

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

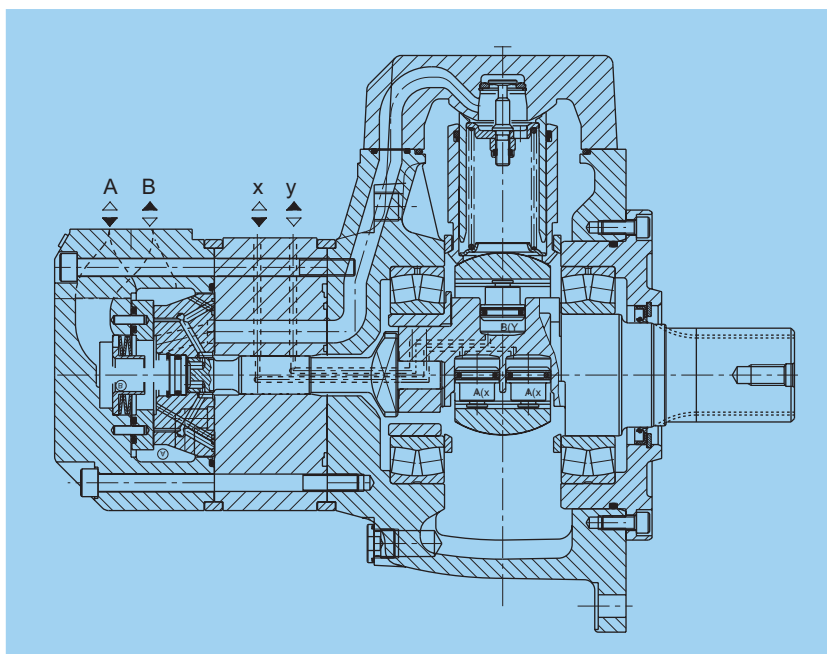


RCOa 2401/03.03

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 mm²/s): Recommended operating range 141 to 230 SUS (30 to 50 mm²/s)(see fluid selection on page 8)

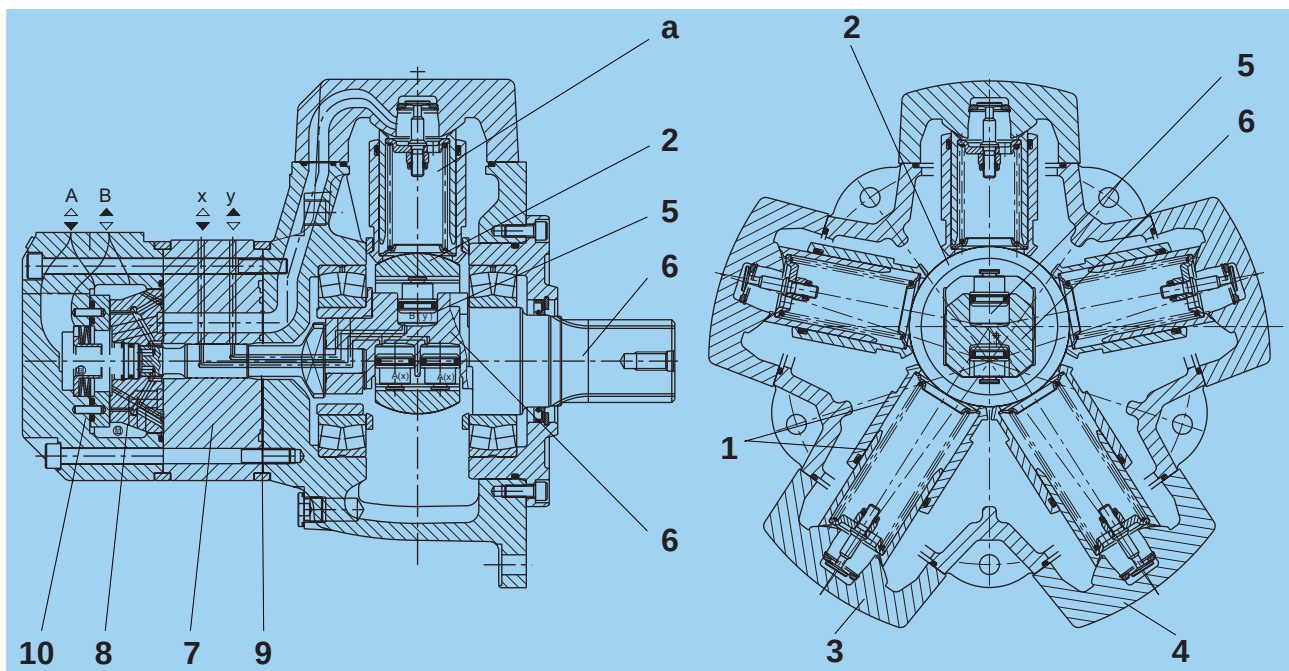
FLUID CLEANLINESS

Maximum permissible degree of contamination of fluid NAS 1638 Class 9. We therefore recommend a filter with a minimum retention rate of $\beta_{10} \geq 75$.

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 $\beta_5 \geq 100$.

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 chosen amongst many different values.

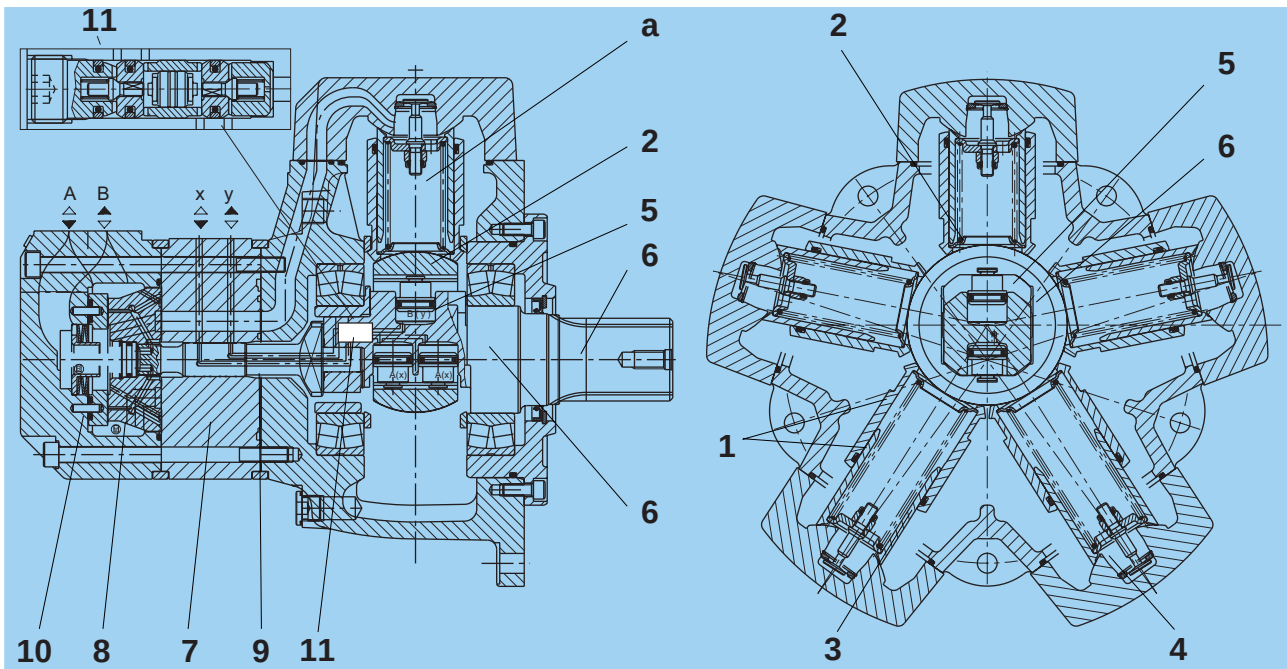
The radial motion is controlled by means of hydraulic cylinders (5) located in the drive shaft (6). The feeding of the displacement cylinders is accomplished by means of the rotating intake (7). The displacement can be changed even while rotating under full load.

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 chosen amongst many different values.

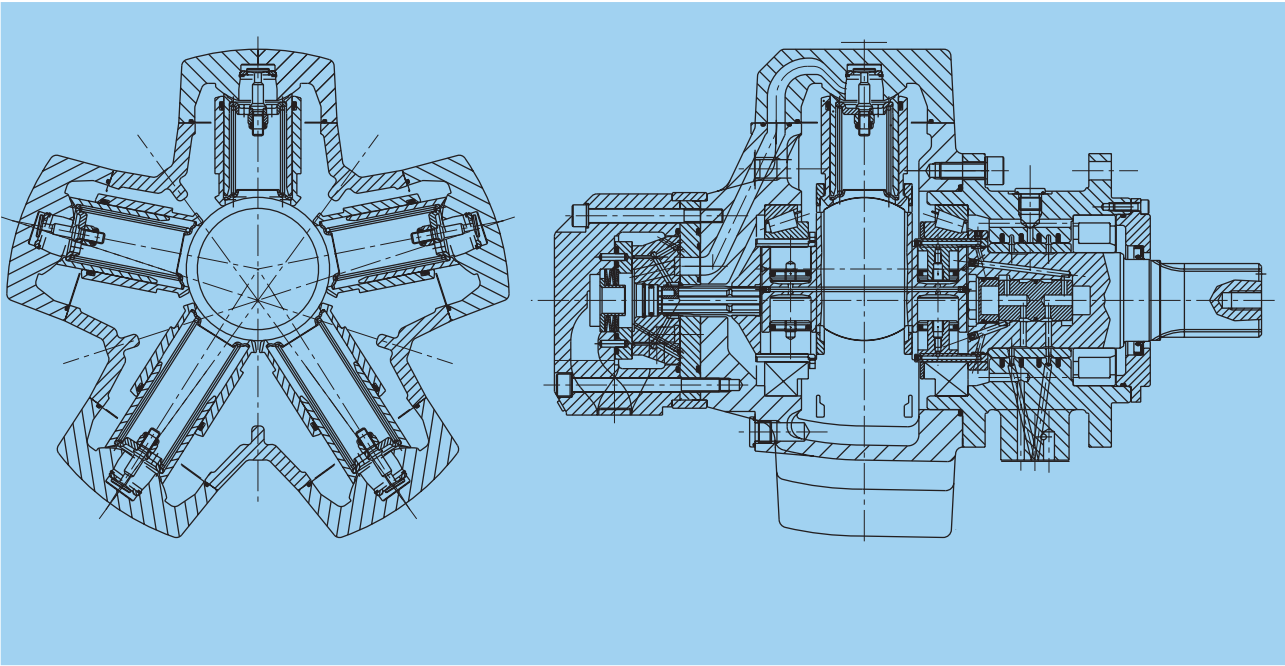
The radial motion is controlled by means of hydraulic cylinders (5) and valve (11) located in the drive shaft (6), this valve allows the step by step movement of the cylinder inside the main shaft, so it is possible to change the displacement. The feeding of the displacement cylinders is accomplished 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 extreme 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 patented 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 systems 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		Displacement		Moment inertia of rotating parts	Theoretical specific torquea	Min. start. torque / Theoretical 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
		in³		lb.in²	lb.ft/psi		psi	psi	psi	psi	psi	rpm	rpm	HP	HP	lb					
M R D	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						
M R V	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						
M R D M R V	700	Min.	20.71	108.39	0.275	-						3046	3626	5076	5802	72.5 (218 psi with "F1" shaft seal)	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	
M R D E	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						
M R D E M R V E	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						

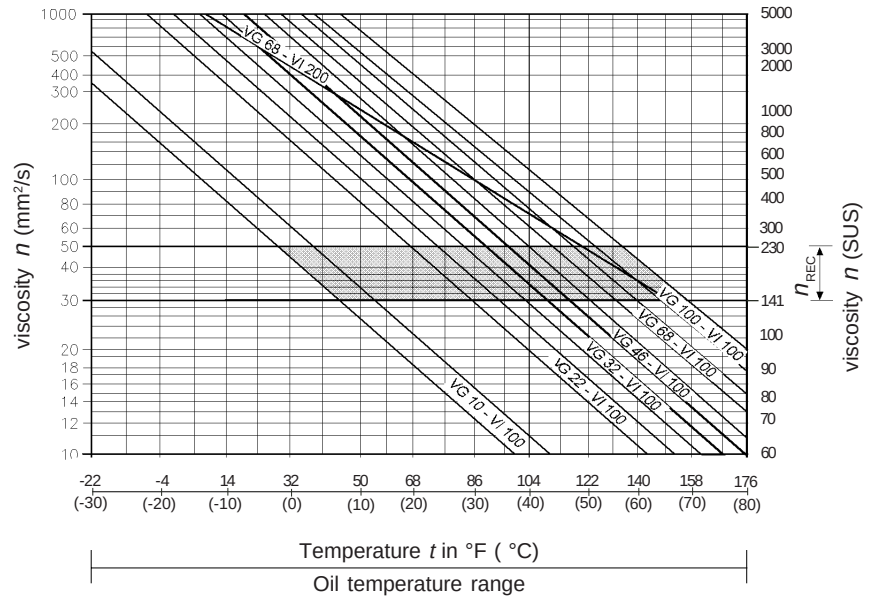
(*) Please contact DENISON Calzoni

EXAMPLE: At a certain ambient temperature, the operating temperature in the circuit is 122° F (50°C). In the optimum operating viscosity range (ν_{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

OPERATING VISCOSITY RANGE

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.

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.

$$n_{rec} = \text{recommended operating viscosity } 141...230 \text{ SUS } (30...50 \text{ mm}^2/\text{s})$$

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.

For limit conditions the following is valid:

$$n_{min, abs.} = 45 \text{ SUS } (10 \text{ mm}^2/\text{s}) \text{ in emergency, short term}$$

$$n_{min.} = 85 \text{ SUS } (18 \text{ mm}^2/\text{s}) \text{ for continuous operation at reduced performances}$$

$$n_{max.} = 4635 \text{ SUS } (1000 \text{ mm}^2/\text{s}) \text{ short term upon cold start}$$

LIMITS OF VISCOSITY RANGE

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

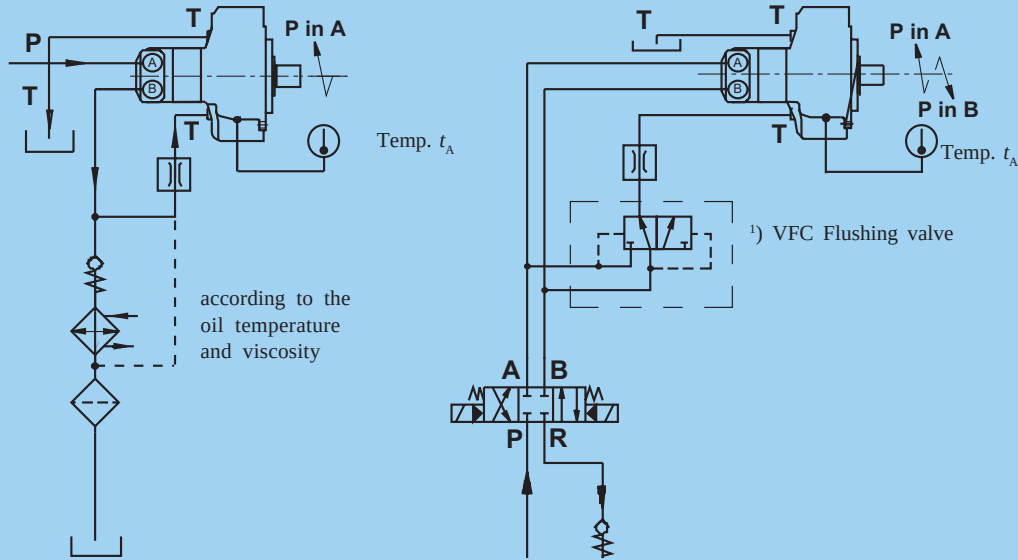
The lower the speed and the case drain pressure, the longer the life of the shaft seal. The maximum permissible housing pressure is

$$p_{max} = 72.5 \text{ psi } (5 \text{ bar})$$

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.



¹⁾ Please consult us.

FLUSHING CIRCUIT
(MONO-DIRECTIONAL ROTATION)

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 mm²/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.

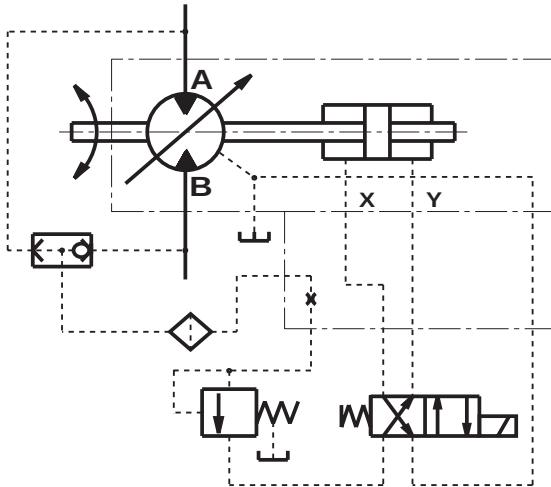
FLOW

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

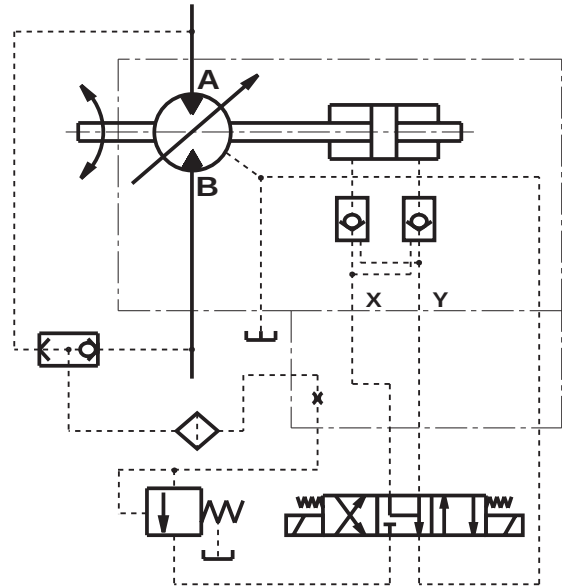
INTERNAL PILOTING

In order to change the motor displacement, see operating diagram for requested minimum pressure.
 X= MIN. DISPLACEMENT
 Y= MAX DISPLACEMENT

Internal piloting Two displacement valve feded by motor pressure



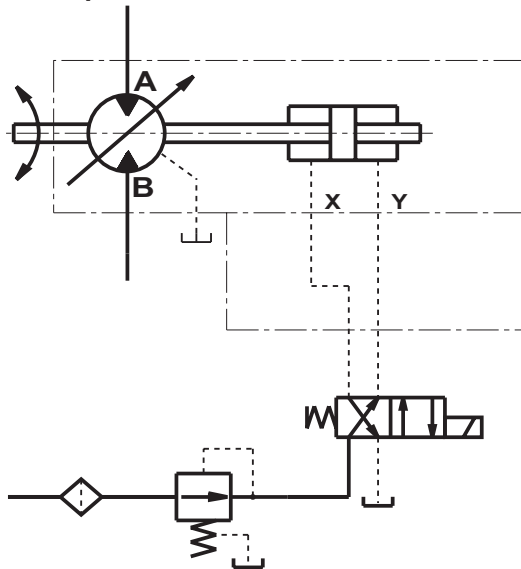
Internal piloting Solenoid operated displacement control valve feded by motor pressure



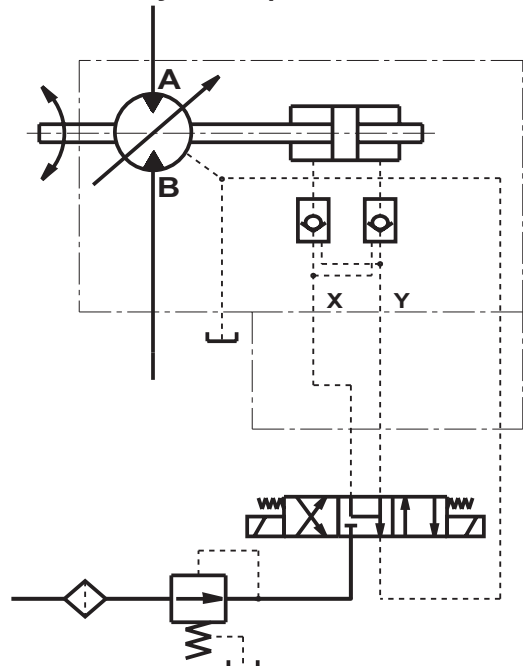
EXTERNAL PILOTING

External piloting pressure requested is 160 bars.
 X= MIN. DISPLACEMENT
 Y= MAX DISPLACEMENT

