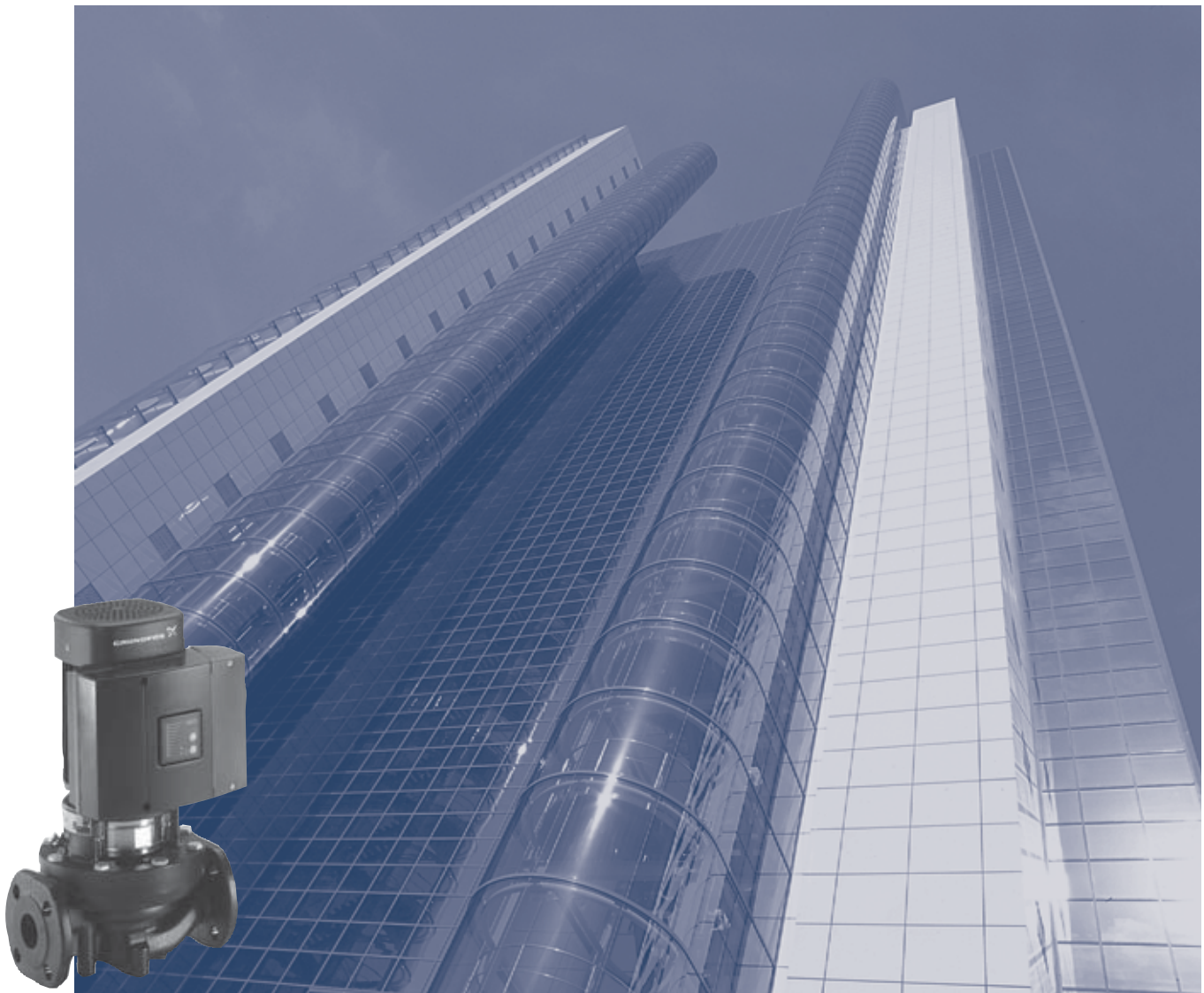


# TPE E-circulators

In-line circulator pumps with  
integrated variable frequency drive  
60 Hz



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# 1. Pump data

## Cross reference guide: B&G, Taco and Armstrong to Grundfos

Grundfos Model TP	Hp	Port to port length	Flange size	B & G Series 60 & 80	Hp	Port to port length	Flange size	Taco Series 1600	Hp	Port to port length	Flange Size	Armstrong Series H	Hp	Port to port length	Flange size
32-40	1/3	11"	1-1/4"									H-32	1/6	8-1/2"	1-1/4"
32-80	1/2	11"	1-1/4"	6011	1/4	11"	1-1/4"	1600	1/4	10-1/4"	1-1/2"	H-52	1/3	11-1/2"	1-1/4"
32-160	3/4	13-1/2"	1-1/2"	6016	3/4	13-1/2"	1-1/2"	1614	3/4	13-1/2"	1-1/2"	H-64	3/4	13-1/2"	1-1/2"
40-40	1/3	13-1/2"	1-1/2"									H-52	1/3	11-1/2"	1-1/4"
	1/2	13-1/2"	1-1/2"									H-53	1/2	11-1/2"	1-1/2"
40-80	3/4	13-1/2"	1-1/2"	6013	1/2	11-1/2"	1-1/2"	1612	1/2	13-1/2"	1-1/2"	H-53	1/2	11-1/2"	1-1/2"
40-80	3/4	13-1/2"	1-1/2"	6015	1/2	13-1/2"	1-1/2"	1612	1/2	13-1/2"	1-1/2"	H-63	1/2	13-1/2"	1-1/2"
40-160	3/4	11-1/2"	1-1/2"									H-67	1	14"	2"
40-240	1-1/2	13-1/2"	1-1/2"	6017	1	13-1/2"	1-1/2"	1616	1-1/2	14-1/2"	2"	H-65	1	13-1/2"	1-1/2"
50-40	1/3	14"	2"									H-53	1/2	11-1/2"	1-1/2"
	3/4	11-1/2"	2"									H-54	3/4	11-1/2"	2"
50-80	3/4	11-1/2"	2"	6014	3/4	11-1/2"	2"	1632	3/4	13-1/2"	2"	H-54	3/4	11-1/2"	2"
50-160	1-1/2	14"	2"	6019	1	14"	2"	1634	1	13-1/2"	2"	H-67	1	14"	2"
50-160	1-1/2	14"	2"	6020	1-1/2	14"	2"	1634	1	13-1/2"	2"	H-68	1-1/2	14"	2"
50-240	2	14"	2"	6021	2	14"	2"					10603D	3	18"	3"
80-40	1/2	19"	3" ANSI									105028	1/2	11-1/2"	2"
80-80	1-1/2	19"	3" ANSI	801	1-1/2	19"	3" ANSI					10603D	1-1/2	18"	3"
80-160	3	19"	3" ANSI	802	3	19"	3" ANSI					10603D	3	18"	3"
80-240	3	19"	3" ANSI	803	3	19"	3" ANSI					10603D	3	18"	3"
100-40	1	21"	4" ANSI									10603D	1	18"	3"
100-80	2	21"	4" ANSI	806	2	21"	4" ANSI					10603D	2	18"	3"
100-160	3	21"	4" ANSI	807	3	21"	4" ANSI					10603D	3	18"	3"

## Introduction

TP, TPE pumps are designed for applications such as

- district heating systems
- heating systems
- air-conditioning systems
- district cooling systems
- water supply
- industrial processes
- industrial cooling.

The pumps are available with either standard motors (TP) or electronically speed-controlled motors (TPE).

The pumps are all single-stage, in-line centrifugal pumps with standard motor and mechanical shaft seal. The pumps are of the close-coupled type, i.e. pump and motor are separate units. Consequently, the pumps are less sensitive to impurities in the pumped liquid than similar pumps of the canned rotor type.

The TP, TPE range is divided into the following three groups:

- TP pumps (uncontrolled standard pumps).
- TPE Series 2000 pumps (speed controlled pumps with factory-fitted pressure sensor).
- TPE Series 1000 pumps (speed controlled pumps).

**This product guide covers Series 2000 and 1000 speed controlled pumps.**

**Please see Grundfos publication L-TP-PG-001 for TP (uncontrolled standard pump) product range and details.**

## TPE Series 2000 pumps

The main differences between the TP and the TPE Series 2000 pump range are the motor and the factory-fitted integrated differential-pressure sensor.

The motors of TPE Series 2000 pumps have a built-in variable frequency drive (VFD) designed to continuously regulate the pressure to the flow.

The TPE Series 2000 range is recognized as a pre-configured solution for quick and safe installation.

TPE Series 2000 pumps are based on TP pumps. The pump materials are the same as those of the TP pump range.

For further information about TPE Series 2000 pumps, see page 14.

## TPE Series 1000 pumps

The difference between the TP and the TPE Series 1000 pump range is the motor. The motors of TPE Series 1000 pumps have a built-in VFD.

Via an external signal (from a sensor or a controller), TPE Series 1000 pumps allow for any configuration and control method required: constant pressure, constant temperature or constant flow.

TPE Series 1000 pumps are based on TP pumps. The pump materials are the same as those of the TP pump range.

For further information about TPE Series 1000 pumps, see page 17.

## Why select a TPE pump?

A TPE pump with electronic, speed-controlled adaptation of performance offers these obvious benefits:

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

## Type key

Example	TP	E	32	-160	/4	S	-U	-G	-A	-BUBE
Pump range										
Electronically speed-controlled pump series 1000/2000										
Nominal diameter of suction and discharge flanges (mm)										
Maximum head [dm (decimeters)]										
Pole number										
S = TPE Series 2000 (with factory-fitted differential pressure sensor)										
U = NEMA motor dimensions										
G = ANSI or US flange										
Code for materials: A = Basic version Z = Bronze pump housing and motor stool										
Code for shaft seal (incl. other plastic and rubber components in the pump except the neck ring)										

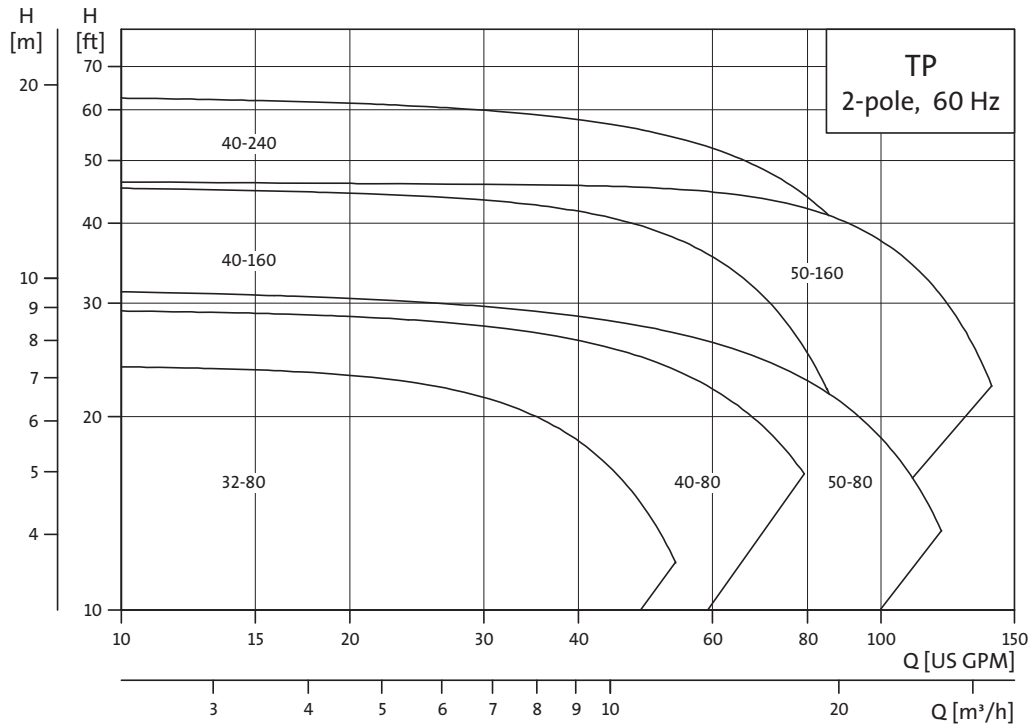
## Codes for shaft seal

Example	B	B	U	E
<b>Grundfos type designation</b> A = O-ring seal with fixed seal driver B = Rubber bellows seal D = O-ring seal, balanced G = Bellows seal with reduced seal faces R = O-ring seal with reduced seal faces				
<b>Material of rotating face</b> A = Carbon, antimony-impregnated B = Carbon, synthetic resin-impregnated Q = Silicon carbide U = Tungsten carbide				
<b>Material of stationary seat</b> B = Carbon, synthetic resin-impregnated Q = Silicon carbide U = Tungsten carbide				
<b>Material of secondary seal</b> E = EPDM V = FKM				

## 2. Performance range

### Performance range, 2-pole, 3400 RPM

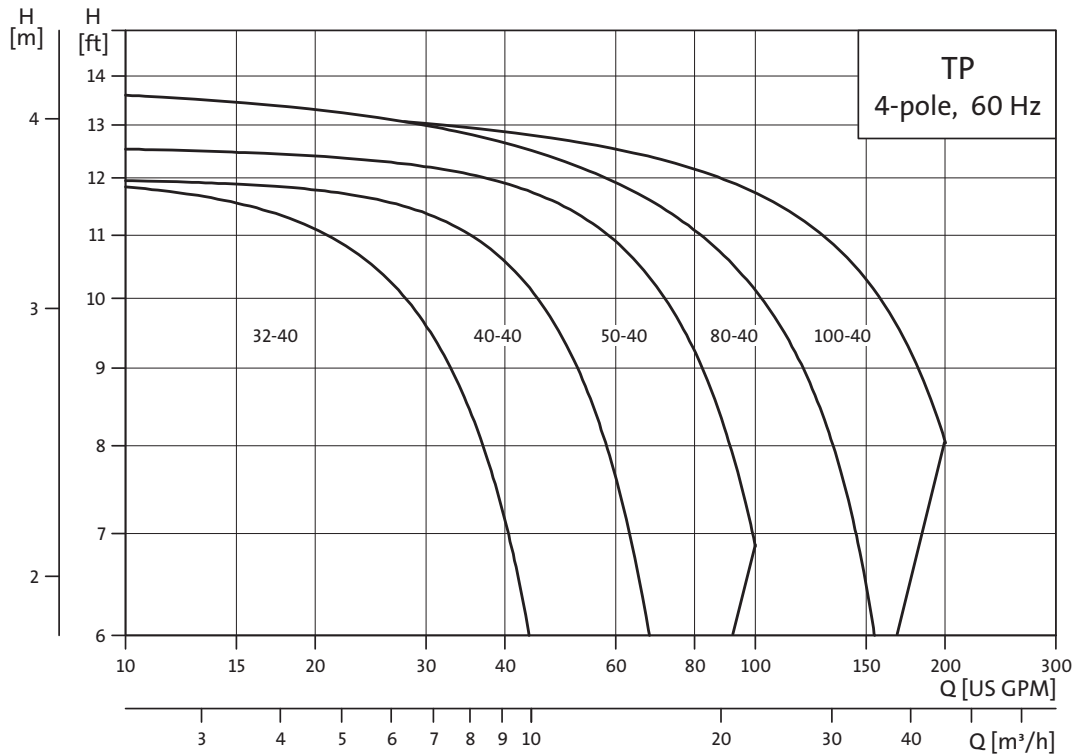
(See page 23 for performance curves)



TM02 5104 0306

### Performance range, 4-pole, 1690 RPM

(See page 23 for performance curves)



