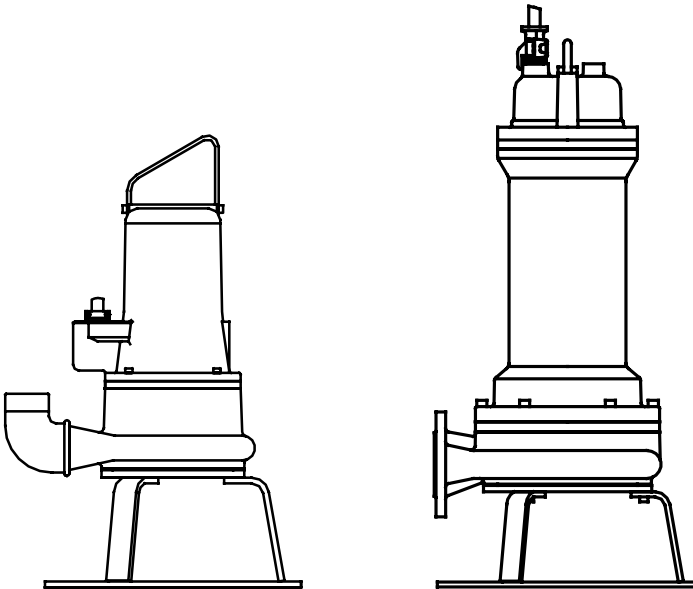


## APG

- ⓐ Installation and operating instructions
- ⓓ Montage- und Betriebsanleitung
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## Declaration of Conformity

We **GRUNDFOS** declare under our sole responsibility that the products **APG**, 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 292.
- 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 60 335-2-41.

## Déclaration de Conformité

Nous **GRUNDFOS** déclarons sous notre seule responsabilité que les produits **APG** 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 292.
- 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 60 335-2-41.

## Declaración de Conformidad

Nosotros **GRUNDFOS** declaramos bajo nuestra única responsabilidad que los productos **APG** 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 292.
- 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 60 335-2-41.

## Δήλωση Συμμόρφωσης

Εμείς η **GRUNDFOS** δηλώνουμε με αποκλειστική δική μας ευθύνη ότι τα προϊόντα **APG** 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 292.
- Ηλεκτρομαγνητική συμβατότητα (89/336/EEC).  
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/EEC) [95].  
Πρότυπα που χρησιμοποιήθηκαν: EN 60 335-1 και EN 60 335-2-41.

## Försäkran om överensstämmelse

Vi **GRUNDFOS** försäkrar under ansvar, att produkterna **APG**, 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 292.
- 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/EC) [95].  
Använda standarder: EN 60 335-1 och EN 60 335-2-41.

## Overensstemmelseserklæring

Vi **GRUNDFOS** erklærer under ansvar, at produkterne **APG**, 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 292.
- Elektromagnetisk kompatibilitet (89/336/EØF).  
Anvendte standarder: EN 61 000-6-2 og EN 61 000-6-3.
- Elektrisk materiel bestemt til anvendelse inden for visse spændingsgrænser (73/23/EØF) [95].  
Anvendte standarder: EN 60 335-1 og EN 60 335-2-41.

## Konformitätserklärung

Wir **GRUNDFOS** erklären in alleiniger Verantwortung, daß die Produkte **APG**, 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 292.
- Elektromagnetische Verträglichkeit (89/336/EWG).  
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 60 335-2-41.

## Dichiarazione di Conformità

Noi **GRUNDFOS** dichiariamo sotto la nostra esclusiva responsabilità che i prodotti **APG** 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 292.
- 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 60 335-2-41.

## Declaração de Conformidade

Nós **GRUNDFOS** declaramos sob nossa única responsabilidade que os produtos **APG** 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 292.
- Compatibilidade electromagnética (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 60 335-2-41.

## Overeenkomstigheidsverklaring

Wij **GRUNDFOS** verklaren geheel onder eigen verantwoordelijkheid dat de producten **APG** 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 292.
- 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 60 335-2-41.

## Vastaavuusvakuutus

Me **GRUNDFOS** vakuutamme yksin vastuullisesti, että tuotteet **APG**, jota tämä vakuutus koskee, noudattavat direktiivejä jotka käsittelevät EY:n jäsenvaltioiden koneellisia laitteita koskevien lakien yhdenmukaistusta seur:

- Koneet (98/37/EY).  
Käytetty standardi: EN 292.
- Elektromagneettinen vastaavuus (89/336/EY).  
Käytetyt standardit: EN 61 000-6-2 ja EN 61 000-6-3.
- Määrättyjen jänniterajoitusten puitteissa käytettävät sähköiset laitteet (73/23/EY) [95].  
Käytetyt standardit: EN 60 335-1 ja EN 60 335-2-41.

