IWAKI

Magnetic Drive Pumps

Product Guide



The Heart of Industry

An Overview of Iwaki's World Leading Magnetic Drive Pumps

Magnetic drive technology is fast becoming the pump choice for corrosive applications.

Iwaki offers a wide range of magnetic drive pumps from fractional horsepower for OEM applications to large pumps for chemical processing.

No other manufacturer can offer such a wide breadth of technology.

This brochure in an overview of Iwaki's large chemical process pumps.
For information on our smaller pump technology
please contact Iwaki or visit www.iwakipumps.jp







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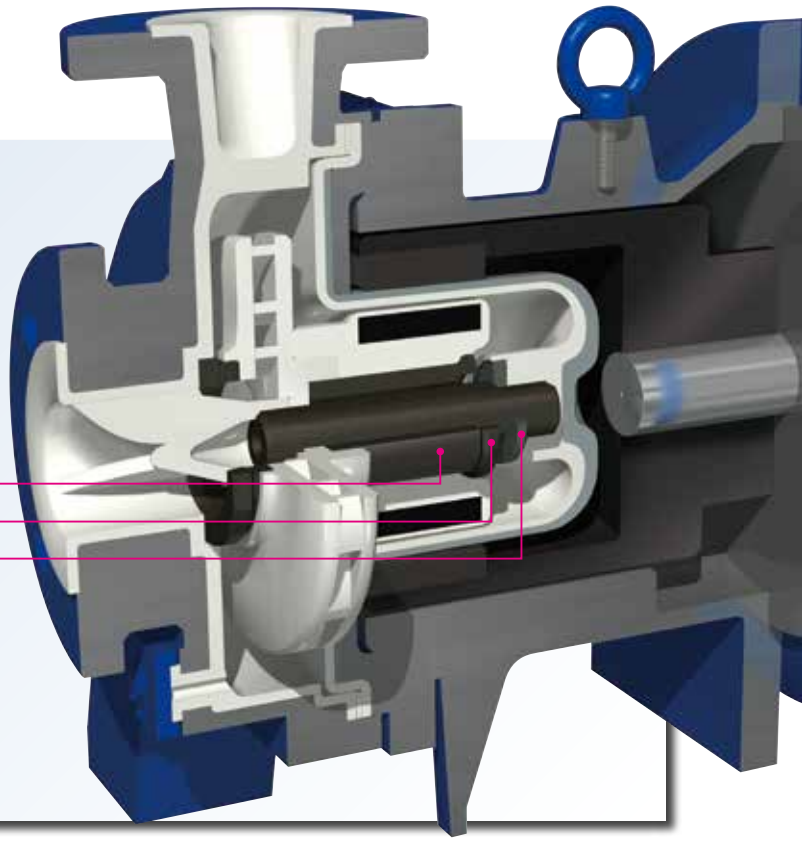
Magnetic Drive Pumps

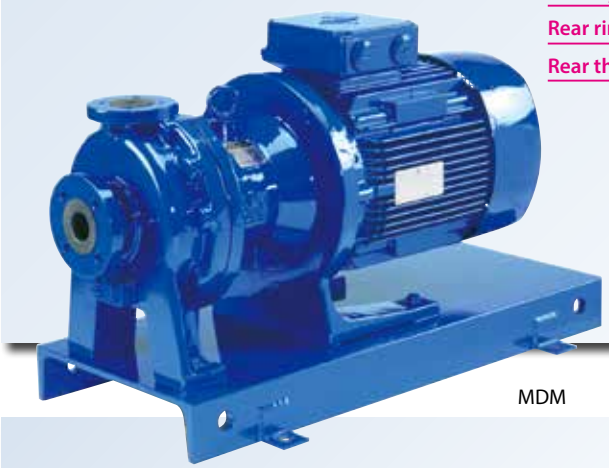
(MDM, MXM, SMX-F, MX-F)

Unique design prevents dry running Non contact system

High powered rare earth magnets prevent the magnet capsule from coming in contact with the rear casing., thus preventing heat generation. This improves the dry running resistance and increases pump life in comparison to other fluororesin pumps.

MDM





MDM

ETFE and PFA available in standard models

Carbon fiber reinforced CFRETFE and PFA liners are available for varying applications. The unfilled PFA liners are ideal for high purity chemical applications.

MDM

Modular design and low maintenance cost

The pumps modular design leads to easy maintenance. There is no need to check clearances or align any liquid end parts. All wetted parts can be replaced individually reducing maintenance costs.

MDM



MXM



Highly durable structure

The ductile cast iron body of the pump provides strength and durability. The rear casing utilizes a secondary pressure containment cover made of fiber reinforced plastic. This allows for higher pressures as well as temperatures without the efficiency loss of eddy current generation. Should the drive magnet come in contact with the rear casing cover its non-metallic design will not generate sparks.

MDM MXM



SMX-F

Fast self-priming

The SMX-F requires no external self-priming chambers or valves. The gas-liquid separation design ensures fast self-priming of up 4 meters in under 90 seconds.

SMX-F

Self-radiating structure

Heat dispersion holes in the magnet capsule and impeller allow liquid circulation that cools the radial bearing and spindle. This design prevents melting due to excessive friction. (Except MX-F100)

Non-contact structure

Precise alignment of the drive magnet and magnet capsule creates a non-contact system that prevents friction during dry running.

MXM SMX-F MX-F

Volute casing divided into two sections

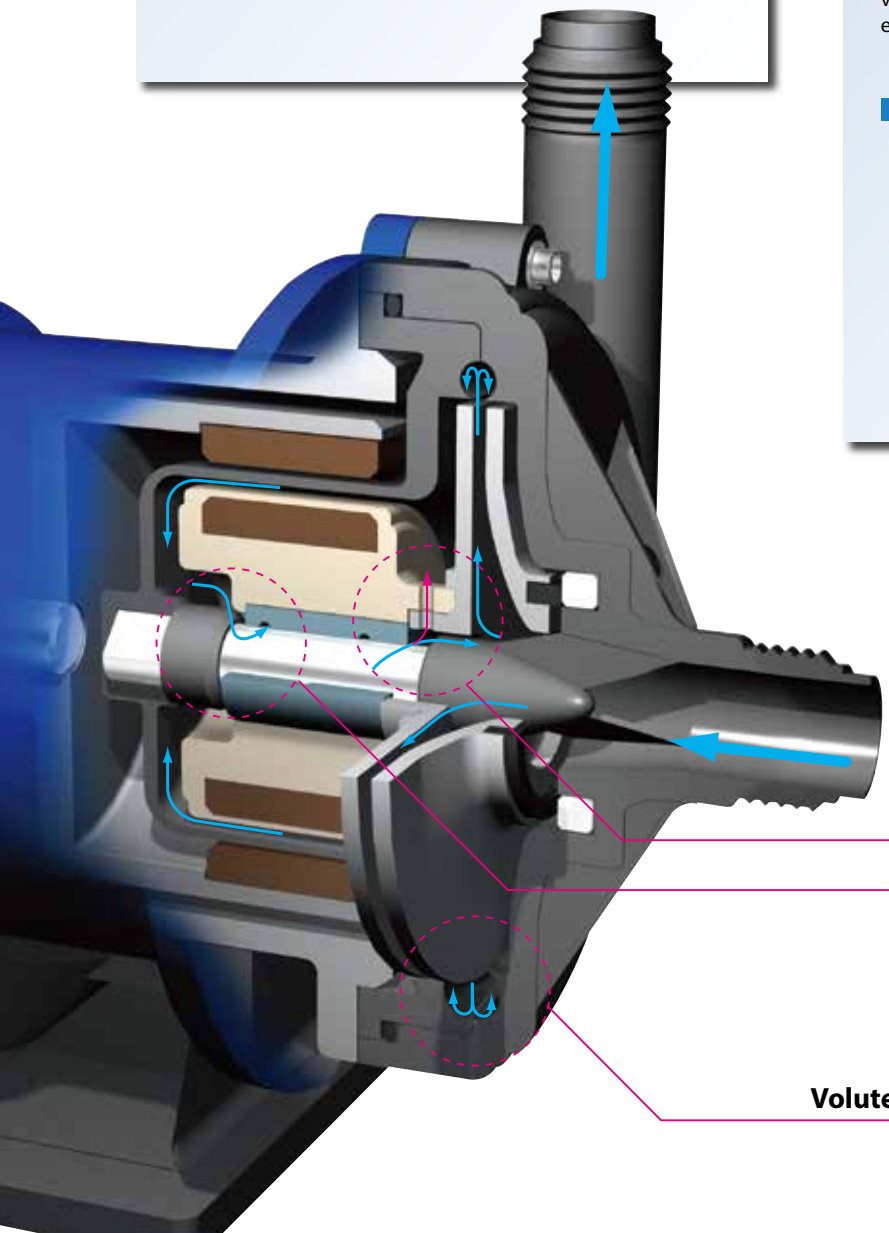
The first non-metallic magnetic drive pump to incorporate a vortex chamber in the front and rear casings to increase pump efficiencies. (Except MX-F400)

MX-F





MX-F



Self-radiating structure

Non-contact design

Volute casing divided into two sections

Large Magnetic Drive Pumps

(MDW, MDM)

The world's largest fluoroplastic magnetic drive pump

The MDW series are the largest fluoroplastic magnetic drive pumps in the world, offering high efficiency and durability for chemical process applications. Using larger motors for even higher output, the MDW series opens up performance potential in previously unexplored areas.

MDW

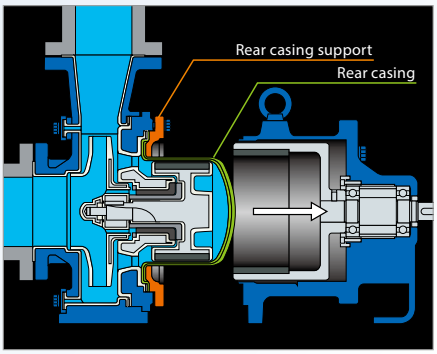


MDW

Back pullout system

The back pullout system allows easy maintenance and inspection without removing the pump from the piping. Integrated components and a sealed rear casing support structure allow motor removal without chemical leakage.

MDW MDE





MDE

Compliant with ISO

The performance and dimensions standards of the pumps are in compliance with the international standard (ISO2858, 3661, 5199*). They are interchangeable with general-purpose centrifugal pumps.

*MDW is ISO2858, 3661 only
• Model MDE 125-250 is excluded

MDW MDE

Robust structure

The ductile cast iron body of the pump provides strength and durability. The rear casing utilizes a patented triple layer structure for high pressure resistance. A metal shaft is incorporated in the MDW & MDE design to withstand high radial forces and allow continuous operation even under difficult service conditions.



