
# OPERATING INSTRUCTIONS

EN

Translation of the original instructions

# COMBILINE

**WU/WD/WH pumping stations**

PW 0200 BENJ (1605)

PFEIFFER VACUUM

氦天真空
MT VACUUM

# Table of contents

# 1 About this manual

## 1.1 Validity

This operating manual is for customers of Pfeiffer Vacuum. It describes the functioning of the designated product and provides the most important information for safe use of the unit. The description follows applicable EU guidelines. All information provided in this operating manual refers to the current state of the product's development. The documentation remains valid as long as the customer does not make any changes to the product.

Up-to-date operating instructions can also be downloaded from www.pfeiffer-vacuum.com.

### Applicable documents

| WU-/WD-/WH-Pumpstände | Operating instructions |
|---|---|
| Declaration of Conformity | Part of this document |
| Operating instructions for accessories (order-specifically) | see section "accessories"* |

*also available via www.pfeiffer-vacuum.com

## 1.2 Conventions

### Safety instructions

The safety instructions in Pfeiffer Vacuum operating instructions are the result of risk evaluations and hazard analyses and are oriented on international certification standards as specified by UL, CSA, ANSI Z-535, SEMI S1, ISO 3864 and DIN 4844. In this document, the following hazard levels and information are considered:

**DANGER**

**Imminent danger**

Indicates an imminent hazardous situation that will result in death or serious injury.

**WARNING**

**Possibly imminent danger**

Indicates an imminent hazardous situation that can result in death or serious injury.

**CAUTION**

**Possibly imminent danger**

Indicates an imminent hazardous situation that can result in minor or moderate injury.

***NOTICE***

**Command or note**

Command to perform an action or information about properties, the disregarding of which may result in damage to the product.

## Pictographs

Prohibition of an action to avoid any risk of accidents, the disregarding of which may result in serious accidents

Warning of a displayed source of danger in connection with operation of the unit or equipment

Command to perform an action or task associated with a source of danger, the disregarding of which may result in serious accidents

Important information about the product or this document

## Instructions in the text

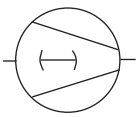
➔ Work instruction: here you have to do something.

## Abbreviations

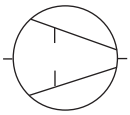
**Okta:** Roots pump
**HV**: Vacuum safety valve (with shut-off and venting function)
**STP:** Dust separator
**SAS:** Dust separator
**OME:** Oil mist filter
**ODK:** Oil mist filter with return unit
**EVB:** Angle valve
**VFS 010:** Power failure venting unit
**KS:** Condensor
**KAS:** Condensate separator

## Symbols used

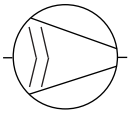
The following symbols are used consistently throughout in all illustrations:



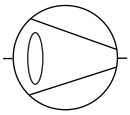
Roots pump (Okta)



Rotary vane pump



Screw pump



Rotary piston pump

# 2 Safety

## 2.1 Safety precautions

**Duty to inform**

Each person involved in the installation, operation or maintenance of the vacuum pump must read and observe the safety-related parts of these operating instructions.

➔ The operator is obligated to make operating personnel aware of dangers originating from the vacuum pump, the pumped medium and the entire system.

**Installation and operation of accessories**

Pfeiffer Vacuum pumps can be equipped with a series of adapted accessories. The installation, operation and maintenance of connected devices are described in detail in the operating instructions of the individual components.

➔ For information on order numbers of components, see "Accessories".

➔ Use original accessory parts only.

- Do not expose any body parts to the vacuum.
- Observe the safety and accident prevention regulations.
- Check regularly that all safety precautions are being complied with.
- Do not carry out any unauthorised modifications or conversions to the pumps.
- Depending on the operating and ambient conditions, the surface temperature of the pumps may rise above 70 °C. Use suitable finger guards if necessary.
- When returning the components to us please note the instructions in the Service section.
- Adjust the customer's process/operation mode clearly to the capacity of the pumping station.
- The electrical connection may only be made by an expert electrician according to VDE 0105 in accordance with the regulations of VDE 0100.

## 2.2 Protective equipment

Determined situations concerning the handling of vacuum pumps require wearing of personal protective equipment. The owner, respectively the employer are obligated to provide an adequate equipment to any operating persons.

**DANGER**

**Danger to health by hazardous substances during maintenance or installation**

Depending on the process vacuum pumps, components or operating fluids can be contaminated by toxic, reactive or radioactive substances.

➔ Wear adequate protective equipment during maintenance and repairs or in case of reinstallation.

**CAUTION**

**Risk of injury through hot surfaces**

Vacuum pumps can become hot during operation.

➔ Allow the pump to cool before maintenance and repairs.

➔ If necessary wear protective gloves according to EN 420.

**WARNING**

**Increased noise emission!**

Increased noise emission can occur within a limited area surrounding the vacuum pump.

➔ Provide noise protection or

➔ wear hearing protection.

## 2.3 Proper use

***NOTICE***

**EC conformity**

The manufacturer's declaration of conformity becomes invalid if the operator modifies the original product or installs additional components.

➔ Following installation into a plant and before commissioning, the operator must check the entire system for compliance with the valid EU directives and reassess it accordingly.

- The pumping station is intended for evacuating vacuum chambers to pressure values in the medium vacuum range.
- Only use the pumping station for creating vacuum.
- Only use the pumping station for evacuation of dry and inert gases; other applications only after consultation with Pfeiffer Vacuum.
- Use suitable gases (process-specific) such as sealing gas, flushing gas and cooling gas at the inlets of the pumping station components.
- Installation, operating and maintenance regulations must be complied with.
- Other accessories, than those described in this manual, must not be used without the agreement of Pfeiffer Vacuum.

## 2.4 Improper use

Improper use will cause all claims for liability and warranties to be forfeited. Improper use is defined as usage for purposes deviating from those mentioned above, especially:

- pumping of corrosive and reactive gases; special conditions of use only after consultation with Pfeiffer Vacuum
- pumping of explosive media or of oxygen at greater than atmospheric concentration
- operation of the pumping station in potentially explosive areas
- operation of the pump with open vacuum flange
- pumping of gases containing impurities such as particles, dusts and condensate; note the vapour compatibility levels of the pump
- pumping of substances that tend to sublime
- operation of the pumping station to generate pressure
- pumping of liquids
- connection to pumps or units which are not suitable for this purpose according to their operating instructions
- connection to units which have exposed voltage-carrying parts
- the evacuation of gases that may form adherent deposits or condensate in the suction chamber

# 3 Transport and storage

## 3.1 Unpacking / repacking

For transport, the pumping station is fastened to a pallet in a slip-free manner, covered with a plastic sheet and secured in wooden holders or wooden crates.

**Disposal of packaging materials**

The packaging materials cannot be reused after unpacking.

➔ Dispose of them according to the applicable regulations.

