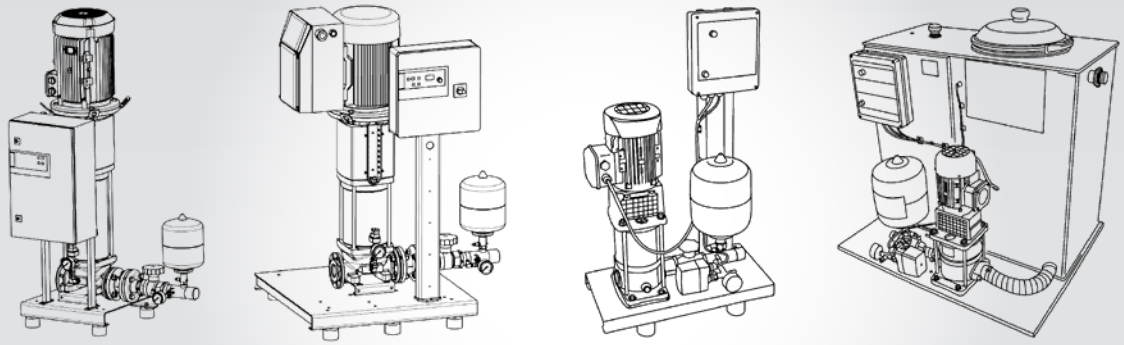
Pioneering for You

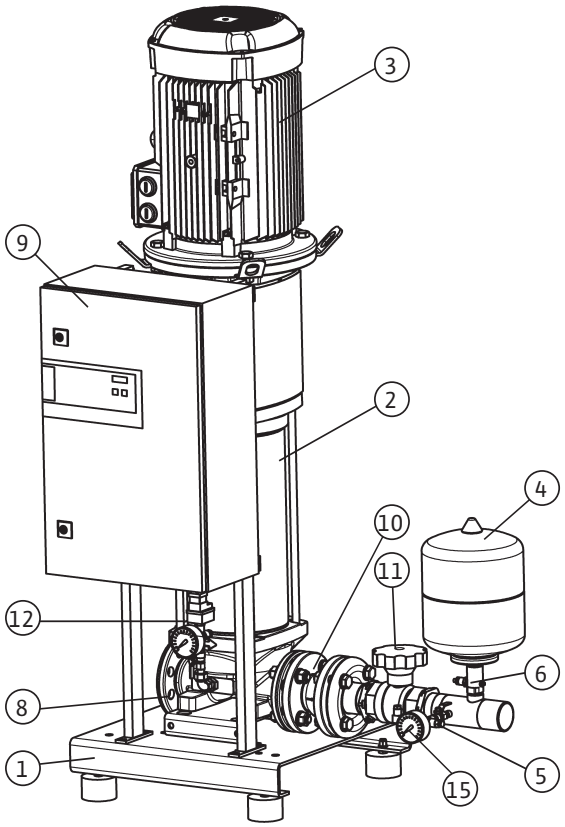
Wilo-Economy CO-1 ..., CO/T-1 ... .../CE+ .../ER
Wilo-Comfort-Vario COR-1 ... ...-GE .../VR



en Installation and operating instructions

2527299-Ed.04 / 2021-07-Wilo

Fig. 1a



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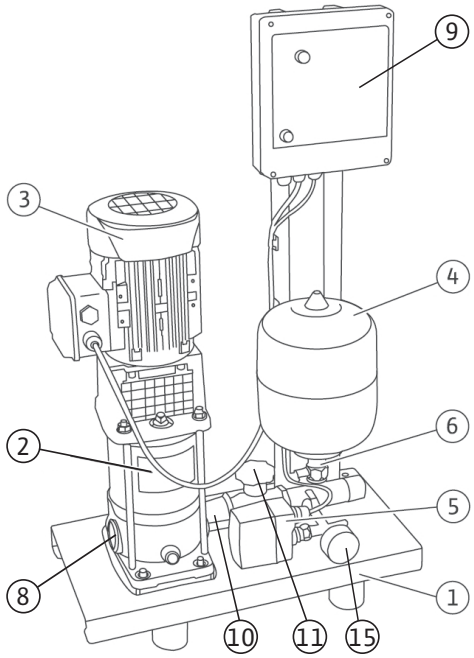

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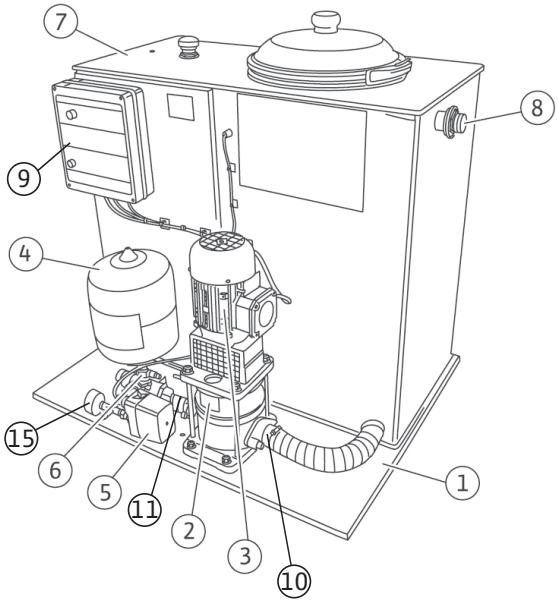

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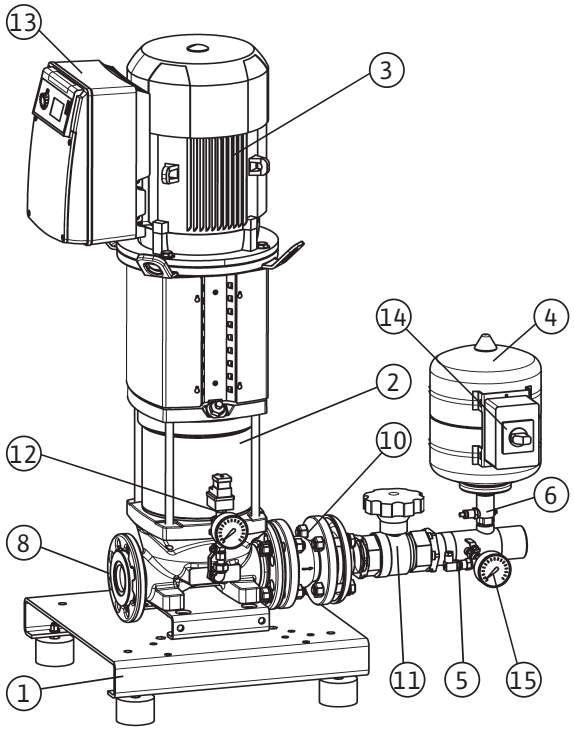

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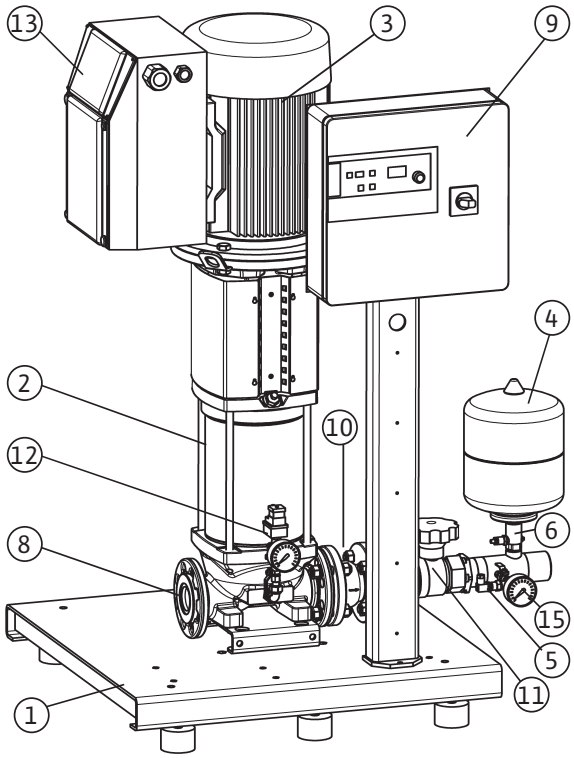

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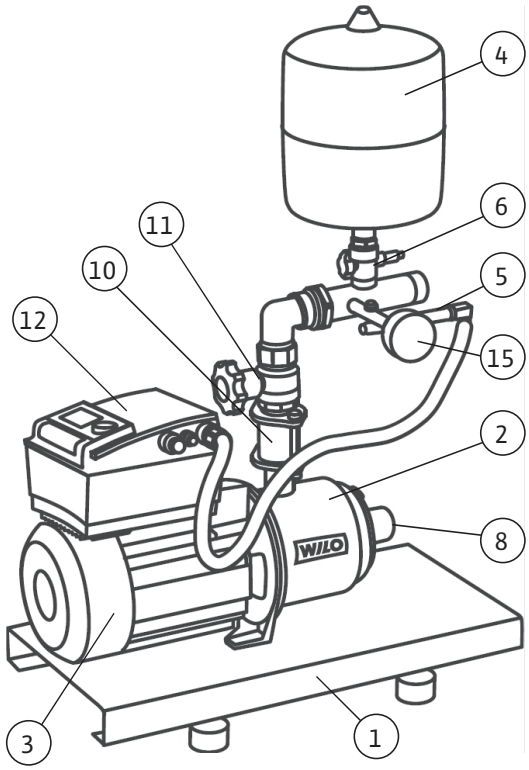

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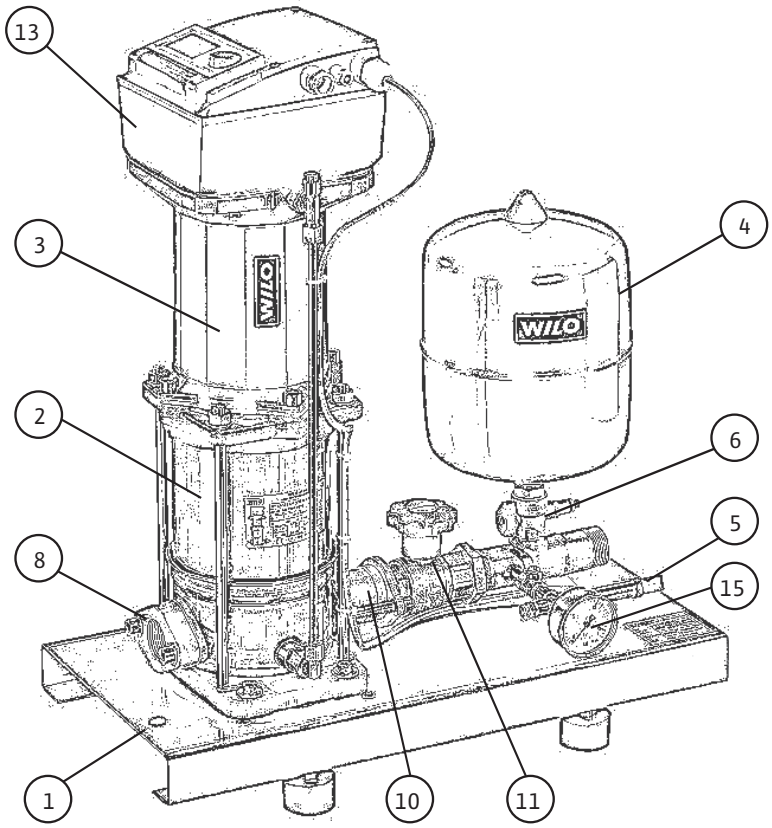


