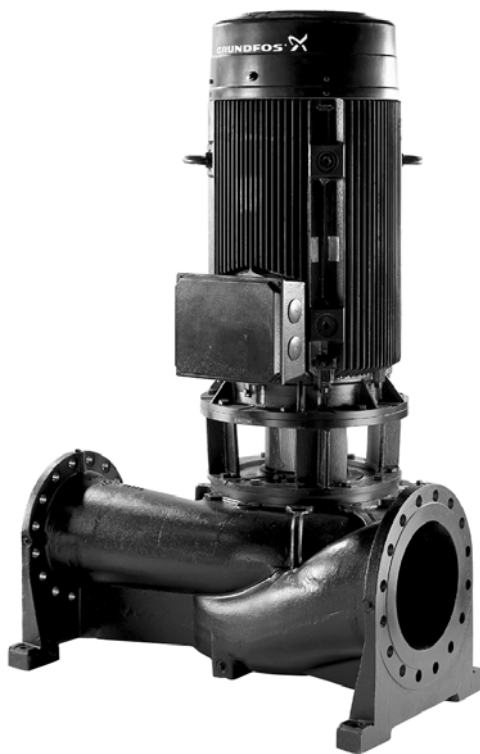
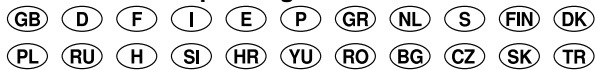


TP

Installation and operating instructions



Declaration of Conformity

We **Grundfos** declare under our sole responsibility that the products **TP**, to which this declaration relates, are in conformity with the Council Directives on the approximation of the laws of the EC Member States relating to

- Machinery (98/37/EC).
Standard used: EN ISO 12100.
- Electromagnetic compatibility (89/336/EEC).
Standards used: EN 61 000-6-2 and EN 61 000-6-3.
- Electrical equipment designed for use within certain voltage limits (73/23/EEC) [95].
Standards used: EN 60 335-1 and EN 60 335-2-51.

Déclaration de Conformité

Nous **Grundfos** déclarons sous notre seule responsabilité que les produits **TP** auxquels se réfère cette déclaration sont conformes aux Directives du Conseil concernant le rapprochement des législations des Etats membres CE relatives à

- Machines (98/37/CE).
Standard utilisé: EN ISO 12100.
- Compatibilité électromagnétique (89/336/CEE).
Standards utilisés: EN 61 000-6-2 et EN 61 000-6-3.
- Matériel électrique destiné à employer dans certaines limites de tension (73/23/CEE) [95].
Standards utilisés: EN 60 335-1 et EN 60 335-2-51.

Declaración de Conformidad

Nosotros **Grundfos** declaramos bajo nuestra única responsabilidad que los productos **TP** a los cuales se refiere esta declaración son conformes con las Directivas del Consejo relativas a la aproximación de las legislaciones de los Estados Miembros de la CE sobre

- Máquinas (98/37/CE).
Norma aplicada: EN ISO 12100.
- Compatibilidad electromagnética (89/336/CEE).
Normas aplicadas: EN 61 000-6-2 y EN 61 000-6-3.
- Material eléctrico destinado a utilizarse con determinadas límites de tensión (73/23/CEE) [95].
Normas aplicadas: EN 60 335-1 y EN 60 335-2-51.

Δήλωση Συμμόρφωσης

Εμείς η **Grundfos** δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προϊόντα **TP** συμμορφώνονται με την Οδηγία του Συμβουλίου επί της σύγκλισης των νόμων των Κρατών Μελών της Ευρωπαϊκής Ένωσης σε σχέση με τα

- Μηχανήματα (98/37/ΕΚ).
Πρότυπα που χρησιμοποιήθηκε: EN ISO 12100.
- Ηλεκτρομαγνητική συμβατότητα (89/336/ΕΟΚ).
Πρότυπα που χρησιμοποιήθηκαν: EN 61 000-6-2 και EN 61 000-6-3.
- Ηλεκτρικές συσκευές σχεδιασμένες για χρήση εντός ορισμένων ορίων ηλεκτρικής τάσης (73/23/ΕΟΚ) [95].
Πρότυπα που χρησιμοποιήθηκαν: EN 60 335-1 και EN 60 335-2-51.

Försäkran om överensstämmelse

Vi **Grundfos** försäkrar under ansvar, att produkterna **TP**, som omfattas av denna försäkran, är i överensstämmelse med Rådets Direktiv om inbördes närmande till EU-medlemsstaternas lagstiftning, avseende

- Maskinell utrustning (98/37/EC).
Använd standard: EN ISO 12100.
- Elektromagnetisk kompatibilitet (89/336/EEC).
Använda standarder: EN 61 000-6-2 och EN 61 000-6-3.
- Elektrisk material avsedd för användning inom vissa spänningsgränser (73/23/EEC) [95].
Använda standarder: EN 60 335-1 och EN 60 335-2-51.

Overensstemmelseerklæring

Vi **Grundfos** erklærer under ansvar, at produkterne **TP**, som denne erklæring omhandler, er i overensstemmelse med Rådets direktiver om indbyrdes tilnærmede til EF medlemsstaternes lovgivning om

- Maskiner (98/37/EF).
Anvendt standard: EN ISO 12100.
- Elektromagnetisk kompatibilitet (89/336/EEG).
Anvendte standarder: EN 61 000-6-2 og EN 61 000-6-3.
- Elektrisk materiel bestemt til anvendelse inden for visse spændingsgrænser (73/23/EEF) [95].
Anvendte standarder: EN 60 335-1 og EN 60 335-2-51.

Свидетельство о соответствии требованиям

Мы, фирма **Grundfos**, со всей ответственностью заявляем, что изделия **TP**, к которым и относится данное свидетельство, отвечают требованиям следующих указаний Совета ЕС об унификации законодательных предписаний стран-членов ЕС.

- Машиностроение (98/37/ЕС).
Применявшиеся стандарты: Евростандарт EN ISO 12100.
- Электромагнитная совместимость (89/336/ЕЕG).
Применявшиеся стандарты: Евростандарт EN 61 000-6-2 и EN 61 000-6-3.
- Электрические машины для эксплуатации в пределах определенного диапазона значений напряжения (73/23/ЕWГ) [95].
Применявшиеся стандарты: Евростандарт EN 60 335-1 и EN 60 335-2-51.