## 3.2 Transport

➔ Remove the locking cap from the vacuum and exhaust flange immediately before connecting!

– Check the cone strainer, paying attention to the O-ring.

➔ Lift the pumping stations using the eyebolts provided on the frame or transport them with a fork lift truck.

– For versions without a frame and eyebolts, use transport straps for lifting.

– Do not lift pumping station by the intake flange of the Roots pump.

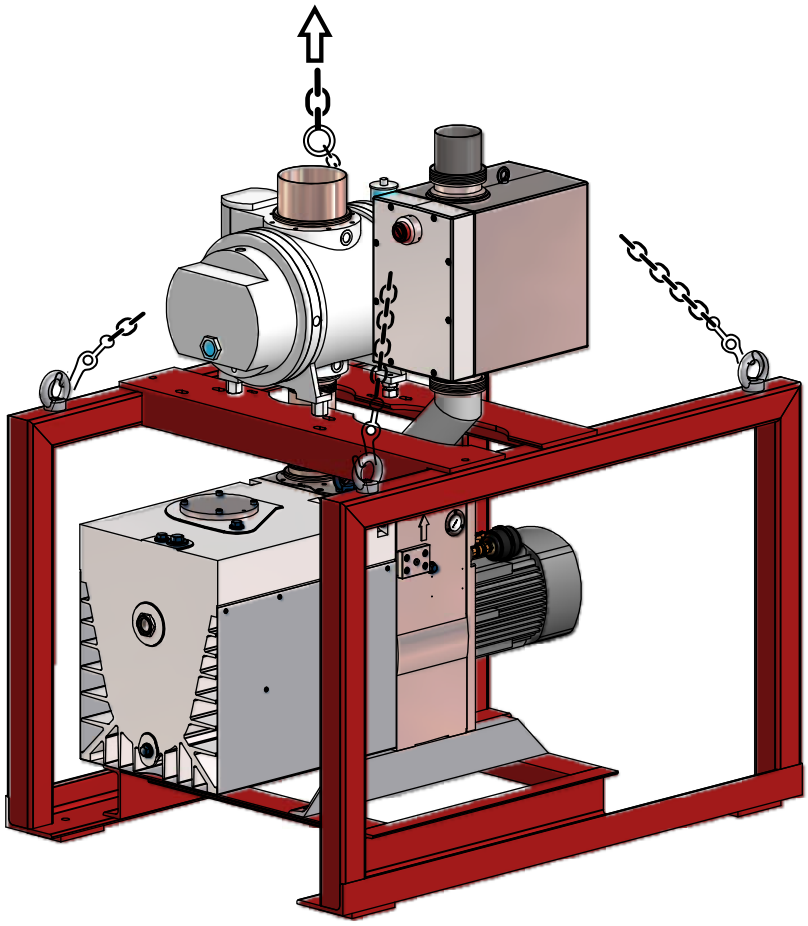


**Fig. 1: Lifting and transporting the pumping station**

**WARNING**

**There is a risk of injury if the system is not transported properly.**

Danger to life from falling or protruding loads if the system is not properly secured to lifting devices or is not transported properly.

➔ Use suitable lifting devices and tools.

➔ Ensure that the weight is distributed evenly (danger of tipping!).

➔ Test the hanging for high center of gravity.

## 3.3 Storage

The pumping station is suitable for storage. Enclosed, dry and dust-free rooms are suitable storage locations.

➔ Check that all the openings on the pumps are securely closed.

➔ Store the pumping station only indoors, preferably at temperatures between -10 °C and +40 °C.

– For a longer period of storage, leave the pumping station in its original packaging or cover with a plastic sheet.

– After a period of storage longer than one year, it is recommended to carry out maintenance and change the operating fluid and lubricants prior to commissioning.

***NOTICE***

**Note the risk of corrosion for storage**

Storage of vacuum pumps can lead to corrosion and aging of lubricants/operating fluids and elastomer seals.

➔ Observe the notes in the operating manuals for the individual components.

➔ Change lubricants and operating fluids before restarting operation.

# 4 Product description

## 4.1 Product identification

Roots pumping stations of the CombiLine series basically consist of a Roots pump (Okta), a backing pump and process-specific accessories. Various pumps can be used as backing pump.

To correctly identify the product when communicating with Pfeiffer Vacuum, always have the information from the rating plate available.

- Pumping station type and article number
- Serial number
- Voltage and rated current
- Date of manufacture
- Wiring diagram
- Weight

For component-specific data, please see the separately installed rating plates for the pumps and motors.

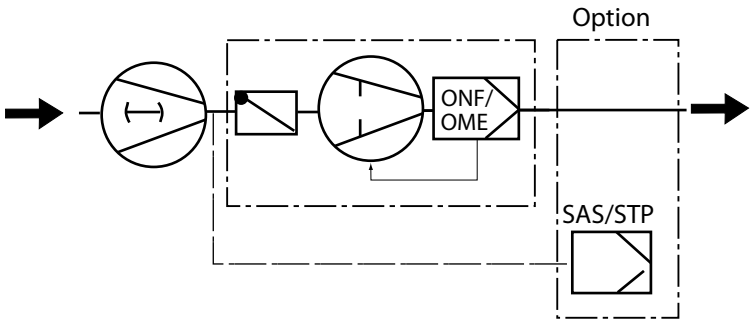
**Supply scope**

- Pumping station components mounted on frame ready for connection, with all necessary connecting lines including counter flanges on the intake side and pressure side:
  - Stationary pumping stations with bores in the base plate for fastening
  - Mobile pumping stations with castors
- Roots pump with motor in standard version or with magnetic coupling
- Backing pump with motor
  - Rotary vane pump with suitable oil mist filter or
  - Screw pump e. g. HeptaDry
- Operating fluid and lubricant P3 / D1
- Optional accessories
  - Control cabinet
  - Measuring gauge with measuring and control unit (e.g. TPG 261/262)
- Operating manuals for pumping station and individual components
- Wiring diagram for pumping stations with control cabinet

## Variants

### CombiLine-WU with single-stage rotary vane pump

These pumping stations of the CombiLine-WU consist of a single-stage HenaLine rotary vane pump with an integrated oil mist separator and a Roots pump.