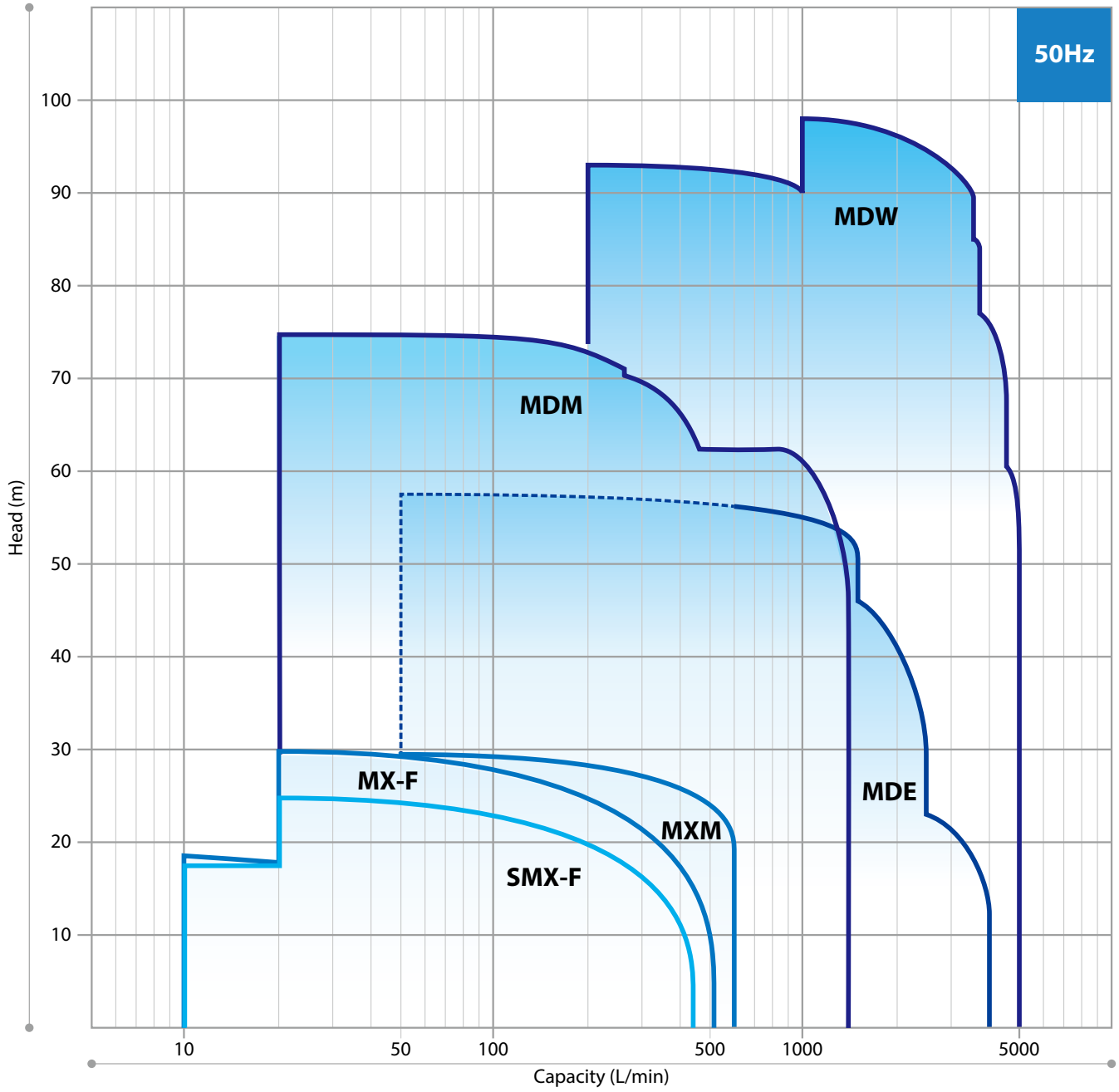
MDW MDE

Liquid end materials

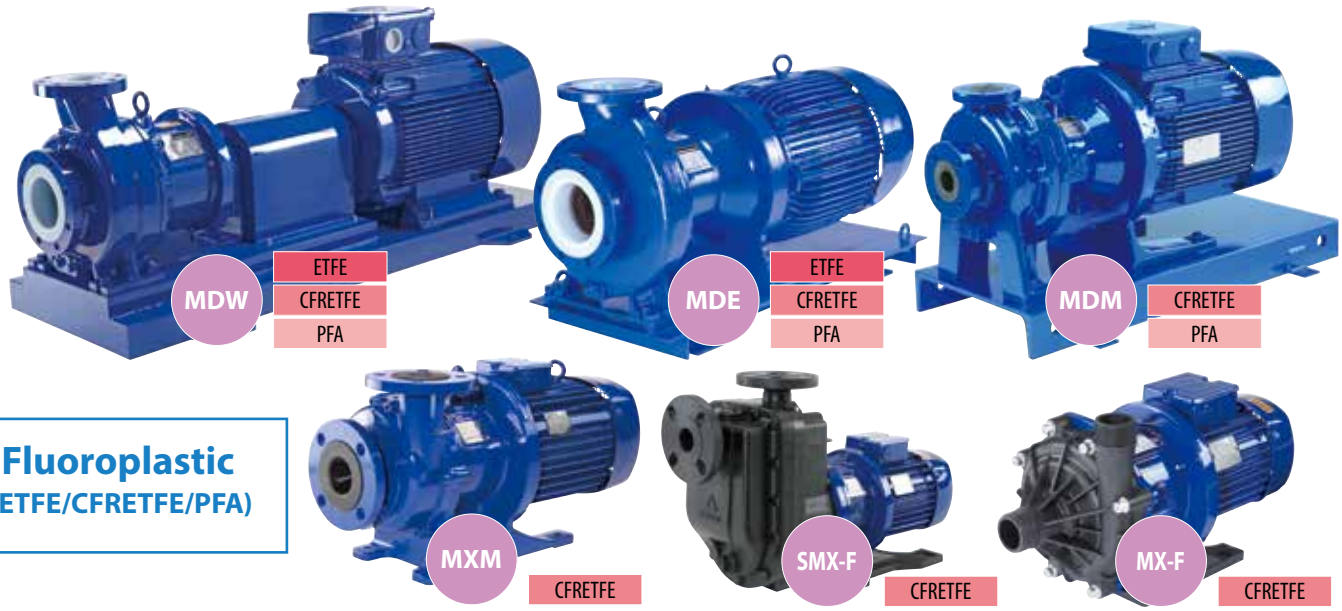
ETFE
CFRETFE
PFA

Performance Comparison for Iwaki Magnetic Drive Pumps

Materials: Fluoroplastic (ETFE/CFRETFE/PFA)



Liquid end Materials



Fluoroplastic
(ETFE/CFRETFE/PFA)

Materials

Model	Molded				Bearing system		Static sealing parts	
	Front casing	Rear casing	Impeller	Magnet capsule	Bearing	Spindle	Gasket	O ring
MDW	ETFE / PFA	PFA	CFRETFE / PFA	PFA	SiC	—	PTFE	Kalrez®
MDE	ETFE	PFA	CFRETFE	PFA	SiC	—	PTFE	Kalrez® / FKM / EPDM
MDM	CFRETFE / PFA	CFRETFE / PFA	CFRETFE / PFA	CFRETFE / PFA	High density carbon / SiC	High purity alumina ceramic / SiC	PTFE	—
MXM	CFRETFE	CFRETFE	CFRETFE	CFRETFE	High density carbon / High purity alumina ceramic / SiC	High purity alumina ceramic / SiC	AFLAS® / DAI-EL PERFLUORO® / FKM / EPDM	AFLAS® / DAI-EL PERFLUORO® / FKM / EPDM
SMX-F	CFRETFE	CFRETFE	CFRETFE	CFRETFE	High density carbon / PTFE / SiC	High purity alumina ceramic	FKM / EPDM	FKM / EPDM
MX-F	CFRETFE	CFRETFE	CFRETFE	CFRETFE	High density carbon / PTFE / SiC	High purity alumina ceramic / SiC	—	FKM

Material index

Plastic materials	
PFA	Tetrafluoroethylene/perfluoroalkoxy vinyl ether copolymer
ETFE	Ethylenetetrafluoroethylene copolymer (“Fluon®,” etc.)
CFRETFE	Carbon fiber-reinforced ETFE
PTFE	Polytetrafluoroethylene (“Teflon®,” etc.)

Rubber	
FKM	Fluorine rubber
EPDM	Ethylene propylene rubber

Materials for sliding parts/bearings	
High-density carbon	Hard carbon
Highly pure ceramics	Alumina ceramic with a purity of 99.5% or more
SiC	Silicon carbide ceramic



Liquid end materials
ETFE/CFRETFE/PFA

MDW series

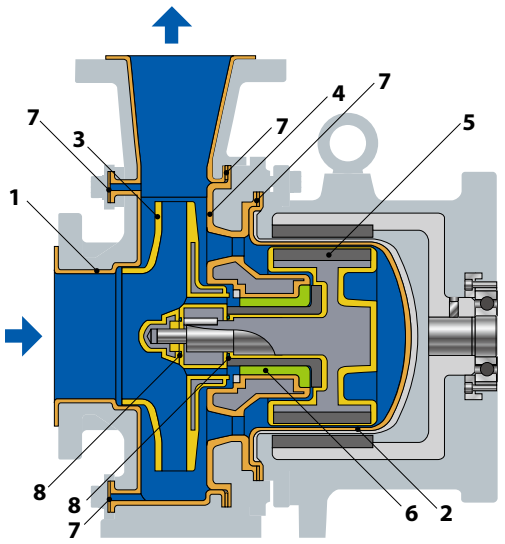
- High discharge capacity, high head and high efficiency
- Excellent chemical resistance
- Robust structure
- Back pullout design

Specifications

Max. discharge capacity	300 m^3/hr
Max. discharge head	98 m
Materials	ETFE, CFRETFE, PFA
Power range	11 to 75kW
Pump size (Discharge)	50 to 100 A
Liquid temp. range	MDW80/100: -10 to 100°C* MDW50: -10 to 120°C*
Specific-gravity limit	3.0 (For details, please contact Iwaki.)
Sealing method	Seal-less construction

*Fluid dependent.

Liquid end materials

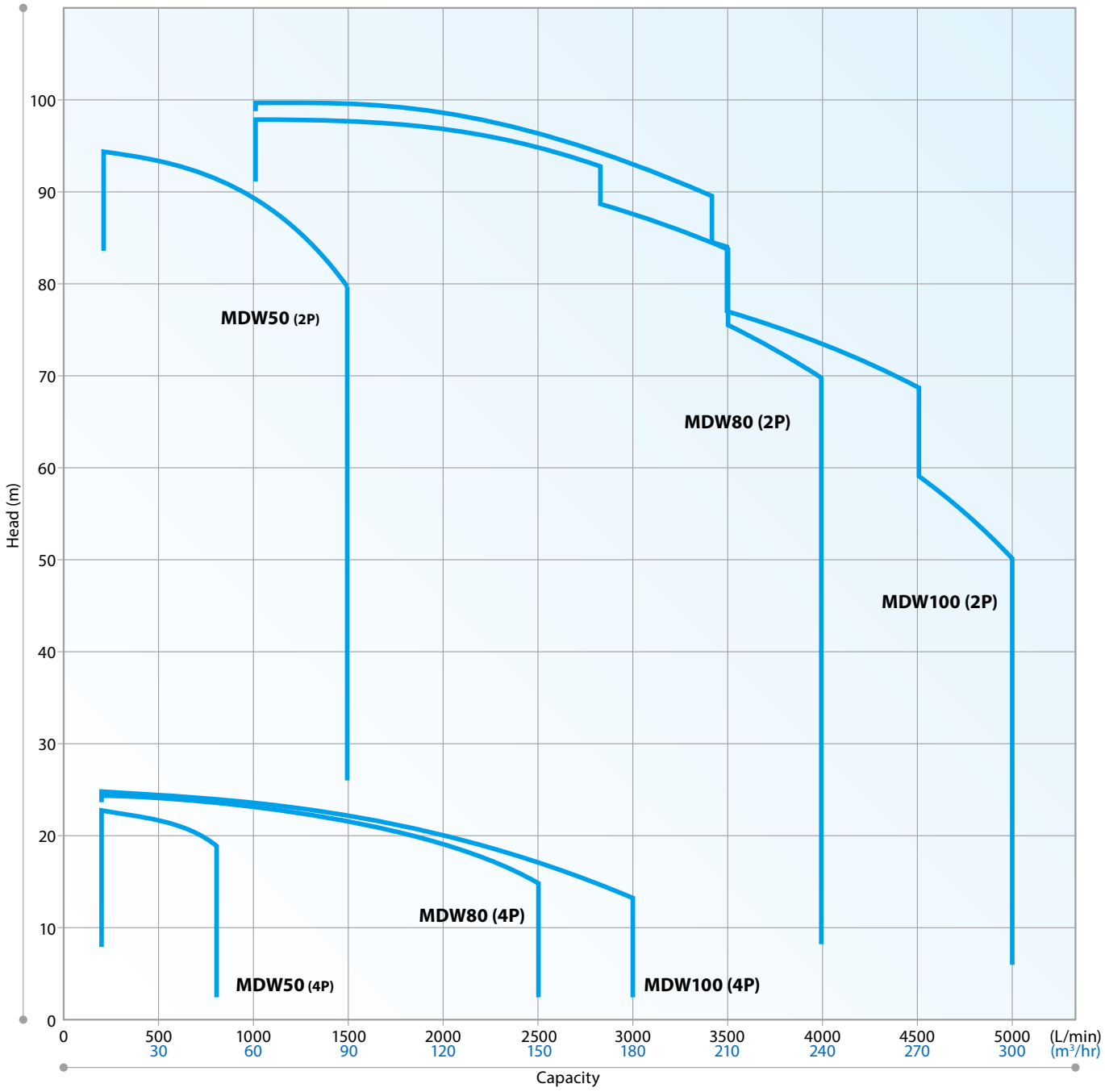


1	Front casing	ETFE, PFA
2	Rear casing	PFA
3	Impeller	CFRETFE, PFA
4	Split plate	PFA
5	Magnet capsule	PFA
6	Bearing	SiC
7	Gasket	PTFE
8	O ring	Kalrez®

Max. discharge capacity 300 m^3/hr and Max. discharge head of 98 m. The world's largest fluoroplastic magnetic drive pump

Performance curves (50Hz)

- Pump size (Suction×Discharge)MDW50: 80A×50A, MDW80: 125A×80A, MDW100: 125A×100A
- 2P: 2P poles motor, 4P: 4P poles motor





Liquid end materials
ETFE/CFRETFE/PFA

MDE series

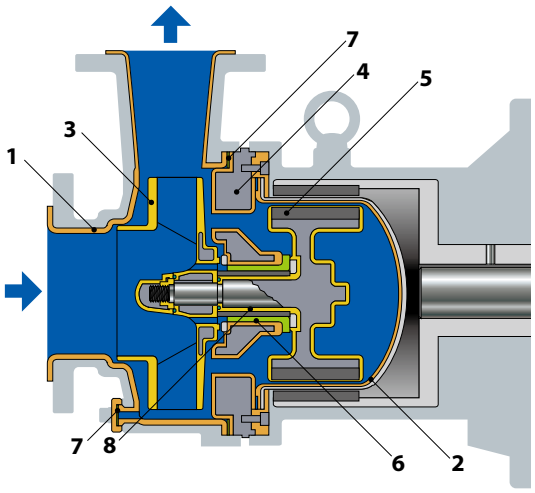
- Strong corrosion resistance
- High durability
- Compliant with ISO standards
- Back pullout design

Specifications

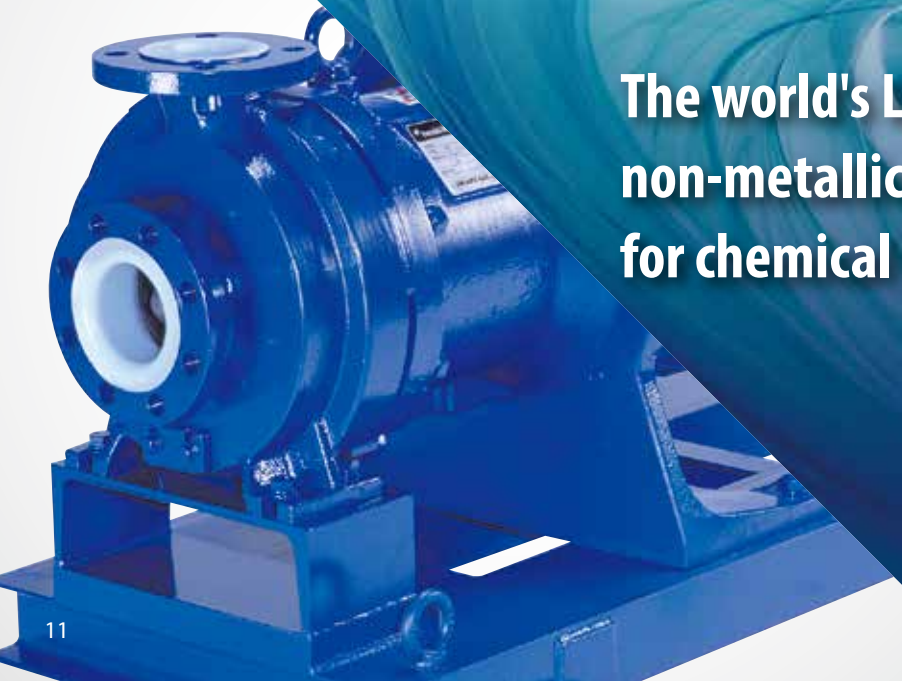
Max. discharge capacity.....240 m³/hr
Max. discharge head .....55 m
Materials .....ETFE, CFRETFE, PFA
Power range .....11 to 37kW
Pump size (Discharge) .....50 to 125 A
Liquid temp. range.....0 to 100°C*
Specific-gravity limit 3.0
(For details, please contact Iwaki.)
Sealing method.....Seal-less construction

*Fluid dependent.