Konformitæterklæring

Wir **Grundfos** erklæren in alleiniger Verantwortung, dass die Produkte **TP**, auf die sich diese Erklärung bezieht, mit den folgenden Richtlinien des Rates zur Angleichung der Rechtsvorschriften der EG-Mitgliedstaaten übereinstimmen:

- Maschinen (98/37/EG).
Norm, die verwendet wurde: EN ISO 12100.
- Elektromagnetische Verträglichkeit (89/336/EEG).
Normen, die verwendet wurden: EN 61 000-6-2 und EN 61 000-6-3.
- Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen (73/23/EWG) [95].
Normen, die verwendet wurden: EN 60 335-1 und EN 60 335-2-51.

Dichiarazione di Conformità

Noi **Grundfos** dichiariamo sotto la nostra esclusiva responsabilità che i prodotti **TP** ai quali questa dichiarazione se riferisce sono conformi alle Direttive del Consiglio concernente il ravvicinamento delle legislazioni degli Stati membri CE relative a

- Macchine (98/37/CE).
Standard usato: EN ISO 12100.
- Compatibilità elettromagnetica (89/336/CEE).
Standard usati: EN 61 000-6-2 e EN 61 000-6-3.
- Materiale elettrico destinato ad essere utilizzato entro certi limiti di tensione (73/23/CEE) [95].
Standard usati: EN 60 335-1 e EN 60 335-2-51.

Declaração de Conformidade

Nós **Grundfos** declaramos sob nossa única responsabilidade que os produtos **TP** aos quais se refere esta declaração estão em conformidade com as Diretivas do Conselho das Comunidades Europeias relativas à aproximação das legislações dos Estados Membros respeitantes à

- Máquinas (98/37/CE).
Norma utilizada: EN ISO 12100.
- Compatibilidade eletromagnética (89/336/CEE).
Normas utilizadas: EN 61 000-6-2 e EN 61 000-6-3.
- Material eléctrico destinado a ser utilizado dentro de certos limites de tensão (73/23/CEE) [95].
Normas utilizadas: EN 60 335-1 e EN 60 335-2-51.

Overeenkomstigheidsverklaring

Wij **Grundfos** verklaren geheel onder eigen verantwoordelijkheid dat de producten **TP** waarin deze verklaring betrekking heeft in overeenstemming zijn met de Richtlijnen van de Raad inzake de onderlinge aanpassing van de wetgevingen van de Lid-Staten betreffende

- Machines (98/37/EG).
Norm: EN ISO 12100.
- Elektromagnetische compatibiliteit (89/336/EEG).
Normen: EN 61 000-6-2 en EN 61 000-6-3.
- Elektrisch materiaal bestemd voor gebruik binnen bepaalde spanningsgrenzen (73/23/EEG) [95].
Normen: EN 60 335-1 en EN 60 335-2-51.

Vastaa vuovakuutus

Me **Grundfos** vakautamme yksin vastuullisesti, että tuotteen **TP**, jota tämä vakuuks koskee, noudattavat direktiivijä jotta käsiteltävät EY:n jäsenvaltioiden koneellisia laitteita koskevien lakien yhdenmukaista seura:

- Koneet (98/37/EY).
Käytetty standardit: EN ISO 12100.
- Elektromagneettinen vastaa vuus (89/336/EY).
Käytetyt standardit: EN 61 000-6-2 ja EN 61 000-6-3.
- Määrättyjen jänniterajojen puitteissa käytettävät sähköiset laitteet (73/23/EY) [95].
Käytetyt standardit: EN 60 335-1 ja EN 60 335-2-51.

Deklaracja zgodności

My, **Grundfos**, oświadczamy z pełną odpowiedzialnością, że nasze wyroby **TP**, których deklaracja niniejsza dotyczy, są zgodne z następującymi wytycznymi Rady d/s ujednolicenia przepisów prawnych krajów członkowskich EG:

- maszyny (98/37/EG),
zastosowana norma: EN ISO 12100.
- zgodność elektromagnetyczna (89/336/EEG),
zastosowane normy: EN 61 000-6-2 i EN 61 000-6-3.
- wyposażenie elektryczne do stosowania w określonym zakresie napięć (73/23/EWG) [95],
zastosowane normy: EN 60 335-1 i EN 60 335-2-51.

Konformitási nyilatkozat

Mi, a **Grundfos**, egyedül felelősséggel kijelentjük, hogy a **TP** termékek, amelyekre jelen nyilatkozat vonatkozik, megfelelnek az Európai Unió tagállamainak jogi irányműveit összehangoló tanács alábbi irányelveinek:

- Gépek (98/37/EG).
Alkalmazott szabvány: EN ISO 12100.
- Elektromágneses összeférhetőség (89/336/EEG).
Alkalmazott szabványok: EN 61 000-6-2 és EN 61 000-6-3.
- Meghatározott feszültséghatárokon belül használt elektromos eszközök (73/23/EGK) [95].
Alkalmazott szabványok: EN 60 335-1 és EN 60 335-2-51.

Izjava o ustreznosti

Mi, **Grundfos**, pod polno odgovornostjo izjavljam, da so izdelki **TP** na katere se ta izjava nanaša, v skladu z naslednjimi smernicami Sveta za uskladitev pravnih predpisov držav članic Evropske skupnosti:

- Stroji (98/37/EG).
- Uporabljena norma: EN ISO 12100.
- Elektromagnetna kompatibilnost (89/336/EWG).
- Uporabljeni normi: EN 61 000-6-2 in EN 61 000-6-3.
- Električna pogonska sredstva za uporabo v določenih napetostnih mejah (73/23/EWG) [95].
- Uporabljeni normi: EN 60 335-1 in EN 60 335-2-51.

Izjava o konformitetu

Mi, **Grundfos**, izjavljamo pod potpunom odgovornostjo da su proizvodi **TP** na koje se odnosi ova izjava u saglasnosti sa smernicama i uputstvima Saveta za usaglašavanje pravnih propisa članica Evropske unije:

- mašine (98/37/EG),
- korišćen standard: EN ISO 12100,
- elektromagnetna usaglašenost (89/336/EWG),
- korišćeni standardi: EN 61 000-6-2 i EN 61 000-6-3.
- električna oprema razvijena za korišćenje unutar određenih naponskih granica: (73/23/EWG) [95],
- korišćeni standardi: EN 60 335-1 i EN 60 335-2-51.