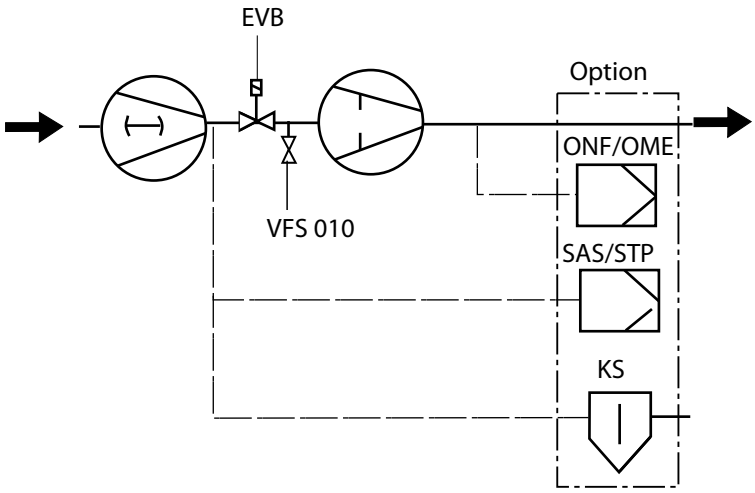

| CombiLine-WU | HenaLine Hena ... | Okta ... A | Pumping speed at 1 hPa 50 Hz in [$m^3$/h] | Pumping speed at 1 hPa 60 Hz in [$m^3$/h] | Motor power at 50 Hz in [kW] | Motor power at 60 Hz in [kW] | Nominal connection diameter, inlet, flange according to ISO-F[1], DN --- | Nominal connection diameter, outlet flange according to ISO-(K)F, DN | Weight in [kg] | Final pressure, total, (without gas ballast) [hPa] | Final pressure, total, (with gas ballast) [hPa] |
|---|---|---|---|---|---|---|---|---|---|---|---|
| WU 232 | 60 | 250 | 230 | 280 | 2.6 | 3.1 | 63 | 40 | 240 | $8 \cdot 10^{-3}$ | $5 \cdot 10^{-2}$ |
| WU 242 | 100 | 250 | 240 | 290 | 3.3 | 3.9 | 63 | 40 | 250 | $8 \cdot 10^{-3}$ | $5 \cdot 10^{-2}$ |
| WU 252 | 200 | 250 | 250 | 300 | 6.3 | 6.4 | 63 | 100 | 410 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 392 | 60 | 500 | 390 | 470 | 3.3 | 4.0 | 100 | 40 | 270 | $8 \cdot 10^{-3}$ | $5 \cdot 10^{-2}$ |
| WU 412 | 100 | 500 | 400 | 500 | 4 | 4.8 | 100 | 40 | 285 | $8 \cdot 10^{-3}$ | $5 \cdot 10^{-2}$ |
| WU 452 | 200 | 500 | 450 | 540 | 7 | 7.3 | 100 | 100 | 440 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 462 | 300 | 500 | 460 | 550 | 9 | 9.3 | 100 | 100 | 470 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 482 | 400 | 500 | 480 | 560 | 12.5 | 16.8 | 100 | 100 | 700 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 752 | 60 | 1000 | 750 | 840 | 4.8 | 5.8 | 160 | 40 | 395 | $8 \cdot 10^{-3}$ | $5 \cdot 10^{-2}$ |
| WU 852 | 100 | 1000 | 850 | 970 | 5.5 | 6.6 | 160 | 40 | 415 | $8 \cdot 10^{-3}$ | $5 \cdot 10^{-2}$ |
| WU 912 | 200 | 1000 | 900 | 1100 | 8.5 | 9.1 | 160 | 100 | 570 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 942 | 300 | 1000 | 940 | 1140 | 10.5 | 11.1 | 160 | 100 | 610 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 982 | 400 | 1000 | 980 | 1180 | 14 | 18.6 | 160 | 100 | 930 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 1002 | 630 | 1000 | 1000 | 1200 | 18 | 22.1 | 160 | 100 | 1100 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 1702 | 200 | 2000 | 1700 | 1990 | 11 | 12.1 | 160 | 100 | 690 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 1752 | 300 | 2000 | 1750 | 2050 | 13 | 14.1 | 160 | 100 | 715 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 1902 | 400 | 2000 | 1900 | 2200 | 16.5 | 21.6 | 160 | 100 | 1040 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 1952 | 630 | 2000 | 1950 | 2300 | 20.5 | 25.1 | 160 | 100 | 1200 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 1992 | 1000 | 2000 | 2000 | 2300 | 27.5 | 36.6 | 160 | 100 | 1730 | $5 \cdot 10^{-2}$ | $5 \cdot 10^{-2}$ |
| WU 2002 | 1600 | 2000 | 2000 | 2400 | 35.5 | 43.6 | 160 | 2x100 | 2250 | $5 \cdot 10^{-2}$ | $5 \cdot 10^{-2}$ |
| WU 2952 | 300 | 4000 | 2900 | 3100 | 18.5 | 20.7 | 250 | 100 | 1030 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 3202 | 400 | 4000 | 3200 | 3600 | 22 | 28.2 | 250 | 100 | 1280 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 3302 | 630 | 4000 | 3300 | 4000 | 26 | 31.7 | 250 | 100 | 1440 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 3702 | 1000 | 4000 | 3700 | 4400 | 33 | 43.2 | 250 | 100 | 1970 | $5 \cdot 10^{-2}$ | $5 \cdot 10^{-2}$ |
| WU 3902 | 1600 | 4000 | 3800 | 4700 | 41 | 52 | 250 | 2x100 | 2500 | $5 \cdot 10^{-2}$ | $5 \cdot 10^{-2}$ |
| WU 3502 | 400 | 6000 | 3500 | 4700 | 26 | 28.2 | 250 | 100 | 1530 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 4202 | 630 | 6000 | 4200 | 5550 | 30 | 36.5 | 250 | 100 | 1680 | $8 \cdot 10^{-3}$ | $3 \cdot 10^{-2}$ |
| WU 5002 | 1000 | 6000 | 5000 | 5700 | 37 | 48 | 250 | 100 | 2250 | $5 \cdot 10^{-2}$ | $5 \cdot 10^{-2}$ |
| WU 5502 | 1600 | 6000 | 5500 | 6550 | 45 | 55 | 250 | 2x100 | 2750 | $5 \cdot 10^{-2}$ | $5 \cdot 10^{-2}$ |

[1] Pressure surge protected version: flange according to DIN PN 16

### CombiLine-WU with UnoLine Plus single-stage rotary vane pump

The pumping stations of the CombiLine-WU consist of a single-stage UnoLinePlus rotary vane pump and a Roots pump. The pumping stations are additionally equipped with an OME oil mist filter, an EVB angle valve and a VFS 010 power failure venting unit.

