

CHEMISTRY DIAPHRAGM PUMPS CHEMISTRY PUMPING UNITS

ME 4C NT VARIO
MZ 2C NT VARIO
MD 4C NT VARIO
MV 10C VARIO-B
MD 12C VARIO-B

PC 3002 VARIO
PC 3003 VARIO
PC 3004 VARIO
PC 3010 VARIO
PC 3012 VARIO

Part II of II:
*Readjustment - Interface parameters -
Accessories - Maintenance*



Instructions for use



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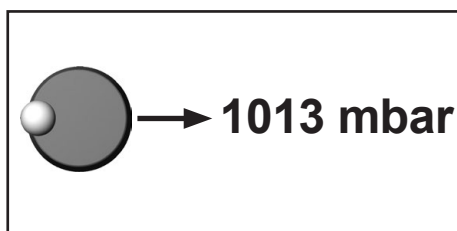
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Readjustment of CVC 3000

NOTICE

The vacuum gauge was adjusted using factory standards, which are traceable through regular calibration in an accredited laboratory (DAkkS calibration laboratory) to the German national pressure standard. Depending on the process and/or accuracy requirements, check the adjustment and readjust if necessary. For readjustment, the device has to be adjusted both at atmospheric pressure as well as under vacuum but only if the reference pressures are known with certainty. The adjustment mode can be activated only if the process control is inactive. Press "START/STOP" key, if necessary. In the range between 15 to 525 Torr (20 to 700 mbar) no adjustment is possible; ---- Torr is displayed.

Adjustment at atmospheric pressure



An adjustment at atmospheric pressure is only possible if the pressure is higher than 525 Torr (700 mbar).

Vent the measurement connection of the CVC 3000 and/or the vacuum system. Make sure that the pressure transducer is at atmospheric pressure.

- ➔ In "Configuration" menu, select program "Adjustment" at the controller.
- ➔ Use the selection knob to adjust the reading to the current atmospheric pressure.
- ➔ Press the selection knob to confirm.

Note: To determine the actual atmospheric pressure, use an accurate barometer or get accurate reading from the weather service, or a nearby airport or other reliable source (taking into account the difference in altitude between the source and the laboratory).

Adjustment under vacuum



0 mbar

An adjustment under vacuum is only possible if the pressure is lower than 15 Torr (20 mbar) absolute.

Evacuate the measurement connection of the CVC 3000 to a pressure < 0.1 Torr (mbar) (e.g. by applying a good two-stage rotary vane pump).

- ➔ In "Configuration" menu, select program "Adjustment" at the controller.
- ☞ The reading is automatically adjusted to "zero".
- ➔ Press the selection knob to confirm.

Note: Adjustment under vacuum with an actual pressure higher than 0.1 Torr (mbar) reduces the accuracy of the measurement. If the pressure is significantly higher than 0.1 Torr (mbar), adjustment to a reference pressure is recommended.

Adjustment at a reference pressure



0...20 mbar

Instead of adjustment under vacuum to a pressure < 0.1 Torr (mbar), adjustment to a precisely known reference pressure within the range of 0..... 15 Torr (20 mbar) is possible. Evacuate the measurement connection of the CVC 3000 to a pressure within 0 15 Torr (0.....20 mbar).

- ➔ In "Configuration" menu, select program "Adjustment" at the controller.
- ☞ The reading is automatically adjusted to "zero".
- ➔ Use the selection knob to adjust the display to the reference pressure at the vacuum line within the range of 0 15 Torr (0.....20 mbar).
- ➔ Press the selection knob to confirm.

Note: The accuracy of the value of the reference pressure will directly affect the accuracy of the adjustment. If the nominal ultimate vacuum of a diaphragm pump is used as reference vacuum, the accuracy of the controller might be doubtful. The diaphragm pump may not achieve the specified value (due to condensate, poor condition, failure of valves or diaphragm, leaks).

Calibration in the factory

Control of measuring equipment

The **VACUUBRAND DAkkS calibration laboratory** is accredited by the Deutsche Akkreditierungsstelle GmbH (national accreditation body of the Federal Republic of Germany) for the measurable variable **pressure in the pressure range from $7.5 \cdot 10^{-4}$ Torr to 975 Torr (10^{-3} mbar to 1300 mbar)** in accordance with the general criteria for the operation of testing laboratories defined in the DIN EN ISO/IEC 17025:2000 series of standards (accreditation number D-K-15154-01).

The DAkkS is signatory to the multilateral agreements of the European cooperation for Accreditation (EA) and of the International Laboratory Accreditation Cooperation (ILAC) for the mutual recognition of calibration certificates.

Rely on calibration in the VACUUBRAND calibration laboratory:

- To meet the requirements of the DIN ISO 9000ff and 10012 series of standards regarding the calibration of inspection, measuring and test equipment at specified intervals.
- To document that the vacuum gauges calibrated are traceable to national standards of the PTB (Physikalisch-Technische Bundesanstalt; German national institute for science and technology and the highest technical authority of the Federal Republic of Germany for the field of metrology and certain sectors of safety engineering).

To order DAkkS calibration of the CVC 3000 pressure transducer,

order number:**20900215**

Cleaning the pressure transducer

NOTICE

Attention: Never use a pointed or sharp-edged tool to clean the pressure transducer.

Never touch the ceramic diaphragm of the pressure transducer with hard objects.

- Fill the measurement chamber with a solvent (e.g., benzene) and allow sufficient cleaning time. Observe all regulations concerning usage and disposal of solvents!
- Drain the solvent and dispose of in accordance with regulations. Repeat cleaning if necessary.
- Rinse the measurement chamber several times with alcohol in order to remove all solvent residues.
- Allow the pressure transducer to dry.
- Readjust the pressure transducer if necessary.

Readjustment of the controller CVC 3000

See section "Readjustment of CVC 3000", pg. 84.

Interface parameters

The CVC 3000 controller is equipped with a serial interface (RS 232C, nine-pin Sub-D-plug).

- ☞ Plug-in or remove the cable (cable RS 232C) from the interface only if the equipment is switched off.
- ☞ The interface is **not** electrically isolated from the measuring circuit.

The controller is fully operable via the serial interface. Measuring results, preselections and the status of the controller can be read at any time.

The factory-set read and write commands are completely compatible with the VACUUBRAND CVC 2000 controller (see sections "Read / Write commands CVC 2000"). An extended instruction set is available using the command "CVC 3" (see sections "Read / Write commands CVC 3000").

Setting of the interface

Set the interface parameters directly at the controller CVC 3000. The factory set values are underlined.

Edit and confirm the interface parameters in the "Configuration" menu in "RS-232" submenu using the selection knob.

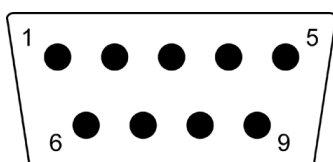
- ➔ Baud: 2400, 4800, 9600 or 19200
- ➔ Parity: 8-N-1, 7-O-1 or 7-E-1
- ➔ Handshake: Off, Xon-Xoff or RTS-CTS
- ➔ Remote: On or Off
- ➔ Timeout: Sending 1s, receiving 10s.

