

COMBI

RU/RD/RH Vacuum Booster Pumping Units

Instruction Manual

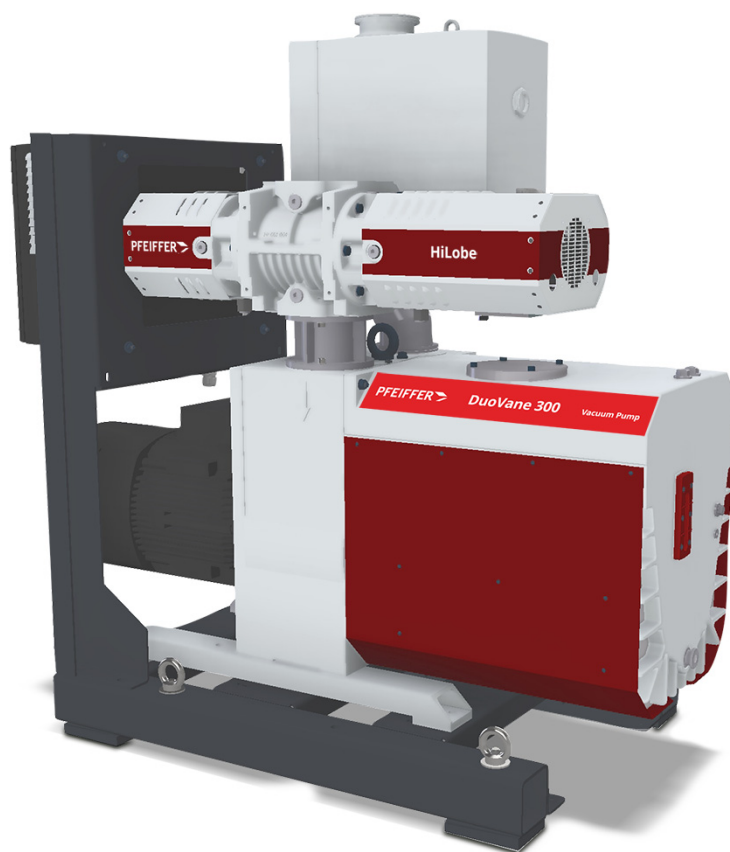


Table of Contents

1	About this manual	4
1.1	Validity.....	4
1.1.1	Applicable documents	4
1.1.2	Variants	4
1.2	Target Group	4
1.3	Conventions.....	4
1.3.1	Instructions in the text	4
1.3.2	Abbreviations.....	5
1.3.3	Symbols used.....	5
2	Safety.....	6
2.1	General Safety Information	6
2.2	Safety Precautions	6
2.3	Limits of Use of Product.....	7
2.4	Protective equipment.....	7
2.5	Intended Use	8
2.6	Foreseeable misuse.....	8
2.7	Personnel Qualification.....	9
2.7.1	Ensuring Personnel Qualification	9
2.7.2	Personnel Qualification for Maintenance and Repair	9
2.7.3	Advanced Training with Pfeiffer Vacuum+Fab Solutions	10
3	Transport and Storage	11
3.1	Unpacking / Repacking	11
3.2	Transport	11
3.3	Storage.....	12
4	Product Description.....	13
4.1	Product Identification	13
4.2	Supply Scope	13
4.3	Variants	14
4.4	Function	17
5	Installation	18
5.1	Installation Location	18
5.2	Preparatory Work	18
5.3	Connections.....	19
5.3.1	Connecting the Vacuum Side	19
5.4	Connecting the Exhaust Side.....	20
5.5	Connecting to the Mains Power Supply.....	21
6	Operation.....	22
6.1	Recommendations for the Operator	22
6.2	Before Switching on	22
6.3	Switching on the Vacuum Booster Pumping Unit	22
6.4	Switching off the Vacuum Booster Pumping Unit.....	23
7	Malfunctions.....	24
8	Maintenance.....	25
8.1	Maintenance Intervals and Responsibilities.....	25
8.2	Removal of Components for their Maintenance	25
9	Decommissioning	27
9.1	Shutting down for longer Periods	27
9.2	Re-starting	27
9.3	Disposal.....	27
10	Service Solutions.....	28
11	Spare Parts.....	29

12	Accessories	30
12.1	Documentation for Accessories	30
13	EU Declaration of Conformity	31
14	UK Declaration of Conformity	32

1 About this manual



NOTE

Important

Read carefully before use.

- Keep the manual for future consultation.

1.1 Validity

This operating manual is for customers of Pfeiffer Vacuum+Fab Solutions. It describes the functioning of the designated product and provides the most important information for safe use of the unit. The description follows applicable 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.

1.1.1 Applicable documents

Document	Number
Declaration of Conformity	Part of this document
Operating instructions for accessories (order-specifically)	see section "Accessories"

Current documents are available from the *Pfeiffer Vacuum+Fab Solutions Dokumenten Finder*.

1.1.2 Variants

- RU-Line with HiLobe Small/Medium and R5 single-stage Rotary vane pump
- RD-Line with HiLobe Small/Medium and DuoVane two-stage Rotary vane pump
- RH-Line with HiLobe Small/Medium and COBRA dry Screw vacuum pump

1.2 Target Group

This instruction manual is aimed at all persons performing the following activities on the product:

- Transportation
- Setup (Installation)
- Usage and operation
- Decommissioning
- Maintenance and cleaning
- Storage or disposal

The work described in this document is only permitted to be performed by persons with the appropriate technical qualifications (expert personnel) or who have received the relevant training from Pfeiffer Vacuum+Fab Solutions.

