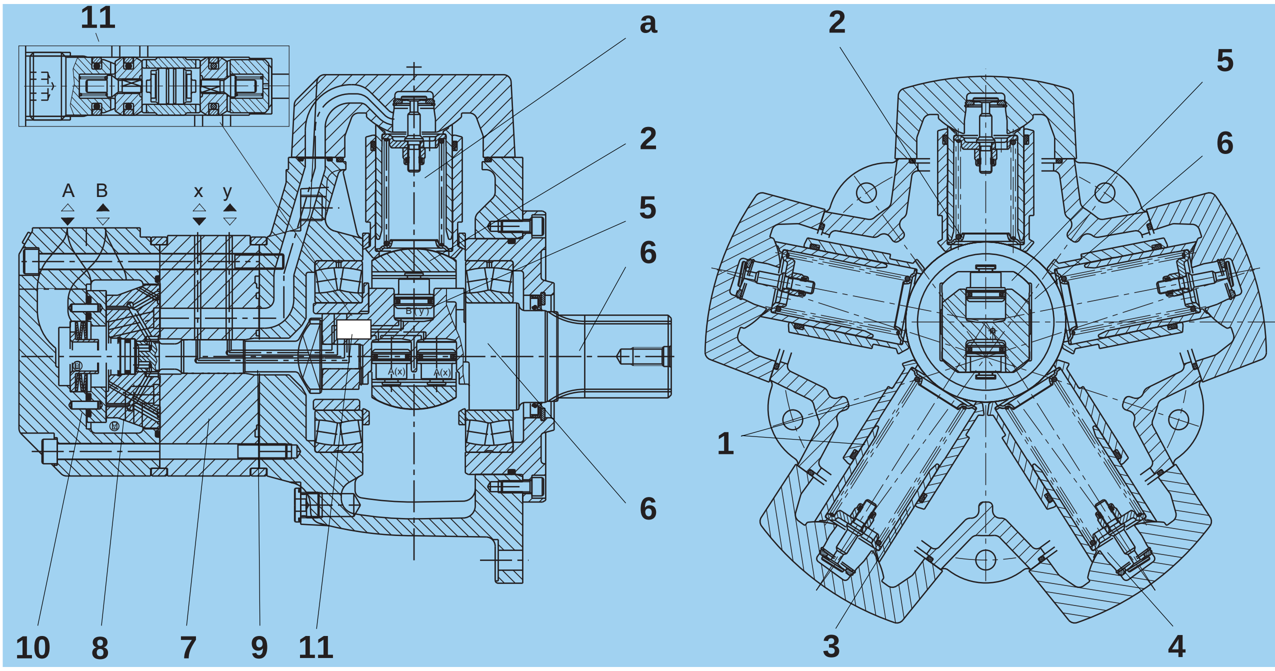
The outstanding performance of the motor is the result of an original and patented design. The principle is to transmit force to the driving shaft (2 and 6) by means of a pressurized column of oil (a) without any connecting rods, pistons, pads and pins.
This oil column is contained by a telescopic cylinder (1) with a mechanical connection at the lips at each end, which seal against the spherical surfaces (3) of the cylinder-head (4) and the spherical surface of the rotating shaft (2). These lips retain their circular cross section when stressed by the pressure so there is no alteration in the sealing geometry. The careful selection of materials and optimized design has minimized both friction and leakage. Another advantage of this design stems from the elimination of any connecting rods, the cylinder can only expand and retract linearly so there are no transverse components of the thrust. This means no oval wear on the moving parts and no side forces on the cylinder joints.
Dual displacement is accomplished by having the eccentric shaft cam free to move radially changing its eccentricity. In this way the displacement can be choosen amongst many different values.
The radial motion is controlled by means of hydraulic cylinders (5) located in the drive shaft (6). The feeding of the displacement cylinders is accomplished by means of the rotating intake (7). The displacement can be changed even while rotating under full load.

TIMING SYSTEM

Timing is accomplished by means of a rotary valve (8) driven by the rotary valve driving shaft (9) that it is connected to the rotating eccentric shaft. The rotary valve rotates between the rotating intake (7) and the reaction ring (10) which are fixed to the rotary valve housing. This timing system is also of a patented design being pressure balanced and self-compensating for thermal expansion.

EFFICIENCY

The advantages of this type of timing system, combined with a revolutionary propulsion system, produces a motor with extremely high values of mechanical and volumetric efficiency. The torque output is smooth even at very low speed under high pressure, and the motor offers high performance starting under load.



MRV-MRVE
FUNCTIONAL DESCRIPTION

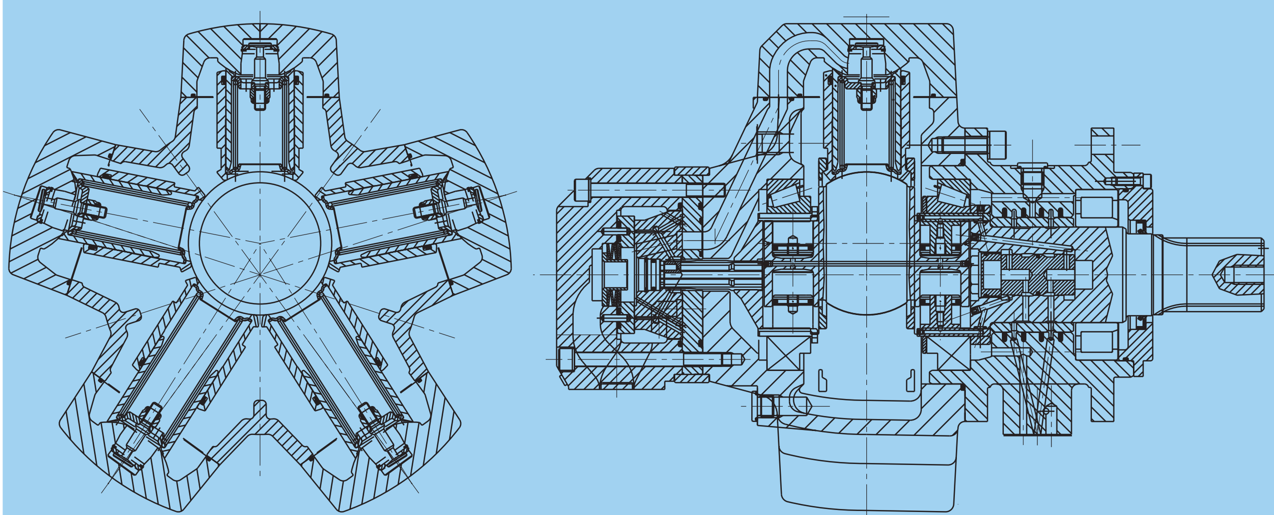
The outstanding performance of the motor is the result of an original and patented design. The principle is to transmit force to the driving shaft (2 and 6) by means of a pressurized column of oil (a) without any connecting rods, pistons, pads and pins.
This oil column is contained by a telescopic cylinder (1) with a mechanical connection at the lips at each end, which seal against the spherical surfaces (3) of the cylinder-head (4) and the spherical surface of the rotating shaft (2). These lips retain their circular cross section when stressed by the pressure so there is no alteration in the sealing geometry. The careful selection of materials and optimized design has minimized both friction and leakage.
Another advantage of this design stems from the elimination of any connecting rods, the cylinder can only expand and retract linearly so there are no transverse components of the thrust. This means no oval wear on the moving parts and no side forces on the cylinder joints.
Dual displacement is accomplished by having the eccentric shaft cam free to move radially changing its eccentricity. In this way the displacement can be choosen amongst many different values.
The radial motion is controlled by means of hydraulic cylinders (5) and valve (11) located in the drive shaft (6), this valve allows the step by step movement of the cylinder inside the main shaft, so it is possible to change the displacement . The feeding of the displacement cylinders is accomplished by means of the rotating intake (7). The displacement can be changed even while rotating under full load.

TIMING SYSTEM

Timing is accomplished by means of a rotary valve (8) driven by the rotary valve driving shaft (9) that it is connected to the rotating eccentric shaft. The rotary valve rotates between the rotating intake (7) and the reaction ring (10) which are fixed to the rotary valve housing. This timing system is also of a patented design being pressure balanced and self-compensating for thermal expansion.

EFFICIENCY

The advantages of this type of timing system, combined with a revolutionary propulsion system, produces a motor with extremely high values of mechanical and volumetric efficiency. The torque output is smooth even at very low speed under high pressure, and the motor offers high performance starting under load.



MRV 450
FUNCTIONAL DESCRIPTION

The estreme versatility of this motor is because of two simple but ingenious designs combined in one machine. The rotation of the shaft is by the same original and patended mechanism as the MR motor but, in addition, the MRV has an arrangement of internal cylinders to actually change the motor displacement, even while turning under full load.
The principle of the rotation mechanism is to transmit the effort from the stator to the eccentric part of the shaft by means of a pressurized column of oil.
This oil column is contained by a telescopic cylinder with a mechanical connection only at the lips at each end which seal against the spherical surfaces of the stator and the rotor.
These lips retain their circular cross section when stressed by the pressure so there is no alteration in the sealing geometry. The particular selection of materials and optimization of design has minimized both the friction and the leakage. Another advantage of this design stems from the elimination of any connecting rods, the cylinder can only expand and retract linearly so there are no transverse components of the thrust.
This means no oval wear on the moving parts and no side forces on the cylinder joints.
In the MRV motor the eccentric part of the shaft is free to move radially. The radial motion is controlled by two lateral hydraulic cylinders which are an integral part of the shaft.
As the eccentricity changes so does the stroke of the telescopic cylinders and hence the displacement.
The variation is stepless between full eccentricity (maximum displacement) and full concentricity. It is possible to insert spacers in the lateral cylinders to limit the maximum and minimum displacements and so tailor the motor to the exact requirements of any application.
The facility of variable displacement can be used with hydraulic regulation valves to create a variety of control systems ex. constant pressure operation, constant power operation, two speed operation. When used with electronic regulators even more control system are possible ex. high efficiency speed control, high efficiency ring main systems, high efficiency torque control etc.
In common with the MR range, this motor has a patented distributor valve being pressure balanced and self compensating for thermal expansion. The advantages of this type of valve coupled with a revolutionary cylinder arrangement produce a motor with extremely high values of mechanical and volumetric efficiency. The torque output is smooth even at very low speeds and the motor gives a high performance starting under load.

Size Motor version			Displace-ment	Moment inertia of rotating parts	Theore-tical specific torquea	Min. start. torque / Theore-tical torque	Maximum Pressure					Speed range		Maximum output power		Weight
							input					flushing		flushing		
							cont.	int.	peak	A+B *	Drain	without	with	without	with	
			V	J		%	p	p	p	p	p	n	n	P	P	m
			in^3	$lb.in^2$	lb.ft/psi		psi	psi	psi	psi	psi	rpm	rpm	HP	HP	lb
MRD	300	Min.	9.28	19.99	0.123	-	3626	4351	6092	5802	72.5 (218 psi with "F1" shaft seal)	1-1000	1-1000	26.8	46.9	123.5
		Max.	18.56	22.38	0.244	90						1-750	1-750	46.9	71.1	
	450	Min.	13.78	71.21	0.183	-						1-850	1-850	38.9	60.4	183.0
		Max.	27.56	78.53	0.366	90						1-600	1-600	67.1	100.6	
MRV	450	Min.	8.15	63.39	0.107	-						1-850	1-850	29.5	46.9	242.5
		Max.	27.56	78.53	0.366	90						1-600	1-600	61.7	100.6	
MRD MRV	700	Min.	20.71	108.39	0.275	-						1-700	1-700	48.3	72.4	227.1
		Max.	43.14	122.47	0.575	90						1-500	1-500	87.2	130.1	
	1100	Min.	31.02	136.21	0.412	-						0,5-580	0,5-580	60.4	91.2	324.1
		Max.	68.70	154.29	0.910	90						0,5-330	0,5-330	103.3	159.6	
	1800	Min.	55.21	262.68	0.733	-						0,5-400	0,5-400	75.1	111.3	460.8
		Max.	110.43	291.86	1.465	90						0,5-250	0,5-250	138.1	210.5	
	2800	Min.	85.19	915.15	1.130	-						0,5-120	0,5-280	80.5	120.7	716.5
		Max.	170.38	1016.85	2.263	90						0,5-120	0,5-215	170.3	260.2	
	4500	Min.	137.38	1542.38	1.823	-						0,5-100	0,5-250	115.3	167.6	1119.9
		Max.	274.77	1713.75	3.646	91						0,5-80	0,5-170	187.7	281.6	
MRDE	330	Min.	10.14	19.99	0.135	-	3046	3626	5076	5802	72.5 (218 psi with "F1" shaft seal)	1-1000	1-1000	28.2	42.9	123.5
		Max.	20.28	22.38	0.270	90						1-750	1-750	42.9	65.7	
	500	Min.	15.19	71.21	0.201	-						1-800	1-800	34.9	51.0	183.0
		Max.	30.38	78.53	0.403	90						1-600	1-600	61.7	93.9	
MRDE MRVE	800	Min.	23.56	108.39	0.313	-						1-650	1-650	42.9	64.4	227.1
		Max.	49.08	122.47	0.651	90						1-450	1-450	87.2	124.7	
	1400	Min.	37.74	136.21	0.501	-						0,5-550	0,5-550	59.0	87.2	324.1
		Max.	83.57	154.29	1.109	92						0,5-280	0,5-280	103.3	136.8	
	2100	Min.	63.81	262.68	0.847	-						0,5-370	0,5-370	67.1	104.6	498.2
		Max.	127.61	291.86	1.693	91						0,5-250	0,5-250	134.1	198.5	
	3100	Min.	94.70	915.15	1.257	-						0,5-120	0,5-280	73.8	108.6	738.5
		Max.	189.40	1016.85	2.512	91						0,5-120	0,5-215	167.6	254.8	
	5400	Min.	164.80	1542.38	2.187	-						0,5-80	0,5-210	97.9	146.2	1153.0
		Max.	329.60	1713.75	4.374	92						0,5-80	0,5-160	187.7	281.6	

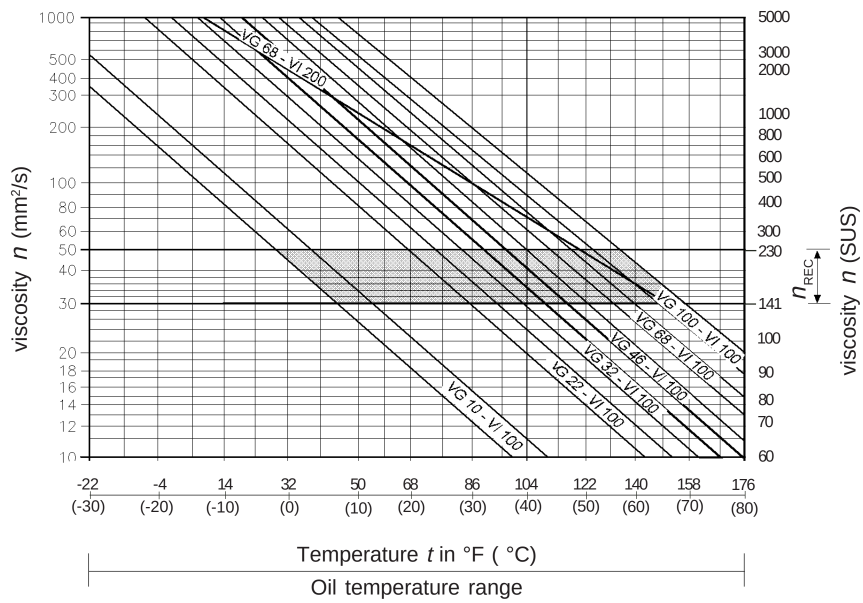
(*) Please contact DENISON Calzoni

EXAMPLE: At a certain ambient temperature, the operating temperature in the circuit is 122° F (50°C). In the optimum operating viscosity range (v_{rec}; shaded section), this corresponds to viscosity grades VG 46 or VG 68; VG 68 should be selected.

IMPORTANT: The drain oil temperature is influenced by pressure and speed and is usually higher than the circuit temperature or the tank temperature. At no point in the system, however, may the temperature be higher than 176° F (80°C).

If the optimum conditions cannot be met due to the extreme operating parameters or high ambient temperature, we always recommend flushing the motor case in order to operate within the viscosity limits.

Should it be absolutely necessary to use a viscosity beyond the recommended range, you should first contact DENISON Calzoni for confirmation.



GENERAL NOTES

More detailed information regarding the choice of the fluid can be requested to DENISON Calzoni. When operating with HF pressure fluids or bio-degradable pressure fluids possible limitations of the technical data must be taken into consideration, please see information sheet TCS 85, or consult DENISON Calzoni.

OPERATING VISCOSITY RANGE

The viscosity, quality and cleanliness of operating fluids are decisive factors in determining the reliability, performance and life-time of an hydraulic component. The maximum life-time and performance are achieved within the recommended viscosity range. For applications that go beyond this range, we recommend to contact DENISON Calzoni.

$n_{rec.}$ = recommended operating viscosity 141...230 SUS (30...50 mm²/s)

This viscosity refers to the temperature of the fluid entering the motor, and at the same time to the temperature inside the motor housing (case temperature). We recommend to select the viscosity of the fluid based on the maximum operating temperature, to remain within the recommended viscosity range. To reach the value of maximum continuous power the operating viscosity should be within the recommended viscosity range of 30 - 50 cSt.

LIMITS OF VISCOSITY RANGE

For limit conditions the following is valid:

$n_{min.abs.}$ = 45 SUS (10 mm²/s) in emergency, short term

$n_{min.}$ = 85 SUS (18 mm²/s) for continuous operation at reduced performances

$n_{max.}$ = 4635 SUS (1000 mm²/s) short term upon cold start

CHOOSING THE TYPE OF FLUID ACCORDING TO THE OPERATING TEMPERATURE

The operating temperature of the motor is defined as the greater temperature between that of the incoming fluid and that of the fluid inside the motor housing (case temperature). We recommend that you choose the viscosity of the fluid based on the maximum operating temperature, to remain within the recommended viscosity range (see diagram). We recommend that the higher viscosity grade must be selected in each case.

FILTRATION

The motor life also depends on the fluid filtration. At least it must correspond to one of the following cleanliness.

	class 9	according to NAS 1638
	class 6	according to SAE, ASTM, AIA
	class 18/15	according to ISO/DIS 4406

In order to assure a longer life a cleanliness class 8 to NAS 1638 is recommended, achieved with a filter of b_5=100. In case the above mentioned classes can not be achieved, please consult us.

CASE DRAIN PRESSURE

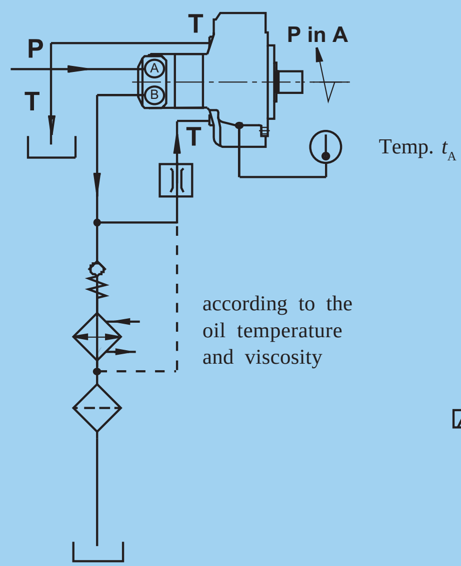
The lower the speed and the case drain pressure, the longer the life of the shaft seal. The maximum permissible housing pressure is

p_{max} = 72.5 psi (5 bar)

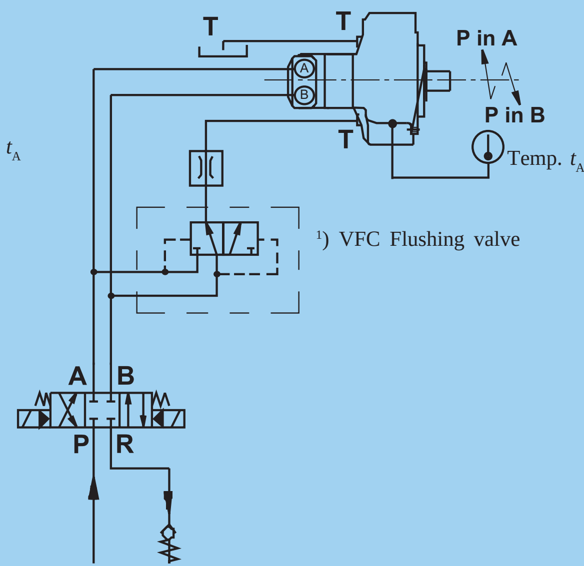
If the case drain pressure is higher than 5 bar it is possible to use a special 218 psi (15 bar) shaft seal (see page 45, Seals, Code"F1").

"FPM" SEALS

In case of operating conditions with high oil temperature or high ambient temperature, we recommend to use "FPM" seals (see page 45, Seals, Code "V1"). These "FPM" seals should be used with HFD fluids.



FLUSHING CIRCUIT
(MONO-DIRECTIONAL ROTATION)



[1]) Please consult us.

FLUSHING CIRCUIT
(BI-DIRECTIONAL ROTATION)

FLUSHING

The motor case must be flushed when the continuous operating performances of the motor are inside the "Continuous operating area with flushing" (see Operating Diagram from page 11 to page 25), in order to assure the minimum oil viscosity inside the motor case of 141 SUS (30 mm^2/s) (see page 8 - Fluid Selection). The flushing can be necessary also when the operating performances are outside the "Continuous operating area with flushing", but the system is not able to assure the minimum viscosity conditions requested by the motor as specified at page 8.

NOTE1:

The oil temperature inside the motor case is obtainable by adding 5°F (3°C) to the motor surface temperature (t_A , see figures).

NOTE2:

With the standard shaft seal the maximum drain case pressure is 73.5 psi (5 bar). For the selection of the restrictor, please consult us.

FLOW

TYPE	MOTOR VERSION	FLUSHING FLOW
MRD - MRDE	300, 330	Q = 1.6 gpm
MRD - MRDE MRV	450, 500	Q = 2.0 gpm
MRD - MRDE MRV - MRVE	700, 800, 1100, 1400	Q = 3.0 gpm
MRD - MRDE MRV - MRVE	1800, 2100	Q = 4.0 gpm
MRD - MRDE MRV - MRVE	2800, 3100, 4500, 5400,	Q = 5.3 gpm

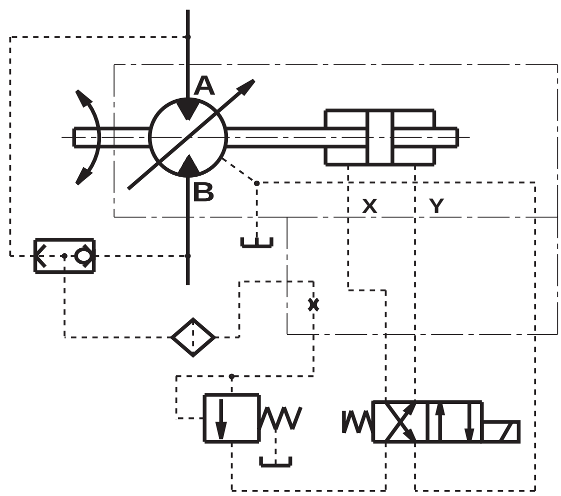
INTERNAL PILOTING

In order to change the motor displacement, see operating diagram for requested minimun pressure.

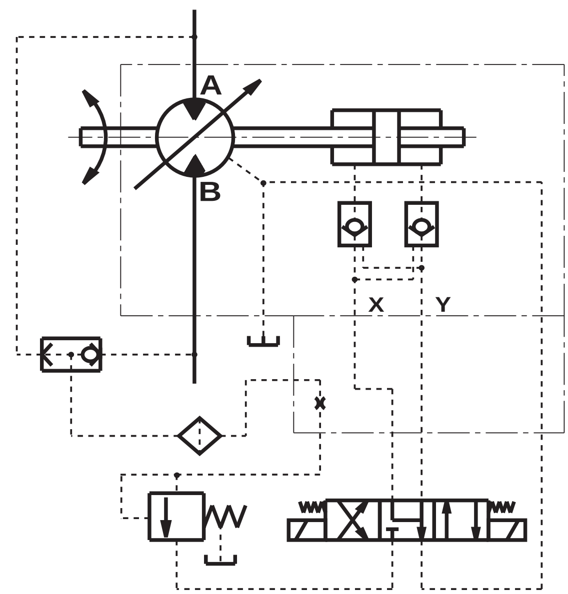
X= MIN. DISPLACEMENT

Y= MAX DISPLACEMENT

Internal piloting
Two displacement valve feeded by motor pressure



Internal piloting
Solenoid operated displacement control valve feeded by motor pressure



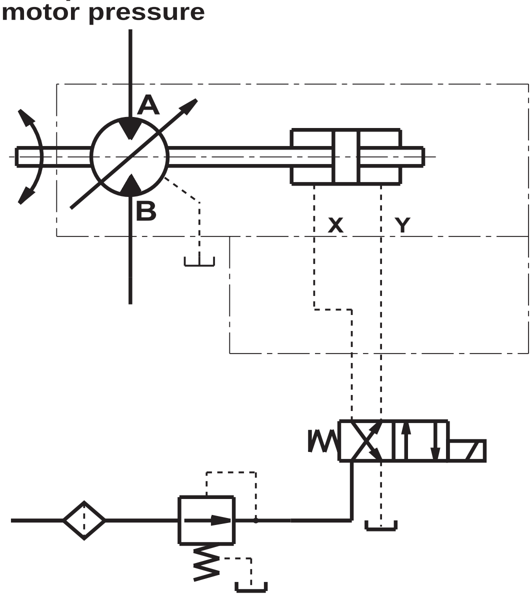
EXTERNAL PILOTING

External piloting pressure requested is 160 bars.

