MTS, MTSE

50/60 Hz IEC

Screw pumps

GRUNDFOS

Table of contents

1. Introduction

MTS

TM063406

MTS pump with cutaway view

MTS pumps are screw pumps designed for pumping cooling lubricants and cutting oils for machine tool applications.

Depending on which pump you choose, the pump can be mounted on top of tanks with the pump immersed in the pumped liquid or the pump can be dry-installed with pipe connections to the tank. See the section on pump designs.

The pumps come in various sizes and screw pitches to provide the flow rate, pressure and length required.

The pumps consist of a motor and a pump unit. The motor is a Grundfos standard MG motor designed to EN standards.

The pump unit consists of optimised hydraulics, various types of connections, a motor stool and various other parts.

Related information

Pump designs

When to select an E-pump

Select an E-pump if the following is required:

- controlled operation, that is the consumption fluctuates
- constant pressure
- communication with the pump.

Adaptation of performance through frequency-controlled speed control offers obvious benefits, such as the following:

- energy savings
- increased comfort
- control and monitoring of the pump performance.

MTSE pumps with built-in frequency converter

TM074915

MTSE pump with an E-motor

MTSE pumps are MTS pumps with an E-motor, that is a motor with built-in frequency converter. A frequency converter enables continuously variable control of motor speed, making it possible to set the pump to operate in any duty point. The motors of the MTSE pumps are Grundfos MGE motors designed to EN standards.

MTSE pumps are ideal for machining centres 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 MTSE pump:

- energy savings
- low heat input into the cooling lubricant
- increased cooling efficiency
- better performance of the machining centre
- simple integration with the machining centre
- Safe Torque Off safety function.

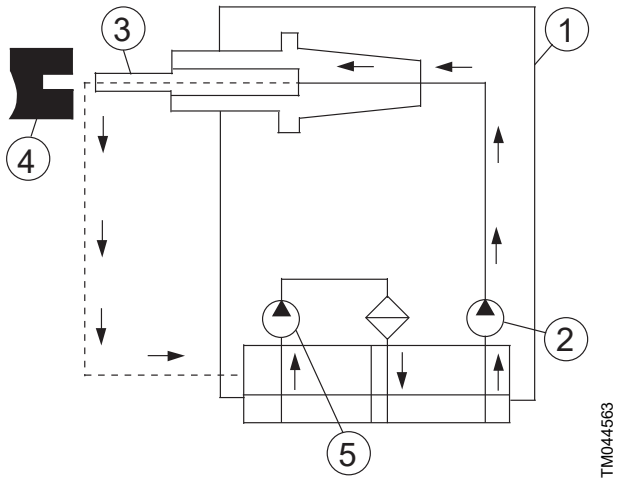
2. Applications

MTS pumps are an important part of modern metal machining centres, transfer lines and grinding and deep-hole drilling machines.

MTS pumps transfer well, conditionally or poorly lubricating abrasive liquids in metal working or process engineering, such as cutting, grinding and deep-hole drilling oils, oil-in-water emulsions and cooling lubricant solutions. The pumped liquid must not attack the materials.

Permissible cooling lubricants:

- Solutions (inorganic substances in water; organic and synthetic substances in water)
- Emulsions (oil-in-water, oil content minimum 2 to 20 %)
- Cutting and grinding oils (without additives; with polar physically acting additives; with mildly acting, lubricating film forming additives; with polar and mildly acting additives; with active, chemical additives; with polar and active additives).

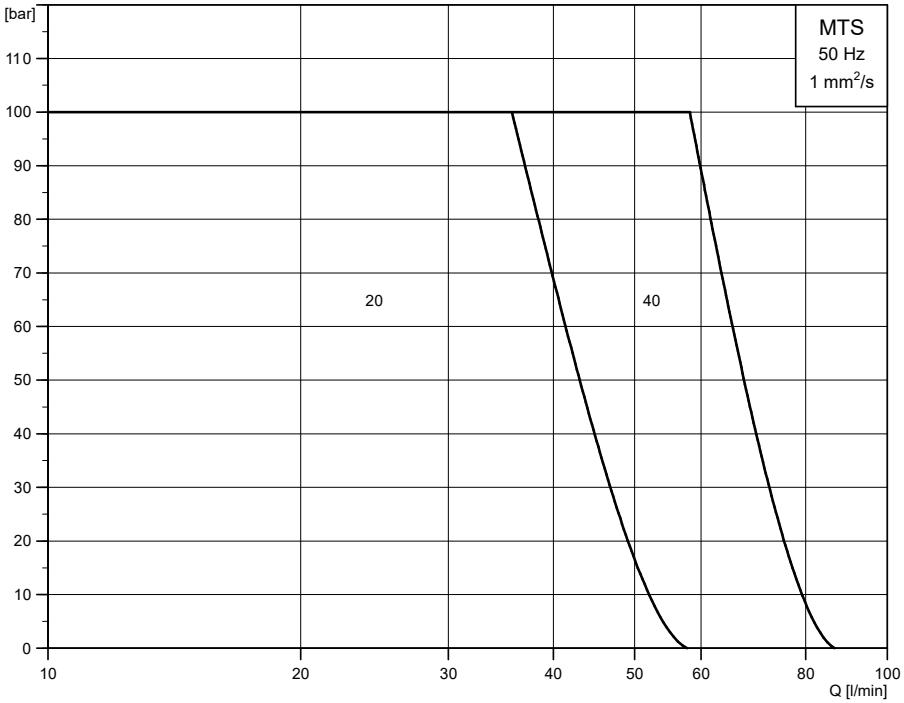


Schematic drawing

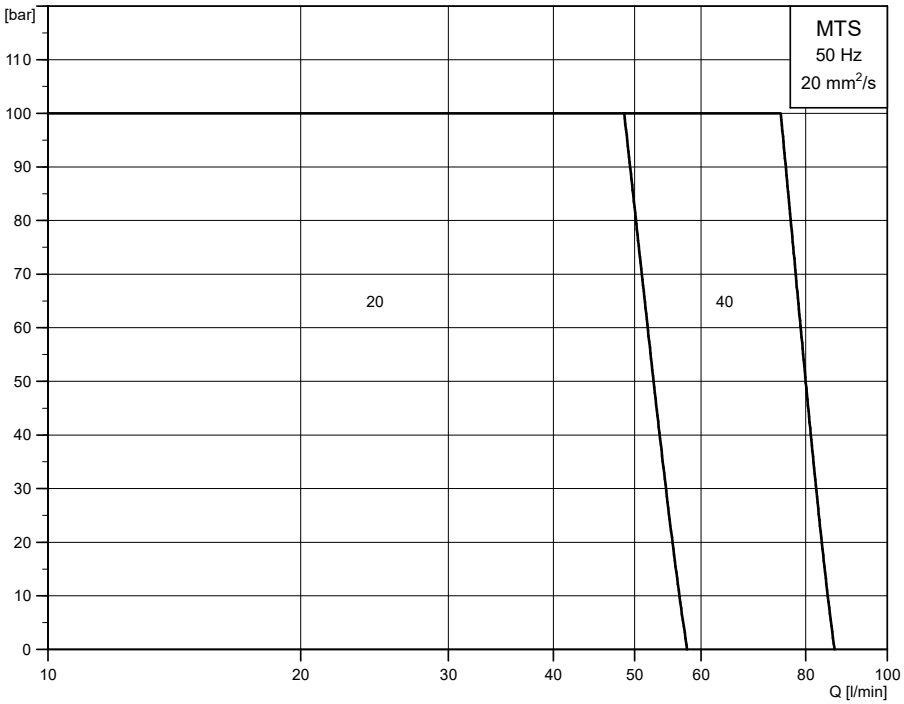
Pos.	Description
1	Machining centre
2	MTS high-pressure pump
3	Drilling tool
4	Work piece
5	Filter pump

3. Performance range

MTS, 50 Hz

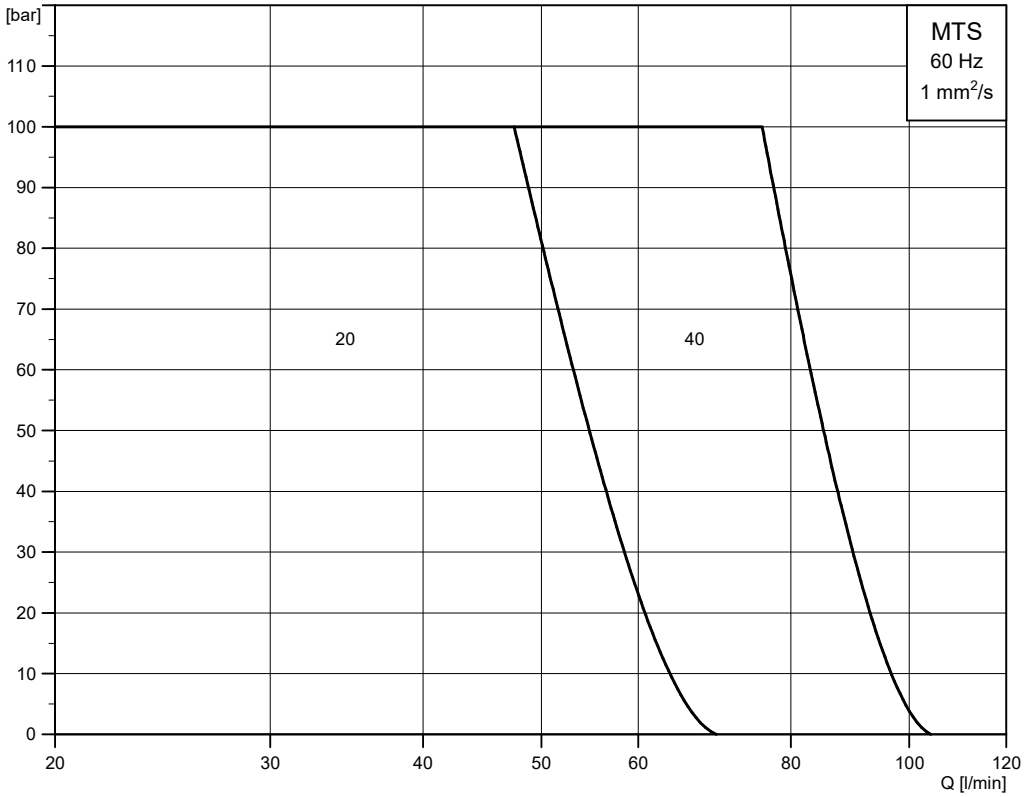


Performance range - MTS, 50 Hz

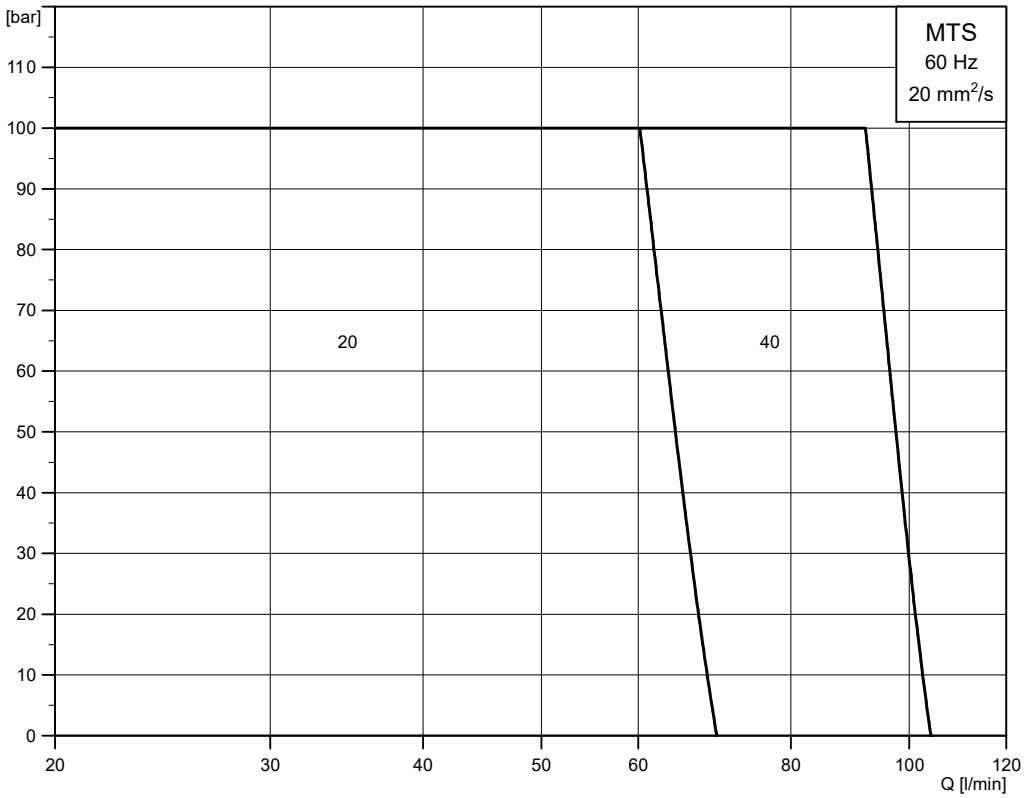


Performance range - MTS, 50 Hz

MTS, 60 Hz

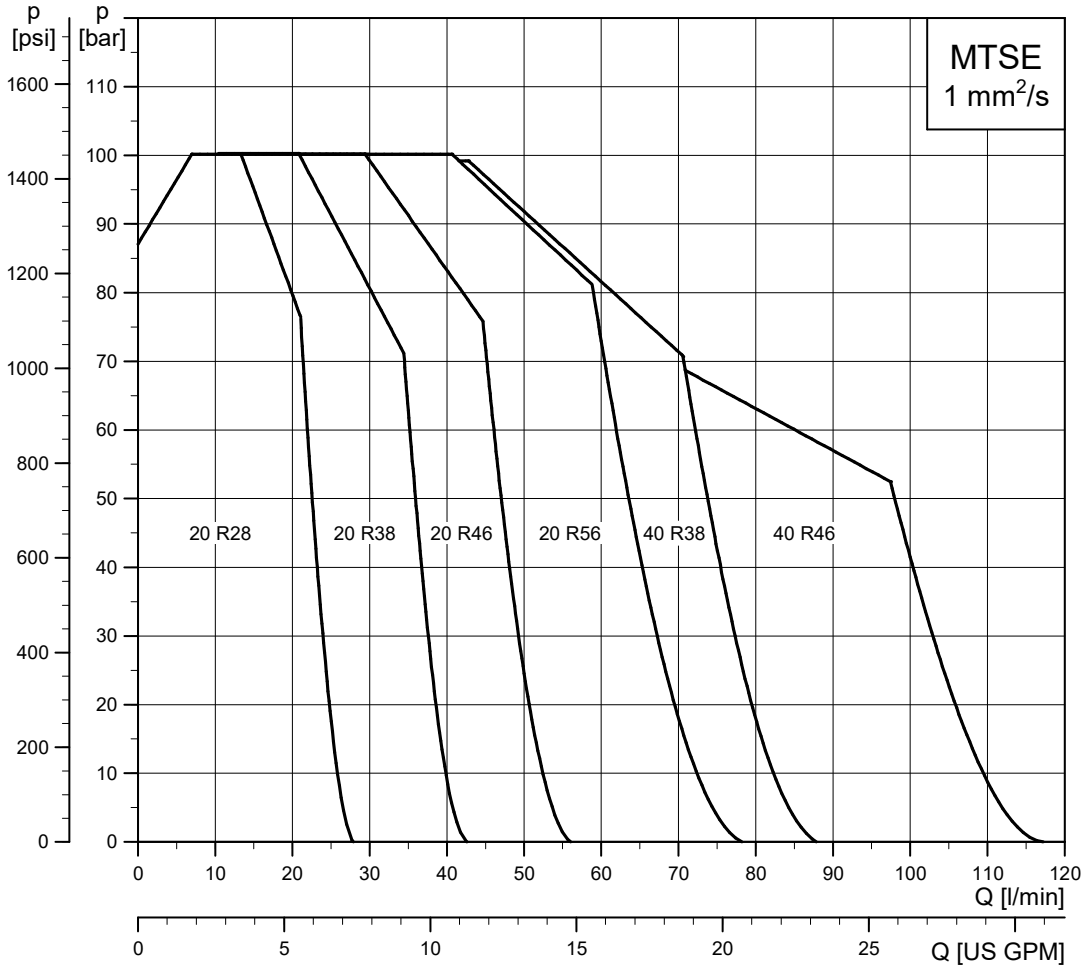


Performance range - MTS, 60 Hz



Performance range - MTS, 60 Hz

MTSE, 50/60 Hz



Performance range - MTSE, 50/60 Hz

4. Product range

50 Hz

Range	MTS 20	MTS 40
Flow range [l/min]	0 - 57.8	0 - 86.6
Motor power P2 [kW]	0.3 - 7.9	0.4 - 12

60 Hz

Range	MTS 20	MTS 40
Flow range [l/min]	0 - 69.6	0 - 104.2
Motor power P2 [kW]	0.4 - 9.7	0.5 - 14.4

Operating conditions

Range	MTS 20	MTS 40
Maximum temperature [°C]	80	80
Maximum differential pressure (emulsion) [bar]	80	100
Maximum differential pressure (oil) [bar]	80	100
Maximum inlet pressure (DQ version) [bar]	1	1
Maximum inlet pressure (D8.6 version) [bar]	10	10

Pipe connection

Range	MTS 20	MTS 40
Inlet (DQ version)	G 1 1/4	G 1 1/4
Inlet (D8.6 version)	SAE 1 1/2"	SAE 1 1/2"
Outlet pipe thread	G 3/4	G 3/4
Outlet flange	SAE 1"	SAE 1"
Installation length [mm]	230	280

Shaft seal

Range	MTS 20	MTS 40
DQ (seal ring)	•	•
D8.6 (mechanical seal)	•	•

5. Motors

Motors for MTS pumps

The pumps are fitted with a totally enclosed, fan-cooled, 2-pole Grundfos standard MG motor with principal dimensions according to EN and IEC standards.

Electrical tolerances according to EN 60034.

Electrical data

Mounting designation	B5/V1	
Insulation class	F	
Efficiency class, 50 Hz	MG motors: Siemens motors:	IE3 IE3
Efficiency class, 60 Hz	MG motors:	IE2/IE3 (see the section on MG motors)
Enclosure class	IP55	
Supply voltage, 50 Hz (tolerance -10 % / +10 %)	P_2: 1.5 - 22 kW:	3 × 220-240D / 380-415Y V
	P_2: 7.5 - 22 kW:	3 × 380-415D / 660-690Y V
Supply voltage, 60 Hz (tolerance -10 % / +10 %)	P_2: 1.5 - 22 kW:	3 × 220-277D / 380-480Y V
		3 × 380-480D / 660-690Y V
On request		
Supply voltage, 50 Hz	3 × 200-220 / 346-380 V	
Supply voltage, 60 Hz	3 × 200-230 / 346-400 V 3 × 208-230 / 460-480 V	

On request, Grundfos MG motors are available with cURus approvals carried out by the Underwriters Laboratories Inc. according to the UL 1004 standard for electrical motors.

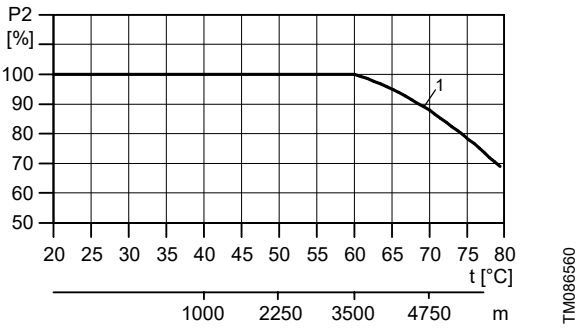
Related information

MG motors

Ambient temperature

MG motors (1.5 - 22 kW): Maximum 60 °C.

If the ambient temperature exceeds the above maximum value, or if the motor is located 1000 metres above sea level, the motor output (P2) 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.



Relationship between motor output (P2) and ambient temperature/altitude

Pos.	Description
1	MG motors (1.5 - 22 kW)

Motor protection

Three-phase motors must be connected to a motor-protective circuit breaker in accordance with local regulations.

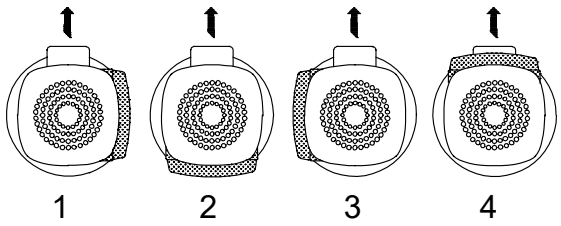
Three-phase Grundfos and Siemens motors from 3 kW and upwards have a built-in thermistor (PTC) according to DIN 44082 (IEC 34-11: TP 211).

Maximum number of starts

Pump	Motor [kW]	Recommended maximum number of starts per hour
MTS	1.5 - 2.2	250
	3-4	100
	5.5 - 11	50
	15-22	40

Terminal box positions

As standard, the pumps have their terminal box mounted in position 12 o'clock of the pump. However, other positions are possible.