Liquid end materials



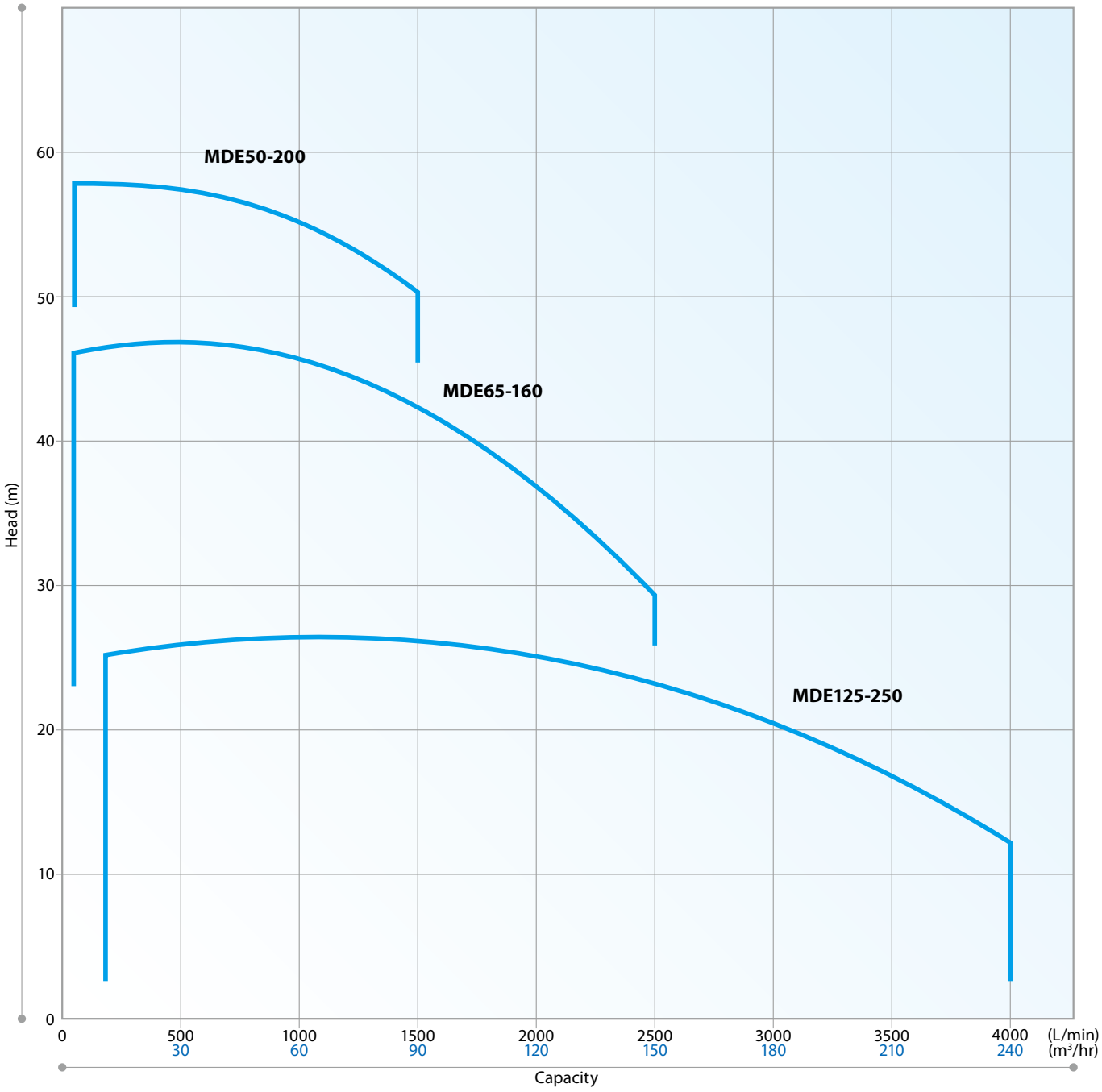
1 Front casing ..... ETFE
2 Rear casing ..... PFA
3 Impeller ..... CFRETFE
4 Split plate..... PFA
5 Magnet capsule..... PFA
6 Bearing ..... SiC
7 Gasket ..... PTFE
8 O ring..... Kalrez®, FKM, EPDM



The world's Largest-class non-metallic magnetic drive pumps for chemical processing

Performance curves (50Hz)

• Pump size (Suction×Discharge) MDE50: 80A×50A, MDE65: 100A×65A, MDE125: 150A×125A





Liquid end materials
CFRETFE/PFA

MDM series

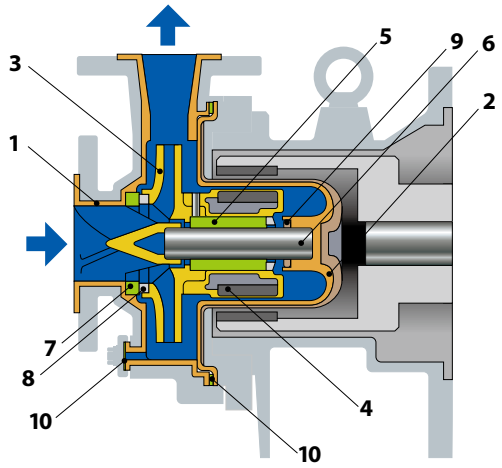
- CFRETFE and PFA available in standard models
- Durable design
- High head models available
- Back pullout design

Specifications

Max. discharge capacity..... 108 m^3/hr
Max. discharge head ..... 74 m
Materials ..... CFRETFE, PFA
Power range ..... 1.5 to 30kW
Pump size (Discharge) ..... 25 to 50 A
Liquid temp. range..... CFRETFE: -20 to 105°C*
PFA: -20 to 150°C*
Specific-gravity limit 2.0
(For details, please contact Iwaki.)
Sealing method..... Seal-less construction

*Fluid dependent.

Liquid end materials



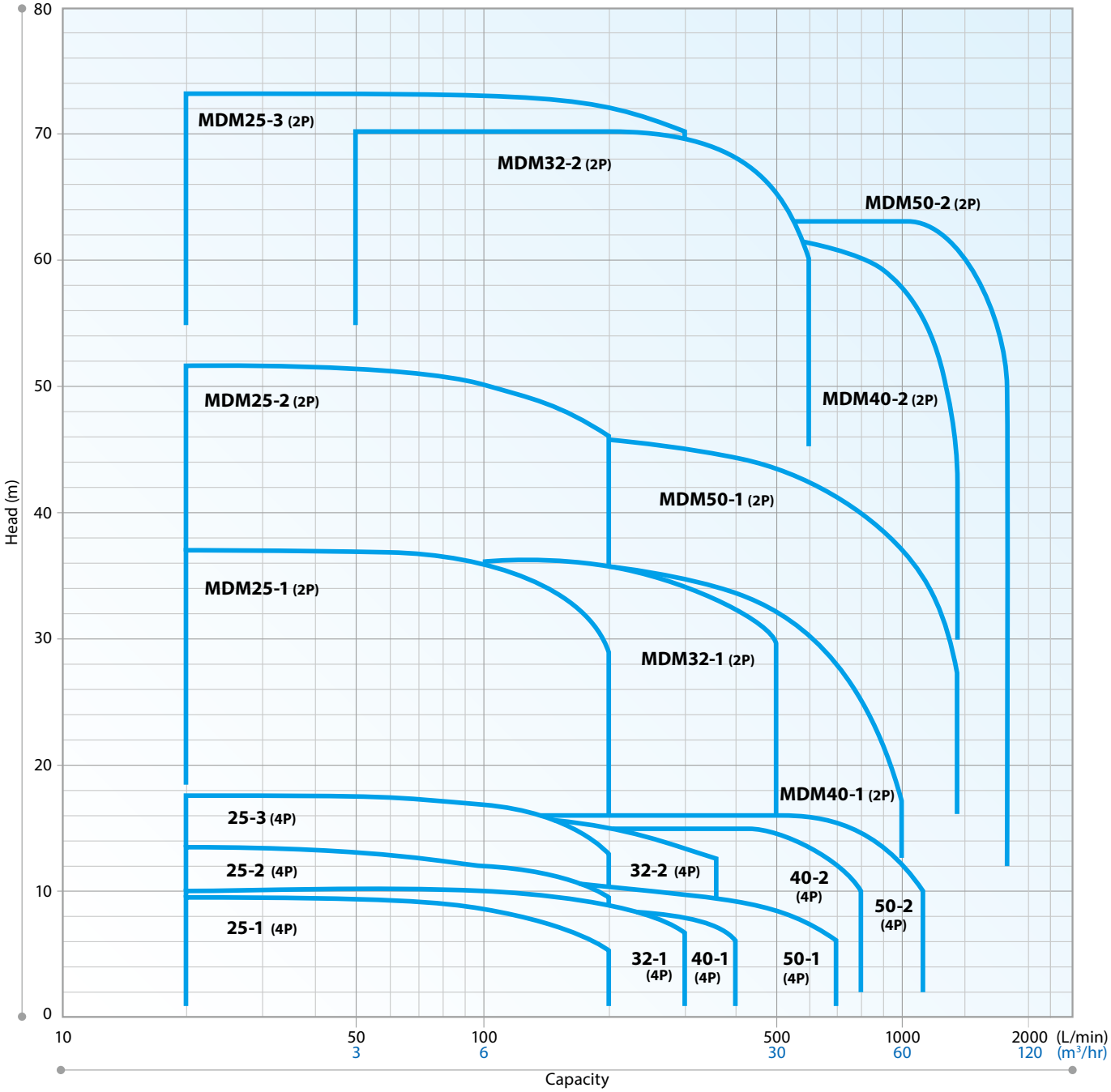
1	Front casing	CFRETFE, PFA
2	Rear casing	CFRETFE, PFA
3	Impeller	CFRETFE, PFA
4	Magnet capsule	CFRETFE, PFA
5	Bearing	High density carbon, SiC
6	Spindle	High purity alumina ceramic, SiC
7	Liner ring	High purity alumina ceramic, SiC
8	Mouth ring	PTFE (with filler), SiC
9	Rear thrust	PTFE (with filler), SiC, PTFE
10	Gasket	PTFE



Dry run capable magnetic drive process pump design

Performance curves (50Hz)

- Pump size (Suction×Discharge) MDM25: 40A×25A, MDM32: 50A×32A, MDM40: 65A×40A, MDM50: 80A×50A
- 2P: 2P poles motor, 4P: 4P poles motor





Liquid end material
CFRETFE

MXM series

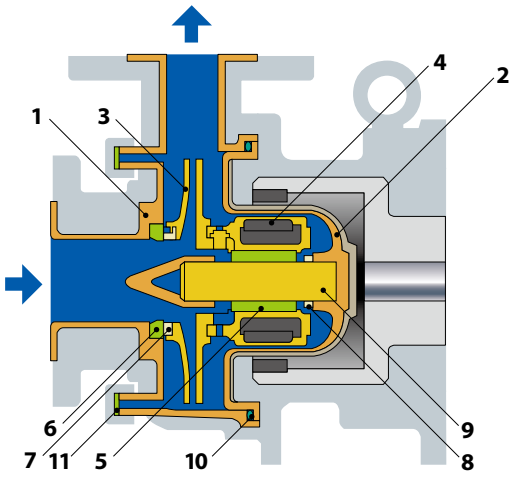
- Withstands difficult operation
- Superior corrosion resistance
- Robust structure
- Enhanced safety

Specifications

Max. discharge capacity.....600 L/min
Max. discharge head .....29 m
Material .....CFRETFE
Power range .....0.4 to 3.7kW
Pump size (Discharge) 25A, 40A
Liquid temp. range*.....-10 to 105°C
Specific-gravity limit 2.0
(For details, please contact Iwaki.)
Sealing method.....Seal-less construction

*Operating temperature for the pumps with an Aflas® O-ring should be 10°C or more. Fluid dependent.