Fig. 2a

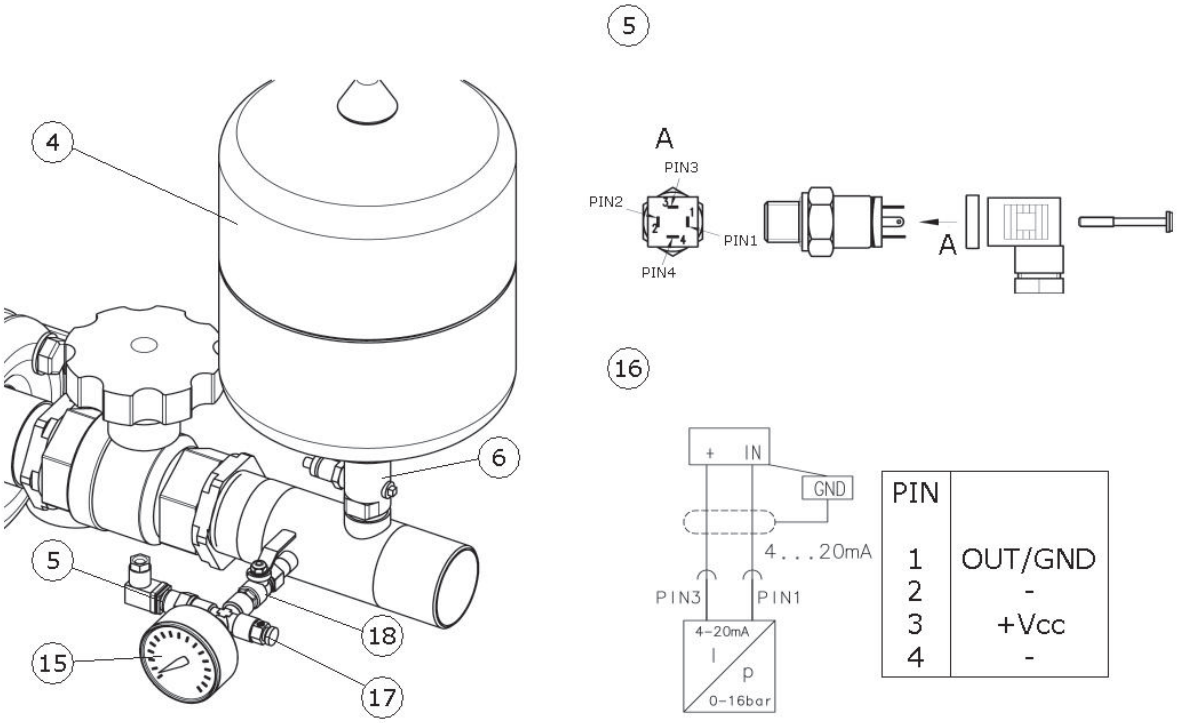
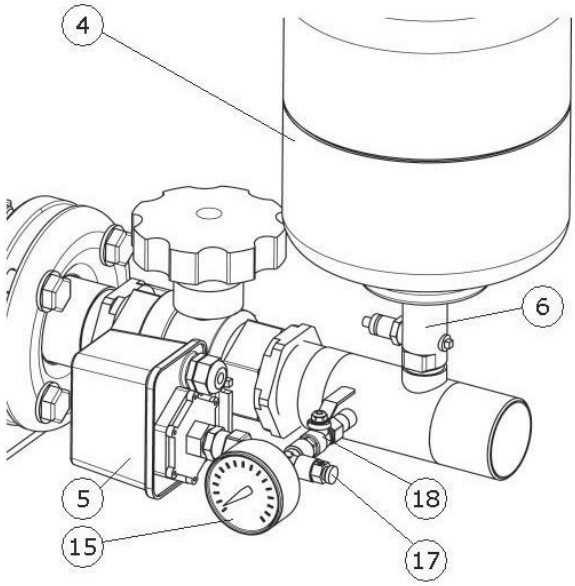

4
5
6
15
17
18
A
PIN3
PIN2
PIN1
PIN4
A
16
+ IN
GND
4...20mA
PIN3
PIN1
4–20mA
I
p
0–16bar
PIN
1
2
3
4
OUT/GND
-
+Vcc
-

Fig. 2b


4
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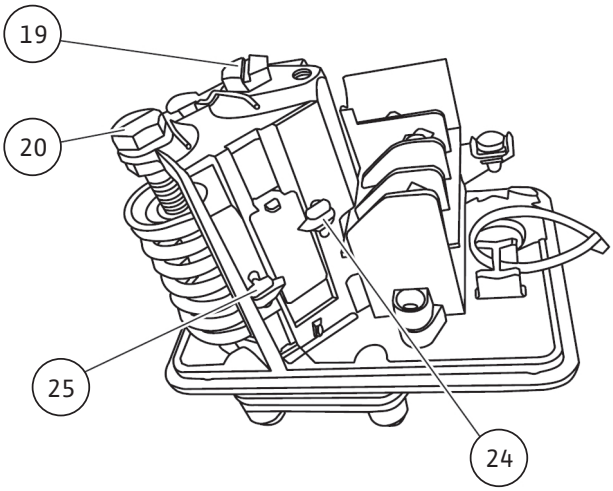
17
18

Fig. 3a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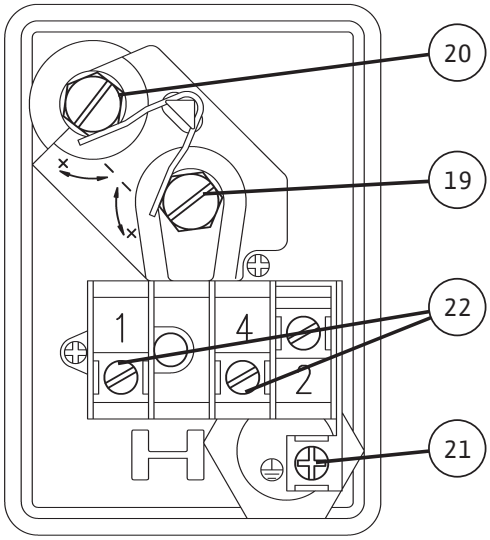
20
25
24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22
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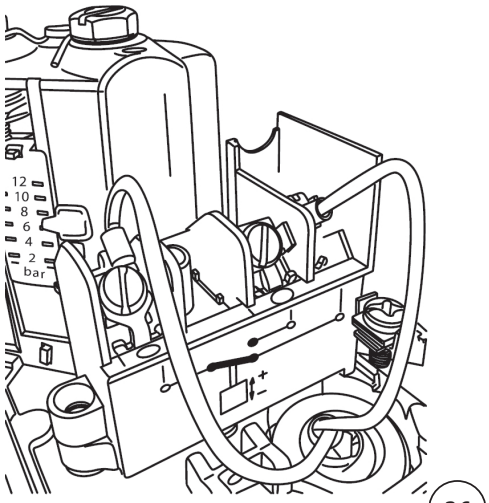
12
10
8
6
4
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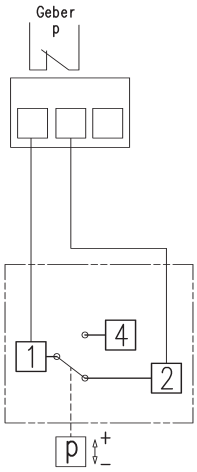
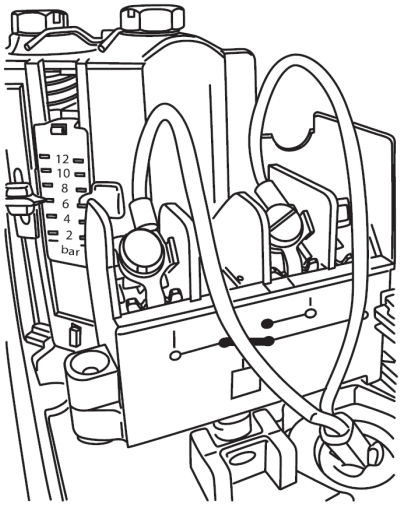
bar

