



**JOHNSON PUMP**  
AN SPX BRAND

# Instruction Manual

## MDR-series

### Magnetic Drive Centrifugal Pumps



Read and understand this manual prior to operating or servicing this product.

MDR/EN (0909)

## Declaration of conformity

(Directive 98/37/EG, Annex IIA)

### **Manufacturer**

SPX Process Equipment NL B.V.  
Dr. A.F. Philipsweg 51, 9403 AD Assen  
P.O. Box 9, 9400 AA Assen  
The Netherlands

We declare under our sole responsibility that the product:

### **MDR-series**

### **Magnetic Drive Centrifugal Pump**

is in conformity with  
COUNCIL DIRECTIVE on the approximation of the laws of the  
Member States relating to Machinery 98/37/EG.

## Declaration of incorporation

(Directive 98/37/EG, Annex IIB)

The pump must not be put into service until the machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive.

Assen, May 1 st 2008



Gerwin Schaafsma  
Managing Director

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# 1.0 Introduction

## 1.1 General

Johnson magnetic drive centrifugal pumps type MDR are manufactured by SPX Process Equipment, Assen, The Netherlands.

This instruction manual contains necessary information on the magnetic drive centrifugal pumps and must be read carefully before installation, service and maintenance. The manual must be kept easily accessible to the operator.

**Important!**

The pump must not be used for other purposes than recommended and quoted for without consulting SPX Process Equipment's distributor.



Liquids not suitable for the pump can cause damages to the pump unit and imply risk of personal injury.

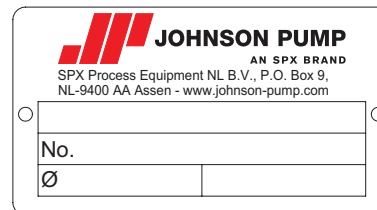
## 1.2 Reception, handling and storage

### 1.2.1 Reception

Remove all packing materials immediately after reception. Check the consignment for damage immediately on arrival and make sure that the name plate/type designation is in accordance with the packing slip and your order.

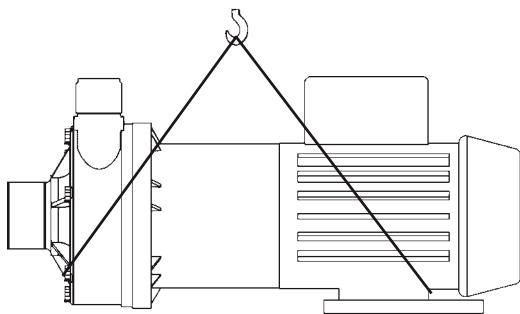
In case of damage and/or missing parts, a report should be drawn up and presented to the carrier at once. Notify your local distributor.

On the pump there is a plate with article number and fabrication number. Always state these numbers and the pump type when contacting your local distributor.

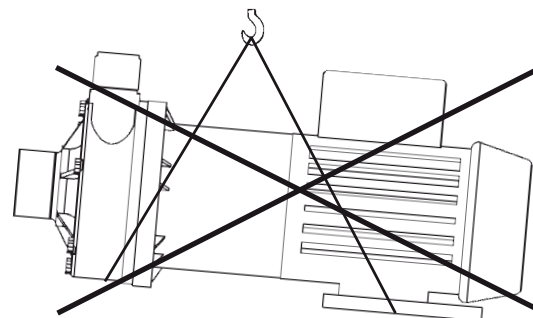


### 1.2.2 Handling

Check the weight of the pump unit (see section 7.0). All parts weighing more than 20 kg must be lifted using lifting slings or suitable lifting devices, e.g. overhead crane or an industrial truck.



*Always use two lifting slings. Make sure that they are secured in such a way as to prevent them from slipping and that the pump unit is hanging straight.*



*Never lift the pump unit with only one fastening point. Incorrect lifts can cause personal injury and/or damage to the product.*

### 1.2.3 Storage

If the pump is not installed immediately, it must be stored in a dry and cool place.

## 1.3 Safety



***Personnel who have a pacemaker should not be allowed to work with the magnetic coupling! The magnetic field is sufficiently strong to affect the operation of a pacemaker. A safe distance is 1 metre!***

### ***Important!***

The pump must not be used for other purposes than recommended and quoted for without consulting SPX Process Equipment's distributor.

A pump must always be installed and used in accordance with existing national and local sanitary and safety regulations and laws.



- Always wear suitable safety clothing when handling the pump.



- Anchor the pump properly before start up to avoid personal injury and/or damage to the pump unit.



- Install shut-off valves on both sides of the pump to be able to shut off the in- and outlet before service and maintenance. Check to see that the pump can be drained without injuring anyone and without damaging the environment or nearby equipment.



- Make sure that all movable parts are properly covered to avoid personal injury.
- Do not run the pump dry. If the pump is run dry there is a risk of pump breakdown caused by generated friction heat. If there is a risk of dry running, install a suitable dry running protection to avoid serious damages.
- All electrical installation work must be carried out by authorized personnel in accordance with EN60204-1. Install a lockable circuit breaker to avoid inadvertent starting. Protect the motor and other electrical equipment from overloads with suitable equipment. The electric motors must be supplied with ample cooling air.