– Ultimate pressure, total: < $2 \cdot 10^{-3}$ hPa (without gas ballast)
– Ultimate pressure, total: < $3 \cdot 10^{-2}$ hPa (with gas ballast)



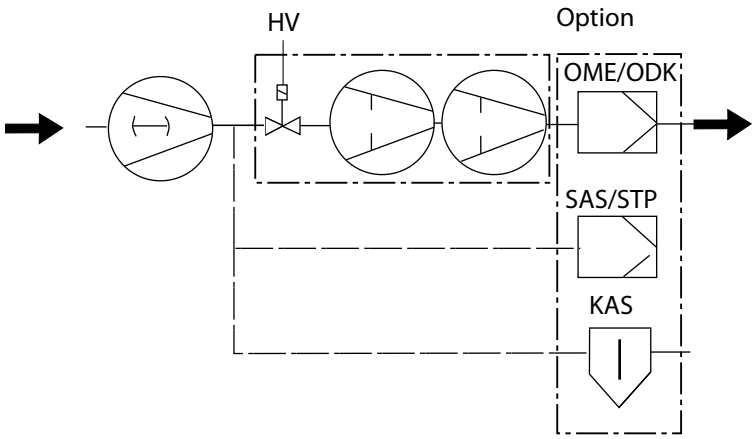

| CombiLine-WU ... | UnoLine Plus | Okta ... A | Pumping speed at 1 hPa 50 Hz in [$m^3/h$] | Pumping speed at 1 hPa 60 Hz | Motor power at 50 Hz in [kW] | Motor power at 60 Hz in [kW] | Emission sound pressure level at $p_A$ < 1 hPa in dB(A) | Nominal connection diameter, inlet, flange according to ISO-F[1], DN --- | Nominal connection diameter, outlet flange according to ISO-F, DN --- | Weight in [kg] |
|---|---|---|---|---|---|---|---|---|---|---|
| WU 471 | BA 251 | 500 | 470 | 550 | 12.5 | 14.8 | 80 | 100 | 63 | 810 |
| WU 951 | BA 251 | 1000 | 950 | 1150 | 14 | 16.6 | 80 | 160 | 63 | 940 |
| WU 1001 | BA 501 | 1000 | 1000 | 1200 | 18 | 21.6 | 80 | 160 | 100 | 1500 |
| WU 1801 | BA 251 | 2000 | 1800 | 2100 | 16.5 | 19.6 | 80 | 160 | 63 | 1150 |
| WU 2001 | BA 501 | 2000 | 1900 | 2200 | 20.5 | 24.6 | 80 | 160 | 100 | 2000 |
| WU 3001 | BA 251 | 4000 | 2900 | 3250 | 22 | 26.2 | 80 | 250 | 63 | 1300 |
| WU 3501 | BA 501 | 4000 | 3400 | 3900 | 26 | 31.2 | 80 | 250 | 100 | 1750 |
| WU 4801 | BA 501 | 6000 | 4700 | 5400 | 30 | 36 | 80 | 250 | 100 | 2050 |

[1] Pressure surge protected version: flange according to DIN PN 16

### CombiLine-WD with DuoLine® two-stage rotary vane pump

The pumping stations of the CombiLine-WD consist of a two-stage DuoLine® rotary vane pump and a Roots pump. The pumping stations are additionally equipped with an OME oil mist filter and are mounted on a base frame.

– Ultimate pressure, total: < $5 \cdot 10^{-4}$ hPa (without gas ballast)
– Ultimate pressure, total: < $5 \cdot 10^{-4}$ hPa (with gas ballast)




| CombiLine-WD | DuoLine® DUO ... | Okta ... | Pumping speed at 1 hPa 50 Hz in [$m^3/h$] | Pumping speed at 1 hPa 60 Hz in [$m^3/h$] | Motor power at 50 Hz in [kW] | Motor power at 60 Hz in [kW] | Emission sound pressure level at $p_A$ < 1 hPa in dB(A) | Nominal connection diameter, inlet, flange according to ISO-F[1], DN --- | Nominal connection diameter, outlet flange according to ISO-F, DN --- | Weight in [kg] |
|---|---|---|---|---|---|---|---|---|---|---|
| WD 220 | 35 | 250 | 220 | 260 | 1.85 | 2.2 | 75 | 63 | 40 | 220 |
| WD 235 | 65 | 250 | 230 | 290 | 2.25 | 2.7 | 75 | 63 | 40 | 250 |
| WD 245 | 125 | 250 | 245 | 300 | 4.75 | 5.7 | 80 | 63 | 40 | 470 |
| WD 380 | 35 | 500 | 380 | 390 | 2.6 | 3.1 | 75 | 100 | 40 | 240 |
| WD 400 | 65 | 500 | 400 | 470 | 3.0 | 3.6 | 75 | 100 | 40 | 250 |
| WD 440 | 125 | 500 | 440 | 530 | 5.5 | 6.6 | 80 | 100 | 63 | 400 |
| WD 470 | 255 | 500 | 470 | 570 | 9 | 10.8 | 80 | 100 | 100 | 570 |
| WD 800 | 65 | 1000 | 800 | 880 | 4.5 | 5.4 | 75 | 160 | 40 | 400 |
| WD 900 | 125 | 1000 | 900 | 1050 | 7 | 8.4 | 80 | 160 | 63 | 530 |
| WD 950 | 255 | 1000 | 950 | 1190 | 10.5 | 12.6 | 80 | 160 | 100 | 700 |
| WD 1600 | 125 | 2000 | 1600 | 1850 | 9.5 | 11.4 | 80 | 160 | 63 | 760 |
| WD 1800 | 255 | 2000 | 1800 | 2200 | 13 | 15.6 | 80 | 160 | 100 | 980 |
| WD 3000 | 255 | 4000 | 3000 | 3600 | 18.5 | 22.2 | 80 | 250 | 100 | 1180 |

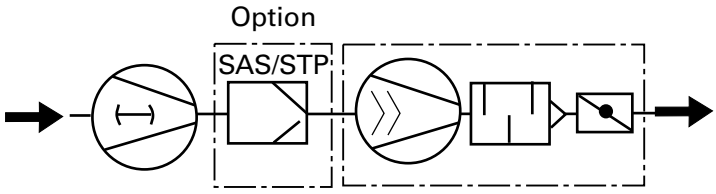
[1] Pressure surge protected version: flange according to DIN PN 16

Please refer to the associated design drawing and the relevant pumping station rating plate / the rating plate for the component.

**CombiLine-WH with screw pump HeptaDry®**

The pumping stations of the CombiLine-WH consist of a srew pump HeptaDry® and a Roots pump Okta ... .