External piloting Two displacement valve feded by motor pressure



External piloting Solenoid operated displacement control valve feded by motor pressure



OPERATING DIAGRAM

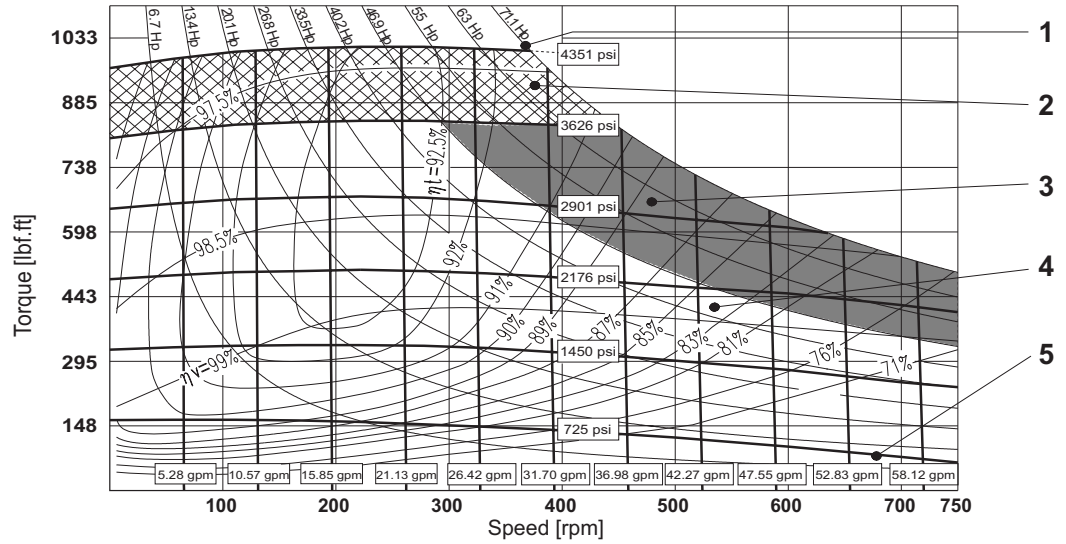
(average values) measured at $n = 167 \text{ SUS (36 mm}^2\text{/s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

MRD 300

set to

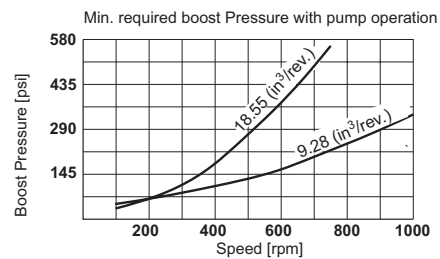
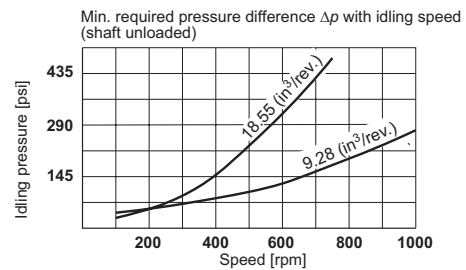
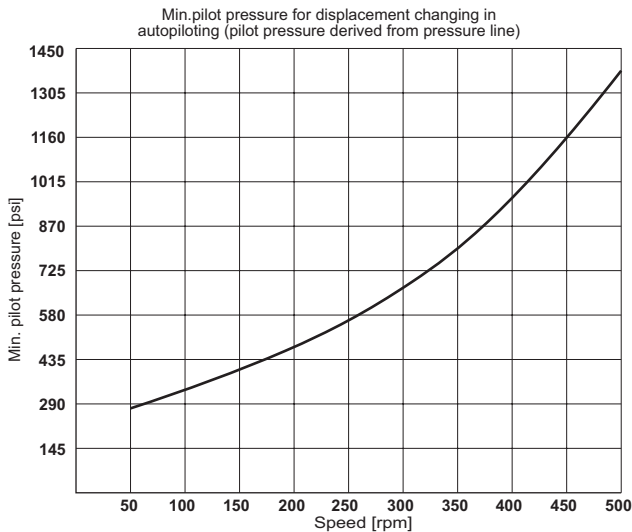
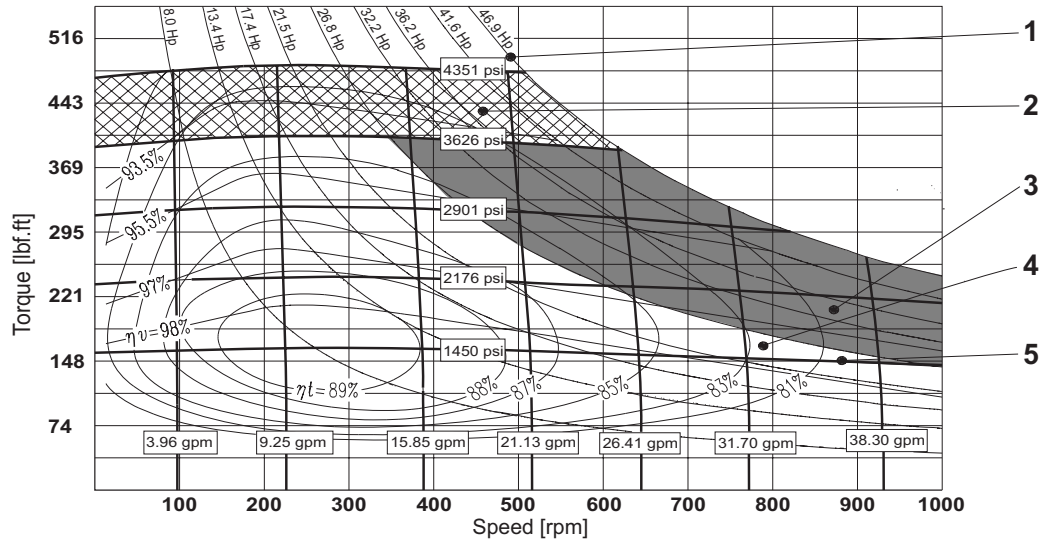
18.55 in³



MRD 300

set to

9.28 in³



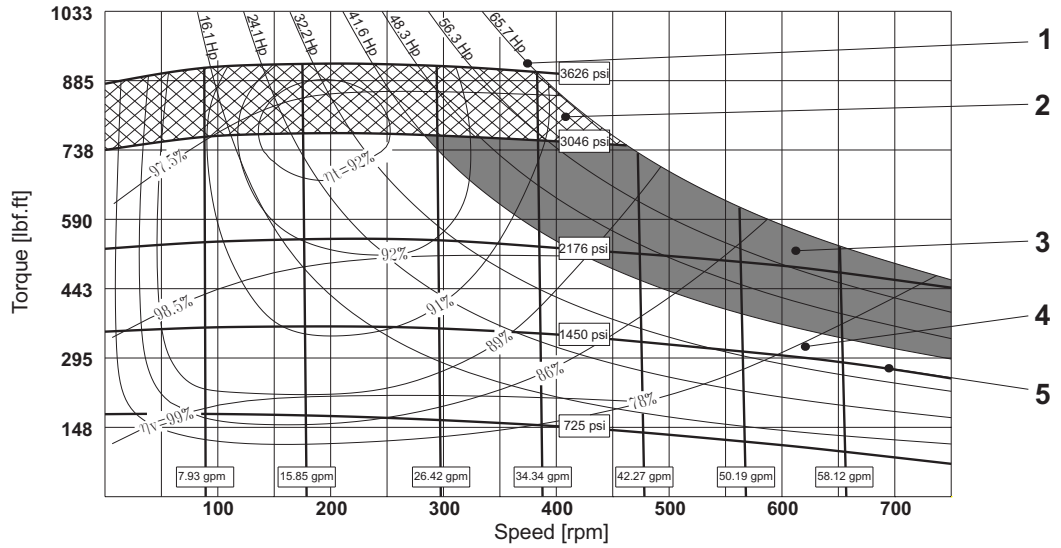
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2/\text{s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

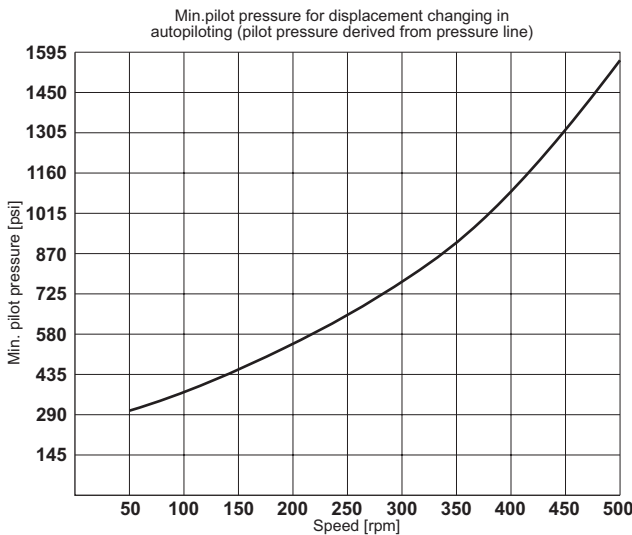
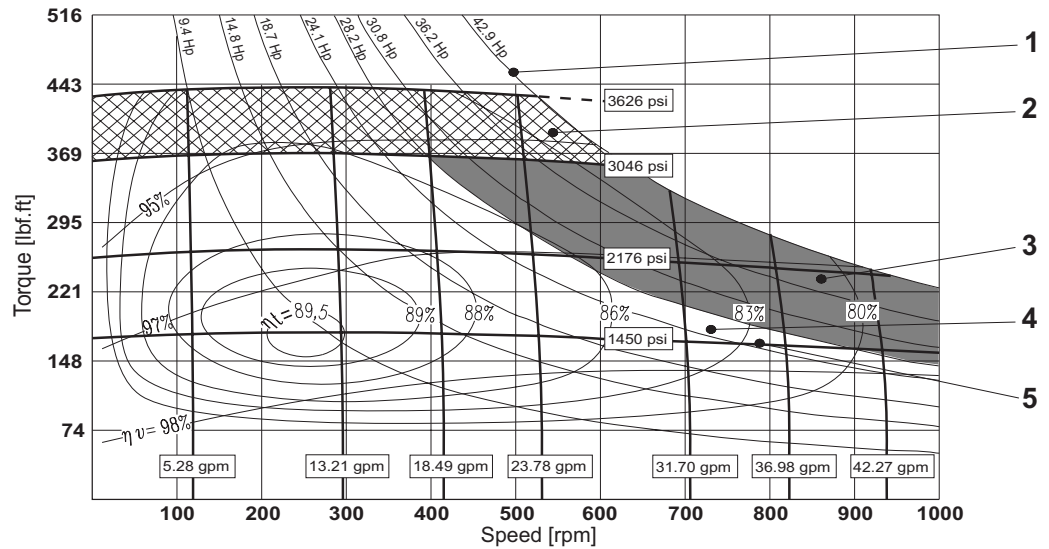
MRDE 330

set to
20.26 in³

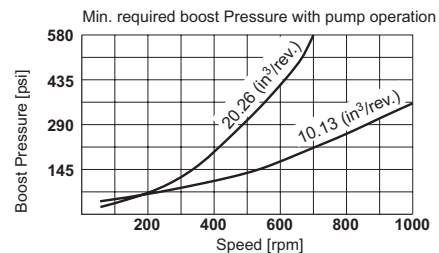
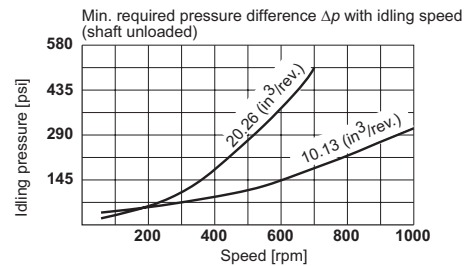


MRDE 330

set to
10.13 in³



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



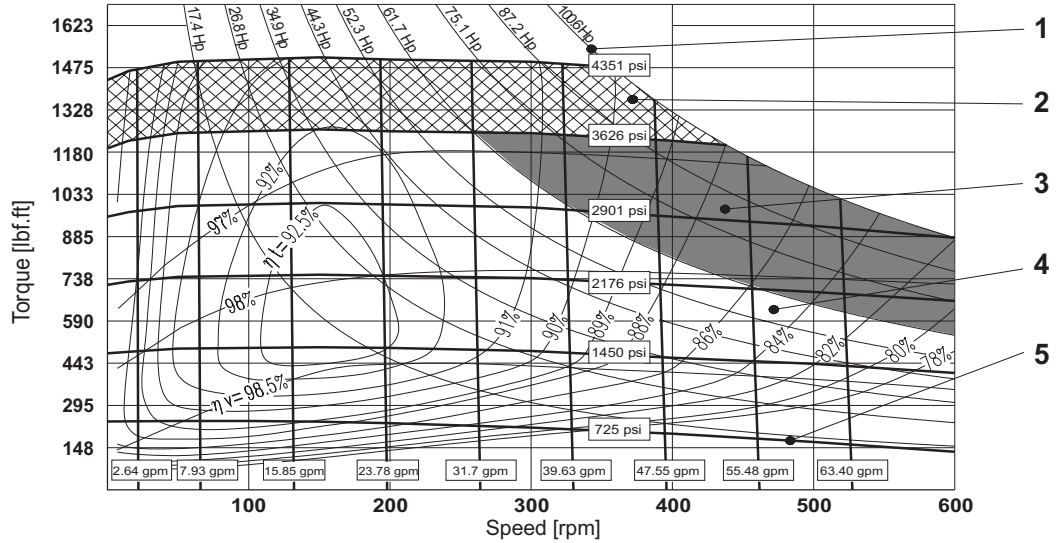
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2\text{/s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

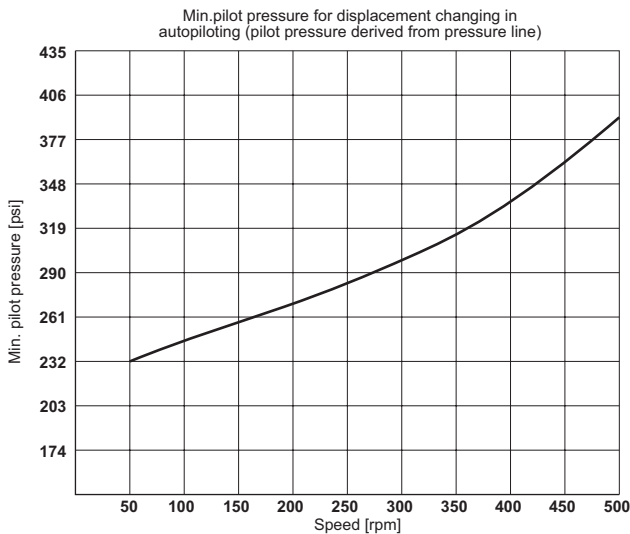
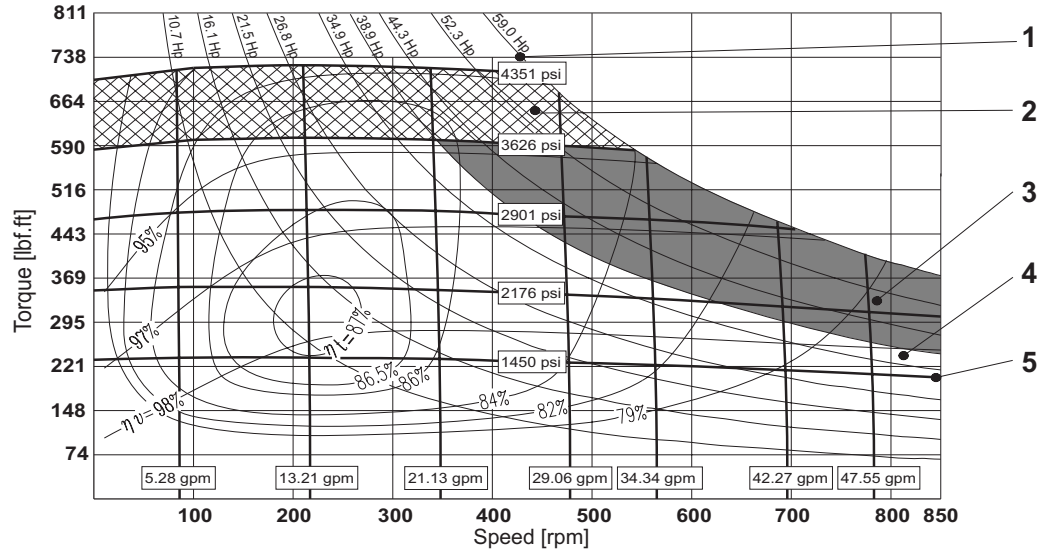
MRD 450

set to
27.58 in³

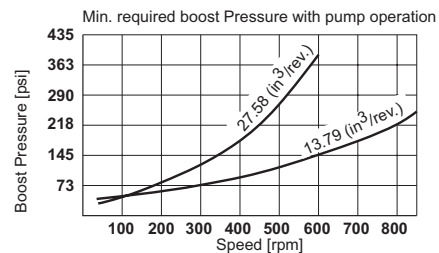
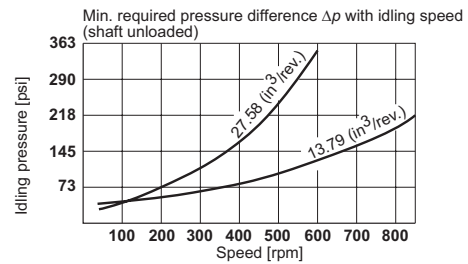


MRD 450

set to
13.79 in³



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



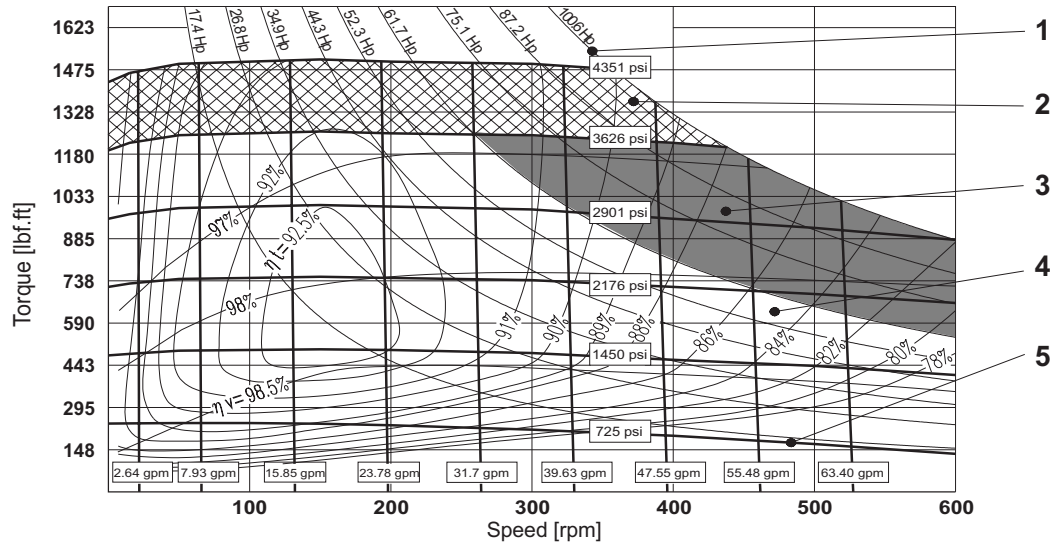
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2/\text{s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