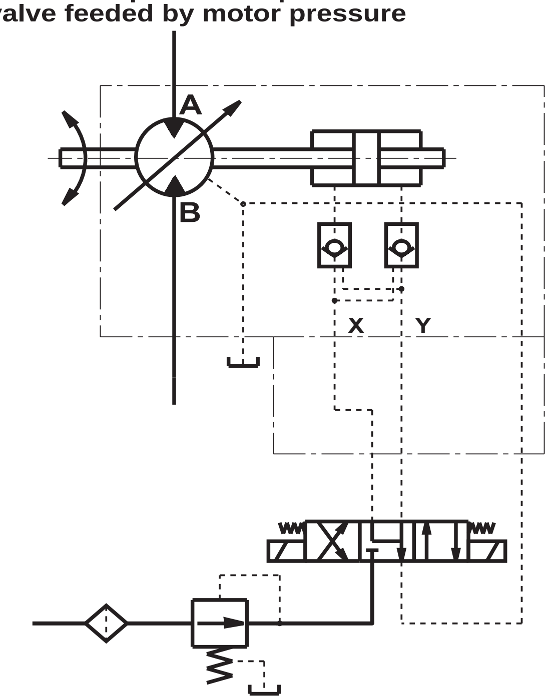
X= MIN. DISPLACEMENT

Y= MAX DISPLACEMENT

External piloting
Two displacement valve feeded by motor pressure



External piloting
Solenoid operated displacement control valve feeded by motor pressure



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

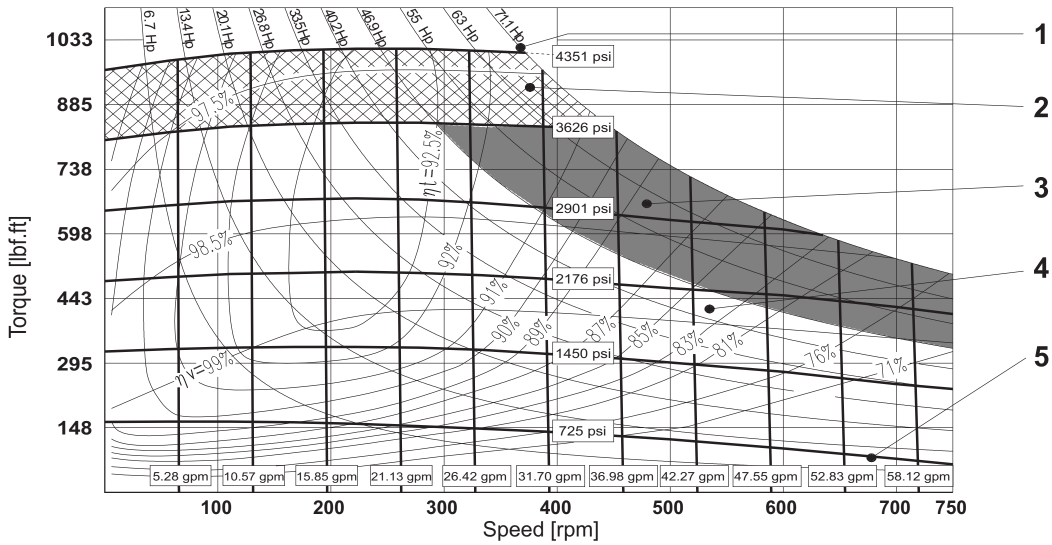
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRD 300

set to

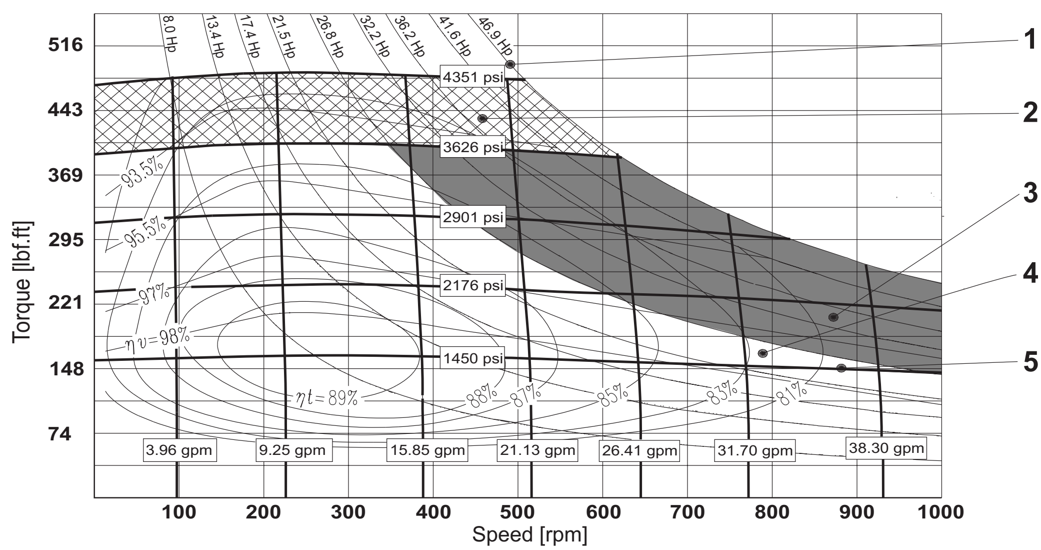
18.55 in³

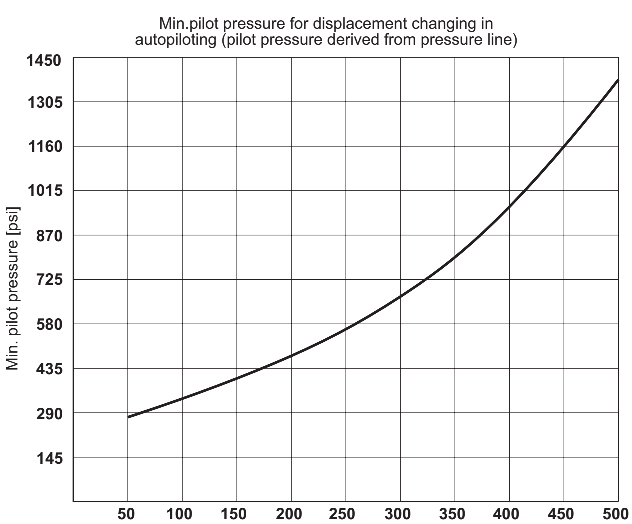


MRD 300

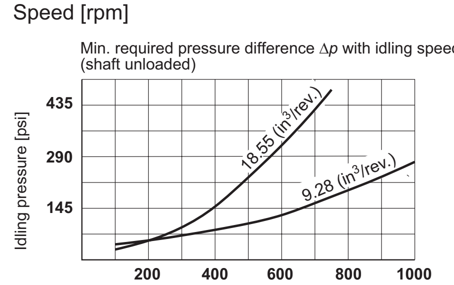
set to

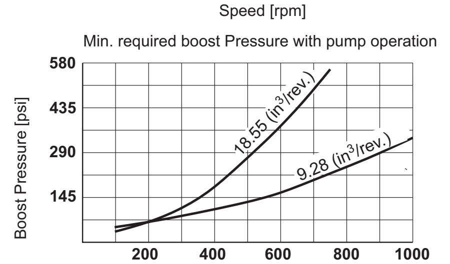
9.28 in³





Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni





OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

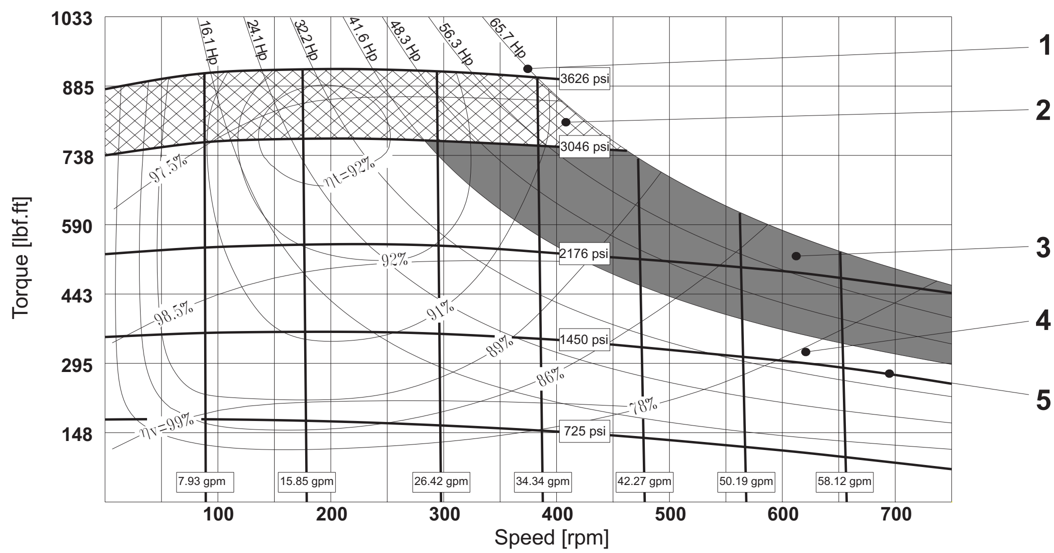
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRDE 330

set to

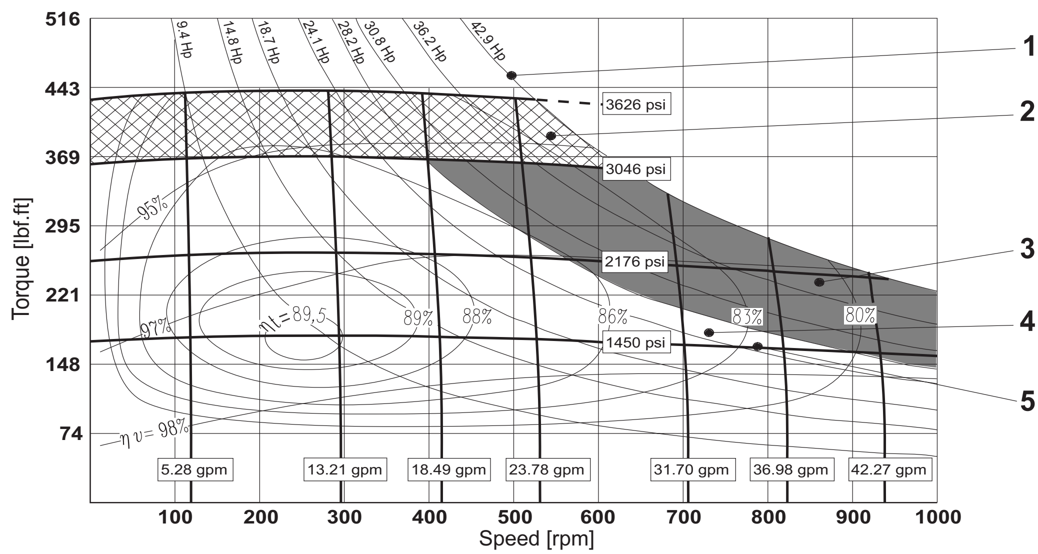
20.26 in³



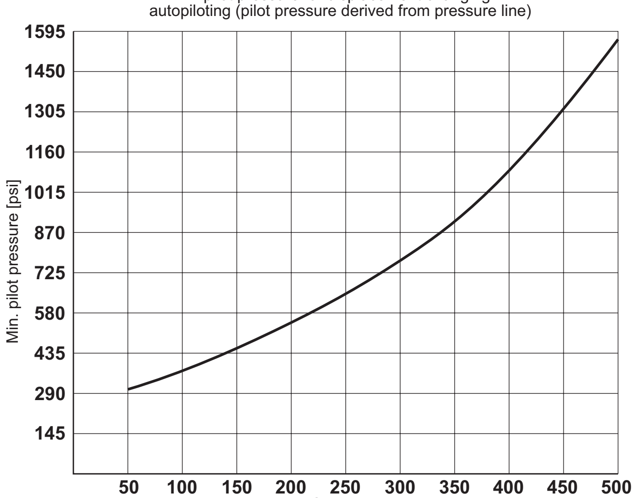
MRDE 330

set to

10.13 in³

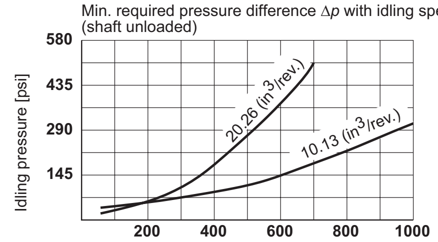


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

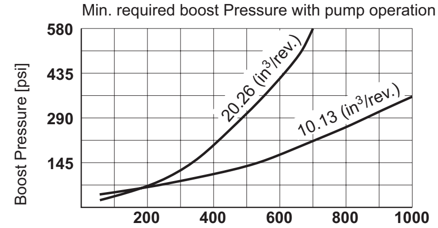


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

Min. required pressure difference Δ*p* with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

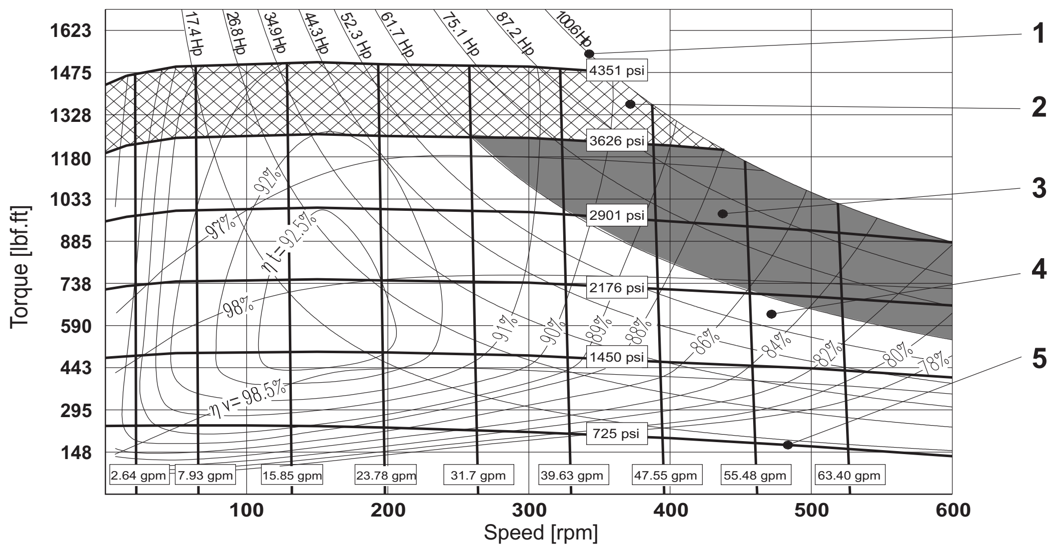
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRD 450

set to

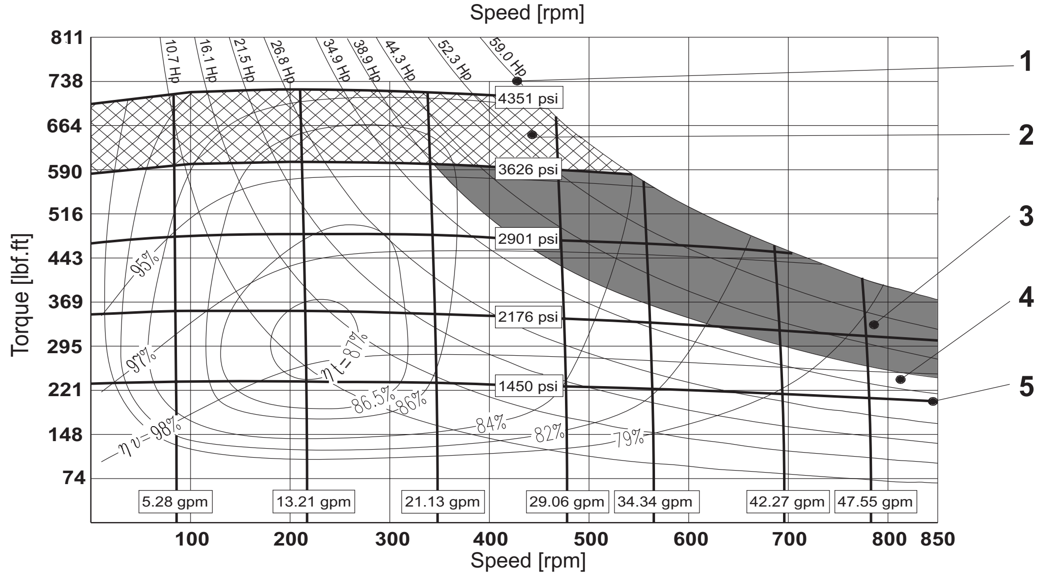
27.58 in³



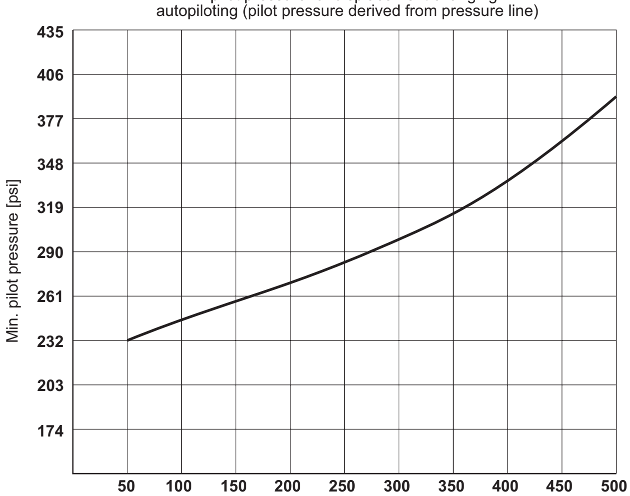
MRD 450

set to

13.79 in³

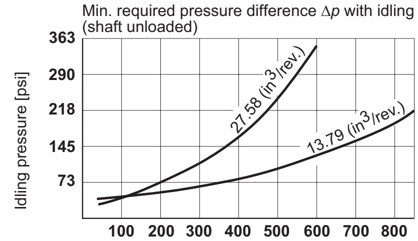


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

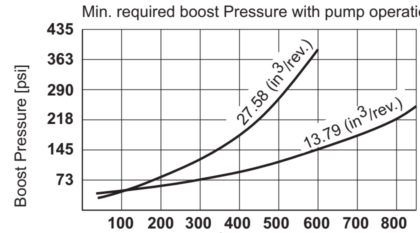


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzonii

Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

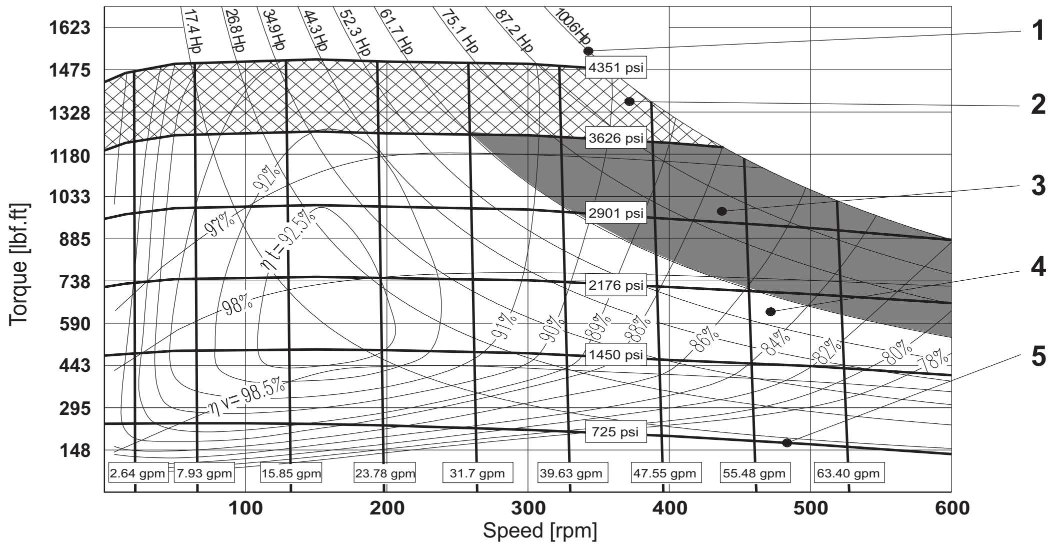
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ηt*** Total efficiency ***ηv*** Volumeter efficiency

MRV 450

set to

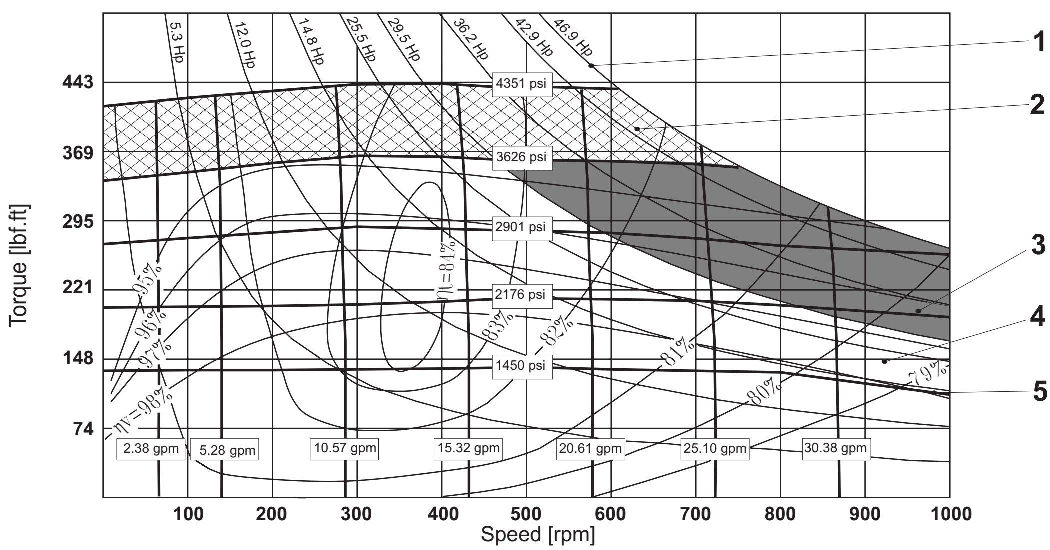
27.58 in³



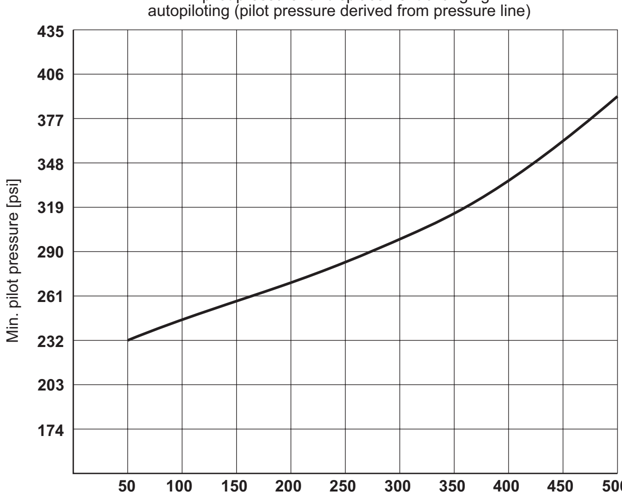
MRV 450

set to

8.18 in³

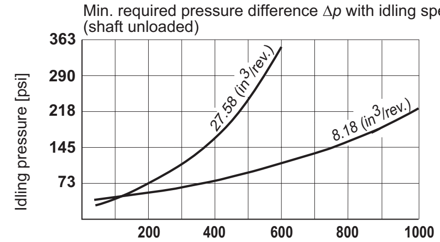


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

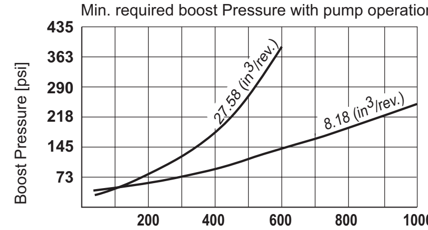


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

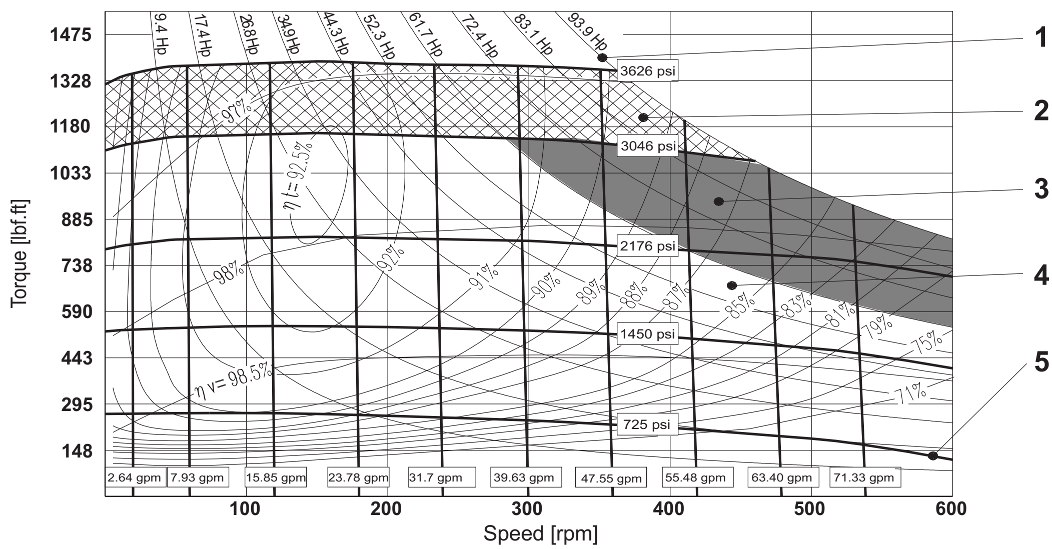
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRDE 500