1.3 Conventions

1.3.1 Instructions in the text

Usage instructions in the document follow a general structure. The action required is indicated by bullet points.

The bullet point list indicates an action with necessary steps followed by another.

- Step 1
- Step 2
- Step 3
 - Step 3.1

The indented bullet point above indicates an action, feature or additional information related to the previous step.

1.3.2 Abbreviations

HiLobe: Roots pump

HV: Vacuum safety valve (with shut-off and venting function)

STP: Dust separator

SAS: Dust separator

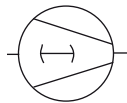
OME: Oil mist filter

ODK: Oil mist filter with return unit

KAS: Condensate separator

1.3.3 Symbols used

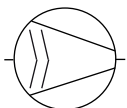
The following symbols are used consistently throughout in all illustrations:



Roots pump (HiLobe)



Rotary vane pump (R5 or DuoVane)



Dry screw pump (COBRA)

2 Safety

2.1 General Safety Information

The following 4 risk levels and 1 information level are taken into account in this document.



DANGER

... indicates an imminent dangerous situation that will result in death or serious injuries if not prevented.



WARNING

... indicates a potentially dangerous situation that could result in death or serious injuries.



CAUTION

... indicates a potentially dangerous situation that could result in minor injuries.



NOTICE

... indicates a potentially dangerous situation that could result in damage to property.



NOTE

... indicates helpful tips and recommendations, as well as information for efficient and trouble-free operation.

2.2 Safety Precautions



NOTE

Duty to provide information on potential dangers

The product holder or user is obliged to make all operating personnel aware of dangers posed by this product.

Every person who is involved in the installation, operation or maintenance of the product must read, understand and adhere to the safety related parts of this document.



NOTE

Infringement of conformity due to modifications to the product

The Declaration of Conformity from the manufacturer is no longer valid if the operator changes the original product or installs additional equipment.

- Following the installation into a system, the operator is required to check and reevaluate the conformity of the overall system in the context of the relevant European Directives, before commissioning that system.

General safety precautions when handling the product

- 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 section 10 "Service Solutions".
- Adjust the customer's process/operation mode clearly to the capacity of the Vacuum Booster Pumping Unit.
- The electrical connection may only be made by an expert electrician according to VDE 0105 in accordance with the regulations of VDE 0100.

2.3 Limits of Use of Product

Parameter	Limit values
Installation location	weatherproof (internal space)
Installation altitude	max. 2000 m above m.s.l.
Orientation	horizontal, max. permissible angle of inclination: $\pm 3^\circ$
Ambient temperature	+5°C to +45°C
Relative air humidity	max. 85%

2.4 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.



WARNING



Increased noise emission!

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

- Provide noise protection or
- Wear hearing protection.



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.

2.5 Intended Use

- The Vacuum Booster Pumping Unit is intended for evacuating vacuum chambers to pressure values in the medium vacuum range.
- Only use the Vacuum Booster Pumping Unit for creating vacuum.
- Only use the Vacuum Booster Pumping Unit for evacuation of dry and inert gases; other applications only after consultation with Pfeiffer Vacuum+Fab Solutions.
- Use suitable gases (process-specific) such as sealing gas, flushing gas and cooling gas at the inlets of the Vacuum Booster Pumping Unit's 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+Fab Solutions.

2.6 Foreseeable misuse

Improper use of the product invalidates all warranty and liability claims. Any use that is counter to the purpose of the product, whether intentional or unintentional, is regarded as improper use; in particular:

- pumping of corrosive and reactive gases; special conditions of use only after consultation with Pfeiffer Vacuum+Fab Solutions
- pumping of explosive media or of oxygen at greater than atmospheric concentration
- operation of the Vacuum Booster Pumping Unit in potentially explosive areas
- operation 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 Vacuum Booster Pumping Unit 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

2.7 Personnel Qualification

The work described in this document may only be carried out by persons who have appropriate professional qualifications and the necessary experience or who have completed the necessary training as provided by Pfeiffer Vacuum+Fab Solutions.

Training people

- Train the technical personnel on the product.
- Only let personnel to be trained work with and on the product when under the supervision of trained personnel.
- Only allow trained technical personnel to work with the product.
- Before starting work, make sure that the commissioned personnel have read and understood these instruction manual and all applicable documents, in particular the safety, maintenance and repair information.

2.7.1 Ensuring Personnel Qualification

Specialist for mechanical work

Only a trained specialist may carry out mechanical work. Within the meaning of this document, specialists are people responsible for construction, mechanical installation, troubleshooting and maintenance of the product, and who have the following qualifications:

- Qualification in the mechanical field in accordance with nationally applicable regulations
- Knowledge of this documentation

Specialist for electrotechnical work

Only a trained electrician may carry out electrical engineering work. Within the meaning of this document, electricians are people responsible for electrical installation, commissioning, troubleshooting, and maintenance of the product, and who have the following qualifications:

- Qualification in the mechanical field in accordance with nationally applicable regulations
- Knowledge of this documentation

In addition, these individuals must be familiar with applicable safety regulations and laws, as well as the other standards, guidelines, and laws referred to in this documentation. The above individuals must have an explicitly granted operational authorization to commission, program, configure, mark, and earth devices, systems, and circuits in accordance with safety technology standards.

