RIVA CALZONI OLEODINAMICA

INSTALLATION AND MAINTENANCE MANUAL
HYDRAULIC MOTORS
TYPE MR/MRE - MRD/MRDE

FOREWORD 0

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FOREWORD

Contents

Section 0
FOREWORD

This section must be read before consulting the rest of the documentation, and before undertaking any type of activity with the machinery. This section is required reading for anyone assigned to interact with the machinery in any capacity (shipping, installation, running, maintenance, etc.).

0.1 GENERAL SAFETY WARNINGS

When using industrial machinery and systems, one must be aware that moving parts (both linear and rotary), high-voltage electrical parts, any high-temperature parts, etc. may cause serious harm to people and property.
Those responsible for system security must ensure that:

- all improper use and operations are avoided
- the safety devices are not removed or tampered with
- maintenance operations are regularly performed
- all precautions, individual protection, etc. required by safety regulations and legislation in the user's country are adopted (see EEC directives 89/686/EEC and 89/656/EEC)
- **only original spares** are used, especially for components that perform a safety function

For this purpose, it is essential that:

- said documentation has been carefully read, and its instructions therefore put into practice
- only adequately trained personnel is assigned to the machinery.

The “Machine Directive” (89/392/EEC and subsequent changes) defines the term **“OPERATOR”** as “*... the person(s) assigned to install, operate, adjust, maintain, clean, repair and move a machine”*. To better define the degree of preparation, field of operation and level of responsibility of the “OPERATORS”, we shall define the following terms:

OPERATOR

Person who does not necessarily possess a strong technical background, trained to run the machine in ordinary production regarding: start-up, stopping at the end of the shift, simple maintenance operations (cleaning, etc.).

MAINTENANCE TECHNICIAN (mechanical or electrical)

QUALIFIED TECHNICIAN assigned to the more complex operations of installation, maintenance, repairs, etc. within his/her specific field of skill (mechanical or electrical).

It is essential to make sure that the assigned operators do not perform tasks outside their own range of skill and responsibility.

NOTE:
Current regulations define a **QUALIFIED TECHNICIAN** as a person who is able to recognize and avoid any hazardous situations due to:
- training, experience and education,
- awareness of regulations, rules and operations to prevent accidents
- knowledge of the working conditions of the machinery,

and has been authorized by the system safety manager to perform all types of operations.
Also see the specific regulations dealing with operators assigned to high-voltage electrical systems.

0.2 DOCUMENTATION

0.2.1 This instruction manual

This manual has been prepared taking into account the directives to standardize safety regulations and for the free circulation of industrial products within the EU (EEC Council directive **89/392/EEC** and subsequent changes, known as the “Machine Directive”).
The purpose of the instruction manual is to provide the user with helpful information to safely **install**, **commission**, **use** and **maintain** the machine.
The main topics are divided into chapters to facilitate finding information.

The figures and tables, as well as the pages of the manual, are labeled with the number of the chapter followed by a progressive number.

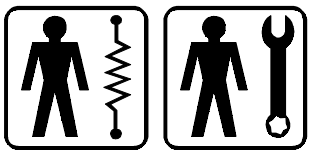
Thus:
Figure 3-2 stands for: Figure 2 of Section 3
Page 4-3 stands for: Page 3 of Section 4

However, the manual cannot go into exhaustive detail for every possible need. In case of doubt or lack of information, contact the **RIVA CALZONI OLEODINAMICA** service center for your geographical area, or contact the **RIVA CALZONI OLEODINAMICA** sales department in Anzola dell’Emilia - Bologna (Italy) directly.

0.2.2 To whom it is addressed

To make it easier to consult, the manual is organized in **sections** divided by numerical separators. Each section deals with a separate topic, helpful for using the machine: installation, use, maintenance, etc.
It is essential that each operator assigned to the machine **read and clearly understand** the parts of the manual that concern him/her, and in particular:

- The **OPERATOR** must have reviewed sections: **1** (recommended) and **4** (compulsory).



- **MAINTENANCE TECHNICIANS** assigned to installation, maintenance, repairs, etc. must have reviewed **all parts** of the manual.

0.2.3 Indicators, warnings

In this documentation we have used special symbols to highlight, in each instance, possible hazardous conditions for people and/or property:

DANGER — ***SERIOUS danger that may be LIFE-threatening to people.***

WARNING — ***Danger of personal harm and product damage.***

CAUTION — ***Danger of damage, possibly serious, to the product***

Danger of contamination.

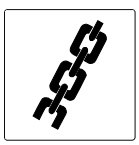
Danger deriving from fluids under pressure.

Requirement to use protective goggles.

Requirement to protect hands.

Center of gravity.

Do not store in a damp place.



Use special lifting equipment.

0.2.4 Other documentation

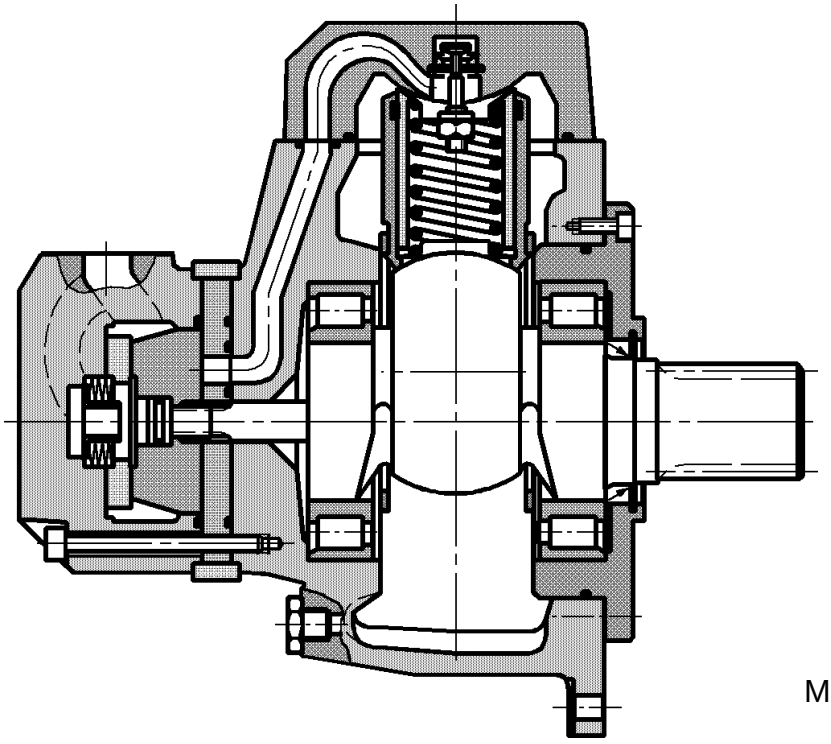
Along with the present INSTRUCTION MANUAL, upon request, the following additional documentation may be provided for each product (see separate booklets):

a) SPARES CATALOGUE: Catalogue of the mechanical components that make up the motor

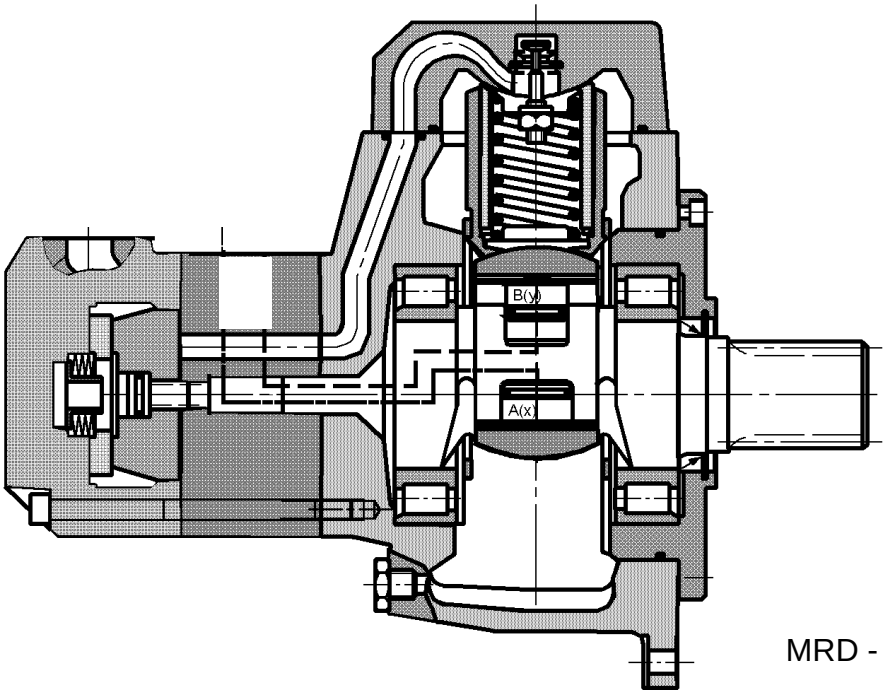
b) DIMENSIONAL DRAWINGS

Section 1
GENERAL INFORMATION

Contents



MR - MRE



MRD - MRDE

Section 1

GENERAL INFORMATION

This section is dedicated to introducing the machine.
This manual refers to radial-piston hydraulic motors from the series:
1.MR/MRE
2.MRD/MRDE
with fixed and dual displacement, respectively, in the standard and expanded (E) versions. These motors serve to convert the energy from the working fluid pressure into kinetic energy for the rotating shaft.

The motors **MR/MRE** and **MRD/MRDE** fall into the range of “low speed, high-torque”(lsht) motors. One important function of these motors is their ability to develop a high starting torque even with the motor stopped, capable of overcoming resistant torque and starting the system.

This information represents an initial approach to becoming familiar with the motor; specific, in-depth information on the various topics is contained in the sections that follow.

1.1 DESCRIPTION OF THE MOTOR

Riva Calzoni Oleodinamica motors are the result of an original, patented design. The principle is to transmit force to the rotating shaft by means of a pressurized column of oil without any connecting rods, pistons, pads and pins. This oil column is contained by a telescopic cylinder and piston working against the two spherical surfaces of the eccentric cam and cylinder cap. The sealing surfaces retain their circular cross-section when stressed by pressure, so there is no alteration in the sealing geometry.
The self aligning design of the cylinder and piston unit reduces friction, leakage and speed pulsation, furthermore, there is no transverse component of thrust (side load), which means no out of round wear of the cylinder/piston assembly.
In the **MRD/MRDE** motor series, the eccentric cam of the driving shaft is free to move radially. As the eccentricity varies, the motor displacement changes accordingly.

The change in displacement is achieved hydraulically by small cylinders built directly into the drive shaft, and can be actuated under load.
The use of electronic and hydraulic regulating circuits makes these motors extremely flexible to use, and makes it possible to increase the efficiency and performance of the machines where they are installed.

The hydraulically balanced design of the timing system and the special materials adapted, ensure the maximum reliability and efficiency.

The advantages of all of the above features combined produce a motor with extremely high values of mechanical and volumetric efficiency. These values remain stable over time, ensuring the well-known reliability of **Riva Calzoni Oleodinamica** motors.

1.2 IDENTIFYING THE MOTOR

The identification can be found attached to the rotary valve housing (Fig. **1-2**).It shows the complete code of the motor, which describes its configuration (see technical catalogues), as well as the maximum permissible continuous working pressure.
Each motor also has a serial number (Fig. **1-2b**) engraved on the rotary valve housing, consisting of a 5-digit code of five numbers or 1 letter and 4 numbers.
In order to correctly identify the motor, you must refer to both the motor code and its serial number.