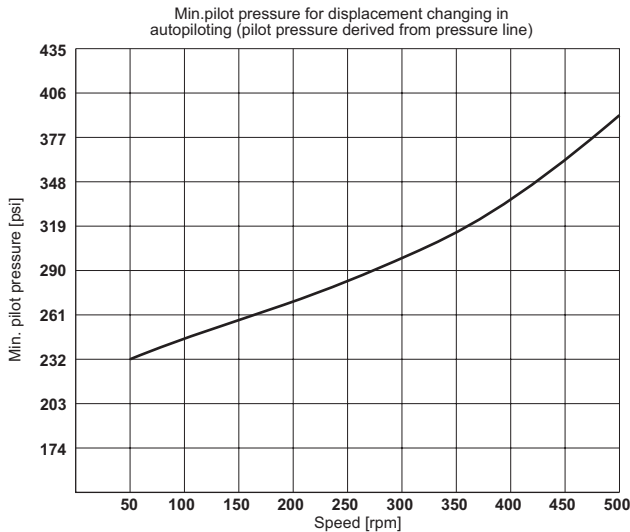
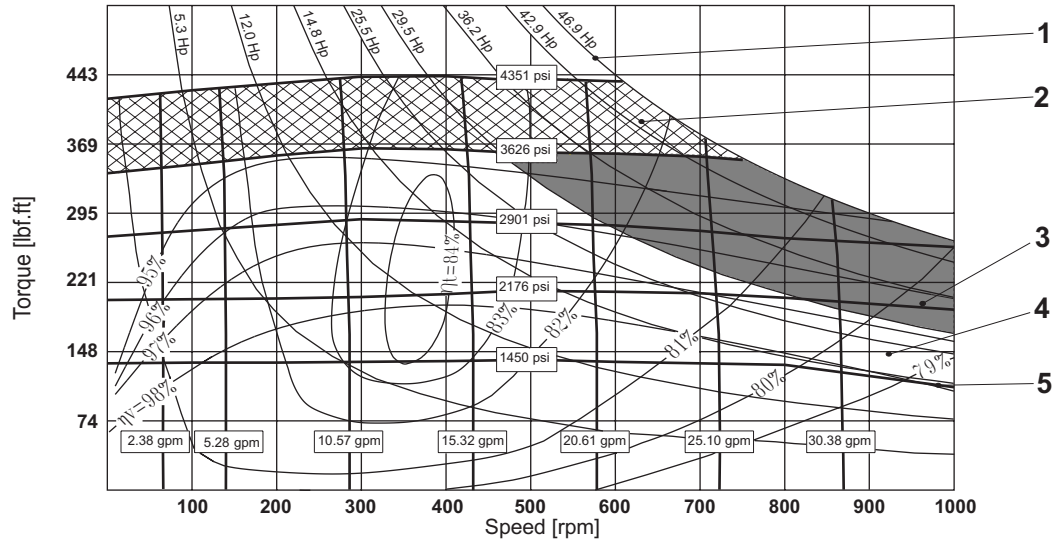
MRV 450

set to
27.58 in³

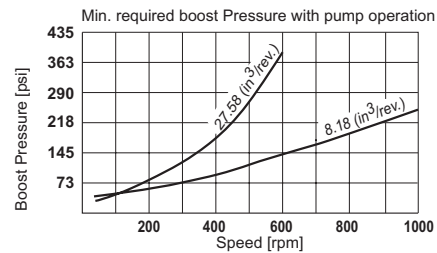
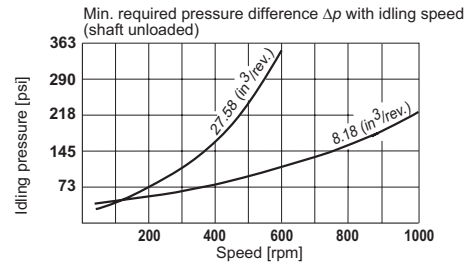


MRV 450

set to
8.18 in³



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



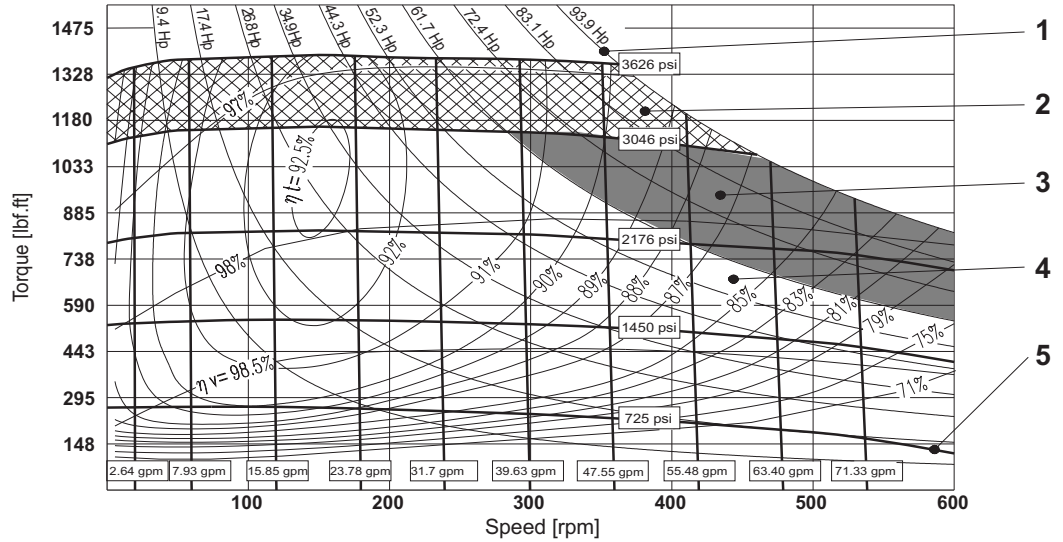
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2/\text{s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

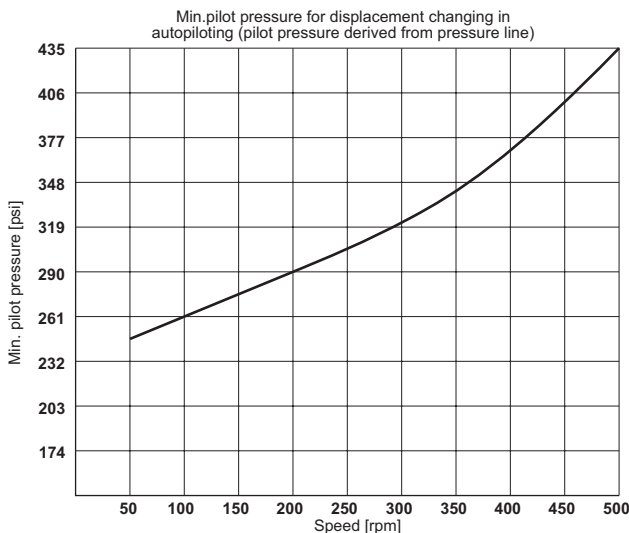
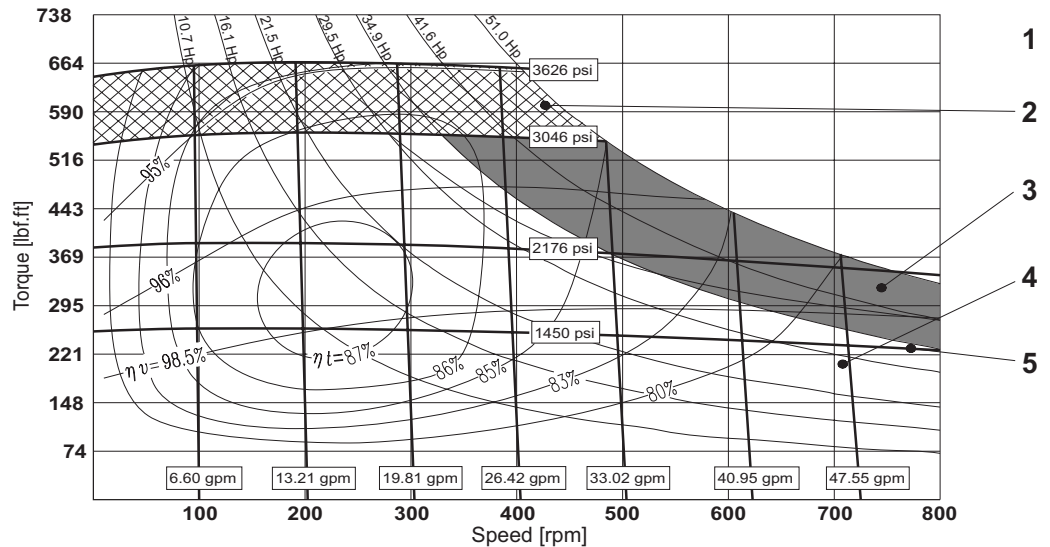
MRDE 500

set to
30.39 in³

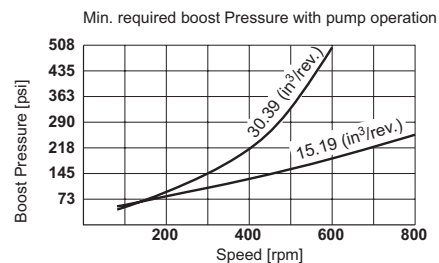
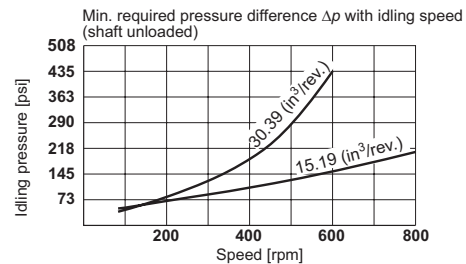


MRDE 500

set to
15.19 in³



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



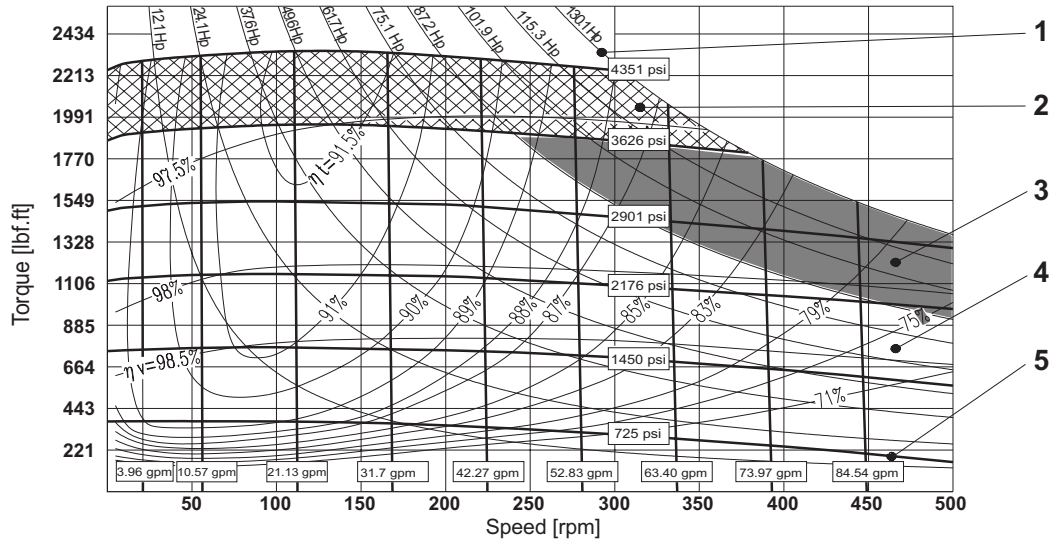
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2\text{/s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

MRD 700
MRV 700

set to
43.14 in³



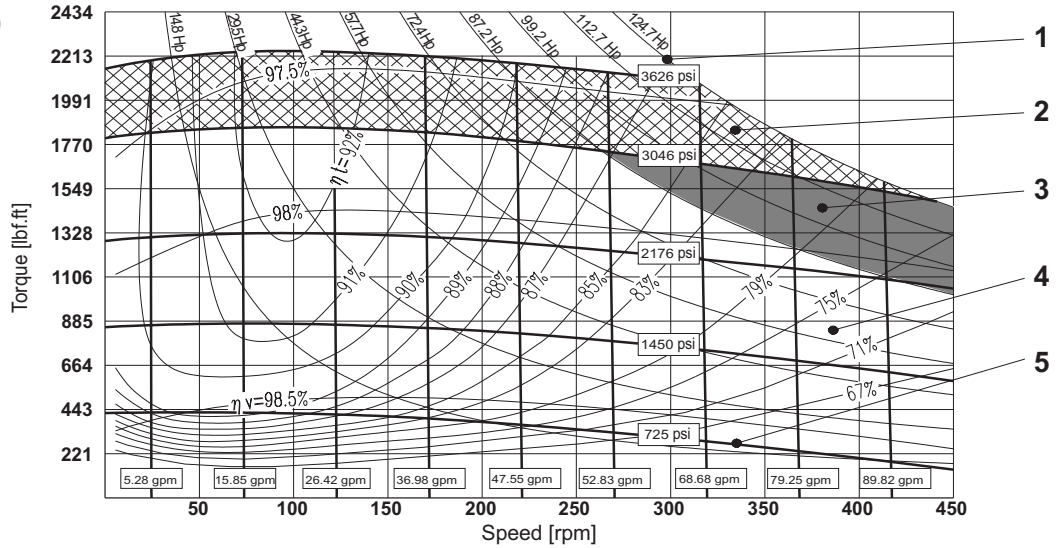
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2/\text{s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

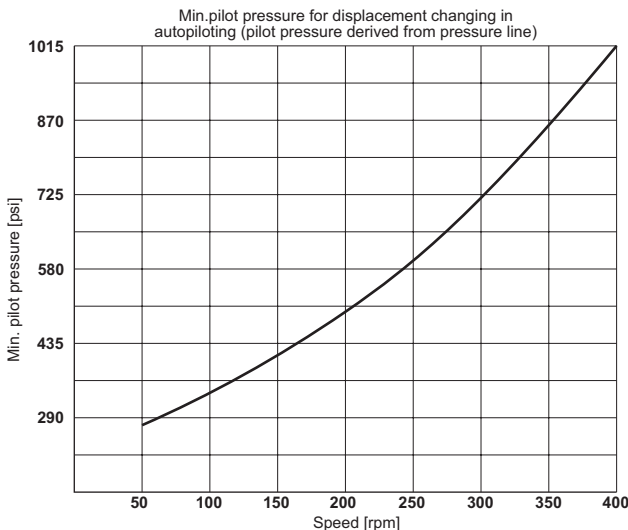
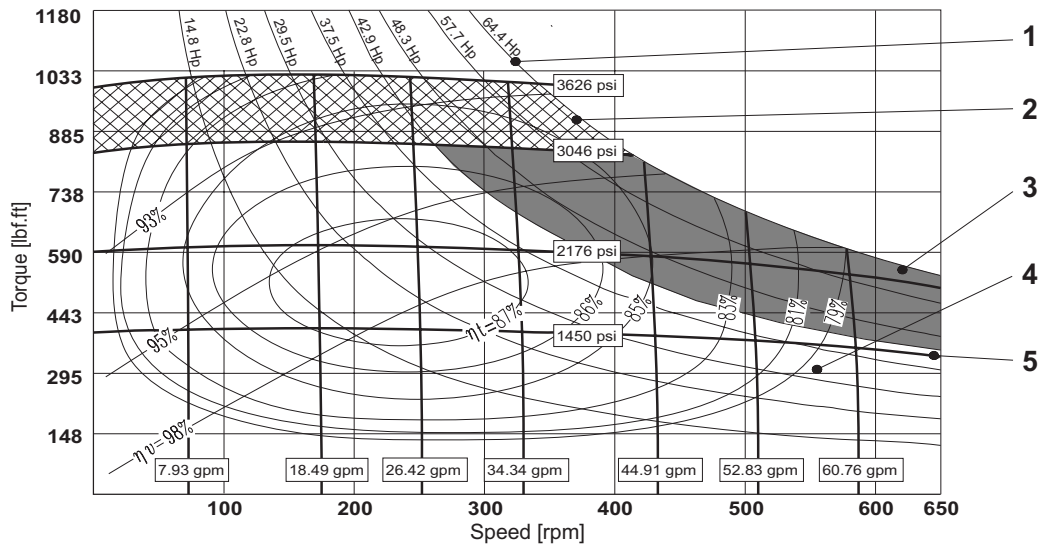
MRDE 800
MRVE 800

set to
49.06 in³

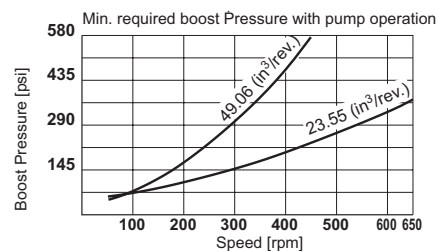
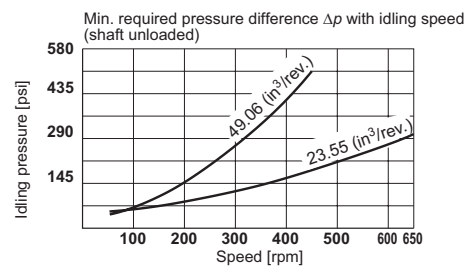


MRDE 800
MRVE 800

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



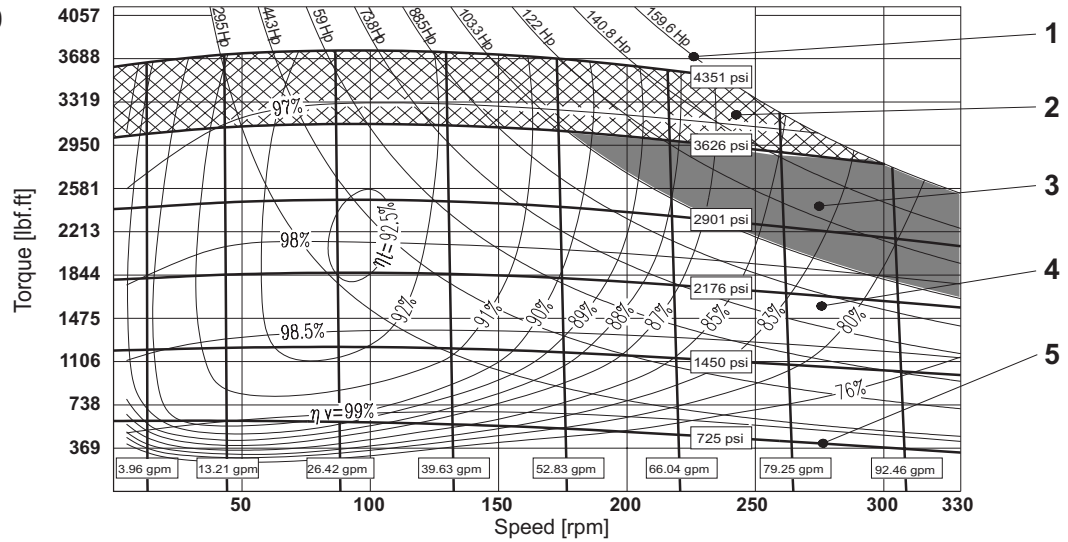
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2\text{/s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