Декларация за съответствие

Ние, фирма **ГРУНДФОС** заявяваме с пълна отговорност, че продуктите **TP**, за които се отнася настоящата декларация, отговарят на следните указания на Съвета за уеднаквяване на правните разпоредби на държавите членки на ЕО:

- Машини (98/37/ЕО).
- Приложена норма: EN ISO 12100.
- Електромагнетична поносимост (89/336/ЕИО).
- Приложени норми: EN 61 000-6-2 и EN 61 000-6-3.
- Електрически машини и съоръжения за употреба в рамките на определени граници на напрежение на електрически ток (73/23/ЕИО) [95].
- Приложени норми: EN 60 335-1 и EN 60 335-2-51.

Prehlásenie o konformite

My, firma **Grundfos**, na svoju plnú zodpovednosť prehlasujeme, že výrobky **TP**, na ktoré sa toto prehlásenie vzťahuje, sú v súlade s nasledovnými smernicami Rady pre zblíženie právnych predpisov členských zemí Európskej únie:

- Stroje (98/37/EC).
- Použitá norma: EN ISO 12100.
- Elektromagnetická únosnosť (89/336/EEC).
- Použité normy: EN 61 000-6-2 a EN 61 000-6-3.
- Elektrické prevádzkové prostriedky, použité v určitej napät'ovej hranici (73/23/EEC) [95].
- Použitá norma: EN 60 335-1 a EN 60 335-2-51.

Izjava o usklađenosti

Mi, **Grundfos**, izjavljujemo uz punu odgovornost, da su proizvodi **TP**, na koje se ova izjava odnosi, sukladni smjernicama Savjeta za prilagodbu propisa država članica EZ:

- Strojevi (98/37/CE).
- Korištena norma: EN ISO 12100.
- Elektromagnetska kompatibilnost (89/336/EEZ).
- Korištene norme: EN 61 000-6-2 i EN 61 000-6-3.
- Električni pogonski uređaji za korištenje unutar određenih granica napona (73/23/EEZ) [95].
- Korištene norme: EN 60 335-1 i EN 60 335-2-51.

Declaratie de conformitate

Noi, **Grundfos**, declarăm asumându-ne întreaga responsabilitate că produsele **TP** la care se referă această declarație sunt în conformitate cu Directivele Consiliului în ceea ce privește alinierea legislațiilor Stateelor Membre ale CE, referitoare la:

- Utilaje (98/37/CE).
- Standard aplicat: EN ISO 12100.
- Compatibilitate electromagnetică (89/336/CEE).
- Standarde aplicate: EN 61 000-6-2 și EN 61 000-6-3.
- Echipamente electrice destinate utilizării între limite exacte de tensiune (73/23/CEE) [95].
- Standarde aplicate: EN 60 335-1 și EN 60 335-2-51.

Prohlášení o konformitě

My firma **Grundfos** prohlašujeme na svou plnou odpovědnost, že výrobky **TP** na něž se toto prohlášení vztahuje, jsou v souladu s ustanovenými směrnice Rady pro sblížení právních předpisů členských států Evropského společenství v oblastech:

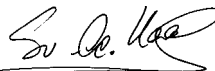
- strojřerství (98/37/EG),
- použitá norma: EN ISO 12100.
- elektromagnetická kompatibilita (89/336/EWG),
- použité normy: EN 61 000-6-2 a EN 61 000-6-3.
- provozování spotřebičů v toleranci napětí (73/23/EWG) [95],
- použité normy: EN 60 335-1 a EN 60 335-2-51.

Uygunluk Bildirgesi

Biz Grundfos olarak, bu bildirgede belirtilen **Grundfos TP** ürünlerinin, Konsey Direktifleri

- Makinelei (98/37/EC).
- Kullanilan standartlar: EN ISO 12100.
- Elektromanyetik uyumluluk (89/336/EEC).
- Kullanilan standartlar: EN 61 000-6-2 ve EN 61 000-6-3.
- Belli voltaj sinirlari için üretilmiş elektrik donanimi (73/23/EEC) [95].
- Kullanilan standartlar: EN 60 335-1 ve EN 60 335-2-51.

Bjerringbro, 15th May 2005



Svend Aage Kaae
Technical Director

TP

| | | |
|--|-----|------------|
| Installation and operating instructions | 6 | GB |
| Montage- und Betriebsanleitung | 13 | D |
| Notice d'installation et d'entretien | 22 | F |
| Istruzioni di installazione e funzionamento | 29 | I |
| Instrucciones de instalación y funcionamiento | 36 | E |
| Instruções de instalação e funcionamento | 43 | P |
| Οδηγίες εγκατάστασης και λειτουργίας | 50 | GR |
| Installatie- en bedieningsinstructies | 58 | NL |
| Monterings- och driftsinstruktion | 65 | S |
| Asennus- ja käyttöohjeet | 72 | FIN |
| Monterings- og driftsinstruktion | 79 | DK |
| Instrukcja montażu i eksploatacji | 86 | PL |
| Руководство по монтажу и эксплуатации | 95 | RU |
| Szerelési és üzemeltetési utasítás | 105 | H |
| Navodilo za montažo in obratovanje | 114 | SI |
| Montažne i pogonske upute | 123 | HR |
| Uputstvo za montažu i upotrebu | 131 | YU |
| Instrucțiuni de instalare și utilizare | 140 | RO |
| Упътване за монтаж и експлоатация | 148 | BG |
| Montážní a provozní návod | 157 | CZ |
| Návod na montáž a prevádzku | 165 | SK |
| Montaj ve kullanım kılavuzu | 173 | TR |

CONTENTS

GB

| | |
|--|-----------|
| 1. Versions | 6 |
| 2. Delivery and handling | 6 |
| 2.1 Delivery | 6 |
| 2.2 Handling | 6 |
| 3. Applications | 7 |
| 3.1 Pumped liquids | 7 |
| 4. Technical data | 7 |
| 4.1 Ambient temperature | 7 |
| 4.2 Liquid temperature | 7 |
| 4.3 Minimum inlet pressure | 7 |
| 4.4 Maximum inlet pressure | 7 |
| 4.5 Electrical data | 7 |
| 4.6 Sound level | 7 |
| 5. Installation | 7 |
| 5.1 Pump location | 7 |
| 5.2 Pipework | 7 |
| 5.3 Bypass | 8 |
| 5.4 Foundation | 8 |
| 5.5 Vibration dampening | 8 |
| 6. Electrical connections | 8 |
| 6.1 Frequency converter operation | 9 |
| 7. Start-up | 9 |
| 7.1 Priming | 9 |
| 7.2 Checking the direction of rotation | 9 |
| 7.3 Starting | 10 |
| 7.4 Frequency of starts and stops | 10 |
| 8. Maintenance | 10 |
| 8.1 Pump | 10 |
| 8.2 Motor | 10 |
| 9. Frost protection | 10 |
| 10. Fault finding chart | 11 |
| 11. Service | 12 |
| 12. Disposal | 12 |



Before beginning installation procedures, these installation and operating instructions should be studied carefully. The installation and operation should also be in accordance with local regulations and accepted codes of good practice.