In remote mode (Remote On, with the "PC symbol" in the display) all keys at the controller are inoperable.

To return to the manual operation of the controller, set the controller to "Remote off" in menu configuration: Switch off the controller. Then switch the controller back on, and press the selection knob within 2s.

- ➔ A maximum of ten commands per second is possible.
- ➔ Read commands and commands "REMOTE", "CVC", and "STORE" can always be sent. The sending of other write commands is only possible, if "Remote on" is selected.
- ➔ The commands have to be written in capital letters.
- ➔ Command and parameter have to be separated by a blank.
- ➔ The string is terminated with <CR> or <LF> or <CR><LF>.
- ➔ The response of the controller is always terminated with <CR><LF>.
- ➔ Numerical values and parameters can be written without leading zeros.
- ➔ The response of the controller always includes leading zeros.

Pin assignment RS-232 C



2: RxD
3: TxD
4: DTR

5: Mass
7: RTS
8: CTS

9: +5V (Bluetooth)

Read commands "CVC 2000"

Command	Operation	Response	Description
IN_PV_1	current pressure	XXXX mbar/ Torr/hPa	unit according to preselections
IN_PV_2	current frequency	XX.X Hz	pump speed
IN_CFG	device set preselections	0XXXX 1XXXX 2XXXX 3XXXX X0XXX X1XXX XX0XX XX1XX XXX0X XXX1X XXXX0 XXXX1	VACUU•LAN continuous pumping vacuum control without automatic vacuum control with automatic no coolant valve coolant valve no venting valve venting valve no automatic switch off automatic switch off remote operation off remote operation on
IN_ERR	error code	1XXX X1XX XX1X XXX1	fault at pump electronics overpressure maloperation mode pressure transducer last command to interface incorrect
IN_STAT	status of process control	0XXX 1XXX X0XX X1XX XX00 XX01 XX02 XX03 XX10 XX11 XX20 XX21 XX22 XX23 XX30 XX31 XX32 XX33	coolant valve closed coolant valve open venting valve closed venting valve open VACUU•LAN: inactive VACUU•LAN: pumping down, current pressure > selected pressure VACUU•LAN: pumping down, time for automatic switching off is running VACUU•LAN: system is switched off continuous pumping: not active continuous pumping; active vacuum control: not active vacuum control: current pressure above set vacuum vacuum control: current pressure equals set vacuum (± 1 Torr/mbar) vacuum control: current pressure below set vacuum automatic: not active automatic: determining boiling point automatic: adjusting boiling point automatic: system is switched off

Write commands "CVC 2000"

Command	Operation	Parameter	Description
OUT_MODE	function	1 2 3 30 31 32	continuous pumping vacuum control without automatic vacuum control with automatic <i>optional: sensitivity: low</i> <i>optional: sensitivity: normal</i> <i>optional: sensitivity: high</i>
OUT_SP_1	set vacuum	XXXX	unit (mbar/Torr/hPa) according to pre-selection; see respective function for parameter range
OUT_SP_V	set vacuum with venting*	XXXX	unit (mbar/Torr/hPa) according to pre-selection; see respective function for parameter range
OUT_SP_2	set frequency	XX.X	motor speed in Hz (99.9 for "HI")
OUT_SP_3	vacuum for switch on (VACUU•LAN)	XXXX	unit (mbar/Torr/hPa) according to pre-selection; see respective function for parameter range
OUT_SP_4	delay	XX:XX	hh:mm (hours:minutes)
OUT_SP_5	vacuum for automatic switching off	XXXX	unit (mbar/Torr/hPa) according to pre-selection; see respective function for parameter range
OUT_SP_6	time for automatic switching off (VACUU•LAN)	XX:XX	hh:mm (hours:minutes)
START	starting process control		
STOP	stopping process control	1 2	termination of process control termination of process control and storage of the current pressure as new set point
REMOTE	remote operation**	0 1	set controller to local operation set controller to remote operation
OUT_VENT	driving venting valve	0 1	close venting valve (not automatically) open venting valve (process control stopped)

* Pressure setting with venting is only possible in "Vac control" function if a venting valve is connected and configured, and vacuum control is started. The venting valve opens automatically if the actual pressure is at least 7.5 Torr (10 mbar) below the preset pressure. Automatic venting becomes inactive if vacuum control is stopped (by pressing "START/STOP" or "VENT"), a pressure value is set using the command OUT_SP_1, or if the function is changed. Activate the command OUT_SP_V again if necessary.

- ** If remote operation is selected or deselected, the user has to ensure that no dangerous status of the system can occur due to the change of the mode of operation, and must take appropriate safety precautions, especially if selecting remote operation interferes with a locally operated active process.

Read commands "CVC 3000"

Command	Operation	Response	Description
IN_PV_1	current pressure	XXXX.X mbar/Torr/hPa	unit according to preselections
IN_PV_2	current speed	XXX%	1-100% or "HI"
IN_PV_3	time	XX:XX h:m	process runtime (hours:minutes)
IN_PV_X	pressure	XXXX.X XXXX.X ...	pressure of all connected sensors, unit (mbar/Torr/hPa) according to preselections
IN_PV_T	operation time of the controller	XXXXdXXh	operation time in days and hours
IN_CFG	device set preselections	0XXXXXXXXXXXXXXXXXX	VACUU•LAN
		1XXXXXXXXXXXXXXXXXX	Pump down
		2XXXXXXXXXXXXXXXXXX	Vac control
		3XXXXXXXXXXXXXXXXXX	Auto mode
		4XXXXXXXXXXXXXXXXXX	Program
		5XXXXXXXXXXXXXXXXXX	measuring device
		XyXXXXXXXXXXXXXXXX	y: 0.....D: language ⁺ (hexadecimal)
		XX0XXXXXXXXXXXXXXXX	pressure unit mbar
		XX1XXXXXXXXXXXXXXXX	pressure unit Torr
		XX2XXXXXXXXXXXXXXXX	pressure unit hPa
		XXX0XXXXXXXXXXXXXXXX	autostart off
		XXX1XXXXXXXXXXXXXXXX	autostart on
		XXXX0XXXXXXXXXXXXXXXX	acoustic signal off
		XXXX1XXXXXXXXXXXXXXXX	acoustic signal on
		XXXXX0XXXXXXXXXXXXXXXX	VARIO pump not connected
		XXXXX1XXXXXXXXXXXXXXXX	VARIO pump connected
		XXXXXX0XXXXXXXXXXXX	VMS not connected
		XXXXXX1XXXXXXXXXXXX	VMS connected
		XXXXXXX0XXXXXXXXXXX	in-line valve not connected
		XXXXXXX1XXXXXXXXXXX	in-line valve connected
		XXXXXXX0XXXXXXXXXXX	coolant valve not connected
		XXXXXXX1XXXXXXXXXXX	coolant valve connected
		XXXXXXX0XXXXXXXXXXX	venting valve not connected
		XXXXXXX1XXXXXXXXXXX	venting valve connected
		XXXXXXX0XXXXXXXXXXX	fault indicator not connected
		XXXXXXX1XXXXXXXXXXX	fault indicator connected
		XXXXXXX0XXXXXXXXXXX	level sensor not connected
XXXXXXX1XXXXXXXXXXX	level sensor connected		
XXXXXXX0XXXXXXXXXXX	remote module not connected		
XXXXXXX1XXXXXXXXXXX	remote module connected		
XXXXXXXXXXXXXXXXXyXX	y: 1.....9: sensor number		
XXXXXXXXXXXXXXXXXyX	y: 1.....9: sensor quantity		
XXXXXXXXXXXXXXXXXX0	remote operation off		
XXXXXXXXXXXXXXXXXX1	remote operation on		

