

SEN

Installation and operating instructions

GB D F I E P GR NL S FIN DK
PL RU SI HR YU BG CZ SK



(GB) Declaration of Conformity

We **Grundfos** declare under our sole responsibility that the products **SEN, 1,0 - 21 kW**, 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 61000-6-2 and EN 61000-6-3.
- Electrical equipment designed for use within certain voltage limits (73/23/EEC) [95].
Standards used: EN 60335-1: 1994 and EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Standards used: EN 50014, EN 50018, EN 13463-1 and pr EN 13463-5.

(F) Déclaration de Conformité

Nous **Grundfos** déclarons sous notre seule responsabilité que les produits **SEN, 1,0 - 21 kW** 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 61000-6-2 et EN 61000-6-3.
- Matériel électrique destiné à employer dans certaines limites de tension (73/23/CEE) [95].
Standards utilisés: EN 60335-1: 1994 et EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Standards utilisés: EN 50014, EN 50018, EN 13463-1 et pr EN 13463-5.

(E) Declaración de Conformidad

Nosotros **Grundfos** declaramos bajo nuestra única responsabilidad que los productos **SEN, 1,0 - 21 kW** 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 61000-6-2 y EN 61000-6-3.
- Material eléctrico destinado a utilizarse con determinadas límites de tensión (73/23/CEE) [95].
Normas aplicadas: EN 60335-1: 1994 y EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Normas aplicadas: EN 50014, EN 50018, EN 13463-1 y pr EN 13463-5.

(GR) Δήλωση Συμμόρφωσης

Εμείς η **Grundfos** δηλώνουμε με αποκλειστικά δική μας ευθύνη ότι τα προϊόντα **SEN, 1,0 - 21 kW** συμμορφώνονται με την Οδηγία του Συμβουλίου επί της σύγκλισης των νόμων των Κρατών Μελών της Ευρωπαϊκής Ένωσης σε σχέση με τα

- Μηχανήματα (98/37/EC).
Πρότυπο που χρησιμοποιήθηκε: EN ISO 12100.
- Ηλεκτρομαγνητική συμβατότητα (89/336/EEC).
Πρότυπα που χρησιμοποιήθηκαν: EN 61000-6-2 και EN 61000-6-3.
- Ηλεκτρικές συσκευές σχεδιασμένες για χρήση εντός ορισμένων ορίων ηλεκτρικής τάσης (73/23/EEC) [95].
Πρότυπα που χρησιμοποιήθηκαν: EN 60335-1: 1994 και EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Πρότυπα που χρησιμοποιήθηκαν: EN 50014, EN 50018, EN 13463-1 και pr EN 13463-5.

(S) Försäkran om överensstämmelse

Vi **Grundfos** försäkrar under ansvar, att produkterna **SEN, 1,0 - 21 kW**, 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 61000-6-2 och EN 61000-6-3.
- Elektrisk material avsedd för användning inom vissa spänningsgränser (73/23/EC) [95].
Använda standarder: EN 60335-1: 1994 och EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Använda standarder: EN 50014, EN 50018, EN 13463-1 och pr EN 13463-5.

(D) Konformitätserklärung

Wir **Grundfos** erklären in alleiniger Verantwortung, dass die Produkte **SEN, 1,0 - 21 kW**, 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/EWG).
Normen, die verwendet wurden: EN 61000-6-2 und EN 61000-6-3.
- Elektrische Betriebsmittel zur Verwendung innerhalb bestimmter Spannungsgrenzen (73/23/EWG) [95].
Normen, die verwendet wurden: EN 60335-1: 1994 und EN 60335-2-41: 1996.
- ATEX 94/9/EG.
Normen, die verwendet wurden: EN 50014, EN 50018, EN 13463-1 und pr EN 13463-5.

(I) Dichiarazione di Conformità

Noi **Grundfos** dichiariamo sotto la nostra esclusiva responsabilità che i prodotti **SEN, 1,0 - 21 kW**, ai quali questa dichiarazione si 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 61000-6-2 e EN 61000-6-3.
- Materiale elettrico destinato ad essere utilizzato entro certi limiti di tensione (73/23/CEE) [95].
Standard usati: EN 60335-1: 1994 e EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Norme di riferimento: EN 50014, EN 50018, EN 13463-1 e pr EN 13463-5.

(P) Declaração de Conformidade

Nós **Grundfos** declaramos sob nossa única responsabilidade que os produtos **SEN, 1,0 - 21 kW** aos quais se refere esta declaração estão em conformidade com as Directivas 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 electromagnética (89/336/CEE).
Normas utilizadas: EN 61000-6-2 e EN 61000-6-3.
- Material eléctrico destinado a ser utilizado dentro de certos limites de tensão (73/23/CEE) [95].
Normas utilizadas: EN 60335-1: 1994 e EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Normas utilizadas: EN 50014, EN 50018, EN 13463-1 e pr EN 13463-5.

(NL) Overeenkomstigheidsverklaring

Wij **Grundfos** verklaren geheel onder eigen verantwoordelijkheid dat de producten **SEN, 1,0 - 21 kW** waarop 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 61000-6-2 en EN 61000-6-3.
- Elektrisch materiaal bestemd voor gebruik binnen bepaalde spanningsgrenzen (73/23/EEG) [95].
Normen: EN 60335-1: 1994 en EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Normen: EN 50014, EN 50018, EN 13463-1 en pr EN 13463-5.

(FIN) Vastaavuusvakuutus

Me **Grundfos** vakuutamme yksin vastuullisesti, että tuotteet **SEN, 1,0 - 21 kW**, jota tämä vakuutus koskee, noudattavat direktiivejä jotka käsittelevät EY:n jäsenvaltioiden koneellisia laitteita koskevien lakien yhdenmukaisuutta seur.:

- Koneet (98/37/EY).
Käytetty standardi: EN ISO 12100.
- Elektromagneettinen vastaavuus (89/336/EY).
Käytetyt standardit: EN 61000-6-2 ja EN 61000-6-3.
- Määrättyjen jänniterajoitusten puitteissa käytettävät sähköiset laitteet (73/23/EY) [95].
Käytetyt standardit: EN 60335-1: 1994 ja EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Käytetyt standardit: EN 50014, EN 50018, EN 13463-1 ja pr EN 13463-5.