26


Geber
p
1
4
2
p


12
10
8
6
4
2
bar

27

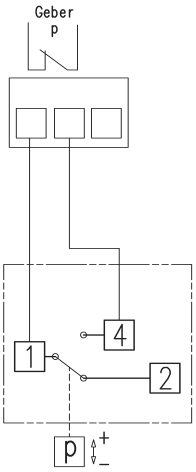

Geber
p
1
4
2
p

Fig. 3b

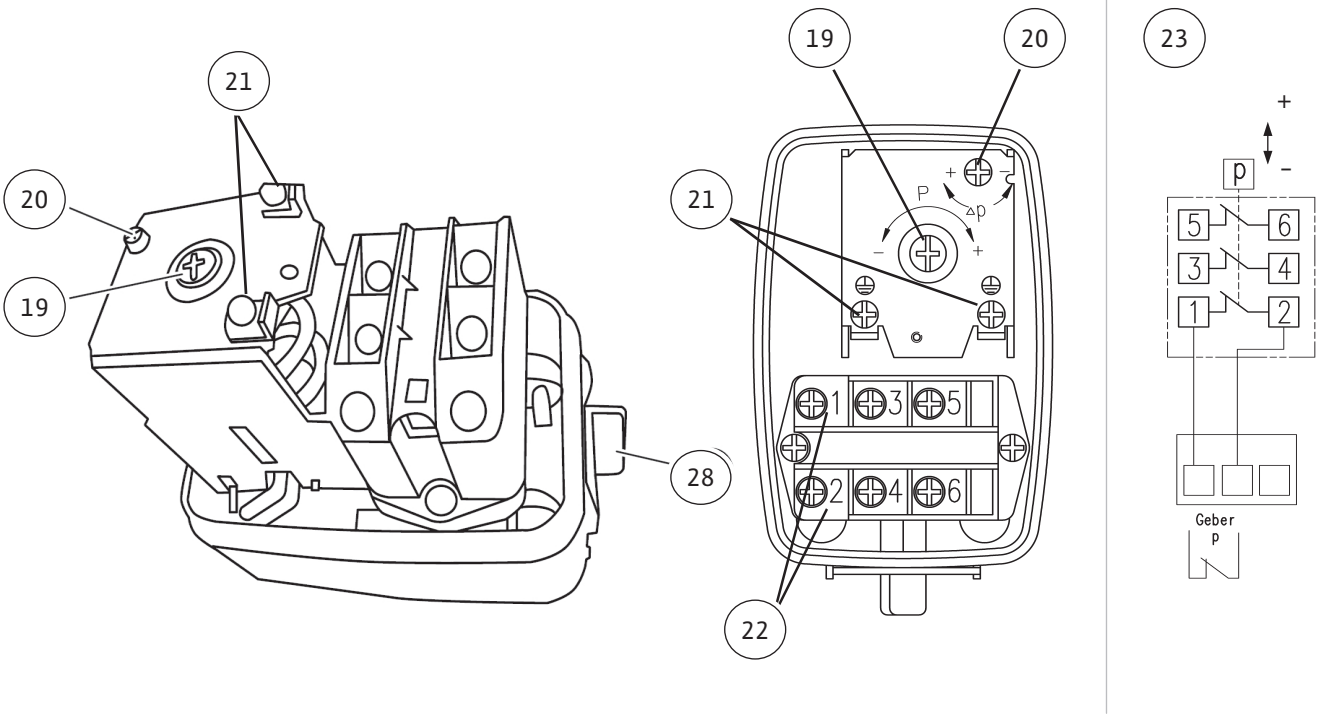


Fig. 4

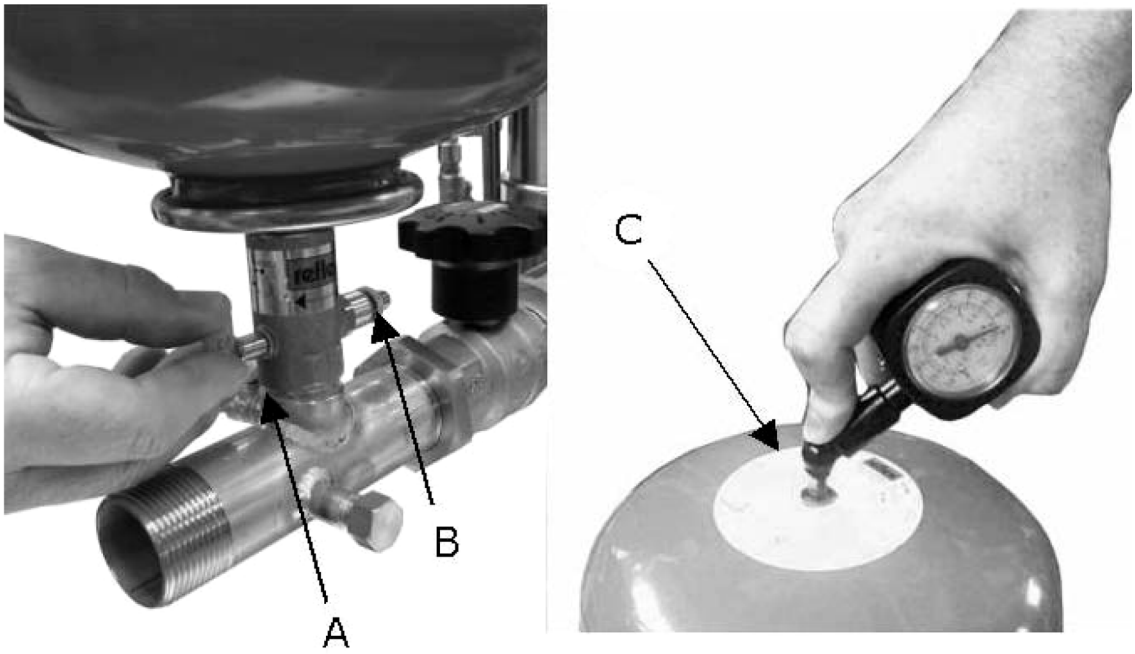

A
B
C

Fig. 5

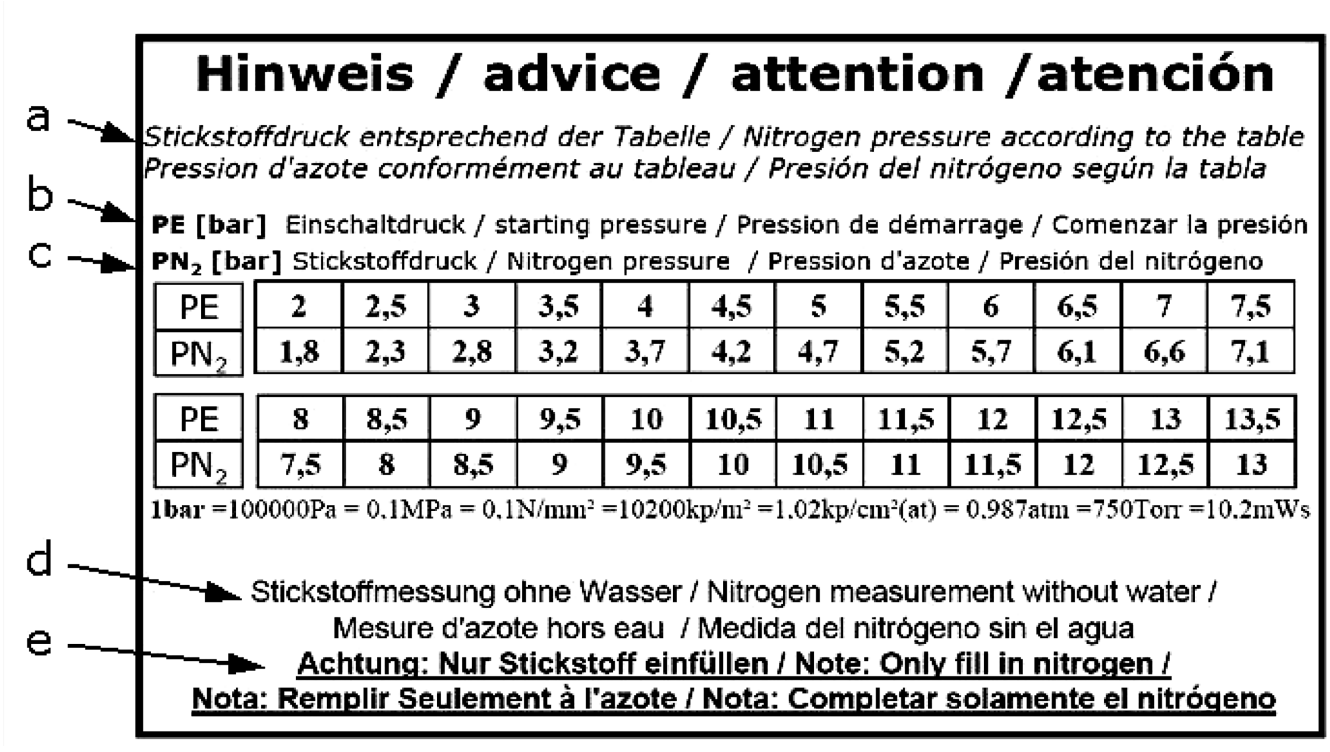
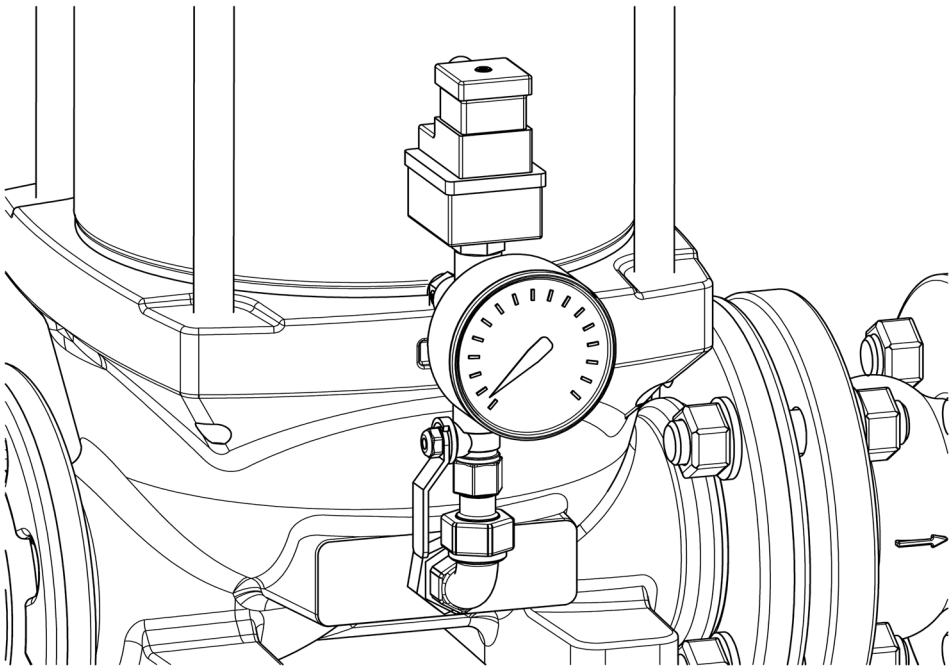

Hinweis / advice / attention /atención
a
Stickstoffdruck entsprechend der Tabelle / Nitrogen pressure according to the table
Pression d'azote conformément au tableau / Presión del nitrógeno según la tabla
b
PE [bar] Einschaltdruck / starting pressure / Pression de démarrage / Comenzar la presión
c
PN2 [bar] Stickstoffdruck / Nitrogen pressure / Pression d'azote / Presión del nitrógeno
PE 2 2,5 3 3,5 4 4,5 5 5,5 6 6,5 7 7,5
PN2 1,8 2,3 2,8 3,2 3,7 4,2 4,7 5,2 5,7 6,1 6,6 7,1
PE 8 8,5 9 9,5 10 10,5 11 11,5 12 12,5 13 13,5
PN2 7,5 8 8,5 9 9,5 10 10,5 11 11,5 12 12,5 13
1bar =100000Pa = 0,1MPa = 0,1N/mm² =10200kp/m² =1.02kp/cm²(at) = 0.987atm =750Torr =10.2mWs
d
Stickstoffmessung ohne Wasser / Nitrogen measurement without water /
Mesure d'azote hors eau / Medida del nitrógeno sin el agua
e
Achtung: Nur Stickstoff einfüllen / Note: Only fill in nitrogen /
Nota: Remplir Seulement à l'azote / Nota: Completar solamente el nitrógeno