Command	Operation	Response	Description
IN_STAT	status process control	0XXXXXX 1XXXXXX X0XXXXX X1XXXXX XX0XXX XX1XXX XXX0XX XXX1XX XXXX0X XXXX1X XXXX2X XXXX3X XXXX4X XXXX5X XXXXX0 XXXXX1 XXXXX2 XXXXX3	pump off pump on in-line valve closed in-line valve open coolant valve closed coolant valve open venting valve closed venting valve open VACUU•LAN Pump down Vac control Auto mode Program measuring device control off pump down - determining boiling point set vacuum reached - boiling pressure found current pressure below set vacuum - automatic switch-off
IN_ERR	fault status	0XXXXXXXXX 1XXXXXXXXX X0XXXXXXXXX X1XXXXXXXXX XX0XXXXXXXXX XX1XXXXXXXXX XXX0XXXXXXXXX XXX1XXXXXXXXX XXXX0XXXXX XXXX1XXXXX XXXXX0XXX XXXXX1XXX XXXXXX0XX XXXXXX1XX XXXXXXXX0X XXXXXXXX1X XXXXXXXXX0 XXXXXXXXX1	no fault at pump fault at pump no fault at in-line valve fault at in-line valve no fault at coolant valve fault at coolant valve no fault at venting valve fault at venting valve no overpressure overpressure no fault at pressure transducer fault at pressure transducer catchpot not full catchpot full no external fault external fault last interface command correct last interface command incorrect
IN_SP_1	set vacuum	XXXX mbar/Torr/hPa	unit according to preselections
IN_SP_2	maximum speed	XXX%	speed in % (1-100% or "HI")
IN_SP_3	switching pressure	XXXX mbar/Torr/hPa	switching pressure for VACUU•LAN or two point control; unit according to preselections

Command	Operation	Response	Description
IN_SP_4	delay	XX:XX h:m	hours:minutes (00:00 = Off)
IN_SP_5	switch off pressure	XXXX mbar/Torr/hPa	"Maximum" for "Vac control", "Minimum" for "Pump down") unit according to preselections
IN_SP_6	runtime	XX:XX h:m	process runtime (hours:minutes)
IN_SP_P1y	time	XX:XX:XX h:m:s	time in program step y (0.....9) (hours:minutes:seconds)
IN_SP_P2y	pressure	XXXX mbar/Torr/hPa	pressure in program step y (0.....9) unit according to preselections
IN_SP_P3y	venting valve	0 1	no venting valve in program step y (0.....9) venting valve in program step y (0.....9)
IN_SP_P4y	Step	0 1	no "Step" in program step y (0.....9) "Step" in program step y (0.....9)
IN_SP_P5y	Auto	0 1	no "Auto" in program step y (0.....9) "Auto" in program step y (0.....9)
IN_PV_Sx	current pressure of pressure transducer x	XXXX mbar/hPa/Torr	pressure of pressure transducer x (order of numbering according to display in "Sensors" menu)
IN_VER	version	CVC 3000 VX.XX	software version

Write commands "CVC 3000"

Command	Operation	Parameter	Description
OUT_MODE	function	0 1 2 3 30 31 32 4	VACUU•LAN Pump down Vac control Auto mode <i>optional: sensitivity: low</i> <i>optional: sensitivity: normal</i> <i>optional: sensitivity: high</i> Program
OUT_CFG	configuration (bus monitoring)	yXXX X0XX X1XX X2XX XX0X XX1X XXX0 XXX1	y: 0.....D: language+ (hexadecimal), see "Read commands CVC 3000" pressure unit mbar pressure unit Torr pressure unit hPa Autostart off Autostart on acoustic signal off acoustic signal on

Attention (OUT_MODE): If control is running, it is only possible to switch either from 1 to 2, or from 2 to 3, or from 3 to 2. The set vacuum is adopted in each case.

Command	Operation	Parameter	Description
OUT-SP_1	set vacuum	XXXX	unit according to preselection; see respective function for parameter range
OUT_SP_V	set vacuum with venting	XXXX	unit according to preselection; see respective function for parameter range
OUT_SP_2	speed	XXX	speed in % or "HI"
OUT_SP_3	start-up pressure	XXXX	unit according to preselection; see respective function for parameter range
OUT_SP_4	delay	XX:XX	hh:mm (hours:minutes)
OUT_SP_5	switch-off pressure	XXXX	unit according to preselection; see respective function for parameter range
OUT_SP_6	switch-off time	XX:XX	hh:mm (hours:minutes)
OUT_SP_PL	open program	X	program 0.....9
OUT_SP_PS	store program	X	program 0.....9
OUT_SP_P1y	time	XX:XX:XX +XX:XX:XX	total runtime until program step y (0.....9) or time for program step y (0.....9) (additive)
OUT_SP_P2y	pressure	XXXX	pressure at program step y (0.....9) unit according to preselection
OUT_SP_P3y	venting valve	0 1	no venting valve in program step y (0...9) venting valve in program step y (0.....9)
OUT_SP_P4y	Step	0 1	no "Step" in program step y (0.....9) "Step" in program step y (0.....9)
OUT_SP_P5y	Auto	0 1 2	no "Auto" in program step y (0.....9) "Auto↓" in program step y (0.....9) "Auto←" in program step y (0.....9)
START			started
STOP		0 1 2	Stop and delete fault Stop Stop and adopt the set vacuum
REMOTE*		0 1	Remote off Remote on
ECHO**		0 1	Echo off Echo on, write command with return value
CVC		2 3	CVC 2000 commands CVC 3000 commands***
OUT_VENT		0 1 2	venting valve closed venting valve open venting until atmospheric pressure (788 Torr (1050 mbar) at maximum)
STORE			store settings permanently, if "ECHO = 1" after realization

Command	Operation	Parameter	Description
OUT_SENSOR		1 2...9	internal sensor external sensors (if connected)

- * If remote operation is selected or deselected, the user has to ensure that no dangerous status of the system can occur due to the change of the mode of operation, and must also take appropriate safety precautions, especially if selecting remote operation interferes with a locally operated active process.
- ** With command "ECHO 1" a return value can be activated at write commands. A return value is only given if the command is performed correctly.
- *** After being switched on, the controller is in "CVC 2" mode by default. Send "CVC 3" and "STORE" to permanently set the controller RS 232C commands to the extended set "CVC 3000".