Trained individuals

Only adequately trained individuals may carry out all works in other transport, storage, operation and disposal fields. Such training must ensure that individuals are capable of carrying out the required activities and work steps safely and properly.

2.7.2 Personnel Qualification for Maintenance and Repair



NOTE

Advanced training courses

Pfeiffer Vacuum+Fab Solutions offers advanced training courses to maintenance levels 2 and 3.

Adequately trained individuals are:

Maintenance level 1

- Customer (trained specialist)

Maintenance level 2

- Customer with technical education
- Pfeiffer Vacuum+Fab Solutions service technician

Maintenance level 3

- Customer with Pfeiffer Vacuum+Fab Solutions service training
- Pfeiffer Vacuum+Fab Solutions service technician

2.7.3 Advanced Training with Pfeiffer Vacuum+Fab Solutions

For optimal and trouble-free use of this product, Pfeiffer Vacuum+Fab Solutions offers a comprehensive range of courses and technical trainings.

For more information, please contact *Pfeiffer Vacuum+Fab Solutions technical training*.

3 Transport and Storage

3.1 Unpacking / Repacking

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



NOTE

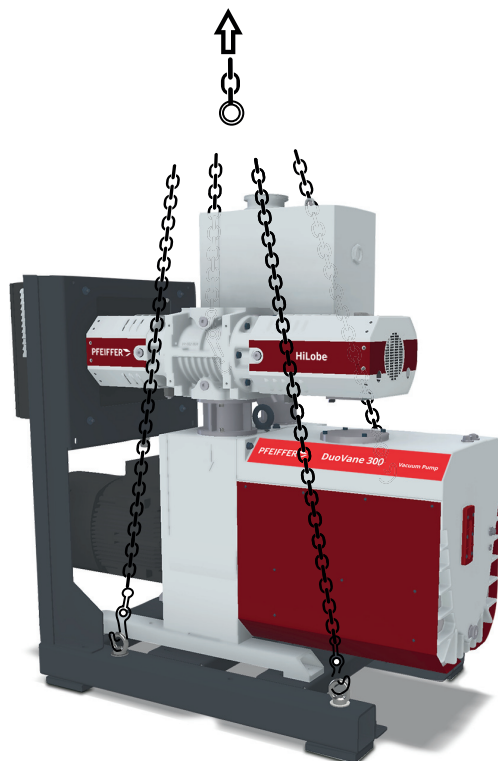
Disposal of packaging materials

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 Vacuum Booster Pumping Unit 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 Vacuum Booster Pumping Unit by the intake flange of the Roots pump.



Graphic 1: Lifting and transporting the Vacuum Booster Pumping Unit



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 Vacuum Booster Pumping Unit 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 Vacuum Booster Pumping Unit only indoors, preferably at temperatures between -10°C and +40°C.
- For a longer period of storage, leave the Vacuum Booster Pumping Unit 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

Vacuum Booster Pumping Units of the COMBI RU/RD/RH series basically consist of a Roots pump (HiLobe), a backing pump and process-specific accessories. The following pumps can be used as backing pump:

- single-stage Rotary vane pump R5 (RU-Line)
- two-stage Rotary vane pump DuoVane (RD-Line)
- dry Screw pump COBRA (RH-Line)

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

- Vacuum Booster Pumping Unit 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.

4.2 Supply Scope

Vacuum Booster Pumping Unit components mounted on frame ready for connection, with all necessary connecting lines including counter flanges on the intake side and pressure side:

- Stationary Vacuum Booster Pumping Unit with bores in the base plate for fastening
- Mobile Vacuum Booster Pumping Unit with castors

Roots pump with motor and RC 5500/7500 drive electronics

- HiLobe small
- HiLobe medium
- Drive electronics (control box), supplied in loose form or permanently mounted on the frame

Backing pump with motor

- single-stage Rotary vane pump R5 (RU-Line)
- two-stage Rotary vane pump DuoVane (RD-Line)
- dry Screw pump COBRA (RH-Line)

Operating fluid and lubricant P3 / D2 / VSC100

Optional accessories

- Measuring gauge with measuring and control unit (e.g. OmniControl)

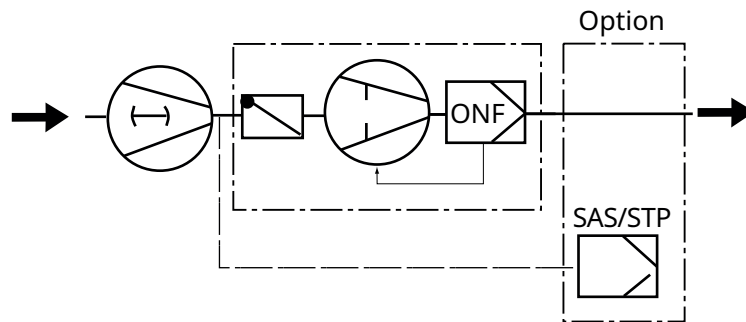
Operating manuals for Vacuum Booster Pumping Unit and individual components

Wiring diagram for Vacuum Booster Pumping Unit with control cabinet (option)

4.3 Variants

COMBI RU with single-stage Rotary vane pump R5

The Vacuum Booster Pumping Units of the COMBI RU series consist of a single-stage Rotary vane pump R5 and a HiLobe Small or Medium Roots pump. The Vacuum Booster Pumping Units are additionally mounted on frame.