These instructions apply to TP pumps fitted with Grundfos motors, type MMG. If the pump is fitted with a motor make other than Grundfos, please note that the motor data may differ from the data stated in these instructions.

1. Versions

The TP pumps described in these instructions are available in two versions:

- PN 10 (10 bar) and
- PN 25 (25 bar).

See nameplates in fig. 1 and 2.

Fig. 1

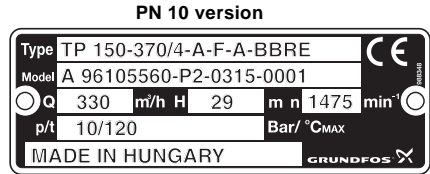
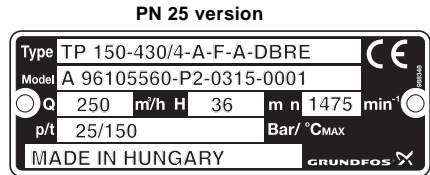


Fig. 2



2. Delivery and handling

2.1 Delivery

The pump is delivered from the factory in a carton with a wooden bottom, which is specially designed for transport by fork-lift truck or a similar vehicle.

Pumps in PN 10 version are supplied mounted on base plate.

On pumps in PN 25 version the pump flanges are designed to support the entire pump.

2.2 Handling



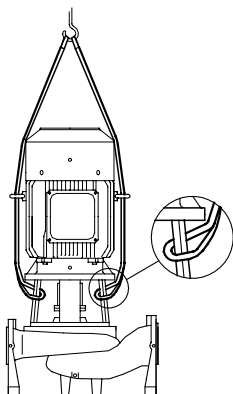
The lifting eyes fitted to the motor can be used for lifting the pump head (motor, motor stool and impeller). The lifting eyes **must not** be used for lifting the entire pump.

TM00 7019 2303

TM00 7020 2303

The pump should be lifted by means of nylon straps and shackles, see fig. 3.

Fig. 3



TM02 6991 2203

3. Applications

Grundfos single-stage in-line centrifugal pumps, type TP, are typically used for

- circulation in heating systems, including district heating
- circulation in ventilating and air-conditioning systems
- circulation and transfer in cooling systems
- distribution and pressure boosting in water supply systems
- circulation, transfer and pressure boosting in industrial systems

3.1 Pumped liquids

Thin, clean, non-aggressive and non-explosive liquids, not containing solid particles or fibres. The liquid must not attack the pump materials chemically.

When pumping liquids with a density and/or viscosity higher than that of water, motors with correspondingly higher outputs must be used, if required.

The O-rings and the mechanical shaft seal chosen must be suitable for the liquid to be pumped.

Special shaft seals may be required if the pump is used for pumping treated water at temperatures above 80°C containing additives to prevent system corrosion, calcareous deposits, etc., e.g. in heating and ventilating systems.

When fitted with the correct shaft seal, the pump can be used for pumping liquids at temperatures down to -25°C.

4. Technical data

4.1 Ambient temperature

Maximum +40°C.

4.2 Liquid temperature

See pump nameplate.

Depending on the cast-iron version and the pump application, the maximum liquid temperature may be limited by local regulations and laws.

4.3 Minimum inlet pressure

To ensure optimum pump operation, the inlet pressure (system pressure) must be adjusted correctly, see page 181.

4.4 Maximum inlet pressure

The actual inlet pressure + pressure when the pump is running against a closed valve must always be lower than the "maximum operating pressure", see pump nameplate.

4.5 Electrical data

See motor nameplate.

4.6 Sound level

See page 186.

5. Installation

5.1 Pump location

The pump should be sited in a dry, well ventilated, but frost-free position.



When pumping hot liquids, care should be taken to ensure that persons cannot accidentally come into contact with hot surfaces.

To ensure sufficient ventilation to the motor and pump, at least 0.5 metre clearance should be left above the pump.

Furthermore, it should be ensured that sufficient clearance is available to allow the use of lifting equipment when the pump/motor is to be serviced.

5.2 Pipework

Arrows on the pump housing show the direction of flow of liquid through the pump.

The pump is suitable for mounting in horizontal pipes.

Isolating valves should be fitted either side of the pump to avoid draining the system if the pump needs to be cleaned or repaired.

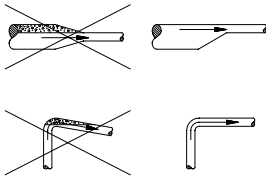
When installing the pipes, it must be ensured that the pump housing is not stressed by the pipework.

The suction and discharge pipes must be of an adequate size, taking the pump inlet pressure into account.

To avoid sediment build-up, do not fit the pump at the lowest point of the system.

Install the pipes so that air locks are avoided, especially on the suction side of the pump, see fig. 4.

Fig. 4



TM00 2263 0195

5.3 Bypass



The pump is not allowed to run against a closed discharge valve as this will cause an increase in temperature/formation of steam in the pump which may cause damage to the pump.

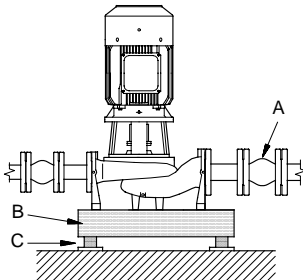
If there is any danger of the pump running against a closed discharge valve, a minimum liquid flow through the pump should be ensured by connecting a bypass/a drain to the discharge pipe. The drain can for instance be connected to a tank. A minimum flow rate equal to 10% of the flow rate at maximum efficiency is needed at all times. Flow rate and head at maximum efficiency are stated on the pump nameplate.

5.4 Foundation

Grundfos recommends to install the pump on a concrete foundation which is heavy enough to provide permanent and rigid support to the entire pump. The foundation must be capable of absorbing any vibration, normal strain or shock. As a rule of thumb, the weight of the concrete foundation should be 1.5 times the weight of the pump.

