MTR(E), MTC, MTA

Immersible pumps
60 Hz

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GRUNDFOS

Table of contents

1. MTR(E)

Introduction

TM05 5165 3412

Fig. 1 Grundfos MTR pumps

MTR pumps are vertical multistage centrifugal pumps designed for pumping of cooling lubricants for machine tools, condensate transfer and similar applications.

The pumps are designed to be mounted on top of tanks with the chamber stack immersed in the pumped liquid.

Grundfos MTR pumps come in various pump sizes and numbers of stages to provide the flow, the pressure and the installation length required. To meet specific depths of tanks or containers, the immersible length of the pump can be varied using empty chambers.

The pumps consist of two main components, the motor and the pump unit.

The motor is a Grundfos standard ML motor or Grundfos specified motor designed to NEMA standards.

The pump unit consists of optimized hydraulics, a variety of connections, a motor stool, a given number of chambers and various other parts.

The pumps are available in two material versions:

- standard range (A-version) with wetted parts of cast iron and stainless steel.
- stainless steel version (I-version) with all wetted parts of 304 stainless steel (EN/DIN 1.4301) or better.
- The mounting flange dimensions are according to DIN 5440. The mechanical shaft seal is according to EN 12 756.

MTRE pumps with built-in variable frequency drive

TM02 8537 0404

Fig. 2 Grundfos MTRE pumps

MTRE pumps are MTR pumps with an E-motor, i.e. a motor with built-in variable frequency drive. Frequency control enables continuously variable control of motor speed, which makes it possible to set the pump to operate in any duty point. The motors of the MTRE pumps are Grundfos MLE motors

MTRE pumps are ideal for machining centers which operate with different machining processes and tools, as this will often result in different needs for flow and pressure.

The following features and benefits are typical for choosing an MTRE pump:

- energy savings
- low heat input into the cooling lubricant
- increased cooling efficiency
- better performance of the machining center
- simple integration with the machining center.

Applications

Application	MTR(E)
Boring	•
Sawing	-
Milling	•
Grinding	•
Spark erosion	•
Wire cutting	•
Turning	•
Chilling	•
Part washing	•
Filtration	-
Condensate systems	•
Wash and clean	•

• The pump is suitable for this application.

Machine tool applications

Grundfos' range of high-pressure pumps offers unsurpassed accuracy and stability to make sure that nothing interferes with the delicate machining process. Equally important, high efficiency ensures a remarkably low heat input into the cooling lubricant. Integrated variable frequency drives can be optionally supplied for increased system efficiency and flexibility. Suitable for machine tool applications, the immersible MTR offers a tank mounted design.

Machine tool sub applications

Boring

Grundfos is capable of providing the exact pressure and flow required for different materials, bore diameters and tool speeds in both through boring and blind boring. Our MTR(E) range includes pumps supplying a pressure of up to 435 psi (30 bar), required for the deep blind-hole boring.

Milling and turning

The Grundfos range easily meets the individual cooling requirements of different materials in milling and turning - from low flow and low pressure to high flow and high pressure. The pumps are available in different lengths and customized to fit specific tank sizes. In fact, the modular construction of our pumps allows for more than 1,000,000 individual configurable variants.

Wire cutting

In wire cutting it is essential that the liquids are clean. This results in a more accurate process and extends the life of the filter. As a steady temperature is required for wire cutting operation, the process will benefit from a Grundfos E-pump (pump with variable frequency drive) solution.

Filtration

Reliable filtration is crucial in top quality machine tool applications, as it prolongs the life of the tool as well as prevents chips from damaging surfaces or tolerances.

Part washing

The Grundfos range includes pumps suitable for corrosive liquids and liquids with a high content of particles. Our variable frequency drive operated pumps with high-efficiency motors ensure that systems operate under the best possible conditions with low-energy consumption.

Chilling

The reliable and thoroughly-tested range of pumps for chillers offers a particularly diverse application spectrum. It covers cooling water circuits, washing plants, industrial circulation systems as well as general pressure boosting applications. All pumps are available with an E-motor to increase efficiency and perfectly control any process. Pumps suitable for this application are all immersible pumps.

Condensate systems

As condensate is normally pumped from a tank, an immersible pump will be a perfect choice.
Compact solution as half the pump will be in the tank.
Optimum suction as no pipes or valves are needed in front of inlet.

Wash and clean

As for condensate systems, wash and clean applications are typically based around a tank. So also here the immersible pumps can save space and secure optimum suction. A version in all stainless steel is available for aggressive liquids.

Pumped liquids

MTR(E) pumps are designed to pump non-explosive liquids that do not chemically attack the pump materials.

When pumping liquids with a density and/or viscosity higher than that of water, oversized motors may be required.

Whether a pump is suitable for a particular liquid depends on a number of factors of which the most important are the chloride content, pH-value temperature and content of chemicals, oils, etc.

Please note that aggressive liquids may attack or dissolve the protective oxide film of the stainless steel and thus cause corrosion.

Pumping of solid particles

MTR(E) pumps are fitted with a suction strainer. The strainer prevents large solid particles from entering and damaging the pump.

The table below describes the size of the passage in the strainer and the impeller.

Pump type	Strainer passage [⌀ in. (⌀ mm)]	Free strainer passage [$in.^2$ (mm^2)]	Impeller passage [in. (mm)]
MTR(E) 1s	0.08 (2)	3.60 (2322)	0.09 (2.29)
MTR(E) 1	0.08 (2)	3.60 (2322)	0.09 (2.29)
MTR(E) 3	0.08 (2)	3.60 (2322)	0.12 (3.05)
MTR(E) 5	0.16 (4)	4.30 (2774)	0.21 (5.33)
MTR(E) 10	0.16 (4)	6.70 (4322)	0.21 (5.33)
MTR(E) 15	0.16 (4)	6.70 (4322)	0.23 (5.84)
MTR(E) 20	0.16 (4)	6.70 (4322)	0.31 (7.87)
MTR(E) 32	0.16 (4)	8.70 (5612)	0.31 (7.87)
MTR(E) 45	0.16 (4)	8.70 (5612)	0.37 (9.40)
MTR(E) 64	0.16 (4)	8.70 (5612)	0.51 (12.95)

If the pumped liquid contains solid particles larger than the size of the holes in the strainer, the passage of the strainer may be blocked. In such situations the performance will drop as a result of a reduced flow through the pump.

Note: If the strainer is removed from the suction port, solid particles may enter the pump and cause a seizure or even damage the pump.

In grinding applications Grundfos recommends that the pumped liquid is screened for abrasive particles before entering the pump. When pumped, abrasive particles reduce the life of the pump components.

Wear of the pump components caused by abrasive particles starts when the concentration exceeds 20 ppm.

List of pumped liquids

A number of typical liquids are listed in the following table.

Other pump versions may be applicable, but those stated in the list are considered to be the best choices.

The table is intended as a general guide only, and it cannot replace actual testing of the pumped liquids and pump materials under specific working conditions.

The list should, however, be applied with some caution as factors such as concentration of the pumped liquid, liquid temperature or pressure may affect the chemical resistance of a specific pump version.

Safety precautions must be made when pumping dangerous liquids.

Notes

D	Often with additives.
E	Density and/or viscosity differ from that of water. Allow for this when calculating motor output and pump performance.
F	Pump selection depends on many factors. Contact Grundfos.
H	Risk of crystallization/precipitation in shaft seal.
1	The pumped liquid is easily ignited.
2	The pumped liquid highly flammable.
3	Insoluble in water.
4	Low self-ignition point.

Pumped liquid	Note	Liquid concentration, liquid temperature	MTR(E)			MTRI(E)	
			1s, 1, 3, 5	10, 15, 20	32, 45, 64	1s, 1, 3, 5	10, 15, 20
Acetic acid, CH_3COOH	-	5 %, 68 °F	-	-	-	HUUE	HUUE
Alkaline degreasing agent	D, F	-	HUUE	HUUE	HUUE	-	-
Ammonium bicarbonate, NH_4HCO_3	E	20 %, 86 °F	-	-	-	HUUE	HUUE
Ammonium hydroxide, NH_4OH	-	20 %, 104 °F	HUUE	HUUE	HUUE	-	-
Benzoic acid, C_6H_5COOH	H	0.5 %, 68 °F	-	-	-	HUUV	HUUV
Boiler water	-	< 194 °F	HUUE	HUUE	HUUE	-	-
Calcareous water	-	< 194 °F	HUUE	HUUE	HUUE	-	-
Calcium acetate (as coolant with inhibitor) $Ca(CH_3COO)_2$	D, E	30 %, 122 °F	HUUE	HUUE	HUUE	-	-
Calcium hydroxide, $Ca(OH)_2$	E	Saturated solution, 122 °F	HUUE	HUUE	HUUE	-	-
Chloride-containing water	F	< 86 °F, max. 500 ppm	-	-	-	HUUE	HUUE
Citric acid, $HOC(CH_2CO_2H)_2COOH$	H	5 %, 104 °F	-	-	-	HUUE	HUUE
Completely desalinated water (demineralized water)	-	< 194 °F	-	-	-	HUUE	HUUE
Condensate	-	< 194 °F	HUUE	HUUE	HUUE	-	-
Copper sulfate, $CuSO_4$	E	10 %, 86 °F	-	-	-	HUUE	HUUE
Corn oil	D, E, 3	100 %, 176 °F	HUUV	HUUV	HUUV	-	-
Domestic hot water (potable water)	-	< 248 °F	HUUE	HUUE	HUUE	-	-
Ethylene glycol, $HOCH_2CH_2OH$	D, E	50 %, 122 °F	HUUE	HUUE	HUUE	-	-
Formic acid, HCOOH	-	2 %, 68 °F	-	-	-	HUUE	HUUE
Glycerine (glycerol), $OHCH_2CH(OH)CH_2OH$	D, E	50 %, 122 °F	HUUE	HUUE	HUUE	-	-
Hydraulic oil (mineral)	E, 2, 3	100 %, 212 °F	HUUV	HUUV	HUUV	-	-
Hydraulic oil (synthetic)	E, 2, 3	100 %, 212 °F	HUUV	HUUV	HUUV	-	-
Lactic acid, $CH_3CH(OH)COOH$	E, H	10 %, 68 °F	-	-	-	HUUV	HUUV
Linoleic acid, $C_{17}H_{31}COOH$	E, 3	100 %, 68 °F	HUUV	HUUV	HUUV	-	-
Motor oil	E, 2, 3	100 %, 176 °F	HUUV	HUUV	HUUV	-	-
Cutting oil	E	194 °F	HUUV	HUUV	HUUV	-	-
Water based cooling lubricant	E	194 °F	HUUV	HUUV	HUUV	-	-
Naphthalene, $C_{10}H_8$	E, H	100 %, 176 °F	HUUV	HUUV	HUUV	-	-
Nitric acid, HNO_3	F	1 %, 68 °F	-	-	-	HUUE	HUUE
Oil-containing water	-	< 194 °F	HUUV	HUUV	HUUV	-	-
Olive oil	D, E, 3	100 %, 176 °F	HUUV	HUUV	HUUV	-	-
Oxalic acid, $(COOH)_2$	H	1 %, 68 °F	-	-	-	HUUE	HUUE
Peanut oil	D, E, 3	100 %, 176 °F	HUUV	HUUV	HUUV	-	-
Phosphoric acid, H_3PO_4	E	20 %, 68 °F	-	-	-	HUUE	HUUE
Propylene glycol, $CH_3CH(OH)CH_2OH$	D, E	50 %, 194 °F	HUUE	HUUE	HUUE	-	-
Potassium carbonate, K_2CO_3	E	20 %, 122 °F	HUUE	HUUE	HUUE	-	-
Potassium formate (as coolant with inhibitor), KOOCH	D, E	30 %, 122 °F	HUUE	HUUE	HUUE	-	-
Potassium hydroxide, KOH	E	20 %, 122 °F	-	-	-	HUUE	HUUE
Potassium permanganate, $KMnO_4$	-	1 %, 68 °F	-	-	-	HUUE	HUUE
Rape seed oil	D, E, 3	100 %, 176 °F	HUUV	HUUV	HUUV	-	-
Salicylic acid, $C_6H_4(OH)COOH$	H	0.1 %, 68 °F	-	-	-	HUUE	HUUE
Silicone oil	E, 3	100 %	HUUV	HUUV	HUUV	-	-
Sodium bicarbonate, $NaHCO_3$	E	10 %, 148 °F	-	-	-	HUUE	HUUE
Sodium chloride (as coolant), NaCl	D, E	30 %, < 41 °F, pH > 8	HUUE	HUUE	HUUE	-	-
Sodium hydroxide, NaOH	E	20 %, 122 °F	-	-	-	HUUE	HUUE
Sodium nitrate, $NaNO_3$	E	10 %, 148 °F	-	-	-	HUUE	HUUE
Sodium phosphate, Na_3PO_4	E, H	10 %, 148 °F	-	-	-	HUUE	HUUE
Sodium sulfate, Na_2SO_4	E, H	10 %, 148 °F	-	-	-	HUUE	HUUE
Softened water	-	< 168 °F	-	-	-	HUUE	HUUE
Soya oil	D, E, 3	100 %, 176 °F	HUUV	HUUV	HUUV	-	-
Unsalted swimming pool water	-	Approx. 2 ppm free chlorine (Cl_2)	HUUE	HUUE	HUUE	-	-

MTR pump

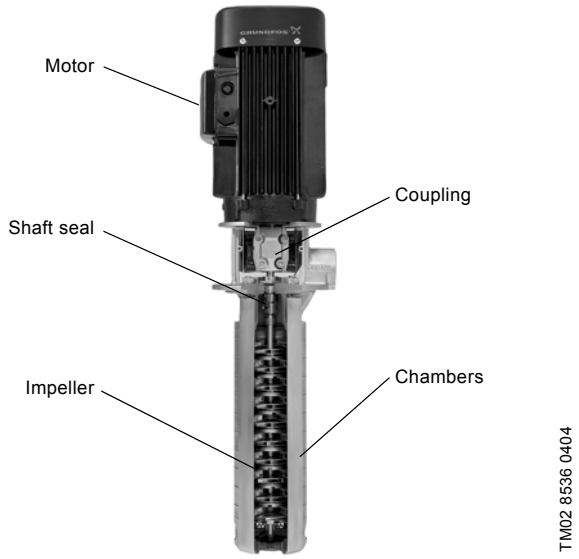


Fig. 3 Photo of an MTR pump

The pump is a vertical multistage centrifugal pump with mechanical shaft seal.

Mounting flange dimensions according to DIN 5440.

Grundfos offers the following types of pipework connection for MTR(E) pumps:

Connection	Code	Description
Threaded	NPT	NPT threads (National Pipe Thread) (Female)
Flange	ANSI	Flanged connection

The pump is fitted with closed impellers offering optimum hydraulic efficiency and minimum power consumption.

The pumps are available in two versions:

- Standard range with wetted parts of cast iron and stainless steel
- Stainless steel version (MTRI) with all wetted parts of stainless steel AISI 304.

Note: The MTRI version is to be used in applications where the pumped liquid can be corrosive.

To meet specific depths of tanks or containers, the immersible length of the pump can be varied using empty chambers.

Motors

Grundfos standard motors (ML and Baldor® motors)

MTR and MTRI pumps are fitted with a Grundfos specified motor. The motors are all heavy-duty 2-pole, NEMA C-face motors.

Frequency-controlled motors (MLE motors)

MTRE and MTRIE pumps are fitted with a totally enclosed, fan-cooled, 2-pole frequency-controlled motor.

Permanent magnet motors

From 0.5 Hp to 2 Hp Grundfos offers MTRE pumps fitted with single phase MLE motors (1 x 200-240 V).

From 1 Hp to 3 Hp Grundfos offers MTRE pumps fitted with three phase MLE motors (3 x 440-480 V).

Asynchronous motors

From 5 Hp to 30 Hp Grundfos offers MTRE pumps fitted with three phase MLE motors (3 x 460-480 V).

From 1.5 Hp to 7.5 Hp Grundfos offers MTRE pumps fitted with three-phase MLE motors (3 x 208-230 V).

See Grundfos Product Center at *http://product-selection.grundfos.com*.

Electrical data, MTR pumps

Mounting designation	NEMA
Insulation class	F & B
Efficiency class*	Energy efficient Premium efficiency - on request
Enclosure class	TEFC - Totally Enclosed Fan Cooled (Grundfos standard) ODP - Open Drip Proof - on request
60 Hz Standard voltages	1 x 115/208-230 V 3 x 208-230/460 V 3 x 575 V

* 1 Hp - 10 Hp motors are premium efficiency as standard.

Electrical data, MTRE pumps

	MLE motor
Mounting designation	NEMA
Insulation class	F
Efficiency	See section *MTR(E) motor data* on page 63.
Enclosure class	TEFC (Totally Enclosed Fan Cooled)
Supply voltage Tolerance: - 10 %/+ 10 %	0.5 Hp to 2 Hp: 1 x 200-240 V 1 Hp to 3 Hp: 3 x 440-480 V 5 Hp to 30 Hp: 3 x 460-480 V 1.5 Hp to 7.5 Hp: 3 x 208-230 V

Approvals

	The motors are rated for:	
	Baldor	ML/MLE
Approvals:		

MLE 0.5 Hp to 3 Hp permanent magnet motors

Supply voltage:
0.5 Hp to 2 Hp (1 x 200-240 V)
1 Hp to 3 Hp (3 x 440-480 V)

Advanced functional module (FM 300)

The FM 300 is the standard functional module in all MLE motors 0.5 Hp to 3 Hp.

The module has a number of inputs and outputs enabling the motor to be used in advanced applications where many inputs and outputs are required.

The FM 300 has these connections:

- three analog inputs
- one analog output
- two dedicated digital inputs
- two configurable digital inputs or open-collector outputs
- Grundfos Digital Sensor input and output
- two Pt100/1000 inputs
- two LiqTec sensor inputs
- two signal relay outputs
- GENIbus connection.

Connection terminals

MTRE pumps have a number of inputs and outputs enabling the pumps to be used in advanced applications where many inputs and outputs are required.

Functional module 300 has been selected as standard for MTRE pumps. See fig. 4.

As a precaution, the wires to be connected to the following connection groups must be separated from each other by reinforced insulation in their entire lengths.

Inputs and outputs

- Start/stop (digital input 1) (terminals 2 and 6)
- pressure sensor (analog input 1) (terminals 4 and 8)
- pressure switch (digital input 3) (terminals 10 and 6)
- external analog signal input (analog input 2) (terminals 7 and 23)
- GENIbus (terminals A, Y and B).

All inputs and outputs are internally separated from the power-conducting parts by reinforced insulation and galvanically separated from other circuits.

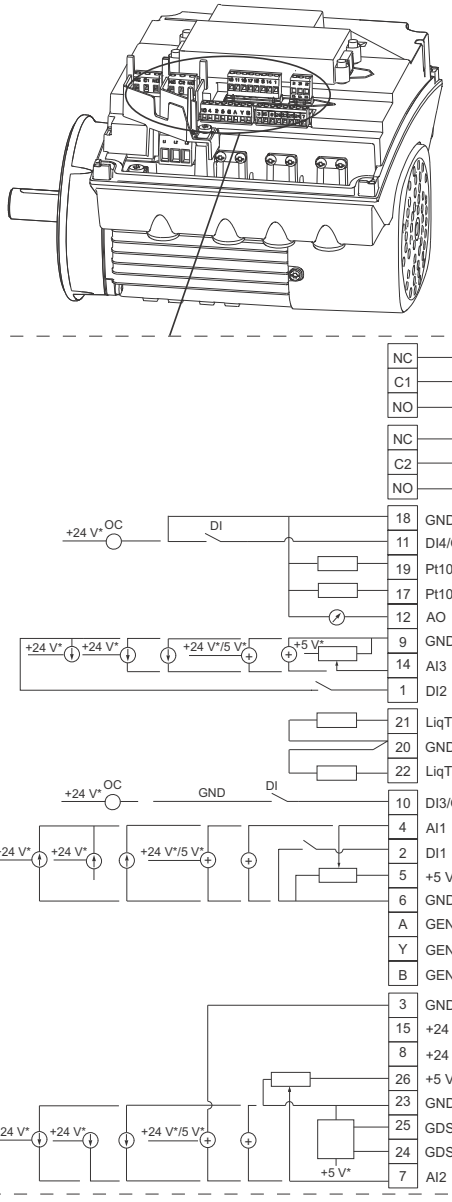
All control terminals are supplied by safety extra-low voltage (SELV), thus ensuring protection against electric shock.

Signal relay outputs

– Signal relay 1:
LIVE:
Power supply voltages up to 250 VAC can be connected to this output.
SELV:
The output is galvanically separated from other circuits. Therefore, the supply voltage can be connected to the output as desired.

– Signal relay 2:
SELV:
The output is galvanically separated from other circuits. Therefore, the supply voltage can be connected to the output as desired.

- **Power supply** (terminals N, PE, L or L1, L2, L3, PE)



* If an external supply source is used, there must be a connection to GND.

Fig. 4 Connection terminals, FM 300 functional module

MLE 1.5 Hp to 10 Hp asynchronous motors

Supply voltage:
1.5 Hp to 7.5 Hp (3 x 208-230 V)
5 to 10 Hp (3 x 460-480 V)

Advanced I/O module

The Advanced I/O module is the standard functional module in these MLE motors.

The module has a number of inputs and outputs enabling the motor to be used in advanced applications where many inputs and outputs are required.

The Advanced I/O module has these connections:

- start/stop terminals
- three digital inputs
- one setpoint input
- one sensor input
- one analog output
- GENIbus connection.

Connection terminals

As a precaution, the wires to be connected to the following connection groups must be separated from each other by reinforced insulation in their entire lengths.

Inputs and outputs

- Start/stop (terminals 2 and 3)
- digital inputs (terminals 1 and 9, 10 and 9, 11 and 9)
- setpoint input (terminals 4, 5 and 6)
- sensor input (terminals 7 and 8)
- GENIbus (terminals B, Y and A).

All inputs are internally separated from the power-conducting parts by reinforced insulation and galvanically separated from other circuits.

All control terminals are supplied with protective extra-low voltage (PELV), thus ensuring protection against electric shock.

Output (relay signal, terminals NC, C, NO)

The output is galvanically separated from other circuits.

Therefore, the supply voltage can be connected to the output as desired.

- Analog output (terminal 12 and 13).

Power supply (terminals L1, L2, L3)

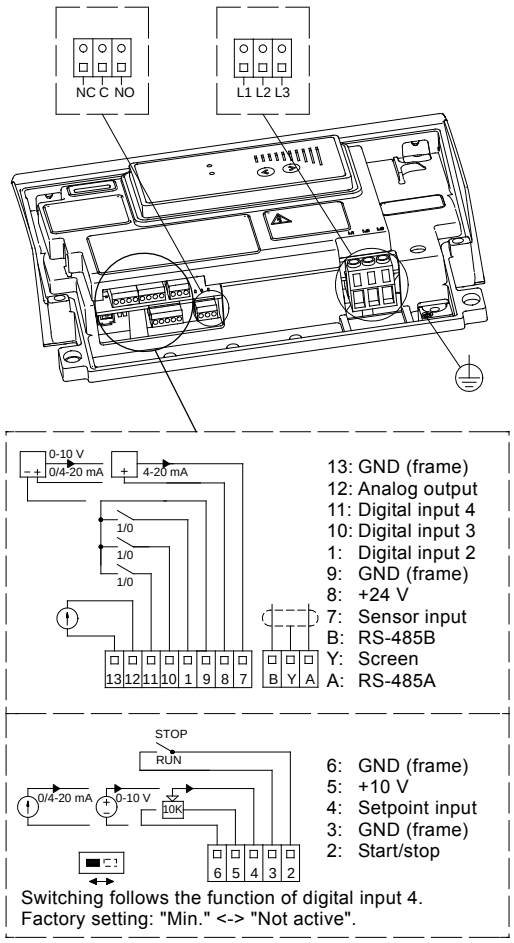


Fig. 5 Connection terminals, Advanced I/O module

MLE 15 Hp to 30 Hp asynchronous motors

Supply voltage:
15 Hp to 30 Hp (3 x 460-480 V)

Advanced I/O module

The advanced I/O module is the standard functional module in these MLE motors.

The module has a number of inputs and outputs enabling the motor to be used in advanced applications where many inputs and outputs are required.

The Advanced I/O module has these connections:

- start/stop terminals
- three digital inputs
- one setpoint input
- one sensor input (feedback sensor)
- one sensor 2 input
- one analog output
- two Pt100 inputs
- two signal relay outputs
- GENIbus connection.

Connection terminals

As a precaution, the wires to be connected to the following connection groups must be separated from each other by reinforced insulation in their entire lengths.

Inputs and outputs

- Start/stop (terminals 2 and 3)
- digital inputs (terminals 1 and 9, 10 and 9, 11 and 9)
- sensor input 2 (terminals 14 and 15)
- Pt100 sensor inputs (terminals 17, 18, 19 and 20)
- setpoint input (terminals 4, 5 and 6)
- sensor input (terminals 7 and 8)
- GENIbus (terminals B, Y and A).

All inputs are internally separated from the power-conducting parts by reinforced insulation and galvanically separated from other circuits.

All control terminals are supplied with protective extra-low voltage (PELV), thus ensuring protection against electric shock.

Output (relay signal, terminals NC, C, NO)

The output is galvanically separated from other circuits.

Therefore, the supply voltage can be connected to the output as desired.

- Analog output (terminal 12 and 13).

Power supply (terminals L1, L2, L3)

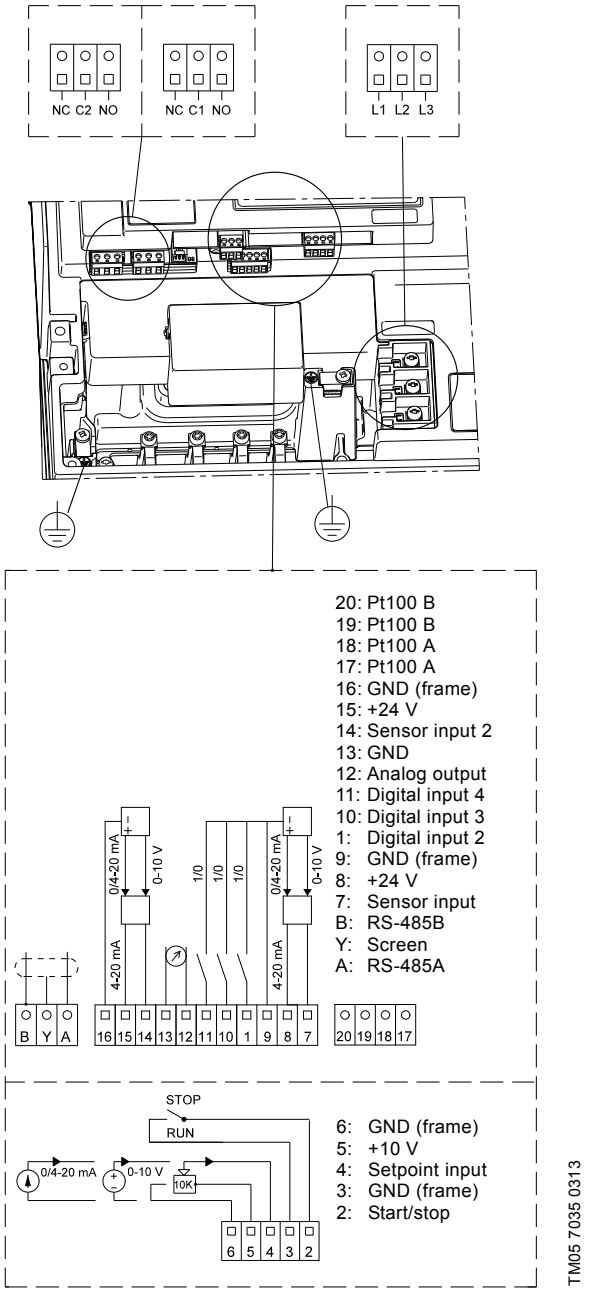


Fig. 6 Connection terminals, Advanced I/O module

MLE technical data

Grundfos MLE motors are equipped with NEMA standard C-face flanges.

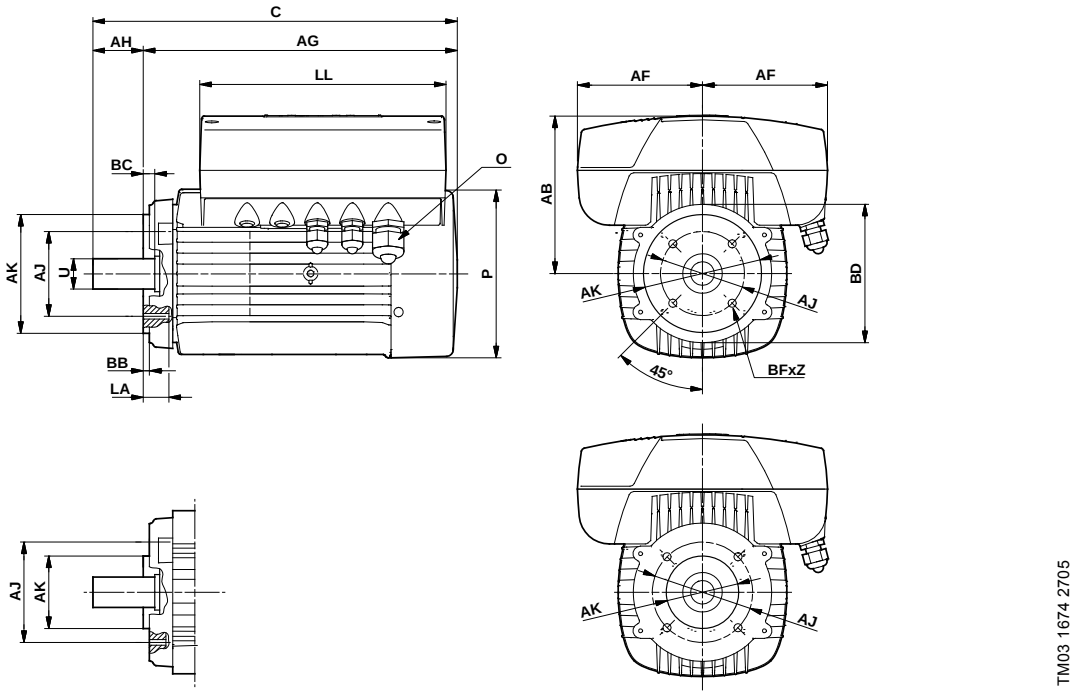
Grundfos MLE motors are recognized under the Component Recognition Program of Underwriters Laboratories Inc. for the United States and Canada.

MLE motors are equipped with a reinforced bearing system with locked bearings at the drive end, either a deep-groove ball bearing or an angular-contact bearing depending on the motor model.

This ensures an even uptake of the load in order to maximize the lifetime of the bearings, which are guaranteed for a minimum of 18,0000 hours service life. At the non-drive end, the motors are fitted with bearings with axial clearance in order to meet production tolerances while allowing for thermal expansion during motor operation. This ensures trouble-free operation and long life.

MLE permanent magnet motors 0.5 Hp - 2 Hp

(2 pole) 1/60/200-240



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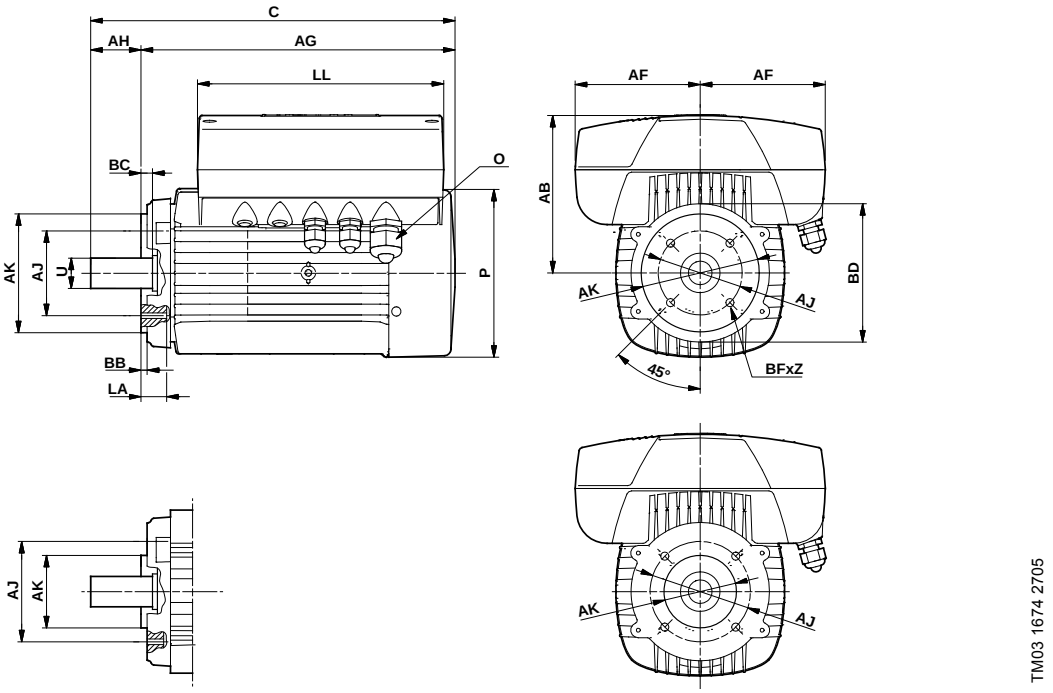
2-pole dimensional data

Power [Hp]	Short type designation	Stator housing [in. (mm)]							Shaft end [in. (mm)]	
		P	AB	AF	AF	C	AG	LL	U	AH
0.5	MLE071A2HA	4.80 (122)	6.22 (158)	4.17 (106)	4.17 (106)	10.55 (268)	8.46 (215)	7.56 (192)	0.63 (15.9)	2.05 (52)
0.75	MLE071A2HA									
1	MLE080A2HA	4.80 (122)	6.22 (158)	4.17 (106)	4.17 (106)	10.55 (268)	8.46 (215)	7.56 (192)	0.63 (15.9)	2.05 (52)
1.5	MLE080B2HA									
2	MLE090C2HA	4.80 (122)	6.22 (158)	4.17 (106)	4.17 (106)	11.34 (288)	9.25 (235)	7.56 (192)	0.63 (15.9)	2.05 (52)

Power [Hp]	Short type designation	Flange [in. (mm)]						Cable entries [mm]
		LA	AJ	AK	BD	BF	BB	O
0.5	MLE071A2HA	0.63 (16)	5.87 (149.2)	4.50 (114.3)	6.50 (165)	3/8"	0.16 (4)	4 x M20
0.75	MLE071A2HA							
1	MLE080A2HA	0.63 (16)	5.87 (149.2)	4.50 (114.3)	6.50 (165)	3/8"	0.16 (4)	4 x M20
1.5	MLE080B2HA							
2	MLE090C2HA	1.42 (36)	5.87 (149.2)	4.50 (114.3)	6.50 (165)	3/8"	0.16 (4)	4 x M20

MLE permanent magnet motors 1 Hp - 3 Hp

(2 pole) 3/60/440-480



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Dimensional data

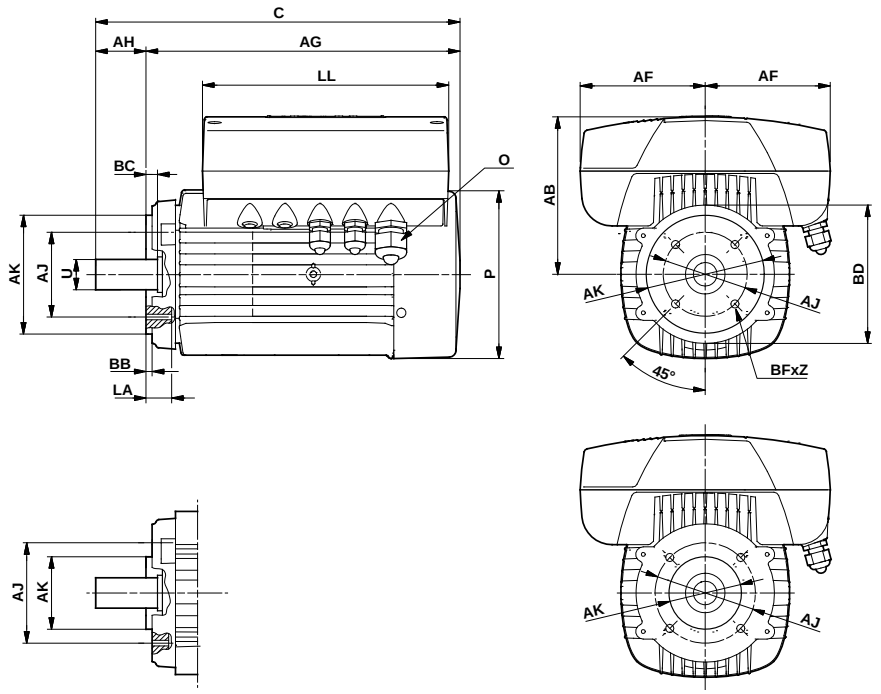
P2 [Hp]	Short type designation	Stator housing [in. (mm)]							Shaft end [in. (mm)]	
		P	AB	AF	AF	C	AG	LL	U	AH
1	MLE080A2IA	4.8 (122)	6.22 (158)	5.28 (134)	5.28 (134)	12.13 (308)	10.04 (255)	9.13 (232)	0.63 (15.9)	2.06 (52.3)
1.5	MLE080B2IA									
2	MLE090C2IA	4.80 (122)	6.22 (158)	5.28 (134)	5.28 (134)	12.91 (328)	10.83 (275)	9.13 (232)	0.63 (15.9)	2.06 (52.3)
3	MLE090D2IA									

P2 [Hp]	Short type designation	Flange [in. (mm)]							Cable entries [mm]
		LA	AJ	AK	BD	BF	BB	Z	O
1	MLE080A2IA	0.63 (16)	5.87 (149.2)	4.50 (114.3)	6.50 (165)	3/8"	-	0.16 (4)	4 x M20
1.5	MLE080B2IA								
2	MLE090C2IA	1.42 (36)	5.87 (149.2)	4.50 (114.3)	6.50 (165)	3/8"	-	0.16 (4)	4 x M20
3	MLE090D2IA								

MLE asynchronous motors 1.5 Hp - 10 Hp

1.5 Hp - 7.5 Hp (2 pole) 3/60/208-230

5 Hp - 10 Hp (2 pole) 3/60/460-480



TM03 1674 2705

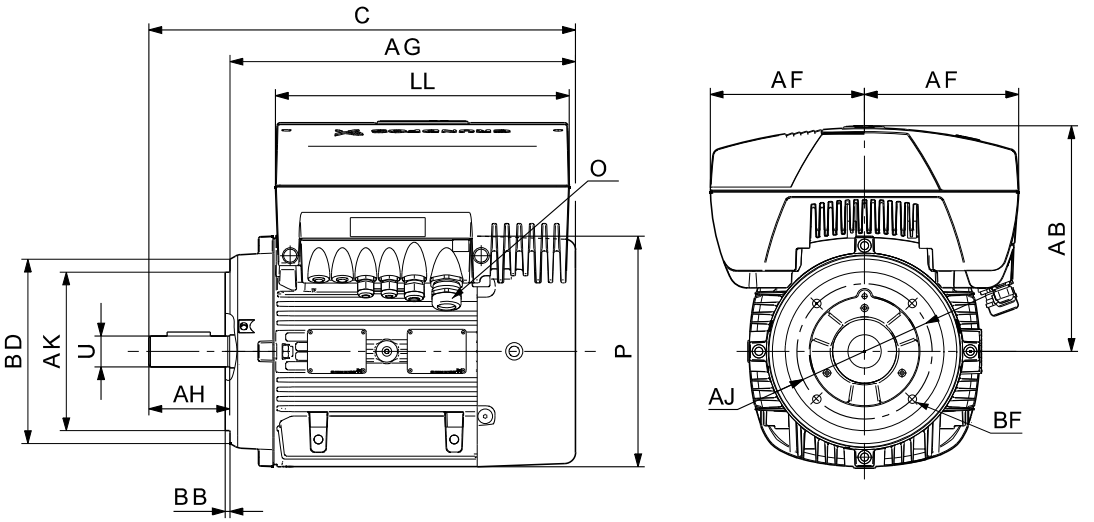
Dimensional data

P2 [Hp]	Short type designation	Stator housing [in. (mm)]							Shaft end [in. (mm)]	
		P	AB	AF	AF	C	AG	LL	U	AH
1.5	MLE90CC-2-56C-G3	7.00 (178)	6.57 (167)	5.20 (132)	5.20 (132)	15.00 (381)	12.95 (329)	10.24 (260)	0.62 (16)	2.06 (52)
2	MLE90CC-2-56C-G3									
3	MLE90FA-2-182TC-G3	7.00 (178)	6.57 (167)	5.20 (132)	5.20 (132)	16.05 (408)	13.31 (338)	10.24 (260)	1.12 (28)	2.62 (67)
5	MLE112CA-2-184TC-G3	8.66 (220)	7.40 (188)	5.71 (145)	5.71 (145)	18.25 (464)	15.51 (394)	11.81 (300)	1.12 (28)	2.62 (67)
7.5	MLE132DA-2-215TC-G3	8.66 (220)	7.40 (188)	5.71 (145)	5.71 (145)	18.75 (476)	15.51 (394)	11.81 (300)	1.37 (35)	3.12 (79)
10	MLE132FA2-215-TC-G3	10.24 (260)	8.39 (213)	5.71 (145)	5.71 (145)	18.07 (459)	14.92 (379)	11.81 (300)	1.37 (35)	3.12 (79)

P2 [Hp]	Short type designation	Flange [in. (mm)]							Cable entries [mm]
		LA	AJ	AK	BD	BF	BB	Z	O
1.5	MLE90CC-2-56C-G3	0.59 (15)	5.87 (149)	4.5 (114)	6.50 (165)	3/8 " - 16	0.16 (4)	0.16 (4)	2 x M16 + 1 x M25 + 2 x knock out M16
2	MLE90CC-2-56C-G3								
3	MLE90FA-2-182TC-G3	0.75 (19)	7.24 (184)	8.50 (216)	8.50 (216)	1/2" - 13	-	0.16 (4)	2 x M16 + 1 x M25 + 2 x knock out M16
5	MLE112CA-2-184TC-G3	0.63 (16)	7.24 (184)	8.50 (216)	8.50 (216)	1/2" - 13	-	0.16 (4)	2 x M16 + 1 x M25 + 2 x knock out M16
7.5	MLE132DA-2-215TC-G3	0.63 (16)	7.24 (184)	8.50 (216)	8.50 (216)	1/2" - 13	-	0.16 (4)	2 x M16 + 1 x M25 + 2 x knock out M16
10	MLE132FA2-215-TC-G3								

MLE asynchronous motors 15 Hp - 30 Hp

(2 pole) 3/60/460-480



Dimensional data

P2 [Hp]	Short type designation	Stator housing [in. (mm)]							Shaft end [in. (mm)]	
		P	AB	AF	AF	C	AG	LL	U	AH
15	MLE160 254TC	13.39 (340)	12.13 (308)	8.27 (210)	8.27 (210)	22.56 (573)	18.78 (477)	15.75 (400)	1.62 (41)	3.75 (95)
20	MLE160 256TC	13.39 (340)	12.13 (308)	8.27 (210)	8.27 (210)	22.56 (573)	18.78 (477)	15.75 (400)	1.62 (41)	3.75 (95)
25	MLE160 284TSC	13.39 (340)	12.13 (308)	8.27 (210)	8.27 (210)	24.53 (623)	22.72 (577)	15.75 (400)	1.62 (41)	3.75 (95)
30	MLE180 286TSC	13.39 (340)	12.13 (308)	8.27 (210)	8.27 (210)	24.53 (623)	22.72 (577)	15.75 (400)	1.62 (41)	3.75 (95)

P2 [Hp]	Short type designation	Flange [in. (mm)]					Cable entries [mm]
		AJ	AK	BD	BF	BB	O
15	MLE160 254TC	7.25 (184)	8.50 (216)	9.88 (251)	1/2"	0.26 (7)	1 x M40 + 1 x M20 + 2 x M16 + 2 x knock out M16
20	MLE160 256TC	7.25 (184)	8.50 (216)	9.88 (251)	1/2"	0.26 (7)	1 x M40 + 1 x M20 + 2 x M16 + 2 x knock out M16
25	MLE160 284TSC	9.00 (229)	10.50 (267)	10.75 (273)	1/2"	0.32 (8)	1 x M40 + 1 x M20 + 2 x M16 + 2 x knock out M16
30	MLE180 286TSC	9.00 (229)	10.50 (267)	10.75 (273)	1/2"	0.32 (8)	1 x M40 + 1 x M20 + 2 x M16 + 2 x knock out M16

Optional motors

The Grundfos standard range of motors covers a wide variety of application demands. However, for special applications or operating conditions, custom-built motor solutions can be provided.

For special applications or operating conditions, Grundfos offers custom-built motors such as:

- explosion proof motors
- motors with anti-condensation heating unit
- low-noise motors
- premium efficiency motors
- motors with thermal protection.

Motor protection

ML motors

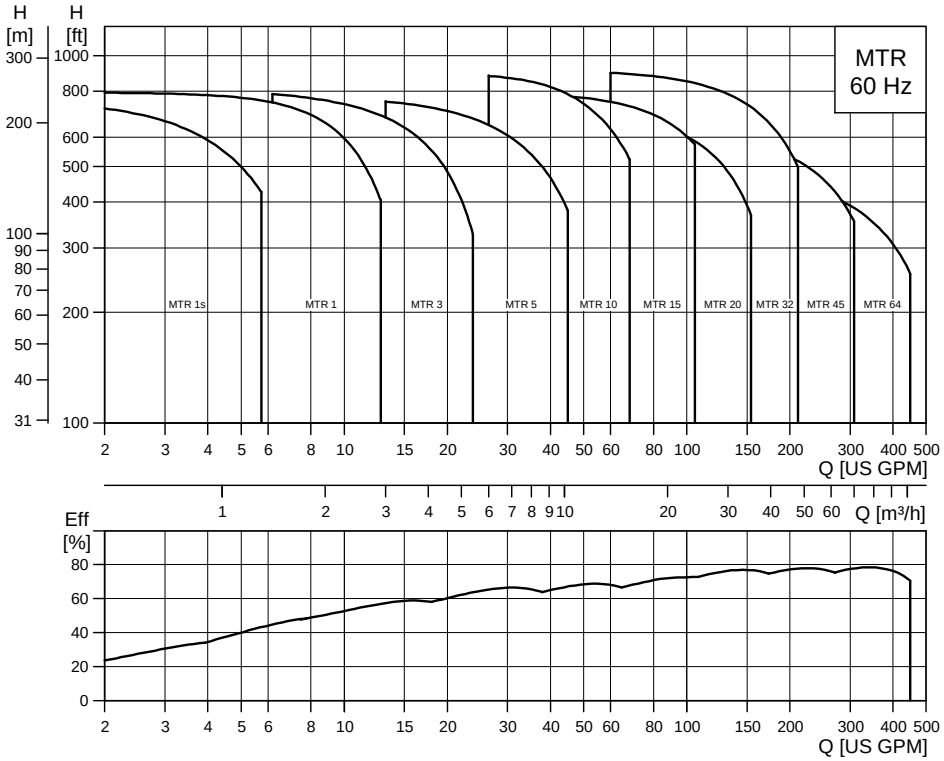
Three-phase motors **must** be connected to a motor starter in accordance with local regulations.

MLE motors

MTR(E) pumps require no external motor protection. The MLE motor incorporates thermal protection against slow overloading and blocking (IEC 11: TP 211). A circuit breaker is required to protect the power cord to the motor.