TM02 5103 0306

### 3. Product range

#### TPE Series 2000

TPE SERIES 2000 with differential pressure sensor						
	Cast iron product number	Bronze product number	Motor			
			Hp	Type	Ph	Volt
GF 15/26 flange mount						
TPE32-40/4	91136129	91136134	.33	TEFC	1	208-230
TPE32-80/2	91136104	91136109	.5	TEFC	1	208-230
GF 40/43 flange mount						
TPE32-160/2	91136105	91136110	.75	TEFC	1	208-230
TPE40-40/4	91136130	91136135	.33	TEFC	1	208-230
TPE40-80/2	91136106	91136111	.75	TEFC	1	208-230
TPE40-160/2	91136107	91136112	.75	TEFC	1	208-230
TPE40-240/2	91136108	91136113	1.5	TEFC	1	208-230
GF 50 flange mount						
TPE50-40/4	91136131	91136136	.33	TEFC	1	208-230
TPE50-80/2	91136178	91136114	.75	TEFC	1	208-230
TPE50-160/2	91136025	91136115	1.5	TEFC	1	208-230
GF 80 flange mount						
TPE80-40/4	91136132	91136137	.5	TEFC	1	208-230
GF 100 flange mount						
TPE100-40/4	91136026	91136139	1	TEFC	1	208-230

#### TPE Series 1000

TPE SERIES 1000 without differential pressure sensor						
	Cast iron product number	Bronze product number	Motor			
			Hp	Type	Ph	Volt
GF 15/26 flange mount						
TPE32-40/4	91136140	91136146	1/3	TEFC	1	208-230
TPE32-80/2	91136116	91136122	1/2	TEFC	1	208-230
GF 40/43 flange mount						
TPE32-160/2	91136117	91136123	3/4	TEFC	1	208-230
TPE40-40/4	91136141	91136147	1/3	TEFC	1	208-230
TPE40-80/2	91136118	91136124	3/4	TEFC	1	208-230
TPE40-160/2	91136119	91136125	3/4	TEFC	1	208-230
TPE40-240/2	91136120	91136126	1-1/2	TEFC	1	208-230
GF 50 flange mount						
TPE50-40/4	91136142	91136148	1/3	TEFC	1	208-230
TPE50-80/2	91136179	91136127	3/4	TEFC	1	208-230
TPE50-160/2	91136121	91136128	1-1/2	TEFC	1	208-230
GF 80 flange mount						
TPE80-40/4	91136143	91136149	1/2	TEFC	1	208-230
GF 100 flange mount						
TPE100-40/4	91136145	91136151	1	TEFC	1	208-230

## 4. Speed regulation

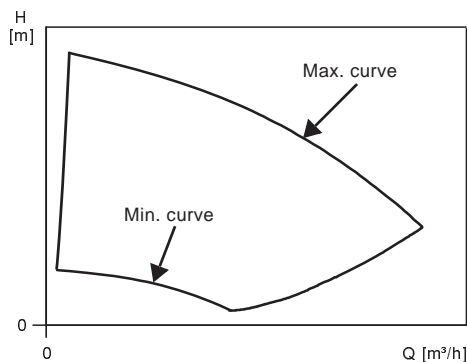
### Affinity equations

Normally, TPE pumps are used in applications characterized by a **variable** flow. Consequently, it is not possible to select a pump that is constantly operating at optimum efficiency.

In order to achieve optimum operating economy, select the pump on the basis of the following criteria:

- The max. required duty point should be as close as possible to the QH curve of the pump.
- The flow rate at the duty point required should be close to the optimum efficiency ( $\eta$ ) for most operating hours.

Between the min. and max. performance curve TPE 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.



TM01 4916 4803

**Fig. 1** Min. and max. performance curves

In situations where it is not possible to select a duty point close to the max. curve, affinity equations can be used. The head (H), the flow (Q) and the input power (P) are 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.

### WinCAPS and WebCAPS

WinCAPS and WebCAPS are both selection programs offered by Grundfos.

The two programs make it possible to calculate a TPE pump's specific duty point and energy consumption.

By entering the dimensional data of the pump, WinCAPS and WebCAPS can calculate the exact duty point and energy consumption. For further information, please contact Grundfos or see Grundfos' homepage [www.grundfos.com](http://www.grundfos.com).

## 5. Operating conditions

### Working pressure

Maximum working pressure 145 psi (10 bar).

### Fluid temperature

Maximum fluid temperature +284 °F (140 °C).

### Relative humidity

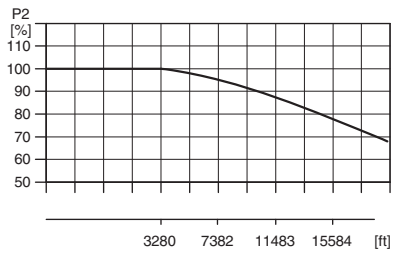
Maximum 95%.

### Ambient temperature

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

#### Note:

When motors installed more than 3000 ft (914 m) above sea level, the rated motor output will fall due to the low density and consequent low cooling effect of the air. In such cases, it may be necessary to use an oversize motor with a higher output.



TM03 3446 0506

**Fig. 2** Relationship between motor output (P<sub>2</sub>) and altitude.

## 6. Pumped liquids

### Pumped liquids

TP, TPE pumps are suitable for pumping thin, clean, non-aggressive and non-explosive liquids, not containing solid particles or fibers that may mechanically or chemically attack the pump; please see "List of pumped liquids" below.

#### Examples of liquids:

- Central heating system water (we recommend that the water meets the requirements of accepted standards on water quality in heating systems).
- cooling liquids.
- domestic hot water.
- industrial liquids.
- softened water.

If glycol or another antifreeze agent is added to the pumped liquid, the pump must have a shaft seal of the type RUUE.

The pumping of liquids with densities or kinematic viscosities higher than those of water can cause

- a considerable pressure drop
- a drop in the hydraulic performance
- a rise in the power consumption.

In these situations, equip the pump with an oversize motor. If in doubt, contact Grundfos.

If the water contains mineral oils or chemicals, or if other liquids than water are pumped, choose the O-rings accordingly.

### Liquid temperature

Liquid temperature:

–13 °F (–25 °C) to +284 °F (+140 °C).

Please note that shaft seals operating close to their maximum temperature will require regular maintenance, i.e. replacement.

Pump type	Shaft seal	Temperature
TP, TPE	BUBE	32°F to +284 °F (0 °C to 140 °C)
	AUUE	32°F to +194 °F (0 °C to 90 °C)
	RUUE	–13 °F to +194 °F (–25 °C to 90 °C)

### List of pumped liquids

Grundfos TP pumps are designed for circulation systems with constant flow; TPE pumps are for systems with variable flow.

Thanks to their design, these pumps can be used in a wider liquid temperature range than pumps of the canned rotor type.

A number of typical liquids are listed page 11.

Other pump versions may be used, but we consider the ones stated in the list to be the best choices.

The list is intended as a general guide only, and it cannot replace actual testing of the pumped liquids and pump materials under specific working conditions. If in doubt, contact Grundfos.

However, use the list with some caution as these or other factors may affect the chemical resistance of a specific pump version:

- concentration of the pumped liquid
- liquid temperature or
- pressure.

### Legend for notes in the list

<b>A</b>	May contain additives or impurities that may cause shaft seal problems.
<b>B</b>	The density and/or viscosity differ from those of water. Consider this when calculating motor and pump performance.
<b>C</b>	The liquid must be oxygen-free (anaerobic).
<b>D</b>	Risk of crystallization/precipitation in shaft seal.
<b>E</b>	Insoluble in water.
<b>F</b>	The shaft seal rubber parts must be replaced with FKM rubber.
<b>G</b>	Bronze housing/impeller required.
<b>H</b>	Risk of formation of ice on the standby pump.

## Pumped liquids

Pumped liquids	Notes	Additional information	Shaft seal
			TP
<b>Water</b>			
Groundwater		<+194 °F (+90 °C)	AUUE
		>+194 °F (+90 °C)	BUBE
Boiler feed water		<+248 °F (+120 °C)	BUBE
District heating water		<+248 °F (+120 °C)	BUBE
Condensate		<+194 °F (+90 °C)	AUUE
		>+194 °F (+90 °C)	BUBE
Softened water	C	<+194 °F (+90 °C)	AUUE
		>+194 °F (+90 °C)	BUBE
Brackish water	G	pH>6.5, +40 °F (+4 °C), 1000 ppm Cl <sup>-</sup>	BUBE AUUE
<b>Coolants</b>			
Ethylene glycol	B, D, H	+122 °F (+50 °C), 50 %	AUUE RUUE
Glycerine (glycerol)	B, D, H	+122 °F (+50 °C), 50 %	AUUE RUUE
Potassium acetate	B, D, C, H	+122 °F (+50 °C), 50 %	AUUE RUUE
Potassium formate	B, D, C, H	+122 °F (+50 °C), 50 %	AUUE RUUE
Propylene glycol	B, D, H		AUUE RUUE
Brine-sodium chloride	B, D, C, H	+41 °F (+5 °C), 30 %	AUUE RUUE
<b>Synthetic oils</b>			
Silicone oil	B, E		BUBE AUUE
<b>Vegetable oils</b>			
Corn oil	B, F, E		BUBV <sup>3)</sup> AUUV <sup>3)</sup>
Olive oil	B, F, E	<+176 °F (80 °C)	BUBV <sup>3)</sup> AUUV <sup>3)</sup>
Peanut oil	B, F, E		BUBV <sup>3)</sup> AUUV <sup>3)</sup>
Grape seed oil	D, B, F, E		BUBV <sup>3)</sup> AUUV <sup>3)</sup>
Soya bean oil	B, F, E		BUBV <sup>3)</sup> AUUV <sup>3)</sup>
<b>Cleaning agents</b>			
Soap (salts of fatty acids)	A, E, (F)	<+176 °F (80 °C)	AUUE (AUUV <sup>3)</sup> )
Alkaline degreasing agent	A, E, (F)	<+176 °F (80 °C)	AUUE (AUUV <sup>3)</sup> )
<b>Oxidants</b>			
Hydrogen peroxide		<+104 °C, <2 %	BUBE AUUE
<b>Salts</b>			
Ammonium bicarbonate	A	<+68 °F (+14 °C), <15 %	AUUE
Calcium acetate	A, B	<+68 °F (+14 °C), <30 %	AUUE
Potassium bicarbonate	A	<+68 °F (+14 °C), <20 %	AUUE
Potassium carbonate	A	<+68 °F (+14 °C), <20 %	AUUE
Potassium permanganate	A	<+68 °F (+14 °C), <10 %	AUUE

Pumped liquids	Notes	Additional information	Shaft seal
			TP
Potassium sulfate	A	<+68 °F (+14 °C), <20 %	AUUE
Sodium acetate	A	<+68 °F (+14 °C), <100 %	AUUE
Sodium bicarbonate	A	<+68 °F (+14 °C), <2 %	AUUE
Sodium carbonate	A	<+68 °F (+14 °C), <20 %	AUUE
Sodium nitrate	A	<+68 °F (+14 °C), <40 %	AUUE
Sodium nitrite	A	<+68 °F (+14 °C), <40 %	AUUE
Sodium phosphate (di)	A	<+212 °F (100 °C), <30%	AUUE
Sodium phosphate (tri)	A	<+194 °F (90 °C), <20%	AUUE
Sodium sulfate	A	<+68 °F (+14 °C), <20%	AUUE
Sodium sulfite	A	<+68 °F (+14 °C), <1%	AUUE
<b>Alkalis</b>			
Ammonium hydroxide		<+212 °F (100 °C), <30%	AUUE
Calcium hydroxide	A	<+212 °F (100 °C), <10%	AUUE
Potassium hydroxide	A	<+68 °F (+14 °C), <20%	AUUE
Sodium hydroxide	A	<+104 °F (40 °C), <20%	AUUE

<sup>3)</sup> The shaft seal is not standard, but available on request.

## 7. TP, TPE pumps



Fig. 3 TP Series pumps

TM03 4875 3206

### Technical data

Flow rate: up to 300 gpm (68 m<sup>3</sup>h)

Head: up to 65 ft (20 m)

Liquid temperature: -13 (-25 °C) to +284 °F (140 °C)

Max. operating pressure: up to 145 psi (10 bar)

**Note:** See Grundfos product guide L-TP-PG-001 for performance range.

### Construction

Grundfos TP, TPE pumps are single-stage, close-coupled pumps with in-line suction and discharge ports flanges of identical diameter.

The pumps are equipped with a fan-cooled asynchronous motor. Motor and pump shafts are connected via a rigid two-part coupling.

The pumps are equipped with an unbalanced mechanical shaft seal.

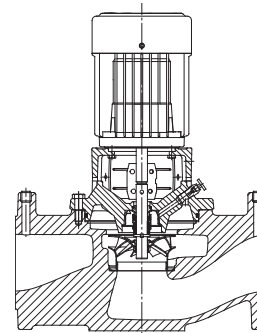
The pumps are of the top-pull-out design, i.e. the power head (motor, pump head and impeller) can be removed for maintenance or service while the pump housing remains in the pipework.

As radial and axial forces are absorbed by the fixed bearing in the motor drive-end, the pump requires no bearing.

Pumps with bronze pump housing are suitable for circulation of domestic hot water.

## Materials

### TP, TPE



TM 00 9274 2002

Fig. 4 Sectional drawing of a single-phase TP, TPE pump

### Material specification

Pos.	Component	Material	AISI, ASTM
1	Pump housing	Cast iron	EN-JL 1040 ASTM 48 CL 30
2	Impeller	Stainless steel	304
3	Shaft	Stainless steel	431
4	Coupling	Cast iron	
5	Pump head	Cast iron	EN-JL 1040 ASTM 48 CL 30
	Secondary seals	EPDM	ASTM 48 CL30
	Rotating seal face	Tungsten carbide	
	Stationary seat	Carbon (synthetic resin-impregnated) tungsten carbide	

## Mechanical shaft seal

Three types of unbalanced mechanical shaft seal are available as standard:

- **BUBE**  
The BUBE shaft seal is a Grundfos rubber bellows seal with tungsten carbide/carbon seal faces and secondary seals of EPDM (standard seal).
- **RUUE**  
The RUUE shaft seal is a Grundfos O-ring seal with reduced tungsten carbide/tungsten carbide seal faces and secondary seals of EPDM.
- **AUUE**  
The AUUE shaft seal is a Grundfos O-ring seal with fixed seal driver, tungsten carbide/tungsten carbide seal faces and secondary seals of EPDM.

Information on a selection of common pumped liquids with recommended shaft seals is shown on page 11.

### Shaft seal specification

Unbalanced shaft seal	TPE	Version NU according to EN 12756
Shaft diameter		12 and 16 mm
Rubber bellows		EPDM
Seal faces		Tungsten carbide/carbon
		Tungsten carbide/ tungsten carbide
		Silicon carbide/ silicon carbide

Special shaft seals are available for partly conditioned water or other liquids containing abrasive or crystallizing particles. See page 11.

## Connections

Pumps up to 2" discharge has US standard flanges; 3" and higher discharge flanges are 125 lb. ANSI connection.

## Control

Electronically controlled TPE pumps are suitable for demand-dependent performance control.

**TPE pumps have the following features and benefits:**

### Optimized hydraulics for high efficiency

- reduced power consumption.

### TPE pumps with built-in variable frequency drive

- 2-pole and 4-pole TP pumps from 0.33 to 1.5 Hp single phase are available as TPE pumps with variable frequency drive. For further information, see page 22.

### Top-pull-out design

- easy dismantling in case of service.

### In-line design

- contrary to end-suction pumps, in-line pumps allow a straight pipework and thus often reduced installation costs.

### Pump housing and pump head are electrocoated

- high corrosion resistance.

Electrocoating includes:

1. Alkaline cleaning
2. Pre-treatment with zinc phosphate coating
3. Cathodic electrocoating (epoxy)
4. Curing of paint film at 392-482 °F (200-250 °C).

For low-temperature applications at a high humidity, Grundfos offers pumps with extra surface treatment to avoid corrosion. These pumps are available on request.

### Stainless steel impeller and neck ring

- wear-free operation with high efficiency.