set to

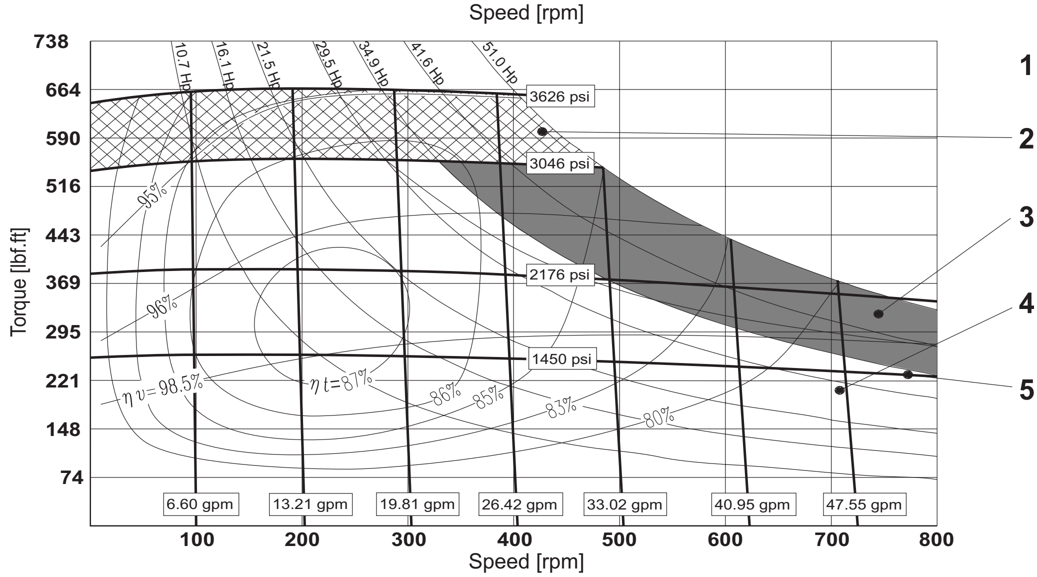
30.39 in³



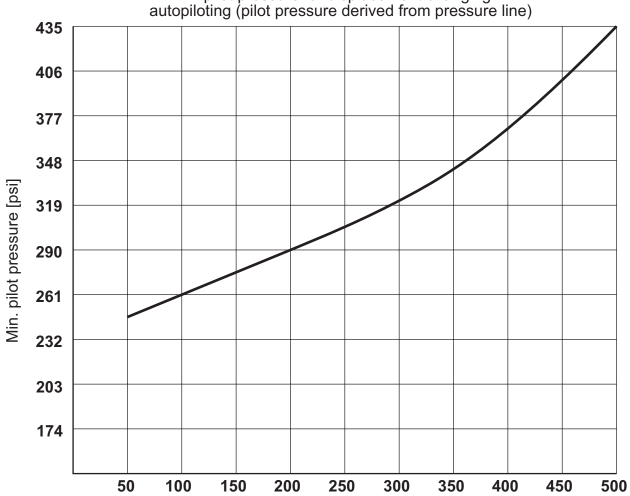
MRDE 500

set to

15.19 in³

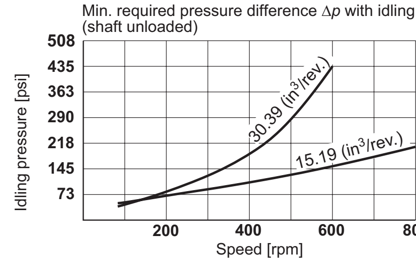


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

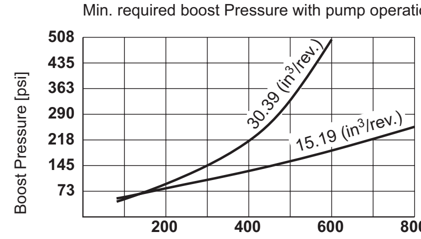


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

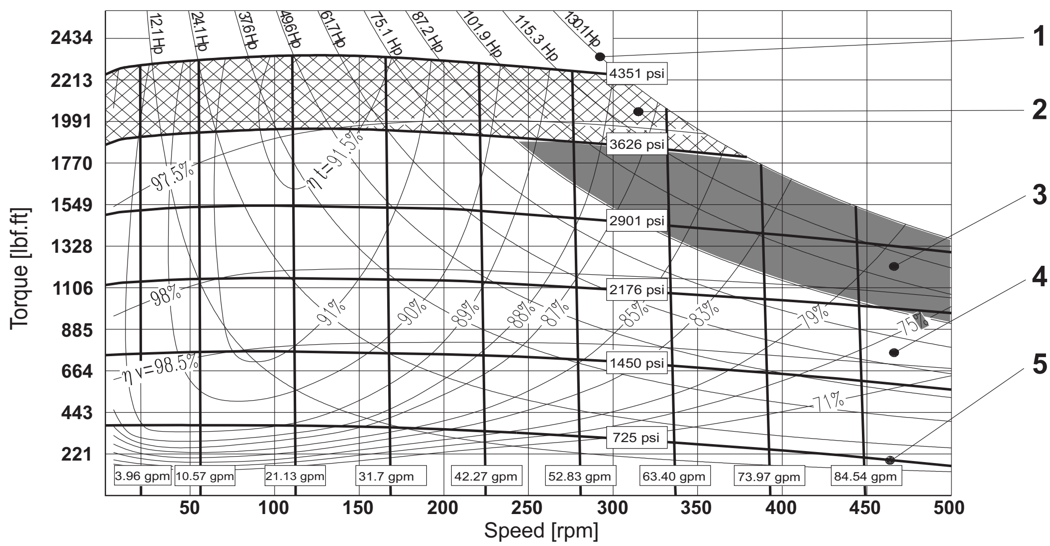
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRD 700
MRV 700

set to

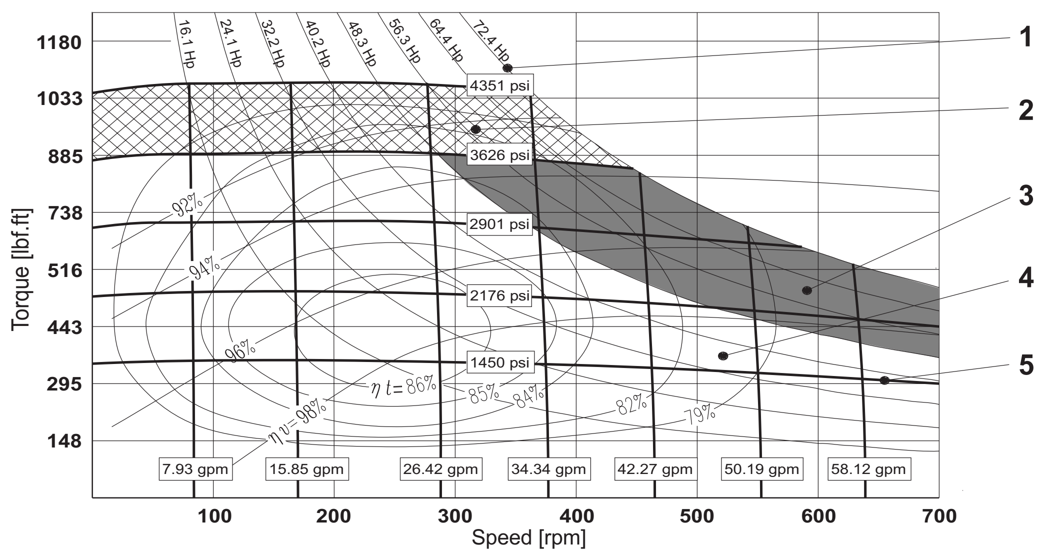
43.14 in³



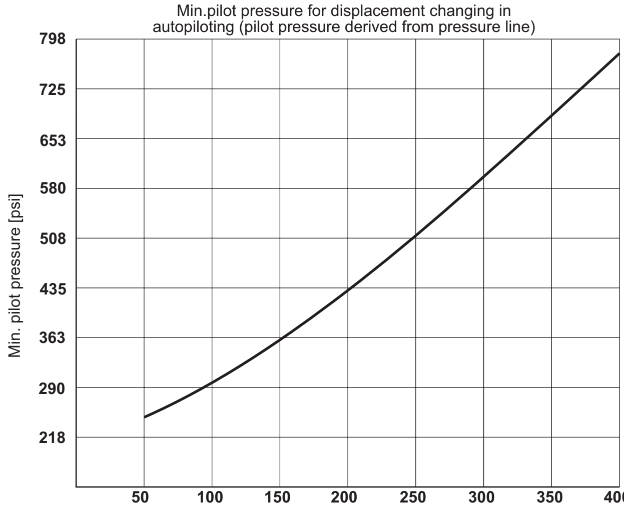
MRD 700
MRV 700

set to

20.69 in³

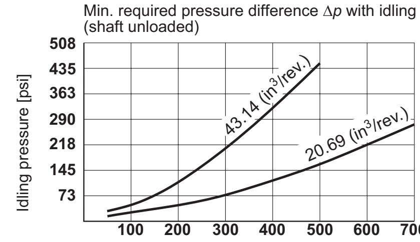


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

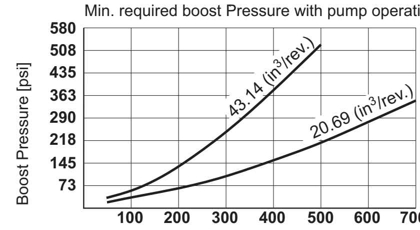


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

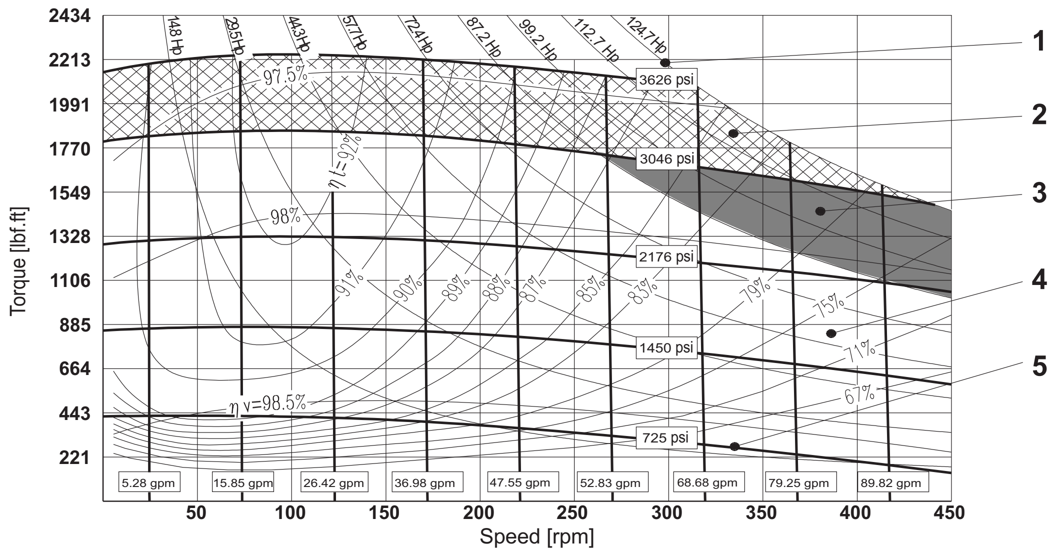
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRDE 800
MRVE 800

set to

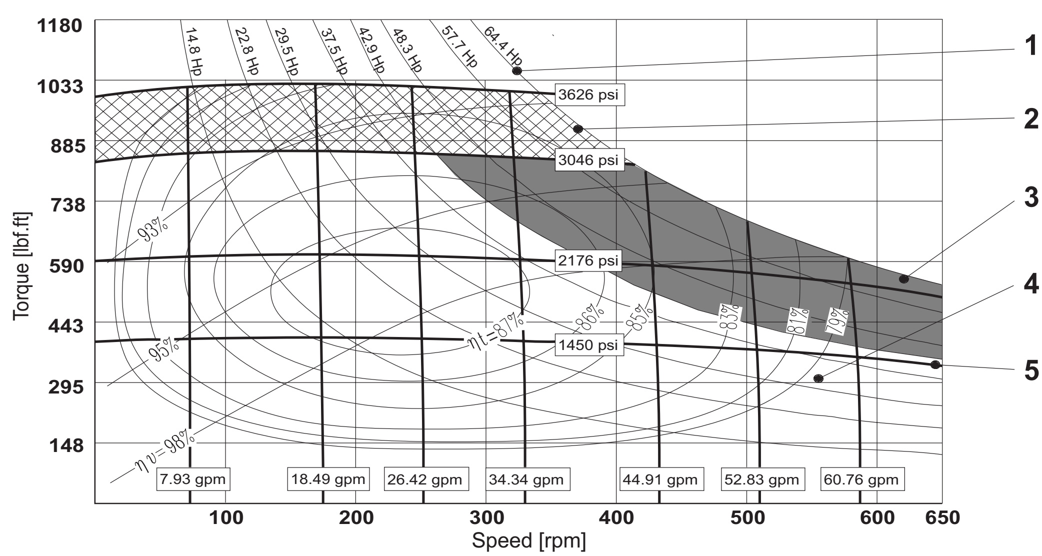
49.06 in³

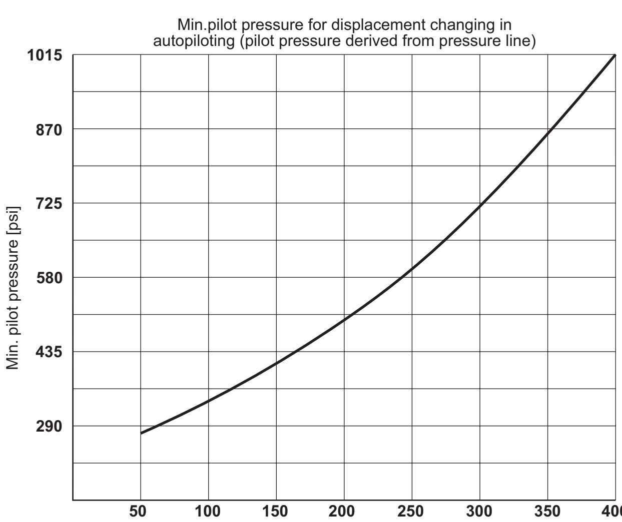


MRDE 800
MRVE 800

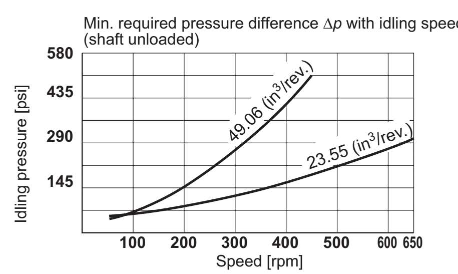
set to

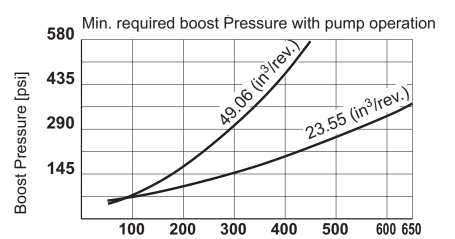
23.55 in³





Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni





OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

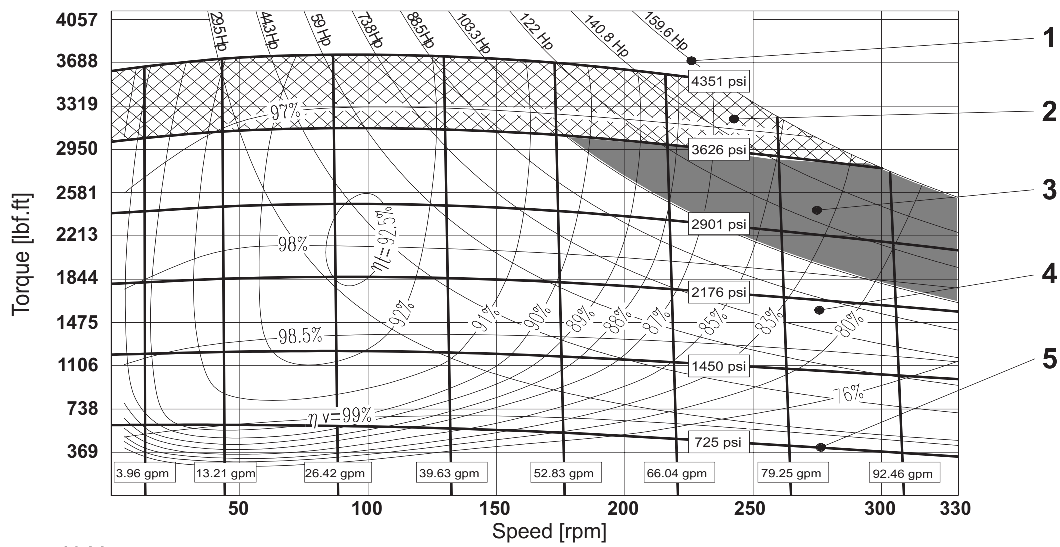
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRD 1100
MRV 1100

set to

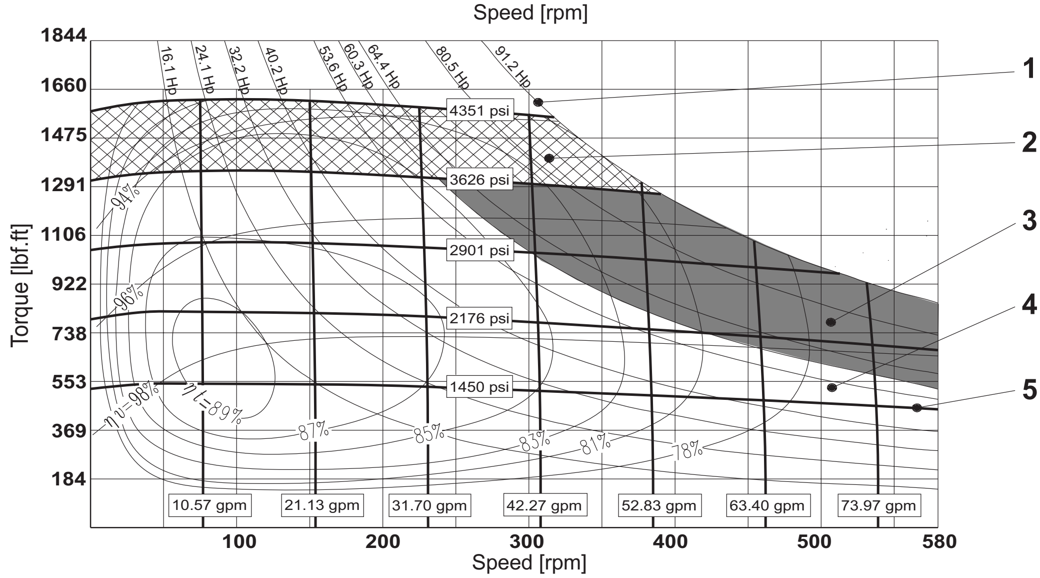
68.71 in³



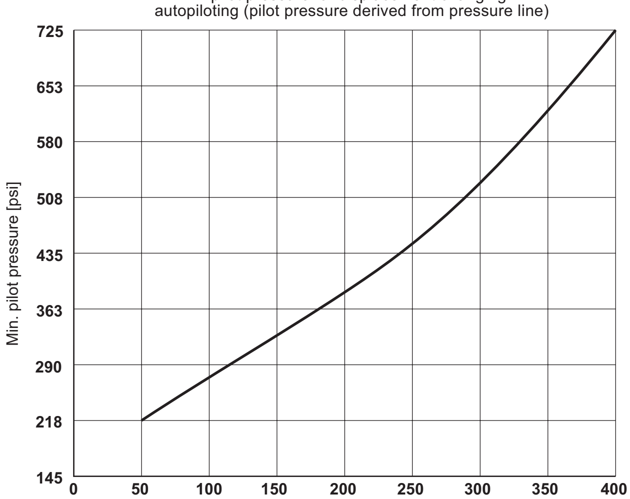
MRD 1100
MRV 1100

set to

31.00 in³

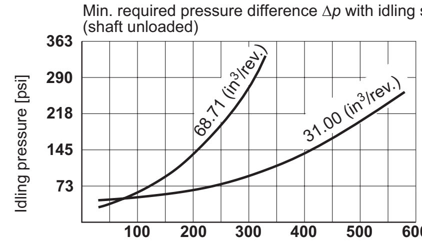


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

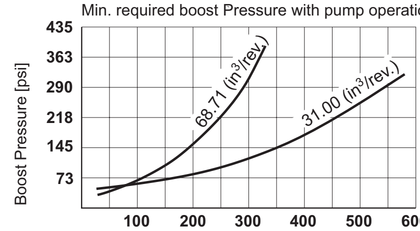


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

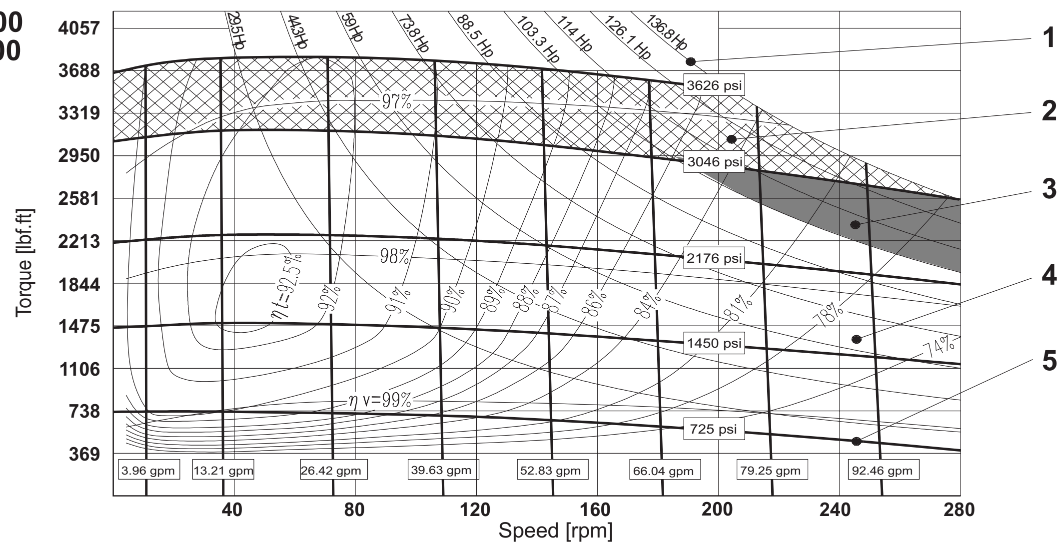
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRDE 1400
MRVE 1400

set to

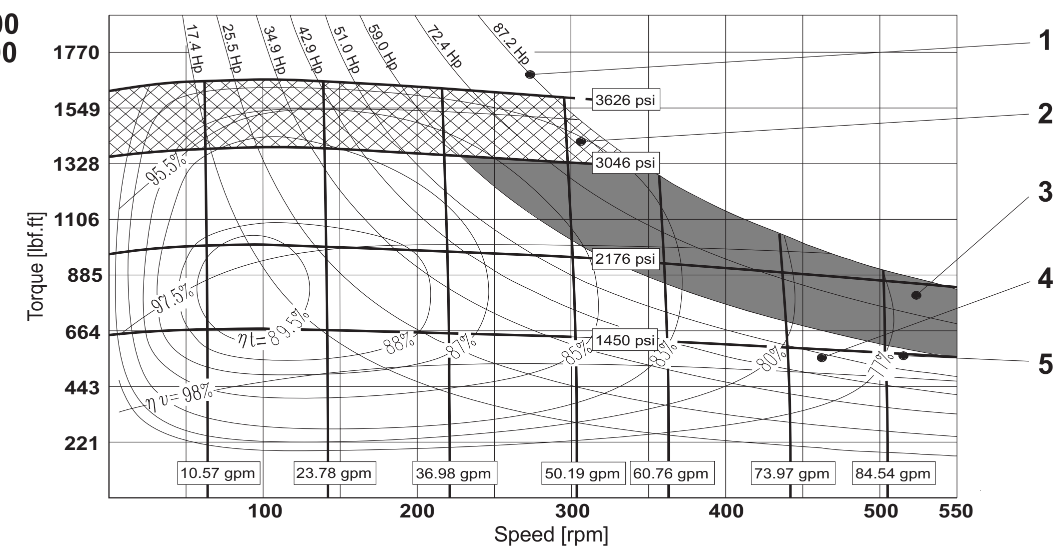
83.60 in³

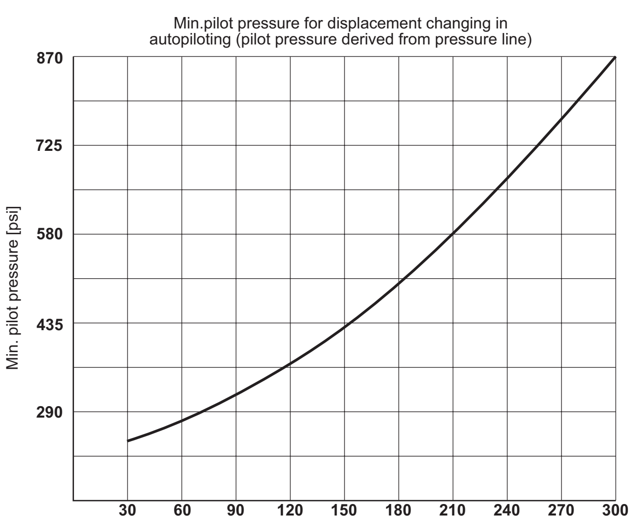


MRDE 1400
MRVE 1400

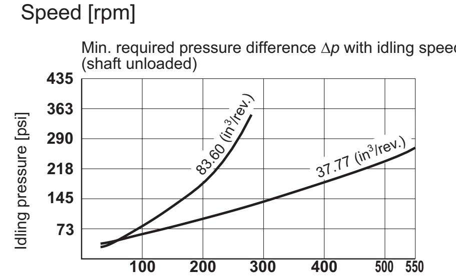
set to

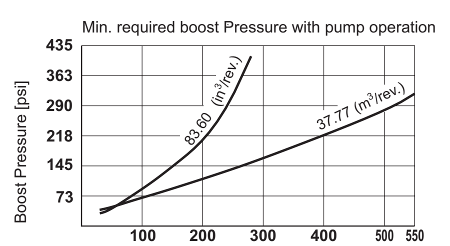
37.77 in³





Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni





OPERATING DIAGRAM

(average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

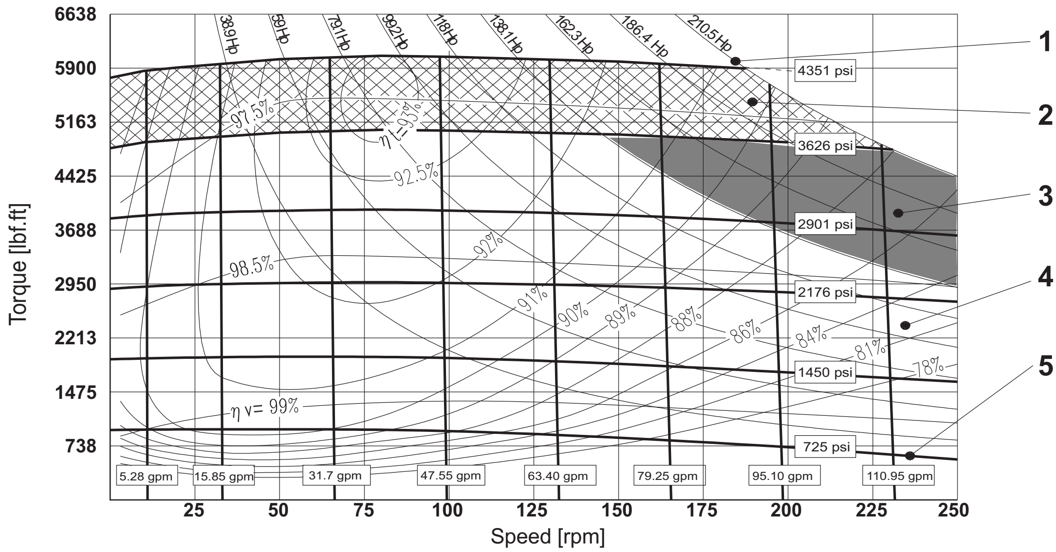
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure **ht** Total efficiency **hv** Volumeter efficiency