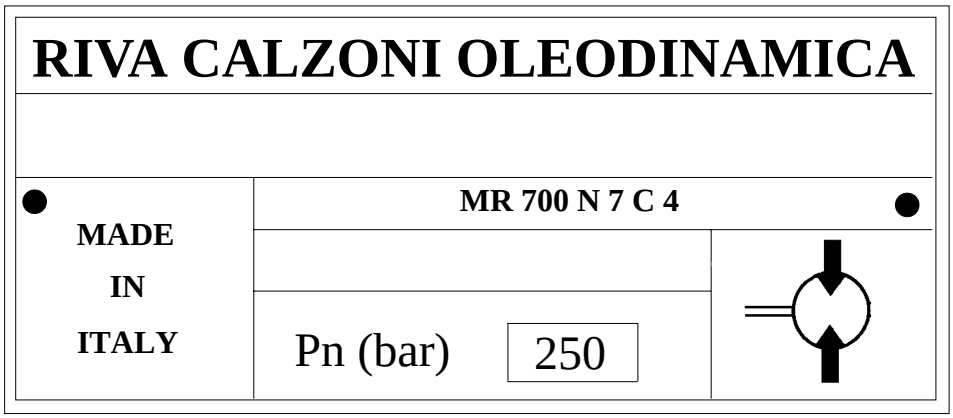


Figure 1-2
Identification plate

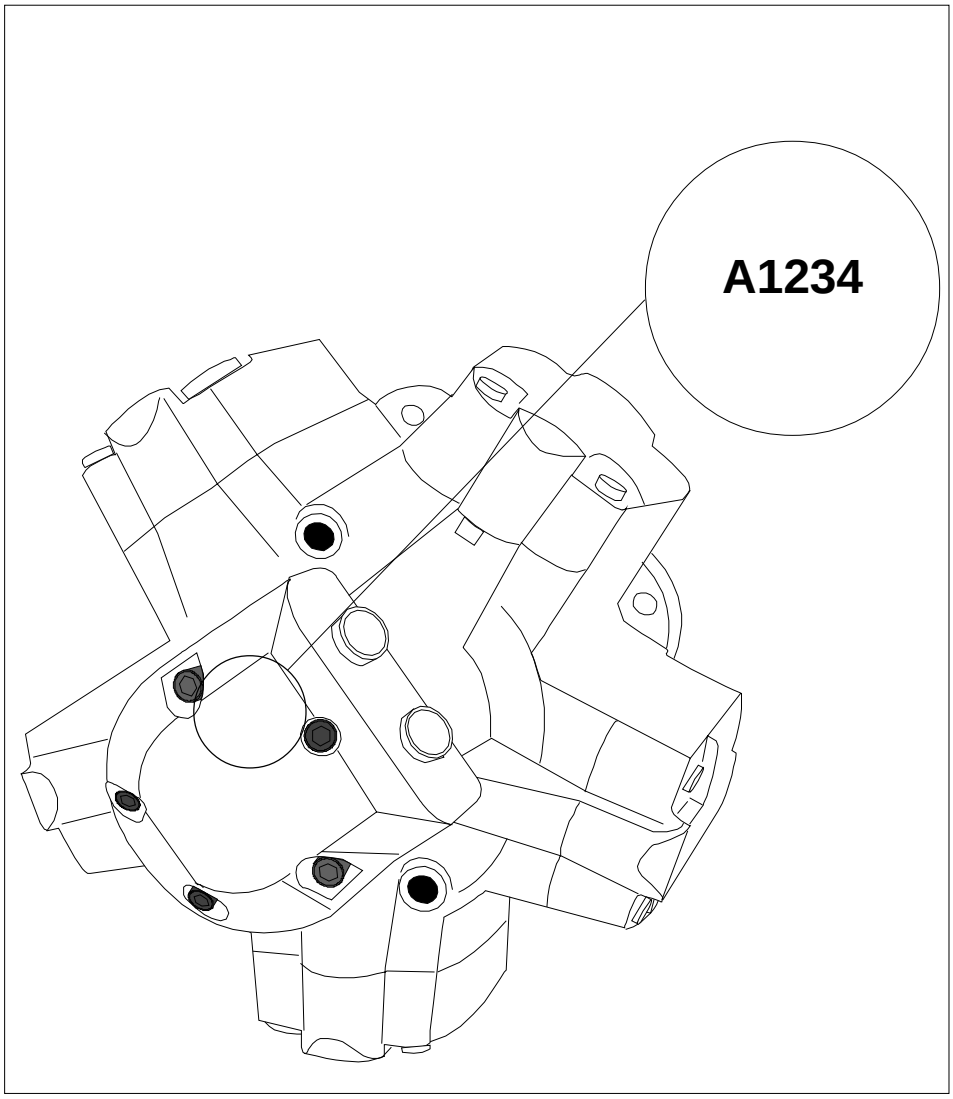


Figure 1-2b
Serial number

1.3 OPERATING PARAMETERS

1.3.1 Units of measure

All of the units of measure used in this manual are from the International System (I.S.), with the following exceptions:

Measure	Unit used	I.S. Unit	Conversion factor
Kinetic viscosity	cSt	m^2/s	1 cSt = 10^{-4} m^2/s = 1mm^2/s
Pressure	bar	Pa	1bar = 10^5 Pa
Volume	l	m^3	1l = 10^{-3} m^3

1.3.2 Conversion factors

The conversion factors for the units of measure used and Imperial/U.S. system measurements are:

Measure	Unit used	Imperial/us units	Conversion factor
Displacement	c.c./Rev.	In^3/Rev.	1c.c./Rev. = 0,061 in^3/Rev
Specific torque	Nm/bar	lb·ft/psi	1Nm/bar = 0,0509 lb·ft/psi
Torque	Nm	lb·ft	1Nm = 0,73757 lb·ft
Pressure	bar	psi	1bar = 14,5052 psi
Power	KW	Hp(US)	1KW = 1,3410 Hp (US)
Weight	Kg	lb	1Kg = 2,2046 lb
Capacity	l	US gallon Imperial gallon	1l = 0,2642 US gallon 1l = 0,2200 Imperial gallon
Temperature	°C	°F	$°C = \frac{(°F-32)}{1,8}$
Length	mm	in	1mm = 0,03937 in

1.3.3 Running parameters

The main running parameters for the motors are given in the tables below. Consult Riva Calzoni Oleodinamica for any use beyond these figures.

NOTE:

All figures were obtained using an oil viscosity of V=36 cSt, oil temperature T= 45°C, back pressure p=0 bar. For technical specifications relating to other versions of the motors not listed in the tables, consult Riva Calzoni Oleodinamica.

MR - Technical Specifications

Nominal displacement - Version				**160-1**	**190-2**	**250-0**	**300-4**	**350-1**	**450-3**	**600-1**	**700-7**
Actual displacement		Vg	cc/rev	159,7	191,6	250,9	304,1	349,5	451,6	607,9	706,9
Theoretical specific torque			Nm/bar	2,54	3,05	4,00	4,84	5,57	7,19	9,68	11,26
Starting torque/theoretical torque			%	90							
Maximum inlet pressure:	continuous	p	bar	250							
	intermittent	p	bar	300							
	peak	p	bar	420							
Maximum pressure A+B		p	bar	400							
Maximum case pressure*		p	bar	5							
Speed range:	without flushing	n	r.p.m.	1-800	1-800	1-750	1-750	1-600	1-600	1-500	1-500
	with flushing	n	r.p.m.	1-800	1-800	1-750	1-750	1-600	1-600	1-500	1-500
Max. output power:	without flushing	P	kW	20	24	32	35	36	46	56	65
	with flushing	P	kW	30	36	48	53	54	75	84	97
Weight		m	kg	46	46	50	50	77	77	97	97

Nominal displacement - Version				**1100-9**	**1800-7**	**2400-2**	**2800-4**	**3600-3**	**4500-5**	**6500-0**	**7000-1**
Actual displacement		Vg	cc/rev	1125,8	1809,6	2393,1	2792,0	3636,8	4502,7	6504,1	6995,0
Theoretical specific torque			Nm/bar	17,93	28,82	38,11	44,46	57,91	71,70	103,57	111,39
Starting torque/theoretical torque			%	91	90				91		
Maximum inlet pressure:	continuous	p	bar	250							
	intermittent	p	bar	300							
	peak	p	bar	420							
Maximum pressure A+B		p	bar	400							
Maximum case pressure*		p	bar	5							
Speed range:	without flushing	n	r.p.m.	0,5-330	0,5-250	0,5-220	0,5-200	0,5-150	0,5-130	0,5-110	0,5-100
	with flushing	n	r.p.m.	0,5-330	0,5-250	0,5-220	0,5-200	0,5-180	0,5-170	0,5-130	0,5-130
Max. output power:	without flushing	P	kW	77	103	120	127	130	140	165	170
	with flushing	P	kW	119	157	183	194	198	210	250	260
Weight		m	kg	140	209	325	325	508	508	750	750

NOTE:

* ***Consult Riva Calzoni Oleodinamica if a higher pressure is required.***

MRE - Technical Specifications

Nominal displacement - Version				**500-1**	**800-1**	**1400-2**	**2100-2**	**3100-2**	**5400-2**	**8500-1**	**9500-0**
Actual displacement		Vg	cc/rev	497,9	804,2	1369,5	2091,2	3103,7	5401,2	8525,6	9542,7
Theoretical specific torque			Nm/bar	7,93	12,81	21,81	33,30	49,42	86,01	135,76	151,95
Starting torque/theoretical torque			%	90	91	92	91	91	92	92	92
Maximum inlet pressure:	continuous	p	bar	210							180
	intermittent	p	bar	250							220
	peak	p	bar	350							320
Maximum pressure A+B		p	bar	400							400
Maximum case pressure*		p	bar	5							5
Speed range:	without flushing	n	r.p.m.	1-600	1-450	0,5-280	0,5-250	0,5-200	0,5-120	0,5-90	0,5-80
	with flushing	n	r.p.m.	1-600	1-450	0,5-280	0,5-250	0,5-200	0,5-160	0,5-120	0,5-100
Max. output power:	without flushing	P	kW	46	65	77	100	125	140	170	170
	with flushing	P	kW	70	93	102	148	190	210	260	225
Weight		m	kg	77	97	140	209	320	508	750	750

NOTE: **** Consult Riva Calzoni Oleodinamica if a higher pressure is required.***

DANGER

The MRE 9500 version 0 motor must not be subjected to cavitation, even temporarily.
There must be no pressure inside the motor housing with the motor stopped.

MRD - Technical Specifications

Nominal displacement - Version				**300-1**		**450-1**		**700-1**	
Actual displacement (max. - min.)		Vg	cc/rev	304,1	152,1	451,6	225,8	706,9	339,3
Theoretical specific torque			Nm/bar	4,84	2,42	7,19	3,60	11,26	5,40
Starting torque/theoretical torque			%	90	-	90	-	90	-
Maximum inlet pressure:	continuous	p	bar	250					
	intermittent	p	bar	300					
	peak	p	bar	420					
Maximum pressure A+B		p	bar	400					
Maximum case pressure*		p	bar	5					
Speed range:	without flushing	n	r.p.m.	1-750	1-1000	1-600	1-850	1-500	1-700
	with flushing	n	r.p.m.	1-750	1-1000	1-600	1-850	1-500	1-700
Max. output power:	without flushing	P	kW	35	20	47	30	65	36
	with flushing	P	kW	58	31	70	45	86	54
Pilot pressure:	minimum	p	bar	40		40		40	
	maximum	p	bar	130		130		130	
Weight		m	kg	56		83		103	

Nominal displacement - Version				**1100-1**		**1800-1**	
Actual displacement (max. - min.)		Vg	cc/rev	1125,8	508,4	1809,6	904,8
Theoretical specific torque			Nm/bar	17,93	8,10	28,82	14,41
Starting torque/theoretical torque			%	90	-	90	-
Maximum inlet pressure:	continuous	p	bar	250			
	intermittent	p	bar	300			
	peak	p	bar	420			
Maximum pressure A+B		p	bar	400			
Maximum case pressure*		p	bar	5			
Speed range:	without flushing	n	r.p.m.	0,5-330	0,5-580	0,5-250	0,5-400
	with flushing	n	r.p.m.	0,5-330	0,5-580	0,5-250	0,5-400
Max. output power:	without flushing	P	kW	66	48	90	65
	with flushing	P	kW	96	70	120	87
Pilot pressure:	minimum	p	bar	40		40	
	maximum	p	bar	130		130	
Weight		m	kg	147		216	

Nominal displacement - Version				**2800-1**		**4500-1**	
Actual displacement (max. - min.)		Vg	cc/rev	2792	1396	4502,7	2251,3
Theoretical specific torque			Nm/bar	44,46	22,23	71,70	35,85
Starting torque/theoretical torque			%	90	-	91	-
Maximum inlet pressure	continuous	p	bar	250			
	intermittent	p	bar	300			
	peak	p	bar	420			
Maximum pressure A+B		p	bar	400			
Maximum case pressure*		p	bar	5			
Speed range:	without flushing	n	r.p.m.	0,5-90	0,5-95	0,5-75	0,5-80
	with flushing	n	r.p.m.	0,5-200	0,5-280	0,5-170	0,5-250
Max. output power:	without flushing	P	kW	-	-	-	-
	with flushing	P	kW	140	92	180	125
Pilot pressure:	minimum	p	bar	40		40	
	maximum	p	bar	130		130	
Weight		m	kg	335		523	

NOTE: **** Consult Riva Calzoni Oleodinamica if a higher pressure is required.***