Fig. 6a



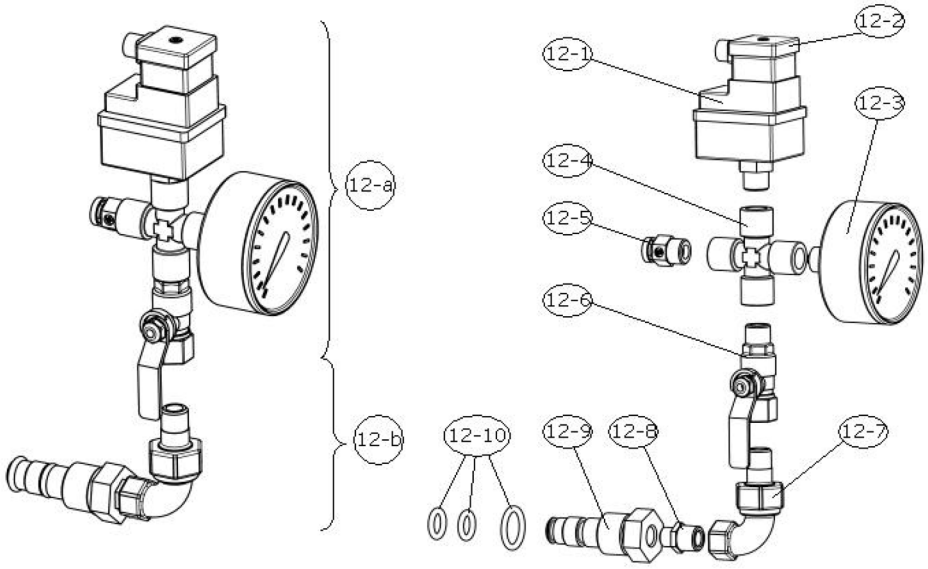


Fig. 6b

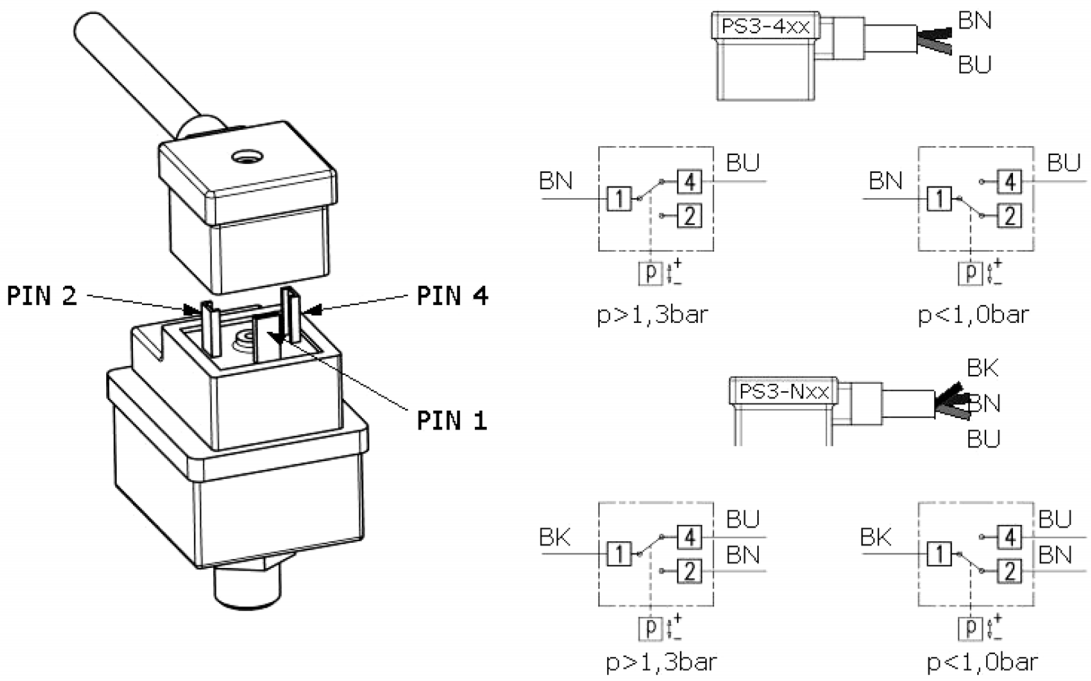


Fig. 7a

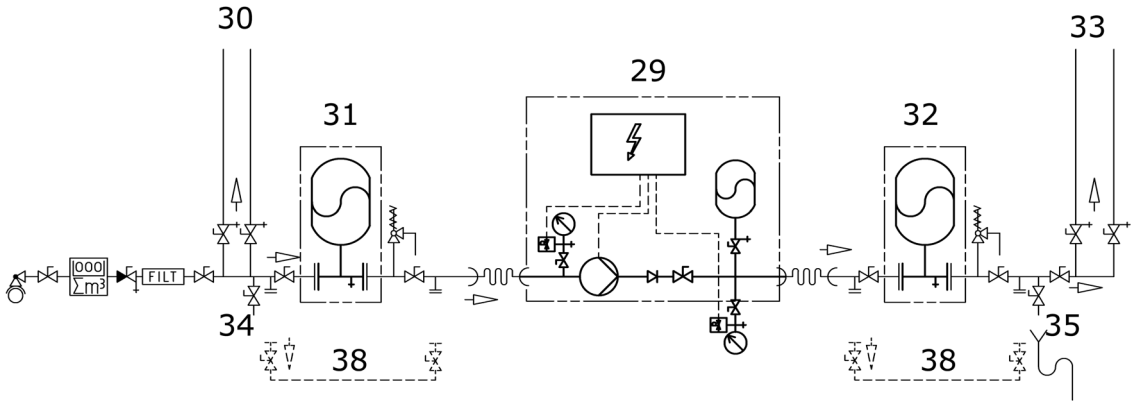


Fig. 7b

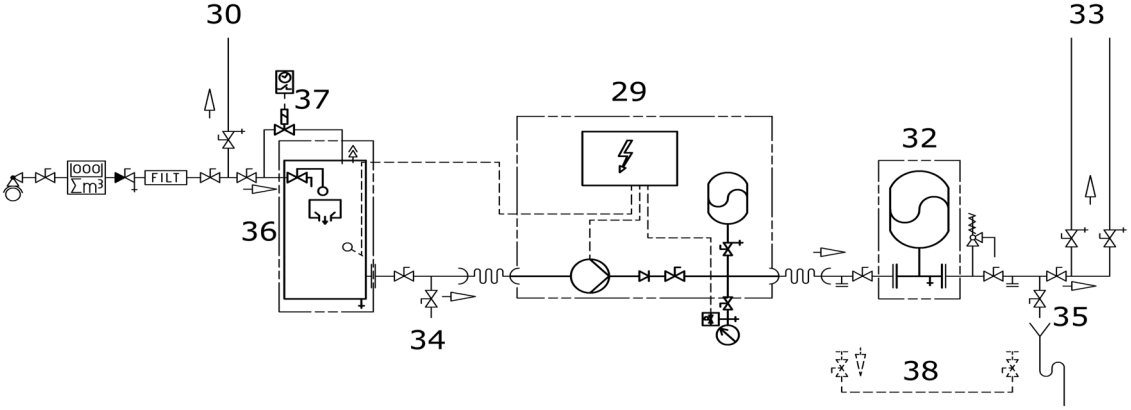


Fig. 8

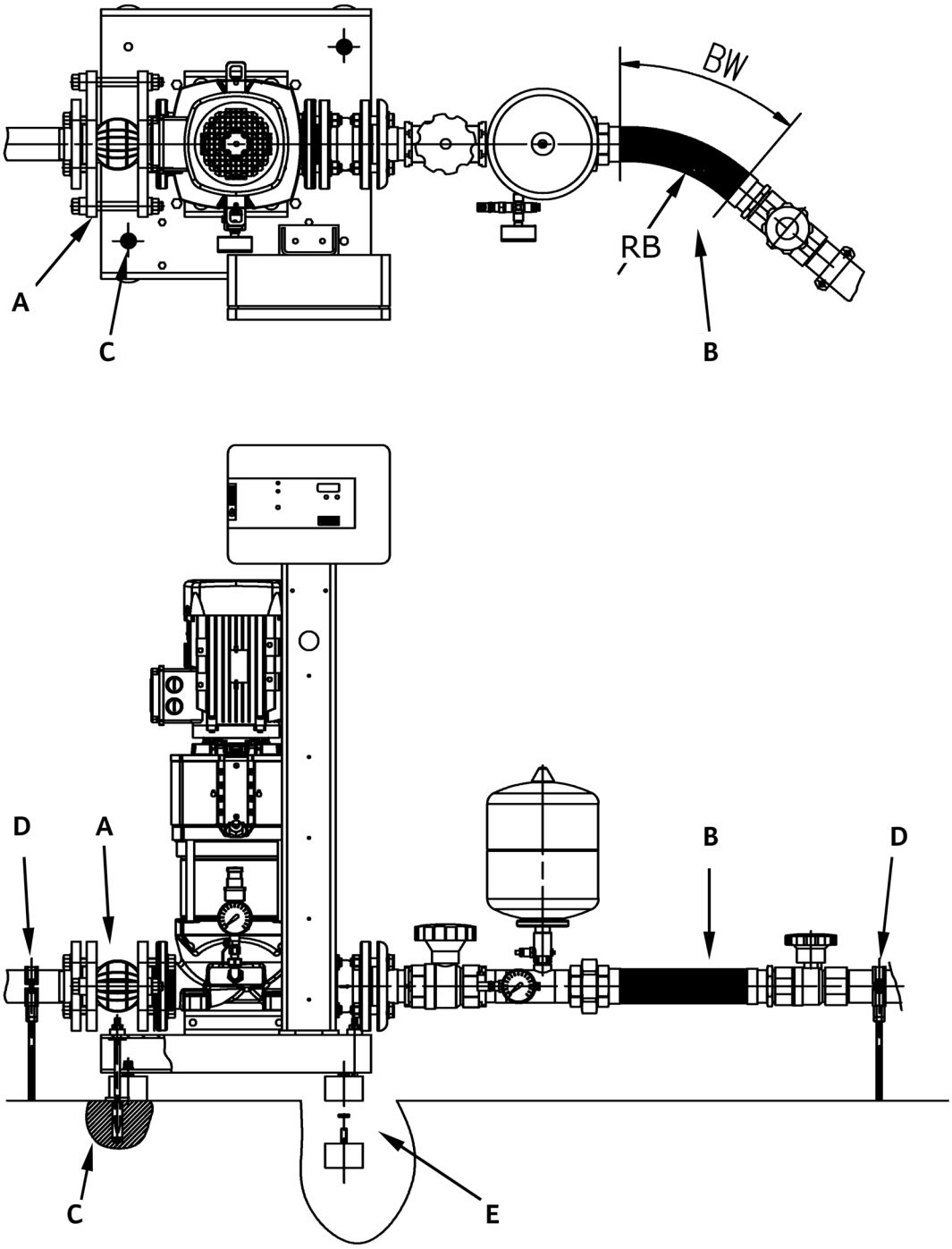


Fig. 9

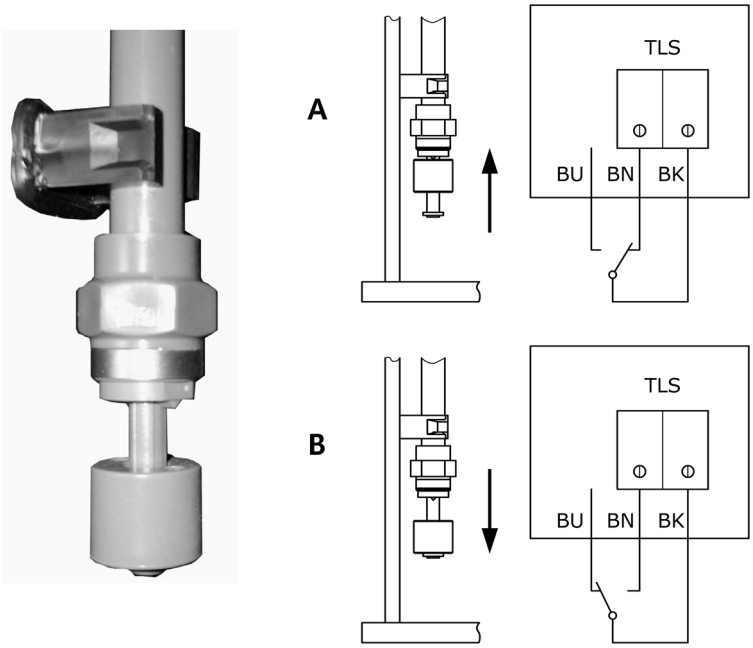


Fig. 10a

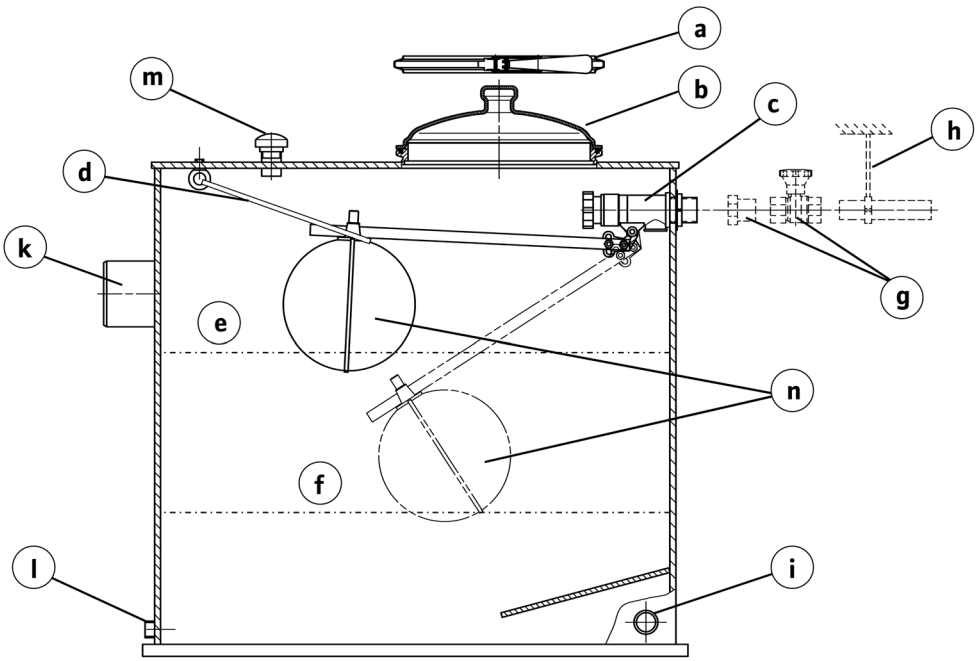
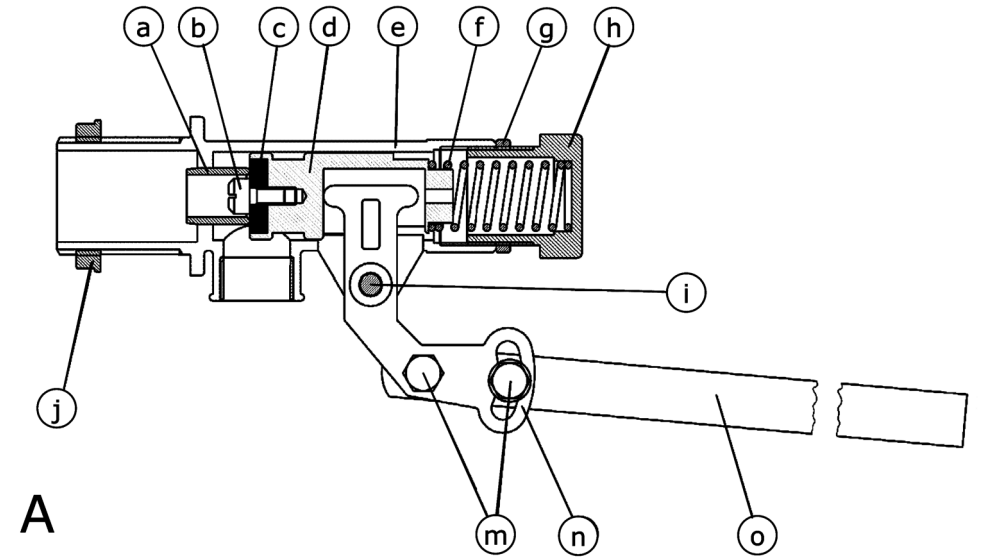
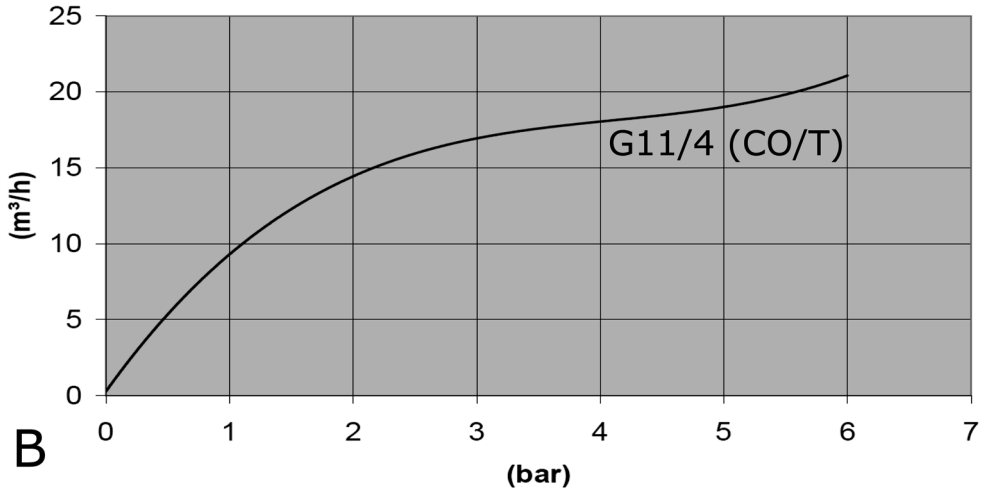