## 8. TPE Series 2000 pumps

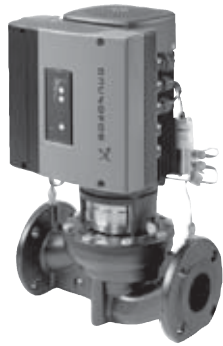


Fig. 5 TPE

### Technical data

Flow rate:	up to 200 gpm (45 m <sup>3</sup> h)
Head:	up to 60 ft (18 m)
Liquid temperature:	-13 to +284 °F (-25 ° to 140 °C)
Max. operating pressure:	145 psi (10 bar)
Motor sizes (single-phase):	0.33 to 1.5 hp

### Construction

TPE Series 2000 pumps are based on TP pumps.

The main differences between the TP and the TPE Series 2000 pump range are the motor and the factory-fitted integrated differential pressure sensor.

The motor of TPE Series 2000 pumps has a built-in variable frequency drive designed to continuously regulate the pressure based on the flow demand.

The TPE Series 2000 range is recognized as a pre-configured solution for quick and safe installation.

For further information on construction and materials of TPE Series 2000 pumps, see page 12.

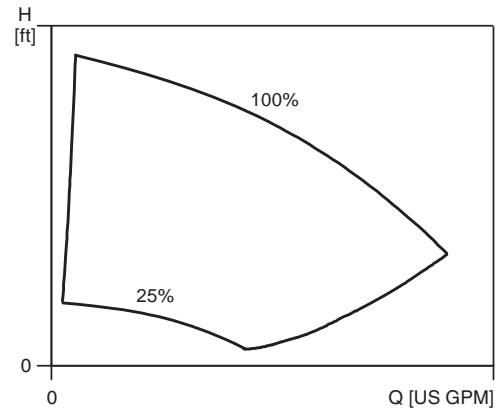
TM03 0348 4904

### Applications

TPE Series 2000 pumps have integrated speed control for automatic adaptation of performance to current conditions.

This ensures that the energy consumption is kept at a minimum.

TPE Series 2000 pumps can operate in any duty point within the range between 25 % and 100 % speed.



TM03 3609 0506

In the QH-chart the 100 %-curve corresponds to the curve for a pump fitted with a standard fixed-speed motor.

Depending on the nature of the application, TPE Series 2000 pumps offer energy-savings, increased comfort or improved processing.

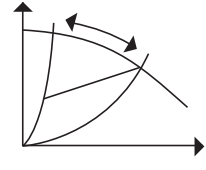
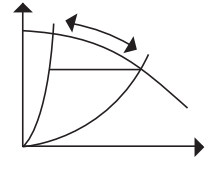
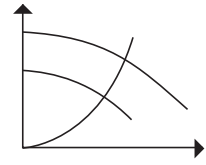
TPE Series 2000 pumps are suitable for applications where you want to control the pressure.

**Differential proportional pressure**

TPE Series 2000 pumps are factory-set to proportional pressure. We recommend proportional pressure control in systems with relatively large pressure losses as it is the most economical control mode.

TPE Series 2000 pumps set to proportional pressure control continuously adjust the pump head to the system water requirement.

The charts below show possible control modes of TPE Series 2000 pumps in different applications.

Control mode	Application
<b>Differential proportional pressure</b>	
	Systems with two-way valves - the head against closed valve is half the setpoint.
<b>Differential constant pressure</b>	
	Systems with two-way valves.
<b>Constant curve</b>	
	Single-pipe heating system. Systems with three-way valves. Heating and cooling surfaces. Chiller pumps

**Control options**

Communication with TPE Series 2000 pumps is possible via:

- a central building management system
- remote control (Grundfos R100) or
- a control panel.

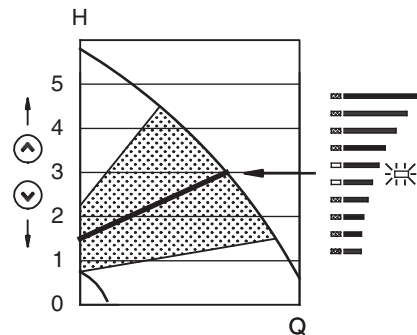
The purpose of controlling TPE Series 2000 pumps is to monitor and control the pressure.

For further information on control options of TPE pumps, see page 20.

**Pump selection guidelines**

**Differential proportional pressure control**

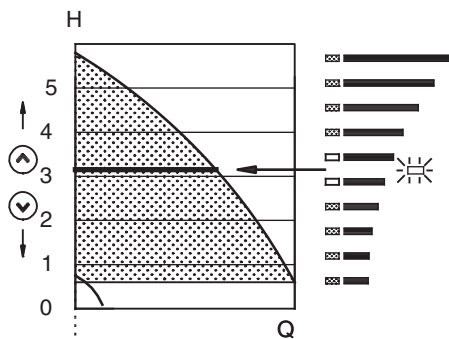
TPE 2000 pump operating range in differential pressure control mode is between 3/4th of the maximum head (shut off) to 1/4th of the maximum head. Select pump to operate within this range when pump is running full load speed. With differential proportional control, pump will follow a straight line between set point and and half of the set point at closed valve as shown below.



TM03 3670 0606

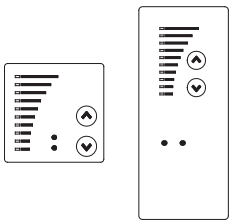
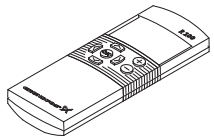
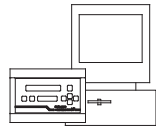
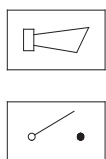
**Constant differential pressure control**

The setting range for constant pressure control is between maximum head to 1/8th of the maximum head.



TM03 3671 0606

## Overview of functions

E-pump functions		TPE Series 2000 with single-phase MLE
	<b>Setting via control panel:</b>	
	Setpoint	●
	Start/stop	●
	Max. curve	●
	Min. curve	●
	Alarm reset	●
	Constant/proportional pressure	●
	<b>Reading via control panel:</b>	
	Setpoint	●
	Operating indication	●
Fault indication	●	
	<b>Setting via R100:</b>	
	Setpoint	●
	Start/stop	●
	Max. curve	●
	Min. curve	●
	Alarm reset	●
	Controlled/uncontrolled	
	Constant/proportional pressure, constant curve	
	Controller constants Kp, Ti	
	External setpoint signal	●
	Signal relay function	
	Pump number (for bus communication)	●
	Stop function	
	Sensor range and signal	
	Duty/standby	
	Operating range (min./max. speed)	
	<b>Reading via R100:</b>	
	Setpoint	●
Operating mode	●	
Actual sensor value	●	
Pump speed	●	
Actual power consumption	●	
Energy consumption	●	
Running hours	●	
	<b>Setting via GENIbus:</b>	
	Setpoint	●
	Start/stop	●
	Max. curve	●
	Min. curve	●
	Controlled/uncontrolled	
	Constant/proportional pressure, constant curve	
	<b>Reading via GENIbus:</b>	
	Setpoint	●
	Operating indication	●
Pump status	●	
<b>Additional functions:</b>		
Parallel operation	●	
Clock program	●	
	<b>Settings via external signal:</b>	
	Setpoint	●
	Start/stop	●
	Min./max. curve via digital input	●
	Min./max. curve, external fault, Flow switch via digital input	●
	<b>Readings via external signal:</b>	
Fault signal (relay)	●	
Fault, Operation or Ready signal (relay)		

● Available

## 9. TPE Series 1000 pumps



TM03 0347 4904

TM03 3609 0506

Fig. 6 TPE Series 1000

### Technical data

Flow rate:	up to 200 gpm (45 m <sup>3</sup> h)
Head:	up to 60 ft (18 m)
Liquid temperature:	-13 to +284 °F (-25 ° to 140 °C)
Max. operating pressure:	145 psi (10 bar)
Motor sizes (single-phase):	0.33 to 1.5 hp

### Construction

TPE Series 1000 pumps are based on TP pumps.

The main difference between the TP and the TPE Series 1000 pump range is the motor.

The motor of TPE Series 1000 pumps has a built-in variable frequency drive designed to continuously regulate the pressure and the flow.

TPE Series 1000 pumps are suitable for applications where you want to retrofit a sensor in order to control e.g. the pressure, temperature, flow etc. at some arbitrary point in the system. Sensors shall be supplied by others.

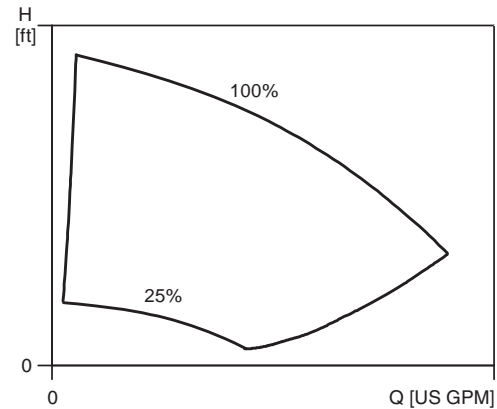
For further information on construction and materials of TPE Series 1000 pumps, see page 12 and 13.

### Applications

TPE Series 1000 pumps have integrated speed control for automatic adaptation of performance to current conditions.

This ensures that the energy consumption is kept at a minimum.

TPE Series 1000 pumps can operate in any duty point within the range between 25 % and 100 % speed.



In the QH-chart the 100 %-curve corresponds to the curve for a pump fitted with a standard fixed speed motor.

Depending on the nature of the application, TPE Series 1000 pumps offer energy-savings, increased comfort or improved processing.

The pumps can be fitted with sensor types meeting the requirements mentioned below:

### Start/stop

External potential-free switch.

Voltage: 5 VDC.

Current: < 5 mA.

Screened cable: 0.5 - 1.5 mm<sup>2</sup> / 28-16 AWG.

### Digital

External potential-free switch.

Voltage: 5 VDC.

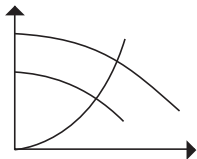
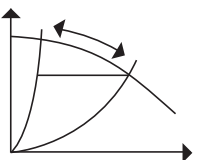
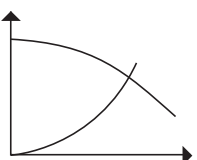
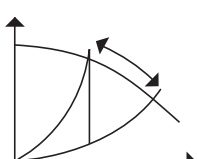
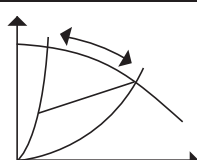
Current: < 5 mA.

Screened cable: 0.5 - 1.5 mm<sup>2</sup> / 28-16 AWG.

### Setpoint signals

- Potentiometer  
0-10 VDC, 10 k $\Omega$  (via internal voltage supply).  
Screened cable: 0.5 - 1.5 mm<sup>2</sup> / 28-16 AWG.  
Maximum cable length: 328 ft (100 m).
- Voltage signal  
0-10 VDC,  $R_i > 10$  k $\Omega$ .  
Tolerance: +0%/-3% at maximum voltage signal.  
Screened cable: 0.5 - 1.5 mm<sup>2</sup> / 28-16 AWG.  
Maximum cable length: 1640 ft (500 m).
- Current signal  
DC 0-20 mA/4-20 mA,  $R_i = 175$   $\Omega$ .  
Tolerance: +0%/-3% at maximum current signal.  
Screened cable: 0.5 - 1.5 mm<sup>2</sup> / 28-16 AWG.  
Maximum cable length: 1640 ft (500 m).  
Power source for sensor: 24 VDC is available from VFD. Max 40 mA

The charts below show possible control modes of TPE Series 1000 pumps in different applications.

Control mode	Application
<b>Constant curve</b>	
	<ul style="list-style-type: none"> <li>Single-pipe heating systems.</li> <li>Systems with three-way valves.</li> <li>Heating and cooling surfaces.</li> <li>Chiller pumps.</li> </ul>
<b>Constant differential pressure</b>	
	<ul style="list-style-type: none"> <li>Systems with two-way valves.</li> <li>(Sensor is needed)</li> </ul>
<b>Temperature control</b>	
	<ul style="list-style-type: none"> <li>Single-pipe heating systems.</li> <li>Systems with three-way valves.</li> <li>Cooling towers.</li> <li>Chiller pumps.</li> <li>Domestic hot water recirculation systems.</li> <li>(Sensor is needed)</li> </ul>
<b>Constant flow</b>	
	<ul style="list-style-type: none"> <li>Heating and cooling surfaces.</li> <li>Cooling towers.</li> <li>Flow filters.</li> <li>(Sensor is needed)</li> </ul>
<b>Proportional differential pressure (measured)</b>	
	<ul style="list-style-type: none"> <li>System with two-way valves.</li> <li>(Differential pressure sensor is located in the system)</li> <li>(Sensor is needed)</li> </ul>

## Control options

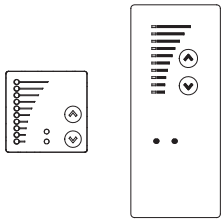
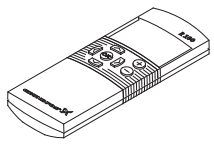
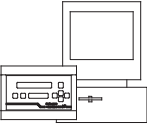
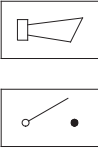
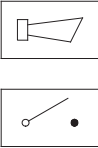
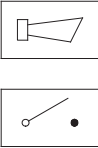
Communication with TPE Series 1000 pumps is possible via:

- a central building management system
- a remote control (Grundfos R100)
- a control panel.

The purpose of controlling a TPE Series 1000 pumps is to monitor and control the pressure, temperature, flow and liquid level of the system.

For further information on control options of TPE pumps, see page 20.

## Overview of functions

	E-pump functions	TPE Series 1000, without sensor
	<b>Setting via control panel:</b>	
	Setpoint	●
	Start/stop	●
	Max. curve	●
	Min. curve	●
	Alarm reset	●
	Constant/proportional pressure	
	<b>Reading via control panel:</b>	
	Setpoint	●
	Operating indication	●
Fault indication	●	
	<b>Setting via R100:</b>	
	Setpoint	●
	Start/stop	●
	Max. curve	●
	Min. curve	●
	Alarm reset	●
	Controlled/uncontrolled	●
	Constant/proportional pressure, constant curve	●
	Controller constants Kp, Ti	●
	External setpoint signal	●
	Signal relay function	●
	Pump number (for bus communication)	●
	Stop function	
	Sensor range and signal	●
	Duty/standby	
	Operating range (min./max. speed)	●
	<b>Reading via R100:</b>	
	Setpoint	●
	Operating mode	●
	Actual sensor value	●
Pump speed	●	
Actual power consumption	●	
Energy consumption	●	
Running hours	●	
	<b>Setting via GENIbus:</b>	
	Setpoint	●
	Start/stop	●
	Max. curve	●
	Min. curve	●
	Controlled/uncontrolled	●
	Constant/proportional pressure, constant curve	
	<b>Reading via GENIbus:</b>	
	Setpoint	●
	Operating indication	●
Pump status	●	
	<b>Additional functions:</b>	
	Parallel operation	●
	Clock program	●
	<b>Settings via external signal:</b>	
	Setpoint	●
	Start/stop	●
	Min./max. curve via digital input	●
	Min./max. curve, external fault, Flow switch via digital input	
	<b>Readings via external signal:</b>	
	Fault signal (relay)	
	Fault, Operation or Ready signal (relay)	●

● Available

# 10. Communication

## Communication with TPE pumps

Communication with TPE pumps is possible via a central building management system, remote control (Grundfos R100) or a control panel.

### Central building management system

The operator can communicate with a TPE pump even when he is not present near the pump.

Communication can take place via a central building management system allowing the operator to monitor and change control modes and setpoint settings.