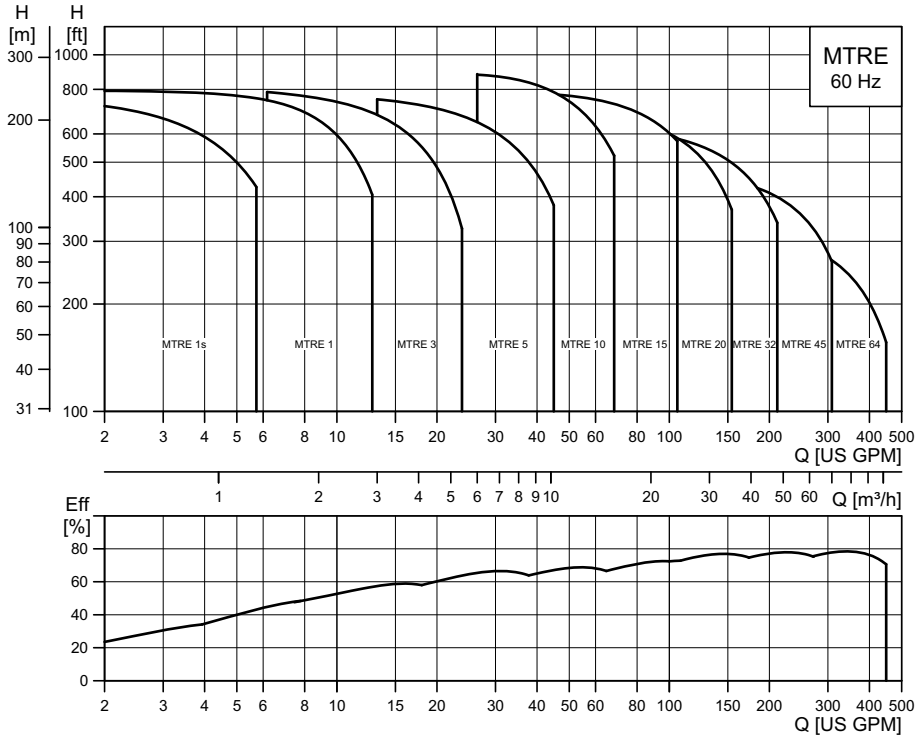
MTR(E) performance range

MTR, 60 Hz



TM03 4250 4110

MTRE, 60 Hz



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MTR(E) product range

Range	MTR, MTRE 1s	MTR, MTRE 1	MTR, MTRE 3	MTR, MTRE 5	MTR, MTRE 10	MTR, MTRE 15	MTR, MTRE 20	MTR 32	MTR 45	MTR 64
Nominal flow rate [US gpm]	4.4	8.5	15	30	55	95	110	140	220	340
Nominal flow rate [m^3/h]	1.0	1.9	3.6	6.8	12.5	21.6	25.2	31.8	50.0	77.2
Temperature range [°F (°C)]	+14 to +194 °F (-10 to +90 °C)									
Max. pump efficiency [%]	35	49	59	67	70	72	72	76	78	79
MTR pumps										
Flow range [US gpm]	0.5 - 7	0.9 - 12.8	1.5 - 23.8	3-45	5.5 - 68	9.5 - 125	11-155	14-210	22-310	34-450
Flow range [m^3/h]	0.1 - 1.6	0.2 - 2.9	0.4 - 5.4	0.7 - 10.2	1.3 - 15.4	2.2 - 28.4	2.5 - 35.2	3.2 - 47.7	5.0 - 70.4	7.8 - 102
Maximum head [H (ft)]	760	795	820	780	835	800	700	630	590	450
Maximum head [psi]	329	344	355	337	361	347	303	273	255	195
Motor power [Hp]	0.33 - 2	0.33 - 3	0.5 - 5	0.75 - 7.5	1-15	2-25	3-25	5-40	7.5 - 40	10-40
MTRE pumps										
Flow range [US gpm]	0-7	0 - 12.8	0 - 23.8	0-45	0-68	0-125	0-155	0-210	0-310	0-450
Flow range [m^3/h]	0 - 1.6	0 - 2.9	0 - 5.4	0 - 10.2	0 - 15.4	0 - 28.4	0 - 35.2	0 - 47.7	0 - 70.4	0-102
Maximum head [H (ft)]	760	795	820	780	835	800	700	630	590	450
Maximum head [psi]	329	344	355	337	361	347	303	273	255	195
Motor power [Hp]	0.5 - 2	0.5 - 3	0.5 - 5	0.75 - 7.5	1-15	2-25	3-25	5-40	7.5 - 40	10-40
Material variants										
MTR (AISI 304/cast iron)	●	●	●	●	●	●	●	●	●	●
MTRI (AISI 316/AISI 304)	●	●	●	●	●	●	●	-	-	-
Pipe connection										
Internal thread [NPT]	1.25"	1.25"	1.25"	1.25"	2"	2"	2"	-	-	-
Flange ANSI Class 125#	-	-	-	-	-	-	-	2.5"	3.0"	3.0"
Flange ANSI Class 250#	-	-	-	-	-	-	-	2.5"★	3.0"★	-
Installation length [in.]										
MTR	6.3 - 24	6.3 - 24	6.3 - 23.3	6.7 - 30	5.8 - 29.4	7 - 33.6	7 - 33.6	8.8 - 41.9	9.6 - 41.1	9.8 - 42.3
MTRE	7.7 - 24	7.7 - 24	7 - 23.3	7.7 - 30	5.8 - 29.4	7 - 33.6	7 - 33.6	8.8 - 41.9	9.6 - 41.1	9.8 - 42.3
Shaft seal										
HUUV	●	●	●	●	●	●	●	●	●	●
HUUE★★	●	●	●	●	●	●	●	●	●	●
HUUK★★	●	●	●	●	●	●	●	●	●	●
HQQE★★	●	●	●	●	●	●	●	●	●	●
HQQV★★	●	●	●	●	●	●	●	●	●	●

★ Standard for > 5 impellers for MTR 32, > 3 impellers for MTR 45
★★ On request

MTR(E) identification

Type key

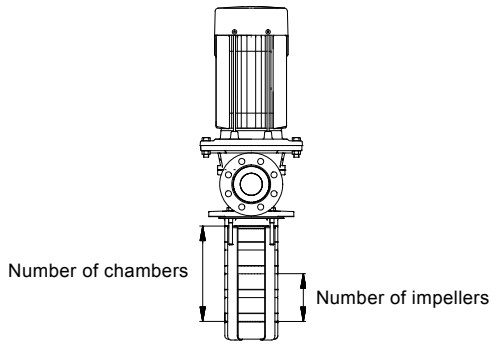
MTR(E)

Example	MTR	E	32	(s)	-2	/1	-1	-A	-G	-A	-HUUV
Pump type											
Pump with integrated frequency control											
Rated flow rate [m^3/h]											
All impellers with reduced diameter (applies only to MTR 1s)											
Number of chambers											
Number of impellers											
Number of impellers with reduced diameter											
Code for pump version	A: Basic										
Code for pipe connection	A: Basic WB: NPT G: ANSI flange										
Code for materials											
Code for shaft seal											

Mechanical shaft seal

Example	H	U	U	V
A: O-ring seal with fixed driver				
H: Balanced cartridge seal				
Q: Silicone carbide				
U: Cemented tungsten carbide				
E: EPDM				
V: FKM				

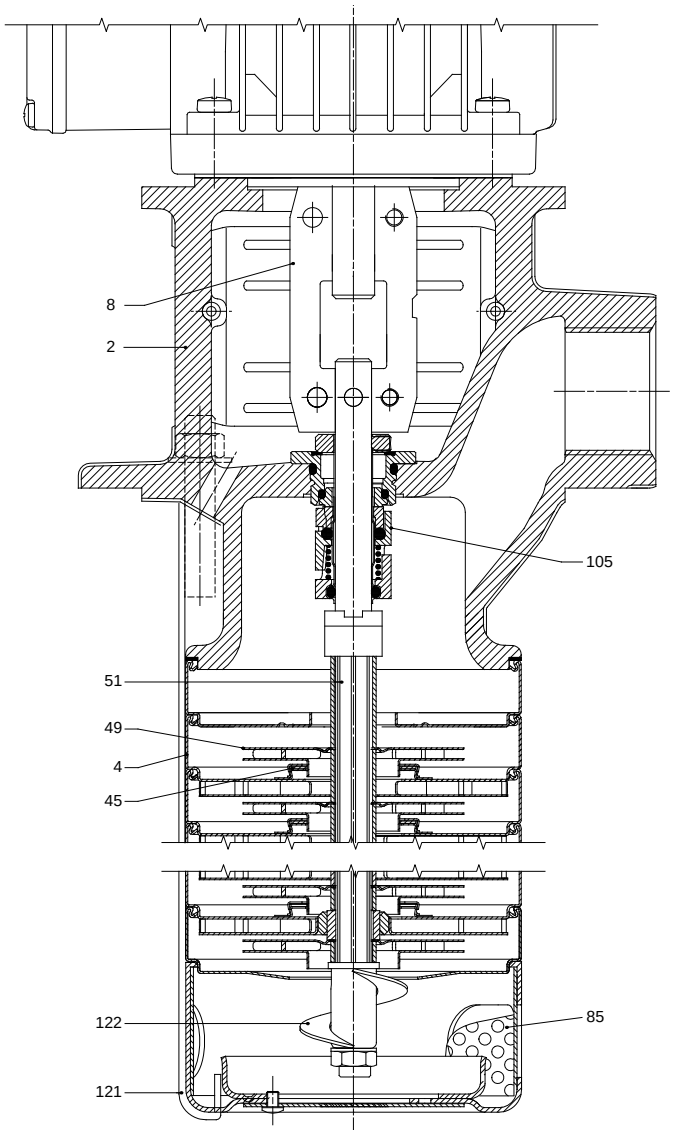
MTR(E)



TM01 4991 1299

MTR(E) construction

Sectional drawing of MTR(E) 1s, 1, 3 and 5



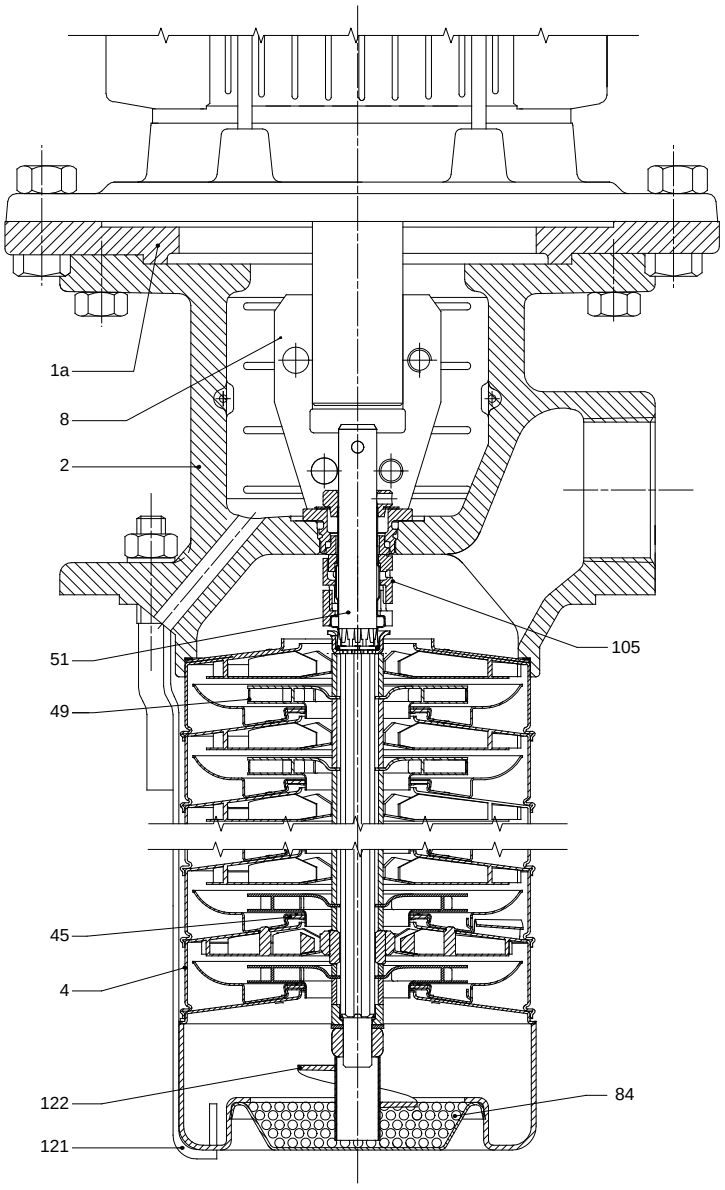
Material specification - MTR(E), MTRI(E)

Pos.	Description	Materials	EN/DIN	AISI/ASTM
1a	Motor stool	Cast iron EN-GJL-200	0.6020	ASTM 25B
2	Pump head	Cast iron EN-GJS-500-7	0.7050	ASTM 80-55-06
		Stainless steel (MTRI)	1.4408	CF 8M*
4	Chamber complete	Stainless steel	1.4301	AISI 304
8	Coupling	Sinter metal		
		Cast iron	0.7040	ASTM 60-40-18
121	Retainer for suction strainer	Stainless steel	1.4301	AISI 304
45	Neck ring	PTFE		

Pos.	Description	Materials	EN/DIN	AISI/ASTM
47	Bearing ring	SIC		
49	Impeller	Stainless steel	1.4301	AISI 304
51	Pump shaft, MTR 1s, 1, 3, 5	Stainless steel	1.4401	AISI 316
	Pump shaft, MTR 10, 15, 20 MTR 32, 45, 64	Stainless steel	1.4057	AISI 431
84	Suction strainer, ∅0.16" holes	Stainless steel	1.4301	AISI 304
85	Strainer	Stainless steel	1.4301	AISI 304
105	Shaft seal	HUUV/HUUE		
122	Priming screw	Stainless steel	1.4301	AISI 304

* CF 8M is cast equivalent of AISI 316 stainless steel

Sectional drawing of MTR(E) 10, 15 and 20



TM02 8688 0704

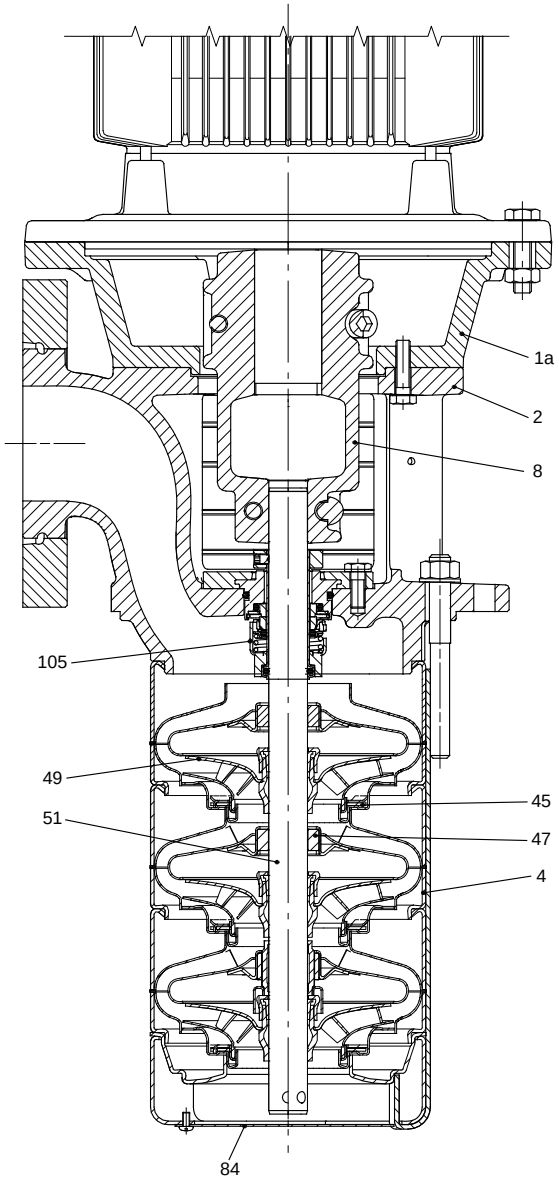
Material specification - MTR(E), MTRI(E)

Pos.	Description	Materials	EN/DIN	AISI/ASTM
1a	Motor stool	Cast iron EN-GJL-200	0.6020	ASTM 25B
2	Pump head	Cast iron EN-GJS-500-7	0.7050	ASTM 80-55-06
		Stainless steel (MTRI)	1.4408	CF 8M*
4	Chamber complete	Stainless steel	1.4301	AISI 304
8	Coupling	Sinter metal		
		Cast iron	0.7040	ASTM 60-40-18
121	Retainer for suction strainer	Stainless steel	1.4301	AISI 304
45	Neck ring	PTFE		

Pos.	Description	Materials	EN/DIN	AISI/ASTM
47	Bearing ring	SIC		
49	Impeller	Stainless steel	1.4301	AISI 304
51	Pump shaft, MTR 1s, 1, 3, 5	Stainless steel	1.4401	AISI 316
	Pump shaft, MTR 10, 15, 20 MTR 32, 45, 64	Stainless steel	1.4057	AISI 431
84	Suction strainer, ∅0.16" holes	Stainless steel	1.4301	AISI 304
85	Strainer	Stainless steel	1.4301	AISI 304
105	Shaft seal	HUUV/HUUE		
122	Priming screw	Stainless steel	1.4301	AISI 304

* CF 8M is cast equivalent of AISI 316 stainless steel

Sectional drawing of MTR(E) 32, 45 and 64



TM02 8689 0704

Material specification - MTR(E), MTRI(E)

Pos.	Description	Materials	EN/DIN	AISI/ASTM
1a	Motor stool	Cast iron EN-GJL-200	0.6020	ASTM 25B
2	Pump head	Cast iron EN-GJS-500-7	0.7050	ASTM 80-55-06
		Stainless steel (MTRI)	1.4408	CF 8M*
4	Chamber complete	Stainless steel	1.4301	AISI 304
8	Coupling	Sinter metal		
		Cast iron	0.7040	ASTM 60-40-18
121	Retainer for suction strainer	Stainless steel	1.4301	AISI 304
45	Neck ring	PTFE		

Pos.	Description	Materials	EN/DIN	AISI/ASTM
47	Bearing ring	SIC		
49	Impeller	Stainless steel	1.4301	AISI 304
51	Pump shaft, MTR 1s, 1, 3, 5	Stainless steel	1.4401	AISI 316
	Pump shaft, MTR 10, 15, 20 MTR 32, 45, 64	Stainless steel	1.4057	AISI 431
84	Suction strainer, ∅0.16" holes	Stainless steel	1.4301	AISI 304
85	Strainer	Stainless steel	1.4301	AISI 304
105	Shaft seal	HUUV/HUUE		
122	Priming screw	Stainless steel	1.4301	AISI 304

* CF 8M is cast equivalent of AISI 316 stainless steel

MTR(E) operating conditions

Ambient temperature

MLE motor power [Hp]	Motor make	Voltage [V]	Max. ambient temp. [°F (°C)]	Max. altitude above sea level [ft (m)]
0.5 to 2	MLE	1 x 200-240	122 (50)	3280 (1000)
1 to 3	MLE	3 x 440-480	122 (50)	
1.5 to 7.5	MLE	3 x 208-230	104 (40)	
5 to 30	MLE	3 x 460-480	104 (40)	

If the ambient temperature exceeds the above maximum ambient temperatures or the pump is installed at an altitude exceeding 3280 ft (1000 m), the motor must not be fully loaded due to the risk of overheating. Overheating may result from excessive ambient temperatures or high altitudes.

In such cases, it may be necessary to use a motor with a higher rated output.

Installation altitude

Installation altitude is the height above sea level of the installation site. Motors installed up to 3280 ft (1000 m) above sea level can be loaded 100 %.

Motors installed more than 3280 ft (1000 m) above sea level must not be fully loaded due to the low density and consequently low cooling effect of the air.

MLE permanent magnet motors
0.5 Hp to 2 Hp (1 x 200-240 V)
1 Hp to 3 Hp (3 x 440-480 V)

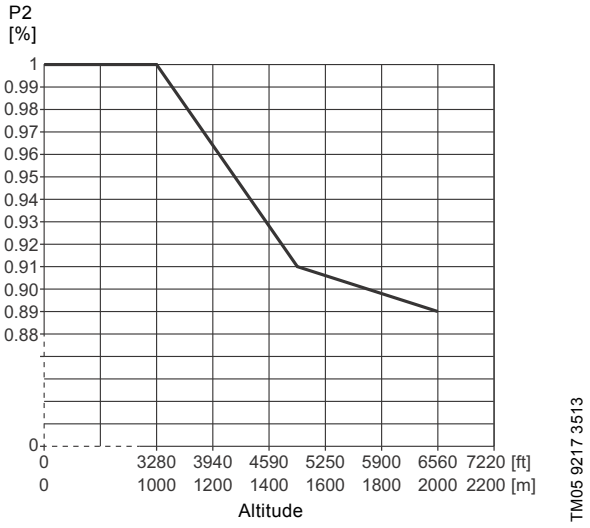


Fig. 7 Derating of motor output (P2) in relation to altitude above sea level

MLE asynchronous motors
1.5 Hp to 7.5 Hp (3 x 208-230 V)
5 Hp to 30 Hp (3 x 460-480 V)

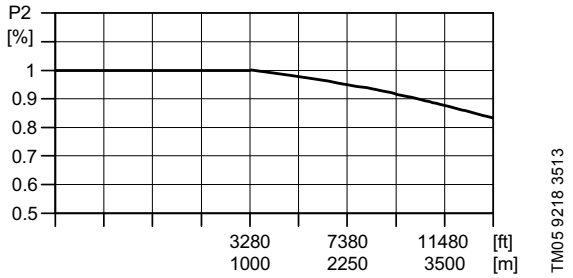


Fig. 8 Derating of motor output (P2) in relation to altitude above sea level

Pressures

Maximum operating pressure

Immersible pump model	Maximum permissible operating pressure	
	NPT threads [psi (bar)]	ANSI flange [psi (bar)]
MTR(I) 1s --> MTR(I) 5	362 (25)	--
MTR(I) 10 --> MTR(I) 20	362 (25)	--
MTR(I) 32-2/1-1 --> MTR(I) 32-5	--	232 (16)
MTR(I) 32-6 --> MTR(I) 32-8	--	362 (25)
MTR(I) 32-9 --> MTR(I) 32-11-2	--	435 (30)
MTR(I) 45-2/1 --> MTR(I) 45-3	--	232 (16)
MTR(I) 45-4 --> MTR(I) 45-5	--	362 (25)
MTR(I) 64-2/1-1 --> MTR(I) 64-4-2	--	232 (16)

Viscosity

MTR(E) 1s, 1, 3, 5 can pump up to 50 cst.

MTR(E) 10, 15, 20, 32, 45, 64 can pump up to 100 cst.

The pumping of liquids with densities or kinematic viscosities higher than those of water will cause a considerable pressure drop, a drop in the hydraulic performance and a rise in the power consumption.

In such situations the pump should be equipped with a larger motor. If in doubt, contact Grundfos.

The following examples show the drop in the hydraulic performance of MTR(E) pumps pumping oil with a density of 54.4 lb/ft^3 but with three different kinematic viscosities.

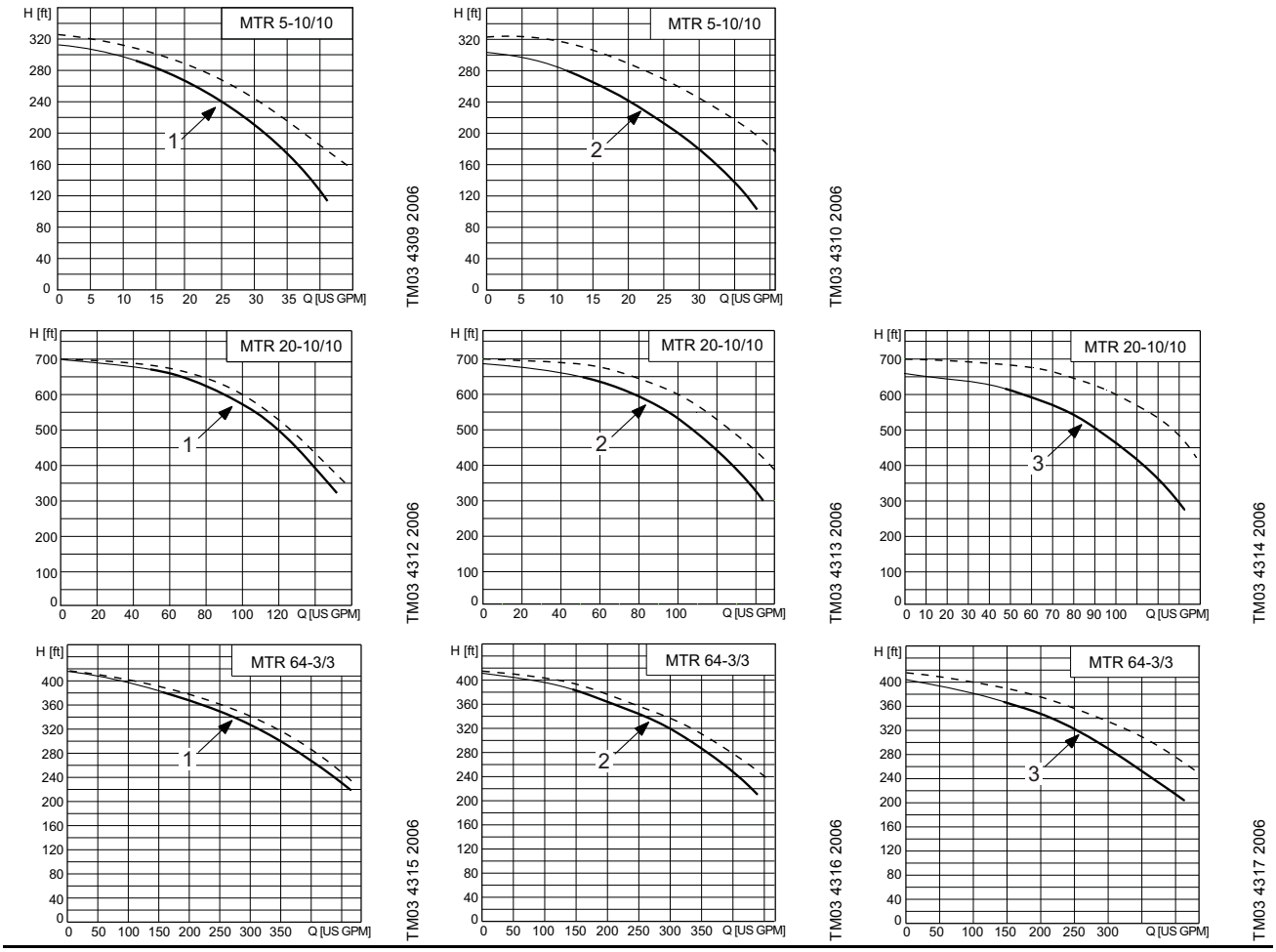


Fig. 9 Drop in the hydraulic performance of MTR(E) pumps pumping oil with three different kinematic viscosities.

Key

Position	Description	
1	Kinematic viscosity: Density:	16 Cst. 54.4 lb/ft^3
2	Kinematic viscosity: Density:	32 Cst. 54.4 lb/ft^3
3	Kinematic viscosity: Density:	75 Cst. 54.4 lb/ft^3

Immersible pump model	Maximum kinematic viscosity
MTR(E) 1s through MTR 10 MTR(E) 15 through MTR 64	50 Cst. 100 Cst.
MTC	50 Cst.
MTA / MTAD	50 Cst.

For further information about pump performance when pumping liquids with densities or kinematic viscosities higher than those of water, see section *Further product documentation* on page 124.

Viscosity of different oils

The curves below show the viscosity of different oils in relation to oil temperature.

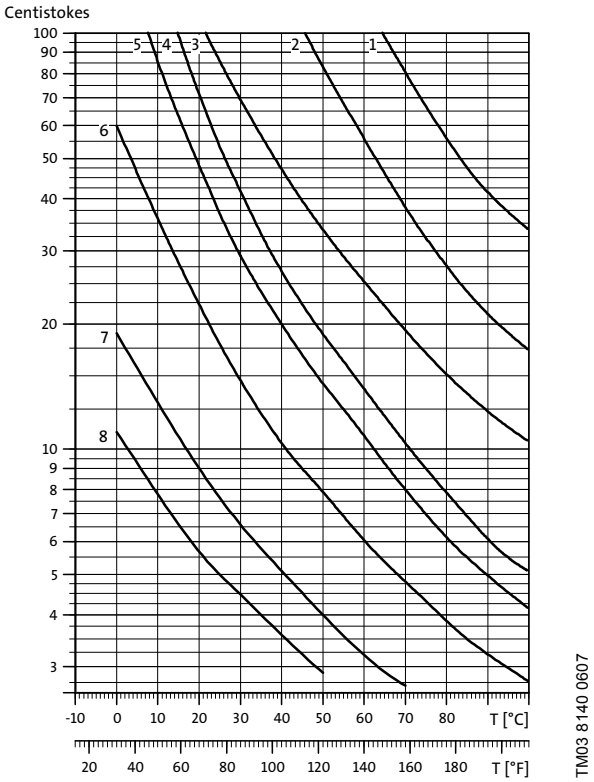


Fig. 10 Viscosity of different oils in relation to oil temperature

Key to viscosities of different oils

Curve number	Type of oil
1	Gear oil
2	Motor oil (20W-50)
3	Hydraulic oil (ISO VG46)
4	Cutting oil
5	Thermal oil
6	Hydraulic oil (ISO VG10)
7	Grinding oil
8	Honing oil

Pressure loss

During operation pressure losses occur in all centrifugal pumps.

The below curves illustrate the pressure losses for pumped liquid passing through one empty chamber. An empty chamber is a chamber without an impeller.

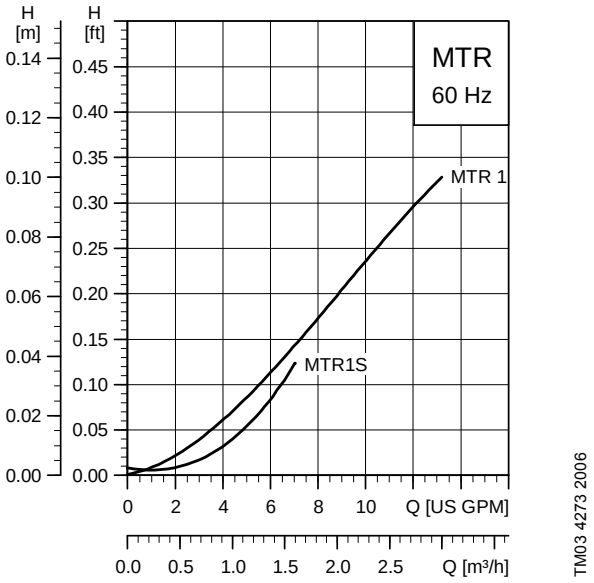


Fig. 11 Pressure losses of pumped liquid passing through an empty chamber for MTR 1s and MTR 1 pumps

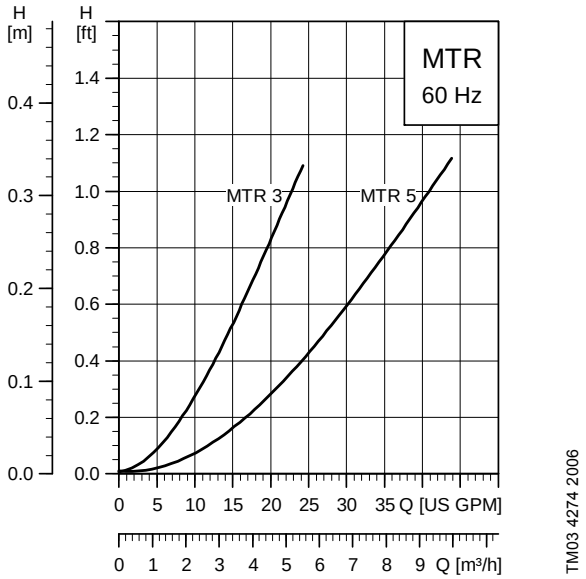


Fig. 12 Pressure losses of pumped liquid passing through an empty chamber for MTR 3 and MTR 5 pumps

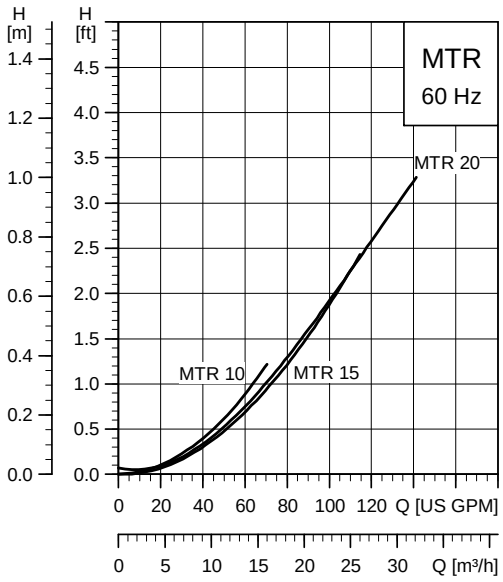


Fig. 13 Pressure losses of pumped liquid passing through an empty chamber for MTR 10, MTR 15 and MTR 20 pumps

As MTR(E) 32, 45 and 64 pumps have holes in the guide vanes, no pressure losses occur in the empty chambers of these pumps.

Calculation of the reduced head of a pump with empty chambers

Calculation of pressure loss in empty chambers

From the pressure loss curves and the pump performance curves, it is possible to calculate the reduced head of a pump with empty chambers.

The calculation can be made as shown below.

Example:

Pump type	MTR 5-18/7
Flow Q (duty point)	25 gpm
Head (duty point)	180 ft

The selected pump is an MTR 5-18/7 with 11 empty chambers. From the above pressure loss curve of MTR 5, it appears that the pressure loss of each empty chamber at 25 gpm is 0.46 ft. This results in a total pressure loss of:

Total pressure loss = 0.46 x 11 = 5 ft

The reduced head of the MTR 5-18/7 pump including pressure losses caused by empty chambers is:

Head = 185 - 5 = 180 ft

The head 185 ft is read from the performance curve for an MTR 5-7.

Control options for MTRE pumps

It is possible to communicate with MTRE pumps via the following:

- control panel on the pump
- Grundfos GO Remote
- central management system.

The purpose of controlling an E-pump is to monitor and control the pressure, temperature, flow and liquid level of the system.

Control panel on pump

The control panel on the E-pump terminal box makes it possible to change the setpoint settings manually.

MLE permanent magnet motors

0.5 Hp to 2 Hp (1 x 200-240 V)
1 Hp to 3 Hp (3 x 440-480 V)

The operating condition of the pump is indicated by the Grundfos Eye on the control panel. See fig. 14, pos. A.

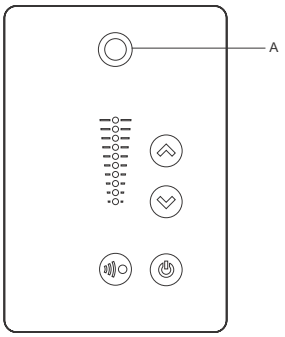


Fig. 14 Control panel on MTRE pump

MLE asynchronous motors

1.5 Hp to 7.5 Hp (3 x 208-230 V)
5 Hp to 30 Hp (3 x 460-480 V)

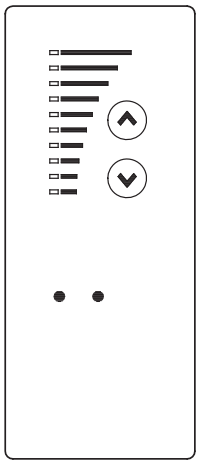


Fig. 15 Control panel on MTRE pump

Grundfos GO Remote

The pump is designed for wireless radio or infrared communication with the Grundfos GO Remote.

The Grundfos GO Remote enables setting of functions and gives access to status overviews, technical product information and actual operating parameters.

The Grundfos GO Remote offers three different mobile interfaces (MI). See fig. 16.

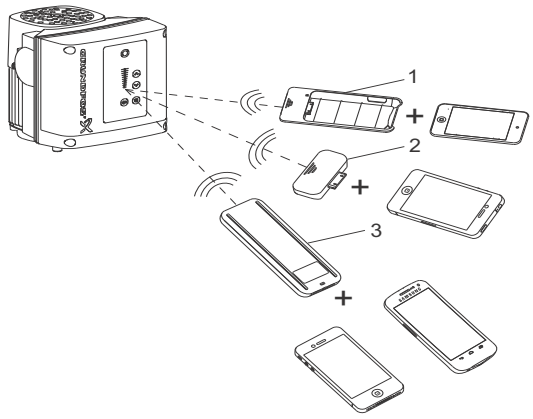


Fig. 16 Grundfos GO Remote communicating with the pump via radio or infrared light

Pos.	Description
1	Grundfos MI 201: Consists of an Apple iPod touch 4G and a Grundfos cover.
2	Grundfos MI 202: Add-on module which can be used in conjunction with Apple iPod touch 4, iPhone 4G or later.
3	Grundfos MI 301: Separate module enabling radio or infrared communication. The module can be used in conjunction with an Android or iOS-based Smartphone with Bluetooth connection.

Central management system

Communication with the E-pump is possible even if the operator is not present near the E-pump. Communication is enabled by connecting the E-pump to a central management system. This allows the operator to monitor the pump and to change control modes and setpoint settings.

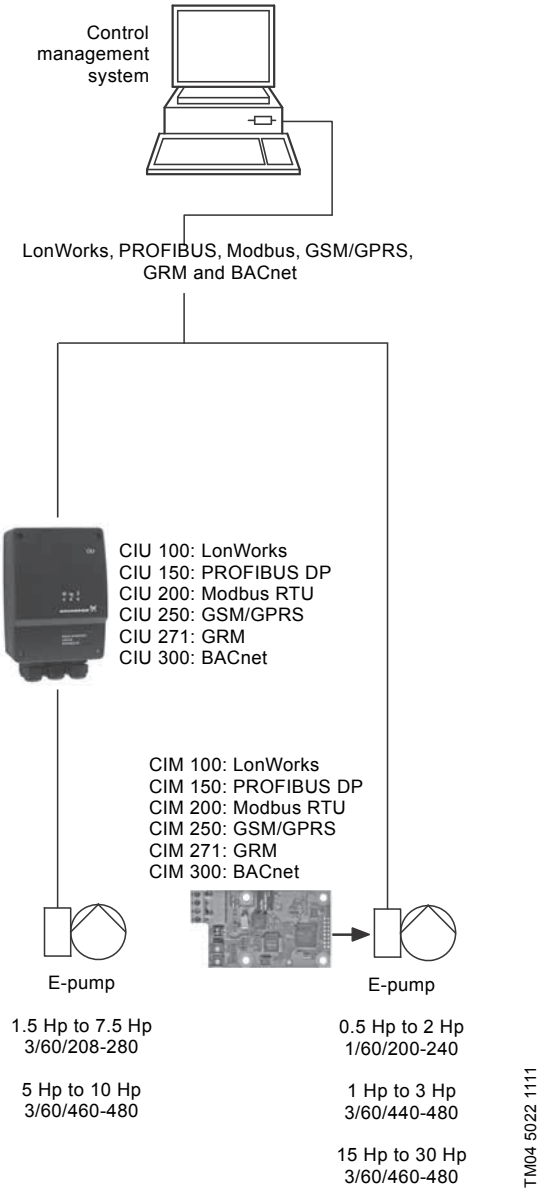


Fig. 17 Structure of a central management system

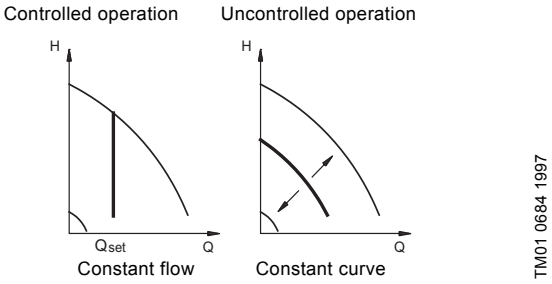


Fig. 18 Controlled and uncontrolled operating modes

The pumps are set to uncontrolled operation from factory.

Besides normal duty (constant flow and constant curve) the operating modes **Stop, Min.** or **Max.** are available.

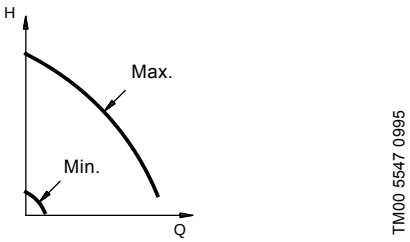


Fig. 19 Max. and min. curves

Advanced use of MLE motors

Grundfos MLE motors have many features for the advanced user.

Grundfos three-phase MLE motors have features such as bearing monitoring, standstill heating, stop function, signal relays, analog sensors and limit exceeded. These features give a unique opportunity to customize the E-pumps.

The PC Tool E-products gives access to most of the settings available in the products, as well as the possibility of logging and viewing data.

All of these features are described below.

Bearing monitoring

Bearing monitoring is a built-in function indicating the time to relubricate or replace the bearings of the MLE motor. The relubrication feature is only available for three-phase pumps of 15 Hp - 30 Hp.

Purpose and benefits

The purpose of this function is to give an indication to the user when it is time to relubricate or replace the motor bearings. This is important information for maintenance planning.

Bearing monitoring provides these benefits:

- The bearing can be relubricated at the right time according to the manufacturer's recommendations.
- Maximum life of the motor bearings is obtained.
- Maintenance intervals are determined by the pump itself.
- No worn-down or damaged bearings, and consequently no costly down-time, due to overseen maintenance.

Description

When the bearing monitoring function determines that it is time to relubricate the bearings, the user will receive a warning via the R100, Grundfos GO, PC Tool E-products, bus or relay.

When the bearings have been relubricated, a certain number of times, the warning function will inform the user to replace the bearings.

The number of relubrications before bearing replacement is set up by Grundfos.

Technical description

The bearing monitoring function is available on two levels for calculating the relubrication interval, basic and advanced:

Bearing monitoring function
Basic level
Calculation of relubrication intervals based on motor revolutions. The basic level is a standard feature of the 15-30 Hp basic controller and no special functional module is required.
Advanced level (only 15 Hp - 30 Hp)
Calculation of relubrication intervals based on motor revolutions and bearing temperature. **Note:** The advanced-level function requires the following: • The extended functional module is fitted in the MLE motor as standard. • Temperature sensors are fitted at the drive end and at the non-drive end of the motor.

Standstill heating

Standstill heating is a feature ensuring that even during standstill periods the motor windings have a certain minimum temperature.

Purpose and benefits

The purpose of this function is to make the MLE motor more suitable for outdoor installation. During standstill periods, there is a need to keep the motor temperature higher than the ambient temperature to avoid condensation in and on the motor.

Traditionally this issue has been solved by using an anti-condensation heater on the stator coil heads. Now Grundfos provides this feature by means of a special function within the MLE motor and terminal box.

The MLE motor has standstill heating included. An external heater on the stator coil is not necessary.

Applications

This function is especially suitable in outdoor applications and at installation sites with fluctuating temperatures.

Description

The working principle is that AC voltage is applied to the motor windings. The applied AC voltage will ensure that sufficient heat is generated to avoid condensation in the motor. The terminal box is kept warm and dry by the heat generated via the power supply. However, it is a condition that the terminal box is not exposed to open air. It must be provided with a suitable cover to protect it from rain.

Dry-running protection

This function protects the pump against dry running. When lack of inlet pressure or water shortage is detected, the pump will be stopped before being damaged.

Lack of inlet pressure or water shortage can be detected with a switch connected to a digital input configured to dry-running protection.

The use of a digital input requires an accessory:

- a float switch installed on the suction side of the pump.

The pump cannot restart as long as the digital input is activated.

Temperature sensors 1 and 2

One or two Pt100 temperatures sensors may be connected to the input terminals 17, 18, 19, and 20.

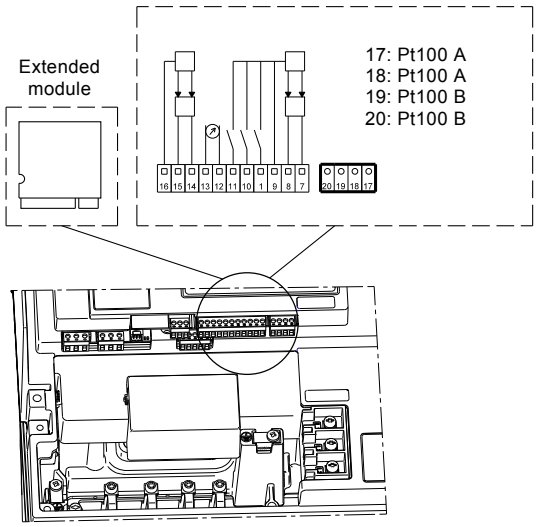


Fig. 20 Temperature sensor connections in the extended functional module

Purpose and benefits

The temperature sensor inputs 1 and 2 provide these benefits:

- The temperature sensor inputs can be used as input to the "limit exceeded" functions 1 and 2.
- In combination with the bearing monitoring function, the temperature sensors provide optimum monitoring of the motor bearings.
- A bearing warning or a bearing alarm can be indicated as the motor bearing temperature is measured.
- Status readings of the measured temperatures are available via the R100, Grundfos GO, PC Tool E-products and bus.
- The function has a built-in signal fault detection if the temperature sensors fail or a conductor is broken.

Applications

The temperature inputs can be used in all applications where temperatures in the system or in the motor need to be monitored.

Note: The temperature sensor inputs are available on all MLE motors.

Description

The temperature sensor inputs enable several functions.

- The temperature sensor inputs 1 and 2 can be used as input to the "limit exceeded" functions 1 and 2. If a limit is exceeded, this will be indicated. The indication will be in the form of outputs (relay) or alarms/warnings set up/defined in the "limit exceeded" functions 1 and 2.
- The temperature sensor inputs 1 and 2 can be set up to measure bearing temperature. The measured values of temperature sensor 1 and 2 are used in the calculation of relubrication intervals. Additionally, the measured value can activate the indication of a bearing warning or a bearing alarm. In case of high bearing temperature, a warning or an alarm can be logged and force the pump to stop.

Signal relays

Signal relays are used to give an output indication of the current operational status of the MLE. The signal relay is a potential free contact (also called a dry contact). The output signals are typically transmitted to external control systems.

Purpose and benefits

The signal relays offer these features:

- The signal relays can be remotely (via bus) or internally controlled.
- The signal relays can be set up to indicate several types of operational status.
- A relay delay can be defined to avoid activating the relay in case of periodic failures.

Applications

Signal relays can be used in all applications involving a need to read out the operational status to e.g. a control room or to a superior control system.

Description

The signal relays can be set up with these three parameters:

- relay control
- relay setup
- relay delay.

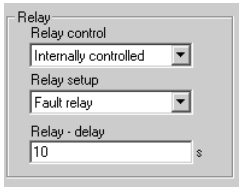


Fig. 21 Signal relay parameters for 0.5 Hp - 10 Hp pumps

Fig. 22 Signal relay parameters for 15 Hp - 30 Hp pumps

Relay control

The relay time is 0 seconds and the signal relay is internally controlled.

The advanced relay control can only be set via the PC Tool E-products.

Relay control has these two setting options:

- **Internally controlled**
  The relay is internally controlled by the variable frequency drive software according to the setup of the relay [Ready, Fault, Operation].
- **Remotely controlled**
  The relay is controlled via commands from the GENIbus.

Analog sensor inputs 1 and 2

The analog sensor inputs 1 and 2 are standardized inputs for measuring all types of analog parameters.

Sensor input 1 is the only sensor input set up for closed-loop operation. The input will be used as the sensor feedback input.

Sensor input 2 is referred to as the secondary sensor.

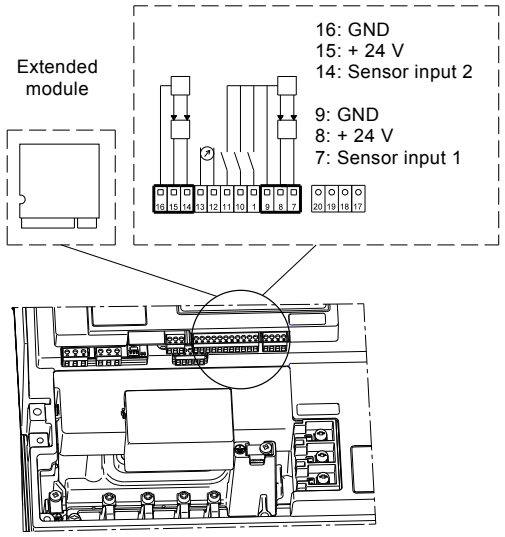


Fig. 23 Sensor inputs 1 and 2 connections

Purpose and benefits

The analog sensor inputs 1 and 2 provide these benefits:

- Sensor input 1 can be feedback input for the built-in PI controller.
- It is possible to monitor secondary parameters in the process, e.g. flow or liquid temperature.
- The secondary sensor can be set up as a redundant sensor.
- The sensors can give input to the "limit exceeded" functions 1 and 2.
- Status readings of the inputs are available via the R100, Grundfos GO and PC Tool E-products.

Applications

Analog sensor inputs 1 and 2 can be used in applications with a need for monitoring essential parameters.

Description

The analog sensors 1 and 2 enable several functions.

- When the secondary sensor is set up as an input to the "limit exceeded" functions 1 and 2, defined outputs or warnings or alarms can be given when system parameters are outside defined system limits.
- Connecting a flow sensor.
  When sensor input 2 is set up with a flow sensor, the measured value can be used as input to the proportional-pressure function. The flow displayed in the R100 or Grundfos GO will be the measured flow instead of the estimated flow.
  The flow measurement can also be used in the low-flow stop function to detect low flow instead of estimating the flow by lowering the speed of the pump.
- Sensor reading via the R100 or Grundfos GO and PC Tool E-products.
  When sensors are set up. the user can get a status reading via the R100, Grundfos GO and PC Tool E-products.

Analog output

Analog output

The analog output (0-10 mA) can be set via the PC Tool to one of these indications:

- feedback value
- speed
- frequency
- motor current
- external setpoint input
- limit exceeded.

The analog output is default set to not active.

Feedback value

The output signal is a function of the actual feedback sensor.

Speed

The output signal is a function of the actual pump speed.

Frequency

The output signal is a function of the actual frequency.

Motor current

The output signal is a function of the actual motor current.

External setpoint input

The output signal is a function of the external setpoint input.

Limit exceeded

The output signal indicates whether the limit is exceeded:

- Minimum output = limit is not exceeded.
- Maximum output = limit is exceeded.

Limit exceeded 1 and 2

Limit exceeded is a monitoring function monitoring one or two values/inputs. The function enables different **inputs** to activate various **outputs** and **alarms/ warnings** when the signal input has exceeded pre-determined limits.

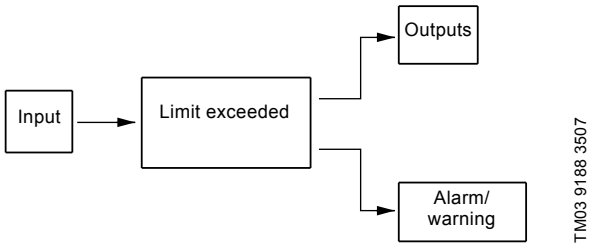


Fig. 24 Example of a "limit exceeded" sequence

Purpose and benefits

The purpose of this function is to monitor parameters which are central for the application. This will enable the controller to react to possible, abnormal operating conditions. This makes the E-pump a more important and integrated part of a system, and it can thus replace other existing monitoring units.

The liquid temperature can be monitored, and thus the E-pump can ensure that the system temperature does not exceed a maximum permissible level.

The minimum inlet pressure can be monitored, and thus the E-pump can prevent damage caused by a cavitation or dry run.

Applications

The limit exceeded function is typically used for monitoring secondary parameters in the systems.

Description

The figures below show two examples of setpoint monitoring by means of the limit exceeded function.

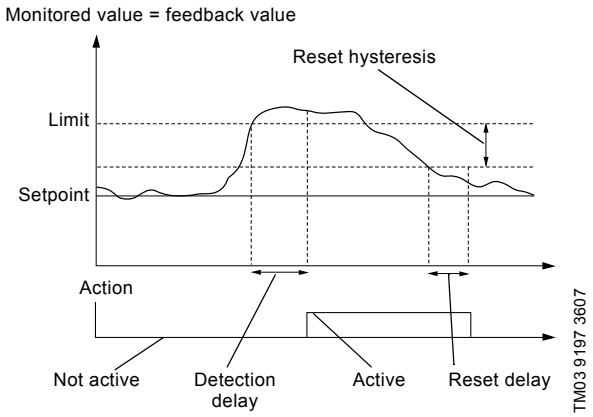


Fig. 25 Limit exceeded sequence with the limit type "max. limit", for example monitoring of bearing temperature

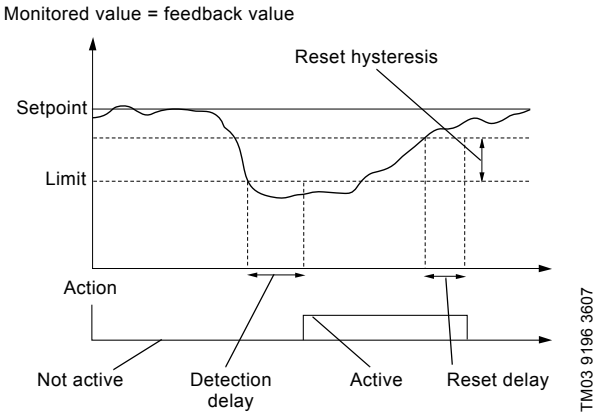


Fig. 26 Limit exceeded sequence with the limit type "min. limit"

When the limit is exceeded, the signal input crosses the limit as an increasing or decreasing value, and the function can be set to cover both situations.

Pump operating at power limit

When a pump in operation is running at maximum output power (P2) in the entire performance range from closed valve to maximum flow, it is said to be operating at power limit.

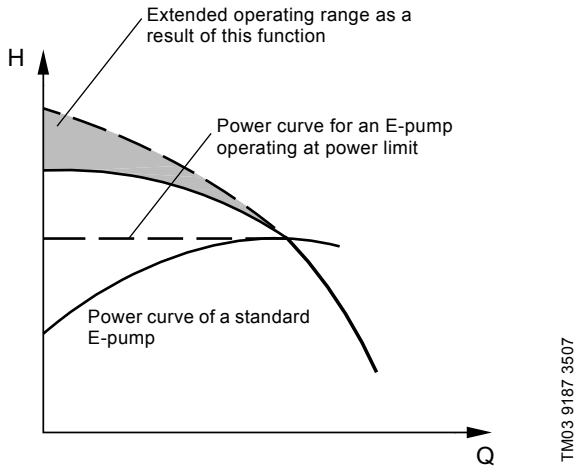


Fig. 27 Power curves of a standard pump and a pump operating at power limit

Purpose and benefits

This function utilizes the fact that often a standard E-pump does not load the MLE motor fully in the entire operating range. By controlling the MLE motor to always put out maximum power, irrespective of the load, it is now possible to extend the performance range of the pump without overloading the MLE motor. See fig. 27.

In practice, this function provides these benefits:

- The pressure range of the pump can be increased at low flows without using a bigger motor, provided that the pump construction can handle the pressure.
- In some cases, the pump can be fitted with a smaller motor than the corresponding standard pump when the E-pump has a fixed operating range at low flows.

Applications

This function is most often used in applications with relatively low flow in relation to rated performance where at the same time the demanded maximum pressure corresponds to the maximum pressure that motor and pump can achieve.

Examples of application:

- washing and cleaning
- irrigation
- boiler feed.

Description

As mentioned in section *Purpose and benefits* on page 26, there are two primary fields of application for this function:

Increased pressure

Figure 28 illustrates the operating range of a standard 60 Hz E-pump with increased pressure range achieved by using the "pump operating at power limit" function.

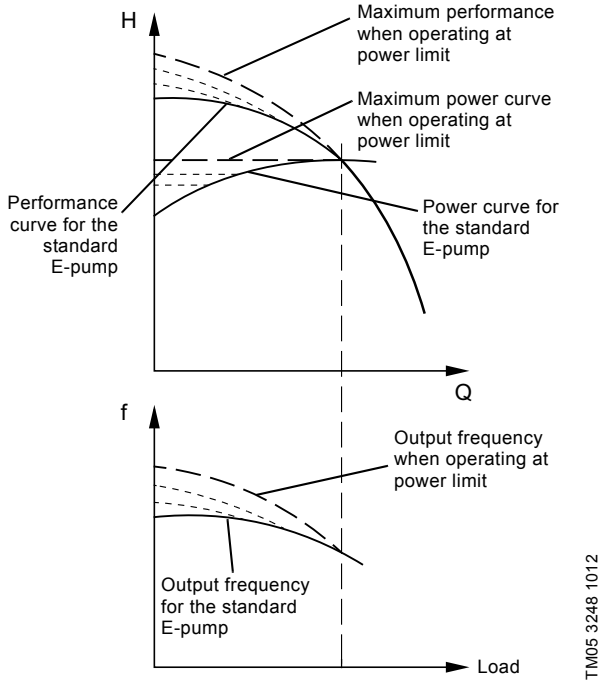


Fig. 28 Standard performance curve vs a performance curve with the "pump operating at power limit" function

The MLE motor is set to a higher speed (f_{max}) than the rated speed of the pump. This leads to a higher pressure at closed valve and low flow.

The pump will operate at a speed corresponding to the set frequency (f_{max}) until the pump reaches the flow where the motor is loaded to its full rated power. If the flow is increased further, the motor will reduce its speed so as not to exceed its rated power.

Note: The pump will be running at oversynchronous speed in the low-flow area which may alter the sound level.

Reduced motor size

Figure 29 shows the operating range of a standard 60 Hz pump where the "pump operating at power limit" function is used to optimize pump performance in relation to the motor size.

A pump operating at low flows and relatively high pressures (1) can be fitted with a smaller motor whose power matches this operating range. At higher flows and relatively lower pressures (2), the motor will reduce its speed when the power limit is exceeded and follow a steeper curve corresponding to the power available.

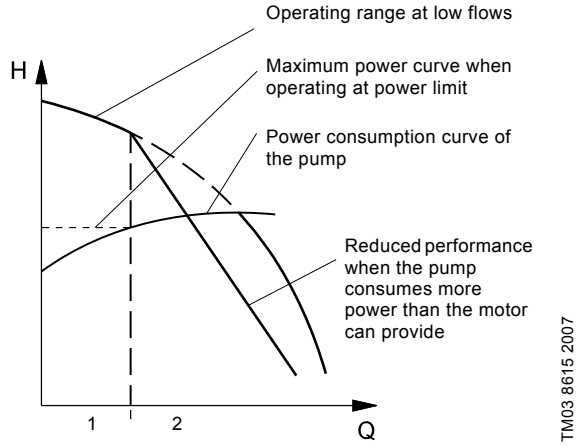


Fig. 29 Standard performance curve vs a curve operated at reduced power limit

Size of pump and MLE motor

No special considerations need to be taken when sizing pump and motor. If the pump is oversized for the motor, the MLE motor will just reduce its speed and thus the pump performance according to the illustration in fig. 29.

Setup

The "pump operating at power limit" function can be set up via a configuration file downloaded to the product via the Grundfos PC Tool E-products.

MTR(E) installation

MTR(E) 1s to 20 pumps can only be installed vertically. MTRI 1s to 20 can be installed horizontally as well (see note below).

MTR(E) 32, 45, 64 pumps must be installed in a vertical position.

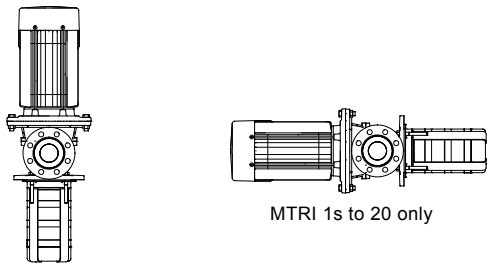


Fig. 30 Installation of an MTR(E) pump

Note: If the MTRI(E) pump is to be installed horizontally, the drain hole in the pump head must be fitted with a plug, and four closed nuts with O-rings must be fitted to the straps.

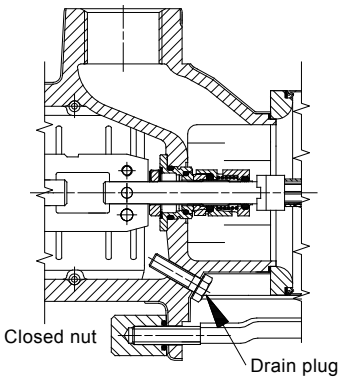


Fig. 31 Horizontal installation

The pumps are designed to provide full performance down to a level of A inches above the bottom of the strainer.