Liquid end materials

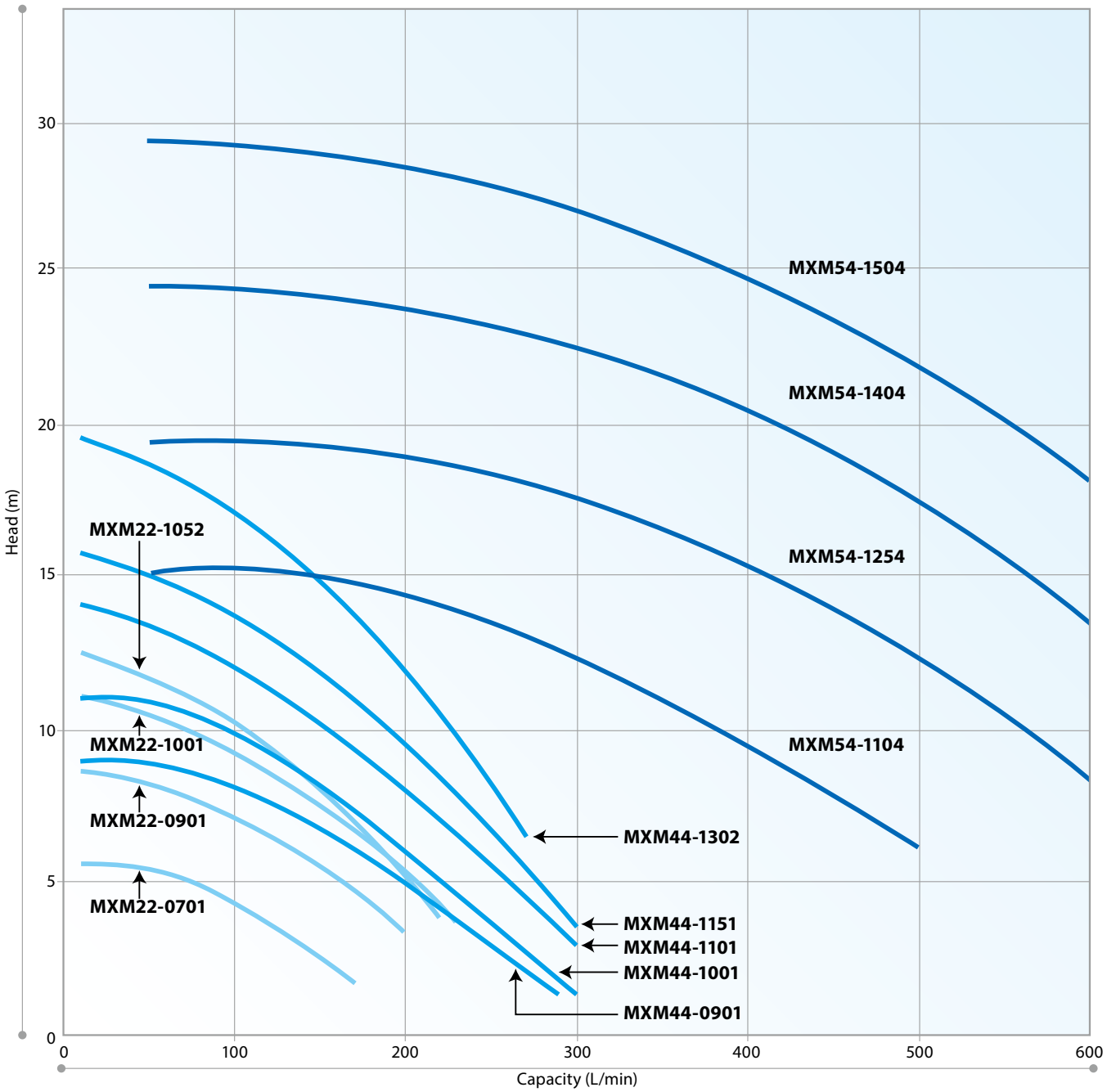


1	Front casing	CFRETFE
2	Rear casing	CFRETFE
3	Impeller	CFRETFE
4	Magnet capsule	CFRETFE
5	Bearing	High density carbon, High purity alumina ceramic, SiC
6	Liner ring	High purity alumina ceramic, SiC
7	Mouth ring	PTFE (with filler), SiC
8	Rear thrust	CFRETFE
9	Spindle	High purity alumina ceramic, SiC
10	O ring	FKM, EPDM, AFLAS® DAI-EL PERFLUORO®
11	Gasket	FKM, EPDM, AFLAS® DAI-EL PERFLUORO®

Magnetic drive pumps with an excellent balance of features and performance

Performance curves (50Hz)

• Pump size (Suction×Discharge) MXM22: 25A×25A, MXM44: 40A×40A, MXM54: 50A×40A



• High-lift/small-flow impellers are also available. Please contact us for more information.



Liquid end material
CFRETFE

SMX-F series

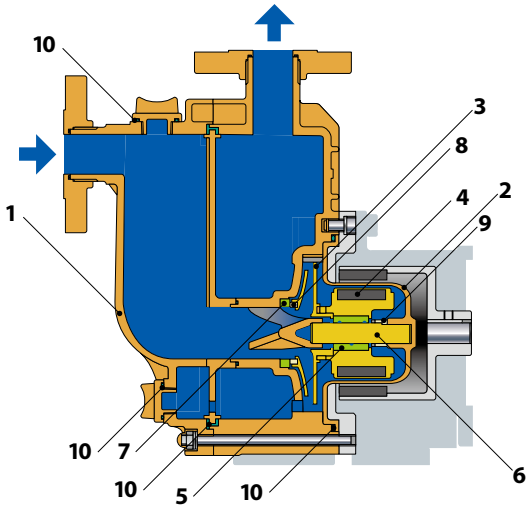
- Excellent corrosion resistance
- Expanded versatility
- Easy maintenance
- Able to withstand abnormal operation
- Fast self-priming

Specifications

Max. discharge capacity.....440 L/min
Max. discharge head .....24.5 m
Rated self-priming height 4m
Material .....CFRETFE
Power range .....0.4 to 3.7kW
Pump size (Discharge) 25A, 40A
Liquid temp. range.....0 to 80°C*
Specific-gravity limit 2.0
(For details, please contact Iwaki.)
Sealing method.....Seal-less construction

*Fluid dependent.

Liquid end materials

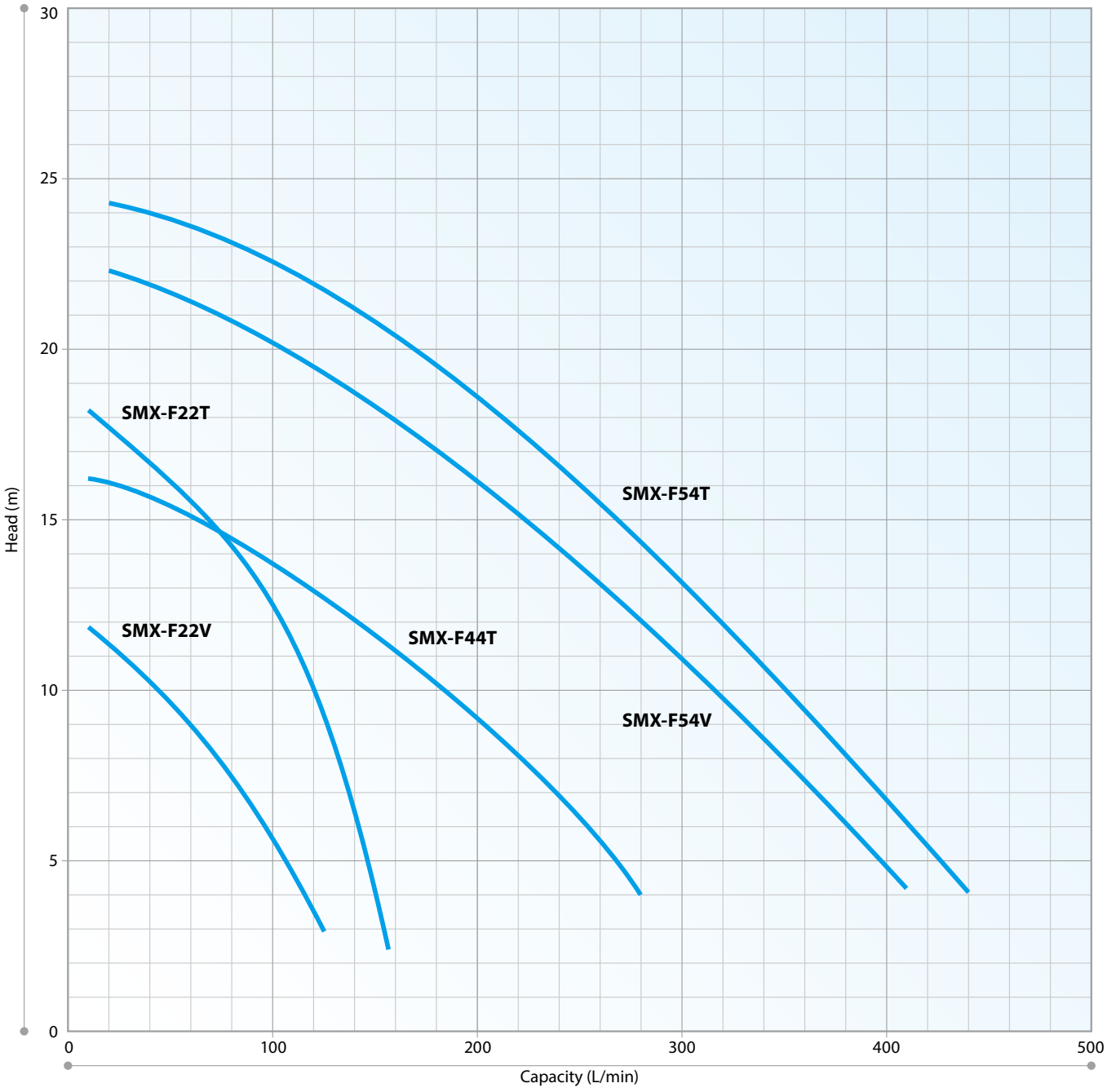


1 Front / Rear case..... CFRETFE
2 Rear casing..... CFRETFE
3 Impeller..... CFRETFE
4 Magnet capsule..... CFRETFE
5 Bearing ..... High density carbon, SiC, PTFE(with filler)
6 Spindle..... High purity alumina ceramic, SiC
7 Liner ring..... High purity alumina ceramic, SiC
8 Mouth ring ..... PTFE (with filler), SiC
9 Rear thrust..... High purity alumina ceramic, SiC, CFRETFE
10 Gasket ..... FKM, EPDM

Chemically resistant self-priming magnetic drive pumps built to withstand abnormal operation

Performance curves (50Hz)

• Pump size (Suction×Discharge) SMX-F22: 25A×25A, SMX-F44: 40A×40A, SMX-F54: 50A×40A





Liquid end material
CFRETFE

MX-F series

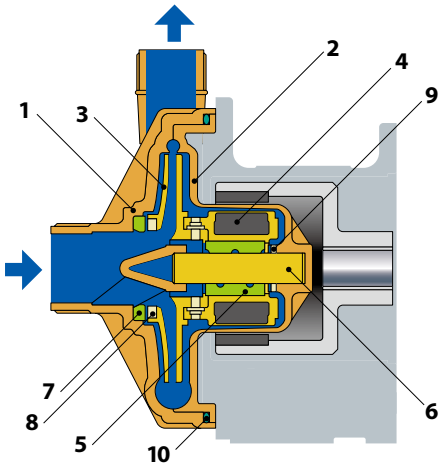
- Self-radiating structure
- Dual section volute casing
- Robust structure
- Excellent chemical resistance

Specifications

Max. discharge capacity.....510 L/min
Max. discharge head .....29.5 m
Material .....CFRETFE
Power range .....0.26 to 2.2kW
Pump size (Discharge) G1, G1½
Liquid temp. range.....0 to 80°C*
Specific-gravity limit 2.0
(For details, please contact Iwaki.)
Sealing method.....Seal-less construction

*An Aflas® O-ring is 10 to 80°C.
Fluid dependent.