If the pump is used for easily flammable liquids it is absolutely necessary that the pump and the pipe system is filled up before start up and during operation. Make sure that no air occurs in the system. Follow the instructions for start up (see section 4.3).

In environments where there is risk of explosion, motors classified as explosion safe must be used, along with special safety devices. Check with the governmental agency responsible for such precautions.



Improper installation can cause fatal injuries.



- Dust, liquids and gases that can cause overheating, short circuits, corrosion damage and fire must be kept away from motors and other exposed equipment. If the pump handles liquids hazardous for person or environment, some sort of container must be installed into which leakage can be led.



- If the surface temperature of the system or parts of the system exceeds 60°C, these areas must be marked with warning text reading "Hot surface" to avoid burns.



- The pump unit must not be exposed to rapid temperature changes of the liquid without prior pre-heating/pre-cooling. Absolutely forbidden to flush a hot pump with cold water. Big temperature changes can cause crack formation or explosion, which in turn can entail severe personal injuries.
- The pump must not operate above stated performance.



- Before intervening in the pump/system, the power must be shut off and the starting device be locked. When intervening in the pump unit, follow the instructions for disassembly/assembly. If the instructions are not followed, the pump or parts of the pump can be damaged. It will also invalidate the warranty.
- If the pump does not function satisfactorily, contact your distributor.

## 1.4 Type designation

Example	MDR	45	P2	-	1V
	1	2	3		4

### 1 Family name

Magnetic Drive Centrifugal Pump

### 2 Pump size

45, 75, 85, 105, 116

### 3 Pump material

P2 = polyvinylidenefluoride (PVDF)

P3 = polypropylene (PP)

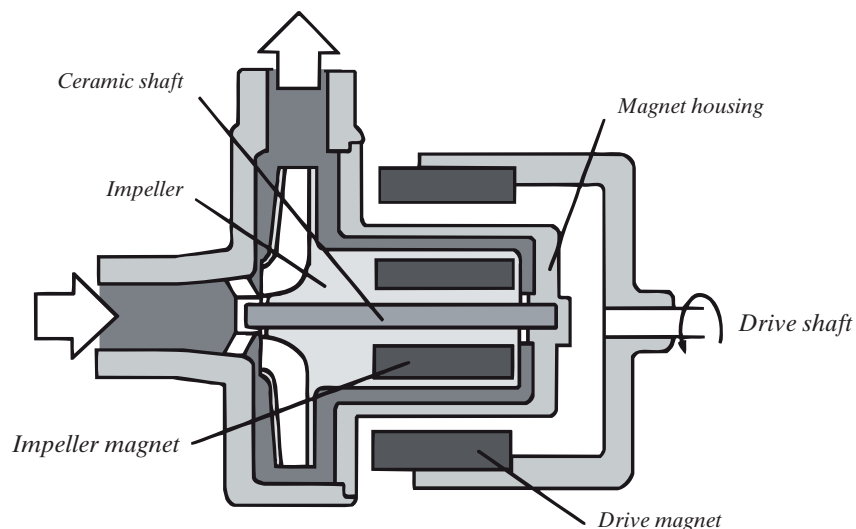
### 4 Impeller diameter

1V = full diameter for specific gravity up to 1.2 kg/dm<sup>3</sup> and viscosity 10 cP

1VD = reduced diameter for specific gravity up to 1.8 kg/dm<sup>3</sup> and viscosity 30 cP

## 1.5 Function and operating principle

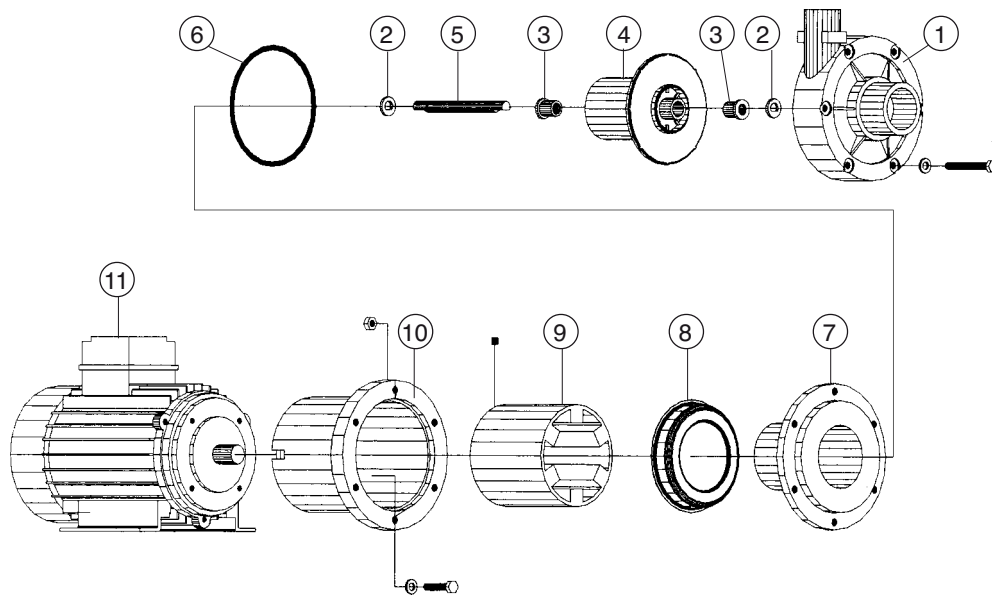
The drive magnet, attached to the drive shaft transfers its torque to the impeller magnet. The impeller can thereby rotate around the ceramic shaft in the pump body without any physical contact between the drive shaft and the pump body. This makes the pump completely leak-proof.