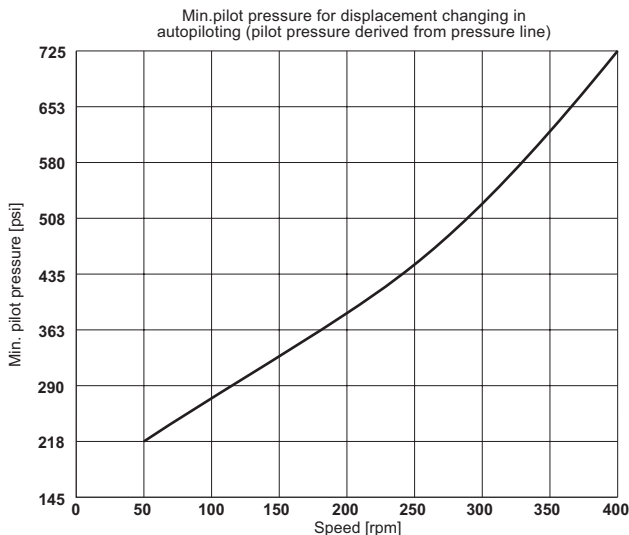
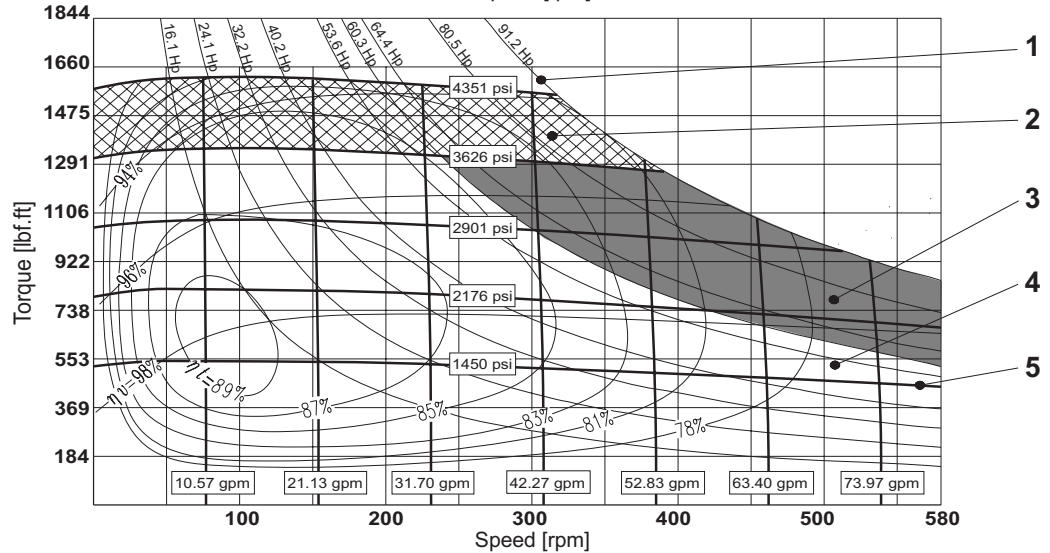
MRD 1100
MRV 1100

set to
68.71 in³

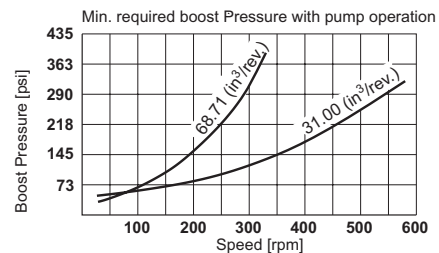
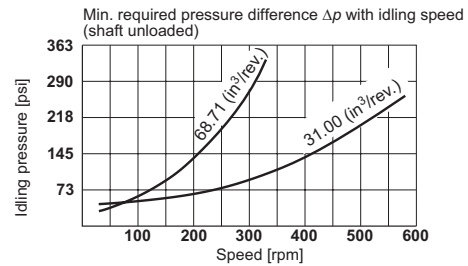


MRD 1100
MRV 1100

set to
31.00 in³



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



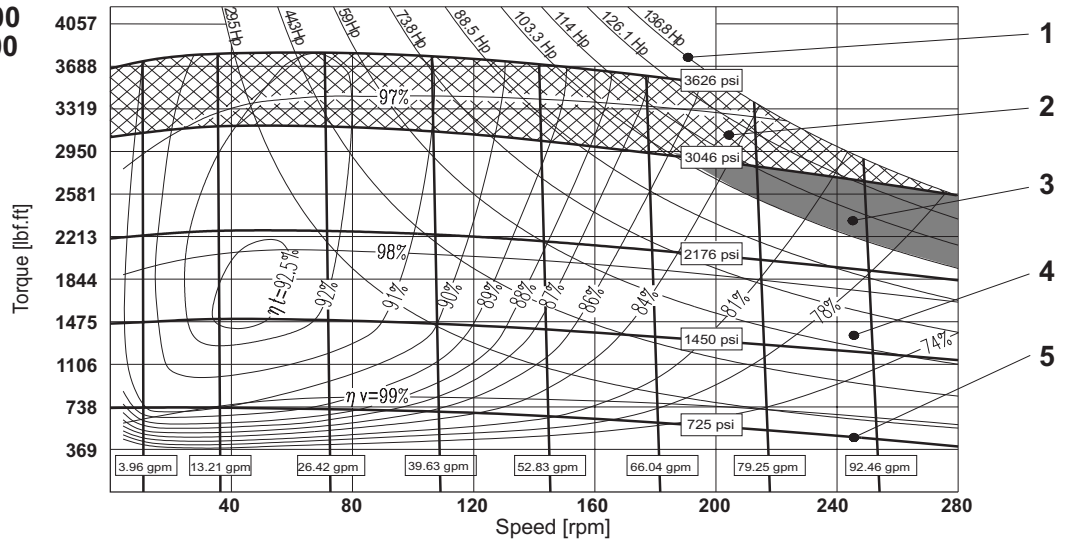
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2\text{/s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
 - 2 Intermittent operating area
 - 3 Continuous operating area with flushing
 - 4 Continuous operating area
 - 5 Inlet pressure
- ht Total efficiency hv Volumetric efficiency

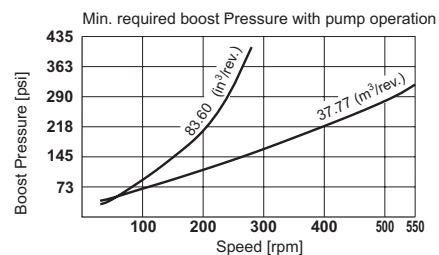
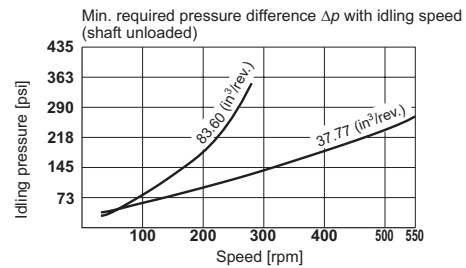
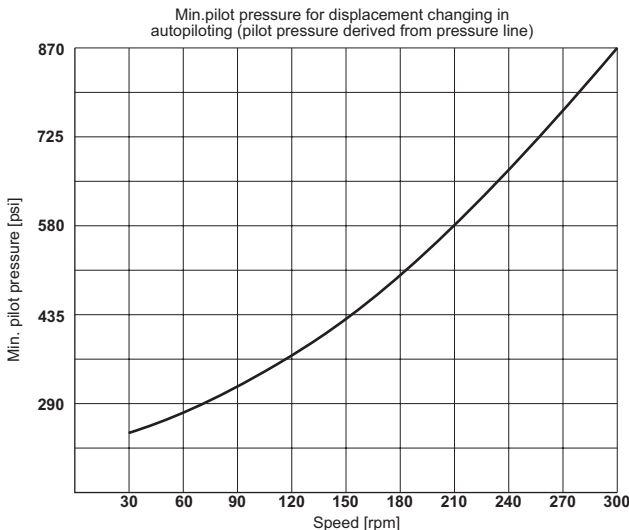
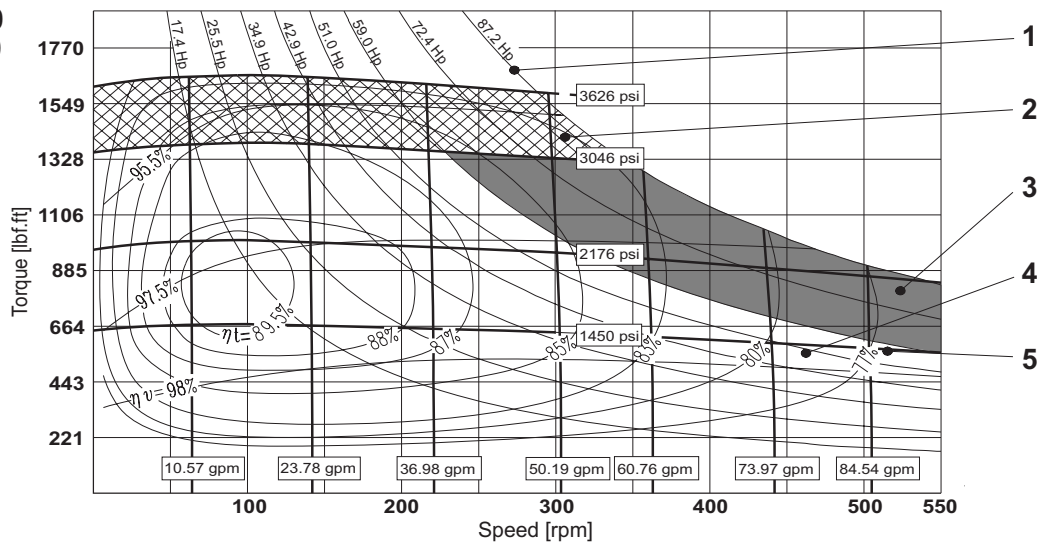
MRDE 1400
MRVE 1400

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

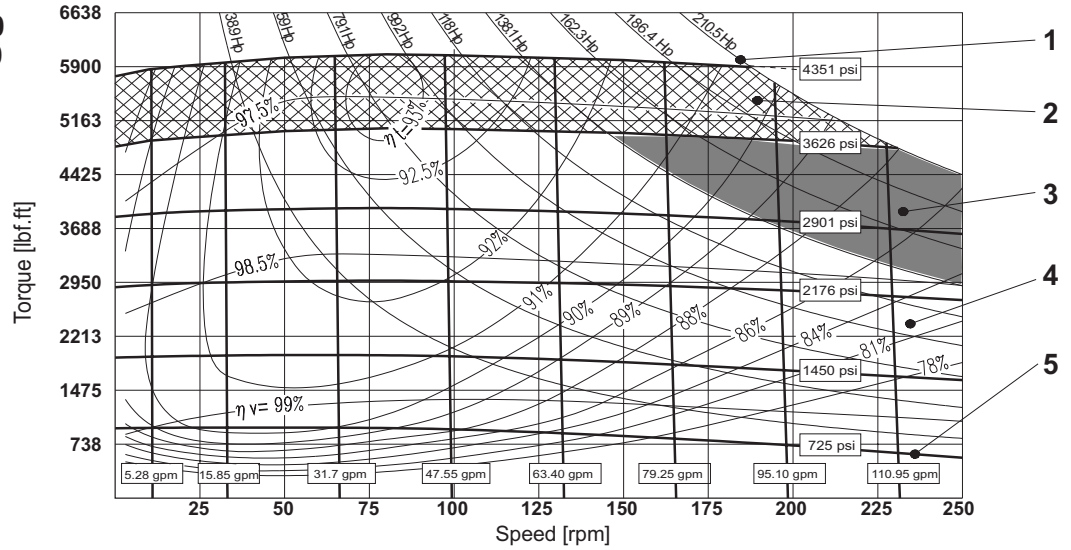
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2\text{/s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

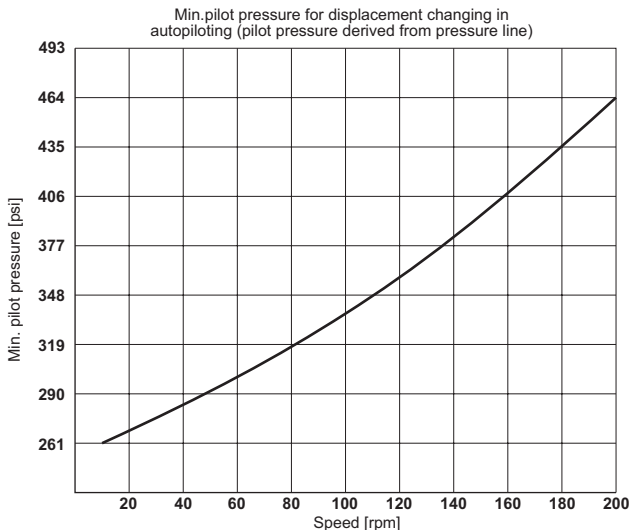
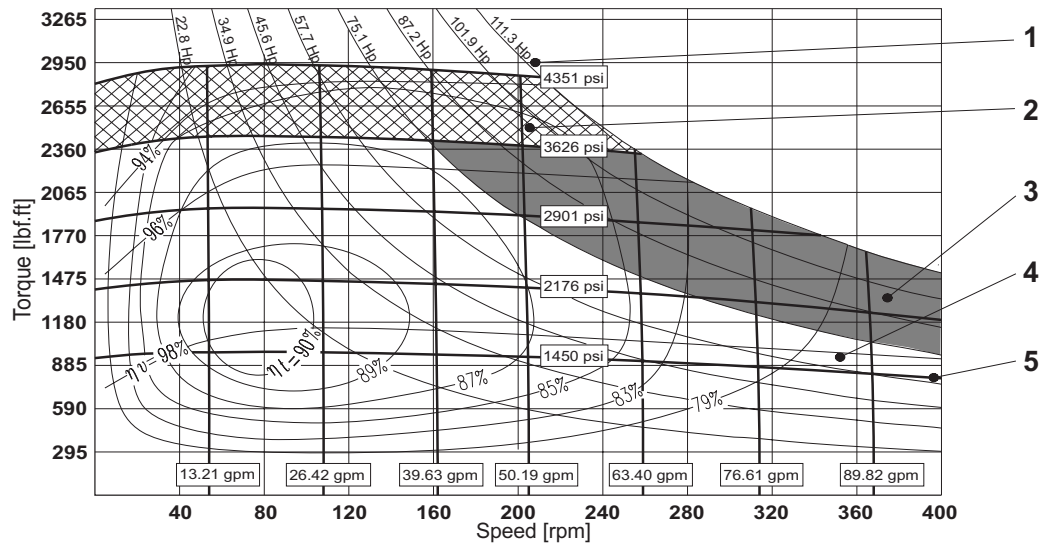
MRD 1800
MRV 1800

set to
110.45 in³

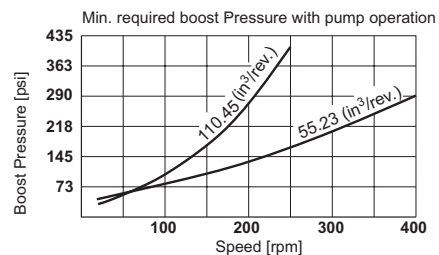
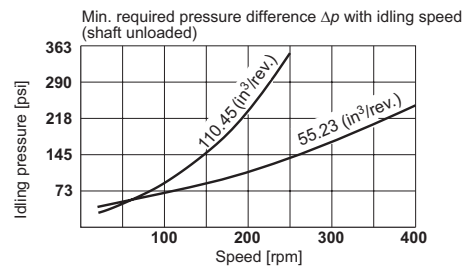


MRD 1800
MRV 1800

set to
55.23 in³



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



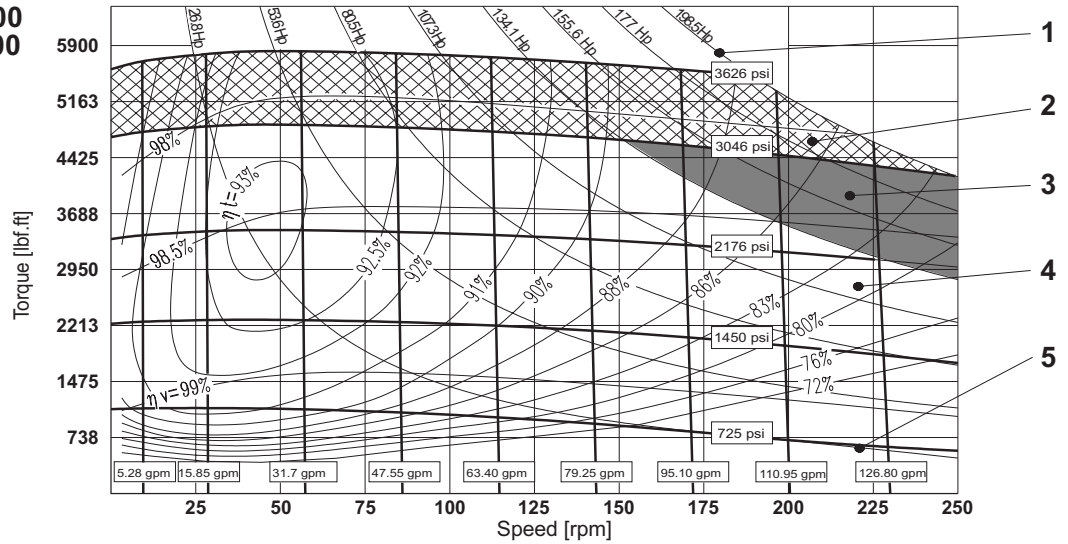
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2\text{/s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

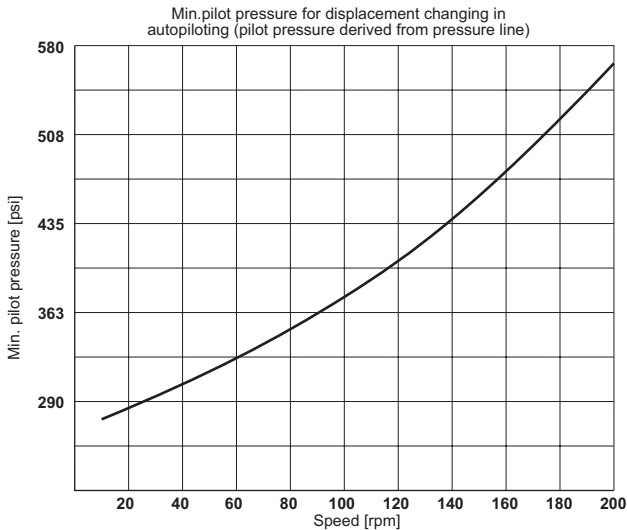
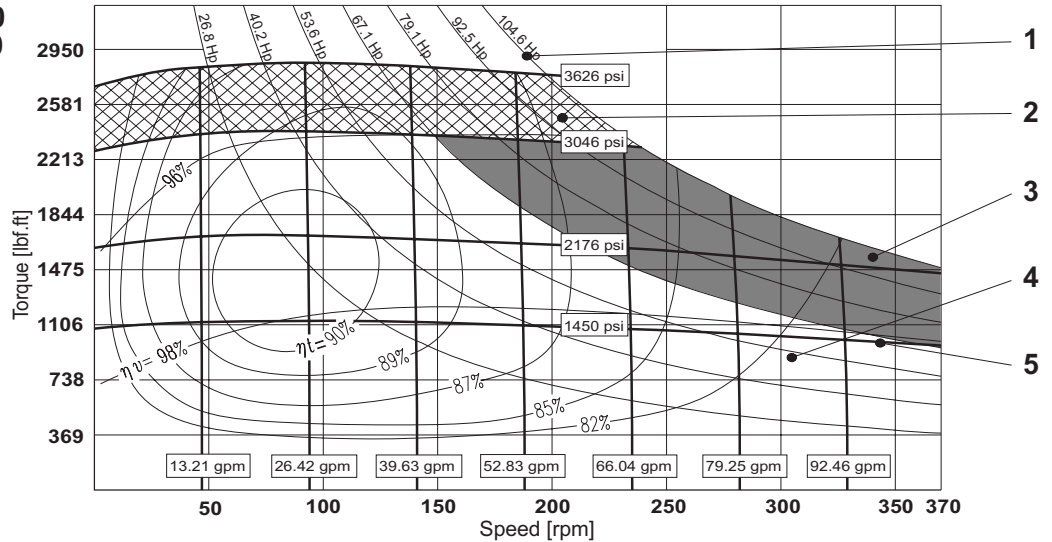
MRDE 2100
MRVE 2100

set to
127.60 in³

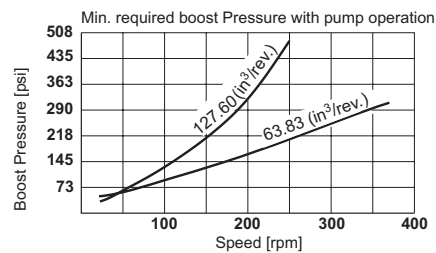
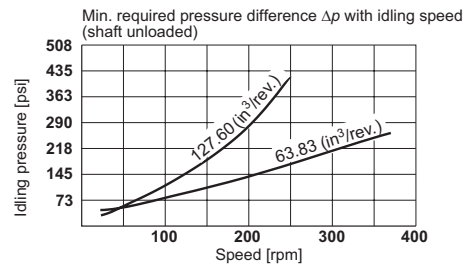