Accessories

External pressure transducer VSK 3000, capacitive, ceramic diaphragm sensor 1080-0.1 mbar	20636657
Coolant valve VKW-B, VACUU•BUS	20674220
Venting valve VBM-B / KF 16, VACUU•BUS	20674217
VACUU•BUS Y-type adapter	20636656
VACUU•BUS extension cable, 6.6ft (2m)	20612552
VACUU•BUS wall jack.....	20636153
Serial cable RS 232C, 9-pin, Sub-D	20637837
Installation set CVC 3000 (clips and screws)	20636593
Level sensor	20699908
(control of liquid level in catchpots, only for PC 3002/3003/3004 VARIO)	
Peltronic exhaust waste vapor condenser.....	20699905
VACUU•BUS Digital-I/O-Module.....	20636228
(e.g., fault indicator / remote module)	
VACUU•BUS Analog-I/O-Module.....	20636229
(for analog input and output of vacuum and motor speed)	
Silencer (with connection hose).....	20636588

Attention: Dust-laden gases, deposits and condensed solvent vapor can restrict air flow out the silencer. The resultant back pressure can lead to damage of pump bearings, diaphragms, and valves. Under those conditions, a silencer must not be used.

Ways to connect NT VARIO chemistry diaphragm pumps:

Small flange KF DN 16, with hose - for installation at hose nozzle	20677058
Adapter hose nozzle DN 10 to hose nozzle 1/2"	20636002
Small flange KF DN 16, for assembly directly at the valve head.....	20699918
(at inlet of ME 4C NT VARIO / MD 4C NT VARIO; at outlet of ME 4C NT VARIO / MZ 2C NT VARIO)	
Small flange KF DN 16, for assembly directly at the valve head.....	20699919
(at outlet of MD 4C NT VARIO)	
Adapter to PTFE tubing*, for assembly directly at the valve head	20636274
(at inlet of ME 4C NT VARIO / MD 4C NT; at outlet of ME 4C NT VARIO / MZ 2C NT VARIO)	
Adapter to PTFE tubing*, for assembly directly at the valve head	20636275
(at inlet of MZ 2C NT VARIO; at outlet of MD 4C NT VARIO)	
Elbow connecting piece (90°) for PTFE tubing*	20638434
T-piece for PTFE tubing*	20638435
Adapter for gas ballast connection via small flange KF DN 16	20636193
PTFE tubing* (sold by meter)	20638644

Ways to connect pumping units PC 300x VARIO:

Modification kit for small flange KF DN 16 at inlet.....	20699939
Hose nozzle for tubing I.D. 1/4" / 3/8" (6/10 mm), for inlet.....	20636635
Elbow piece (90°) for PTFE tubing* for assembly at inlet.....	20637873
PTFE tubing* (sold by meter)	20638644

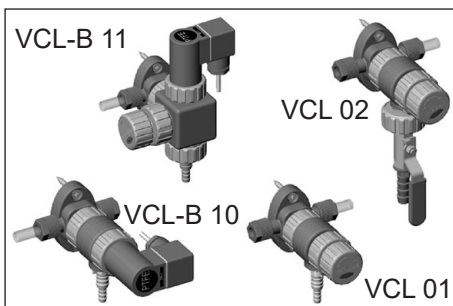
* PTFE tubing DN 10/8 mm

VACUU•LAN® networks are engineered to perform to specification when installed with PTFE tubing, DN 10/8 mm. All VACUU•LAN® modules, pumps and connectors are designed for compatibility with this tubing.

Conversion of VACUUBRAND valves with DIN plug to VACUUBRAND valves with VACUU•BUS plug:

VACUUBRAND-valve with DIN plug	Conversion kit valve cable with VACUU•BUS plug
Coolant valve VKW, 24 V= (20676013)	20612567
Venting valve VBM, 24 V= (20666817)	20612554

Vacuum distribution:



The VACUU•LAN® modules allow process-oriented, flexible and cost effective connections according to your requirements. One vacuum pump can support several workstations. Contact VACUUBRAND for details.

VACUU•LAN® manual flow control module VCL 01.....	20677106
VACUU•LAN® shut off / manual flow control module VCL 02.....	20677107
VACUU•LAN® automatic control module VCL-B 10.....	20677208
VACUU•LAN® manual flow control/ automatic control module VCL-B 11	20677209

On this page we offer only a small selection of VACUU•LAN® options. Please contact VACUUBRAND for further information. Listed modules are designed for surface-mounted installation. Different catalog numbers are used for modules designed for flush-mounting with concealed tubing.


For additional accessories such as vacuum valves, small-flange components, vacuum gauges or vacuum controllers refer to www.vacuubrand.com.

Spare parts:

Catchpot 0.52 qt (500 ml), coated (PC 300x VARIO)	20638497
O-ring 28 x 2.5.....	20635628
at the spherical ground joint of the catchpot at the inlet (PC 300x VARIO)	
Exhaust waste vapor condenser (PC 301x VARIO)	20699975
Collecting bottle 1.06 qt (1000ml) (PC 301x VARIO).....	20638877
Catchpot (at inlet) (PC 301x VARIO).....	20699980

Troubleshooting

Fault	Possible cause	Remedy
<input type="checkbox"/> No display.	<ul style="list-style-type: none"> ➔ Electrical power cord not plugged in, electrical supply failure? ➔ Device fuse blown? ➔ Controller CVC 3000 or pump NT VARIO / VARIO-B switched off? ➔ VACUU•BUS cable between pump and controller not plugged in at controller? ➔ Other than above mentioned causes? 	<ul style="list-style-type: none"> ✓ Plug in power cord. Check fuse. ✓ Identify cause of failure. Replace device fuse. ✓ Switch on controller and/or pump. ✓ Plug in VACUU•BUS cable at CVC 3000 controller. ✓ Contact local distributor.
<input type="checkbox"/> Display disappears.	<ul style="list-style-type: none"> ➔ Too much load (e.g., valves) connected? ➔ Short circuit at connected valves? ➔ Short circuit at the RS 232 plug? ➔ Other than above mentioned causes? 	<ul style="list-style-type: none"> ✓ Check current draw of the connected devices. ✓ Replace valves. ✓ Check plug and cable. ✓ Contact local distributor.
<input type="checkbox"/> Pressure reading incorrect.	<ul style="list-style-type: none"> ➔ Pressure transducer decalibrated? ➔ Humidity in the measurement chamber? ➔ Pressure transducer contaminated? ➔ Other than above mentioned causes? 	<ul style="list-style-type: none"> ✓ Readjust CVC 3000. ✓ Let the pressure transducer dry, e.g., by pumping. Readjust if necessary. Determine and eliminate the cause for humidity. ✓ See "Cleaning the pressure transducer". ✓ Contact local distributor.
<input type="checkbox"/> Digital pressure reading is flashing, display shows "0.0".	<ul style="list-style-type: none"> ➔ Pressure transducer not correctly adjusted under vacuum? 	<ul style="list-style-type: none"> ✓ Adjust CVC 3000 correctly.