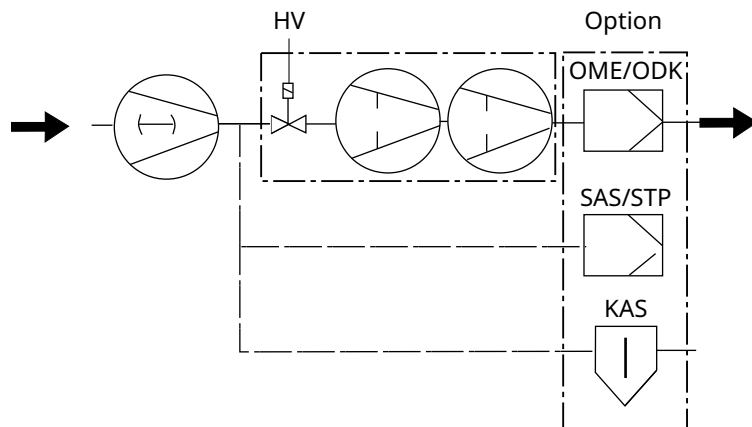
COMBI RU	HiLobe Small	R5	Pumping speed at 1 hPa 50 Hz [m³/h]	Motorleistung bei 50 Hz [kW]	Final pressure [hPa]	Final pressure with gas ballast [hPa]	Connection flange (inlet) DN ...	Connection flange (outlet) DN ...	Weight [kg]
RU 1002	HiLobe 1302	R5 RD 0240 A	1028	6.5	7.00E-03	2.00E-02	100 ISO-F	63 ISO-K	415
RU 1052	HiLobe 1302	R5 RD 0360 A	1091	8.0	7.00E-03	2.00E-02	100 ISO-F	63 ISO-K	430
RU 1102	HiLobe 1302	R5 RA 0520 A	1106	16.0	5.00E-03	1.00E-02	100 ISO-F	100 ISO-K	850
RU 1152	HiLobe 1302	R5 RA 0630 C	1204	17.5	7.00E-03	2.00E-02	100 ISO-F	100 ISO-K	1010
RU 1454	HiLobe 2104	R5 RD 0240 A	1485	7.5	1.00E-02	3.00E-02	100 ISO-F	63 ISO-K	435
RU 1604	HiLobe 2104	R5 RD 0360 A	1626	9.0	1.00E-02	3.00E-02	100 ISO-F	63 ISO-K	450
RU 1654	HiLobe 2104	R5 RA 0520 A	1623	17.0	1.00E-02	2.00E-02	100 ISO-F	100 ISO-K	870
RU 1754	HiLobe 2104	R5 RA 0630 C	1839	18.5	1.00E-02	2.00E-02	100 ISO-F	100 ISO-K	1025

COMBI RU	HiLobe Medium	R5	Pumping speed at 1 hPa 50 Hz [m³/h]	Motorleistung bei 50 Hz [kW]	Final pressure [hPa]	Final pressure with gas ballast [hPa]	Connection flange (inlet) DN ...	Connection flange (outlet) DN ...	Weight [kg]
RU 2004	HiLobe 2704	R5 RD 0360 A	2014	9.0	1.00E-02	3.00E-02	160 ISO-F	63 ISO-K	625
RU 2204	HiLobe 2704	R5 RA 0520 A	2057	17.0	1.00E-02	2.00E-02	160 ISO-F	100 ISO-K	1000
RU 2304	HiLobe 2704	R5 RA 0630 C	2302	18.5	1.00E-02	2.00E-02	160 ISO-F	100 ISO-K	1200
RU 2954	HiLobe 4504	R5 RD 0360 A	2960	11.0	1.00E-02	3.00E-02	160 ISO-F	63 ISO-K	625
RU 3404	HiLobe 4504	R5 RA 0520 A	3010	19.0	5.00E-03	2.00E-02	160 ISO-F	100 ISO-K	1000
RU 3554	HiLobe 4504	R5 RA 0630 C	3567	20.5	1.00E-02	2.00E-02	160 ISO-F	100 ISO-K	1200
RU 4704	HiLobe 6204	R5 RA 0630 C	4689	22.5	1.00E-02	2.00E-02	160 ISO-F	100 ISO-K	1200

Please refer to the associated design drawing and the relevant Vacuum Booster Pumping Unit rating plate / the rating plate for the component.

COMBI RD with two-stage Rotary vane pump DuoVane

The Vacuum Booster Pumping Units of the COMBI RD series consist of a two-stage Rotary vane pump DuoVane and a HiLobe Small or Medium Roots pump. The Vacuum Booster Pumping Units are additionally equipped with an OME oil mist filter and mounted on frame.