– Ultimate pressure, total: < $2 \cdot 10^{-3}$ hPa (50 Hz operation)
– Ultimate pressure, total: < $5 \cdot 10^{-4}$ hPa (60 Hz operation)



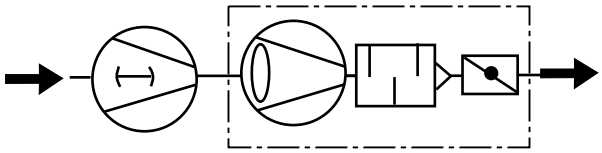
| CombiLine-WH | HeptaDry® Hepta ...(P) | Okta ... A | Pumping speed at 1 hPa 50 Hz in [m³/h] | Pumping speed at 1 hPa 60 Hz in [m³/h] | Motor power at 50 Hz in [kW] | Motor power at 60 Hz in [kW] | Nominal connection diameter, inlet, flange according to ISO-F[1], DN --- | Nominal connection diameter, outlet flange according to DN --- PN 16 | Weight in [kg] |
|---|---|---|---|---|---|---|---|---|---|
| WH 250 (P) | 100 | 250 | 250 | 310 | 3.75 | 4.9 | 100 | 40 | 490 |
| WH 450 (P) | 100 | 500 | 450 | 530 | 4.5 | 5.8 | 100 | 40 | 510 |
| WH 470 (P) | 200 | 500 | 470 | 560 | 7 | 9.3 | 100 | 50 | 570 |
| WH 500 (P) | 300 | 500 | 500 | 570 | 9 | 11 | 100 | 50 | 590 |
| WH 900 (P) | 100 | 1000 | 900 | 1000 | 6 | 7.6 | 160 | 40 | 640 |
| WH 950 (P) | 200 | 1000 | 950 | 1200 | 8.5 | 11.1 | 160 | 50 | 700 |
| WH 970 (P) | 300 | 1000 | 970 | 1200 | 10.5 | 12.8 | 160 | 50 | 720 |
| WH 990 (P) | 400 | 1000 | 990 | 1200 | 10.5 | 12.8 | 160 | 80 | 950 |
| WH 1000 (P) | 630 P | 1000 | 1000 | 1250 | 18 | 20,6 | 160 | 80 | 1150 |
| WH 1700 (P) | 200 | 2000 | 1700 | 2150 | 11 | 14.1 | 160 | 50 | 810 |
| WH 1800 (P) | 300 | 2000 | 1800 | 2280 | 13 | 15.8 | 160 | 50 | 840 |
| WH 1900 (P) | 400 | 2000 | 1900 | 2280 | 13 | 15.8 | 160 | 80 | 1070 |
| WH 2000 (P) | 630 P | 2000 | 2000 | 2350 | 20.5 | 23.6 | 160 | 80 | 1270 |
| WH 3300 (P) | 400 | 4000 | 3300 | 3880 | 18.5 | 22.4 | 160 | 80 | 1300 |
| WH 3500 (P) | 630 P | 4000 | 3500 | 4050 | 26 | 30.2 | 250 | 80 | 1500 |
| WH 5000 (P) | 630 P | 6000 | 5000 | 5800 | 30 | 35 | 250 | 80 | 1750 |

[1] Pressure surge protected version: flange according to DIN PN 16

### CombiLine-WH with rotary piston pump UniDry

The CombiLine-WH pumping stations consist of a Roots pump Okta and a rotary piston pump UniDry plus accessories (optional).

– Ultimate pressure, total: < $5 \cdot 10^{-3}$ hPa (UniDry 50 S/SM)



| CombiLine-WH | UniDry ... | Okta ... A | Pumping speed at 1 hPa 50 Hz in [m³/h] | Pumping speed at 1 hPa 60 Hz in [m³/h] | Motor power at 50 Hz in [kW] | Motor power at 60 Hz in [kW] | Emission sound pressure level at $p_A$ < 1 hPa in dB(A) | Nominal connection diameter, inlet, flange according to ISO-F, DN --- | Nominal connection diameter, outlet, flange according to ISO-F, DN --- | Weight in [kg] |
|---|---|---|---|---|---|---|---|---|---|---|
| WH 240 S/SM | 50 S/SM | 250 | 240 | 290 | 3.75 | 4.5 | 75 | 63 | 40 | 360 |
| WH 400 S/SM | 50 S/SM | 500 | 400 | 470 | 4.5 | 5.4 | 75 | 100 | 40 | 390 |

## 4.2 Function

The pumping stations of the CombiLine are two-stage pumping stations with a single-stage or two-stage rotary vane pump or a dry pump as a backing pump and a Roots pump.

The pumping stations are intended for evacuating vacuum chambers to pressure values in the medium vacuum range.

# 5 Installation

## 5.1 Installation location

Observe the following requirements when setting up the pump:

- Consider the load-bearing capacity of the installation site.
- Maximum installation altitude 2000 m (above mean sea level)
- Permissible ambient temperature: +12 ... 40 °C
- Maximum relative humidity 85%

➔ The installation location is to be chosen so that pumping station components are freely accessible for inspection and servicing.
  – Note set-up conditions for the individual components.

➔ Always place the pumping station on a firm, even surface.
  – The base frame has four holes for anchoring onto the base.

➔ Protect pumping station against air draughts and direct atmospheric exposure.

➔ When installing the pump in a closed housing, ensure there is sufficient air circulation.
  – Sight glass and gas ballast valve must be visible and readily accessible.
  – Voltage and frequency information given on the motor rating plate must be visible.

➔ Mobile pumping stations must be located on a horizontal surface and the locking rollers secured.

## 5.2 Preparatory work

Before installing and commissioning the system, the installation location must be equipped.

The pumping station is delivered mounted on a base frame and ready for connection. If parts of the pumping station are dismantled for transport reasons, they must be re-mounted according to the design drawing.

***NOTICE***

**Use approved operating fluids only!**

The use of operating fluids that have not been approved by Pfeiffer Vacuum shall result in a limited warranty. In such cases, it is not possible to guarantee that product-specific performance data will be achieved.

➔ Prior consultation is required before using other application-specific operating fluids.

**Ensure media supply!**

Note information on supply and disposal of relevant media to be provided such as electricity, cooling water and inert gas.

➔ See rating plate

➔ See technical data for individual components

➔ Fill pumping station components with operating fluids and lubricants;
  – Quantity and type in accordance with the rating plate.

➔ Remove protective cover from intake and exhaust flange.

➔ Provide process-specific and pump-specific media supply and connect.

➔ Ensure process-specific and pump-specific media disposal.

**CAUTION**

**Risk of tripping!**

Risk of tripping when working in the installation area.

➔ Place supply lines in such a way that no tripping hazards occur.

**NOTICE**

**Electrostatic unloading procedures**

Damage of safety-relevant parts or releasing unintentional machine movements.

➔ Carry out installation works at the pumping station only by EMC trained specialists according to the instructions of the parts manufacturers.

## 5.3 Connections

### Connecting the vacuum side

**WARNING**

**Exposed, rotating rolling pistons!**

Fingers and hands can become crushed when the intake flange is open.

➔ Keep all body parts out of operating range of the rolling pistons.

➔ Use a wooden handle to rotate the rolling pistons during cleaning.

➔ The connection between the pump and the vacuum chamber should be kept as short as possible and should have at least the nominal diameter of the pump flange. Use a greater nominal diameter on line lengths > 5 m.

➔ Lay the pipes in such a way that the Roots or backing pump will not be subjected to any mechanical tension.

– Suspension components should be integrated into the piping.

– Ensure that mating flanges are in a parallel position.

➔ Clear welded lines of any welding scales, loose parts etc. before installation.