## 1.6 General precautions

- Do not run dry. If the pump is run without liquid, friction heat will be generated inside the pump which will melt the impeller onto the ceramic shaft and also possibly cause damage to other parts.
- Do not use the pump for other liquids than quoted for without consulting your SPX Process Equipment distributor.
- Do not run against closed valve. The pump will be damaged if it is run more than 3 minutes against closed valve.
- Do not run reverse. The impeller must rotate in clockwise direction when viewed from the motor end (see rotation arrow on the pump body).
- Do not run with cavitation or air entrainment.
- Do not run with fluid containing solid or abrasive particles without consulting your local distributor.
- Do not expose the pump to thermal shocks.
- Check the impeller bearing, shaft and wear plates regularly for wear (see section 4.4).
- Do not cause chock pressure.

## 1.7 Standard parts



- |               |                  |   |            |
|---------------|------------------|---|------------|
| 1. Pump body  | 4. Impeller      | 7. Magnet housing                             | 10. Flange |
| 2. Wear plate | 5. Ceramic shaft | 8. Reinforcement<br>(not available for MDR45) | 11. Motor  |
| 3. Bearing    | 6. O-ring        | 9. Drive magnet                               |            |

## 2.0 Technical information

### 2.1 Material specification

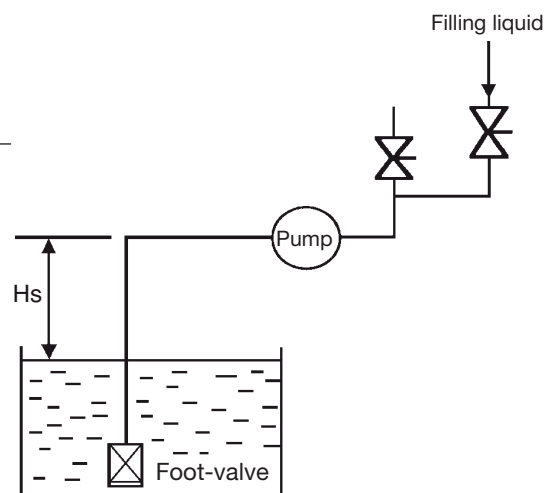
<b>Flange</b> (not exposed to the liquid)	Polypropylene filled with glass fibre
<b>Magnet housing, impeller, body</b>	Polypropylene filled with glass fibre alt Polyvinylidenfluoride with carbon fibre
<b>Shaft, wear plates</b>	Ceramic/ $Al_2O_3$
<b>Impeller bearings</b>	PTFE-Rulon LD
<b>O-ring</b>	FPM
<b>Impeller magnet</b> (not exposed to the liquid)	Ferrite

### 2.2 Suction lift and liquid level

#### 2.2.1 Max suction lift (Hs)

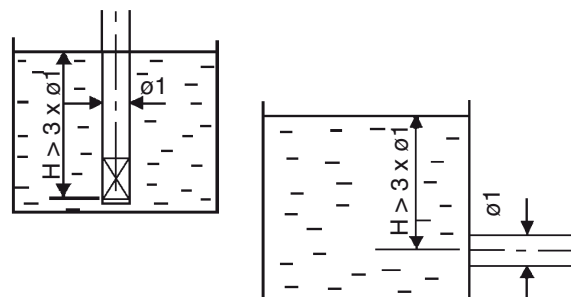
$$H_s [m] = \frac{4}{\text{Specific gravity [kg/dm}^3\text{]}}$$

To be used only as a guidance.  
 Please contact your local distributor for NPSH curves.



#### 2.2.2 Min required liquid level

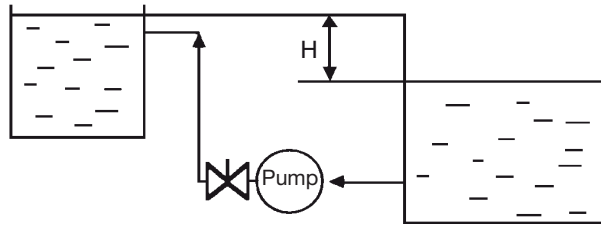
Minimum required liquid level at the suction nozzle must be more than 3 x the diameter of the suction pipe.



## 2.3 Min back pressure

The MDR-series demands a certain head for good function.

Min head = 0.5 m wc or 0.05 bar manometric pressure. If less, install a valve in the discharge pipe to adjust head.



## 2.4 Min flow required

To cool and lubricate the impeller bearing and shaft a certain flow is required through the pump.