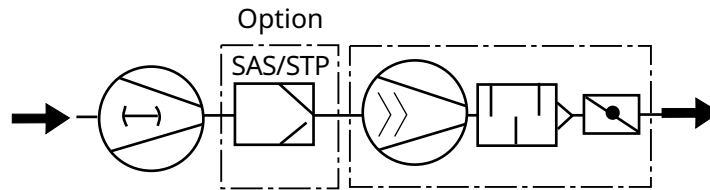
COMBI RD	HiLobe Small	DuoVane	Pumping speed at 1 hPa 50 Hz [m³/h]	Motorleistung bei 50 Hz [kW]	Final pressure [hPa]	Final pressure with gas ballast [hPa]	Connection flange (inlet) DN ...	Connection flange (outlet) DN ...	Weight [kg]
RD 1002	HiLobe 1302	DuoVane 135	975	6.5	5.00E-04	9.00E-04	100 ISO-F	63 ISO-F	218
RD 1604	HiLobe 2104	DuoVane 300	1644	11.0	9.00E-04	2.00E-03	100 ISO-F	100 ISO-F	270

COMBI RD	HiLobe Medium	DuoVane	Pumping speed at 1 hPa 50 Hz [m³/h]	Motorleistung bei 50 Hz [kW]	Final pressure [hPa]	Final pressure with gas ballast [hPa]	Connection flange (inlet) DN ...	Connection flange (outlet) DN ...	Weight [kg]
RD 2054	HiLobe 2704	DuoVane 300	2037	11.0	9.00E-04	2.00E-03	160 ISO-F	100 ISO-F	575

Please refer to the associated design drawing and the relevant Vacuum Booster Pumping Unit rating plate / the rating plate for the component.

COMBI RH with Screw pump COBRA

The Vacuum Booster Pumping Units of the COMBI RH series consist of a COBRA dry Screw pump and a HiLobe Small or Medium Roots pump. The Vacuum Booster Pumping Units are additionally mounted on frame.



COMBI RD	HiLobe Small	COBRA	Pumping speed at 1 hPa 50 Hz [m³/h]	Motorleistung bei 50 Hz [kW]	Final pressure [hPa]	Connection flange (inlet) DN ...	Connection flange (outlet) DN/G	Weight [kg]
RH 902	HiLobe 1302	COBRA NC 0100 B	959	6.0	4.00E-03	100 ISO-F	DN 40	550
RH 1102	HiLobe 1302	COBRA NC 0200 B	1096	8.5	7.00E-03	100 ISO-F	DN 50	590
RH 1152	HiLobe 1302	COBRA NC 0300 B	1143	10.0	4.00E-03	100 ISO-F	DN 50	635
RH 1202 L	HiLobe 1302	COBRA NX 0450 A	1155	10.0	7.00E-03	100 ISO-F	G 2"	750
RH 1252	HiLobe 1302	COBRA NC 0630 C	1225	17.5	1.00E-03	100 ISO-F	DN 80	850
RH 1252 L	HiLobe 1302	COBRA NX 0650 A	1220	15.0	7.00E-03	100 ISO-F	G 3"	950
RH 1304	HiLobe 2104	COBRA NC 0100 B	1325	7.0	7.00E-03	100 ISO-F	DN 40	570
RH 1604	HiLobe 2104	COBRA NC 0200 B	1627	9.5	7.00E-03	100 ISO-F	DN 50	615
RH 1704	HiLobe 2104	COBRA NC 0300 B	1720	11.0	7.00E-03	100 ISO-F	DN 50	660
RH 1754 L	HiLobe 2104	COBRA NX 0450 A	1746	11.0	1.00E-02	100 ISO-F	G 2"	770
RH 1854	HiLobe 2104	COBRA NC 0630 C	1875	18.5	2.00E-03	100 ISO-F	DN 80	870
RH 1854 L	HiLobe 2104	COBRA NX 0650 A	1873	16.0	1.00E-02	100 ISO-F	G 3"	970
RH 1904 L	HiLobe 2104	COBRA NX 0950 A	1925	22.0	1.00E-02	100 ISO-F	DN 100 ISO-K	1270

COMBI RD	HiLobe Medium	COBRA	Pumping speed at 1 hPa 50 Hz [m³/h]	Motorleistung bei 50 Hz [kW]	Final pressure [hPa]	Connection flange (inlet) DN ...	Connection flange (outlet) DN/G	Weight [kg]
RH 2154	HiLobe 2704	COBRA NC 0400 B	2167	11.0	7.00E-03	160 ISO-F	DN 80	940
RH 2204 L	HiLobe 2704	COBRA NX 0450 A	2175	11.0	1.00E-02	160 ISO-F	G 2"	940
RH 2354	HiLobe 2704	COBRA NC 0630 C	2344	18.5	2.00E-03	160 ISO-F	DN 80	1030
RH 2404 L	HiLobe 2704	COBRA NX 0650 A	2348	16.0	1.00E-02	160 ISO-F	G 3"	1130
RH 2504 L	HiLobe 2704	COBRA NX 0950 A	2413	22.0	1.00E-02	160 ISO-F	DN 100 ISO-K	1450
RH 3304	HiLobe 4504	COBRA NC 0400 B	3269	13.0	7.00E-03	160 ISO-F	DN 80	940
RH 3354 L	HiLobe 4504	COBRA NX 0450 A	3310	13.0	1.00E-02	160 ISO-F	G 2"	940
RH 3654	HiLobe 4504	COBRA NC 0630 C	3655	20.5	2.00E-03	160 ISO-F	DN 80	1030
RH 3704 L	HiLobe 4504	COBRA NX 0650 A	3668	18.0	1.00E-02	160 ISO-F	G 3"	1130
RH 3804 L	HiLobe 4504	COBRA NX 0950 A	3811	24.0	1.00E-02	160 ISO-F	DN 100 ISO-K	1450
RH 4254 L	HiLobe 6204	COBRA NX 0450 A	4239	15.0	1.00E-02	160 ISO-F	G 2"	940
RH 4854	HiLobe 6204	COBRA NC 0630 C	4824	22.5	2.00E-03	160 ISO-F	DN 80	1030
RH 4904 L	HiLobe 6204	COBRA NX 0650 A	4860	20.0	1.00E-02	160 ISO-F	G 3"	1130
RH 5104 L	HiLobe 6204	COBRA NX 0950 A	5098	26.0	1.00E-02	160 ISO-F	DN 100 ISO-K	1450