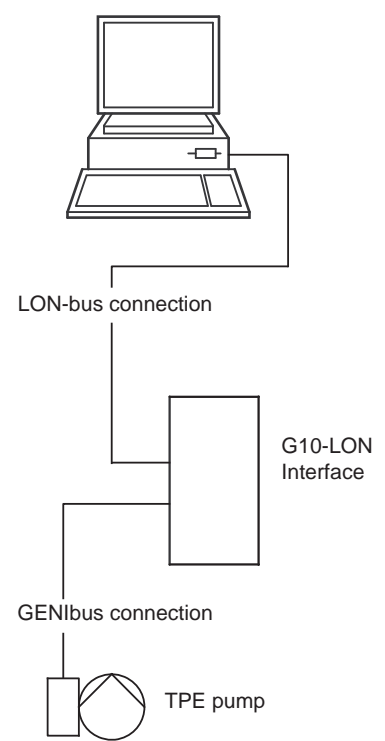


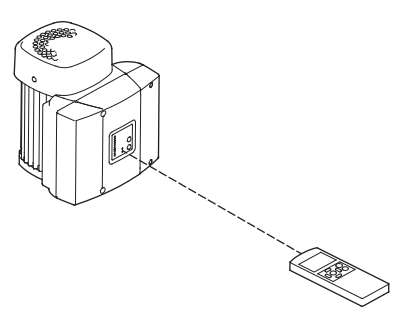
Fig. 7 Structure of a central building management system

TM02 6592 1103

## Remote control

The R100 remote control produced by Grundfos is available as an accessory.

The operator communicates with the TPE pump by pointing the IR-signal transmitter at the control panel of the TPE pump terminal box.



TM02 0936 0501

Fig. 8 R100 remote control

The operator can monitor and change control modes and settings of the TPE pump via the R100 display.

## Control panel

The operator can change the setpoint settings manually on the control panel of the TPE pump terminal box.



TM00 7600 0304

Fig. 9 Control panel of a TPE pump

# 11. Motors for TPE pumps

## Motor

The motor fitted on TPE pumps is a totally enclosed, fan-cooled standard motor with main dimensions and electrical tolerances to NEMA standards.

Relative humidity:	Max. 95 %
Enclosure class:	TEFC
Insulation class:	F, to IEC 85
Ambient temperature:	Max. +104 °F

## Motor range

hp	Electronic speed controlled motors	
	2-pole/1 ph	4-pole/1 ph
0.34		
0.50		
0.75	MLE	MLE
1.0		
1.5		

MLE is Grundfos motor brands.

The grey-shaded areas indicate non-available motors.

## Motor protection

**Single-phase** motors have integrated, interconnected thermal switches.

## Electrical data

### 2 pole (3600 rpm)

Hp	Voltage	Ph	NEMA frame	Service factor	Full load eff [%] *	Ins. class	Full load amps	Power factor	Min/max speed [rpm]
0.5	208-230	1	56C	1.0	71.0	F	2.8 - 2.5	0.96	360-3400
0.75	208-230	1	56C	1.0	74.0	F	3.9 - 3.5	0.97	360-3400
1	208-230	1	56C	1.0	76.0	F	5.2 - 4.7	0.97	360-3400
1.5	208-230	1	56C	1.0	77.0	F	7.5 - 6.8	0.97	360-3400

### 4 pole (1800 rpm)

Hp	Voltage	Ph	NEMA frame	Service factor	Full load eff [%] *	Ins. class	Full load amps	Power factor	Min/max speed [rpm]
0.33	208-230	1	56C	1.0	67.0	F	2 - 1.9	0.94	180-1690
0.5	208-230	1	56C	1.0	70.0	F	2.8 - 2.5	0.96	180-1690
0.75	208-230	1	56C	1.0	72.0	F	4 - 3.70	0.96	180-1690
1	208-230	1	56C	1.0	73.0	F	5.4 - 4.9	0.97	180-1690

\* The values apply to the combined efficiency of the motor and variable frequency drive.

## Grundfos variable frequency drive

The variable frequency drive in the MLE motor of the TPE-pump is a highly integrated electronic unit. It is based on an integrated hybrid module developed by Grundfos.

The functional blocks of the single-phase MLE motor variable frequency drive with PFC-circuit (Power Factor Correction) are shown in figure 10. Components of Power electronics are;

- RFI filter (Radio Frequency Interference)
- Rectifier, PFC-circuit and intermediate circuit (1 ph)
- Inrush circuit
- Inverter

### EMC (electromagnetic compatibility)

The Grundfos MLE motors fulfill the EMC directive 89/336/EEC and are tested according to standard EN 61 800-3. All Grundfos MLE motors are equipped with radio interference filter and varistors in the mains supply input to protect the electronics against voltage peaks and noise present in the mains supply (immunity). All inputs included in the electronic unit are protected against peaks and noise which can damage or disturb the function of the unit.

Grundfos MLE motors are designed to operate under a radiated electromagnetic disturbance well above requirements in EN61 800-3. MLE motors can be used in both residential areas and industrial areas.

### Integrated RFI filter

The integrated radio interference filter (RFI) limits the amount of electrical noise which the MLE motor emits to the mains supply network (emission). At the same time the filter ensures that noise signals in the mains generated by other equipment do not enter the electronic devices of the variable frequency drive causing damage or disturbances.

### Rectifier, PFC-circuit and intermediate circuit, single-phase E-pumps

Single-phase MLE motors are equipped with PFC-circuit (Power Factor Correction). The purpose of this circuit is to ensure that the current input from the mains is sinusoidal and the power factor is close to 1.

The single phase MLE motor range is not covered by EMC directive and not required to comply with it. Grundfos chose to include the PFC -circuit with the variable frequency drive design in order to comply with the EMC directive standard EN 61000-3-2 stipulating the limits for harmonic current emissions.

The purpose of PFC is to ensure that the mains are not "contaminated" by non-sinusoidal loads which have a tendency to distort the waveform of the mains voltage and furthermore cause unnecessarily high peak currents in the mains.

Benefits of PFC circuit:

- Low reactive load on power supply
- the current will have 40-50% lower RMS
- smaller fuses are required in the installation
- when connecting several pumps supplied by different phases in parallel, the current in the common neutral lead will be balanced so that the neutral lead current will never exceed the current in any one of the mains phases.
- the pump is less sensitive to variations in the mains voltage.

### Inrush circuit

When the variable frequency drive is connected to the mains voltage, the intermediate circuit capacitor is charged to achieve its normal operating voltage. A series resistor ensures that the charging happens slowly to avoid large charge spike in supply power and intermediate capacitors.

### Inverter

The inverter consists of six transistors which are "switched on/off" by control signals from the control electronics. The transistors have a diode placed in parallel and are arranged in three branches each consisting of a series connection comprising two transistors.

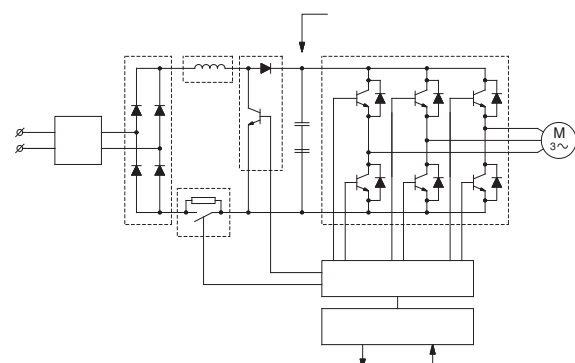
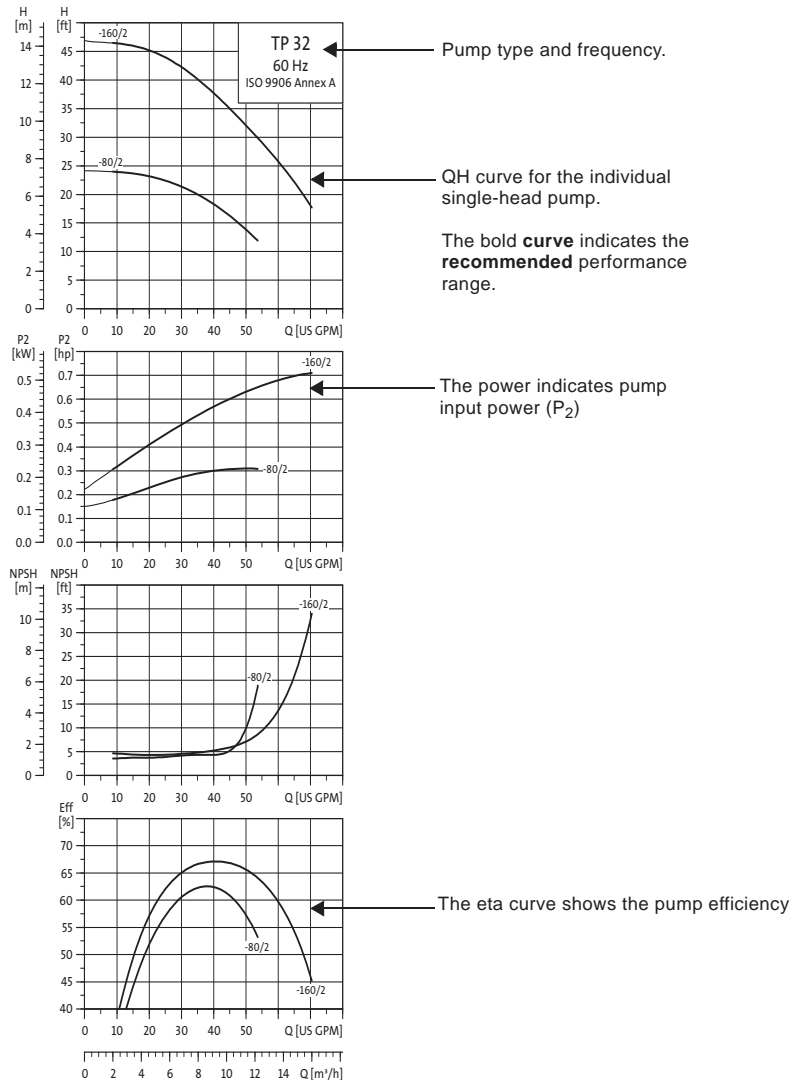


Fig. 10 Block diagram showing the functional blocks of the frequency converter of a single-phase MLE motor

## 12. Curve charts

### How to read the curve charts

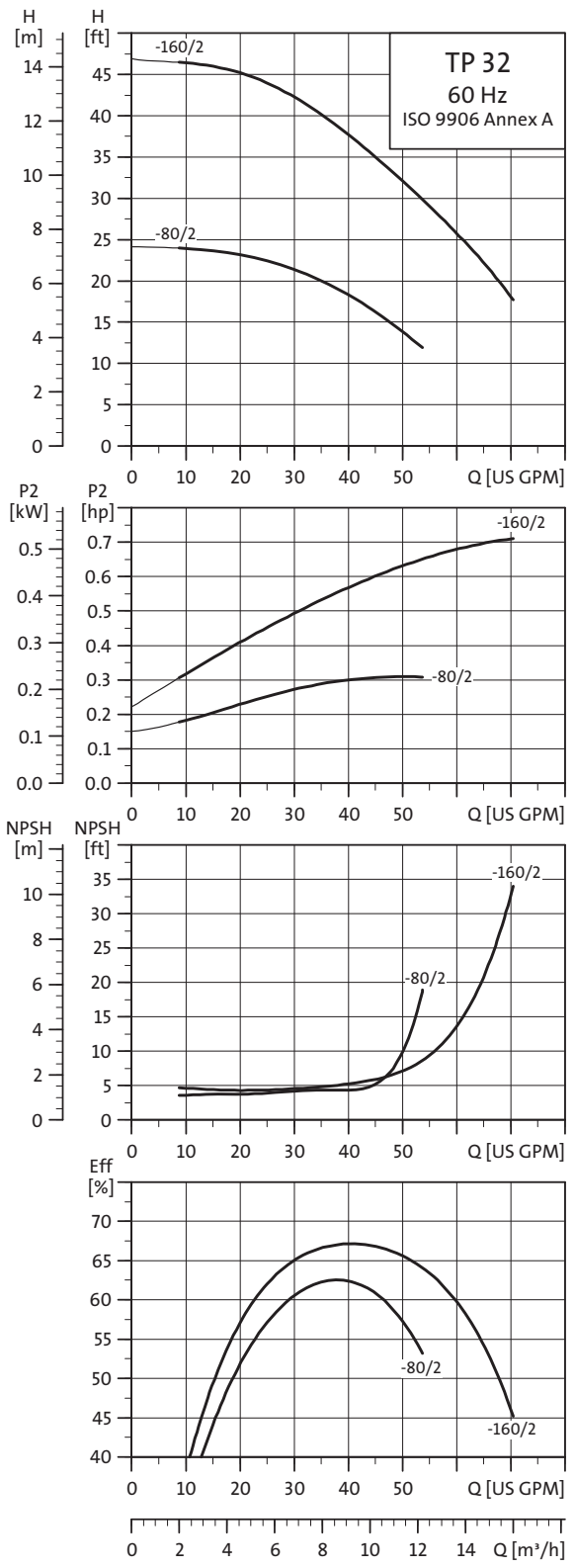


### Curve conditions

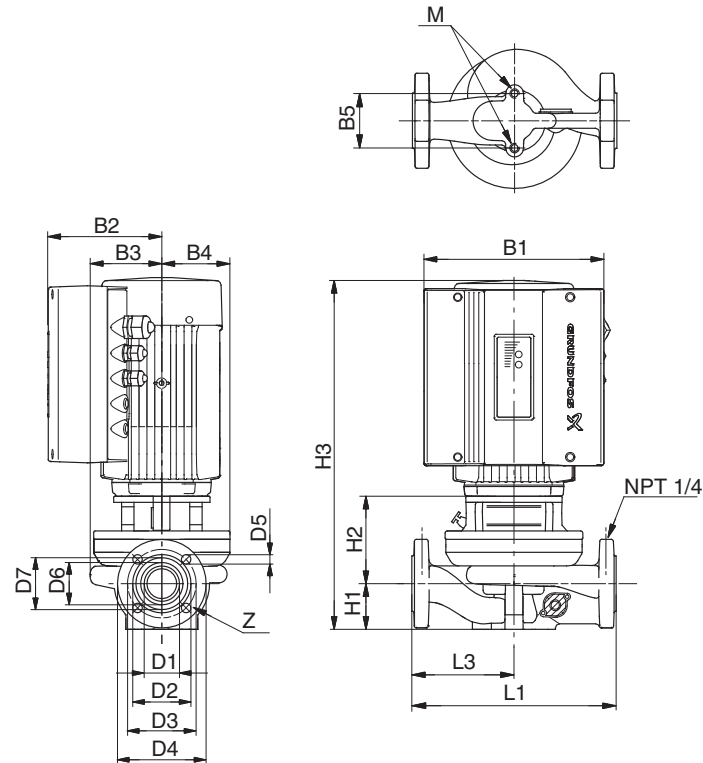
The guidelines below apply to the curves shown on the following pages:

1. Tolerances to ISO 9906, Annex A.
2. The curves apply to the performance of **single-phase pumps**. For other versions, please see the exact curves in WinCAPS or WebCAPS.
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 1 St (1 mm<sup>2</sup>/s).
5. Due to the risk of pump overheating, the pumps should not be used below the minimum flow rate indicated by the **bold-faced** curves.  
**Note:** We do not recommend constant operation at a flow rate below 10 %.
6. If the pumped liquid density and/or viscosity is higher than that of water, it may be necessary to use a motor with a higher performance.
7. Motor speed:  
2-pole = 3400 RPM  
4-pole = 1690 RPM