At a liquid level between A and B mm above the bottom of the strainer, the built-in priming screw will protect the pump against dry running.

Note: MTR(E) 32, 45 and 64 pumps have no priming screw.

Pump type	A [in. (mm)]	B [in. (mm)]
MTR(E) 1s, 1, 3, 5	1.6 (40.6)	1.1 (27.9)
MTR(E) 10, 15, 20	2.0 (50.8)	1.0 (25.4)
MTR(E) 32, 45, 64	2.8 (71.1)	-

The distance between the pump and the tank bottom must be minimum 1 inch.

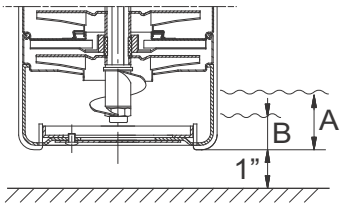


Fig. 32 MTR(E) 1s, 1, 3 and 5

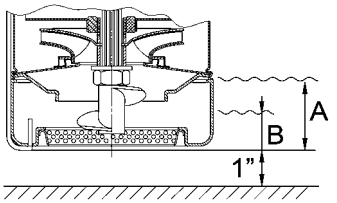


Fig. 33 MTR(E) 10, 15 and 20

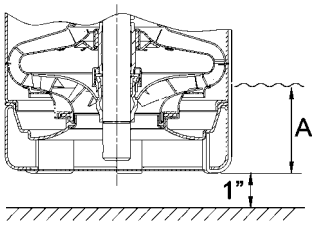


Fig. 34 MTR(E) 32, 45 and 64

Terminal box positions

As standard MTR(E) pumps have their terminal box mounted in position 6 o'clock of the pump; however other positions are possible.

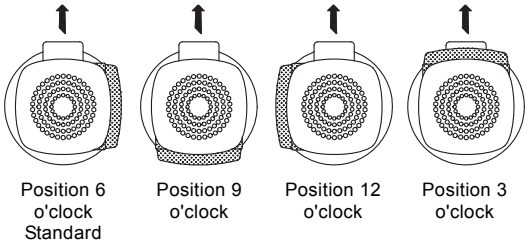


Fig. 35 Terminal box positions

MTR(E) selection and sizing

Selection of pumps

Selection of pumps should be based on

- the duty point of the pump
- sizing data such as pressure loss as a result of height differences, friction loss in the pipework, pump efficiency etc.
- minimum inlet pressure - NPSHR.

1. Duty point of the pump

From a duty point it is possible to select a pump on the basis of the curve charts shown in sections *MTR(I)(E) curve charts* and *MTR(I)(E) dimensions and weights* starting on page 37.

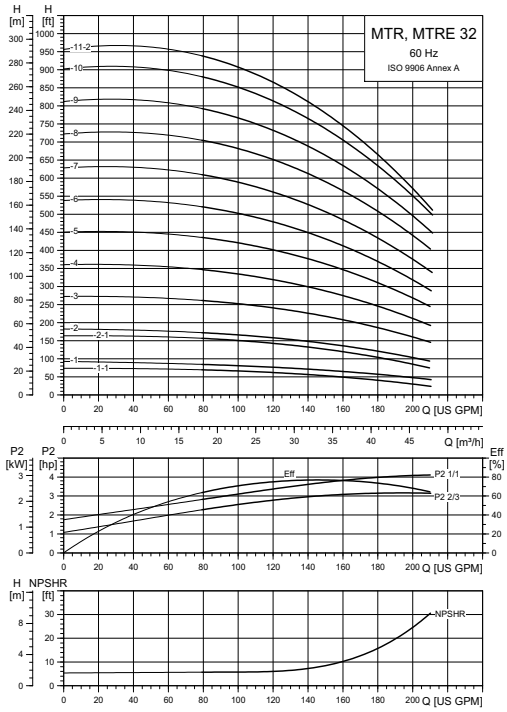


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Fig. 36 Example of a curve chart

2. Sizing data

When sizing a pump the following must be taken into account:

- Required flow rate and pressure at the point of use.
- Pressure loss as a result of height differences (H_{geo}).
- Friction loss in the pipework (H_f).
  It may be necessary to account for pressure loss in connection with long pipes, bends or valves, etc.
- Best efficiency at the estimated duty point.
- NPSHR value.
  For calculation of the NPSHR value, see section *Minimum inlet pressure - NPSHR* on page 35.

Efficiency

Before determining the point of best efficiency the operation pattern of the pump needs to be identified.

Is the pump expected always to operate at the **same** duty point, select an MTR pump which is operating at a duty point corresponding to the best efficiency of the pump.

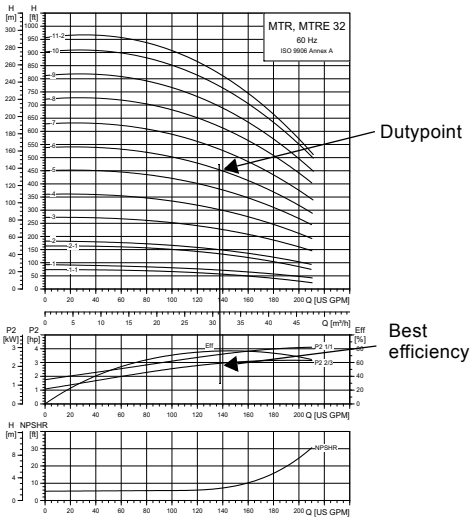

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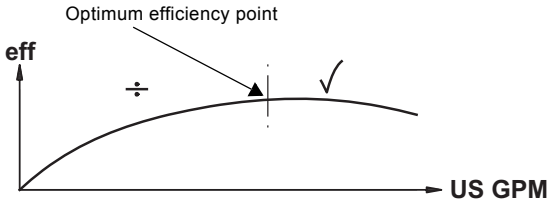
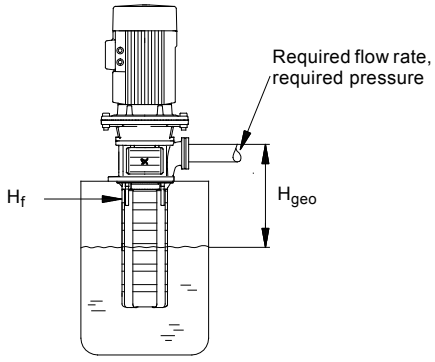
Fig. 37 Example of an MTR pump's duty point

As the pump is sized on the basis of the highest possible flow, it is important always to have the duty point to the right of the optimum efficiency point (see fig. 38, range with check mark). This must be considered in order to keep efficiency high when the flow drops.



TM03 4874 3206

Fig. 38 Best efficiency



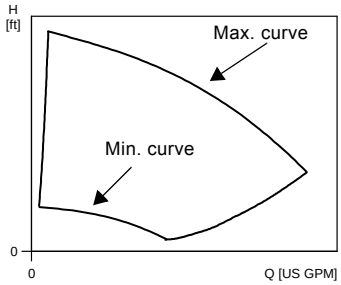
TM02 7531 3703

Fig. 39 Dimensional data

Normally, MTRE pumps are used in applications characterized by a **variable** flow rate. Consequently, it is not possible to select a pump that is operating constantly at optimum efficiency. In order to achieve optimum operating economy, the pump should be selected on the basis of the following criteria:

- The maximum duty point should be as close as possible to the QH curve of the pump.
- The required duty point should be positioned so that P_2 is close to the max. point of the QH curve.

Between the minimum and maximum performance curves, MTRE pumps have an infinite number of performance curves each representing a specific speed. Therefore it may not be possible to select a duty point close to the max. curve.



TM03 4276 2006

Fig. 40 Min. and max. performance curves

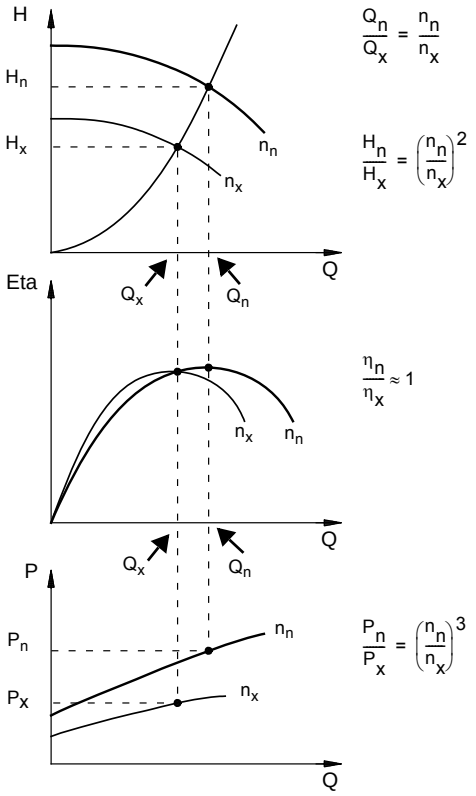
In situations where it is not possible to select a duty point close to the max. curve, the affinity equations following can be used. The head (H), the flow rate (Q) and the input power (P) are all the appropriate variables you need to be able to calculate the motor speed (n).

Note:

The approximated formulas apply on condition that the system characteristic remains unchanged for n_n and n_x and that it is based on the formula $H = k \times Q^2$ where k is a constant.

The power equation implies that the pump efficiency is unchanged at the two speeds. In practice this is **not** quite correct.

Finally, it is worth noting that the efficiencies of the variable frequency drive and the motor **must** be taken into account if a precise calculation of the power saving resulting from a reduction of the pump speed is wanted.



TM00 8720 3496

Fig. 41 Affinity equations

Legend

H_n	Rated head in feet
H_x	Current head in feet
Q_n	Flow rate in gpm
Q_x	Current flow rate in gpm
n_n	Rated motor speed in min^{-1}
n_x	Current motor speed in min^{-1}
η_n	Rated efficiency in %
η_x	Current efficiency in %

Grundfos Product Center

Grundfos Product Center provides selection assistance. You can calculate an MTR(E) pump's specific duty point and energy consumption.

By entering the sizing data of the pump, Grundfos Product Center can calculate the exact duty point and energy consumption. For further information see section *Further product documentation* on page 124.

Minimum inlet pressure - NPSHR

Calculation of the inlet pressure "H" is recommended when...

- the liquid temperature is high,
- the flow is significantly higher than the rated flow,
- inlet conditions are poor.

To avoid cavitation, make sure that there is a minimum pressure on the suction side of the pump. The maximum suction lift "H" in feet of head can be calculated as follows:

$$H = p_b - NPSHR - H_v - H_s$$

p_b = Barometric pressure in feet absolute. (Barometric pressure can be set to 33.9 feet). In closed systems, p_b indicates the system pressure in feet.

NPSHR = Net Positive Suction Head in feet of head. (To be read from the NPSHR curve at the highest flow rate the pump will be delivering).

H_f = Friction loss in suction pipe in feet of head. (At the highest flow rate the pump will be delivering.)

H_v = Vapor pressure in feet. (To be read from the vapor pressure scale. "H_v" depends on the liquid temperature "T_m").

H_s = Safety margin = minimum 2.0 feet.

If the "H" calculated is positive, the pump can operate at a suction lift of maximum "H" feet of head.

If the "H" calculated is negative, an inlet pressure of minimum "H" feet of head is required.

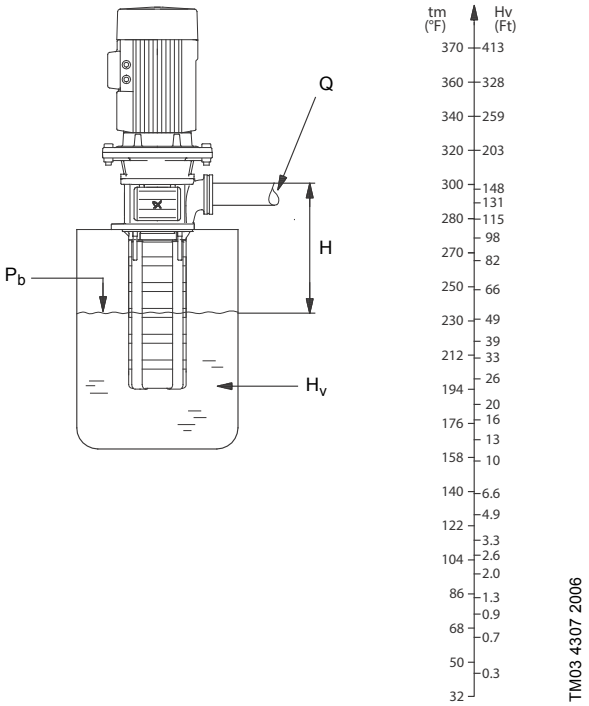


Fig. 42 Minimum inlet pressure - NPSHR

Note: In order to avoid cavitation, **never** select a pump whose duty point is too far to the right on the NPSHR curve.

Always check the NPSHR value of the pump at the highest possible flow rate.

How to read the curve charts

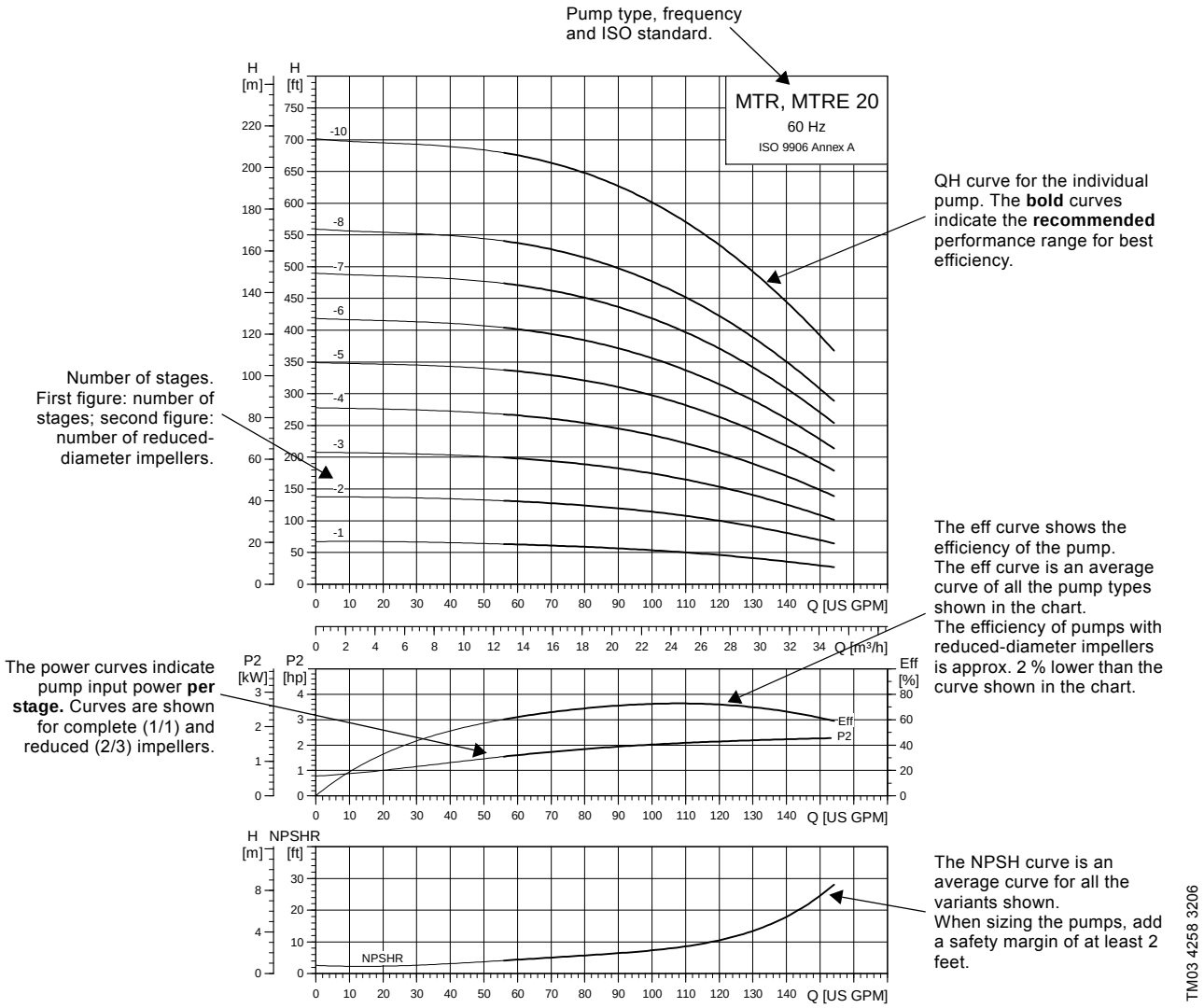


Fig. 43 Example of an MTR, MTRE curve chart

Guidelines to performance curves

The guidelines below apply to the curves shown on the following pages:

1. Tolerances to ISO 9906, Annex A, if indicated.
2. The motors used for the measurements are standard Grundfos motors (ML or MLE).
3. Measurements have been made with airless water at a temperature of 68 °F (20 °C).
4. The curves apply to a kinematic viscosity of υ = 1 mm^2/s (1 cSt).
5. Due to the risk of overheating, the pumps should not be used at a flow below the minimum flow rate.
6. QH curves of the individual pumps are based on current motor speeds.

The curve below shows the minimum flow rate as a percentage of the nominal flow rate in relation to the liquid temperature. Only pumps with EPDM elastomers in the shaft seals can run in the temperature range from 194 °F to 248 °F (90 °C to 120 °C). Closed strap nuts with o-rings and plugging of the shaft seal drain hole, may also be required at temperatures above 212 °F (100 °C) (see page 32).

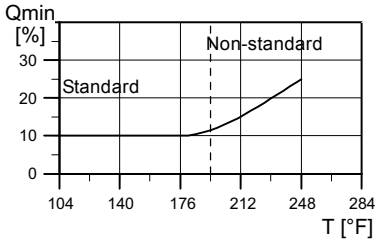
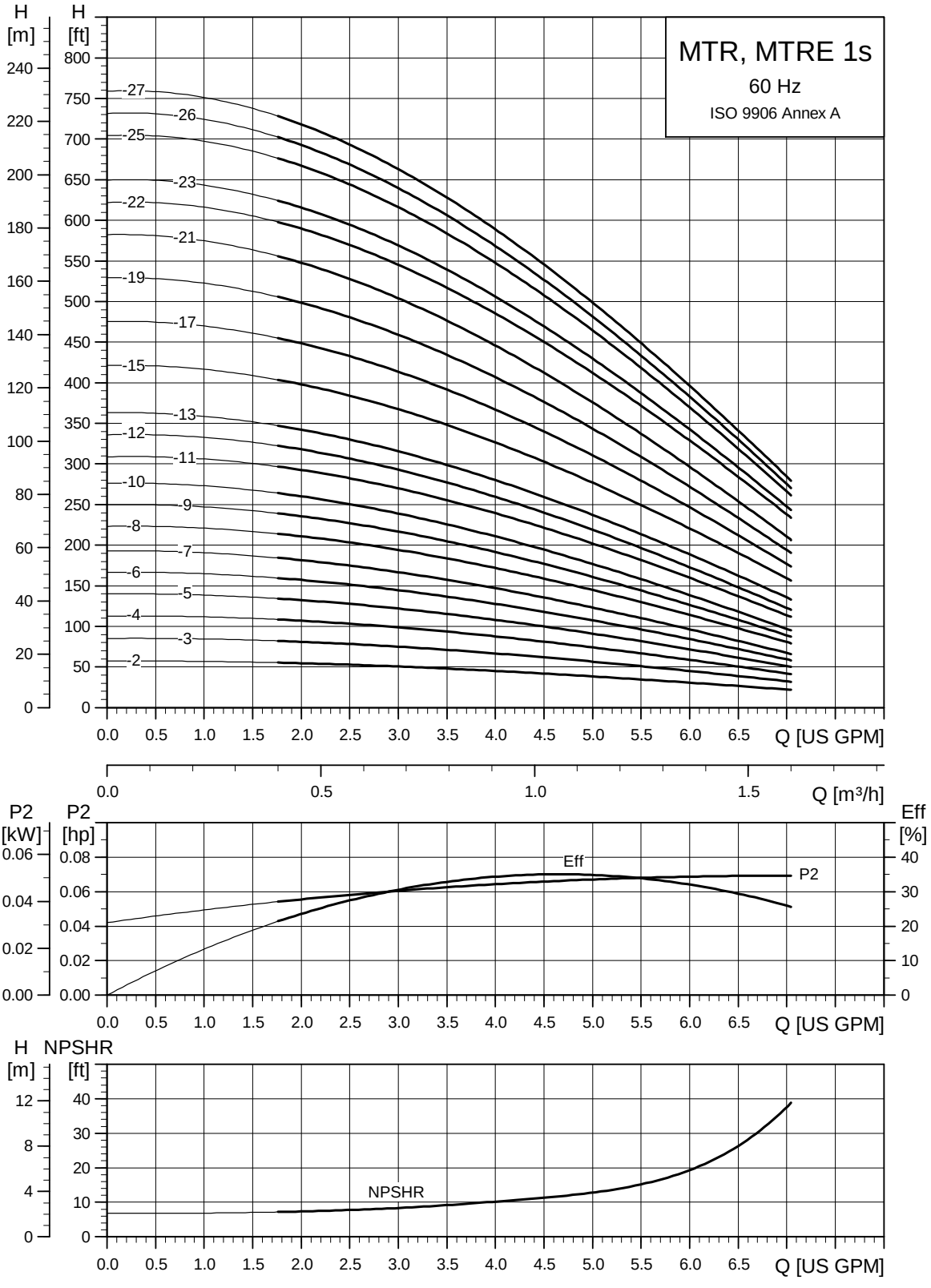


Fig. 44 Minimum flow rate

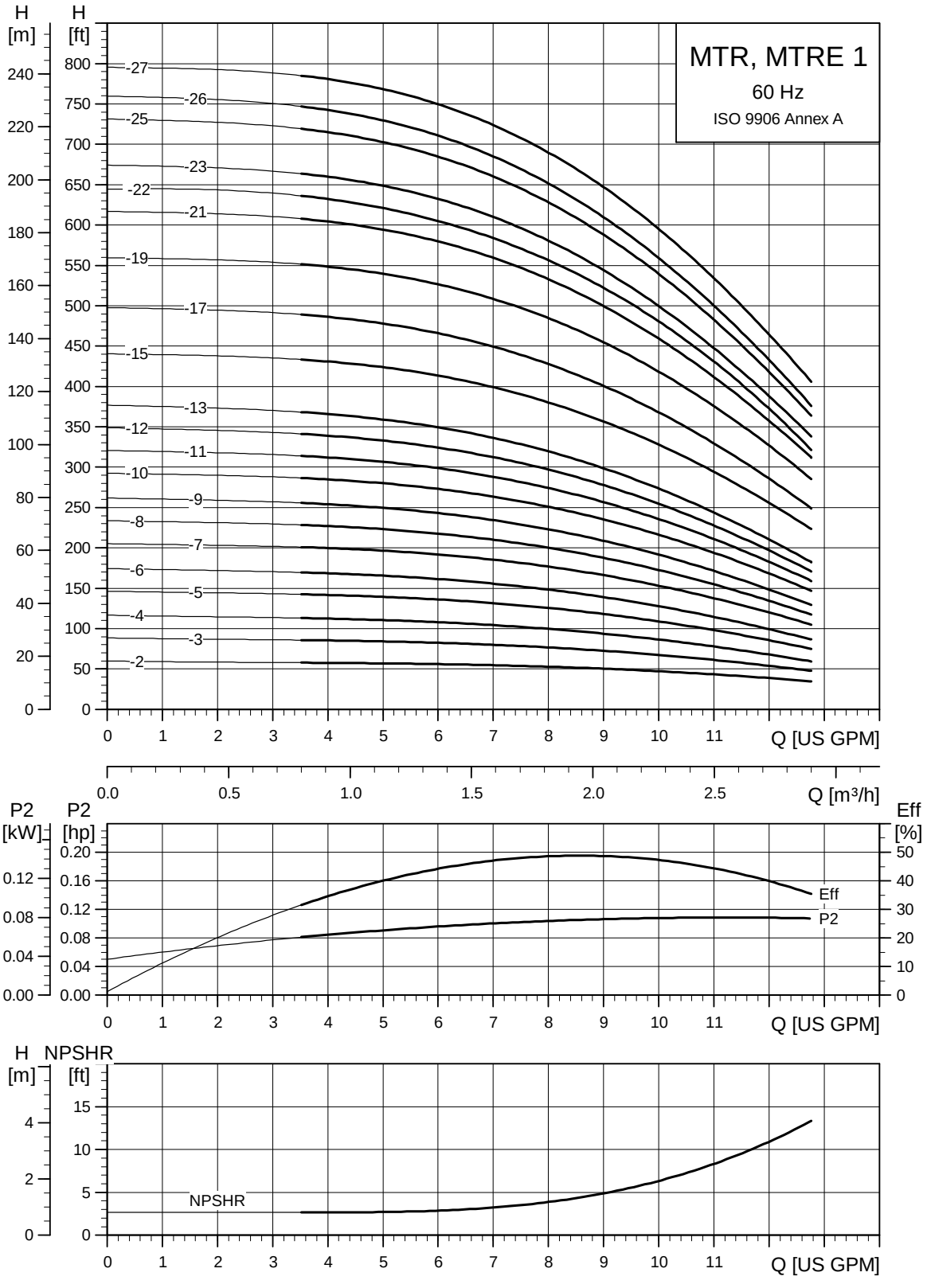
MTR(I)(E) curve charts

MTR, MTRI, MTRE 1s, 60 Hz



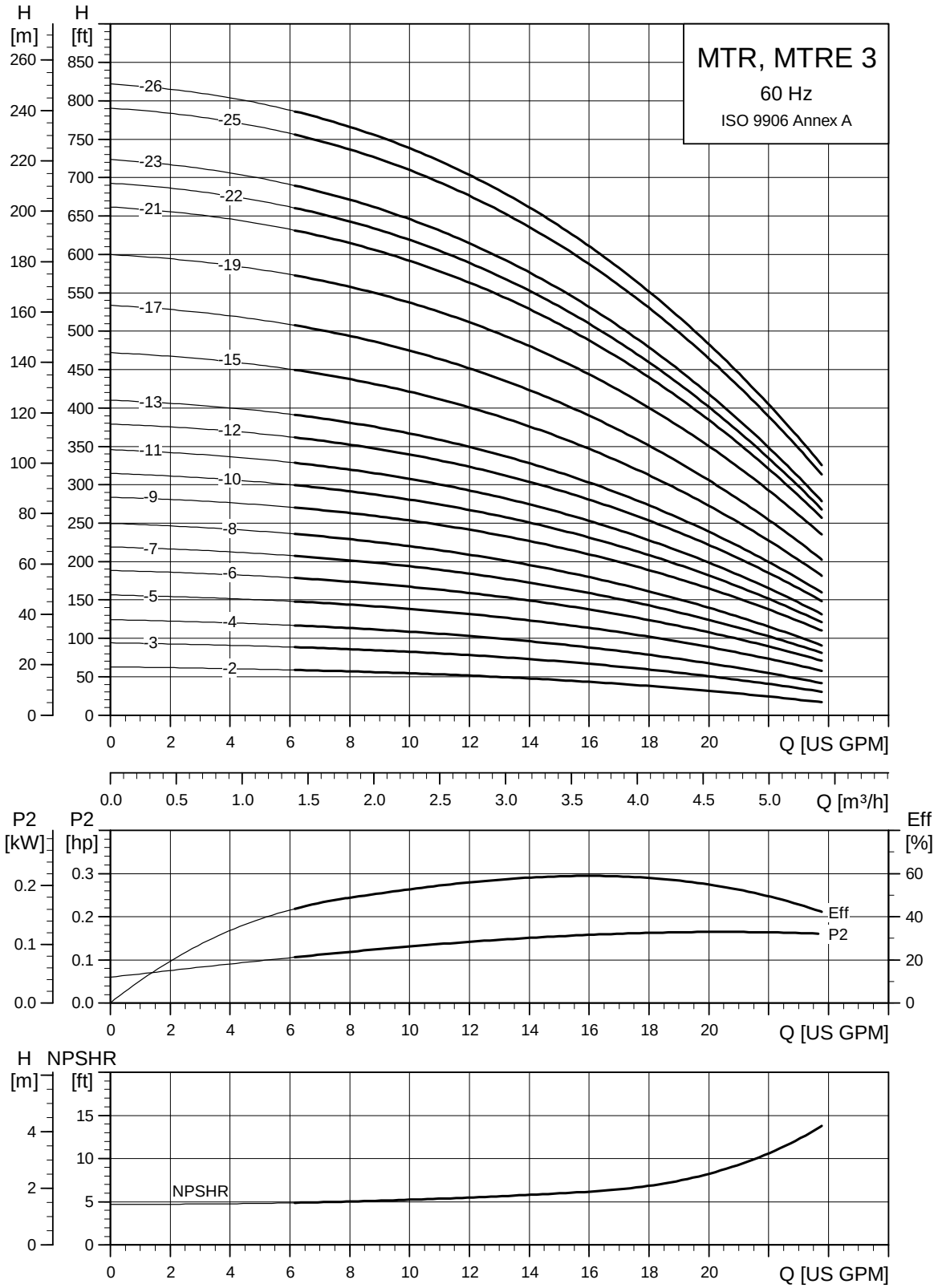
TM03 4252 2006

MTR, MTRI, MTRE 1, 60 Hz



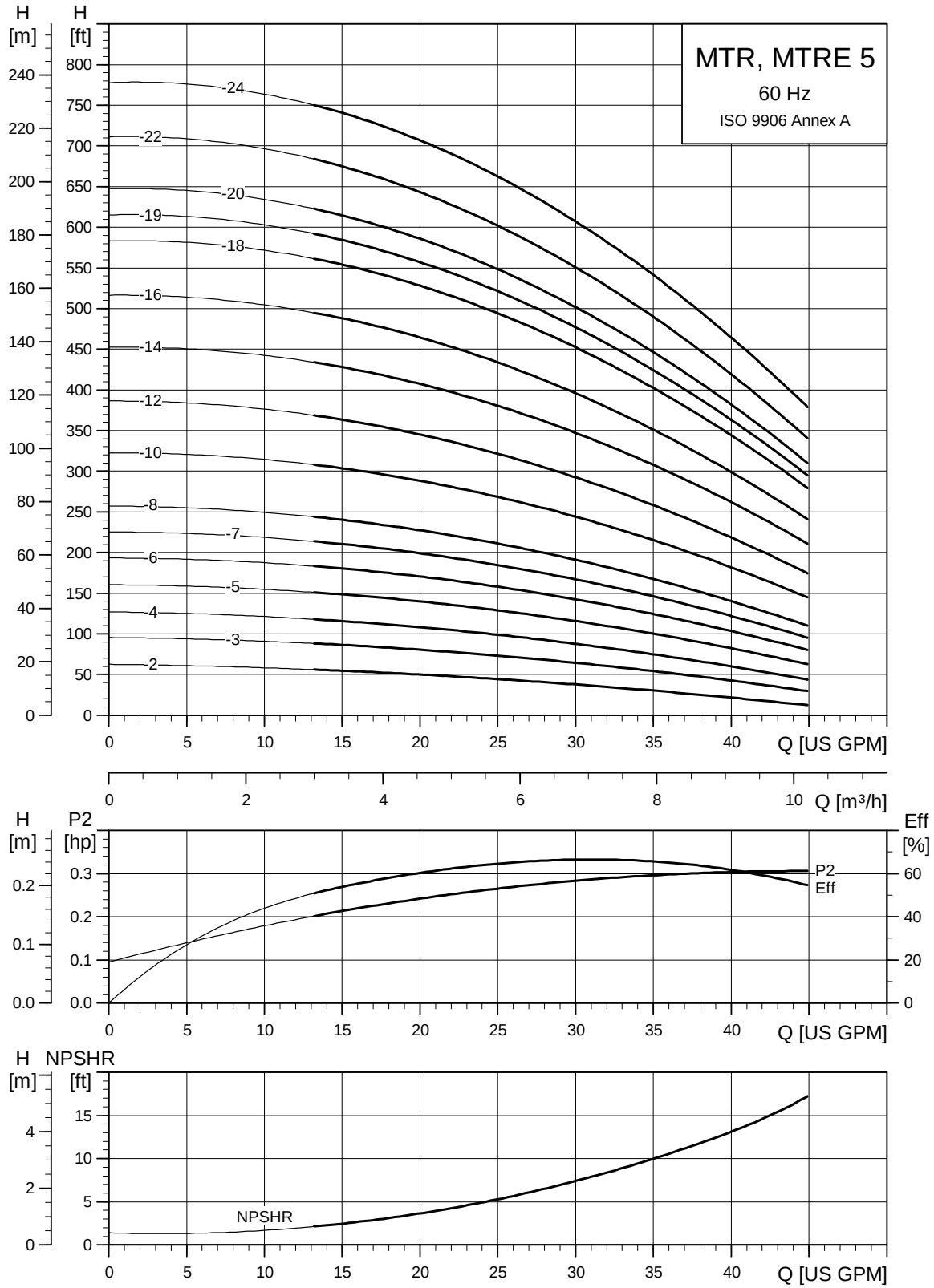
TM03 4253 2006

MTR, MTRI, MTRE 3, 60 Hz



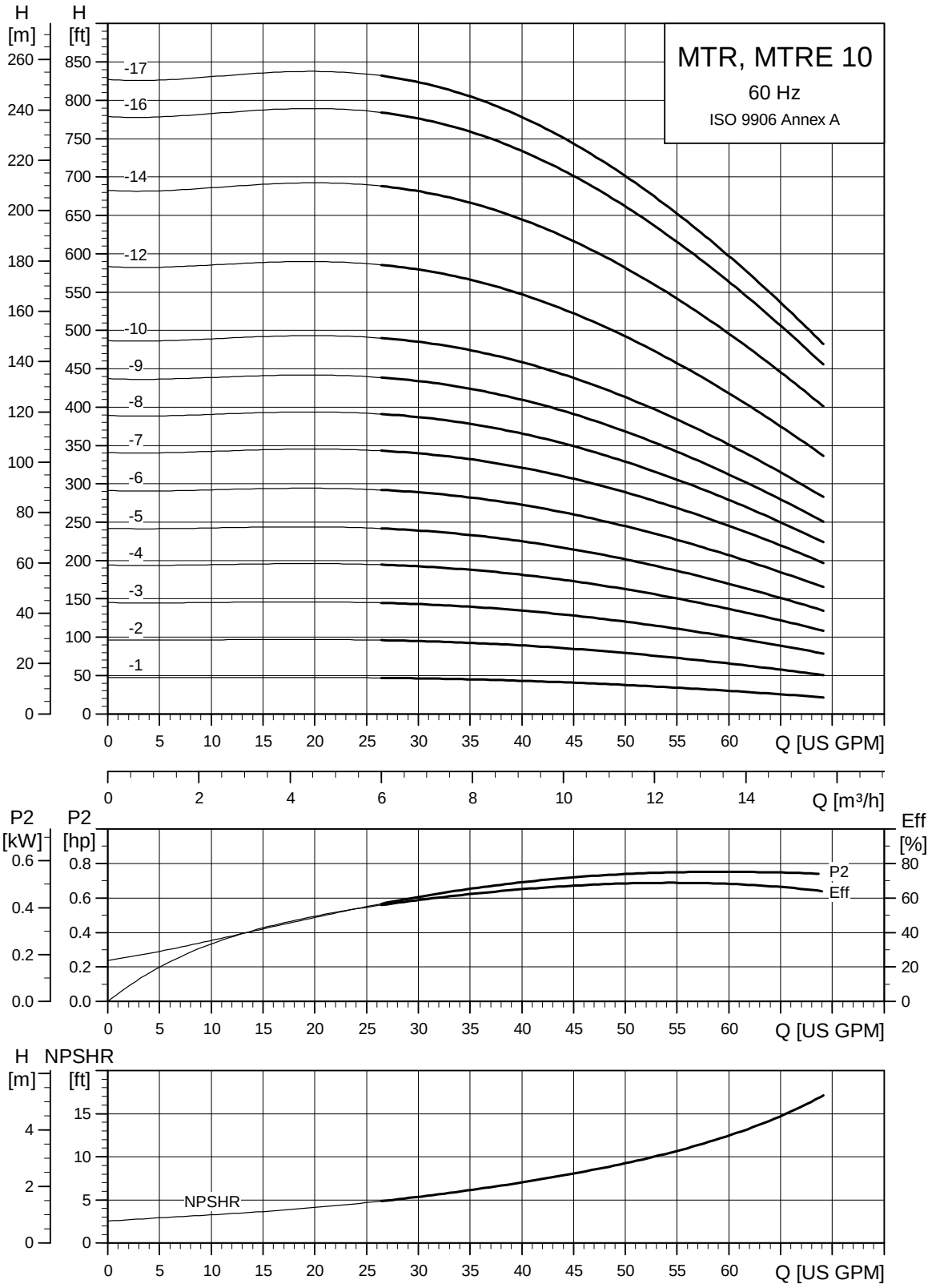
TM03 4254 2006

MTR, MTRI, MTRE 5, 60 Hz



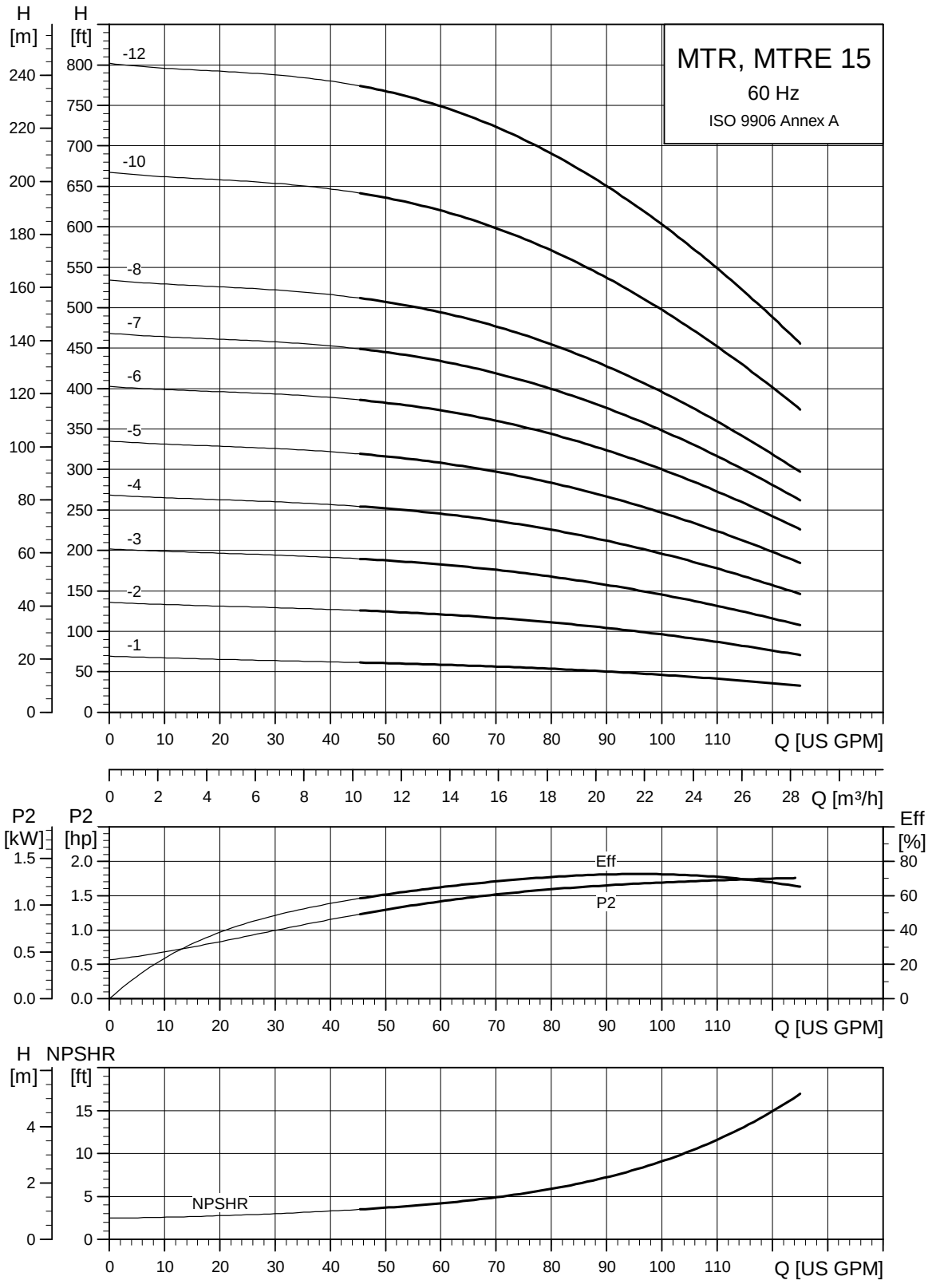
TM03 4255 2006

MTR, MTRI, MTRE 10, 60 Hz



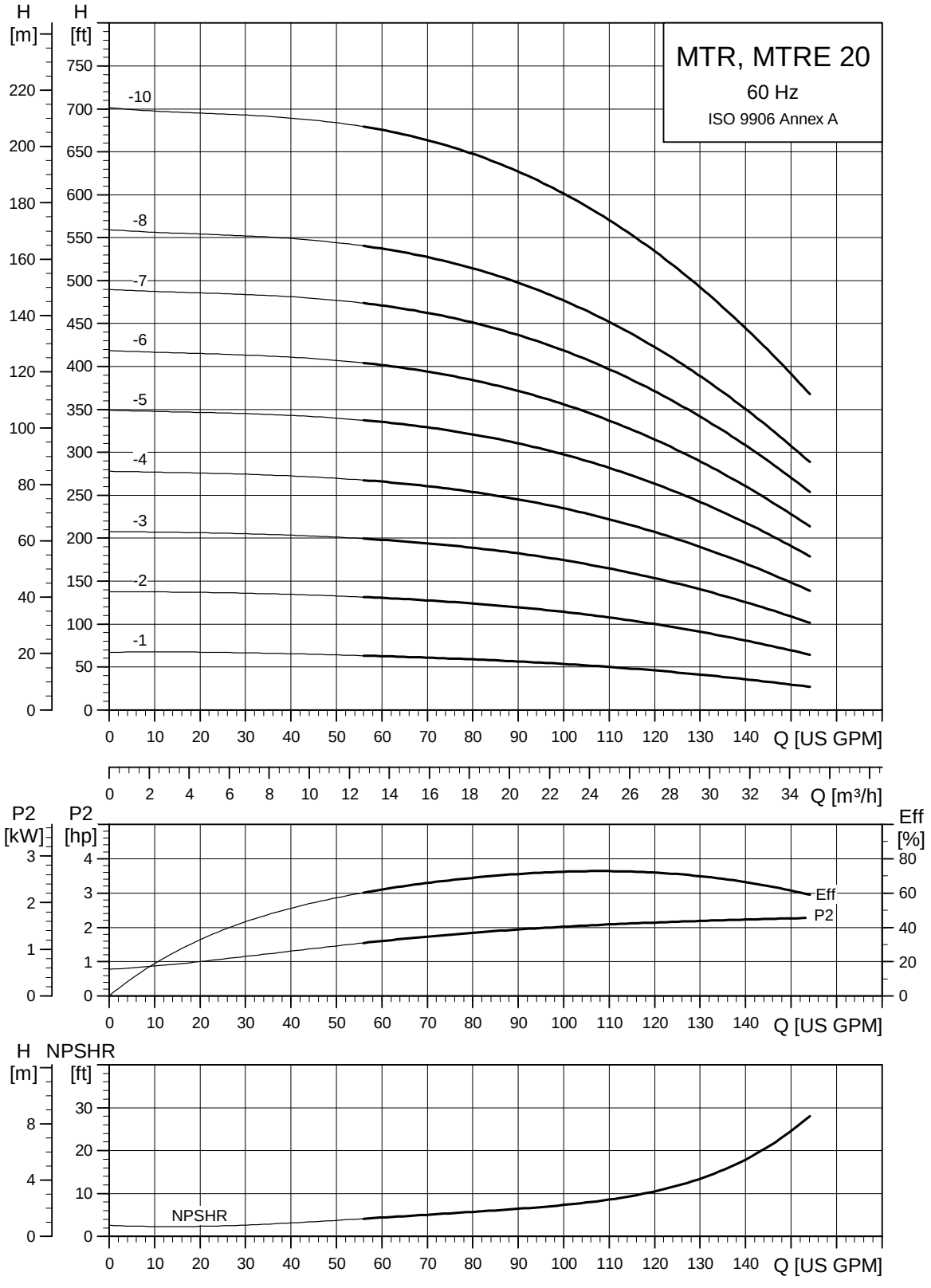
TM03 4256 2006

MTR, MTRI, MTRE 15, 60 Hz



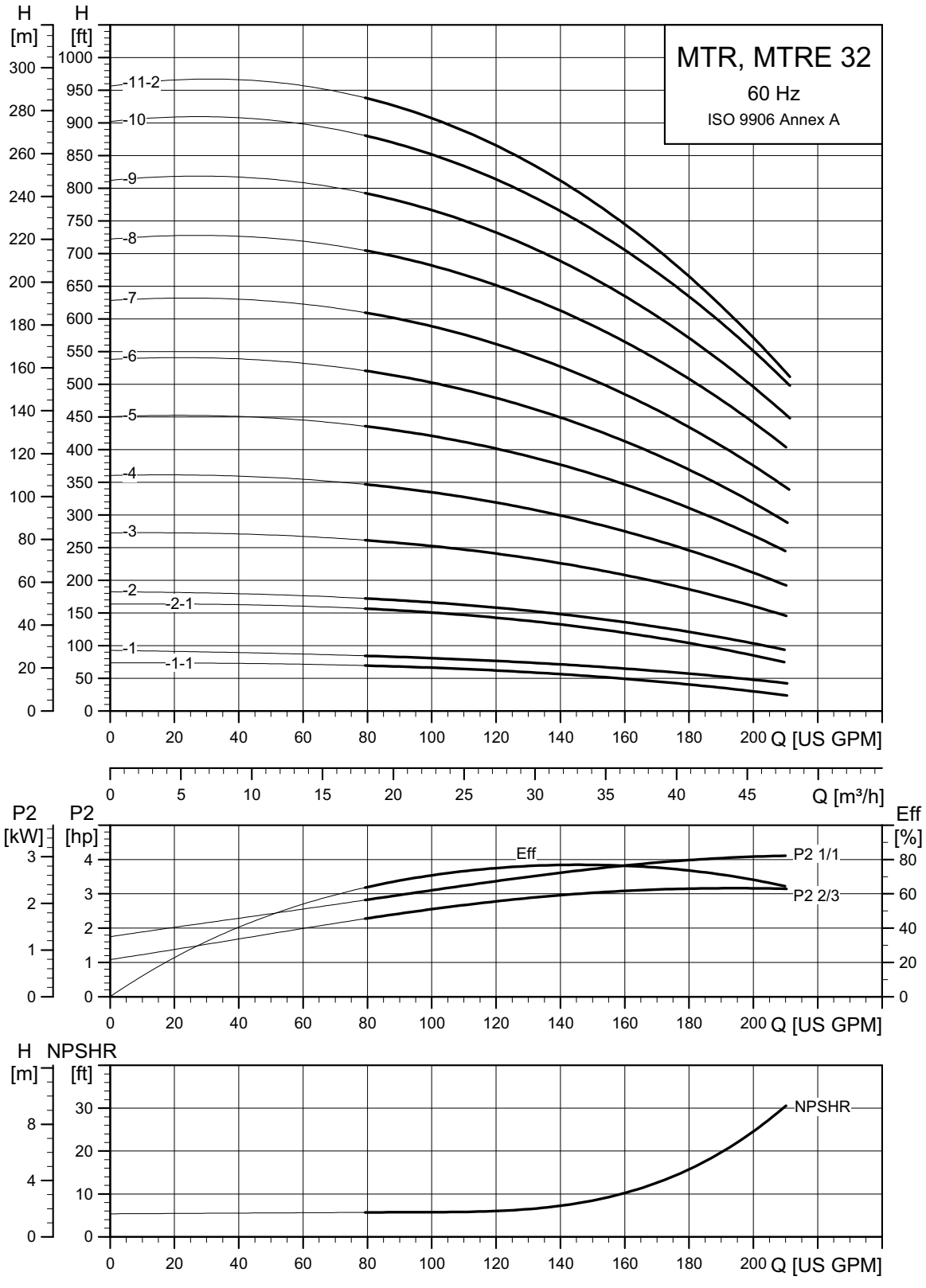
TM03 4257 2006

MTR, MTRI, MTRE 20, 60 Hz



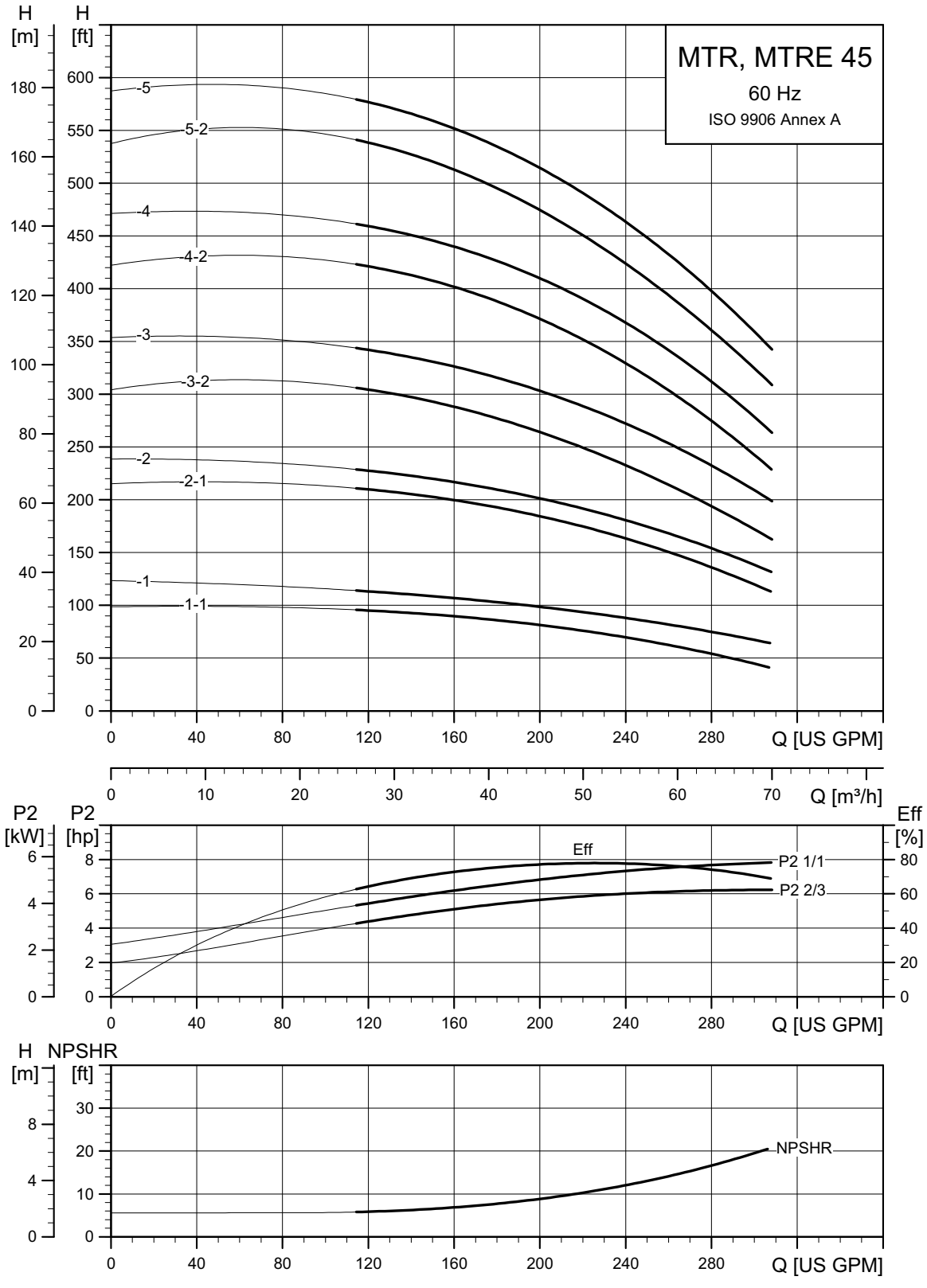
TM03 4258 2006

MTR, MTRE 32, 60 Hz



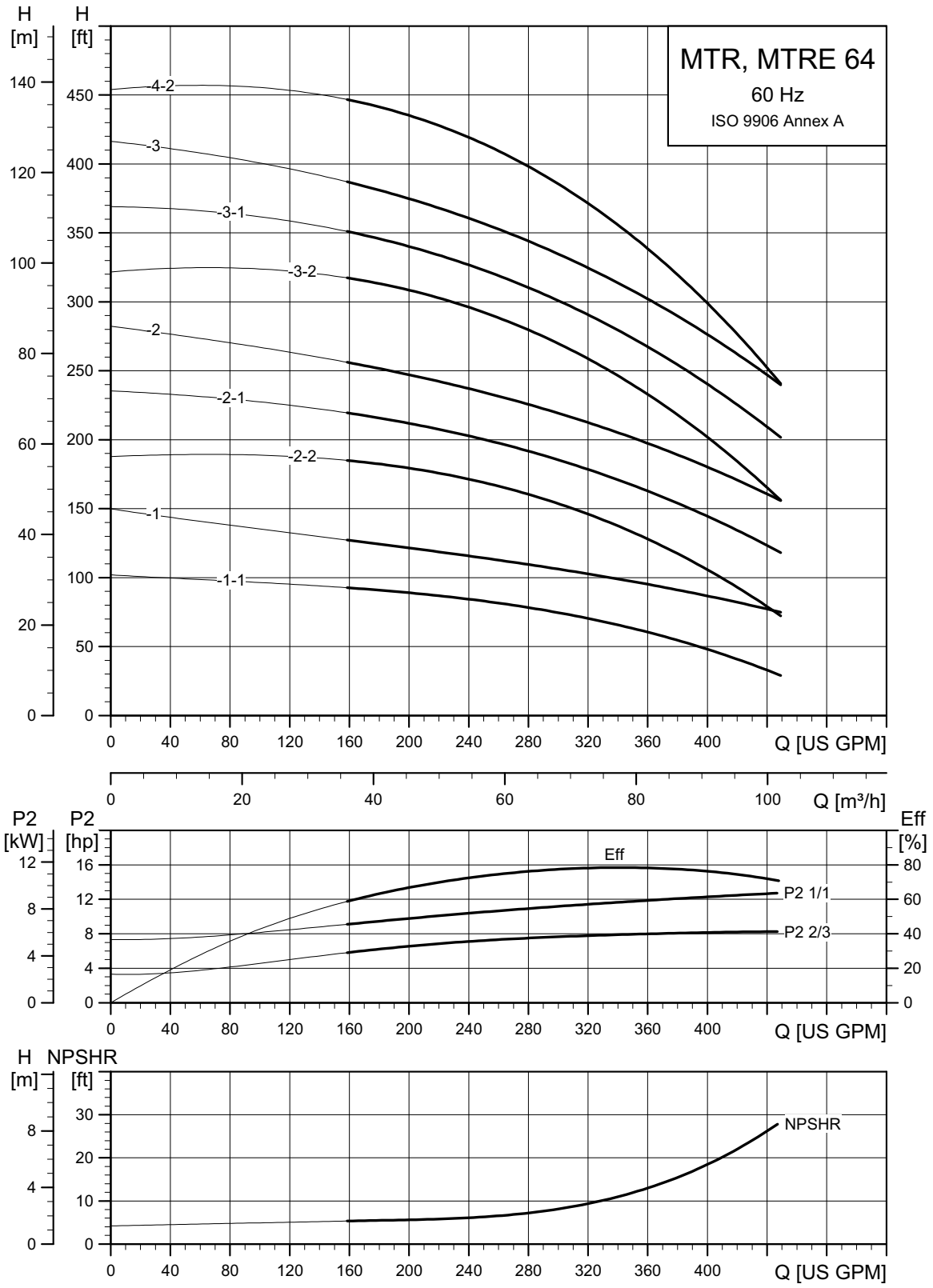
TM03 4259 1515

MTR, MTRE 45, 60 Hz



TM03 4260 1515

MTR, MTRE 64, 60 Hz



TM03 4261 1515

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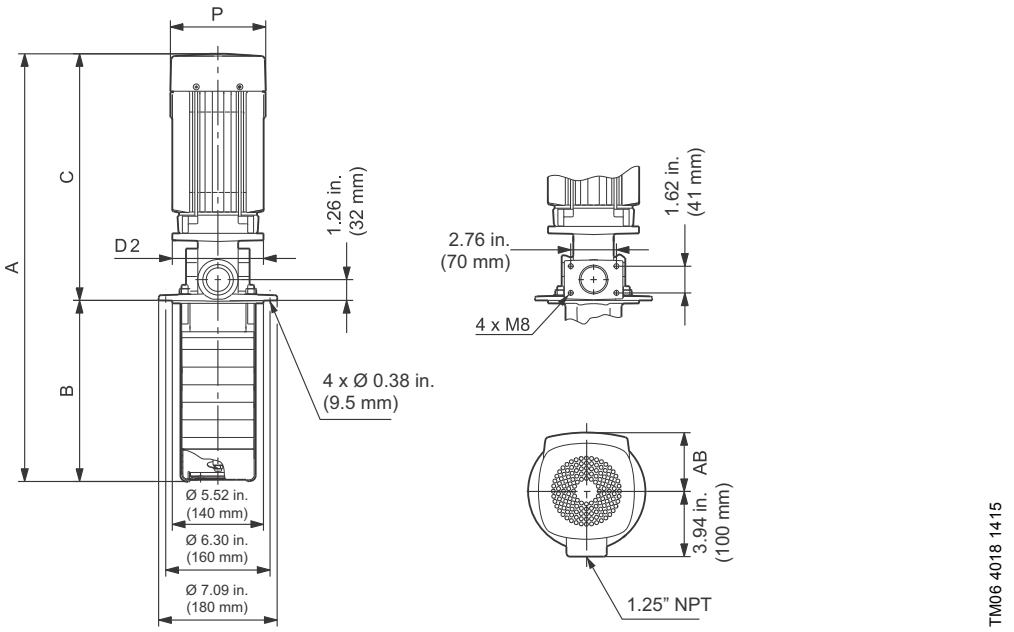
MTR(I)(E) dimensions and weights