Please refer to the associated design drawing and the relevant Vacuum Booster Pumping Unit rating plate / the rating plate for the component.

4.4 Function

The standard Vacuum Booster Pumping Units of the COMBI RU/RD/RH series are two-stage pumping stations with a backing pump and a Roots pump (HiLobe).

The Vacuum Booster Pumping Units 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 Vacuum Booster Pumping Unit:

- Consider the load-bearing capacity of the installation site.
- Maximum installation altitude 2000 m (above mean sea level)
- Permissible ambient temperature: +5°C to +45°C
- Maximum relative humidity 85%
- The installation location is to be chosen so that Vacuum Booster Pumping Unit components are freely accessible for inspection and servicing.
- Note set-up conditions for the individual components.
- Always place the Vacuum Booster Pumping Unit on a firm, even surface.
- The base frame has four holes for anchoring onto the base.
- Protect Vacuum Booster Pumping Unit against air draughts and direct atmospheric exposure.
- When installing 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 Vacuum Booster Pumping Units 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 Vacuum Booster Pumping Unit is delivered mounted on a base frame and ready for connection. If parts of the Vacuum Booster Pumping Unit are dismantled for transport reasons, they must be remounted according to the design drawing.



NOTE

Use approved operating fluids only!

The use of operating fluids that have not been approved by Pfeiffer Vacuum+Fab Solutions 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.



NOTE

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 Vacuum Booster Pumping Unit 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 Vacuum Booster Pumping Unit only by EMC trained specialists according to the instructions of the parts manufacturers.

5.3

Connections

5.3.1

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.



NOTE

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.

5.4 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.

5.5 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 backing 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.

The HiLobe Roots pumps are shipped with the corresponding electronic drive unit, the mains connection must be made in accordance with the information on the type plate, separately from the connection for the backing pump.

- 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 Vacuum Booster Pumping Unit, for the separation of the Vacuum Booster Pumping Unit from the mains (e.g. main switch or emergency-stop button), so that the Vacuum Booster Pumping Unit can be switched off in an emergency situation without any problems.

Versions with a control cabinet (option)

Vacuum Booster Pumping Units 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 Vacuum Booster Pumping Unit 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 Vacuum Booster Pumping Unit. He explains that damages to persons and systems can occur, if the Vacuum Booster Pumping Unit is not operated correctly. To this in particular belong also information concerning the residual risks.

Before maintenance and repairs the Vacuum Booster Pumping Unit 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 Vacuum Booster Pumping Unit 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 Vacuum Booster Pumping Unit



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 Vacuum Booster Pumping Unit to operating temperature before process start.
- After completion of the process, let the Vacuum Booster Pumping Unit continue to run for about 30 minutes with the intake line closed and the gas ballast valve open.

For Vacuum Booster Pumping Units **without** control cabinet, the backing pump and the Roots pump have to be switched on with separate switches in accordance to the process requirements. There are various ways for controlling HiLobe Roots pumps, which are described in detail in the pump's individual operating instructions. These instructions also contain a description of all settings and function-related characteristics.

For Vacuum Booster Pumping Units **with** a control cabinet, the switch-on sequence is specified by the controller. Switch on the master switch on the control cabinet.

- Switch on Vacuum Booster Pumping Unit.
- When water cooling is used: Open cooling water supply and check the flow.
- Open shut-off valve in the intake line and switch the pumps over to the process.
- When sealing gas is used: Open the sealing gas supply and check the flow.

6.4 Switching off the Vacuum Booster Pumping Unit

- Close shut-off valve in the intake line and separate the pumps from the process.
- Switch off the Vacuum Booster Pumping Unit.
- Flush Vacuum Booster Pumping Unit 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.