Place the pump on the foundation and fasten it, see fig. 5.

Fig. 5



- A: Expansion joint
- B: Concrete pedestal
- C: Vibration damper

TM02 6966 2003

5.5 Vibration dampening

To prevent vibrations from being transmitted to the building and pipework, it is recommended to fit expansion joints and vibration dampers, see fig. 5.

5.5.1 Expansion joints

Expansion joints provide the following functions:

- Absorption of thermal expansion and contraction of pipework caused by variations in liquid temperature.
- Reduction of mechanical influences in connection with pressure surges in the pipework.
- Isolation of structure-borne noise in the pipework (only rubber bellows expansion joints).

Note: Expansion joints must not be fitted to make up for inaccuracy in the pipework, e.g. centre displacement or misalignment of flanges.

The expansion joints should be fitted at a minimum distance of $1-1\frac{1}{2}$ x DN diameter from the pump, both on the suction and the discharge sides. This prevents turbulence in the joints, thus ensuring optimum suction conditions and minimum pressure drop on the discharge side.

At high water velocities (> 5 m/s), it is recommended to fit larger expansion joints matching the pipework.

5.5.2 Vibration dampers

To prevent vibrations from being transmitted to the building, it is recommended to isolate the pump foundation from buildings by means of vibration dampers. In order to select the right vibration damper, the following details are required:

- Forces transferred through the damper.
- Motor speed. In the case of speed control, this must also be taken into account.
- Desired dampening in % (recommended value 70%).

The selection of vibration damper differs from installation to installation. A wrong damper may in certain cases increase the vibration level. Vibration dampers should therefore be sized by the supplier.

If the pump is installed on a foundation with vibration dampers, expansion joints must be fitted on both sides of the pump. This is very important to ensure that the pump is not "hanging" from the flanges.

6. Electrical connections

The electrical connections should be carried out by an authorized electrician in accordance with local regulations.

Before removing the terminal box cover and before any removal/dismantling of the pump, make sure that the electricity supply has been switched off.



The pump must be connected to an external mains switch.

The operating voltage and frequency are marked on the nameplate. Make sure that the motor is suitable for the electricity supply on which it will be used.

The motor must be connected to a motor starter.

Motors of 3 kW and up incorporate thermistors (PTC). The thermistors are designed according to DIN 44 082. The motor starter and the thermistors must be connected in series. Consequently, the motor will not be started until it has cooled to normal temperature.

The terminal box can be turned in 30° or 45° steps, depending on pump size. Remove the bolts securing the motor to the pump. Turn the motor to the required position. Replace and tighten the bolts.

The electrical connection should be carried out as shown in the diagram inside the terminal box cover.

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

6.1 Frequency converter operation

Grundfos motors:

All three-phase Grundfos motors from frame size 90 and up can be connected to a frequency converter.

The connection of a frequency converter will often have the effect that the motor insulation system is loaded more and that the motor will be more noisy than during normal operation. In addition, large motors are loaded by bearing currents caused by the frequency converter.

In the case of frequency converter operation, the following should be considered:

- In 2- and 4-pole motors of 110 kW and up and 6-pole motors of 75 kW and up, one of the motor bearings should be electrically isolated to prevent damaging currents from passing through the motor bearings.
- In the case of noise critical applications, the motor noise can be reduced by fitting a dU/dt filter between the motor and the frequency converter. In particularly noise critical applications, it is recommended to fit a sinusoidal filter.
- The length of the cable between motor and frequency converter affects the motor load. It should therefore be checked that the cable length meets the specifications laid down by the frequency converter supplier.
- For supply voltages between 500 and 690 V, either a dU/dt filter should be fitted to reduce voltage peaks or a motor with reinforced insulation should be used.
- For supply voltages of 690 V, a motor with reinforced insulation should be used and a dU/dt filter should be fitted.

Other motor makes than Grundfos:

Please contact Grundfos or the motor manufacturer.

7. Start-up

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

7.1 Priming

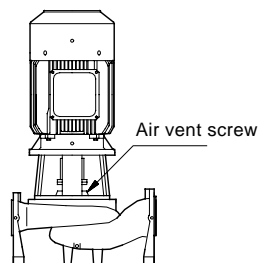
Closed systems or open systems where the liquid level is above the pump inlet:

1. Close the discharge isolating valve and loosen the air vent screw in the motor stool, see fig. 6.



Pay attention to the direction of the vent hole and take care to ensure that the escaping water does not cause injury to persons or damage to the motor or other components. In hot-water installations, special attention should be paid to the risk of injury caused by scalding hot water.

Fig. 6



2. Slowly open the isolating valve in the suction pipe until a steady stream of liquid runs out of the vent hole.
3. Tighten the air vent screw and completely open the isolating valve(s).

Open systems where the liquid level is below the pump inlet:

The suction pipe and the pump must be filled with liquid and vented before the pump is started.

1. Close the discharge isolating valve and open the isolating valve in the suction pipe.
2. Loosen the air vent screw.
3. Remove the plug from one of the pump flanges, depending on the pump location.
4. Pour liquid through the priming port until the suction pipe and the pump are completely filled with liquid.
5. Replace the plug and tighten securely.
6. Tighten the air vent screw.

The suction pipe can to some extent be filled with liquid and vented before it is connected to the pump. A priming device can also be installed before the pump.

7.2 Checking the direction of rotation

Do not start the pump to check the direction of rotation until it has been filled with liquid.

The correct direction of rotation is indicated by arrows on the pump.

TM02 6967 2003

7.3 Starting

1. Before starting the pump, completely open the isolating valve on the suction side of the pump and leave the discharge isolating valve almost closed.
2. Start the pump.
3. Vent the pump during starting by loosening the air vent screw in the motor stool until a steady stream of liquid runs out of the vent hole, see fig. 6.



Pay attention to the direction of the vent hole and take care to ensure that the escaping water does not cause injury to persons or damage to the motor or other components.

In hot-water installations, special attention should be paid to the risk of injury caused by scalding hot water.

4. When the piping system has been filled with liquid, slowly open the discharge isolating valve until it is completely open.

Note: If the pumps are fitted with motors with outputs selected on the basis of a specific maximum flow rate, the motors may be overloaded if the differential pressure is lower than anticipated.

Measure motor current consumption and compare the result with the nominal current stated on the motor nameplate. In the event of motor overload, throttle the discharge isolating valve until the motor is no longer overloaded.

It is advisable always to check the motor current consumption during starting.