Dimensional sketch



MTR, MTRI 1s

Pump type	P_2 [Hp]	MTR, MTRI dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 1S-2/2	0.33	18.27 (464)	6.30 (160)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	39
MTR 1S-3/3	0.33	18.98 (482)	7.01 (178)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	39
MTR 1S-4/4	0.33	19.69 (500)	7.72 (196)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1S-5/5	0.5	20.39 (518)	8.43 (214)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1S-6/6	0.5	21.10 (536)	9.13 (232)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1S-7/7	0.5	21.81 (554)	9.84 (250)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1S-8/8	0.75	22.52 (572)	10.55 (268)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1S-9/9	0.75	23.23 (590)	11.26 (286)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1S-10/10	0.75	23.94 (608)	11.97 (304)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1S-11/11	0.75	24.65 (626)	12.68 (322)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1S-12/12	1	25.35 (644)	13.39 (340)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1S-13/13	1	26.06 (662)	14.09 (358)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1S-15/15	1.5	28.66 (728)	15.51 (394)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1S-17/17	1.5	30.08 (764)	16.93 (430)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1S-19/19	1.5	31.50 (800)	18.35 (466)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1S-21/21	1.5	32.91 (836)	19.76 (502)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	42
MTR 1S-22/22	2	36.22 (920)	20.47 (520)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 1S-23/23	2	36.93 (938)	21.18 (538)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 1S-25/25	2	38.35 (974)	22.60 (574)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 1S-26/26	2	39.06 (992)	23.31 (592)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 1S-27/27	2	39.76 (1010)	24.02 (610)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63

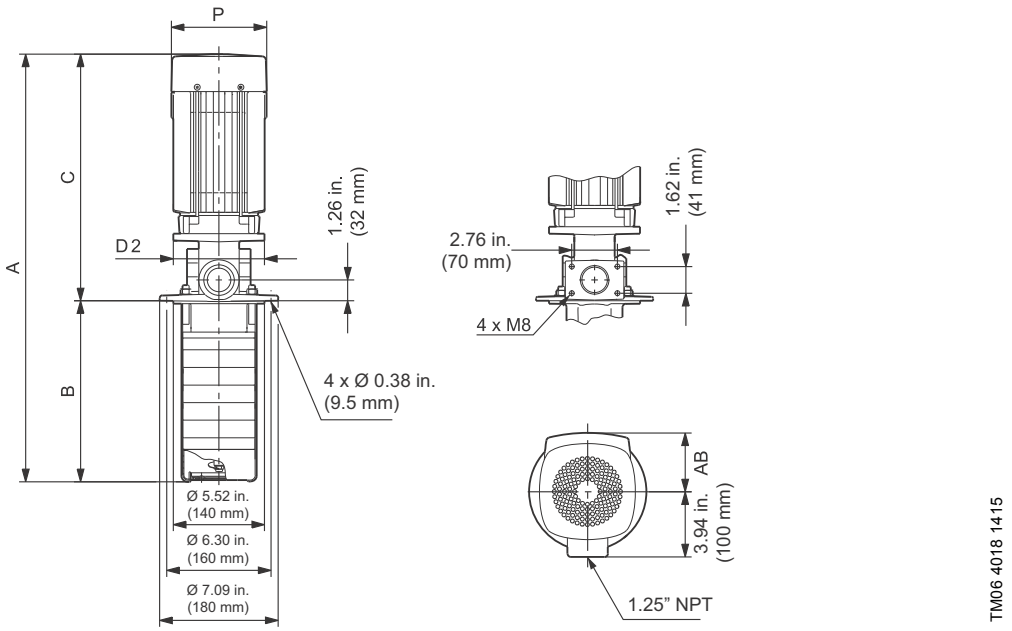
For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 1s

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 1S-4/4	0.33	1	200-240	56C	20.56 (522)	7.72 (196)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	22.13 (562)	7.72 (196)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 1S-7/7	0.5	1	200-240	56C	22.68 (576)	9.85 (250)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	24.26 (616)	9.85 (250)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 1S-10/10	0.75	1	200-240	56C	24.81 (630)	11.97 (304)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	26.38 (670)	11.97 (304)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 1S-13/13	1	1	200-240	56C	26.93 (684)	14.10 (358)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	28.51 (724)	14.10 (358)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 1S-21/21	1.5	1	200-240	56C	32.60 (828)	19.77 (502)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	48
		3	208-230	56C	37.09 (942)	19.77 (502)	17.33 (440)	7.01 (178)	6.50 (165)	6.58 (167)	80
			440-480	56C	34.18 (868)	19.77 (502)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	52
MTRE 1S-23/23	2	1	200-240	56C	34.81 (884)	21.19 (538)	13.63 (346)	4.81 (122)	6.50 (165)	6.23 (158)	52
		3	208-230	56C	38.51 (978)	21.19 (538)	17.33 (440)	7.01 (178)	6.50 (165)	6.58 (167)	80
			440-480	56C	36.38 (924)	21.19 (538)	15.20 (386)	4.81 (122)	6.50 (165)	6.23 (158)	56
MTRE 1S-27/27	2	1	200-240	56C	37.64 (956)	24.02 (610)	13.63 (346)	4.81 (122)	6.50 (165)	6.23 (158)	53
		3	208-230	56C	41.34 (1050)	24.02 (610)	17.33 (440)	7.01 (178)	6.50 (165)	6.58 (167)	81
			440-480	56C	39.22 (996)	24.02 (610)	15.20 (386)	4.81 (122)	6.50 (165)	6.23 (158)	56

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

Dimensional sketch



MTR, MTRI 1

Pump type	P_2 [Hp]	MTR, MTRI dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 1-2/2	0.33	18.27 (464)	6.30 (160)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	39
MTR 1-3/3	0.5	18.98 (482)	7.01 (178)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	39
MTR 1-4/4	0.5	19.69 (500)	7.72 (196)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1-5/5	0.75	20.40 (518)	8.43 (214)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1-6/6	0.75	21.11 (536)	9.13 (232)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1-7/7	0.75	21.82 (554)	9.84 (250)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1-8/8	1	22.52 (572)	10.55 (268)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1-9/9	1	23.23 (590)	11.26 (286)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 1-10/10	1.5	25.12 (638)	11.97 (304)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1-11/11	1.5	25.83 (656)	12.68 (322)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1-12/12	1.5	26.54 (674)	13.39 (340)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1-13/13	1.5	27.25 (692)	14.09 (358)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 1-15/15	2	31.26 (794)	15.51 (394)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 1-17/17	2	32.68 (830)	16.93 (430)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 1-19/19	3	36.78 (934)	18.35 (466)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	84
MTR 1-21/21	3	38.19 (970)	19.76 (502)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	84
MTR 1-22/22	3	38.90 (988)	20.47 (520)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	84
MTR 1-23/23	3	39.61 (1006)	21.18 (538)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	84
MTR 1-25/25	3	41.03 (1042)	22.60 (574)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	84
MTR 1-26/26	3	41.74 (1060)	23.31 (592)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	84
MTR 1-27/27	3	42.45 (1078)	24.02 (610)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	84

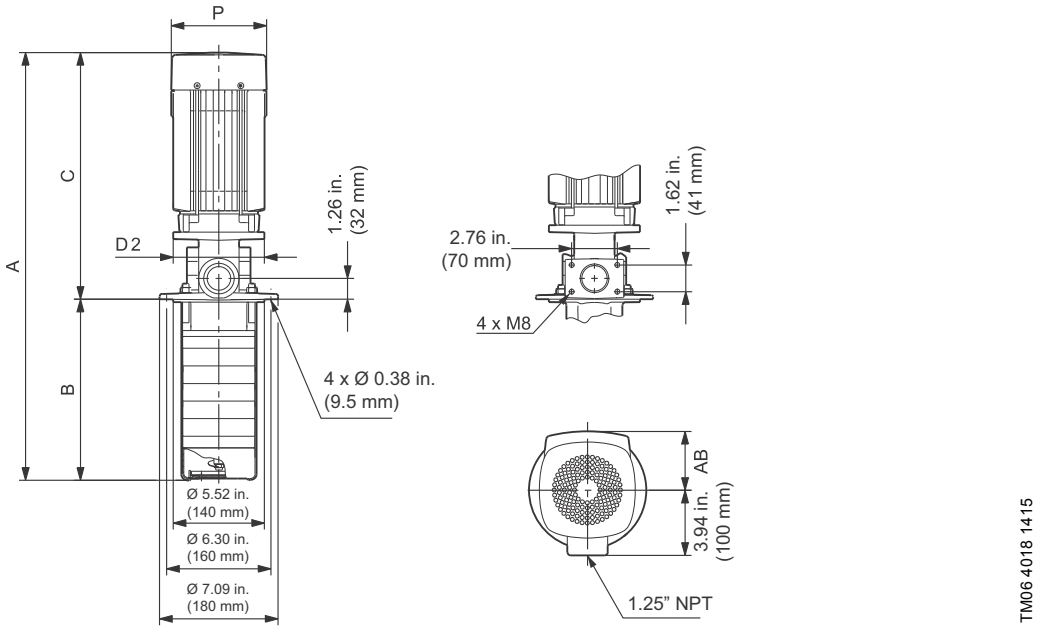
For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 1

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 1-4/4	0.5	1	200-240	56C	20.56 (522)	7.72 (196)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	22.13 (562)	7.72 (196)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 1-7/7	0.75	1	200-240	56C	22.68 (576)	9.85 (250)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	24.26 (616)	9.85 (250)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 1-9/9	1	1	200-240	56C	24.10 (612)	11.26 (286)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	25.67 (652)	11.26 (286)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 1-13/13	1.5	1	200-240	56C	26.93 (684)	14.10 (358)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	48
		3	208-230	56C	31.42 (798)	14.10 (358)	17.33 (440)	7.01 (178)	6.50 (165)	6.58 (167)	80
			440-480	56C	28.51 (724)	14.10 (358)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	52
MTRE 1-17/17	2	1	200-240	56C	30.56 (776)	16.93 (430)	13.63 (346)	4.81 (122)	6.50 (165)	6.23 (158)	52
		3	208-230	56C	34.26 (870)	16.93 (430)	17.33 (440)	7.01 (178)	6.50 (165)	6.58 (167)	80
			440-480	56C	32.13 (816)	16.93 (430)	15.20 (386)	4.81 (122)	6.50 (165)	6.23 (158)	56
MTRE 1-22/22	3	3	208-230	182TC	38.98 (990)	20.48 (520)	18.51 (470)	7.01 (178)	9.85 (250)	6.58 (167)	100
			440-480	182TC	35.67 (906)	20.48 (520)	15.20 (386)	4.81 (122)	6.50 (165)	6.23 (158)	59
MTRE 1-27/27	3	3	208-230	182TC	42.52 (1080)	24.02 (610)	18.51 (470)	7.01 (178)	9.85 (250)	6.58 (167)	101
			440-480	182TC	39.22 (996)	24.02 (610)	15.20 (386)	4.81 (122)	6.50 (165)	6.23 (158)	59

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

Dimensional sketch



MTR, MTRI 3

Pump type	P_2 [Hp]	MTR, MTRI dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 3-2/2	0.5	18.27 (464)	6.30 (160)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	39
MTR 3-3/3	0.5	18.98 (482)	7.01 (178)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	39
MTR 3-4/4	0.75	19.69 (500)	7.72 (196)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 3-5/5	1	20.39 (518)	8.43 (214)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 3-6/6	1	21.10 (536)	9.13 (232)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	40
MTR 3-7/7	1.5	22.99 (584)	9.84 (250)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 3-8/8	1.5	23.70 (602)	10.55 (268)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 3-9/9	1.5	24.41 (620)	11.26 (286)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 3-10/10	2	27.72 (704)	11.97 (304)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 3-11/11	2	28.43 (722)	12.68 (322)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 3-12/12	2	29.13 (740)	13.39 (340)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 3-13/13	3	32.52 (826)	14.09 (358)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	83
MTR 3-15/15	3	33.94 (862)	15.51 (394)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	83
MTR 3-17/17	3	35.35 (898)	16.93 (430)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	83
MTR 3-19/19	5	39.06 (992)	18.35 (466)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	123
MTR 3-21/21	5	40.47 (1028)	19.76 (502)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	123
MTR 3-22/22	5	41.18 (1046)	20.47 (520)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	123
MTR 3-23/23	5	41.89 (1064)	21.18 (538)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	123
MTR 3-25/25	5	43.31 (1100)	22.60 (574)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	123
MTR 3-26/26	5	44.02 (1118)	23.31 (592)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	124

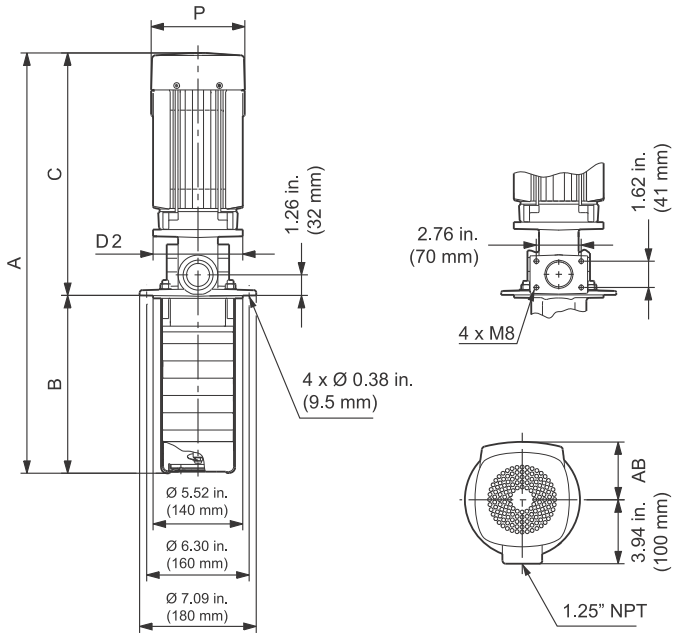
For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 3

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 3-3/3	0.5	1	200-240	56C	19.85 (504)	7.01 (178)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	21.42 (544)	7.01 (178)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	49
MTRE 3-4/4	0.75	1	200-240	56C	20.56 (522)	7.72 (196)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	22.13 (562)	7.72 (196)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 3-6/6	1	1	200-240	56C	21.97 (558)	9.14 (232)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	23.55 (598)	9.14 (232)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 3-9/9	1.5	1	200-240	56C	24.10 (612)	11.26 (286)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	48
		3	208-230	56C	28.59 (726)	11.26 (286)	17.33 (440)	7.01 (178)	6.50 (165)	6.58 (167)	80
			440-480	56C	25.67 (652)	11.26 (286)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	51
MTRE 3-12/12	2	1	200-240	56C	27.01 (686)	13.39 (340)	13.63 (346)	4.81 (122)	6.50 (165)	6.23 (158)	52
		3	208-230	56C	30.71 (780)	13.39 (340)	17.33 (440)	7.01 (178)	6.50 (165)	6.58 (167)	80
			440-480	56C	28.59 (726)	13.39 (340)	15.20 (386)	4.81 (122)	6.50 (165)	6.23 (158)	55
MTRE 3-17/17	3	3	208-230	182TC	35.44 (900)	16.93 (430)	18.51 (470)	7.01 (178)	9.85 (250)	6.58 (167)	100
			440-480	182TC	32.13 (816)	16.93 (430)	15.2 (386)	4.81 (122)	6.50 (165)	6.23 (158)	59
MTRE 3-23/23	5	3	208-230	184TC	41.89 (1064)	21.19 (538)	20.71 (526)	8.67 (220)	9.85 (250)	7.41 (188)	126
			460	184TC	41.89 (1064)	21.19 (538)	20.71 (526)	8.67 (220)	9.85 (250)	7.41 (188)	136
MTRE 3-26/26	5	3	208-230	184TC	44.02 (1118)	23.31 (592)	20.71 (526)	8.67 (220)	9.85 (250)	7.41 (188)	126
			460	184TC	44.02 (1118)	23.31 (592)	20.71 (526)	8.67 (220)	9.85 (250)	7.41 (188)	136

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

Dimensional sketch



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MTR, MTRI 5

Pump type	P_2 [Hp]	MTR, MTRI 5 dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 5-2/2	0.75	18.62 (473)	6.65 (169)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 5-3/3	1	19.69 (500)	7.72 (196)	11.97 (304)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 5-4/4	1.5	21.93 (557)	8.78 (223)	13.15 (334)	5.56 (141)	6.50 (165)	4.57 (116)	41
MTR 5-5/5	2	25.59 (650)	9.84 (250)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 5-6/6	2	26.65 (677)	10.91 (277)	15.75 (400)	7.01 (178)	6.50 (165)	4.34 (110)	63
MTR 5-7/7	3	30.39 (772)	11.97 (304)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	84
MTR 5-8/8	3	31.46 (799)	13.03 (331)	18.43 (468)	7.01 (178)	9.85 (250)	4.34 (110)	84
MTR 5-10/10	5	35.87 (911)	15.16 (385)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	124
MTR 5-12/12	5	37.99 (965)	17.28 (439)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	124
MTR 5-14/14	5	40.12 (1019)	19.41 (493)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	124
MTR 5-16/16	5	42.24 (1073)	21.54 (547)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	124
MTR 5-18/18	7.5	44.37 (1127)	23.66 (601)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	147
MTR 5-19/19	7.5	45.43 (1154)	24.72 (628)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	147
MTR 5-20/20	7.5	46.50 (1181)	25.79 (655)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	147
MTR 5-22/22	7.5	48.62 (1235)	27.91 (709)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	223
MTR 5-24/24	7.5	50.75 (1289)	30.04 (763)	20.71 (526)	8.67 (220)	9.85 (250)	5.28 (134)	223

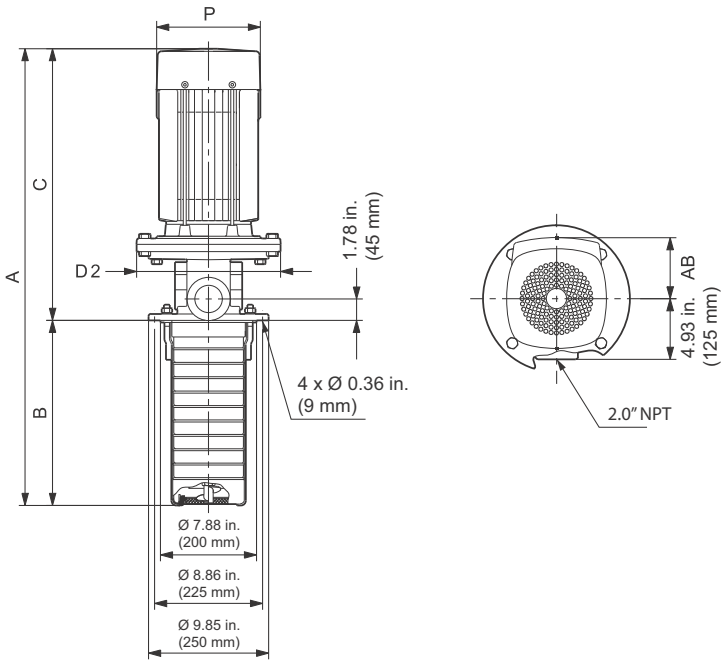
For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 5

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 5-3/3	1	1	200-240	56C	20.56 (522)	7.72 (196)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	46
		3	440-480	56C	22.13 (562)	7.72 (196)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	50
MTRE 5-4/4	1.5	1	200-240	56C	21.62 (549)	8.78 (223)	12.84 (326)	4.81 (122)	6.50 (165)	6.23 (158)	48
		3	208-230	56C	26.11 (663)	8.78 (223)	17.33 (440)	7.01 (178)	6.50 (165)	6.58 (167)	80
			440-480	56C	23.19 (589)	8.78 (223)	14.41 (366)	4.81 (122)	6.50 (165)	6.23 (158)	52
MTRE 5-6/6	2	1	200-240	56C	24.53 (623)	10.91 (277)	13.63 (346)	4.81 (122)	6.50 (165)	6.23 (158)	52
		3	208-230	56C	28.23 (717)	10.91 (277)	17.33 (440)	7.01 (178)	6.50 (165)	6.58 (167)	80
			440-480	56C	26.11 (663)	10.91 (277)	15.20 (386)	4.81 (122)	6.50 (165)	6.23 (158)	56
MTRE 5-8/8	3	3	208-230	182TC	31.54 (801)	13.04 (331)	18.51 (470)	7.01 (178)	9.85 250)	6.58 (167)	101
			440-480	182TC	28.23 (717)	13.04 (331)	15.20 (386)	4.81 (122)	6.50 (165)	6.23 (158)	59
MTRE 5-12/12	5	3	208-230	184TC	38.00 (966)	17.29 (439)	20.71 (526)	8.67 (220)	9.85 (250)	7.41 (188)	126
			460	184TC	38.00 (965)	17.29 (439)	20.71 (526)	8.67 (220)	9.85 (250)	7.41 (188)	136
MTRE 5-16/16	5	3	208-230	184TC	42.25 (1073)	21.54 (547)	20.71 (526)	8.67 (220)	9.85 (250)	7.41 (188)	126
			460	184TC	42.25 (1073)	21.54 (547)	20.71 (526)	8.67 (220)	9.85 (250)	7.41 (188)	136
MTRE 5-20/20	7.5	3	208-230	215TC	46.50 (1181)	25.79 (655)	20.71 (526)	7.01 (178)	9.85 (250)	6.58 (167)	148
			460	215TC	46.50 (1181)	25.79 (655)	20.71 (526)	7.01 (178)	9.85 (250)	6.58 (167)	157
MTRE 5-24/24	7.5	3	208-230	215TC	50.75 (1289)	30.04 (763)	20.71 (526)	7.01 (178)	9.85 (250)	6.58 (167)	223
			460	215TC	50.75 (1289)	30.04 (763)	20.71 (526)	7.01 (178)	9.85 (250)	6.58 (167)	232

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

Dimensional sketch



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MTR, MTRI 10

Pump type	P_2 [Hp]	MTR, MTRI 10 dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 10-2/1	1	18.94 (481)	5.83 (148)	13.11 (333)	5.56 (141)	6.50 (165)	4.57 (116)	58
MTR 10-2/2	2	22.72 (577)	5.83 (148)	16.89 (429)	7.01 (178)	6.50 (165)	4.34 (110)	80
MTR 10-3/3	3	27.28 (693)	7.01 (178)	20.28 (515)	7.01 (178)	9.85 (250)	4.34 (110)	99
MTR 10-4/4	5	30.75 (781)	8.19 (208)	22.56 (573)	8.67 (220)	9.85 (250)	5.28 (134)	139
MTR 10-5/5	5	31.93 (811)	9.37 (238)	22.56 (573)	8.67 (220)	9.85 (250)	5.28 (134)	139
MTR 10-6/6	5	33.11 (841)	10.55 (268)	22.56 (573)	8.67 (220)	9.85 (250)	5.28 (134)	140
MTR 10-7/7	7.5	34.41 (874)	11.73 (298)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	236
MTR 10-8/8	7.5	35.59 (904)	12.91 (328)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	236
MTR 10-9/9	7.5	36.77 (934)	14.09 (358)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	236
MTR 10-10/10	10	37.95 (964)	15.28 (388)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	236
MTR 10-12/12	10	40.31 (1024)	17.64 (448)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	236
MTR 10-14/14	15	45.98 (1168)	20.00 (508)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	334
MTR 10-16/16	15	48.35 (1228)	22.36 (568)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	334
MTR 10-18/17	15	50.47 (1282)	24.49 (622)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	334
MTR 10-20/17	15	53.07 (1348)	27.09 (688)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	335
MTR 10-22/17	15	55.43 (1408)	29.45 (748)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	335

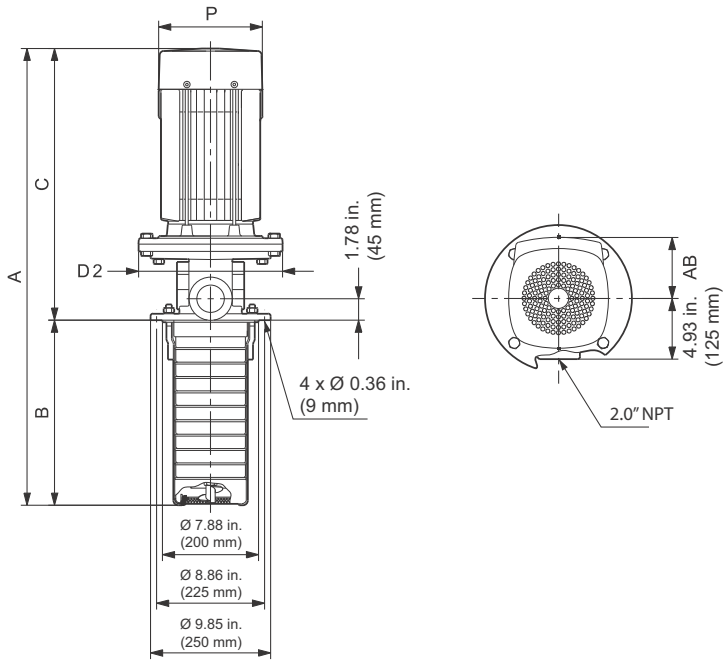
For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 10

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 10-2/2	2	1	200-240	56C	20.60 (523)	5.83 (148)	14.77 (375)	4.81 (122)	6.50 (165)	6.23 (158)	69
		3	208-230	56C	24.30 (617)	5.83 (148)	18.47 (469)	7.01 (178)	6.50 (165)	6.58 (167)	97
			440-480	56C	22.17 (563)	5.83 (148)	16.34 (415)	4.81 (122)	6.50 (165)	6.23 (158)	73
MTRE 10-3/3	3	3	208-230	182TC	27.37 (695)	7.01 (178)	20.36 (517)	7.01 (178)	9.85 (250)	6.58 (167)	116
			440-480	182TC	23.35 (593)	7.01 (178)	16.34 (415)	4.81 (122)	6.50 (165)	6.23 (158)	76
MTRE 10-5/5	5	3	208-230	184TC	31.93 (811)	9.38 (238)	22.56 (573)	8.67 (220)	9.85 (250)	7.41 (188)	142
			460	184TC	31.93 (811)	9.38 (238)	22.56 (573)	8.67 (220)	9.85 (250)	7.41 (188)	152
MTRE 10-6/6	5	3	208-230	184TC	33.12 (841)	10.56 (268)	22.56 (573)	8.67 (220)	9.85 (250)	7.41 (188)	142
			460	184TC	33.12 (841)	10.56 (268)	22.56 (573)	8.67 (220)	9.85 (250)	7.41 (188)	152
MTRE 10-8/8	7.5	3	208-230	215TC	35.60 (904)	12.92 (328)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	237
			460	215TC	35.60 (904)	12.92 (328)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	245
MTRE 10-9/9	7.5	3	208-230	215TC	36.78 (934)	14.10 (358)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	237
			460	215TC	36.78 (934)	14.10 (358)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	246
MTRE 10-10/10	10	3	460	215TC	37.60 (955)	15.28 (388)	22.33 (567)	13.39 (340)	9.85 (250)	12.13 (308)	276
MTRE 10-12/12	10	3	460	215TC	39.97 (1015)	17.64 (448)	22.33 (567)	13.39 (340)	9.85 (250)	12.13 (308)	276
MTRE 10-14/14	15	3	460	254TC	45.95 (1167)	20.01 (508)	25.95 (659)	13.39 (340)	9.85 (250)	12.13 (308)	415
MTRE 10-18/17	15	3	460	254TC	50.44 (1281)	24.49 (622)	25.95 (659)	13.39 (340)	9.85 (250)	12.13 (308)	416

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

Dimensional sketch



TM06 4020 1415

MTR, MTRI 15

Pump type	P2 [Hp]	MTR, MTRI dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 15-2/1	2	23.90 (607)	7.01 (178)	16.89 (429)	7.01 (178)	6.50 (165)	4.34 (110)	82
MTR 15-2/2	5	29.57 (751)	7.01 (178)	22.56 (573)	8.67 (220)	9.85 (250)	5.28 (134)	141
MTR 15-3/3	7.5	31.46 (799)	8.78 (223)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	237
MTR 15-4/4	7.5	33.23 (844)	10.55 (268)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	238
MTR 15-5/5	10	35.00 (889)	12.32 (313)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	238
MTR 15-6/6	15	40.08 (1018)	14.09 (358)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	335
MTR 15-7/7	15	41.85 (1063)	15.87 (403)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	335
MTR 15-8/8	15	43.62 (1108)	17.64 (448)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	336
MTR 15-10/10	20	47.17 (1198)	21.18 (538)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	336
MTR 15-12/12	25	54.21 (1377)	24.72 (628)	29.49 (749)	12.96 (329)	11.23 (285)	11.54 (293)	378
MTR 15-14/12	25	57.76 (1467)	28.27 (718)	29.49 (749)	12.96 (329)	11.23 (285)	11.54 (293)	379
MTR 15-16/12	25	61.30 (1557)	31.81 (808)	29.49 (749)	12.96 (329)	11.23 (285)	11.54 (293)	379
MTR 15-17/12	25	63.07 (1602)	33.58 (853)	29.49 (749)	12.96 (329)	11.23 (285)	11.54 (293)	380

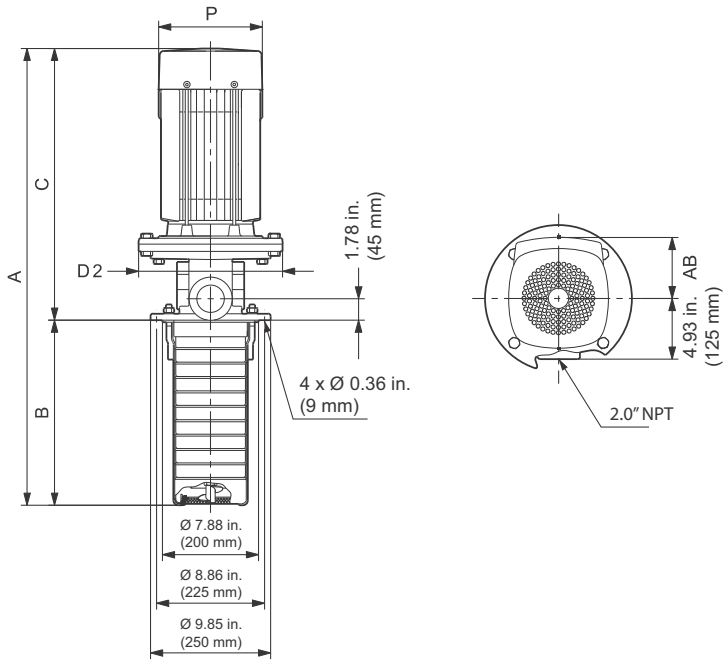
For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 15

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 15-2/1	2	1	200-240	56C	21.78 (553)	7.01 (178)	14.77 (375)	4.81 (122)	6.50 (165)	6.23 (158)	71
		1	208-230	56C	25.48 (647)	7.01 (178)	18.47 (469)	7.01 (178)	6.50 (165)	6.58 (167)	99
		3	440-480	56C	23.35 (593)	7.01 (178)	16.34 (415)	4.81 (122)	6.50 (165)	6.23 (158)	75
MTRE 15-2/2	5	3	208-230	184TC	29.57 (751)	7.01 (178)	22.56 (573)	8.67 (220)	9.85 (250)	7.41 (188)	144
		3	460	184TC	29.57 (751)	7.01 (178)	22.56 (573)	8.67 (220)	9.85 (250)	7.41 (188)	154
MTRE 15-3/3	7.5	3	208-230	215TC	31.46 (799)	8.78 (223)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	238
		3	460	215TC	31.46 (799)	8.78 (223)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	247
MTRE 15-4/4	7.5	3	208-230	215TC	33.23 (844)	10.56 (268)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	238
		3	460	215TC	33.23 (844)	10.56 (268)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	247
MTRE 15-5/5	10	3	460	215TC	34.65 (880)	12.33 (313)	22.33 (567)	13.39 (340)	9.85 (250)	12.13 (308)	278
MTRE 15-8/8	15	3	460	254TC	43.59 (1107)	17.64 (448)	25.95 (659)	13.39 (340)	9.85 (250)	12.13 (308)	417
MTRE 15-10/10	20	3	460	256TC	47.13 (1197)	21.19 (538)	25.95 (659)	13.39 (340)	9.85 (250)	12.13 (308)	422
MTRE 15-12/12	25	3	460	284TC	54.18 (1376)	24.73 (628)	29.45 (748)	13.39 (340)	11.23 (285)	12.13 (308)	464

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

Dimensional sketch



TM06 4020 1415

MTR, MTRI 20

Pump type	P2 [Hp]	MTR, MTRI 20 dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 20-2/1	3	27.28 (693)	7.01 (178)	20.28 (515)	7.01 (178)	9.85 (250)	4.34 (110)	102
MTR 20-2/2	5	29.57 (751)	7.01 (178)	22.56 (573)	8.67 (220)	9.85 (250)	5.28 (134)	141
MTR 20-3/3	7.5	31.46 (799)	8.78 (223)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	237
MTR 20-4/4	10	33.23 (844)	10.55 (268)	22.68 (576)	8.67 (220)	9.85 (250)	5.28 (134)	238
MTR 20-5/5	15	38.31 (973)	12.32 (313)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	335
MTR 20-6/6	15	40.08 (1018)	14.09 (358)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	335
MTR 20-7/7	20	41.85 (1063)	15.87 (403)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	335
MTR 20-8/8	20	43.62 (1108)	17.64 (448)	25.98 (660)	10.08 (256)	9.85 (250)	8.55 (217)	336
MTR 20-10/10	25	50.67 (1287)	21.18 (538)	29.49 (749)	12.96 (329)	11.23 (285)	11.54 (293)	378
MTR 20-12/10	25	54.21 (1377)	24.72 (628)	29.49 (749)	12.96 (329)	11.23 (285)	11.54 (293)	378
MTR 20-14/10	25	57.76 (1467)	28.27 (718)	29.49 (749)	12.96 (329)	11.23 (285)	11.54 (293)	379
MTR 20-16/10	25	61.30 (1557)	31.81 (808)	29.49 (749)	12.96 (329)	11.23 (285)	11.54 (293)	379
MTR 20-17/10	25	63.07 (1602)	33.58 (853)	29.49 (749)	12.96 (329)	11.23 (285)	11.54 (293)	380

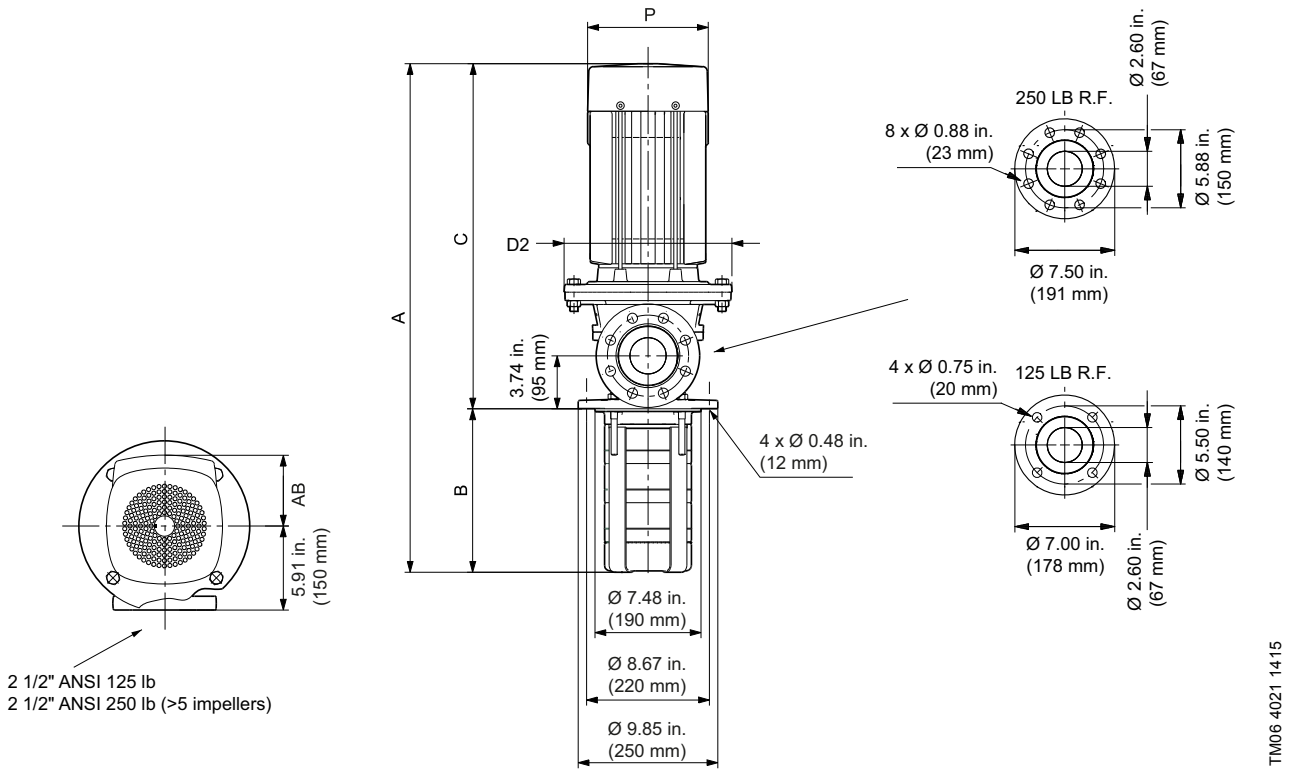
For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 20

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 20-2/1	3	3	208-230	182TC	27.37 (695)	7.01 (178)	20.36 (517)	7.01 (178)	9.85 (250)	6.58 (167)	282
MTRE 20-2/2	5	3	208-230	184TC	29.57 (751)	7.01 (178)	22.56 (573)	8.67 (220)	9.85 (250)	7.41 (188)	144
			460	184TC	29.57 (751)	7.01 (178)	22.56 (573)	8.67 (220)	9.85 (250)	7.41 (188)	154
MTRE 20-3/3	7.5	3	208-230	215TC	31.46 (799)	8.78 (223)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	238
			460	215TC	31.46 (799)	8.78 (223)	22.68 (576)	7.01 (178)	9.85 (250)	6.58 (167)	247
MTRE 20-4/4	10	3	460	215TC	32.88 (835)	10.56 (268)	22.33 (567)	13.39 (340)	9.85 (250)	12.13 (308)	277
MTRE 20-6/6	15	3	460	254TC	40.04 (1017)	14.10(358)	25.95 (659)	13.39 (340)	9.85 (250)	12.13 (308)	417
MTRE 20-8/8	20	3	460	256TC	43.59 (1107)	17.64 (448)	25.95 (659)	13.39 (340)	9.85 (250)	12.13 (308)	422
MTRE 20-10/10	25	3	460	284TC	50.63 (1286)	21.19 (538)	29.45 (748)	13.39 (340)	11.23 (285)	12.13 (308)	464

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

Dimensional sketch



MTR, MTRI 32

Pump type	P2 [Hp]	MTR, MTRI 32 dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 32-2/1-1	5	32.52 (826)	8.78 (223)	23.74 (603)	8.67 (220)	8.94 (227)	5.28 (134)	256
MTR 32-2/1	5	32.52 (826)	8.78 (223)	23.74 (603)	8.67 (220)	8.94 (227)	5.28 (134)	256
MTR 32-2/2-1	7.5	32.52 (826)	8.78 (223)	23.74 (603)	8.67 (220)	8.94 (227)	5.28 (134)	267
MTR 32-2/2	10	32.52 (826)	8.78 (223)	23.74 (603)	8.67 (220)	8.94 (227)	5.28 (134)	267
MTR 32-3/3	15	38.59 (980)	11.54 (293)	27.05 (687)	12.37 (314)	8.94 (227)	8.04 (204)	365
MTR 32-4/4	20	41.34 (1050)	14.29 (363)	27.05 (687)	12.37 (314)	8.94 (227)	8.04 (204)	365
MTR 32-5/5	20	44.10 (1120)	17.05 (433)	27.05 (687)	12.37 (314)	8.94 (227)	8.04 (204)	366
MTR 32-6/6	25	50.79 (1290)	19.80 (503)	30.98 (787)	12.37 (314)	11.26 (286)	8.04 (204)	400
MTR 32-7/7	30	53.55 (1360)	22.56 (573)	30.98 (787)	12.37 (314)	11.26 (286)	8.04 (204)	427
MTR 32-8/8	40	56.50 (1435)	25.31 (643)	31.18 (792)	15.56 (395)	11.26 (286)	13.12 (333)	610
MTR 32-9/9	40	59.26 (1505)	28.07 (713)	31.18 (792)	15.56 (395)	11.26 (286)	13.12 (333)	611
MTR 32-10/10	40	62.01 (1575)	30.83 (783)	31.18 (792)	15.56 (395)	11.26 (286)	13.12 (333)	612

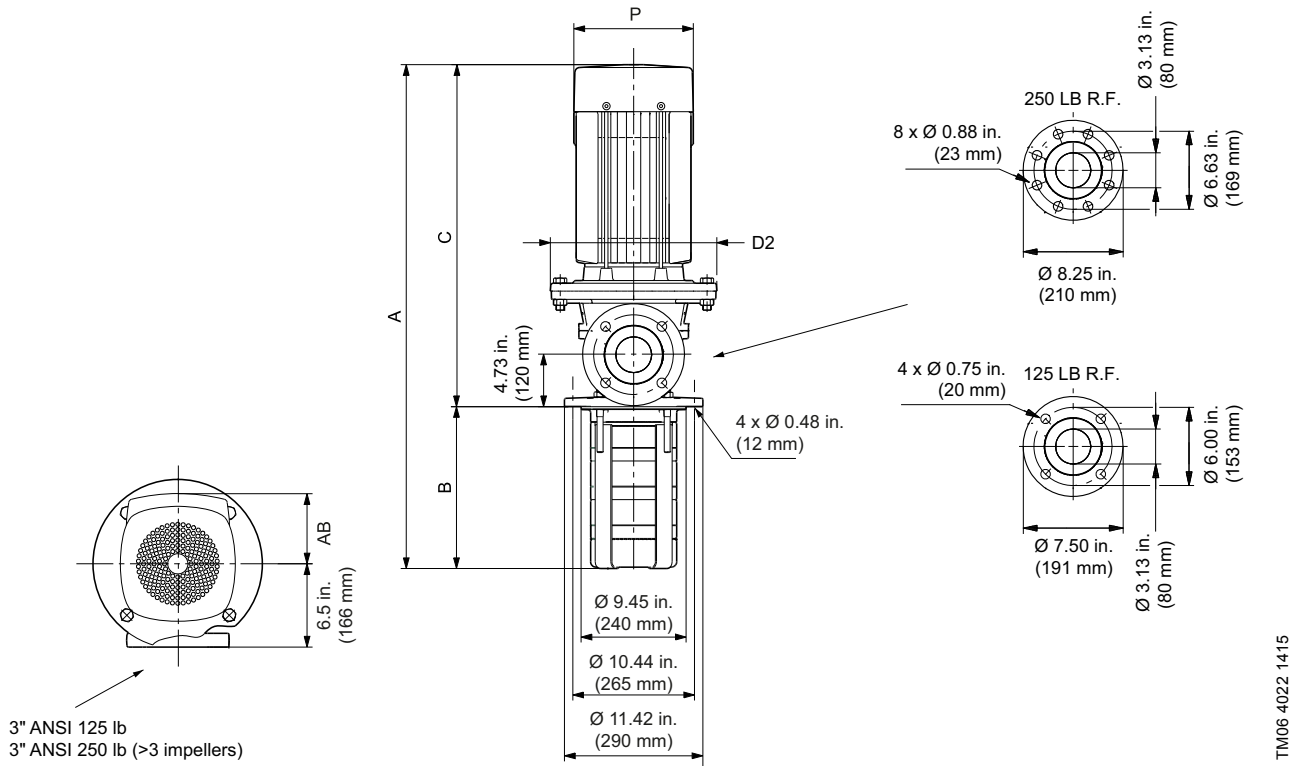
For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 32

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 32-2/1	5	3	208-230	184TC	32.52 (826)	8.78 (223)	23.75 (603)	8.67 (220)	8.94 (227)	7.41 (188)	258
			460	184TC	32.52 (826)	8.78 (223)	23.75 (603)	8.67 (220)	8.94 (227)	7.41 (188)	268
MTRE 32-2/2-1	7.5	3	208-230	215TC	32.52 (826)	8.78 (223)	23.75 (603)	7.01 (178)	8.94 (227)	6.58 (167)	268
			460	215TC	32.52 (826)	8.78 (223)	23.75 (603)	7.01 (178)	8.94 (227)	6.58 (167)	276
MTRE 32-2/2	10	3	460	215TC	32.17 (817)	8.78 (223)	23.39 (594)	13.39 (340)	8.94 (227)	12.13 (308)	307
MTRE 32-3/3	15	3	460	254TCZ	38.55 (979)	11.54 (293)	27.01 (686)	13.39 (340)	8.94 (227)	12.13 (308)	446
MTRE 32-4/4	20	3	460	256TCZ	41.30 (1049)	14.30 (363)	27.01 (686)	13.39 (340)	8.94 (227)	12.13 (308)	451
MTRE 32-5/5	20	3	460	256TCZ	44.06 (1119)	17.05 (433)	27.01 (686)	13.39 (340)	8.94 (227)	12.13 (308)	452
MTRE 32-6/6	25	3	460	284TSCZ	50.75 (1289)	19.81 (503)	30.95 (786)	13.39 (340)	11.26 (286)	12.13 (308)	487
MTRE 32-7/7	30	3	460	286TSCZ	53.51 (1359)	22.56 (573)	30.95 (786)	13.39 (340)	11.26 (286)	12.13 (308)	514

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

Dimensional sketch



MTR, MTRI 45

Pump type	P_2 [Hp]	MTR, MTRI 45 dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 45-2/1	15	34.57 (878)	9.61 (244)	24.96 (634)	8.67 (220)	8.94 (227)	5.28 (134)	287
MTR 45-2/2	15	37.88 (962)	9.61 (244)	28.27 (718)	12.37 (314)	8.94 (227)	8.04 (204)	384
MTR 45-3/3-2	20	41.03 (1042)	12.76 (324)	28.27 (718)	12.37 (314)	8.94 (227)	8.04 (204)	384
MTR 45-3/3	25	44.97 (1142)	12.76 (324)	32.20 (818)	12.37 (314)	11.26 (286)	8.04 (204)	418
MTR 45-4/4	30	48.12 (1222)	15.91 (404)	32.20 (818)	12.37 (314)	11.26 (286)	8.04 (204)	445
MTR 45-5/5	40	51.46 (1307)	19.06 (484)	32.40 (823)	15.56 (395)	11.26 (286)	13.12 (333)	628
MTR 45-12/5	40	73.51 (1867)	41.10 (1044)	32.40 (823)	15.56 (395)	11.26 (286)	13.12 (333)	633

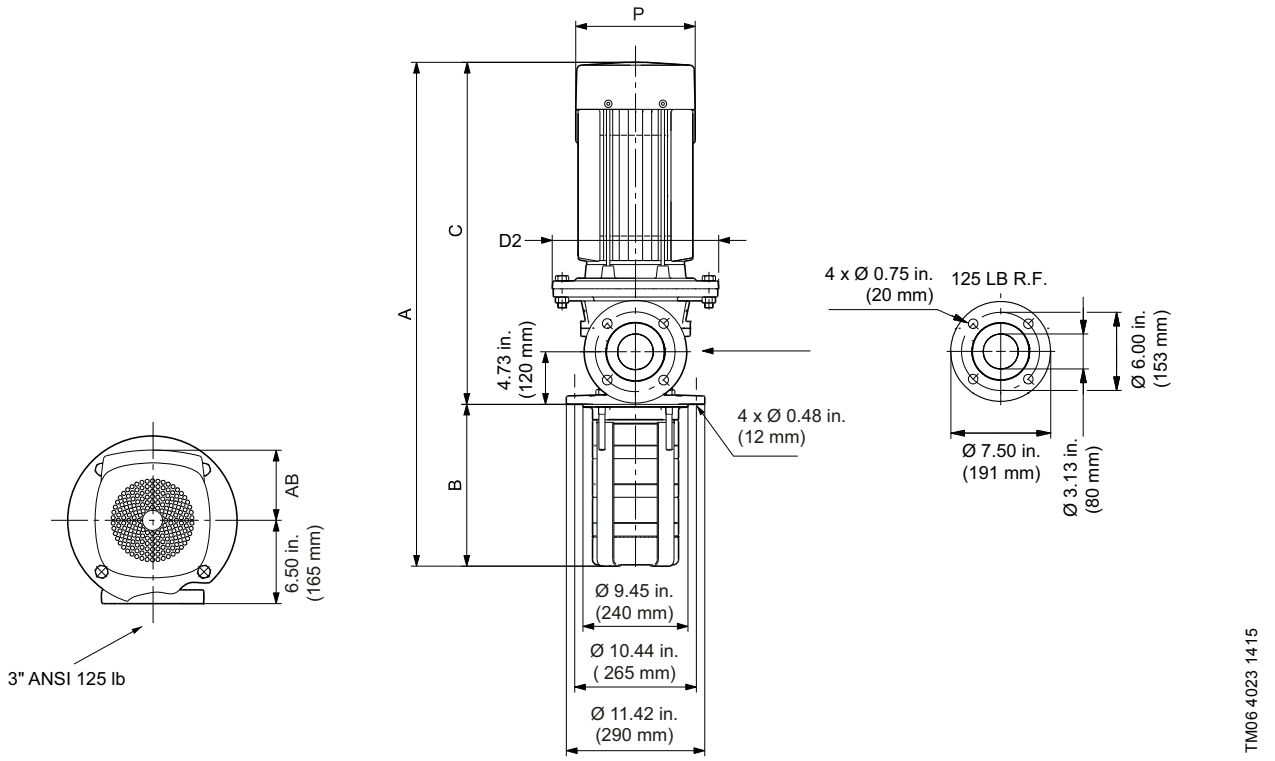
For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 45

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 45-2/1-1	7.5	3	208-230	215TC	34.57 (878)	9.61 (244)	24.97 (634)	7.01 (178)	8.94 (227)	6.58 (167)	287
			460	215TC	34.57 (878)	9.61 (244)	24.97 (634)	7.01 (178)	8.94 (227)	6.58 (167)	296
MTRE 45-2/1	10	3	460	215TC	34.22 (869)	9.61 (244)	24.61 (625)	13.39 (340)	8.94 (227)	12.13 (308)	326
MTRE 45-2/2	15	3	460	254TC	37.84 (961)	9.61 (244)	28.23 (717)	13.39 (340)	8.94 (227)	12.13 (308)	465
MTRE 45-3/3-2	20	3	460	256TC	40.99 (1041)	12.76 (324)	28.23 (717)	13.39 (340)	8.94 (227)	12.13 (308)	470
MTRE 45-3/3	25	3	460	284TC	44.93 (1141)	12.76 (324)	32.17 (817)	13.39 (340)	11.26 (286)	12.13 (308)	504
MTRE 45-4/4-2	30	3	460	286TC	48.08 (1221)	15.91 (404)	32.17 (817)	13.39 (340)	11.26 (286)	12.13 (308)	532
MTRE 45-4/4	30	3	460	286TC	48.08 (1221)	15.91 (404)	32.17 (817)	13.39 (340)	11.26 (286)	12.13 (308)	532

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

Dimensional sketch



MTR, MTRI 64

Pump type	P_2 [Hp]	MTR, MTRI 64 dimensions [in. (mm)]						Ship weight [lb]
		A	B	C	P	D2	AB	
MTR 64-2/1-1	10	34.77 (883)	9.80 (249)	24.96 (634)	8.67 (220)	8.94 (227)	5.28 (134)	292
MTR 64-2/1	15	38.08 (967)	9.80 (249)	28.27 (718)	12.37 (314)	8.94 (227)	8.04 (204)	389
MTR 64-2/2-2	20	38.08 (967)	9.80 (249)	28.27 (718)	12.37 (314)	8.94 (227)	8.04 (204)	389
MTR 64-2/2-1	20	38.08 (967)	9.80 (249)	28.27 (718)	12.37 (314)	8.94 (227)	8.04 (204)	389
MTR 64-2/2	25	42.01 (1067)	9.80 (249)	32.20 (818)	12.37 (314)	11.26 (286)	8.04 (204)	423
MTR 64-3/3-2	30	45.28 (1150)	13.07 (332)	32.20 (818)	12.37 (314)	11.26 (286)	8.04 (204)	450
MTR 64-3/3-1	40	45.48 (1155)	13.07 (332)	32.40 (823)	15.56 (395)	11.26 (286)	13.12 (333)	633
MTR 64-3/3	40	45.48 (1155)	13.07 (332)	32.40 (823)	15.56 (395)	11.26 (286)	13.12 (333)	633
MTR 64-4/4-2	40	48.71 (1237)	16.30 (414)	32.40 (823)	15.56 (395)	11.26 (286)	13.12 (333)	633
MTR 64-12/4-2	40	74.69 (1897)	42.28 (1074)	32.40 (823)	15.56 (395)	11.26 (286)	13.12 (333)	639

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTRE, MTRIE 64

Pump type	P2 [Hp]	Ph	Voltage [V]	NEMA frame size	MTRE, MTRIE dimensions [in. (mm)]						Ship weight [lb]
					A	B	C	P	D2	AB	
MTRE 64-2/1-1	10	3	460	215TC	34.41 (874)	9.81 (249)	24.61 (625)	13.39 (340)	8.94 (227)	12.13 (308)	332
MTRE 64-2/1	15	3	460	254TCZ	38.04 (966)	9.81 (249)	28.23 (717)	13.39 (340)	8.94 (227)	12.13 (308)	471
MTRE 64-2/2-2	20	3	460	256TCZ	38.04 (966)	9.81 (249)	28.23 (717)	13.39 (340)	8.94 (227)	12.13 (308)	475
MTRE 64-2/2-1	20	3	460	256TCZ	38.04 (966)	9.81 (249)	28.23 (717)	13.39 (340)	8.94 (227)	12.13 (308)	475
MTRE 64-2/2	25	3	460	284TSCZ	41.97 (1066)	9.81 (249)	32.17 (817)	13.39 (340)	11.26 (286)	12.13 (308)	509
MTRE 64-3/3-2	30	3	460	286TSCZ	45.24 (1149)	13.08 (332)	32.17 (817)	13.39 (340)	11.26 (286)	12.13 (308)	536

For information about electrical data see "*MTR(E) motor data*" on page 63 and 64.