Bjerringbro, 1st March 2004



Kenth Hvid Nielsen  
Technical Manager

# APG

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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.

## 1. General description

### 1.1 Applications

GRUNDFOS APG pumps are designed for pumping:

- wastewater,
- sludge-containing water,
- groundwater,
- sewage from restaurants, hotels, camping sites, etc.

The compact design makes the pumps suitable for both temporary and permanent installation. Furthermore, the pumps are suitable for free-standing installation as well as installation by means of an auto-coupling guide rail system.

The APG pumps are equipped with a cutter system which cuts all destructible solids into small pieces so that they can be led away through pipes of a relatively small diameter.

#### 1.1.1 Potentially explosive environments

Use the explosion-proof APG pump versions for applications involving the risk of explosion.

**Note:** The explosion classification of the pump is EEx de IIB T4 and **must** in each individual case be approved by the local authorities for use at the desired installation site.

## 1.2 Operating conditions

### 1.2.1 pH-value

APG pumps in permanent installations can cope with pH-values ranging from 4 to 10.

### 1.2.2 Liquid temperature

Liquid temperature: 0°C to +40°C.  
For short periods up to +60°C.

### 1.2.3 Density of pumped liquid

Maximum density of pumped liquid: 1100 kg/m<sup>3</sup>.

### 1.2.4 Installation depth

Maximum 10 metres below liquid level.

### 1.2.5 Level of pumped liquid

The lowest stop level must always be above the top of the pump housing.

### 1.2.6 Operation

Maximum 20 starts per hour.

**Note:** The pumps are designed for intermittent operation only.

## 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/EEC relating to machinery.

## 2. Safety



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

## 3. Transportation and storage

The pump may be transported and stored in a vertical or horizontal position. Make sure that it cannot roll or fall over.

Always lift the pump by its carrying handle, **never** by the motor cable or the hose/pipe.

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

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 shaft seals and the cable entry.

## 4. Installation

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

Prior to installation, check the oil level in the oil chamber, see section 7. *Maintenance and service*.

### 4.1 Installation on auto-coupling

See figs. A and B, pages 83 and 84, for pumps up to and including 3.3 kW and fig. D, page 86, for pumps from 4.8 kW up to and including 9.2 kW.

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 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 with heavy-duty 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 line in accordance with the generally accepted procedures and without exposing the line to distortion or tension.
4. Insert the guide rails in the rings of the auto-coupling base unit and adjust the length of the rails accurately to the guide rail bracket.
5. Unscrew the provisionally fastened guide rail bracket, fit it on top of the guide rails and finally fasten it firmly to the pit wall.

**Note:** The guide rails must not have any axial play as this would cause noise during pump operation.

6. Clean out debris from the pit before lowering the pump into the pit.
7. Fit the auto-coupling half on to the discharge port of the pump. Then slide the guide bar of this coupling half between the guide rails and lower the pump into the pit by means of a chain. When the pump reaches the auto-coupling base unit, the pump will automatically connect tightly.
8. Hang up the end of the chain on a suitable hook at the top of the pit.
9. Adjust the length of the motor cable by coiling it up on a relief fitting, so the cable is not damaged during operation. Fasten the relief fitting to a suitable bracket at the top of the pit. Make sure that the cables are not sharply bent or pinched.

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

## 4.2 Free-standing installation

See figs. C and E, pages 85 and 86.

The APG.50.09.3(Ex), APG.50.11.1(Ex), APG.50.11.3 and APG.50.12.1 pumps have pump housing and base stand cast in one unit for free-standing installation.

The larger APG pumps should be provided with a separate base stand.

For free-standing installation of the pumps, fit a 90° elbow to the discharge port. The pump can be installed with a hose or rigid pipe and valves.

In order to facilitate service of the pump, fit a flexible union or coupling to the discharge line for easy separation.

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

**If a rigid pipe is used,** the union or coupling, non-return valve and isolating valve should be fitted in the sequence mentioned, as seen from the pump side.

Lower the pump into the liquid.

If the pump is installed in muddy conditions or on uneven ground, it is recommended to support the pump on bricks.

## 4.3 Pumps supplied with control box

Pumps supplied with a control box may be supplied with a level switch with cable. The level switch cable, if supplied, should be fastened in the retainer on the pump handle.

The difference in level between start and stop may be adjusted by adjusting the free length of cable between the level switch and the retainer.

Large difference in level: Long cable.

Small difference in level: Short cable.

## 4.4 Separate level controllers

Three-phase APG pumps without control box or level switch can be supplied with a separate level controller with level switches: Type LC for one-pump installations and type LCD for two-pump installations.

The **LC** controller is fitted with two or three level switches. 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 pumps. The fourth level switch, which is optional, is for high-level alarm.