### TP, TPE 32-XX/2



TM02 5553 3206



TM03 3669 0606

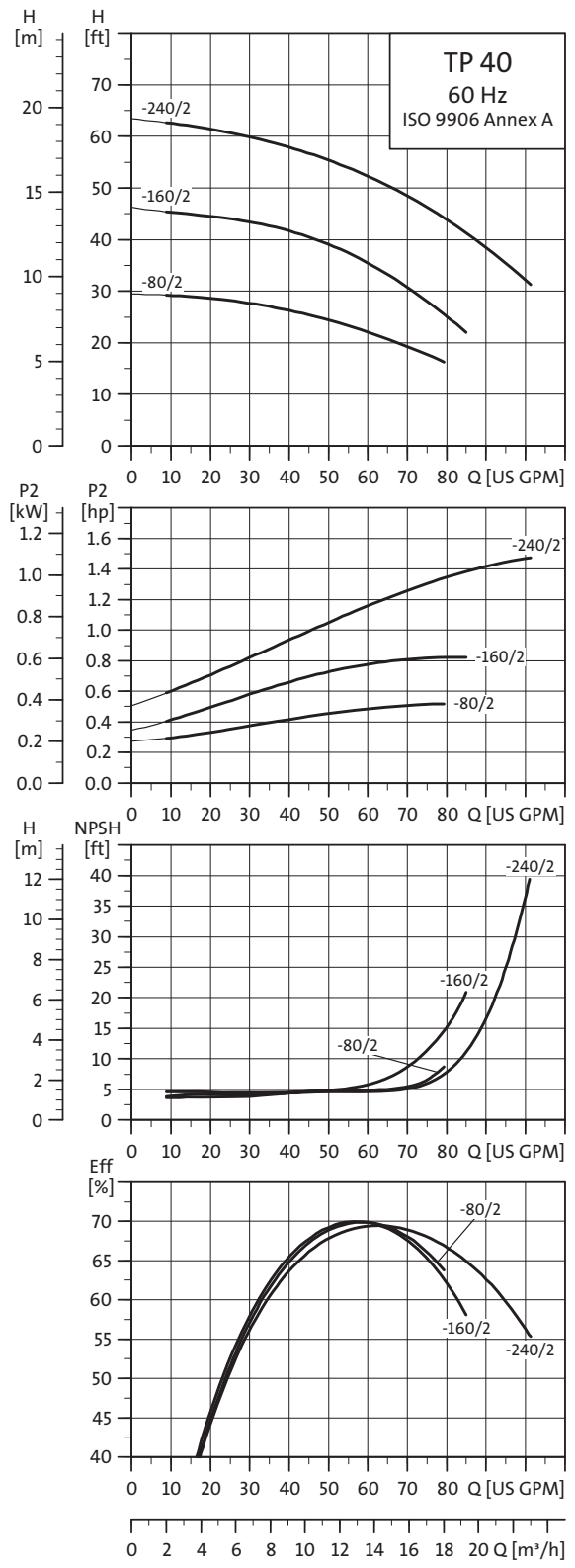
## Technical data

Pump type	TPE		TPE	
	NEMA 56C		NEMA 56C	
Motor type	NEMA 56C		NEMA 56C	
P2 [HP] / Max speed [rpm]	0.50 / 3400		0.75 / 3400	
Motor flange	56C		56C	
Flange type	US (1)		US (2)	
D1 [Inch] / [mm]	1 7/16	35.9	1 11/16	43
D2 [Inch] / [mm]	2 9/16	65	2 7/8	73
D3 [Inch] / [mm]	3 1/2	89	3 15/16	100
D4 [Inch] / [mm]	4 5/8	117	5	127
D5 [Inch] / [mm]	5/8	16	11/16	16
D6 [Inch] / [mm]	1 13/16	46	2 1/16	52
D7 [Inch] / [mm]	2 1/4	57	2 9/16	65
B1 [Inch] / [mm]	5 9/16	141	5 9/16	141
B2 [Inch] / [mm]	5 1/2	140	5 1/2	140
B3 [Inch] / [mm]	3	75	3	75
B4 [Inch] / [mm]	3	75	3	75
B5 [Inch] / [mm]	3 3/16	80	3	75
H1 [Inch] / [mm]	2 11/16	68	2 11/16	68
H2 [Inch] / [mm]	5 13/16	147.6	5 7/8	148.4
H3 [Inch] / [mm]	16 1/16	408.6	16 1/8	409.4
L1 [Inch] / [mm]	11	279.4	13 1/2	343
L3 [Inch] / [mm]	5 1/2	139.7	6 3/4	171
M	M12		M12	
Net weight [lbs]/[kg]	60	27	65	29
Gross weight [lbs] / [kg]	63	28.6	68	30.8

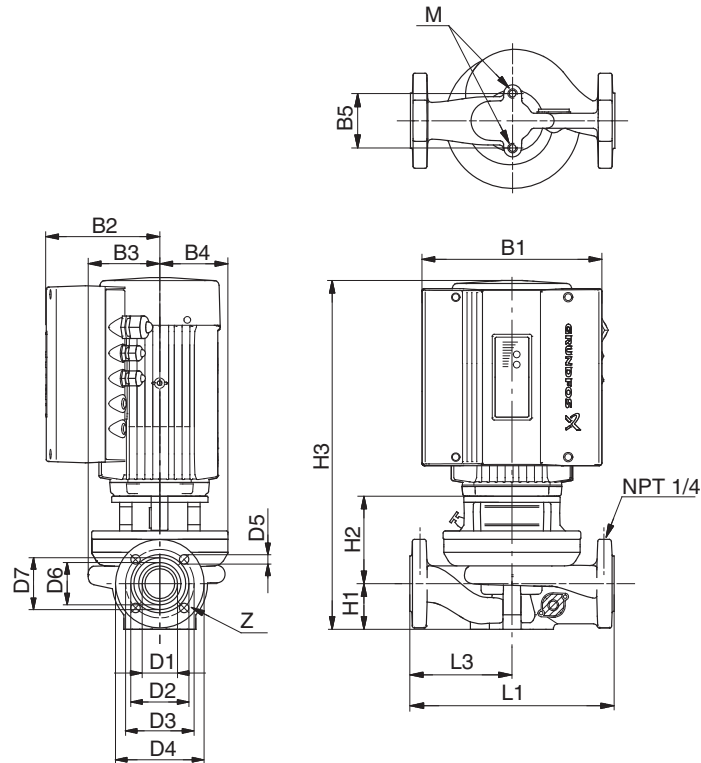
(1) 1-1/4", 2 bolt with 5/8 dia. holes

(2) 1-1/2", 2 bolt with 5/8 dia. holes

### TP, TPE 40-XX/2



TM02 5554 3206



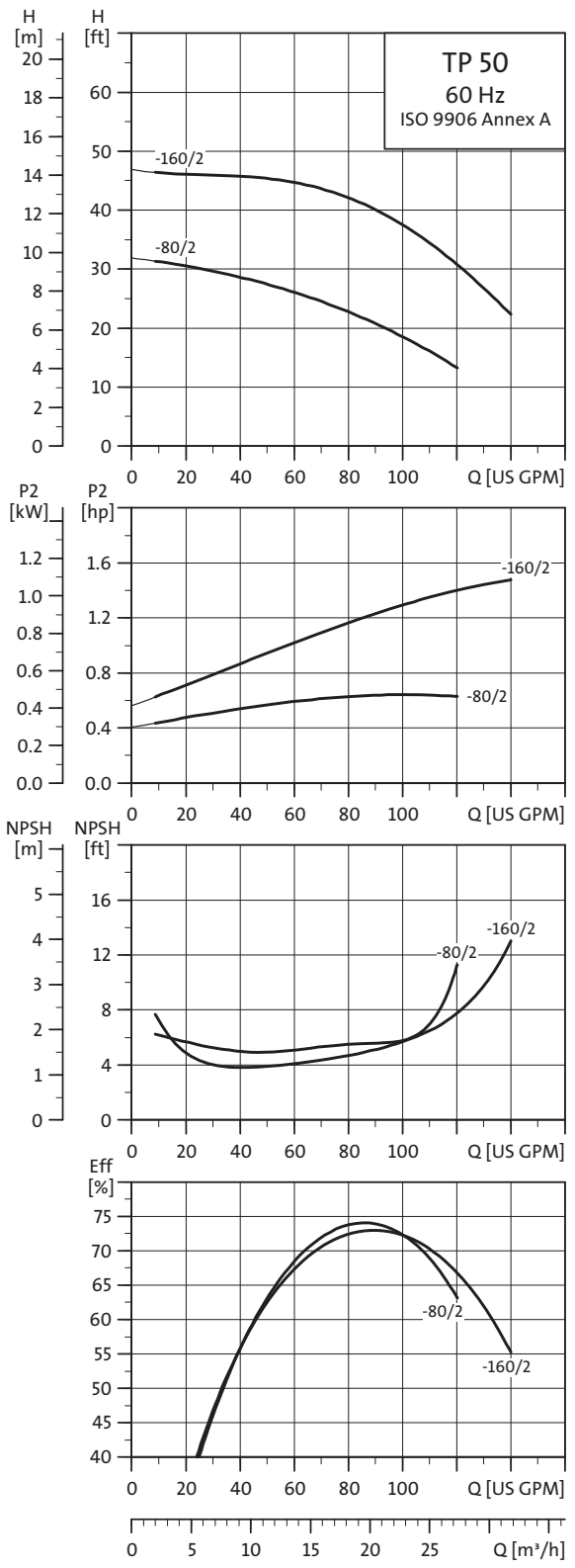
TM03 3669 0606

Technical data

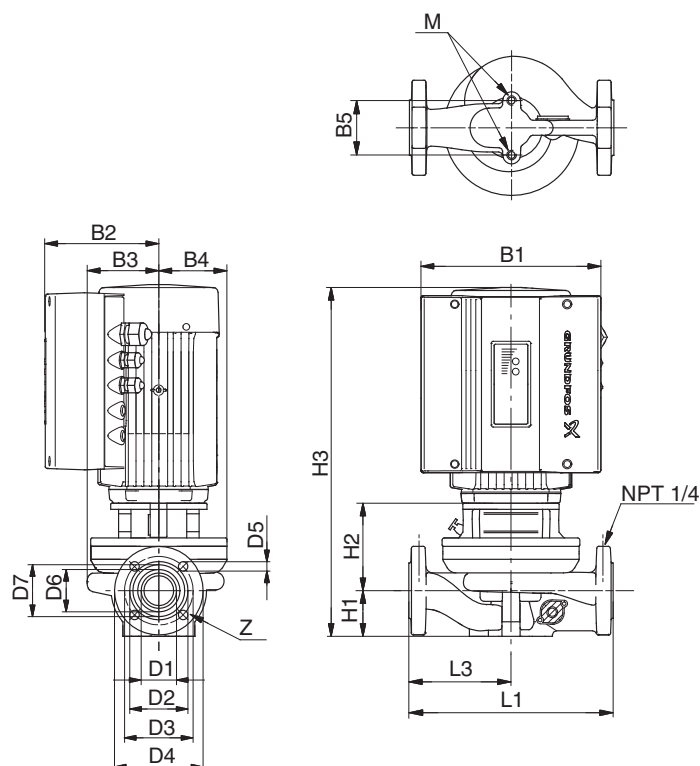
Pump type	TPE		TPE		TPE	
	NEMA 56C		NEMA 56C		NEMA 56C	
Motor type	0.75	3400	0.75	3400	1.5	3400
P2 [HP] / Max speed [rpm]	56C		56C		56C	
Motor flange	US (1)		US (1)		US (1)	
Flange type	D1 [Inch] / [mm]	1 11/16 / 41.8	D1 [Inch] / [mm]	1 11/16 / 41.8	D1 [Inch] / [mm]	1 11/16 / 41.8
D1 [Inch] / [mm]	D2 [Inch] / [mm]	2 7/8 / 73	D2 [Inch] / [mm]	2 7/8 / 73	D2 [Inch] / [mm]	2 7/8 / 73
D2 [Inch] / [mm]	D3 [Inch] / [mm]	3 15/16 / 99	D3 [Inch] / [mm]	3 15/16 / 99	D3 [Inch] / [mm]	3 15/16 / 99
D3 [Inch] / [mm]	D4 [Inch] / [mm]	5 / 127	D4 [Inch] / [mm]	5 / 127	D4 [Inch] / [mm]	5 / 127
D4 [Inch] / [mm]	D5 [Inch] / [mm]	5/8 / 16	D5 [Inch] / [mm]	5/8 / 16	D5 [Inch] / [mm]	5/8 / 16
D5 [Inch] / [mm]	D6 [Inch] / [mm]	2 1/16 / 52	D6 [Inch] / [mm]	2 1/16 / 52	D6 [Inch] / [mm]	2 1/16 / 52
D6 [Inch] / [mm]	D7 [Inch] / [mm]	2 9/16 / 64.6	D7 [Inch] / [mm]	2 9/16 / 64.6	D7 [Inch] / [mm]	2 9/16 / 64.6
D7 [Inch] / [mm]	B1 [Inch] / [mm]	5 9/16 / 141	B1 [Inch] / [mm]	5 9/16 / 141	B1 [Inch] / [mm]	5 9/16 / 141
B1 [Inch] / [mm]	B2 [Inch] / [mm]	5 1/2 / 140	B2 [Inch] / [mm]	5 1/2 / 140	B2 [Inch] / [mm]	5 1/2 / 140
B2 [Inch] / [mm]	B3 [Inch] / [mm]	3 / 75	B3 [Inch] / [mm]	3 15/16 / 100	B3 [Inch] / [mm]	3 15/16 / 100
B3 [Inch] / [mm]	B4 [Inch] / [mm]	3 / 75	B4 [Inch] / [mm]	3 15/16 / 100	B4 [Inch] / [mm]	3 15/16 / 100
B4 [Inch] / [mm]	B5 [Inch] / [mm]	4 3/4 / 120	B5 [Inch] / [mm]	3 3/16 / 80	B5 [Inch] / [mm]	3 3/16 / 80
B5 [Inch] / [mm]	H1 [Inch] / [mm]	2 11/16 / 68	H1 [Inch] / [mm]	2 11/16 / 68	H1 [Inch] / [mm]	2 11/16 / 68
H1 [Inch] / [mm]	H2 [Inch] / [mm]	6 1/16 / 153.4	H2 [Inch] / [mm]	5 7/8 / 148	H2 [Inch] / [mm]	6 3/16 / 156.6
H2 [Inch] / [mm]	H3 [Inch] / [mm]	16 5/16 / 414.4	H3 [Inch] / [mm]	16 1/8 / 409	H3 [Inch] / [mm]	17 5/8 / 447.6
H3 [Inch] / [mm]	L1 [Inch] / [mm]	13 1/2 / 342.9	L1 [Inch] / [mm]	13 1/2 / 342.9	L1 [Inch] / [mm]	13 1/2 / 342.9
L1 [Inch] / [mm]	L3 [Inch] / [mm]	6 13/16 / 171.5	L3 [Inch] / [mm]	6 13/16 / 171.5	L3 [Inch] / [mm]	6 13/16 / 171.5
L3 [Inch] / [mm]	M	M12 / M12	M	M12 / M12	M	M12 / M12
M	Net weight [lbs]/[kg]	65 / 29	Net weight [lbs]/[kg]	72 / 33	Net weight [lbs]/[kg]	77 / 35
Net weight [lbs]/[kg]	Gross weight [lbs] / [kg]	68 / 30.8	Gross weight [lbs] / [kg]	75 / 34	Gross weight [lbs] / [kg]	80 / 36.3
Gross weight [lbs] / [kg]						