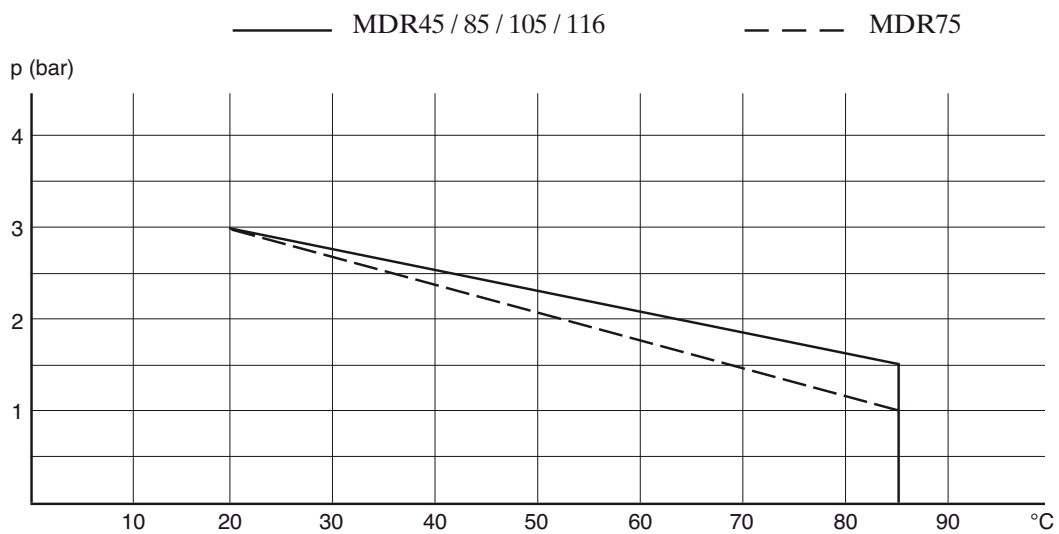
	Min. flow l/min	Max. system pressure bar (20°C)
MDR45	3	3
MDR75	5	3
MDR85	7	3
MDR105	10	3
MDR116	10	3

## 2.5 Temperature range

P2 (PVDF) = -10°C - +100°C

P3 (PP) = -10°C - + 85°C

## 2.6 Max temperature versus system pressure



Valid for P3 (polypropylene) pumps tested in water

## 2.7 Viscosity and specific gravity limits

Impeller diameter	Max. viscosity cP	Specific gravity kg/dm <sup>3</sup>
-1V	10	1.2
1VD	30	1.8