DK Overensstemmelseserklæring

Vi **Grundfos** erklærer under ansvar, at produkterne **SEN, 1,0 - 21 kW**, som denne erklæring omhandler, er i overensstemmelse med Rådets direktiver om indbyrdes tilnærmelse til EF medlemsstaternes lovgivning om

- Maskiner (98/37/EF).
Anvendt standard: EN ISO 12100.
- Elektromagnetisk kompatibilitet (89/336/EØF).
Anvendte standarder: EN 61000-6-2 og EN 61000-6-3.
- Elektrisk materiel bestemt til anvendelse inden for visse spændingsgrænser (73/23/EØF) [95].
Anvendte standarder: EN 60335-1: 1994 og EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Anvendte standarder: EN 50014, EN 50018, EN 13463-1 og pr EN 13463-5.

RU Свидетельство о соответствии требованиям

Мы, фирма **Grundfos**, со всей ответственностью заявляем, что изделия **SEN, 1,0 - 21 кВт**, к которым и относится данное свидетельство, отвечают требованиям следующих указаний Совета ЕС об унификации законодательных предписаний стран-членов ЕС:

- Машиностроение (98/37/EC).
Применявшиеся стандарты: Евростандарт EN ISO 12100.
- Электромагнитная совместимость (89/336/ЕЭС).
Применявшиеся стандарты: Евростандарт EN 61000-6-2 и EN 61000-6-3.
- Электрические машины для эксплуатации в пределах определенного диапазона значений напряжения (73/23/ЕЭС) [95].
Применявшиеся стандарты: Евростандарт EN 60335-1: 1994 и EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Применявшиеся стандарты: EN 50014, EN 50018, EN 13463-1 и pr EN 13463-5.

HR Izjava o usklađenosti

Mi, **Grundfos**, izjavljujemo uz punu odgovornost, da su proizvodi **SEN, 1,0 - 21 kW**, na koje se ova izjava odnosi, sukladni smjernicama Savjeta za prilagodbu propisa država-članica EZ:

- Strojevi (98/37/EZ).
Korištena norma: EN ISO 12100.
- Elektromagnetska kompatibilnost (89/336/EEZ).
Korištene norme: EN 61000-6-2 i EN 61000-6-3.
- Električni pogonski uređaji za korištenje unutar određenih granica napona (73/23/EEZ) [95].
Korištene norme: EN 60335-1: 1994 i EN 60335-2-41: 1996.
- ATEX 94/9/EZ.
Korištene norme: EN 50014, EN 50018, EN 13463-1 i pr EN 13463-5.

BG Декларация за съответствие

Ние, фирма **Grundfos** заявяваме с пълна отговорност, че продуктите **SEN, 1,0 - 21 kW**, за които се отнася настоящата декларация, отговарят на следните указания на Съвета за уеднаквяване на правните разпоредби на държавите членки на ЕС:

- Машини (98/37/EO).
Приложена норма: EN ISO 12100.
- Електромагнетична поносимост (89/336/ЕИО).
Приложени норми: EN 61000-6-2 и EN 61000-6-3.
- Електрически машини и съоръжения за употреба в рамките на определени граници на напрежение на електрически ток (73/23/ЕИО) [95].
Приложени норми: EN 60335-1: 1994 и EN 60335-2-41: 1996.
- ATEX 94/9/EO.
Приложени норми: EN 50014, EN 50018, EN 13463-1 и pr EN 13463-5.

SK Prehlásenie o konformite

My firma **Grundfos**, na svoju plnú zodpovednosť prehlasujeme, že výrobky **SEN, 1,0 - 21 kW**, na ktoré sa toto prehlásenie vzťahuje, sú v súlade s nasledovnými smernicami Rady pro zblíženie právnych predpisov členských zemí Európskej únie:

- Stroje (98/37/EG),
Použitá norma: EN ISO 12100.
- Elektromagnetická kompatibilita (89/336/EWG),
Použité normy: EN 61000-6-2 a EN 61000-6-3.
- Elektrické prevádzkové prostriedky, použité v určitom napäťovom rozsahu (73/23/EWG) [95],
Použité normy: EN 60335-1: 1994 a EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Použité normy: EN 50014, EN 50018, EN 13463-1 a pr EN 13463-5.

PL Deklaracja zgodności

My, **Grundfos**, oświadczamy z pełną odpowiedzialnością, że nasze wyroby **SEN, 1,0 - 21 kW**, 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/EWG),
zastosowane normy: EN 61000-6-2 i EN 61000-6-3.
- wyposażenie elektryczne do stosowania w określonym zakresie napięć (73/23/EWG) [95],
zastosowane normy: EN 60335-1: 1994 i EN 60335-2-41: 1996.
- ATEX 94/9/EG.
Zastosowane normy: EN 50014, EN 50018, EN 13463-1 i pr EN 13463-5.

SI Izjava o ustreznosti

Mi, **Grundfos**, pod polno odgovornostjo izjavljamo, da so izdelki **SEN, 1,0 - 21 kW**, na katere se ta izjava nanaša, v skladu z naslednjimi smernicami Sveta za uskladitev pravnih predpisov držav članic Evropske skupnosti:

- Stroji (98/37/EG).
Uporabljen norma: EN ISO 12100.
- Elektromagnetna kompatibilnost (89/336/EWG).
Uporabljeni normi: EN 61000-6-2 in EN 61000-6-3.
- Električna pogonska sredstva za uporabo v določenih napetostnih mejah (73/23/EWG) [95].
Uporabljeni normi: EN 60335-1: 1994 in EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Uporabljen standarda: EN 50014, EN 50018, EN 13463-1 in pr EN 13463-5.

YU Izjava o konformitetu

Mi, **Grundfos**, izjavljujemo pod potpunom odgovornošću da su proizvodi **SEN, 1,0 - 21 kW** 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 61000-6-2 i EN 61000-6-3.
- električna oprema razvijena za korišćenje unutar određenih naponskih granica: (73/23/EWG) [95],
korišćeni standardi: EN 60335-1: 1994 i EN 60335-2-41: 1996.
- ATEX 94/9/EG.
Korišćeni standardi: EN 50014, EN 50018, EN 13463-1 i pr EN 13463-5.