Fault	Possible cause	Remedy
❑ No digital pressure reading.	➔ Pressure transducer defective?	✓ Contact local distributor.
❑ Digital pressure reading is flashing, one blip*.	➔ Overpressure at the pressure transducer, pressure > 795 Torr (1060 mbar)?	✓ Release pressure immediately (risk of bursting). 
❑ Warning triangle and black valve symbol are flashing, two blips*.	➔ External venting valve removed or defective?	✓ Connect valve or replace with a new one or reconfigure without valve.
❑ Warning triangle and valve symbol are flashing, three blips*.	➔ NT VARIO / VARIO-B pump and in-line valve connected?	✓ Disconnect in-line valve; switch controller off/on to reconfigure.
❑ Warning triangle and coolant valve symbol are flashing, four blips*.	➔ Coolant valve removed or defective?	✓ Check connection cable of the valve; or use new valve or reconfigure without valve.
❑ Warning triangle and pump symbol are flashing, six blips*.	➔ NT VARIO / VARIO-B pump and VMS** (Vacuum Management System) connected? ➔ Fault at the NT VARIO / VARIO-B pump?	✓ Remove VMS. Restart controller. ✓ Check pump, restart controller.
❑ Clock symbol is flashing.	➔ Preselected process time is over?	✓ Confirm by pressing START/STOP key.
❑ Venting valve does not respond, valve symbol is displayed.	➔ Venting valve contaminated?	✓ Clean valve.
❑ "Vac control" function: Control stops, "arrow up" is flashing.	➔ Preset maximum pressure exceeded?	✓ Confirm by pressing START/STOP key. Change maximum pressure value if necessary.
❑ "Pump down" function: Control stops, "arrow down" is flashing.	➔ Pressure below preset minimum pressure?	✓ Confirm by pressing START/STOP key. Change minimum pressure value if necessary.
❑ Controller does not respond when pressing keys (except ON/OFF). PC symbol is displayed.	➔ Controller in remote mode?	✓ Control CVC 3000 via interface or switch off remote mode.

Fault	Possible cause	Remedy
<input type="checkbox"/> Controller does not respond when operating any keys. No change after switching off/on.		<input checked="" type="checkbox"/> Contact local distributor.
<input type="checkbox"/> Pump does not start or stops immediately. Warning triangle and pump symbol are flashing.	<ul style="list-style-type: none"> ➔ Pump has been exposed to condensate? ➔ Overpressure in outlet line? ➔ Motor overloaded? 	<ul style="list-style-type: none"> ✓ Allow pump to run for some minutes at maximum speed with atmospheric pressure at the inlet. ✓ Remove blockage in line, open valve. ✓ Allow motor to cool down, identify and eliminate cause of failure. Manual reset is necessary. Switch off pump or unplug.
<input type="checkbox"/> Pump does not achieve its ultimate vacuum or usual pumping speed.	<ul style="list-style-type: none"> ➔ Centring ring at small flange connection not correctly positioned, or leak in the pipeline or vacuum system? ➔ Wrong setting at controller? ➔ Long, narrow vacuum line? ➔ Pump has been exposed to condensate? ➔ Deposits have been formed inside the pump? ➔ Diaphragms or valves damaged? ➔ Outgassing substances or vapor generated in the process? 	<ul style="list-style-type: none"> ✓ Check pump directly - connect CVC 3000 directly at pump inlet - then check connection, pipeline and vacuum system if necessary. ✓ Select function "Pump down" with speed set to "HI" and check again. ✓ Use lines with larger diameter, length as short as possible. ✓ Allow pump to run for some minutes with atmospheric pressure at the inlet to purge. ✓ Clean and inspect the pump heads. ✓ Replace diaphragms and/or valves. ✓ Check process parameters.

Fault	Possible cause	Remedy
<input type="checkbox"/> Pump does not achieve its ultimate vacuum or usual pumping speed.	<ul style="list-style-type: none"> ➔ Pressure below "Minimum" in Auto mode? ➔ Pump too hot? 	<ul style="list-style-type: none"> ✓ Change switch off pressure ("Minimum") if necessary. ✓ Allow pump to cool down. Determine and eliminate the cause of overheating.
<input type="checkbox"/> Pump too noisy.	<ul style="list-style-type: none"> ➔ Atmospheric or high pressure at the pump inlet? ➔ Diaphragm crack or diaphragm clamping disc loose? ➔ Other than above mentioned causes? 	<ul style="list-style-type: none"> ✓ Connect hose or silencer to pump outlet. Be careful not to cause outlet overpressure, especially with condensable vapors. ✓ Perform maintenance. ✓ Contact local distributor.
<input type="checkbox"/> Pump seized.		<ul style="list-style-type: none"> ✓ Contact local distributor.
<input type="checkbox"/> Pump stops and does not start again.	<ul style="list-style-type: none"> ➔ The preset motor speed is too low for the motor type and the application configuration? ➔ The setting of the motor speed at the controller is too low, e. g., "Pump Down" with a motor speed of 5 %? ➔ The control operates the motor with a too low speed? 	<ul style="list-style-type: none"> ✓ Set a motor speed > 15 % at the controller.

* only if "Sound" "On" is selected

** VMS: Vacuum management system to switch non-VARIO pumps

➔ A service manual with exploded view drawings, spare parts list and directions for repair is available on request.

☞ The service manual is intended for trained service people only.

Replacing diaphragms and valves

☞ Please read section "Replacing diaphragms and valves" completely before starting maintenance.

The pictures may show other versions of pumps. This does not change the method of replacing diaphragms and valves.



☞ **Never operate the pump if covers or other parts of the pump are disassembled.**



☞ Before starting maintenance, **disconnect the electrical power cord. Wait two minutes** after isolating the equipment from AC power to allow the capacitors to discharge.

☞ Ensure that the pump cannot be operated accidentally.

☞ **Note:** The pump might be contaminated with the process chemicals that have been pumped during operation. Ensure that the pump is decontaminated before maintenance.

☞ Avoid the release of pollutants.



☞ **Never operate a defective or damaged pump.**

☞ Take adequate precautions to protect people from the effects of dangerous substances that may have contaminated the pump and may be released upon disassembly. Ensure that the maintenance technician is familiar with the safety procedures which relate to the products processed by the pumping system.

Use appropriate protective clothing, safety goggles and protective gloves.

☞ Allow sufficient cooling of the pump before starting maintenance.

☞ **Vent the pump and isolate it from the vacuum system before you start maintenance.**

NOTICE

Ensure that maintenance is done only by suitably trained and supervised technicians.

The valves and diaphragms are wear parts. If the rated ultimate vacuum is no longer achieved or in case of increased noise level, the pump interior, the diaphragms and the valves must be cleaned and the diaphragms and valves must be checked for cracks or other damage.

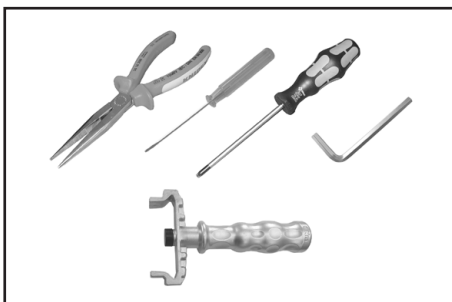
All bearings are encapsulated and are filled with long-life lubricant. Under normal operating conditions, the drive system is maintenance free.