(1) 1-1/2", 2 bolt with 5/82 dia. holes

### TP, TPE 50-XX/2



TM02 5555 3206



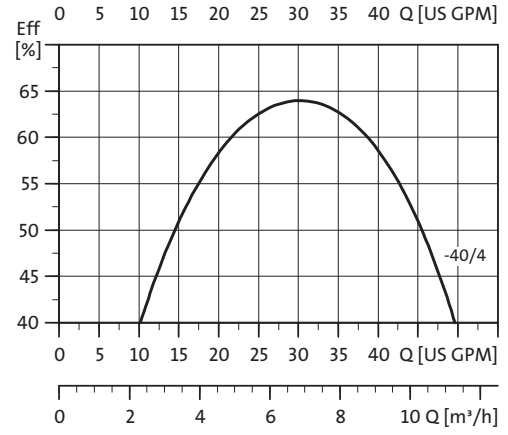
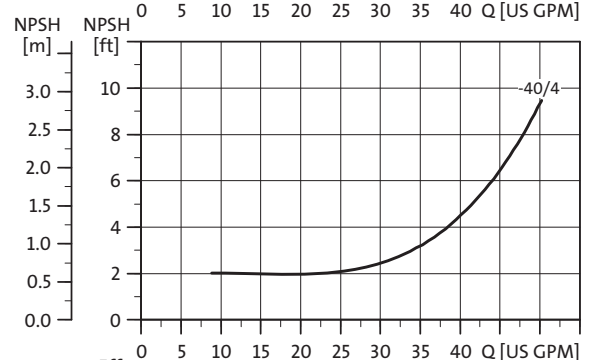
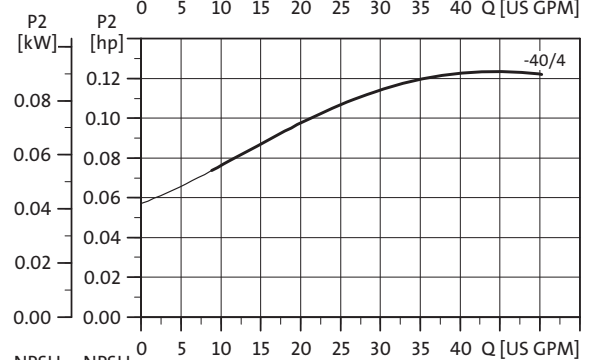
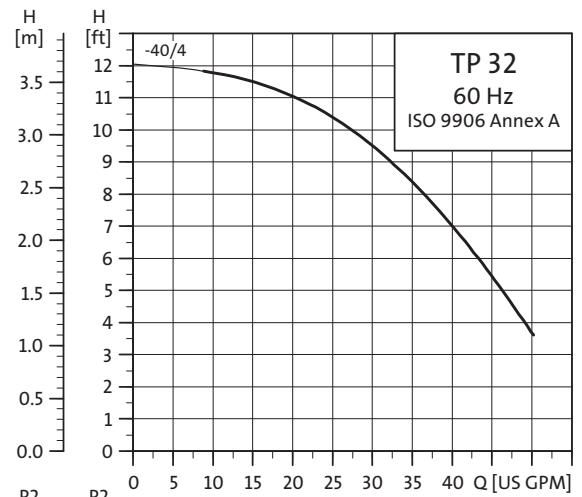
TM03 3669 0606

### Technical data

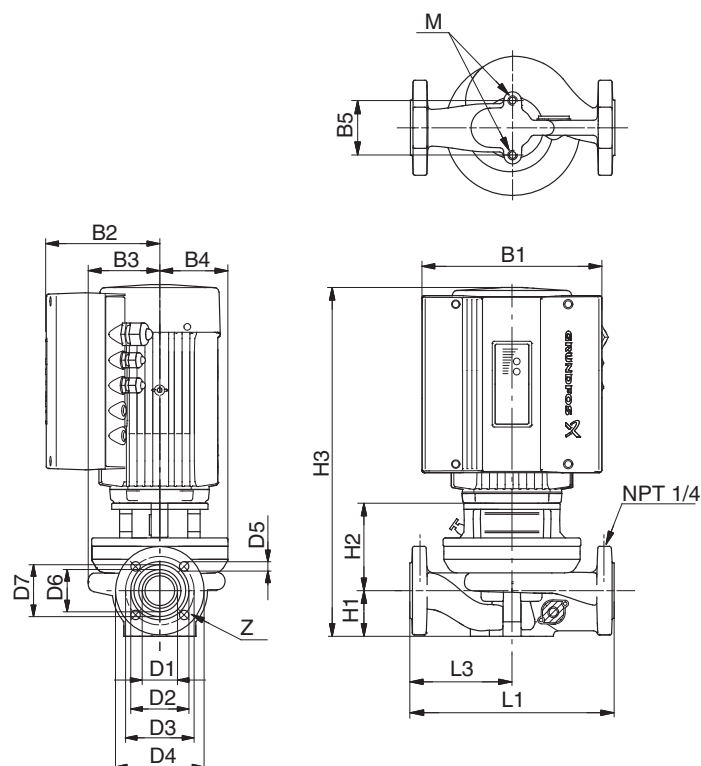
Pump type	TPE 50-80/2		TPE 50-160/2	
Motor type	NEMA 56C		NEMA 56C	
P2 [HP] / Max speed [rpm]	0.75	3400	1.5	3400
Motor flange	56C		56C	
Flange type	US (1)		US (1)	
D1 [Inch] / [mm]	2 1/8	54	2 1/8	53
D2 [Inch] / [mm]	3 7/16	87	3 7/16	87
D3 [Inch] / [mm]	4 1/16	103	4 1/16	103
D4 [Inch] / [mm]	5 1/4	133	5 1/4	133
D5 [Inch] / [mm]	5/8	14.3	5/8	14.3
D6 [Inch] / [mm]	2 1/2	64	2 1/2	64
D7 [Inch] / [mm]	3 1/8	78	3 1/8	78
B1 [Inch] / [mm]	5 9/16	141	5 9/16	141
B2 [Inch] / [mm]	5 1/2	140	5 1/2	140
B3 [Inch] / [mm]	3 3/4	95	3 15/16	100
B4 [Inch] / [mm]	3	76	3 15/16	100
B5 [Inch] / [mm]	4 3/4	121	4 3/4	121
H1 [Inch] / [mm]	3	76	3 1/4	82
H2 [Inch] / [mm]	6 3/16	157	5 15/16	149.9
H3 [Inch] / [mm]	16 3/4	426	17 15/16	454.9
L1 [Inch] / [mm]	11 1/2	292	14	355.6
L3 [Inch] / [mm]	5 3/4	146	7	177.8
M	M12	M12	M12	M12
Net weight [lbs]/[kg]	78	35	83	38
Gross weight [lbs] / [kg]	81	36.7	86	39

(1) 2", 4 bolt with (4) 9/16" dia. holes

### TP, TPE 32-XX/4



TM02 5556 3206



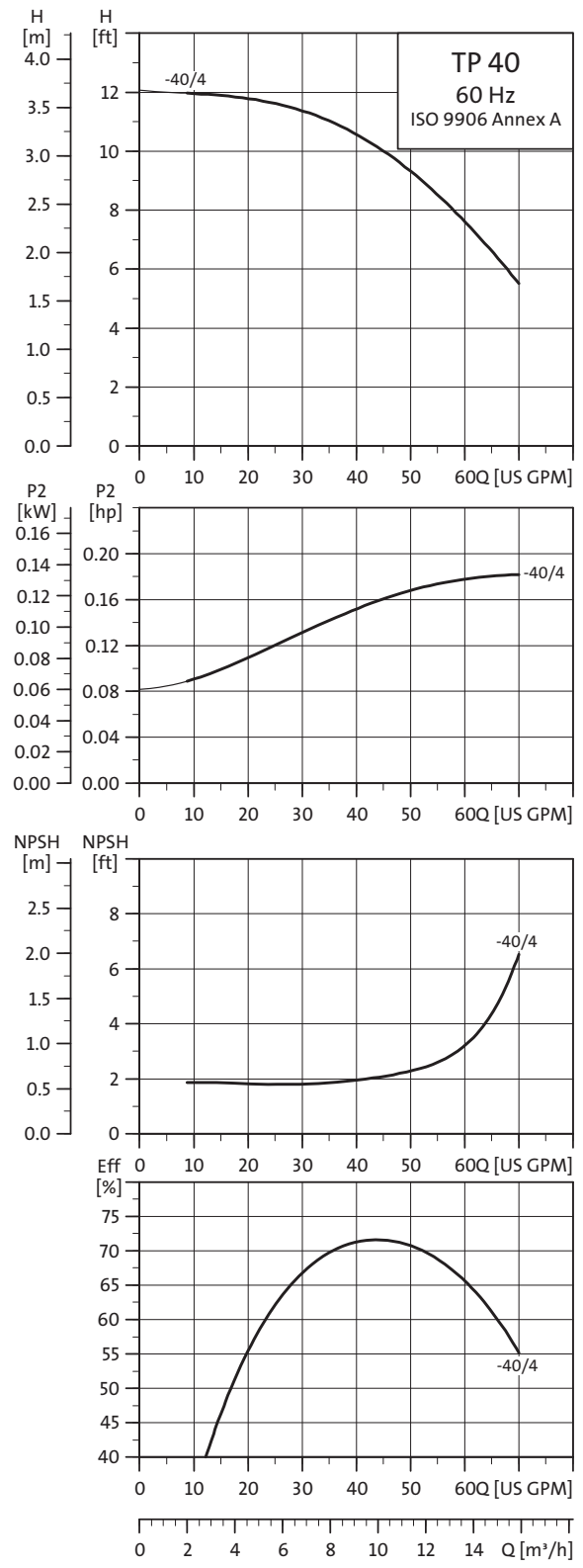
TM03 3669 0606

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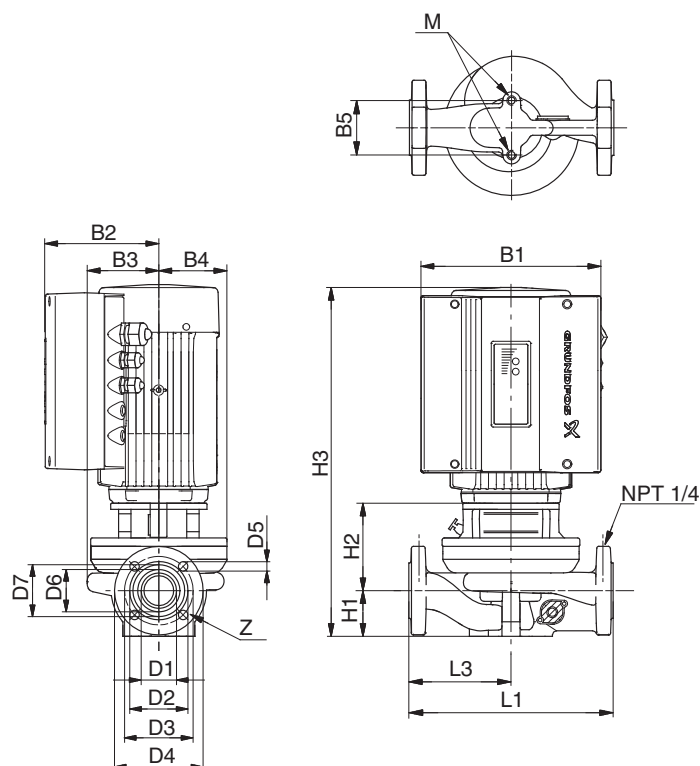
Pump type	TPE 32-40/4	
Motor type	NEMA 56C	
P2 [HP] / Max speed [rpm]	0.33	1690
Motor flange	56C	
Flange type	US (1)	US
D1 [Inch] / [mm]	1 7/16	35.9
D2 [Inch] / [mm]	2 9/16	64
D3 [Inch] / [mm]	3 9/16	89
D4 [Inch] / [mm]	4 5/8	117
D5 [Inch] / [mm]	11/16	16
D6 [Inch] / [mm]	1 13/16	46
D7 [Inch] / [mm]	2 1/4	57
B1 [Inch] / [mm]	5 9/16	141
B2 [Inch] / [mm]	5 1/2	140
B3 [Inch] / [mm]	3	75
B4 [Inch] / [mm]	3	75
B5 [Inch] / [mm]	3 3/16	80
H1 [Inch] / [mm]	2 11/16	68
H2 [Inch] / [mm]	5 15/16	150.3
H3 [Inch] / [mm]	16 3/16	411.3
L1 [Inch] / [mm]	11	279.4
L3 [Inch] / [mm]	5 1/2	139.7
M	M12	
Net weight [lbs]/[kg]	58	26
Gross weight [lbs] / [kg]	61	27.7

(1) 1-1/4", 2 bolt with 5/8 dia. holes

### TP, TPE 40-XX/4



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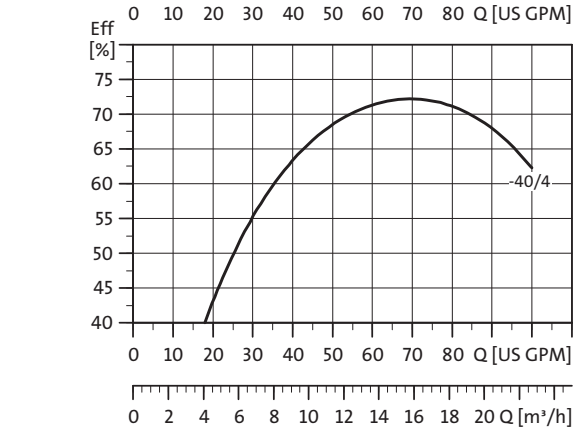
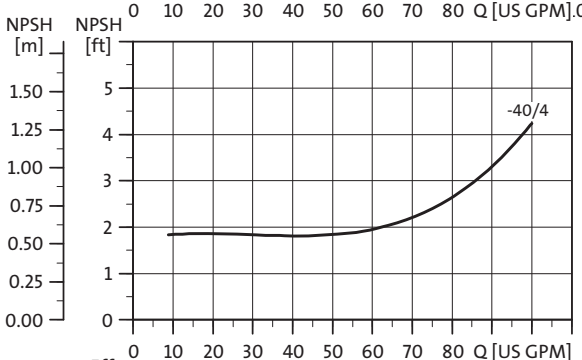
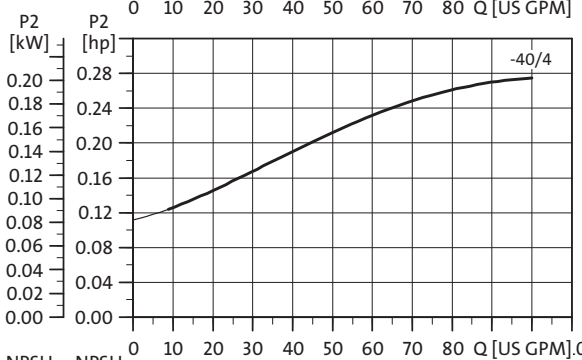
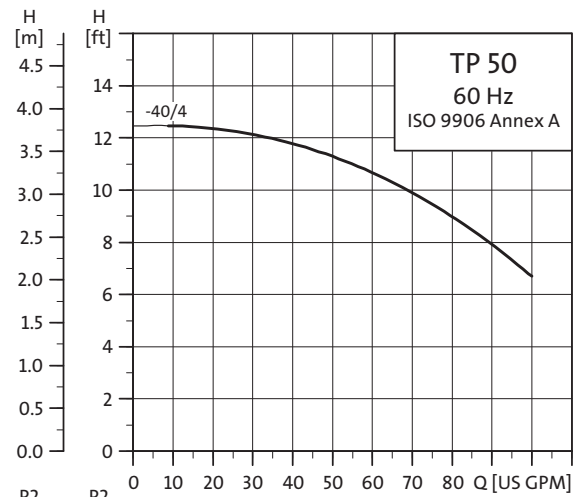
TM03 3669 0606