CZ Prohlášení o konformitě

My firma **Grundfos** prohlašujeme na svou plnou odpovědnost, že výrobky **SEN, 1,0 - 21 kW**, na něž se toto prohlášení vztahuje, jsou v souladu s ustanoveními směrnice Rady pro sblížení právních předpisů členských států Evropského společenství v oblastech:

- strojírenství (98/37/EG),
použitá norma: EN ISO 12100.
- elektromagnetická kompatibilita (89/336/EWG),
použité normy: EN 61000-6-2 a EN 61000-6-3.
- provozování spotřebičů v toleranci napětí (73/23/EWG) [95],
použité normy: EN 60335-1: 1994 a EN 60335-2-41: 1996.
- ATEX 94/9/EC.
Použité normy: EN 50014, EN 50018, EN 13463-1 a pr EN 13463-5.

Bjerringbro, 25th October 2005



Jan Strandgaard
Technical Director

SEN

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Prior to installation, read these installation and operating instructions. Installation and operation must comply with local regulations and accepted codes of good practice.

1. General description

This booklet includes instructions for installation, operation and maintenance of Grundfos submersible wastewater pumps, type SEN, fitted with motors of 1.0 to 21 kW.

The booklet also includes specific instructions for the explosion-proof pumps.

1.1 Applications

The SEN pumps are designed for the pumping of wastewater in a wide range of municipal, private and industrial applications in aggressive environments.

Depending on version, the pumps can be used for submerged or dry installation.

Maximum solids size: 80 mm or 100 mm.

1.1.1 Potentially explosive environments

In potentially explosive environments, the explosion-proof SEN pumps must be used, see sections *1.5.1 Ex certification and classification* and *7.3 Explosion-proof pumps*.

Note: The explosion classification of the pump is EEx dIIB T3 or EEx dIIB T4. The installation must in each individual case be approved by the local fire-fighting authorities.

1.2 Operating conditions

1.2.1 pH value

All pumps can be used for pumping liquids with a pH value between 2 and 14.

1.2.2 Liquid temperature

0°C to +40°C.

1.2.3 Ambient temperature

-20°C to +40°C.

1.2.4 Density and viscosity of pumped liquid

Maximum density: 1000 kg/m³.

Maximum kinematic viscosity: 1 mm²/s (1 cSt).

Note: When pumping liquids with a density and/or a kinematic viscosity higher than the values stated above, motors with correspondingly higher outputs must be used.

1.2.5 Level of pumped liquid

In the case of submerged pump installation, the lowest stop level must always be above the pump housing.



The pump must always be filled with the liquid to be pumped.

An additional level switch must be installed to ensure that the pump is stopped in case the stop level switch is not operating.

To ensure adequate cooling of the motor during operation, the following minimum requirements must be met:

- **Pumps without cooling jacket, motor sizes 1.0 to 4.5 kW, and pumps with cooling jacket, motor sizes 5.5 to 21 kW:**
No special requirements.
- **Pumps without cooling jacket, motor sizes 5.5 to 21 kW, in submerged installation:**
The pump must always be covered by the pumped liquid to the middle of the motor.

1.2.6 Operating mode

The pumps are designed for continuous operation or for intermittent operation with the maximum number of starts per hour stated in the table below:

Motor size	Starts per hour
1.0 - 4.5 kW	25
5.5 - 21.0 kW	20

1.2.7 Enclosure class

IEC IP 68.

1.3 Sound pressure level

The sound pressure level of the pump is lower than the limiting values stated in the EC Council Directive 98/37/EC relating to machinery.

1.4 Type key

Example SEN1.100.100.130.D.Ex.4.511.Q	SE	N	1	.100	.100	.130	.D	.Ex	4	.511	Q
Pump range											
N = Stainless steel											
Impeller type											
1 = Figures indicate channel impellers and the number indicates the number of channels											
V = SuperVortex											
Maximum solids size [mm]											
Nominal diameter of discharge port [mm]											
Motor power output $P_2 / 100$ [W]											
Installation											
Blank = Without cooling jacket											
D = With cooling jacket											
Version											
Blank = Non-explosion-proof											
Ex = Explosion-proof motor											
A = In conformity with the ATEX directive											
Number of poles											
Number of phases											
Blank = 3 phases											
Frequency, voltage and starting method											
511 = 50 Hz, 400 V, star-delta starting. The first digit indicates the frequency and the next two digits indicate the voltage and starting method.											
5 = 50 Hz											
01 = 400 V, direct-on-line starting											
11 = 400 V, star-delta starting											
Generation											
Blank = First generation (A)											
B = Second generation											
C = Third generation, etc.											
Pump materials											
R = Pump and motor of stainless steel, DIN W.-Nr. 1.4408											
S = Hydraulic parts of stainless steel, DIN W.-Nr. 1.4408											
Q = Cast-iron pump with stainless steel impeller, DIN W.-Nr. 1.4408											

1.5 Nameplates

All pumps can be identified by means of the nameplate on the motor top cover, see fig. 1. If the nameplate is missing or damaged, the pump can be identified by the serial number stamped under the nameplate.

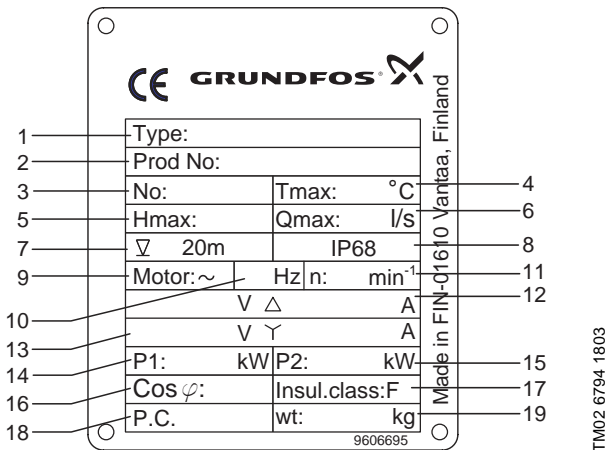


Fig. 1

Pos.	Description
1	Type designation
2	SAP code
3	Serial number
4	Maximum liquid temperature
5	Maximum head
6	Maximum flow
7	Maximum installation depth
8	Enclosure class
9	Number of phases
10	Frequency
11	Rated speed
12	Voltage/current, delta connection
13	Voltage/current, star connection
14	Power input
15	Shaft power
16	Power factor
17	Insulation class
18	Production code, year/week
19	Weight of the pump

1.5.1 Ex certification and classification

Explosion-proof pumps have been approved by Baseefa (2001) Ltd. in conformity with the essential health and safety requirements relating to the design and construction of equipment intended for use in potentially explosive atmospheres given in Annex II to the Council Directive 94/9/EC (ATEX).