If dust appears in the intake medium, a dust filter must be installed in addition. When extracting vapors we recommend using condensate separators on the intake side and on the exhaust side. Please enquire for details.

**NOTICE**

**Danger of intake of solid particles!**

Even in clean processes, fouling from the system must be anticipated during initial commissioning.

➔ Use a suitable start-up strainer at the intake connection (see accessories).

➔ Ensure that this strainer is only removed when the risk of solid particles entering the pump can be excluded.

➔ Note loss of pumping speed if necessary.

### Connecting the exhaust side

**CAUTION**

**High pressure in the exhaust line!**

Danger of damage to the seals and danger of the pump bursting.

➔ Install the line without shut-off valves on the exhaust side.

➔ If there is danger of a build-up of excess pressure (> 1500 hPa abs.) in the lines, observe all official accident prevention safety regulations.

➔ If the exhaust gases are being extracted, the exhaust pressure must be at least 250 hPa greater than the pressure at the intake side.

➔ Choose the cross-section of the exhaust line to be at least the size of the nominal connection diameter of the vacuum pump's exhaust connection.

➔ Piping to the pump must be suspended or supported.
  – Physical forces from the piping system must not be allowed to act on vacuum pumps.
➔ Lay piping from the pump sloping downward so that no condensate can flow back into the pump; otherwise fit a condensate separator.
  – If an air trap is created in the system, then a device for draining condensation water must be provided at the lowest point.

**WARNING**

**Emission of toxic substances from the exhaust!**

Danger of poisoning from emitted gases or vapours, which can be detrimental to health and/or can pollute the environment, depending on the particular application.

➔ Comply with the applicable regulations when working with toxic substances.
➔ Only officially approved filter systems may be used to separate and remove these substances.

## Connecting to the mains power supply

**DANGER**

**Voltage-bearing elements**

Danger to life from electric shock.

➔ The electrical connection can be carried out only by trained and authorised electricians.
➔ Disconnect the power supply and secure it against being switched back on.
➔ Ensure the system is adequately earthed.

The pumps are shipped as standard with a three-phase motor, but without accessories for the electrical connection. Connection according to regulations requires the use of a suitable motor protection switch. The setting of the motor protection switch must correspond to the specification on the rating plate of the pump motor in question.

➔ Check the direction of rotation for pumps with three-phase motors in accordance with the description in the operating manual of the individual components (see the arrow on the housing).

➔ The operator must provide suitable safety devices, when connecting the pumping station, for the separation of the pumping station from the mains (e.g. main switch or emergency-stop button), so that the pumping station can be switched off in an emergency situation without any problems.

### Versions with a control cabinet

Pumping stations with a control cabinet are completely wired internally. The drive motors of the Roots and backing pumps are already wired so they rotate in the same direction.

➔ Make electrical connections according to the wiring diagrams located in the control cabinet when the pumping station was shipped.

### Fuse

In the version with a control cabinet the phase sequence relay has a monitoring function. If a measuring tube is connected, the associated power supply unit has an internal 100 mA microfuse.

# 6 Operation

## 6.1 Recommendations for the operator

- The service personnel must be advised in regular training courses on the necessity for wearing the personal protective equipment. Working without protective equipment can lead to serious and also lasting health damages.
- The operator advises in recurring training courses the operating, maintenance, and service personnel in the correct behaviors while handling the pumping station. He explains that damages to persons and systems can occur, if the pumping station is not operated correctly. To this in particular belong also information concerning the residual risks.
- Before maintenance and repairs the pumping station is shut down. The main switch, provided by the operator, is switched off by the operational, technically responsible supervisor and secured against restarting with a lock. The key is taken off and carried.
- After completion of the work and before restarting, the responsible supervisor makes sure, that this is possible without endangerment of persons or equipment. Before switching on a well-timed and clear warning must be given to all involved persons.

## 6.2 Before switching on

The instructions also apply for each time the pumping station is restarted after shutting down for storage, maintenance or inspection.

➔ Check operating fluid and lubricant levels of the pumps and refill if necessary.
➔ Check sealing oil chamber on Roots pump (oiler).
➔ Check that all lines are properly connected.
➔ Check process-specific and pump-specific media supplies.
➔ Verify direction of rotation of pumps as described in the operating manuals for the individual components.
➔ Operate shut-off units in the exhaust line in such a way that they open before or at the same time as starting the pump.

## 6.3 Switching on the pumping station

***NOTICE***

**Danger of corrosion from condensation in the pumps!**

The operating fluid / lubricant can become contaminated by mist during evacuation, degrading the properties of the oil.

➔ Bring pumping station to operating temperature before process start.
➔ After completion of the process, let the pumping station continue to run for about 30 minutes with the intake line closed and the gas ballast valve open.

The pumping station can be switched on using a common switch contact for the backing pump and the Roots pump or with separate switches in accordance to the process requirements.

For pumping stations with a control cabinet, the switch-on sequence is specified by the controller. Switch on the master switch on the control cabinet.

➔ Switch on pumping station.
➔ When water cooling is used: Open cooling water supply and check the flow.
➔ Open shut-off valve in the intake line and switch the pump over to the process.
➔ When sealing gas is used: Open the sealing gas supply and check the flow.

## 6.4 Switching off the pumping station

➔ Close shut-off valve in the intake line and separate the pump from the process.
➔ Switch off the pumping station.
➔ Flush pumping station with flushing gas, if necessary.
➔ Dry the pump completely inside after flushing.
➔ Switch off process-specific and pump-specific media supplies.
➔ Venting.
➔ When shutting down for longer periods, see the operating manuals of the individual components.

## 6.5 Operating the pumping station with a control cabinet

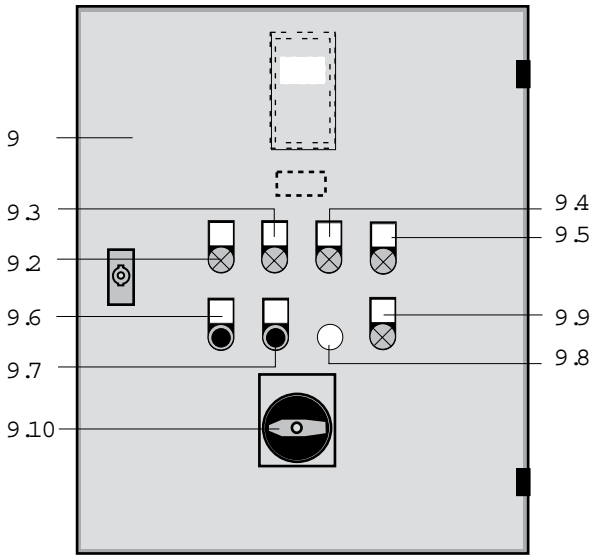
To ensure a safe process, operate the pumping station as follows:

### Status at standstill

– Shut-off valve intake line closed, if present.
– Exhaust valve closed, if present.
– Master switch 9.10 on control panel in position "0".