In demanding circumstances, it may be efficient to check and clean the pump heads on a regular basis. In normal use, the lifetime of the diaphragms and valves is typically 15,000 operating hours.

- Prevent internal condensation, transfer of liquids or dust. The diaphragms and valves will be damaged if liquid is pumped in significant amount.
- Carry out maintenance frequently if the pump is exposed to corrosive media or in case of deposits.
- Regular maintenance will improve the lifetime of the pump and also protect both users and the environment.

Service kit for ME 4C NT VARIO	20696864
Service kit for MZ 2C NT VARIO / PC 3002 VARIO	20696869
Service kit for MD 4C NT VARIO / PC 3003/3004 VARIO	20696870
Service kit for MV 10C VARIO-B / MD 12C VARIO-B / PC 301x VARIO	20696821
Diaphragm key (width 66 mm)	20636554

Cleaning and inspecting the pump heads (pumps NT VARIO / PC 300x VARIO)



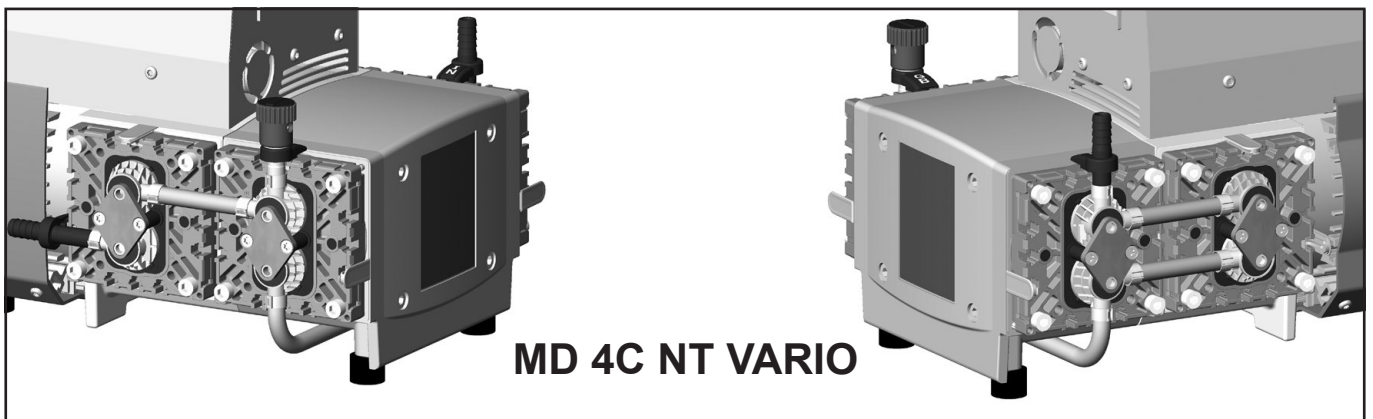
Tools required (metric):

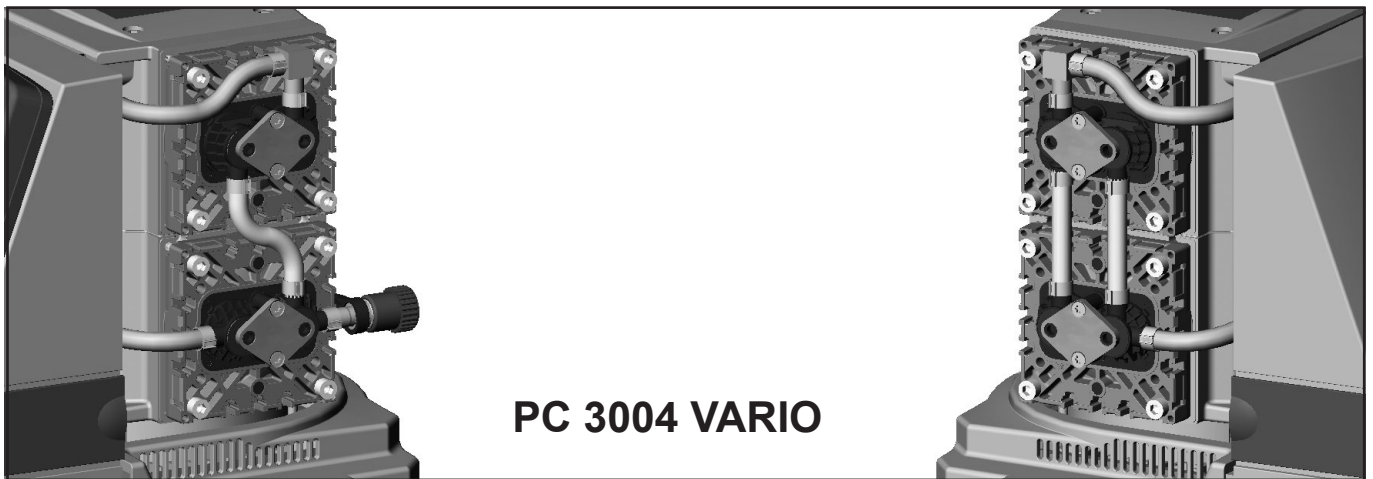
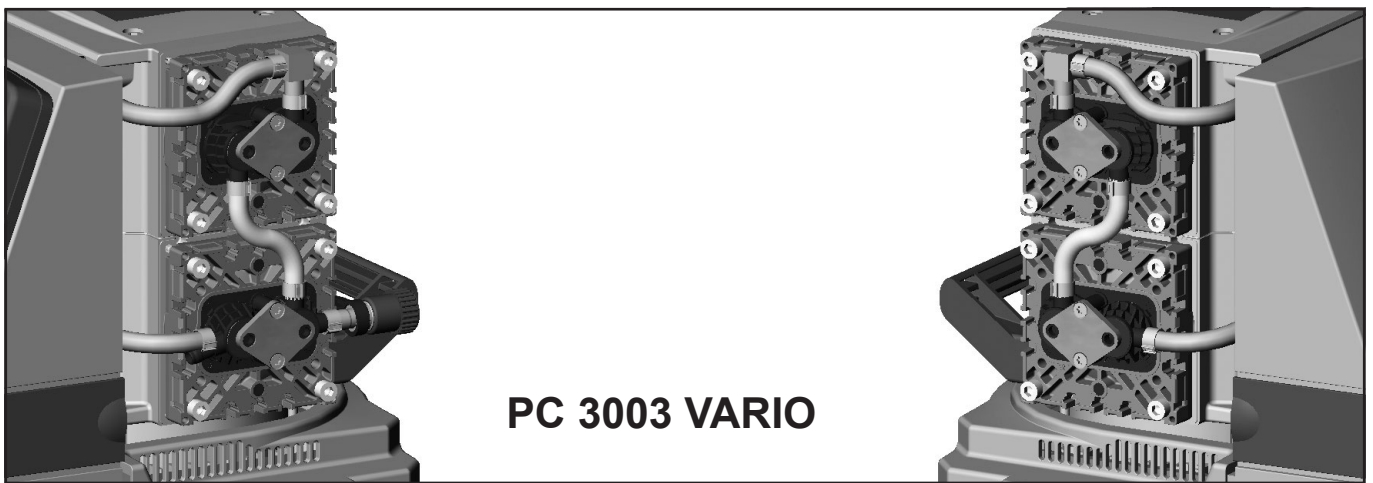
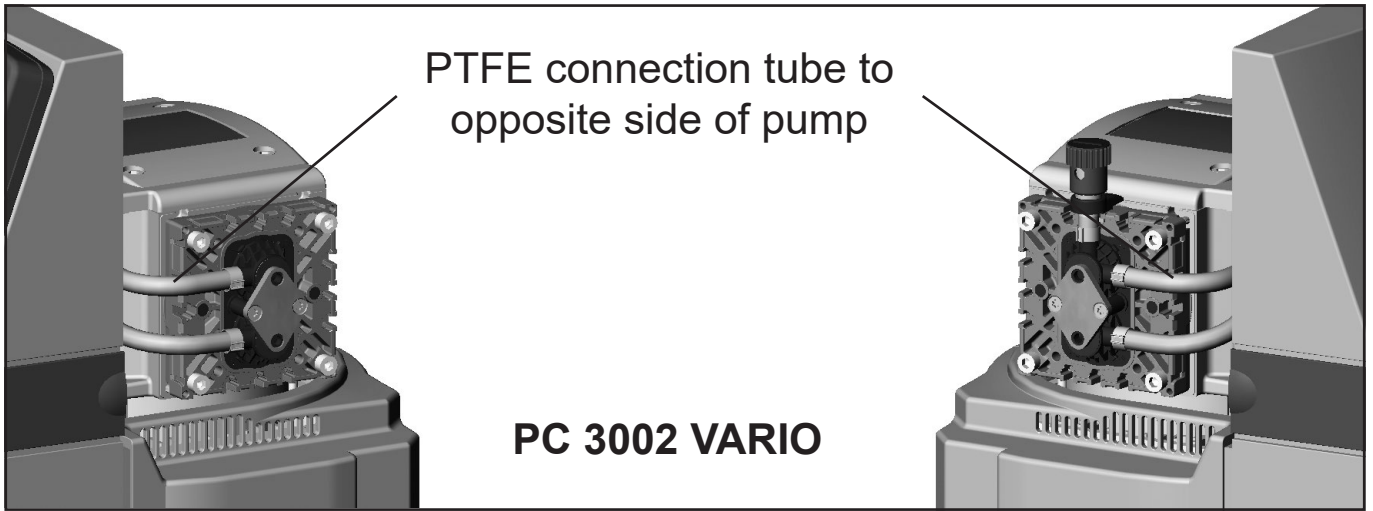
- Torx driver T20
- Torx driver T10 (PC 300x VARIO)
- 5 mm wide Allen key
- 2.5 mm wide slotted screwdriver
- Flat pliers
- Diaphragm key width 66 mm