The certified pumps (Ex-pumps) are supplied with an approval plate fixed in the visible place close to the nameplate.

Fig. 2 shows the approval plates for the pumps equipped optionally with the motors classified to T3 or T4 temperature class.

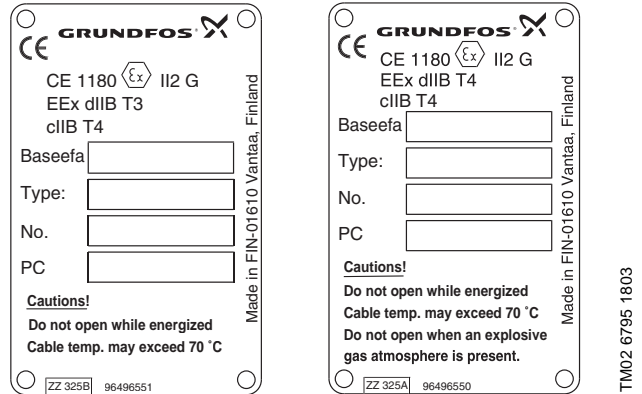


Fig. 2

The approval plate gives the following details:

- CE CE mark.
- 1180 Number of Quality Assurance notified body.
- Ex EU ex-symbol.
- II Equipment group (II = non-mining).
- 2 Equipment category (high protection).
- G Type of explosive atmosphere.
- EEx Motor explosion-proof according to European standard.
- d Motor withstands explosion pressure.
- IIB Gas Group.
- T3 Maximum surface temperature of the motor is 200°C.
- T4 Maximum surface temperature of the motor is 135°C.
- c Constructional safety.
- Baseefa Certificate number.
- No. HA.
- PC Production code.

2. Safety



Pump installation in pits must be carried out by specially trained persons.



Persons should not enter the installation area when an explosive atmosphere is present.

For safety reasons, all work in pits must be supervised by a person outside the pump pit.

Pits for submersible wastewater pumps contain wastewater with toxic and/or disease-causing substances. Therefore, all persons involved must wear appropriate personal protective equipment and clothing and all work on and near the pump must be carried out under strict observance of the hygiene regulations in force.

3. Transportation and storage

The pump is supplied from the factory in proper packing in which it should remain until it is to be installed.

Make sure that the pump cannot roll or fall over.

All lifting equipment must be rated for the purpose and checked for damages before any attempts are made to lift the pump.

The lifting equipment rating must under no circumstances be exceeded. The pump weight is stated on the pump nameplate.



Always lift the pump by its lifting bracket or by means of a fork-lift truck, **never** by means of the motor cable or the hose/pipe.

Note: Do not remove the protection from the free end of the supply cable until the electrical connections are to be made. The free cable end must never be exposed to moisture or water, whether it is protected or not. Non-compliance may involve the risk of damage to the motor.

For long periods of storage, the pump must be protected against moisture and heat.

Storage temperature: -30°C to $+60^{\circ}\text{C}$.

After a long period of storage, the pump should be inspected before it is put into operation. Make sure that the impeller can rotate freely. Pay special attention to the condition of the shaft seals and the cable entry.

4. Installation

The loose nameplate supplied with the pump should be fixed at the installation site.

All safety regulations must be observed at the installation site, e.g. the use of blowers for fresh-air supply to the pit.



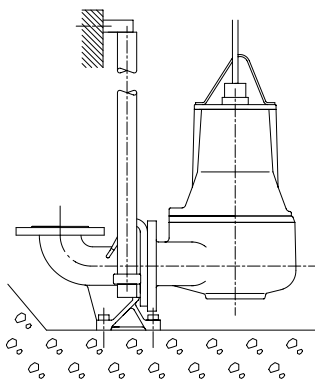
Do not put your hands or any tool into the pump suction or discharge port after the pump has been connected to the electricity supply, unless the pump has been switched off by removing the fuses or switching off the mains switch. It must be ensured that the electricity supply cannot be accidentally switched on.

Prior to installation, check the oil level in the oil chamber, see section 7.1 *Oil check and oil change*.

The SEN pumps are designed for various installation types.

Figures 3 to 6 show the possible installation types.

Submerged installation on auto-coupling

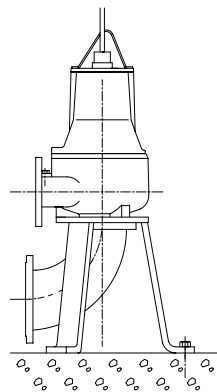


TM02 2399 4201

Permanent installation in pit. The pump can easily be pulled out and lowered into the pit by means of the guide rails.

Fig. 3

Vertical dry installation with base stand

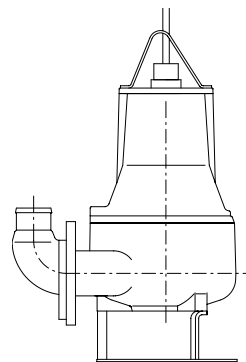


TM02 2400 4201

Permanent installation in a pump room. The pump is bolted to the suction and discharge pipes by means of flange connections.

Fig. 4

Submerged installation, portable

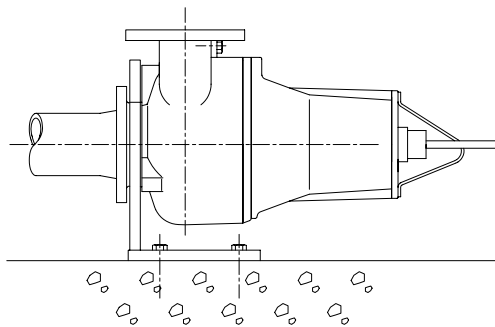


TM02 2401 4201

For portable use in pit or temporary installation.