Fig. 10b



A



B

Captions:

Fig. 1a	Example CO-1HELIX V...../CE+
Fig. 1b	Example CO-1MVI...../ER
Fig. 1c	Example CO/T-1MVI.../ER
Fig. 1d	Example COR-1HELIX VE..... -GE
Fig. 1e	Example COR-1HELIX VE...../VR
Fig. 1f	Example COR-1MHIE...-GE
Fig. 1g	Example COR-1MVISE...-GE
1	Base frame
2	Pump
3	Motor
4	Diaphragm pressure vessel
5	Pressure switch/pressure sensor
6	Throughflow fitting
7	Break tank (CO/T only)
8	Inlet connection
9	Control device
10	Non-return valve
11	Stop valve
12	Low-water cut-out switchgear (WMS), optional
13	Frequency converter
14	Main switch (HS), optional (COR-1...GE only)
15	Pressure gauge

Fig. 2a	Pressure sensor and diaphragm pressure tank assembly
4	Diaphragm pressure vessel
5	Pressure sensor
6	Throughflow fitting
15	Pressure gauge
16	Electrical connection, pressure sensor
17	Drainage/venting
18	Stop valve

Fig. 2b	Pressure sensor and diaphragm pressure tank assembly
4	Diaphragm pressure vessel
5	Pressure sensor
6	Throughflow fitting
15	Pressure gauge
17	Drainage/venting
18	Stop valve

Fig. 3a	Pressure switch, type FF (two-way switch)
19	Adjusting screw for deactivation pressure (upper switching point)
20	Adjusting screw for differential pressure (lower switching point)
21	Earth connection (PE)
22	Terminal block/contacts
24	Scale for deactivation pressure
25	Scale for differential pressure
26	Connection as normally closed contact (i.e. the contact opens when pressure rises)
27	Connection as normally open contact (i.e. the contact closes when pressure rises)

Fig. 3b	Pressure switch, type CS (normally closed contact)
19	Adjusting screw for deactivation pressure (upper switching point)
20	Adjusting screw for differential pressure (lower switching point)
21	Earth connection (PE)
22	Terminal block/contacts
23	Connection diagram (the contact opens when pressure rises)
28	Hand switch 0/Automatic

Fig. 4	Throughflow fitting operation/pressure testing the diaphragm pressure vessel
A	Open/close
B	Drain
C	Check supply pressure

Fig. 5	Information table: nitrogen pressure, diaphragm pressure vessel (example)
a	Nitrogen pressure according to the table
b	Start-up pressure, base-load pump, in bar PE
c	Nitrogen pressure in bar PN2
d	Nitrogen measurement without water
e	Attention: Introduce nitrogen only

Fig. 6a Fig. 6b	Low-water cut-out switchgear assembly (WMS) Electric connection options/ switching logic WMS
12-a	**WMS assembly**
12-1	Pressure switch PS3
12-2	Plug PS3-Nxx or PS3-4xx
12-3	Pressure gauge
12-4	Distributor
12-5	Bleed valve
12-6	Stop valve
12-b	**WMS connection kit for CO-1**
12-7	Screwed connection
12-8	Fitting
12-9	Drainage screw MVI
12-10	O-ring seals
PS3-4xx	Two-core connecting cable, normally closed function (opens when pressure drops)
PS3-Nxx	Three-core connecting cable, two-way-switch function
BN	Brown
BU	Blue
BK	Black
	Connection in control device (see attached terminal diagram)

Fig. 7a Fig. 7b	Example of a direct connection (hydraulic diagram) Example of an indirect connection (hydraulic diagram)
29	System CO-1....
30	Consumer connections upstream of the system
31	Diaphragm pressure vessel (accessory) on the inlet side with bypass
32	Diaphragm pressure vessel (accessory) on the pressure side with bypass
33	Consumer connections downstream of the system
34	Infeed connection for flushing the system
35	Drainage connection for flushing the system
36	Non-pressurised break tank (accessory) on the inlet side
37	Flushing apparatus for the inlet connection of the break tank
38	Bypass for inspection/maintenance (not permanently installed)

Fig. 8	Installation example
A	Expansion joint with extension limiters (accessory)
B	Flexible connection line (accessory)
C	Floor fixing, with structure-borne noise insulation (by the customer)
D	Fixation of pipes, e.g. with pipe clips (by the customer)
E	Screw the vibration dampers (included in delivery) into the threaded inserts provided and secure with counter nuts
BW	Bend angle for flexible connection line
RB	Bend radius for flexible connection line

Fig. 9	Low-water signal transmitter (float switch) CO/T
A	Tank full, contact closed
B	Tank empty, contact open BN = Brown BU = Blue BK = Black
TLS	Contacts in the control device for low-water signal transmitter

Fig. 10a	Break tank and float valve CO/T
a	Tension ring for cover latch
b	Inspection opening with cover
c	Float valve (filling valve)
d	Fitting to secure float valve during transport
e	Maximum water level
f	Minimum water level
g	Stop valve with screwed connection (by the customer)
h	Fixation of pipes, e.g. with pipe clips (by the customer)
i	Draw-off connection for pump
k	Overflow connection
l	Drainage
m	Ventilation and exhaust
n	Float of the filling valve

Fig. 10b	Float valve
A	**Structure**
a	Valve seat
b	Screw
c	Seal
d	Valve body
e	Housing
f	Spring
g	Threaded ring
h	Plug
i	Pin
j	Support nut
k	Sealing disc, outer
l	Sealing disc, inner
m	Screw
n	Lever arm
o	Lever rod
B	**Float valve curve CO/T (11/4)**
m^3/h	Volume flow rate
bar	Inlet pressure

1 General

Only properly trained staff should carry out the installation and commissioning!

1.1 About this document

The language of the original operating instructions is German. All other languages of these instructions are translations of the original operating instructions.
These installation and operating instructions are an integral part of the product. They must be kept readily available at the place where the product is installed. Strict adherence to these instructions is a precondition for the proper use and correct operation of the product.
These installation and operating instructions correspond to the relevant version of the product and the underlying safety standards valid at the time of going to print.
EC declaration of conformity:
A copy of the EC declaration of conformity is a component of these operating instructions.
If a technical modification is made on the designs named there without our agreement, this declaration loses its validity.

2 Safety

These operating instructions contain basic information which must be adhered to during installation and operation. For this reason, these operating instructions must, without fail, be read by the service technician and the responsible operator before installation and commissioning.
It is not only the general safety instructions listed under the main point "safety" that must be adhered to but also the special safety instructions with danger symbols included under the following main points.

2.1 Indication of instructions in the operating instructions

Symbols:

General danger symbol

Danger due to electrical voltage

NOTE: ...

Signal words:

DANGER!
Acutely dangerous situation.
Non-observance results in death or the most serious of injuries.

WARNING!
The user can suffer (serious) injuries. 'Warning' implies that (serious) injury to persons is probable if this information is disregarded.

CAUTION!
There is a risk of damage to the product/unit. 'Caution' implies that damage to the product is likely if this information is disregarded.

NOTE: Useful information on handling the product. It draws attention to possible problems.

2.2 Personnel qualifications

The installation, maintenance and repair personnel must have the necessary qualifications for this work.

2.3 Danger in the event of non-observance of the safety instructions

Non-observance of the safety instructions can result in risk of injury to persons and damage to product/unit. Non-observance of the safety instructions can result in the loss of any claims to damages.
In detail, non-observance can, for example, result in the following risks:

- Failure of important product/unit functions
- Failure of required maintenance and repair procedures
- Danger to persons from electrical, mechanical and bacteriological influences
- Property damage

2.4 Safety instructions for the operator

The existing directives for accident prevention must be adhered to.
Danger from electrical current must be eliminated. Local directives or general directives [e.g. IEC, VDE etc.] and local power supply companies must be adhered to.
This device is not intended to be operated by persons (including children) with impaired physical, sensory or mental capacities or lack of experience and/or lack of knowledge, except in cases where they are supervised by a person responsible for their safety or where they receive instruction from such a person as to how the device is to be operated.
Children must be kept under supervision in order to ensure that they do not play with the device.

2.5 Safety instructions for inspection and installation work

The operator must ensure that all inspection and installation work is carried out by authorised and qualified personnel, who are sufficiently informed from their own detailed study of the operating instructions.
Work on the product/unit should only be carried out when it has been brought to a standstill. It is mandatory that the procedure described in the installation and operating instructions for shutting down the product/unit be complied with.

2.6 Unauthorised modification and manufacture of spare parts

Modifications to the product are only permissible after consultation with the manufacturer. The use of other parts can nullify the liability from the results of their usage.

2.7 Improper use

The operating safety of the supplied product is only guaranteed for conventional use in accordance with Section 4 of the operating instructions. The limit values must on no account fall under or exceed those specified in the catalogue/data sheet.

3 Transport and interim storage

The system is supplied on a pallet, on transport boards or in a crate and is film-wrapped to protect it against moisture and dust. Transport and storage instructions marked on the packing must be observed.

CAUTION! Risk of damage!

The equipment must be transported by means of authorised load carriers. Stability of the load must be ensured, since with this particular range of pumps, the centre of gravity has been shifted to the top (top-heavy). Transport straps or ropes must be secured to the existing transport lugs or taken round the base frame. The pipes and fittings will not withstand loads and should not be used to secure loads in transit.

CAUTION!

Loading of the pipes in transit can result in leaks!

The transport dimensions, weights and necessary passageways and transport areas at the installation are given in the attached installation plan or other documentation.

CAUTION!

The system must be protected against moisture, frost and heat and also mechanical damage by means of suitable measures!

If, when unpacking the system and the accompanying accessories, packaging damage is found which could have been caused by a fall or the like, check the system and/or the accessory components for possible deficiencies.

You may wish to inform the delivery company (the carrier) or Wilo factory after-sales service, even if no product damage has yet been found.

After removing the packing, the installation must be stored or installed according to the installation conditions described (see section entitled Installation).