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

- To prevent air intake and vibrations, 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.
- 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 in the pit.
- The **high-level alarm switch**, if installed, should always be installed about 10 cm above the starting level switch; however, alarm must always be given before the liquid level reaches the inlet pipe to the pit.

## 4.5 Temperature sensors

In **single-phase explosion-proof pumps** and **all three-phase pumps**, temperature sensors are built into the stator windings. Via the safety circuit, the temperature sensors will cut out the motor in case of overtemperature, i.e. 130°C.

Maximum operating current of temperature sensors is 0.5 A at 500 VAC and  $\cos \varphi$  0.6.

**Non-explosion-proof** pumps have only one set of temperature sensors.

**Explosion-proof pumps** have two sets of temperature sensors. The extra set of sensors will open at a temperature that is approx. 10°C higher than the opening temperature of standard sensors. The extra set of sensors provides additional protection against overtemperature in potentially explosive environments.

#### 4.6 Moisture sensors

Applies only to APG.50.48, APG.50.65 and APG.50.92:

Pumps for submerged installation are available with or without moisture sensors.

Pumps with moisture sensors have one sensor in the oil chamber between the motor and the pump housing and another in the chamber below the top cover.

### 5. Electrical connection

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

The operating voltage and frequency are marked on the nameplate. Voltage tolerance:  $\pm 10\%$  of the voltage stated on the nameplate. Make sure that the motor is suitable for the electricity supply available at the installation site.

#### 5.1 Motor protection

All pumps are supplied with 10 metres of cable and a free cable end.

All **single-phase** pumps supplied *without* control box must be connected to a separate control box with motor starter and operating capacitor. Furthermore, the pumps must be connected to a starting capacitor. For capacitor sizes, see the tables below:

**50 Hz:**

Pump type	Starting capacitor		Operating capacitor	
	[ $\mu$ F]	[V]	[ $\mu$ F]	[V]
APG.50.11.1(Ex)	60	1 x 230	30	1 x 450
APG.50.18.1	100	1 x 230	50	1 x 450

**60 Hz:**

Pump type	Starting capacitor		Operating capacitor	
	[ $\mu$ F]	[V]	[ $\mu$ F]	[V]
APG.50.12.1	50	1 x 230	25	1 x 450
APG.50.18.1	80	1 x 230	40	1 x 450
APG.50.30.1	150	1 x 230	60	1 x 450
APG.50.33.1	150	1 x 230	60	1 x 450

All **single-phase non-explosion-proof** pumps have a thermal switch built into the motor windings. The thermal switch cuts out the motor in case of overtemperature and cuts it in again after cooling.

All pumps supplied *without* control box must be connected to a separate motor starter.

#### Pumps with temperature sensors:

The temperature sensors must be connected to the safety circuit of the motor starter. See section 4.5 *Temperature sensors*.

Figure 1 shows the connection of APG pumps up to and including 3.3 kW.

Figure 2 shows the connection of APG pumps of 4.8 kW and up.

The temperature sensors are connected to the monitoring cable. The temperature sensors must be connected to the safety circuit of the separate pump controller.

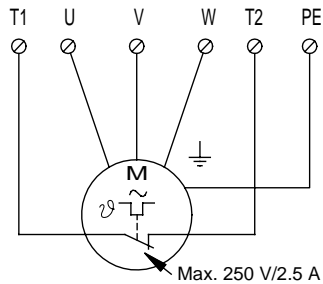
#### Moisture sensors:

Applies only to APG.50.48, APG.50.65 and APG.50.92:

The moisture sensors will cut out the motor in case of moisture/water penetration.

The moisture sensors are connected to the monitoring cable. The tripping units of the moisture sensors must be connected to the safety circuit of the separate pump controller.

**Fig. 1**

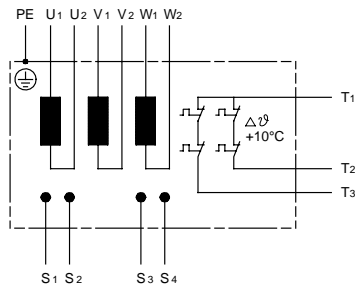


TM00 1618 0693



The separate control box/motor starter must not be installed in potentially explosive environments.

**Fig. 2**



TM00 5612 1295

APG pumps of 4.8 kW and up are prepared for star-delta starting, i.e. both ends of the motor windings are accessible through the motor cable, see fig. 2.

- T1 and T3 are connected to the standard set of temperature sensors.
- T1 and T2 are connected to the extra set of temperature sensors in explosion-proof pumps.
- S1 and S2 are connected to the moisture sensor in the oil chamber.
- S3 and S4 are connected to the moisture sensor in the chamber below the top cover.
- Pumps with two moisture sensors can be connected to a common alarm relay (parallel connection) or two alarm relays.