7 Malfunctions

Please note the following instructions should the Vacuum Booster Pumping Unit malfunction:

Problem	Possible causes	Remedy, please refer to component operating instructions
Vacuum Booster Pumping Unit 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
Vacuum Booster Pumping Unit 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
Vacuum Booster Pumping Unit 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	Check backing pump
	Leak in system	Localize/repair leak in Vacuum Booster Pumping Unit
	Dirty or damaged overflow valve	Roots pump
	Operational loss of lubricant at the oiler	Roots pump
	Operating fluid filling level too low	Backing pump
Pumping speed of the Vacuum Booster Pumping Unit too low	Intake line not well-dimensioned	Keep connections as short as possible and see that cross-sections of Vacuum Booster Pumping Unit are sufficiently dimensioned
	Exhaust pressure too high	Check opening of exhaust line and exhaust accessories
Loss of operating fluid	Casing seal leaky	Rotary vane pump
	Operational loss of operating fluid	Rotary vane pump
	Radial shaft seal ring leaky	Rotary vane pump
Unusual operating noises	Suction chamber dirty	Roots pump
	Silencer dirty	Rotary vane pump
	Bearings or gear wheels damaged	Backing pump/Roots pump
	Dirty overflow valve	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 Vacuum Booster Pumping Unit 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.



NOTE

Disclaimer of liability

Pfeiffer Vacuum+Fab Solutions 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 Vacuum Booster Pumping Unit in accordance with the instructions in the individual operating manuals.
- Clarify shorter maintenance intervals for extreme loads or impure processes with Pfeiffer Vacuum+Fab Solutions Service.
- For all other cleaning, maintenance or repair work, please contact your Pfeiffer Vacuum+Fab Solutions service location.

8.2 Removal of Components for their Maintenance

In some cases, components may need to be dismantled from the Vacuum Booster Pumping Unit 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 Vacuum Booster Pumping Unit 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.



NOTE

Refer to the notes on Proper Use of the unit.

The Vacuum Booster Pumping Unit must only be operated as a complete unit. Disassembly and operation of individual Vacuum Booster Pumping Unit 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 Vacuum Booster Pumping Unit should be shut down for longer than a year:

- Remove the Vacuum Booster Pumping Unit from the system, if necessary.
- Only store the Vacuum Booster Pumping Unit indoors at an ambient temperature between -10°C and +40°C.
- In rooms with moist or aggressive atmospheres, the Vacuum Booster Pumping Unit must be air-proof 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 Vacuum Booster Pumping Unit for contamination and moisture.
- If necessary, have Pfeiffer Vacuum+Fab Solutions Service clean the Vacuum Booster Pumping Unit 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 Solutions

We offer first-class service

High vacuum component service life, in combination with low downtime, are clear expectations that you place on us. We meet your needs with efficient products and outstanding service.

We are always focused on perfecting our core competence – servicing of vacuum components. Once you have purchased a product from Pfeiffer Vacuum+Fab Solutions, our service is far from over. This is often exactly where service begins. Obviously, in proven Pfeiffer Vacuum+Fab Solutions quality.

For a quick and smooth service process, we recommend the following steps:

- Fill out the online service request.
- Your request will be sent to the competent Service Center in your country/region.

A copy of your request and a ticket number will be emailed to you.

Please remember to print out the declaration of contamination, sign it and return it to Pfeiffer Vacuum+Fab Solutions.

You will receive the pre-filled declaration by email after submitting the online service request.

In addition, please follow the steps below:

- Prepare the product for safe transport according to the specifications from the declaration on contamination.
- Attach the Declaration of Contamination on the outside of the shipping box.
- Next, send your product to your local Service Center (you will receive the shipping address by email).
- You will receive response from Pfeiffer Vacuum+Fab Solutions.

11 Spare Parts



NOTICE



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

Pfeiffer Vacuum+Fab Solutions 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+Fab Solutions printed or Online Catalogue.

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

12.1 Documentation for Accessories

Depending on the Vacuum Booster Pumping Unit version, supplementary information may be required for safe use of accessories:

Component operating manuals/supplementary information for accessories	Document no.	COMBI
R5 RD 0240 A/0360 A	0870572700/-0008	RU
R5 RA 0520 A	0870242264/-0003	RU
R5 RA 0630 C	0870569645/-0010	RU
DuoVane 135	PD 0066 BDE	RD
DuoVane 300	PD 0065 BDE	RD
COBRA NC 0100 B/0200 B/0300 B	0870573306/-0006	RH
COBRA NC 0400 B	0870565283/-0008	RH
COBRA NC 0630 C	0870567092/-0008	RH
COBRA NX 0450 A/650 A	0870565358/-0010	RH
COBRA NX 0950 A	0870222540/-0005	RH
HiLobe 1002/1302	PW 0322 BN	RU, RD, RH
HiLobe 1004/1304/2104	PW 0329 BN	RU, RD, RH
HiLobe 2704/4504/6204	PW 0333 BN	RU, RD, RH
Supplementary information sight glass adapter with sensors for operating fluid levels, operating fluid temperature and exhaust pressure	PK 0190 BN	RD
Level switch for monitoring the fill level of operating fluids and lubricants in both oil chambers; including pressure equalisation line	PK 0222 BN	RU, RD, RH
Chemical oil filter OFC 35/65	PK 0182 BN	RD
Mechanical oil filter OFM 35/65 for Uno/Duo 35/65	PK 0184 BN	RD
Mechanical oil filter OFM 125/255	PD 0032 BN	RD
Oil mist filter OME 63/100 M/C, 160 M, ODK 005	PD 0052 BN	RD
Oil mist filter OME 40 M/MR, OME 40 C/CR	PD 0053 BN	RD
Condensate separator KAS	PK 0116 BN	RD
Dust separator SAS 16/25/40/63/100/160	PD 0031 BN	RU, RD, RH

These documents can be downloaded from the Internet.