MRD 1800
MRV 1800

set to

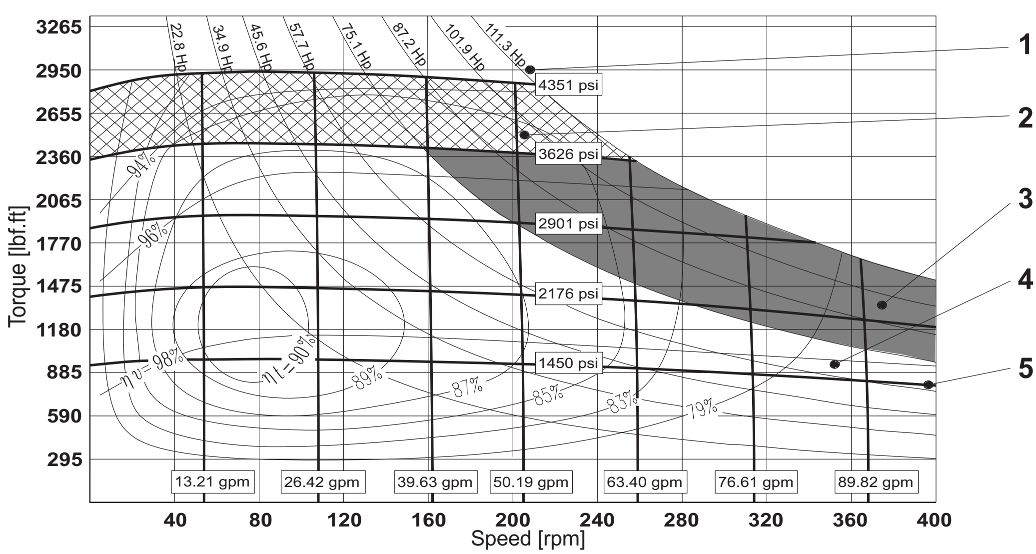
110.45 in³



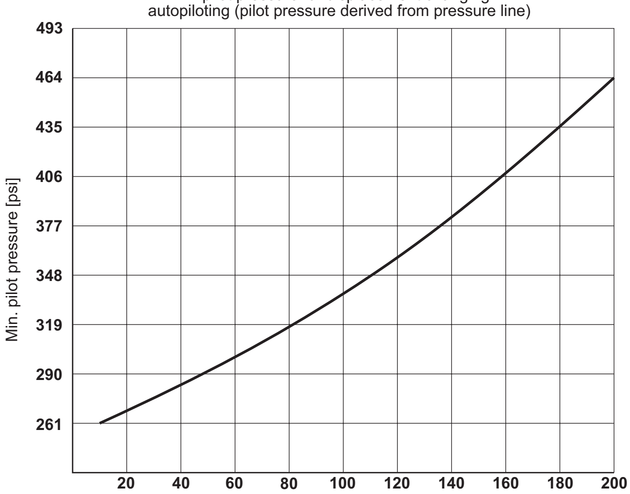
MRD 1800
MRV 1800

set to

55.23 in³

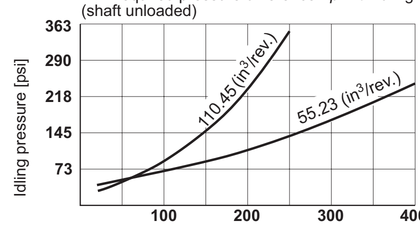


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

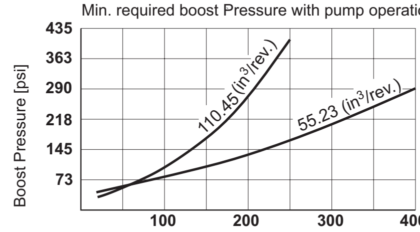


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

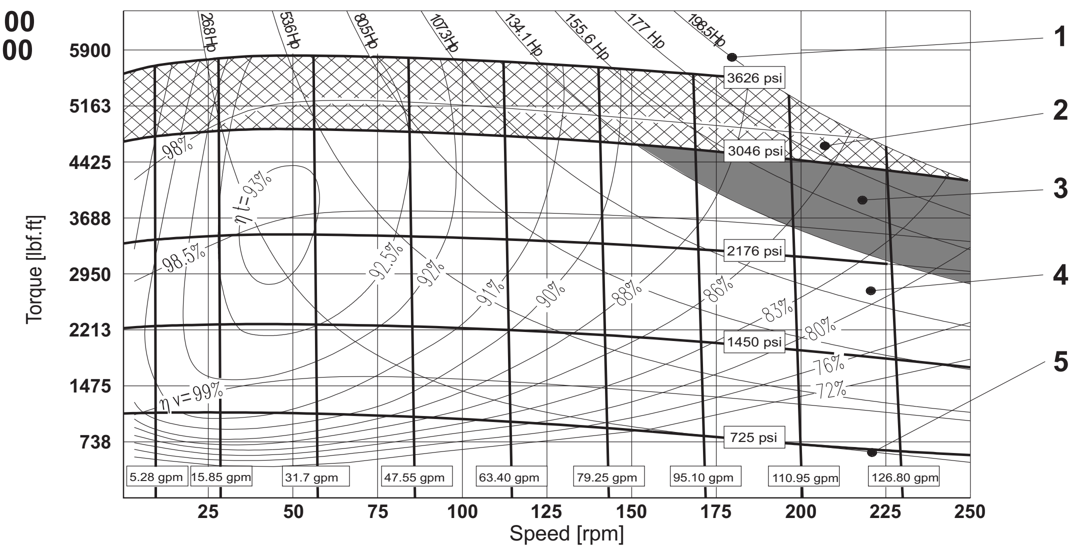
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRDE 2100
MRVE 2100

set to

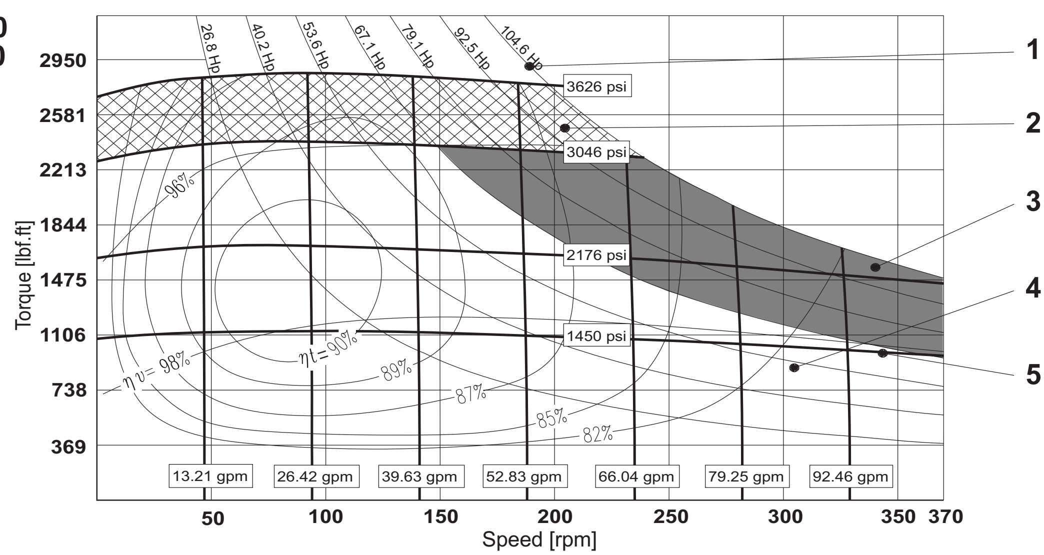
127.60 in³

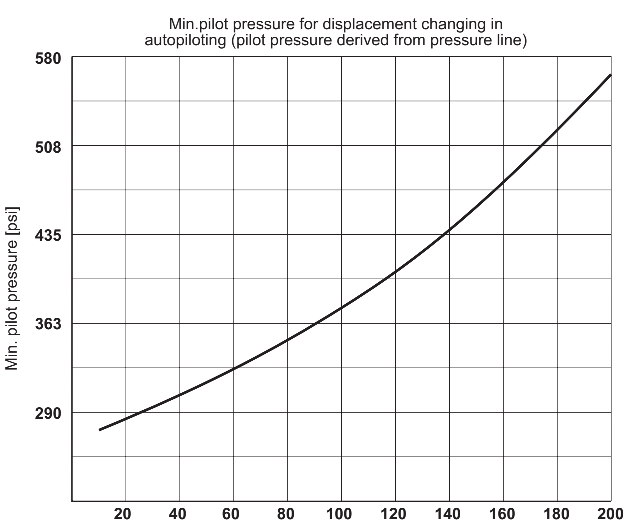


MRDE 2100
MRVE 2100

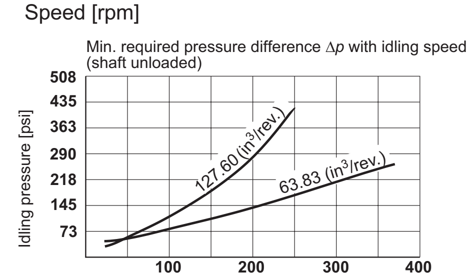
set to

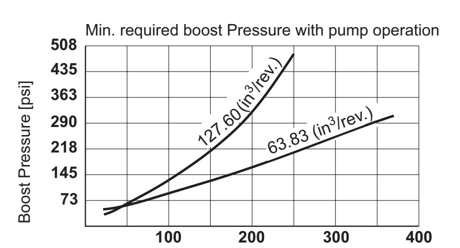
63.83 in³





Valid for back pressure up to 725 psi, drain pressure up to 72.5 bar.
For other working conditions please consult DENISON Calzoni





OPERATING DIAGRAM

(average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

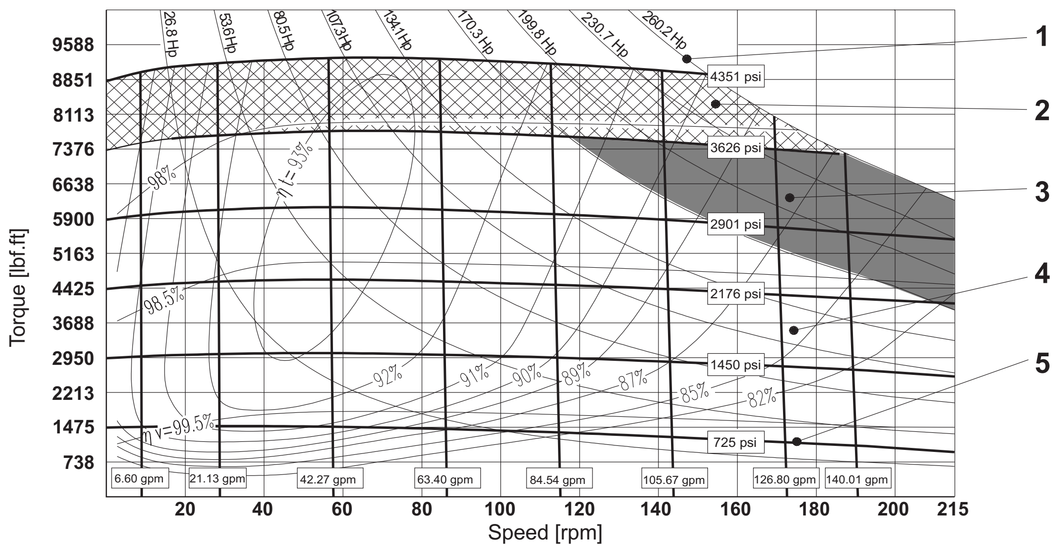
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRD 2800
MRV 2800

set to

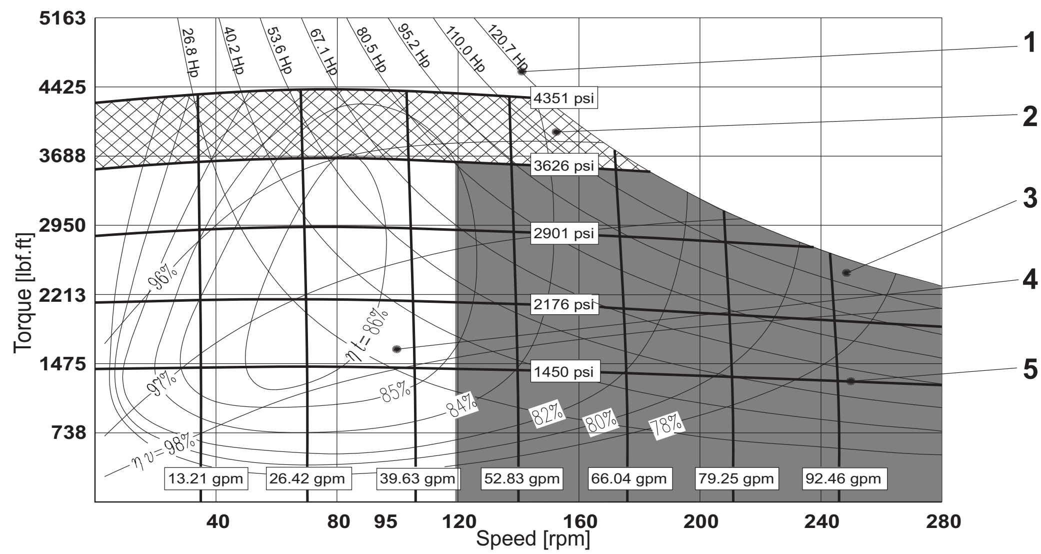
170.38 in³



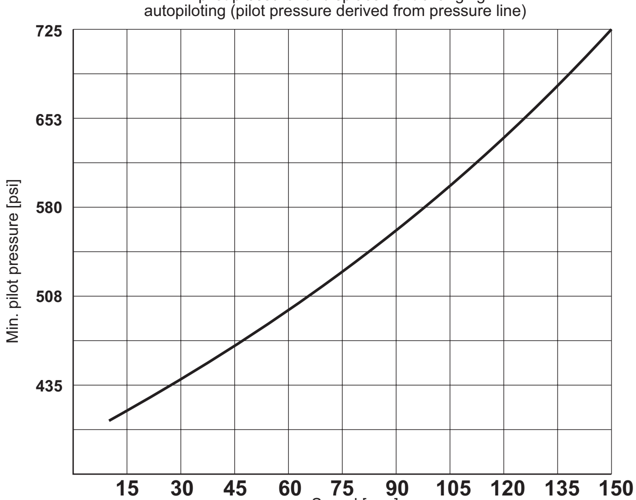
MRD 2800
MRV 2800

set to

85.19 in³

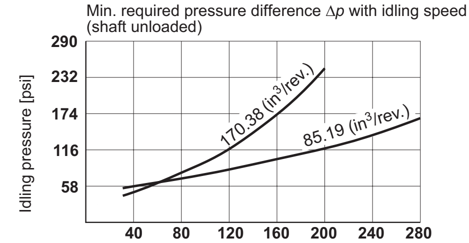


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

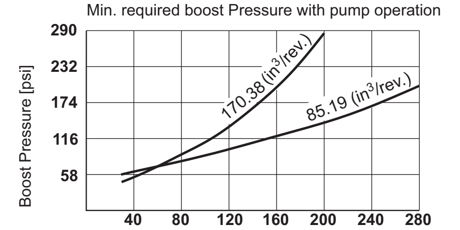


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

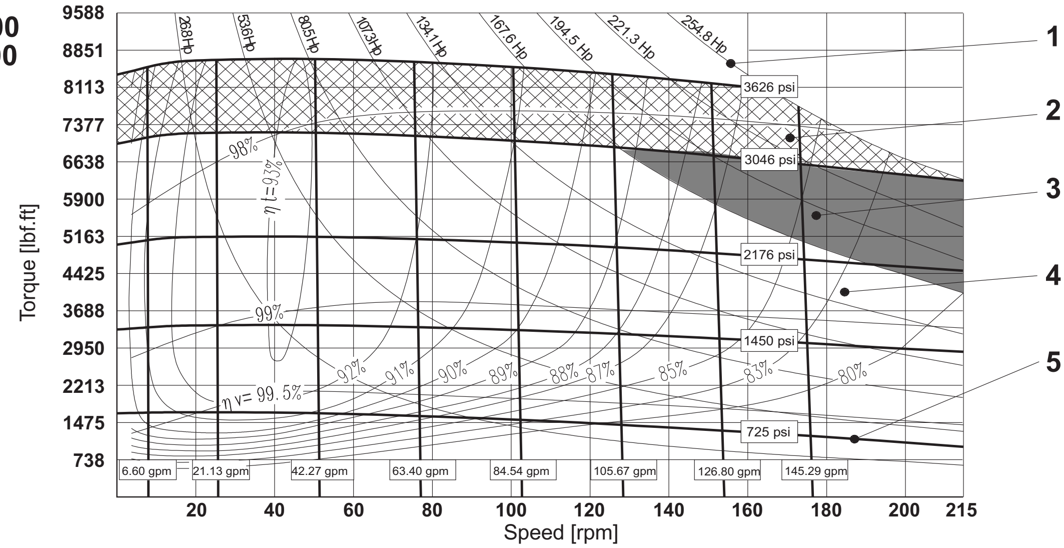
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRDE 3100
MRVE 3100

set to

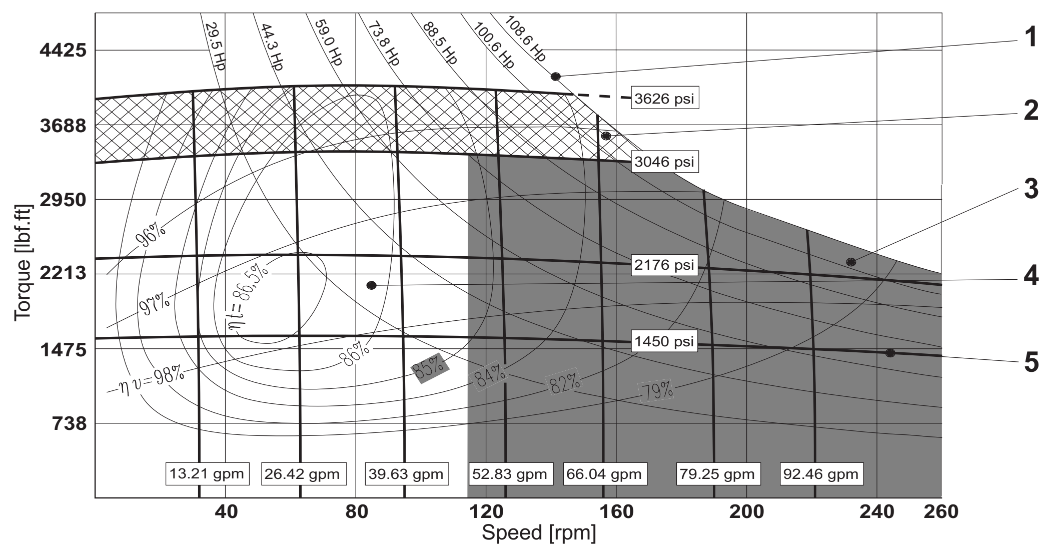
189.42 in³



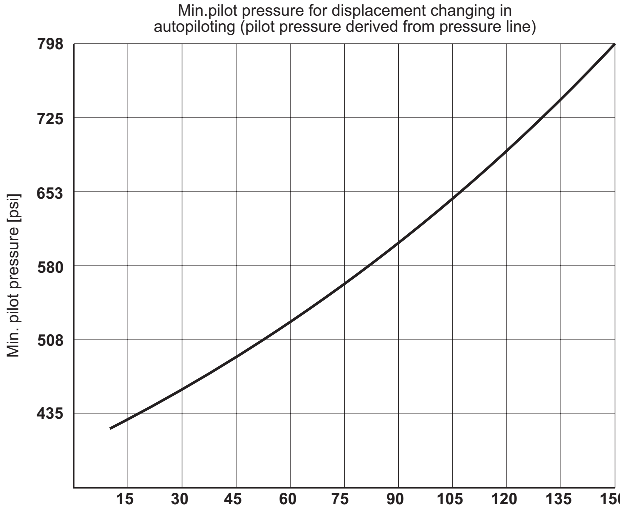
MRDE 3100
MRVE 3100

set to

94.71 in³

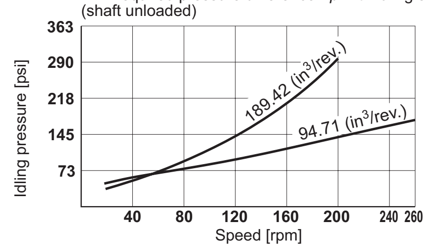


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

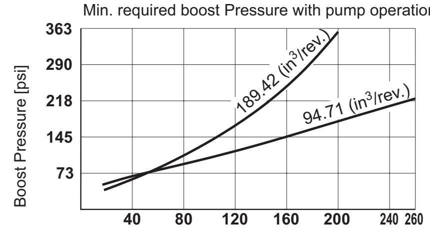


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM (average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