Terminal box positions

Pos.	Description
1	Position 3 o'clock
2	Position 6 o'clock
3	Position 9 o'clock
4	Position 12 o'clock Standard

Motors for MTSE pumps

The pumps are fitted with a totally enclosed, fan-cooled, 2-pole Grundfos frequency-controlled MGE motor with principal dimensions in accordance with the EN standards.

Electrical tolerances comply with EN 60034. MTSE pumps from 1.5 to 11 kW are fitted with three-phase MGE motors as standard.

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

Electrical data

Mounting designation	B5/V1
Insulation class	F
Efficiency class	I5

Enclosure class	IP55
Supply voltage (-10 % / +10 %)	380-500 V
Supply frequency	50/60 Hz

Related information

12. Grundfos Product Center

Maximum ambient temperature and altitude for Grundfos MGE motors

The table shows the maximum permissible ambient temperature at full load and the maximum permissible installation altitude above sea level at full load.

Motor efficiency class: IE5

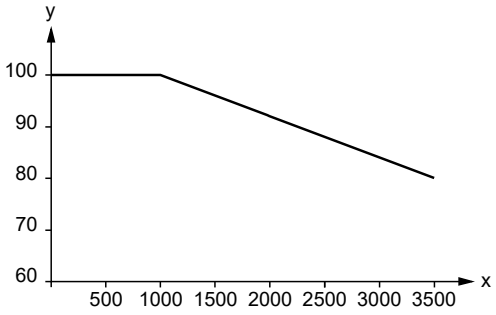
Motor power [kW]	Motor make	Phase	Max. ambient temperature [°C]	Max. altitude above sea level [m]
1.5 - 11	MGE	3	50 [1)]	1000

1) 3 × 200−240 V MGE motors are rated for a maximum ambient temperature of 40 °C.

Motor load for Grundfos MGE motors

MGE motors can be installed up to 3500 metres above sea level.

Motors installed above the maximum installation altitude of 1000 metres above sea level must not be fully loaded. Use the below curve to calculate the derated motor power. If the required motor output exceeds the derated motor power, select an oversized motor.



Derating of motor output power P2 % (y-axis) in relation to installation altitude above sea level in metres (x-axis)

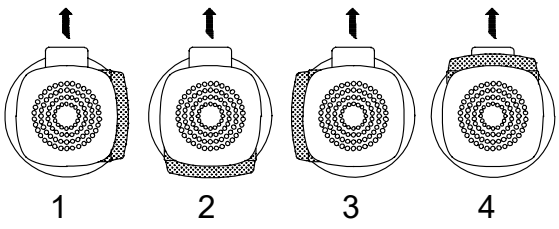
Motor protection

MGE motors incorporate thermal protection against slow overload and blocking (IEC 34-11:TP 211).

Grundfos pumps with an MGE motor require no external motor protection.

Terminal box positions

As standard, the pumps have their terminal box mounted in position 12 o'clock of the pump. However, other positions are possible.



Terminal box positions

Pos.	Description
1	Position 3 o'clock
2	Position 6 o'clock
3	Position 9 o'clock
4	Position 12 o'clock Standard

Sound pressure level

MTS construction design allows gentle, even, virtually pulsation-free and low-noise pumping. The noise emission lies between 56 and 74 dB(A) and depends on speed, pump size and installation. MTS pumps operate significantly quieter than rotary lobe and centrifugal pumps with comparable performance.

Measuring conditions:

Distance to the pump:	1 m
Operation:	Cavitation-free
Motor:	IEC standard motor
Tolerance:	± 3 dB.

Size	Sound pressure level [dB]	
	2900 [rpm]	3500 [rpm]
20	56	58
40	59	61

The data are reference values.

The actual airborne sound level depends especially on the installation conditions.

Motors for MTS

Motor [kW]	Maximum sound pressure level [dB(A)] ISO 3743	
	50 Hz	60 Hz
1.5	55.5	59.8
2.2	55.5	59.8
3	55.3	59.8
4	58.7	63.6
5.5	58.8	63.6
7.5	60.3	65.1
11	60.5	65.1
15	60.6	65.2
18.5	60.7	65.3
22	64.4	69.1

The values apply only to MG motors.

The values for both 50 and 60 Hz have a tolerance of 3 dB(A) according to EN ISO 4871, which is not added to the values in these tables.

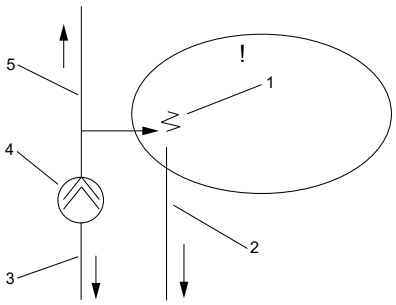
Motors for MTSE

Motor [kW]	Maximum sound pressure level [dB(A)] ISO 3743
	50/60 Hz
1.5	64
2.2	64
3	68
4	68

Motor [kW]	Maximum sound pressure level [dB(A)] ISO 3743
	50/60 Hz
5.5	68
7.5	74
11	74

Overload protection

The pump has no pressure relief valve. Thus the overload protection must be provided in the control system or with a pressure relief.



Overload protection

Pos.	Description
1	Pressure relief valve
2	Backflow line to tank
3	Suction from tank
4	Pump
5	Pressure line to system

6. Identification

Type key

Example: MTS (E) 20-40 R 46 D 8.6 T

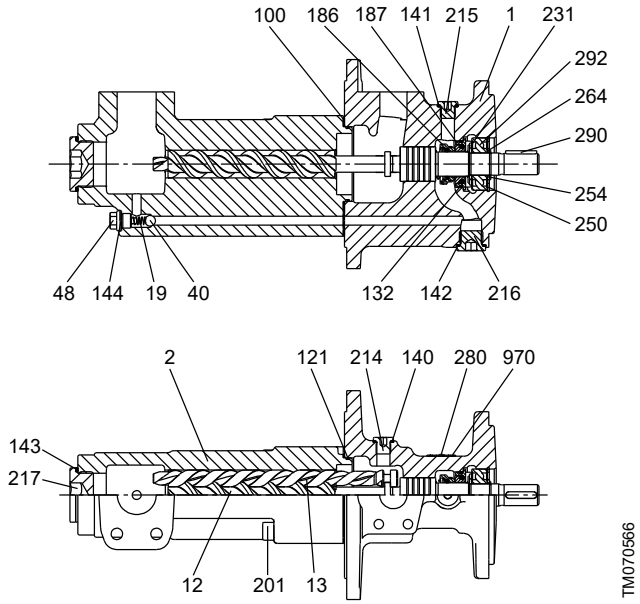
Code	Explanation
MTS	Pump type
(E)	Pump with integrated frequency converter
20-40	Frame size - maximum pressure (bar)
R	Spindle sense of gradient (R = right)
46	Spindle pitch angle in degrees
D	Construction feature D = External ball bearing, shaft seal unheated, uncooled
8.6	Shaft seal or connections Q = Shaft seal ring or axial inlet, pipe thread as standard 8.6 = Mechanical shaft seal or radial inlet, SAE as standard
T	T = Pump for tank-top installation D = Pump for dry installation H = Pump for horizontal installation

7. Construction

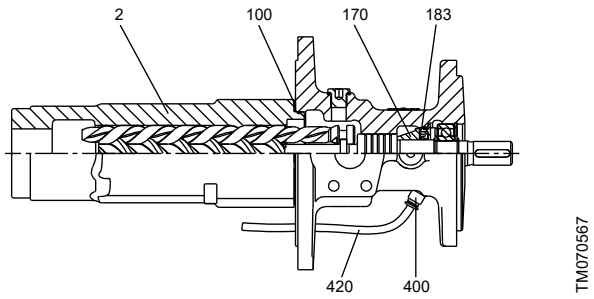
Three-screw, self-priming, flange-mounted pump (DIN ISO 3019-2) with special surface-hardened drive and idler screws. The idler screws are hydraulically driven, and the axial thrust is completely neutralised hydrostatically. The drive screw is fixed in position with external, permanently lubricated groove ball bearing. The large overall length with its many chambers results in little surface pressure, low pressure differences and thus reduced wear. The rotor housing has been optimised to ensure maximum resistance to wear. The material used is specially hardened grey cast iron (EN-GJL) that is part of a special safety concept. The housing surface in contact with the screws has a ceramic-like hardness. Additionally, unlike with other materials (such as SiC), wear, shocks, vibration or aeration cannot lead to sudden failure of the pump unit. Construction and materials result in little wear, good controllability and high efficiency.

MTS 20 and 40

DQ with axial pipe thread connection on inlet side



D 8.6 SAE flange on inlet side



Pos.	Designation	Pos.	Designation	Pos.	Designation
1	Outlet casing	142	Seal ring	231	Washer
2	Rotor housing	143	Seal ring	250	Retaining ring
12	Drive screw	144	Seal ring	254	Retaining ring
13	Idler screw	170	Secondary seal	264	Supporting washer
19	Spring	183	Shaft seal ring	280	Rivet
40	Ball	186	Mechanical seal	290	Key
48	Stop screw	187	Mechanical seal adapter	292	Bearing
121	Gasket	201	Socket head cap screw	400	Adapter
122	O-ring	214	Sealing plug	420	Tube
132	O-ring	215	Sealing plug	970	Nameplate
140	Seal ring	216	Sealing plug		
141	Seal ring	217	Sealing plug		

Material specification

Pos.	Designation		Materials W 110221	
2	Rotor housing (basic material)	EN GJL-250	GG25	Cast iron
	Rotor housing (active surfaces in the spindle bores)	Specially hardened	Basic hardness	62 HRC
			Surface hardness	1200 HV
4	Inlet casing	EN-GJL-250	GG25	Cast iron
1	Outlet casing	EN-GJL-250	GG25	Cast iron
13	Screw set (basic material)	1.7139	16MnCrS5	Special steel, nitrided 62 HRC
13	Screw set (surface)	Specially treated	(PVD)	1200 HV
3	Pump cover	EN-GJL-250	GG25	Cast iron
186	Mechanical shaft seal	Q1Q1VGG	SiC/SiC, FPM, 1.4571	Silicon carbide, fluoroelastomer, stainless steel
183	Shaft seal ring	FPM		Fluoroelastomer
140	Static gaskets	FPM		Fluoroelastomer

8. Operating conditions

Pumped liquids

List of pumped liquids

The composition, oil content, that is the ability to provide lubrication, and cooling effect of the liquid determine the pump maintenance intervals and maximum permissible performance data.

Cooling lubricants according to DIN 51 385 are divided into three groups according to water and oil content. The pump also pumps cooling lubricants with a very low lubricating effect, but a very high cooling performance.

Cooling lubricant main group	Subgroup	Effect at the processing spot
L Solutions	Solutions of inorganic materials in water	Higher cooling effect, lower lubricating effect
	Solutions, dispersions of organic and synthetic materials in water	
E Emulsions	Oil-in-water emulsions (Oil content E 2 to E 20 %)	Cooling-lubricating effect
S Petroleum-based cutting and grinding oils (natural and synthetic)	Cutting oils without additives (pure)	Higher lubricating effect, lower cooling effect
	Cutting oils with polar (physically effective) additives	
	Cutting oils with mild-effect (lubricating film forming) EP additives	Better surface adhesion provides protection against corrosion
	Cutting oils with polar and mild-effect EP additives	
	Cutting oils with active (chemical) EP additives	Higher temperature and pressure resistance
	Cutting oils with polar and active EP additives	

Filtration

To reach an acceptable pump life, we recommend that you filtrate the cooling lubricants to the following cleanness classes according to ISO 4406/99. The recommended cleanness class depends on the pumping pressure and abrasive class 1 to 7.

There are process examples for abrasive classes given in the table below.

The additional specifications to filter mesh and mass proportion are guide values for orientation. The decisive factor is the cleanness of the liquid indicated by the cleanness class.

To avoid damage by coarse particles, we recommend that you use a filter mesh of 65 µm (nominal, two dimensional) or finer.

	Abrasive class						
	1	**2**	**3**	**4**	**5**	**6**	**7**
Material	Steel, GG, Al	Steel, GG, Al	Al (Si > 5 %)	Steel	Steel, hard	Hard metal	Titanium
Process	Drilling	Turning/milling	Turning/milling	Grinding	Grinding	Grinding	Grinding
Tool	HSS	Hard metal	Hard metal	Corundum	Corundum	CBN	Diamond
Pressure stage							
≤ 120 bar	**21/19/16**	**21/19/16**	**21/19/16**	**20/18/15**	**20/18/15**	**19/17/14**	**18/16/13**
	≤ 30 µm	≤ 25 µm	≤ 20 µm	≤ 17 µm	≤ 15 µm	≤ 10 µm	≤ 6 µm
	≤ 30 mg/l	≤ 25 mg/l	≤ 20 mg/l	≤ 15 mg/l	≤ 10 mg/l	≤ 5 mg/l	≤ 3 mg/l
≤ 90 bar	**22/20/17**	**22/20/17**	**22/20/17**	**21/19/16**	**21/19/16**	**20/18/15**	**19/17/14**
	≤ 50 µm	≤ 45 µm	≤ 40 µm	≤ 30 µm	≤ 20 µm	≤ 15 µm	≤ 10 µm
	≤ 60 mg/l	≤ 50 mg/l	≤ 40 mg/l	≤ 30 mg/l	≤ 20 mg/l	≤ 10 mg/l	≤ 5 mg/l
≤ 60 bar	**23/21/18**	**23/21/18**	**23/21/18**	**22/20/17**	**22/20/17**	**21/19/16**	**20/18/15**
	≤ 80 µm	≤ 75 µm	≤ 60 µm	≤ 50 µm	≤ 40 µm	≤ 20 µm	≤ 15 µm
	≤ 120 mg/l	≤ 100 mg/l	≤ 80 mg/l	≤ 60 mg/l	≤ 40 mg/l	≤ 20 mg/l	≤ 10 mg/l
≤ 30 bar	**24/22/19**	**24/22/19**	**24/22/19**	**23/21/18**	**23/21/18**	**22/20/17**	**21/19/16**
	≤ 150 µm	≤ 120 µm	≤ 100 µm	≤ 80 µm	≤ 60 µm	≤ 40 µm	≤ 20 µm
	≤ 250 mg/l	≤ 200 mg/l	≤ 160 mg/l	≤ 120 mg/l	≤ 80 mg/l	≤ 40 mg/l	≤ 20 mg/l

Control of MTSE pumps

Control options

It is possible to communicate with E-pumps via the following platforms:

- the operating panel on the pump
- Grundfos GO
- Grundfos GO Link
- the 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.

Operating panels

The operating panel on the E-pump terminal box makes it possible to change the setpoint settings manually. All settings are saved if the power supply is switched off.

The following operating panels are available as standard:

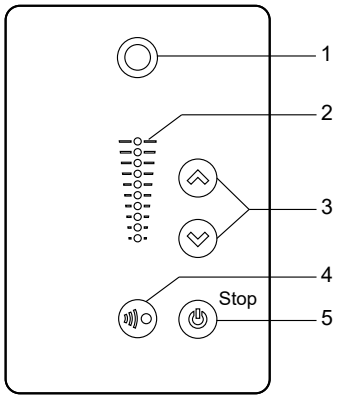
- HMI 200
- HMI 300.

Note that these panels include an integrated radio module.

The following operating panels without an integrated radio module are available on request:

- HMI 100
- HMI 101
- HMI 201
- HMI 301.

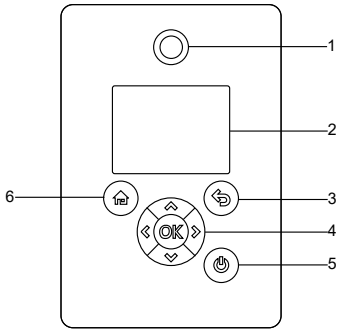
Standard operating panel, HMI 200 and HMI 201



TM054848

Pos.	Symbol	Description
1		**Grundfos Eye**: Indicator light to show the operating status of the product.
2	-	Light fields for indication of the setpoint.
3		**Up/Down**: Buttons to change the setpoint.
4		**Radio communication**: Button to enable radio communication with Grundfos GO.
5		**Start/Stop**: Button to start and stop the product.

Advanced operating panel, HMI 300 and HMI 301



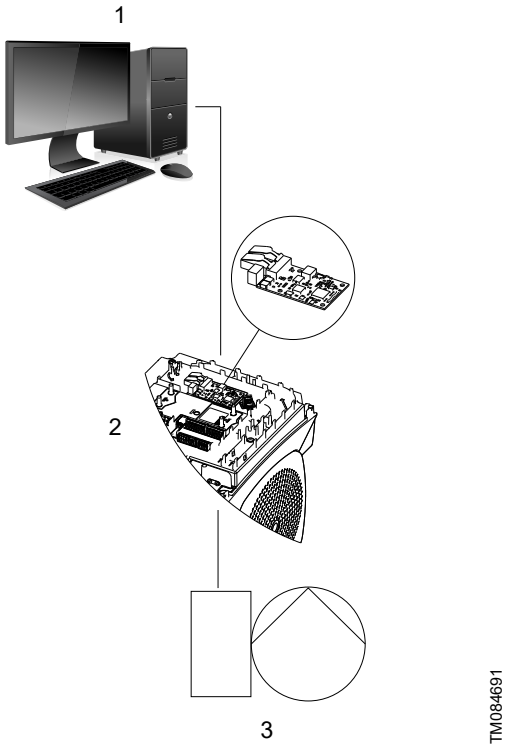
TM054849

Pos.	Symbol	Description
1		**Grundfos Eye**: Indicator light to show the operating status of the product.
2	-	Graphical colour display.
3		**Back**: Button to go one step back.
4		**Left/Right**: Button to navigate between main menus, displays and digits.
		Up/Down: Buttons to navigate between submenus or change the value settings.
	OK	**OK**: Button to save changed values, reset alarms, expand the value field and to enable radio connection with Grundfos GO.
5		**Start/Stop**: Button to start and stop the product.
6		**Home**: Button to go to the Home menu.

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 building management system. This allows the operator to monitor the pump and change control modes and setpoint settings.

Communication between E-pumps and a central building management system is enabled via a Grundfos Communication Interface Module (CIM).



Structure of a central management system

Pos.	Description
1	Central management system
2	CIM (See the section on Communication Interface Modules)
3	E-pump

Related information

CIM (communication interface modules)

Communication

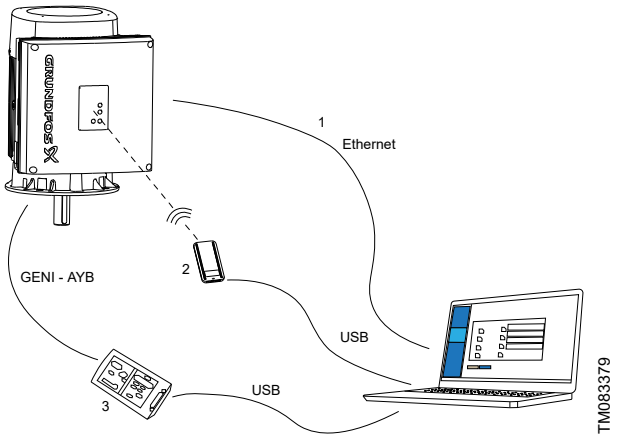
MGE 1.5 to 2.2 kW

Grundfos GO Link

The product is designed for wired or wireless communication with Grundfos GO Link.

Grundfos GO Link enables you to set functions and gives you access to status overviews, configuration and current operating parameters.

Use Grundfos GO Link together with these interfaces:



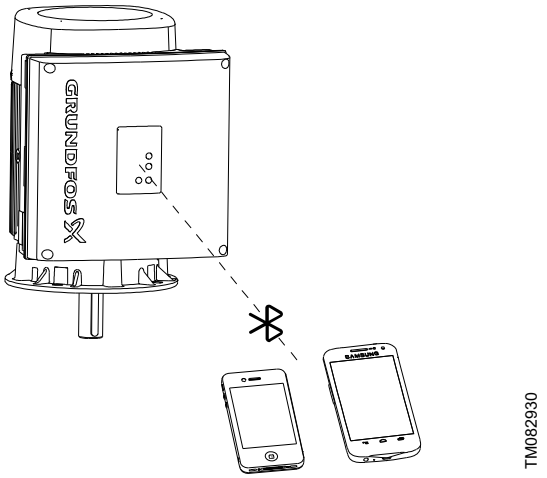
Grundfos GO Link setup

Pos.	Description
1	Ethernet cable: Standard Ethernet cable CAT5/CAT6.
2	Grundfos MI 301: Separate module enabling radio communication. Use the module together with a USB cable to connect to a laptop.
3	Grundfos PC Tool Link: Separate module enabling wired connection to the pump. Use the module together with a USB cable to connect to a laptop.

MGE 3 to 11 kW

Bluetooth

Via the built-in Bluetooth module, the product can communicate with Grundfos GO. Bluetooth communication can take place at distances up to 10 metres.



Bluetooth information

Frequency of operation	2400 - 2483.5 MHz
Modulation type	GFSK
Data rate	2 Mbps
Transmit power	5 dBm EIRP with internal antenna

GLoWpan information

Frequency of operation	2405-2480 MHz
Modulation type	GP O-QPSK
Data rate	1 Mbps
Transmit power	5 dBm EIRP with internal antenna

Control modes for E-pumps

Grundfos MTSE pumps are only available without a pressure sensor.