MRDE - Technical Specifications

Nominal displacement - Version				**500-1**		**800-1**		**1400-1**	
Actual displacement		Vg	cc/rev	497,9	248,9	804,2	386	1369,5	618,5
Theoretical specific torque			Nm/bar	7,93	3,96	12,81	6,15	21,81	9,85
Starting torque/theoretical torque			%	90	-	91	-	92	-
Maximum inlet pressure:	continuous	p	bar	210					
	intermittent	p	bar	250					
	peak	p	bar	350					
Maximum pressure A+B		p	bar	400					
Maximum case pressure*		p	bar	5					
Speed range:	without flushing	n	r.p.m.	1-600	1-800	1-450	1-650	0,5-280	0,5-550
	with flushing	n	r.p.m.	1-600	1-800	1-450	1-650	0,5-280	0,5-550
Max. output power:	without flushing	P	kW	49	31	66	43	70	54
	with flushing	P	kW	72	42	88	57	90	75
Pilot pressure:	minimum	p	bar	40		40		40	
	maximum	p	bar	130		130		130	
Weight		m	kg	83		103		147	

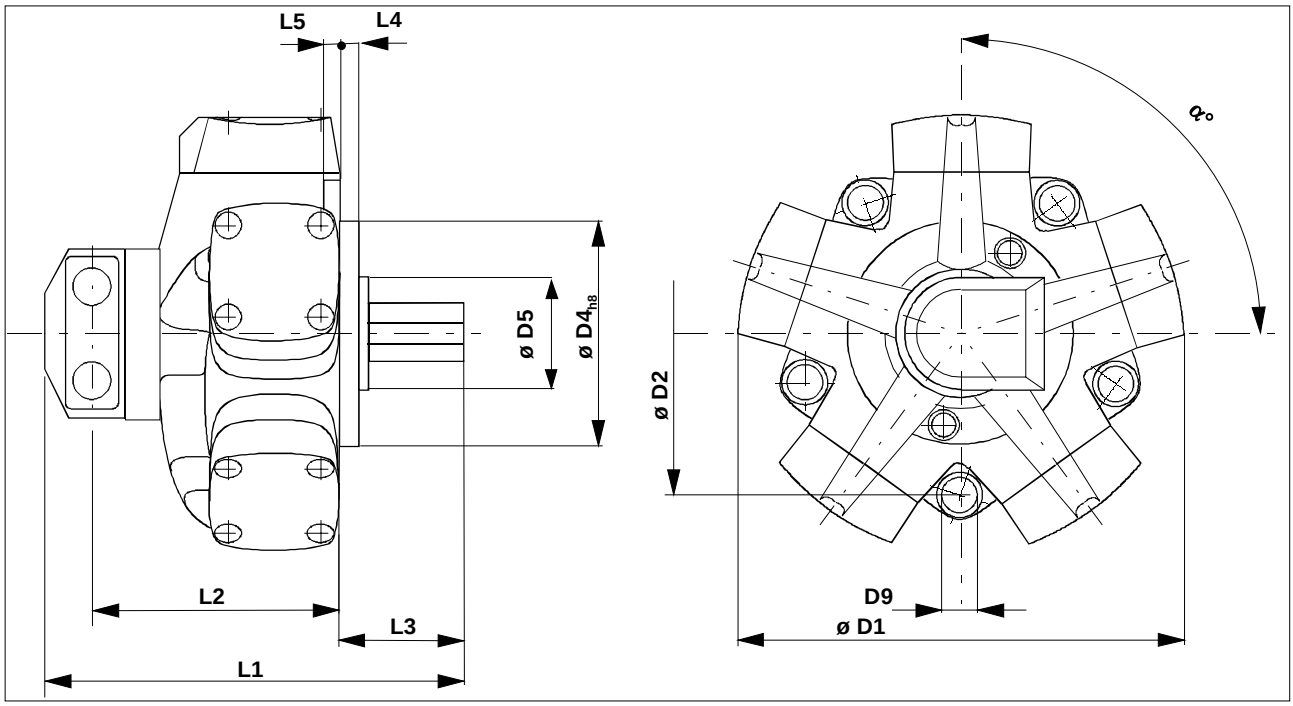
Nominal displacement - Version				**2100-1**		**3100-1**		**5400-1**	
Actual displacement		Vg	cc/rev	2091,2	1045,6	3103,7	1551,9	5401,2	2700,6
Theoretical specific torque			Nm/bar	33,30	16,65	49,42	24,71	86,01	43,00
Starting torque/theoretical torque			%	90	-	91	-	92	-
Maximum inlet pressure	continuous	p	bar	210					
	intermittent	p	bar	250					
	peak	p	bar	350					
Maximum pressure A+B		p	bar	400					
Maximum case pressure*		p	bar	5					
Speed range:	without flushing	n	r.p.m.	0,5-250	0,5-370	0,5-90	0,5-95	0,5-75	0,5-80
	with flushing	n	r.p.m.	0,5-250	0,5-370	0,5-200	0,5-280	0,5-160	0,5-210
Max. output power:	without flushing	P	kW	95	69	-	-	-	-
	with flushing	P	kW	132	87	145	100	190	130
Pilot pressure:	minimum	p	bar	40		40		40	
	maximum	p	bar	130		130		130	
Weight		m	kg	216		335		523	

NOTE: **** Consult Riva Calzoni Oleodinamica if a higher pressure is required.***

1.4 MAJOR DIMENSIONS

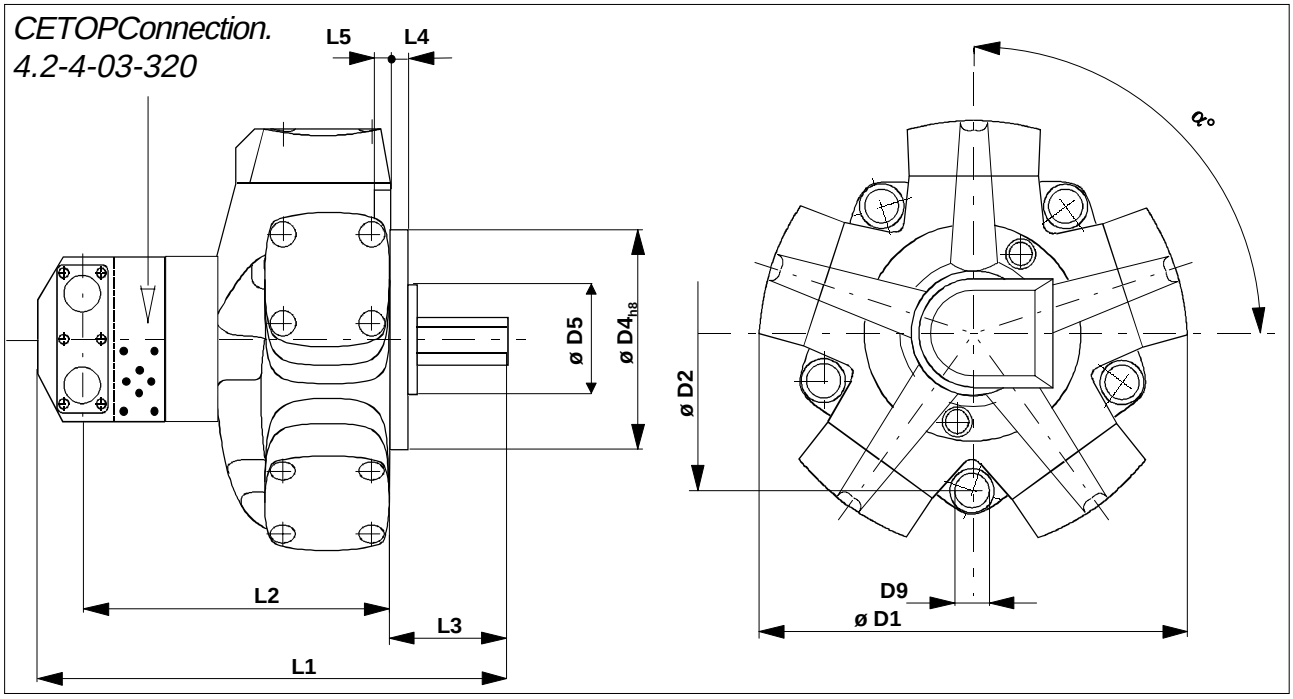
The paragraphs that follow specify the major dimensions for MR/MRE and MRD/MRDE motors.
For more detailed information about standard motors, refer to the dimensions specified in the technical catalogues; for special motors, refer solely to the dimension drawings available from **Riva Calzoni Oleodinamica** as specified in part. 0.2.4.

1.4.1 Model MR/MRE



Motor Type	L1 mm	L2 mm	L3 mm	L4 mm	L5 mm	øD1 mm	øD2 mm	øD4$_{h8}$ mm	øD5 mm	D9 mm	α
160 190	309	204	67	14	16	314	225	160	-	11	90°
250 300	323	204	81	15	16	328	232	175	90	11	90°
350 450 500	376	235	97	15	18	368	266	190	96	13	90°
600 700 800	400	255	101	15	20	405	290	220	102	13	90°
1100 1400	455	290	117	20	22	470	330	250	120	15	104°
1800 2100	503	323	132	21	24	558	380	290	148	17	90°
2400 2800 3100	619	392	153	24	26	642	440	335	140	19	90°
3600 4500 5400	699.5	418.5	210	32	28	766	540	400	-	23	108°
6500 7000 8500	746	451	230	32	30	856	600	450	190	25	108°
9500	746	451	230	32	30	860	600	450	190	25	108°

1.4.2 Model MRD/MRDE



Motor Type	L1 mm	L2 mm	L3 mm	L4 mm	L5 mm	øD1 mm	øD2 mm	øD4$_{h8}$ mm	øD5 mm	D9 mm	α
300	363	244	81	15	16	328	232	175	90	11	90°
450 **500**	426	285	97	15	18	368	266	190	96	13	90°
700 **800**	450	305	101	15	20	405	290	220	102	13	90°
1100 **1400**	511.5	346.5	117	20	22	470	330	250	120	15	104°
1800 **2100**	559.5	379.5	132	21	24	558	380	290	148	17	90°
2800 **3100**	677	452	153	24	26	642	440	335	140	19	90°
4500 **5400**	757.5	478.5	210	32	28	766	540	400	-	23	108°

1.5 OPERATING FLUIDS

The viscosity, quality and cleanliness of operating fluids are decisive factors in determining the reliability, performance, and life-time of a hydraulic component.

- Working viscosity range

The maximum life-time and performance are achieved within the recommended viscosity range. For applications that go beyond this range, we recommend that you contact Riva Calzoni Oleodinamica.

Vrec. = recommended operating viscosity 30....50 mm^2/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).

- Extreme conditions

The following limitations apply:

Vmin. abs. =10 mm^2/s for brief moments in case of emergency, with a maximum case fluid temperature of 80 °C.

Vmin. = 18 mm^2/s with reduced torque performance and maximum power.

Vmax. = 1000 mm^2/s when starting the motor cold.