Liquid end materials



1 Front casing ..... CFRETFE
2 Rear casing ..... CFRETFE
3 Impeller ..... CFRETFE
4 Magnet capsule ..... CFRETFE
5 Bearing ..... PTFE(with filler), High density carbon, SiC
6 Spindle..... High purity alumina ceramic, SiC
7 Liner ring..... High purity alumina ceramic, SiC
8 Mouth ring ..... PTFE (with filler), SiC
9 Rear thrust..... CFRETFE
10 O ring..... FKM, EPDM, AFLAS®

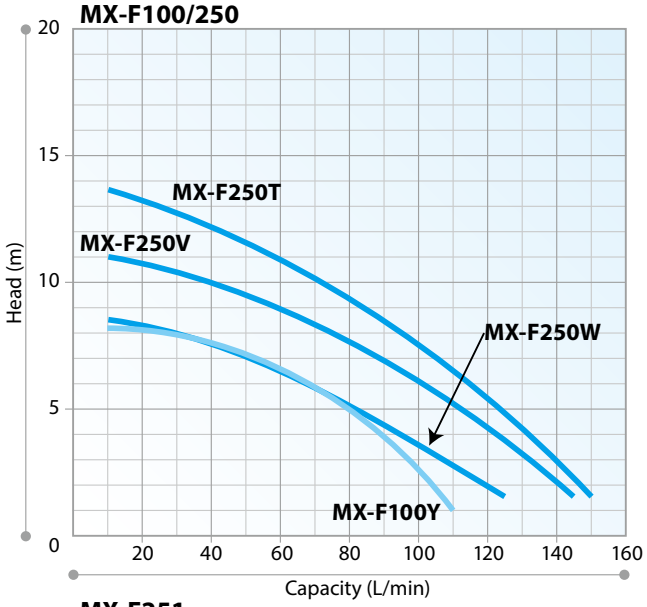


Chemically resistant magnetic drive pumps built to withstand abnormal operation

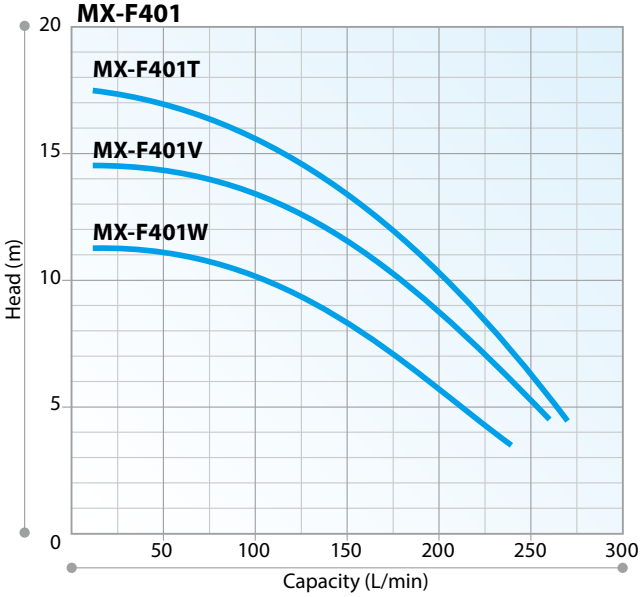
Performance curves (50Hz)

• Pump size (Suction×Discharge) MX-F100: G1×G1, MX-F250/251: G1×G1, MX-F400: G1½×G1½
MX-F401: G1½×G1½, MX-F402/403: G2×G1½

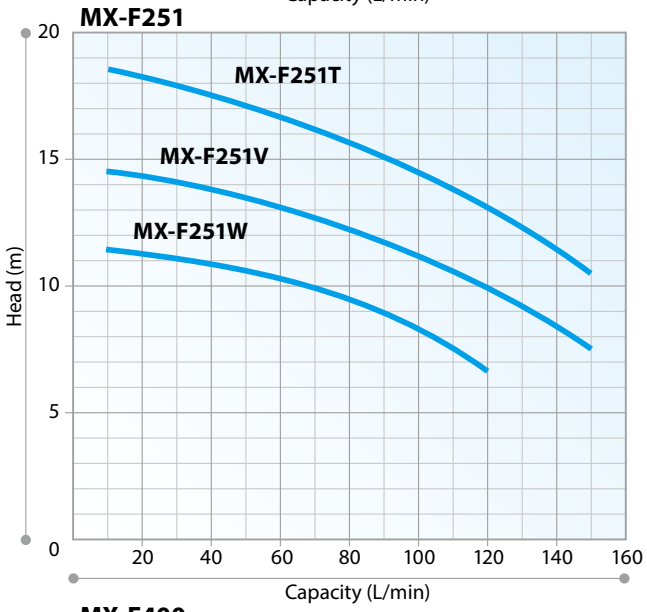
MX-F100/250



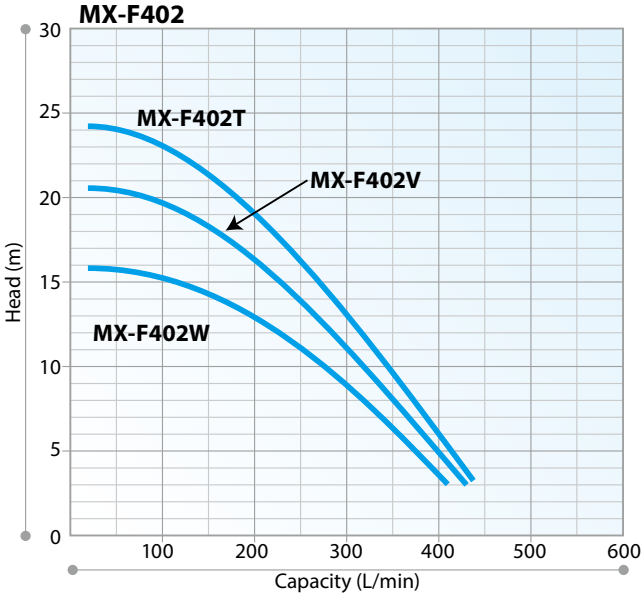
MX-F401



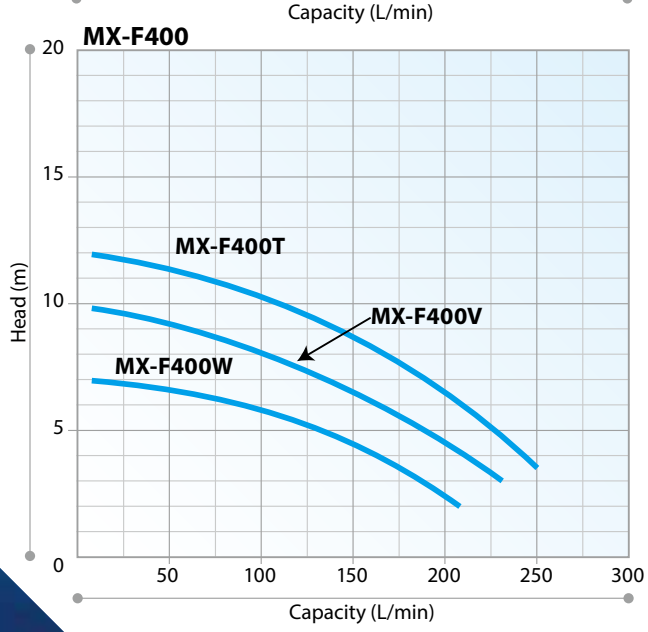
MX-F251



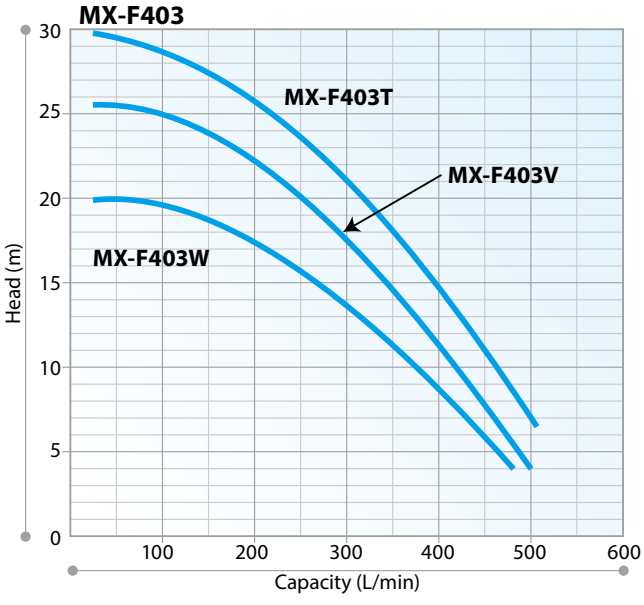
MX-F402



MX-F400



MX-F403



Precautions for pump selection

• MXM

(1) The performance curves in this catalogue represent the data measured using clear water at 20 °C.
(2) Choose the pump model suited to the liquid gravity.
Make sure that the motor output is ten percent higher than theoretically required.
Shaft power (Sp) × liquid gravity × 1.1 < Motor output
(Note) The shaft power (Sp) increases in proportion to the liquid gravity. As the viscosity rises, the shaft power is higher while the head and the discharge are lower.
The power and the performance need to be adjusted.
(3) No magnetic drive pump supports continuous closed running. Be sure to ensure the minimum flow volume.
• Minimum flow volume
MXM22/44 : 10 L/min.
MXM54 Impeller range 1, 2 and 3 : 20 L/min.
Impeller range 4 : 50 L/min.
(4) The pressure resistance of the pump is as follows.
Be sure to ensure that the internal pressure of the pump does not exceed the value specified below.
• Standard model -10 °C to 90 °C (without rear casing cover)
MXM22: 0.2MPa, MXM44: 0.3MPa, MXM54: 0.45MPa
• High temperature version -10 °C to 105 °C (with rear casing cover)
: 0.7MPa
(5) FF material models
• Liquid should be 1m Pa·s (cP) or more.
• HQ performance is somewhat different from CF/KK models. If you need to know the detail, please contact with us.
(6) Deliberate prolonged dry running or entrained air operation is not recommended.
• The CF type has a degree of tolerance to dry running and operation with entrained air in the liquid.
• The KK type has the same degree of tolerance as the CF type under operation with entrained air in the liquid, but not allowed to run dry.
• The FF type is not allowed to run dry or operation with entrained air.

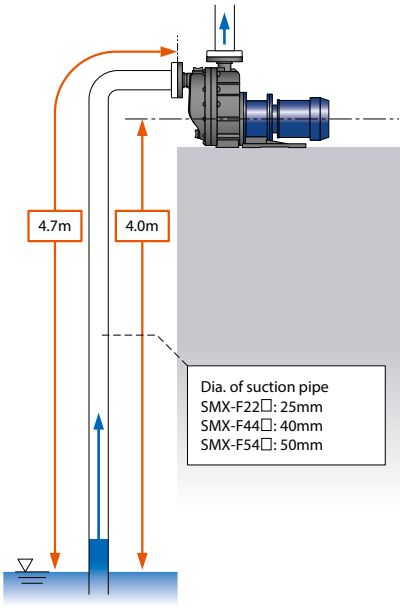
• SMX-F

(1) The performance curves on this catalogue are based on the operation with 20 °C clean water in flooded suction. Keep a margin (3% of the curves) when selecting the pump.

(2) The magnetic pump cannot run continuously with a closed-discharge. Be sure to observe the minimum flow rate.
• The minimum flow rate SMX-F22□: 10L/min
SMX-F44□: 10L/min
SMX-F54□: 20L/min

(3) Select a pump model according to liquid specific gravity. Always keep 10% allowance to motor output.
• Pump shaft power Sp x Specific gravity x 1.1 (margin) ≦ Motor output

(4) The self-priming performance (4m in 90 seconds) is based on the operation with 20 °C clean water on the right piping condition. Self-priming performance varies with liquid temperature, characteristics and piping conditions. Obtain a rough guide of the highest possible self-priming height at each liquid specific gravity by the following formula.
• The highest possible self-priming height[m] = Self-priming height with clean[m] / Liquid specific gravity



Self-priming considerations

(1) The diameter of the piping on the suction side should be the same as that of the pumps inlet port (22□: 25mm, 44□: 40mm, 54□: 50mm), and the length of the piping should be limited to less than 4.7m. A larger pipe diameter or longer piping could adversely affect the self-priming performance, or could even hinder the self-priming process itself.

(2) In cases where the liquid level fluctuates, take the height from the lowest liquid level as the maximum self-priming height.

(3) Always perform priming before first operation, and start the pump only after the pump chamber has been filled with the handled liquid.

(4) To prevent early deterioration, avoid frequent start/stop of the pump.

(5) If a foot valve is installed on the suction pipe. Pipe resistance may increase so that the pump cannot suck liquid enough.

• MX-F

(1) The performance curves on this catalogue are based on clean water of 20 °C. Keep a margin (3% of the curves) when selecting the pump.