## Technical data

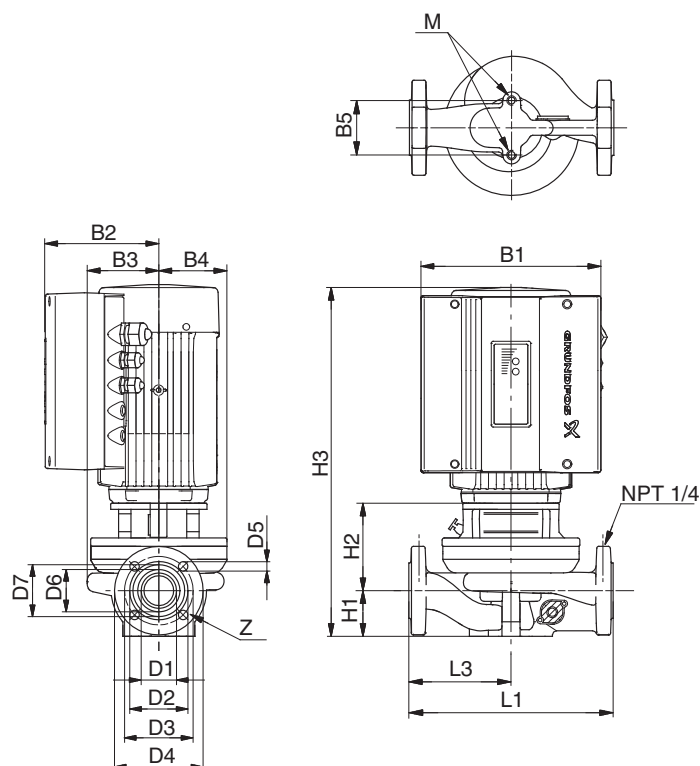
Pump type	TPE 40-40/4	
Motor type	NEMA 56C	
P2 [HP] / Max speed [RPM]	0.33	1690
Motor flange	56C	
Flange type	US (1)	
D1 [Inch] / [mm]	1 11/16	41.8
D2 [Inch] / [mm]	2 7/8	73
D3 [Inch] / [mm]	3 15/16	99
D4 [Inch] / [mm]	5	127
D5 [Inch] / [mm]	11/16	16
D6 [Inch] / [mm]	2 1/16	52
D7 [Inch] / [mm]	2 9/16	64.6
B1 [Inch] / [mm]	5 9/16	141
B2 [Inch] / [mm]	5 1/2	140
B3 [Inch] / [mm]	3 3/8	85
B4 [Inch] / [mm]	3	75
B5 [Inch] / [mm]	4 3/4	120
H1 [Inch] / [mm]	2 11/16	68
H2 [Inch] / [mm]	6 1/8	154.5
H3 [Inch] / [mm]	16 3/8	415.5
L1 [Inch] / [mm]	13 1/2	342.9
L3 [Inch] / [mm]	6 13/16	171.5
M	M12	
Net weight [lbs] / [kg]	62	28
Gross weight [lbs] / [kg]	65	29.5

(1) 1-1/2", 2 bolt 5/8" dia. holes

### TP, TPE 50-XX/4



TM02 5560 3206



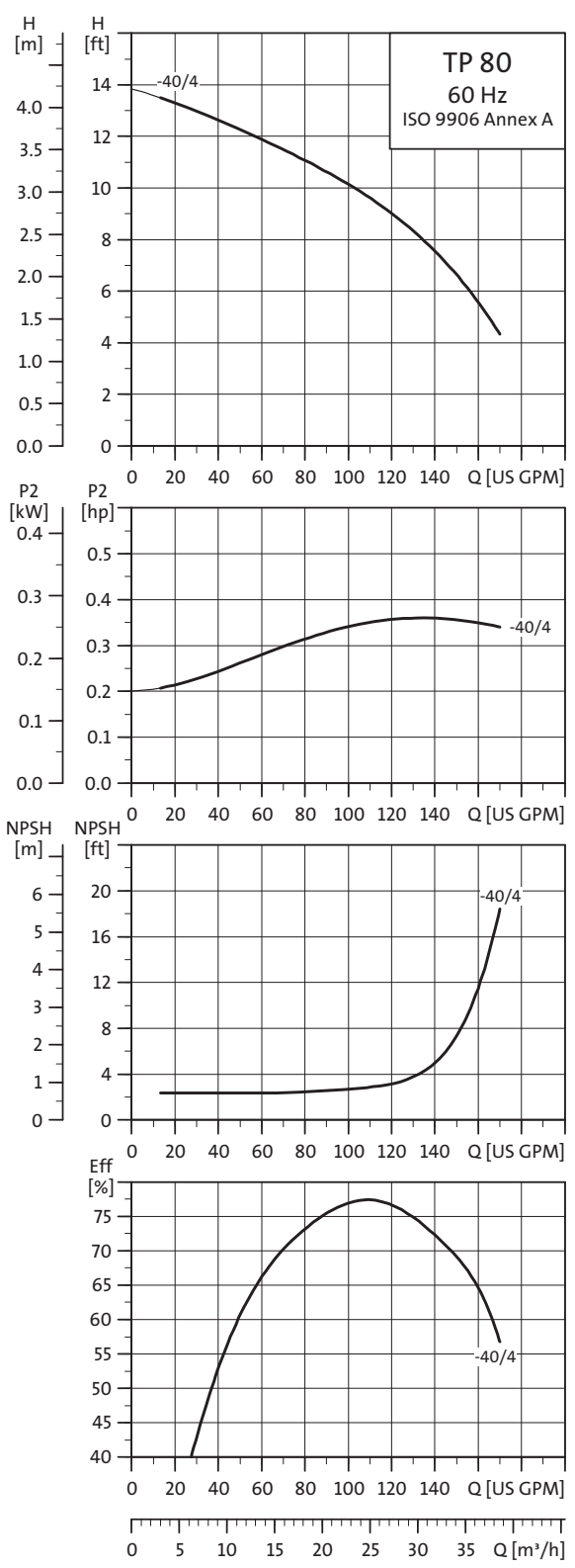
TM03 3669 0606

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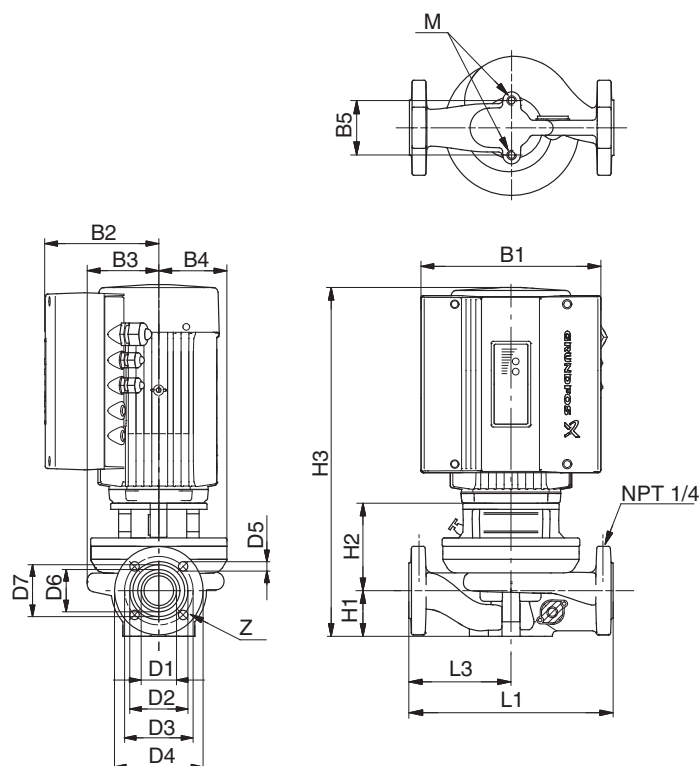
Pump type	TPE 50-40/4	
Motor type	NEMA 56C	
P2 [HP] / Max speed [rpm]	0.33	1690
Motor flange	56C	
Flange type	US (1)	
D1 [Inch] / [mm]	2 1/8	53
D2 [Inch] / [mm]	3 1/2	87.5
D3 [Inch] / [mm]	4 1/8	103.2
D4 [Inch] / [mm]	5 1/4	133
D5 [Inch] / [mm]	5/8	14.3
D6 [Inch] / [mm]	2 1/2	63
D7 [Inch] / [mm]	3 1/8	77.8
B1 [Inch] / [mm]	5 9/16	141
B2 [Inch] / [mm]	5 1/2	140
B3 [Inch] / [mm]	3 9/16	90
B4 [Inch] / [mm]	3	75
B5 [Inch] / [mm]	4 3/4	120
H1 [Inch] / [mm]	3 1/4	82
H2 [Inch] / [mm]	6 1/4	157.6
H3 [Inch] / [mm]	17 1/16	432.6
L1 [Inch] / [mm]	14	355.6
L3 [Inch] / [mm]	7	177.8
M	M12	
Net weight [lbs] / [kg]	68	31
Gross weight [lbs] / [kg]	71	32.2

(1) 2", 4 bolt with 9/16" dia. holes

### TP, TPE 80-XX/4



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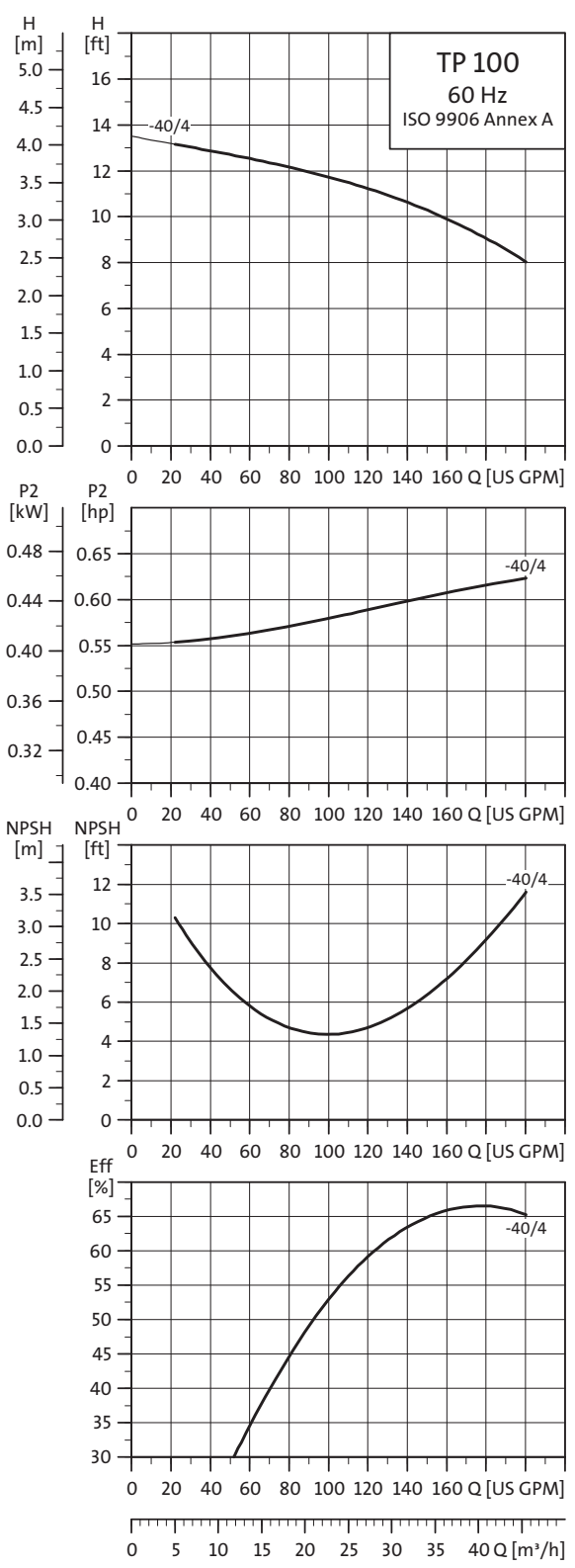


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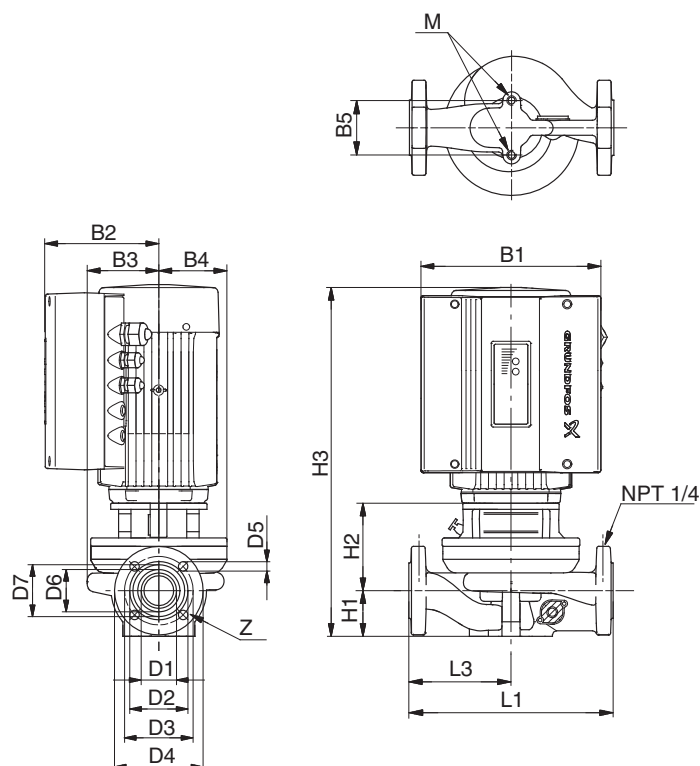
## Technical data

Pump type	TPE 80-40/4	
Motor type	NEMA 56C	
P2 [HP] / Max speed [rpm]	0.50	1690
Motor flange	56C	
Flange type	3" ANSI 125lb..RF.	
D1 [Inch] / [mm]	3 3/16	80.8
D2 [Inch] / [mm]	5	127
D3 [Inch] / [mm]	6	152
D4 [Inch] / [mm]	7 9/16	191
D5 [Inch] / [mm]	3/4	19
B1 [Inch] / [mm]	5 9/16	141
B2 [Inch] / [mm]	5 1/2	140
B3 [Inch] / [mm]	4 15/16	125
B4 [Inch] / [mm]	3 15/16	100
B5 [Inch] / [mm]	6 5/16	160
H1 [Inch] / [mm]	3 7/8	97
H2 [Inch] / [mm]	6 3/8	160.9
H3 [Inch] / [mm]	17 3/4	450.9
L1 [Inch] / [mm]	19	482.6
L3 [Inch] / [mm]	9 1/2	241.3
M	M16	M16
Net weight [lbs] / [kg]	120	54.4
Gross weight [lbs] / [kg]	122	55.3

### TP, TPE 100-XX/4



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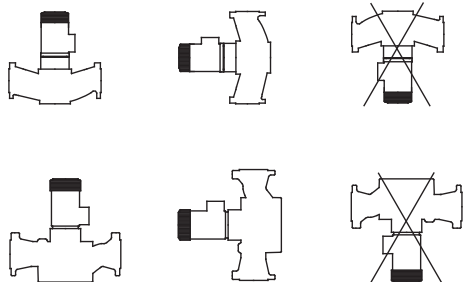
## Technical data

Pump type	TPE 100-40/4	
Motor type	NEMA 56C	
P2 [HP] / Max speed [rpm]	1.0	1690
Motor flange	56C	
Flange type	3" ANSI 125lb..RF.	
D1 [Inch] / [mm]	4 3/16	105
D2 [Inch] / [mm]	6 3/16	157
D3 [Inch] / [mm]	7 9/16	191
D4 [Inch] / [mm]	9 1/16	229
D5 [Inch] / [mm]	3/4	19
B1 [Inch] / [mm]	5 9/16	141
B2 [Inch] / [mm]	5 1/2	140
B3 [Inch] / [mm]	5 1/8	130
B4 [Inch] / [mm]	3 15/16	100
B5 [Inch] / [mm]	6 5/16	160
H1 [Inch] / [mm]	4 13/16	122
H2 [Inch] / [mm]	7 7/16	188.2
H3 [Inch] / [mm]	21	533.2
L1 [Inch] / [mm]	21	533.4
L3 [Inch] / [mm]	10 1/2	266.7
M	M16	
Net weight [lbs] / [kg]	154	69.9
Gross weight [lbs] / [kg]	156	70.8

# 13. Installation

## Mechanical installation

TP, TPE pumps can be installed in horizontal and vertical pipes.



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Fig. 11 Installation

Install the pumps in such a way that strain from the pipework is not transferred to the pump housing.