MRDE 2100
MRVE 2100

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



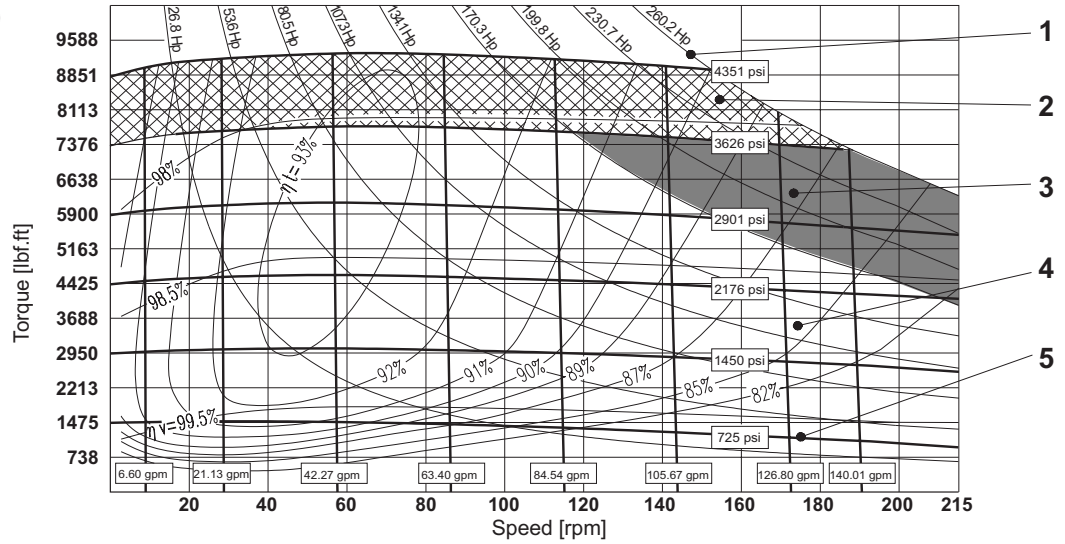
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2/\text{s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

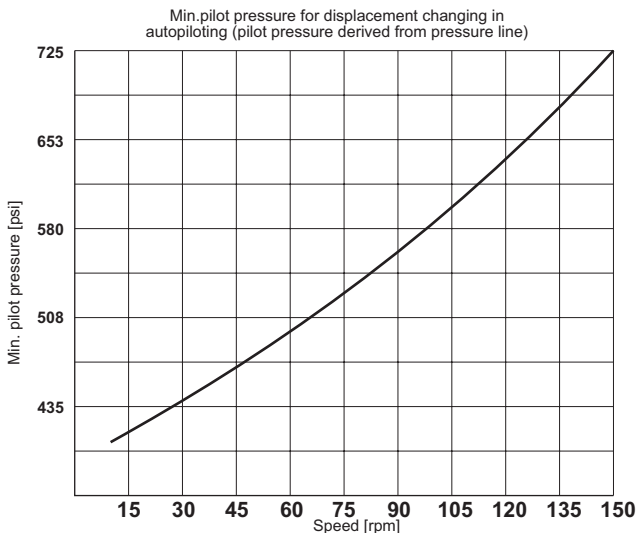
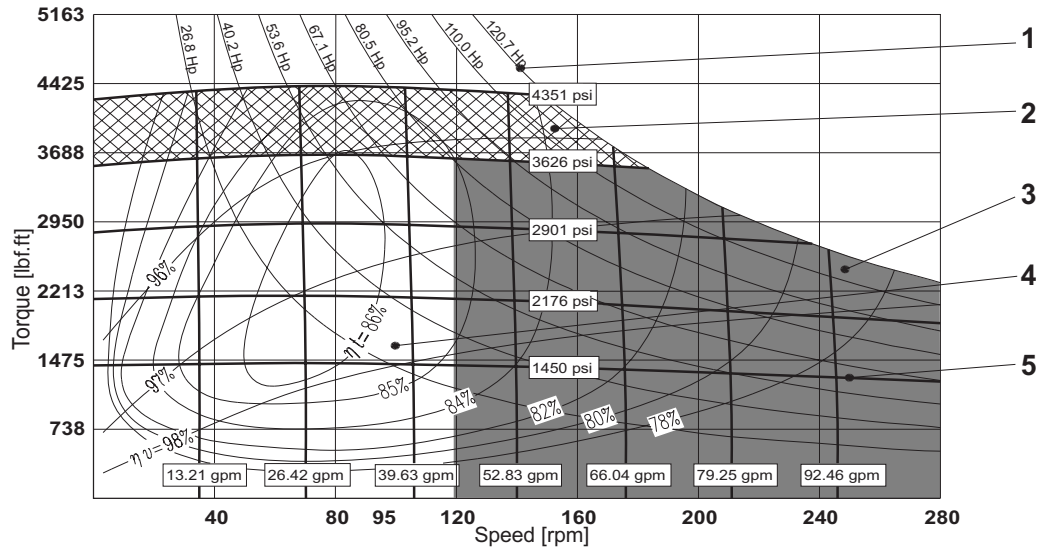
MRD 2800
MRV 2800

set to
170.38 in³

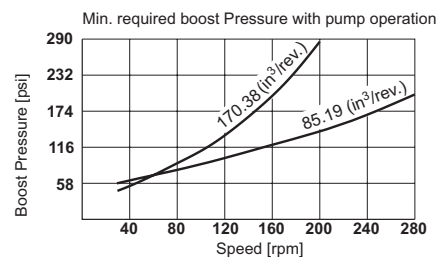
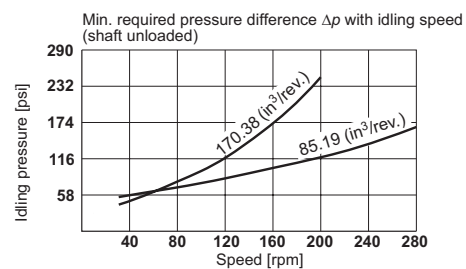


MRD 2800
MRV 2800

set to
85.19 in³



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



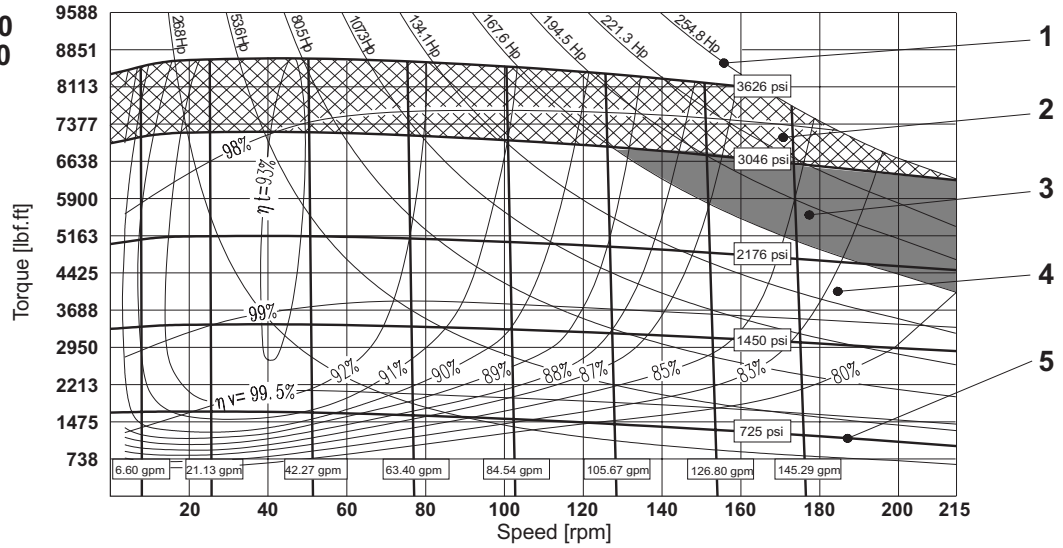
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2\text{/s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

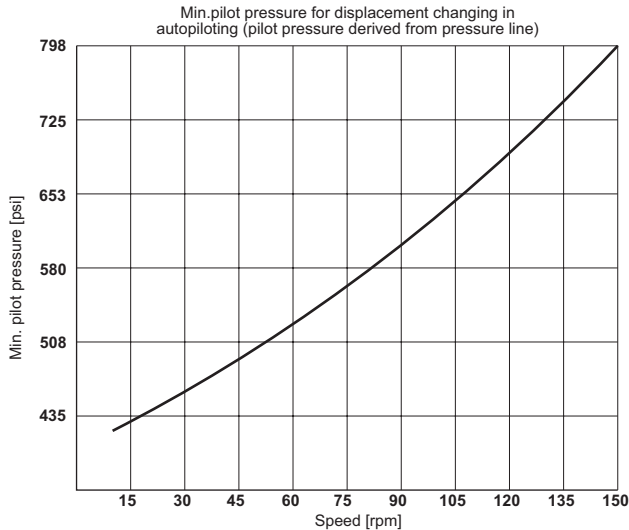
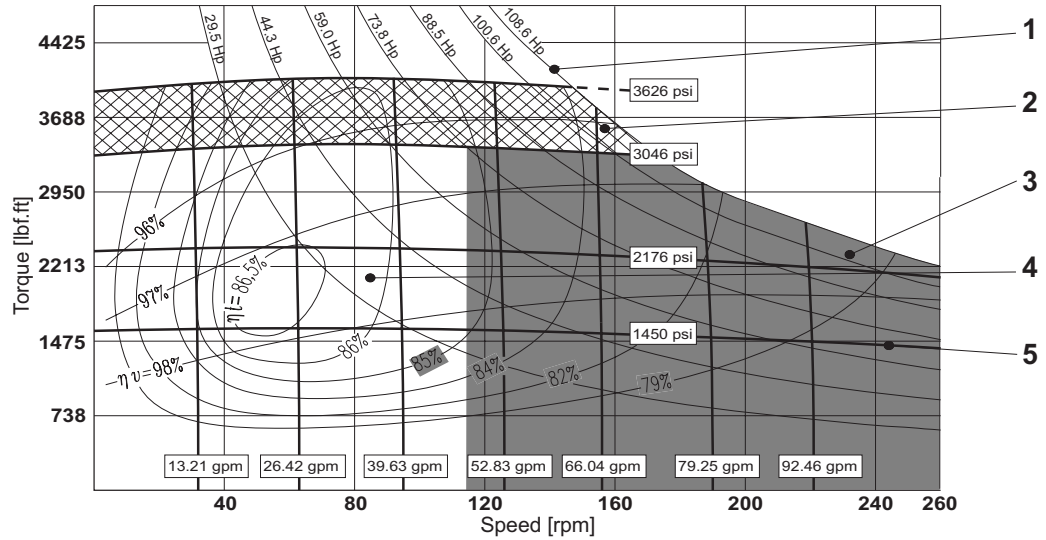
MRDE 3100
MRVE 3100

set to
189.42 in³

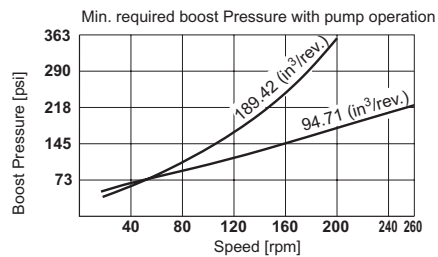
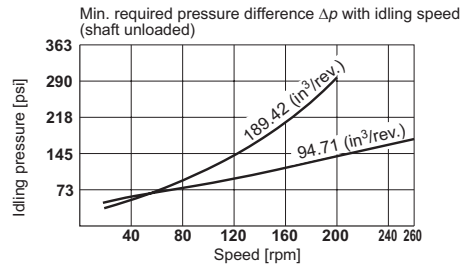


MRDE 3100
MRVE 3100

set to
94.71 in³



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



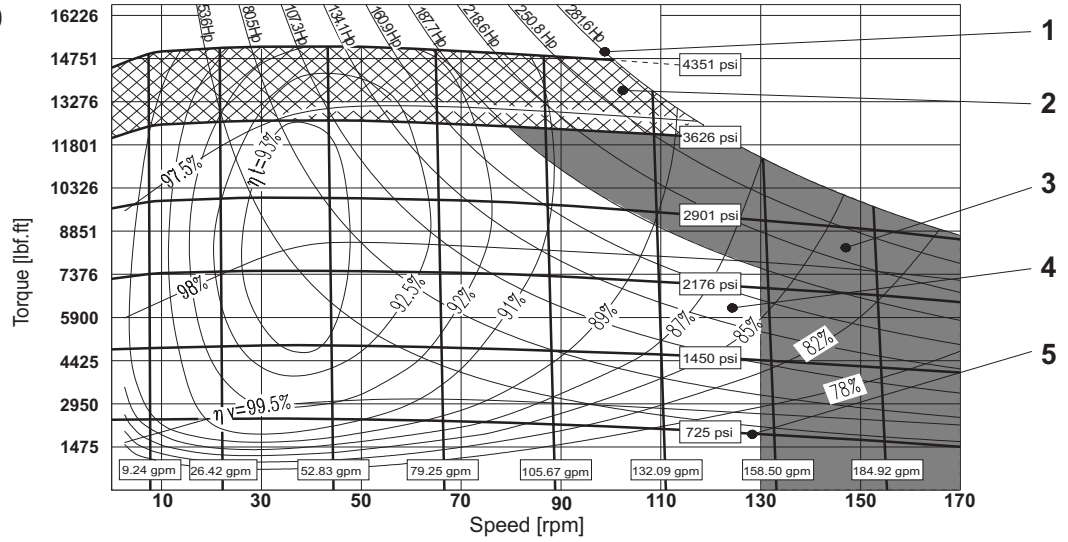
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2/\text{s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

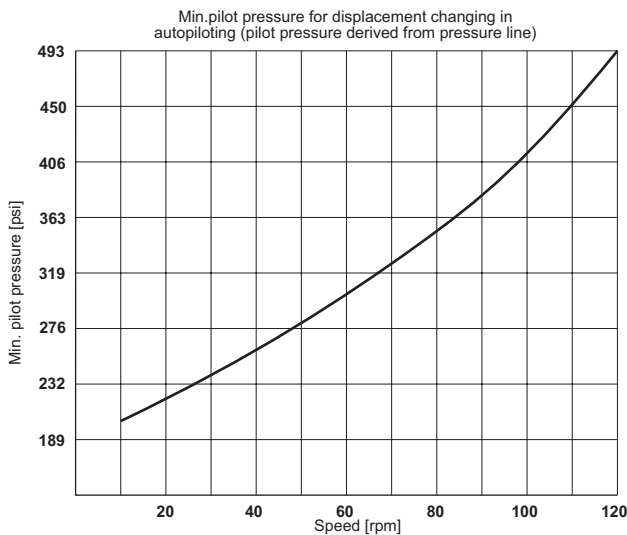
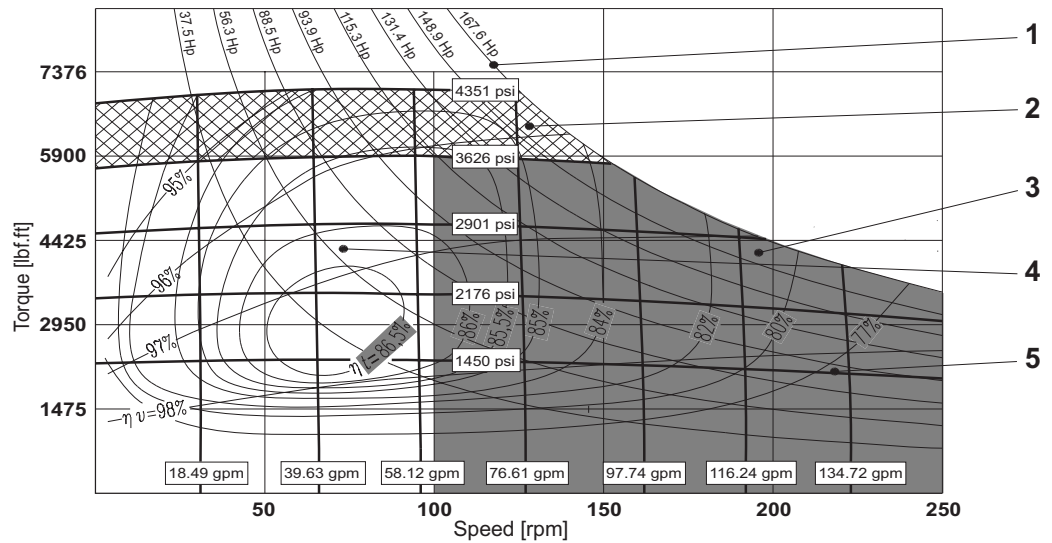
MRD 4500
MRV 4500

set to
274.73 in³

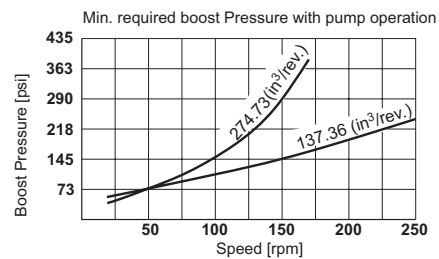
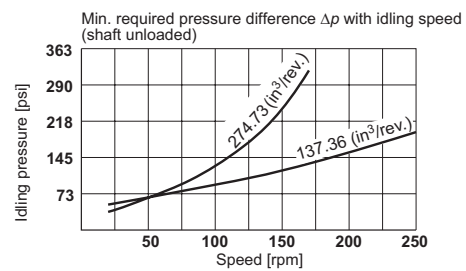


MRD 4500
MRV 4500

set to
137.36 in³



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



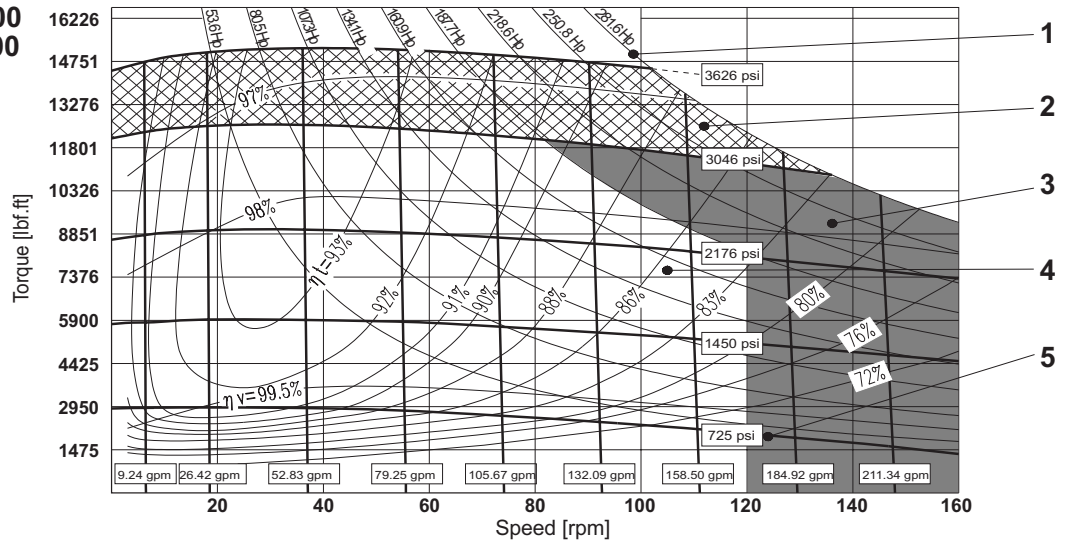
OPERATING DIAGRAM

(average values) measured at $n = 167 \text{ SUS (36 mm}^2\text{/s)}$; $t = 113^\circ \text{ F (45}^\circ \text{ C)}$; $p_{\text{outlet}} = 0 \text{ psi (0 bar)}$

- 1 Output power
- 2 Intermittent operating area
- 3 Continuous operating area with flushing
- 4 Continuous operating area
- 5 Inlet pressure
- ht Total efficiency
- hv Volumetric efficiency