(2) For the MX-F250 or larger models, select a proper impeller size according to specific gravity. Always keep 10% allowance to motor output.
Applicable motor output
$Sp \times S.G \times \underbrace{(1.1)}_{\text{Allowance}} \leqq$ Motor output

(3) The magnetic drive pump is not durable for a long time in closed-discharge operation. Always keep the minimum flow.
• Minimum flow
MX-F100, 250, 251, 400, 401: 10 L/min
MX-F402, 403: 20 L/min

(4) NPSH validation
Observe the following for the prevention of cavitation.

$$NPSHa \leqq NPSHr + \underbrace{0.5\ m}_{\text{Allowance}}$$

$$NPSHa = 10^6 \times \frac{(Pa - Pv)}{\rho g} \pm hs - hfs$$

(5) Maximum withstand pressure

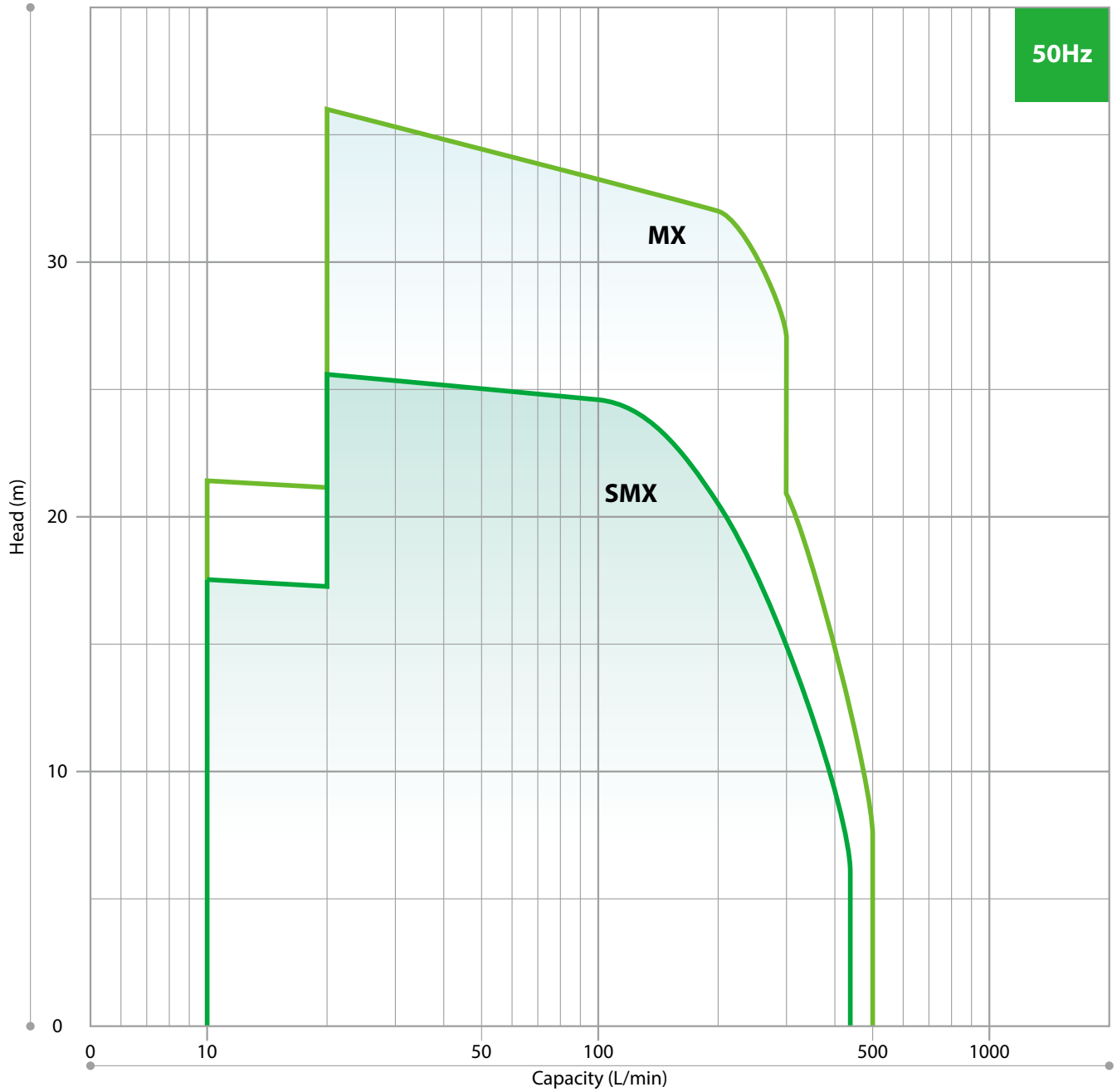
MX-F100: 0.19MPa
MX-F250: 0.25MPa
MX-F251: 0.33MPa
MX-F400: 0.22MPa
MX-F401: 0.28MPa
MX-F402: 0.43MPa
MX-F403: 0.43MPa

NPSHa: Net Positive Suction Head Available (m)
NPSHr: Net Positive Suction Head Required (m)
Pa: Pressure on the suction liquid level (MPa) (Absolute pressure)
Pv: Pressure of saturated vapor (MPa)
hs: Static suction head (m)
hfs: Suction pipe resistance (m)
ρ: Liquid density (kg/m^3)
g: G-force (9.8m/sec^2)

CFRPP
GFRPP

Performance Comparison for Iwaki Magnetic Drive Pumps

Materials: Polypropylene (CFRPP/GFRPP)



Liquid end Materials





Polypropylene
(GFRPP)

Materials

Model	Resin parts				Sliding parts		Sealing parts	
	Front casing	Rear casing	Impeller	Magnet capsule	Bearing	Spindle	Gasket	O ring
SMX	GFRPP	GFRPP	GFRPP	PP	Carbon	High purity alumina ceramic	FKM	FKM
					PTFE		EPDM	EPDM
					SiC	SiC		
MX	GFRPP	GFRPP	CFRPP	PP	CFRPPS	Alumina ceramic	—	FKM
					PTFE			
			GFRPP		Carbon	High purity alumina ceramic		EPDM
					Alumina ceramic			

Material index

Plastic materials	
PP	Polypropylene
CFRPP	Carbon fiber-reinforced PP
GFRPP	Fiberglass-reinforced PP

Rubber	
FKM	Fluorine rubber
EPDM	Ethylene propylene rubber

Materials for sliding parts/bearings	
Carbon	Carbon
SiC	Silicon carbide ceramic
CFRPPS	Carbon fiber-reinforoed PPS



Liquid end material
GFRPP

SMX series

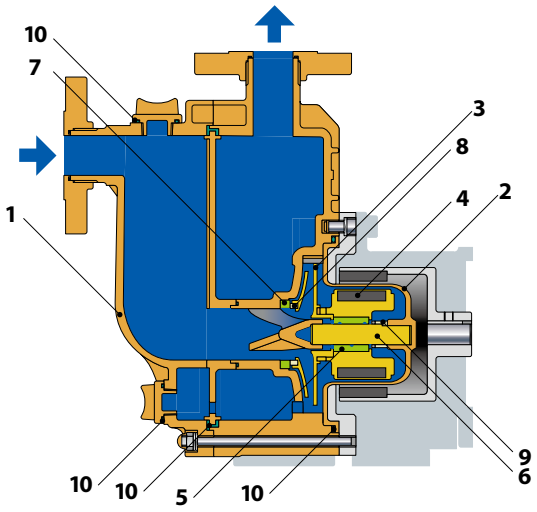
- Expanded versatility
- Easy maintenance
- Able to withstand abnormal operation
- Fast self-priming

Specifications

Max. discharge capacity.....440 L/min
Max. discharge head .....25.5 m
Rated self-priming height 4m
Material .....GFRPP
Power range .....0.4 to 3.7kW
Pump size (Discharge) 25A, 40A
Liquid temp. range.....0 to 80°C*
Specific-gravity limit 2.0
(For details, please contact Iwaki.)
Sealing method.....Seal-less construction

*Fluid dependent.

Liquid end materials

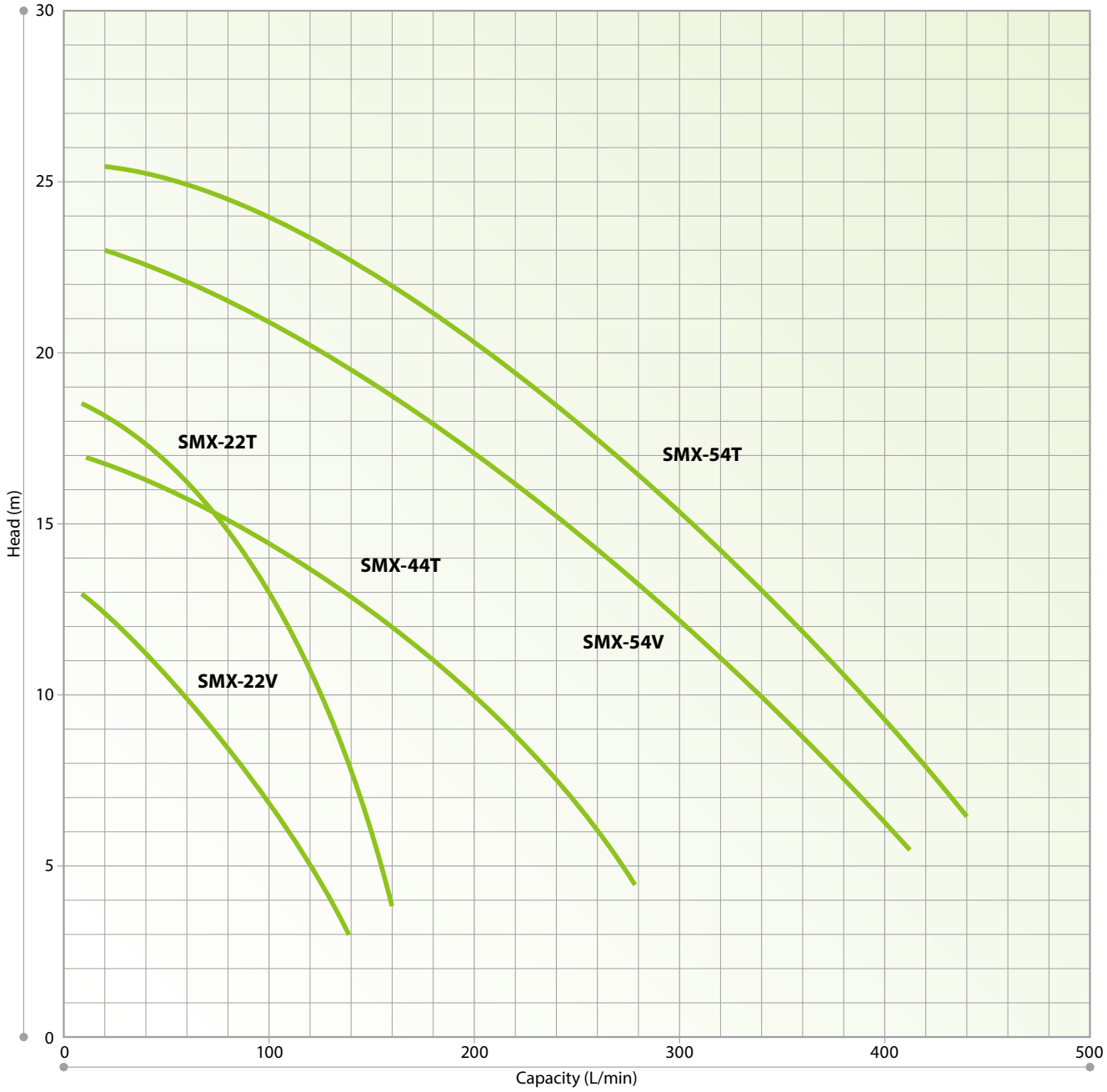


1 Front / Rear case..... GFRPP
2 Rear casing..... GFRPP
3 Impeller..... GFRPP
4 Magnet capsule..... PP
5 Bearing ..... High density carbon, SiC, PTFE(with filler)
6 Spindle..... High purity alumina ceramic, SiC
7 Liner ring..... High purity alumina ceramic
8 Mouth ring ..... PTFE (with filler)
9 Rear thrust..... High purity alumina ceramic, SiC, CFRETFE
10 O ring..... FKM, EPDM

Versatile self-priming magnetic drive pumps built to withstand abnormal operation

Performance curves (50Hz)

• Pump size (Suction×Discharge) SMX22: 25A×25A, SMX44: 40A×40A, SMX54: 50A×40A





Liquid end material
GFRPP

MX series

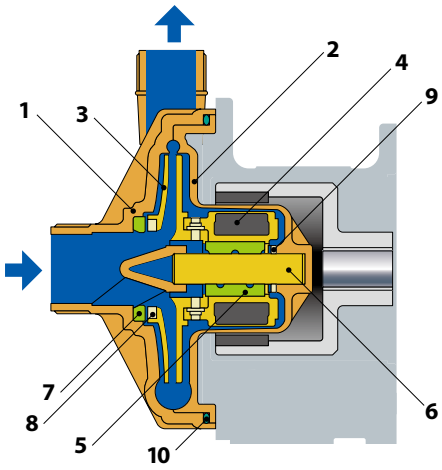
- Self-radiating structure
- Non-contact structure
- Dual section volute casing
- Robust structure

Specifications

Max. discharge capacity.....800 L/min
Max. discharge head .....35 m
Material .....GFRPP
Power range .....0.15 to 4.0kW
Pump size (Discharge) G1, G1½, 50A
Liquid temp. range.....0 to 80°C*
Specific-gravity limit 2.0
(For details, please contact Iwaki.)
Sealing method.....Seal-less construction

*An Aflas® O-ring is 10 to 80°C.
Fluid dependent.