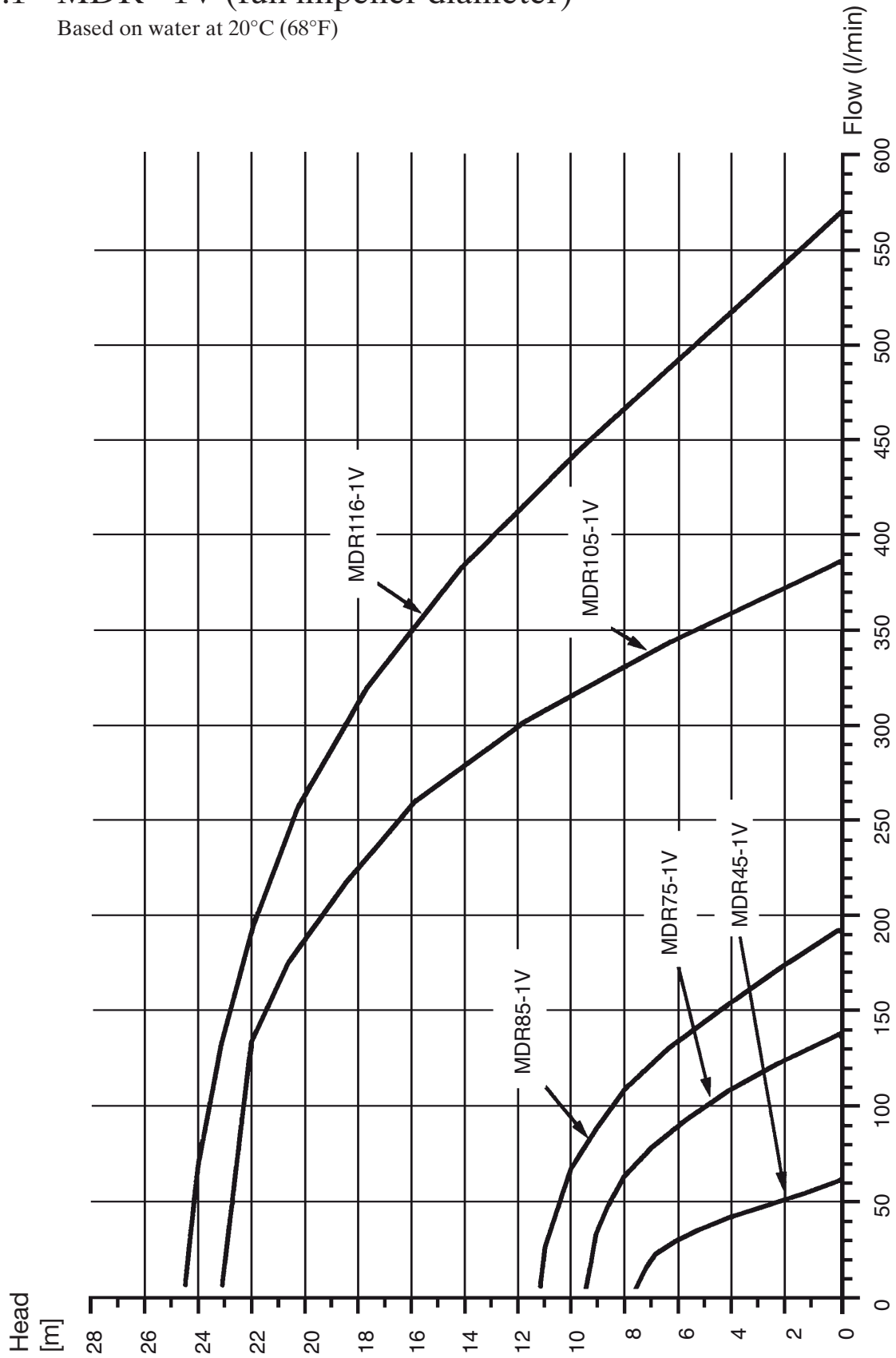
## 2.8 Sound level

Highest measured sound level for the MDR-pump is 70 dB(A) for pump fitted to standard electric motor.

## 3.0 Capacity

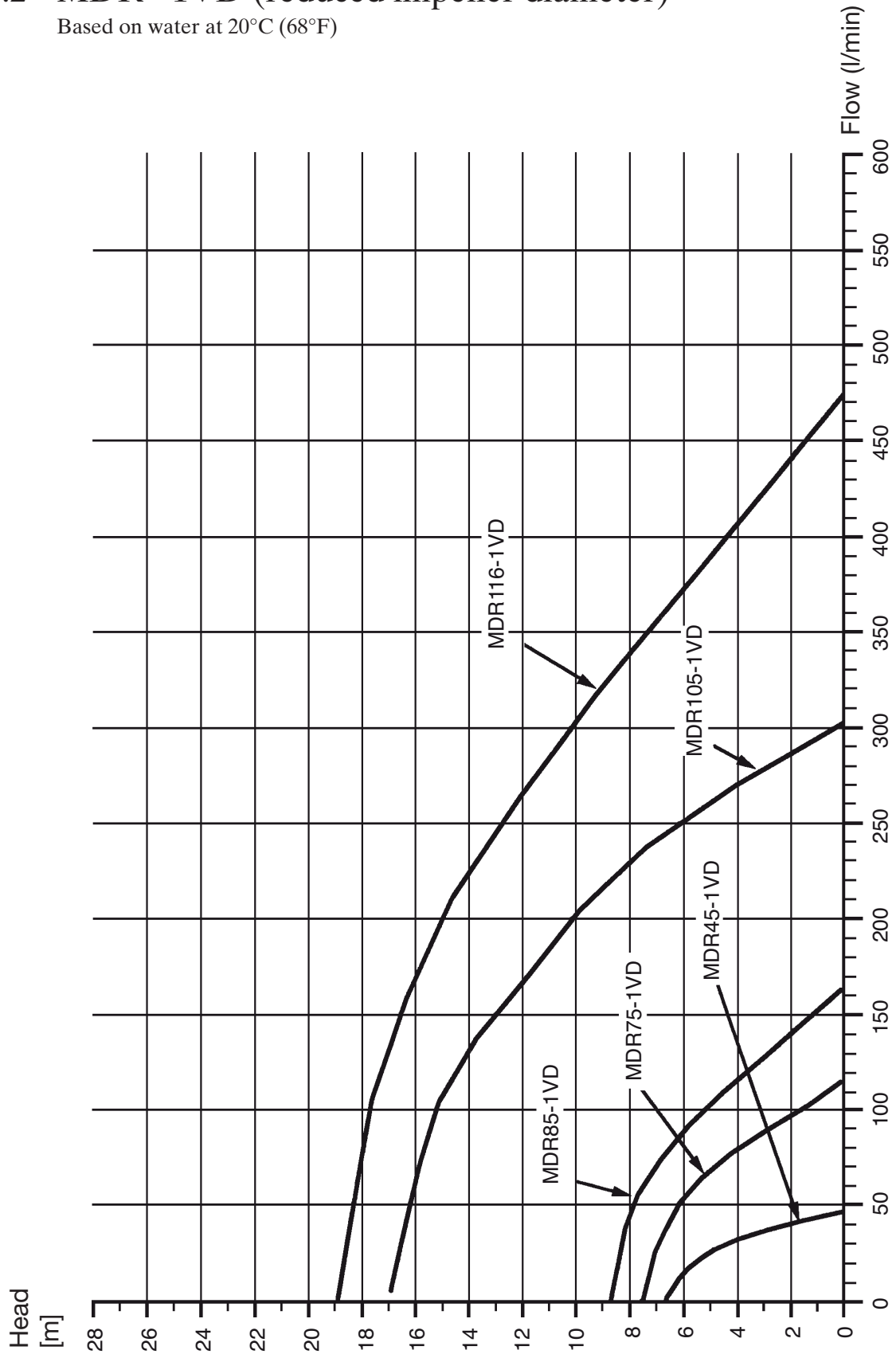
### 3.1 MDR - 1V (full impeller diameter)

Based on water at 20°C (68°F)



### 3.2 MDR - 1VD (reduced impeller diameter)

Based on water at 20°C (68°F)



## 4.0 Installation and maintenance

### 4.1 General

- Anchor the pump properly.