4 Intended use

Automatic single-pump pressure boosting systems, referred to simply as “the system” in the following, are used in commercial and residential fields where pressures higher than the usual network pressure are required and a standby pump is not necessary; for example, for:

- Domestic water supply and cooling systems
- Industrial water supply and cooling systems
- Fire extinguishing water supply installations
- Irrigation and sprinkling installations
- The following standards and directives (or their local equivalents) should be applied during planning and installation:
  - DIN 1988
  - DIN 2000
  - EU Directive 98/83/EC
  - Trinkwasserverordnung (Drinking water regulations) TrinkwV 2001
  - DVGW regulations

Make sure that the fluid to be pumped in the system will not attack the materials used in the system either chemically or mechanically and that it does not contain any abrasive or long-fibre constituents.

System types CO-1.. (Fig. 1a and Fig. 1b) or COR-1.. (Fig. 1d to Fig. 1f) can be connected to the public water mains either directly or indirectly, through a break tank from the Wilo range or a break tank provided independently by the customer.

The system type CO/T... (Fig. 1c) is supplied with an integrated break tank and is therefore already prepared for indirect connection to the public water supply network.

5 Product information

5.1 Type key

e.g.: CO-1 Helix V22 08/CE+	
CO	**CO**mpact pressure boosting system
1	With one pump
Helix V	Pump series reference (see attached pump documentation)
22	Nominal volume flow Q [m^3/h]
08	Number of pump stages
CE+	Control device, in this case **C**ontroller **E**conomy **+**

e.g.: CO/T-1 MVI 2 04/ER	
CO	**CO**mpact pressure boosting system
/T	With integrated break tank for system separation
1	With one pump
MVI	Pump series reference (see attached pump documentation)
2	Nominal volume flow Q [m^3/h]
04	Number of pump stages
ER	Control device, in this case the **E**conomy **R**egler (controller)

e.g.: COR -1 Helix VE22 03 -GE	
CO	**CO**mpact pressure boosting system
R	Control by frequency converter
1	With one pump
Helix VE	Pump series reference (see attached pump documentation)
22	Nominal volume flow Q [m^3/h]
03	Number of pump stages
GE	**G**rund**E**inheit (basic unit); in other words, without an additional control device Controlled by the pump's integrated frequency converter

e.g.: COR-1Helix VE5203/3/VR	
CO	**CO**mpact pressure boosting system
R	Control by frequency converter
1	With one pump
Helix VE	Pump series reference (see attached pump documentation)
52	Nominal volume flow Q [m^3/h]
03	Number of pump stages
/3	Number of reduced stages
VR	Control device, in this case the **V**ario **R**egler (controller)

e.g.: COR-1MHIE 406-2G-GE	
CO	**CO**mpact pressure boosting system
R	Control by frequency converter
1	With one pump
MHIE	Pump series reference (see attached pump documentation)
4	Nominal volume flow Q [m^3/h]
03	Number of pump stages
2G	Generation specification
GE	**G**rund**E**inheit (basic unit); in other words, without an additional control device Controlled by the pump's integrated frequency converter

6 Description of the product and accessories

6.1 General description

The system with its non-self-priming, vertically (MV... or Helix V...) or horizontally (MH...) mounted **high-pressure multistage centrifugal pump** is supplied with all pipework installed as a compact unit ready for connection. The only connections that have to be made are for the inlet and pressure pipes and the power mains connection. Systems from series CO-1 (Fig. 1a and 1b) and COR-1 (Fig. 1d to 1f) are mounted on a steel base frame with vibration absorbers. Systems from series CO/T (Fig. 1e) are mounted on a plastic baseplate together with a plastic break tank.
It may also be necessary to install accessories ordered and supplied separately.

The systems CO-1 and COR-1 can be connected to the water supply network either directly (diagram in Fig. 7a) or indirectly (diagram in Fig. 7b). When supplied with a self-priming pump (special version), the system may only be connected to the public water supply network indirectly (system separation with a non-pressurised break tank). You will find notes on the pump type used in the attached installation and operating instructions for the pump. The systems of type CO/T are prepared for indirect connection to the public water supply network by the integrated break tank with level-dependent replenishment and system separation.

Observe the relevant, applicable regulations and standards for using the potable water supply and/or fire extinguishing supply. **The installations must be operated and maintained in accordance with the relevant instructions (in Germany, according to DIN 1988 (DVGW) so that the security of the water supply is permanently guaranteed and neither the public water support nor other consumption installations are detrimentally affected.** The relevant standards or directives (see Section 4 “Intended use” on page 22) on connection and the type of connection to the public water mains must be observed; and supplemented by **regulations of water companies or the responsible fire protection authorities**, as required. In addition, local conditions (e.g. a supply pressure that is too high or fluctuates sharply and which might require the installation of a pressure relief valve) must also be observed.

6.2 Components of the system

The system is comprised of several main components, which are described in the following. The scope of delivery includes separate installation and operating instructions for the operating parts/components. (Also see attached installation plan.)

Mechanical and hydraulic system components:
Series CO-1 and COR-1 (Fig. 1a, 1b, 1d, 1e, 1f)
The system is mounted on a **base frame** *with* **vibration absorbers (1)**. It comprises a **high-pressure multistage centrifugal pump (2) with a three-phase AC motor (3)**, with a **stop valve (11)** and a **non-return valve (10)** on the pressure side. There is also a unit that can be shut off containing a **pressure sensor or pressure switch (5)** (depending on the type of control device) and a **pressure gauge (15)**, and an 8 litre **diaphragm pressure vessel (4)** with a **throughflow fitting (6)** that can be shut off (for throughput according to DIN 4807, part 5). As an option, a **low-water cut-out switchgear (WMS) (12)** can be mounted or retrofitted on the pump's drainage port or on the inlet pipe. The **control device (9)** is mounted on the base frame by means of an upright support bracket and ready-wired to the electrical components of the system.
Series CO/T-1 (Fig. 1c)
The system is mounted on a **plastic baseplate (1)** belonging to the integrated **break tank (7)**. It comprises a **high-pressure multistage centrifugal pump (2) with a three-phase AC motor (3)**, with a **stop valve (11)** and a **non-return valve (10)** on the pressure side. There is also a unit that can be shut off containing a **pressure sensor or pressure switch (5)** (depending on the type of control device) and a **pressure gauge (15)**, and an 8 litre **diaphragm pressure vessel (4)** with a **throughflow fitting (6)** that can be shut off (for throughput according to DIN 4807, part 5). A **float switch (Fig. 9)** is installed in the break tank as a signal transmitter for protection against low water level. Water from the supply mains is fed into the break tank via a level-dependent opening and closing **float valve (Fig. 10a and 10b)**.
The **control device (9)** is mounted on the tank by means of a mounting plate and is ready-wired to the electrical components of the system.

These installation and operating instructions describe the overall system in general only, without going into a detailed description of the operation of the control device (see section 7.3 and the accompanying documentation for the control device).

High-pressure multistage centrifugal pump (2) with three-phase AC motor (3) :
Different types of multi-stage high pressure centrifugal pumps are installed in the system depending on the application and the performance parameters required. For information about the pump, see the attached installation and operating instructions for the pump.

Control device (9):
Different switching and control devices of different types with different ranges of features can be supplied and installed to activate and control the system. For information on the control device installed in this system, see the attached installation and operating instructions for the control device.
Systems of series COR-1...GE do not have a separate control device. The system is controlled by the pump's integrated frequency converter module. For operation and handling, see the installation and operating instructions for the pump.

Pressure sensor/diaphragm pressure vessel assembly (Fig. 2a):
Included in systems of types CO-1.../CE+, CO/T-1.../CE+, COR-1.../GE and COR-1.../VR
- Diaphragm pressure vessel (4) with throughflow fitting (6)
- Pressure gauge (15)
- Pressure sensor (5)
- Electrical connection for pressure sensor (16)
- Draining/venting (17)
- Stop valve (18)

Pressure sensor/diaphragm pressure vessel assembly (Fig. 2b and Fig. 3a or Fig. 3b):
Included in systems of types CO-1.../ER, CO/T-1.../ER
- Diaphragm pressure vessel (4) with throughflow fitting (6)
- Pressure gauge (15)
- Pressure switch (5) type FF (Fig. 3a) or type CS (Fig. 3b)
- Electrical connection for pressure switch FF (Fig. 3a) or pressure switch CS (Fig. 3b)
- Draining/venting (17)
- Stop valve (18)

6.3 Function of the system

Wilo single-pump pressure boosting systems are fitted as standard with a non-self-priming high-pressure multistage centrifugal pump with a three-phase AC motor. This pump is supplied with water via the inlet connection (8). If a self-priming pump is used, or generally in the case of suction mode from lower-lying tanks, a separate, vacuum-proof and pressure-proof suction line with a foot valve has to be installed. It should be positioned at a constant incline from the tank to the pump connection port. The pump increases the pressure and pumps the water to the consumer via the pressure pipe. To do this, it is switched on and off or controlled depending on the pressure. The pressure is monitored either by a pressure sensor (Fig. 2a) or a mechanical pressure switch (Fig. 2b) depending on the type of control device.

- **Pressure switch for system series CO-1 and CO/T-1 with ER:**
  The mechanical pressure switch is used to monitor the pressure present on the consumer side of the pump. As water consumption increases, the pressure in the consumer line drops. When the minimum switch-on pressure set on the pressure switch is reached, a switching signal is sent to the control device, which switches the pump on immediately. Conversely, when consumption falls (closing of taps) the pressure in the system rises. When the deactivation pressure set on the pressure switch is reached, a switching signal is again sent to the control device and the pump is switched off. For a more precise description of the type of control and the control process, see the installation and operating instructions for the control device.
- **Pressure sensor for system series CO-1 and CO/T-1 with CE+ or COR-1..-GE and COR-1.../VR:**
  The pressure sensor continuously measures the actual pressure value, converts it into an analogue current signal and transmits it to the control device. Depending on demand and the type of control system, the control device switches the pump on or off or changes the speed of the pump until the set control parameters are reached. For a more precise description of the type of control, the control process and the setting options, see the installation and operating instructions for the control device.
  The diaphragm pressure vessel installed (4) (total content approx. 8 litres) performs a certain buffer function on the pressure sensor and prevents oscillation of the control system when switching the system on and off. However, it also allows the extraction of small amounts of water (e.g. due to very small leaks) from the available storage volume without switching on the pump. This reduces the switching frequency of the pumps and stabilises the operating state of the system.

CAUTION!
To protect the mechanical shaft seal or slide bearing, the pump must not run dry. Otherwise the pump may leak.

An assembly for protection against low water level (WMS) (12) (for detailed drawings see Fig. 6a and 6b) is provided as an accessory for direct connection to the public water mains. It monitors the available supply pressure and sends a switching signal which is processed by the control device. The WMS assembly is installed on the pump's drainage opening (this also requires the WMS connection kit (Fig. 6a, 12b) for CO-1 from the Wilo accessories range) or at an installation point which must be provided in the inlet pipe.
In the case of an indirect connection (system separation through non-pressurised break tank), a level-dependent signal transmitter must be provided and installed in the break tank as a dry-running protection device. With systems of series CO/T or if a Wilo break tank is used, a float switch (Fig. 9) is already included in the supplied system. For existing onsite tanks, you will find various signal transmitters in the Wilo range that can be retrofitted (e.g. float switch WA65 or low-water warning electrodes with level relay SK 277).

WARNING!
Materials that do not adversely affect the quality of the water must be used for drinking water systems!

6.4 Noise

Depending on power requirements, the system may be delivered with a wide variety of pumps which can vary just as widely in their noise and vibration characteristics. You will find the relevant data in the installation and operating instructions for the pump or in the catalogue specifications for the pump.