MTR(E) motor data

MTR

TEFC motors

(Totally Enclosed Fan Cooled, constant speed)

Hp	PH	Frame	S.F.	Voltage [V]	Mtr. Eff. [%]	Insul. class	KVA code	Full load current [A]	Service Factor current [A]	Start current [A]	Motor type
0.33	1	56C	1.35	115/230	55	B	K	6.0/3.0	7.6/3.8	28/14	Baldor
	3	56C	1.35	208-230/460	78.5	F	L	1.12-1.1/0.55	1.5-1.45/0.75	7.1-7.7/3.9	ML
0.5	1	56C	1.6	115/230	62	B	K	7.4/3.7	9.8/4.9	39/19.5	Baldor
	3	56C	1.25	208-230/460	78.5	F	K	1.64-1.55/0.78	2.0-1.9/0.95	9.7-10.1/5.1	ML
0.75	1	56C	1.25	115/230	66	B	K	9.6/4.8	11.4/5.7	56/28	Baldor
	3	56C	1.25	208-230/460	79	F	K	2.4-2.3/1.2	2.9-2.75/1.4	14.2-15/7.8	ML
1	1	56C	1.25	115/230	66	B	K	12/6.0	14.4/7.2	77/38.5	Baldor
	3	56C	1.25	208-230/460	80	F	J	3.25-3.35/1.68	4.0-3.9/1.95	19.2-21.8/10.9	ML
1.5	1	56C	1.3	115/208-230	71	B	K	17/9.5-8.6	20.4/11.3-10.2	106/58.6-53	Baldor
	3	56C	1.15	208-230/460	84	F	M	4.7-4.6/2.3	5.2-5.1/2.55	33.8-36.8/18.4	ML
2	1	56C	1.15	115/208-230	74	F	K	23/12.7-11.5	25.4/14.0-12.7	156/86-78	Baldor
	3	56C	1.15	208-230/460	85.5	F	G	5.7-5.4/2.7	6.55-6.1/3.05	46.2-48.6/24.3	ML
3	1	182TC	1.15	115/208-230	75	F	H	29/16-14.5	31.8/18-15.9	170/94-85	Baldor
	3	182TC	1.15	208-230/460	86.5	F	M	8.4-7.7/3.9	9.5-8.6/4.3	79.0-80.1/40.6	ML
5	1	213TCZ	1.15	208-230	80	F	J	24-22	27-25	188-170	Baldor
	3	182TC	1.15	208-230/460	88.5	F	L	13.8-13.0/6.5	15.6-14.6/7.3	124-129/64.4	ML
7.5	1	213TC	1.15	208-230	82	F	F	33.8-31	38.5-35.5	244-220	Baldor
	3	213TC	1.15	208-230/460	90	F	N	20.4-19.4/9.7	23-21.5/10.8	192-202/101	ML
10	1	213TC	1.15	230	85.5	F	F	40	46	284	Baldor
	3	213TC	1.15	208-230/460	90.2	F	L	26.5-25.5/12.8	30.5-28.5/14.5	239-252/127	Baldor
15	3	254TCZ	1.15	208-230/460	90.2	F	K	37.5-34/17	42.5-39/19.5	270-304/152	Baldor
20	3	254TCZ	1.15	208-230/460	90.2	F	K	47-46/23	53-52/26	355-412/206	Baldor
25	3	284TSCZ	1.15	230/460	91	F	J	56/28	64/32	498/249	Baldor
30	3	286TSCZ	1.15	230/460	91	F	G	70/35	78/39	450/225	Baldor
40	3	286TSC	1.15	230/460	91.7	F	G	88/44	102/51	614/307	Baldor

Baldor motor

TM02 7696 3803

ML motor

TM06 0504 2604

Notes:

1. The information in this chart applies to **Grundfos ML motors and Grundfos specified Baldor® motors.**
   ML motors: Three-phase, 0.33 Hp to 7.5 Hp
   Baldor motors: Single phase, to 10 Hp; and Three-phase, 10 Hp to 40 Hp.
   Grundfos MTR pumps are supplied with heavy-duty 2-pole, NEMA C-frame motors built or selected to our rigid specifications. All MTR pump motors have heavy-duty bearings in them for maximum thrust requirements.
   It is not recommended that an off-the-shelf standard Baldor motor be used on a Grundfos pump. Ideally, the best motor choice would be the Grundfos specified motor.
2. Other motor types are available (i.e., Explosion proof, Mill and Chem duty, High Efficiency, etc.), consult local Grundfos company for more information.
3. Pumps supplied by Grundfos Canada are normally supplied with motors from other manufacturers. 575 volt motors meet EPAct/NRC efficiency standards. Dimensions and data will vary, contact local Grundfos company for more information.
4. All values are subject to change without notice.

ODP motors

(Open Drip Proof, constant speed)

Hp	Ph	ODP Frame	ODP S.F.	ODP voltage	ODP mtr. eff. %	ODP insul. class	ODP KVA code	ODP full load current	ODP service factor current	ODP start current	Baldor motor
15	3	254TCZ	1.15	208-230/460	89.5	F	H	37-35/17.5	40-39.4/19.7	225-248/124	
20	3	254TC	1.15	230/460	90.2	B	G	48/24	55/27.5	306/153	
25	3	284TSCZ	1.15	208-230/460	91	B	G	64-59/29.5	74-67/33.5	335-374/187	
30	3	284TSC	1.15	230/460	91	F	H	70/35	80/40	480/240	
40	3	286TSCZ	1.15	230/460	91.7	F	F	94/47	108/54	542/271	
50	3	324TSCZ	1.15	230/460	92.4	F	G	116/58	134/67	732/366	
60	3	324TSCZ	1.15	230/460	93	B	G	132/66	152/76	876/438	

TM02 7696 3703

MLE motors

(Integrated variable frequency drive)

2 pole

Hp	Short type designation	Voltage [V]	Ph	NEMA frame Size	Service Factor	Motor full load efficiency [%]	Full load current amps** [A]	Service factor current amps [A]	Power factor	Full load speed [rpm]	Sound pressure level [dB(A)]
0.33[1)]	MLE071A2HA	200-240	1	56C	1	81.0	2.4 - 2.1	-	0.96	3400	58
0.75[1)]	MLE071A2HA	200-240	1	56C	1	84.0	3.4 - 2.9	-	0.98	3400	58
1[1)]	MLE080A2HA	200-240	1	56C	1	85.0	4.6 - 3.8	-	0.99	3400	58
1[1)]	MLE080A2IA	440-480	3	56C	1.25	86.0	1.40	1.75	0.82	3480	58
1.5[1)]	MLE080B2HA	200-240	1	56C	1	87.5	6.55 - 5.45	-	0.99	3400	58
1.5[2)]	MLE90CC-2-56C-G	208-230	3	56C	1	82.5	4.35 - 4.05	-	0.94	3480	65
1.5[1)]	MLE080B2IA	440-480	3	56C	1.15	88.5	1.90	2.10	0.85	3480	58
2[1)]	MLE090C2HA	200-240	1	56C	1	86.5	8.9 - 7.45		0.99	3400	64
2[2)]	MLE90CC-2-56C-G	208-230	3	56C	1	84	5.75 - 5.25	-	0.95	3460	70
2[1)]	MLE090C2IA	440-480	3	56C	1.15	88.0	2.60	2.90	0.87	3480	64
3[2)]	MLE90FA-2-182TC-G	208-230	3	182TC	1	85.5	8.3 - 7.6	-	0.95	3460	70
3[1)]	MLE090D2IA	440-480	3	182TC	1.15	89.0	3.70	4.25	0.89	3480	64
5[2)]	MLE112CA-2-184TC-G	208-230	3	184TC	1	87.5	13.8 - 13.3	-	0.94	3470	75
5[2)]	MLE112CA-2-184TC-G	460-480	3	184TC	1.15	88.5	6.1	7	0.92	3470	75
7.5[2)]	MLE132DA-2-215TC-G	208-230	3	215TC	1	88.5	20.0 - 18.5	-	0.94	3450	80
7.5[2)]	MLE132DA-2-215TC-G	460-480	3	215TC	1.15	88.5	8.9	10.3	0.94	3470	80
10[2)]	MLE132FA-2-215TC-G	460-480	3	215TC	1.15	89.5	11.6	13.4	0.93	3500	80
15[2)]	MLE160AA-2-254TC-F	460-480	3	254TC	1.15	90.2	18	20.6	0.89	3500	68
20[2)]	MLE160AB-2-256TC-F	460-480	3	256TC	1.15	90.2	24	27.5	0.89	3540	68
25[2)]	MLE160AC-2-284TC-F	460-480	3	284TC	1.15	91	30.5	35	0.88	3540	70
30[2)]	MLE180AA-2-286TC-F	460-480	3	286TC	1.15	91	36.5	42	0.88	3540	70

1) Permanent magnet motor

2) Asynchronous motor

** At 460 volts for 460-480 volt motors

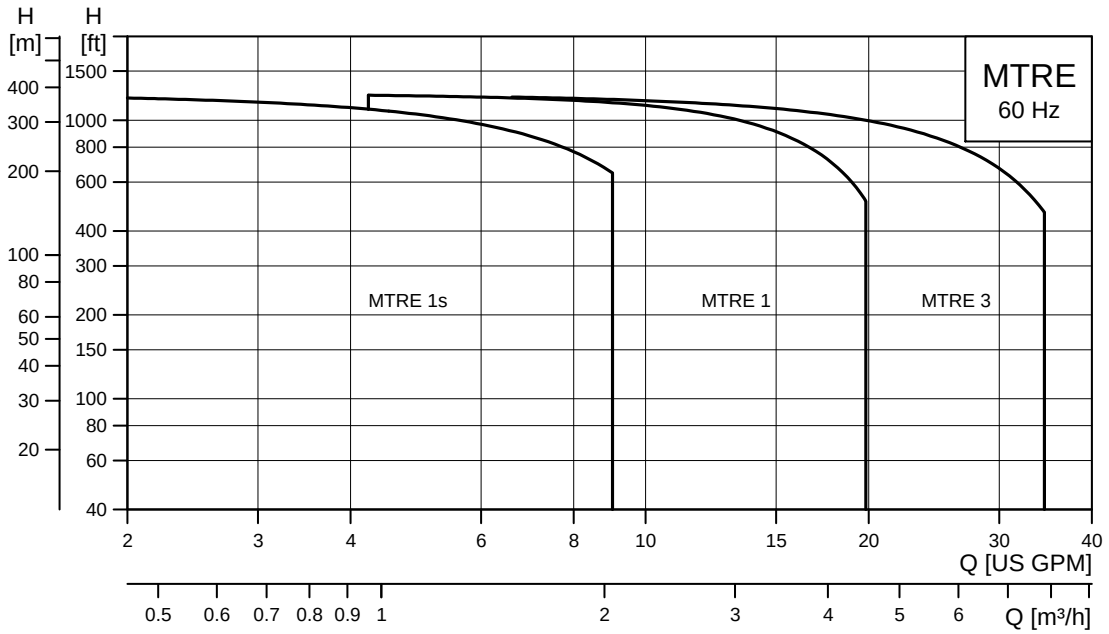
Immersion depths, MTR(E)

Number of chambers	Immersion depth [in. (mm)]									
	MTR(E) 1s	MTR(E) 1	MTR(E) 3	MTR(E) 5	MTR(E) 10	MTR(E) 15	MTR(E) 20	MTR(E) 32	MTR(E) 45	MTR(E) 64
1	-	-	-	-	-	-	-	-	-	-
2	6.30 (160)	6.30 (160)	6.30 (160)	6.66 (169)	5.83 (148)	7.01 (178)	7.01 (178)	8.78 (223)	9.61 (244)	9.81 (249)
3	7.01 (178)	7.01 (178)	7.01 (178)	7.72 (196)	7.01 (178)	8.78 (223)	8.78 (223)	11.54 (293)	12.76 (324)	13.08 (332)
4	7.72 (196)	7.72 (196)	7.72 (196)	8.78 (223)	8.19 (208)	10.56 (268)	10.56 (268)	14.30 (363)	15.91 (404)	16.30 (414)
5	8.43 (214)	8.43 (214)	8.43 (214)	9.85 (250)	9.38 (238)	12.33 (313)	12.33 (313)	17.05 (433)	19.06 (484)	19.57 (497)
6	9.14 (232)	9.14 (232)	9.14 (232)	10.91 (277)	10.56 (268)	14.10 (358)	14.10 (358)	19.81 (503)	22.21 (564)	22.80 (579)
7	9.85 (250)	9.85 (250)	9.85 (250)	11.97 (304)	11.74 (298)	15.87 (403)	15.87 (403)	22.56 (573)	25.36 (644)	26.07 (662)
8	10.56 (268)	10.56 (268)	10.56 (268)	13.04 (331)	12.92 (328)	17.64 (448)	17.64 (448)	25.32 (643)	28.51 (724)	29.30 (744)
9	11.26 (286)	11.26 (286)	11.26 (286)	14.10 (358)	14.10 (358)	19.41 (493)	19.41 (493)	28.08 (713)	31.66 (804)	32.56 (827)
10	11.97 (304)	11.97 (304)	11.97 (304)	15.16 (385)	15.28 (388)	21.19 (538)	21.19 (538)	30.83 (783)	34.81 (884)	35.79 (909)
11	12.68 (322)	12.68 (322)	12.68 (322)	16.23 (412)	-	22.96 (583)	22.96 (583)	33.59 (853)	37.96 (964)	39.06 (992)
12	13.39 (340)	13.39 (340)	13.39 (340)	17.29 (439)	17.64 (448)	24.73 (628)	24.73 (628)	36.34 (923)	41.11 (1044)	42.29 (1074)
13	14.10 (358)	14.10 (358)	14.10 (358)	18.35 (466)	-	26.50 (673)	26.50 (673)	39.10 (993)	44.26 (1124)	45.56 (1157)
14	14.81 (376)	14.81 (376)	14.81 (376)	19.41 (493)	20.01 (508)	28.27 (718)	28.27 (718)	41.86 (1063)	47.41 (1204)	48.78 (1239)
15	15.52 (394)	15.52 (394)	15.52 (394)	20.48 (520)	-	30.04 (763)	30.04 (763)	44.61 (1133)	50.56 (1284)	52.05 (1322)
16	16.23 (412)	16.23 (412)	16.23 (412)	21.54 (547)	22.37 (568)	31.82 (808)	31.82 (808)	47.37 (1203)	53.71 (1364)	55.28 (1404)
17	16.93 (430)	16.93 (430)	16.93 (430)	22.6 (574)	-	33.59 (853)	33.59 (853)	50.12 (1273)	56.86 (1444)	58.55 (1487)
18	17.64 (448)	17.64 (448)	17.64 (448)	23.67 (601)	24.73 (628)	35.36 (898)	35.36 (898)	52.88 (1343)	-	-
19	18.35 (466)	18.35 (466)	18.35 (466)	24.73 (628)	-	37.13 (943)	37.13 (943)	-	-	-
20	19.06 (484)	19.06 (484)	19.06 (484)	25.79 (655)	27.09 (688)	38.90 (988)	38.90 (988)	-	-	-
21	19.77 (502)	19.77 (502)	19.77 (502)	26.86 (682)	-	40.67 (1033)	40.67 (1033)	-	-	-
22	20.48 (520)	20.48 (520)	20.48 (520)	27.92 (709)	29.45 (748)	-	-	-	-	-
23	21.19 (538)	21.19 (538)	21.19 (538)	28.98 (736)	30.63 (778)	-	-	-	-	-
24	21.89 (556)	21.89 (556)	21.89 (556)	30.04 (763)	31.82 (808)	-	-	-	-	-
25	22.60 (574)	22.60 (574)	22.60 (574)	31.11 (790)	33.00 (838)	-	-	-	-	-
26	23.31 (592)	23.31 (592)	23.31 (592)	32.17 (817)	34.18 (868)	-	-	-	-	-
27	24.02 (610)	24.02 (610)	24.02 (610)	33.23 (844)	35.36 (898)	-	-	-	-	-
28	24.73 (628)	24.73 (628)	24.73 (628)	34.30 (871)	36.54 (928)	-	-	-	-	-
29	25.44 (646)	25.44 (646)	25.44 (646)	35.36 (898)	37.72 (958)	-	-	-	-	-
30	26.15 (664)	26.15 (664)	26.15 (664)	36.42 (925)	38.90 (988)	-	-	-	-	-
31	26.86 (682)	26.86 (682)	26.86 (682)	37.49 (952)	40.08 (1018)	-	-	-	-	-
32	27.56 (700)	27.56 (700)	27.56 (700)	38.55 (979)	-	-	-	-	-	-
33	28.27 (718)	28.27 (718)	28.27 (718)	39.61 (1006)	-	-	-	-	-	-
34	28.98 (736)	28.98 (736)	28.98 (736)	-	-	-	-	-	-	-
35	29.69 (754)	29.69 (754)	29.69 (754)	-	-	-	-	-	-	-
36	30.40 (772)	30.40 (772)	30.40 (772)	-	-	-	-	-	-	-
37	31.11 (790)	31.11 (790)	31.11 (790)	-	-	-	-	-	-	-
38	31.82 (808)	31.82 (808)	31.82 (808)	-	-	-	-	-	-	-
39	32.52 (826)	32.52 (826)	32.52 (826)	-	-	-	-	-	-	-
40	33.23 (844)	33.23 (844)	33.23 (844)	-	-	-	-	-	-	-
41	33.94 (862)	33.94 (862)	33.94 (862)	-	-	-	-	-	-	-
42	34.65 (880)	34.65 (880)	34.65 (880)	-	-	-	-	-	-	-
43	35.36 (898)	35.36 (898)	35.36 (898)	-	-	-	-	-	-	-
44	36.07 (916)	36.07 (916)	36.07 (916)	-	-	-	-	-	-	-
45	36.78 (934)	36.78 (934)	36.78 (934)	-	-	-	-	-	-	-
46	37.49 (952)	37.49 (952)	37.49 (952)	-	-	-	-	-	-	-
47	38.19 (970)	38.19 (970)	38.19 (970)	-	-	-	-	-	-	-
48	38.90 (988)	38.90 (988)	38.90 (988)	-	-	-	-	-	-	-
49	39.61 (1006)	39.61 (1006)	39.61 (1006)	-	-	-	-	-	-	-

E-variants

For high-pressure applications, Grundfos offers a unique MTR pump capable of generating up to 550 psi (38 bar).

These pumps are equipped with a high-speed motor, type MLE.



TM05 4989 3112

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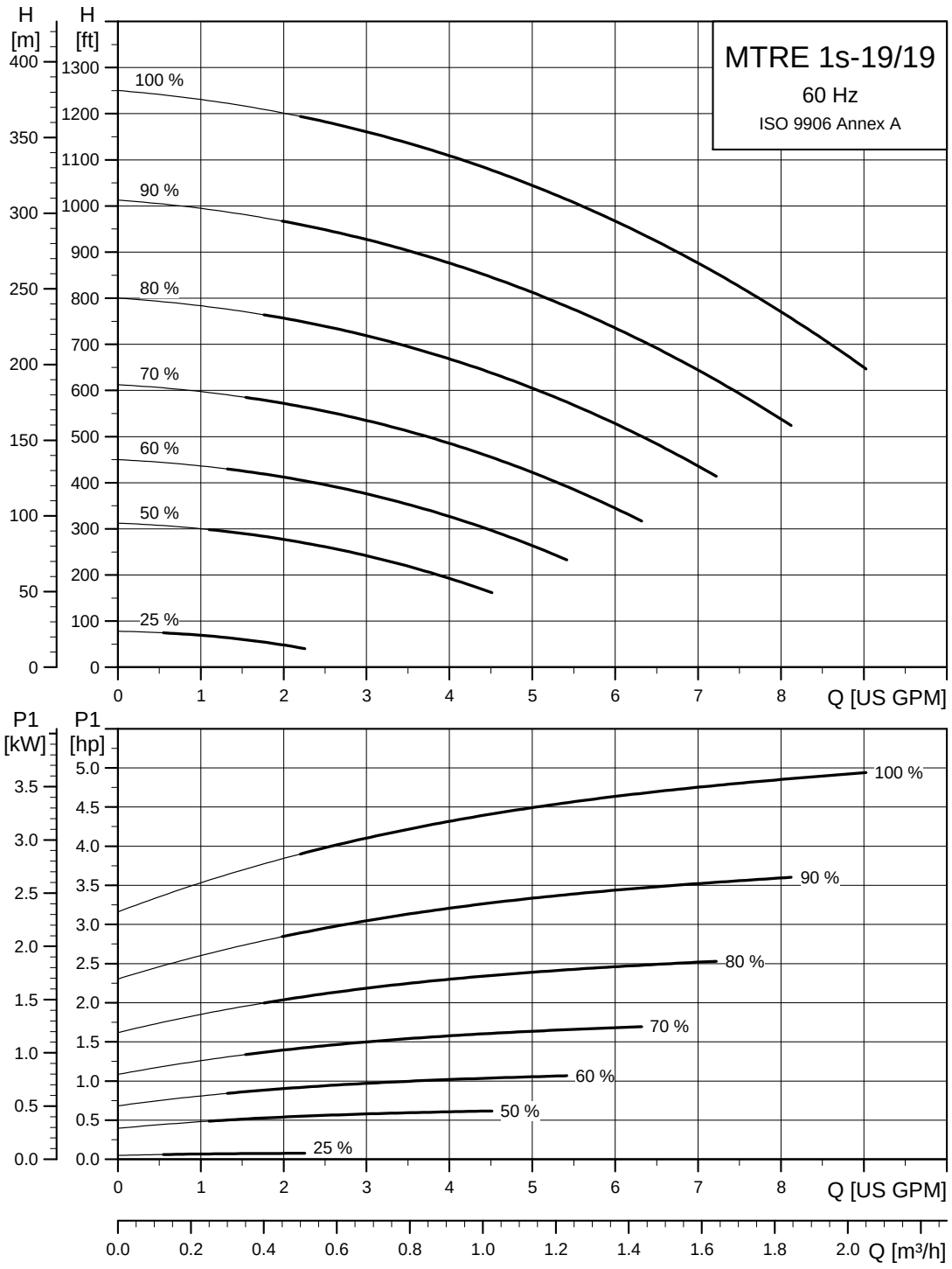
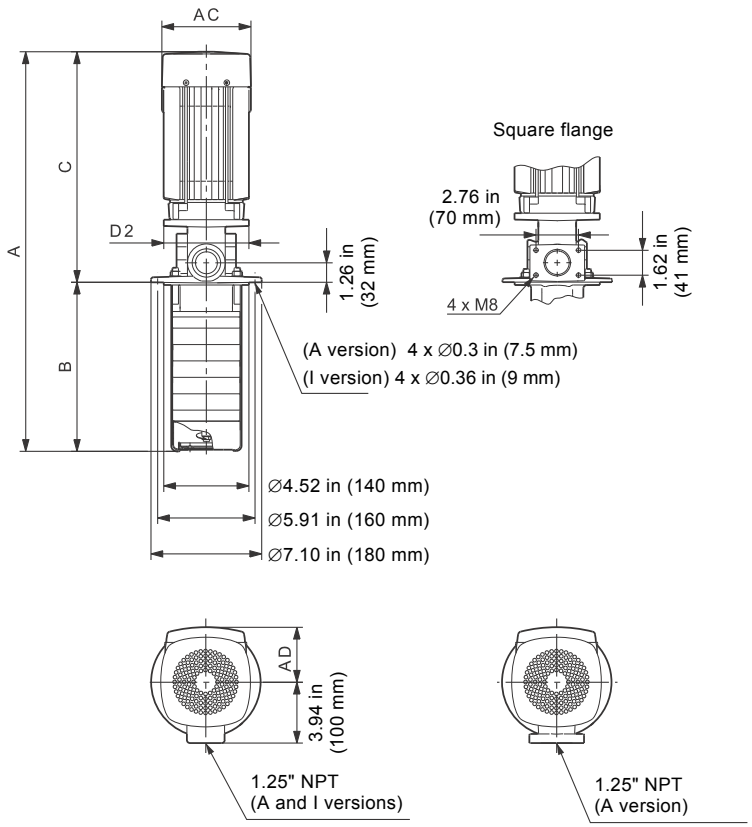
MTRE 1s high-pressure pump



TM05 4987 3112

Dimensional sketches



TM05 5147 3312

Dimensions and weight

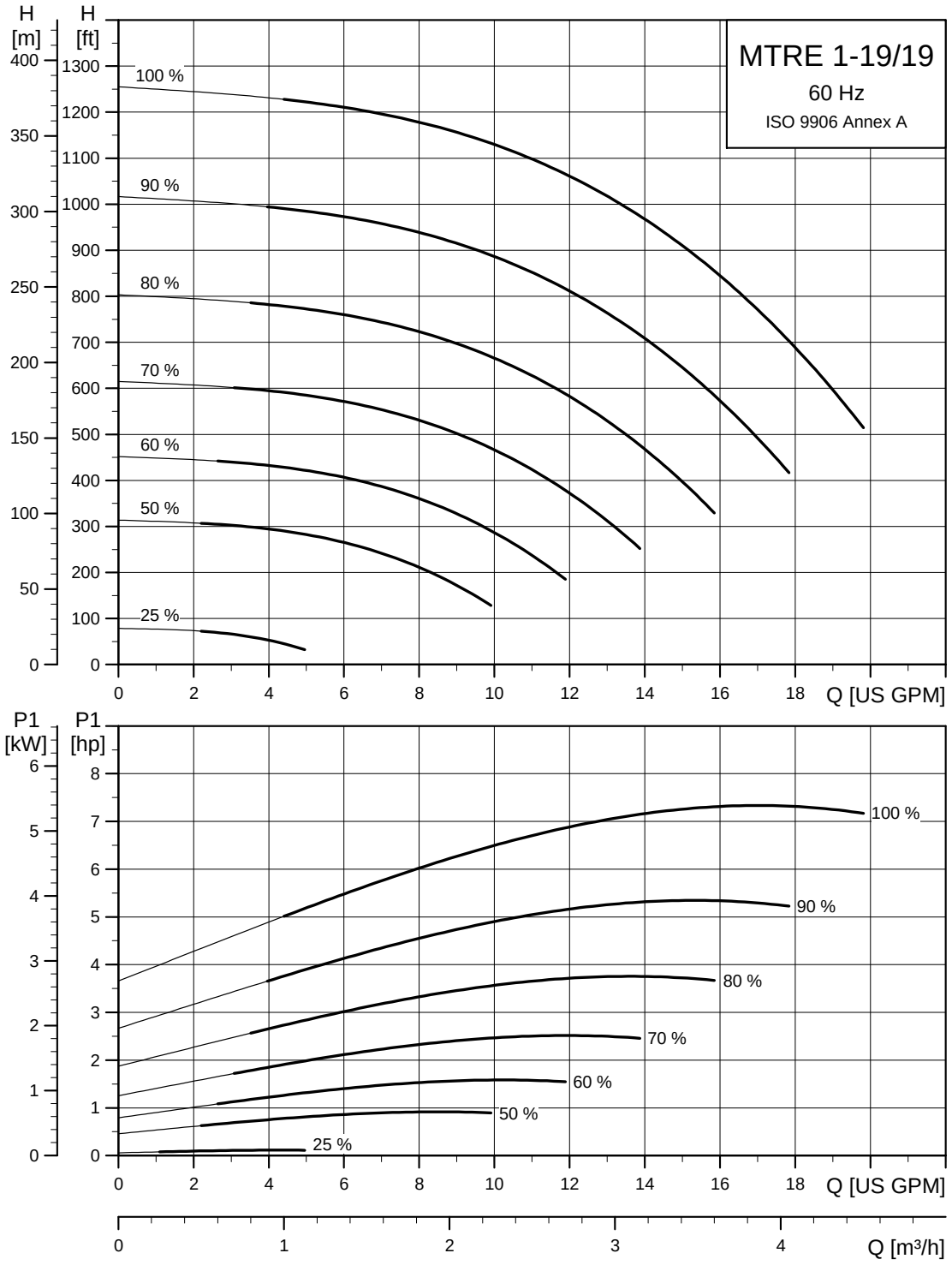
Pump type	Dimensions [in. (mm)]						Weight [lb]
	A	B	C	AC	D2	AD	
MTRE 1s-19/19 HS	37.5 (951)	18.4 (466)	19.1 (485)	8.7 (220)	6.3 (160)	7.5 (188)	110

Electrical data

Voltage	P_2 [Hp]	Type	Full load current $I_{1/1}$ [A]	Starting current I_{Start} [A]	Power factor cos $\varphi_{1/1}$	Motor efficiency		Maximum motor speed [min^{-1}]
						η [%]	Class	
3 x 380-480 V 50/60 Hz	5.3	MLE 112MC	8.1 - 6.6	8.1 - 6.6	0.94 - 0.92	88.1	IE3	5425
3 x 200-230 V 50/60 Hz	5.3	MLE 112MC	13.4 - 12.8	13.4 - 12.8	0.94	88.1	IE3	5425

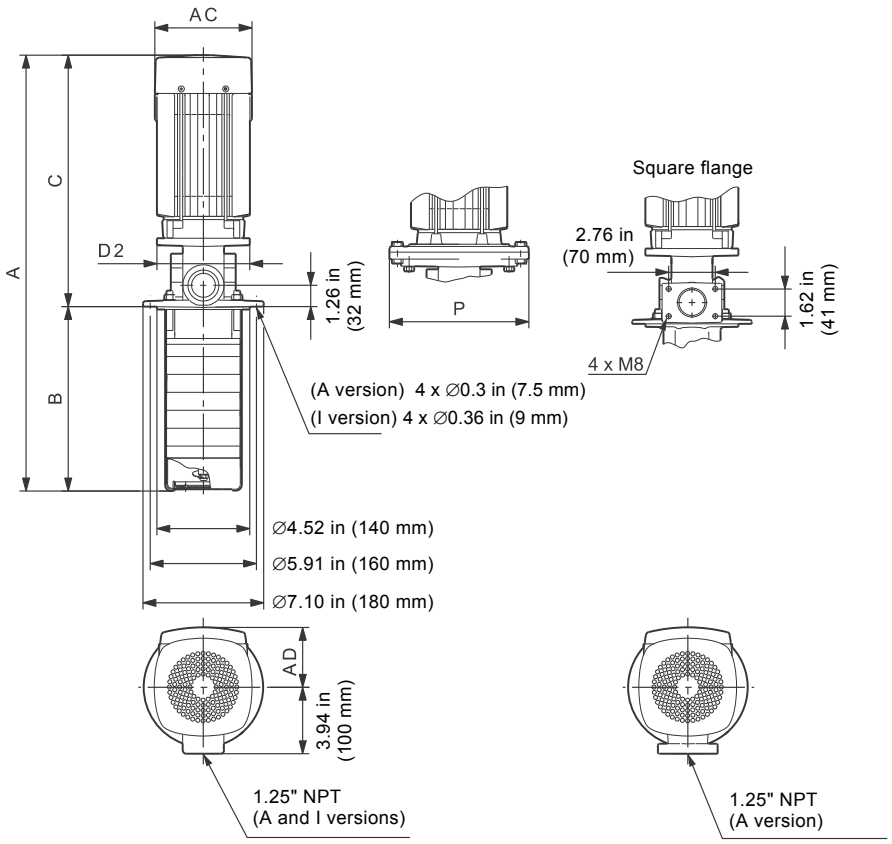
The maximum immersion depth is 39.5 in. (1006 mm). For further details about the available immersion depths for MTR, MTRE pumps, contact Grundfos.

MTRE 1 high-pressure pump



TM05 4990 3112

Dimensional sketches



TM05 5148 3312

Dimensions and weight

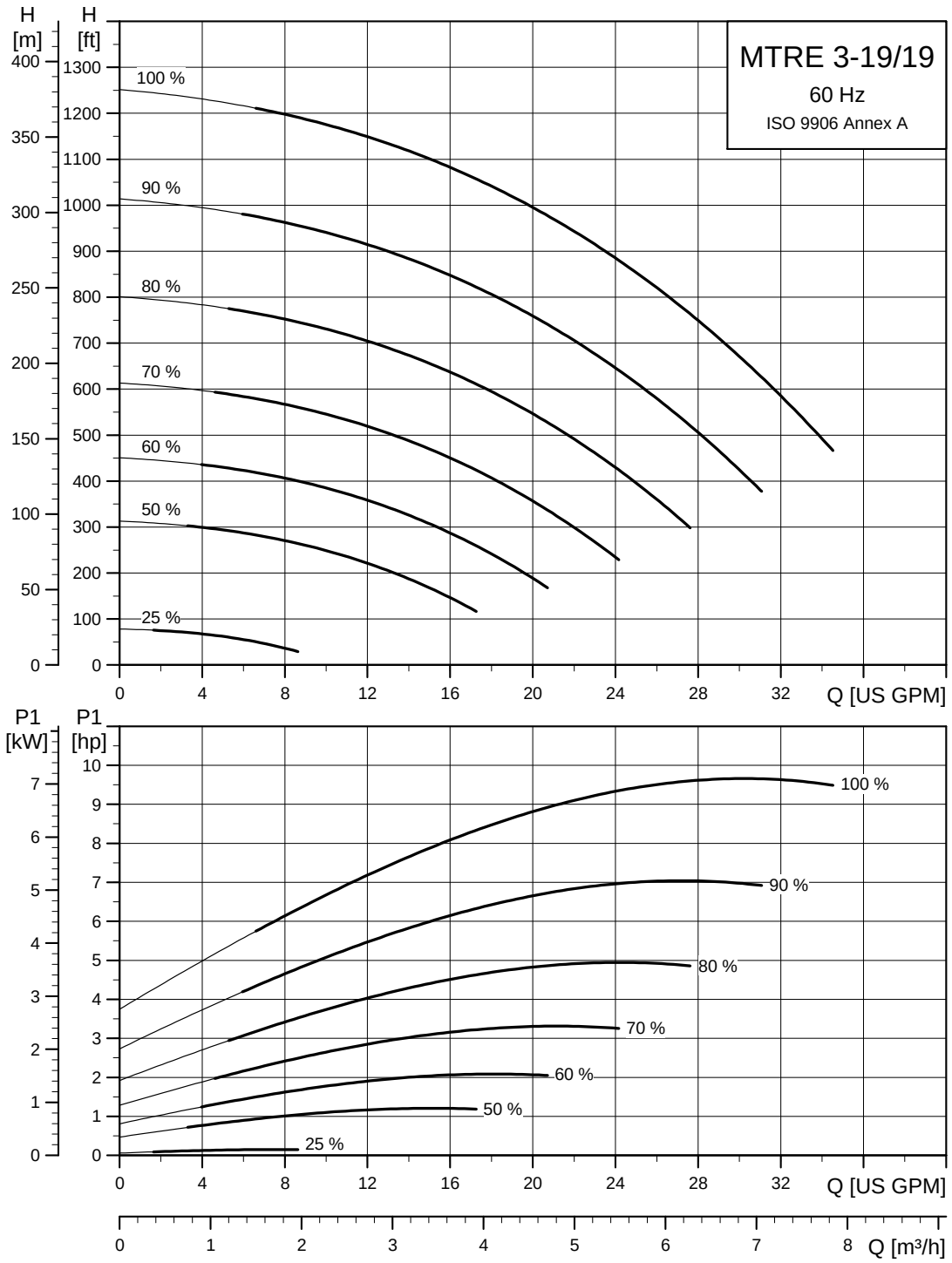
Pump type	Dimensions [in. (mm)]						Weight [lb]
	A	B	C	AC	P	AD	
MTRE 1-19/19 HS	39.2 (994)	18.4 (466)	20.8 (528)	8.7 (220)	11.9 (300)	7.5 (188)	135

Electrical data

Voltage	P_2 [Hp]	Type	Full load current $I_{1/1}$ [A]	Starting current I_{Start} [A]	Power factor cos $\varphi_{1/1}$	Motor efficiency		Maximum motor speed [min^{-1}]
						η [%]	Class	
3 x 380-480 V 50/60 Hz	7.3	MLE 132SC	11 - 8.8	11 - 8.8	0.94 - 0.93	85.5	IE2	5400
3 x 200-230 V 50/60 Hz	7.3	MLE 132SC	19.7 - 18.1	19.7 - 18.1	0.94	88.5	IE2	5400

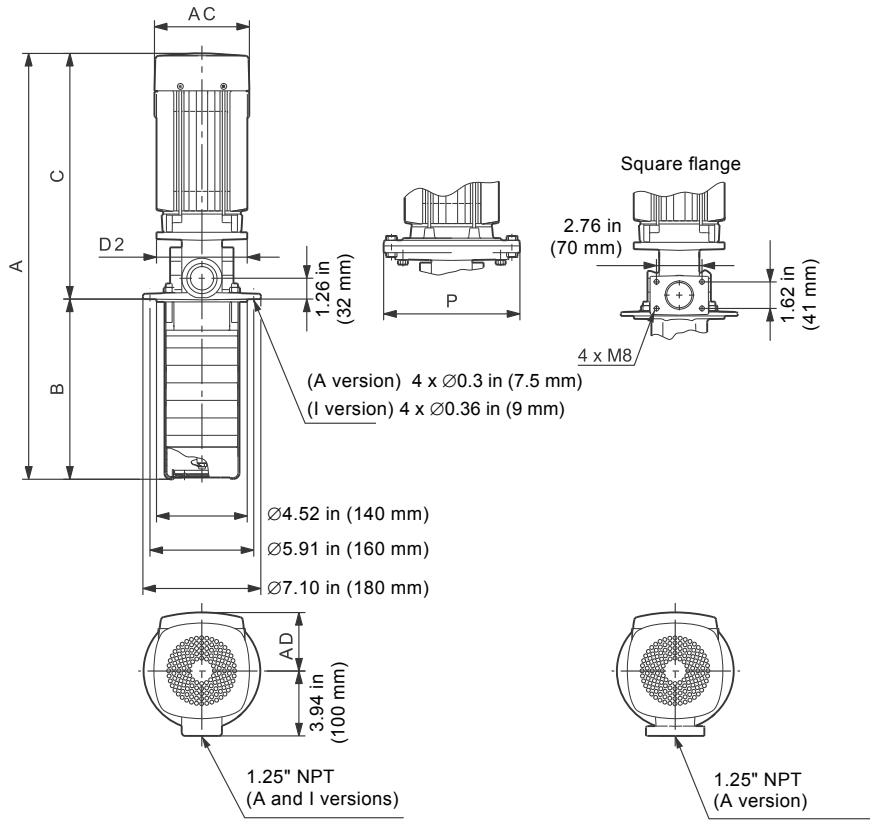
The maximum immersion depth is 39.6 in. (1006 mm). For further details about the available immersion depths for MTR, MTRE pumps, contact Grundfos.

MTRE 3 high-pressure pump



TM05 4988 3112

Dimensional sketches



TM05 5148 3312

Dimensions and weight

Pump type	Dimensions [mm]						Weight [lb]
	A	B	C	AC	P	AD	
MTRE 3-19/19 HS	38.7 (982)	18.4 (466)	20.4 (516)	10.3 (260)	11.9 (300)	8.4 (213)	142

Electrical data

Voltage	Motor							
	P_2 [Hp]	Type	Full load current $I_{1/1}$ [A]	Starting current I_{Start} [A]	Power factor cos $\varphi_{1/1}$	Motor efficiency		Maximum motor speed [min^{-1}]
						η [%]	Class	
3 x 380-480 V 50/60 Hz	10	MLE 132SC	14.6 - 11.6	14.6 - 11.6	0.94	88.1	IE2	5050

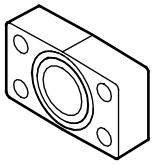
The maximum immersion depth is 39.5 in. (1006 mm). For further details about the available immersion depths for MTR, MTRE pumps, contact Grundfos.

MTR(E) accessories

Square flange* for MTR(E) 1s, 1, 3 and 5

Grundfos offers square flange kit for MTR(E) 1s, 1, 3 and 5 with G 1.25" threads.

A set of the square flange kit consists of one flange, four bolts, four nuts and an O-ring.

Drawing		Product number
	TM02 8027 4503	405178

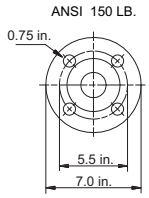
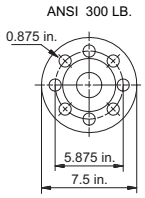
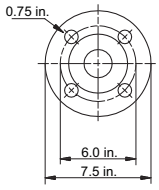
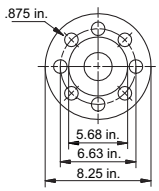
* Square flange will only fit special MTR pumps with square flange pump head.

Pipework connection

For pipework connection, various sets of counter flanges and couplings are available.

Counter flanges for MTR(E) 32, 45, and 64

A set consists of one counter flange, one gasket, bolts and nuts.

Counter flange		Pump type	Description	Pressure class	Pipework connection	Product number
		TM02 5693 3802 TM02 5694 3802 **MTR(E) 32**	Threadded	ANSI 125 lb.	2.5" NPT	91136523
			Threadded	ANSI 250 lb.	2.5" NPT	91136524
		TM02 5695 3802 TM02 5696 3802 **MTR(E) 45, 64**	Threadded	ANSI 125 lb.	3" NPT	91136525
			Threadded	ANSI 250 lb.	3" NPT	91136526

Remote controls

Grundfos GO Remote

The Grundfos GO Remote is used for wireless infrared or radio communication with the pumps.

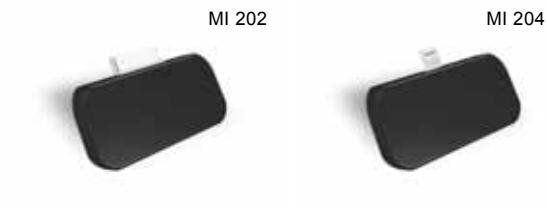
Various Grundfos GO Remote variants are available. The variants are described in the following.

MI 202 and MI 204

The MI 202 and MI 204 are add-on modules with built-in infrared and radio communication. The MI 202 can be used in conjunction with an Apple iPhone or iPod with 30-pin connector and iOS 5.0 or later, e.g. fourth generation iPhone or iPod.

The MI 204 can be used in conjunction with an Apple iPhone or iPod with Lightning connector, e.g. fifth generation iPhone or iPod.

(The MI 204 is also available together with an Apple iPod touch and a cover.)



TM05 3887 1612 - TM05 7704 1513

Fig. 45 MI 202 and MI 204

Supplied with the product:

- Grundfos MI 202 or 204
- sleeve
- quick guide
- charger cable.

MI 301

The MI 301 is a module with built-in infrared and radio communication. The MI 301 must be used in conjunction with an Android or iOS-based Smartphone with a Bluetooth connection. The MI 301 has rechargeable Li-ion battery.

TM05 3890 1712

Fig. 46 MI 301

Supplied with the product:

- Grundfos MI 301
- battery charger
- Quick Guide.

Product numbers

Grundfos GO Remote variant	Product number
Grundfos MI 202	98046376
Grundfos MI 204	98424092
Grundfos MI 204 including iPod touch	98612711
Grundfos MI 301	98046408

Supported units

Make	Model	Operating system	MI 201	MI 202	MI 301
Apple	iPod touch 4G	iOS 5.0 or later	•	•	•
	iPhone 4G, 4GS		-	•	•
HTC	Desire S	Android 2.3.3 or later	-	-	•
	Sensation	Android 2.3.4 or later	-	-	•
Samsung	Galaxy S II		-	-	•

Note: Similar Android and iOS-based devices may work as well, but are not supported by Grundfos.

Potentiometer for MTRE

The potentiometer is for setpoint setting and start/stop of the MTRE pump.

Product	Product number
External potentiometer with cabinet for wall mounting	00625468

Pressure sensor

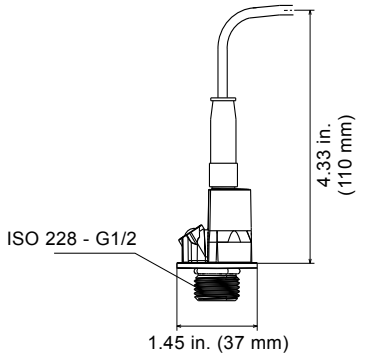

TM04 7865 2510

Accessory	Supplier	Type	Pressure range [psi (bar)]	Product number EPDM	Product number FKM
Pressure sensors Pressure Transmitter with 6 ft screened cable Connection: 0.25" - 18 NPT	Grundfos	RPI	0-87 (0-6)	97748922	97748953
			0-145 (0-10)	97748923	97748954
			0-232 (0-16)	97748924	97748955
			0-362 (0-25)	97748925	97748956

Technical data

Pressure sensor				
Product number	97748922 97748953	97748923 97748954	97748924 97748955	97748925 97748956
Pressure range [psi (bar)]	0-87 (0-6)	0-145 (0-10)	0-232 (0-16)	0-362 (0-25)
Max. operating pressure [psi (bar)]	870 (60)			
Supply voltage	12.5 - 30 VDC			
Output signal [mA]	4-20			
Load Impedance	60 Ω at 12.5 VDC			
	100 Ω at 13.3 V			
	Max 900 Ω at 30 VDC			
Response time	100 ms typical 50 ms			
Resolution	1/1000 FS			
Accuracy	32 to +76 °F +/- 2.0 % FS			
	-22 to +212 °F +/- 2.5 % FS			
Operation temperature	-22 to +212 °F (-30 to +100 °C)			
Ambient temperature	-13 to +140 °F (-25 to +60 °C)			
Wetted parts material	AISI 316 L			
Housing material	AISI 316 L			
Enclosure	IP67			
Weight [lb (kg)]	0.3 (14)			
EMC -	EN 61326-1			
Pressure - mechanical connection	Adaptor solution for 1/2" and 1/4" NPT			
Markings	CE		C SP US	

Dimensions



TM04 9237 1612

Fig. 47 Dimensions RPI transmitter

Pressure sensor

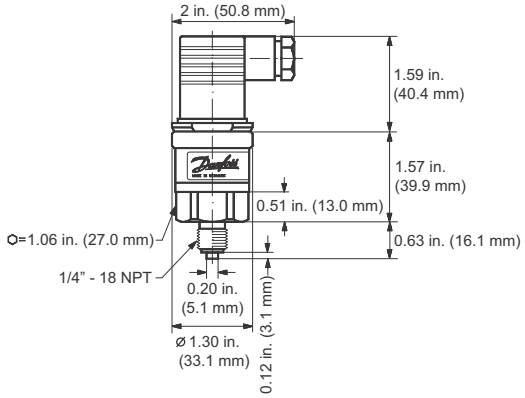
TM05 1533 2911

Accessory	Supplier	Type	Pressure range [psi (bar)]	Product number
Pressure sensors Pressure Transmitter with 6 ft screened cable Connection: 0.25" - 18 NPT	Danfoss	MBS3000	0-87 (0-6)	91136169
			0-145 (0-10)	91136170
			0-232 (0-16)	91136171
			0-362 (0-25)	91136172
			0-580 (0-40)	91136173
			0-870 (0-60)	91136174

Technical data

Pressure sensor						
Product number	91136169	91136170	91136171	91136172	91136173	91136174
Pressure range [psi (bar)]	0-87 (0-6)	0-145 (0-10)	0-232 (0-16)	0-362 (0-25)	0-580 (0-40)	0-870 (0-60)
Max. operating pressure [psi (bar)]	300 (20.1)	300 (20.1)	750 (51.7)	1450 (100)	2900 (200)	2900 (200)
Supply voltage	9-32 VDC					
Output signal [mA]	4-20					
Insulation resistance	> 100 MΩ at 100 V					
Accuracy, typical +/- FS [%]	0.5 %					
Response time, max. [ms]	4 ms					
Medium temperature range [°F (°C)]	-40 to +185 °F (-40 °C to +85 °C)					
Ambient temperature range [°F (°C)]	-40 to +185 °F (-40 °C to +85 °C)					
Wetted parts, material	AISI 316L					
Housing material	AISI 316L					
Enclosure rating	IP65					
Weight [lb (kg)]	0.3 (0.14)					
EMC - Emission	EN 61000-6-3					
EMC Immunity	EN 61000-6-2					
Pressure connection	NPT 1/4-18					
CE-marked	EMC protected in accordance with EU EMC Directive					

Dimensions



TM05 1532 4114

Fig. 48 Dimensional sketch

CIU communication interface units

GrA 6118

Fig. 49 Grundfos CIU communication interface unit

The CIU units enable communication of operating data, such as measured values and setpoints, between MTRE pumps and a building management system.

The CIU unit incorporates a 24-240 VAC/VDC power supply module and a CIM module. You can mount it on a DIN rail or on a wall.

You can use the CIU modules for MTRE pumps with MLE motors from **4-10 Hp (3.0 to 7.5 kW).**

We offer the following CIU units:

Description	Fieldbus protocol	Product number
CIU 100	LonWorks	96753735
CIU 150	PROFIBUS DP	96753081
CIU 200	Modbus RTU	96753082
CIU 250*	GSM/GPRS	96787106
CIU 271*	Grundfos Remote Management (GRM)	96898819
CIU 300	BACnet MS/TP	96893769
CIU 500	BACnet IP	96753894
CIU 500	Modbus TCP	
CIU 500	PROFINET IO	

* Antenna not included. See below.

Antenna for CIU 250 and 270

Description	Product number
Antenna for roof	97631956
Antenna for desk	97631957

For further information about data communication via CIU units and fieldbus protocols, see the CIU documentation available in Grundfos Product Center. See page 157.