- The pump must be provided with lockable circuit breaker to avoid inadvertent starting.



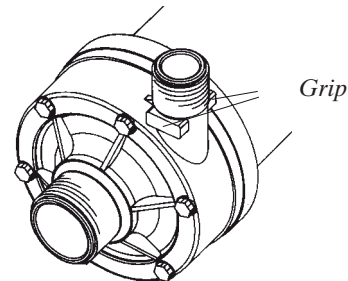
- Before any service or maintenance in the pump or system, shut off the power and lock the starting device to prevent inadvertent start. Close the valves on the in- and outlet line and drain the pump and system before it is separated from the system. Follow the instructions for disassembly/assembly (see section 4.5).

### 4.2 Installation and piping

- Use **at least** the same diameter on pipes from and to the pump as for the diameter of the in- and outlet ports.
- Flush all pipes before installing the pump.
- Install the pump closest possible to the tank to be pumped from.
- Bolt the pump in place horizontally.
- Only use plastic pipe connections.
- Use care to prevent scraps or trashes from entering the piping during piping work.
- Only use pipe sealants formulated specifically for plastics, i.e. Teflon tape, Permatex no. 2, etc.
- Use the grip on the pump outlet when assembling/disassembling the pipe connections to avoid damaging the pump body (see fig).



- Install a valve on the suction and pressure side to be able to disconnect the pump from the system. Make sure that the pump can be drained without damaging persons, environment or equipment.
- When the pump does not have a flooded suction, install a foot valve on the suction line. Fill up the pump and evacuate all air. Make sure that it will never run dry.
- If there is any risk of air pockets in the system or in the pump body, a ventilating valve must be installed on the pressure side.
- If there is any risk that the discharge head will not reach the minimum head needed (see section 2.3), install a valve to adjust the head.
- If there is any risk of dry running, install a suitable dry running protection to avoid pump breakdown. This is absolutely necessary and required when pumping liquids that are easily flammable.



## 4.3 Start up

- **Prime pump**  
When operating with lift, prime and work out all air.



**Note!** Pump must not be run without liquid – not even for a short time. When pumping liquids that are easily flammable, no air is allowed in the system. This is absolutely necessary in order to avoid that static electricity is generated in the pump which may cause severe personal and material damage.

- **Check rotation**  
Open the suction valve and close discharge valve.  
Check the rotation of the pump by turning the pump on briefly **once**. Make sure that the motor rotates in the correct direction (see rotation arrow on the pump body).
- **Starting**  
When the pump has been started, open the discharge valve slowly and check the pressure, temperature and flow. Make sure that the piping is properly sealed and that the pump functions satisfactorily. If not, follow the trouble shooting chart (see section 6.0) or contact your local distributor.  
**Do not run against closed valve for more than 3 minutes.**

When returning a pump for repair, investigation or other reason, it must be cleaned and wrapped up in a proper way. Documentation stating pumped liquid, operating conditions, your own opinion of fault/failure reason and your contact person must be included in the pump package. Also contact the consignee before returning the pump.

## 4.4 Routine control

- To avoid problems, regularly check pump noise, vibration, capacity, pressure gauge, motor amperage draw, etc.
- Check impeller bearings for wear after 1 to 2 months of operation.
- Decide the control intervals according to wear and bearing diameter.

### **Diameter of impeller bearing**

*Replace the impeller at the following inner diameters:*

MDR45	7.25 mm
MDR75	10.35 mm
MDR85	10.35 mm
MDR105	15.50 mm
MDR116	15.50 mm

- If the impeller bearings only are replaced, they have to be reamed jointly to the following diameters after assembly:

MDR45	7.10 ± 0.05 mm
MDR75/85	10.16 ± 0.04 mm
MDR105/116	15.21 ± 0.04 mm

- Check wear on the ceramic shaft and the ceramic wear plates.  
Replace when necessary.
- If the pump will be stopped for a long time, drain and clean the interior of the pump.

## 4.5 Disassembly and assembly

See drawing, section 5.0.

Always wear suitable safety clothing. Clean the pump carefully before disassembling.

### 4.5.1 Disassembly

1. Place the pump vertically with the motor facing downwards and the pump body upwards.
2. Remove the screws (pos 10) and the pump body (pos 8).
3. Remove the front wear plate (pos 4), the impeller (pos 6), O-ring (pos 7), shaft (pos 5) and rear wear plate (pos 4). MDR105 and MDR116 have only the rear wear plate. The front wear plate is integrated in the impeller.
4. Remove the magnet housing (pos 3) including the reinforcement (pos 19 – not available for MDR45).
5. If the motor, drive magnet or flange is to be replaced, loosen the two locking screws (pos 2) locking the drive magnet onto the motor shaft. The screws can be reached through the assembly hole in the flange (see section 5.0). Remove the drive magnet (pos 13).
6. Remove the screws (pos 12) and the flange (pos 1).
7. Check and clean all the parts which will be reused.