MTSE without sensor

MTSE pumps without a sensor are suitable in these situations:

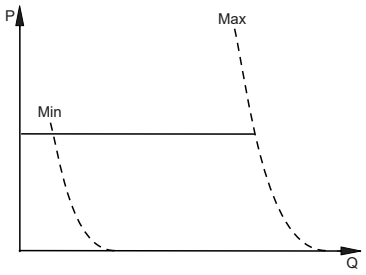
- Where uncontrolled operation is required.
- You want to retrofit another sensor in order to control, for example, the flow rate, temperature, differential temperature, liquid level and pH value at some arbitrary points in the system.

MGE 1.5 to 11 kW

These MTSE pumps without a sensor can be set to either of these control modes:

- constant pressure
- constant curve
- constant other value.

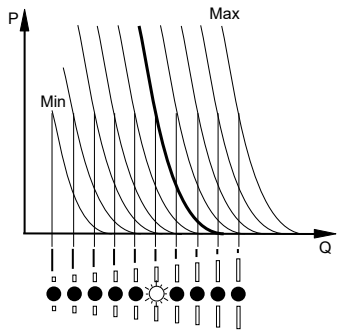
In constant pressure operating mode, the pump adjusts its performance to the desired setpoint. See the figure below.



TM074814

Constant pressure mode

In constant curve operating mode (factory setting), the pump operates according to the constant curve set. See the figure below.



TM074810

Constant curve mode

Functional module for MGE 1.5 to 2.2 kW

FM300

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.

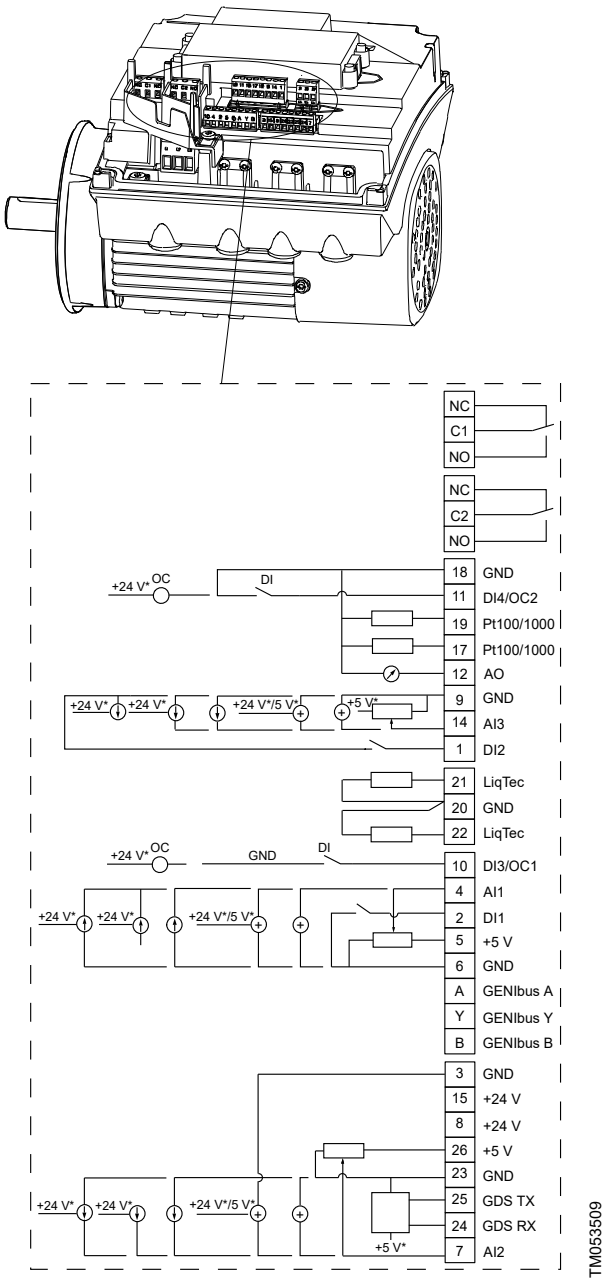
The FM300 has these connections:

- 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

All inputs and outputs are internally separated from the mains-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.

- Signal relay outputs
  - Signal relay 1:
    LIVE:
    Power supply voltages up to 250 VAC can be connected to this output.
    PELV:
    The output is galvanically separated from other circuits. Therefore, the supply voltage or protective extra-low voltage can be connected to the output as desired.
  - Signal relay 2:
    PELV:
    The output is galvanically separated from other circuits. Therefore, the supply voltage or protective extra-low 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.

Connection terminals, FM300 functional module

Terminal	Type	Function
NC	Normally closed contact	Signal relay 1: LIVE or PELV
C1	Common	
NO	Normally open contact	
NC	Normally closed contact	Signal relay 2: PELV only
C2	Common	
NO	Normally open contact	
18	GND	Signal ground
110.5 - 3.5 V or 0-5 V or 0-10 V	DI4/OC2	Digital input/output, configurable Open collector: Maximum 24 V resistive or inductive

Terminal	Type	Function
19	Pt100/1000 input 2	Pt100/1000 sensor input 2
17	Pt100/1000 input 1	Pt100/1000 sensor input 1
12	AO	Analog output: • 0-20 mA or 4-20 mA • 0-10 V
9	GND	Signal ground
14	AI3	Analog input: • 0-20 mA or 4-20 mA • 0-10 V
1	DI2	Digital input, configurable
21	LiqTec sensor input 1	LiqTec sensor input 1 White conductor
20	GND	Signal ground Brown and black conductors
22	LiqTec sensor input 2	LiqTec sensor input 2 Blue conductor
10	DI3/OC1	Digital input/output, configurable Open collector: Maximum 24 V resistive or inductive
4	AI1	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V
2	DI1	Digital input, configurable
5	+5 V	Supply to potentiometer and sensor
6	GND	Signal ground
A	GENIbus, A	GENIbus, A (+)
Y	GENIbus, Y	GENIbus, GND
B	GENIbus, B	GENIbus, B (-)
3	GND	Signal ground
15	+24 V	Power supply
8	+24 V	Power supply
26	+5 V	Supply to potentiometer and sensor
23	GND	Signal ground
25	GDS TX	Grundfos Digital Sensor output
24	GDS RX	Grundfos Digital Sensor input
7	AI2	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V

Functional module for MGE 3 to 11 kW

FM310 and FM311

Inputs and outputs

Note that the FM311 functional module does not include Bluetooth connection.

The module 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/Modbus connection
- two Safe Torque Off (STO) inputs [2)]
- Ethernet connection
- Bluetooth (BLE) connection. [3)]

2) Safe Torque Off (STO) is a safety function with the purpose to stop the motor from turning, without actively braking it. It follows the definition by EN 61800-5-2.

3) FM311 is without Bluetooth.

Connection terminals

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

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

Cables for the relays and the Ethernet cable must be rated at least 250V/2A.

The relays are approved for overvoltage category II, whether power is supplied from a transformer or the power supply.

Signal relay outputs

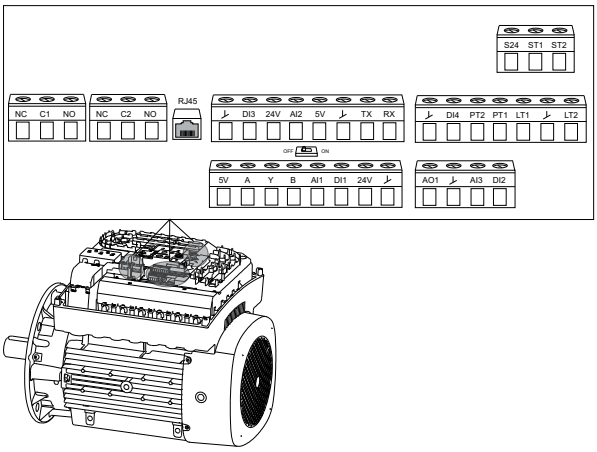
Signal relay 1

LIVE: You can connect supply voltages up to 250 VAC to the output.

SELV: The output is galvanically separated from other circuits. Therefore, you can connect the supply voltage or safety extra-low voltage to the output as desired.

Signal relay 2

SELV: The output is galvanically separated from other circuits. Therefore, you can connect the supply voltage or safety extra-low voltage to the output as desired.



TM082862

Terminal	Type	Function
NC	Normally closed contact	Signal relay 1: LIVE or SELV
C1	Common	
NO	Normally open contact	
NC	Normally closed contact	Signal relay 2: SELV only
C2	Common	
NO	Normally open contact	
RJ45	Ethernet	Ethernet communication
GND	GND	Signal ground

Terminal	Type	Function
DI3	DI3/OC1	Digital input/output, configurable Open collector: Maximum 24 V resistive or inductive
24V	+24 V	Power supply
AI2	AI2	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V.
5V	+5 V	Power supply to a potentiometer or sensor
GND	GND	Signal ground
TX	GDS TX	Grundfos Digital Sensor output
RX	GDS RX	Grundfos Digital Sensor input
GND	GND	Signal ground
DI4	DI4/OC2	Digital input/output, configurable Open collector: Maximum 24 V resistive or inductive
PT2	Pt100/1000 input 2	Pt100/1000 sensor input 2
PT1	Pt100/1000 input 1	Pt100/1000 sensor input 1
LT1	LiqTec sensor input 1	LiqTec sensor input 1 White conductor
GND	GND	Signal ground Brown and black conductors
LT2	LiqTec sensor input 2	LiqTec sensor input 2 Blue conductor
5V	+5 V	Power supply to a potentiometer or sensor
A	GENIbus, A	GENIbus, A (+) / Modbus, D1 (+)
Y	GENIbus, Y	GENIbus, GND / Modbus, GND
B	GENIbus, B	GENIbus, B (-) / Modbus, D0 (-)
AI1	AI1	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V.
DI1	DI1	Digital input [4], configurable
24V	+24 V	Power supply
GND	GND	Signal ground
AO1	AO	Analog output: • 0-20 mA or 4-20 mA • 0-10 V.
GND	GND	Signal ground
AI3	AI3	Analog input: • 0-20 mA or 4-20 mA • 0.5 - 3.5 V, 0-5 V or 0-10 V.
DI2	DI2	Digital input, configurable
S24	+24 V (STO)	Power supply to the Safe Torque Off inputs
ST1	STO1	Safe Torque Off - Input 1
ST2	STO2	Safe Torque Off - Input 2

4) Digital input 1 is factory-set to be start or stop input where an open circuit results in stop. A jumper has been factory-fitted between terminals DI1 and GND. Remove the jumper if digital input 1 is to be used as external start or stop or any other external function.

Safe Torque Off (STO) function

Safe Torque Off (STO) is a safety function with the purpose to stop the motor from turning, without actively braking it. It follows the definition by EN 61800-5-2.

The STO safety function's main difference from a functional stop using a digital input, for example DI1, is the fact that STO is approved to provide a defined safety integrity.

The principle of operation is the following:

1. The STO function is activated. The input circuits are opened, for example by opening contactors.
2. The STO inputs of the motor de-energize.
3. The motor cuts off the control signal for the output transistors.
4. The motor coasts to a stop if it is running. The drive cannot restart while the STO function is activated. After deactivating STO, the motor can restart immediately.
5. The control software of the motor generates an STO alert and corresponding indications. The STO alert can be configured.

The version of the STO function is marked on the motor nameplate, after the product version number.

Safety approvals

The Safe Torque Off (STO) function of the E-pump with an MGE, MLE motor complies with the following standards:

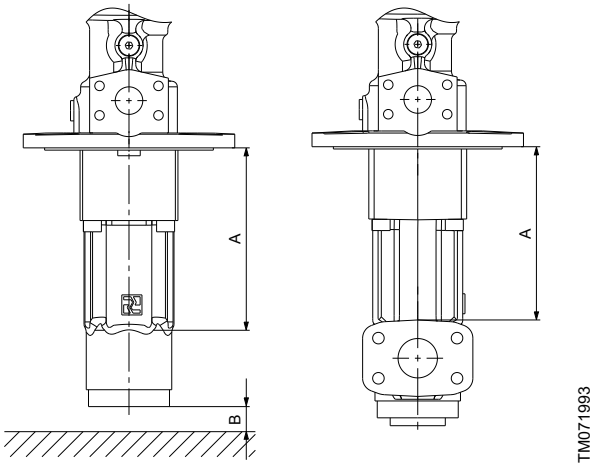
Rating	Standard
Definition of safety function STO	IEC 61800-5-2:2016
Safety Integrity Level SIL3	IEC 61508-1/-2:2010
Performance level e (PL e)	EN ISO 13849-1:2015
Category 3	EN ISO 13849-1:2015

Installation

The following applies for pumps installed in tanks.

In order to protect the pump at startup and to ensure correct performance, observe the requirements in the table below.

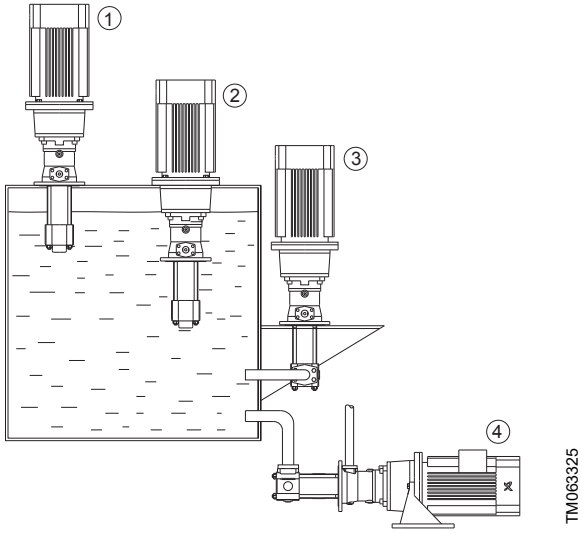
Pump type	A [mm]	B [mm]
MTS 20	Max. 147	Min. 25
MTS 40	Max. 190	Min. 25



Design types DQ (left) and D8.6 (right)

Pump designs

The pump designs available as standard and on request are shown in the figure below.

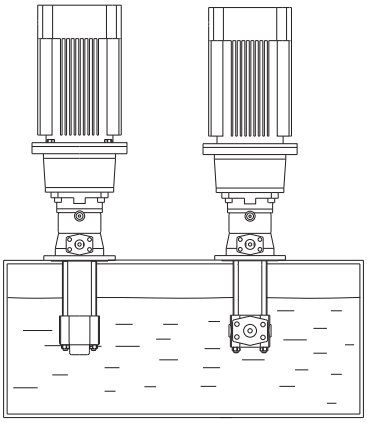


Pump designs

Pos.	Description
1	Pump designed for tank-top installation
2	Pump designed for in-tank installation (on request)
3	Pump designed for dry installation with flange
4	Pump designed for dry installation with mounting foot

Pumps for tank-top installation

The pump is equipped with a flange for mounting on the tank top, and the outlet port is above the tank cover. This type of installation is easy and economic to install. The pump is equipped with a seal ring and is well-suited for operation with an inlet pressure up to 1 bar. See the section on installation for installation requirements.



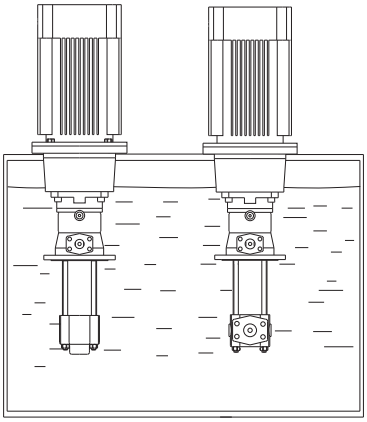
Tank-top installation

Related information

Installation

Pumps for in-tank installation

This type of installation saves space compared with pumps which are designed for dry installation. Any leakage remains in the tank. See the section on installation for installation requirements.

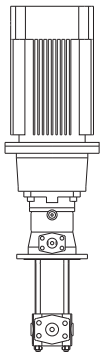


In-tank installation

Related information

Installation

Pumps for dry installation

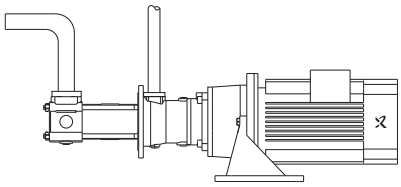


TM063350

Pump designed for dry installation with a flange

This type of installation is well-suited for operation with an inlet pressure up to 10 bar, and it is easy to access the pump. A silicon carbide mechanical shaft seal ensures a long service life.

Pumps for horizontal installation



TM063351

Pump designed for dry installation with horizontal mounting foot

The pump is equipped with a mounting foot. This type of installation is well-suited for operation with an inlet pressure up to 10 bar, and it is easy to access the pump. A silicon carbide mechanical shaft seal ensures a long service life.

Shaft seals

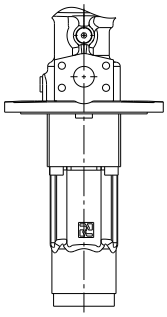
Design DQ

The shaft seal includes a sealing ring and is well-suited for operation with an inlet pressure up to 1 bar.

The design features the following:

- Axial inlet with pipe thread connection according to DIN EN ISO 228-1
- Radial high-pressure outlet flange according to SAE J518C.

Note that MTS 20 to MTS 140 pumps are available with pipe thread connection (DIN EN ISO 228-1).



TM072096

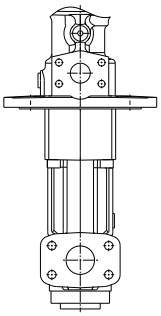
Design DQ

Design D8.6

The maintenance-free and highly wear-resistant shaft seal conforms to EN 12756.

The design features the following:

- Radial high-pressure inlet and outlet flanges according to SAE J518C
- Optional: Axial inlet connection with pipe thread (DIN ISO 228-1).



TM071992

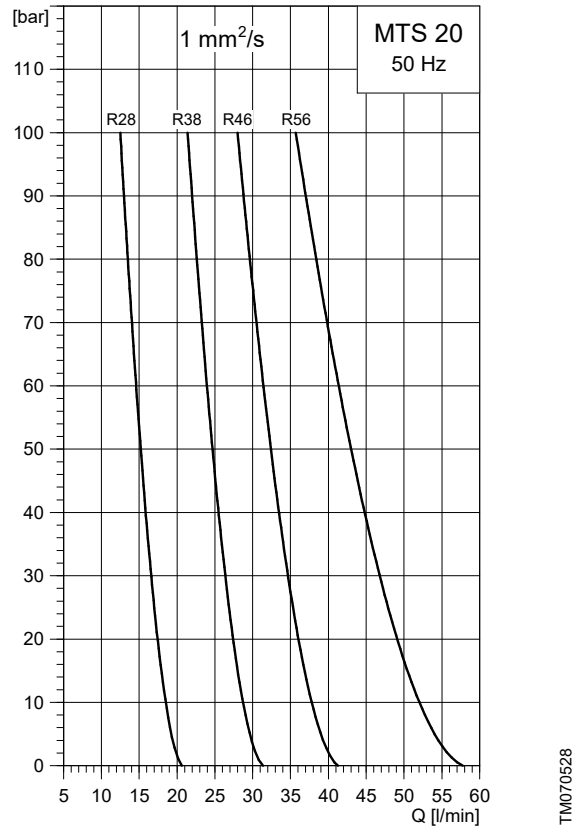
Design D8.6

9. Performance curves and technical data

MTS 20, 50 Hz

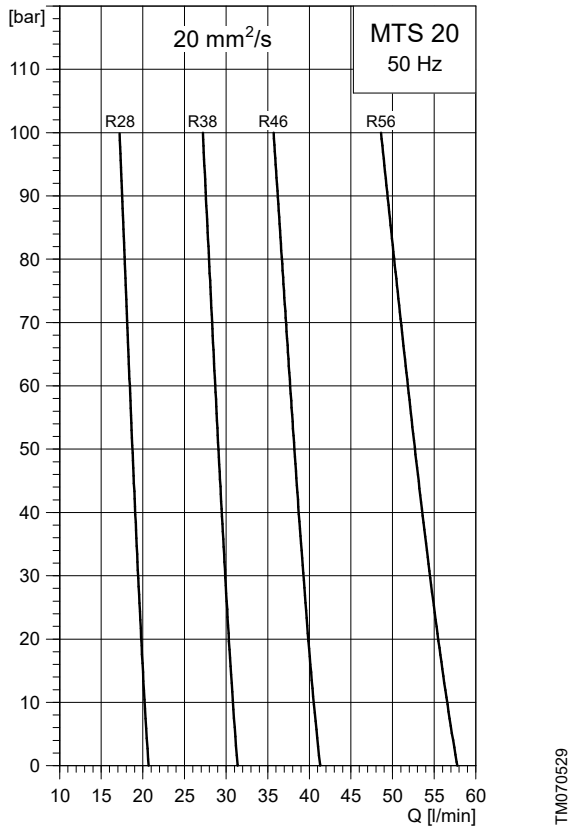
Performance range

Performance data at 1 mm^2/s (emulsion)



TM070528

Performance data at 20 mm^2/s (cutting oil with EP additives)