- Choosing the type of fluid according to the operating temperature

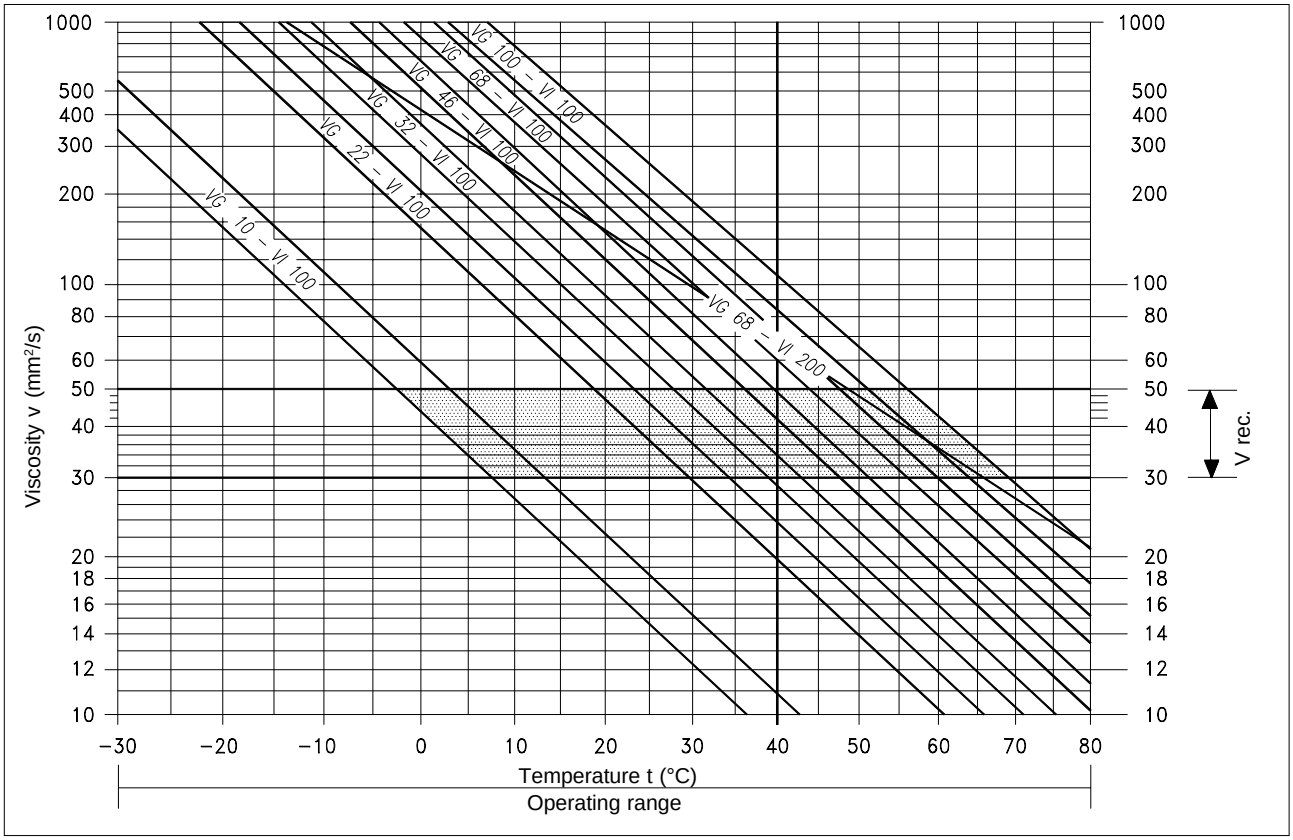
The operating temperature of the motor is defined as the greater temperature between that of the incoming fluid and that of the fluid inside the motor housing (case temperature).

CAUTION

The temperature must never exceed 80 °C anywhere in the system.

We recommend that you choose the viscosity of the fluid based on the maximum operating temperature, to remain within the recommended viscosity range.
If these conditions cannot be met due to extreme operating parameters or high ambient temperatures, we always recommend flushing the motor case to operate within the viscosity limits.
Should it be absolutely necessary to use a viscosity beyond the recommended range, you should first contact **Riva Calzoni Oleodinamica** for confirmation.

Figure 1-3
Choosing the type of fluid



- Types of fluids allowed

We recommend **HLP oils** based on the standard **DIN 51524 part 2** (with wear-proof, oxidation-proof and corrosion-proof additives), and **part 3** (with a high viscosity index, suitable for applications subject to broad temperature ranges).
The use of **water-based fluids** is permitted only with **motors marked with the code "W"**, reducing the motor performance based on the class of oil used: **HFA, HFB** or **HFC** (see Fig. **1-4**).
The use of synthetic fluids (type **HFD**) is permitted with motors supplied with seals of **FPM** material (motor code **"V"**).
Seals of **FPM** material are necessary for **HFD/U** fluids only if expressly indicated by the fluid manufacturer.
The use of synthetic fluids (type **HFD**) does not require reducing the motor performance.

Three families of biodegradable fluids are currently available on the market:

1. **Vegetable-based fluids HETG**
2. **Polyglycol-based synthetic fluids HEPG**
3. **Ester-based synthetic fluids HEE**

At the present time, very little pratical experience has been gathered with regard to the aging of the various fluid in the HETG class, particularly with the ingress of water.

Figure 1-4
Table of fluids.

FLAMMABLE AND SELF-EXTINGUISHING FLUIDS

Fluid characteristics

Class	Type of fluid	Water content % weight
HFA	Oil-water emulsion	95 - 98
HFB	Water-oil emulsion	>40
HFC	Water-based solutions (mostly with glycol)	35÷55
HFD	Synthetic fluids (water-free)	0÷0.1
HFD/R	based on phosphorous esters	
HFD/S	based on chlorinated hydrocarbons	
HFD/T	based on phosphorous esters and chlorinated hydrocarb.	
HFD/U	other compositions	

Motor application limitations

Class	Pressure (bar) (%nom. Pressure)	Speed (RPM) (%maximum speed)	Power (kW) (% maximum power)	Temperature °C	
				Maximum	Ideal
HFA	50	50	25	50	40
HFB	80	80	60	60	45
HFC	60	50	30	60	45
HFD	100	100	100	80	50

Motor version Code

Class	Motor code	Seal code
HFA	W	-
HFB	W	-
HFC	W	-
HFD	-	V

Note: For HFD/U fluids, you must use FPM seals (code V) only if required by the fluid manufacturer.

WARNING

AS FOR MINERAL-BASED FLUIDS, BIODEGRADABLE FLUIDS MUST BE DISPOSED OF IN ACCORDANCE WITH CURRENT REGULATIONS.

- Filtering the fluid

To ensure smooth motor operation, the fluid must belong to at least one of the following classes:

1. **class 9 per NAS 1638**
2. **class 6 per SAE, ASTM, AIA**
3. **class 18/15 per ISO/DRW. 4406**

NOTE:

To ensure a long life for the motor, we recommend class 8 per NAS 1638, which may be obtained using a filtering quotient of ßx=100.
If these classes cannot be respected, please contact Riva Calzoni Oleodinamica.

- Mixing different oils

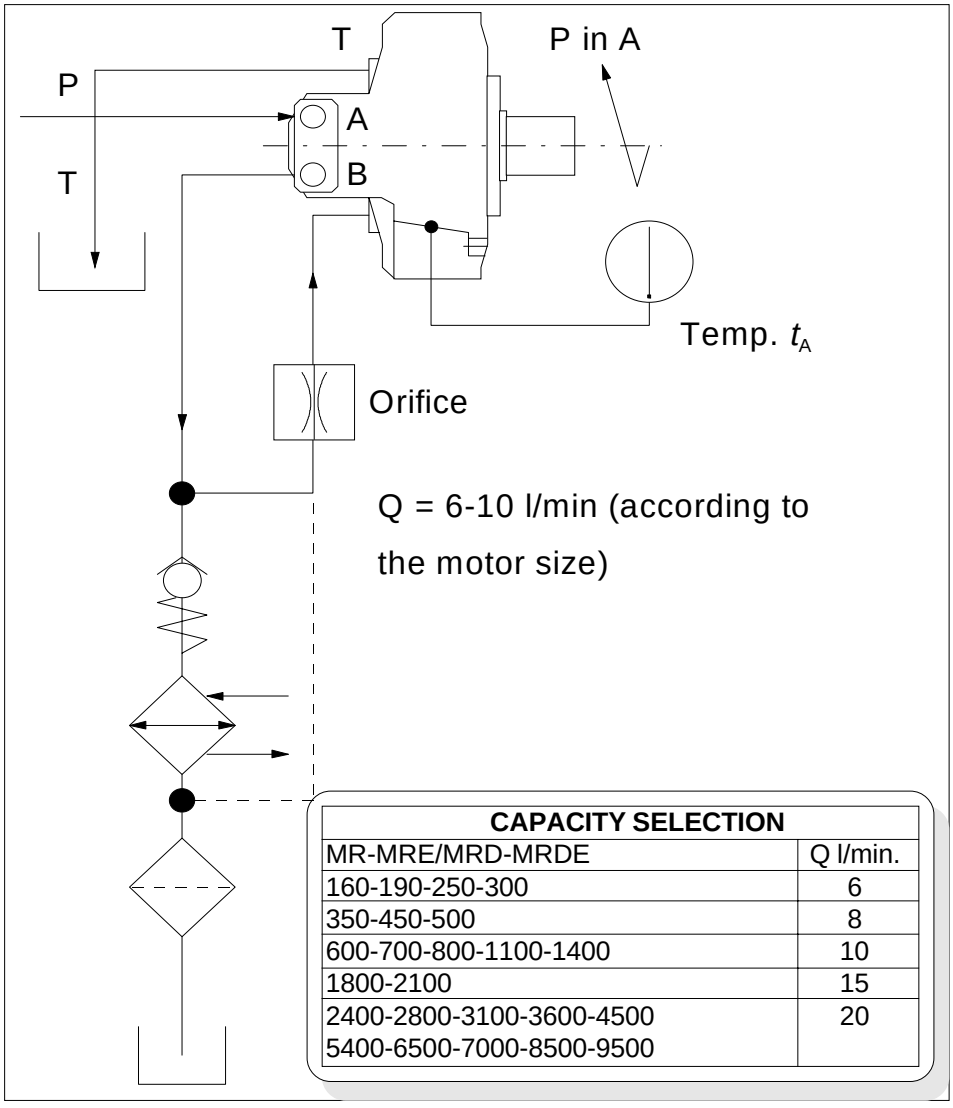
Mixing oils of different brands, or different oils of the same brand, may lead to the formation of sediment and sludge. This may bring about a rapid, irreversible deterioration of the system.

1.6 FLUSHING

It is essential to flush the motor case when operating in the **"Continuing operation area with flushing"** (see operating diagrams in the technical catalogue), in order to ensure a minimum oil viscosity inside the motor case of 30 mm^2/s.
Flushing may also be necessary case beyond the **"Continuing operation area with flushing"** when the system is unable to ensure the minimum recommended viscosity conditions required for the motor.

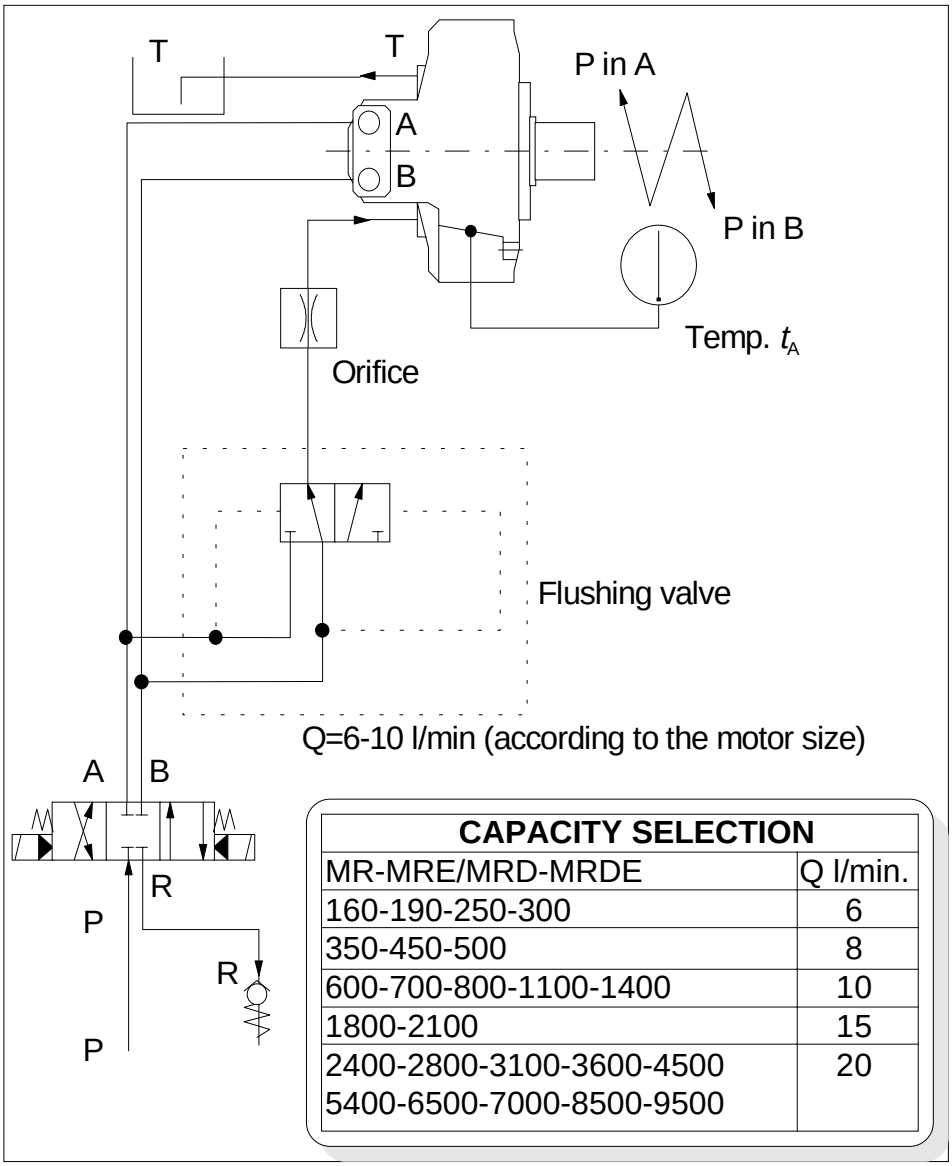
NOTE:

The oil temperature inside the motor may be determined with excellent approximation by measuring the surface temperature of the motor case tA (see Fig. 1-5 A-B) and adding 3°C to this recorded value.