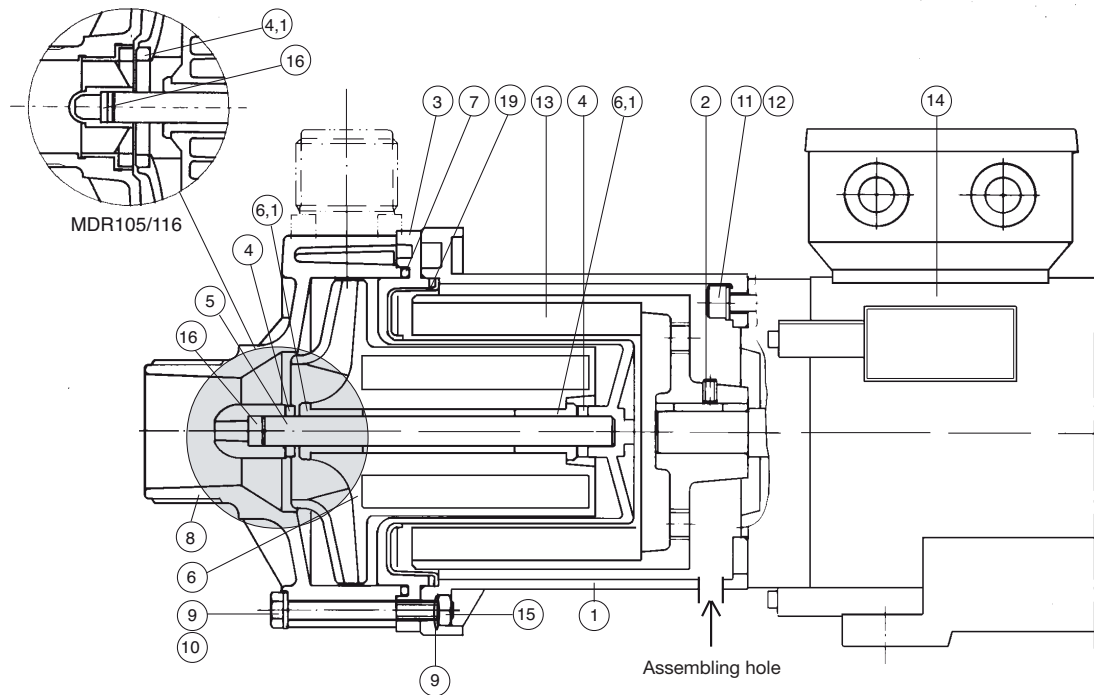
### 4.5.2 Assembly

1. Place the motor with the shaft facing upwards. Check that the drive magnet (pos 13) easily can be slid onto the motor shaft. If necessary the motor shaft should be polished.
2. Assemble the flange (pos 1) to the motor with the assembling hole facing in the same direction as the motor feet. Bolt the flange to the motor with the 4 screws (pos 12) and the washers (pos 11). Secure with Loctice.
3. Assemble the drive magnet (pos 13) to the motor shaft and lock the drive magnet with the two locking screws (pos 2). The screws can be reached through the assembling hole in the flange (see section 5.0).
4. Assemble the magnet housing (pos 3) with the reinforcement (pos 19 – not available for MDR45) on the flange and check that the drive magnet can be turned without touching the magnet housing or reinforcement.
5. Assemble the rear wear plate (pos 4) onto the ceramic shaft (pos 5). Note that the smooth side (without the "dot") of the wear plate must face the impeller bearing. Assemble the shaft and wear plate in the magnet housing. Slide the impeller (pos 6) onto the shaft followed by the front wear plate (pos 4) with the smooth side facing the impeller bearing (not available for MDR105 and MDR116 where the front wear plate is integrated in the impeller).
6. If reusing an old impeller, check that the impeller bearings are not worn beyond the diameter specified in section 4.4. If the bearings need to be replaced, the new bearings must be reamed jointly after assembly in the impeller. Turn the impeller by hand and check that it is running easily on the shaft.
7. Assemble the O-ring (pos 7)  
for MDR45 and MDR85 in the groove of the magnet housing  
for MDR75 in the groove of the pump body  
for MDR105 and MDR116 at the dia 135 mm in the magnet housing.
8. Assemble the pump body (pos 8) and tighten the screws (pos 10) together with the washers (pos 9) and nuts (pos 15).  
**Note!** For the MDR116 the spacer (pos 16) must be mounted before assembly in the pump body.

## 4.6 Waste handling/material recycling

At the products end of life, please dispose of the product according to applicable law.  
Where applicable, please disassemble the product and recycle the parts material.