## 6. Start-up

Proceed as follows:

1. Check the oil level in the oil chamber.
2. Remove the fuses and check whether the impeller can rotate freely.
3. Check whether the monitoring units, if used, are operating satisfactorily.
4. Check whether the system has been filled with liquid and vented.
5. Make sure that the pump is submerged in the liquid.
6. Open the isolating valves, if fitted.
7. Check the setting of the level switches.
8. Start the pump.

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

### 6.1 Direction of rotation

All **single-phase** pumps are factory-set to the correct direction of rotation.

Before starting up **three-phase** pumps, check the direction of rotation. The direction of rotation should be clockwise when viewed from above. When starting up, the pump will jerk in the opposite direction to the direction of rotation. If the direction of rotation is wrong, interchange two of the three phases of the electricity supply.

#### Checking of direction of rotation:

The direction of rotation should be checked every time the pump is connected to a new installation.

Check the direction of rotation as follows:

1. Start the pump and check the quantity of water or the discharge pressure.
2. Stop the pump and interchange two of the phases to the motor.
3. Start the pump and check the quantity of water 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 water or the higher pressure is the correct direction of rotation.

## 7. Maintenance and service



Before starting work on the pump, make sure that the electricity supply has been switched off and that it cannot be accidentally switched on. Furthermore, all rotating parts must have stopped moving.

Before carrying out maintenance and service, make sure that the pump has been thoroughly flushed with clean water. Rinse the pump parts in water after dismantling.



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

Pumps running normal operation should be inspected at least once a year. If the pumped liquid is very muddy or sandy, inspect the pump at shorter intervals.

When the pump is new or after replacement of the shaft seals, check the oil level after one week of operation.

For long and trouble-free operation of the pump the following points should be checked regularly:

- **Power consumption**
- **Oil level and oil condition**

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 replaced after 3000 hours of operation.

Use Shell Ondina 934 oil or similar type.

**Note:** Used oil must be disposed of in accordance with local regulations.

The following table states how much oil the APG pumps must have in the oil chamber:

Pump type	Quantity of oil in oil chamber
APG.50.09	0.70 l
APG.50.11	0.70 l
APG.50.12	0.70 l
APG.50.17	1.20 l
APG.50.18	1.20 l
APG.50.19	1.20 l
APG.50.29	1.20 l
APG.50.30	1.20 l
APG.50.31	1.20 l
APG.50.33	1.20 l
APG.50.48	1.70 l
APG.50.65	1.70 l
APG.50.92	1.70 l

- **Cable entry**

Make sure that the cable entry is watertight and that the cables are not bent sharply and/or pinched.

- **Pump parts**

Check the impeller, pump housing, neck ring, 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 the manufacturer or a competent workshop.

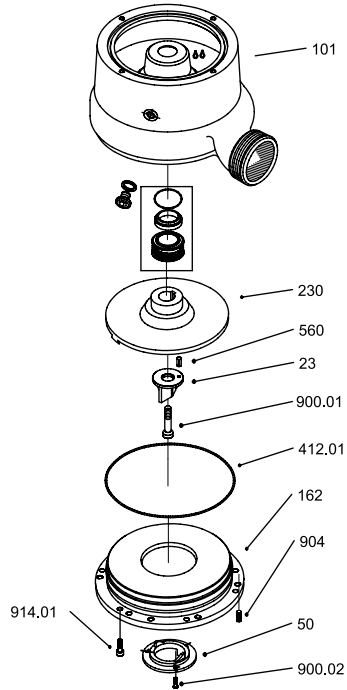
### 7.1 Replacement of cutter head

Remove the cutter head.

Fit the new cutter head as follows:

1. Knock the guide pin (560) into the cutter head (23).
2. Fit the cutter head with guide pin to the impeller (230). Fit and tighten the screw (900.01).
3. Fit the threaded pins (904) to the suction cover (162).
4. Fit the O-ring (412.01) to the suction cover and grease the cover.
5. Knock the suction cover into the pump housing (101) until the suction cover bears against the impeller. Check through the inlet port.
6. Tighten all the threaded pins (904) until they easily touch the pump housing (101).
7. Give all threaded pins a quarter of a turn.
8. Fasten the suction cover by means of the screws (914.01).
9. Fit the cutting ring (50) to the suction cover. Fit and tighten the screws (900.02).