Liquid end materials



1 Front casing ..... GFRPP
2 Rear casing ..... GFRPP
3 Impeller ..... GFRPP
4 Magnet capsule ..... PP
5 Bearing ..... PPS, PTFE(with filler), High density carbon, High purity alumina ceramic
6 Spindle ..... High purity alumina ceramic
7 Liner ring ..... High purity alumina ceramic
8 Mouth ring ..... PTFE (with filler)
9 Rear thrust ..... CFRETFE
10 O ring ..... FKM, EPDM, AFLAS®

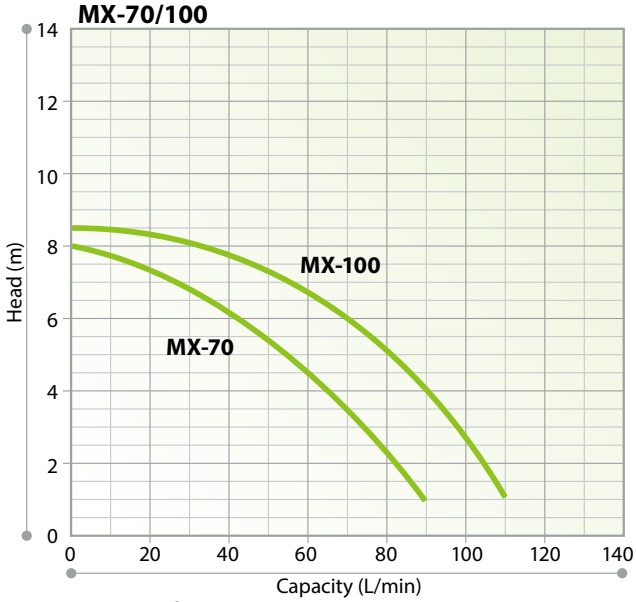


Built to withstand abnormal operation and provide high efficiency

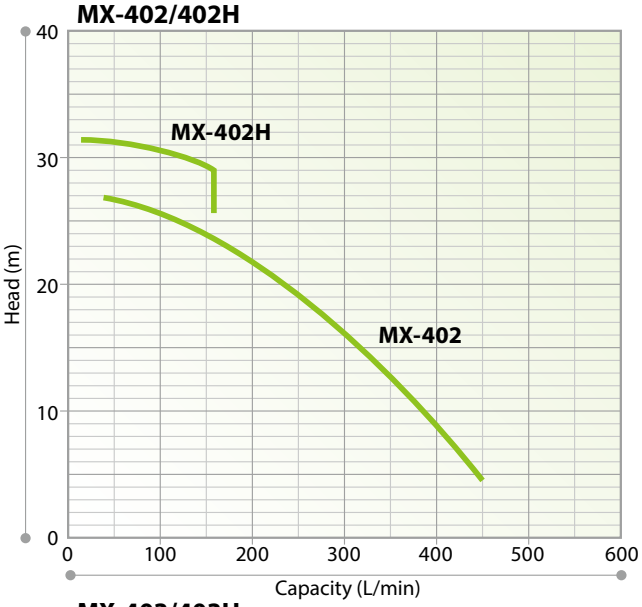
Performance curves (50Hz)

• Pump size (Suction×Discharge) MX-70/100: G1×G1, MX250/251: G1×G1, MX400: G1½×G1½
MX-401: G1½×G1½, MX402/402H/403/403H: G2×G1½, MX-505: 65A×50A

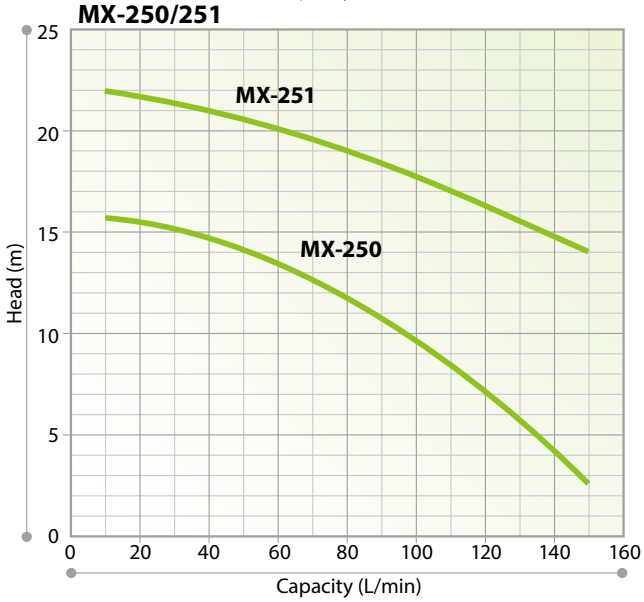
MX-70/100



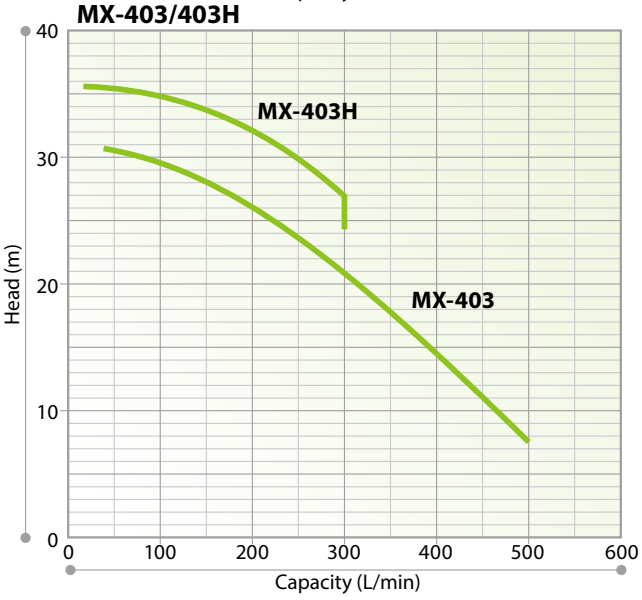
MX-402/402H



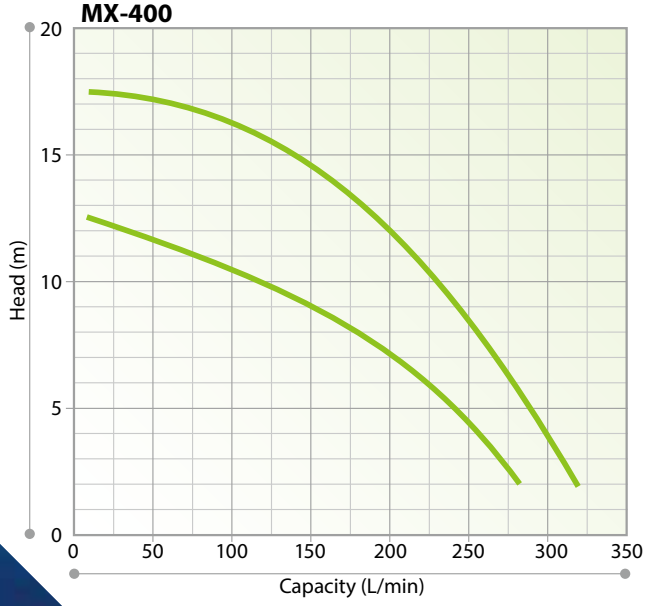
MX-250/251



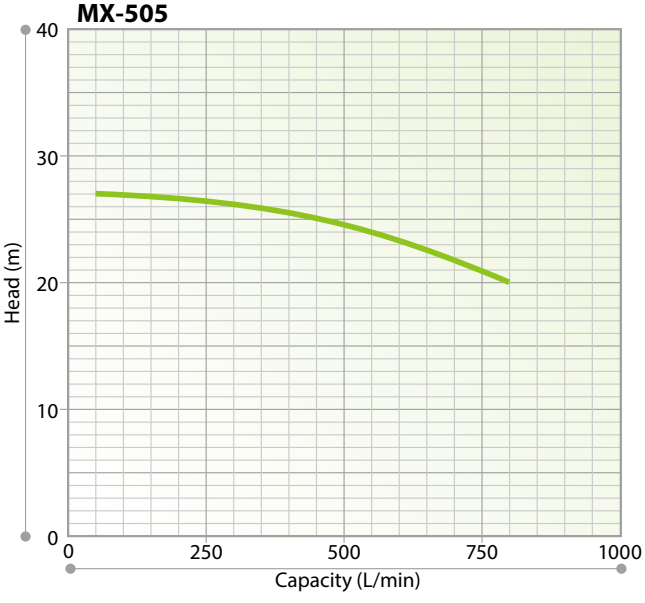
MX-403/403H



MX-400



MX-505



Precautions in piping planning

To safely use the full capability of a pump, observe the precautions below when performing installation.

MDW/MDE/MDM/MXM/AMP/MX/MX-F series

1. Suction tank

1. Capacity
   Make sure the tank has enough capacity. Even if the liquid level fluctuates by operating the pump, make sure that no gas is involved. If gas entrainment operation is performed, lubrication of the sliding parts will be insufficient, causing damage to the pump.
2. Prevention of convection
   Install a rectifying plate in the suction tank to prevent convection. If there is a flow at the part where the suction pipe is taken out, it may cause suction failure.
3. Foreign matter prevention
   Install a screen in the suction tank to prevent foreign matter from entering the pump. In addition, it is important to prevent foreign matter from entering the suction tank from the supply side. Note that installing a strainer in the suction pipe creates resistance and may cause damage to the pump.

2. Suction pipe

1. Flooded suction
   Establish a flooded suction system. A suction lift system is much less efficient and so it is not recommended. In the case a suction lift system, a foot valve is always required.
2. Pipe resistance
   Establish the shortest line length and the minimum number of bends so the pipe resistance is minimized.
3. Piping diameter
   The pipe diameter should be larger than the suction diameter of the pump. As a guideline for selection, select a pipe diameter that allows the flow velocity in the pipe to be 1.5m/s or less. If the flow velocity is too high, it will be affected by air accumulation, etc., and suction failure will easily occur.
   Example : For a flow rate of 1,200L/min ($1.2m^3$/min)

$$d = \sqrt{\frac{4 \times Q}{V \times \pi}}$$
$$= \sqrt{\frac{4 \times (1.2/60)}{1.5 \times \pi}}$$
$$= 0.13(m)$$

d : Pipe diameter (m)
Q : Flow rate (m^3/s)
V : Flow speed (m/s)

Appropriate pipe diameter is 150A

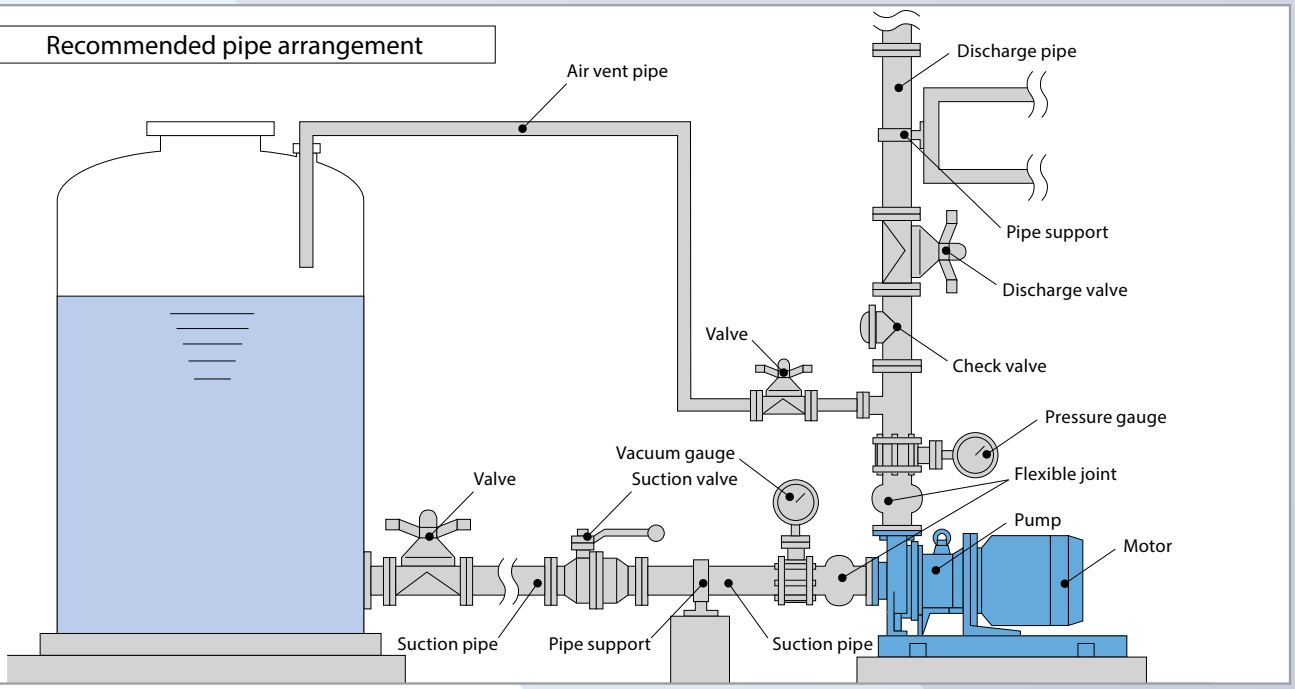
4. Independent piping
   Provide an independent suction pipe for each pump. Collective piping is affected by the flow of each pump, and suction failure may occur. In the unlikely event that independent piping is difficult and should be used as a collective pipe, select a pipe diameter that allows the flow velocity of the collective pipe to be 0.5m/s or less.
5. Shut off valve
   In the case of the push-in type, a shut off valve is required when disassembling and inspecting the pump, so be sure to install it.
6. Tip of suction line
   Always submerge at least 500 mm above the liquid surface to prevent air from being sucked in.
7. Straight section
   Be sure to provide a straight pipe section immediately before the suction port of the pump. If there is a bend in the pipe just before the pump and the liquid flow is uneven, the pump will become unstable and cause failure.
   50A (2B) or smaller: 500mm
   65A (2½B) or wider: 8 times longer than the pump inlet I.D.
   In addition, install a removable short pipe of about 300 mm in the straight pipe section for disassembly and inspection of the pump.
8. No air/gas entrapment
   In general, do not allow any arched line where air may be trapped. In a flooded suction system, lay a suction line in the down-slope (from the tank outlet to the pump inlet) of 1:100 or steeper. In a suction lift system; however, lay it in the up-slope to the pump inlet. If plumbing latitude is limited in your facility and you can not avoid an arched suction line in the system, mount an air vent device.
9. Use of reduced diameter pipe
   If the suction pipe has a diameter different from that of the pump, use an eccentric single drop pipe. The single drop pipe is laid so that the upper part is horizontal so that air does not accumulate.
10. Joint
    Minimize the number of joints in the suction pipe as much as possible. When installing joints, make sure they are properly sealed. If the seal is defective, air will be sucked into the pump, making it impossible to pump liquid, or the lubrication inside the pump will be insufficient, resulting in pump failure.
11. NPSH
    After designing the piping, check the NPSH. Observe the following conditions to prevent cavitation.
    NPSHa ≧ NPSHr + 0.5m
    NPSHa : (Available NPSH) Value determined by piping and transferred liquid
    NPSHr : (Required NPSH) Value determined by pump model

3. Discharge pipe

1. Shut off valve
   Install a shut off valve near the pump discharge port (within 1m) to prevent overload at startup and to adjust the discharge rate.
2. Air vent pipe
   Install an air vent pipe between the pump and the shut off valve (check valve) near the pump, and be sure to release the air before operation. If the air in the pump is not sufficiently vented, the liquid may not be pumped or the temperature inside the pump may rise abnormally, resulting in malfunction. Also, if air remains between the pump and the valve close to the pump, the magnetic coupling may go out of step at startup. Air stagnation also has a harmful effect on the discharge piping downstream of the gate valve, so provide an air vent piping as necessary.
3. Check valve
   Install a check valve in the following cases.
   • Discharge line is longer than 15m.
   • A delivery head is higher than 15m.
   • The top end of a discharge line is 9m or higher than the tank liquid level.
   • Several pumps run in parallel.
   If a check valve is installed, air may accumulate on the upstream side, so install an air vent pipe. Especially for liquids that generate gas, it is necessary to remove the generated gas before starting the pump.