13 EU Declaration of Conformity

This Declaration of Conformity and the CE-markings affixed to the nameplate are valid for the machine(s) within the Pfeiffer Vacuum+Fab Solutions scope of delivery. This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

When this machine(s) is integrated into a superordinate machinery the manufacturer of the superordinate machinery (this can be the operating company, too) must conduct the conformity assessment process for the superordinate machine or plant, issue the Declaration of Conformity for it and affix the CE-marking.

The manufacturer

Pfeiffer Vacuum GmbH
Berliner Straße 43
DE-35614 Asslar

declares that the machine(s): COMBI RD/RU/RH Vacuum Booster Pumping Units
 fulfill(s) all the relevant provisions from EU directives:

- 'Machinery' 2006/42/EC
- 'Electromagnetic Compatibility' (EMC) 2014/30/EU
- 'RoHS' 2011/65/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (incl. all related applicable amendments)
- 'RoHS' 2015/863/EU Restriction of the use of certain hazardous substances in electrical and electronic equipment (incl. all related applicable amendments)

and comply(-ies) with the following harmonized standards that have been used to fulfill those provisions:

Standard	Title of the Standard
DIN EN ISO 12100:2011	Safety of machinery – General principles for design – Risk assessment and risk reduction
DIN EN 1012-2:2011	Compressors and vacuum pumps – Safety requirements – Part 2: Vacuum pumps
DIN EN 60204-1:2019	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
DIN EN 60034-1:2011	Rotating electrical machines – Part 1: Rating and performance
DIN EN IEC 61000-6-2:2019	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
DIN EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test
ISO 21360-4:2018	Vacuum technology – Standard methods for measuring vacuum-pump performance – Part 4: Turbomolecular vacuum pumps
DIN EN IEC 62061:2023	Safety of machinery – Functional safety of safety-related control systems

Legal person authorized to compile the technical file and authorized representative in the EU (if the manufacturer is not located in the EU):

BUSCH Dienste GmbH
Schauinslandstr. 1
DE-79689 Maulburg

Asslar, 28.10.2025



Daniel Sälzer, General Manager Pfeiffer Vacuum GmbH

14 UK Declaration of Conformity

This Declaration of Conformity and the UKCA-markings affixed to the nameplate are valid for the machine(s) within Pfeiffer Vacuum+Fab Solutions scope of delivery. This Declaration of Conformity is issued under the sole responsibility of the manufacturer.

When this machine(s) is integrated into a superordinate machinery the manufacturer of the superordinate machinery (this can be the operating company, too) must conduct the conformity assessment process for the superordinate machine or plant, issue the Declaration of Conformity for it and affix the UKCA-marking.

The manufacturer

Pfeiffer Vacuum GmbH
Berliner Straße 43
DE-35614 Aßlar

declares that the machine(s): COMBI RU/RD/RH Vacuum Booster Pumping Units
 fulfill(s) all the relevant provisions from UK legislations:

- Supply of Machinery (Safety) Regulations 2008
 - Electromagnetic Compatibility Regulations 2016
 - Restriction of the use of certain hazardous substances in Electrical and Electronic Equipment Regulations 2012
- and comply(-ies) with the following designated standards that have been used to fulfill those provisions:

Standard	Title of the Standard
DIN EN ISO 12100:2011	Safety of machinery – General principles for design – Risk assessment and risk reduction
DIN EN 1012-2:2011	Compressors and vacuum pumps – Safety requirements – Part 2: Vacuum pumps
DIN EN 60204-1:2019	Safety of machinery – Electrical equipment of machines – Part 1: General requirements
DIN EN 60034-1:2011	Rotating electrical machines – Part 1: Rating and performance
DIN EN IEC 61000-6-2:2019	Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments
DIN EN 61000-4-2:2009	Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test
ISO 21360-4:2018	Vacuum technology – Standard methods for measuring vacuum-pump performance – Part 4: Turbomolecular vacuum pumps
DIN EN IEC 62061:2023	Safety of machinery – Functional safety of safety-related control systems

Legal person authorized to compile the technical file and importer in the UK (if the manufacturer is not located in the UK):

Pfeiffer Vacuum+Fab Solutions Ltd
16 Plover Close, Interchange Park
UK-MK169PS Newport Pagnell

Asslar, 28.10.2025



Daniel Sälzer, General Manager Pfeiffer Vacuum GmbH

Notes

Grid of dots for notes.

BUSCH GROUP

The Busch Group is one of the world's largest manufacturers of vacuum pumps, vacuum systems, blowers, compressors and gas abatement systems. Under its umbrella, the group houses two well-known brands: Busch Vacuum Solutions and Pfeiffer Vacuum+Fab Solutions. Together, they offer solutions to a wide range of industries. A global network of highly competent local teams in 44 countries ensures that expert, tailor-made support is always available near you. Wherever you are. Whatever your business.



● Busch Group companies

▲ Busch Group production sites

● Busch Group service centers

■ Busch Group local representatives

www.buschvacuum.com

www.pfeiffer-vacuum.com