Fig. 5

Horizontal dry installation with base stand and bracket



TM02 2402 4201

Permanent installation in a pump room. The pump is bolted to the suction and discharge pipes by means of flange connections.

Fig. 6

4.1 Submerged installation on auto-coupling

Pumps for permanent installation can be installed on a stationary auto-coupling and operated completely or partially submerged in the pumped liquid.

1. Drill mounting holes for the guide rail bracket on the inside of the pit and fasten the guide rail bracket provisionally with two screws.
2. Place the auto-coupling base unit on the bottom of the pit. Use a plumb line to establish the correct positioning. Fasten the auto-coupling with expansion bolts. If the bottom of the pit is uneven, the auto-coupling base unit must be supported so that it is level when being fastened.
3. Assemble the discharge pipe in accordance with the generally accepted procedures and without exposing the pipe to distortion or tension.
4. Insert the guide rails into the rings of the auto-coupling base unit and adjust the length of the rails accurately to the guide rail bracket at the top of the pit.
5. Unscrew the provisionally fastened guide rail bracket. Insert the expansion dowels into the guide rails. Fasten the guide rail bracket on the inside of the pit. Tighten the bolts in the expansion dowels.
6. Clean out debris from the pit before lowering the pump into the pit.
7. Fit the guide claw with profile seal to the pump.
8. Slide the guide claw of the pump between the guide rails and lower the pump into the pit by means of a chain secured to the lifting bracket of the pump. When the pump reaches the auto-coupling base unit, the pump will automatically connect tightly.
9. Hang up the end of the chain on a suitable hook at the top of the pit and in such a way that the chain cannot come into contact with the pump housing.
10. Adjust the length of the motor cable by coiling it up on a relief fitting to ensure that the cable is not damaged during operation. Fasten the relief fitting to a suitable hook at the top of the pit. Make sure that the cables are not sharply bent or pinched.
11. Connect the motor cable and the monitoring cable, if any.

Note: The end of the cable must not be submerged, as water may penetrate through the cable into the motor.

4.2 Dry installation

Pumps in dry installation are installed permanently in a pump room.

The pump motor is enclosed and watertight and will not be damaged if the installation site is flooded with water.

1. Mark and drill mounting holes in the concrete floor.
2. Fit the bracket or base stand to the pump.
3. Fasten the pump with expansion bolts.
4. Check that the pump is vertical/horizontal.

In order to facilitate service on the pump, isolating valves should be fitted on either side of the pump.

5. Fit the suction and discharge pipes and isolating valves, if used, and ensure that the pump is not stressed by the pipe-work.
6. Adjust the length of the motor cable by coiling it up on a relief fitting to ensure that the cable is not damaged during operation. Fasten the relief fitting to a suitable hook. Make sure that the cables are not sharply bent or pinched.
7. Connect the motor cable and the monitoring cable, if any.

Note: It is recommended to use a reducer between the suction pipe and the pump in horizontal installations. The reducer must be of the eccentric type and must be installed so that the straight edge is pointing upwards. In this way, the accumulation of air in the suction pipe is avoided and the risk of disturbance of operation is eliminated, see fig. 7.

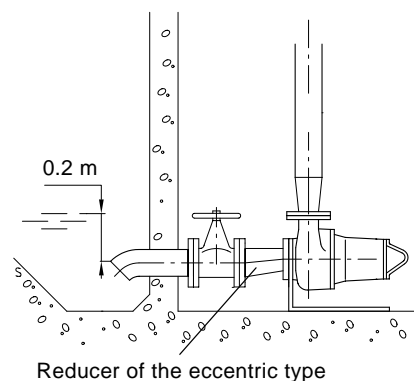


Fig. 7

4.3 Submerged installation, portable

1. Fit the ring stand to the pump suction flange.
2. Fit a 90° elbow to the pump discharge port and connect the discharge pipe/hose.

If a hose is used, make sure that the hose does not buckle and that the inside diameter matches that of the discharge port.

3. Lower the pump into the liquid by means of a chain secured to the lifting bracket of the pump. It is recommended to place the pump on a plane, solid foundation. Make sure that the pump is hanging from the chain and **not** the cable.
4. Hang up the end of the chain on a suitable hook at the top of the pit and in such a way that the chain cannot come into contact with the pump housing.
5. Adjust the length of the motor cable by coiling it up on a relief fitting to ensure that the cable is not damaged during operation. Fasten the relief fitting to a suitable hook. Make sure that the cables are not sharply bent or pinched.
6. Connect the motor cable and the monitoring cable, if any.

4.4 Pump controller

The SEN pumps can be connected to a separate Grundfos pump controller for level control, which is available as an accessory:

- type LC for one-pump installations and
- type LCD for two-pump installations.

Depending on application, different types of level control equipment can be used.

The **LC** controller is fitted with two or three level switches:

Two for start and stop of pump. The third level switch, which is optional, is for high-level alarm.

The **LCD** controller is fitted with three or four level switches:

One for common stop and two for start of the pumps. The fourth level switch, which is optional, is for high-level alarm.

When installing the level switches, the following points should be observed:

1. To prevent air intake and vibrations in submerged pumps, the **stop level switch** must be fitted in such a way that the pump is stopped before the liquid level is lowered below the top of the pump housing.
As a principal rule for pumps in dry installation, the lowest stop level must be at least 20 cm above the opening of the suction pipe, see fig. 7.
2. The **start level switch** should be installed in such a way that the pump is started at the required level; however, the pump must always be started before the liquid level reaches the bottom inlet pipe to the pit.
3. The **high-level alarm switch**, if installed, should always be installed about 10 cm above the start level switch; however, alarm must always be given before the liquid level reaches the inlet pipe to the pit.

Note: The pump controller must not be installed in potentially explosive environments.



Pumps installed in potentially explosive atmosphere must always be filled with the liquid to be pumped. An additional level switch must be installed to ensure that the pump is stopped in case the stop level switch is not operating.

4.5 Thermal switches

Three bimetallic thermal switches are built into the stator windings, and a contact will open in case of overtemperature, i.e. 150°C.

The supply voltage to the thermal switches must be 12-230 VAC. The thermal switches are connected to the monitoring cable, see section 5. *Electrical connection*, and must be connected to the safety circuit of the separate pump controller.

Note: The motor starter of the pump controller must include a circuit which automatically disconnects the electricity supply in case the protective circuit for the pump is opened.