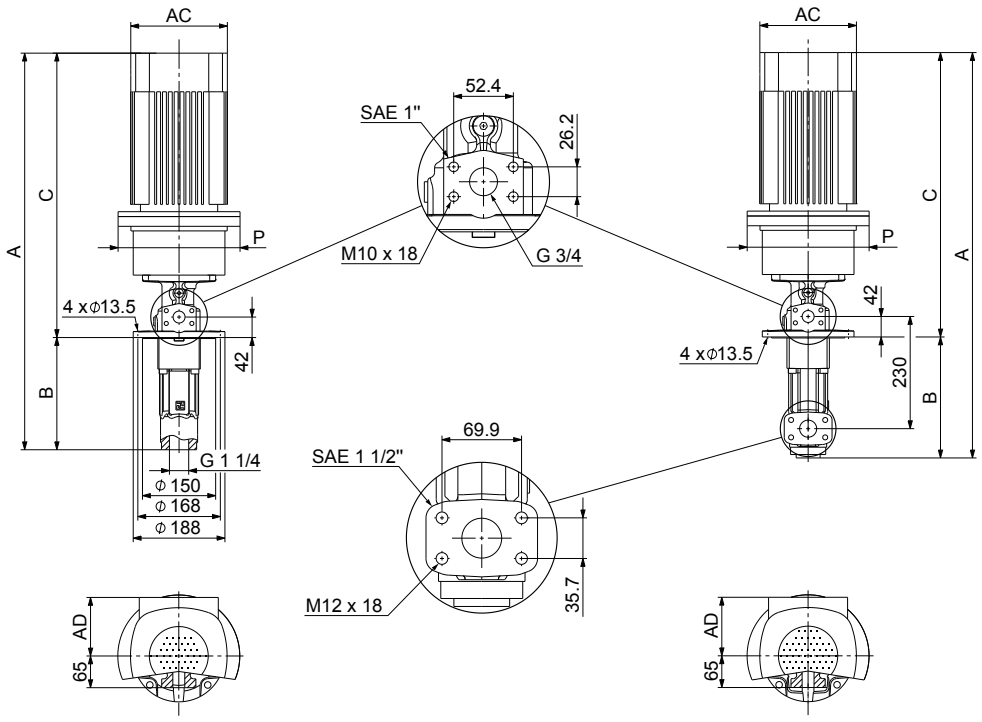


TM070529

Performance data

Pressure	1 mm^2/s (emulsion)								20 mm^2/s (cutting oil with EP additives)							
	R28		R38		R46		R56		R28		R38		R46		R56	
	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P	P	Q	Q	P
[bar]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]
0	20.7	0.3	31.4	0.3	41.3	0.3	57.8	0.3	20.7	0.3	31.4	0.3	41.3	0,3	57.8	0.3
10	18.5	0.7	28.7	0.8	37.8	1	52	1.3	20.2	0.7	30.8	0.8	40.5	1	56.5	1.3
20	17.4	1	27.4	1.3	36	1.7	49.1	2.2	19.8	1	30.3	1.4	39.9	1.7	55.5	2.2
30	16.6	1.4	26.4	1.9	34.7	2.4	46.8	3.2	19.4	1.4	29.9	1.9	39.3	2.4	54.5	3.2
40	15.9	1.7	25.5	2.4	33.5	3.1	44.8	4.2	19.1	1.7	29.5	2.4	38.7	3.1	53.6	4.2
50	15.2	2	24.7	2.9	32.4	3.8	43	5.1	18.8	2	29.1	2.9	38.2	3.8	52.7	5.1
60	14.6	2.4	23.9	3.5	31.4	4.4	41.4	6.1	18.4	2.4	28.7	3.5	37.7	4.4	51.8	6.1
70	14	2.7	23.3	4	30.5	5.1	39.8	7.1	18.1	2.7	28.3	4	37.2	5.1	51	7.1
80	13.5	3.1	22.6	4.5	29.6	5.8	38.4	8	17.8	3.1	27.9	4.5	36.7	5.8	50.2	8
90	13	3.4	22	5	28.8	6.5	37	9	17.5	3.4	27.6	5	36.2	6.5	49.4	9
100	12.5	3.8	21.4	5.6	28	7.2	35.7	10	17.2	3.8	27.2	5.6	35.7	7.2	48.6	10

Dimensional sketches



Tank-top installation (left), dry installation (right)

Dimensions and weights

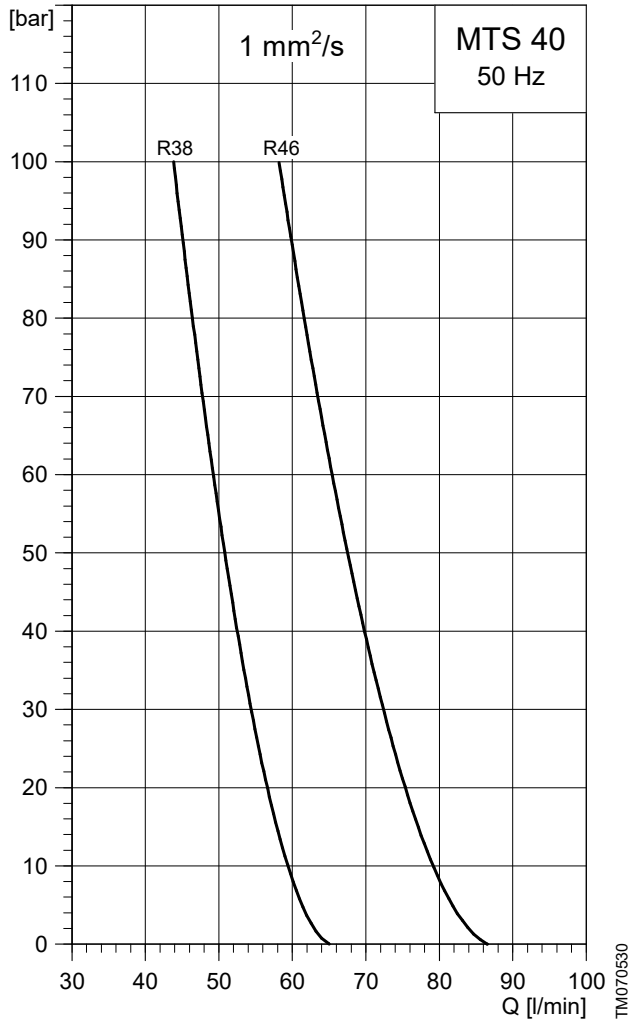
Pump type	P2 [kW]	Dimensions [mm]									Net weight [kg]	
		A		B		C		AC	AD	P	Tank-top	Dry
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry					
MTS 20-30 R28	1.5	754	772	230	248	524	524	178	110	200	36	39
MTS 20-40 R28	2.2	794	812	230	248	564	564	178	110	200	39	42
MTS 20-50 R28	2.2	794	812	230	248	564	564	178	110	200	39	42
MTS 20-60 R28	3	813	831	230	248	583	583	198	120	250	44	47
MTS 20-70 R28	3	813	831	230	248	583	583	198	120	250	44	47
MTS 20-80 R28	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-90 R28	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-100 R28	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-30 R38	2.2	794	812	230	248	564	564	178	110	200	39	42
MTS 20-40 R38	3	813	831	230	248	583	583	198	120	250	44	47
MTS 20-50 R38	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-60 R38	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-70 R38	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-80 R38	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-90 R38	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-100 R38	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-30 R46	3	813	831	230	248	583	583	198	120	250	44	47
MTS 20-40 R46	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-50 R46	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-60 R46	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-70 R46	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-80 R46	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-90 R46	7.5	881	899	230	248	651	651	260	159	300	71	74

Pump type	P2 [kW]	Dimensions [mm]									Net weight [kg]	
		A		B		C		AC	AD	P		
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry				Tank-top	Dry
MTS 20-100 R46	11	1017	1035	230	248	787	787	314	204	350	90	93
MTS 20-30 R56	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-40 R56	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-50 R56	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-60 R56	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-70 R56	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-80 R56	11	1017	1035	230	248	787	787	314	204	350	90	93
MTS 20-90 R56	11	1017	1035	230	248	787	787	314	204	350	90	93
MTS 20-100 R56	11	1017	1035	230	248	787	787	314	204	350	90	93

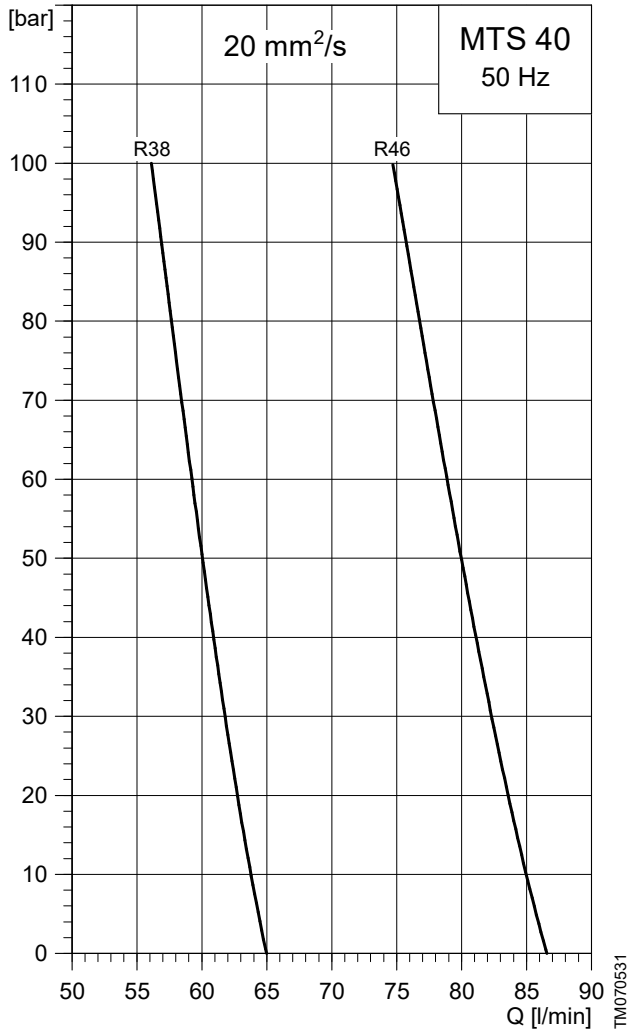
MTS 40, 50 Hz

Performance range

Performance data at 1 mm²/s (emulsion)



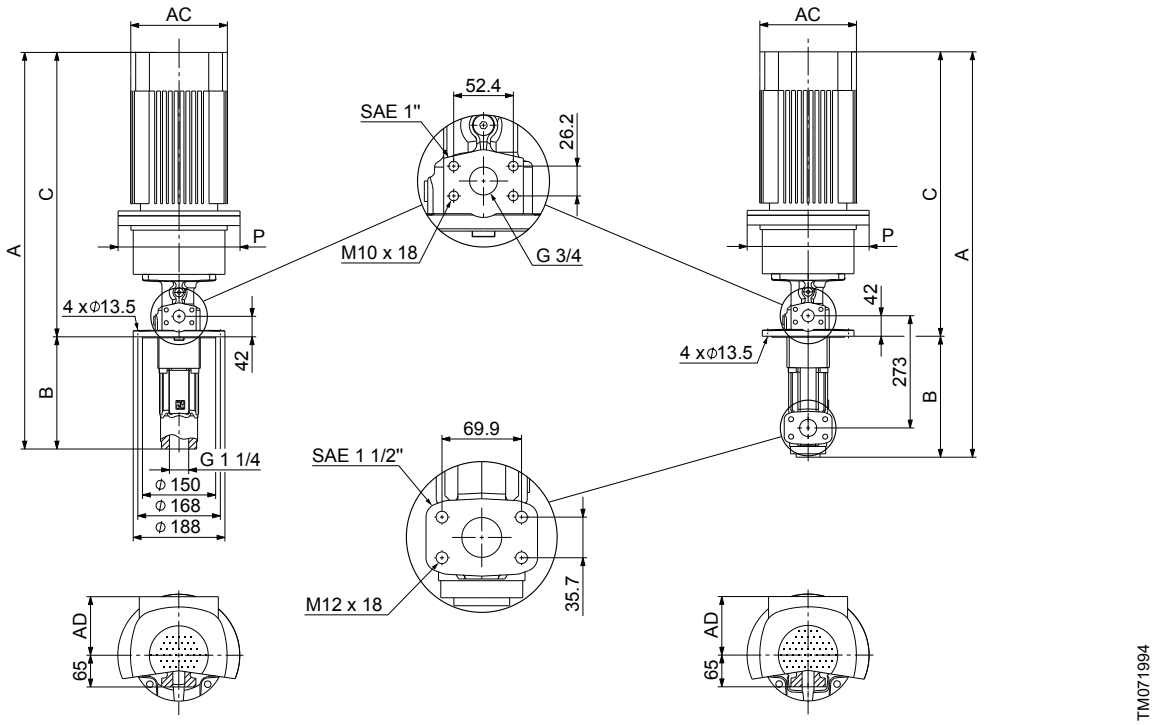
Performance data at 20 mm²/s (cutting oil with EP additives)



Performance data

Pressure	1 mm²/s (emulsion)				20 mm²/s (cutting oil with EP additives)			
	R38		R46		R38		R46	
	Q	P	Q	P	Q	P	Q	P
[bar]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]
0	65	0.4	86.6	0.4	65	0.8	86.6	0.8
10	59.4	1.5	79.1	1.8	63.7	1.8	84.9	2.2
20	56.6	2.6	75.4	3.3	62.7	2.9	83.6	3.6
30	54.4	3.7	72.4	4.7	61.8	4	82.3	5.1
40	52.5	4.7	69.8	6.2	60.9	5.1	81.1	6.5
50	50.8	5.8	67.5	7.6	60.1	6.2	80	8
60	49.2	6.9	65.4	9.1	59.2	7.3	78.9	9.4
70	47.8	8	63.5	10.5	58.4	8.3	77.8	10.9
80	46.4	9.1	61.6	12	57.6	9.4	76.7	12.3
90	45.1	10.2	59.8	13.4	56.9	10.5	75.7	13.7
100	43.8	11.2	58.2	14.8	56.1	11.6	74.7	15.2

Dimensional sketches



Tank-top installation (left), dry installation (right)

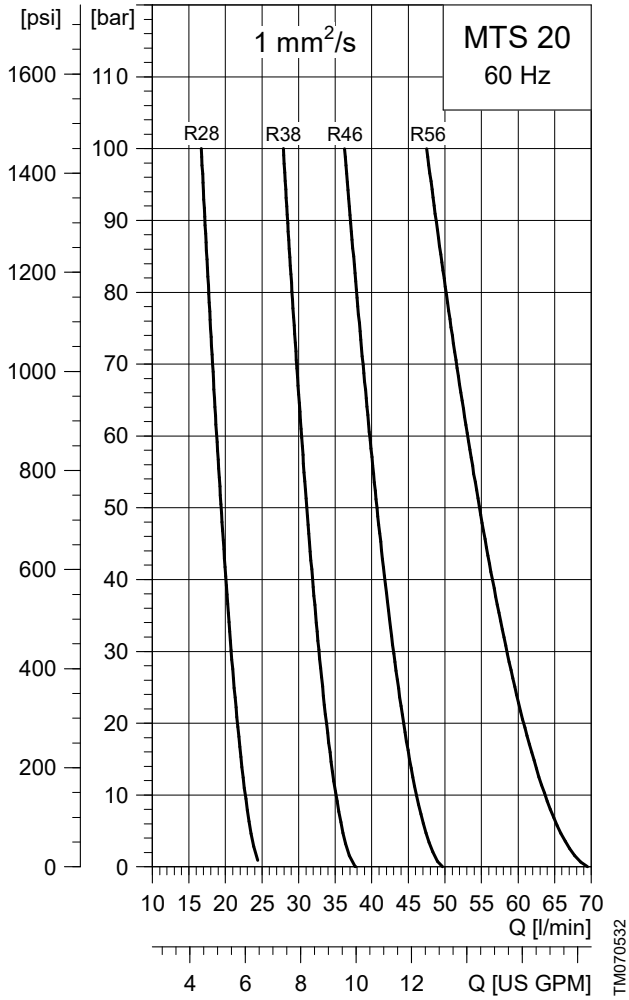
Dimensions and weights

Pump type	P2 [kW]	Dimensions [mm]									Net weight [kg]	
		A		B		C		AC	AD	P		
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry				Tank-top	Dry
MTS 40-30 R38	4	900	911	280	291	620	620	220	134	250	62	65
MTS 40-40 R38	5.5	943	954	280	291	663	663	220	134	300	67	70
MTS 40-50 R38	7.5	931	942	280	291	651	651	260	159	300	77	80
MTS 40-60 R38	7.5	931	942	280	291	651	651	260	159	300	77	80
MTS 40-70 R38	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-80 R38	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-90 R38	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-100 R38	15	1067	1078	280	291	787	787	314	204	350	126	129
MTS 40-30 R46	5.5	943	954	280	291	663	663	220	134	300	67	70
MTS 40-40 R46	7.5	931	942	280	291	651	651	260	159	300	77	80
MTS 40-50 R46	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-60 R46	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-70 R46	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-80 R46	15	1067	1078	280	291	787	787	314	204	350	126	129
MTS 40-90 R46	15	1067	1078	280	291	787	787	314	204	350	126	129
MTS 40-100 R46	18.5	1111	1122	280	291	831	831	314	204	350	140	143

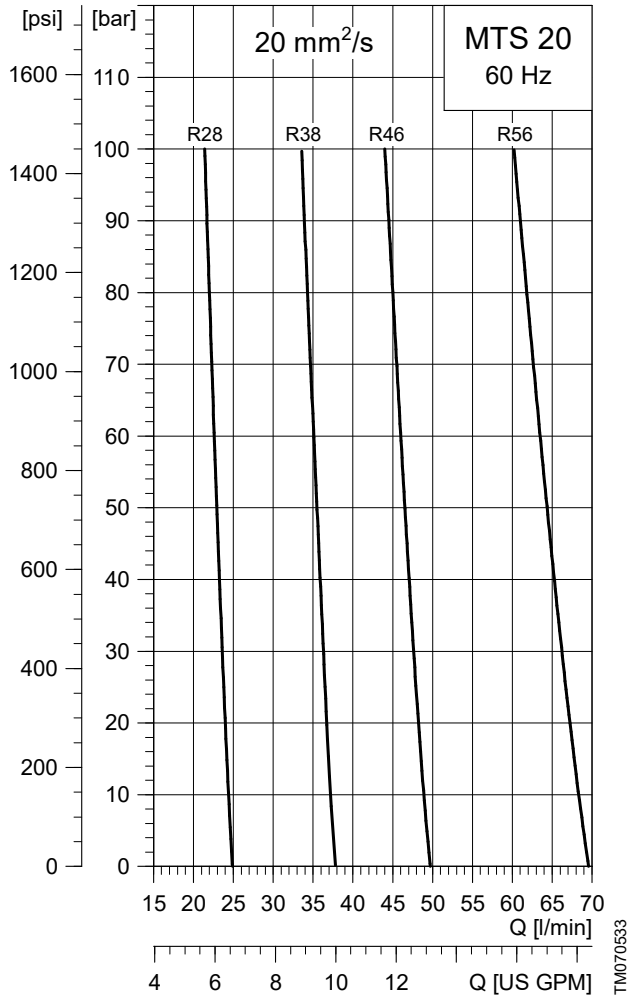
MTS 20, 60 Hz

Performance range

Performance data at 1 mm²/s (emulsion)



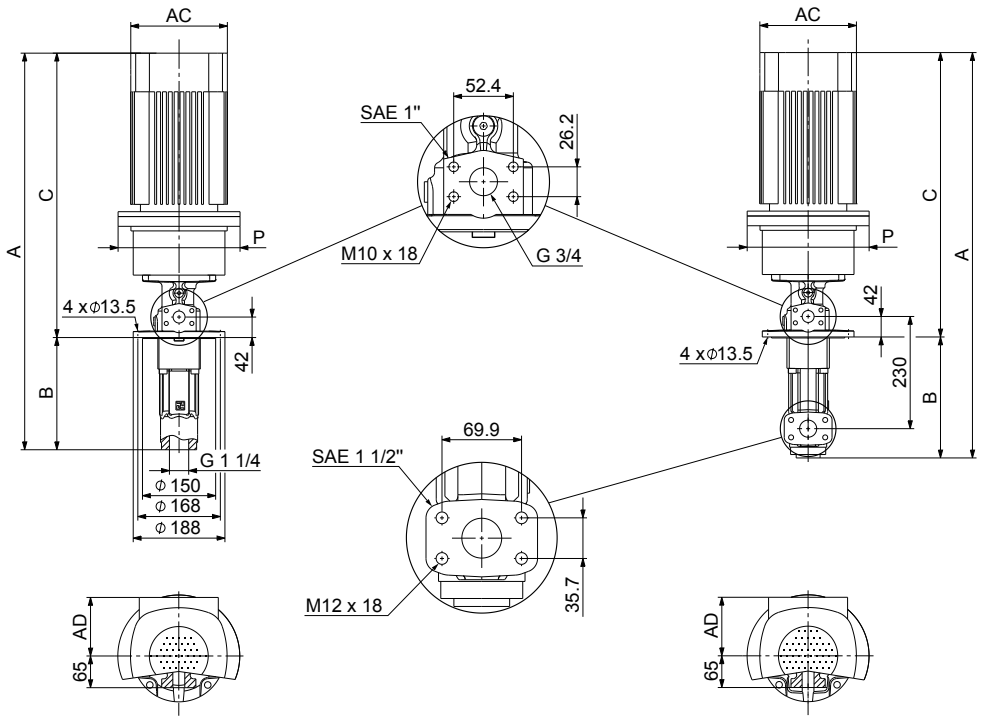
Performance data at 20 mm²/s (cutting oil with EP additives)