CAPACITY SELECTION	
MR-MRE/MRD-MRDE	Q l/min.
160-190-250-300	6
350-450-500	8
600-700-800-1100-1400	10
1800-2100	15
2400-2800-3100-3600-4500 5400-6500-7000-8500-9500	20

Figure 1-5A
Flushing circuit.
Unidirectional rotation



CAPACITY SELECTION	
MR-MRE/MRD-MRDE	Q l/min.
160-190-250-300	6
350-450-500	8
600-700-800-1100-1400	10
1800-2100	15
2400-2800-3100-3600-4500 5400-6500-7000-8500-9500	20

Figure 1-5B
Flushing circuit.
Bi-directional rotation

DANGER ***It is absolutely essential to disable the flushing system before checking the motor case leakage.***

CAUTION ***Motor MRE 9500-0 can only be flushed while the motor is running.***

1.7 OVERLOAD

If the motor is run as a pump or driven by the load (even temporarily), it is important to ensure that an adequate boost pressure is supplied to the inlet port.
The diagrams for the minimum boost pressure required by the motor acting as a pump are shown in the **Riva Calzoni Oleodinamica** technical catalogue.

NOTE:

The hydraulic circuit must be built to protect the motor from insufficient feed pressure.

Figura 1-6A
Generic example of open circuit.

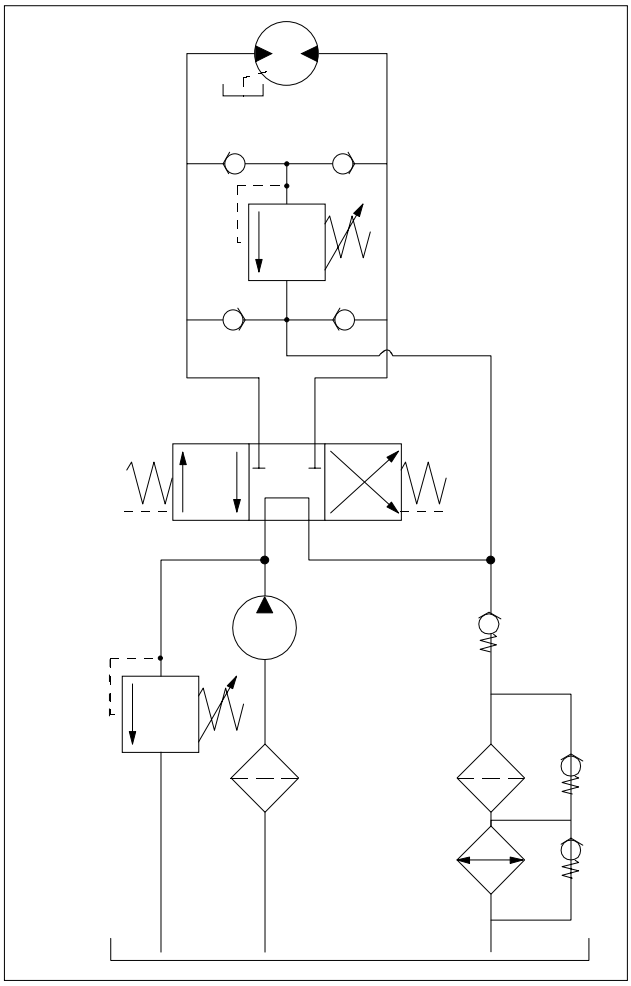


Figura 1-6B
Generic example of closed circuit

Section 2
MOVING AND STORAGE

Contents

SECTION 2

MOVING AND STORAGE

This section contains the instructions essential to operators for removing and lifting the product.
The information contained in this section is intended for **QUALIFIED TECHNICAL PERSONNEL** (MECHANICAL AND ELECTRICAL MAINTENANCE TECHNICIANS) with adequate knowledge to work appropriately and safely with lifting equipment, harnesses, lift trucks, bridge cranes, etc.

2.1 GENERAL WARNINGS

WARNING

Only QUALIFIED TECHNICAL PERSONNEL trained in the specific field of intervention should carry out lifting, moving, placement, mechanical, hydraulic and electrical connections.

2.2 SUPPLY CONDITIONS

The motors are supplied in the following conditions:

- For shipping within Italy, the motors are packed and attached to skids.
- For international shipments, the motors are packed in special cardboard or wooden crates, depending on the type of shipment (truck, ocean, air) and specific customer requests.
- All parts of the motor are protected by a layer of passivating film (Tauton 2), while delicate external parts (flange, hose fitting, case hole, drive shaft) are specially protected.
- Motors to be shipped by sea or ocean freight are painted with a synthetic gray rust-proof primer; other types of paint may be used based on specific customer requests. The coupling surfaces are not painted.
- The motors are supplied without oil from the final inspection, and the interior of the motors is protected by a film of residual oil.
- All motors are tested according to our internal functional testing procedures.

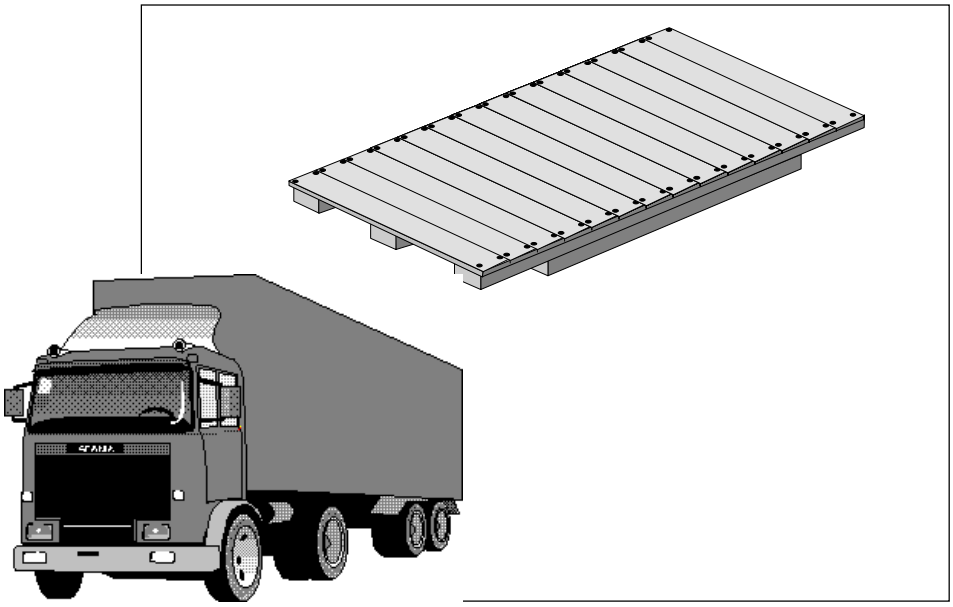
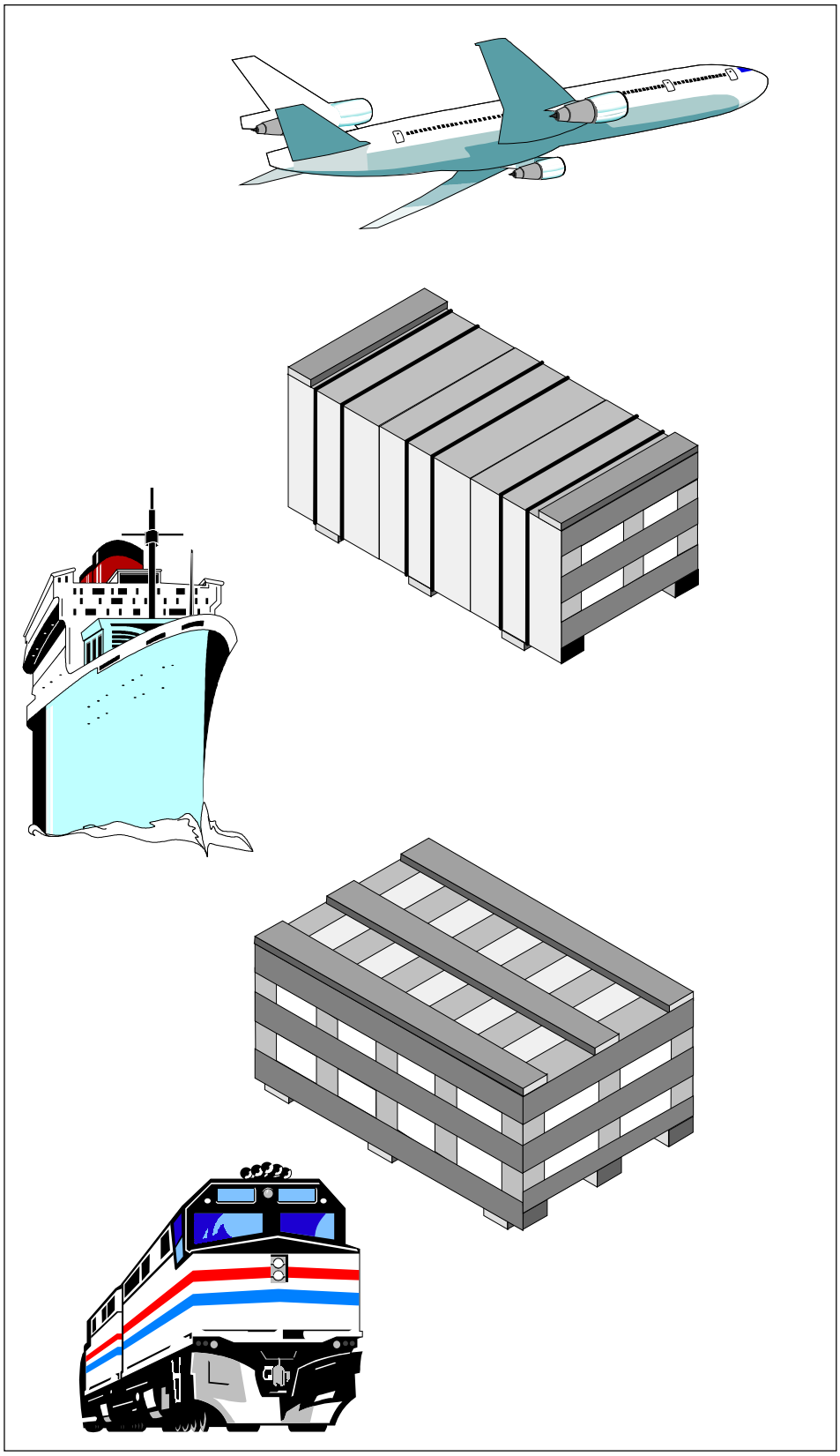


Figure 2-1
Shipping on wooden skid.

Figure 2-2
Shipping in cardboard or wooden crate.



2.3 SHIPPING

During shipment, it is best to treat the motors as delicate goods to prevent them from striking against parts that could damage the packing and contents.

WARNING

When moving the motor in-house, we recommend the utmost care in operations and reduced speeds to avoid bumps or impact, thereby possibly damaging the drive shaft and other delicate parts.

2.4 STORAGE

We recommend in any case that you avoid storing the motors outside, in excessively damp sites or resting directly on the ground.
The motor may be stored in a warehouse, as supplied, for a maximum of 3 months.
Should the motor be stored for a longer period, or in a damp place, it must be filled with filtered hydraulic oil (see Sect. **1** chap. **5**) and re-closed using the caps provided. The oil added should, if possible, be the same type that will be used in the application system, to avoid the risk of mixing different oils (see Sect. **1** chap. **5**).

WARNING

The product may be seriously damaged if it is kept at critical temperatures while awaiting installation. DO NOT expose the product to temperatures below -30 °C and above 80 °C; these temperatures should be considered the absolute lower and upper extremes allowed.

2.5 REMOVING THE PACKING

2.5.1 Opening and disposing of the packing

As illustrated in the previous paragraph, the motor is simply packed on a wooden skid, or a skid with cardboard box or wooden crate. The wooden crate must be opened in order, beginning with the cover, then removing the side panels and finally the end panels (see Fig. **2-3**).