7.4 Frequency of starts and stops

The pump should not start more than 20 times per hour.

8. Maintenance



Before starting work on the pump, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on.

8.1 Pump

The pump is maintenance-free.

If the pump is to be drained for a long period of inactivity, inject a few drops of silicone oil on the shaft between the motor stool and the coupling. This will prevent the shaft seal faces from sticking.

8.2 Motor

The motor should be checked at regular intervals. It is important to keep the motor clean in order to ensure adequate ventilation. If the pump is installed in a dusty environment, the pump must be cleaned and checked regularly.

Lubrication:

The bearings of motors up to 11 kW are greased for life and require no lubrication.

The bearings of motors of 11 kW and up must be greased in accordance with the indications on the motor nameplate.

The motor should be lubricated with a lithium-based grease meeting the following specifications:

- NLGI grade 2 or 3.
- Viscosity of basic oil: 70 to 150 cSt at +40°C (~ +104°F).
- Temperature range: -30°C (~ -22°F) to +140°C (~ +284°F) during continuous operation.

9. Frost protection

Pumps which are not being used during periods of frost should be drained to avoid damage.

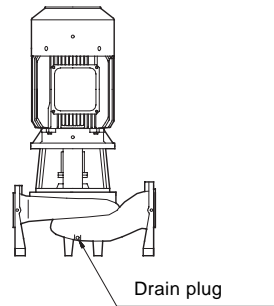
Drain the pump by loosening the air vent screw in the motor stool and by removing the drain plug from the pump housing, see fig. 7.



Care must be taken to ensure that the escaping water does not cause injury to persons or damage to the motor or other components.

In hot water installations, special attention should be paid to the risk of injury caused by scalding hot water.

Fig. 7



Do not tighten the air vent screw and replace the drain plug until the pump is to be used again.

10. Fault finding chart



Before removing the terminal box cover and before any removal/dismantling of the pump, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on.

| Fault | Cause |
|--|---|
| 1. Motor does not run when started. | <ul style="list-style-type: none"> a) Supply failure. b) Fuses blown. c) Motor starter overload has tripped out. d) Main contacts in motor starter are not making contact or the coil is faulty. e) Control circuit fuses are defective. f) Motor is defective. |
| 2. Motor starter overload trips out immediately when supply is switched on. | <ul style="list-style-type: none"> a) One fuse is blown. b) Contacts in motor starter overload are faulty. c) Cable connection is loose or faulty. d) Motor winding is defective. e) Pump mechanically blocked. f) Overload setting too low. |
| 3. Motor starter overload trips out occasionally. | <ul style="list-style-type: none"> a) Overload setting too low. b) Supply voltage periodically too low or too high. c) Differential pressure across pump too low, see section 7.3 <i>Starting</i>. |
| 4. Motor starter has not tripped out but the pump does not run. | <ul style="list-style-type: none"> a) Supply failure. b) Fuses blown. c) Main contacts in motor starter are not making contact or the coil is faulty. d) Control circuit fuses are defective. |
| 5. Pump capacity not constant. | <ul style="list-style-type: none"> a) Pump inlet pressure is too low. b) Suction pipe/pump partly blocked by impurities. c) Pump draws in air. |
| 6. Pump runs but gives no water. | <ul style="list-style-type: none"> a) Suction pipe/pump blocked by impurities. b) Foot or non-return valve blocked in closed position. c) Leakage in suction pipe. d) Air in suction pipe or pump. e) Motor rotates in the wrong direction. |
| 7. Pump runs backwards when switched off. | <ul style="list-style-type: none"> a) Leakage in suction pipe. b) Foot or non-return valve defective. c) Foot or non-return valve blocked in open or partly open position. |
| 8. Leakage in shaft seal. | <ul style="list-style-type: none"> a) Shaft seal is defective. |
| 9. Noise. | <ul style="list-style-type: none"> a) Pump is cavitating. b) Pump does not rotate freely (frictional resistance) because of incorrect pump shaft position. c) Frequency converter operation: See section 6.1 <i>Frequency converter operation</i>. d) Resonance in the installation. e) Foreign bodies in the pump. |
| 10. Pump runs constantly (applies only to pumps with automatic start/stop). | <ul style="list-style-type: none"> a) The stop pressure has been set too high. b) The water consumption is larger than anticipated. c) Leakage in discharge pipe. d) The direction of rotation of the pump is incorrect. e) Pipes, valves or strainer blocked by impurities. f) Pump controller, if fitted, is defective. |
| 11. Period of operation is too long (applies only to pumps with automatic start/stop). | <ul style="list-style-type: none"> a) The stop pressure has been set too high. b) Pipes, valves or strainer blocked by impurities. c) Pump partly blocked or furred up. d) The water consumption is larger than anticipated. e) Leakage in discharge pipe. |

11. Service



If a pump has been used for a liquid which is injurious to health or toxic, the pump will be classified as contaminated.

GB

If Grundfos is requested to service the pump, Grundfos must be contacted with details about the pumped liquid, etc. *before* the pump is returned for service. Otherwise Grundfos can refuse to accept the pump for service.

Possible costs of returning the pump are paid by the customer.

However, any application for service (no matter to whom it may be made) must include details about the pumped liquid if the pump has been used for liquids which are injurious to health or toxic.

12. Disposal

Disposal of this product or parts of it must be carried out according to the following guidelines:

1. Use the local public or private waste collection service.
2. In case such waste collection service does not exist or cannot handle the materials used in the product, please deliver the product or any hazardous materials from it to your nearest Grundfos company or service workshop.