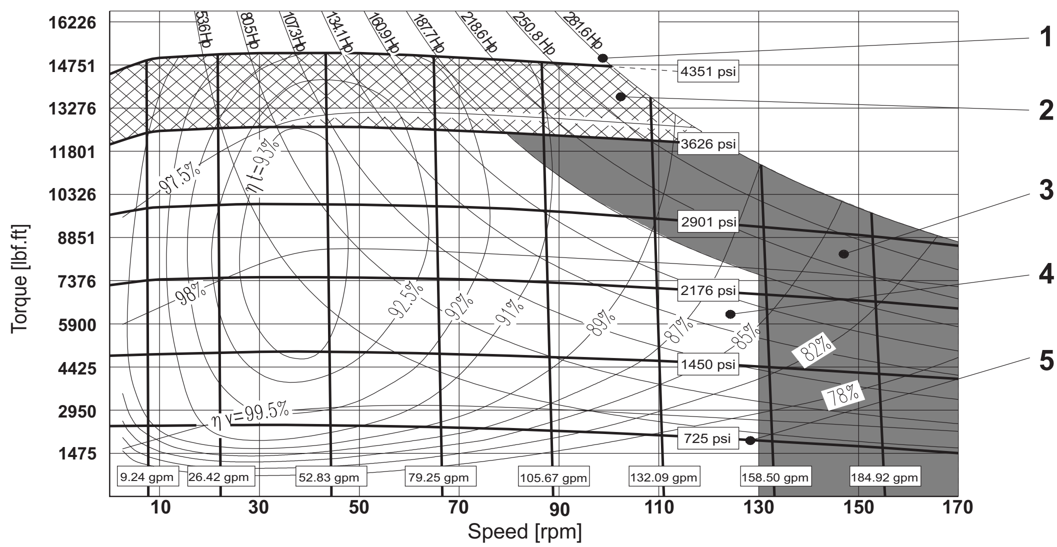
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRD 4500
MRV 4500

set to

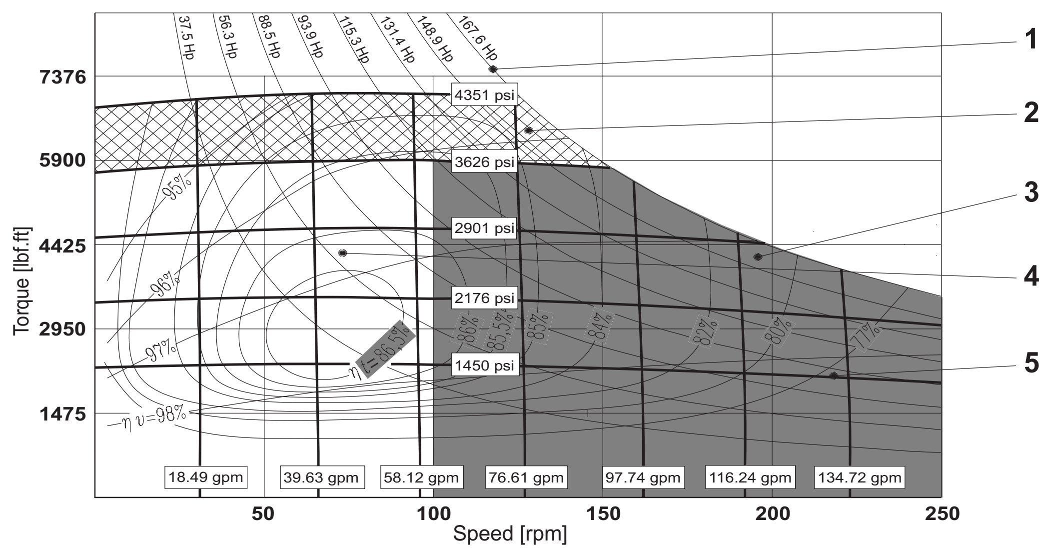
274.73 in³



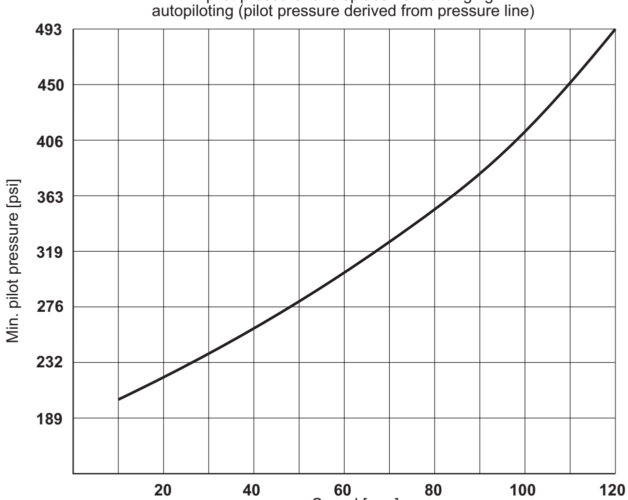
MRD 4500
MRV 4500

set to

137.36 in³

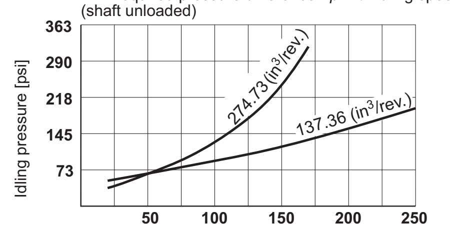


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

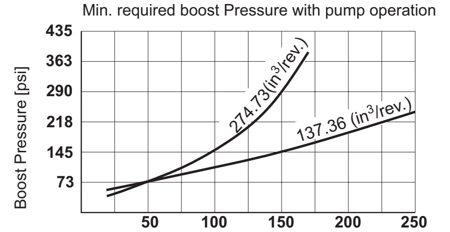


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



OPERATING DIAGRAM

(average values) measured at n = 167 SUS (36 mm²/s); t = 113° F (45° C); p_{outlet} = 0 psi (0 bar)

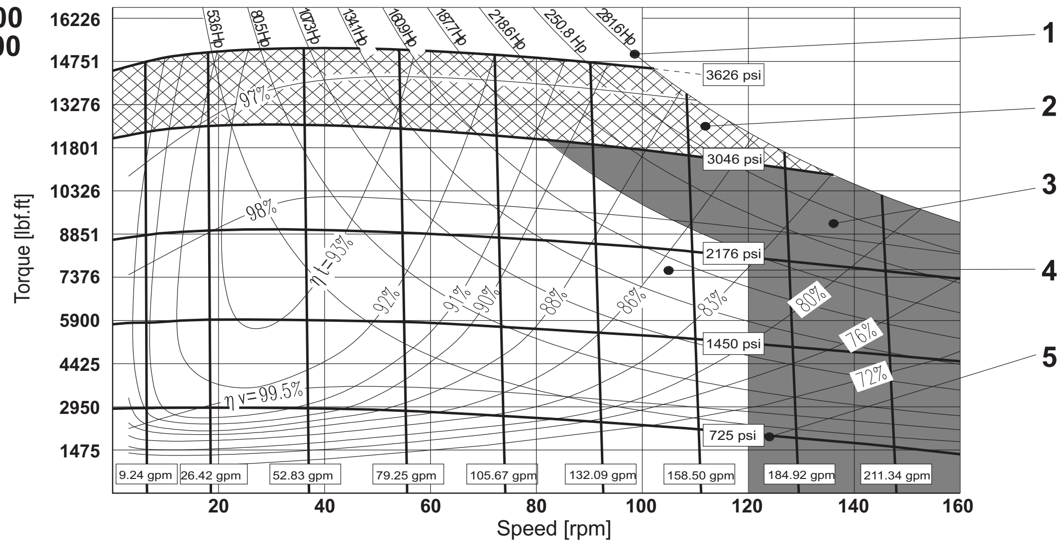
1 Output power **2** Intermittent operating area **3** Continuous operating area with flushing

4 Continuous operating area **5** Inlet pressure ***ht*** Total efficiency ***hv*** Volumeter efficiency

MRDE 5400
MRVE 5400

set to

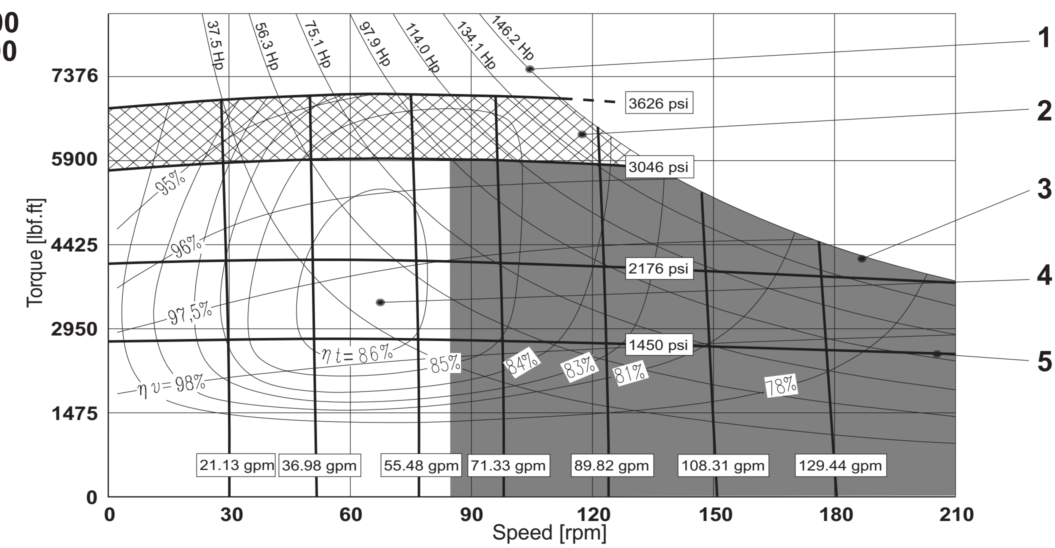
329.59 in³



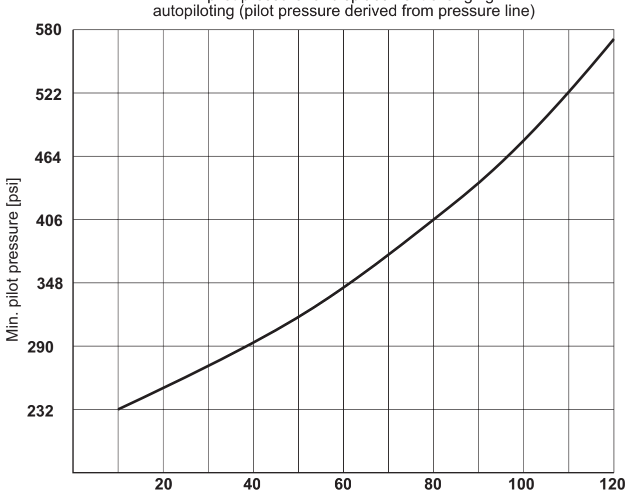
MRDE 5400
MRVE 5400

set to

164.83 in³

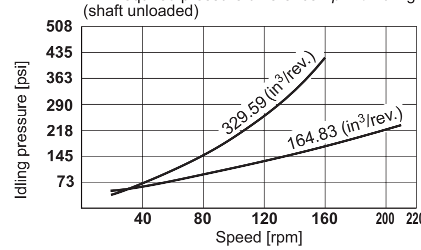


Min.pilot pressure for displacement changing in autopiloting (pilot pressure derived from pressure line)

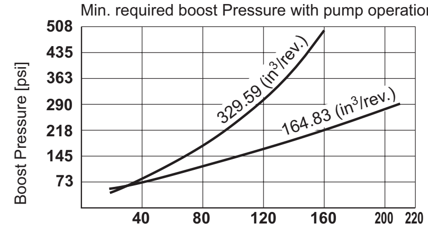


Valid for back pressure up to 725 psi, drain pressure up to 72.5 psi.
For other working conditions please consult DENISON Calzoni

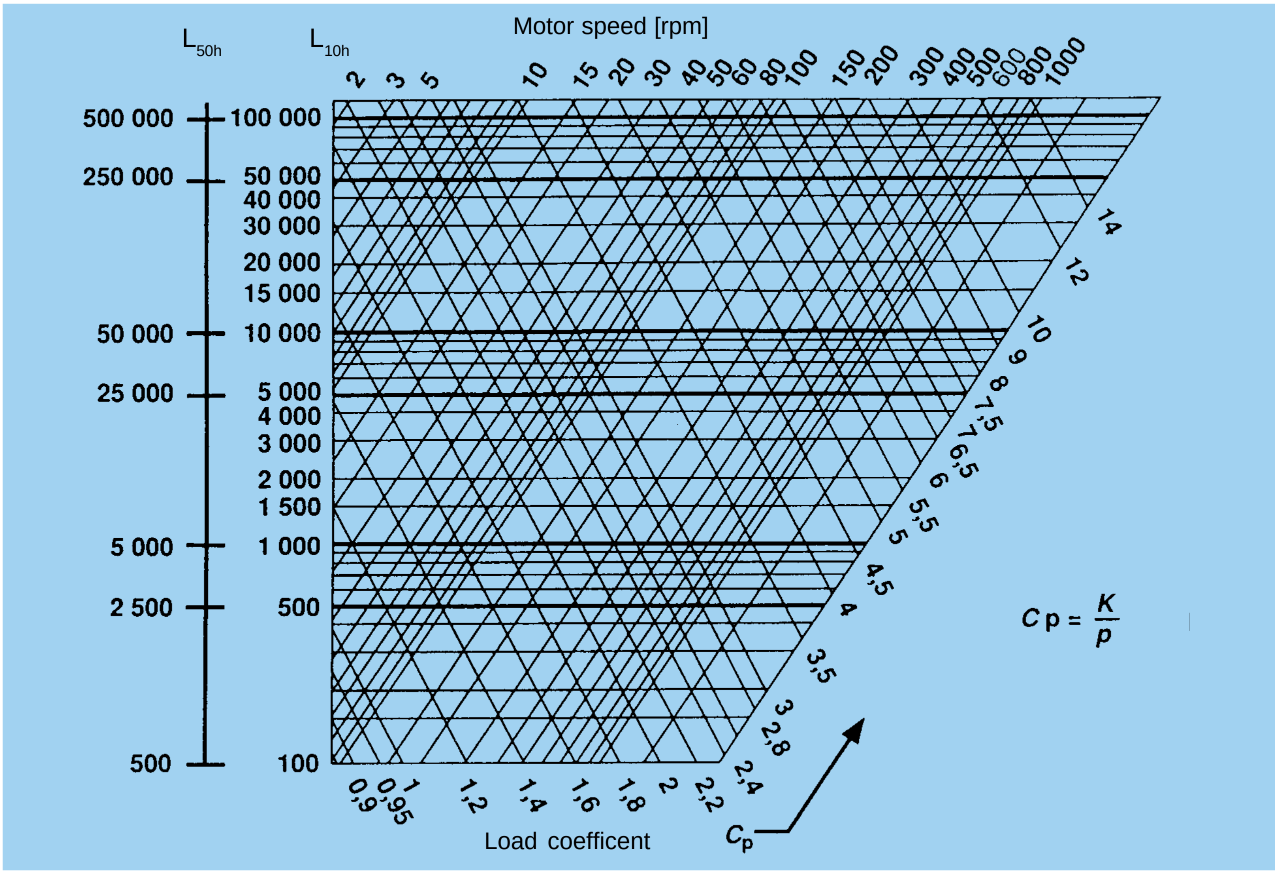
Min. required pressure difference Δp with idling speed (shaft unloaded)



Min. required boost Pressure with pump operation



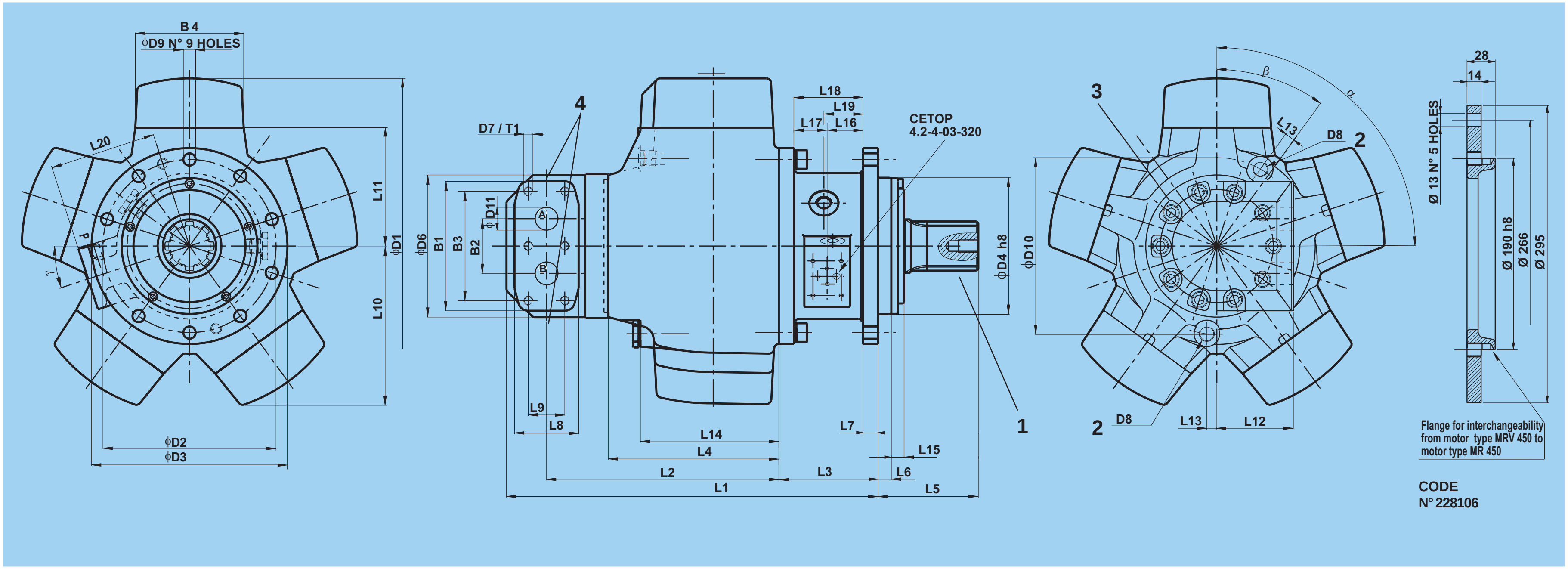
BEARING LIFE



***C* p** = Load coefficent
K = Sevice life coefficent for standard bearing
p = operating pressure in bar

L_{10h} is the theoretically service life value normally reached or exceeded by the 90% of the bearings.
50 % of the bearings reach the value L_{50h} = 5 times L_{10h}.

MOTOR TYPE	K	MOTOR TYPE	K	MOTOR TYPE	K
MRD 300	950	**MRDE 1400**	693	**MRV 4500**	709
MRDE 330	850	**MRVE 1400**	693	**MRDE 5400**	591
MRD 450	1126	**MRD 1800**	835	**MRVE 5400**	591
MRV 450	1126	**MRV 1800**	835		
MRDE 500	1021	**MRDE 2100**	722		
MRD 700	920	**MRVE 2100**	722		
MRV 700	920	**MRD 2800**	924		
MRDE 800	808	**MRV 2800**	924		
MRVE 800	808	**MRDE 3100**	828		
MRD 1100	844	**MRVE 3100**	828		
MRV 1100	844	**MRD 4500**	709		



1 Splined shaft with flank contact
(for dimension see page 30)
Ordering code "N1"
(for further shaft ends see page 30 - 31)

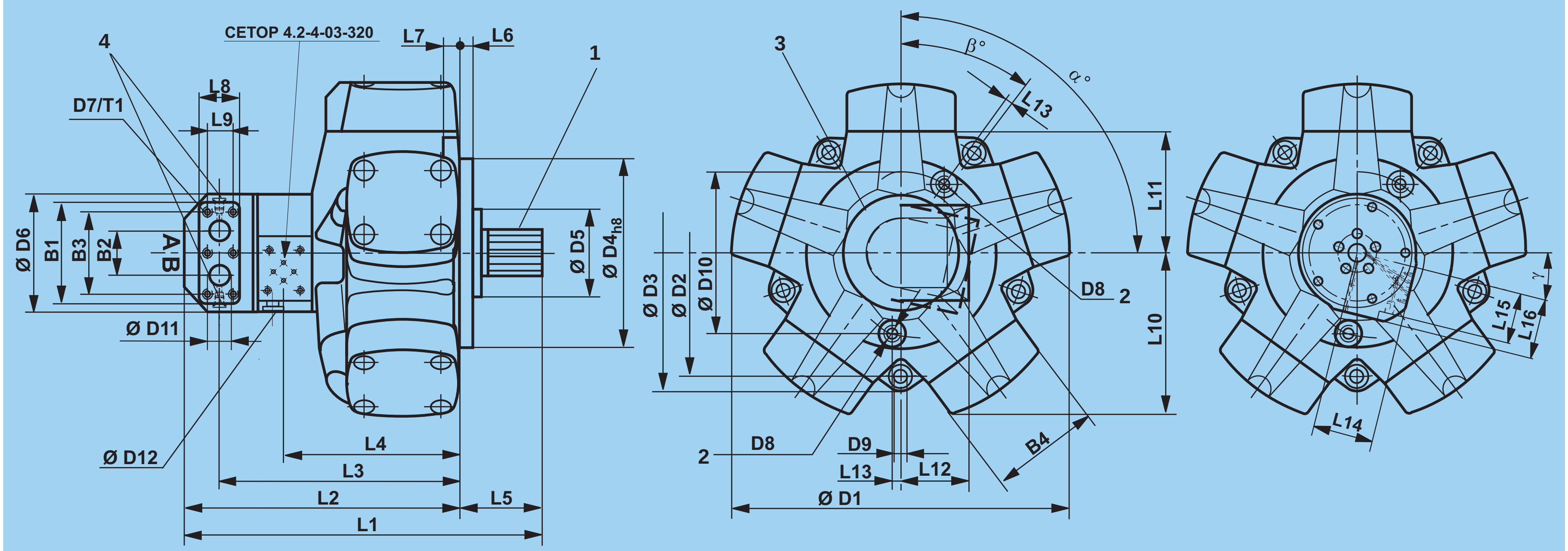
2 Case drain port
BSP threads to ISO 228/1

3 On request the port flange can be rotated by 36°

4 Port 1/4“ BSP threads to ISO 228/1
for pressure reading.

MOTOR TYPE	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19	L20
MRV 450	16.06	10.04	4.29	7.36	4.33	0.57	0.65	2.77	1.58	6.87	5.12	3.31	0.43	5.98	0.55	1.56	1.44	2.99	1.69	4.61

MOTOR TYPE	B1	B2	B3	B4	Ø D1	Ø D2	Ø D3	Ø $D4_{h8}$*	Ø D5	Ø D6	D7	T1	D8	D9	Ø D10	Ø D11	Ø D12	α	β	γ
MRV 450	5.59	2.36	4.72	4.69	14.49	7.48	8.47	5.9055 5.9031 (150 mm)	-	6.14	M10	0.71	G 3/8	0.53	7.64	0.98	G 1/4	90°	36°	18°



1 Splined shaft with flank contact
(for dimension see page 30)
Ordering code "N1"
(for further shaft ends see page 30 - 31)

2 Case drain port
BSP threads to ISO 228/1

3 On request the port flange can be rotated by 72°
(For MRD 300, MRDE 330, MRD 450, MRDE 500, MRD 700, MRDE 800 can be rotated by 36°)
For standard position see ange a.

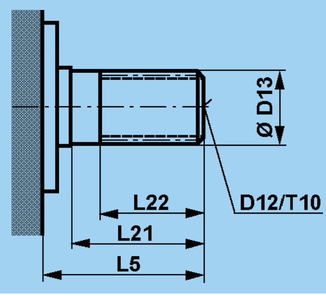
4 Port 1/4“ BSP threads to ISO 228/1 for pressure reading.