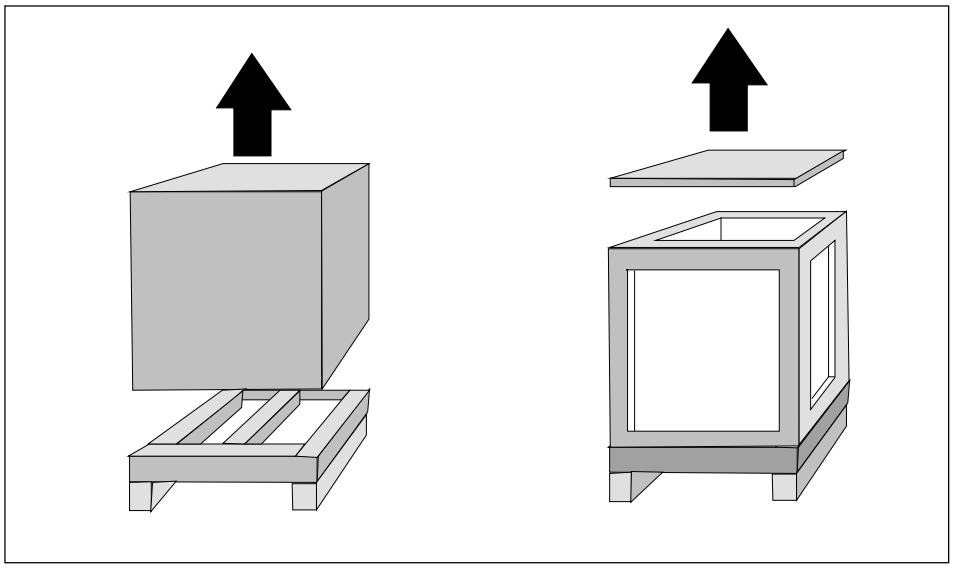


Fig. 2-3
Procedure for opening the packing

WARNING

The parts making up the crate must be kept from harming people; thus, before storing them, you must remove dangerous parts such as: wooden pins, screws, nails, sharply pointed or edged parts, etc.

CAUTION

Operators assigned to move and open the packing must adopt individual protective gear (gloves, helmet, safety shoes) and respect the general safety regulations required by EEC directives and legislation in the user's country. Regarding individual protective gear, the European Community has issued directives 89/686/EEC and 89/656/EEC.

Once you have completely removed the packing, if the motor has been partially or fully subjected to an corrosion-proof treatment you must clean the treated parts thoroughly to remove the anti-oxidants; do so using cloths dampened with solvent.
The materials used for packing, boards, wooden walls, waterproof coverings, may be stored and re-used as loose material.
In NO case may they be disposed of in the environment; in particular, **do NOT burn** the waterproof coverings. They must be disposed of at authorized sites for differentiated waste disposal.

NOTE:

RIVA CALZONI OLEODINAMICA may not be held responsible for improper use of the packing materials during subsequent shipments of the motor or other material.

2.6 CHECKING THE CONTENTS

2.6.1 Packing slip

Check carefully to make sure that the material received complies to the shipping documents, and that it has not been damaged during shipment. Notify any discrepancies or damages immediately.
The user must specify the data on the identification plate shown in Fig. **1-2** on any request or correspondence regarding the motor, indicating: **Complete motor code and serial number.**

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E-Mail: rco@rco.rivacalzoni.it

2.7 MOVING

To move the motor during assembly and disassembly from the application, we recommend the following procedures:

· Harness the motor (**1**) using a nylon belt (**2**) as shown in Fig. **2-4**.

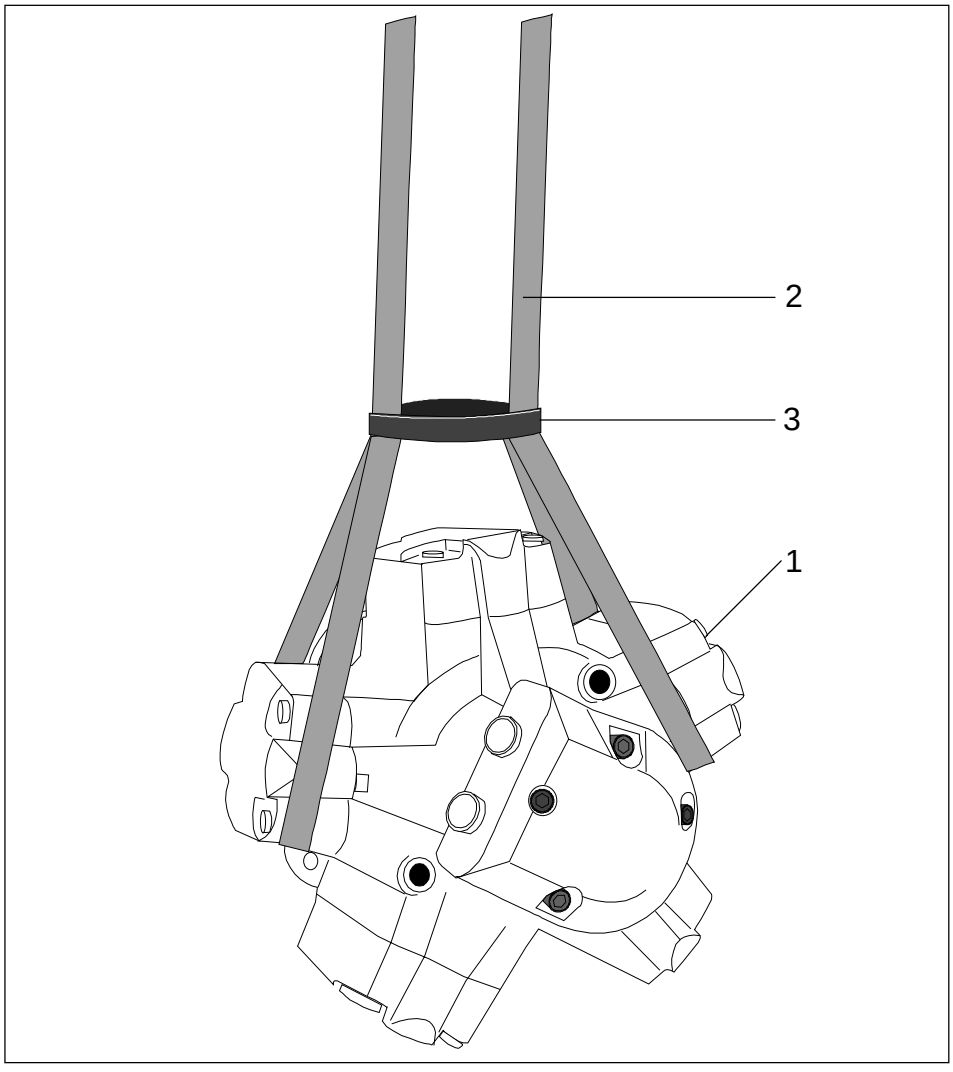

Figure 2-4
Lifting with a nylon belt + metal ring.

WARNING

The size of the belt must be chosen according to the weight of the motor, indicated in Sect. 1 chap. 3)

· Use a metal ring (**3**) to “throttle” the belt (**2**), adjusting the height of the metal ring before tightening the cable.

· Attach the motor (**1**) to a special tool (**2**), as indicated in **Fig. 2-5**, available upon request from **RIVA CALZONI OLEODINAMICA**. Move the motor using an adequate lifting system. The tool (**2**) must be attached to a case hole (**3**) on the motor itself and a flange fastening hole (**4**).

NOTE:

A different type of tool is supplied for each family of motors.

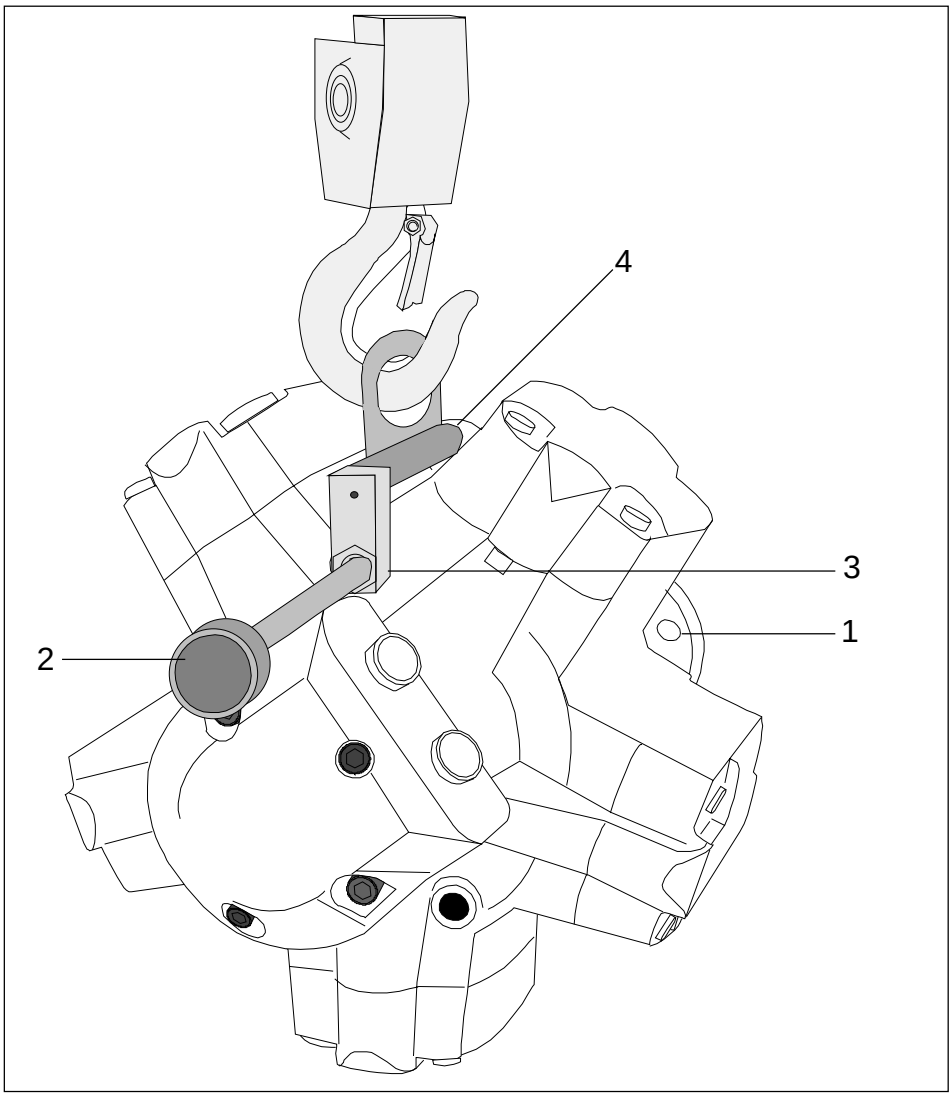

Figure 2-5 Lifting with a dedicated tool.

· For some types of applications as shown in **Fig. 2-6**, upon request by the customer the motor may be supplied with a special hole (**1**) for an eyebolt, on the five cylinder covers (code "Y").

NOTE:

For motors MR 6500 - MR 7000 - MRE 8500 - MRE 9500 code "Y" includes 2 holes for each cylinder cover, and a special lifting tool.