The replacement of the diaphragm and the replacement of the valves can be carried out separately.

- ☞ To replace the valves, remove the head covers of one side of the pump along with the assembled valve heads and fittings.
- ☞ To maintain the diaphragms, the valve heads and the fittings need not be disassembled. The head covers can be removed along with the assembled valve heads and fittings.
- ☞ Service only one side of the pump at a time to avoid the mixing of parts.

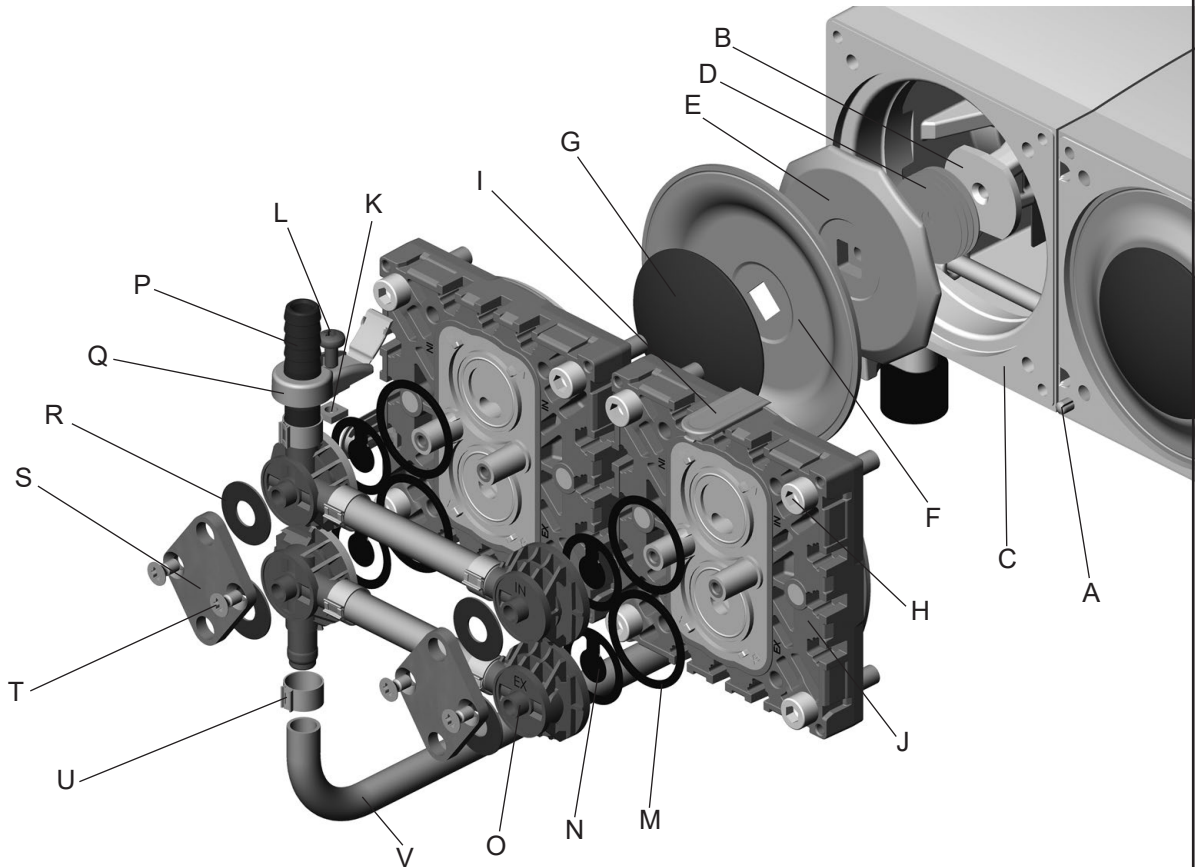
Fittings and tubing of the different pump models:





View of the disassembled pump head parts

(fig.: MD 4C NT VARIO)



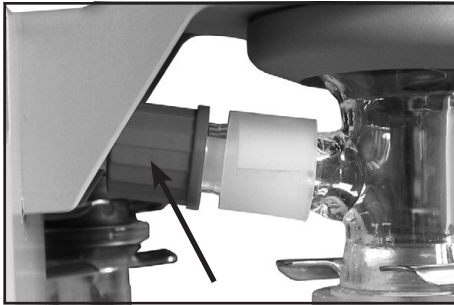
- | | |
|---|--|
| A: Head alignment pin / mark | L: Fillister head screw |
| B: Connecting rod | M: O-ring |
| C: Housing | N: Valve |
| D: Washer | O: Valve head |
| E: Diaphragm support disc | P: Hose nozzle |
| F: Diaphragm | Q: Connection fastener with hinged cover |
| G: Diaphragm clamping disc with square head screw | R: Disc spring |
| H: Allen screw | S: Clamping bracket |
| I: Cap | T: Countersunk screw |
| J: Head cover | U: Hose clip |
| K: Square nut | V: Connection tube |

This labeling is used throughout the following pages.