Dir. of Rotation (Viewed on shaft end)	Port inlet	ordering code (see page35)
clockwise	A	"N"
anti-clockwise	B	
clockwise	B	"S"
anti-clockwise	A	

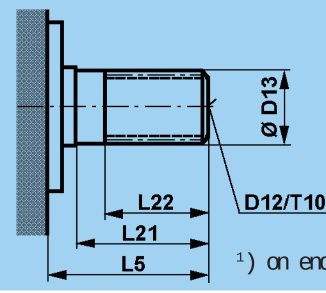
MOTOR TYPE	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16
MRD 300 MRDE 330	14.29	11.10	9.61	6.81	3.19	0.59	0.63	2.13	1.34	6.04	4.69	2.83	0.30	2.76	2.56	2.56
MRD 450 MRDE 500	16.77	12.95	11.22	7.95	3.82	0.59	0.71	2.77	1.57	6.87	5.12	3.31	0.37	3.11	2.76	3.07
MRD 700 MRDE 800 MRV 700 MRVE 800	17.72	13.74	12.01	8.74	3.98	0.59	0.79	2.77	1.57	7.56	5.63	3.31	0.32	3.11	2.76	3.07
MRD 1100 MRDE 1400 MRV 1100 MRVE 1400	20.39	15.79	13.90	9.25	4.61	0.79	0.87	3.23	1.97	8.78	6.50	4.13	0.35	3.46	2.95	3.46
MRD 1800 MRDE 2100 MRV 1800 MRVE 2100	22.28	17.09	15.20	10.55	5.20	0.83	0.94	3.23	1.97	10.39	7.76	4.13	0.43	3.46	2.95	3.46
MRD 2800 MRDE 3100 MRV 2800 MRVE 3100	26.73	526	17.80	12.48	6.02	0.94	1.02	3.86	2.44	11.93	8.70	4.84	0.59	4.25	3.31	4.25
MRD 4500 MRDE 5400 MRV 4500 MRVE 5400	29.90	20.71	18.84	13.41	8.27	1.34	1.10	3.86	2.68	14.15	10.04	5.51	0.75	4.25	3.31	4.25

MOTOR TYPE	B1	B2	B3	B4	Ø D1	Ø D2	Ø D3	Ø $D4_{h8}$*	Ø D5	Ø D6	D7	T1	D8	D9	Ø D10	Ø D11	Ø D12	α	β	γ
MRD 300 MRDE 330	4.72	1.97	3.94	3.94	12.91	9.13	10.08	6.8897 6.8873 (175 mm)	3.54	5.08	M8	0.59	G 3/8	0.43	6.38	0.79	G 1/4	90°	36°	0°
MRD 450 MRDE 500	5.59	2.36	4.72	4.69	14.49	10.47	11.65	7.4802 7.4775 (190 mm)	3.78	6.14	M10	0.71	G 3/8	0.51	7.64	0.98	G 1/4	90°	36°	0°
MRD 700 MRDE 800 MRV 700 MRVE 800	5.59	2.36	4.72	5.24	15.94	11.42	12.60	8.6614 8.6586 (220 mm)	4.02	6.14	M10	0.71	G 3/8	0.51	8.15	0.98	G 1/4	90°	36°	0°
MRD 1100 MRDE 1400 MRV 1100 MRVE 1400	6.38	2.87	5.35	5.83	18.50	12.99	14.45	9.8425 9.8397 (250 mm)	4.72	6.77	M12	0.83	G 1/2	0.59	8.98	1.22	G 1/4	104°	36°	14°
MRD 1800 MRDE 2100 MRV 1800 MRVE 2100	6.38	2.87	5.35	6.61	21.97	14.96	16.65	11.4173 11.4141 (290 mm)	5.83	6.77	M12	0.83	G 1/2	0.67	10.47	1.22	G 1/4	90°	36°	14°
MRD 2800 MRDE 3100 MRV 2800 MRVE 3100	8.19	3.39	7.09	7.48	25.28	17.32	19.45	13.1889 13.1854 (335 mm)	5.51	8.47	M14	1.10	G 1/2	0.75	12.36	1.46	G 1/4	90°	36°	18°
MRD 4500 MRDE 5400 MRV 4500 MRVE 5400	9.06	4.57	7.87	9.45	30.16	21.26	23.50	15.7479 15.7457 (400 mm) * $D4_{h7}$	-	8.47	M16	1.26	G 1/2	0.91	14.96	1.50	G 1/4	108°	36°	18°

Code N 1 (Standard)

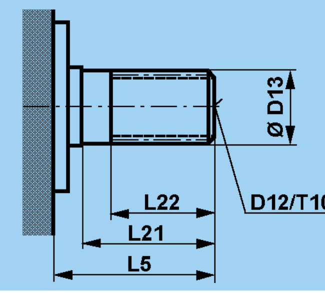


Code B 1 - BS 3550 - [1])



[1]) on enquiry

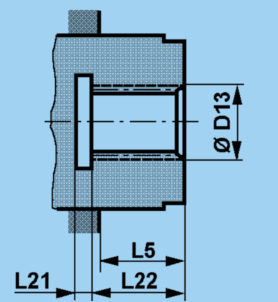
Code D 1 - DIN 5480



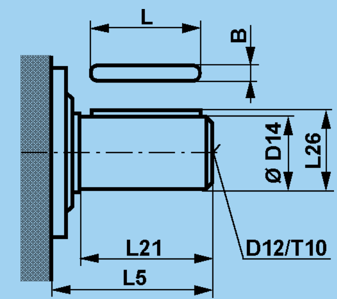
Version	**N1**						**B1**						**D1**					
Type	**L5 (in)**	**L21 (in)**	**L22 (in)**	**D12 (mm)**	**T10 (in)**	**ØD13 ex DIN 5463 (mm)**	**L5 (in)**	**L21 (in)**	**L22 (in)**	**D12 (mm)**	**T10 (in)**	**ØD13 BS 3550**	**L5 (in)**	**L21 (in)**	**L22 (in)**	**D12 (mm)**	**T10 (in)**	**ØD13 DIN 5480 (mm)**
MRD 300 MRDE 330	3.19	2.36	1.81	M12	0.98	B8x42x48	3.19	2.36	1.77	M12	0.98	12/24-21	3.19	2.36	1.81	M12	0.98	W48x2x22-8e
MRD 450 MRDE 500	3.82	2.91	2.22	M12	0.98	B8x46x54	3.82	2.91	2.40	M12	0.98	8/16-17	3.82	2.91	2.36	M12	0.98	W55x3x17-8e
MRV 450	4.33	2.91	2.22	M14	0.87	B8x52x60	-	-	-	-	-	-	4.33	2.91	2.22	M14	0.87	W55x3x17-8e
MRD 700 MRDE 800 MRV 700 MRVE 800	3.98	3.07	2.44	M12	0.98	B8x52x60	3.98	3.07	2.44	M12	0.98	8/16-17	3.98	3.07	2.44	M12	0.98	W60x3x18-8e
MRD 1100 MRDE 1400 MRV 1100 MRVE 1400	4.61	3.46	2.72	M12	0.98	B8x62x72	4.61	3.46	2.64	M12	0.98	6/12-14	4.61	3.46	2.83	M12	0.98	W70x3x22-8e
MRD 1800 MRDE 2100 MRV 1800 MRVE 2100	5.20	3.94	3.11	M12	0.98	B10x72x82	5.20	3.94	2.99	M12	0.98	6/12-20	5.20	3.94	3.15	M12	0.98	W80x3x25-8e
MRD 2800 MRDE 3100 MRV 2800 MRVE 3100	6.02	4.72	3.90	M12	0.98	B10x82x92	6.02	4.72	2.99	M12	0.98	6/12-20	6.02	4.72	3.94	M12	0.98	W90x4x21-8e
MRD 4500 MRDE 5400 MRV 4500 MRVE 5400	8.27	6.81	5.67	M12	0.98	B10x102x112	8.27	6.81	5.61	M12	0.98	6/12-20	8.27	6.81	5.67	M12	0.98	W110x4x26-8-e

NOTE: the threaded holes (D12/T10) for the shaft versions "N1", "B1" and "D1" must be considered as service holes. In case the holes dimensions required by the application are different from the ones listed here above, plese contact DENISON Calzoni.

Code F 1 - DIN 5480



Code P 1



Version	F				P							
Type	**L5 (in)**	**L21 (in)**	**L22 (in)**	**Ø D13 DIN 5480 (mm)**	**L5 (in)**	**L21 (in)**	**L26 (in)**	**D12 (mm)**	**T10 (in)**	**Ø D14 k6 ** (in)**	**Key (mm) L x B**	**Transmitted torque (lbf.ft)**
MRD 300 MRDE 330	1.06	0.20	1.42	N40x2x18-9H	3.19	2.36	2.11	M12	0.98	1.9692 1.9686 (50 mm)	56 x 14	662
MRD 450 MRDE 500	1.10	0.20	1.50	N47x2x22-9H	3.82	2.91	2.32	M12	0.98	2.1661 2.1655 (55 mm)	70 x 16	1042
MRV 450	1.30	0.20	1.50	N47x2x22-9H	4.33	2.91	2.32	M14	0.98	2.1661 2.1655 (55 mm)	70 x 16	1042
MRD 700 MRDE 800 MRV 700 MRVE 800	1.10	0.20	1.73	N55x3x17-9H	3.98	3.07	2.52	M12	0.98	2.3630 2.3623 (60 mm)	70 x 18	1498
MRD 1100 MRDE1400 MRV 1100 MRVE1400	1.50	0.31	1.97	N65x3x20-9H	4.61	3.46	3.01	M12	0.98	2.7567 2.7560 (70 mm)	80 x 20	1984
MRD 1800 MRDE 2100 MRV 1800 MRVE 2100	1.85	0.31	2.24	N75x3x24-9H	5.20	3.94	3.35	M12	0.98	3.1504 3.1497 (80 mm)	90 x 22	2965
MRD 2800 MRDE 3100 MRV 2800 MRVE 3100	1.89	0.31	2.44	N85x3x27-9H	6.02	4.72	3.74	M12	0.98	3.5442 3.5434 (90 mm)	110 x 25	4578
MRD 4500 MRDE 5400 MRV 4500 MRVE 5400	1.97	0.55	2.68	N100x3x32-9H	8.27	6.81	4.57	M12	0.98	4.3316 4.3308 (110 mm)	160 x 28	7934

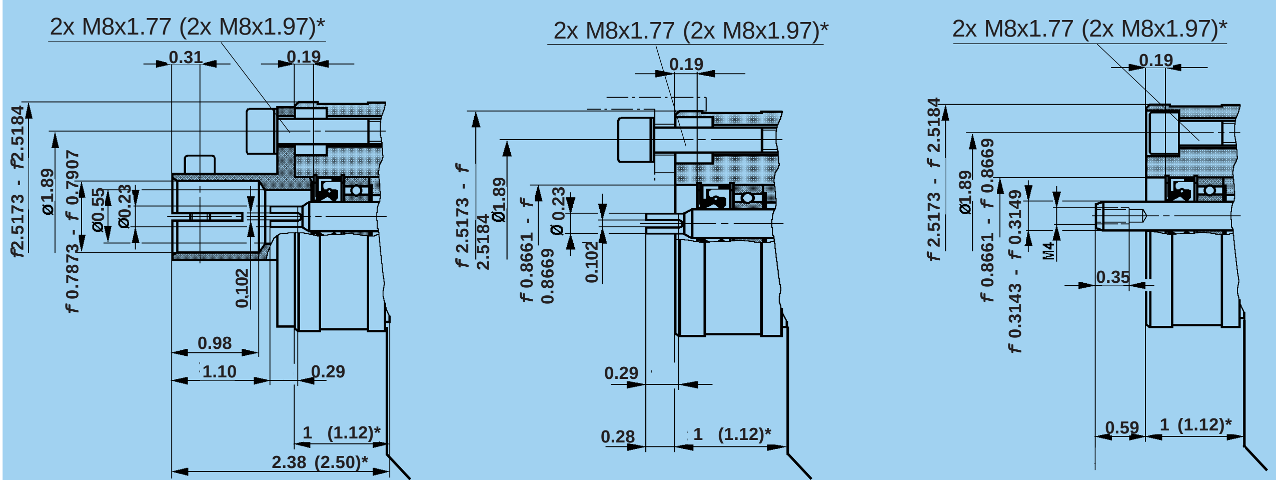
NOTE
For higher values of the torque to be transmitted, please consult DENISON Calzoni

NOTE: the threaded holes (D12/T10) for the shaft versions "P1" must be considered as service holes. In case the holes dimensions required by the application are different from the ones listed here above, plese contact DENISON Calzoni.

MECHANICAL TACHOMETER DRIVE | **TACHOGENERATOR DRIVE** | **ENCODER DRIVE**

Dimensions in inch (threaded holes in mm)

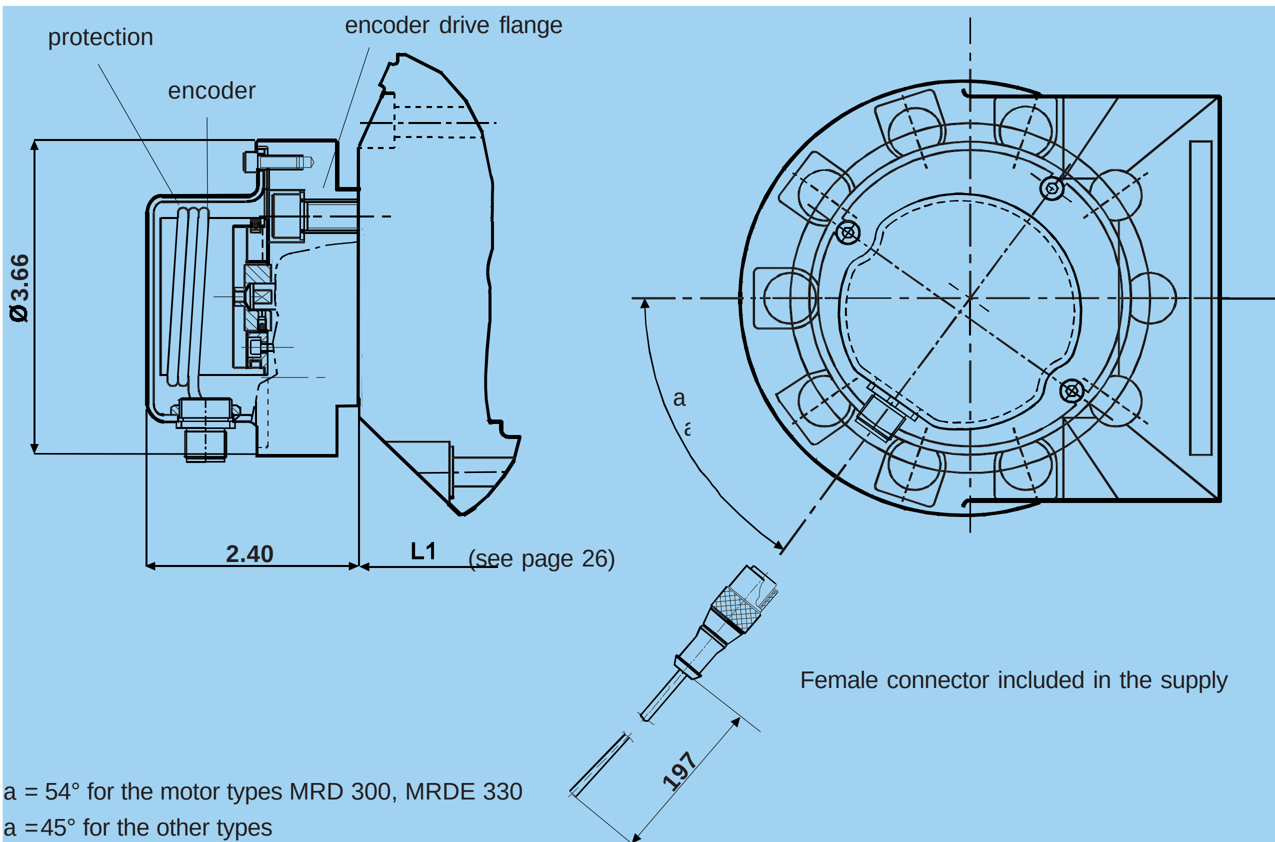
Code "C1" | **Code "T1"** | **Code "Q1"**



( ) * Motor MRD 300, MRDE 330

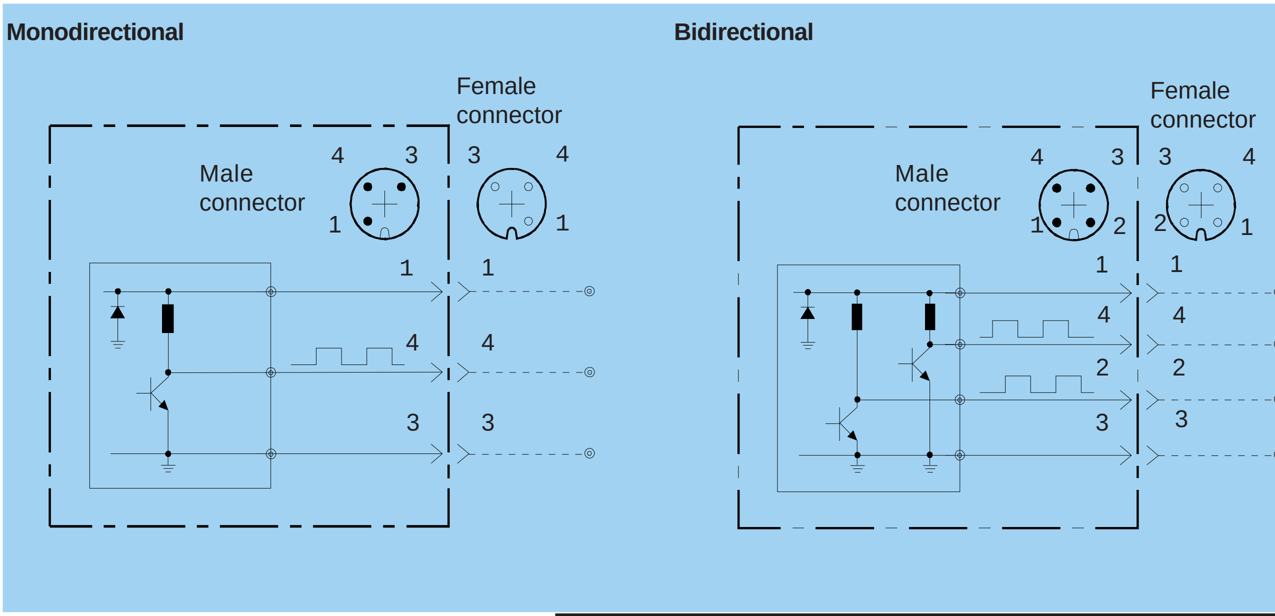
INCREMENTAL ENCODER DIMENSIONS

Dimensions in inch (in)



a = 54° for the motor types MRD 300, MRDE 330
a =45° for the other types

INCREMENTAL ENCODER CONNECTION DIAGRAMS



Color wires and function		
1	**Brown**	Power Supply (8 to 24 Vdc)
2	**White**	Output B phase (MAX 10 mA - 24 Vcc)
3	**Blue**	Power Supply (0 Vdc)
4	**Black**	Output A phase (MAX 10 mA - 24 Vcc)

INCREMENTAL ENCODER TECHNICAL DATA

Encoder type:	**ELCIS mod. 478**
Supply voltage:	**8 to 24 Vcc**
Current consumption:	**120 mA max**
Current output:	**10 mA max**
Output signal:	**A phase- MONODIRECTIONAL A and B phase BIDIRECTIONAL**
Response frequency:	**100 KHz max**
Number of pulses:	**500 (others on request - max 2540)**
Slew speed:	**Always compatible with maximum motor speed**
Operating temperature range:	**from 32 to 158 °F**
Storage temperature range:	**from -22 to +185 °F**
Ball bearing life:	**1.5x10^9 rpm**
Weigth:	**0.220 lb**
Protection degree:	**IP 67 (with protection and connector assembled)**

Connectors:

MONODIRECTIONAL	**RSF3/0.5 M (Lumberg)**	**male**
	RKT3-06/5m (Lumberg)	**female**
BIDIRECTIONAL	**RSF4/0.5 M (Lumberg)**	**male**
	RKT4-07/5m (Lumberg)	**female**

Note: Female connectors cable length equal to 5 m.

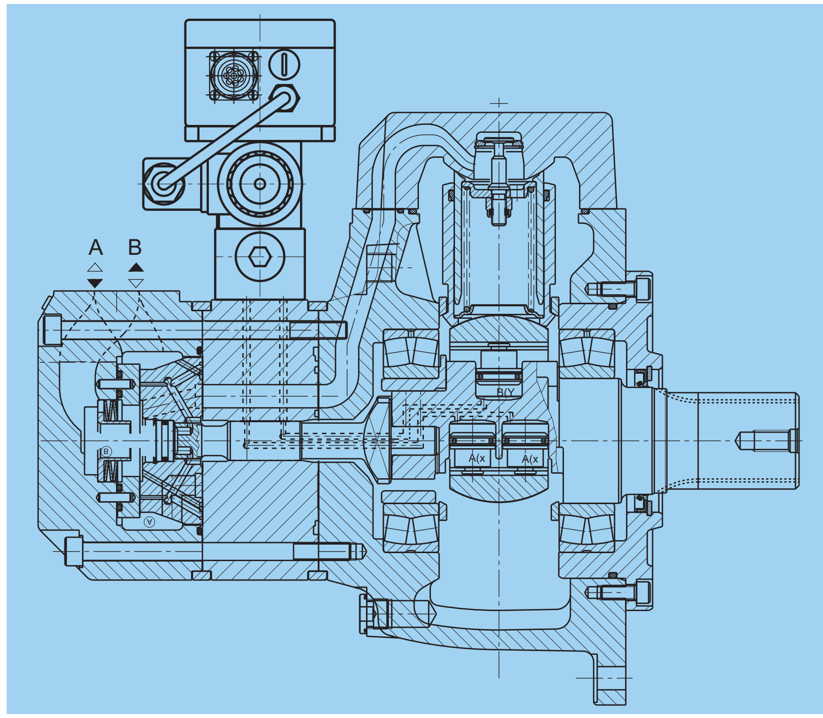
RCE

USING GENERALITIES

The electronic regulator type RCE is designed to be mounted on board of the motors type “MRV/MRVE”, to control their displacement in relation to a reference value of:

- displacement
- pressure
- speed

The RCE regulator is of the bi-directional ON-OFF type, with successive integratory pulses. It is mounted directly on a 4 way, 3 position solenoid valve (CETOP size 6) which pilots the displacement variation of the motor.
The power supply is 24 V DC or 24 V AC rectified.



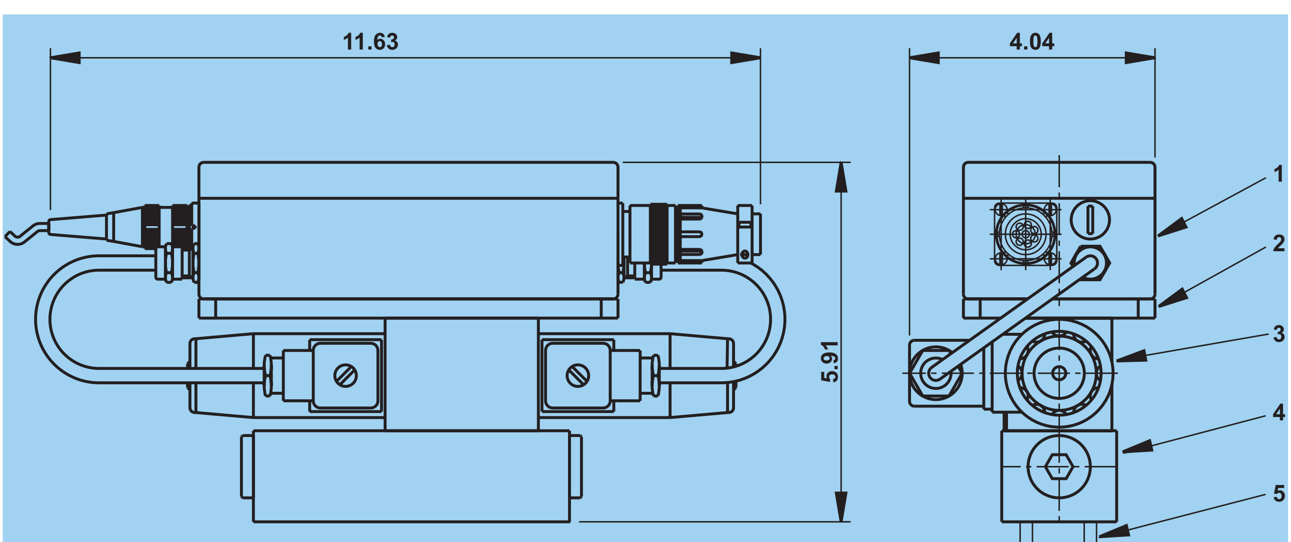
TECHNICAL DATA

Supply Voltage:	**24 Vcc ± 10%rectified (Vmax. peak 35 V)**
Max power needed:	**35 W (60 W if you use the solenoid output: SOLENOID C)**
Referenced voltage:	**0 - 10 Vcc (range 2 - 10 Vcc)**
Displacement output signal:	**2 - 10 Vcc**
Pressure - speed output signal:	**0 - 10 Vcc**
Regolation and speed aptitute pulse command:	**12 - 24 Vcc (opto-insulated input)**

Galvanic insulation between power and control circuits
Reversal of input polarity protection
Output power with self proofed MOSFET
IP 64 protection
Complying with standard CEE

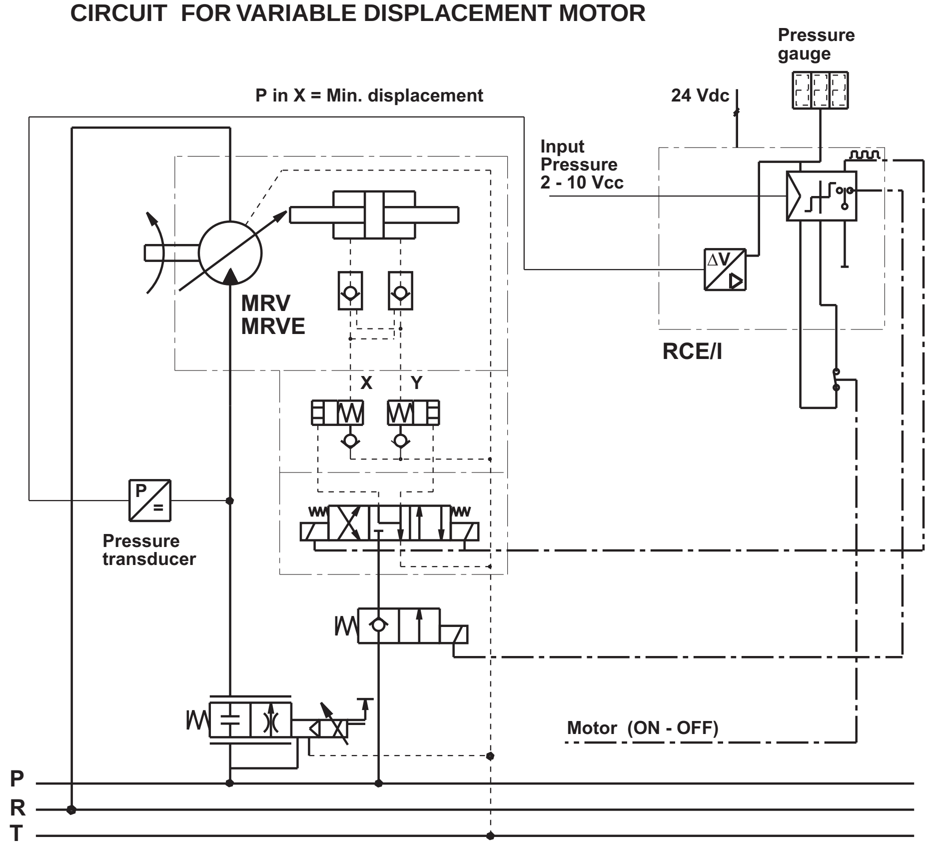
DIMENSION AND DATA

1 Elettronic unit RCE/I-20
2 Middle plate
3 DENISON valve
4 Double metering valve VDD
5 House case fixing screw



RCE

CIRCUIT FOR VARIABLE DISPLACEMENT MOTOR



DESCRIPTION

The circuits of the regulator are powered through a DC/DC converter having 15 V DC output, so to obtain a total galvanic separation from the 24 V DC power lines. The input reference signal to the regulator has been set in the range 2¸10 V DC, as for the output of the regulated values (displacement, pressure, speed). Three internal led show the command condition (+ or -). The pilot oil is dosed at each pulse by a specific dual metering valve type “VDD”, fitted beneath the solenoid valve. In relation to the parameter that it is wished to keep under control by acting on the motor displacement, the RCE/I regulator can allow 3 different regulation modes.