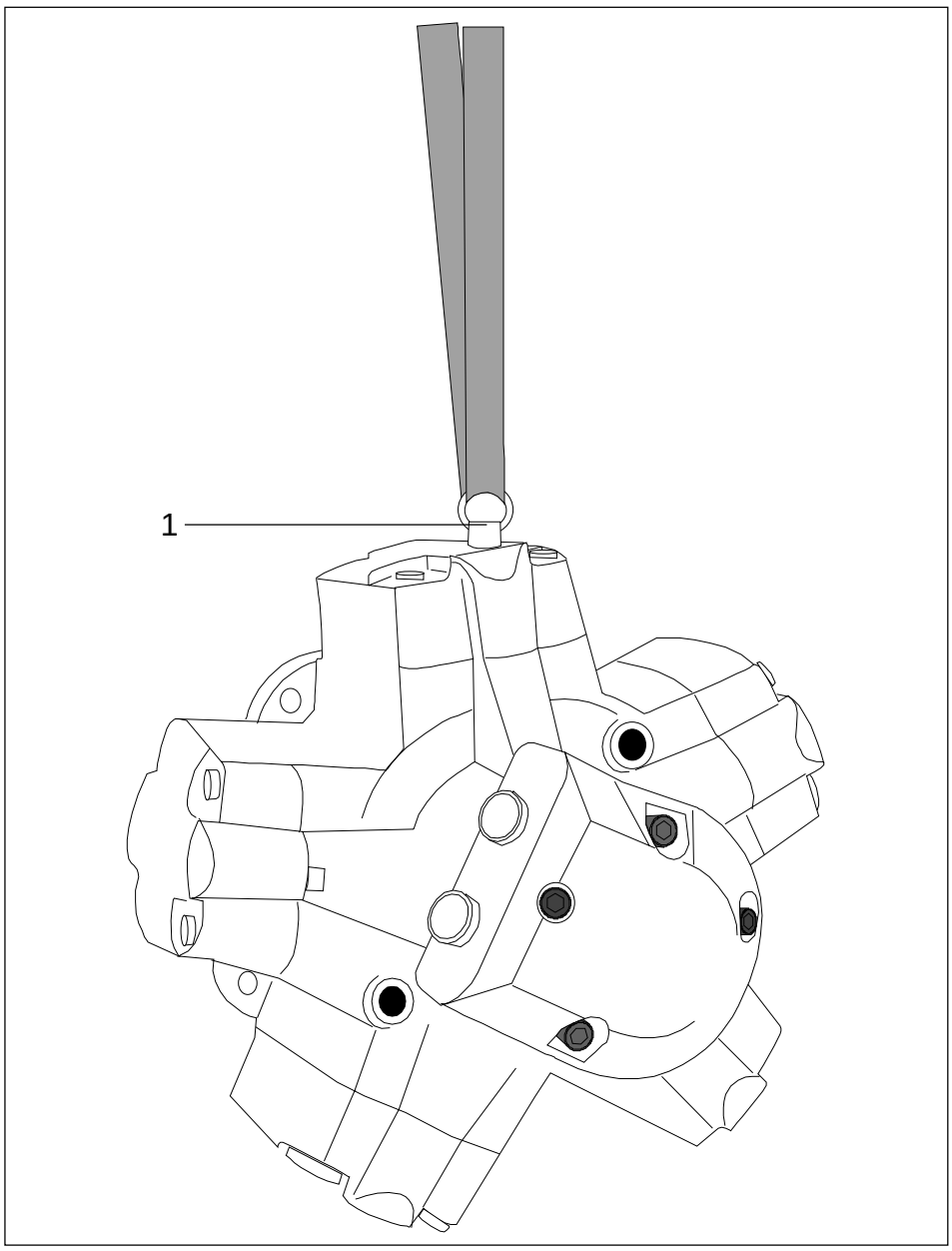

Figure 2-6
Lifting with eyebolt.

Section 3
INSTALLATION

Contents

SECTION 3

INSTALLATION

This section is dedicated to the personnel (**MECHANICAL MAINTENANCE TECHNICIAN**) assigned to install the motor on the machine or system for which it has been purchased.
We therefore emphasize the importance of this section, as optimum operation of the machine/system-motor depends on the correct assembly of these parts. In addition, a correct assembly will limit the sources of danger for those working near the structure.

3.1 APPLYING THE MOTOR TO THE SYSTEM

Create the coupling counter-flanges to the machine or system where the motor is to be installed. These must have a perfectly smooth surface, fully de-greased and non-deforming.
The motor must be attached using screws appropriately sized to the holes, and inserting the appropriate locking washers. The torque should be in proportion to the moment generated by the motor, reaching 70% of the flexing load of the screw if necessary (see table Fig. **3-1**).

Figure 3-1
Table of maximum torques for motor mounting bolts.

MAXIMUM TORQUE FOR MOTOR MOUNTING BOLTS				
Motor type MR-MRE/MRD-MRDE (cc.)	**Nominal screw diameter**	**Maximum moment (daNm)**		
		class 8.8	**class 10.9**	**class 12.9**
160 - 190 250 - 300	M10	4.97	7.00	8.37
350 - 450 - 500 600 - 700 - 800	M12	8.46	11.90	14.30
1100 - 1400	M14	13.46	18.92	22.70
1800 - 2100	M16	20.40	28.80	34.60
2400 - 2800 - 3100	M18	28.40	40.00	48.00
3600 - 4500 - 5400	M22	53.00	74.50	90.000
6500 - 7000 - 8500 - 9500	M24	70.00	98.00	117.00

If the installation requires high-speed operation, frequent reversals, frequent stopping and starting, it is best to use two calibrated holding screws.
If a rigid coupling is used, make sure the couplings between the motor shaft and drive shaft must be perfectly aligned and smooth, with no radial and/or axial pre-loading to avoid mechanical stress that may reduce the life-time of the bearings.
The motor may be assembled horizontally or vertically, with the shaft facing either up or down. In any case, there are no special rules to follow in positioning the main hose fittings, while care must be taken instead with the case hoses (see **sect. 3, chap. 2, par. 2)**.

3.2 HYDRAULIC CONNECTIONS

3.2.1Main inlet hoses

In its standard configuration, the motor has 2 holes on the Rotary valve housing, which may be either inlet or outlet ports depending on the application, and 6 threaded holes.

NOTE:

Remove the plastic protective caps from the inlet holes before connecting the hoses.

Standard **Riva Calzoni Oleodinamica** or **SAE** flanges are supplied upon request (see technical catalogue), which include seats for the sealing gaskets (O-rings).
For pipelines, these must be made of drawn, polished steel and connected to the flange with cutting-ring fittings (such as ERMETO).
We do not recommend using welded pipes; should it be necessary to use them, clean the inside of the pipes thoroughly around the welds, using both mechanical means and chemical pickling, to prevent welding residue from entering the oil circuit.
In any case, steel pipelines must be chemically pickled, then neutralized and fixed, when the pipes show traces of oxidation or in any case are not perfectly clean.

3.2.2 Case pipelines

The case must be connected directly to a tank (without filter) by means of a 1/2 or 3/8”- diameter pipe, not too long and without unnecessary bends and bottlenecks. The pressure inside the motor housing must not exceed **5 bar** to prevent damaging the shaft seal on the drive shaft; **15 bar** if the motor is equipped with a high-capacity shaft seal (code “F”).
As shown in Figures **3-2, 3-3, 3-4**, the case must be connected according to the following instructions.

Horizontal motor installation
Use the case drain port on the motor housing located at the highest point, to ensure perfect lubrication of the two bearings.

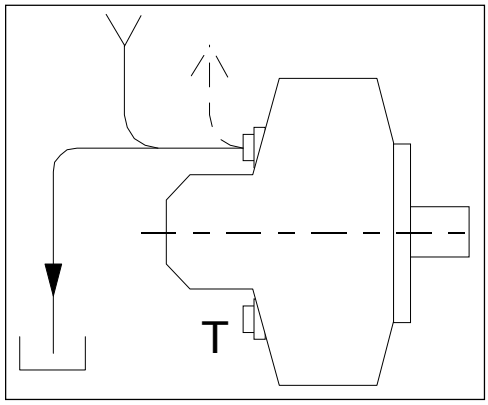

Figure 3-2
Horizontal installation

Vertical motor installation with shaft downward
Any case drain port may be used.

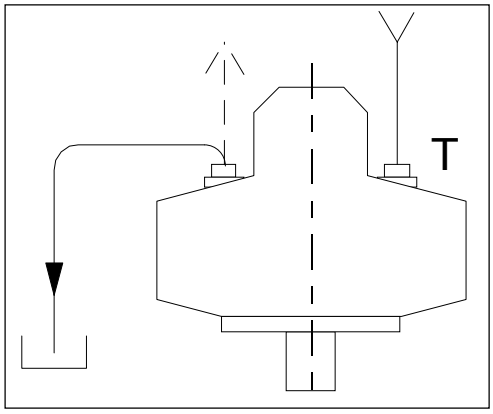

Figure 3-3
Vertical installation with shaft downward.

Vertical motor installation with shaft upward

Use one of the case drain ports on the motor housing, and make sure that the pipe is above the motor fitting flange before connecting it to the tank, to ensure that the bearing is adequately lubricated.
Upon specific request by the customer, the motor may be supplied with an optional drainage and purge hole (T1) on the front cover.

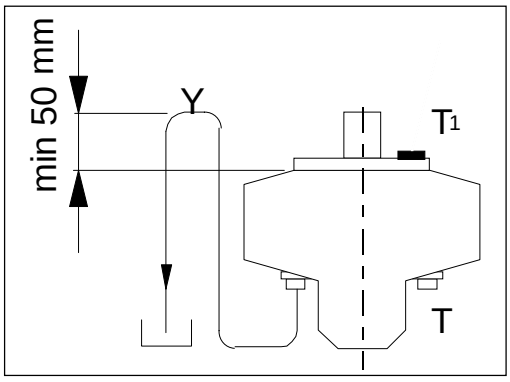

Figure 3-4 Vertical installation with shaft upward.

3.2.3 Pilot pipelines for MRD/MRDE motors

The **CETOP 4.2-4-03-320** fitting is installed on the rotary socket for pilot connections.
The pilot pressure required to change the displacement of **MRD/ MRDE** motors may be taken from a dedicated circuit separate from the motor, or drawn directly from one of the two ports 1/4" BSP located on the rotary valve housing.
Either pipes or hoses may be used, but all specifications listed in **sect. 3, chap. 2, par. 1** must be complied with.
When specifically required by the customer, the motors may be prepared with a built-in self-piloting system.
The pilot pressure values (minimum and maximum) are specified in **sect. 1 chap. 3.**

Section 4
USE

Contents

SECTION 4

USE

The purpose of this section is to indicate the procedures necessary in order to start the motor. The information contained in this section is intended for all **qualified technical personnel** in charge of machine **MAINTENANCE**, and for the machine **operator**.

4.1 PRE-START-UP CHECKS

Before starting the motor for the first time, check the points indicated below:

- Make sure that the motor is connected so that it turns in the desired direction. For motors with standard rotation direction:
  Clockwise rotation (viewed from the shaft side) with inlet pressure at **A** (see Fig. **4-1**).
  Counter-clockwise rotation (viewed from the shaft side) with inlet pressure at **B** (see Fig. **4-1**).

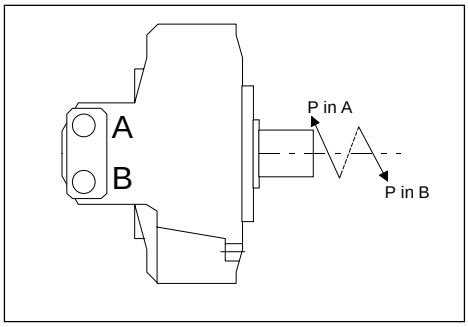

Figure 4-1
Motor rotation direction.

- Select the hydraulic fluid according to the recommendations given in **sect. 1 par. 5 (Operating fluids)**.

- Make sure the inlet, case and pilot (MRD/MRDE motors only) lines are properly connected, as specified in **sect. 3 chap. 2 (Hydraulic connections)**

- If the motor is to be used continuously in the “Continuous operating area with flushing” (see operative diagrams in the technical catalogues), or if the system cannot ensure the working oil viscosity conditions required by the motor, you must create a flushing system for the motor housing as described in **sect. 1 chap. 6 (Flushing)**

- Make sure that all couplings and caps are properly tightened to prevent leakage.

4.2 FILLING

NOTE:

All motors are supplied without lubricating oil.

The two case holes in the motor housing are capped, one with a metal cap and the other plastic.
To fill:

- place the motor in its working position, making sure to close the lower case hole with the metal cap.
- use the upper case hole to fill the motor housing with the same oil used in the system, to the level required in order to ensure efficient lubrication of the two bearings.

CAUTION

For MRE 9500-0 motor, during filling it is necessary to avoid creating pressure inside the motor housing.

CAUTION

The oil must be pre-filtered (see sect. 1 chap. 5).

Below is a list of the amounts of oil needed in order to fill the motor housing.

Motor type MR-MRE MRD-MRDE	liters
160 - 190	1.7
250 - 300	2.0
350 - 450 - 500	2.8
600 - 700 - 800	3.3
1100 - 1400	6.0
1800 - 2100	9.5
2400 - 2800 3100	13.0
3600 - 4500 5400	19.0
6500 - 7000 8500 - 9500	27.0

4.3 START-UP

During and immediately after start-up, any hydraulic system must be checked carefully and frequently.
The motor does not require any special breaking-in, but all residual impurities in the system must be eliminated by running the motor at low speed and with no applied load.
After a brief period, the filters must be cleaned. This will also purge air from the motor cylinders, which may increase initial noise levels.
In **MRD/MRDE** motors it is best to change the displacement several times to purge air from the displacement control cylinders.
If the filter is very dirty after this initial breaking-in phase, repeat the operation; however, this does mean that the precautions indicated for cleaning the circuit have not been taken.