## 5.0 Spare parts list



Pos	Nos	Description	Material	MDR45	MDR75	MDR85	MDR105	MDR116
1	1	Flange P2/P3	PP	01-24373-1	58-08299	01-13097-1	58-018376	58-018376
2	2	Screw		0.0300.544	0.0300.524	0.0300.523	0.0300.565	0.0300.565
3	1	Magnet housing	PP	01-24374-1	58-08301	01-13098-2	58-08334	58-08334
	1		PVDF	01-24405-1	58-08302	01-13113-2	58-08335	58-08335
4	2*	Wear plate	Ceramic	01-45897-1	58-08298	58-08298	58-08330	58-08330
4,1)	1	Wear ring	Rulon	-	-	-	58-08343	58-08343
5	1	Shaft	Ceramic	01-45896-1	58-08297	01-35340-1	58-08329	58-08329
6	1	Impeller -1V	PP/Rulon	04-35345-01	58-08630	04-35334-01	58-08636	58-18695
			PP/Rulon	04-35345-02	04-46243-02	04-35334-02	04-46245-02	04-46612-02
	1		PVDF/Rulon	04-35671-01	58-08631	04-35361-01	58-08637	58-18696
			PVDF/Rulon	04-35671-02	04-46244-02	04-35361-02	04-46246-02	04-46613-02
6,1)	2	Bearing	Rulon	01-35348-1	58-08311	58-08311	58-08342	58-08342
7	1	O-ring	FPM	0.2172.021	0.2172.029	0.2172.020	0.2172.022	0.2172.022
8	1	Body	PP	01-24375-1	58-08307	01-13100-1	04-35766	58-08368
	1		PVDF	01-24406-1	58-08308	01-13115-1	58-08659	58-08369
9		Washer	SS	0.0350.605 (6)	-	0.0350.207 (6)	0.0350.208 (12)	0.0350.208 (12)
10	6	Screw	SS	0.0138.050	0.0251.690	0.0142.738	0.0142.730	0.0142.730
11	4	Washer	SS	0.0350.206	0.0350.206	0.0350.207	0.0350.208	0.0350.208
12	4	Screw	SS	0.0251.688	0.0251.688	0.0251.704	0.0251.714	0.0251.714
13	1	Drive magnet		04-35360-01	58-08624	04-35342-01	58-08634	58-08677
14	1	Motor	1-ph 220 V	4.9309.008	4.9309.317	-	-	-
	1		3-ph 220/380 V	4.9309.009	4.9309.006	4.9309.005	4.9309.012	4.9309.004
15	6	Nut	SS	0.0185.350	0.0185.350	0.0185.069	0.0163.014	0.0163.014
16	1	Spacer	PP	-	-	-	-	58-08370
	1		PTFE	-	-	-	-	58-08372
19	1	Reinforcement	SS	-	58-08295	01-35344-1	58-08324	58-08324

\* The number of wear plates for MDR105 and MDR116 is 1 pce.

## 6.0 Trouble shooting chart

<b>Problem</b>	<b>Possible cause</b>	<b>Remedy</b>
No flow	Air pockets in suction lines	Check piping of suction lines and work out all air
	Lack of prime (when suction head is negative)	Prime again
	Air pockets inside the pump	Work out all air
	Insufficient suction head	See section 2.2.1
	Slipping magnet coupling	Excessive specific gravity and/or viscosity - check against original specification (see point 2.7)
	Wear or damage of parts	Replace parts
Underfeed	No liquid in the pump	Check liquid level in the tank. If a foot valve is installed on the suction line make sure that it is properly sealed. Fill the pump again.
	Air entrainment or air pockets	Check joint sections of suction lines. Work out all air
	Run reverse	Check direction of rotation
	Excessive piping loss	Reduce suction line length or increase diameter
Excessive power	Impeller is clogged with foreign materials	Remove foreign materials
	Excessive specific gravity and/or viscosity	Check viscosity and specific gravity against pump performance (see section 2.7).
	Excessive wear of pump parts	Replace parts
Excessive vibration or noise	Excessive wear of motor bearings	Replace bearings/motor
	Wear or damage of parts	Replace parts
	Short of head	Increase discharge head (see section 2.3)
	Impeller is clogged with foreign materials	Remove foreign materials

<b>Problem</b>	<b>Possible cause</b>	<b>Remedy</b>
Leakage from pump body	Loose pump body screws	Tighten screws
	Wrongly installed O-ring	Replace O-ring
	Damaged O-ring	Replace O-ring Make sure that the material is resistant to the media
Shaft break	Dry running, thermal-shock, running against closed valve, shock at handling, corrosion	Replace shaft Make sure that the material is resistant to the media
	Short of head	Increase discharge head (see section 2.3)
Magnet housing damage	Dry running, excessive wear, running against closed valve, corrosion	Replace magnet housing Make sure that the material is resistant to the media and that no dry running will occur
	Short of head	Increase discharge head (see section 2.3)
Impeller damage	Excessive wear, corrosion	Replace impeller Make sure that the material is resistant to the media
Impeller deformation	Excessive temperature	Replace impeller (see section 2.5)
	Excessive temperature vs system pressure	Replace impeller (see section 2.6)

## 7.0 Dimensions and weights

Dimensions in mm

	A	B	C	D	E	F	G	H	J Male	K Male	L Ø	M	N	Weight, kg	
														Compl pump	Head kit*
MDR45P-1V/-1VD	90	71	166	272	56	130	44	35	BSP1"	BSP1/2"	5,8	M6	9	4,5	1,2
MDR75P-1V/-1VD	100	80	192	322	63	141	60	37	BSP1.1/4"	BSP3/4"	7	M5	11	5,8	1,5
MDR85P-1V/-1VD	112	90	242	373	71	171	66	40	BSP1.1/2"	BSP1"	7	M5	14	10,3	2,9
MDR105P-1V/-1VD	140	100	320	490	90	222	90	58,5	BSP2"	BSP1.1/4"	10	M8	24	23,6	7,2
MDR116P-1V/-1VD	140	125	320	512	90	222	93	58,5	BSP2"	BSP1.1/4"	10	M8	24	26,6	7,2

\* without motor