Performance data

Pressure	1 mm²/s (emulsion)								20 mm²/s (cutting oil with EP additives)							
	R28		R38		R46		R56		R28		R38		R46		R56	
	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P	Q	P
[bar]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]
0	24.9	0.4	37.8	0.4	49.7	0.4	69.6	0.4	24.9	0.4	37.8	0.4	49.7	0.4	69.6	0.4
10	22.7	0.8	35.1	1.1	46.1	1.2	63.6	1.6	24.4	0.8	37.2	1.1	48.9	1.2	68.3	1.6
20	21.6	1.2	33.8	1.7	44.3	2.1	60.8	2.7	24	1.2	36.7	1.7	48.2	2.1	67.2	2.7
30	20.8	1.7	32.8	2.3	43	2.9	58.5	3.9	23.6	1.7	36.3	2.3	47.6	2.9	66.2	3.9
40	20.1	2.1	31.9	2.9	41.8	3.7	56.5	5.1	23.3	2.1	35.9	2.9	47.1	3.7	65.3	5.1
50	19.4	2.5	31.1	3.6	40.7	4.6	54.7	6.2	22.9	2.5	35.5	3.6	46.5	4.6	64.4	6.2
60	18.8	2.9	30.4	4.2	39.7	5.4	53.1	7.4	22.6	2.9	35.1	4.2	46	5.4	63.5	7.4
70	18.2	3.3	29.7	4.8	38.8	6.2	51.6	8.5	22.3	3.3	34.7	4.8	45.5	6.2	62.6	8.5
80	17.7	3.7	29.1	5.5	37.9	7	50.1	9.7	22	3.7	34.3	5.5	45	7	61.8	9.7
90	17.2	4.1	28.5	6.1	37.1	7.9	48.8	10.9	21.7	4.1	33.9	6.1	44.5	7.9	61	10.9
100	16.7	4.6	27.9	6.7	36.3	8.7	47.5	12	21.4	4.6	33.6	6.7	44	8.7	60.2	12

Dimensional sketches



Tank-top installation (left), dry installation (right)

Dimensions and weights

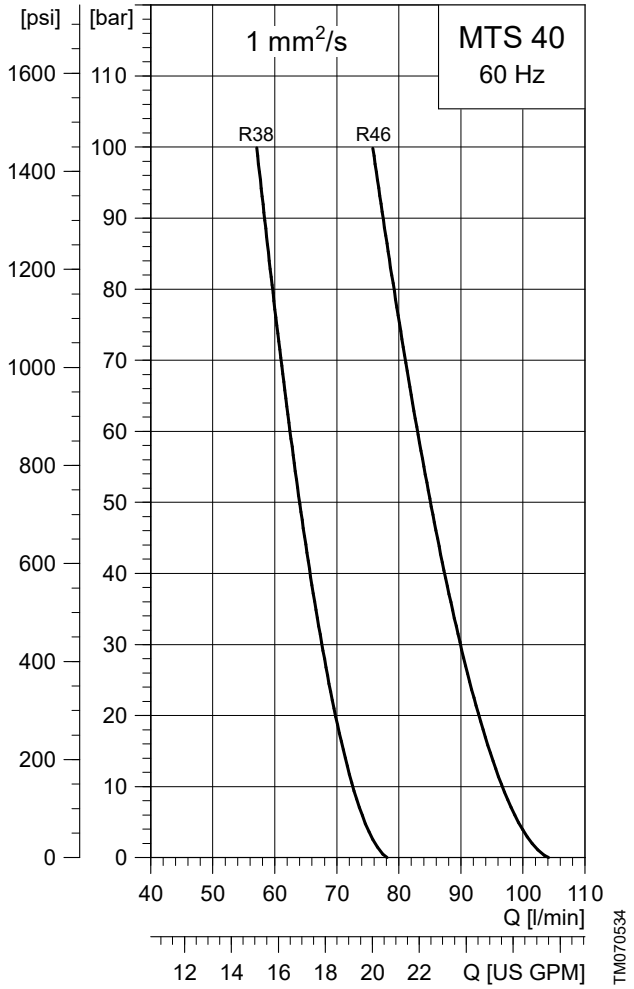
Pump type	P2 [kW]	Dimensions [mm]									Net weight [kg]	
		A		B		C		AC	AD	P	Tank-top	Dry
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry					
MTS 20-30 R28	2.2	794	812	230	248	564	564	178	110	200	39	42
MTS 20-40 R28	2.2	794	812	230	248	564	564	178	110	200	39	42
MTS 20-50 R28	3	813	831	230	248	583	583	198	120	250	44	47
MTS 20-60 R28	3	813	831	230	248	583	583	198	120	250	44	47
MTS 20-70 R28	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-80 R28	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-90 R28	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-100 R28	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-30 R38	3	813	831	230	248	583	583	198	120	250	44	47
MTS 20-40 R38	3	813	831	230	248	583	583	198	120	250	44	47
MTS 20-50 R38	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-60 R38	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-70 R38	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-80 R38	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-90 R38	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-100 R38	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-30 R46	3	813	831	230	248	583	583	198	120	250	44	47
MTS 20-40 R46	4	850	868	230	248	620	620	220	134	250	56	59
MTS 20-50 R46	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-60 R46	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-70 R46	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-80 R46	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-90 R46	11	1017	1035	230	248	787	787	314	204	350	90	93

Pump type	P2 [kW]	Dimensions [mm]									Net weight [kg]	
		A		B		C		AC	AD	P		
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry				Tank-top	Dry
MTS 20-100 R46	11	1017	1035	230	248	787	787	314	204	350	90	93
MTS 20-30 R56	4	850	863	230	248	620	620	220	134	250	56	59
MTS 20-40 R56	5.5	893	911	230	248	663	663	220	134	300	61	64
MTS 20-50 R56	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-60 R56	7.5	881	899	230	248	651	651	260	159	300	71	74
MTS 20-70 R56	11	1017	1035	230	248	787	787	314	204	350	90	93
MTS 20-80 R56	11	1017	1035	230	248	787	787	314	204	350	90	93
MTS 20-90 R56	11	1017	1035	230	248	787	787	314	204	350	90	93
MTS 20-100 R56	15	1017	1035	230	248	787	787	314	204	350	102	105

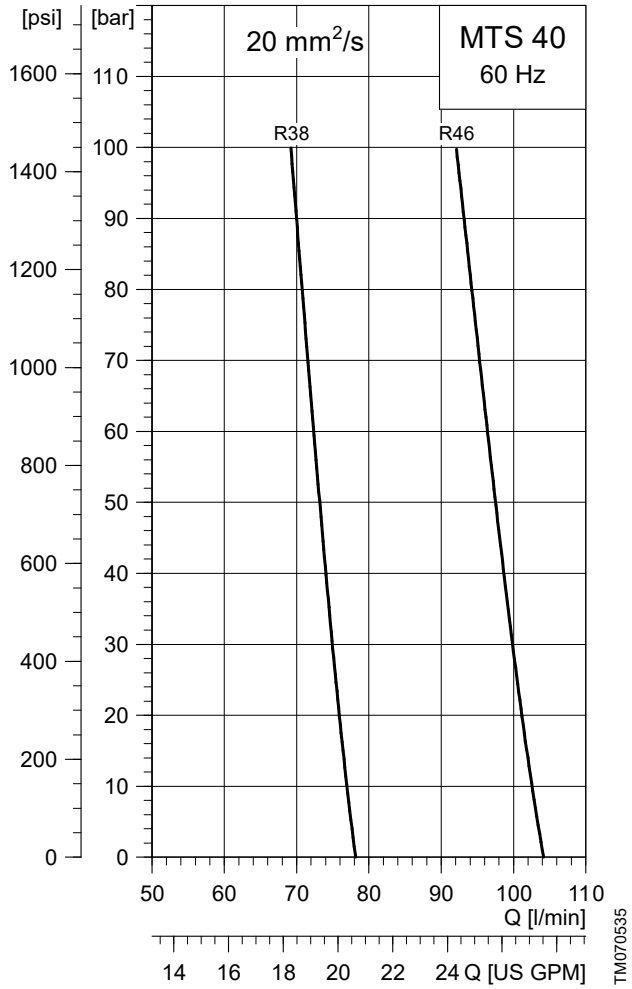
MTS 40, 60 Hz

Performance range

Performance data at 1 mm²/s (emulsion)



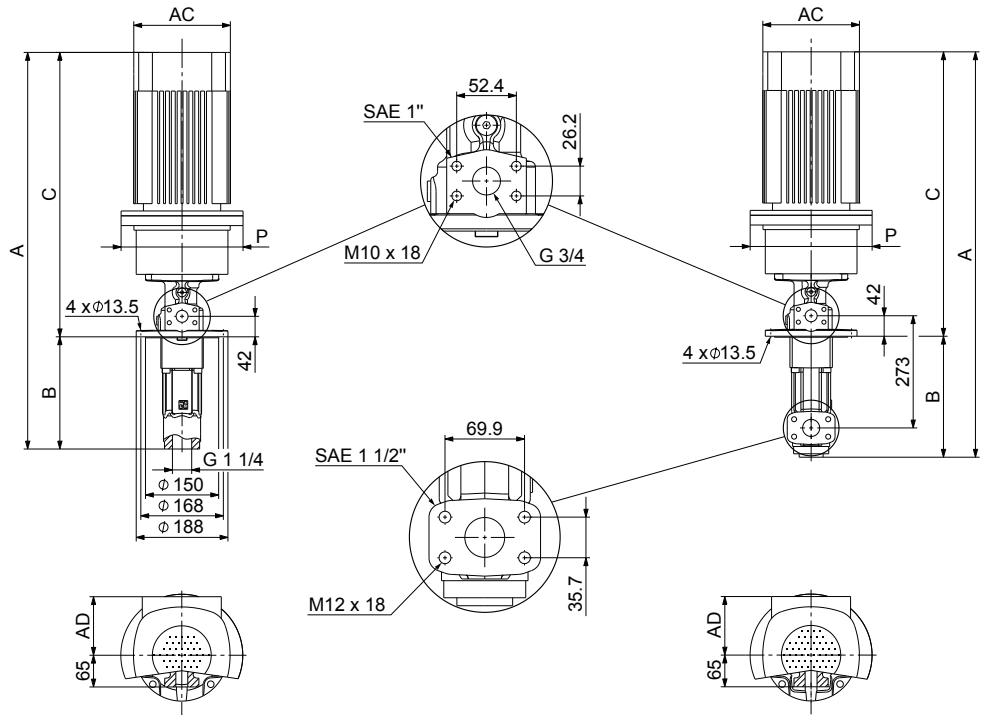
Performance data at 20 mm²/s (cutting oil with EP additives)



Performance data

Pressure	1 mm²/s (emulsion)				20 mm²/s (cutting oil with EP additives)			
	R38		R46		R38		R46	
	Q	P	Q	P	Q	P	Q	P
[bar]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]	[l/min]	[kW]
0	78.2	0.5	104.2	0.5	78.2	1	104.2	1
10	72.5	1.8	96.6	2.3	76.9	2.3	102.5	2.7
20	69.8	3.1	92.9	4	75.9	3.6	101.1	4.5
30	67.6	4.4	89.9	5.7	74.9	4.9	99.9	6.2
40	65.7	5.7	87.4	7.5	74.1	6.2	98.7	7.9
50	64	7.1	85.1	9.2	73.2	7.5	97.5	9.7
60	62.4	8.4	83	11	72.4	8.8	96.4	11.4
70	61	9.7	81	12.7	71.5	10.1	95.3	13.2
80	59.6	11	79.2	14.4	70.7	11.4	94.2	14.9
90	58.3	12.3	77.4	16.2	70	12.7	93.1	16.6
100	57.1	13.6	75.8	17.9	69.2	14	92.1	18.4

Dimensional sketches



Tank-top installation (left), dry installation (right)

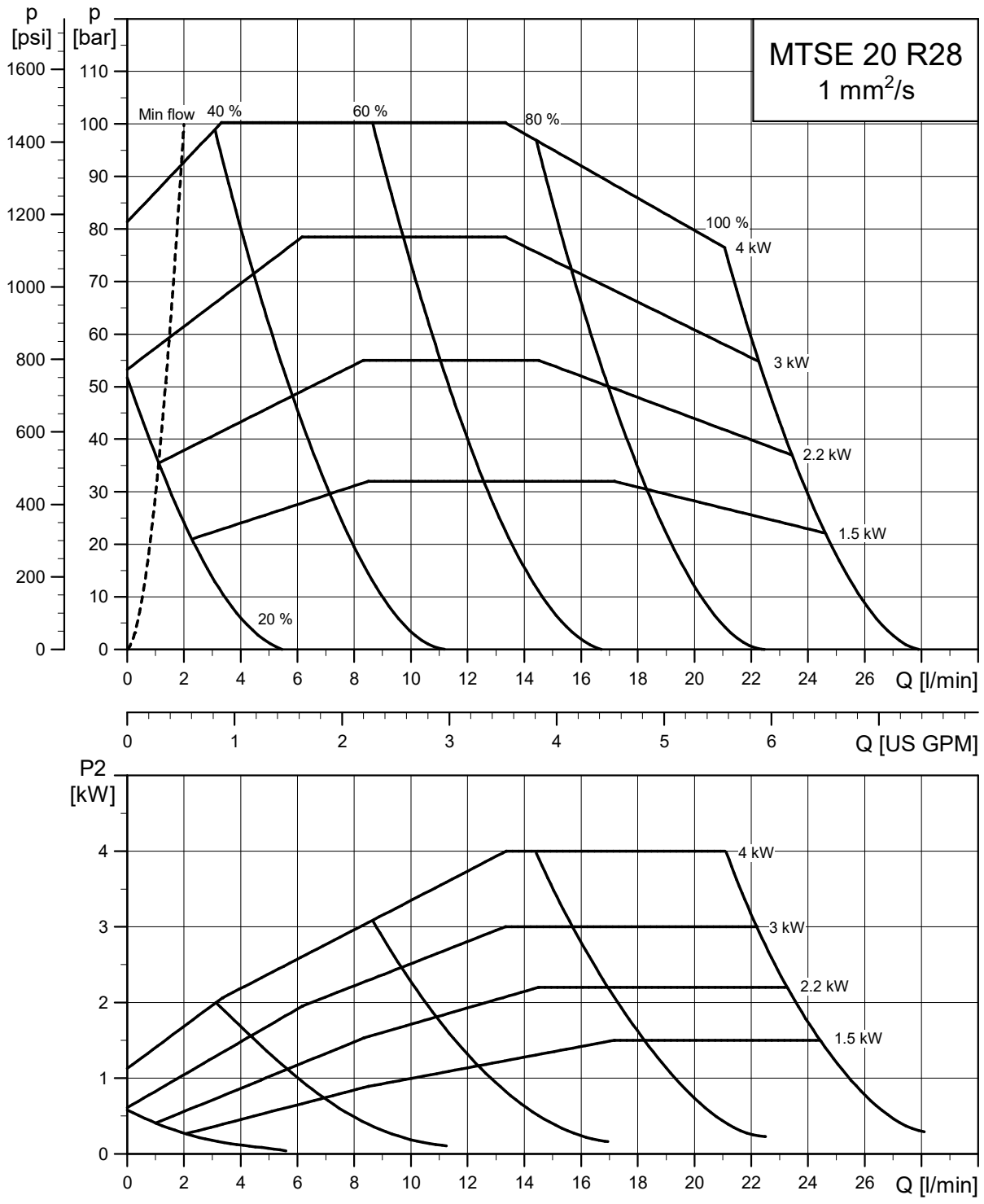
Dimensions and weights

Pump type	P2 [kW]	Dimensions [mm]									Net weight [kg]	
		A		B		C		AC	AD	P		
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry				Tank-top	Dry
MTS 40-30 R38	5.5	943	954	280	291	663	663	220	134	300	67	70
MTS 40-40 R38	7.5	931	942	280	291	651	651	260	159	300	77	80
MTS 40-50 R38	7.5	931	942	280	291	651	651	260	159	300	77	80
MTS 40-60 R38	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-70 R38	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-80 R38	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-90 R38	15	1067	1078	280	291	787	787	314	204	350	126	129
MTS 40-100 R38	15	1067	1078	280	291	787	787	314	204	350	126	129
MTS 40-30 R46	7.5	931	942	280	291	651	651	260	159	300	77	80
MTS 40-40 R46	7.5	931	942	280	291	651	651	260	159	300	77	80
MTS 40-50 R46	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-60 R46	11	1067	1078	280	291	787	787	314	204	350	114	117
MTS 40-70 R46	15	1067	1078	280	291	787	787	314	204	350	126	129
MTS 40-80 R46	15	1067	1078	280	291	787	787	314	204	350	126	129
MTS 40-90 R46	18.5	1111	1122	280	291	831	831	314	204	350	140	140
MTS 40-100 R46	18.5	1111	1122	280	291	831	831	314	204	350	140	140

MTSE 20 R28, 50/60 Hz

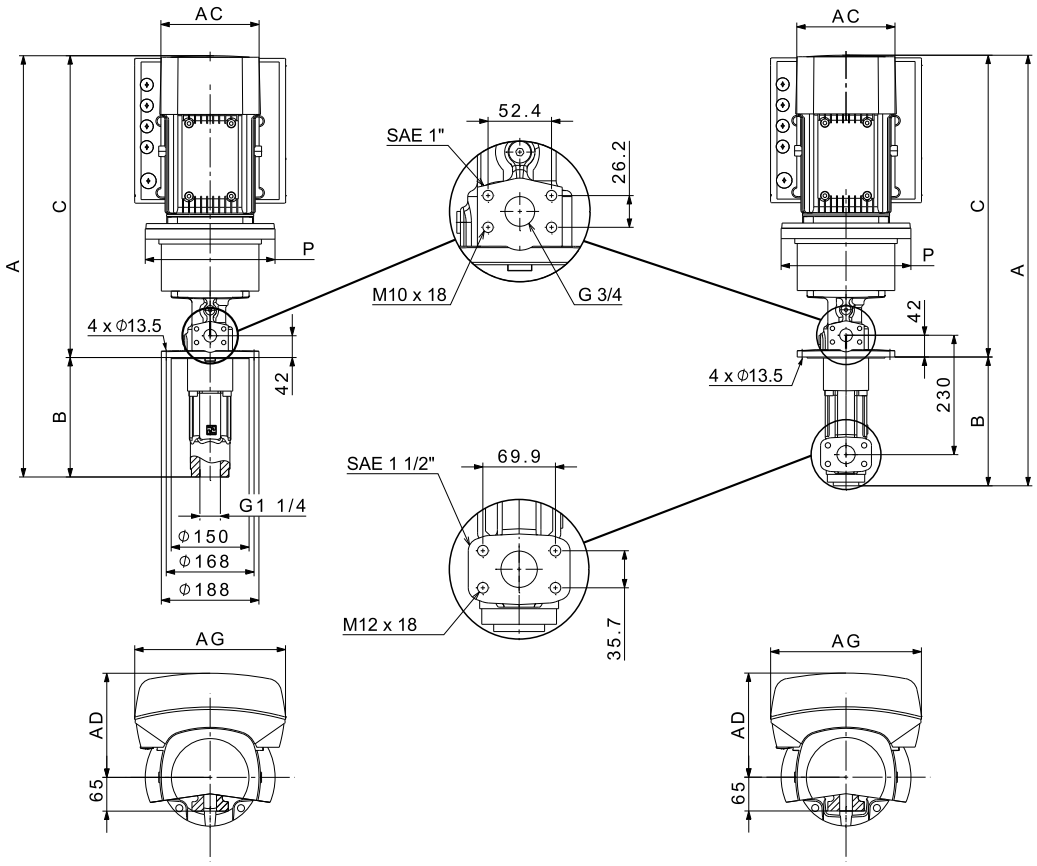
Performance range

Performance data at 1 mm²/s (emulsion)



TM074883

Dimensional sketches



Tank-top installation (left), dry installation (right)