6.5 Scope of delivery

- Single-pump pressure boosting system
- Installation and operating instructions of the single-pump pressure boosting system
- Installation and operating instructions of the pump
- Installation and operating instructions of the control device
- Factory test report
- Installation plan if applicable
- Electrical wiring diagram if applicable
- Installation and operating instructions of the frequency converter if applicable
- Additional sheet with the factory setting of the frequency converter if applicable
- Installation and operating instructions of the signal transmitter if applicable
- Spare parts list if applicable

6.6 Accessories

Accessories must be ordered separately if needed. The accessories included in the Wilo range include the following:

- Open break tank
- Larger diaphragm pressure tank (on the suction side or discharge side)
- Safety valve
- Dry-running protection:
  - Protection against low water level (WMS) (Fig. 6a and 6b) in inlet mode (at least 1.0 bar) (already fitted to the system if part of the order)
  - Float switch
  - Low-water warning electrodes with level relay
  - Electrodes for tank operation (special accessories on request)
- Flexible connection lines
- Expansion joints
- Threaded flange
- Sound-insulating casing (special accessory on request)

7 Installation

7.1 Installation site

- The installation is installed in the technical control room or in a separate, dry, well ventilated and frost-proof room that can be locked (requirement of DIN 1988 to be observed where applicable).
- Adequately dimensioned floor drainage (drain connection or similar) must be provided in the installation room.
- No harmful gases must penetrate the room or be present there.
- Adequate space must be provided for maintenance work. The main dimensions are given on the attached installation plan. The system should be freely accessible from at least two sides.
- The installation surface must be horizontal and flat. The bearing surface must have adequate load-bearing capacity.
- The system is designed for a maximum ambient temperature of +0 °C to 40 °C with a relative atmospheric humidity of 50%.
- Installation and operation in the vicinity of living rooms and bedrooms is not recommended.
- To avoid the transmission of structure-borne noise and to ensure a stress-free connection to upstream and downstream pipes, expansion joints with extension limiters or flexible connection lines should be used.

7.2 Installation

7.2.1 Foundation/bearing surface

The system is constructed for installation on flat concrete floors. The base frame is mounted on height-adjustable vibration absorbers to prevent structure-borne noise.

NOTE:
The vibration dampers may not be fitted when the equipment is delivered for transport reasons. Before installing the system, make sure that all the vibration dampers are fitted and locked by the threaded nuts (see also Fig. 8).

If the customer also wants to secure the installation to the floor, suitable measures must be taken to avoid structure-borne noise.

7.2.2 Hydraulic connection and pipes

- When connecting to the public potable water mains, the requirements of the local water supply company must be met.
- First perform all the welding and soldering work and the necessary flushing and, if necessary, disinfecting of the pipework and the supplied boosting system (see 7.2.3) before connecting the system.
- The customer's pipes must be installed free from stresses. Expansion joints with extension limiters or flexible connection lines are recommended for this purpose in order to avoid stresses on the pipe connections and to minimise the transmission of system vibrations to the building pipework. In order to prevent the transmission of structure-borne noise to the building, do not secure the pipe clamps to the system pipes (see Fig. 8 for example).
- The flow resistance of the suction line must be kept as low as possible (i.e. short pipe, few elbows and sufficiently large stop valves), otherwise the protection against low water level may respond through severe pressure losses in the event of high volume flows. (Observe NPSH of the pump, avoid pressure loss and cavitation.)

7.2.3 Hygiene (TrinkwV 2001)

The pressure boosting system you have received complies with applicable technical standards and has been checked at the factory to make sure it functions perfectly. Please remember that when used in potable water applications, the complete potable water supply system must be transferred to the operator in a perfectly hygienic condition. Be sure to observe the applicable local regulations as well. (In Germany: DIN 1988, part 2 section 11.2, and the commentaries on the DIN standard; according to TwVO § 5, para. 4 , this also includes microbiological requirements, flushing if necessary and also disinfecting in some circumstances. The limit values to be met are given in TwVO § 5).

WARNING! Contaminated potable water is a health hazard!

- **Flushing the pipes and the system reduces the risk of affecting the quality of the potable water!**
- **The water must be completely replaced after a long period of system standstill.**
  Once the system is delivered, install it in the intended installation location and connect it up as soon as possible. Always flush the system.
  For the simple flushing of the system, we recommend the installation of a T-connector on the consumer side of the system (if there is a diaphragm pressure vessel on the discharge side, immediately after it) in front of the next shut-off device. Its branch, provided with a shut-off device, drains into the waste water system during the flushing process and has to be suitably dimensioned according to the maximum volume flow of the pump (see also diagram in Fig. 7a and 7b). If it is not possible to achieve free drainage, the requirements in DIN 1988 part 5 must be observed when connecting a hose, for example.

7.2.4 Dry-running protection/protection against low water level (accessory)

- To fit dry-running protection:
  - Direct connection to the public water mains: screw in the low-water protection device (WMS) on one of the necks provided for that purpose in the suction line (if retrofitting) or on the drainage connection of the pump, and seal it (Fig. 6a). You will also need the WMS connection kit for CO-1... if installing on the pump drainage connection. Connect the wiring to the control device according to the installation and operating instructions and wiring diagram of the control device.
  - Systems from series CO/T are already fitted as standard with a float switch for level monitoring as a dry-running protection device (Fig. 9).
  - In the case of indirect connection via a Wilo break tank, a float switch for level monitoring is likewise already installed as a standard dry-running protection fitting. All that is needed is to connect the wiring to the control device of the system according to the installation and operating instructions and wiring diagram of the control device. Also follow the operating instructions of the break tank.
  - In the case of an indirect connection, i.e. for operating with the customer's tanks:
    fit the float switch in the tank so that if the water level drops to approximately 100 mm above the draw-off connection, the "low water" switching signal is transmitted.
    Alternatively:
    install 3 submersible electrodes in the break tank. The arrangement is as follows: the first electrode should be placed just above the floor of the tank as an earth electrode (must always be submerged) and for the lower switching level (low water) a second electrode should be placed approximately 100 mm above the draw-off connection. For the upper switching level (no longer low water) a third electrode should be fitted at least 150 mm above the lower electrode. Connect the wiring to the control device according to the installation and operating instructions and wiring diagram of the control device.

7.2.5 Diaphragm pressure tank (accessory)

For transport reasons, the diaphragm pressure vessel (8 litre) that is part of the scope of delivery of the system may be not be fitted upon delivery, i.e. it was separately packed. This must be mounted on the throughflow fitting before commissioning (see Fig. 4).

NOTE

Ensure that the throughflow fitting is not twisted. The fitting is correctly mounted when the drain valve (see also Fig. 4) or rather the flow direction arrows stamped on it are parallel to the pressure pipe.

If an additional larger diaphragm pressure vessel needs to be installed – for instance, for a system without a speed-controlled pump – be sure to observe the installation and operating instructions for that vessel. In the case of a potable water installation, a throughflow diaphragm vessel according to DIN 4807 must be used. When installing diaphragm vessels, also make sure there is enough room for maintenance work or replacement.

NOTE

Diaphragm pressure vessels require regular testing according to directive 97/23/EC (in Germany, also taking into account the Operating Safety Ordinance §§ 15(5) and 17 and also Annex 5)

Stop valves must be provided upstream and downstream of the vessel for tests, overhaul and maintenance work on the pipe. To prevent system downtime, connections for a bypass can be fitted before and after the diaphragm pressure vessel. To prevent water stagnation, this bypass must be removed completely upon completion of the work (examples are given in the diagram in Fig. 7a and 7b). Special maintenance and test instructions are given in the installation and operating instructions of the diaphragm pressure vessel concerned. The installation conditions and delivery specifications of the system must be taken into account when selecting the size of the diaphragm pressure vessel. An adequate throughflow of the diaphragm vessel must be ensured. The maximum volume flow of the system must not exceed the maximum admissible volume flow for the diaphragm pressure vessel connection (see Table 1 or the specifications on the rating plate, and the installation and operating instructions of the vessel).

Diaphragm pressure vessel connection							
Nominal diameter DN	20	25	32	50	65	80	100
Connection	R_P ¾“	R_P ¾“	R_P ¾“	Flange	Flange	Flange	Flange
Max. volume flow in m^3/h	2.5	4.2	7.2	15	27	36	56

Table 1

7.2.6 Safety valve (accessory)

A component-tested safety valve must be installed on the discharge side if the sum of the maximum possible supply pressure and the maximum delivery pressure of the pressure boosting system can exceed the admissible positive operating pressure of an installed system component. The safety valve must be designed so that it will drain off the volume flow occurring in the pressure boosting system when the positive operating pressure is 1.1-times the admissible level (design data are given in the data sheets/characteristic curves of the system). The water flow that flows off must be safely drained away. The corresponding installation and operating instructions and the relevant conditions must be observed during the installation of the safety valve.

7.2.7 Non-pressurised break tank (accessory)

To connect the system indirectly to the public potable water mains, it must be installed together with a non-pressurised break tank according to DIN 1988 (except for series CO/T). The rules for the pressure boosting system apply to the installation of the break tank as well (see 7.1). The entire bottom of the tank must be in contact with a solid bearing surface. The maximum volume of the tank concerned must be considered when designing the load-bearing capacity of the bearing surface. When installing, sufficient space must be allowed for overhaul work (at least 600 mm above the tank and 1000 mm on the connection sides). The tank must not slant when full, because an uneven load can lead to its destruction. The enclosed, non-pressurised PE tank (i.e. under atmospheric pressure), which we supply as an accessory, must be installed according to the installation and operating instructions included with the tank. The following procedure applies generally: the tank must be connected free from mechanical stresses before commissioning. This means that the connection must be made using flexible components, like expansion joints or hoses. The tank overflow must be connected according to the regulations in force (in Germany, DIN 1988/part 3). Heat transmission through the

connection pipes must be avoided by taking suitable measures. PE tanks in the Wilo range are only designed to accommodate clean water. The maximum temperature of the water must not exceed 50 °C.

CAUTION!
The tanks are statically designed for their nominal capacity. Subsequent changes can affect the statics and lead to inadmissible deformation or even destruction of the tank.
The electrical wiring (for low-water protection device) to the system's control device must also be connected before the system is commissioned (see the details in the installation and operating instructions for the control device).

NOTE:
The tank must be cleaned and flushed before it is filled.

CAUTION!
You must not walk on plastic tanks. Walking on the cover or subjecting it to loads can result in damage.

7.2.8 Expansion joints (accessory)

For stress-free installation of the system, the pipes must be connected with expansion joints (see for example Fig. 8, A). The expansion joints must be equipped with a structure-borne noise-insulating extension limiter to absorb the reaction forces that occur. The expansion joints must be installed stress-free in the pipes. Alignment errors or pipe displacement must not be compensated for using expansion joints. When installing, the screws must be tightened uniformly in a criss-cross pattern. The ends of the screws must not project beyond the flange. If welding work is done nearby, the expansion joints must be covered for protection (sparks, radiated heat). The rubber parts of expansion joints must not be painted and must be protected from oil. In the installation, the expansion joints must be accessible for inspection at any time and therefore must not be covered by the pipe insulation.

NOTE:
Expansion joints are subject to wear. It is necessary to regularly check for cracks or blisters, exposed fabric or other defects (see recommendations in DIN 1988).

7.2.9 Flexible connection lines (accessory)

In the case of pipes with threaded connections, flexible connection lines can be used for stress-free installation of the system and in the event of slight pipe displacement (see Fig. 8 for example). The flexible connection lines in the Wilo range consist of a high quality stainless steel corrugated hose with stainless steel braiding. A flat-sealing stainless steel screw connection with internal thread is provided on one end for fitting to the system. An external pipe thread is provided at the other end to connect to further pipework. Depending on the size, certain maximum admissible deformation limits must be met (see Table 2 and Fig. 8). Flexible connection lines are not suitable for absorbing axial vibrations and compensating corresponding movements. A suitable tool must be used to prevent kinking or twisting when fitting. In the case of angular displacement of the pipes, it is necessary to fix the system to the floor, taking into account suitable measures to reduce structure-borne noise. The flexible connection lines in the system must be accessible for inspection at any time and must therefore not be covered by the pipe insulation.

Maximum admissible deformations

Nominal connection diameter DN	Screwed connection thread R_P	Tapered male thread R	Admissible bend radius ∞ up to radius in mm	Max. bend angle 0 up to angle in °
32	1¼"	1¼"	220	75
40	1½"	1½"	260	60
50	2"	2"	300	50
65	2½"	2½"	370	40

Table 2

NOTE:
Flexible connection lines are subject to wear in operation. Check regularly for leaks or other defects (see recommendations in DIN 1988).