- GB:** Inlet pressure stated in bar relative pressure (pressure gauge value measured on the suction side of the pump)
- D:** Zulaufdruck in bar Relativdruck (Manometerdruck auf der Saugseite der Pumpe gemessen)
- F:** Pression d'entrée indiquée en bar (valeur mesurée à l'aide d'un manomètre placé sur le côté aspiration de la pompe)
- I:** Pressione di aspirazione indicata in bar (valore misurato con un manometro posto sul lato aspirazione della pompa)
- E:** Presión de aspiración indicada en bar como presión relativa (valor del manómetro medido en la aspiración de la bomba)
- P:** Pressão de entrada com a pressão relativa apresentada em bar (ponto de medida na parte de aspiração da bomba)
- GR:** Πίεση αναρρόφησης σε bar σχετικής πίεσης (μετρούμενη τιμή πίεσης στην πλευρά αναρρόφησης της αντλίας)
- NL:** Inlaatdruk weergegeven in bar relatieve druk (drukopnemer waarde, gemeten aan de zuigkant van de pomp)
- S:** Tillöppstrycket angivet i bar relativt tryck (manometervärde mätt på pumpens sugside)
- SF:** Tulopaine ilmoitettu baareina on suhteellinen paine (painemittarin lukema mitattu pumpun imupuolella)
- DK:** Tilløbstrykket angivet i bar relativt tryk (manometerværdi målt på pumpens sugside)
- PL:** Ciśnienie na króćcu ssawnym pompy wyrażone w barach (mierzone manometrem na stronie ssawnej pompy)
- RU:** Давление на входе в барах (измерения производились во всасывающей части насоса)
- H:** Hozzáfolyási nyomás a szívóoldalon bar-ban, relatív nyomás értékben (szivattyú szívóoldali nyomásmérőjén jelzett érték)
- SI:** Vhodni tlak v barih relativni tlak (izmerjena vrednost na sesalni strani črpalke)
- HR:** Ulazni tlak u barima relativnog tlaka (manometarski tlak izmjeren na usisnoj strani crpke)
- YU:** Ulazni pritisak je dat u barima relativnog pritiska (manometarska vrednost merena na usisnoj strani pumpe)
- RO:** Presiunea de intrare exprimată în bar ca presiune relativă (valoarea măsurată de manometru pe partea de aspirație a pompei)
- BG:** Относително входно налягане в бар (стойност на манометъра в смукателната страна на помпата)
- CZ:** Tlak na sání vyjádřený v barech je relativní tlak (hodnota na manometru měřená na sací straně čerpadla)
- SK:** Vstupný tlak uvedený v baroch relatívneho tlaku (hodnota na manometru meraná na sacej strane čerpadla)
- TR:** Bar olarak belirtilen nispi basınç giriş basıncı (pompanın emme kısmındaki basınç ölçü değeri)

50 Hz, 4-pole, PN 10

| Pump type | p [bar] | | | | | |
|-----------------------------|---------|------|------|-------|-------|-------|
| | 20°C | 60°C | 90°C | 110°C | 120°C | 140°C |
| 50 Hz, 4-pole, PN 10 | | | | | | |
| TP 150-310/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-370/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-260/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-300/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-390/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-430/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-280/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-310/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-390/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |

60 Hz, 4-pole, PN 10

| Pump type | p [bar] | | | | | |
|-----------------------------|---------|------|------|-------|-------|-------|
| | 20°C | 60°C | 90°C | 110°C | 120°C | 140°C |
| 60 Hz, 4-pole, PN 10 | | | | | | |
| TP 150-380/4 | 0.7 | 0.9 | 1.4 | 2.2 | 2.7 | 4.4 |
| TP 150-420/4 | 0.7 | 0.9 | 1.4 | 2.2 | 2.7 | 4.4 |
| TP 150-490/4 | 0.7 | 0.9 | 1.4 | 2.1 | 2.7 | 4.4 |
| TP 150-550/4 | 0.7 | 0.9 | 1.4 | 2.1 | 2.7 | 4.4 |
| TP 200-280/4 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |
| TP 200-320/4 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |
| TP 200-350/4 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |
| TP 200-380/4 | 0.9 | 1.1 | 1.6 | 2.3 | 2.9 | 4.6 |
| TP 200-520/4 | 0.8 | 1.0 | 1.5 | 2.3 | 2.8 | 4.5 |
| TP 200-570/4 | 0.8 | 1.0 | 1.5 | 2.3 | 2.8 | 4.5 |
| TP 250-450/4 | 1.5 | 1.7 | 2.2 | 2.9 | 3.5 | 5.2 |
| TP 250-530/4 | 1.5 | 1.7 | 2.2 | 2.9 | 3.5 | 5.2 |
| TP 250-580/4 | 1.4 | 1.6 | 2.1 | 2.9 | 3.4 | 5.1 |

50 Hz, 2-pole, PN 25

| Pump type | p [bar] | | | | | |
|-----------------------------|---------|------|------|-------|-------|-------|
| | 20°C | 60°C | 90°C | 110°C | 120°C | 140°C |
| 50 Hz, 2-pole, PN 25 | | | | | | |
| TP 100-620/2 | 0.2 | 0.4 | 0.9 | 1.6 | 2.2 | 3.9 |
| TP 100-700/2 | 0.1 | 0.2 | 0.7 | 1.5 | 2.0 | 3.7 |
| TP 100-820/2 | 0.1 | 0.2 | 0.7 | 1.4 | 2.0 | 3.7 |
| TP 100-960/2 | 0.1 | 0.2 | 0.7 | 1.4 | 2.0 | 3.7 |
| TP 1001050/2 | 0.1 | 0.1 | 0.6 | 1.3 | 1.9 | 3.6 |
| TP 100-1180/2 | 0.1 | 0.2 | 0.7 | 1.5 | 2.0 | 3.7 |
| TP 100-1400/2 | 0.1 | 0.2 | 0.7 | 1.5 | 2.0 | 3.7 |
| TP 100-1530/2 | 0.1 | 0.2 | 0.7 | 1.4 | 2.0 | 3.7 |
| TP 100-1680/2 | 0.1 | 0.1 | 0.6 | 1.4 | 1.9 | 3.6 |
| TP 125-580/2 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-720/2 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-750/2 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-1060/2 | 1.6 | 1.8 | 2.3 | 3.1 | 3.6 | 5.3 |
| TP 125-1160/2 | 1.6 | 1.8 | 2.3 | 3.0 | 3.6 | 5.3 |
| TP 125-1310/2 | 1.6 | 1.8 | 2.3 | 3.0 | 3.6 | 5.3 |
| TP 125-1500/2 | 1.5 | 1.7 | 2.2 | 3.0 | 3.5 | 5.2 |
| TP 125-1670/2 | 1.5 | 1.7 | 2.2 | 2.9 | 3.5 | 5.2 |