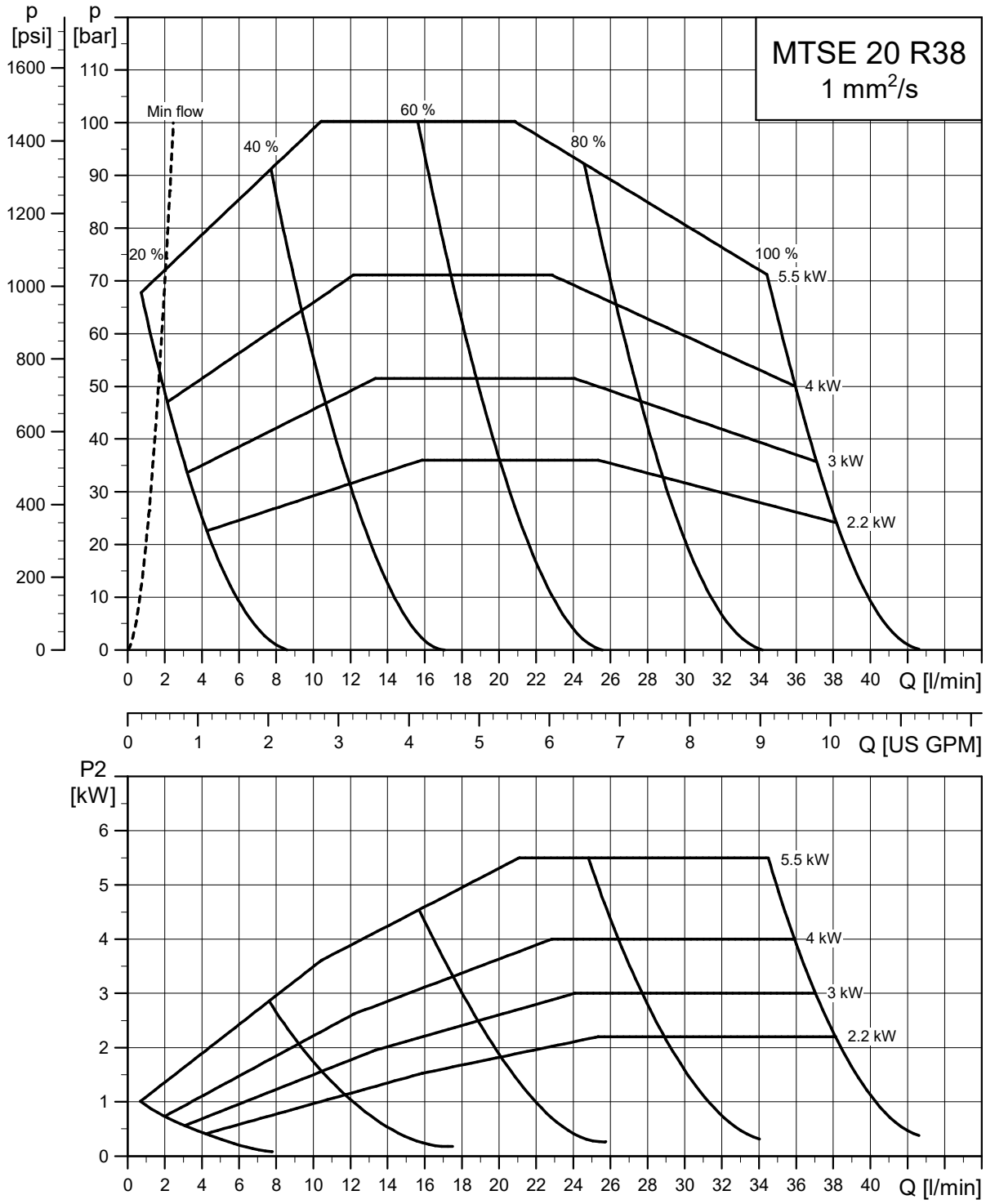
Dimensions and weights

Pump type	P2 [kW]	Dimensions [mm]										Net weight [kg]	
		A		B		C		AC	AD	AG	P	Tank-top	Dry
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry						
MTSE 20-32 R28	1.5	747	765	230	248	517	517	122	158	268	200	32	35
MTSE 20-55 R28	2.2	747	765	230	248	517	517	122	158	268	200	34	37
MTSE 20-78 R28	3.0	812	830	230	248	582	582	191	201	291	250	41	44
MTSE 20-100 R28	4.0	812	830	230	248	582	582	191	201	291	250	48	51

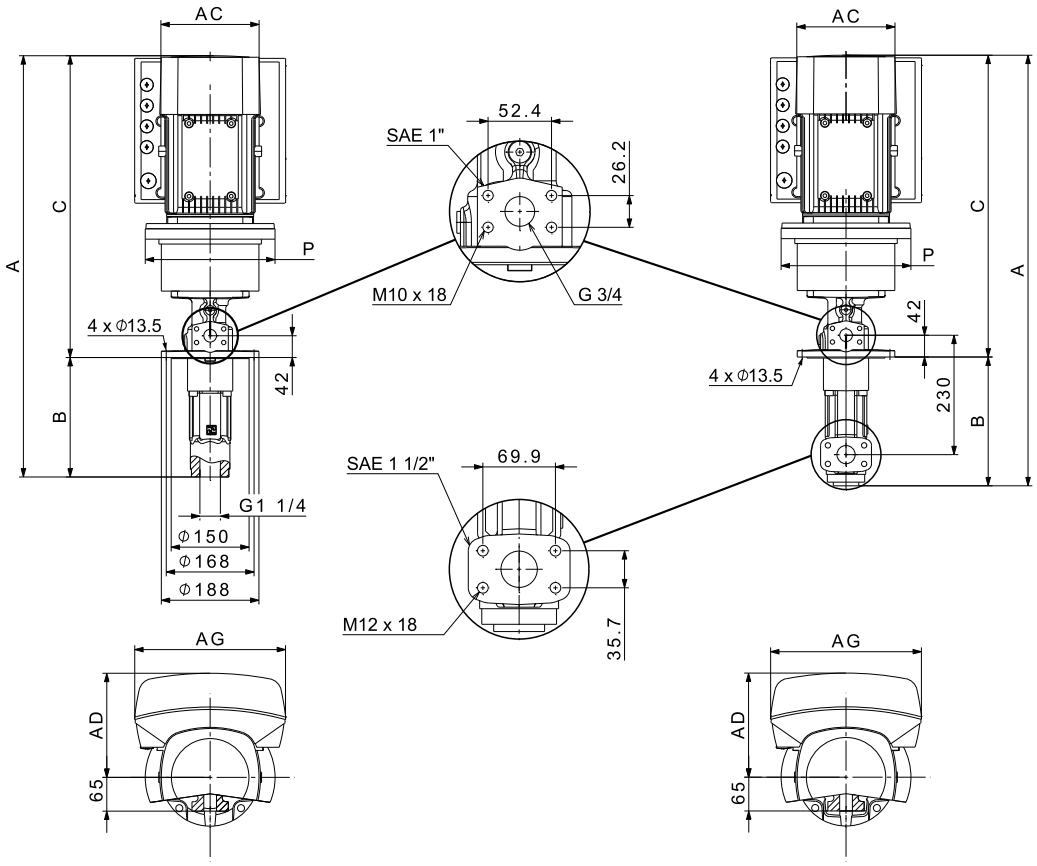
MTSE 20 R38, 50/60 Hz

Performance range

Performance data at 1 mm²/s (emulsion)



Dimensional sketches



Tank-top installation (left), dry installation (right)

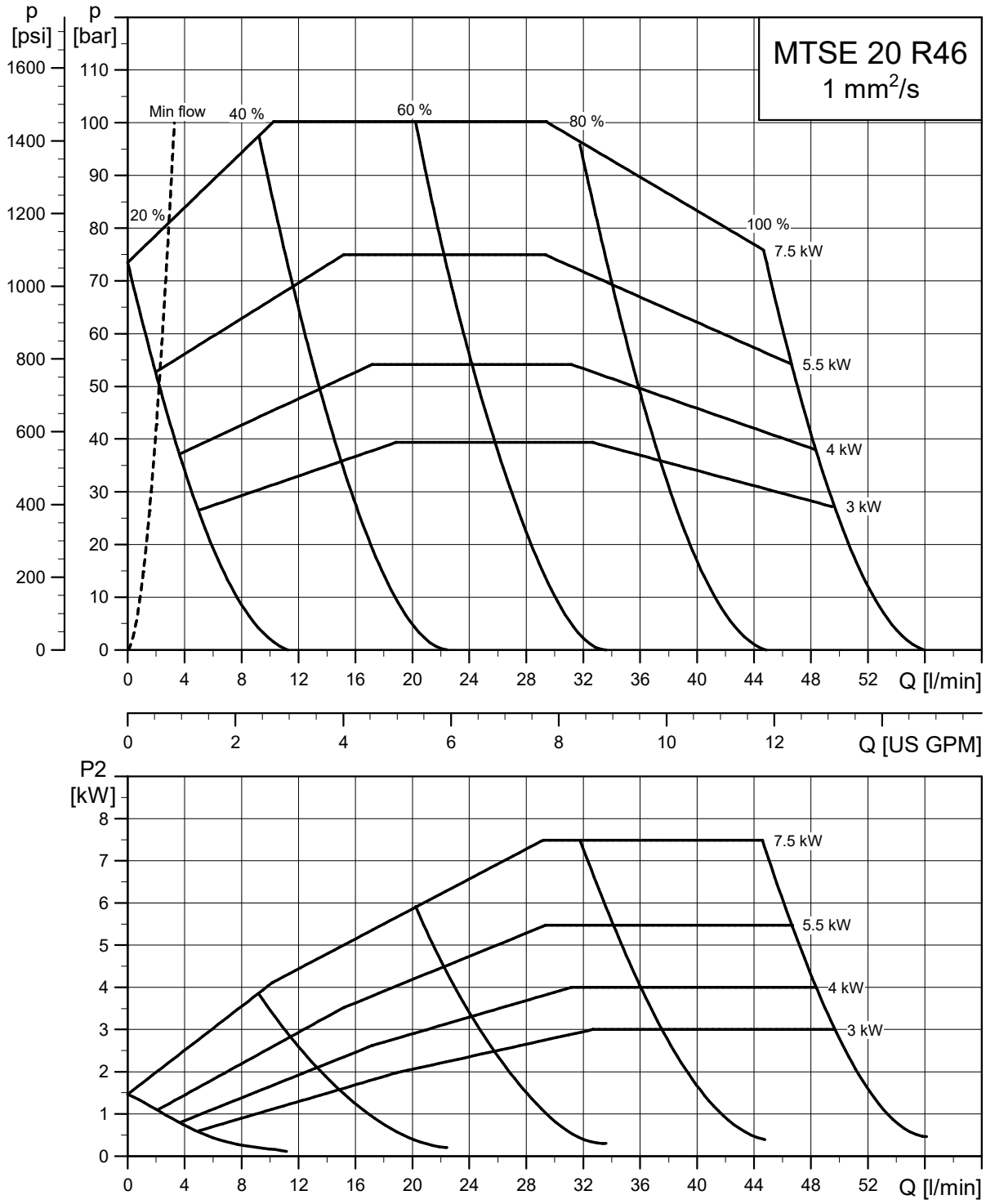
Dimensions and weights

Pump type	P2 [kW]	Dimensions [mm]										Net weight [kg]	
		A		B		C		AC	AD	AG	P	Tank-top	Dry
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry						
MTSE 20-36 R38	2.2	747	765	230	248	517	517	122	158	268	200	34	37
MTSE 20-51 R38	3.0	812	830	230	248	582	582	191	201	291	250	41	44
MTSE 20-71 R38	4.0	812	830	230	248	582	582	191	201	291	250	48	51
MTSE 20-100 R38	5.5	867	885	230	248	637	637	191	201	291	300	56	59

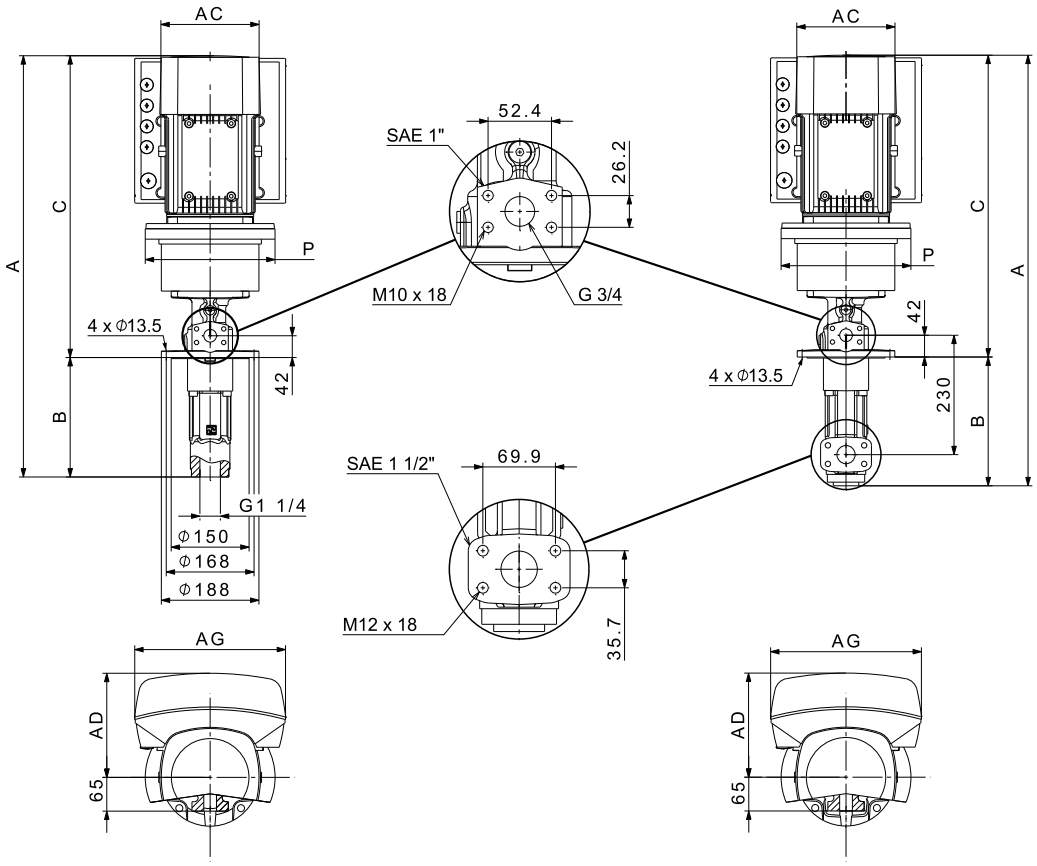
MTSE 20 R46, 50/60 Hz

Performance range

Performance data at 1 mm²/s (emulsion)



Dimensional sketches



Tank-top installation (left), dry installation (right)

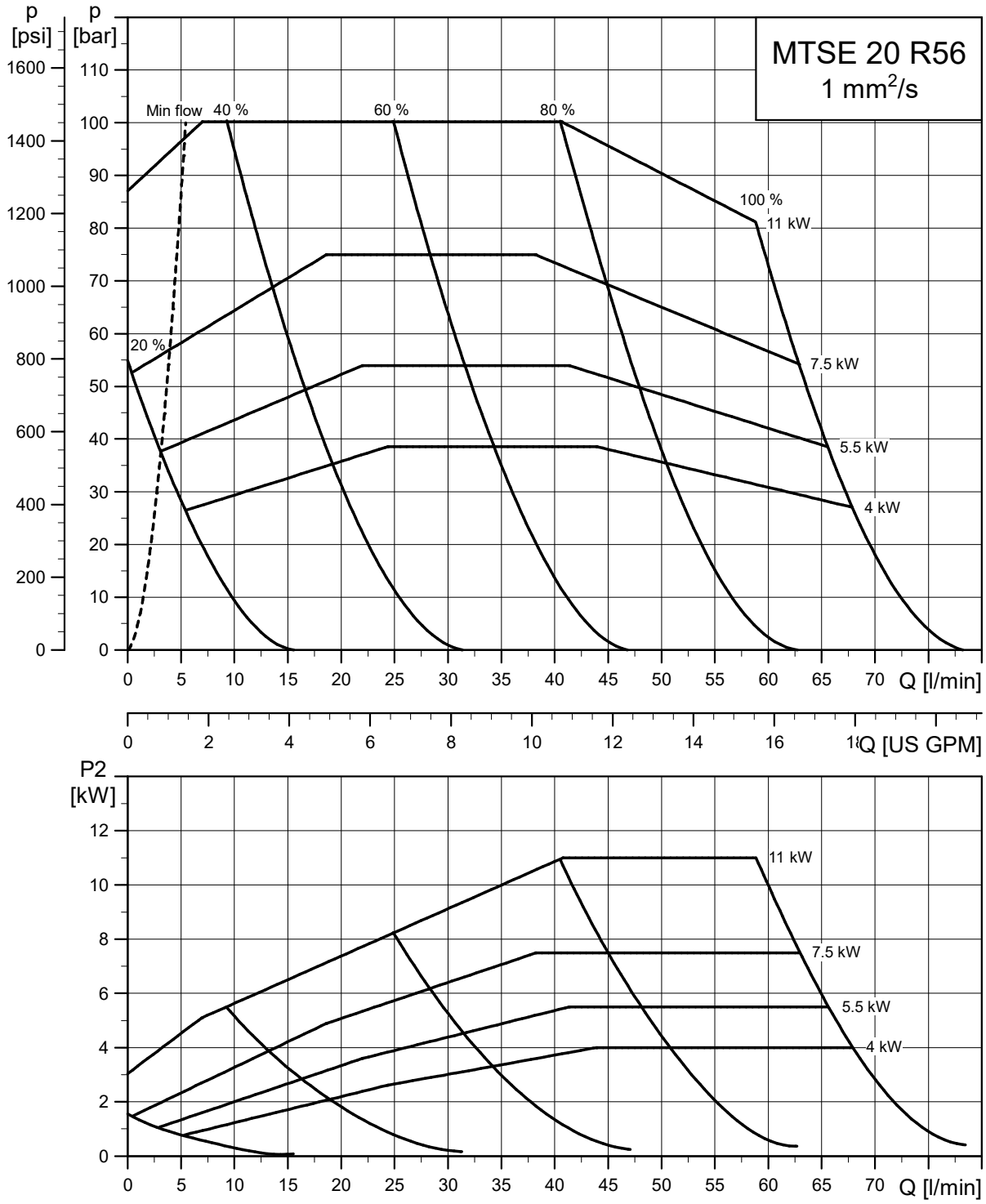
Dimensions and weights

Pump type	P2 [kW]	Dimensions [mm]										Net weight [kg]	
		A		B		C		AC	AD	AG	P	Tank-top	Dry
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry						
MTSE 20-39 R46	3.0	812	830	230	248	582	582	191	201	291	250	41	44
MTSE 20-54 R46	4.0	812	830	230	248	582	582	191	201	291	250	48	51
MTSE 20-75 R46	5.5	867	885	230	248	637	637	191	201	291	300	56	59
MTSE 20-100 R46	7.5	891	909	230	248	661	661	255	237	346	300	66	69

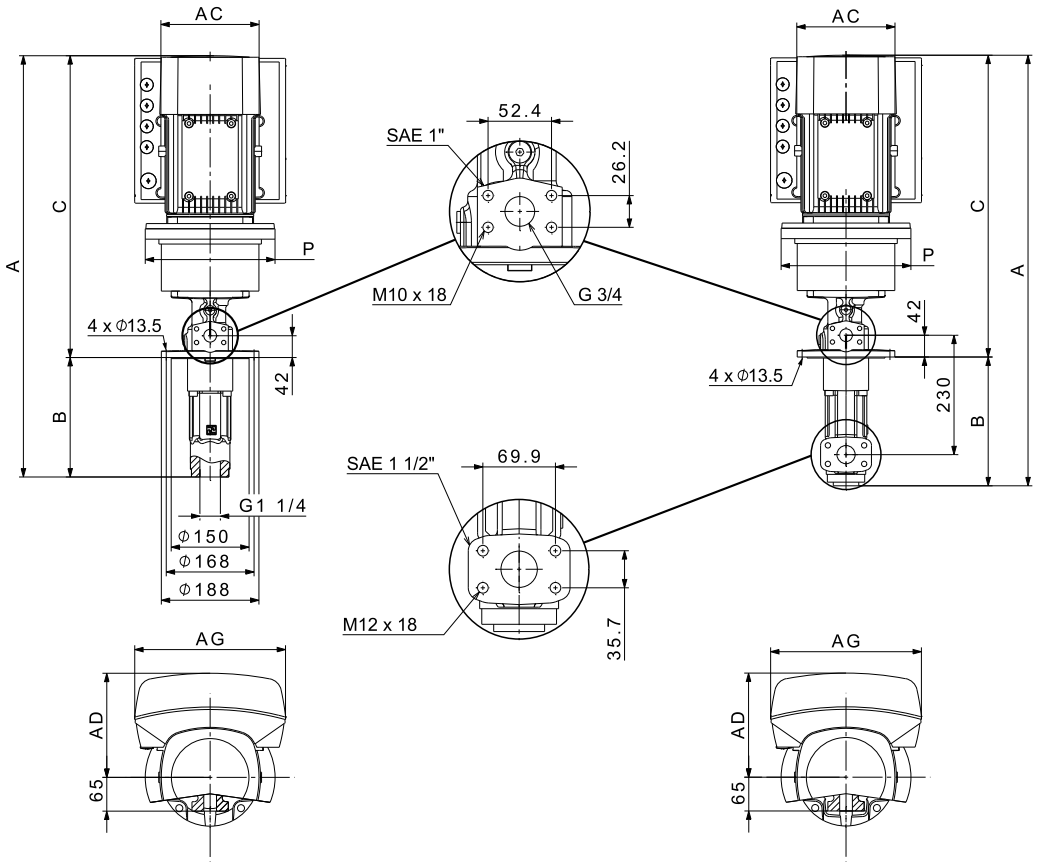
MTSE 20 R56, 50/60 Hz

Performance range

Performance data at 1 mm²/s (emulsion)