7.2.10 Pressure reducer (accessory)

The use of a pressure reducer is necessary with pressure fluctuations in the inlet pipe of more than 1 bar or if the supply pressure fluctuation is so great that the system has to be switched off or the total pressure (supply pressure and pump head at the zero volume point – see characteristic curve) of the system exceeds the nominal pressure. The pressure relief valve can only perform its function if there is a minimum pressure gradient of approx. 5 m or 0.5 bar. The pressure downstream of the pressure reducer (back-pressure) is the basis for the total head calculation of the pressure boosting system. When installing a pressure reducer, there should be an installation section of approximately 600 mm on the supply pressure side.

7.3 Electrical connection

DANGER!

The electrical connection must be made according to the local regulations (VDE regulations) by an electrical installation engineer approved by local electricity supply companies.

The system can be equipped with different types of control device. To make the electrical connection, the corresponding installation and operating instructions and attached electrical wiring diagrams must be observed. General points to be considered are listed below:

- The current type and voltage of the mains connection must comply with the details on the rating plate and wiring diagram of the control device.
- The electrical connection line must be adequately dimensioned according to the total power of the system (see rating plate and data sheet).
- External protection must be provided according to DIN 57100/VDE 0100 part 430 and part 523 (see data sheet and wiring diagrams).
- As a protective measure, the system must be earthed according to regulation (i.e. according to the local regulations and circumstances); the connections intended for this purpose are identified accordingly (see also wiring diagram).

DANGER!

As protective measures against dangerous contact voltages:

- **In the case of systems without a frequency converter (CO-1...) a residual-current-operated protection switch with a trigger current of 30 mA must be installed**
- **In the case of systems with a frequency converter (COR-1...) a universal-current-sensitive residual-current-operated protection switch with a trigger current of 300 mA must be installed**
- **The protection class of the system and of the individual components are indicated by the rating plates and/or data sheets**
- **Further measures/settings, etc. are described in the installation and operating instructions and also the wiring diagram of the control devices**

8 Commissioning/Decommissioning

We recommend that the initial commissioning of the system is performed by Wilo's customer service. Contact your dealer, your nearest Wilo representative or contact our central customer service department directly for details.

8.1 General preparations and checking

- Before switching on for the first time, check that all on-site wiring has been done correctly, particularly the earthing
- Check that the pipe joints are stress-free
- Fill the system and check visually for leakage
- Open the stop valves on the suction and pressure pipes
- Filling and bleeding the pump: open the pump's vent screw and slowly fill the pump with water so that the air can escape completely (see also the installation and operating instructions for the pump: section regarding filling)

CAUTION!

Do not allow the pump to run dry. Dry-running destroys the mechanical shaft seal (MVI(E), Helix V(E)) or leads to motor overload (MVIS(E)).

- In suction mode (i.e. negative level difference between break tank and pump), the pump and the suction line must be filled via the opening in the vent screw (use a funnel as required). (See also the installation and operating instructions for the pump: section regarding filling.)
- Check the diaphragm pressure vessel to make sure that the supply pressure is correct (see Fig. 4). To do this, depressurise the vessel on the water side [(close the flow-through fixture (A, Fig. 4) and allow the residual water to drain (B, Fig. 4)].
- Now check the gas pressure at the air valve (top; remove protective cap) on the diaphragm pressure vessel using an air pressure gauge (C, Fig. 4)
- If necessary, correct the pressure if too low [(PN2 = pump switch-on pressure pmin less 0.2-0.5 bar) or value given in the table on the vessel (see also Fig. 5)] by adding nitrogen (contact Wilo customer service). If the pressure is too high, let off nitrogen at the valve until the value required is reached. Then replace the protective cap, close the drainage valve on the flow-through fixture and open the flow-through fixture.

- With system pressures greater than PN16, the manufacturer's filling instructions given in the attached installation and operating instructions must be observed for the diaphragm pressure vessel.

CAUTION!
Excessive supply pressure (nitrogen) in the diaphragm pressure vessel can lead to damage or destruction of the vessel and thereby also to personal injury.
The safety measures for the handling of pressurised vessels and technical gases must be observed.
The pressure specifications in this documentation (Fig. 5) are given in bar. If other units of pressure measurement are used, always be sure to convert the figures correctly.

- In the case of an indirect connection, check that the water level in the break tank is adequate, or with a direct connection, that the inlet pressure is adequate (minimum inlet pressure 1 bar)
- Correct installation of the right dry-running protection (section 7.2.4.)
- In the break tank, position the float switch or electrodes for protection against low water so that the system is switched off at the minimum water level (section 7.2.4)
- Checking the direction of rotation of pumps with a standard motor (without integrated frequency converter): switch on briefly and verify that the direction of rotation of the pumps (Helix V, MVI or MHI) corresponds to the arrow on the pump housing. In the case of MVIS type pumps, the correct direction of rotation is signalled by the operating lamp in the terminal box lighting up. Swap two phases if the direction of rotation is incorrect.

DANGER!
Switch off the system's main switch before swapping the phases.

- Check the motor protection switch in the control device to make sure that the right nominal current is set according to the specifications on the motor rating plate. Follow the installation and operating instructions of the control device when doing so.
- The pumps should only briefly run against the closed gate valve on the pressure side.
- Check and set the operating parameters required on the control device according to the attached installation and operating instructions.

With systems of types CO-1.../ER and CO/T-1.../ER you may need to check and correct the setting of the pressure switch. This setting is tuned at the factory for the optimum volumetric flow rate for operation without supply pressure.

DANGER!
Contact with live parts can cause death! Use an insulated screwdriver when setting the pressure switch.

Proceed as follows when setting the pressure switch:

Use of pressure switch type FF4.... (Fig. 3a)

- Open the pressure switch cover
- Open the gate valve on the discharge side and one tap
- Set the deactivation pressure using the adjusting screw (item 19 in Fig. 3a). The pressure can be read in bar on the dial (item 24 in Fig. 3a). Factory setting is as shown on the attached acceptance test certificate.
- Slowly close the tap
- Monitor the deactivation point on the pressure gauge and correct it if necessary by turning the adjusting screw (item 19 in Fig. 3a)
- Slowly open the tap
- Set the start-up pressure using the adjusting screw (item 20 in Fig. 3a). The pressure difference can be read on the dial (item 25 in Fig. 3a). (The factory setting for the pressure difference Δp between deactivation and start-up pressure is about 1.0 bar.)
- Close the tap again.
- Put the pressure switch cover back in place.

The **pressure switch of type FF4** is designed as a single-pole two way switch. The switch contact is wired at the factory to close when pressure drops and is set to **pressure boosting** mode (see installation and operating instructions for ER switchgear). If the pump needs to be run in **fire extinguishing system** mode (for setting n ER switchgear, see the attached installation and operating instructions), a pressure switch is needed which opens its contact when pressure drops and closes when the target pressure is reached (i.e. the pump runs with the switch contact open). With the pressure switch of type FF4, the switching logic can be changed by moving the connecting cable in the pressure switch from Contact 2 to Contact 4 (Fig. 3a, 26 and 27). After this connection is swapped around, the contact opens when pressure drops and closes when the target pressure is reached.

Use of pressure switch type CS.... (Fig. 3b)

- Set the hand switch (item 28 in Fig. 3b) on the pressure switch to “0”.
- Open the pressure switch cover.
- Set the deactivation pressure using the central screw (-P+, item 19 in Fig. 3b). The pressure can be read in bar on the dial (on the side). Factory setting is as shown on the attached acceptance test certificate.
- Open the gate valve on the discharge side and one tap.
- Set the hand switch (28) on the pressure switch to “AUT”.
- Slowly close the tap.
- Monitor the deactivation point on the pressure gauge and correct it if necessary by turning the adjusting screw (-P+, item 19 in Fig. 3b).
- Slowly open the tap.
- Set the start-up pressure using the screw (+Δp-, item 20 in Fig. 3b). The factory setting for the pressure difference Δp is about 1.0 bar.
- Close the tap again.
- Set the hand switch on the pressure switch to “0”.
- Put the pressure switch cover back in place.
- Set the hand switch on the pressure switch to “AUT” (automatic mode).

The pressure switch of type CS is designed as a three-pole normally-closed contact (i.e. contacts close when pressure drops and open when the target pressure is reached). This pressure switch only allows the system to be operated in pressure boosting mode (see installation and operating instructions for ER switchgear). If the application absolutely requires the fire extinguishing system mode to be possible, the pressure switch must be replaced, because that mode requires the contact to open when pressure drops.

8.2 Protection against low water level (WMS)

The protection against low water level (WMS) (Fig. 6a and 6b) for monitoring the supply pressure is permanently factory-set to the thresholds 1 bar (deactivates if pressure below this value) and 1.3 bar (starts up again when pressure goes above this value).

8.3 Commissioning the system

After all the preparations and checks according to section 8.1 have been made, the system should be switched on at the main switch on the control device and the control should be set to automatic mode. (Systems of type COR-1...GE have a separate main switch.) The pressure control system switches the pump on until the consumer pipelines are filled with water and the set pressure has built up.

CAUTION!
If the installation has not been flushed up to now, flush it through well at this point at the latest (see section 7.2.3).

8.4 Decommissioning the system

If the system is decommissioned for maintenance, repair or other measures, proceed as follows:

- Switch off the voltage supply and secure to prevent it from being switched on again without authorisation
- Close the stop valves upstream and downstream of the system
- Shut off the diaphragm pressure vessel at the throughflow fitting and drain it
- Drain the system completely if necessary

9 Maintenance

To guarantee maximum reliability in operation at the lowest possible operating cost, we recommend that the system is checked and maintained regularly (see DIN 1988 standard). It is advisable to enter into a maintenance contract with a specialist company or with our central customer service department. The following checks should be made regularly:

- Check that the pressure boosting system is ready to operate
- Check the mechanical shaft seal of the pump. The mechanical shaft seals need water for lubrication and this can leak out of the seal slightly. If this is very noticeable, change the seal.
- Check the diaphragm pressure vessel (every 3 months is recommended) to make sure that the supply pressure is set correctly (see Fig. 2b).

CAUTION!
If the supply pressure is incorrect, the function of the diaphragm pressure vessel is not guaranteed, which increases diaphragm wear and can lead to system faults.
To do this, depressurise the vessel on the water side (close the flow-through fixture (A, Fig. 4) and allow the residual water to drain (B, Fig. 4). Now check the gas pressure at the air valve (top; remove protective cap) on the diaphragm pressure vessel using an air pressure gauge (C, Fig. 4). (PN2 = pump switch-on pressure pmin less 0.2-0.5 bar or the value given in the table on the vessel (Fig. 5) - Wilo customer service). If the pressure is too high, discharge nitrogen at the valve.

CAUTION!
Excessive supply pressure (nitrogen) in the diaphragm pressure vessel can lead to damage or destruction of the vessel and thereby also to personal injury.
The safety measures for the handling of pressurised vessels and technical gases must be observed.
The pressure specifications in this documentation (Fig. 5) are given in bar. If other units of pressure measurement are used, always be sure to convert the figures correctly.

- In the case of installations with a frequency converter, the inlet and outlet filter of the fan must be cleaned if these are very dirty.
- If the installation is out of service for a long period, proceed as described in 8.4 and drain the pump by opening the drainage plug on the pump base. (Also observe the corresponding section in the attached installation and operating instructions for the pump.)

10 Faults, causes and remedies

Faults, particularly those affecting the pumps or the control system, should only be remedied by Wilo's customer service or a specialist company.

NOTE:
The general safety instructions must be observed when doing any maintenance or repair work. Also follow the installation and operating instructions of the pumps and the control device.
You can find information on pump or control device faults not dealt with here in the attached documentation for the components concerned.

If the operating fault cannot be remedied, please consult a specialist company or your nearest Wilo customer service or representative.

11 Spare parts

Spare parts or repairs may be ordered from local specialist retailers or Wilo customer service.
To avoid queries and incorrect orders, all data on the rating plate should be submitted with each order.

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