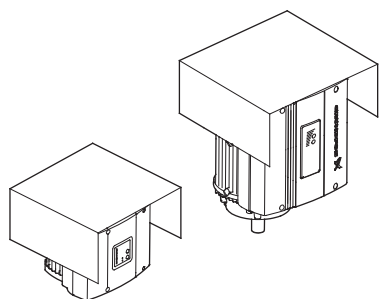
To ensure sufficient cooling of motor and electronics, observe the following:

- Place the pump in such a way that sufficient cooling is ensured.
- Make sure that the temperature of the cooling air does not exceed +104 °F (40 °C).
- Keep the motor cooling fins, holes in fan cover and fan blades clean.

### Condensation cover for TPE pumps

When installing TPE pumps outdoors, provide the motor with a suitable cover to avoid condensation on the electronic components and to protect the pump and motor against the direct effects of the elements.

When mounting the condensation cover on top of the motor, make sure to leave enough space for the air to cool the motor.



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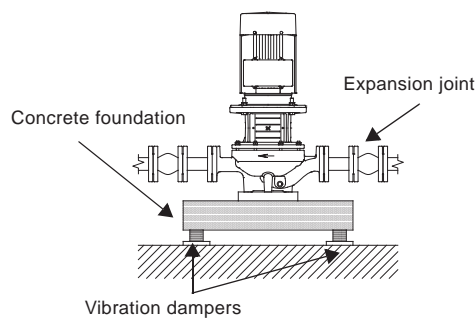
Fig. 12 MGE and MLE motors with condensation cover

## Elimination of noise and vibrations

In order to achieve optimum operation and minimum noise and vibration, consider vibration dampening of the pump.

Noise and vibration are generated by the revolutions of the motor and pump and by the flow in pipes and fittings. The effect on the environment is subjective and depends on correct installation and the state of the remaining system.

Elimination of noise and vibrations is best achieved by means of a concrete foundation, vibration dampers and expansion joints.



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Fig. 13 Foundation of TP pump

### Concrete foundation

Install the pump on a plane and rigid concrete foundation. This is the optimum solution for vibration dampening. As a rule of thumb, the weight of a concrete foundation should be 1.5 times the pump weight.

**Vibration dampers**

To prevent the transmission of vibrations to buildings, we recommend you to isolate the pump foundation from building parts by means of vibration dampers.

The selection of the right vibration damper requires the following data:

- forces transmitted through the damper
- motor speed considering speed control, if any
- required dampening in % (suggested value is 70 %).

Which is the right damper varies from installation to installation, and a wrong damper may increase the vibration level. Vibration dampers should therefore be sized by the supplier.

If you install the pump on a foundation with vibration dampers, always fit expansion joints on the pump flanges. This is important to prevent the pump from "hanging" in the flanges.

**Expansion joints**

Install expansion joints to:

- absorb expansions/contractions in the pipework caused by changing liquid temperature
- reduce mechanical strains in connection with pressure surges in the pipework
- isolate mechanical structure-borne noise in the pipework (only rubber bellows expansion joints).

**Note:** Do not install expansion joints to compensate for inaccuracies in the pipework such as center displacement of flanges.

Fit expansion joints at a distance of minimum 1 to 1½ times the nominal flange diameter away from the pump on the suction as well as on the discharge side. This will prevent the development of turbulence in the expansion joints, resulting in better suction conditions and a

minimum pressure loss on the pressure side. At high water velocities (> 16 ft/s) we recommend you to install larger expansion joints corresponding to the pipework.

The illustration below shows examples of rubber bellows expansion joints with or without limit rods.



TM02 4979 1902 - TM02 4981 1902

**Fig. 14** Examples of rubber bellows expansion joints

Expansion joints with limit rods can be used to reduce the effects of the expansion/contraction forces on the pipework.

Anchor the pipes in such a way that they do not stress the expansion joints and the pump. Follow the supplier's instructions and pass them on to advisers or pipe installers.

The illustration below shows an example of a metal bellows expansion joint with limit rods.



TM02 4980 1902

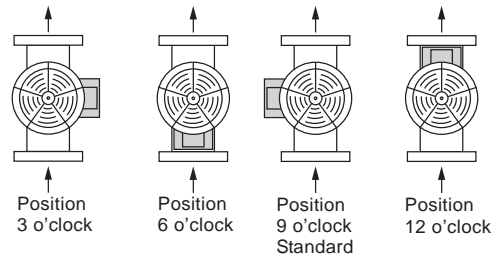
**Fig. 15** Example of metal expansion joint

Due to the risk of rupture of the rubber bellows, metal bellows expansion joints may be preferred at temperatures above +212 °F (100 °C) combined with high pressure.

**Control panel positions**

As standard, the control panels of TP and TPE pumps are mounted in position 9 o'clock.

The possible terminal box positions are shown below.



TM03 0565 2005

Control panel face has an infrared receiver. There should be sufficient space between any obstruction and the control panel.

## Electrical installation

### Electrical connection

Carry out electrical connection and protection in accordance with local regulations.

- Electronically speed-controlled pumps must always be correctly grounded.
- Single-phase standard motors incorporate a thermal switch and require no additional thermal motor protection.

**Note:** Carry out the mains connection of the pump as shown in the diagram inside the terminal box cover.

Do not start the pump until it has been filled with liquid and vented.

### Protection

#### Protection against fault currents

If the pump is connected to an electric installation where an earth leakage circuit breaker (ELCB) is used as additional protection, the earth leakage circuit breaker must be marked with the following symbols.

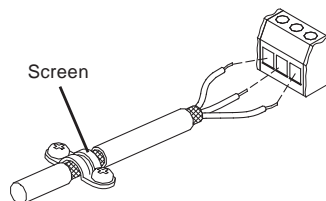


The earth leakage circuit breaker **must** trip out when earth fault currents with DC content (pulsating DC) and smooth DC earth fault currents occur.

### Communication cables for TPE

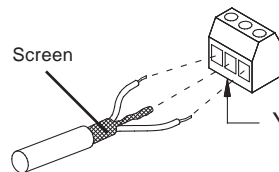
Use screened cables (min. 0.5 mm<sup>2</sup>) for external on/off switch, digital input, sensor and setpoint signals. The screens of the cables should be connected to frame at both ends.

The screen of the cable must have good frame connection which must be as close as possible to the terminals.



**Fig. 16** External start/stop cable connection of TPE

Use a screened 2-core cable for the bus connection. Connect the screen to terminal Y at both ends.



**Fig. 17** Bus connection of TPE

TM02 1325 0901

TM02 1343 1001

**Other connections TPE**

See the wiring diagrams for instructions how to connect external potential-free contacts for start/stop and digital function, external setpoint signal and fault signal.

Connect the wires to the following terminal groups:

**Group 1:** Inputs (external start/stop, digital function, setpoint and sensor signals, terminals 1-9 and bus connection, A, Y, B).

All inputs are separated from the mains conducting parts by reinforced insulation.

**Group 2:** Output (signal relay).

The output, terminals C, NO and NC, are galvanically separated from other circuits. Therefore, the supply voltage or protective extra-low voltage can be connected to the output as desired.

**Group 3:** Mains supply.

**Note:**

- As a precaution, separate the wires from each other by reinforced insulation in their entire lengths.
- If no external on/off switch is connected, maintain the connection across terminals 2 and 3.

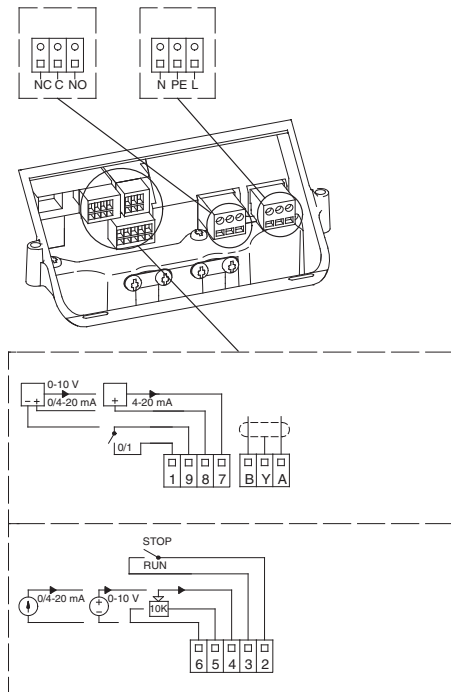


Fig. 18 TPE wiring diagram

TM02 0795 0904

## 14. Accessories

### Sensors for circulation applications

Differential pressure sensor kit	Pressure range	Product number
<ul style="list-style-type: none"> <li>• 1 sensor incl. 4.5 ft screened cable (7/16" connections)</li> <li>• 1 bracket (for wall mounting)</li> <li>• 1 Grundfos bracket (for mounting on motor)</li> <li>• 2 M4 screws for mounting of sensor on bracket</li> <li>• 1 M6 screw (self-cutting) for mounting on</li> <li>• 1 M8 screw (self-cutting) for mounting on</li> <li>• 2 capillary tubes (short/long)</li> <li>• 2 bracket (1/4" - 7/16")</li> <li>• 5 cable clips (black)</li> </ul>	0 - 9 psi ( 0 - 0.6 bar)	485450
	0 - 14.5 psi ( 0 - 1 bar)	485441
	0 - 23 psi ( 0 - 1.6 bar)	485442
	0 - 36 psi ( 0 - 2.5 bar)	485443

### Spare parts

Accessories and spare parts		
For use w/models	Product number	Description
TP32-40	519603	1-1/4" Threaded, Cast Iron
	96409356	1-1/4" Threaded, Bronze
TP32-80	519603	1-1/4" Threaded, Cast Iron
	96409356	1-1/4" Threaded, Bronze
TP32-160	539605	1-1/2" Threaded, Cast Iron
TP40	539615	1-1/2" Threaded, Bronze
TP50	96409354	2" Threaded, Cast Iron
(All Models)	96409355	2" Threaded, Bronze
TP80	569601	3" Threaded, ANSI 125# Cast Iron
(All Models)	569611	3" Threaded, ANSI 125# Bronze
TP100	579801	4" Threaded, ANSI 125# Cast Iron
(All Models)	96409355	4" Threaded, ANSI 125# Cast Iron

### Flange gaskets

For use with these flanges sets	Product number	Description
1-1/4" Threaded	510179	Single Gasket for 1-1/4" Flange
1-1/2" Threaded	530244	Single Gasket for 1-1/2" Flange
2" Threaded	96409353	Single Gasket for 2" Flange
3" Threaded 125#	560185	Single Gasket for 3" Flange
4" Threaded 125#	570008	Single Gasket for 4" Flange

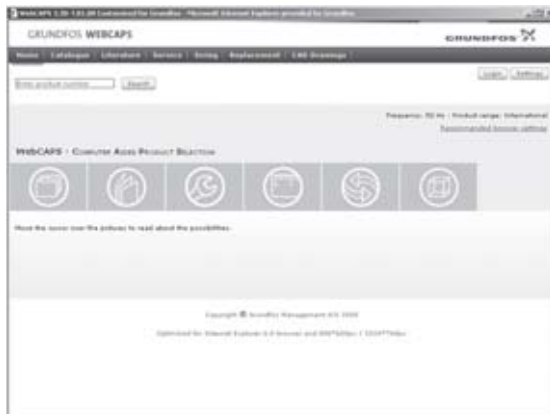
\* Flange sets includes two (2) flanges, two (2) gaskets, and eight (8) nuts and bolts

### Optional shaft seal kits

For use with these models	Type, seal faces, elastomers	Designation	Product number
All TP, TPE	O-ring Type, tungsten carbide/tungsten carbide, EPDM	AUUE	96409266
All TP, TPE	Reduced Face O-ring Type, tungsten carbide/tungsten carbide, EPDM & FKM (FOR USE WITH GLYCOL/WATER MIXTURES)	RUUE/V	985844

# 15. Further product documentation

## WebCAPS



WebCAPS is a **Web-based Computer Aided Product Selection** program available on [www.grundfos.com](http://www.grundfos.com).

WebCAPS contains detailed information on more than 185,000 Grundfos products in more than 20 languages.

In WebCAPS, all information is divided into 6 sections:

- Catalog
- Literature
- Service
- Sizing
- Replacement
- CAD drawings.
- 



### Catalog

This section is based on fields of application and pump types, and contains

- technical data
- curves (QH, Eta, P1, P2, etc) which can be adapted to the density and viscosity of the pumped liquid and show the number of pumps in operation
- product photos
- dimensional drawings
- wiring diagrams
- quotation texts, etc.



### Literature

In this section you can access all the latest documents of a given pump, such as

- product guides/data booklets
- installation and operating instructions
- service documentation, such as Service kit catalog and Service kit instructions
- quick guides
- product brochures, etc.



### Service

This section contains an easy-to-use interactive service catalog. Here you can find and identify service parts of both existing and discontinued Grundfos pumps.

Furthermore, this section contains service videos showing you how to replace service parts.



**Sizing**

This section is based on different fields of application and installation examples, and gives easy step-by-step instructions in how to

- select the most suitable and efficient pump for your installation
- carry out advanced calculations based on energy consumption, payback periods, load profiles, life cycle costs, etc.
- analyze your selected pump via the built-in life cycle cost tool
- determine the flow velocity in wastewater applications, etc.



**Replacement**

In this section you find a guide to selecting and comparing replacement data of an installed pump in order to replace the pump with a more efficient Grundfos pump. The section contains replacement data of a wide range of pumps produced by other manufacturers than Grundfos.

Based on an easy step-by-step guide, you can compare Grundfos pumps with the one you have installed on your site. When you have specified the installed pump, the guide will suggest a number of Grundfos pumps which can improve both comfort and efficiency.



**CAD drawings**

In this section it is possible to download 2-dimensional (2D) and 3-dimensional (3D) CAD drawings of most Grundfos pumps.

These formats are available in WebCAPS:

2-dimensional drawings:

- .dxf, wireframe drawings
- .dwg, wireframe drawings.

3-dimensional drawings:

- .dwg, wireframe drawings (without surfaces)
- .stp, solid drawings (with surfaces)
- .eprt, E-drawings.

**WinCAPS**



Fig. 19 WinCAPS CD

WinCAPS is a **Windows-based Computer Aided Product Selection** program containing detailed information on more than 185,000 Grundfos products in more than 20 languages.

The program contains the same features and functions as WebCAPS, but is an ideal solution if no Internet connection is available.

WinCAPS is available on CD-ROM and updated once a year.

# 16. Submittal data sheet



Company name: \_\_\_\_\_  
 Prepared by: \_\_\_\_\_  
 Phone number: ( ) - \_\_\_\_\_  
 Fax number: ( ) - \_\_\_\_\_  
 Date: \_\_\_\_\_ Page 1 of: \_\_\_\_\_  
 Quote number: \_\_\_\_\_

## Submittal Data Sheet

### Client Information

Project title: _____	Client name: _____
Reference number: _____	Client number: _____
Client contact: _____	Client phone no: ( ) - _____

### Location Information

For: _____	Unit: _____
Site: _____	Service: _____
Address: _____	City: _____ State: _____ Zip Code: _____

### Technical Data

Flow (GPM) \_\_\_\_\_  
 Head (Ft) \_\_\_\_\_  
 Motor \_\_\_\_\_  
 Max Fluid Temp \_\_\_\_\_  
 Min Fluid Temp \_\_\_\_\_  
 Max Working Pressure \_\_\_\_\_  
 Min Required Inlet Pressure \_\_\_\_\_  
 Connection Type and Size \_\_\_\_\_

### Motor Information

HP: \_\_\_\_\_  
 Phase: \_\_\_\_\_  
 Voltage: \_\_\_\_\_  
 Enclosure: \_\_\_\_\_

### Pump Information

Model Information from Type Key and Codes: _____	
Quantity Required: _____	Example: UP-S-15-58-FC
Minimum required flow: _____	NPSH required at duty point: _____
<b>Product Guide additional information pages</b>	
Materials page number: _____	Performance curve page number: _____
Technical data page number: _____	Motor data page number: _____

Custom-built pump information (optional): \_\_\_\_\_

### Additional Information

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