Fig. 3



TM01 7812 4899

Pos.	Component
23	Cutter head
50	Cutting ring
101	Pump housing
162	Suction cover
230	Impeller
560	Guide pin
412.01	O-ring
900.01	Screw
900.02	Screw
904	Threaded pin
914.01	Screw



## 7.2 Service kits

The service kit for APG pumps up to and including 3.3 kW includes: 1 shaft seal kit, 1 O-ring kit, 1 cable entry kit.	The service kit for APG pumps of 4.8 kW and up includes: 1 cutter kit, 1 O-ring kit, 1 shaft seal kit, 1 cable entry kit.
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50 Hz pumps	
APG.50.09, 11 and 12	96 00 33 08
APG.50.09.3Ex and 11.1Ex	96 00 33 00
APG.50.17, 18 and 19	96 00 33 09
APG.50.19.3Ex	96 00 33 10
APG.50.31	96 00 33 11
APG.50.31.3Ex	96 00 33 10
APG.50.48.3(Ex)	96 00 54 98
APG.50.65.3(Ex)	96 00 54 98
APG.50.92.3(Ex)	96 00 54 98
APG.50.48.3(Ex) with moisture sensor	96 00 54 99
APG.50.65.3(Ex) with moisture sensor	96 00 54 99
APG.50.92.3(Ex) with moisture sensor	96 00 54 99
60 Hz pumps	
APG.50.11 and 12	96 00 33 08
APG.50.18 and 19	96 00 33 09
APG.50.29, 30 and 33	96 00 33 11

## 7.3 Oil

1 litre of oil, type Shell Ondina 934.  
Part number: 96 00 33 13.

## 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. Fault finding chart



Make sure that all power supplies have been switched off and that all rotating parts have stopped moving before attempting to diagnose any fault.

GB

Fault	Cause	Remedy
1. Motor does not start. Fuses blow or motor starter trips out immediately. <b>Caution:</b> Do not start again!	a) Supply failure; short-circuit; earth-leakage fault in cable or motor winding.	Have the cable and motor checked and repaired by a qualified electrician.
	b) Fuses blow due to use of wrong type of fuse.	Install fuses of the correct type.
	c) Impeller blocked by impurities.	Clean the impeller.
	d) Level switch out of adjustment or defective.	Check the level switch.
2. Pump operates, but motor starter trips out after a short while.	a) Low setting of thermal relay in motor starter.	Set the relay in accordance with the specifications on the name-plate.
	b) Increased current consumption due to large voltage drop.	Measure the voltage between motor phases. Tolerance: $\pm 10\%$ .
	c) Impeller blocked by impurities. Increased current consumption in all three phases.	Clean the impeller.
3. Pump operates at below-standard performance and power consumption.	a) Impeller blocked by impurities.	Clean the impeller.
	b) Wrong direction of rotation.	Check the direction of rotation and possibly interchange two phases, see section 6.1 <i>Direction of rotation</i> .
4. Pump operates, but gives no liquid.	a) Discharge valve closed or blocked.	Check discharge valve and possibly open and/or clean.
	b) Non-return valve blocked.	Clean non-return valve.
	c) Air in pump.	Vent the pump.

## 9. Disposal

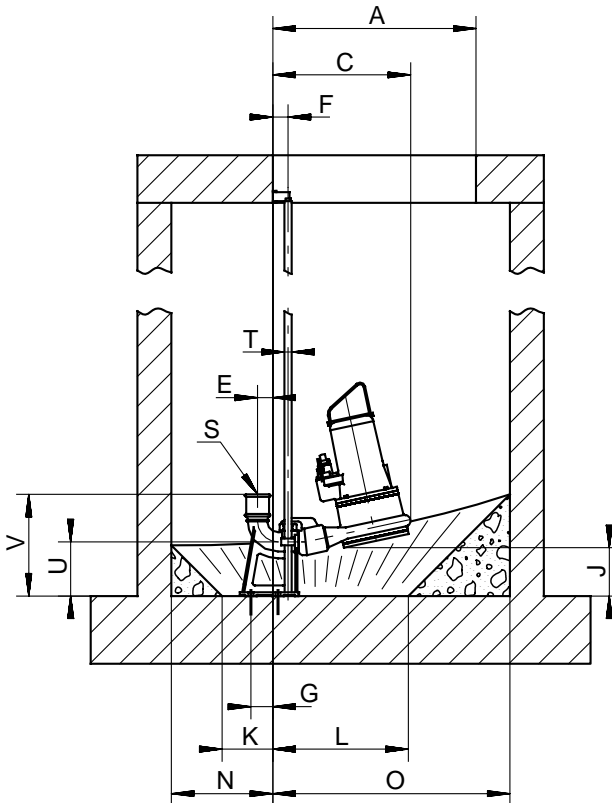
Disposal of this product or parts of it must be carried out according to the following guidelines:

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.

Subject to alterations.