Dimensional sketches



Tank-top installation (left), dry installation (right)

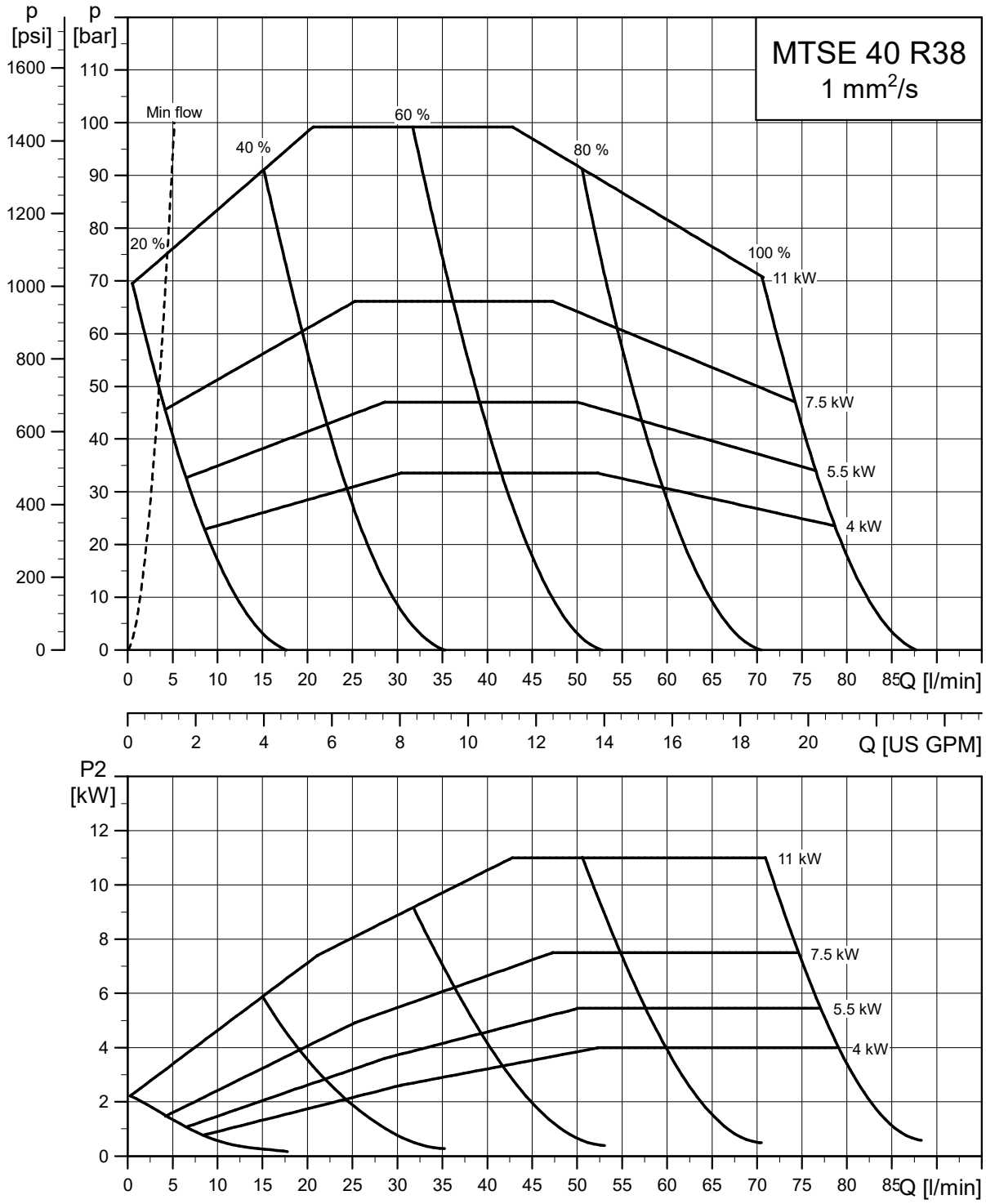
Dimensions and weights

Pump type	P2 [kW]	Dimensions [mm]										Net weight [kg]	
		A		B		C		AC	AD	AG	P		
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry					Tank-top	Dry
MTSE 20-38 R56	4.0	812	830	230	248	582	582	191	201	291	250	48	51
MTSE 20-54 R56	5.5	867	885	230	248	637	637	191	201	291	300	56	59
MTSE 20-75 R56	7.5	891	909	230	248	661	661	255	237	346	300	66	69
MTSE 20-100 R56	11.0	952	970	230	248	722	722	255	237	346	350	83	86

MTSE 40 R38, 50/60 Hz

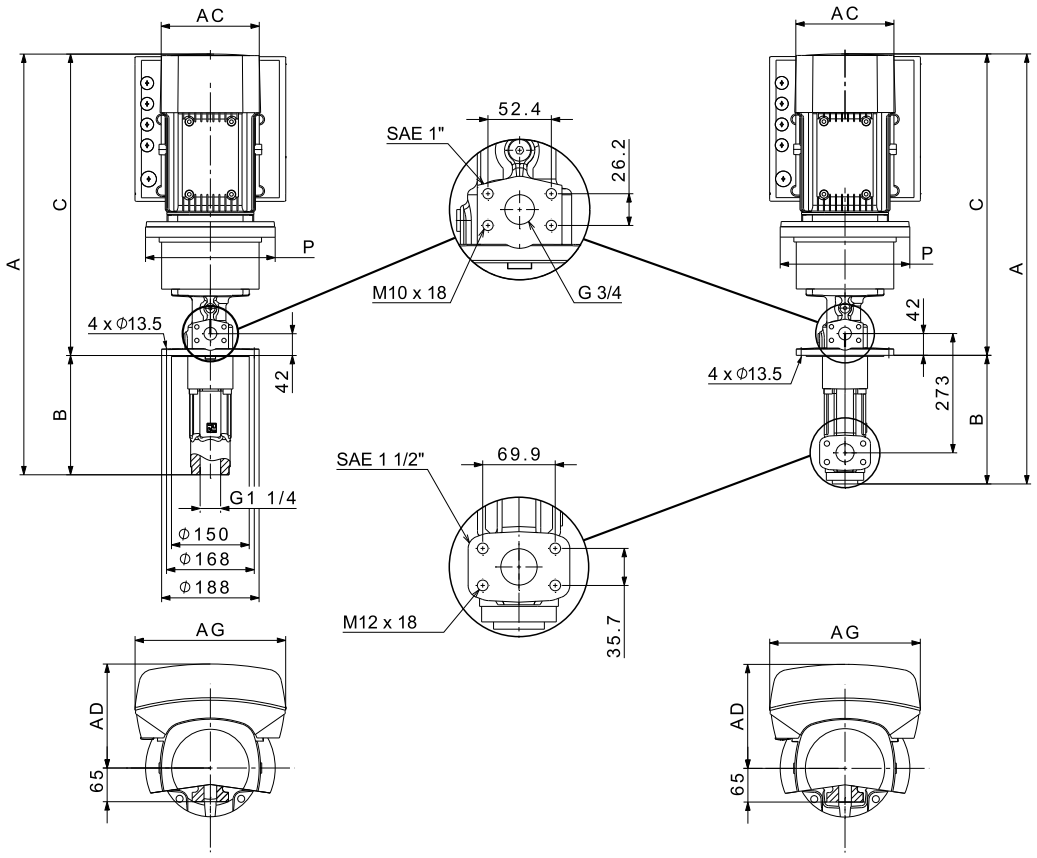
Performance range

Performance data at 1 mm²/s (emulsion)



TM074886

Dimensional sketches



Tank-top installation (left), dry installation (right)

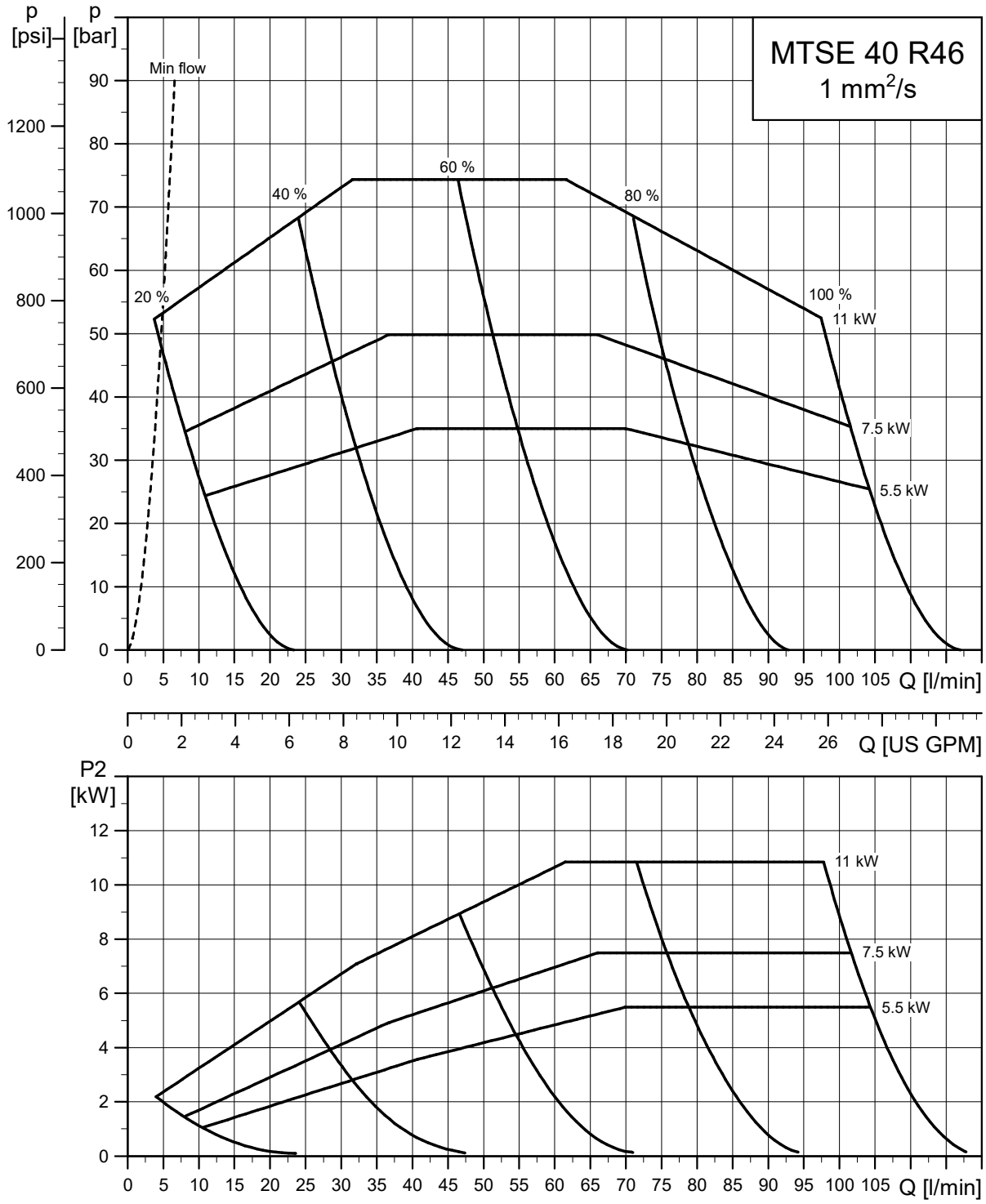
Dimensions and weights

Pump type	P2 [kW]	Dimensions [mm]										Net weight [kg]	
		A		B		C		AC	AD	AG	P	Tank-top	Dry
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry						
MTSE 40-33 R38	4.0	862	873	280	291	582	582	191	201	291	250	54	57
MTSE 40-47 R38	5.5	917	928	280	291	637	637	191	201	291	300	62	65
MTSE 40-66 R38	7.5	941	952	280	291	661	661	255	237	346	300	72	75
MTSE 40-100 R38	11.0	1002	1013	280	291	722	722	255	237	346	350	89	92

MTSE 40 R46, 50/60 Hz

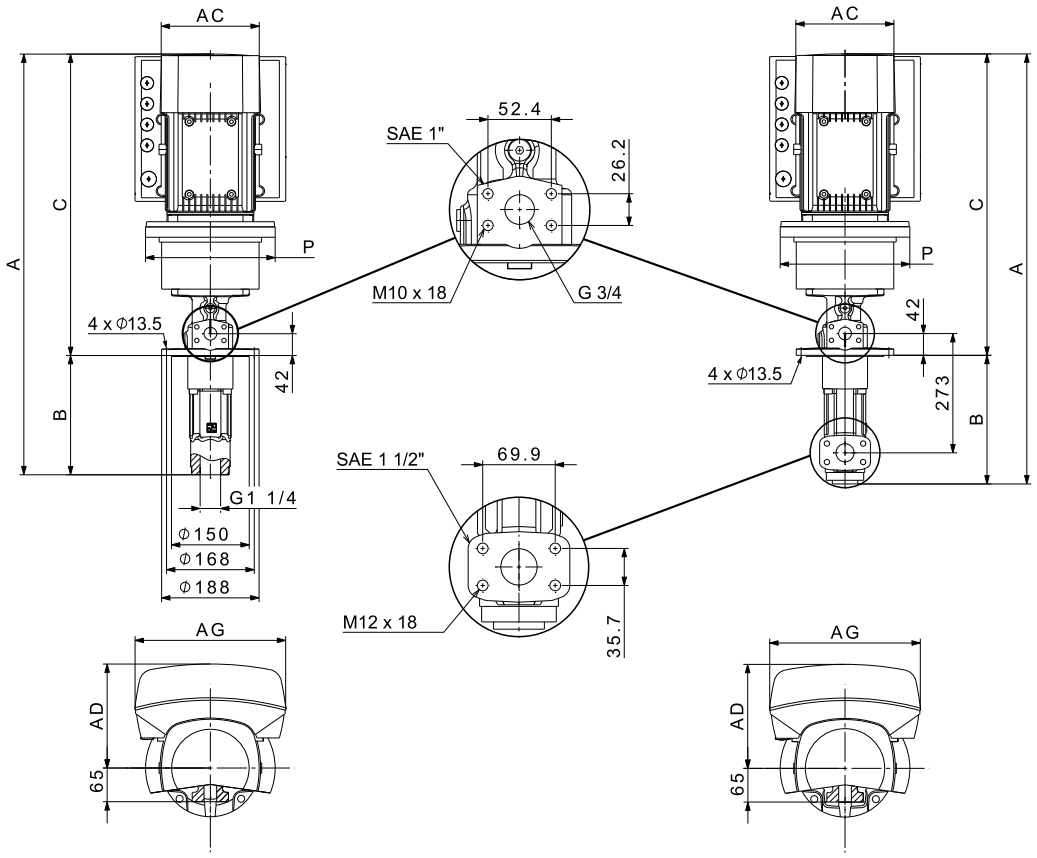
Performance range

Performance data at 1 mm²/s (emulsion)



TM074887

Dimensional sketches



Tank-top installation (left), dry installation (right)

Dimensions and weights

Pump type	P2 [kW]	Dimensions [mm]										Net weight [kg]	
		A		B		C		AC	AD	AG	P	Tank-top	Dry
		Tank-top	Dry	Tank-top	Dry	Tank-top	Dry						
MTSE 40-35 R46	5.5	917	928	280	291	637	637	191	201	291	300	62	65
MTSE 40-50 R46	7.5	941	952	280	291	661	661	255	237	346	300	72	75
MTSE 40-74 R46	11.0	1002	1013	280	291	722	722	255	237	346	350	89	92

NPSH curves for MTS pumps

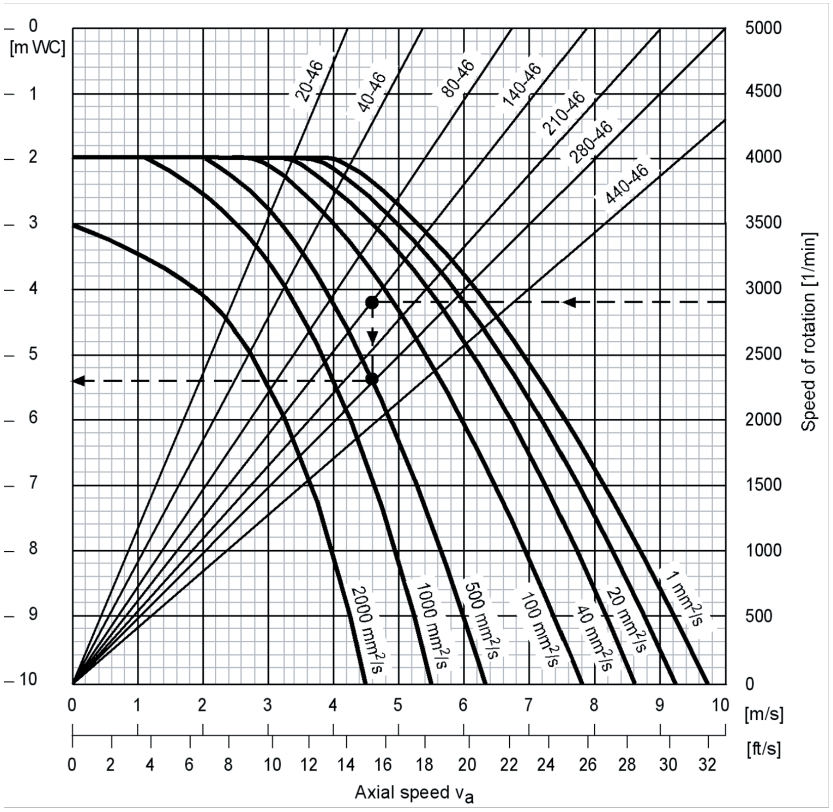
The performance curves refer to liquids without any air enclosed and show the beginning of aeration. For this reason, a safety margin of 0.5 m must be added to the NPSH value taken from the curve. For liquids with air inclusions, undissolved air, an additional value must be added to the NPSH value derived. When dealing with critical conditions in your plant, always consult Grundfos.

Maximum allowable air content

Emulsion: 10 %

Oil: 7 %.

Spindle pitch angle 46 degrees



TM044807

Example

Given:

Size	140-46
Speed	n = 2900 min^{-1}
Viscosity	v = 500 mm^2/s

Wanted:

NPSH required.

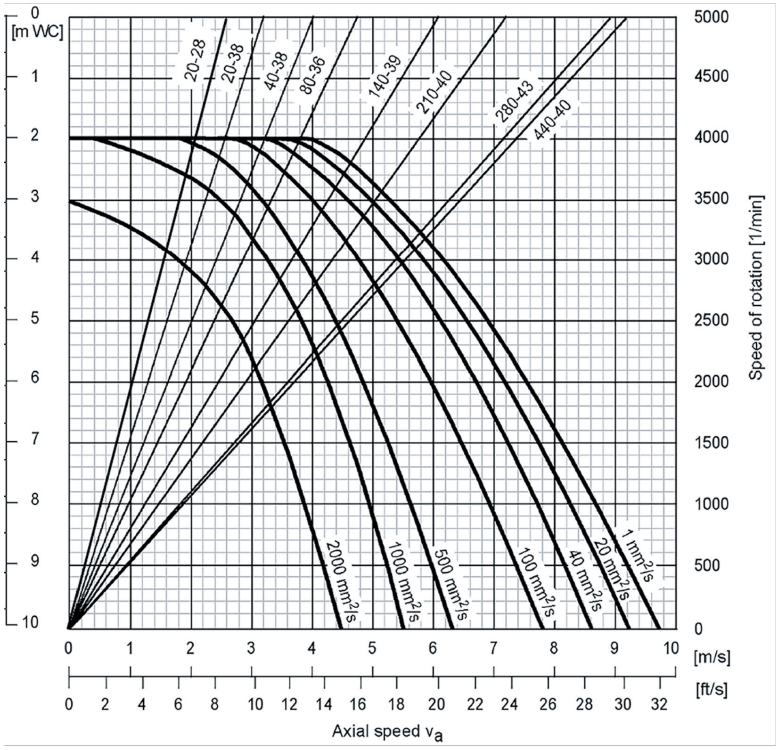
Solution:

NPSH taken from curve = 5.4 m H

+ safety margin 0.5 m

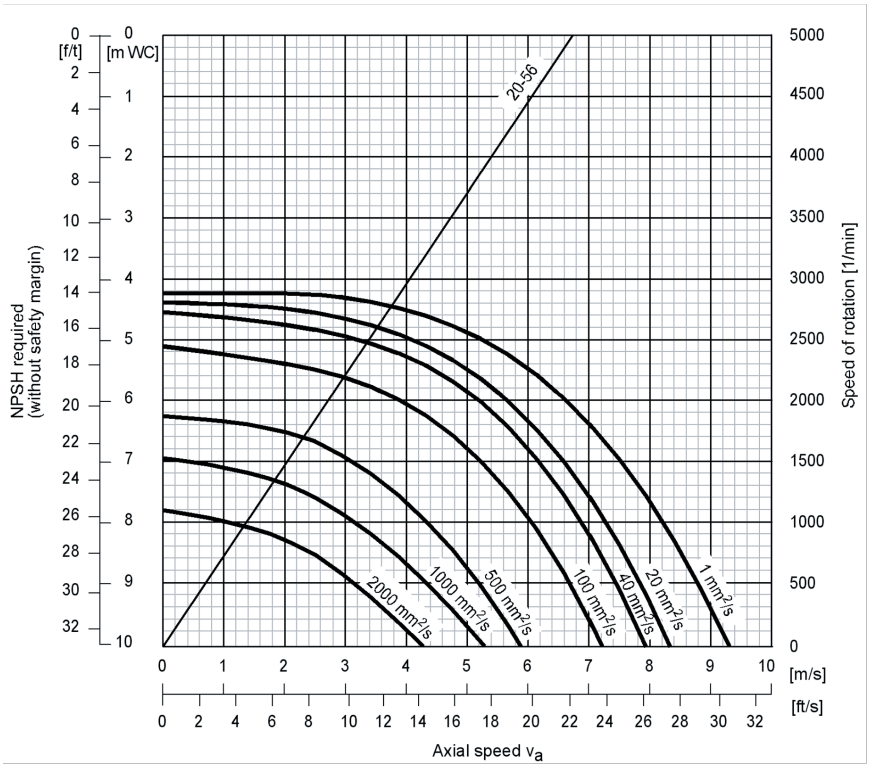
= 5.9 m H.