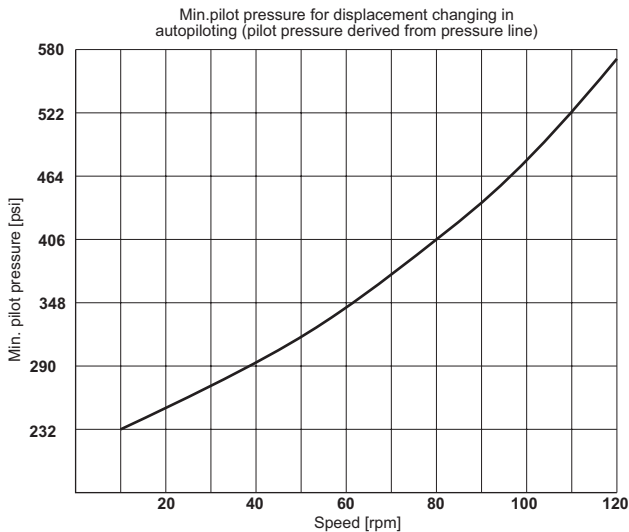
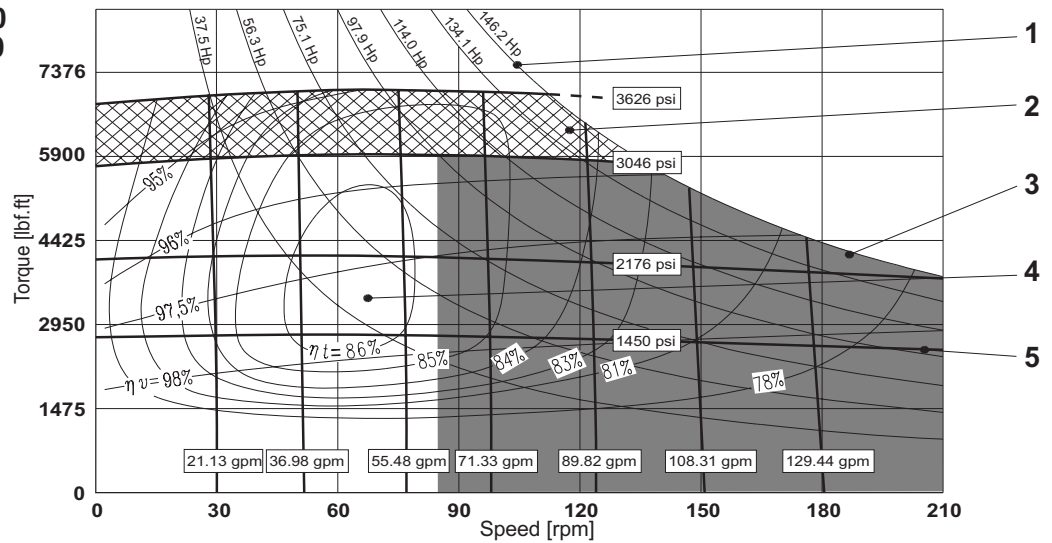
MRDE 5400
MRVE 5400

set to
329.59 in³

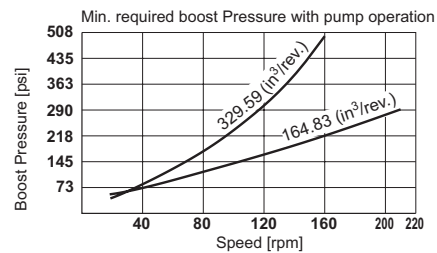
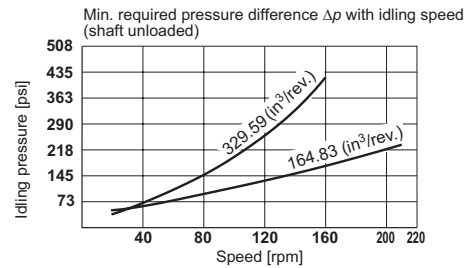


MRDE 5400
MRVE 5400

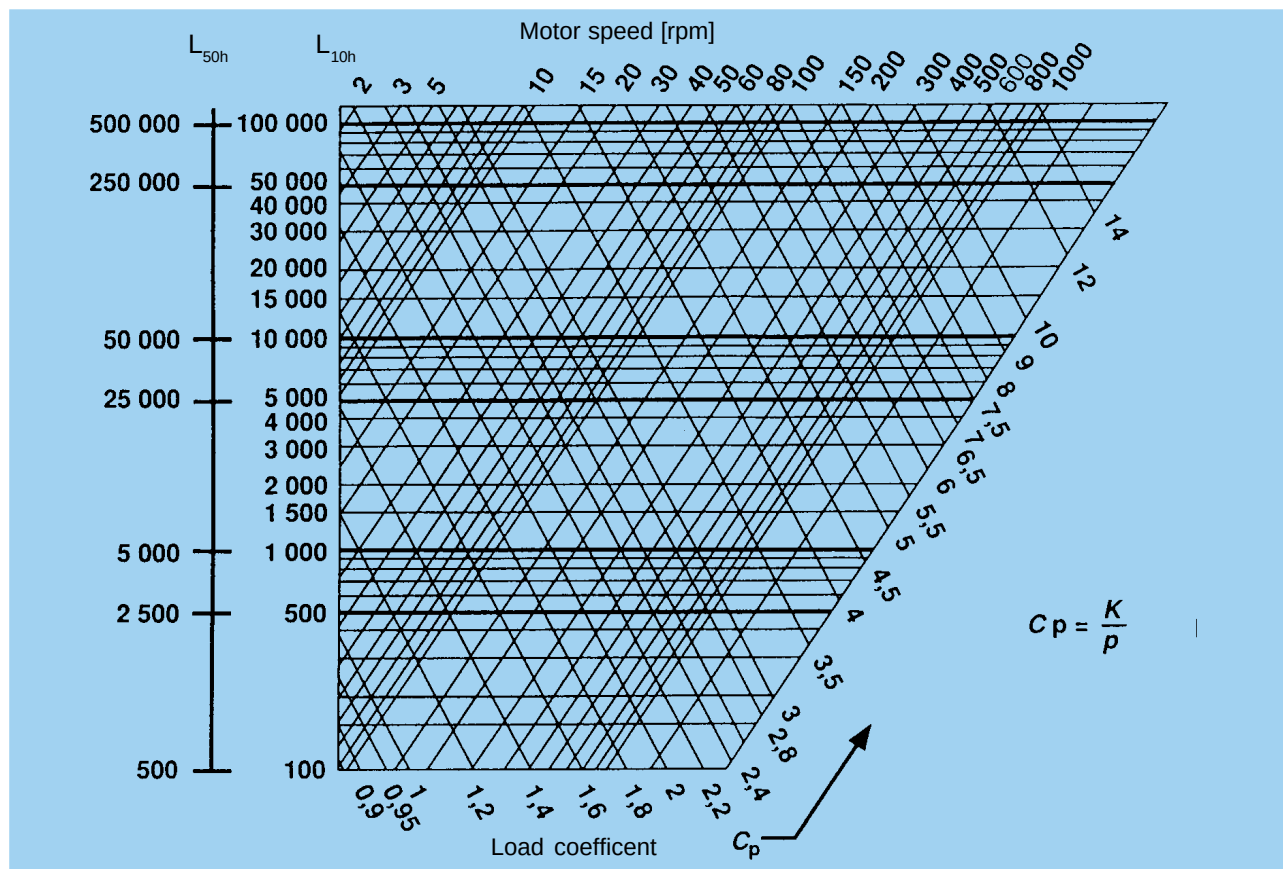
set to
164.83 in³



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



BEARING LIFE

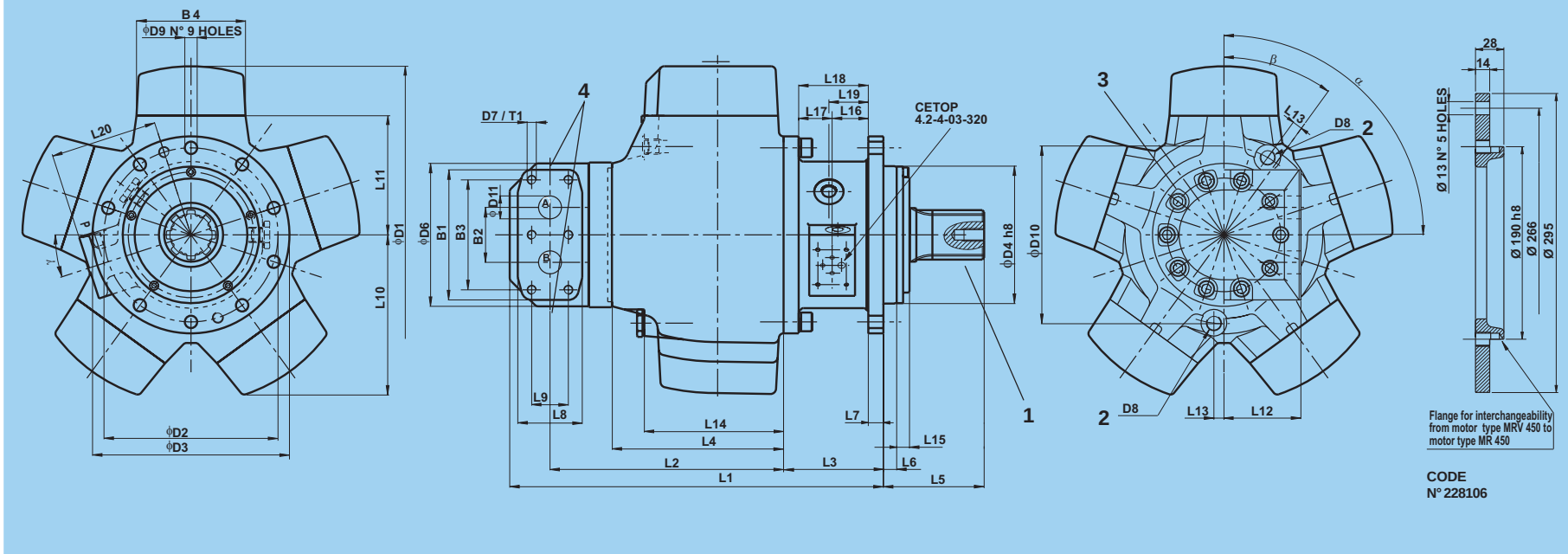


C_p = Load coefficient
 K = Service life coefficient for standard bearing
 p = operating pressure in bar

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} .

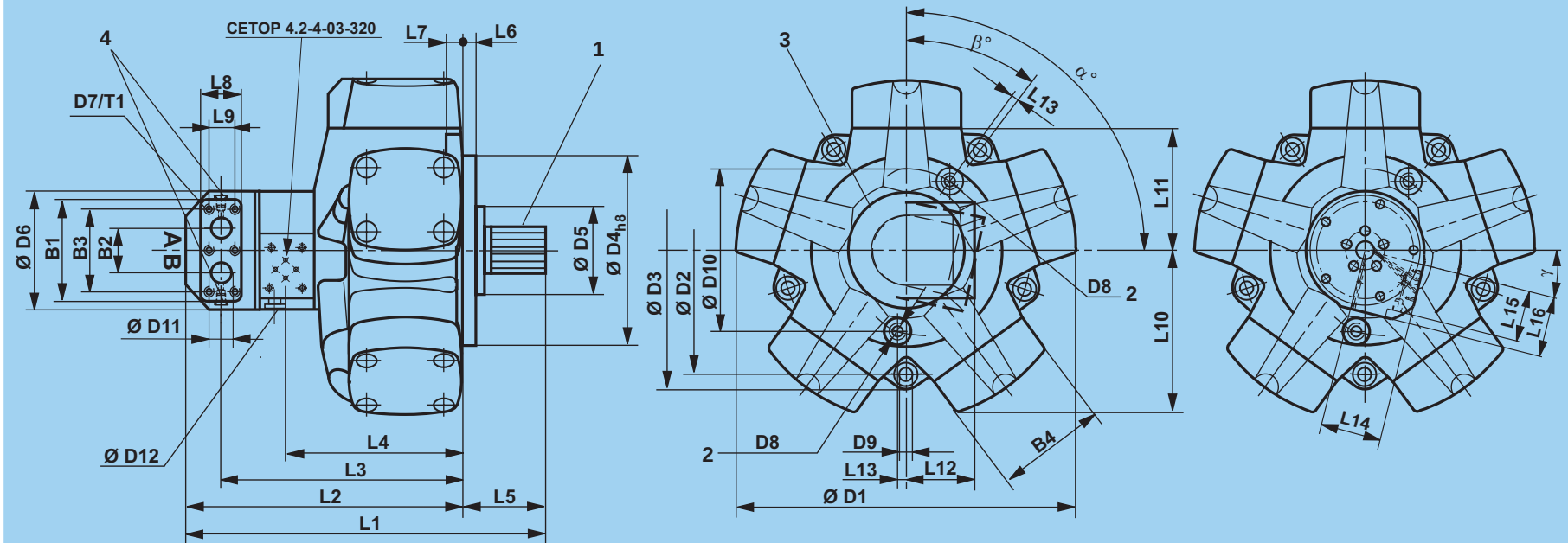
MOTOR TYPE	K	MOTOR TYPE	K	MOTOR TYPE	K
MRD 300	950	MRDE 1400	693	MRV 4500	709
MRDE 330	850	MRVE 1400	693	MRDE 5400	591
MRD 450	1126	MRD 1800	835	MRVE 5400	591
MRV 450	1126	MRV 1800	835		
MRDE 500	1021	MRDE 2100	722		
MRD 700	920	MRVE 2100	722		
MRV 700	920	MRD 2800	924		
MRDE 800	808	MRV 2800	924		
MRVE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



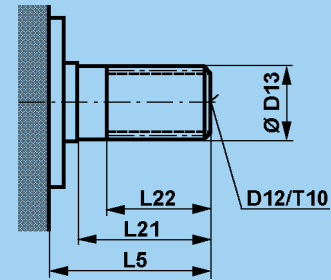
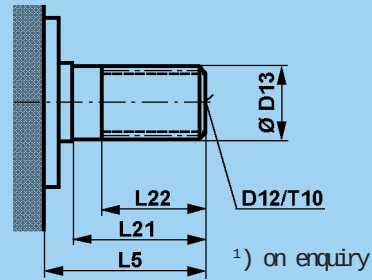
- 1 Splined shaft with flank contact
(for dimension see page 30)
Ordering code "N1"
(for further shaft ends see page 30 - 31)
- 2 Case drain port
BSP threads to ISO 228/1
- 3 On request the port flange can be rotated by 72°
(For MRD 300, MRDE 330, MRD 450, MRDE 500, MRD 700, MRDE 800 can be rotated by 36°)
For standard position see angle 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	"S"
clockwise	B	"S"
anti-clockwise	A	"N"

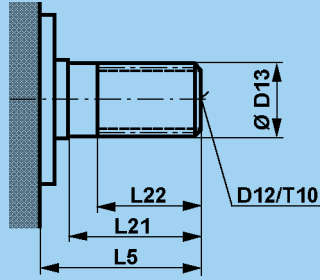
MOTOR TYPE	L1	L2	L3	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	L14	L15	L16
MRD 300 MRDE 330	14.29	11.10	9.61	6.81	3.19	0.59	0.63	2.13	1.34	6.04	4.69	2.83	0.30	2.76	2.56	2.56
MRD 450 MRDE 500	16.77	12.95	11.22	7.95	3.82	0.59	0.71	2.77	1.57	6.87	5.12	3.31	0.37	3.11	2.76	3.07
MRD 700 MRDE 800 MRV 700 MRVE 800	17.72	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,*	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 6.88773 (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, 47	-	8.47	M16	1.26	G 1/2	0.91	14.96	1.50	G 1/4	108°	36°	18°

Code D 1 - DIN 5480

Code B 1 - BS 3550 - ¹⁾

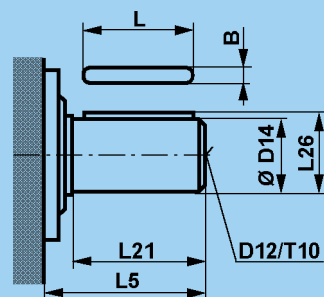
Code N 1 (Standard)



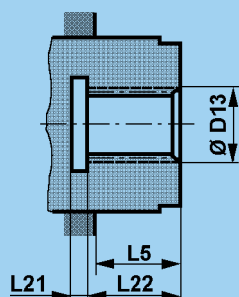
Version	N1						B1						D1					
Type	L5 (in)	L21 (in)	L22 (in)	D12 (mm)	T10 (in)	ØD13 ex DIN 5463 (mm)	L5 (in)	L21 (in)	L22 (in)	D12 (mm)	T10 (in)	ØD13 BS 3550	L5 (in)	L21 (in)	L22 (in)	D12 (mm)	T10 (in)	ØD13 DIN 5480 (mm)
MRD 300 MRDE 330	3.19	2.36	1.81	M12	0.98	B8x42x48	3.19	2.36	1.77	M12	0.98	12/24-21	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, please contact DENISON Calzoni.

Code P 1



Code F 1 - DIN 5480



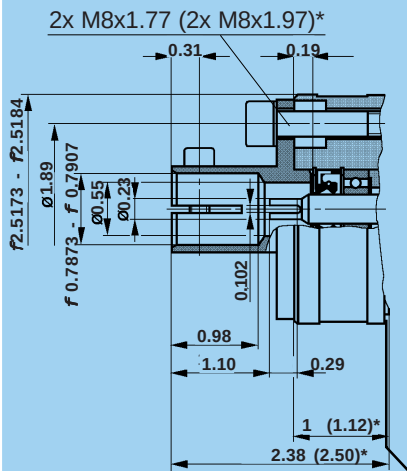
Version	F				P								NOTE For higher values of the torque to be transmitted, please consult DENISON Calzoni
Type	L5 (in)	L21 (in)	L22 (in)	Ø D13 DIN 5480 (mm)	L5 (in)	L21 (in)	L26 (in)	D12 (mm)	T10 (in)	Ø D14 ^{**} (in)	Key (mm) L x B	Transmitted torque (lbf.ft)	
MRD 300 MRDE 330	1.06	0.20	1.42	N40x2x18-9H	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: 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, please contact DENISON Calzoni.