- GB: One-pump installation on auto-coupling**  
**D: Eine Pumpe mit Autokupplung**  
**F: Une pompe avec système d'accouplement automatique**  
**I: Una pompa con accoppiamento rapido**  
**E: Una bomba con autoacoplamiento**  
**P: Uma bomba com acoplamento automático**  
**GR: Εγκατάσταση μίας αντλίας με αυτόματη ζεύξη**  
**NL: Eén pomp met voetbochtsnelkoppeling**  
**S: En pump installerad med kopplingsfot**  
**SF: Yhden pumpun asennus jalustaliittimellä**  
**DK: En pumpe med auto-kobling**

Fig. A



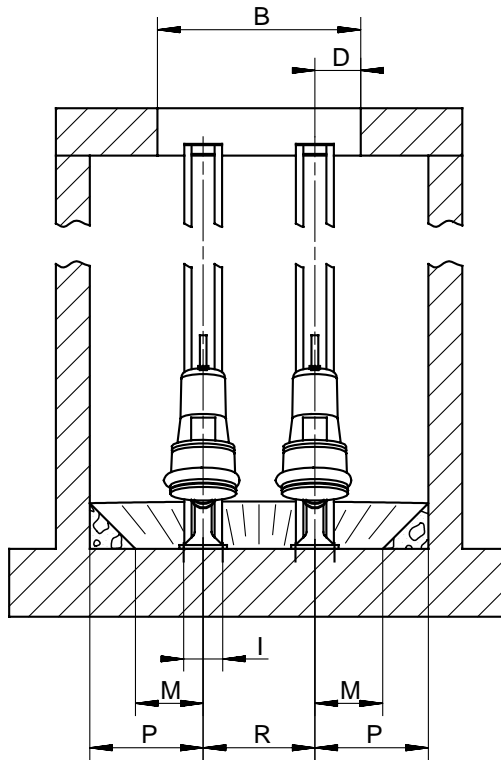
TM01 2606 2098

A	B	C	D	E	F	G	I	J
ø600	ø600	407	300	45	45	65	115	143

K	L	M	N	O	P	R	T	U	V
150	400	200	300	700	500	-	½"	160	295

- GB: Two-pump installation on auto-coupling  
 D: Zwei Pumpen mit Autokupplung  
 F: Deux pompes avec système d'accouplement automatique  
 I: Due pompe con accoppiamento rapido  
 E: Dos bombas con autoacoplamiento  
 P: Duas bombas com acoplamento automático  
 GR: Εγκατάσταση δύο αντλιών με αυτόματη ζεύξη  
 NL: Tvee pompen met voetbochtsnelkoppeling  
 S: Två pumpar installerade med kopplingsfot  
 SF: Kahden pumpun asennus jalustaliittimellä  
 DK: To pumper med auto-kobling

Fig. B



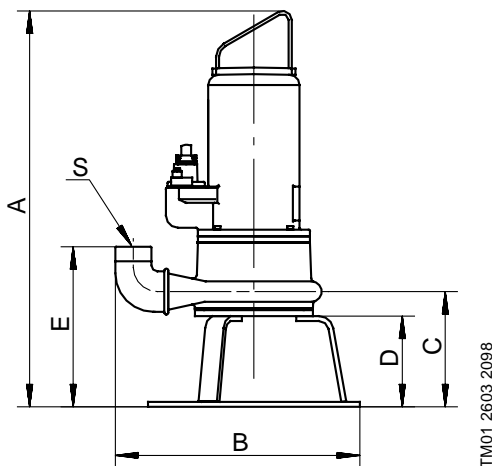
TM01 2607 2098

A	B	C	D	E	F	G	I	J
455	600	407	135	45	45	65	115	143

K	L	M	N	O	P	R	T	U	V
150	400	200	300	700	335	330	½"	160	295

**GB: Free-standing Installation**  
**D: Freistehender Einbau**  
**F: Installation fixe sur socle**  
**I: Installazione su piede d'appoggio**  
**E: Instalación portátil**  
**P: Instalação autónoma**  
**GR: Ανεξάρτητη εγκατάσταση**  
**NL: Vrijstaande opstelling**  
**S: Fristående installation**  
**SF: Vapaasti seisova asennus**  
**DK: Fritstående installation**

**Fig. C**



TM01 2603 2098

APG	A	B	C	D	E	S
<b>APG, 50 Hz</b>						
APG.50.09.3	497	304	130	90	207	R 2
APG.50.09.3Ex	497	304	130	90	207	R 2
APG.50.11.1	497	304	130	90	207	R 2
APG.50.11.1Ex	497	304	130	90	207	R 2
APG.50.17.3	618	405	191	150	265	R 2
APG.50.18.1	618	405	191	150	265	R 2
APG.50.19.3	618	405	191	150	265	R 2
APG.50.19.3Ex	618	405	191	150	265	R 2
APG.50.31.3	655	408	191	150	265	R 2
APG.50.31.3Ex	655	408	191	150	265	R 2



**Denmark**

GRUNDFOS DK A/S  
Poul Due Jensens Vej 7A  
DK-8850 Bjerringbro  
Tlf.: +45-87 50 50 50  
Telefax: +45-87 50 51 51