The installer/user should provide an automatic device which disconnects the electricity supply in case the thermal switches or the moisture switches are not operating.

4.6 Moisture switches

Non-explosion-proof pumps have one moisture switch, which is fitted in the chamber below the motor top cover.

Explosion-proof pumps have two moisture switches connected in series, which are fitted in the chamber below the motor top cover.

The moisture switch is non-reversing and must be replaced after use.

The moisture switches are connected in series with the thermal switches and connected to the monitoring cable, see section 5. *Electrical connection*, and must be connected to the safety circuit of the separate pump controller.

Note: The motor starter of the pump controller must include a circuit which automatically disconnects the electricity supply in case the protective circuit for the pump is opened.

4.7 OCT1 water-in-oil sensor

The OCT1 water-in-oil sensor is available as an accessory for pumps with motor sizes of 5.5 to 21 kW.

The sensor measures the water content in the oil chamber.

The sensor consists of a plate capacitor which is immersed in the oil and measures the electronic circuit, emitting a 4-20 mA proportional current signal. Connect the OCT1 sensor as shown in fig. 8.

4.7.1 Fitting the OCT1 sensor

The OCT1 sensor is to be fitted in the filling hole of the oil chamber instead of the oil screw.

1. Remove the oil screw.
2. Push the sensor into the oil filling hole.
3. Push the sensor to a suitable depth in the oil chamber without letting it touch the rotating parts, but so deep that the sensor is completely covered by the oil. Recommended inserting depths for different pump types appear from the table below.
4. Screw the bush into the thread for the oil screw.

Note: Before refitting after oil change, the OCT1 sensor must be cleaned with white spirit (mineral turpentine).

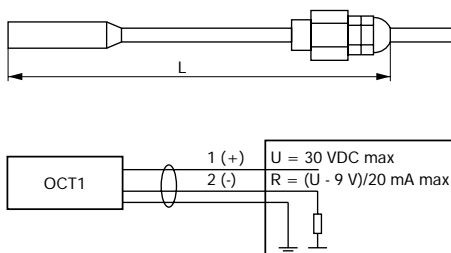


Fig. 8

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Motor size	Inserting depths L [mm]
5.5 - 12.5 kW	80
13.5 - 21 kW	90

Technical specifications

Measuring range	20-100 pF.
Sensor capacitance in air	9 pF.
Measuring range for water content	0-60% corresponding to 4-20 mA.
Temperature range	0-70°C.
Supply voltage	0-30 VDC max. 23 mA.
Material, supply cable	Polyurethane.

Ex approval

EEx ia IIB T4, $U_i = 34$ V, $l_i = 100$ m, $C_i = 220$ nF, $L_i < 1$ uH. In potentially explosive environments, the sensor must be connected via an approved Exi separator.

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5. Electrical connection

The electrical connection should be carried out in accordance with local regulations.

The supply voltage and frequency are marked on the pump nameplate.

The voltage tolerance must be within $\pm 10\%$ of the rated voltage.

Make sure that the motor is suitable for the electricity supply available at the installation site.



The pump must be connected to an external mains switch with a contact separation of at least 3 mm in each pole.

The pump must be connected to a motor starter.

The wiring diagrams for direct-on-line starting and star-delta starting are shown in fig. 9 and fig. 10, respectively.

P1 and P2 are connected in series with the thermal switches and the moisture switches.

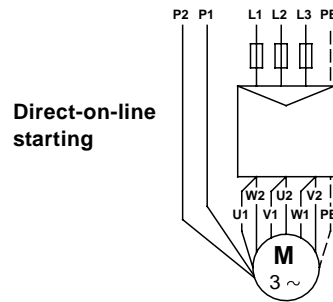


Fig. 9

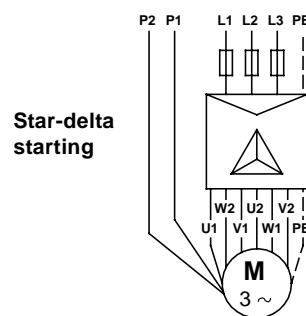


Fig. 10

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The top cover of explosion-proof pumps is provided with an external earth terminal to ensure the connection to earth. The electrical installation must include an external connection from this terminal to earth. The earth wire must fulfil all electrical safety regulations in force.

Cross section of phase wire (S) of the installation [mm ²]	Minimum cross section of earth wire [mm ²]
$S \leq 16$	S
$16 < S \leq 35$	16
$S > 35$	$0.5 * S$, max. 70



Before installation and the first start-up of the pump, the cable condition should be checked visually to avoid short circuits.

6. Start-up



Before manual starting or changeover to automatic control, make sure that no persons are working on or near the pump.

Proceed as follows:

1. Remove the fuses or switch off the mains switch.
2. Check the oil level in the oil chamber. See section 7.1 *Oil check and oil change*.
3. Check whether the impeller can rotate freely.
4. Check whether the monitoring units, if used, are operating satisfactorily.
5. Make sure that the pump is submerged in the liquid.
For pumps in dry installation, it must be ensured that there is liquid in the pit.



Make sure that the pump has been filled with the liquid to be pumped.

Pumps in dry installation must be vented by means of the vent plug in the pump housing.

6. Open the isolating valves, if fitted.
7. Check whether the system has been filled with liquid and vented.
8. Check the setting of the level switches.
9. Start the pump and check the pump operation for abnormal noise or vibrations.

Note: In case of abnormal noise or vibrations from the pump or other pump or supply failures, stop the pump immediately. Do not attempt to restart the pump before the cause of the fault has been found and the fault corrected.

10. After start-up, the actual pump duty point must be established as accurately as possible so that it can be checked whether the operating conditions are as desired.

Note: The pump may be started for a very short period without being submerged for checking of direction of rotation.

The operation of the pump should always take place in accordance with established routines with scheduled checks of pump monitoring equipment and accessories (valves, etc.). Make sure that the pump and equipment settings cannot be changed by unauthorized persons.

6.1 Checking the direction of rotation

An arrow cast in the pump housing indicates the correct direction of rotation. The pump must rotate **clockwise** when seen from the drive end. Observe the movement of the pump (jerk) when started. If the pump moves counter-clockwise, the direction of rotation is correct.