Operation and display elements

The following illustration is merely an example. The number, arrangement and assignment of the keys and lights may differ from the specific version supplied.




9 Control cabinet
9.2 "Pump 1 in operation" lamp
9.3 "Pump 2 in operation" lamp
9.4 "Thermistor protection malfunction" lamp
9.5 "Fuse tripping phase sequence malfunction" lamp
9.6 Pumping station "ON" key
9.7 Pumping station "OFF" key
9.8 Not assigned (option: remote/manual key-operated switch
9.9 Lamp test
9.10 Master switch
Operating hours counter (internal)

**Fig. 2: Example of versions with a control cabinet**

### Switching on the pumping station

➔ Open exhaust valve (ball valve), if present.
➔ Turn master switch 9.10 to the "1" position.
➔ Switch on pump stand using key 9.6 on controller.
  – The switch-on sequence is specified by the controller.
  – Let the pumping station warm up until it reaches operating temperature.
➔ Open shut-off valve in the intake line (ball valve), if present.

### Switching off the pumping station

Depending on the specific process, during process pauses the pumping station can be operated continuously and flushed when the intake line is closed.

➔ Close shut-off valve in the intake line (if present).
➔ Switch off pumps by pressing key 9.7; let pumps continue to run if necessary.

– The switch-off sequence is specified by the controller.

➔ Close exhaust valve (if present).

**NOTICE**

**Roots pump damage due to the rotors starting up!**

Differences in the rate of cooling of the pump housing and rotors can cause damage to the pump.

➔ If the pump / pumping station is switched off and at a standstill for > 5 minutes, then only switch it on again after ventilation and a waiting period of at least 120 minutes to allow a balanced temperature of rotors and housing.

# 7 Malfunctions

Please note the following instructions should the pumping station malfunction:

| Problem | Possible causes | Remedy, please refer to component operating instructions |
|---|---|---|
| Pumping station does not start | No mains voltage or voltage does not correspond to the motor data | Check mains voltage and mains fuse protection; check motor switch. |
| | Thermal protection switch has responded | Backing pump/Roots pump |
| | Suction chamber dirty | Roots pump |
| | Gear wheels damaged | Roots pump |
| | Pumping system dirty | Backing pump |
| | Pumping system damaged | Backing pump |
| | Motor defective | Backing pump/Roots pump |
| Pumping station switches off after a while after being started | Thermal protection switch of the motor has responded | Backing pump/Roots pump |
| | Mains fuse protection triggered due to overload (e. g. cold start) | Backing pump |
| | Exhaust pressure too high | Backing pump |
| Pumping station does not attain ultimate pressure | Pump or connected accessories are dirty | Backing pump/Roots pump |
| | Operating fluid/Lubricant dirty | Backing pump/Roots pump |
| | Backing pump faulty | Backing pump |
| | Leak in system | Localize/repair leak |
| | Dirty or damaged overflow valve | Roots pump |
| | Operationl loss of lubricant at the oiler | Roots pump |
| | Operating fluid filling level too low | Backing pump |
| Pumping speed too low | Intake line not well-dimensioned | Keep connections as short as possible and see that cross-sections are sufficiently dimensioned |
| | Exhaust pressure too high | Check opening of exhaust line and exhaust accessories |
| Loss of operating fluid | Casing seal leaky, operational loss of operating fluid | Backing pump |
| | Radial shaft seal ring leaky | Backing pump |
| Unusual operating noises | Suction chamber dirty | Roots pump |
| | Silencer dirty | Backing pump |
| | Bearings or gear wheels damaged | Backing pump/Roots pump |
| | Dirty overflow | Roots pump |
| | Motor bearing defective | Backing pump/Roots pump |
| | Motor runs - pump doesn't: only valid for pumps with magnetic coupling system | Roots pump |

# 8 Maintenance

➔ Turn off the vacuum pump, vent to atmospheric pressure and allow to cool.

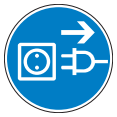
**WARNING**

**Contamination of parts and operating fluid by pumped media is possible.**

Poisoning hazard through contact with materials that damage health.

➔ In the case of contamination, carry out appropriate safety precautions in order to prevent danger to health through dangerous substances.

➔ Decontaminate affected parts before carrying out maintenance work.



**WARNING**

**Danger of electric shock**

The pumping station is only free of voltages when the mains plug has been disconnected.

➔ Switch off the master switch and disconnect the mains plug before all work.

➔ Secure against unintentional restarting.

**CAUTION**

**Release of the connecting screws between backing and Roots pump because of vibrations during operation**

Roots pump moves and falls down.

➔ Control connecting screws regularly during maintenance work and tighten with a tightening torque of 40 - 50 Nm.

***NOTICE***

**Disclaimer of liability**

Pfeiffer Vacuum accepts no liability for personal injury or material damage, losses or operating malfunctions due to improperly performed maintenance. The liability and warranty entitlement expires.

## 8.1 Maintenance intervals and responsibilities

- Carry out the required maintenance on the components of the pumping station in accordance with the instructions in the individual operating manuals.
- Clarify shorter maintenance intervals for extreme loads or impure processes with Pfeiffer Vacuum Service.
- For all other cleaning, maintenance or repair work, please contact your Pfeiffer Vacuum service location.

## 8.2 Removal of components for their maintenance

In some cases, components may need to be dismantled from the pumping station so that customers can carry out necessary maintenance work on them (they should then be reassembled in reverse order).

**CAUTION**

**High weight of backing pump when dismounting and mounting**

Body parts can become crushed between backing pump and pumping station frame.

➔ Use lifting device for lifting the backing pump.

➔ If necessary wear protective gloves according to directive EN 420.

➔ Wear safety shoes with steel toe cap according to directive EN 347.

**NOTICE**

**Refer to the notes on Proper Use of the unit.**

The pumping station must only be operated as a complete unit. Disassembly and operation of individual pumping station components is deemed to be improper use.

- In this case the declaration of conformity will become invalid.

# 9 Decommissioning

## 9.1 Shutting down for longer periods

**WARNING**

**Contamination of parts and operating fluid by pumped media is possible.**

Poisoning hazard through contact with materials that damage health.

➔ In the case of contamination, carry out appropriate safety precautions in order to prevent danger to health through dangerous substances.

➔ Decontaminate affected parts before carrying out maintenance work.

If the pumping station should be shut down for longer than a year:

➔ Remove the pumping station from the system, if necessary.

➔ Only store the pumping station indoors at an ambient temperature between -10 °C and +40 °C.

➔ In rooms with moist or aggressive atmospheres, the pumping station must be airproof shrink-wrapped in a plastic bag together with a bag of dessicant.

## 9.2 Re-starting

***NOTICE***

**Note the risk of corrosion for storage**

Storage of vacuum pumps can lead to corrosion and aging of lubricants/operating fluids and elastomer seals.