**Argentina**

Bombas GRUNDFOS de Argentina S.A.  
Ruta Panamericana km. 37.500  
Lote 34A  
1619 - Garin  
Pcia. de Buenos Aires  
Phone: +54-3327 414 444  
Telefax: +54-3327 411 111

**Australia**

GRUNDFOS Pumps Pty. Ltd.  
P.O. Box 2040  
Regency Park  
South Australia 5942  
Phone: +61-8-8461-4611  
Telefax: +61-8-8340 0155

**Austria**

GRUNDFOS Pumpen Vertrieb  
Ges.m.b.H.  
Grundfosstraße 2  
A-5082 Grödig/Salzburg  
Tel.: +43-6246-883-0  
Telefax: +43-6246-883-30

**Belgium**

N.V. GRUNDFOS Bellux S.A.  
Boomsesteenweg 81-83  
B-2630 Aartselaar  
Tel.: +32-3-870 7300  
Télécopie: +32-3-870 7301

**Brazil**

GRUNDFOS do Brasil Ltda.  
Rua Tomazina 106  
CEP 83325 - 040  
Pinhais - PR  
Phone: +55-41 668 3555  
Telefax: +55-41 668 3554

**Canada**

GRUNDFOS Canada Inc.  
2941 Brighton Road  
Oakville, Ontario  
L6H 6C9  
Phone: +1-905 829 9533  
Telefax: +1-905 829 9512

**China**

GRUNDFOS Pumps (Shanghai)  
Co. Ltd.  
22 Floor, Xin Hua Lian Building  
755-775 Huai Hai Rd., (M)  
Shanghai 200020  
PRC  
Phone: +86-512-67 61 11 80  
Telefax: +86-512-67 61 81 67

**Czech Republic**

GRUNDFOS s.r.o.  
Cajkovského 21  
779 00 Olomouc  
Phone: +420-68-5716 111  
Telefax: +420-68-543 8908

**Finland**

OY GRUNDFOS Pumpat AB  
Mestarintie 11  
Piispankylä  
FIN-01730 Vantaa (Helsinki)  
Phone: +358-9 878 9150  
Telefax: +358-9 878 91500

**France**

Pompes GRUNDFOS Distribution S.A.  
Parc d'Activités de Chesnes  
57, rue de Malacombé  
F-38290 St. Quentin Fallavier  
(Lyon)  
Tél.: +33-4 74 82 15 15  
Télécopie: +33-4 74 94 10 51

**Germany**

GRUNDFOS GMBH  
Schlüterstr. 33  
40699 Erkrath  
Tel.: +49-(0) 211 929 69-0  
Telefax: +49-(0) 211 929 69-3799  
e-mail: infoservice@grundfos.de  
Service in Deutschland:  
e-mail: kundendienst@grundfos.de

**Greece**

GRUNDFOS Hellas A.E.B.E.  
20th km. Athinon-Markopoulou  
Av.  
P.O. Box 71  
GR-19002 Peania  
Phone: +30-10-66 83 400  
Telefax: +30-10-66 46 273

**Hong Kong**

GRUNDFOS Pumps (Hong Kong) Ltd.  
Unit 1, Ground floor  
Siu Wai Industrial Centre  
29-33 Wing Hong Street &  
68 King Lam Street, Cheung Sha  
Wan  
Kowloon  
Phone: +852-27861706/  
27861741  
Telefax: +852-27858664

**Hungary**

GRUNDFOS Hungária Kft.  
Park u. 8  
H-2045 Törökbalint,  
Phone: +36-34 520 100  
Telefax: +36-34 520 200

**India**

GRUNDFOS Pumps India Private Limited  
Flat A, Ground Floor  
61/62 Chamiers Aptmt  
Chamiers Road  
Chennai 600 028  
Phone: +91-44 432 3487  
Telefax: +91-44 432 3489

**Indonesia**

PT GRUNDFOS Pompa  
Jl. Rawa Sumur III, Blok III / CC-1  
Kawasan Industri, Pulogadung  
Jakarta 13930  
Phone: +62-21-460 6909  
Telefax: +62-21-460 6910/460 6901

**Ireland**

GRUNDFOS (Ireland) Ltd.  
Unit 34, Stillorgan Industrial Park  
Blackrock  
County Dublin  
Phone: +353-1-2954926  
Telefax: +353-1-2954739

**Italy**

GRUNDFOS Pompe Italia S.r.l.  
Via Gran Sasso 4  
I-20060 Truccazzano (Milano)  
Tel.: +39-02-95838112/95838212  
Telefax: +39-02-95309290/  
95838461

**Japan**

GRUNDFOS Pumps K.K.  
1-2-3, Shin Miyakoda  
Hamamatsu City  
Shizuoka pref. 431-21  
Phone: +81-53-428 4760  
Telefax: +81-53-484 1014