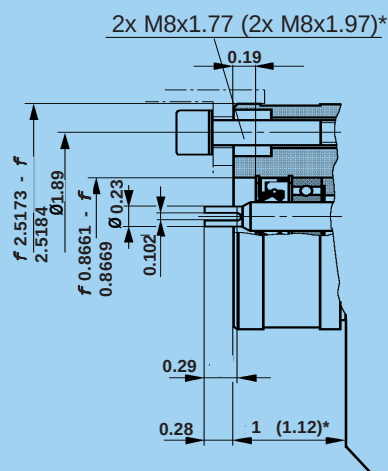
MECHANICAL
TACHOMETER DRIVETACHOGENERATOR
DRIVEENCODER
DRIVE

Dimensions in inch (threaded holes in mm)

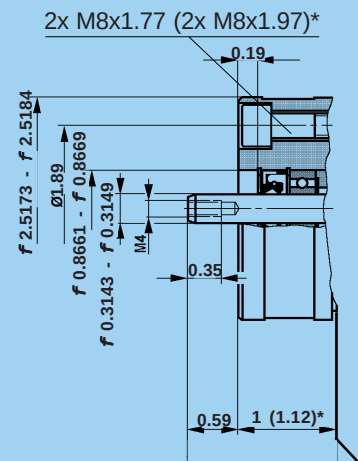
Code "C1"



Code "T1"



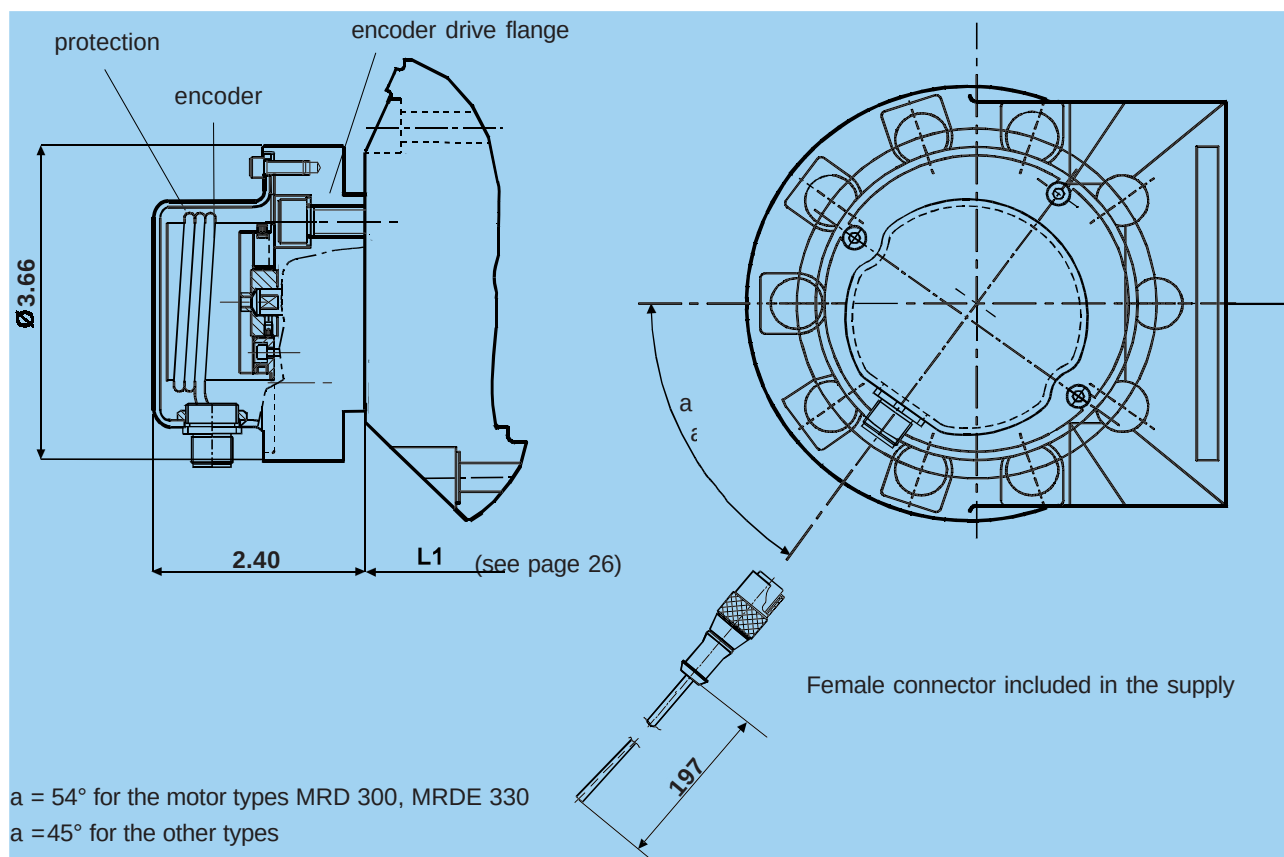
Code "Q1"



() * Motor MRD 300, MRDE 330

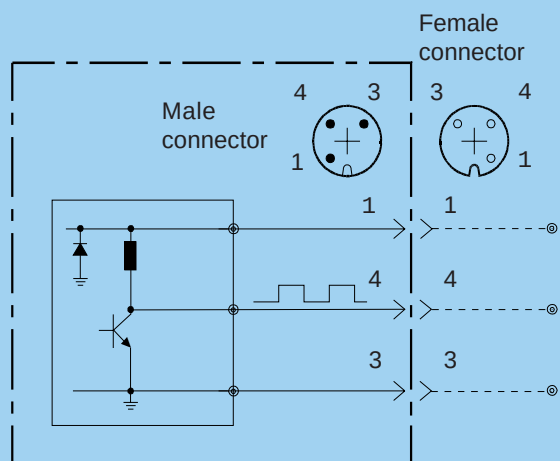
INCREMENTAL ENCODER
DIMENSIONS

Dimensions in inch (in)

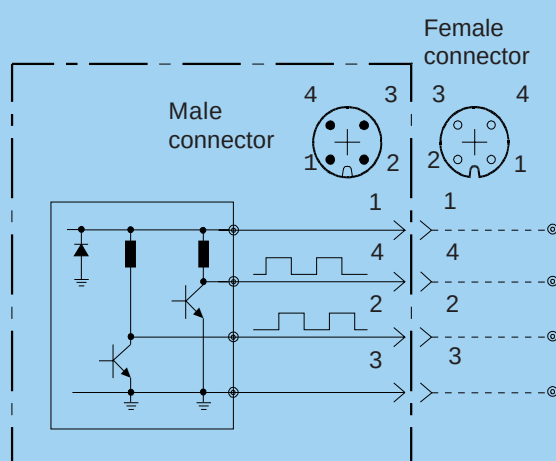


INCREMENTAL ENCODER CONNECTION DIAGRAMS

Monodirectional



Bidirectional



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	
Weighth:	0.220 lb	
Protection degree:	IP 67 (with protection and connector assembled)	
Connectors:		
MONODIRECTIONAL	RSF3/0.5 M (Lumberg) RKT3-06/5m (Lumberg)	male female
BIDIRECTIONAL	RSF4/0.5 M (Lumberg) RKT4-07/5m (Lumberg)	male female
Note: Female connectors cable length equal to 5 m.		

RCE

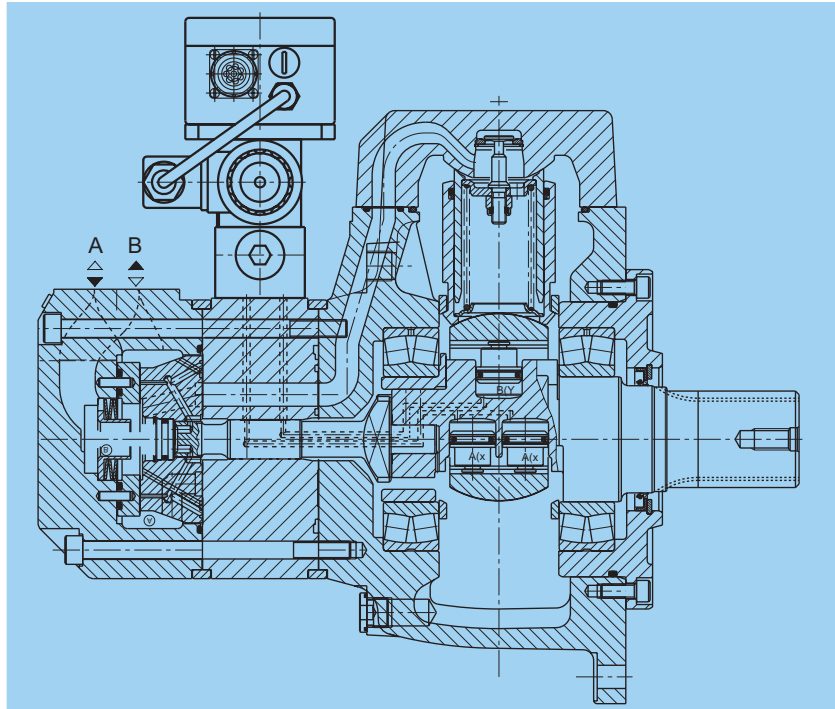
USING GENERALITIES

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.



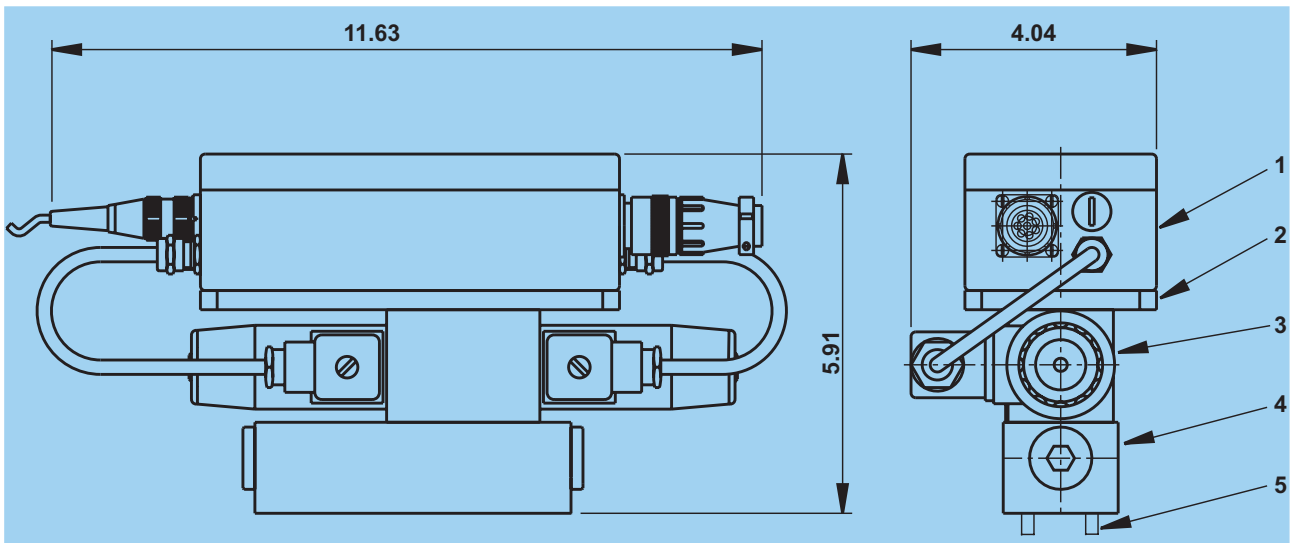
TECHNICAL DATA

Supply Voltage:	24 Vcc $\pm$ 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
Regulation and speed aptitude 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

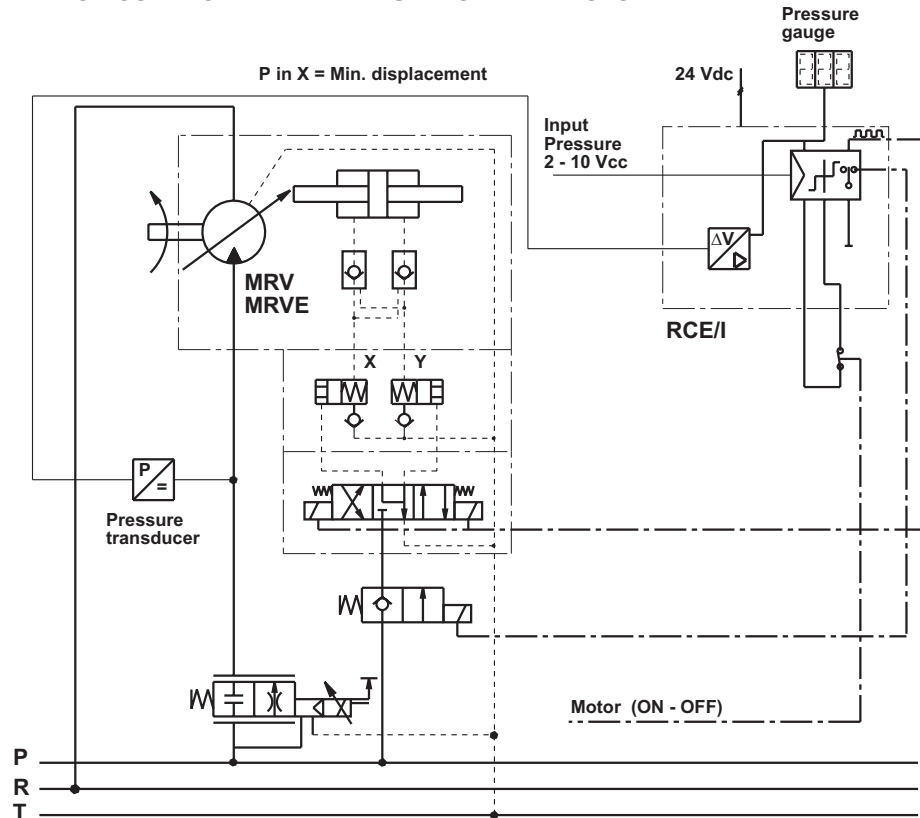
1 Electronic unit RCE/I-20
3 DENISON valve
5 House case fixing screw

2 Middle plate
4 Double metering valve VDD



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.

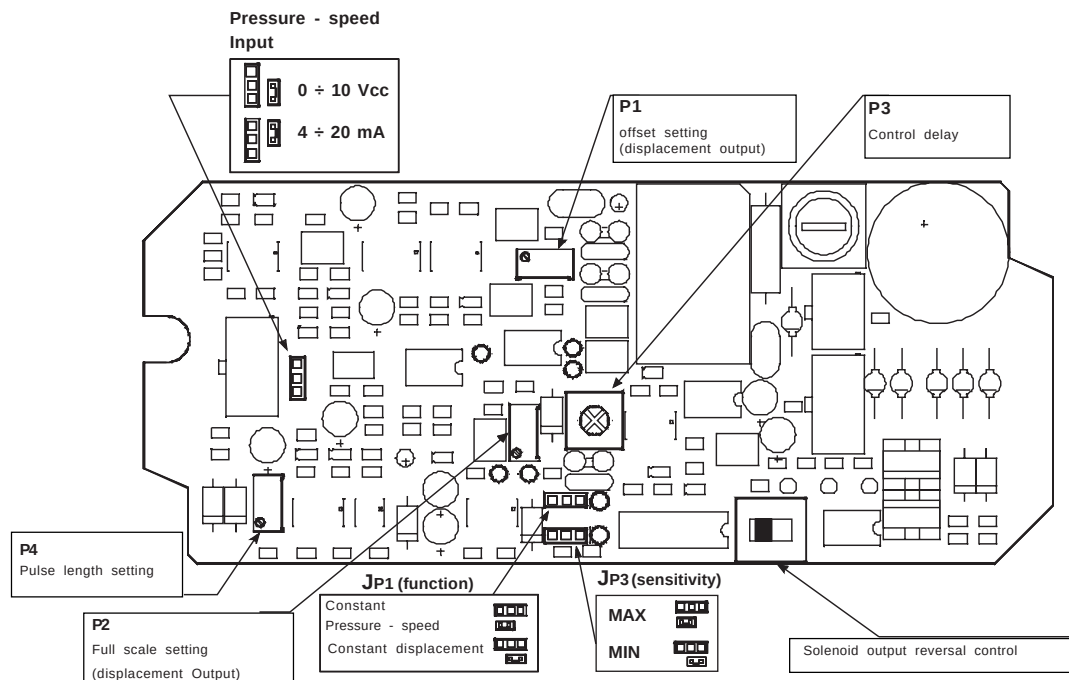
The saved pressure signal can be read remotely, again in the range 0,10 V DC. A third 24 V DC power output is available on the regulator to simultaneously energize a 2-way solenoid valve of the type with a conical diaphragm, which intercepts the pilot oilupstream the 4-way solenoid valve.

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.).

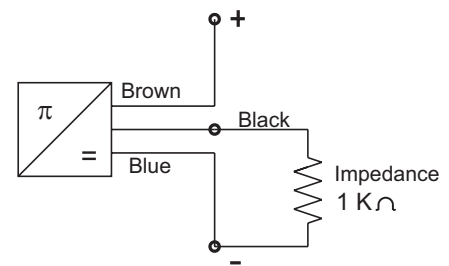
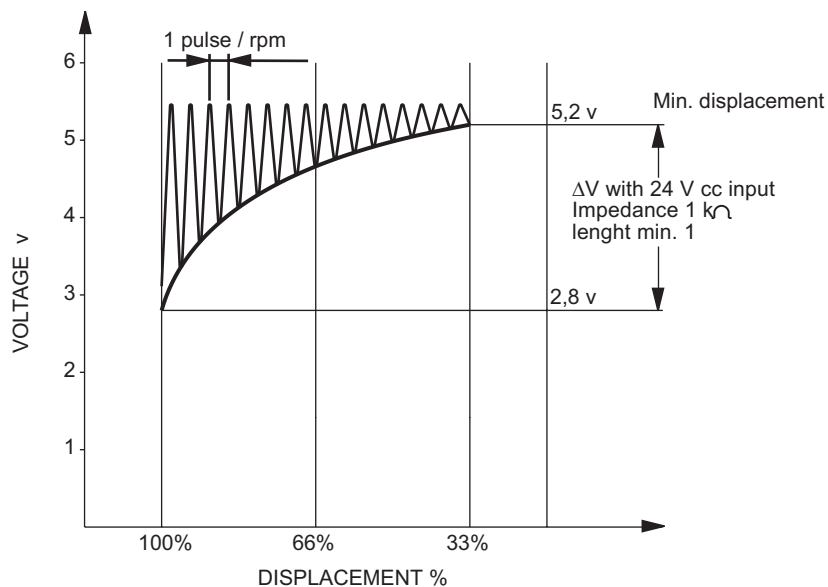
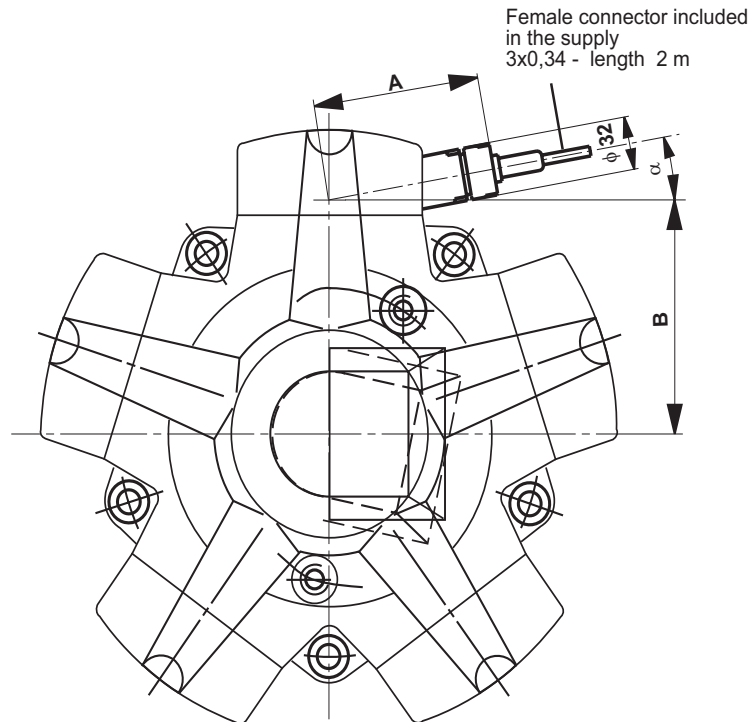
This provides a simple speed regulating system without energy dissipation, since the circuit includes neither flow regulator valves nor drainage valves. The speed signal saved is also available as output signal for remote reading, again in the field of 0,10 V DC; this signal may be useful for detecting 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 $\pm 2\%$ on the fullscale value with the motor at maximum displacement; at minimum displacement the precision is slightly lower.