CIM communication interface modules

GrA 6121

Fig. 50 Grundfos CIM communication interface module

The CIM modules enable communication of operating data, such as measured values and setpoints, between MTRE pumps and a building management system.

The CIM modules are add-on communication modules which are fitted in the terminal box of CRE, CRIE, CRNE pumps of **15-30 Hp (11-22 kW).**

The CIM modules can be used for MTRE pumps with MLE motors from **0.33 - 3 Hp (0.25 - 2.2 kW) and 15-30 Hp (11-22 kW).**

Note: CIM modules must be fitted by authorized staff.

We offer the following CIM modules:

Description	Fieldbus protocol	Product number
CIM 050	GENI	96824631
CIM 100	LonWorks	96824797
CIM 150	PROFIBUS DP	96824793
CIM 200	Modbus RTU	96824796
CIM 250*	GSM/GPRS	96824795
CIM 271*	Grundfos Remote Management (GRM)	96898815
CIM 300	BACnet MS/TP	96893770
CIM 500	BACnet IP	98301408
CIM 500	Modbus TCP	
CIM 500	PROFINET	

* Antenna not included. See below.

Antenna for CIM 250 and 270

Description	Product number
Antenna for roof	97631956
Antenna for desk	97631957

For further information about data communication via CIM modules and fieldbus protocols, see the CIM documentation available in Grundfos Product Center. See page 157.

MP 204 motor protector

TM03 1471 2205

Fig. 51 MP 204

The MP 204 is an electronic motor protector and data collecting unit. Apart from protecting the motor, it can also send information to a control unit via GENIbus, like for instance:

- trip
- warning
- energy consumption
- input power
- motor temperature.

The MP 204 protects the motor primarily by measuring the motor current by means of a true RMS measurement.

The pump is protected secondarily by measuring the temperature with a Tempcon sensor, a Pt100/Pt1000 sensor and a PTC sensor/thermal switch.

The MP 204 is designed for single- and three-phase motors.

Note: The MP 204 must not be used together with variable frequency drives.

MP 204 features

- Phase-sequence monitoring
- indication of current or temperature
- input for PTC sensor/thermal switch
- indication of temperature in °F or °C
- 4-digit, 7-segment display
- setting and status reading with the Grundfos R100 remote control or Grundfos GO
- setting and status reading via the Grundfos GENIbus fieldbus.

Tripping conditions

- Overload
- underload (dry running)
- temperature
- missing phase
- phase sequence
- overvoltage
- undervoltage
- power factor (cos φ)
- current unbalance.

Warnings

- Overload
- underload
- temperature
- overvoltage
- undervoltage
- power factor (cos φ)
- run capacitor (single-phase operation)
- starting capacitor (single-phase operation)
- loss of communication in network
- harmonic distortion.

Learning function

- Phase sequence (three-phase operation)
- run capacitor (single-phase operation)
- starting capacitor (single-phase operation)
- identification and measurement of Pt100/Pt1000 sensor circuit.

Product number

Description	Product number
MP 204 motor protection	96079927

2. MTC

Introduction

MTC pumps are vertical multistage centrifugal pumps designed for pumping of cooling lubricants for machine tools, condensate transfer and similar applications.

Fig. 52 Grundfos MTC pumps

The pumps can be used for applications involving spark machine tools, grinding machines, machine centers, cooling units, industrial washing machines, filtering systems etc. The pumps are designed to be mounted on top of tanks with the pump stack immerged in the pumped liquid.

Grundfos MTC pumps come with various pump sizes and numbers of stages to provide the flow, the pressure and the length required.

The pumps consist of two main components: The motor and the pump unit. The motor is a Grundfos standard ML motor or Grundfos specified motor designed to NEMA standards.

The pump unit consists of optimized hydraulics, a variety of connections, a motor stool, a given number of chambers and various other parts.

Applications

Application	MTC
Lathes	•
Spark machine tools (EDM)	-
Grinding machines	•
Swarf conveyors	•
Machining centers	•
Cooling units	•
Industrial washing machines	•
Filtering systems	•

• The pump is suitable for this application.

Pumped liquids

MTC pumps are designed to pump non-explosive liquids that do not chemically attack the pump materials.

When pumping liquids with a density and/or viscosity higher than that of water, oversized motors may be required.

Whether a pump is suitable for a particular liquid depends on a number of factors of which the most important are the chloride content, pH-value temperature and content of chemicals, oils, etc.

Please note that aggressive liquids may attack or dissolve the protective oxide film of the stainless steel and thus cause corrosion.

Pumping of solid particles

MTC pumps are fitted with a suction strainer. The strainer prevents large solid particles from entering and damaging the pump.

The table below describes the size of the passage in the strainer and the impeller.

Pump type	Strainer passage [⌀ in. (⌀ mm)]	Free strainer passage [in.^{2} (mm^2)]	Impeller passage [in. (mm)]
MTC 2	0.08 (2)	3.6 (2322)	0.10 (2.6)
MTC 4	0.08 (2)	3.6 (2322)	0.11 (2.8)

If the pumped liquid contains solid particles larger than the size of the holes in the strainer, the passage of the strainer may be blocked. In such situations the performance will drop as a result of a reduced flow through the pump.

Note: If the strainer is removed from the suction port, solid particles may enter the pump and cause a seizure or even damage the pump.

In grinding applications Grundfos recommends that the pumped liquid is screened for abrasive particles before entering the pump. When pumped, abrasive particles reduce the life of the pump components.

Wear of the pump components caused by abrasive particles starts when the concentration exceeds 20 ppm.

MTC features and benefits

MTC pumps

MTC pumps are fitted with an integrated Grundfos motor where the rotor shaft is used as pump shaft. Thisgivesthe pump a compact design.

Motors for MTC pumps

MTC motors are totally enclosed, fan-cooled, 2-pole Grundfos standard motors.

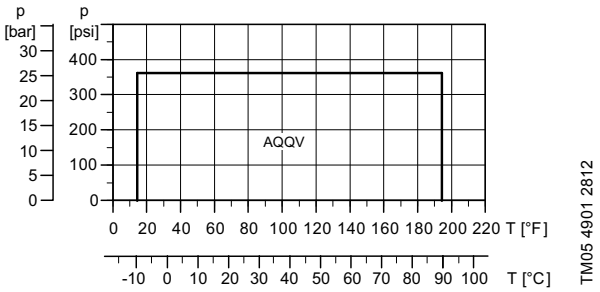
Electrical data

Insulation class	F
Efficiency class	IE2 IE3 available on request
Enclosure class	TEFC - Totally Enclosed Fan Cooled
Supply voltage, 60 Hz Tolerance - 10 %/+ 10 %	3 x 208-230/460 V

As standard all MTC motors are supplied with CE approval.

Shaft seal for MTC

The operating range of the shaft seal depends on operating pressure, pump type, type of shaft seal and liquid temperature.



Shaft seal	Description	Temperature range [°F (°C)]
AQQV	O-ring seal with fixed seal driver, tungsten carbide/ tungsten carbide, FKM	14 °F to 194 °F (-10 °C to +90 °C)

MTC identification

MTC type key example

Example	MTC	2	-6	/3	-A	-W	-A	-AQQV
Pump type								
Rated flow rate [m^3/h]								
Number of chambers								
Number of impellers								
Code for pump version A: Basic								
Internal thread (NPT)								
Code for materials A: Basic								
Code for shaft seal								

Mechanical shaft seal

Example	H	U	U	V
A: O-ring seal with fixed driver				
H: Balanced cartridge seal				
Q: Silicone carbide				
U: Cemented tungsten carbide				
E: EPDM				
V: FKM				

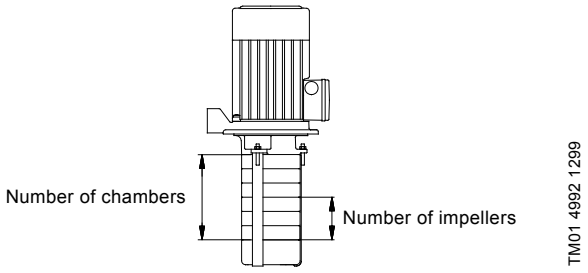
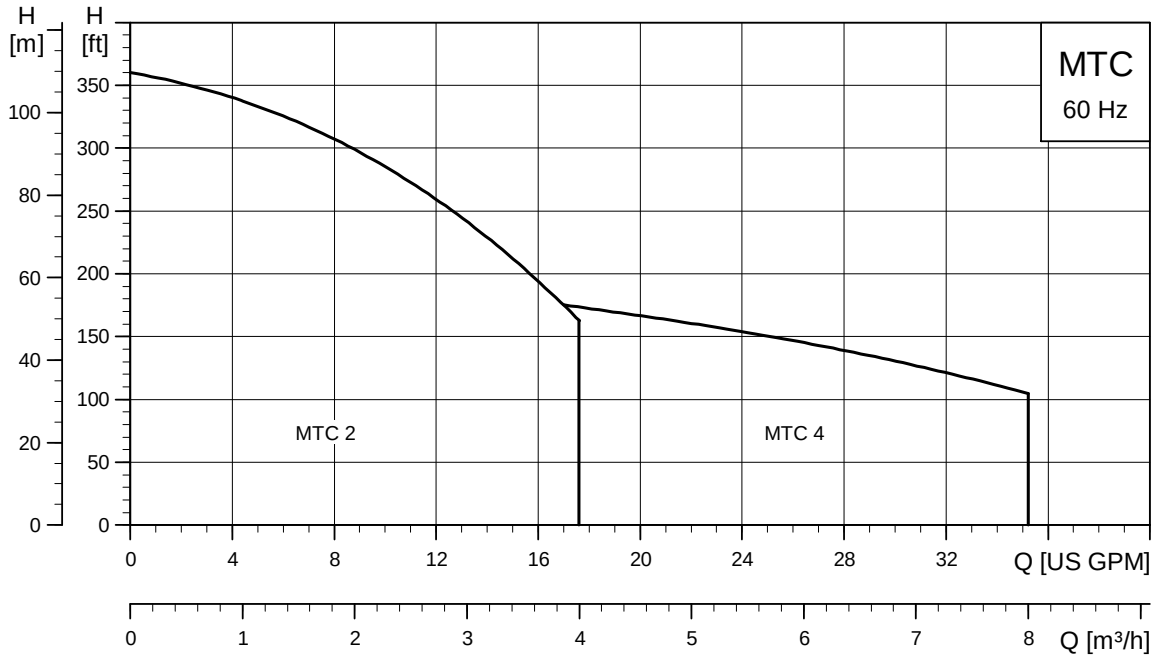


Fig. 53 Nameplate identifies number of chambers and number of impellers

MTC performance range

MTC 60 Hz



TM03 4278 2006

Note: MTC pumps are not available in Canada.

MTC product range

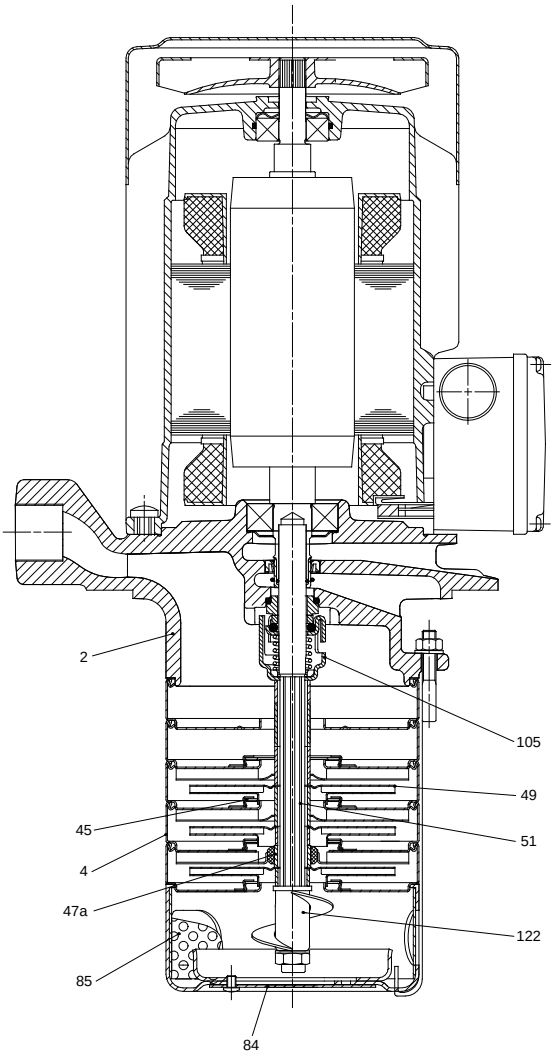
Range	MTC 2	MTC 4
Nominal flow rate [US gpm]	13	25
Nominal flow rate [m^3/h]	3.0	5.7
Temperature range [°F (°C)]	+14 to +194 °F (-10 to +90 °C)	
Max. pump efficiency [%]	44	44
Flow range [US gpm]	1.3 - 17.5	2.5 - 35.5
Flow range [m^3/h]	0.3 - 4.0	0.6 - 8.1
Maximum head [H (ft)]	360	220
Maximum head [psi]	155	95
Motor power [Hp]	0.25 - 2.0	0.5 - 2.1
Material variants		
MTC (AISI 304/cast iron)	•	•
MTCI (AISI 304/cast iron)	•	•
Pipe connection		
Internal thread [NPT]	0.75"	0.75"
Installation length		
inches	5.7 - 11.4	5.7 - 12.1
Shaft seal		
AQQV	•	•
AUUE★	•	•

★ On request.

MTC construction

Sectional drawings

Sectional drawing of MTC 2



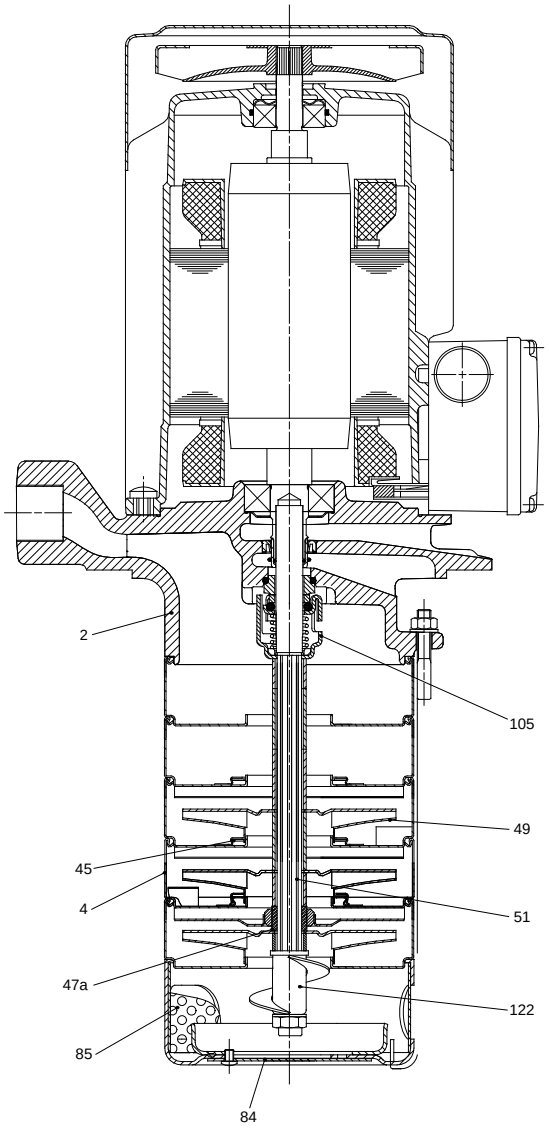
TM02 8690 0704

Material specification - MTC, MTCI

Pos.	Description	Materials	EN/DIN	AISI/ASTM
2	Pump head	Cast iron EN-GJL-200	0.6020	ASTM 25B
		Stainless steel (MTCI)	1.4408	CF 8M*
4	Chamber	Stainless steel	1.4301	AISI 304
45	Neck ring	PTFE (only MTC 2)		
47a	Bearing ring	Tungsten carbide		
49	Impeller	Stainless steel	1.4301	AISI 316
51	Pump shaft	Stainless steel	1.4057	AISI 431
84	Suction trainer, ∅0.08" holes	Stainless steel	1.4301	AISI 304
85	Strainer	Stainless steel	1.4301	AISI 304
105	Shaft seal	AQQV		
122	Priming screw	Stainless steel	1.4301	AISI 304

* CF 8M is cast equivalent of AISI 316 stainless steel

Sectional drawing of MTC 4



TM02 8691 0704

Material specification - MTC, MTCI

Pos.	Description	Materials	EN/DIN	AISI/ASTM
2	Pump head	Cast iron EN-GJL-200	0.6020	ASTM 25B
		Stainless steel (MTCI)	1.4408	CF 8M*
4	Chamber	Stainless steel	1.4301	AISI 304
45	Neck ring	PTFE (only MTC 2)		
47a	Bearing ring	Tungsten carbide		
49	Impeller	Stainless steel	1.4301	AISI 316
51	Pump shaft	Stainless steel	1.4057	AISI 431
84	Suction trainer, ∅0.08" holes	Stainless steel	1.4301	AISI 304
85	Strainer	Stainless steel	1.4301	AISI 304
105	Shaft seal	AQQV		
122	Priming screw	Stainless steel	1.4301	AISI 304

* CF 8M is cast equivalent of AISI 316 stainless steel

MTC operating conditions

Ambient temperature

Maximum ambient temperature 104 °F (40 °C).

If the ambient temperature exceeds 104 °F (40 °C) or if the motor is located 3280 ft (1000 m) above sea level, the motor output (P_2) must be reduced due to the low density and consequently low cooling effect of the air. In such cases, it may be necessary to use a motor with a higher output.

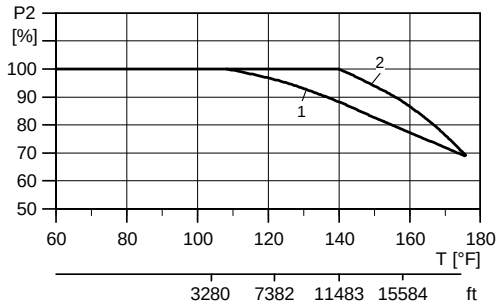


Fig. 54 Relationship between motor output (P_2) and ambienttemperature/altitude

Key

Pos.	Description
1	NEMA Energy Efficient motors
2	NEMA Premium Efficiency motors

Example: From the above figure and key appears that P_2 must be reduced to 88 % when a pump with a NEMA Premium Efficiency, ML motor is installed 15584 feet above sea level. At an ambient temperature of 167 °F, P_2 of an Energy Efficient motor must be reduced to 74 % of rated output.

Maximum operating pressure

Immersible pump model	Maximum permissible operating pressure	
	NPT threads [psi (bar)]	ANSI flange
MTC 2 --> MTC 4	116 (8)	--

Sound pressure level

All MTC pumps have a sound pressure level below 70 dB(A).

Viscosity

Immersible pump model	Max. kinematic viscosity
MTC	50 Cst.

For further information about pump performance when pumping liquids with densities or kinematic viscosities higher than those of water, see section *Further product documentation* on page 124.

Viscosity of different oils

The curves below show the viscosity of different oils in relation to oil temperature.

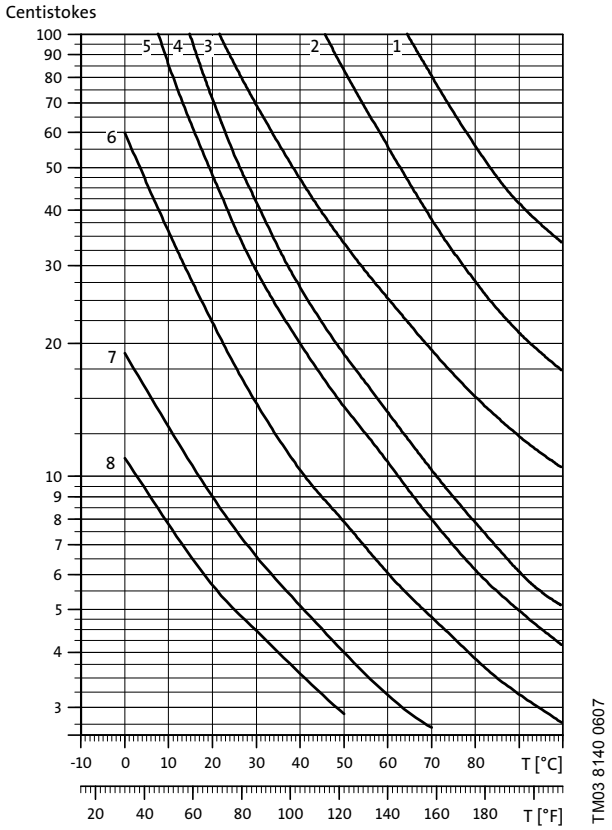


Fig. 55 Viscosity of different oils in relation to oil temperature

Key to viscosities of different oils

Curve number	Type of oil
1	Gear oil
2	Motor oil (20W-50)
3	Hydraulic oil (ISO VG46)
4	Cutting oil
5	Thermal oil
6	Hydraulic oil (ISO VG10)
7	Grinding oil
8	Honing oil

MTC installation

MTC must be installed vertically.

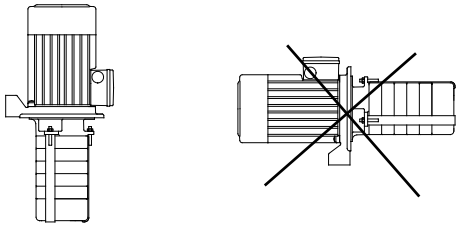


Fig. 56 Installation of an MTC pump

To enable a low liquid level of 1.6 inches (41 mm) above the bottom of the strainer, a priming screw is fitted below the bottom chamber. This helps to protect the pump against dry running down to 1 inch (26 mm) above the bottom of the strainer.

The distance between the pump and tank bottom must be minimum 1 inch (26 mm).

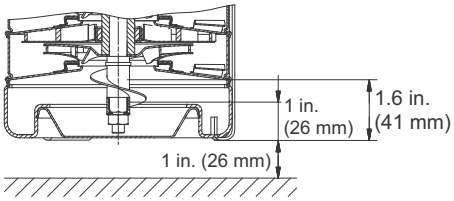


Fig. 57 MTC 2 and MTC 4

Terminal box positions

As standard MTC pumps have their terminal box mounted in position 6 o'clock of the pump; however other positions are possible.

Note: On MTC pumps it is not possible to mount the terminal box in position 12 as the terminal box does not fit in that position.

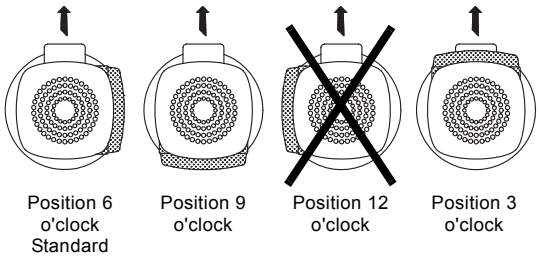


Fig. 58 Terminal box positions

MTC selection and sizing

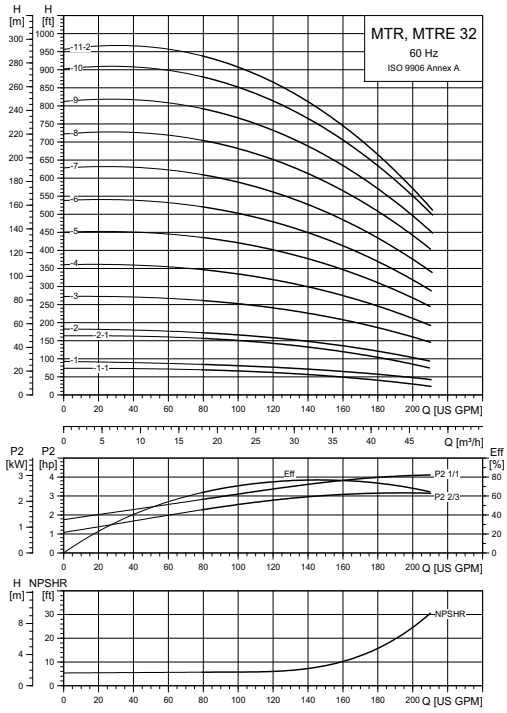
Selection of pumps

Selection of pumps should be based on

- the duty point of the pump
- sizing data such as pressure loss as a result of height differences, friction loss in the pipework, pump efficiency etc.
- minimum inlet pressure - NPSHR.

1. Duty point of the pump

From a duty point it is possible to select a pump on the basis of the curve charts shown in the chapter of *MTC curve charts and technical data* starting on page 90.



TM03 4259 3512

Fig. 59 Example of a curve chart

2. Sizing data

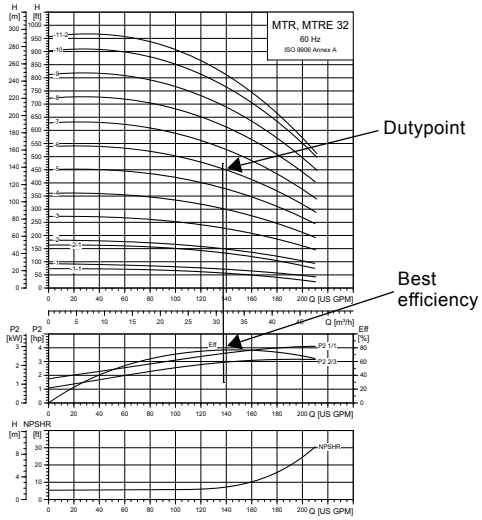
When sizing a pump the following must be taken into account:

- Required flow rate and pressure at the point of use.
- Pressure loss as a result of height differences (H_{geo}).
- Friction loss in the pipework (H_f).
  It may be necessary to account for pressure loss in connection with long pipes, bends or valves, etc.
- Best efficiency at the estimated duty point.
- NPSHR value.
  For calculation of the NPSHR value, see *Minimum inlet pressure - NPSHR* on page 88.

Efficiency

Before determining the point of best efficiency the operation pattern of the pump needs to be identified.

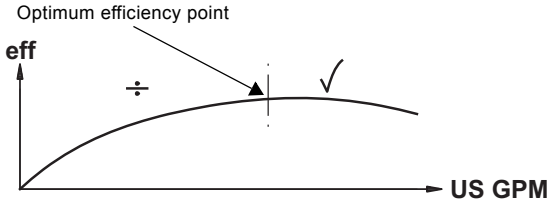
Is the pump expected always to operate at the **same** duty point, select an MTC pump which is operating at a duty point corresponding to the best efficiency of the pump.



TM01 4305 3700

Fig. 60 Example of a pump's duty point

As the pump is sized on the basis of the highest possible flow, it is important always to have the duty point to the right of the optimum efficiency point (see fig. 61, range with check mark). This must be considered in order to keep efficiency high when the flow drops.



TM03 4874 3206

Fig. 61 Best efficiency

Grundfos Product Center

Grundfos Product Center is a selection program offered by Grundfos that makes it possible to calculate an MTC pump's specific duty point and energy consumption.

By entering the sizing data of the pump, Grundfos Product Center can calculate the exact duty point and energy consumption. For further information see section *Further product documentation* on page 124.

Minimum inlet pressure - NPSHR

Calculation of the inlet pressure "H" is recommended when...

- the liquid temperature is high,
- the flow is significantly higher than the rated flow,
- inlet conditions are poor.

To avoid cavitation, make sure that there is a minimum pressure on the suction side of the pump. The maximum suction lift "H" in feet of head can be calculated as follows:

$$H = p_b - NPSHR - H_v - H_s$$

p_b = Barometric pressure in feet absolute. (Barometric pressure can be set to 33.9 feet).

In closed systems, p_b indicates the system pressure in feet.

NPSHR = Net Positive Suction Head in feet of head. (To be read from the NPSHR curve at the highest flow rate the pump will be delivering).

H_f = Friction loss in suction pipe in feet of head. (At the highest flow rate the pump will be delivering.)

H_v = Vapor pressure in feet. (To be read from the vapor pressure scale.

"H_v" depends on the liquid temperature "T_m").

H_s = Safety margin = minimum 2.0 feet.

If the "H" calculated is positive, the pump can operate at a suction lift of maximum "H" feet of head.

If the "H" calculated is negative, an inlet pressure of minimum "H" feet of head is required.

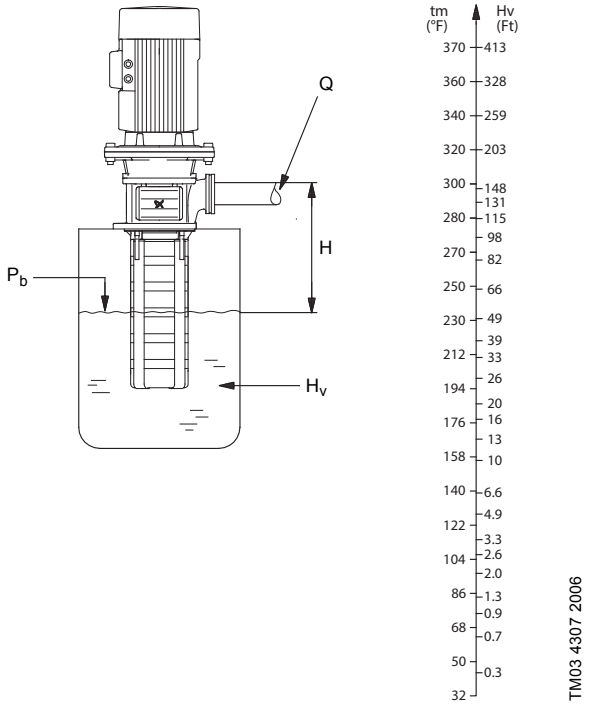


Fig. 62 Minimum inlet pressure - NPSHR

Note: In order to avoid cavitation, **never** select a pump whose duty point is too far to the right on the NPSHR curve.

Always check the NPSHR value of the pump at the highest possible flow rate.

How to read the curve charts

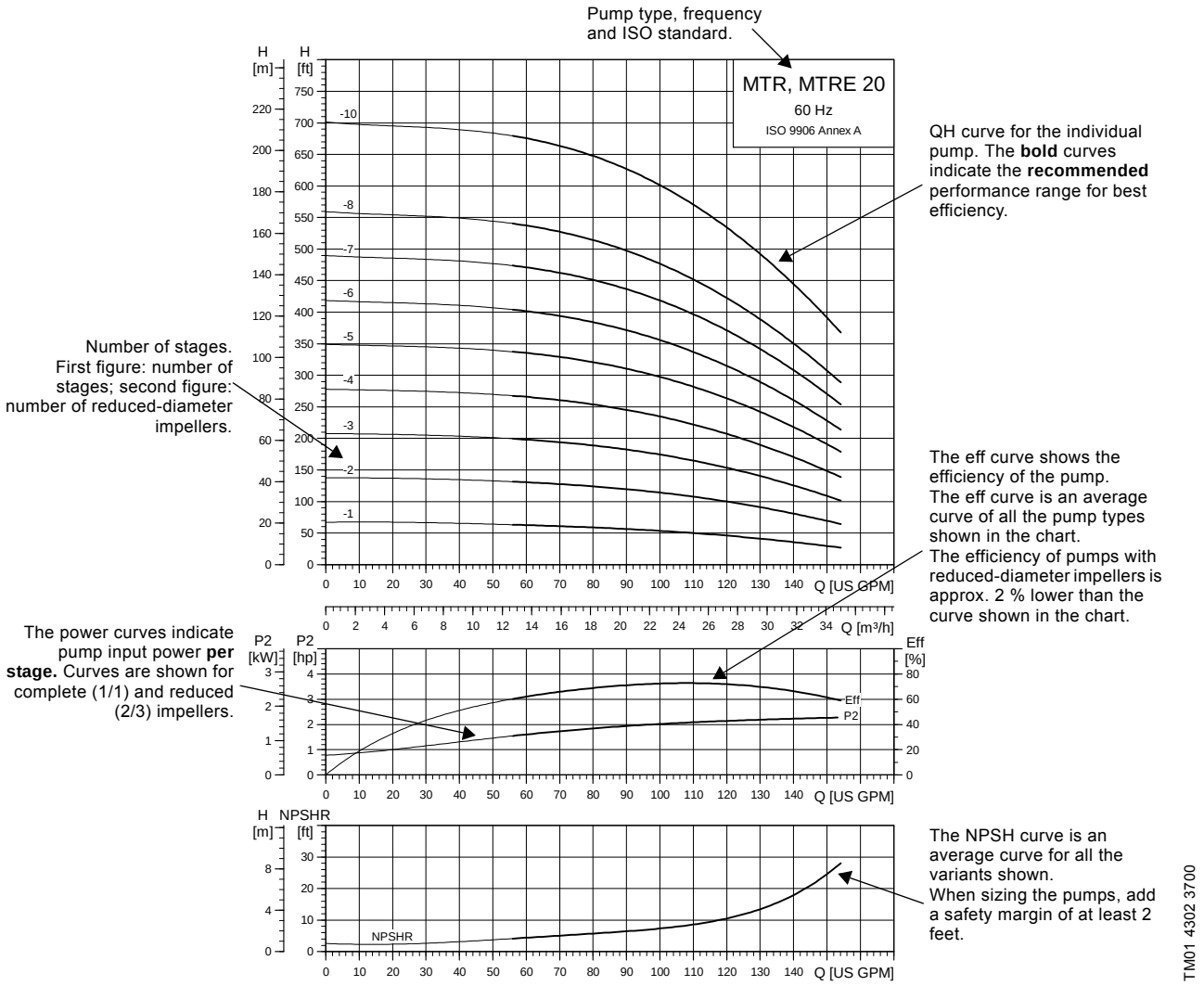


Fig. 63 Example of a curve chart

Guidelines to performance curves

The guidelines below apply to the curves shown on the following pages:

1. Tolerances to ISO 9906, Annex A, if indicated.
2. The motors used for the measurements are standard Grundfos ML motors.
3. Measurements have been made with airless water at a temperature of 68 °F (20 °C).
4. The curves apply to a kinematic viscosity of υ = 1 mm^2/s (1 cSt).
5. Due to the risk of overheating, the pumps should not be used at a flow below the minimum flow rate.
6. QH curves of the individual pumps are based on current motor speeds.

The curve below shows the minimum flow rate as a percentage of the nominal flow rate in relation to the liquid temperature. Only pumps with EPDM elastomers in the shaft seals can run in the temperature range from 194 °F to 248 °F (90 °C to 120 °C). Closed strap nuts with o-rings and plugging of the shaft seal drain hole, may also be required at temperatures above 212 °F (100 °C) (see page 86).

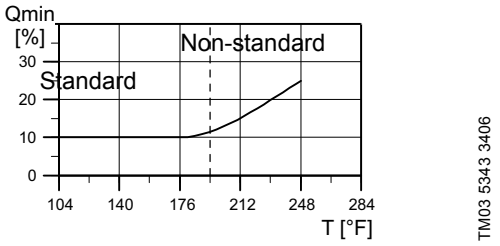
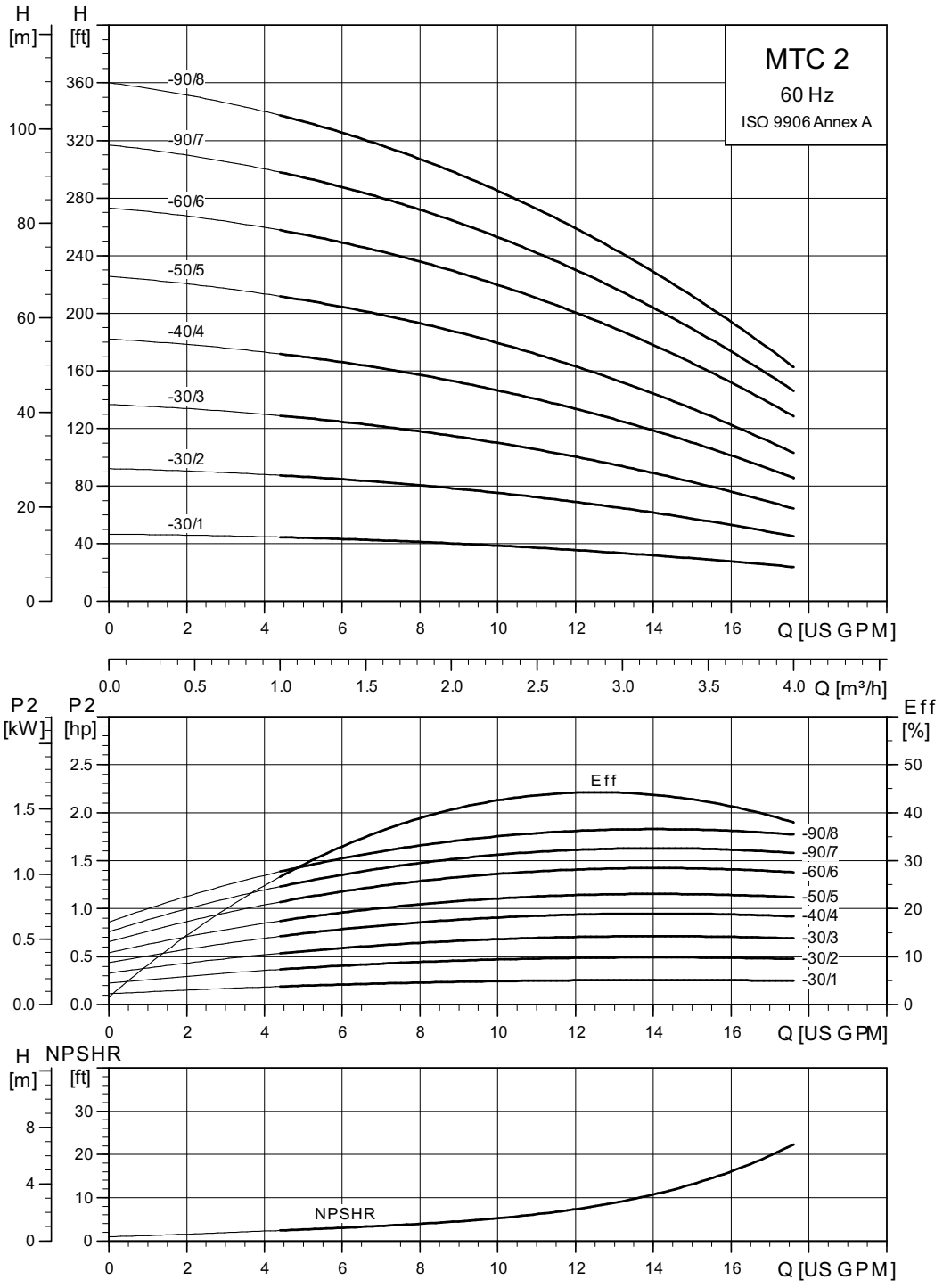


Fig. 64 Minimum flow rate

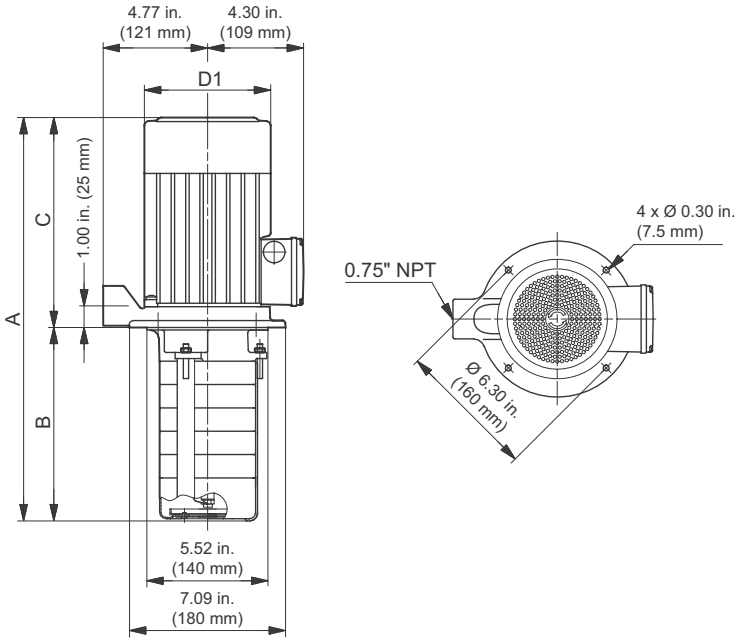
MTC curve charts and technical data

MTC 2, 60 Hz



TM03 4262 4110

MTC dimensional sketch



TM03 4300 1515

MTC technical data - 3x208-230 DV/460 YV, 60 Hz - USA

Pump type	Motor power P1 [W]	Electrical data				Dimensions [in. (mm)]				Ship. weight [lb]
		SF	Eff. [%]	Full load current at 230 V / 460 V [A]	Start current at 230 V / 460 V [A]	A	B	C	D1	
MTC 2-30/1	340	1.0	72	1.8 / 1.0	18 / 9	13.67 (347)	5.71 (145)	7.96 (202)	5.32 (135)	23
MTC 2-30/2	540	1.0	72	2.1 / 1.2	18 / 9	13.67 (347)	5.71 (145)	7.96 (202)	5.32 (135)	24
MTC 2-30/3	740	1.0	74	2.5 / 1.4	18 / 9	13.67 (347)	5.71 (145)	7.96 (202)	5.32 (135)	24
MTC 2-40/1	340	1.0	72	1.8 / 1.0	18 / 9	14.38 (365)	6.42 (163)	7.96 (202)	5.32 (135)	24
MTC 2-40/2	540	1.0	72	2.1 / 1.2	18 / 9	14.38 (365)	6.42 (163)	7.96 (202)	5.32 (135)	24
MTC 2-40/3	740	1.0	74	2.5 / 1.4	18 / 9	14.38 (365)	6.42 (163)	7.96 (202)	5.32 (135)	24
MTC 2-40/4	980	1.0	74	4.0 / 2.3	31 / 15.5	15.95 (405)	6.42 (163)	9.53 (242)	5.60 (142)	27
MTC 2-50/1	340	1.0	72	1.8 / 1.0	18 / 9	15.08 (383)	7.13 (181)	7.96 (202)	5.32 (135)	24
MTC 2-50/2	540	1.0	72	2.1 / 1.2	18 / 9	15.08 (383)	7.13 (181)	7.96 (202)	5.32 (135)	25
MTC 2-50/3	740	1.0	74	2.5 / 1.4	18 / 9	15.08 (383)	7.13 (181)	7.96 (202)	5.32 (135)	25
MTC 2-50/4	980	1.0	74	4.0 / 2.3	31 / 15.5	16.66 (423)	7.13 (181)	9.53 (242)	5.60 (142)	27
MTC 2-50/5	1155	1.0	74	4.3 / 2.5	31 / 15.5	16.66 (423)	7.13 (181)	9.53 (242)	5.60 (142)	27
MTC 2-60/1	340	1.0	72	1.8 / 1.0	18 / 9	15.79 (401)	7.84 (199)	7.96 (202)	5.32 (135)	25
MTC 2-60/2	540	1.0	72	2.1 / 1.2	18 / 9	15.79 (401)	7.84 (199)	7.96 (202)	5.32 (135)	25
MTC 2-60/3	740	1.0	74	2.5 / 1.4	18 / 9	15.79 (401)	7.84 (199)	7.96 (202)	5.32 (135)	25
MTC 2-60/4	980	1.0	74	4.0 / 2.3	31 / 15.5	17.37 (441)	7.84 (199)	9.53 (242)	5.60 (142)	31
MTC 2-60/5	1155	1.0	74	4.3 / 2.5	31 / 15.5	17.37 (441)	7.84 (199)	9.53 (242)	5.60 (142)	31
MTC 2-60/6	1365	1.0	74	4.7 / 2.7	31 / 15.5	17.37 (441)	7.84 (199)	9.53 (242)	5.60 (142)	32
MTC 2-90/1	340	1.0	72	1.8 / 1.0	18 / 9	17.92 (455)	9.97 (253)	7.96 (202)	5.32 (135)	26
MTC 2-90/2	540	1.0	72	2.1 / 1.2	18 / 9	17.92 (455)	9.97 (253)	7.96 (202)	5.32 (135)	26
MTC 2-90/3	740	1.0	74	2.5 / 1.4	18 / 9	17.92 (455)	9.97 (253)	7.96 (202)	5.32 (135)	27
MTC 2-90/4	980	1.0	74	4.0 / 2.3	31 / 15.5	19.49 (495)	9.97 (253)	9.53 (242)	5.60 (142)	32
MTC 2-90/5	1155	1.0	74	4.3 / 2.5	31 / 15.5	19.49 (495)	9.97 (253)	9.53 (242)	5.60 (142)	32
MTC 2-90/6	1365	1.0	74	4.7 / 2.7	31 / 15.5	19.49 (495)	9.97 (253)	9.53 (242)	5.60 (142)	33
MTC 2-90/7	1572	1.0	74	5.0 / 2.9	31 / 15.5	19.49 (495)	9.97 (253)	9.53 (242)	5.60 (142)	33
MTC 2-90/8	1779	1.0	74	5.4 / 3.2	31 / 15.5	19.49 (495)	9.97 (253)	9.53 (242)	5.60 (142)	33
MTC 2-100/1	340	1.0	72	1.8 / 1.0	18 / 9	18.63 (473)	10.67 (271)	7.96 (202)	5.32 (135)	27
MTC 2-100/2	540	1.0	72	2.1 / 1.2	18 / 9	18.63 (473)	10.67 (271)	7.96 (202)	5.32 (135)	27
MTC 2-100/3	740	1.0	74	2.5 / 1.4	18 / 9	18.63 (473)	10.67 (271)	7.96 (202)	5.32 (135)	27
MTC 2-100/4	980	1.0	74	4.0 / 2.3	31 / 15.5	20.20 (513)	10.67 (271)	9.53 (242)	5.60 (142)	33

Pump type	Motor power P1 [W]	Electrical data				Dimensions [in. (mm)]				Ship. weight [lb]
		SF	Eff. [%]	Full load current at 230 V / 460 V [A]	Start current at 230 V / 460 V [A]	A	B	C	D1	
MTC 2-100/5	1155	1.0	74	4.3 / 2.5	31 / 15.5	20.20 (513)	10.67 (271)	9.53 (242)	5.60 (142)	33
MTC 2-100/6	1365	1.0	74	4.7 / 2.7	31 / 15.5	20.20 (513)	10.67 (271)	9.53 (242)	5.60 (142)	33
MTC 2-100/7	1572	1.0	74	5.0 / 2.9	31 / 15.5	20.20 (513)	10.67 (271)	9.53 (242)	5.60 (142)	34
MTC 2-100/8	1779	1.0	74	5.4 / 3.2	31 / 15.5	20.20 (513)	10.67 (271)	9.53 (242)	5.60 (142)	34
MTC 2-110/1	340	1.0	72	1.8 / 1.0	18 / 9	19.34 (491)	11.38 (289)	7.96 (202)	5.32 (135)	27
MTC 2-110/2	540	1.0	72	2.1 / 1.2	18 / 9	19.34 (491)	11.38 (289)	7.96 (202)	5.32 (135)	27
MTC 2-110/3	740	1.0	74	2.5 / 1.4	18 / 9	19.34 (491)	11.38 (289)	7.96 (202)	5.32 (135)	27
MTC 2-110/4	980	1.0	74	4.0 / 2.3	31 / 15.5	20.91 (531)	11.38 (289)	9.53 (242)	5.60 (142)	33
MTC 2-110/5	1155	1.0	74	4.3 / 2.5	31 / 15.5	20.91 (531)	11.38 (289)	9.53 (242)	5.60 (142)	34
MTC 2-110/6	1365	1.0	74	4.7 / 2.7	31 / 15.5	20.91 (531)	11.38 (289)	9.53 (242)	5.60 (142)	34
MTC 2-110/7	1572	1.0	74	5.0 / 2.9	31 / 15.5	20.91 (531)	11.38 (289)	9.53 (242)	5.60 (142)	34
MTC 2-110/8	1779	1.0	74	5.4 / 3.2	31 / 15.5	20.91 (531)	11.38 (289)	9.53 (242)	5.60 (142)	34

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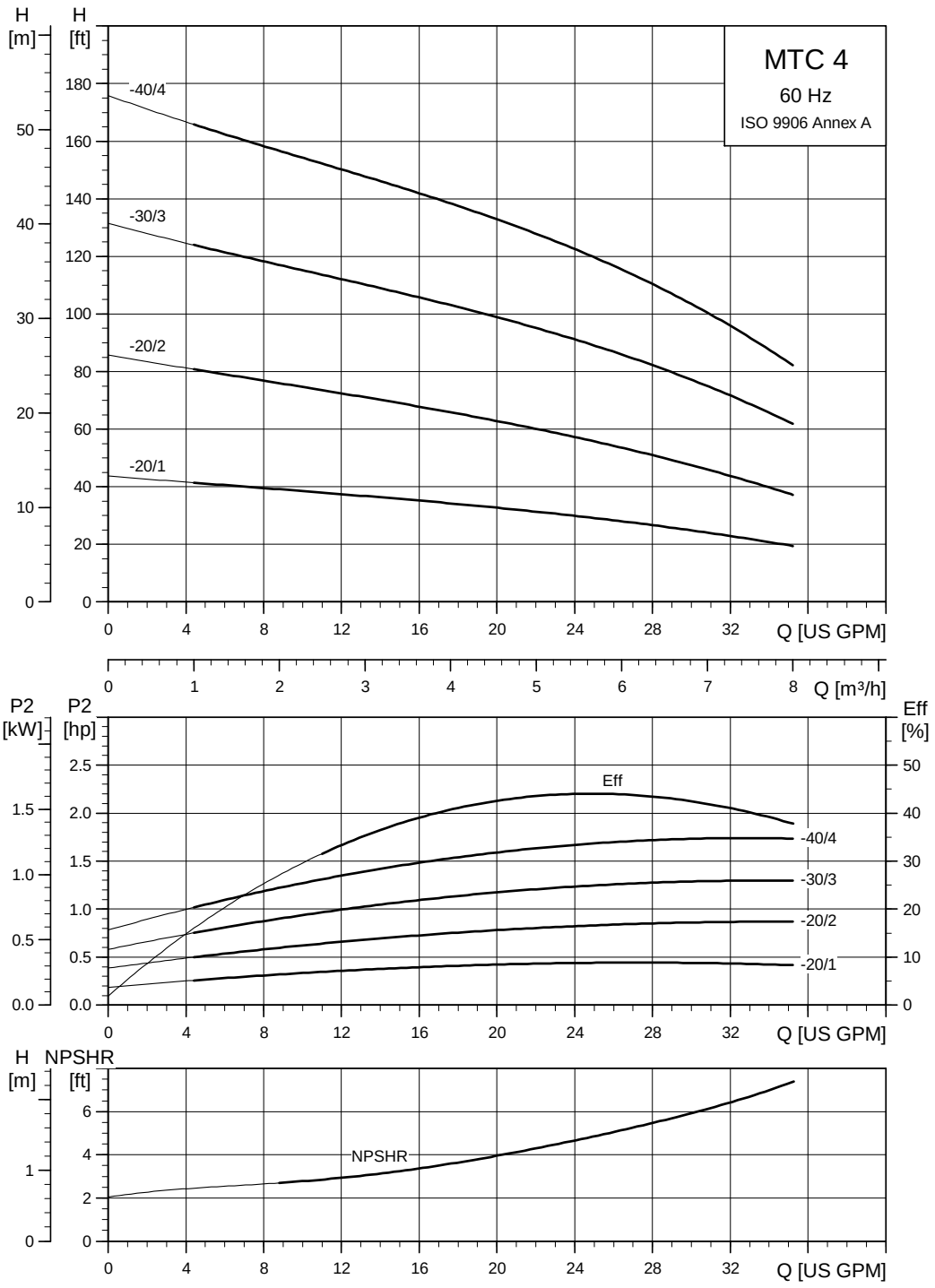
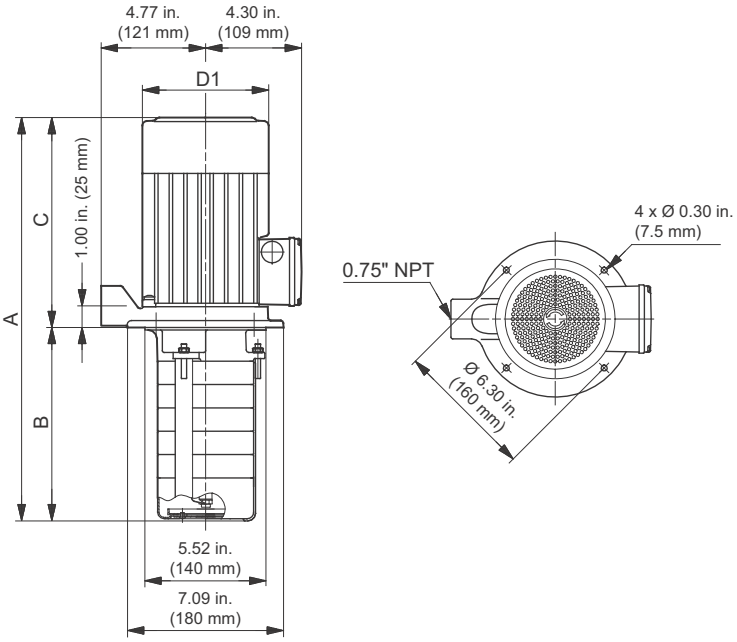
MTC 4, 60 Hz



TM03 4263 0607

MTC dimensional sketch



TM03 4300 1515

MTC technical data - 3x208-230 ΔV/460 YV, 60 Hz - USA

Pump type	Motor power P1 [W]	Electrical data				Dimensions [in. (mm)]				Ship. weight [lb]
		SF	Eff. [%]	Full load current at 230 V / 460 V [A]	Start current at 230 V / 460 V [A]	A	B	C	D1	
MTC 4-20/1	505	1.0	72	2.0 / 1.2	18 / 9	13.67 (347)	5.71 (145)	7.96 (202)	5.32 (135)	27
MTC 4-20/2	870	1.0	74	2.8 / 1.6	18 / 9	13.67 (347)	5.71 (145)	7.96 (202)	5.32 (135)	27
MTC 4-30/1	505	1.0	72	2.0 / 1.2	18 / 9	13.67 (347)	6.78 (172)	7.96 (202)	5.32 (135)	27
MTC 4-30/3	1250	1.0	74	4.5 / 2.1	31 / 15.5	14.73 (374)	6.78 (172)	9.53 (242)	5.60 (142)	31
MTC 4-40/1	505	1.0	72	2.0 / 1.2	18 / 9	15.79 (401)	7.84 (199)	7.96 (202)	5.32 (135)	27
MTC 4-40/2	870	1.0	74	2.8 / 1.6	18 / 9	15.79 (401)	7.84 (199)	7.96 (202)	5.32 (135)	27
MTC 4-40/3	1250	1.0	74	4.5 / 2.1	31 / 15.5	15.79 (401)	7.84 (199)	9.53 (242)	5.60 (142)	31
MTC 4-40/4	1600	1.0	74	5.2 / 3.0	39 / 19.5	17.37 (441)	7.84 (199)	9.53 (242)	5.60 (142)	42
MTC 4-50/1	505	1.0	72	2.0 / 1.2	18 / 9	16.86 (428)	8.90 (226)	7.96 (202)	5.32 (135)	28
MTC 4-50/2	870	1.0	74	2.8 / 1.6	18 / 9	16.86 (428)	8.90 (226)	7.96 (202)	5.32 (135)	31
MTC 4-50/3	1250	1.0	74	4.5 / 2.1	31 / 15.5	16.86 (428)	8.90 (226)	9.53 (242)	5.60 (142)	38
MTC 4-50/4	1600	1.0	74	5.2 / 3.0	39 / 19.5	18.43 (468)	8.90 (226)	9.53 (242)	5.60 (142)	36
MTC 4-60/2	870	1.0	74	2.8 / 1.6	18 / 9	17.92 (455)	9.97 (253)	7.96 (202)	5.32 (135)	29
MTC 4-70/2	870	1.0	74	2.8 / 1.6	18 / 9	18.98 (482)	11.03 (280)	7.96 (202)	5.32 (135)	29
MTC 4-70/3	1250	1.0	74	4.5 / 2.1	31 / 15.5	18.98 (482)	11.03 (280)	7.96 (202)	5.32 (135)	33
MTC 4-70/4	1600	1.0	74	5.2 / 3.0	39 / 19.5	20.56 (522)	11.03 (280)	9.53 (242)	5.60 (142)	42
MTC 4-80/1	505	1.0	72	2.0 / 1.2	18 / 9	20.04 (509)	12.09 (307)	7.96 (202)	5.32 (135)	29
MTC 4-80/2	870	1.0	74	2.8 / 1.6	18 / 9	20.04 (509)	12.09 (307)	7.96 (202)	5.32 (135)	29
MTC 4-80/4	1600	1.0	74	5.2 / 3.0	39 / 19.5	21.62 (549)	12.09 (307)	9.53 (242)	5.60 (142)	43

MTC accessories

Sensors

Accessory	Measuring range		Product number
	[psi]	[bar]	
Pressure sensor Connection: 1/4" NPT	0-200	0 - 13.8	91120777
	0-58	0-4	96026029
	0-87	0-6	96026030
	0-145	0-10	96026031
	0-232	0-16	96026032
	0-362	0-25	96026033

MP 204 motor protector

TM03 1471 2205

Fig. 65 MP 204

The MP 204 is an electronic motor protector and data collecting unit. Apart from protecting the motor, it can also send information to a control unit via GENIbus, like for instance:

- trip
- warning
- energy consumption
- input power
- motor temperature.