➔ Observe the notes in the operating manuals for the individual components.

➔ Change lubricants and operating fluids before restarting operation.

➔ Check pumping station for contamination and moisture.

➔ If necessary, have Pfeiffer Vacuum Service clean the pumping station completely.

➔ Installation and commissioning in accordance with the operating instructions.

## 9.3 Disposal

Products or parts thereof (mechanical and electrical components, operating fluids, etc.) may cause environmental burden.

➔ Safely dispose of the materials according to the locally applicable regulations.

# 10 Service

**Pfeiffer Vacuum offers first-class service!**

- Maintenance/repairs on site by Pfeiffer Vacuum field service
- Maintenance/repairs in a nearby service center or service point
- Fast replacement with exchange products in mint condition
- Advice on the most cost-efficient and quickest solution

Detailed information and addresses at: **www.pfeiffer-vacuum.com (Service)**.

**Maintenance and repairs in Pfeiffer Vacuum ServiceCenter**

The following steps are necessary to ensure a fast, smooth servicing process:

➔ Download the forms "Service Request" and "Declaration on Contamination".[1)]
➔ Fill out the "Service Request" form and send it by fax or e-mail to your Pfeiffer Vacuum service address.
➔ Include the confirmation on the service request from Pfeiffer Vacuum with your shipment.
➔ Fill in the contamination declaration and enclose it in the shipment (required!).
➔ Dismantle all accessories.
➔ Drain operating fluid/lubricant.
➔ Drain cooling medium, if used.
➔ Send the pump or unit in its original packaging if possible.

**Sending of contaminated pumps or devices**

No units will be accepted if they are contaminated with micro-biological, explosive or radioactive substances. “Hazardous substances” are substances and compounds in accordance with the hazardous goods directive (current version). If pumps are contaminated or the declaration on contamination is missing, Pfeiffer Vacuum performs decontamination at the shipper's expense.

➔ Neutralise the pump by flushing it with nitrogen or dry air.
➔ Close all openings airtight.
➔ Seal the pump or unit in suitable protective film.
➔ Return the pump/unit only in a suitable and sturdy transport container and send it in while following applicable transport conditions.

**Service orders**

All service orders are carried out exclusively according to our repair conditions for vacuum units and components.

1) Forms under www.pfeiffer-vacuum.com

# 11 Spare parts

**NOTICE**

**Service work should be carried out by a qualified person only!**

Pfeiffer Vacuum is not liable for any damage to the pump resulting from work carried out improperly.

➔ Take advantage of our service training programs; additional information at www.pfeiffer-vacuum.com.

➔ Please state all the information on the pump rating plate when ordering spare parts.

For information on the individual components, please consult the corresponding operating manuals.

# 12 Accessories

Further detailed accessories are contained in the Pfeiffer Vacuum printed or Online Catalogue.

Special accessories, such as soundproof hoods, are available on request.

## 12.1 Documentation for accessories

Depending on the pump version, supplementary information may be required for safe use of accessories:

| Component operating manuals/supplementary information for accessories | Document no. [1] | CombiLine pumping station |
|---|---|---|
| Hena 60/100 | PD 0040 BN | WU |
| Hena 61/101 | PD 0086 BN | WU |
| Hena 200/300 | PD 0042 BN | WU |
| Hena 201/251/301 | PD 0087 BN | WU |
| Hena 400/630 | PD 0043 BN | WU |
| Hena 401/631 | PD 0088 BN | WU |
| Hena 1000 | PD 0044 BN | WU |
| Hena 1600 | PD 0047 BN | WU |
| BA 251/501 | PK 0156 BN | WU |
| Uno/Duo 35, Uno/Duo 65 | PK 0168 BN | WD |
| Duo 125/Duo 125 M | PD 0066 BN | WD |
| Duo 255/Duo 255 M | PD 0065 BN | WD |
| Hepta 100 P / 200 P / 300 P | PU 0072 BN | WH |
| Hepta 400 | PU 0048 BN | WH |
| Hepta 630 P | PU 0067 BN | WH |
| Okta 250/250 M<br>Okta 500/500 M | PP 0071 BN | WU, WD, WH |
| Okta 1000/1000 M | PP 0950 BN | WU, WD, WH |
| Okta 2000/2000 M | PP 1011 BN | WU, WD, WH |
| Okta 4000/6000<br>Okta 4000/6000 M | PP 0985 BN | WU, WD, WH |
| UniDry$^{TM}$ 50 | PP 0938 BN | WH |
| Supplementary information sight glass adapter with sensors for operating fluid levels, operating fluid temperature and exhaust pressure | PK 0190 BN | WD |
| Supplementary information for motor change of Roots pumps with magnetic coupling | PW 0142 BN | WU, WD, WH |
| Special overflow valves[2]<br>• with modified pressure differential at the overflow valve<br>• buffered version for short-time evacuation<br>• blocked version | PW 0022 BN | WU, WD, WH |
| Level switch for monitoring the fill level of operating fluids and lubricants in both oil chambers; including pressure equalisation line | PK 0222 BN | WU, WD, WH |
| Chemical oil filter OFC 35/65 | PK 0182 BN | WD |
| Mechanical oil filter OFM 35/65 for Uno/Duo 35/65 | PK 0184 BN | WD |
| Mechanical oil filter OFM 125/255 | PD 0032 BN | WD |
| Oil mist filter OME 63/100 M/C, 160 M, ODK 005 | PD 0052 BN | WU, WD |
| Oil mist filter OME 40 M/MR, OME 40 C/CR | PD 0053 BN | WD |
| Condensate separator KAS | PK 0116 BN | WU |
| Dust separator SAS 16/25/40/63/100/160 | PD 0031 BN | WU, WD, WH |

1. these documents can be downloaded from the Internet

# Declaration of conformity

We hereby declare that the product cited below satisfies all relevant provisions according to the following **EC directives**:

- **Machinery 2006/42/EC (Annex II, no. 1 A)**
- **Electromagnetic Compatibility 2014/30/EU**
- **Restriction of the use of certain Hazardous Substances 2011/65/EU**

The agent responsible for compiling the technical documentation is Mr. Andreas Würz, Pfeiffer Vacuum GmbH, Berliner Straße 43, 35614 Aßlar.

**CombiLine**
**WU/WD/WH pumping stations**

Harmonised standards and national standards and specifications which have been applied:

| | |
|---|---|
| DIN EN ISO 13857 : 2008 | DIN EN 61000-6-4 : 2007 |
| DIN EN ISO 12100 : 2011-03 | DIN EN 61000-6-2 : 2006 |
| DIN EN 60204-1 : 2007 | |

Signature:

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(Dr. Ulrich von Hülsen)
Managing Director

2016-05-19

PFEIFFER VACUUM

## VACUUM SOLUTIONS FROM A SINGLE SOURCE

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