CONSTANT DISPLACEMENT MODE

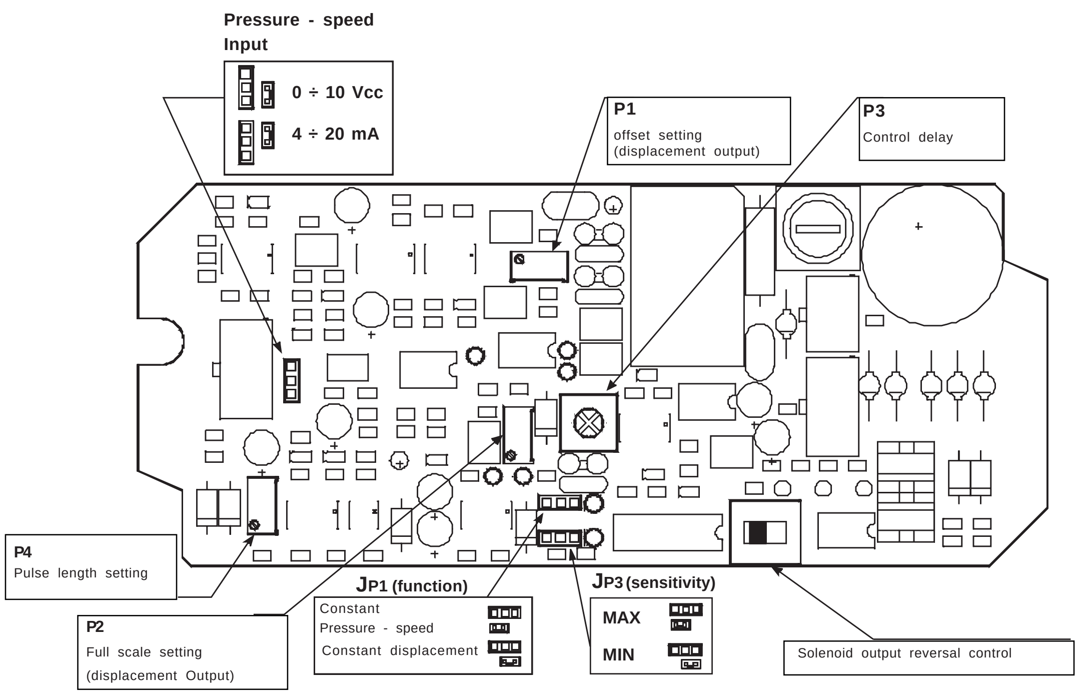
The hydraulic motor is equipped with an inductive (TEC) displacement transducer powered by the regulator, which statically reads and saves the current displacement position at each motor revolution.
Through special built-in valves, the motor keeps the set displacement position constant. Due to an intrinsic feature of radial-piston motors, the tendency under load is to move toward maximum displacement.
Thus the function of the regulator is to restore the original setting with an external voltage reference (range 2¸10 V DC from min. displ. to max displacement).
The precision of the actual displacement value is approximately + 2¸3% over the rated value set.
For remote reading of the displacement a 2¸10 V DC output signal is provided, almost linear in the range of the motor displacement variation.
To quickly change from one value to another of the set displacement, a special opto-insulated input circuit may be activated in transitory mode with a 24 V DC signal.
To enable the regulator only when the motor is running, it is necessary to activate a special opto-insulated input circuit with a 24 V DC signal simultaneously with the start command; an internal trimmer allows a short enabling delay to be inserted if desired.
The regulator is normally set to perform stable adjustments up to a minimum speed of 60 r.p.m.
For lower speeds, to approximately 6 r.p.m., it is necessary to use an internal multiple-turn trimmer to modify the pause length between the control pulses.
The pause length must be greater than the time required by the motor to complete one turn, this is to permit the displacement position read by the transducer at each shaft revolution to be updated in the memory.

CONSTANT WORKING PRESSURE MODE

When the motor is used in systems equipped with hydraulic accumulators and the torque required by the motor may vary in relation to the process characteristics, the displacement is controlled in relation to the working pressure set for the motor, so that the working pressure remains constant as the required torque varies.
The constant pressure regulation can be achieved for torque variations within the displacement variation ratio allowed by the motor.
The hydraulic circuit that feed the motor must include a pressure transducer that may be powered by the regulator itself with a voltage of 15 V DC and a signal output of 0¸10 V DC or 4¸20 mA. The hydraulic motor is equipped with built-in valves, to maintain the displacement, as well as with the displacement transducer if it is wished to read the actual displacement during torque changes (by processing the displacement signal together with the pressure and speed signals, it is possible to determine the torque and absorbed power). The pressure setting is achieved by means of an external signal in the range 0¸10 V DC (2¸ 10 V DC); the 10 V value must correspond to the full scale value (10 V or 20 mA) of the pressure transducer. The min. acceptable reference value is 2 V DC. During the startup transitory, the regulator remains disabled for an adjustable period of time (internal trimmer).
Also in this case the regulator is enable with a 24 V DC input signal.
Even with frequent start-stop cycles, the regulator can change the motor displacement to adapt it to the average pressure value saved during the running cycle.
The saved pressure signal can be read remotely, again in the range 0¸10 V DC. A third 24 V DC power output is available on the regulator to simultaneously energize a 2-way solenoid valve of the type with a conical diaphragm, which intercepts the pilot oilupstream the 4-way solenoid valve.

CONSTANT SPEED MODE

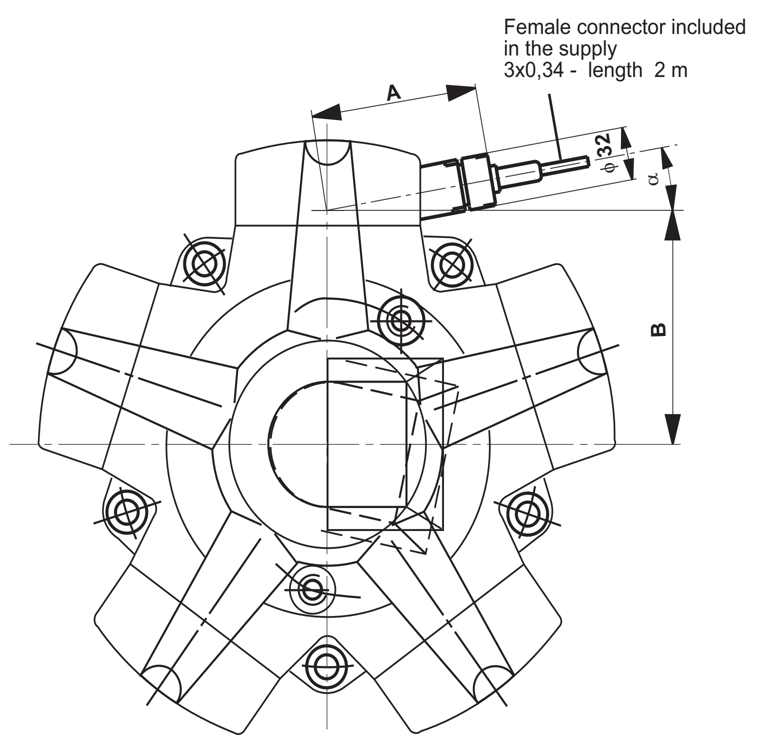
If multi-stage fixed displacement pumps are used to drive the motor, in certain conditions it is necessary to drain off the excess delivery in relation to the set motor speed.
In order to avoid this dissipation, it is possible to use a variable-displacement motor which would absorb the excess delivery by adjusting its displacement. The regulator in this case accents the speed signal and compares it to the reference value; when the motor speed exceeds the set value, the regulator increases the displacement until the excess delivery provided by the pump is absorbed; at the same time, the working pressure is proportionally reduced, to the advantage of the life of the components of the system (pump, motor, etc.).
This provides a simple speed regulating system without energy dissipation, since the circuit includes neither flow regulator valves nor drainage valves. The speed signal saved is also available as output signal for remote reading, again in the field of 0¸10 V DC; this signal may be useful for detecting the maximum speed reached when the motor running cycle is very short (< 2 sec). Here again, the regulation is enable by activating the special 24 V DC input circuit; the command may be delayed by the time the motor needs to accelerate in order to reach the rated speed. If it is wished to switch quickly the speed from one value to another, a special input may be activated with a 24 V DC signal in transitory mode. The precision attainable through this system varies: it is approximately ± 2% on the fullscale value with the motor at maximum displacement; at minimum displacement the precision is slightly lower.

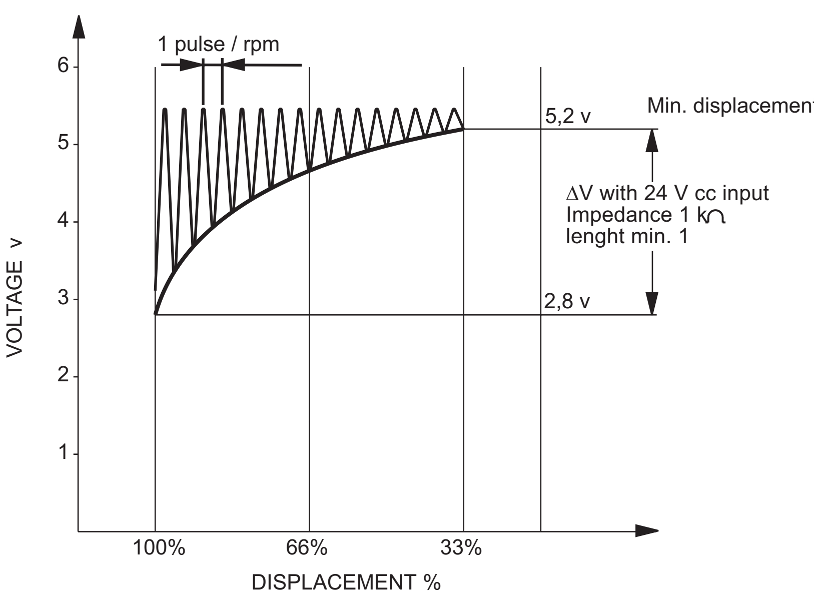


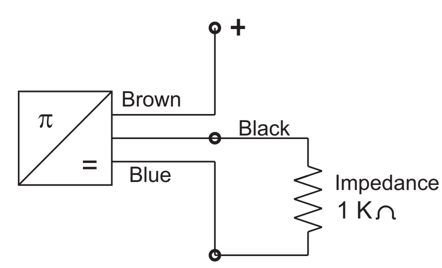
ELECTRONIC DISPLACEMENT TRANSDUCER

DIMENSIONS

MOTOR TYPE	A	B	α
MRV 450	4.25	5.34	12° 30'
MRV 700 MRVE 800	4.54	5.82	12°
MRV 1100 MRVE 1400	4.91	7.05	5°
MRV 1800 MRVE 2100	5.21	8.27	5°
MRV 2800 MRVE 3100	5.56	9.35	5°
MRV 4500 MRVE 5400	6.13	10.47	7°

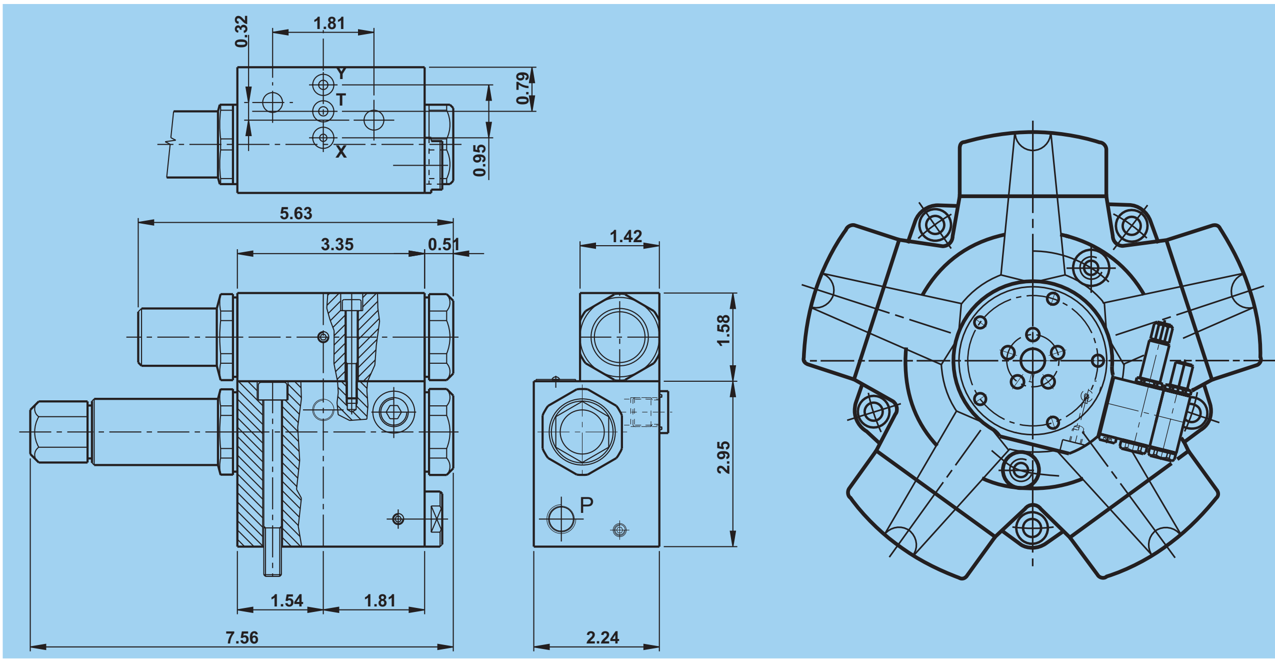






ELECTRONIC DISPLACEMENT TRANSDUCER TECHNICAL DATA

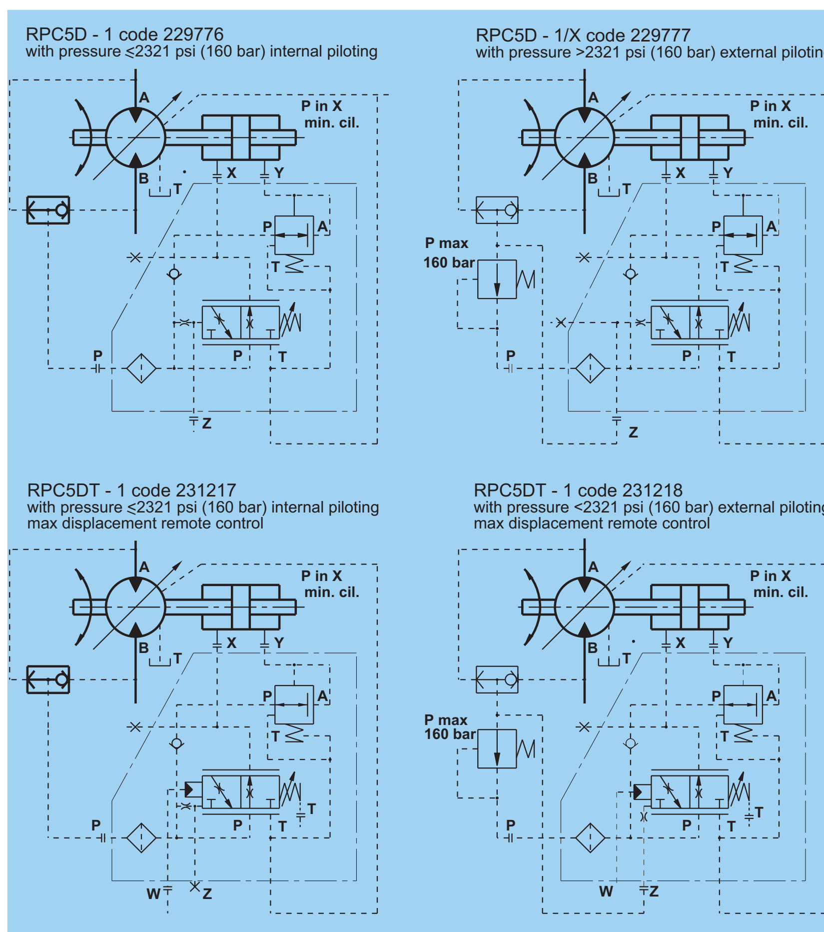
Max cont. pressure:	**36 psi (2,5 bar)**
Supply voltage:	**18 - 24 Vdc - stab. ± 0,5%**
Current consuption:	**10 mA**
Output current:	**1 - 6 mA**
Working temperature range:	**da 0 a 60°C**
Load impedance:	**1 KW**
Reading displacement range:	**1:3**
protection degree:	**IP 68**
Precision F.S.	**± 1%**



RPC
FUNCTIONAL DESCRIPTION

The RPC hydraulic regulator keeps the motor working at a constant pressure while supplying a variable torque. The pressure value can be set in the range from 50 to 250 bar

BASIC CIRCUITS

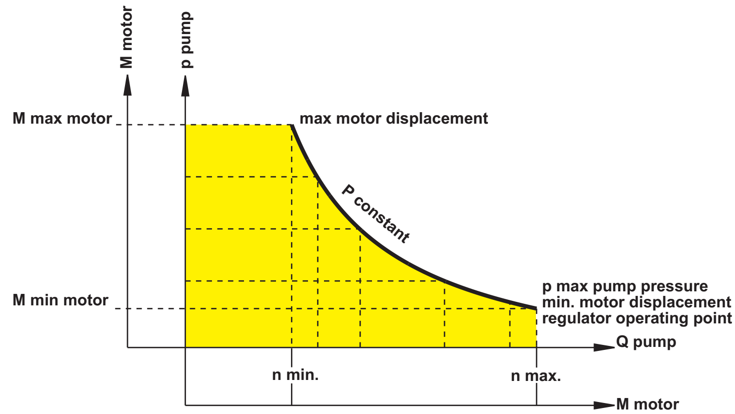


RPC

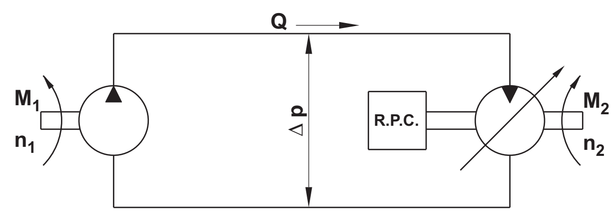
USING GENERALITIES

A variable torque and speed, constant power system can be obtained by using the MRV - MRVE motor provided with the RPC constant pressure regulator along with a fixed displacement pump.

REGULATION SCHEME



HYDRAULIC CIRCUIT



RPC = motor constant pressure regulator

P = Q x p max = constant

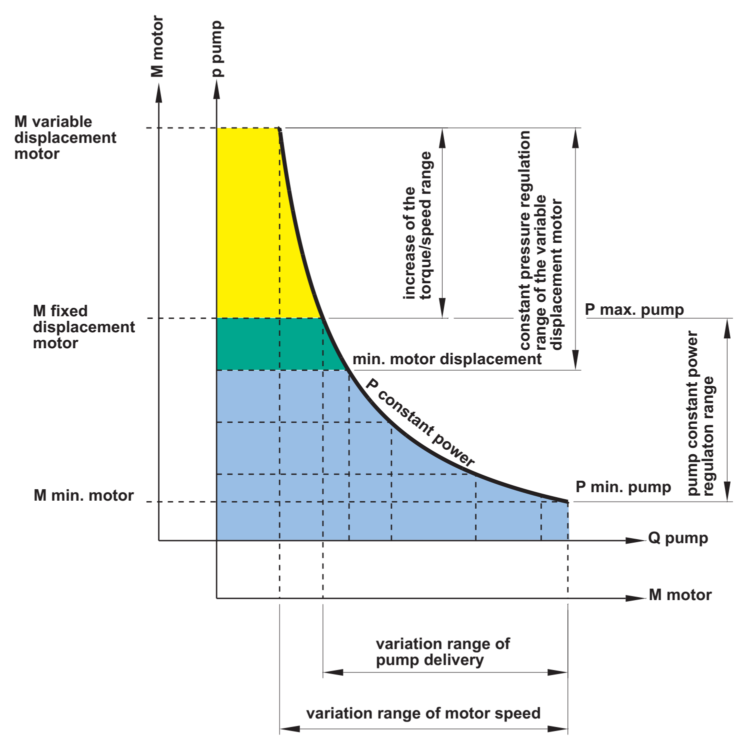
$M_1 \times n_1 = M_2 \times n_2$ = constant

RPC

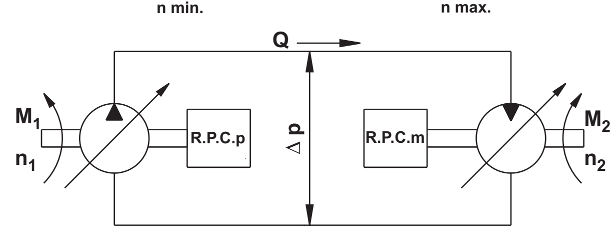
USING GENERALITIES

By replacing the fixed displacement pump with a variable one provided with a constant regulator, it is possible to obtain an enlargement of the torque and speed regulation range to constant power.

REGULATION SCHEME



HYDRAULIC CIRCUIT

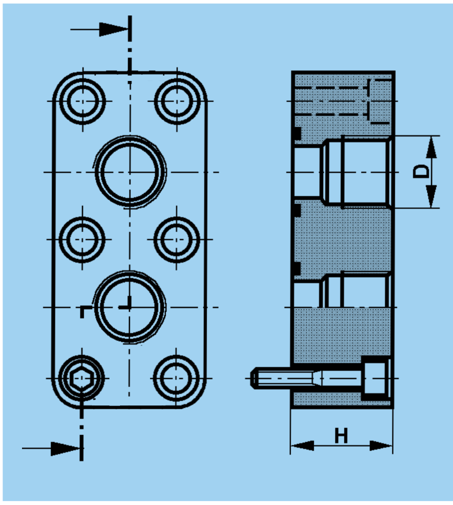


RPCp = pump constant power regulator

RPCm = motor constant pressure regulator

P = $M_1 \times n_1 = M_2 \times n_2$ = constant

STANDARD CONNECTION FLANGE
Code “C1“



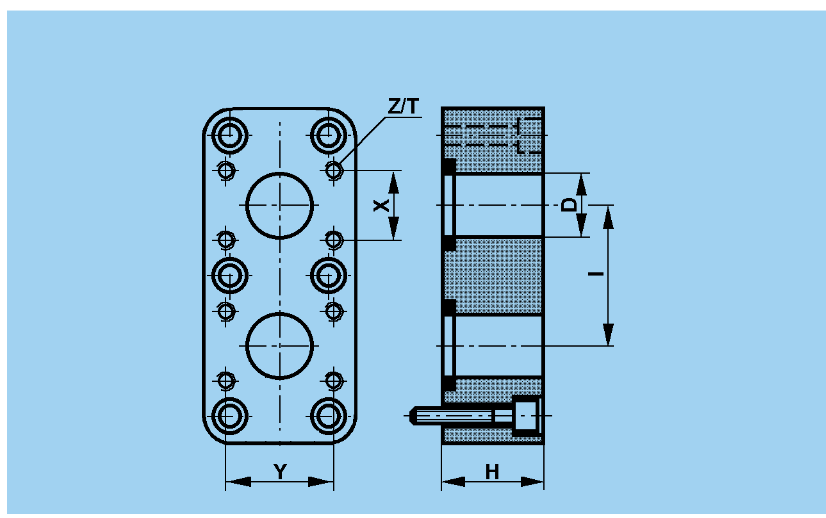
Flange is supplied complete with screws and seals.

MRD - MRDE MRV - MRVE	D (BSP)	H (inch)	CODE NBR	CODE FPM
300 - 330	3/4"	1.42	262 098	229 394
450 - 500 **700 - 800**	1 1/4"	1.57	262 089	229 395
1100 - 1400 **1800 - 2100**	1 1/2"	1.77	262 093	229 396
2800 - 3100	1 1/2"	2.36	264 572	229 397
4500 - 5400	2"	2.36	272 724	229 398

BSP threads to ISO 228/1

Permitted up to 6000 PSI

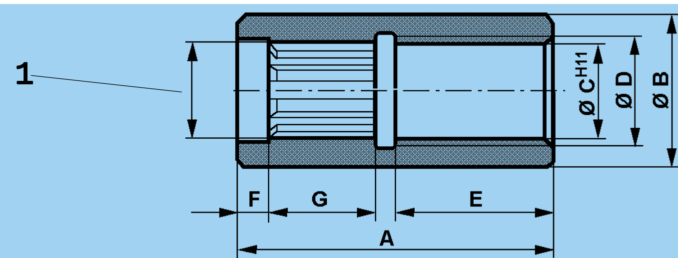
SAE CONNECTION FLANGE
Code “S1“
Code “T1“
Code “G1“
Code “L1“



Flange is supplied complete with screws and seals. FPM seals enquiry.