Before using the pump, be sure to read the instruction manual and use it correctly.

Recommended pipe arrangement



SMX/SMX-F series

1. Suction tank

1. Capacity
   Make sure the tank has enough capacity. Even if the liquid level fluctuates by operating the pump, make sure that no gas is involved. If gas entrainment operation is performed, lubrication of the sliding parts will be insufficient, causing damage to the pump.
2. Prevention of convection
   Install a rectifying plate in the suction tank to prevent convection. If there is a flow at the part where the suction pipe is taken out, it may cause suction failure.
3. Foreign matter prevention
   Install a screen in the suction tank to prevent foreign matter from entering the pump. In addition, it is important to prevent foreign matter from entering the suction tank from the supply side. Note that installing a strainer in the suction pipe creates resistance and may cause damage to the pump.

2. Suction pipe

1. Suction lift system
   Before operating the pump, be sure to prime it and fill the pump chamber with the liquid to be handled before starting. The self-priming limit height (4m) is the value for liquids equivalent to water and 20°C. Self-priming performance varies depending on liquid temperature, liquid quality, piping conditions, etc. Use the following formula to find the approximate height of specific gravity that allows self-priming.

   Self-suction height of specific gravity liquid (reference) [m] = Self-suction height of water [m]/liquid specific gravity

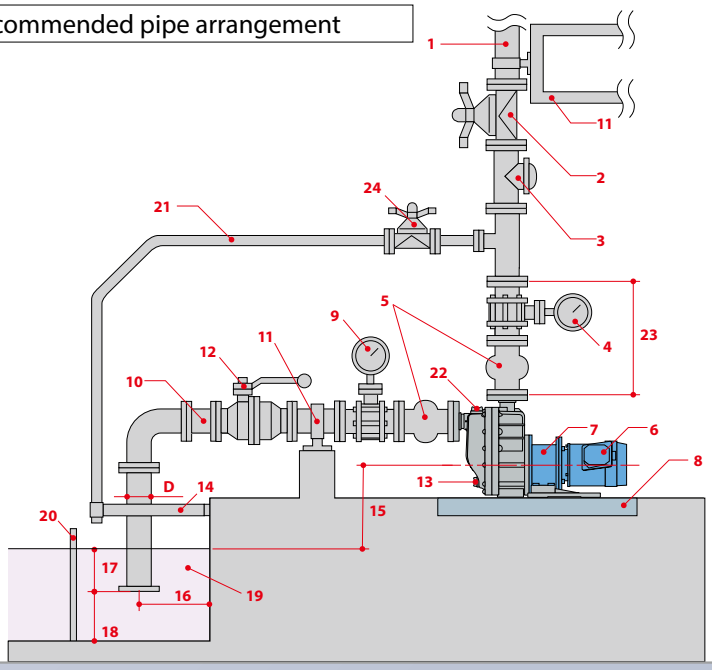
   Also, if there is something that acts as a suction resistance (such as a foot valve) in the suction pipe, it may cause a decrease in self-priming capability or impossibility of self-priming. In addition, there is no particular problem even if it is used in Flooded suction. When using the push-in method, please take the same piping considerations as with magnet drive pumps (MX type, etc.).
2. Pipe resistance
   Keep the length of the pipe within 4.7m, and make it as short as possible with fewer bends. If it is longer than 4.7m, it will not self-suction because the air volume in the suction pipe will be large.
3. Piping diameter
   The pipe diameter should be larger than the suction diameter of the pump. If the diameter is larger than the suction of the pump, the volume of air in the suction pipe will increase, so the pump will not self-suction.
4. Independent piping
   Provide an independent suction pipe for each pump. Collective piping is affected by the flow of each pump, and suction failure may occur.
5. Shut off valve
   In the case of the push-in type, a shut off valve is required when disassembling and inspecting the pump, so be sure to install it.
6. Tip of suction line
   Always submerge at least 500 mm above the liquid surface to prevent air from being sucked in.
7. Straight section
   Be sure to provide a straight pipe section of 500 mm or more immediately before the suction port of the pump. In addition, install a removable short pipe of about 300 mm in the straight pipe section for disassembly and inspection of the pump.
8. No air/gas entrapment
   In general, do not allow any arched line where air may be trapped. In a flooded suction system, lay a suction line in the down-slope (from the tank outlet to the pump inlet) of 1:100 or steeper. In a suction lift system; however, lay it in the up-slope to the pump inlet. If plumbing latitude is limited in your facility and you can not avoid an arched suction line in the system, mount an air vent device.
9. Joint
   Minimize the number of joints in the suction pipe as much as possible. When installing joints, make sure they are properly sealed. If the seal is defective, air will be sucked into the pump, making it impossible to pump liquid, or the lubrication inside the pump will be insufficient, resulting in pump failure.
10. Pipe support
    If piping weight loads the pump, any plastic part is deformed. Be sure to install a pipe support.

3. Discharge pipe

1. Shut off valve
   Install a shut off valve near the pump discharge port (within 1m) to prevent overload at startup and to adjust the discharge rate. Also, during self-priming operation, open either the discharge pipe or the air release pipe to the atmosphere.
2. Air vent line
   An air vent line should be arranged in the following cases
   • An horizontal discharge line is 10m or more.
   • A check valve is installed. Otherwise self-priming can not be performed.
   • A discharge line is not at atmospheric pressure.
   Otherwise self-priming can not be performed.
3. Check valve
   When selecting a check valve, check its maximum operating pressure to make sure it tolerates a possible pressure rise due to water hammer or back flow.
   • Discharge line is longer than 15m.
   • A delivery head is higher than 15m.
   • The top end of a discharge line is 9m or higher than the tank liquid level.
   • Several pumps run in parallel.
4. Straight section
   Provide a vertical straight pipe section of 500 mm or more immediately after the pump to release air during self-priming operation.
5. Pipe support
   If piping weight loads the pump, any plastic part is deformed. Be sure to install a pipe support.

Before using the pump, be sure to read the instruction manual and use it correctly.

Recommended pipe arrangement



1 Discharge line
2 Shut off valve
3 Check valve
4 Pressure gauge
5 Flexible joint
6 Motor
7 Pump
8 Drain channel
9 Vacuum gauge
10 Suction pipe (Pipe diameter : D)
11 Pipe support
12 Suction valve
13 Drain cap
14 Pipe support
15 Suction lift (4m or less)
16 1.5D or wider
17 500 mm or higher
18 1.5D or wider
(500mm or wider if scale could build up in the supply tank)
19 Supply tank
20 Screen
21 Air vent line
22 Priming water cap
23 500mm or longer straight pipe
24 Shutoff valve

Optional Accessories

Pump protector **DRN** series



Detects unusual pump operating conditions including dry-running and overload

The DRN model protects equipment (including pumps) from damage!
Minimizes production downtime.
Identifies possible causes of alarms so they can be investigated and addressed.

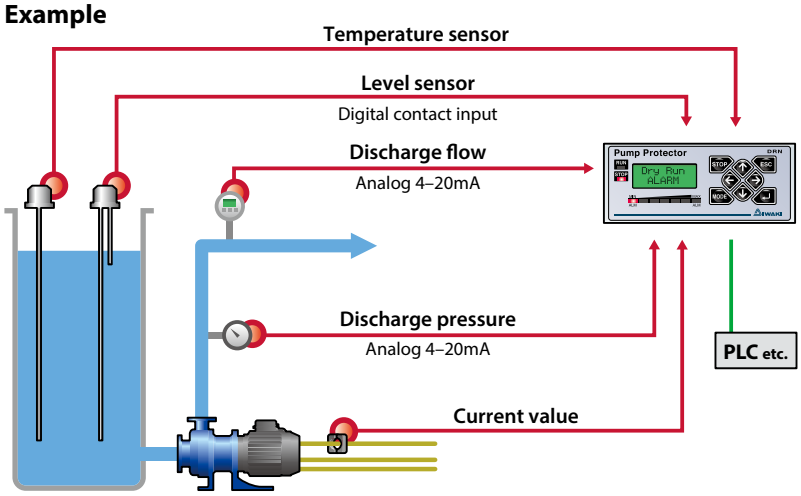
Multiple Input	**Two analog, one digital, one temperature input and one current input**
Easy operation	**Equipped with EASY setup mode to remember the operation status and set the lower/upper limit values, as well as AUTO setup mode**
Bar graph	**Visible indication of current operating status**
Logging capability	**Data log feature for preventative maintenance scheduling**
Communication	**RS485 external communication capability**

Specifications

Model	DRN-01	DRN-02
Current measurement range	0.5–30.00A	5.0–200.0A
Unit's source voltage	AC100–240V 50/60Hz 10VA	
Operating temperature	0 – 40ºC	
Operating humidity	35–85%RH	
Current sensor	JS10FL	JS24FL
Analog input 1	4–20mA or 1–5V	
Analog input 2	4–20mA or 1–5V	
Temperature range	-50 – 200ºC (Pt100, K thermocouple)	
Digital contact input	No-voltage contact signal (also for external reset)	
Contact output	For pre-alarm: AC250V 8A (load resistance) 1c For pump-stopping: AC250V 8A (load resistance) 1a	
Logging capability	Past records (with the calendar)	
Communication	RS485 incorporated	
Supported models	MX, SMX, MXM, MDM, MDE, MDW	
External dimension in mm	D71 x W108 x H90	

* Not used as an inverter. * Safety: UL 61010-1 * EMC: EN61326-1 * RoHS: EN50581
CAN/CSA-C22.2 No. 61010-1-12
EN61010-1 EN61326-1, EN50581

Example



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Germany	**: IWAKI Europe GmbH**	TEL: (49)2154 9254 50	FAX: 2154 9254 55
The Netherlands	**: IWAKI Europe GmbH** (Netherlands Branch)	TEL: (31)74 2420011	FAX: (49)2154 925448
Italy	**: IWAKI Europe GmbH** (Italy Branch)	TEL: (39)0444 371115	FAX: 0444 335350
Spain	**: IWAKI Europe GmbH** (Spain Branch)	TEL: (34)93 37 70 198	FAX: 93 47 40 991
Poland	**: IWAKI Europe GmbH** (East Europe Branch)	TEL: (48)12 347 0755	FAX: 13 67 20 30
Belgium	**: IWAKI Belgium N.V.**	TEL: (32)13 67 02 00	FAX: 12 347 0900
Denmark	**: IWAKI Nordic A/S**	TEL: (45)48 24 2345	
Finland	**: IWAKI Suomi Oy**	TEL: (358)9 2745810	
France	**: IWAKI France S.A.**	TEL: (33)1 69 63 33 70	FAX: 1 64 49 92 73
Norway	**: IWAKI Norge AS**	TEL: (47)23 38 49 00	
Sweden	**: IWAKI Sverige AB**	TEL: (46)8 511 72900	( )Country codes

U.S.A.	**: IWAKI America Inc.**	TEL: (1)508 429 1440	FAX: 508 429 1386
Argentina	**: IWAKI America Inc.** (Argentina Branch)	TEL: (54)11 4745 4116	
Brazil	: IWAKI Do Brazil Comercio De Bombas Hidraulicas LTDA.	TEL: (55)19 3244 5900	FAX: 19 3244 5900
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Australia	**: IWAKI Pumps Australia Pty Ltd.**	TEL: (61)2 9899 2411	FAX: 2 9899 2421
China (Hong Kong)	**: IWAKI Pumps Co., Ltd.**	TEL: (852)2607 1168	FAX: 2607 1000
China (Guangzhou)	**: GFTZ IWAKI Engineering & Trading Co., Ltd.**	TEL: (86)20 84350603	FAX: 20 84359181
China (Shanghai)	**: IWAKI Pumps (Shanghai) Co., Ltd.**	TEL: (86)21 6272 7502	FAX: 21 6272 6929
Korea	**: IWAKI Korea Co.,Ltd.**	TEL: (82)2 6238 4800	FAX: 2 6238 4801
Taiwan	**: IWAKI Pumps Taiwan Co., Ltd.**	TEL: (886)2 8227 6900	FAX: 2 8227 6818
Thailand	**: IWAKI (Thailand) Co.,Ltd.**	TEL: (66)2 322 2471	FAX: 2 322 2477

⚠ Caution for safety use:
Before use of pump, read instruction manual carefully to use the product correctly.

Actual pumps may differ from the photos. Specifications and dimensions are subject to change without prior notice. For further details please contact us.

⚠ Legal attention related to export.

Our products and/or parts of products fall in the category of goods contained in control list of international regime for export control. Please be reminded that export license could be required when products are exported due to export control regulations of countries.

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