NOTE:

It is best to follow the instructions above each time the motor or any other part of the system is dismantled.

When running with no load, make sure whether the pressures, temperatures and noise level of the motor are sufficiently low; high pressures, temperatures, and noise levels during no-load operation may indicate unforeseen operating conditions.

Section 5
MAINTENANCE

Contents

SECTION 5

MAINTENANCE

The purpose of this section is to indicate the procedures necessary in order to properly service the motor, ensuring that it will continue to perform well over time.
The information contained in this section is intended for all **qualified technical personnel** in charge of machine **MAINTENANCE**, and some parts for the machine **operator**.

5.1 PERIODIC MAINTENANCE OF THE HYDRAULIC SYSTEM

The hydraulic system must be subjected to minimal periodic maintenance at regular intervals, which strictly depend on the type of application. These steps must include the following:

· *Check for leaks in the complete hydraulic system*
In case of a leak:
- tighten the holding screw with a torque wrench, especially when there are alternating or high mechanical stresses and during the initial operating period;
- replace any defective and/or worn seals

· *Inspect all filters (air, oil and magnetic) and keep them clean*
- Replace any clogged filters;
- Inspect the tank and check for any water or moisture .

· *While the system is running, you must also:*
- Check the pressure and temperature of the fluid to make sure they correspond to those calculated previously;

- Check the characteristics of the hydraulic fluid used.

- Make sure that no parts of the hydraulic system are contaminated by outside agents.

NOTE:

Remember that it is easier to trace any leaks and/or defects in a clean hydraulic system.

- We recommend that you keep a special register in which to record the findings during routine and/or special maintenance.

5.2 MOTOR MAINTENANCE

To keep the motor running perfectly at all times, it is necessary to perform minimal maintenance as listed in the chapters that follow.

5.2.1 Cleaning the filters

The filters must be changed after the first **200 running hours**; subsequent cleaning and/or changes must take place every **3 months** or **500 running hours**, whichever comes first.
(if the indicator is installed, as soon as a clog is signaled).

5.2.2 Changing the oil-operating fluid

The frequency of oil changes depends on the working conditions of the motor, the environment and the amount of oil in circulation.
The first oil change must be performed after **200 running hours**; thereafter, the frequency may range from **1000** to **2000 running hours**.
As specified in **sect. 5 chap. 1**, we recommend that you analyze the oil periodically to ensure that the characteristics described below are maintained.
For other types of fluid, follow the manufacturer's instructions.

5.2.3 Viscosity

Make sure that the degree of viscosity always respects the values specified in **sect. 1 chap. 5**.

5.2.4 Oxidation

Mineral oils oxidize in proportion to use and temperature. Oxidation is revealed by a change in color, an unpleasant odor and the increased acidity of the oil, as well as the formation of sludge in the tank.
Should you notice these characteristics, change the oil immediately.

5.2.5 Water

The presence of water in the oil may be determined by taking oil samples from the bottom of the tank, since water repels most mineral oils and sinks to the bottom. If found, water must be purged at regular intervals.

WARNING

The presence of water in the hydraulic circuit can cause serious damage to the motor.

5.2.6 Degree of contamination

A high degree of oil contamination causes increased wear on all hydraulic components, thus the cause of the contamination must be identified and eliminated.
These analysis may also serve to determine more precisely how often to change the oil. In any case, the frequency must never exceed every **12 months**.

WARNING

To avoid mixing different oils, during an oil change you must empty all equipment and lines and clean the motor thoroughly, especially the tank.

It is also important to replace all of the oil in the drainage chambers of the motors, emptying the motor completely.

5.3 EMPTYING

To empty the motor completely, proceed as follows:
- unscrew the cap (**1**) (Fig. **5-1**) from the case hole.
- let the oil drain out.

NOTE:

To facilitate this operation, we recommend that you unscrew the second drainage cap (2).

When the operation is complete:
- tighten the cap (**1**), as well as cap (**2**) if previously unscrewed.

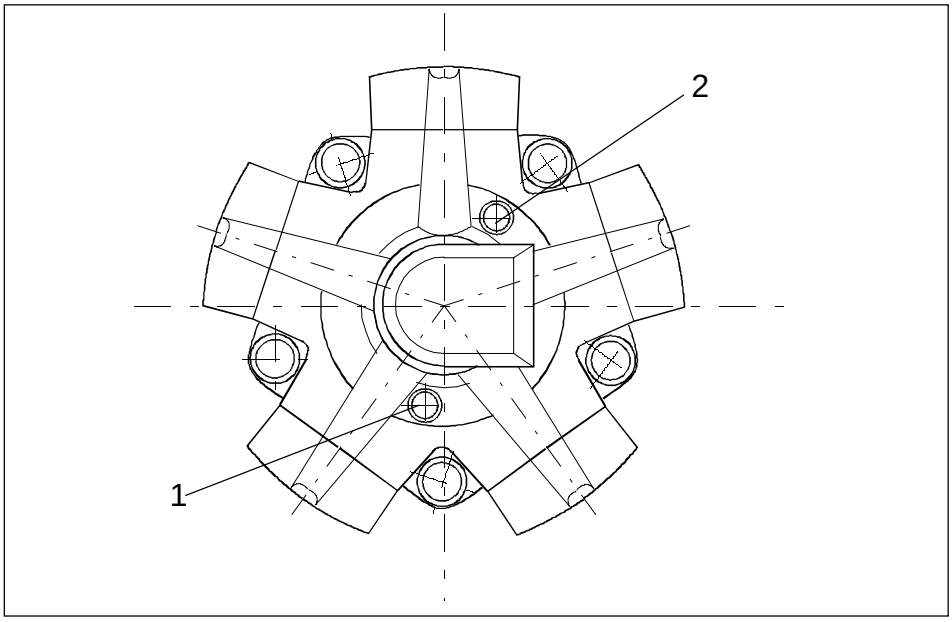

Figure 5-1
Procedure for emptying the fluid from the motor.

WARNING

Once you have emptied the fluid from the motor, send it to authorized waste disposal centers.

IT IS STRICTLY FORBIDDEN TO DISPOSE OF USED OIL THROUGH THE SEWAGE SYSTEM!

Section 6
REPAIRS AND SERVICE

Contents

SECTION 6

REPAIRS AND SERVICE

The purpose of this section is to provide technical support in the event of motor malfunctions, and indicate the major service centers throughout the world. It also lists the general conditions governing the warranty.
The information in this section is intended for all **qualified technical personnel** responsible for motor **MAINTENANCE.**

6.1 GENERAL NOTES

Should it be necessary to service or repair the motors, said service must be performed by an authorized **Riva Calzoni Oleodinamica** service center or directly at headquarters.

During repair, all motor parts are checked to ensure that they respect the technical specifications issued by **Riva Calzoni Oleodinamica**, in reference to the original drawings and technical specifications.
If the motor is sent to **Riva Calzoni Oleodinamica** or a service center, it is important to indicate:

- motor code
- serial number
- total running hours
- malfunctions found
- type of application
- working parameters (cycle, pressures, speed, etc.)
- type and temperature of oil used
- oil filtering level

6.2 MALFUNCTIONS:TROUBLE-SHOOTING

Malfunction	Possible cause	Solution
The motor does not run	1)Mechanical transmission block	1) Check the pressure in the system. If the pressure has exceeded the setting value of the safety valve, remove the load from the transmission.
	2) The motor does not generate enough torque because the working pressure is too low	2) Check the pressure level in the system and correct the setting of the pressure limit valve, if necessary
	3) The motor is not supplying enough power	3) Check the hydraulic system.
The motor turns in the wrong direction	The hydraulic inlet and return connections **A** and **B** are reversed.	Corrrect the connections.
The motor does not run smoothly	Pressure and/or throughput fluctuations in the hydraulic system	Look for the cause in the hydraulic system or mechanical transmission

Malfunction	Possible cause	Solution
The motor is noisy	1) Distributor still breaking in	1) After the first few running hours, the noise (squeaking) generated by the contact surfaces of the distributor unit disappears.
	2) The boost pressure is too low	2) Set the boost pressure value as described in sect. 1 chap. 7
	3) Residual air in the motor	3) The air will be purged, mixed with fluid, after the first few running hours
	4) Resonance inside the pipelines	4) Optimize the diameter and type of connecting lines on the motor. Contact **Riva Calzoni Oleodinamica** for service and information
	5) Bearings	5.1) In no-load operation, you may hear the bearings turn; this disappears when the motor is run under load. 5.2) Bearings breaking. Contact the Technical Service
External oil leaks	1) Perspiration between the coupling surfaces on the motor (passive oil or fluid residues)	1) Clean the motor and see whether the problem persists.
	2) Porous castings	2) Contact the Technical Service.
	3) Shaft sealing ring leaks	3) Contact the technical Service

If the proposed solutions do not solve the malfunction, or in case of doubt or problems not listed in the table: contact the Technical Service.
Motor problems are often highlighted by drastic variations in the case flow in terms of the capacity and/or impurities present.

DANGER

If the motor housing is flushed, before checking the drain flow it is absolutely essential disable the flushing system.

6.3 GENERAL WARRANTY CONDITIONS

- The supplier guarantees the goods for material and manufacturing defects for a period of **six months** following installation of the unit supplied, with normal working shifts. For **units overhauled** by **Riva Calzoni Oleodinamica**, the warranty period is **three months**. If the machines equipped with units covered by warranty are used in multiple-shift operations, the warranty period shall be reduced accordingly.
  In any case, the warranty shall **end twelve months** after delivery.

- In order for the manufacturer to satisfy requests for service under warranty, the customer must have fulfilled all contractual obligations.

- In order to examine the warranty service request, the supplier must have the complete unit. Thus any customer intervention on the contested unit, especially dismantling individual components, shall void the warranty.

- The supplier is required by the terms of the warranty to repair or replace the entire unit or any part thereof, at his own incontestable discretion. All expenses of any kind deriving from machine down time, missed production, dismantling the contested unit and its carriage to the supplier's place of business, as well as those involved in shipping the repaired or replaced unit to the customer, or its reassembly, shall be borne by the customer. For parts and units already repaired by Riva Calzoni Oleodinamica or replaced under warranty, the warranty term shall be extended beyond the original deadline to a maximum of **three months** after delivery.

- The supplier shall not apply the warranty in the case of problems or damage due to negligence or incompetence, or in any case any use of the unit not in compliance with the instructions, in particular under excessive loads or stress.

- If the request for warranty service is denied by the supplier, the latter shall submit to the customer a regular estimate for repair or proposal for trade-in replacement. Should the customer fail to confirm acceptance, the material will be returned and all costs sustained billed to the customer.

Section 7
SCRAPPING

Contents

SECTION 7

SCRAPPING

The purpose of this section is to provide instructions and suggestions for properly scrapping the motor.
The information in this section is intended for all **qualified technical personnel** responsible for motor **MAINTENANCE.**

7.1SHUT-DOWN AND DISMANTLING

7.1.1 Safety warnings

-The machine must be dismantled and disposed of by qualified personnel familiar with safety regulations relating to the type of work to be done.

-During disassembly, the operator must wear the most appropriate protective gear, based on the type of residual or intrinsic hazard involved in dismantling the parts. The operator must also make sure that the parts of the motor to be removed may be lifted individually by the operator (max. 25 kg), and that there is no risk of dropping while being detached.

7.1.2 Instructions

The motors in the MR-MRE/MRD-MRDE series are basically made up of the following materials:

- ferrous material
- plastic/rubber material (gaskets)
- operating fluid

Ferrous material

The motor must be dismantled appropriately in order to separate the different materials of which it consists. All materials must be scrapped at authorized demolition centers.

WARNING

Make sure that the parts of the motor to be removed may be lifted individually by the operator (max. 25 kg), and that there is no risk of dropping while being detached.

Plastic/rubber material

The sealing rings (O-rings) in the motor are the only components made of plastic/rubber material.

Operating fluid

Collect the fluid from the motor following the procedure described in Section 5 par. 3.

WARNING

The collected fluid must be sent to authorized disposal centers.

IT IS STRICTLY FORBIDDEN TO DISPOSE OF USED OIL THROUGH THE SEWAGE SYSTEM !