The MP 204 protects the motor primarily by measuring the motor current by means of a true RMS measurement.

The pump is protected secondarily by measuring the temperature with a Tempcon sensor, a Pt100/Pt1000 sensor and a PTC sensor/thermal switch.

The MP 204 is designed for single- and three-phase motors.

Note: The MP 204 must not be used together with frequency converters.

MP 204 features

- Phase-sequence monitoring
- indication of current or temperature
- input for PTC sensor/thermal switch
- indication of temperature in °F or °C
- 4-digit, 7-segment display
- setting and status reading via the Grundfos GENIbus fieldbus.

Tripping conditions

- Overload
- underload (dry running)
- temperature
- missing phase
- phase sequence
- overvoltage
- undervoltage
- power factor (cos φ)
- current unbalance.

Warnings

- Overload
- underload
- temperature
- overvoltage
- undervoltage
- power factor (cos φ)
- run capacitor (single-phase operation)
- starting capacitor (single-phase operation)
- loss of communication in network
- harmonic distortion.

Learning function

- Phase sequence (three-phase operation)
- run capacitor (single-phase operation)
- starting capacitor (single-phase operation)
- identification and measurement of Pt100/Pt1000 sensor circuit.

Product number

Description	Product number
MP 204 motor protection	96079927

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3. MTA(H)

Introduction

TM05 1132 2211

Fig. 66 Grundfos MTA

Grundfos' MTA range of single-stage immersible pumps has been designed especially for transfer of liquids containing chips, fibers and abrasive particles in filtering systems in the machine tool industry.

These low-pressure pumps are available in nine different variants and come with a choice of top suction or bottom suction.

The pumps are designed to be mounted on top of tanks with the pump part immersed into the pumped liquid.

The pump is designed to be maintenance free, and therefore does not contain shaft seals or other wear parts.

Applications

The MTA(H) pumps are suitable for these applications:

- boring
- sawing
- milling
- grinding
- filtration.

Multiple applications

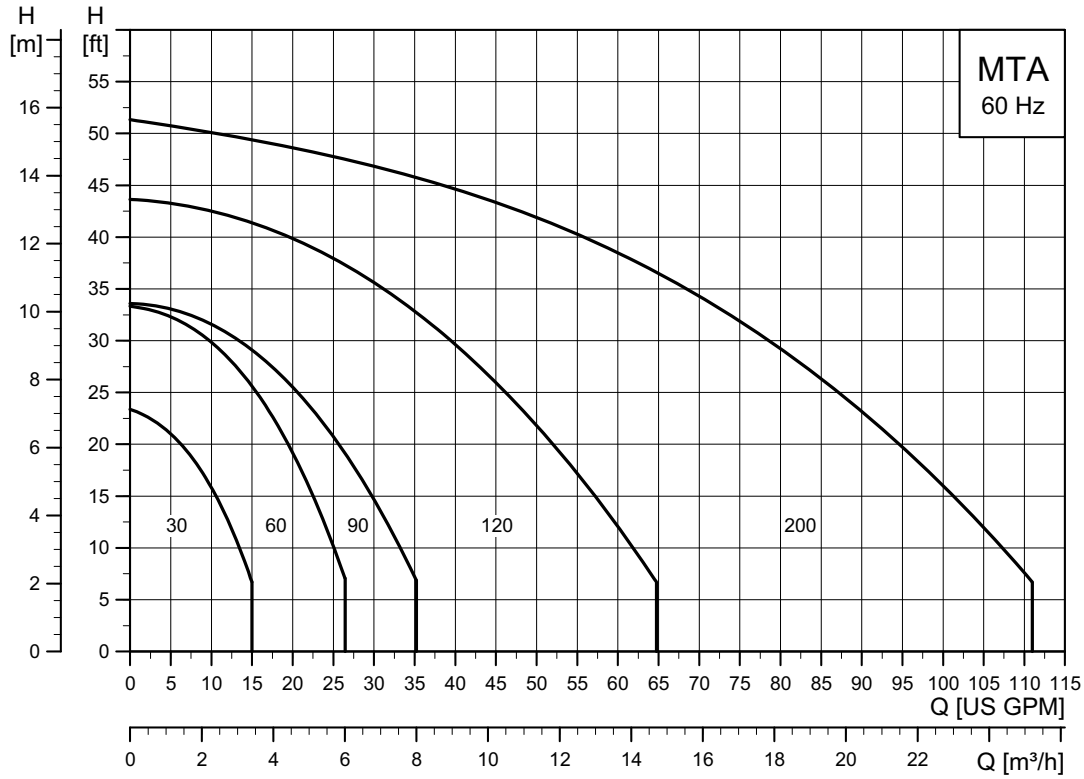
The compact MTA pumps efficiently transport liquid containing chips, fibers and abrasive particles to the filtering unit. Semi-open impellers allow the passing of chips up to 0.40 in. (10 mm), making the pumps ideal for removing liquid from machining processes.

Pumped liquids

Pump	Max. particle size [in. (mm)]
MTA 30	0.16 - 0.20 (4-5)
MTA 60	
MTA 90	0.31 - 0.40 (8-10)
MTA 120	
MTA 200	
MTA 20H	0.16 - 0.20 (4-5)
MTA 40H	
MTA 70H	
MTA 100H	

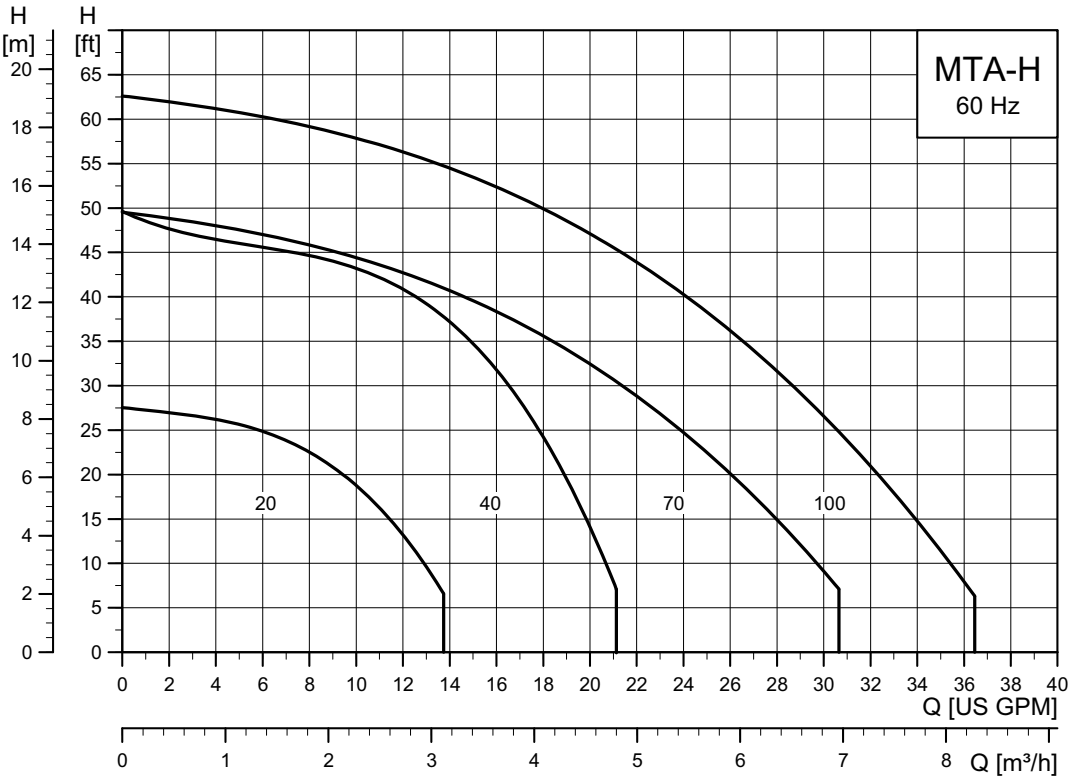
Max. kinematic viscosity [cSt]: 90.

MTA(H) performance range



TM05 4977 3112

Fig. 67 Performance range, MTA, 60 Hz



TM05 4976 3112

Fig. 68 Performance range, MTA-H, 60 Hz

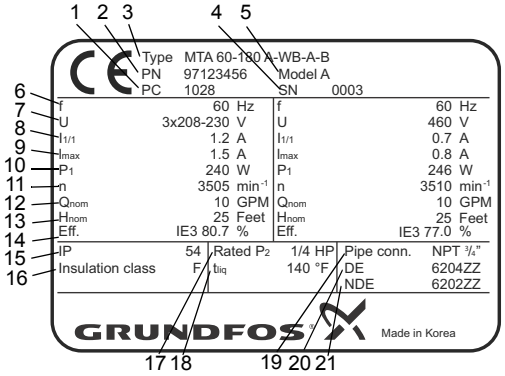
MTA(H) product range

Pump type	MTA 30	MTA 60	MTA 90	MTA 120	MTA 200	MTA 20H	MTA 40H	MTA 70H	MTA 100H
Rated flow rate [gpm (l/min)]	9.25 (35)	15.9 (60)	25.4 (96)	31.7 (120)	66 (250)	6.3 (24)	11.1 (42)	19 (72)	28.5 (108)
Temperature range [°F (°C)]	32 to 140 (0 to 60)								
Flow range [gpm (l/min)]	0 - 14.8 (0-56)	0 - 26.4 (0-100)	0 - 35.4 (0-134)	0 - 64.7 (0-245)	0-111 (0-420)	0 - 13.7 (0-52)	0 - 21.4 (0-81)	0 - 30.1 (0-114)	0 - 36.5 (0-138)
Maximum head [ft (m)]	23.3 (7.1)	33.1 (10.1)	33.5 (10.2)	43.6 (13.3)	51.2 (15.6)	27.6 (8.4)	46.6 (14.2)	47.8 (14.6)	62.7 (19.1)
Motor power [W]	79-145	161-333	219-460	319-755	671-1340	75-145	185-375	198-452	327-725
Pipe connection									
Internal thread	1/2" NPT	3/4" NPT	3/4" NPT	1 1/4" NPT	1 1/2" NPT	1/2" NPT	3/4" NPT	3/4" NPT	1" NPT
Material									
Pump housing	Cast iron	Cast iron	Cast iron	Cast iron	Cast iron	Cast iron	Cast iron	Cast iron	Cast iron
Impeller	PAA GF50	PAA GF50	PAA GF50	PAA GF50	Bronze	Bronze	Bronze	Bronze	Bronze
Installation length [in. (mm)]									
MTA	5.91 (150)	5.12 - 13.78 (130-350)	5.12 - 13.78 (130-350)	7.01 - 13.78 (180-350)	9.84 - 13.78 (250-350)	5.91 (150)	7.01 (180)	9.84 (250)	11.02 (280)
Suction									
Top suction	●	●	●	●	-	●	●	●	●
Bottom suction	●	●	●	●	●	-	-	★	-

★ MTA 70H available with bottom suction and PAA GF50 impeller.

MTA(H) identification

Nameplate



TM05 1444 2711

Fig. 69 Example of nameplate

Pos.	Designation
1	Production code (YYWW)
2	Product number
3	Type designation (see *Type key* on page 101)
4	Serial number
5	Model
6	Frequency
7	Supply voltage
8	Full load current
9	Max. current
10	Motor input power
11	Rated speed
12	Rated flow
13	Rated head
14	Efficiency class (applies only to MTA 200)
15	Motor enclosure class
16	Motor insulation class
17	Motor output power
18	Max. temperature of pumped liquid
19	Pipe connection
20	Motor drive-end bearing
21	Motor non-drive-end bearing

Type key

Example	MTA	60	H	-180	-A	-WB	-A	-B

Type range

Rated flow [l/min]

Pressure type

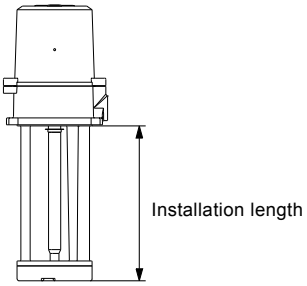
Installation length [mm]. See fig. 70.

Pump version
A = Standard version

Thread type
WB = Internal NPT thread
W = Internal Rp thread

Impeller material
A = PAA GF50
B = Bronze

Suction
T = Top
B = Bottom

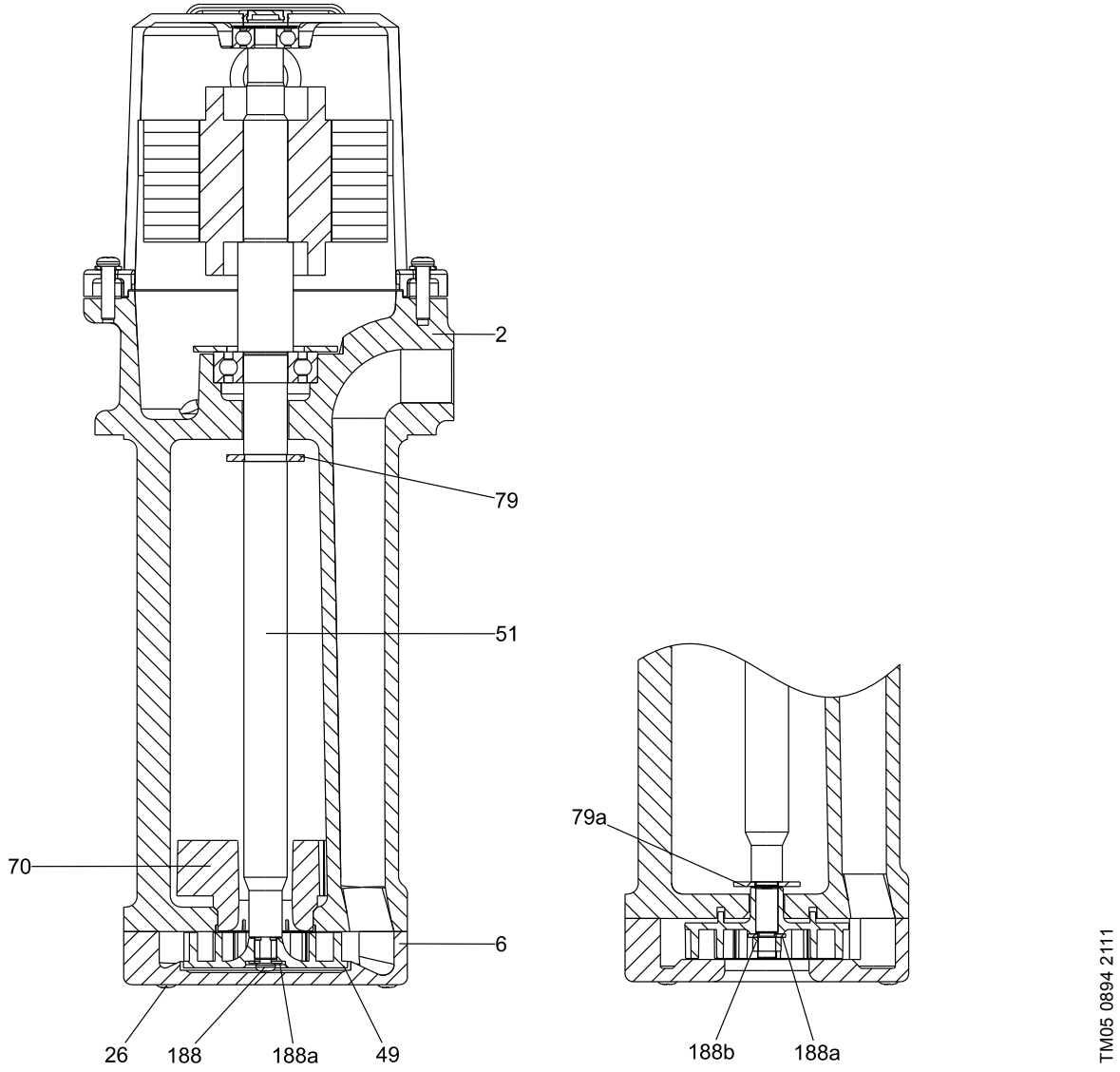


TM05 1021 2011

Fig. 70 Installation length

MTA(H) construction

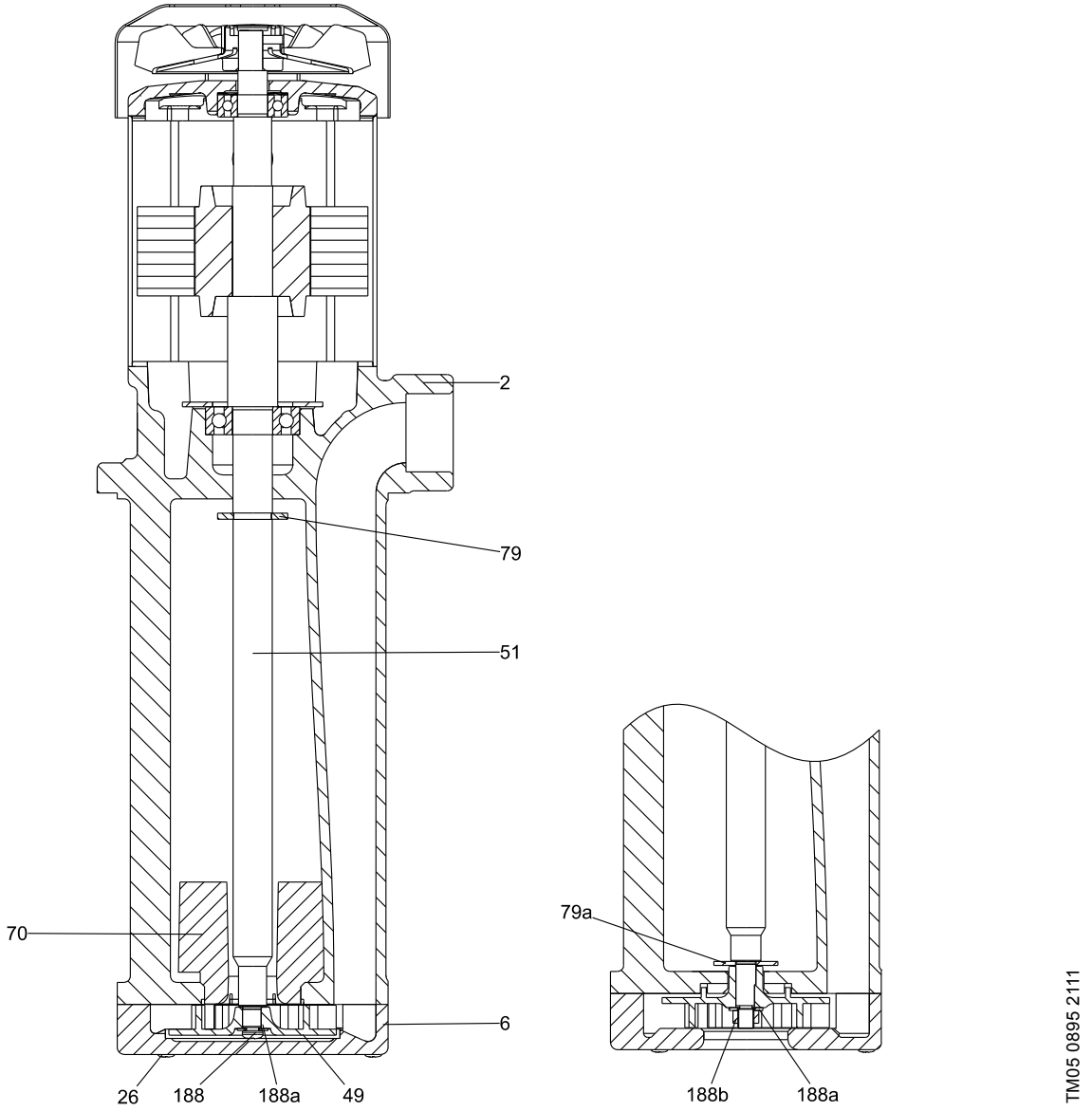
MTA 30, 60, 90, 20H, 40H, 70H



Pos.	Description		Material	EN/DIN	AISI/ASTM	JIS
2	Pump head		Cast iron	GG20	A48-CL30	FC200
6	Pump housing		Cast iron	GG20	A48-CL30	FC200
26	Screw		Stainless steel	1.4301	A276-304	SUS304
49	Impeller	MTA 30, 60, 90, 70H*	PAA GF50			
		MTA 20H, 40H, 70H**	Bronze casting	G-CuZn-5ZnPb	C92200	BC7
51	Shaft with rotor		Steel	C45	A108-1045	S45C
70	Vortex preventer	MTA 90	PP			
79	Thrower		NBR			
79a	Splash ring		Steel	1623 ST 12	A366	SPCC
188	Phillips head screw		Stainless steel	1.4301	A276-304	SUS304
188a	Washer		Stainless steel	1.4301	A276-304	SUS304
188b	Hex head nut		Stainless steel	1.4301	A276-304	SUS304

* MTA 70H, bottom suction
** MTA 70H, top suction

MTA 120, 200, 100H



Pos.	Description		Materials	EN/DIN	AISI/ASTM	JIS
2	Pump head		Cast iron	GG20	A48-CL30	FC200
6	Pump housing		Cast iron	GG20	A48-CL30	FC200
26	Screw		Stainless steel	1.4301	A276-304	SUS304
49	Impeller		Bronze casting	G-CuZn-5ZnPb	C92200	BC7
		MTA 120	PAA GF 50			
51	Shaft with rotor		Steel	C45	A108-1045	S45C
70	Vortex preventer	MTA 120	PP			
79	Thrower		NBR			
79a	Splash ring		Steel	1623 ST 12	A366	SPCC
188	Cross-head screw		Stainless steel	1.4301	A276-304	SUS304
188a	Washer		Stainless steel	1.4301	A276-304	SUS304
188b	Hexagon nut		Stainless steel	1.4301	A276-304	SUS304
	Terminal box		Aluminium			

MTA(H) operating conditions

Temperatures

Permissible liquid temperature [°F (°C)]	32 to 140 (0 to 60)
Maximum permissible ambient temperature during operation [°F (°C)]	104 (40)
Permissible ambient temperature during storage [°F (°C)]	-58 to +158 (-50 to +70)

Sound pressure level

Pump	Motor power [W]	[dB(A)]
MTA 30	100	< 45
MTA 60	180	< 45
MTA 90	250	< 45
MTA 120	400	< 62
MTA 200	750	< 62
MTA 20H	100	< 45
MTA 40H	180	< 45
MTA 70H	250	< 45
MTA 100H	400	< 62

Vibration level

Vibration velocity RMS < 0.07 in/s (1.8 mm/s).
Vibration to ISO 10816-1 class IB.

MTA(H) motor data

Electrical data

Power supply (tolerance ± 10 %)	60 Hz	3 x 200-220 V
		3 x 208-230/460 V
Efficiency class	MTA 200, 750 W*	IE3
Enclosure class to IEC60034-5		IP54
Insulation class		F

* Motors smaller than 750 W are not covered by the IE standard.

We do not recommend operation via a variable frequency drive (VFD).

Maximum number of starts

Recommended maximum number of starts per hour is 250.

MTA(H) installation

Note: The MTA pumps can only be mounted in the vertical position.

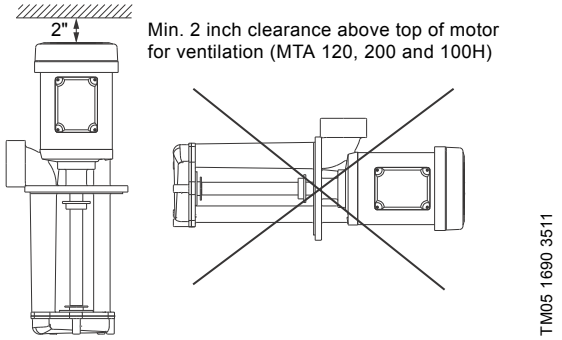


Fig. 71 Correct mounting position

For ventilation and cooling, a clearance of minimum 2 in. (50 mm) above the motor must be ensured (applies only to MTA 120, 200 and 100H).

The pump is designed for indoor operation only. Liquids must not be sprayed directly on the motor.

Liquid level

MTA with top suction

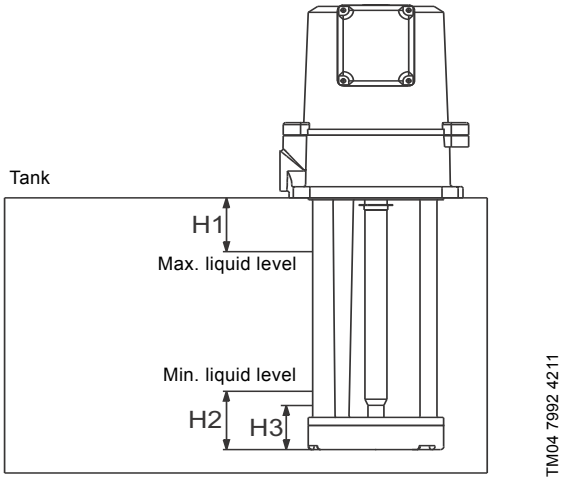


Fig. 72 MTA with top suction

Pump	H1 [in. (mm)]	H2* [in. (mm)]	H3** [in. (mm)]
MTA 30	0.59 (15)	2.36 (60)	1.97 (50)
MTA 60	0.79 (20)	2.76 (70)	1.77 (45)
MTA 90	0.79 (20)	3.35 (85)	2.28 (58)
MTA 120	0.79 (20)	4.33 (110)	2.76 (70)
MTA 20H	0.59 (15)	1.97 (50)	1.57 (40)
MTA 40H	0.79 (20)	2.76 (70)	1.57 (40)
MTA 70H	0.79 (20)	3.15 (80)	1.97 (50)
MTA 100H	0.79 (20)	4.34 (110)	2.36 (60)

* Min. liquid level (full performance)
** Min. permissible liquid level (reduced performance)

MTA with bottom suction

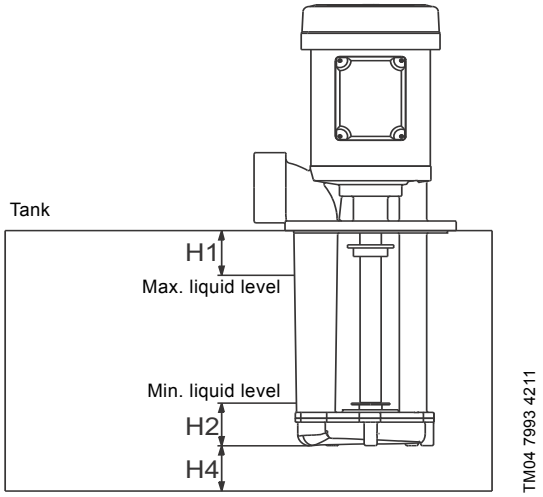


Fig. 73 MTA with bottom suction

Pump	H1 [in. (mm)]	H2 [in. (mm)]	H3* [in. (mm)]
MTA 30	0.59 (15)	0.79 (20)	0.39 (10)
MTA 60	0.79 (20)	0.79 (20)	0.39 (10)
MTA 90	0.79 (20)	0.98 (25)	0.59 (15)
MTA 120	0.79 (20)	0.98 (25)	0.79 (20)
MTA 200	0.98 (25)	0.98 (50)	1.18 (30)

* Min. liquid level (full performance)

When pumping product with a viscosity higher than 1cst, use a higher liquid level to reduce the potential for cavitation/air entrapment.

Terminal box positions

The terminal box of most of the MTA pump types can be turned to another position after delivery. See the table below.

Pump	Terminal box positions			
	3 o'clock	6 o'clock	9 o'clock (standard)	12 o'clock
MTA 30	•	-	•	-
MTA 60	•	(•)	•	(•)
MTA 90	•	(•)	•	(•)
MTA 120	(•)	(•)	•	(•)
MTA 200	(•)	(•)	•	(•)
MTA 20H	•	-	•	-
MTA 40H	•	(•)	•	(•)
MTA 70H	•	(•)	•	(•)
MTA 100H	(•)	(•)	•	(•)

• This position is possible. The pump can be ordered with the terminal box in this position or the terminal box can be turned to this position after delivery.

(•) This position is possible, but the terminal box cannot be turned to this position after delivery. Therefore, the pump must be ordered with the terminal box in this position.

\- This position is not possible.

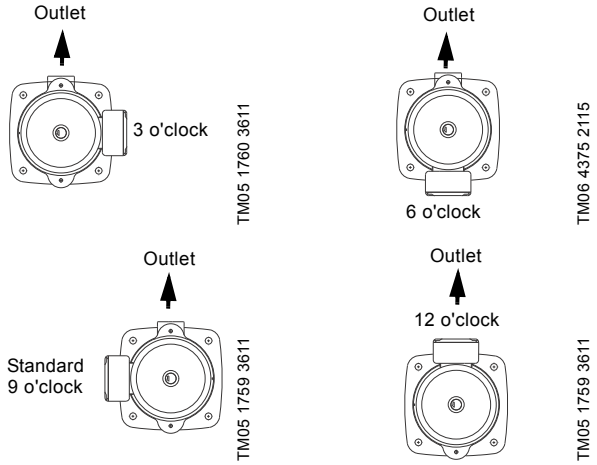
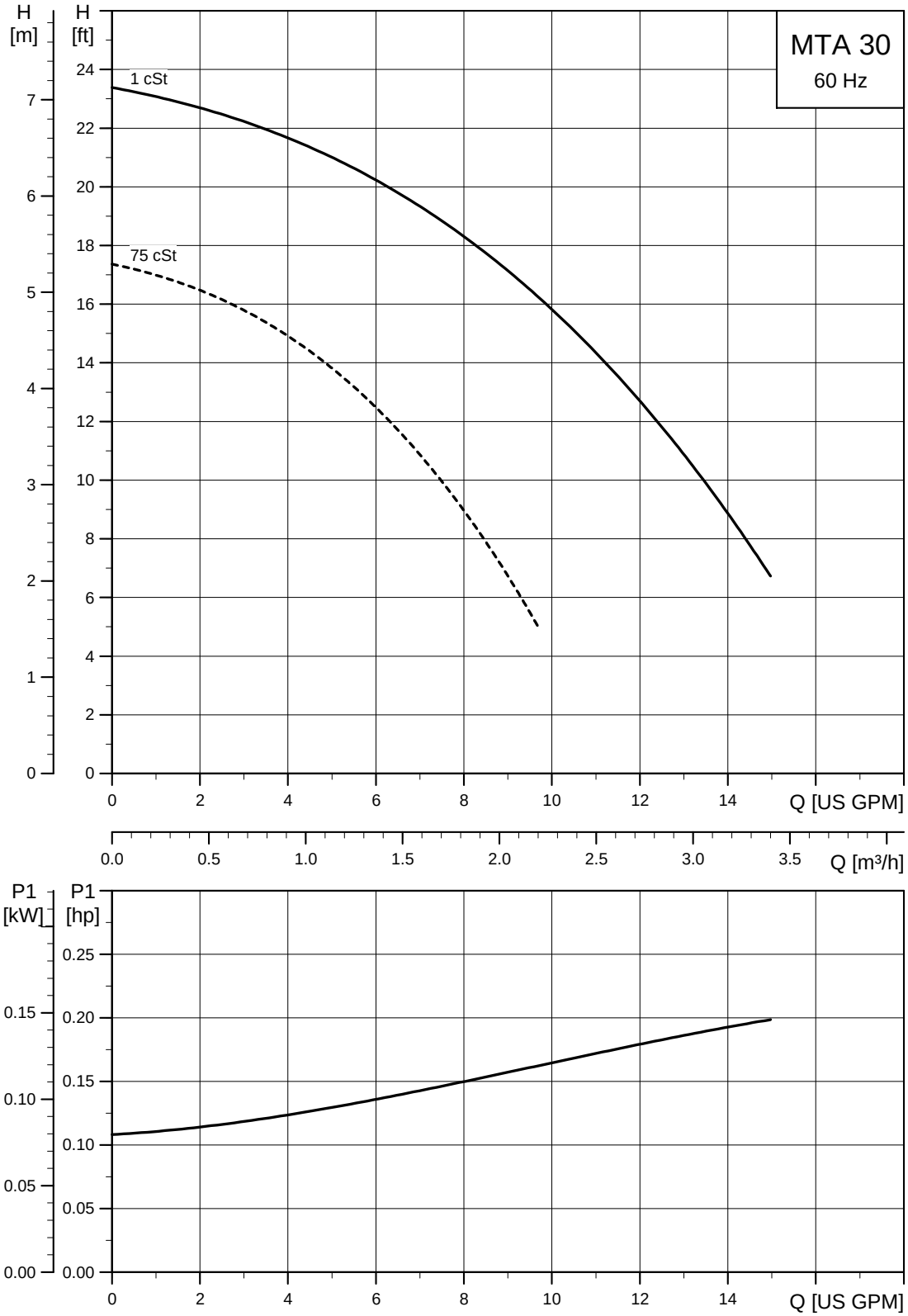


Fig. 74 Possible terminal box positions

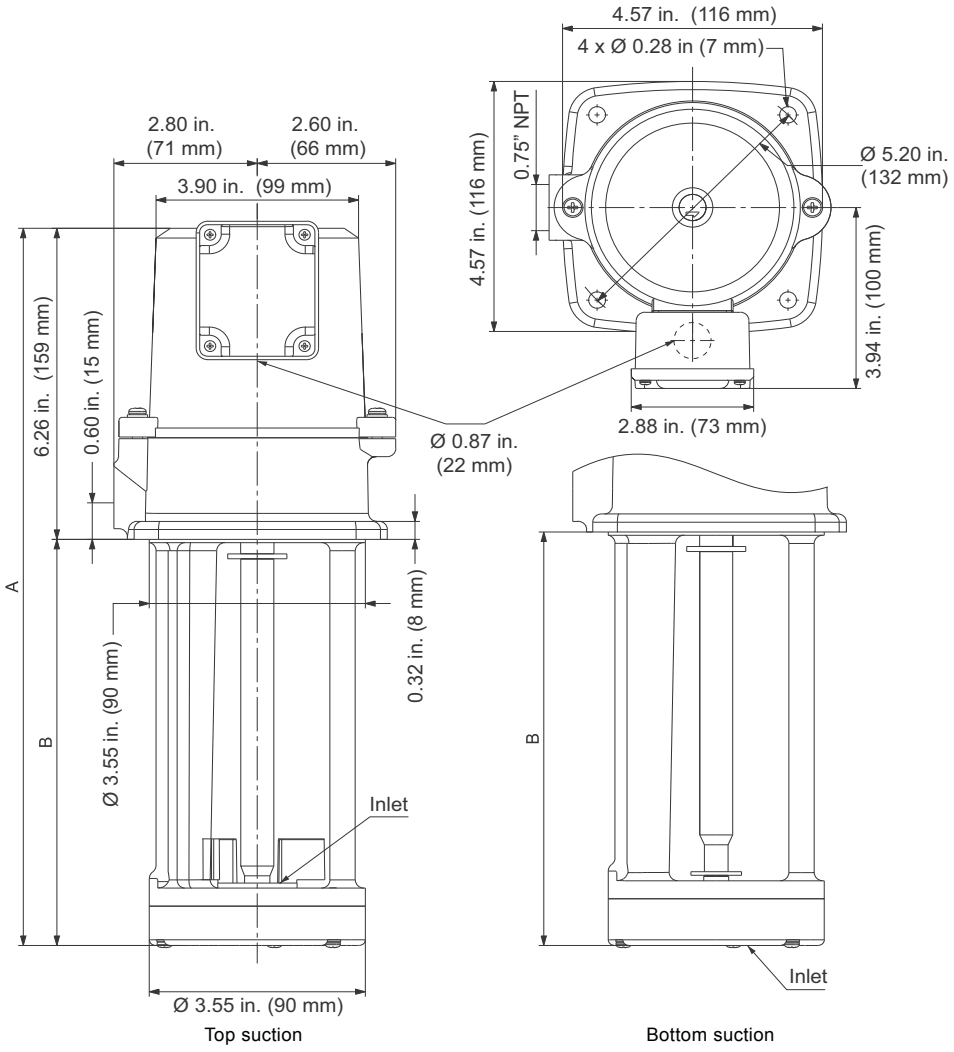
MTA(H) curve charts and technical data

MTA 30



TM05 4979 3112

Dimensional sketches



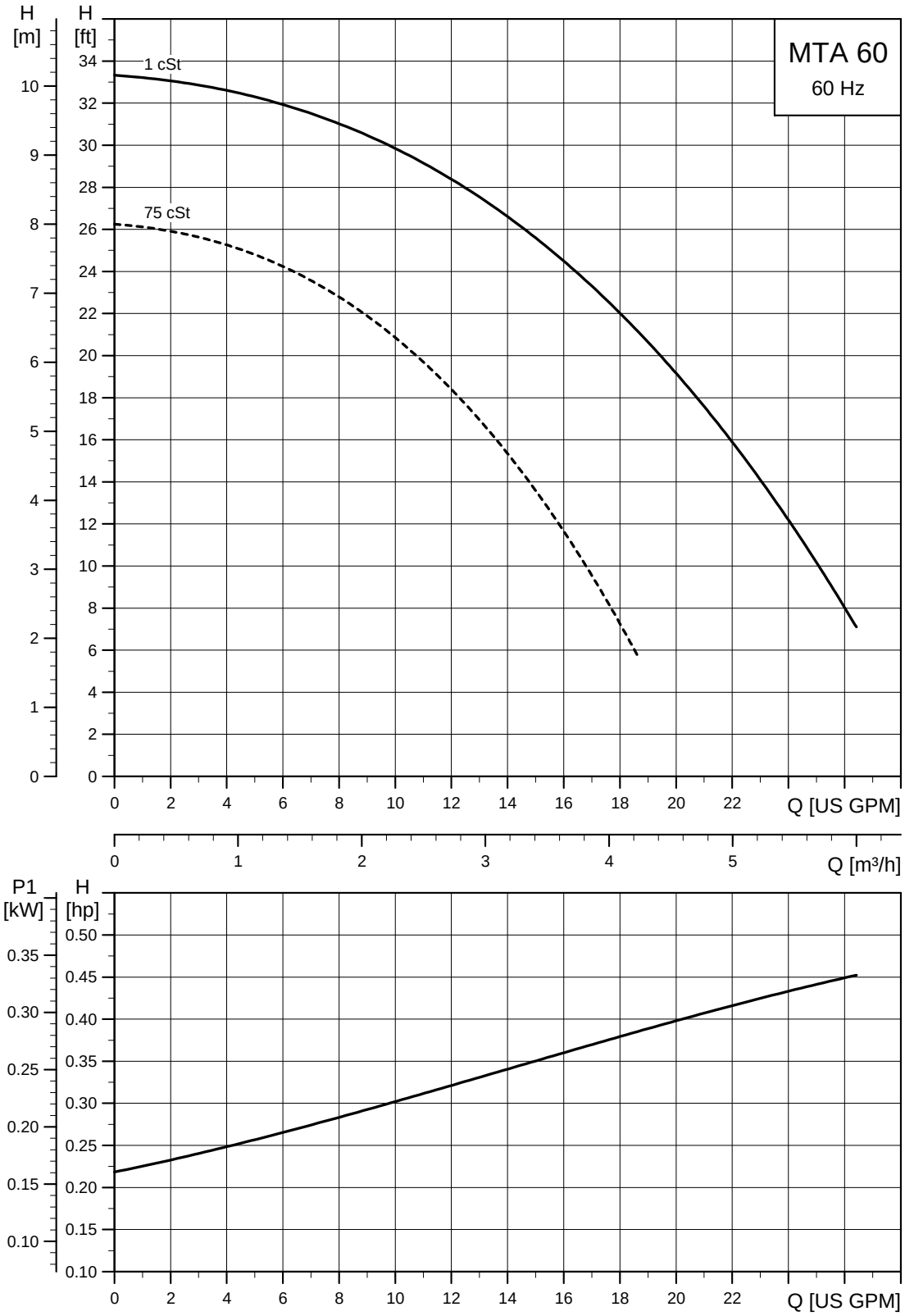
Dimensions and weights

Pump type	Suction	A [in. (mm)]	B [in. (mm)]	Ship weight [lb]
MTA 30-150	Top	12.17 (309)	5.91 (150)	17
MTA 30-150	Bottom	12.29 (312)	6.03 (153)	17

Electrical data

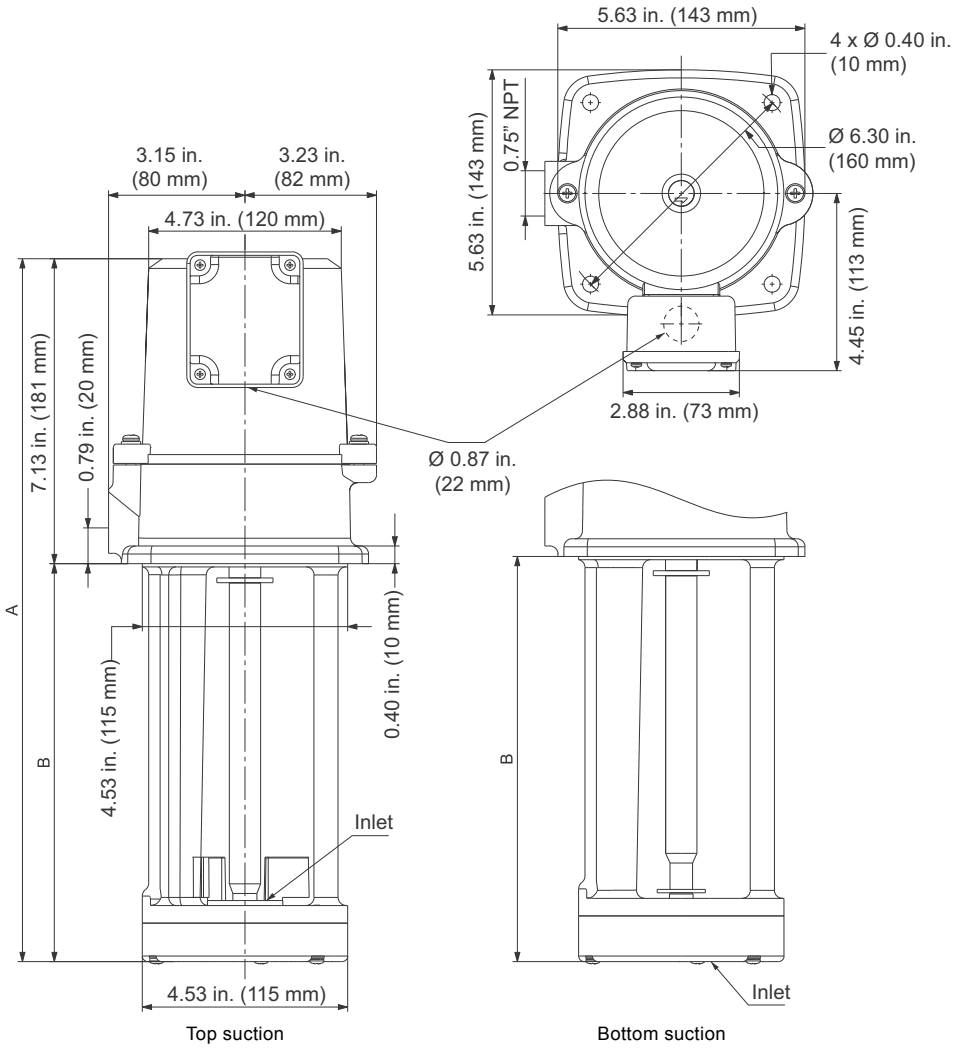
Voltage	Frequency [Hz]	P1 [W]	$I_{1/1}$ [A]	I_{max} [A]	I_{start} / $I_{1/1}$ [A]	Cos φ
3 x 200Δ V	60	145	0.5	0.58 - 0.58	4.8 - 5.2	0.84 - 0.76
3 x 220-240Δ/380-440Y V	60	142	0.41 / 0.24 - 0.22	0.47 / 0.28 - 0.25	4.8 - 5.2	0.91 - 0.83

MTA 60



TM05 4980 3112

Dimensional sketches



TM05 4994 3112

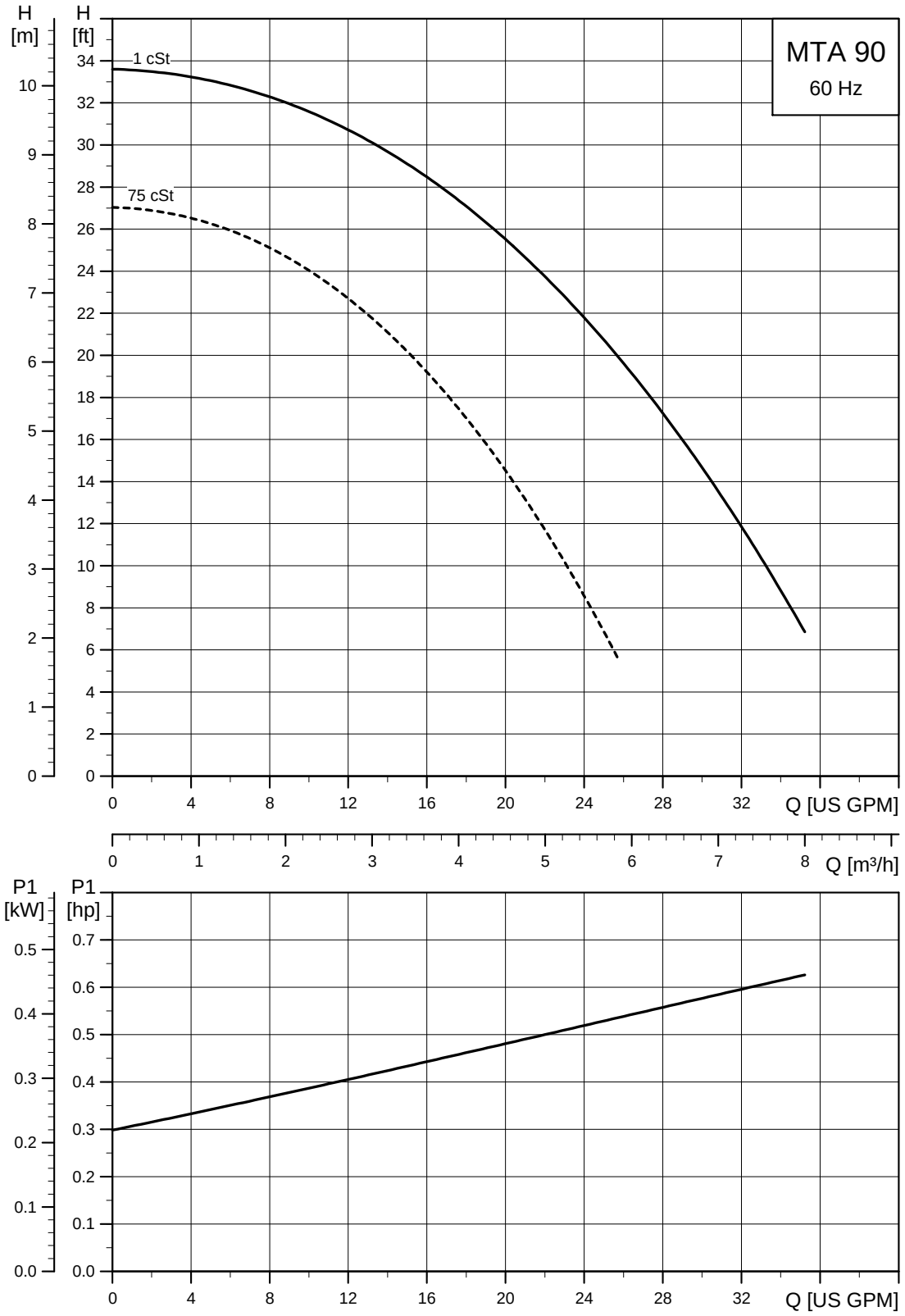
Dimensions and weights

Pump type	Suction	A [in. (mm)]	B [in. (mm)]	Ship weight [lb]
MTA 60-130	Top	12.10 (306)	4.93 (125)	26
MTA 60-180		14.02 (356)	6.89 (175)	27
MTA 60-250		16.78 (426)	9.65 (245)	27
MTA 60-350		20.71 (526)	13.59 (345)	33
MTA 60-130	Bottom	12.29 (312)	5.16 (131)	27
MTA 60-180		14.26 (362)	7.13 (181)	28
MTA 60-250		17.01 (432)	9.89 (251)	30
MTA 60-350		20.95 (532)	13.82 (351)	33

Electrical data

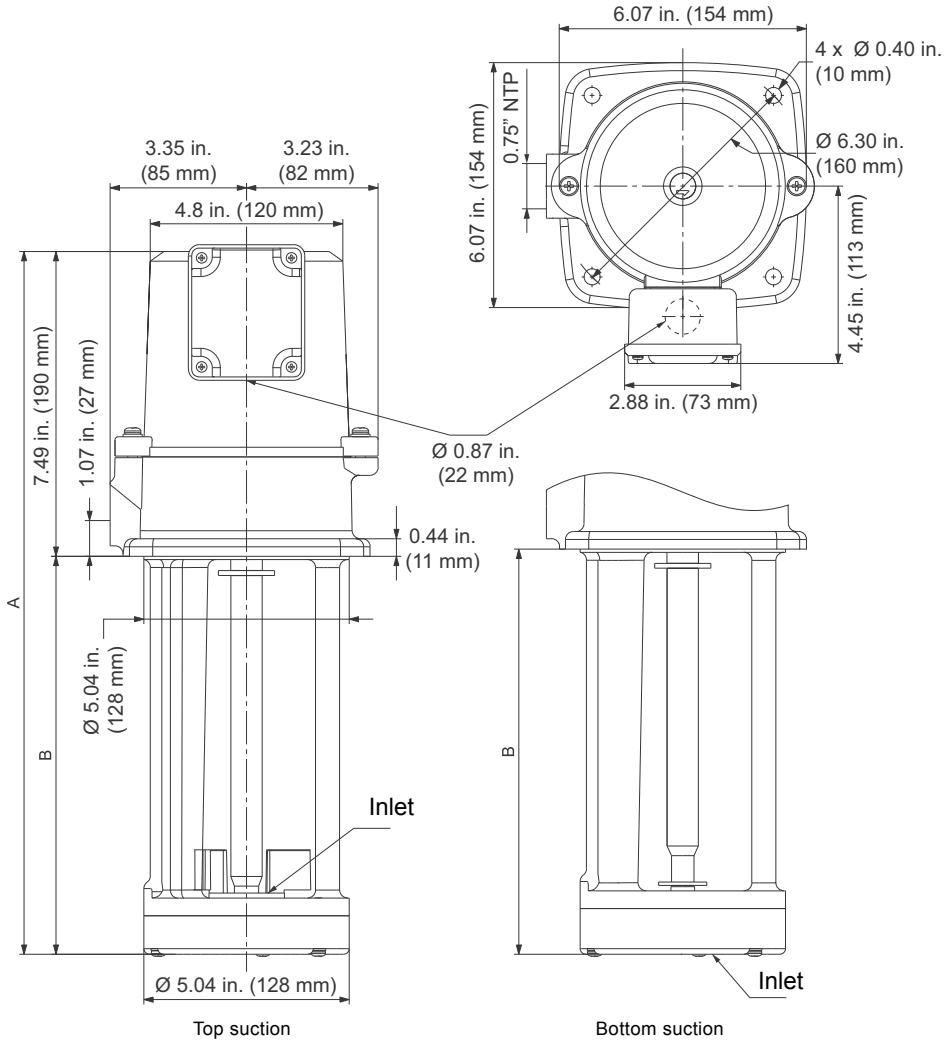
Voltage	Frequency [Hz]	P1 [W]	$I_{1/1}$ [A]	I_{max} [A]	I_{start} / $I_{1/1}$ [A]	Cos φ
3 x 200Δ V	60	333	1.18 - 1.09	1.36 - 1.27	4.8 - 5.2	0.81 - 0.80
3 x 220-240Δ/380-440Y V	60	330	0.99 / 0.63 - 0.57	1.14 / 0.72 - 0.66	4.8 - 5.2	0.87 - 0.8