MRD - MRDE MRV - MRVE	SAE PSI	D		H (inch)	I (inch)	X (inch)	Y (inch)	METRIC		UNC		
		"	(inch)					Z(mm) T(inch)	Denison Calzoni part N° NBR	Z (")	T (inc-h)	Denison Calzoni part N° NBR
300 - 330	5000	3/4"	0.748 (19 mm)	1.42	2.17	0.87	1.87	M10/0.98	277 295	3/8"- 16	0.984	223 335
450 - 500 700 - 800	5000	1"	0.984 (25 mm)	1.57	2.36	1.03	2.06	M10/0.98	277 297	3/8"- 16	0.984	223 336
1100 - 1400 1800 - 2100	4000	1 1/4"	1.220 (31 mm)	1.77	2.95	1.19	2.31	M10/0.98	277 299	7/16"- 14	1.18	223 337
	6000	1"	0.984 (25 mm)	1.77	2.80	1.09	2.25	M12/0.87	230 166	7/16"- 14	1.18	342 092
2800 - 3100	3000	1 1/2"	1.457 (37 mm)	2.36	3.39	1.41	2.75	M12/1.18	277 301	1/2"- 13	1.18	223 338
	6000	1 1/2"	1.457 (37 mm)	2.36	3.84	1.44	3.13	M16/1.18	230 168	5/8"- 11	1.37	349068
4500 - 5400	3000	2"	1.969 (50 mm)	2.36	4.41	1.69	3.06	M12/1.18	277 303	1/2"- 13	1.18	223 339
	6000	2"	1.969 (50 mm)	2.36	4.57	1.75	3.81	M20/1.38	230 170	3/4"- 10	1.49	342 547

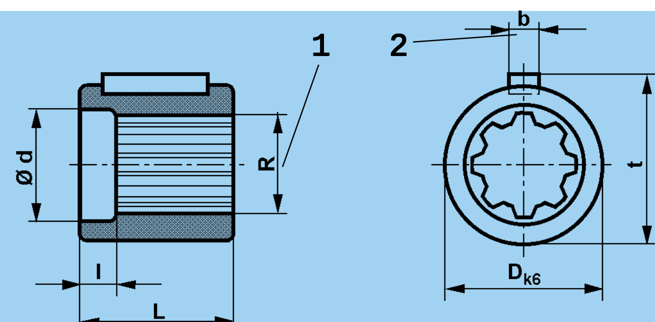
COUPLINGS



1 For standard male splined shaft version "N1" (see page 26).

MRD - MRDE MRV - MRVE	ORDERING CODE	A (inch)	B (inch)	C^{H11} (inch)	D (inch)	E (inch)	F (inch)	G (inch)
300 - 330	465 202	5.31	2.80	1.9354 1.9291 (49 mm)	2.36	2.52	0.59	1.77
450 - 500	465 201	6.10	3.15	2.1728 2.1653 (55 mm)	2.68	2.68	0.73	2.19
700 - 800	465 200	6.73	3.54	2.4090 2.4016 (61 mm)	2.95	3.15	0.75	2.32
1100 - 1400	464 785	7.32	4.17	2.8814 2.8740 (73 mm)	3.48	3.37	0.79	2.58
1800 - 2100	465 199	8.82	4.65	3.2763 3.2677 (83 mm)	3.86	4.21	0.87	3.07
2800 - 3100	465 198	10.43	5.20	3.6700 3.6614 (93 mm)	4.41	5	0.91	3.82
4500 - 5400	474 692	13.98	5.91	4.4574 4.4488 (113 mm)	4.96	6.50	1.18	5.51

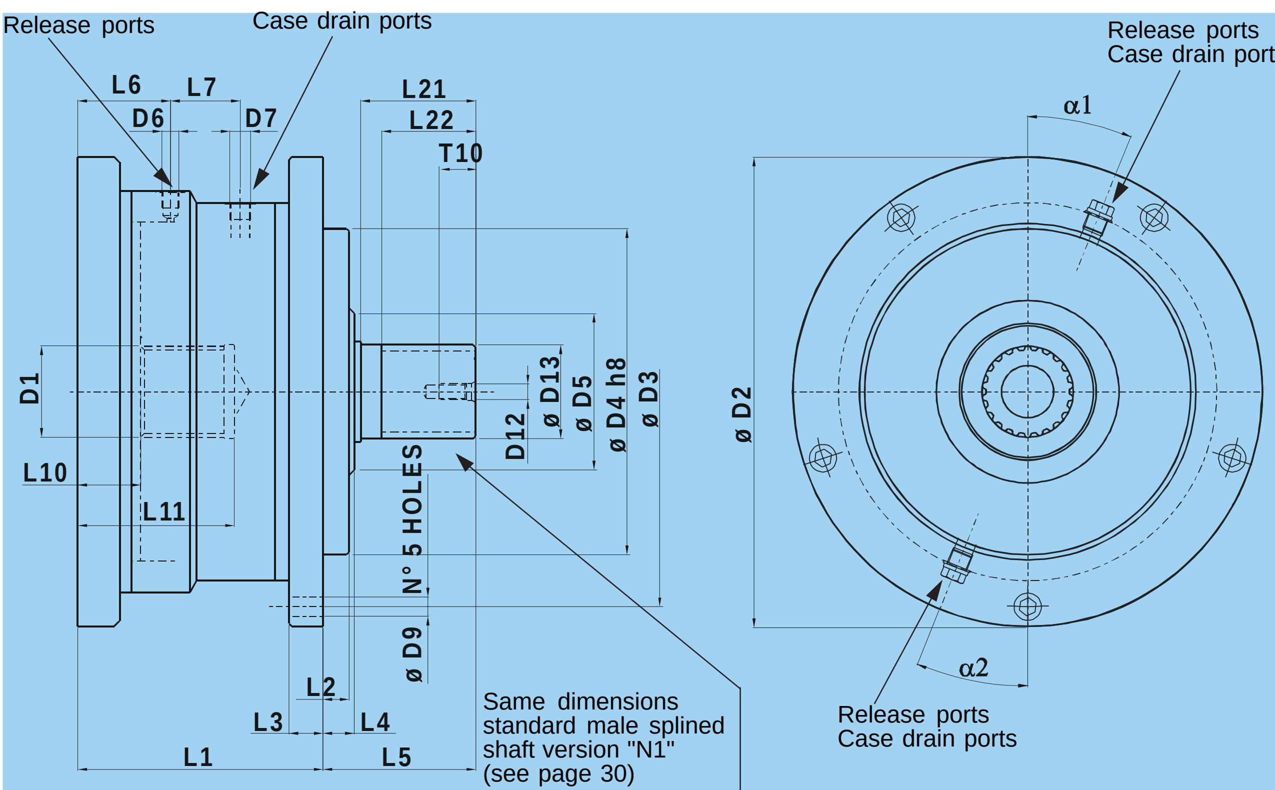
ADAPTERS WITH KEY



1 For standard male splined shaft version "N1" (see page 26).
2 Key to DIN 6885

MRD - MRDE MRV - MRVE	ORDERING CODE	R EX DIN 5463 (mm)	d (inch)	l (inch)	D_{k6} (inch)	L (inch)	b (inch)	t (inch)	KEY DIN 6885
300 - 330	271 118	A8x42x48	1.902	0.59	2.7567 2.7560 (70 mm)	2.36	0.55	2.89	14x9x56
450 - 500	271 119	A8x46X54	2.138	0.73	3.1504 3.1497 (80 mm)	2.95	0.63	3.31	16x10x70
700 - 800	271 120	A8x52x60	2.374	0.75	3.5442 3.5434 (90 mm)	3.15	0.71	3.70	18x11x70
1100 - 1400	271 121	A8x62x72	2.846	0.79	4.1348 4.1340 (105mm)	3.54	0.79	4.311	20x12x90
1800 - 2100	271 122	A10x72x82	3.24	0.87	4.6466 4.6457 (118mm)	4.65	0.87	4.84	22x14x110
2800 - 3100	271 123	A10x82x92	3.634	0.91	5.1191 5.1182 (130mm)	5.83	0.98	5.32	25x14x140
4500 - 5400	272 719	A10x102x112	4.421	1.18	6.3002 6.2993 (160mm)	7.40	1.10	6.54	28x16x180

BRAKE TYPE	B 300	B 450	B 700	B 1100	B 1800	B 2800
MOTOR TYPE MRD - MRDE MRV - MRVE	300 - 330	450 - 500	700 - 800	1100 - 1400	1800 - 2100	2800 - 3100



a1, a2 Corresponding angles to the release ports 1 and 2, to case the drain ports 1 and 2

BRAKE TYPE	L1	L2	L3	L4	L5	L6	L7	L10	L11	L21	L22	D1	D2	D3	$D4_{h8}$	D5	D6	D7	D9	D12	D13	T10	α1	α2
B 300	5.35	-	0.98	0.59	3.19	1.65	1.56	0.83	3.39	2.36	1.81	N 48x2x22-9H DIN 5480	10.08	9.13	6.89	-	G1/4"	G3/8'	0.41	M12	B 8x42x48 ex DIN 5463	1.10	22°30'	22°30'
B 450	5.79	-	1.06	0.59	3.82	1.95	1.42	0.94	3.94	2.91	2.22	N 55x3x17-9H DIN 5480	11.65	10.47	7.48	-	G1/4"	G3/8'	0.53	M12	B 8x46x54 ex DIN 5463	1.10	22°30'	22°30'
B 700	6.77	-	1.10	0.59	3.98	2.17	1.81	0.98	4.13	3.07	2.44	N 60x3x18-9H DIN 5480	12.60	11.42	8.66	-	G1/4"	G3/8'	0.53	M12	B 8x52x60 ex DIN 5463	1.10	22°30'	22°30'
B 1100	7.40	0.79	1.02	0.94	4.60	2.80	53,5	1.89	4.72	3.46	2.83	N 70x3x22-9H DIN 5480	14.17	12.99	9.84	4.72	G1/4"	M16- x1,5	0.59	M12	B 8x62x72 ex DIN 5463	1.10	0°	0°
B 1800	8.50	-	1.10	0.83	5.20	63,5	58,5	1.34	5.31	3.94	3.11	N 80x3x25-9H DIN 5480	16.65	14.96	11.42	-	G1/4"	G1/2'	0.69	M12	B 10x72x82 ex DIN 5463	1.10	22°30'	22°30'
B 2800	10.35	-	1.18	0.94	153	87	67	42,5	165	120	99	N 90x4x21-9H DIN 5480	19.45	17.32	13.19	-	G1/4"	G1/2'	0.75	M12	B 10x82x92 ex DIN 5463	1.10	22°30'	22°30'

TECHNICAL DATA (For operation outside these parameters, please consult **DENISON Calzoni)**

CHARACTERISTICS		B 300	B 450	B 700	B 1100	B 1800	B 2800
STATIC BRAKING TORQUE	lbf.ft	1328	1955	2950	4573	8408	12612
DYNAMIC BRAKING TORQUE	lbf.ft	885	1069	1623	3098	4610	8851
RELEASE PRESSURE	psi	406	392	392	392	435	435
MAX. OPERATING PRESSURE	psi	6092	6092	6092	6092	6092	6092
MOMENT OF INERTIA OF ROTATING PARTS	lbf.ft²	0.147	0.688	1.020	1.448	4.746	6.407
WEIGHT	lb	86	119	163	220.5	348.5	577.5
MOTOR TYPE MRD - MRDE -MRV - MRVE		300 330	450 500	700 800	1100 1400	1800 2100	2800 3100

CODE

Example: BRAKE - B 450 - N1 V1 **

1. BRAKE - **B 450** N1 V1 **

BRAKE TYPE

B 190	Brake for motor size "C"
B 300	Brake for motor size "D"
B 450	Brake for motor size "E"
B 700	Brake for motor size "F"
B 1100	Brake for motor size "G"
B 1800	Brake for motor size "H"
B 2800	Brake for motor size "I"

2. BRAKE - B 450 - **N1** V1 **

SHAFT

N1	Spline ex DIN 5463 (see page 30)
D1 *	Spline DIN 5480 (see page 30)
F1 *	Female spline DIN 5480 (see page 31)
*** please contact DENISON Calzoni**	

3. BRAKE - B 450 - N1 **V1** **

SEALS

N1	NBR: mineral oil
V1 *	FPM seals
U1	No shaft seal (for brake)
*** please contact DENISON Calzoni**	

4. BRAKE - B 450 - N1 V1 ******

SPECIAL

******	Space reserved to Denison Calzoni

Mounting

Any mounting position
- Note the position of the case drain port (see below)

Install the motor properly
- Mounting surface must be flat and resistant to bending

Min. tensile strength of mounting screws to DIN 267 Part 3 class 10.9
- Note the prescribed fastening torque

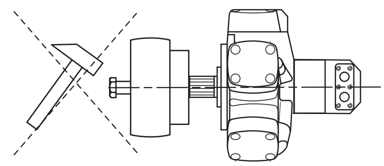
Pipes, pipe connections

Use suitable screws!
- Depending on type of motor use either threaded or flange connection

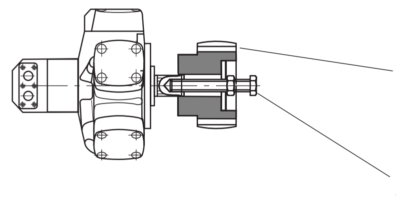
Choose pipes and hoses suitable for the installation
- Please note manufacturing data!

Before operation fill with hydraulic fluid
- Use the prescribed filter!

Coupling



- Mounting with screws
- Use threaded bore in the drive shaft
- Take apart with extractor



NOTE: Two of the mounting screws must be precisely located/fitted if operation is started and stopped frequently or if high reversible frequencies exist.

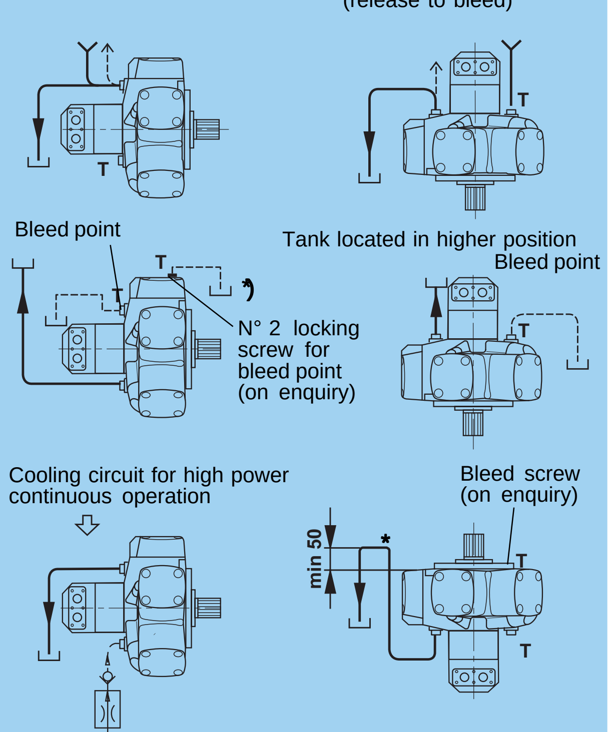
DRAIN AND FLUSHING LINK INSTALLATION EXAMPLES

Note: Position the case drain pipe, so that the motor **cannot run** empty.

T = Seal
Y = Motor housing feeding line
← = Bleed

Installation instructions for motors of the series "MRD - MRDE - MRV - MRVE"

Low pressure case drain returns to tank.

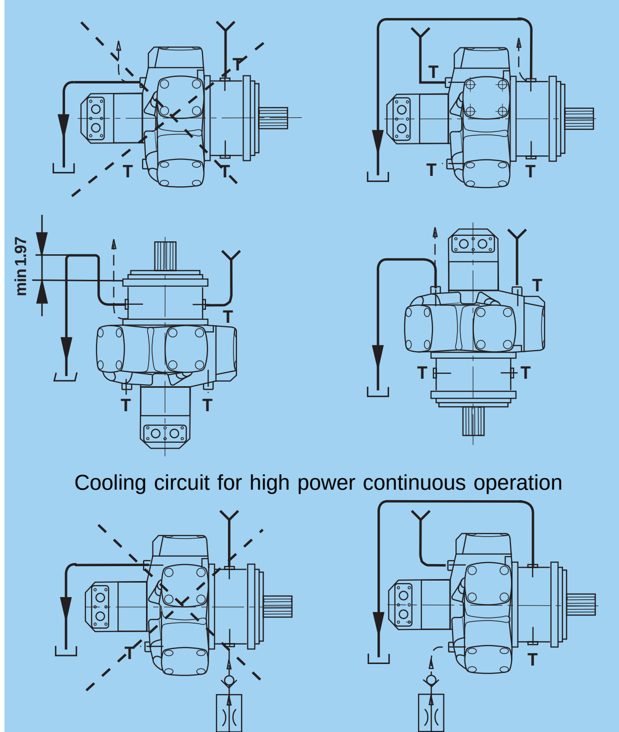


Flushing p max= 5 bar

***)** Special designs for applications, where the equipment needs to be filled with oil.(e.g. in a salty atmosphere)

Installation instructions for motors of the series "MRD - MRDE - MRV - MRVE with brakes"

Low pressure case drain returns to tank.



Flushing p max= 5 bar

Motors without shaft seal used with brake

CODE

Example: MRD 700 F 340 N1 M1 F1 N1 N **

1. **MRD** 700 F 340 N1 M1 F1 N1 N **

SERIES

MRD	standard 3626 psi max. continuous
MRDE	expanded 3046 psi max. continuous
MRV	standard 3626 psi max. continuous
MRVE	expanded 3046 psi max. continuous

2. MRD **700 F 340** N1 M1 F1 N1 N **

SIZE & DISPLACEMENT

D	code	**MRD 300 D 150**		**MRDE 330 D 165**					
	in^3	18.56	9.28	20.28	10.14				
E	code	**MRD 450 E 225**		**MRDE 500 E 250**		**MRV 450 E 133**			
	in^3	27.56	13.78	30.38	15.19	27.56	8.15		
F	code	**MRD 700 F 340**		**MRDE 800 F 390**		**MRV 700 F 340**		**MRVE 800 F 390**	
	in^3	43.14	20.71	49.08	23.56	43.14	20.71	49.08	23.56
G	code	**MRD 1100 G 500**		**MRDE 1400 G 620**		**MRV 1100 G 500**		**MRVE 1400 G 620**	
	in^3	68.70	31.02	83.57	37.74	68.70	31.02	83.57	37.74
H	code	**MRD 1800 H 900**		**MRDE 2100 H 1050**		**MRV 1800 H 900**		**MRVE 2100 H 1050**	
	in^3	110.43	55.21	127.61	63.81	110.43	55.21	127.61	63.81
I	code	**MRD 2800 I 1400**		**MRDE 3100 I 1550**		**MRV 2800 I 1400**		**MRVE 3100 I 1550**	
	in^3	170.38	85.19	189.40	94.70	170.38	85.19	189.40	94.70
L	code	**MRD 4500 L 2250**		**MRDE 5400 L 2700**		**MRV 4500 L 2250**		**MRVE 5400 L 2700**	
	in^3	274.77	137.38	329.60	164.80	274.77	137.38	329.60	164.80

3. MRD 700 F 340 **N1** M1 F1 N1 N **

SHAFT

N1	spline ex DIN 5463 (see page 30)
D1	spline DIN 5480 ((see page 30)
F1	female spline DIN 5480 (see page 31)
P1	shaft with key (see page 31)
B1	spline B.S. 3550 (see page 30)

4. MRD 700 F 340 N1 **M1** F1 N1 N **

SPEED SENSOR OPT ION

N1	none	
Q1	encoder drive (see page 32)	
C1	mechanical tachometer drive (see page 32)	
T1	tachogenerator drive (see page 32)	
M1	incremental Elcis encoder (500 pulse/rev) (see page 32)	Uni-directional
B1		Bi-directional

5. MRD 700 F 340 N1 M1 **F1** N1 N **

SEALS

N1	NBR mineral oil
F1	NBR, 218 psi shaft seal
V1	FPM seals
U1	no shaft seal (for brake)

6. MRD 700 F 340 N1 M1 F1 **N1** N **

CONNECTION FLANGE

N1	none
C1	standard DENISON Calzoni (see page 40)
S1	standard SAE metric (see page 40)
T1	standard SAE UNC (see page 40)
G1	SAE 6000 psi metric (see page 40)
L1	SAE 6000 psi UNC (see page 40)

7. MRD 700 F 340 N1 M1 F1 N1 **N** **

ROTATION

N	standard rotation (CW: inlet in A, CCW: inlet in B)
S	reversed rotation (CW: inlet in B, CCW: inlet in A)

8. MRD 700 F 340 N1 M1 F1 N1 N ******

SPECIAL

**	space reserved to Denison Calzoni

International Distributors

In Europe :
Cyprus
Czech Republic
Greece
Hungary
Iceland
Jugosavia
Norway
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Poland
Romania
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Slovakia
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Switzerland
The Faroe Islands
Turkey

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Iran
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Kuwait
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Korea
Malaysia
New Zealand
Philippines
Thailand

South-America :
Argentina
Brazil
Chile
Colombia
Ecuador
Mexico
Peru
Venezuela

Denison Calzoni S.p.a.
Via Caduti di Sabbiuno 15/17
40011 Anzola dell'Emilia
Bologna Italy
Tel: +39 (051) 6501611
Fax: +39 (051) 736221
e-mail: rco@rco.it

Asia-Pacific

Australia

Denison Hydraulics PTY
41-43 St Hilliers Road
P.O.Box 192
Auburn N.S.W. 2144, Australia
Tel : +61 (2) 9646 5200
Fax : +61 (2) 9643 1305

Hong Kong

Denison Hydraulics Ltd.
Unit 6A, 33/F Cable TV Tower
9 Hoi Shing Road, Tsuen Wan
NT, Hong Kong
Tel : +852 2498 8381
Fax : +852 2499 1522

Japan

Denison Japan Inc.
4-2-1 Tsujido-Shinmachi
Fujisawa 251, Japan
Tel : +81 (466) 35-3050
Fax : +81 (466) 35-2019

China

Denison Hydraulics Engineering Ltd.
Room 8018, No. 601, Zhang Yang
Road Pudong New Area
Shanghai 200120, China
Tel : +86 (21) 58205042 / 58205034
Fax : +86 (21) 58205014

Singapore

Denison Hydraulics Sea Pte LTD
Blk 5#06-12
Ang Mo Kio Industrial Park 2A
Singapore 567760
Tel : +65 6268 7840
Fax : +65 6268 7847

Taiwan

Denison Hydraulics LTD
6F-10. No. 79,Sec. 2
Roosevelt Road, Taipei
Tel : +65 268 7840
Fax : +65 268 7847

Europe

Austria

Denison Hydraulics GmbH
Zweigneiderlassung Linz
Haibachstraße 69
4061 Pasching, Austria
Tel : +43 (72 29) 48 87
Fax : +43 (72 29) 6 30 92

Benelux

Denison Hydraulics Benelux B.V.
Pascalstraat 100
3316 GR Dordrecht, Holland
Tel : +31 (78) 6179 900
Fax : +31 (78) 6175 755

Denmark

Denison Hydraulics Denmark A/S
Industrikrogen 2
2635 Ishöj, Denmark
Tel : +45 (4371) 15 00
Fax : +45 (4371) 15 16

Finland

Denison Lokomec OY
Polunmäenkatu 22
P.O.Box 116
33721 Tampere, Finland
Tel : + 358 (3) 3575 100
Fax : + 358 (3) 3575 111

France

Denison Hydraulics France S.A.
14 route du bois blanc
BP 539
18105 Vierzon, Cedex, France
Tel : +33 (2) 48 53 01 20
Fax : +33 (2) 48 75 02 91

Great Britain

Denison Hydraulics UK LTD
Kenmore road
Wakefield 41, Industrial Park
Wakefield, WF2 OXE
West Yokshire, England
Tel : +44 (1924) 826 021
Fax : +44 (1924) 826 146

Germany

Denison Hydraulik GmbH.
Auf dem Sand 14
D-40721 Hilden, Germany
Tel : +49 (2103) 940 300
Fax : +49 (2103) 940 558

Italy

Denison Hydraulics Italy Srl
Viale Europa 68
20090 Cusago (MI), Italy
Tel : +39 (02) 90330-1
Fax : +39 (02) 90390694/5/6

Denison Calzoni S.p.A
Via Caduti di Sabbiuno15/17
40011 Anzola dell'Emilia
Bologna, Italy
Tel : +39 (051) 6501611
Fax : +39 (051) 736221

Spain

Denison Hydraulics S.A.
Poligono "La Post"
C/ Enginy n°.6, Nave 8
08850 Gava, Barcelona, Spain
Tel : +34 (93) 635 5170
Fax : +34 (93) 635 5178

Sweden

Denison Hydraulics Svenska AB
Sporregatan 13
213 77 - Malmö, Sweden
Tel : +46 (40) 600 13 00
Fax : +46 (40) 600 13 50

North America

Canada

Denison Hydraulics Canada Inc.
2880 Brighton Road, Unit 1
Oakville, ON L6H 5S3, Canada
Tel : +1 (905) 829 5800
Fax : +1 (905) 829 5805

Mexico, Central America, South America, Caribbean countries

Denison Hydraulics Corp.
6167 NW 181 Terrace Circle
North
Miami, FL 33015, USA
Tel : +1 (305) 362 2246
Fax : +1 (305) 362 2246

USA

Denison Hydraulics Inc.
14249 Industrial Parkway
Marysville, OH 43040-9551,
USA
Tel : +1 (937) 644 3915
Fax : +1 (937) 642 3738

Others

Other European, Middle East, African countries

Denison Hydraulics France S.A
14 route du bois blanc
BP 539
18105 Vierzon, France
Tel : +33 (2) 48 53 01 20
Fax : +33 (2) 48 53 01 46

Your local Denison Hydraulics representative

DENISON CALZONI