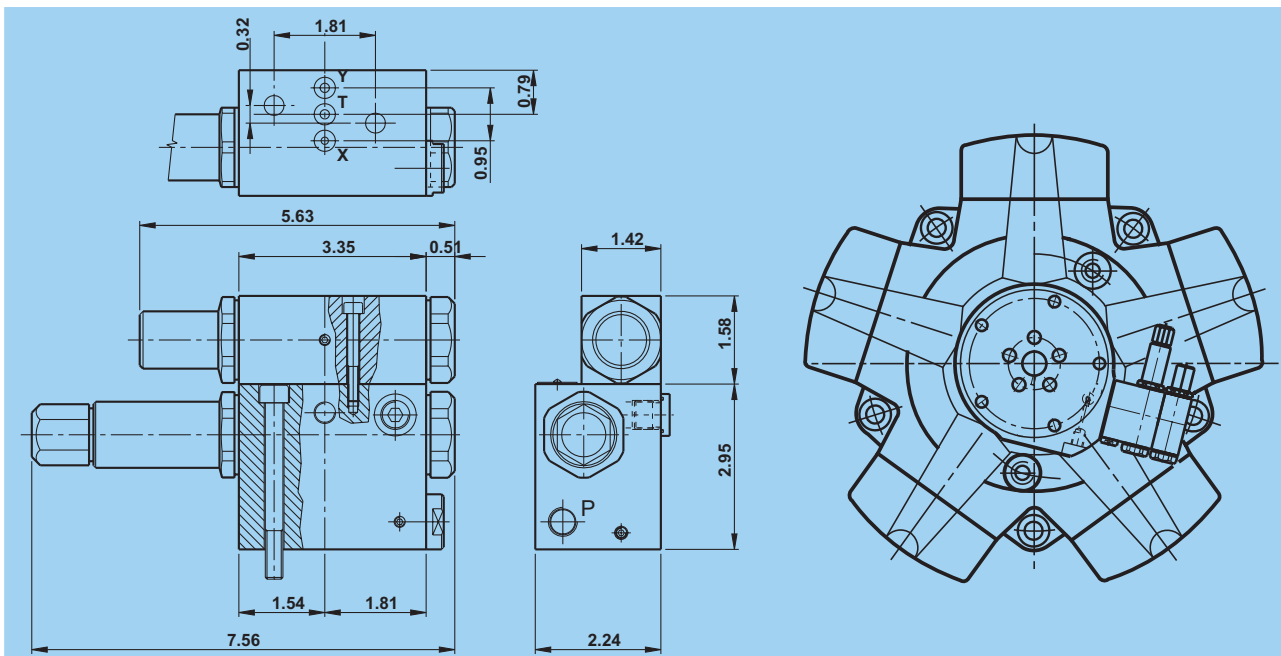
ELECTRONIC DISPLACEMENT
TRANSDUCER

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. $\pm$ 0,5%
Current consumption:	10 mA
Output current:	1 - 6 mA
Working temperature range:	da 0 a 60°C
Load impedance:	1 K Ω
Reading displacement range:	1:3
protection degree:	IP 68
Precision F.S.	$\pm$ 1%



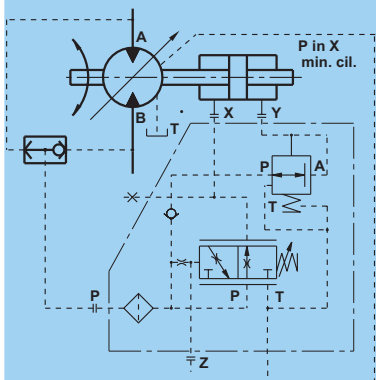
RPC

FUNCTIONAL DESCRIPTION

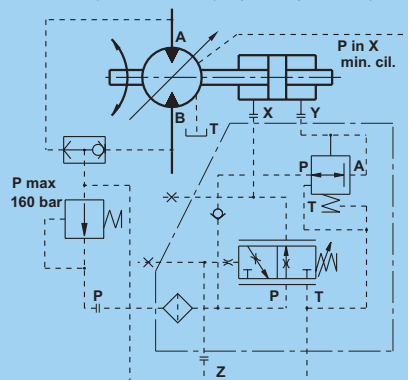
The RPC hydraulic regulator keeps the motor working at a constant pressure while supplying a variable torque. The pressure value can be set in the range from 50 to 250 bar

BASIC CIRCUITS

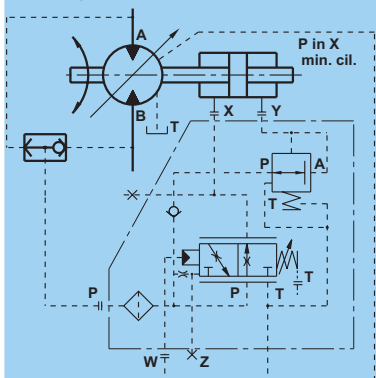
RPC5D - 1 code 229776
with pressure ≤ 2321 psi (160 bar) internal piloting



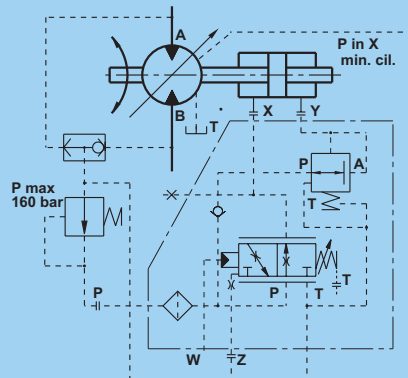
RPC5D - 1/X code 229777
with pressure > 2321 psi (160 bar) external piloting



RPC5DT - 1 code 231217
with pressure ≤ 2321 psi (160 bar) internal piloting
max displacement remote control



RPC5DT - 1 code 231218
with pressure ≤ 2321 psi (160 bar) external piloting
max displacement remote control

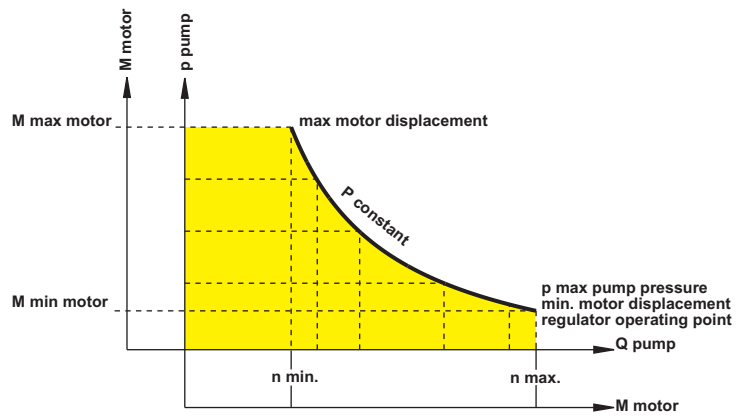


RPC

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

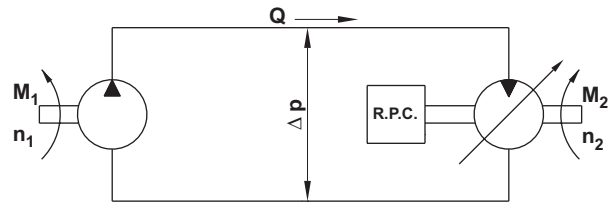


HYDRAULIC CIRCUIT

RPC = motor constant pressure regulator

$$P = Q \times p \text{ max} = \text{constant}$$

$$M_1 \times n_1 = M_2 \times n_2 = \text{constant}$$

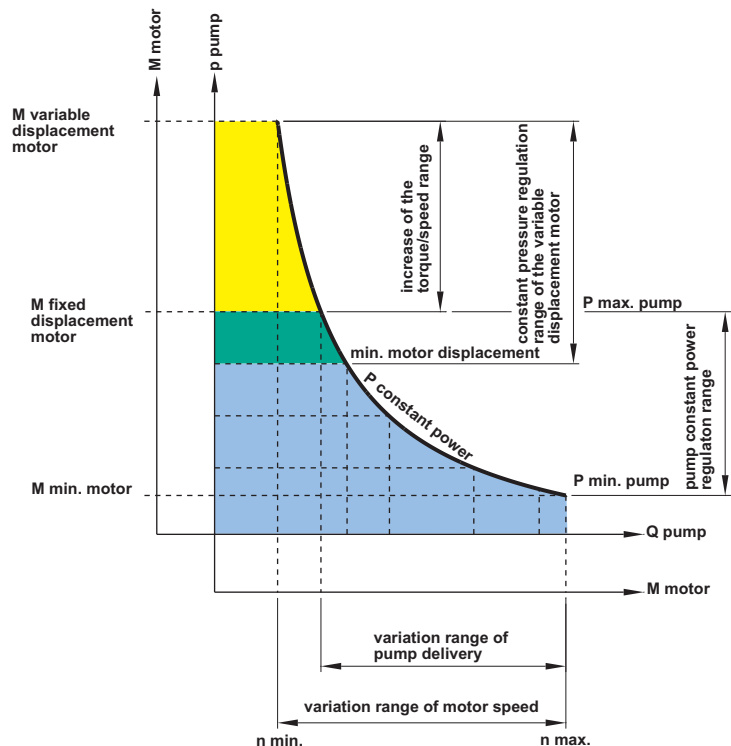


RPC

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

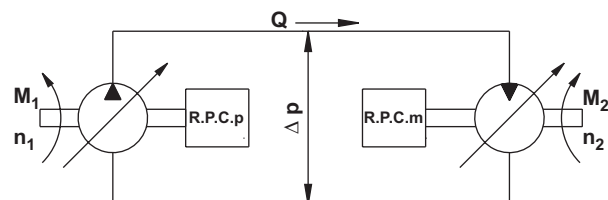


HYDRAULIC CIRCUIT

RPCp = pump constant power regulator

RPCm = motor constant pressure regulator

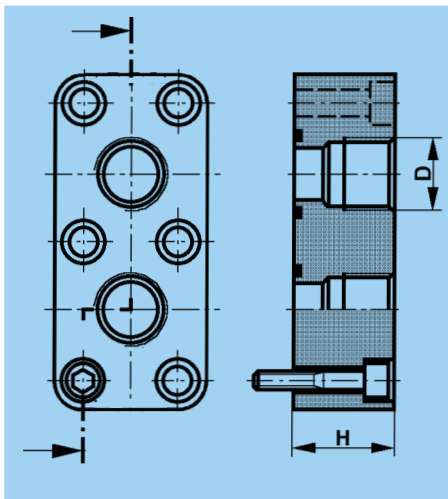
$$P = M_1 \times n_1 = M_2 \times n_2 = \text{constant}$$



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

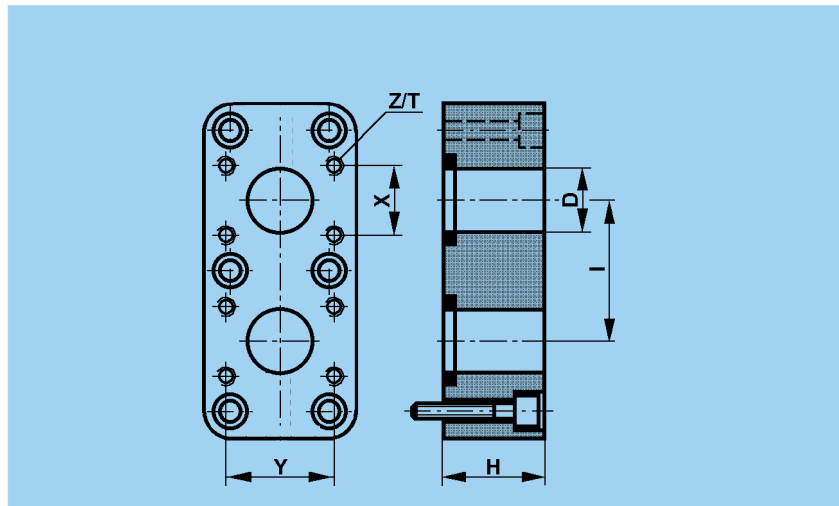
SAE CONNECTION FLANGE

Code "S1"

Code "T1"

Code "G1"

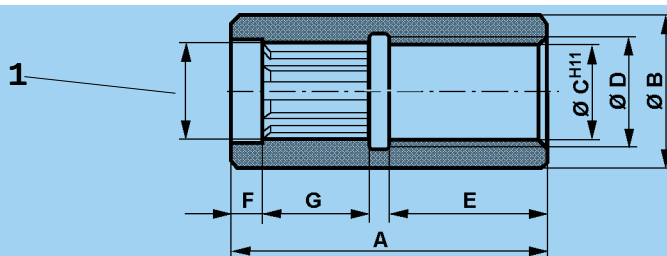
Code "L1"



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 (inch)	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

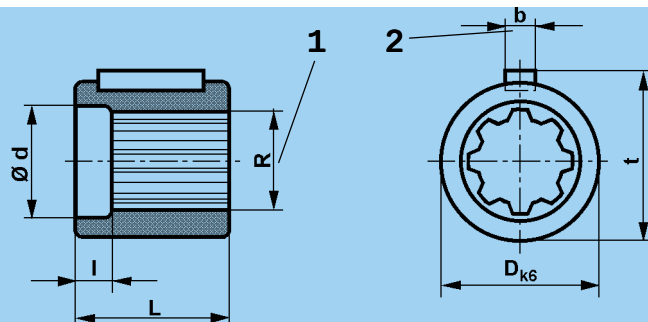
COUPLINGS



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

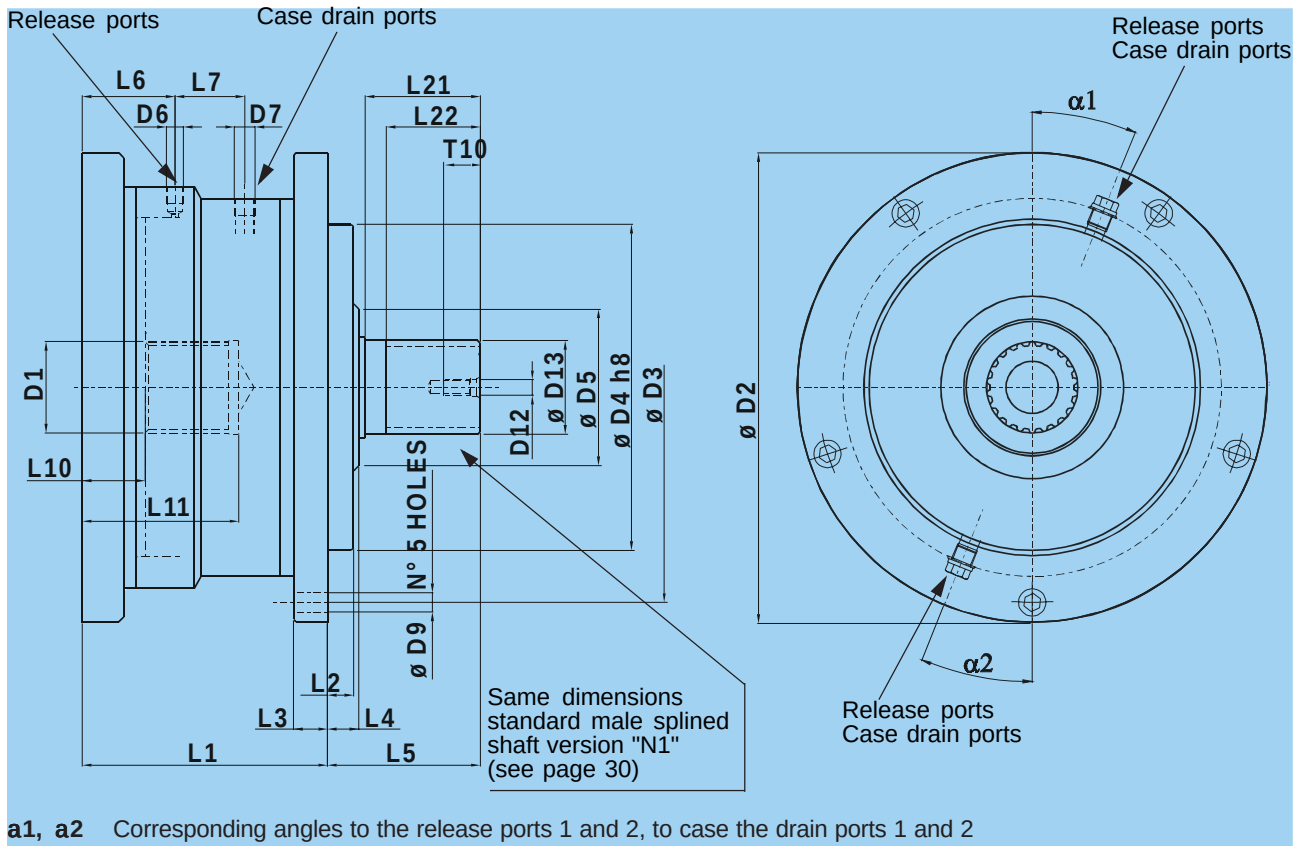


1 For standard male splined shaft version "N1" (see page 26).

2 Key to DIN 6885

MRD - MRDE MRV - MRVE	ORDERING CODE	R EX DIN 5463 (mm)	d (inch)	I (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 48x3x22-9H 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.ft ²	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
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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

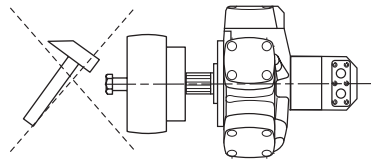
- Please note manufacturing data!

Before operation fill with hydraulic fluid

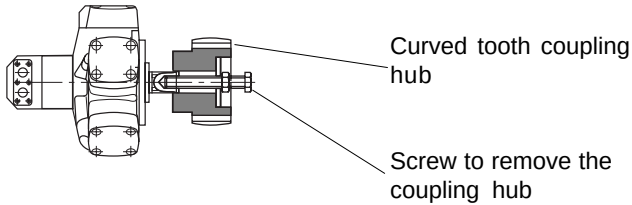
- Use the prescribed filter!

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

Coupling



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



Curved tooth coupling hub

Screw to remove the coupling hub

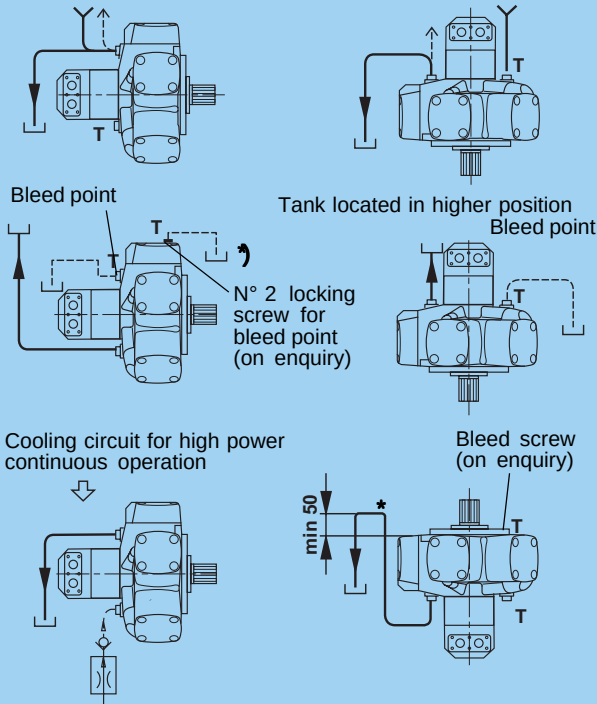
DRAIN AND FLUSHING LINK INSTALLATION EXAMPLES

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.
(release to bleed)

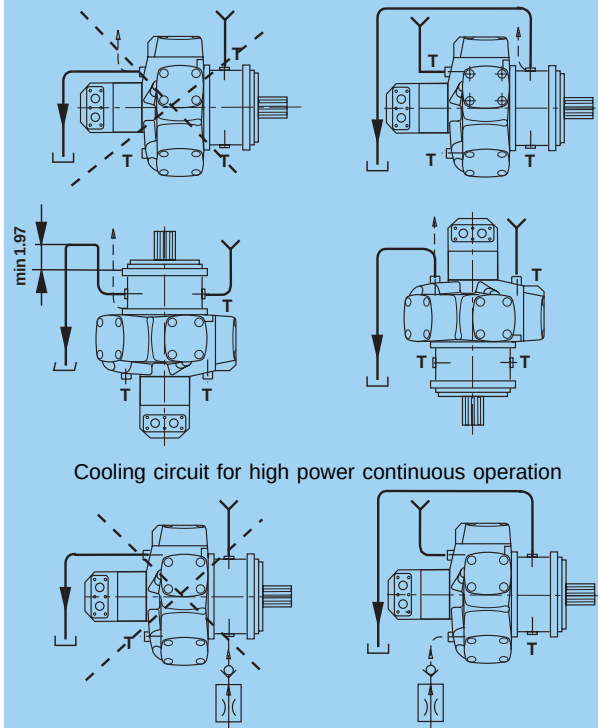


Flushing $p_{max} = 5 \text{ bar}$

*) 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.



Cooling circuit for high power continuous operation

Flushing $p_{max} = 5 \text{ bar}$

Motors without shaft seal used with brake

CODE

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

SERIES

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

SIZE & DISPLACEMENT

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

SHAFT

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

SPEED SENSOR OPTION

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

SEALS

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

CONNECTION FLANGE

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

ROTATION

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

SPECIAL

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

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

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

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)

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	Uni-directional
B1	(500 pulse/rev) (see page 32)	Bi-directional

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

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)

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

**	space reserved to Denison Calzoni
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