**Korea**

GRUNDFOS Pumps Korea Ltd.  
2nd Fl., Dong Shin Building  
994-3 Daechi-dong, Kangnam-  
Ku  
Seoul 135-280  
Phone: +82-2-5317 600  
Telefax: +82-2-5633 725

**Malaysia**

GRUNDFOS Pumps Sdn. Bhd.  
7 Jalan Peguam UI/25  
Glenmarie Industrial Park  
40150 Shah Alam  
Selangor  
Phone: +60-3-5569 2922  
Telefax: +60-3-5569 2866

**Mexico**

Bombas GRUNDFOS de Mexico S.A. de C.V.  
Boulevard TLC No. 15  
Parque Industrial Stiva Aeropuerto  
Apodaca, N.L. 66600  
Mexico  
Phone: +52-81-8144 4000  
Telefax: +52-81-8144 4010

**Netherlands**

GRUNDFOS Nederland B.V.  
Postbus 104  
NL-1380 AC Weesp  
Tel.: +31-294-492 211  
Telefax: +31-294-492244/492299

**New Zealand**

GRUNDFOS Pumps NZ Ltd.  
17 Beatrice Tinsley Crescent  
North Harbour Industrial Estate  
Albany, Auckland  
Phone: +64-9-415 3240  
Telefax: +64-9-415 3250

**Norway**

GRUNDFOS Pumper A/S  
Strømsveien 344  
Postboks 235, Leirdal  
N-1011 Oslo  
Tlf.: +47-22 90 47 00  
Telefax: +47-22 32 21 50

**Poland**

GRUNDFOS Pompy Sp. z o.o.  
ul. Klonowa 23  
Baranowo k. Poznania  
PL-62-081 Przemierowo  
Phone: +48-61-650 13 00  
Telefax: +48-61-650 13 50

**Portugal**

Bombas GRUNDFOS Portugal, S.A.  
Rua Calvet de Magalhães, 241  
Apartado 1079  
P-2780 Paço de Arcos  
Tel.: +351-21-440 76 00  
Telefax: +351-21-440 76 90

**Russia**

OOO GRUNDFOS  
Shkolnaya, ul., 39  
RUS-109544 Moscow  
Phone: +7-095 564 8800, 737 3000  
Telefax: +7-095 564 8811, 737 7536

**Singapore**

GRUNDFOS (Singapore) Pte. Ltd.  
24 Tuas West Road  
Jurong Town  
Singapore 638381  
Phone: +65-6865 1222  
Telefax: +65-6861 8402

**Spain**

Bombas GRUNDFOS España S.A.  
Camino de la Fuentequilla, s/n  
E-28110 Algete (Madrid)  
Tel.: +34-91-848 8800  
Telefax: +34-91-628 0465

**Sweden**

GRUNDFOS AB  
Box 63, Angeredsvinkeln 9  
S-424 22 Angered  
Tel.: +46-771-32 23 00  
Telefax: +46-31 331 94 60

**Switzerland**

GRUNDFOS Pumpen AG  
Bruggacherstrasse 10  
CH-8117 Fällanden/ZH  
Tel.: +41-1-806 8111  
Telefax: +41-1-806 8115

**Taiwan**

GRUNDFOS Pumps (Taiwan) Ltd.  
14, Min-Yu Road  
Tunglo Industrial Park  
Tunglo, Miao-Li County  
Taiwan, R.O.C.  
Phone: +886-37-98 05 57  
Telefax: +886-37-98 05 70

**Thailand**

GRUNDFOS (Thailand) Ltd.  
947/168 Moo 12, Bangna-Trad  
Rd., K.M. 3,  
Bangna, Phrakonong  
Bangkok 10260  
Phone: +66-2-744 1785 ... 91  
Telefax: +66-2-744 1775 ... 6

**Turkey**

GRUNDFOS POMPA SAN. ve  
TIC. LTD. STI  
Bulgurlu Caddesi no. 32  
TR-81190 Üsküdar Istanbul  
Phone: +90 - 216-4280 306  
Telefax: +90 - 216-3279 988

**United Arab Emirates**

GRUNDFOS Gulf Distribution  
P.O. Box 16768  
Jebel Ali Free Zone  
Dubai  
Phone: +971-4- 8815 166  
Telefax: +971-4-8815 136

**United Kingdom**

GRUNDFOS Pumps Ltd.  
Grovebury Road  
Leighton Buzzard/Beds. LU7 8TL  
Phone: +44-1525-850000  
Telefax: +44-1525-850011

**U.S.A.**

GRUNDFOS Pumps Corporation  
17100 West 118th Terrace  
Olathe, Kansas 66061  
Phone: +1-913-227-3400  
Telefax: +1-913-227-3500

96 43 48 22 0502	<b>30</b>
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