Spindle pitch angle less than 46 degrees



TM063113

Spindle pitch angle 56 degrees



TM044809

10. Motor data

Mains-operated motors for MTS, 50 Hz

MG motors

TM031711

Motor make	P2 [kW]	Frame size	Phase	Standard voltage [V]	$I_{1/1}$ [A]	$\frac{I_{start}}{I_{1/1}}$[%]	Cos φ 1/1	η [%]	Motor efficiency class
Grundfos MG	1.50	90SD	3	3 × 220-240Δ / 380-415Y	5.70 / 3.30	700-750	0.84 - 0.78	84.2	IE3
Grundfos MG	2.20	90LE			8.00 / 4.60	790-860	0.86 - 0.80	85.9	
Grundfos MG	3.00	100LC			11.0 / 6.30	840-1100	0.87 - 0.82	87.1	
Grundfos MG	4.00	112MC			13.6 / 7.90	1000-1470	0.87	88.1	
Grundfos MG	5.50	132SC			19.0 / 11.0	1080-1480	0.87 - 0.82	89.2	
Grundfos MG	7.50	132SB			25.0 - 24.2 / 14.4 - 14.0	780-1050	0.88 - 0.82	90.1 - 90.4	
Grundfos MG	11.0	160MB			36.0 - 34.5 / 20.8 - 19.8	660-890	0.88 - 0.84	91.2	
Grundfos MG	15.0	160MD			48.5 - 45.0 / 28.0 - 26.0	660-890	0.89 - 0.87	91.9	
Grundfos MG	18.5	160LB			59.5 - 56.5 / 34.5 - 32.5	830-1100	0.89 - 0.85	92.4	
Grundfos MG	22.0	180MB			68.5 / 39.5	830-1040	0.90	92.7	
Grundfos MG	1.50	90SD		3 × 380-415Δ	3.30	700-750	0.84 - 0.78	84.2	
Grundfos MG	2.20	90LE			4.60	790-860	0.86 - 0.80	85.9	
Grundfos MG	3.00	100LC			6.30	840-1100	0.87 - 0.82	87.1	
Grundfos MG	4.00	112MC			7.90	1000-1470	0.87	88.1	
Grundfos MG	5.50	132SC			11.0	1080-1480	0.87 - 0.82	89.2	
Grundfos MG	7.50	132SB		3 × 380-415Δ / 660-690Y	14.4 - 14.0 / 8.30 - 8.10	780-1050	0.88 - 0.86	90.4	
Grundfos MG	11.0	160MB			20.8 - 19.8 / 12.0 - 11.8	660-890	0.88 - 0.84	91.2	
Grundfos MG	15.0	160MD			28.0 - 26.0 / 16.2 - 15.6	660-890	0.89 - 0.87	91.9	
Grundfos MG	18.5	160LB			34.5 - 32.5 / 20.0 - 18.8	830-1100	0.89 - 0.85	92.4	
Grundfos MG	22.0	180MB			39.5 / 22.8	830-1040	0.90	92.7	

Mains-operated motors for MTS, 60 Hz

MG motors

TM031711

Motor make	P2 [kW]	Frame size	Phase	Standard voltage [V]	$I_{1/1}$ [A]	$\frac{I_{start}}{I_{1/1}}$ [%]	Cos φ 1/1	η [%]	Motor efficiency class
Grundfos MG	1.50	90SD	3	3 × 230-277Δ / 400-480Y	5.30 - 5.00 / 3.5 - 2.90	730-900	0.85 - 0.75	85.5	IE3
Grundfos MG	2.20	90LE		3 × 230-277Δ / 400-480Y	7.50 - 6.95 / 4.30 - 4.00	750-950	0.88 - 0.80	86.5	IE3
Grundfos MG	3.00	100LC		3 × 220-277Δ / 380-480Y	10.8 - 9.35 / 6.20 - 5.40	840-1100	0.91 - 0.84	87.1	IE2 - IE3
Grundfos MG	4.00	112MC			13.6 - 11.8 / 7.80 - 6.80	1000-1470	0.91 - 0.82	88.1	IE3
Grundfos MG	5.50	132SC			18.4 - 16.2 / 10.6 - 9.30	1080-1480	0.90 - 0.80	89.2	IE3
Grundfos MG	7.50	132SB			24.6 - 20.8 / 14.2 - 12.0	780-1050	0.90 - 0.82	90.4	IE2 - IE3
Grundfos MG	11.0	160MB			36.0 - 30.0 / 20.8 - 17.2	660-890	0.89 - 0.83	91.2	IE2 - IE3
Grundfos MG	15.0	160MD			48.5 - 39.0 / 28.0 - 22.4	660-890	0.90 - 0.86	91.9	IE2 - IE3
Grundfos MG	18.5	160LB			59.5 - 48.5 / 34.5 - 28.0	830-1100	0.89 - 0.84	92.4	IE2 - IE3
Grundfos MG	22.0	180MB			69.5 - 56.5 / 40.0 - 32.5	830-1040	0.91	92.7	IE3
Grundfos MG	1.50	90SD		3 × 400-480Y	3.05 - 2.90	730-900	0.85 - 0.75	85.5	IE3
Grundfos MG	2.20	90LE		3 × 400-480Y	4.30 - 4.00	750-950	0.88 - 0.80	86.5	IE3
Grundfos MG	3.00	100LC		3 × 380-480Δ / 660-690Y	6.20 - 5.40	840-1100	0.91 - 0.84	87.1	IE2 - IE3
Grundfos MG	4.00	112MC			7.80 - 6.80	1000-1470	0.91 - 0.82	88.1	IE3
Grundfos MG	5.50	132SC			10.6 - 9.30	1080-1480	0.90 - 0.80	89.2	IE3
Grundfos MG	7.50	132SB			14.2 - 12.0 / 8.20 - 8.10	780-1050	0.90 - 0.82	90.1 - 90.4	IE2 - IE3
Grundfos MG	11.0	160MB			20.8 - 17.2 / 12.0 - 11.6	660-890	0.89 - 0.83	91.2	IE2 - IE3
Grundfos MG	15.0	160MD			28.0 - 22.4 / 16.2 - 15.6	660-890	0.90 - 0.86	91.9	IE2 - IE3
Grundfos MG	18.5	160LB			34.5 - 28.0 / 20.0 - 16.6	830-1100	0.89 - 0.84	92.4	IE2 - IE3
Grundfos MG	22.0	180MB			40.0 - 32.5 / 23.0 - 22.2	830-1040	0.91	92.7	IE3

Mains-operated motors for MTSE, 50/60 Hz

MGE motors

TM085711

MGE 380-500 V

Motor make	P2 [kW]	Frame size	Phase	Standard voltage [V]	$I_{1/1}$ [A]	Cos φ 1/1	η [%]	Motor efficiency class
Grundfos MGE	1.5	90	3	380-500	2.9 - 2.4	0.92 - 0.85	88.9	IE5
	2.2	90		380-500	4.15 - 3.4	0.93 - 0.87	90.1	
	3	100		380-500	5.8 - 4.8	0.91 - 0.86	90.7	
	4	112		380-500	7.6 - 6.2	0.92 - 0.87	92.2	
	5.5	132		380-500	10.3 - 8.2	0.92 - 0.88	92.7	
	7.5	132		380-500	14.1 - 11.2	0.93 - 0.89	92.5	
	11	160		380-500	20.3 - 16.0	0.93 - 0.90	93.1	

MGE 200-240 V

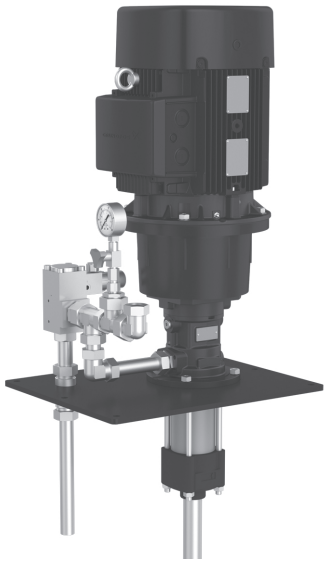
Motor make	P2 [kW]	Frame size	Phase	Standard voltage [V]	$I_{1/1}$ [A]	Cos φ 1/1	η [%]	Motor efficiency class
Grundfos MGE	2.2	90	3	200-240	7.8 - 6.5	0.94 - 0.94	88.8	IE5
	3	100		200-240	10.5 - 8.8	0.94 - 0.94	90.3	
	4	112		200-240	14.1 - 11.8	0.94 - 0.94	90.8	
	5.5	132		200-240	19.6 - 16.3	0.94 - 0.94	90.2	

11. Accessories

Pump

MTS pump system

The assembled MTS pump system consists of an MTS screw pump, a mounting plate, a pressure relief valve and pipes.



TM054422

Fully integrated all-in-one system

All components, including valves, are preassembled to customer specifications.

Pump design

The pumps are screw pumps designed for pumping cooling lubricants and cutting oils for machine tool applications.

Long lifetime

Highly wear-resistant, PVD coated spindles and special, hardened rotor housing extend the lifetime.

High-efficiency motor

IE3 motors are standard, and MTSE with IE5 motors are optional.

Economical pump operation

- Pump efficiency above 80 %
- low heat transfer into the coolant system
- low cooling requirements.

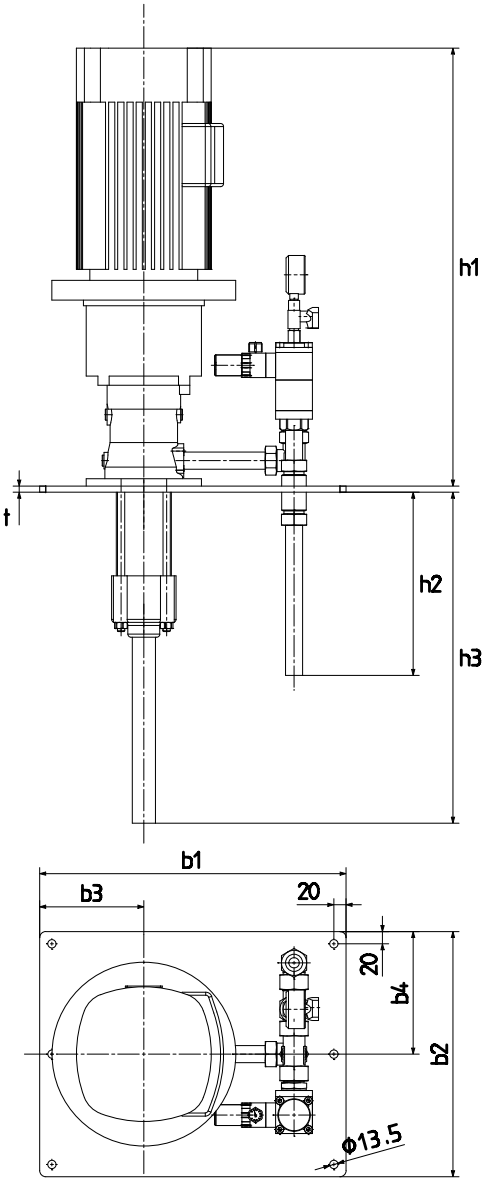
Wide pump range

- Seven pump sizes
- 16 versions.

Noiseless

The design of MTS allows gentle, pulsation-free and low-noise pumping.

Dimensional sketches



TM054423

Dimensions

Pump type	Dimensions [mm]						
	t	h1	h2	h3	b1	b2	b3
MTS 20	10	5)	250	6)	500	400	170
MTS 40	10		290		500	400	170

5) See the section on performance curves and technical data.

6) On request

Related information

Dimensions and weights

MTS 20, 50 Hz

Dimensions and weights

Pressure relief valves

Screw spindle pumps are positive-displacement pumps which must be pressure controlled in order to protect the motor and pipe system. The pumped liquid which is not needed is returned to the tank via the pressure relief valve. Selection of valves depends on the following factors:

- required pressure, flow rate and viscosity of the pumped liquid
- required valve adjustability/control.

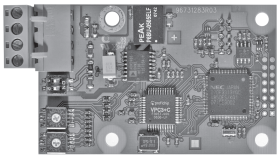
The pressure relief valves below are especially designed for use in coolant applications.

Type	Description	Product number	
H	Manually operated, continuously adjustable pressure relief valve. • The valve working pressure can be adjusted by means of a hand wheel.	98784405	 TM054391
P	Manually operated, continuously adjustable pressure relief valve with air pilot valve and solenoid valve for pressureless circulation. • The valve working pressure can be adjusted by means of a hand wheel. • Circulation with minimised pressure can be electrically activated. The valve is open at zero current and pressure.	98784432	 TM054390
E	Electrically controlled, continuously adjustable pressure relief valve with proportional solenoid air pilot valve. • The vario valve type enables the setting of any pressure from 5 to 120 bar. For pressure regulation, the machine control sends an analogue signal (0-10 V). The pneumatic control pressure is changed in proportion to the analogue signal and regulates the working pressure. • The valve is open in case of power loss or loss of pressure.	98784436	 TM054392
-	Manually operated, safety valve. • The valve working pressure can be adjusted by means of a hexagon key.	98659731	

Customisation

The pump system can be customised to fit your special needs. Contact Grundfos for further information.

CIM (communication interface modules)



GRA6121

Grundfos CIM (communication interface module)

The CIM modules enable communication of operating data, such as measured values and setpoints, between the pumps and a building management system. The CIM modules are add-on communication modules that are fitted in the terminal box of the pumps.

Note that CIM modules must be fitted by authorised persons.

We offer the following CIM modules:

CIM 100

For communication via LONWorks.

CIM 150

For communication via PROFIBUS DP.

CIM 200

For communication via Modbus RTU.

CIM 300

For communication via BACnet MS/TP.

CIM 500

Ethernet module for communication via PROFINET, Modbus TCP, BACnet IP, EtherNet/IP GRM IP, Grundfos iSOLUTIONS Cloud.

Available CIM modules

Description	Fieldbus protocol	Product number
CIM 100	LONWorks	96824797
CIM 150	PROFIBUS DP	96824793
CIM 200	Modbus RTU	96824796
CIM 300	BACnet MS/TP	96893770
CIM 500	Ethernet	98301408
Antenna (puc)	3G/4G	99518079

For further information about data communication via CIM modules and fieldbus protocols, see the CIM documentation available in Grundfos Product Center at www.grundfos.com.

Remote controls

Grundfos GO

Use Grundfos GO for the following types of wireless communication with the pump:

- infrared
- radio
- Bluetooth.

MGE 1.5 to 2.2 kW

These motors will connect to the pump through wireless infrared or radio communication.

MI 301

MI 301 is a module with built-in infrared and radio communication. It is required for Grundfos GO communication. MI 301 can be used together with Android or iOS-based smart devices with a Bluetooth connection. MI 301 has a rechargeable Li-ion battery that must be charged separately.

TM053890

MI 301

Supplied with the product:

- Grundfos MI 301
- sleeve
- battery charger
- quick guide.

Product numbers

Grundfos GO variant	Product number
Grundfos MI 301	98046408

MGE 3 to 11 kW

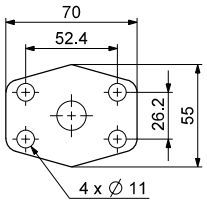
These motors will connect to the pump via Bluetooth (BLE).

Related information

Bluetooth

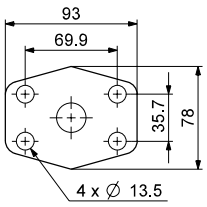
Counterflanges for outlet port

A set consists of one counterflange, one O-ring, bolts and lock washers.

SAE flange	Pump type	SAE size	Description	Rated pressure	Pipe connection	Product number
 TM041963	MTS 20 MTS 40	1"	Threaded For welding	345 bar 160 bar	G1 25 mm, nominal	96397165 96397171

Counterflanges for inlet port (only D8.6)

A set consists of one counterflange, one O-ring, bolts and lock washers.

SAE flange	Pump type	SAE size	Description	Rated pressure	Pipe connection	Product number
 TM041964	MTS 20 MTS 40	1 1/2"	Threaded For welding	207 bar 16 bar	G1 1/2 38 mm, nominal	96397166 96397176

12. Grundfos Product Center

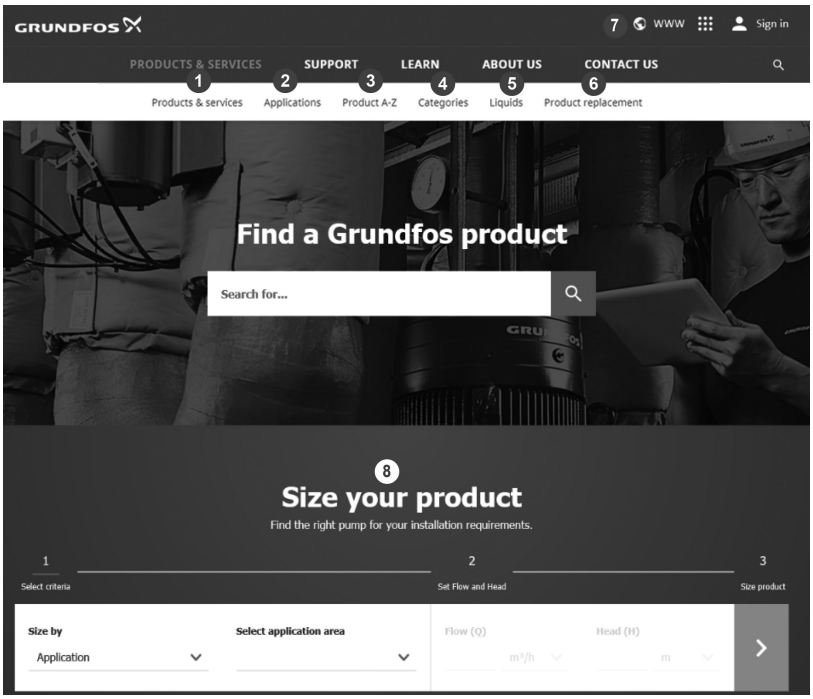
Online search and sizing tool to help you make the right choice.
From the international view, you can select your specific country to view the product range available to you.
International view: *https://product-selection.grundfos.com*

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.



When you select your country, you will see the menus below. Note that some menus may not be available depending on the country.
Example: *https://product-selection.grundfos.com/uk*

Pos.	Description
1	**Products & services** enables you to find products and documents by typing a product number or name into the search field.
2	**Applications** enables you to choose an application to see how Grundfos can help you design and optimise your system.
3	**Products A-Z** enables you to look through a list of all the Grundfos products.
4	**Categories** enables you to look for a product category.
5	**Liquids** enables you to find pumps designed for aggressive, flammable or other special liquids.
6	**Product replacement** enables you to find a suitable replacement.
7	**WWW** enables you to select the country, which changes the language, the available product range and the structure of the website.
8	**Sizing** enables you to size a product based on your application and operating conditions.

Grundfos GO

Mobile solution for professionals on the GO!

Grundfos GO is the mobile tool box for professional users on the go. It is the most comprehensive platform for mobile pump control and pump selection, including sizing, replacement and documentation. It offers intuitive, handheld assistance and access to Grundfos online tools, and it saves valuable time for reporting and data collection.

GET IT ON Google play

Available on the App Store

13. Document quality feedback

To provide feedback about this document, scan the QR code using your phone's camera or a QR code app.

FEEDBACK99507914

Click here to submit your feedback

99507914 **02.2024**
ECM: 1387645

GRUNDFOS Holding A/S
Poul Due Jensens Vej 7
DK-8850 Bjerringbro
Tel: +45 87 50 14 00
www.grundfos.com