MTA 90



TM05 4981 3112

Dimensional sketches



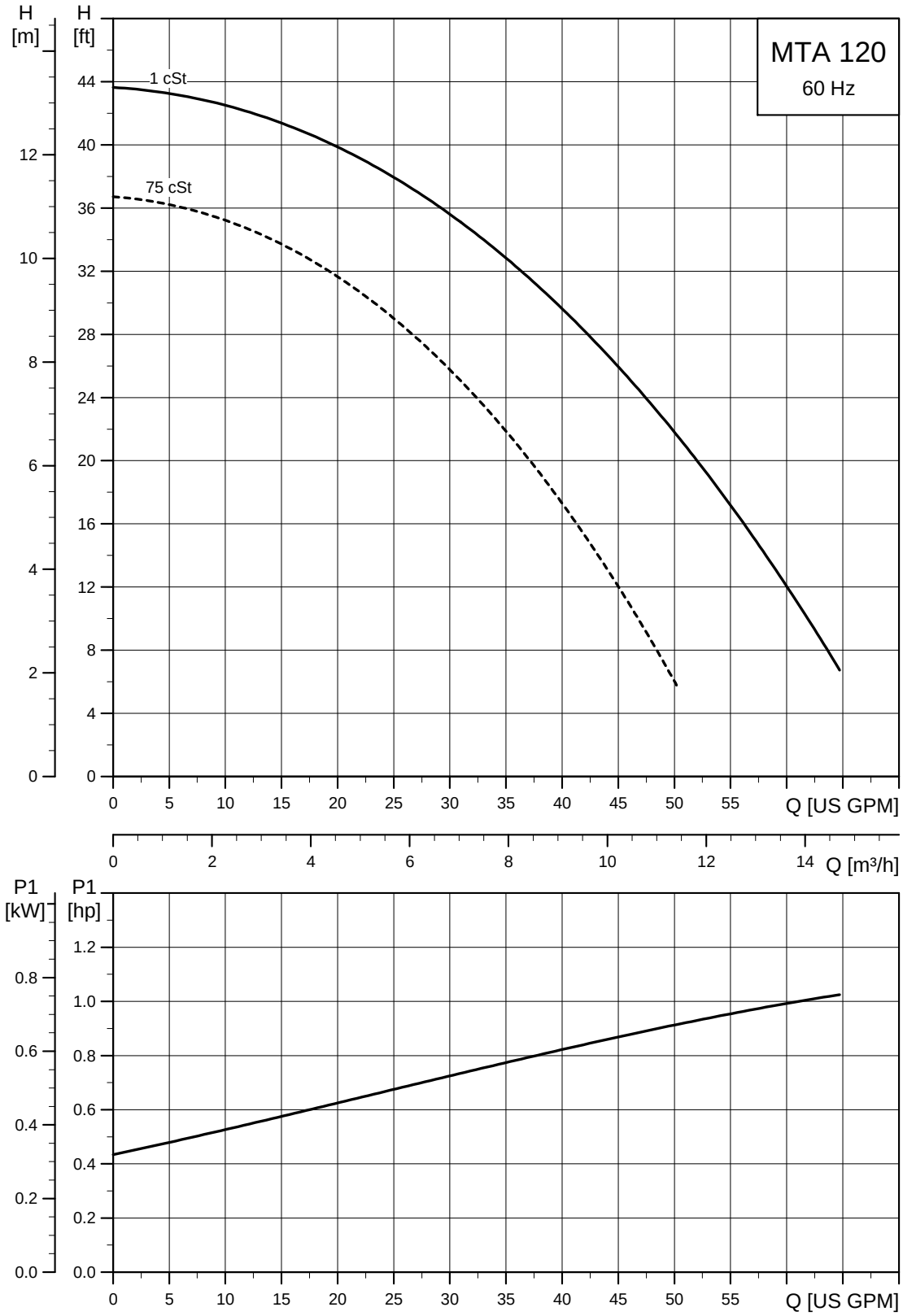
Dimensions and weights

Pump type	Suction	A [in. (mm)]	B [in. (mm)]	Ship weight [lb]
MTA 90-130	Top	12.52 (318)	5.01 (128)	32
MTA 90-180		14.49 (368)	7.01 (178)	34
MTA 90-250		17.25 (438)	9.77 (248)	36
MTA 90-350		21.19 (538)	13.71 (348)	40
MTA 90-130	Bottom	12.72 (323)	5.24 (133)	32
MTA 90-180		14.69 (373)	7.21 (183)	34
MTA 90-250		17.45 (443)	9.96 (253)	36
MTA 90-350		21.38 (543)	13.90 (353)	40

Electrical data

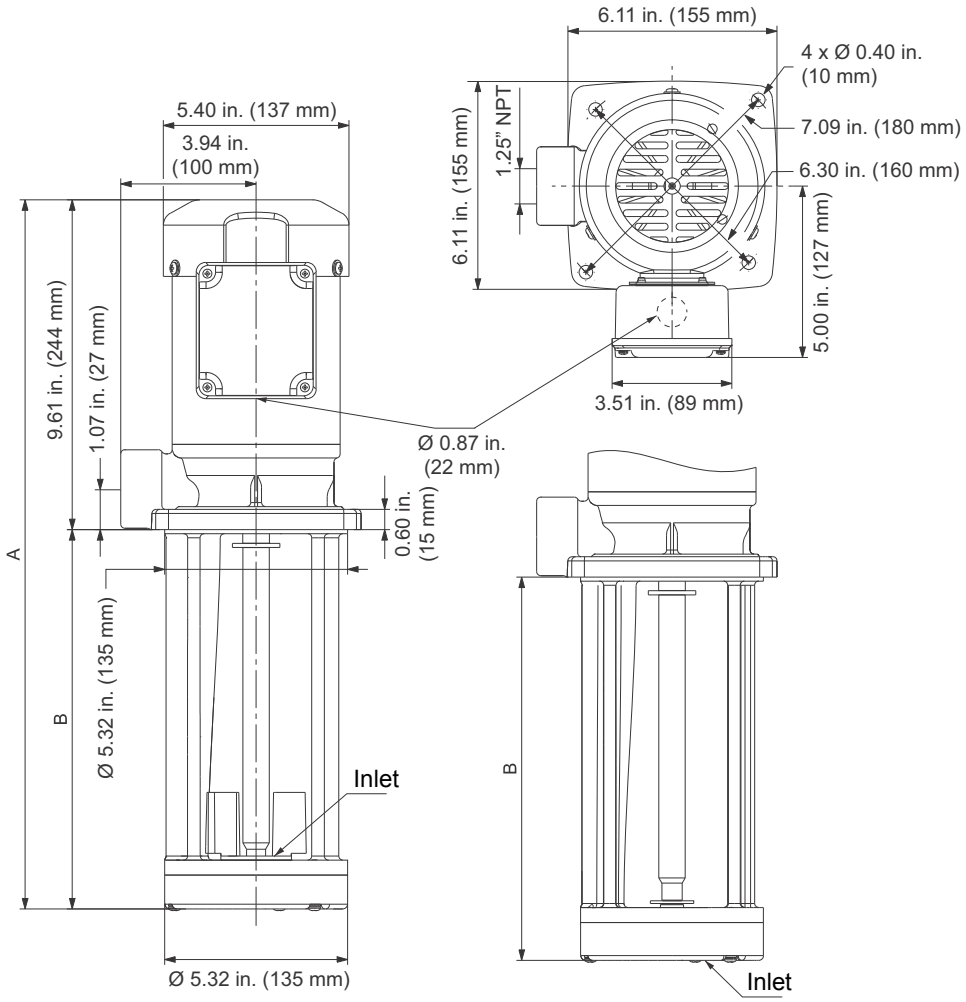
Voltage	Frequency [Hz]	P1 [W]	$I_{1/1}$ [A]	I_{max} [A]	I_{start} / $I_{1/1}$ [A]	Cos φ
3 x 200Δ V	60	460	1.63 - 1.51	1.87 - 1.74	4.8 - 5.2	0.81 - 0.80
3 x 220-240Δ/380-440Y V	60	440	1.3 / 0.8 - 0.72	1.5 / 0.92 - 0.83	4.8 - 5.2	0.89 - 0.81

MTA 120



TM05 4982 3112

Dimensional sketches



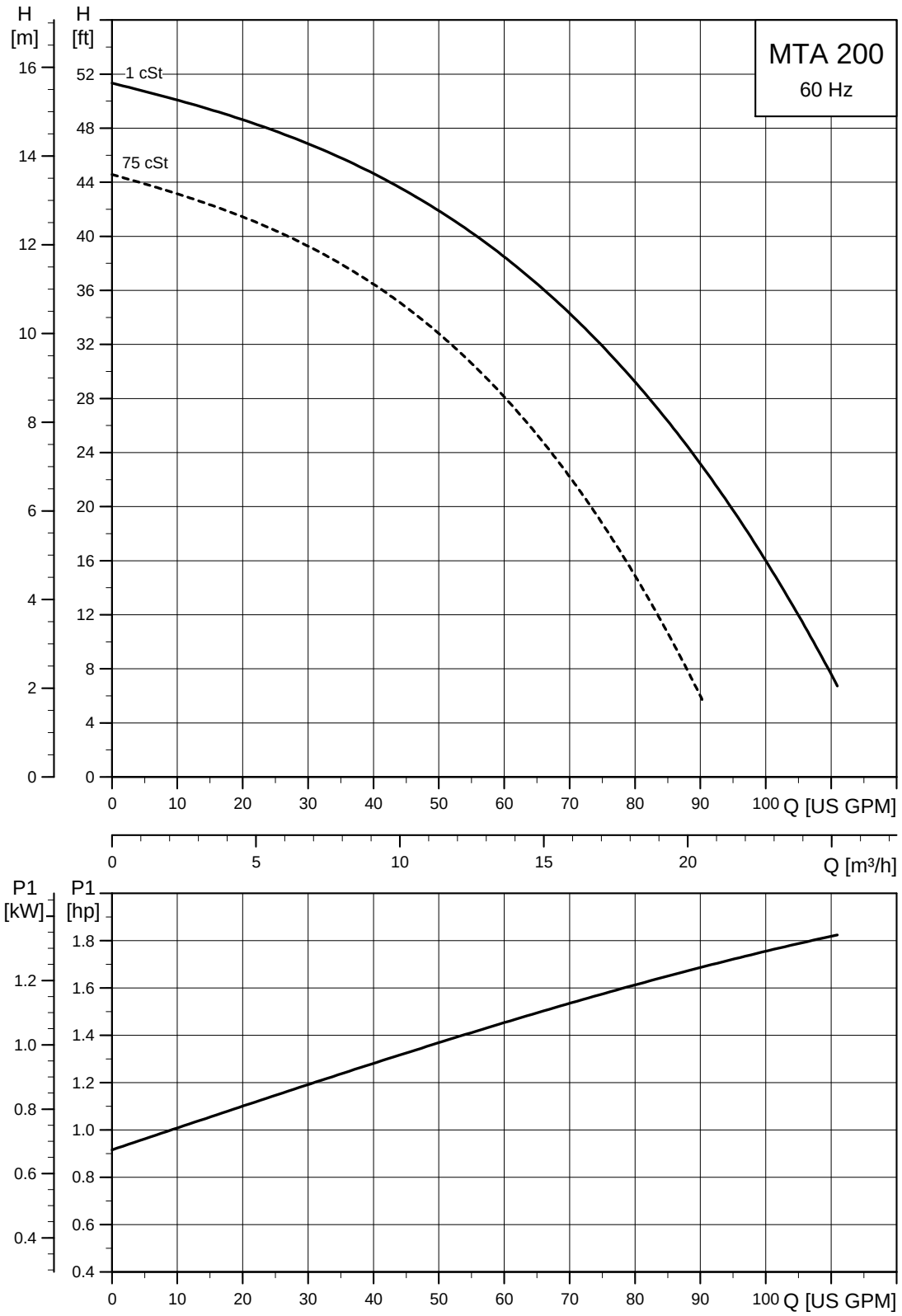
Dimensions and weights

Pump type	Suction	A [in. (mm)]	B [in. (mm)]	Ship weight [lb]
MTA 120-180	Top	16.70 (424)	7.10 (180)	39
MTA 120-250		19.45 (494)	9.85 (250)	42
MTA 120-280		20.63 (524)	11.03 (280)	43
MTA 120-350		23.39 (594)	13.78 (350)	48
MTA 120-180	Bottom	16.82 (427)	7.21 (183)	40
MTA 120-250		19.57 (497)	9.97 (253)	43
MTA 120-280		20.75 (527)	11.15 (283)	44
MTA 120-350		23.51 (597)	13.90 (353)	48

Electrical data

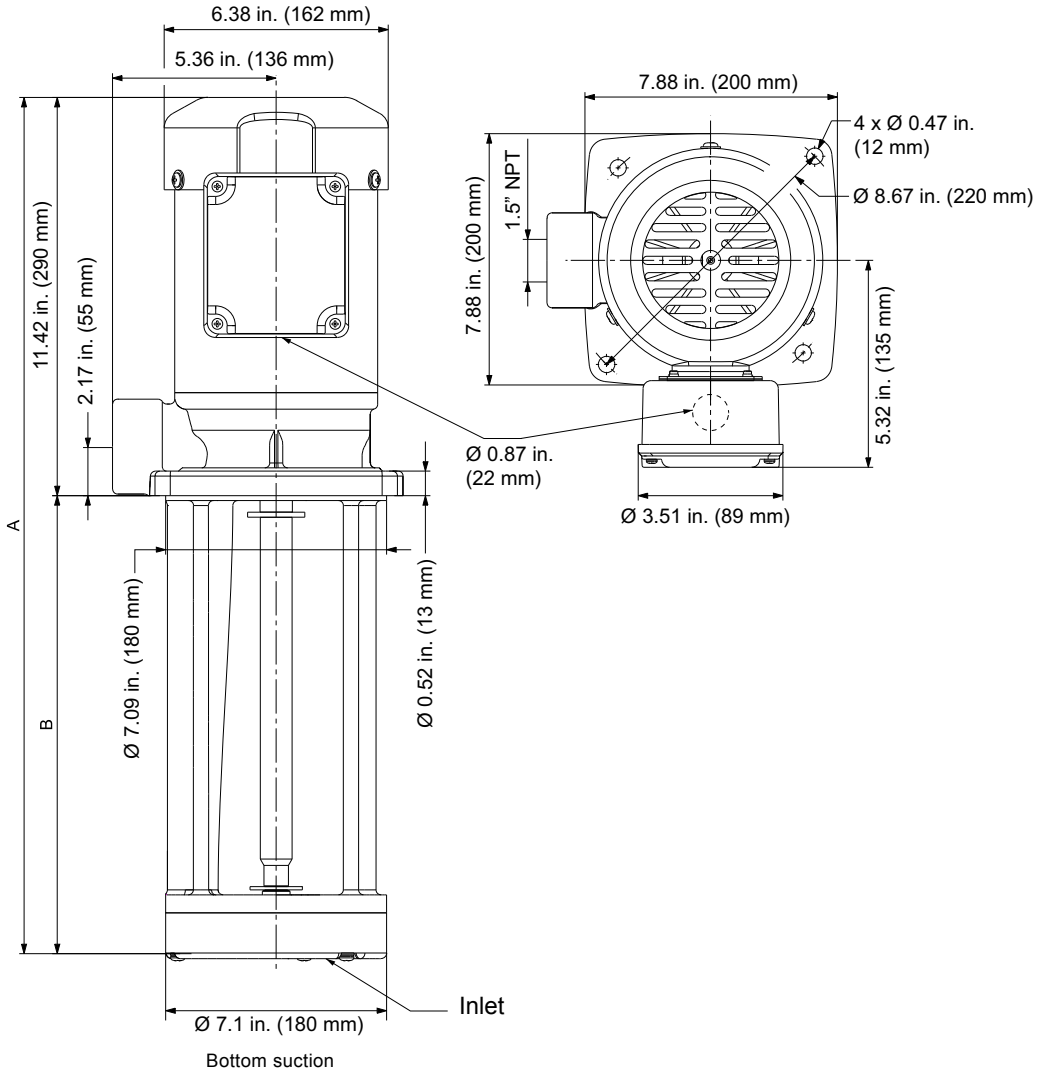
Voltage	Frequency [Hz]	P1 [W]	$I_{1/1}$ [A]	I_{max} [A]	I_{start} / $I_{1/1}$ [A]	Cos φ
3 x 200Δ V	60	755	2.47 - 2.37	2.84 - 2.73	5.0 - 5.5	0.88 - 0.84
3 x 220-240Δ/380-440Y V	60	730	2.1 / 1.26 - 1.13	2.42 / 1.45 - 1.3	5.0 - 5.5	0.91 - 0.84

MTA 200



TM05 4983 3212

Dimensional sketches



TM05 4997 3412

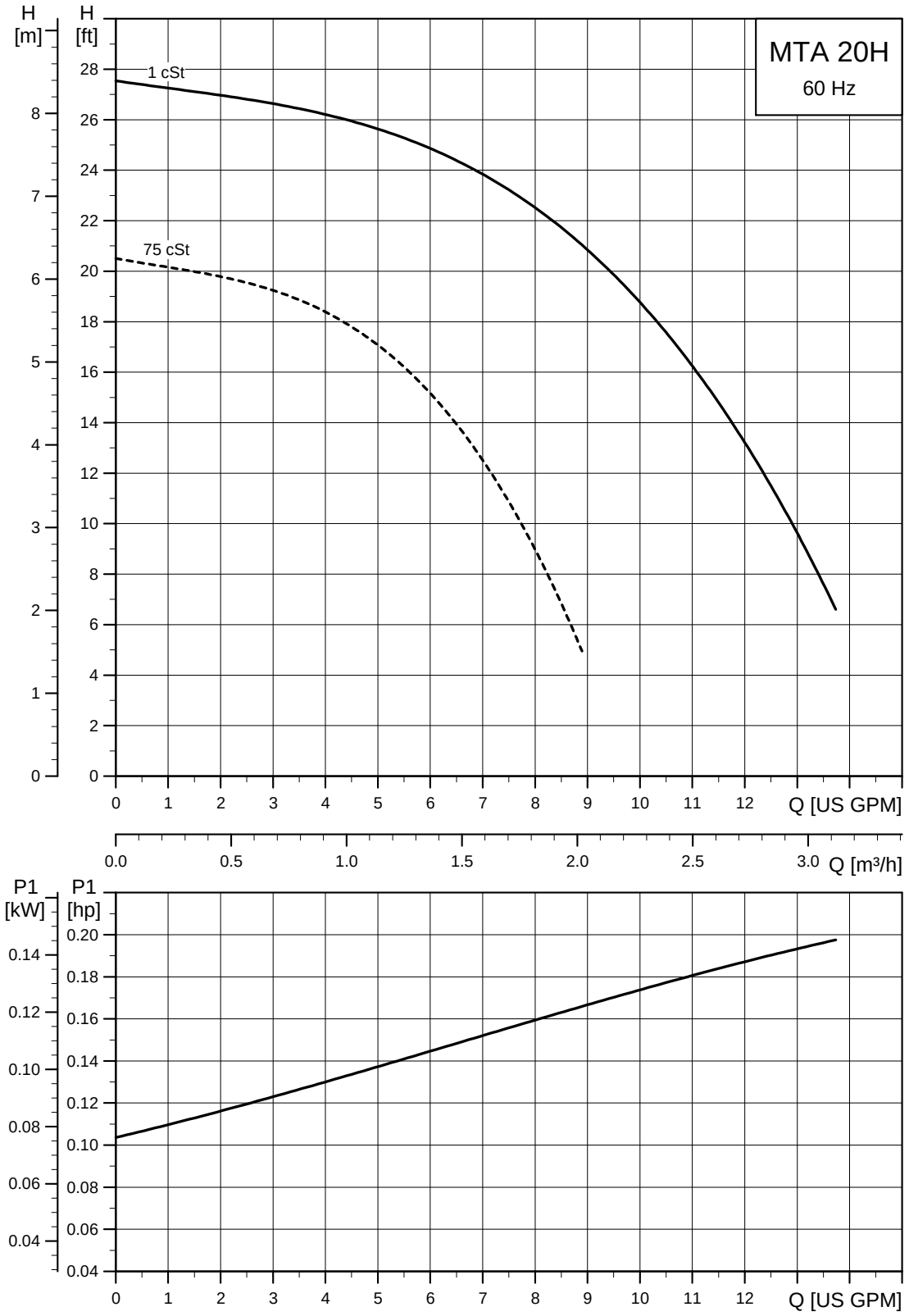
Dimensions and weights

Pump type	Suction	A [in. (mm)]	B [in. (mm)]	Ship weight [lb]
MTA 200-250	Bottom	21.26 (540)	9.85 (250)	60
MTA 200-280		22.45 (570)	11.03 (280)	61
MTA 200-350		25.20 (640)	13.78 (350)	64

Electrical data

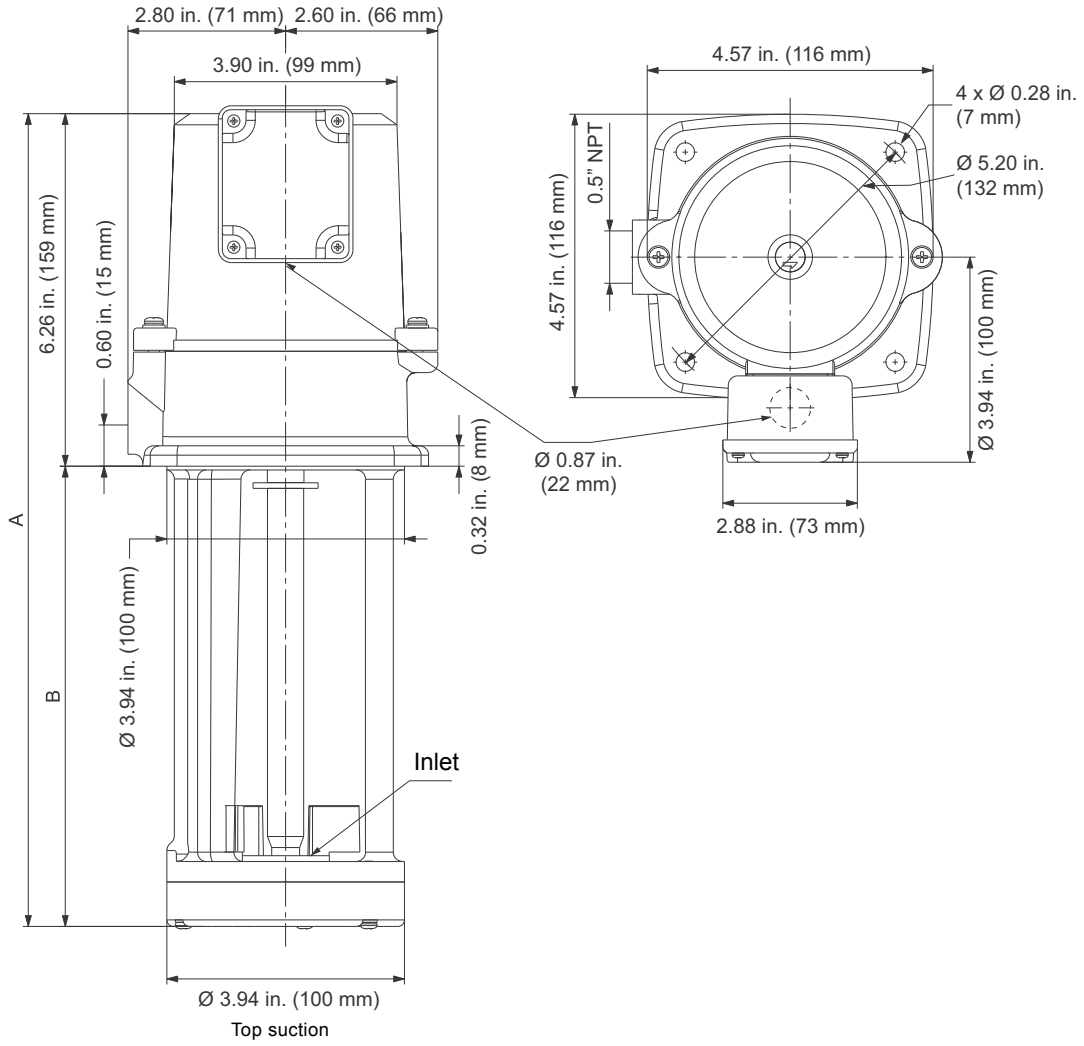
Voltage	Frequency [Hz]	P1 [W]	$I_{1/1}$ [A]	I_{max} [A]	I_{start} / $I_{1/1}$ [A]	Cos φ
3 x 200Δ V	60	1340	4.28 - 4.28	4.92 - 4.92	5.0 - 5.5	0.90 - 0.82
3 x 220-240Δ/380-440Y V	60	1270	3.48 / 2.11-1.96	4.0 / 2.43-2.25	5.0 - 5.5	0.96 - 0.88

MTA 20H



TM05 4984 3112

Dimensional sketches



TM05 4998 3112

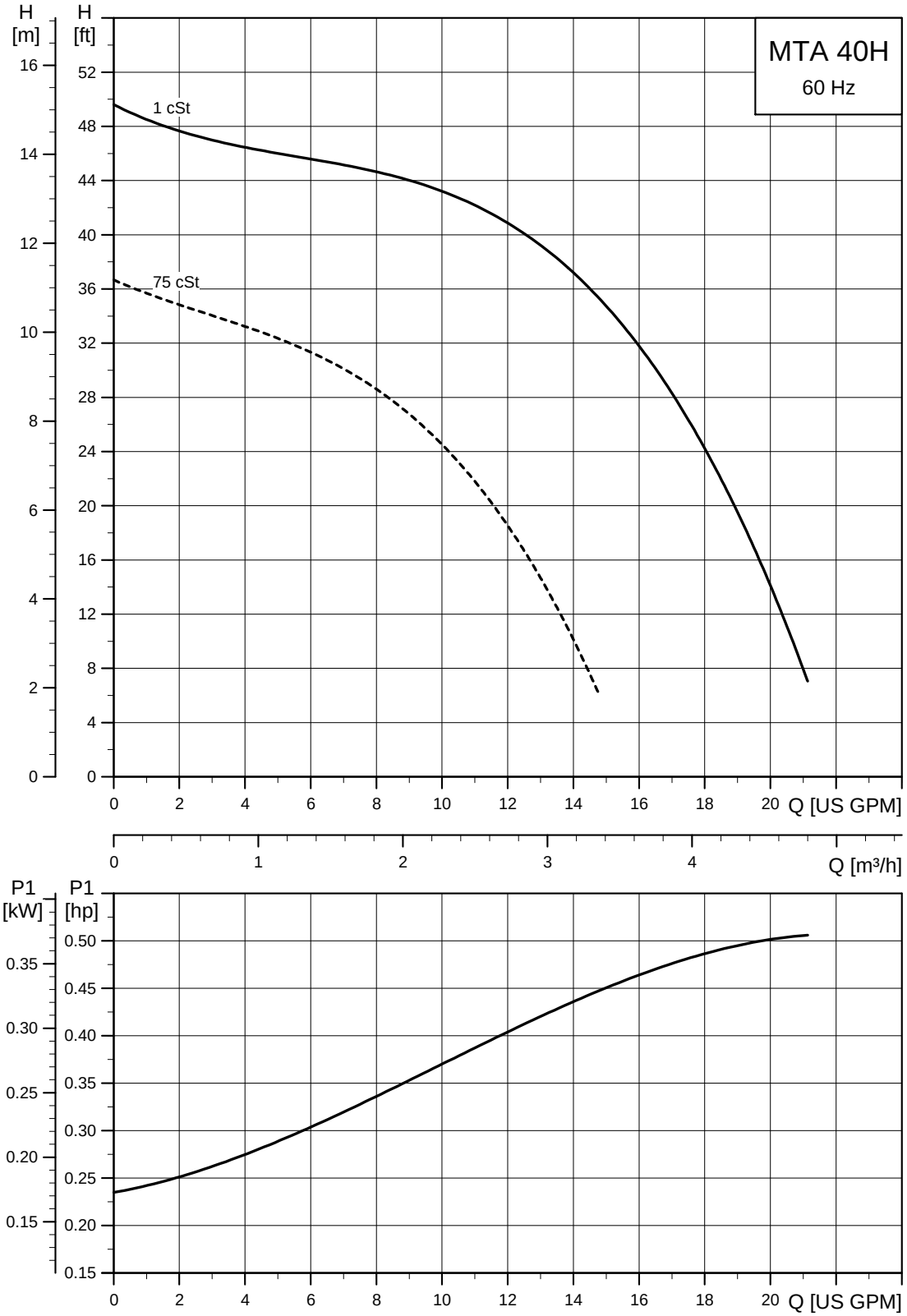
Dimensions and weights

Pump type	Suction	A [in. (mm)]	B [in. (mm)]	Ship weight [lb]
MTA 20H-150	Top	12.17 (309)	5.91 (150)	17

Electrical data

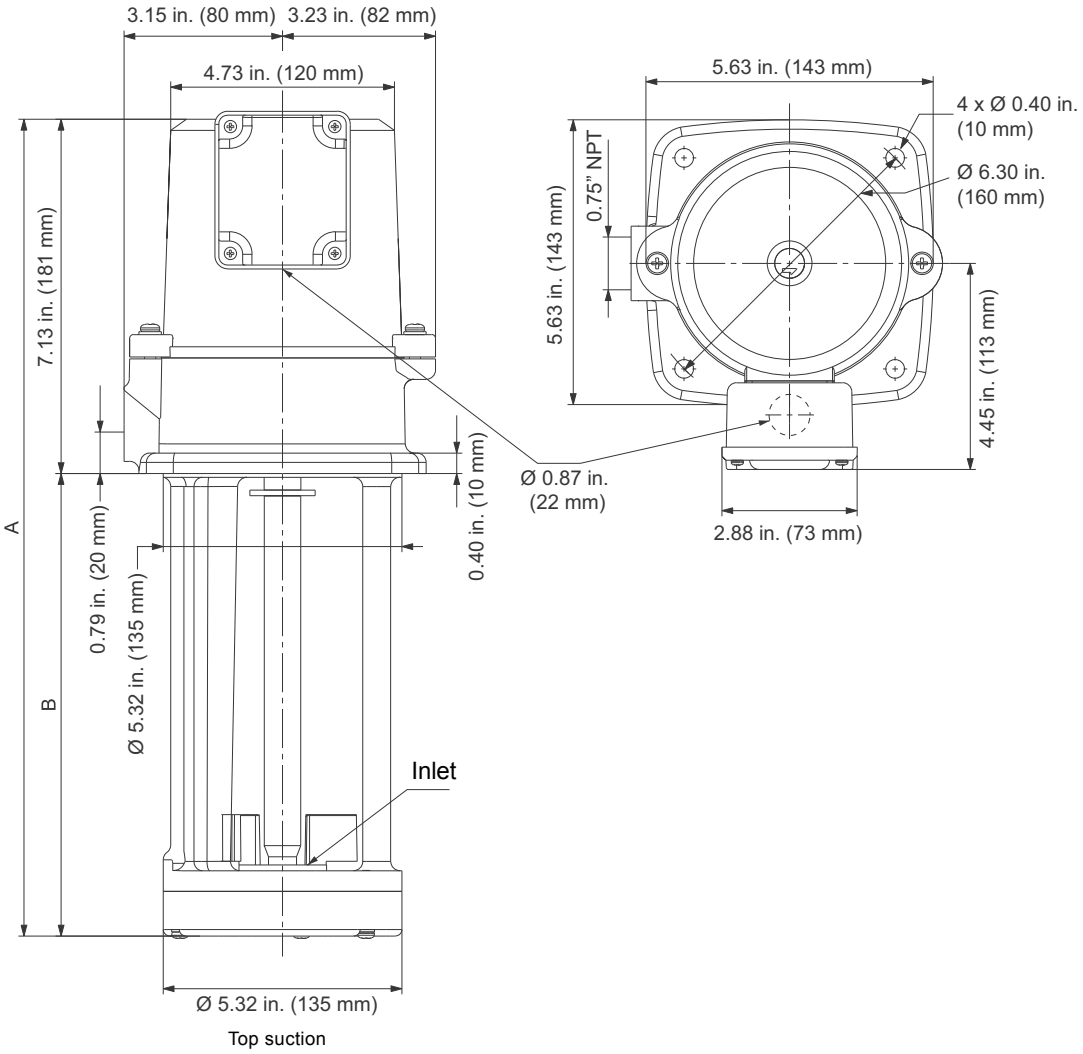
Voltage	Frequency [Hz]	P1 [W]	$I_{1/1}$ [A]	I_{max} [A]	I_{start} / $I_{1/1}$ [A]	Cos φ
3 x 200Δ V	60	145	0.46 - 0.46	0.53 - 0.53	4.8 - 5.2	0.91 - 0.83
3 x 220-240Δ/380-440Y V	60	140	0.41 / 0.25 - 0.22	0.47 / 0.29 - 0.25	4.8 - 5.2	0.9 - 0.82

MTA 40H



TM05 4985 3112

Dimensional sketches



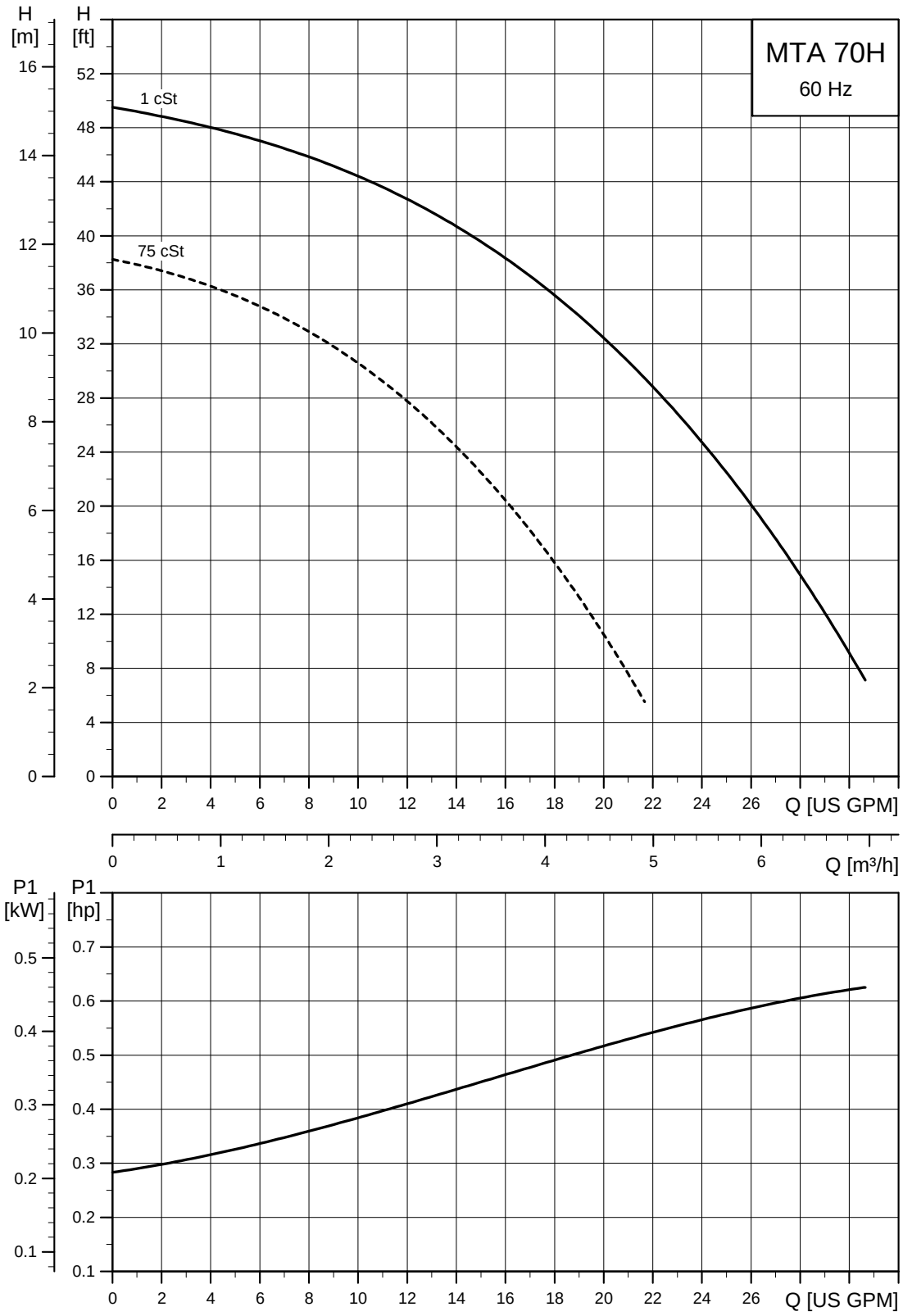
Dimensions and weights

Pump type	Suction	A [in. (mm)]	B [in. (mm)]	Ship weight [lb]
MTA 40H-180	Top	14.22 (361)	7.09 (180)	28

Electrical data

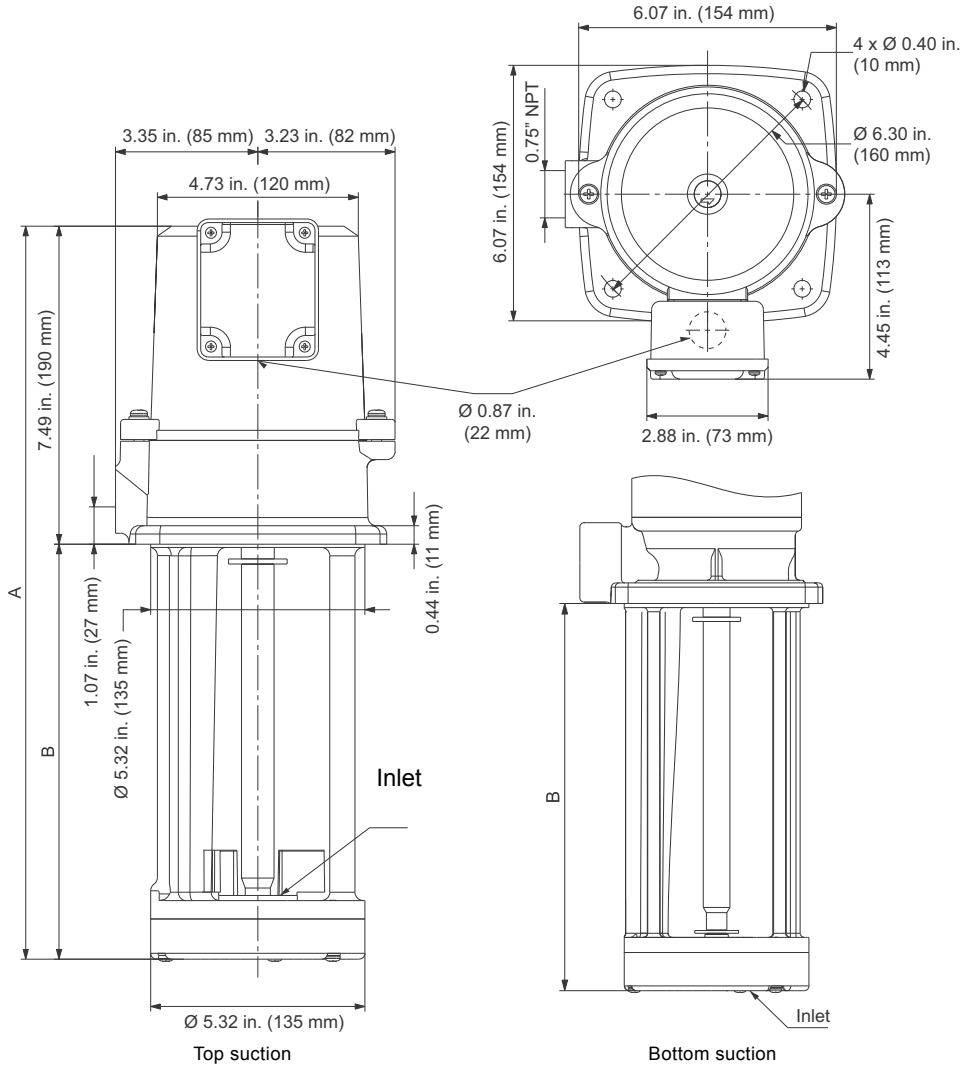
Voltage	Frequency [Hz]	P1 [W]	$I_{1/1}$ [A]	I_{max} [A]	I_{start} / $I_{1/1}$ [A]	Cos φ
3 x 200Δ V	60	375	1.28 - 1.2	1.47 - 1.38	4.8 - 5.2	0.85 - 0.82
3 x 220-240Δ/380-440Y V	60	365	1.14 / 0.69 - 0.63	1.31 / 0.79 - 0.72	4.8 - 5.2	0.84 - 0.77

MTA 70H



TM05 4986 3112

Dimensional sketches



TM05 5000 3212

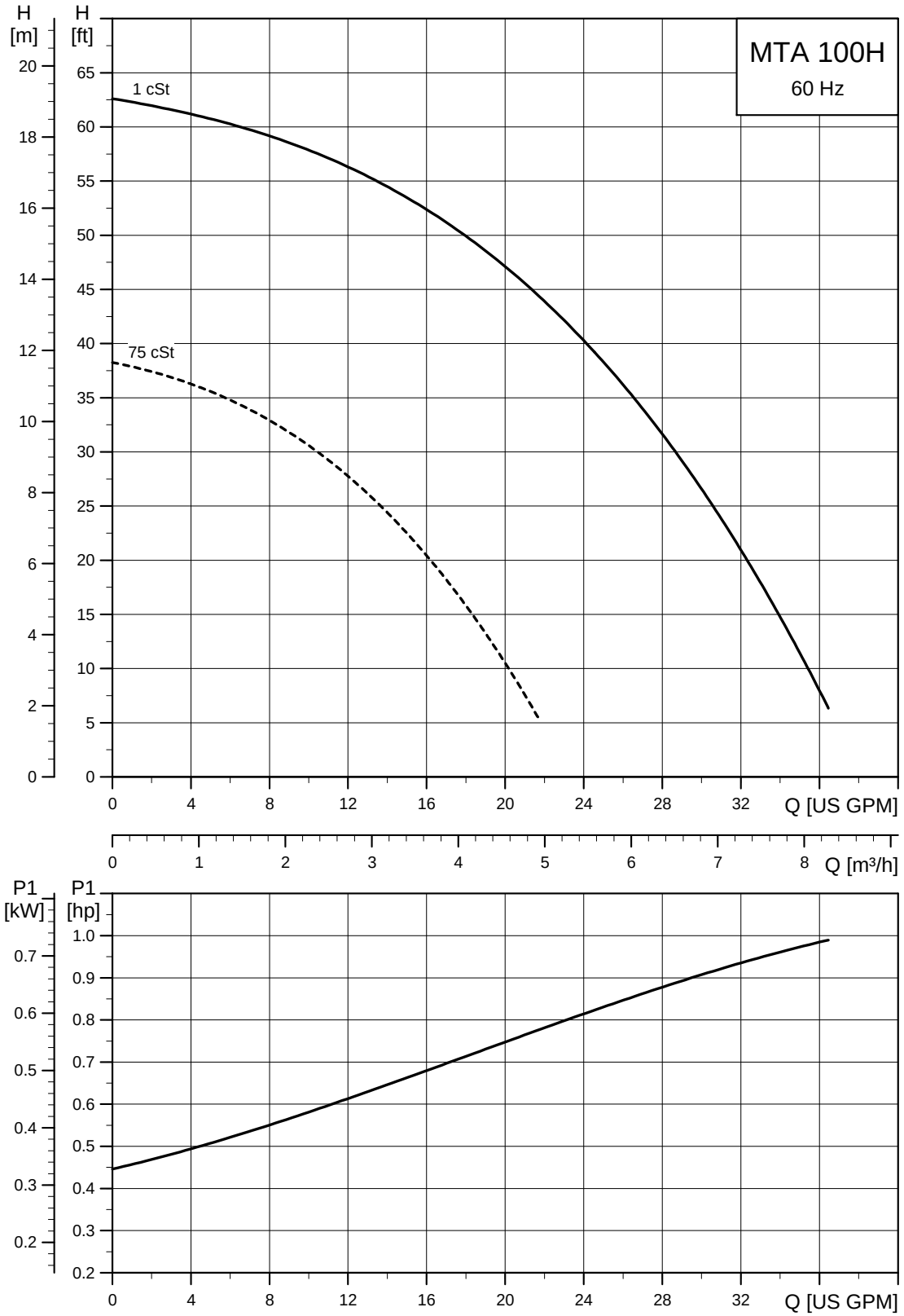
Dimensions and weights

Pump type	Suction	A [in. (mm)]	B [in. (mm)]	Ship weight [lb]
MTA 70H-250	Top/bottom	17.33 (440)	9.85 (250)	36

Electrical data

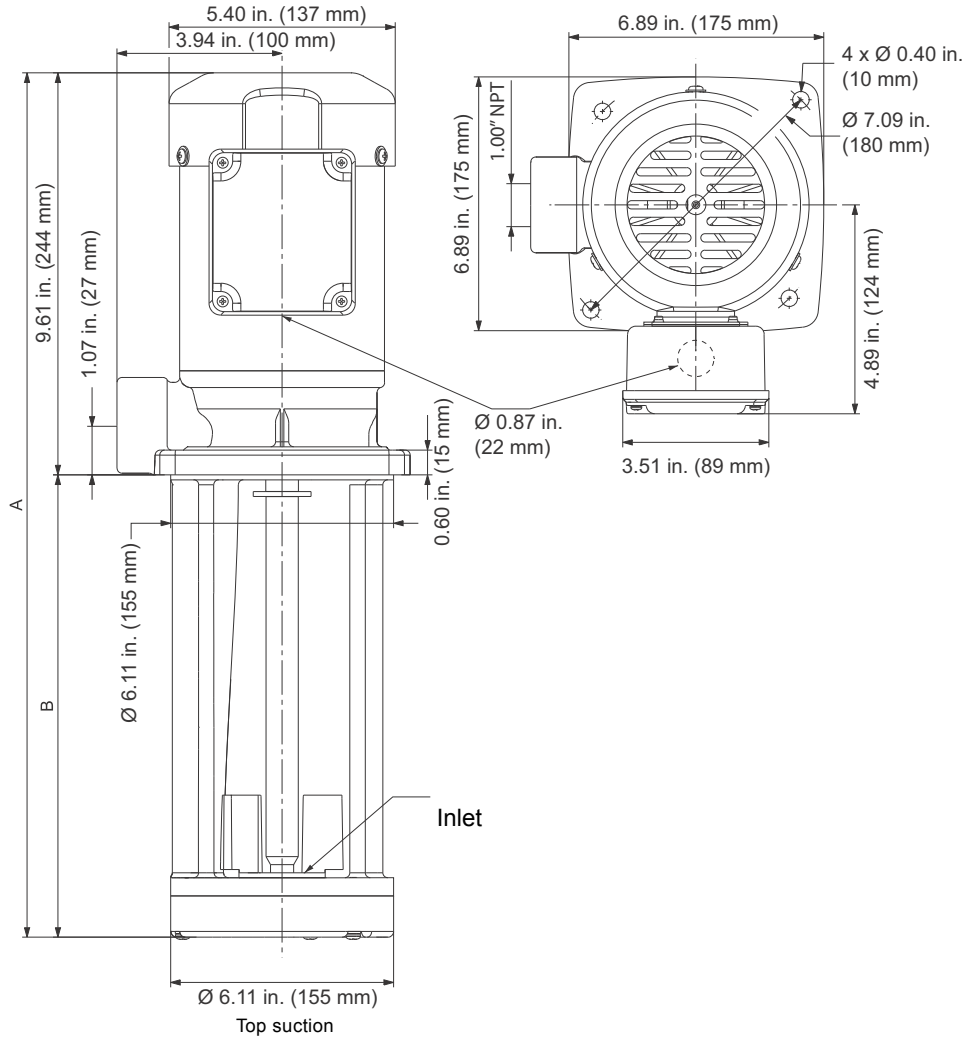
Voltage	Frequency [Hz]	P1 [W]	$I_{1/1}$ [A]	I_{max} [A]	I_{start} / $I_{1/1}$ [A]	Cos φ
3 x 200Δ V	60	460	1.63 - 1.54	1.87 - 1.77	4.8 - 5.2	0.81 - 0.78
3 x 220-240Δ/380-440Y V	60	458	1.45 / 0.86 - 0.74	1.67 / 0.99 - 0.85	4.8 - 5.2	0.83 - 0.76

MTA 100H



TM05 5116 3212

Dimensional sketches



TM05 5001 3212

Dimensions and weights

Pump type	Suction	A [in. (mm)]	B [in. (mm)]	Ship weight [lb]
MTA 100H-280	Top	20.63 (524)	11.03 (280)	36

Electrical data

Voltage	Frequency [Hz]	P1 [W]	$I_{1/1}$ [A]	I_{max} [A]	I_{start} / $I_{1/1}$ [A]	Cos φ
3 x 200Δ V	60	725	2.4 - 2.28	2.76 - 2.62	5.0 - 5.5	0.87 - 0.83
3 x 220-240Δ/380-440Y V	60	715	1.98 / 1.21 - 1.05	2.28 / 1.39 -1.21	5.0 - 5.5	0.95 - 0.87

4. Further product documentation

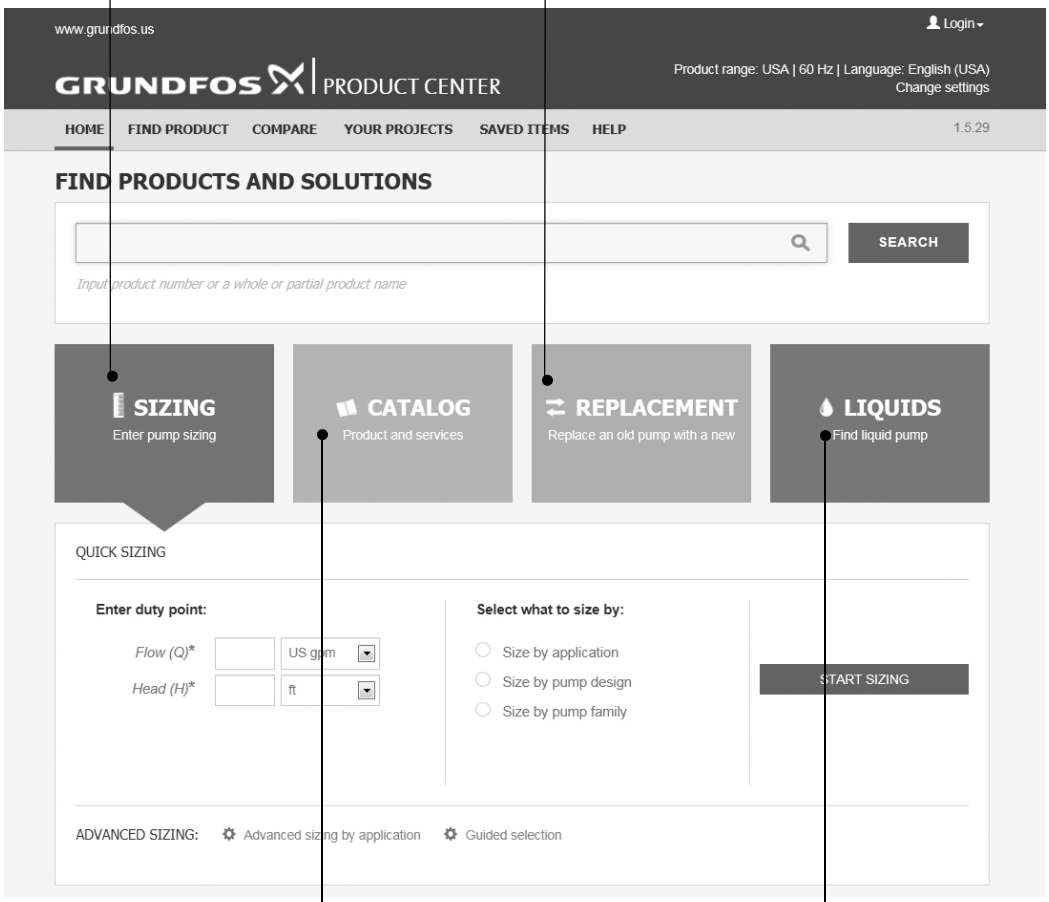
Grundfos Product Center is an online search and sizing tool to help you make the right choice.

http://product-selection.grundfos.com

SIZING enables you to size a pump based on entered data and selection choices.

REPLACEMENT enables you to find a replacement product.
Search results will include information on

- the lowest purchase price
- the lowest energy consumption
- the lowest total life cycle cost.



CATALOG gives you access to the Grundfos product catalog.

LIQUIDS enables you to find pumps designed for aggressive, flammable or other special liquids.

All the information you need in one place

Performance curves, technical specifications, pictures, dimensional drawings, motor curves, wiring diagrams, spare parts, service kits, 3D drawings, documents, system parts. The Product Center displays any recent and saved items - including complete projects - right on the main page.

Downloads

On the product pages, you can download installation and Operating Instructions, data booklets, service instructions, etc. in PDF format.

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