As an alternative, the direction of rotation can be checked as follows:

1. Start the pump and check the quantity of liquid or the discharge pressure.
2. Stop the pump and interchange two of the phases to the motor.
3. Restart the pump and check the quantity of liquid or the discharge pressure.
4. Stop the pump.
5. Compare the results taken under points 1 and 3. The connection which gives the larger quantity of liquid or the higher pressure is the correct direction of rotation.

Note: The pump must only run for a short period when suspended from a chain.

7. Maintenance and service



Before starting work on the pump, make sure that the fuses have been removed or the mains switch has been switched off. It must be ensured that the electricity supply cannot be accidentally switched on. All rotating parts must have stopped moving.

Maintenance and service must be carried out by specially trained persons.



The maintenance and service work on explosion-proof pumps must be carried out by Grundfos or a service workshop authorized by Grundfos.

Before carrying out maintenance and service, it must be ensured that the pump has been thoroughly flushed with clean water. Rinse the pump parts in water after dismantling.

Pumps running normal operation should be inspected every 2000 operating hours or at least once a year. If the pumped liquid is very muddy or sandy, the pump should be inspected every 1000 operating hours or every six months.

The following points should be checked:

- **Power consumption**
- **Oil level and oil condition**
When the pump is new or after replacement of the shaft seals, check the oil level after one week of operation. The oil becomes greyish white like milk if it contains water. This may be the result of a defective shaft seal. The oil should be changed if it contains water. See section 7.1 *Oil check and oil change*.
Note: Used oil must be disposed of in accordance with local regulations.
The oil chamber contains 1.9 to 3.5 litres of SAE 10 W 30 motor oil depending on pump size.
- **Cable entry**
Make sure that the cable entry is watertight and that the cables are not sharply bent or pinched.
- **Impeller clearance**
Check the impeller clearance. See section 7.2 *Inspection and adjustment of impeller clearance*.
- **Pump parts**
Check the pump housing, etc. for possible wear. Replace defective parts.
- **Ball bearings**
Check the shaft for noisy or heavy operation (turn the shaft by hand). Replace defective ball bearings.
A general overhaul of the pump is usually required in case of defective ball bearings or poor motor function. This work must be carried out by an authorized service workshop.



The ball bearings must be replaced at least every 25,000 operating hours.

Note: Out of consideration for the heat-conducting ability, the pump should be cleaned on the outside at regular intervals.

7.1 Oil check and oil change

The oil chamber has three screws, A, B and C, for oil drainage, oil filling and level control, see fig. 11.

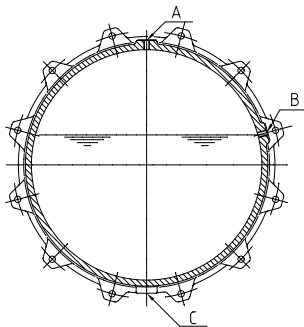


Fig. 11

The screw B is used for the indication of the oil level in the oil chamber, see fig. 12.

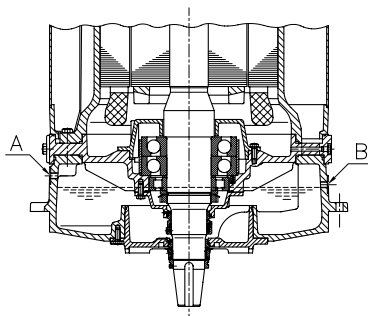


Fig. 12

Proceed as follows:

1. Place the pump in such a position that the screw A is pointing upwards.



When slackening the screw A of the oil chamber, note that pressure may have built up in the chamber. Do not remove the screw until the pressure has been fully relieved.

2. Place a clean container under the pump to collect all the drained-off oil. Slacken the screw B pointing to the side and observe the oil level. The drained-off quantity of oil indicates whether the lower mechanical shaft seal is leaking, which may be normal.
3. Turn the pump or remove the screw C and allow all the oil to drain from the chamber into the container. Pour an oil sample into a glass container and observe the condition of the oil. Clear oil can be reused. Emulsified oil must be changed and disposed of.
Note: Used oil must be disposed of in accordance with local regulations. Low oil level may indicate that the upper mechanical shaft seal is defective. Contact an authorized service workshop for further overhaul of the pump and repair, if required.
4. Fill the oil chamber with oil through the top hole A until the oil level reaches the hole B. Replace the O-rings by new rings, insert the screws and tighten securely.



Use viscosity grade SAE 10 W 30.
ONDINA 917 can be used in temperature class T4 applications only.

7.2 Inspection and adjustment of impeller clearance

Adjustment of the impeller clearance is only relevant for pumps with channel impellers (SEN1 and SEN2 pumps).

The correct impeller clearance is 0.7 mm ±0.2 mm. The clearance should be adjusted if it is worn to 1.2 mm or more.

The procedures for adjustment of the impeller clearance are different for pumps in submerged installation and pumps in dry installation. Both procedures are described in the following.

7.2.1 Inspection of impeller clearance for pumps in submerged installation

1. Lay the pump flat on a work bench.
2. Locate the six fixing screws securing the pump housing to the motor and the three adjusting screws, see fig. 13.
3. Check the clearance between impeller and pump housing all the way round using a feeler gauge.
4. Turn the impeller by hand and check at several points, see fig. 14.

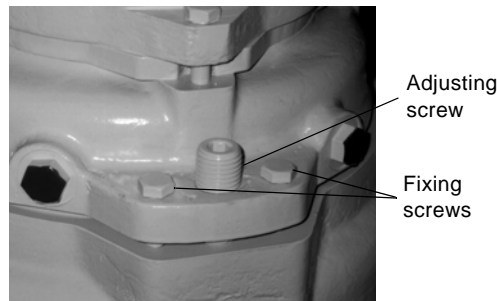


Fig. 13



Fig. 14

If the impeller clearance needs adjustment, follow one of the procedures described below.

7.2.2 Adjustment of impeller clearance for pumps in submerged installation

Procedure:

1. Slacken all fixing screws and adjusting screws between pump housing and motor.
2. Tap on the pump housing at several points using a rubber mallet to loosen the pump housing from the motor.
3. Close the impeller clearance by tightening three of the fixing screws until the impeller touches the pump housing. Do not use unnecessary force.
4. Slacken the fixing screws and open the clearance to 0.7 mm ±0.2 mm by tightening the three adjusting screws, see fig. 15. Check that the clearance is equal all around the suction opening.