50 Hz, 4-pole, PN 25

| Pump type | p [bar] | | | | | |
|-----------------------------|---------|------|------|-------|-------|-------|
| | 20°C | 60°C | 90°C | 110°C | 120°C | 140°C |
| 50 Hz, 4-pole, PN 25 | | | | | | |
| TP 100-170/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-220/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-260/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-270/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-320/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-380/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-420/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-150/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-210/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-240/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-280/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-320/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-370/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-430/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-170/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-220/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-230/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-240/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-270/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-320/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |

| Pump type | p [bar] | | | | | |
|-----------------------------|---------|------|------|-------|-------|-------|
| | 20°C | 60°C | 90°C | 110°C | 120°C | 140°C |
| 50 Hz, 4-pole, PN 25 | | | | | | |
| TP 150-350/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-430/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-530/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-650/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-260/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-280/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-380/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-420/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-450/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-510/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-560/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-620/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-270/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-320/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-370/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-490/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-540/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-600/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 250-660/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 300-590/4 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |
| TP 300-670/4 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |
| TP 300-750/4 | 0.3 | 0.5 | 1.0 | 1.8 | 2.3 | 4.0 |
| TP 400-470/4 | 0.1 | 0.3 | 0.8 | 1.6 | 2.1 | 3.8 |
| TP 400-510/4 | 0.1 | 0.3 | 0.8 | 1.6 | 2.1 | 3.8 |
| TP 400-540/4 | 0.1 | 0.3 | 0.8 | 1.5 | 2.1 | 3.8 |
| TP 400-670/4 | 0.6 | 0.8 | 1.3 | 2.1 | 2.6 | 4.3 |
| TP 400720/4 | 0.6 | 0.8 | 1.3 | 2.1 | 2.6 | 4.3 |
| TP 400-760/4 | 0.6 | 0.8 | 1.3 | 2.0 | 2.6 | 4.3 |
| 60 Hz, 2-pole, PN 25 | | | | | | |
| Pump type | p [bar] | | | | | |
| 60 Hz, 2-pole, PN 25 | 20°C | 60°C | 90°C | 110°C | 120°C | 140°C |
| TP 100-1000/2 | 0.5 | 0.7 | 1.2 | 1.9 | 2.5 | 4.2 |
| TP 100-1100/2 | 0.4 | 0.6 | 1.1 | 1.9 | 2.4 | 4.1 |
| TP 100-1250/2 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |
| TP 100-1350/2 | 0.3 | 0.5 | 1.0 | 1.8 | 2.3 | 4.0 |
| TP 100-1450/2 | 0.6 | 0.8 | 1.3 | 2.1 | 2.6 | 4.3 |
| TP 100-1560/2 | 0.6 | 0.8 | 1.3 | 2.0 | 2.6 | 4.3 |
| TP 100-1700/2 | 0.5 | 0.7 | 1.2 | 2.0 | 2.5 | 4.2 |
| TP 100-2100/2 | 0.5 | 0.7 | 1.2 | 1.9 | 2.5 | 4.2 |
| TP 100-2350/2 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |

60 Hz, 4-pole, PN 25

| Pump type | p [bar] | | | | | |
|----------------------|---------|------|------|-------|-------|-------|
| | 20°C | 60°C | 90°C | 110°C | 120°C | 140°C |
| 60 Hz, 4-pole, PN 25 | | | | | | |
| TP 100-210/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-250/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-330/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-360/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-420/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-450/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-530/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 100-590/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-240/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-270/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-320/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-370/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 125-350/4 | 0.1 | 0.2 | 0.7 | 1.5 | 2.0 | 3.7 |
| TP 125-440/4 | 0.1 | 0.2 | 0.7 | 1.5 | 2.0 | 3.7 |
| TP 125-500/4 | 0.1 | 0.2 | 0.7 | 1.4 | 2.0 | 3.7 |
| TP 125-570/4 | 0.1 | 0.2 | 0.7 | 1.4 | 2.0 | 3.7 |
| TP 125-620/4 | 0.1 | 0.1 | 0.6 | 1.4 | 1.9 | 3.6 |
| TP 150-330/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-370/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-450/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-490/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-710/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-800/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 150-930/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-350/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-370/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-520/4 | 0.1 | 0.1 | 0.1 | 0.8 | 1.4 | 3.1 |
| TP 200-560/4 | 0.1 | 0.1 | 0.6 | 1.3 | 1.9 | 3.6 |
| TP 200-670/4 | 0.2 | 0.4 | 0.9 | 1.7 | 2.2 | 3.9 |
| TP 200-760/4 | 0.2 | 0.4 | 0.9 | 1.6 | 2.2 | 3.9 |
| TP 200-840/4 | 0.2 | 0.4 | 0.9 | 1.6 | 2.2 | 3.9 |
| TP 200-930/4 | 0.2 | 0.4 | 0.9 | 1.6 | 2.2 | 3.9 |
| TP 250-430/4 | 0.3 | 0.5 | 1.0 | 1.7 | 2.3 | 4.0 |
| TP 250-500/4 | 0.2 | 0.4 | 0.9 | 1.7 | 2.2 | 3.9 |
| TP 250-550/4 | 0.2 | 0.4 | 0.9 | 1.7 | 2.2 | 3.9 |
| TP 250-720/4 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |
| TP 250-800/4 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |
| TP 250-910/4 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |
| TP 250-1020/4 | 0.4 | 0.6 | 1.1 | 1.8 | 2.4 | 4.1 |

Maximum sound pressure level

| Three-phase motors [kW] | 50 Hz [dB(A)] | | 60 Hz [dB(A)] | |
|----------------------------|------------------|--------|------------------|--------|
| | 2-pole | 4-pole | 2-pole | 4-pole |
| 5.5 | | 58 | | 62 |
| 7.5 | | 58 | | 62 |
| 11 | | 60 | | 64 |
| 15 | | 60 | | 64 |
| 18.5 | | 61 | | 65 |
| 22 | | 61 | | 65 |
| 30 | 69 | 62 | | 66 |
| 37 | 69 | 65 | | 69 |
| 45 | 72 | 65 | | 69 |
| 55 | 74 | 65 | 78 | 69 |
| 75 | 76 | 69 | 80 | 73 |
| 90 | 76 | 69 | 80 | 73 |
| 110 | 78 | 70 | 82 | 74 |
| 132 | 78 | 70 | 82 | 74 |
| 160 | 78 | 70 | 82 | 74 |
| 200 | 78 | 70 | 82 | 74 |
| 250 | 82 | 73 | 86 | 77 |
| 315 | | 73 | | 77 |
| 355 | | 75 | | |
| 400 | | 75 | | |
| 500 | | 75 | | |
| 560 | | 78 | | |
| 630 | | 78 | | |

| | |
|--------------------------------------|------------|
| 96511031 0505 | 177 |
| Repl. 96511031 0603 96511032 0603 | |