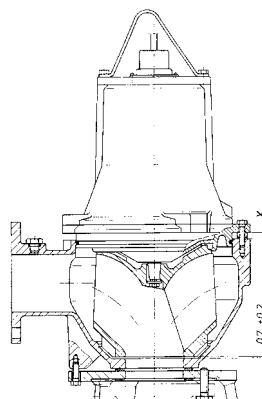


Fig. 15

5. Tighten all fixing screws and check that the clearance is still equal all around the suction opening.

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7.2.3 Adjustment of impeller clearance for pumps in dry installation

The impeller clearance can be adjusted while the pump is mounted on the base stand and connected to the pipework, see fig. 15.

Procedure:

1. Slacken all fixing screws and adjusting screws between pump housing and motor.
2. Tap on the pump housing at several points using a rubber mallet to loosen the pump housing from the motor.
3. Close the impeller clearance by tightening three of the fixing screws until the impeller touches the pump housing. Do not use unnecessary force.
4. Measure the distance X between the shaft seal housing and the pump housing at three points using a slide caliper, see fig. 15.
5. Slacken the fixing screws and pull the motor 0.7 mm \pm 0.2 mm out by tightening the three adjusting screws and using the distance X as reference.
6. Tighten all fixing screws and check that the distance X at the three reference points is equal.

7.3 Explosion-proof pumps

Overhauled and repaired explosion-proof motors are marked with a repair plate giving the following information:

- The repair symbol R.
- Name or registered trade mark of the repairing workshop.
- Workshop reference number relating to the repair.
- Date of overhaul or repair.

In the event of subsequent repairs, the existing plate should be replaced by a new updated plate and earlier markings are recorded.

The repairing workshop must keep records of performed overhauls and repairs together with records of all previous overhauls, repairs and possible modifications. Copies of the repairing workshop's detailed records should be filed by the owner or operator together with the original type certificate of the explosion-proof motor in question.

7.3.1 Motor cable

Only cables which are approved by the manufacturer and suitable for the cable entry as to diameter, number of leads, conductor cross section and sheath material may be used for the motor.

7.3.2 Cable entry

Only EExd cable entry parts corresponding to the cable diameter may be used. The corresponding cable dimension marking is stamped on the inlet or the cable entry.

Secure the cable entry to the motor top cover by tightening the screws evenly one by one until the cable entry is lying flat against the top cover.

7.3.3 Spare parts

Damaged motor parts, such as top cover and cable entry, should always be replaced by new and approved parts. Motor parts must not be reconditioned by machining, re-tapping, welding, etc.

7.4 Contaminated pumps

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

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.

8. 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.

9. Fault finding chart



Before attempting to diagnose any fault, make sure that the fuses have been removed or the mains switch has been switched off. It must be ensured that the electricity supply cannot be accidentally switched on. All rotating parts must have stopped moving.

The safety instructions in section 2. *Safety* must be read and observed.

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Fault	Cause	Remedy
1. Pump does not start or stops without visible cause.	a) No electricity supply.	Check electricity supply and fuses. Start the pump manually and check contactor operation.
2. Pump does not start or stops. The control panel of the controller indicates that the motor starter or protection equipment has tripped out.	a) Missing phase.	Check electricity supply and fuses.
	b) Pump momentarily overloaded.	If the fault does not disappear automatically, find the cause.
	c) Impeller blocked by impurities.	Check impeller and clean as required.
	d) Motor starter not set correctly.	Check and set as required according to rated current.
	e) Thermal switches tripped out. Insufficient motor cooling.	Allow the motor to cool. Ensure adequate cooling in the case of submerged installation.
	f) Moisture switch in motor tripped out.	Contact authorized service workshop.
	g) Motor cable defective.	Check for visual damages. Contact authorized service workshop.
	h) Fluctuating voltage.	Check voltage. Permissible deviation is $\pm 10\%$.
3. Pump runs but does not deliver the rated flow.	a) Wrong direction of rotation.	Check the direction of rotation and possibly interchange two phases to the motor.
	b) Impeller loose or worn.	Check impeller and adjust as required.
	c) Pump or pipework blocked by impurities.	Check pump and pipework and clean as required.
	d) Pump head too high.	Check by measuring the pressure and reinstall discharge pipe or install new pump.
	e) Valves closed or blocked. Non-return valve not operating.	Check valve position and clean as required.
	f) Air in pump or suction pipe.	Vent the pump and suction pipe. Increase the stop level in the pit or reinstall suction pipe.
	g) Pumped liquid too dense.	Dilute the liquid or change the process.
	h) Pump not properly connected to auto-coupling.	Pump down the liquid level in pit. Lift out the pump and relocate the pump on the auto-coupling.
	i) Leakage in pipework.	Check pipework for leaks and make tight as required.
	j) Pump pit flushing system inadvertently activated.	Check function and repair as required.
4. Pump starts, but stops immediately.	a) Clogged pump causes motor starter to trip out.	Check pump and clean as required.
	b) Overheated motor causes thermal switches to trip out.	Allow pump to cool. Check for cause as above.
	c) Level switch out of adjustment or defective.	Clean or set level switch or replace as required.
5. Pump vibrating or emitting excessive noise.	a) Pump partly choked by impurities.	Check pump and clean as required.
	b) Wrong direction of rotation.	Check the direction of rotation and possibly interchange two phases to the motor.
	c) Pump operates outside specified operating range.	Check operating conditions.
	d) Pump defective.	Check pump for damages. Repair the pump or contact an authorized workshop, if necessary.
	e) Pump not properly connected to auto-coupling.	Pump down the liquid level in pit. Lift out the pump and relocate the pump on the auto-coupling.
	f) Pump cavitates.	Check pump for partial suction blockage and clean as required. Check duty point and adjust as required.
	g) Base stand, auto-coupling, ring stand or guide rails not installed correctly.	Check installation and tighten bolts where necessary.
6. Oil watery or emulsified.	a) Lower mechanical seal leaking.	Contact authorized service workshop.
7. Low oil level.	a) Upper mechanical seal leaking.	Contact authorized service workshop.

Subject to alterations.

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