PC 3002/3003/3004 VARIO

- ➔ Remove catchpots (14) at inlet and outlet (see "Use and operation", pg. 40).



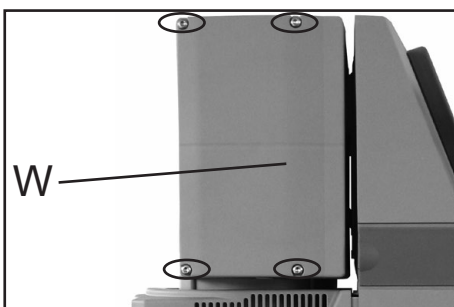
Disassemble the exhaust vapor condenser EK:

- ➔ Loosen the union nut at the inlet of the exhaust vapor condenser.



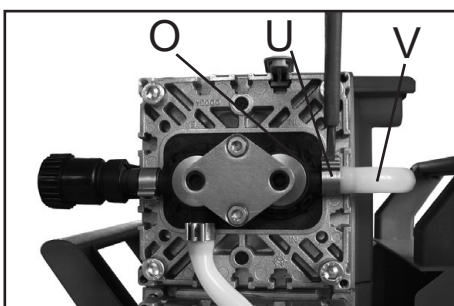
- ➔ Remove the 4 screws affixing the counter holder of the exhaust vapor condenser with a Torx driver T10. Remove the exhaust vapor condenser. In doing so pull the PTFE hose out of the inlet of the exhaust vapor condenser.

- ➔ For maintenance, lay the pump / pumping unit on its side with the pump heads to be maintained at the top. Support the pump / pumping unit appropriately.



- ➔ Remove the 4 screws affixing the head cover cowling (W) with a Torx driver T20. Pay attention to the washers under the screws and remove.

- ➔ Pull off head cover cowling (W) carefully. Do not tilt.

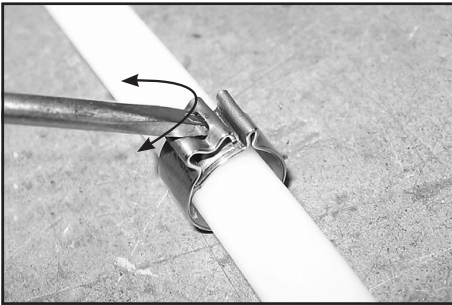


Detach the coupling of the connection tube (V) to the other side of the pump at the valve head (O).

PC 3002/3003/3004:

Detach the coupling of the connection tube (V) to the other side of the pump as well as the hose connection to the inlet/outlet of the vacuum system at the valve head (O).

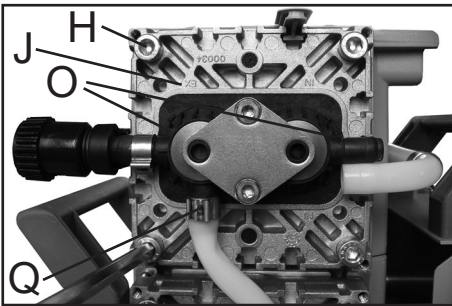
- ➔ Open the hose clip (U) with a slotted screwdriver.
- ➔ Pull the tubing off the hose connector.



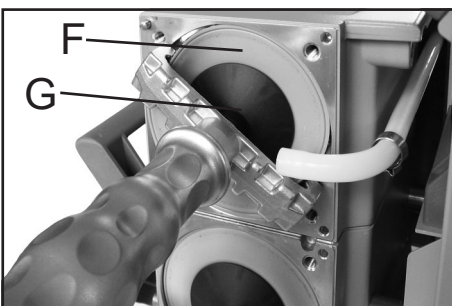
Opening the hose clip:

- ➔ Apply slotted screwdriver as shown and turn.

Replacing the diaphragm

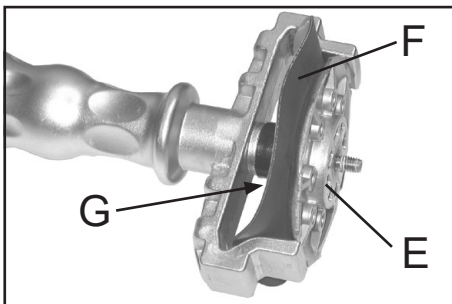


- ➔ Disassemble head covers (J) to check the diaphragm (F).
- ➔ Unscrew four (pump with two heads) or eight (pump with four heads) Allen screws (H) with a 5mm wide Allen key. Remove both head covers (J) (pumps with two heads: only one head cover) together with valve heads (O) and connections.
- ☞ It is not necessary to disassemble the valve heads (O), the connection fasteners (Q), or the hose connection between the adjacent head covers (pumps with four heads).



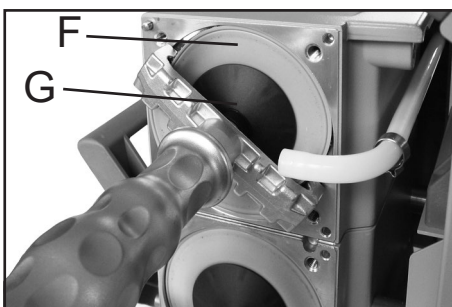
- ☞ Check diaphragm (F) for damage and replace if necessary.
- ➔ Lift diaphragm carefully sidewise.
- ☞ Never use a pointed or sharp-edged tool to lift the diaphragm.
- ➔ Use the diaphragm key to grip the diaphragm support disc (E) below the diaphragm.
- ➔ Unscrew diaphragm support disc (E) with diaphragm (F) and diaphragm clamping disc (G).

- ➔ Check for washers (D) between the diaphragm support disc (E) and the connecting rod (B). Do not mix the washers from the different pump heads, since these are set at the factory to ensure proper pump performance. Make sure that the original number is reassembled at the individual pump head.
- ☞ Too few washers: The pump will not attain vacuum specification. Too many washers: Diaphragm clamping disc will hit head cover, causing noisy operation and possibly causing the pump to seize up.
- ☞ If the old diaphragm is difficult to separate from the diaphragm support disc, immerse assembly in naphtha or petroleum ether. Do not inhale vapors!



- ➔ Position new diaphragm (F) between diaphragm clamping disc with square head screw (G) and diaphragm support disc (E).
- ☞ Note: Position diaphragm with pale side towards diaphragm clamping disc (facing pump chamber).

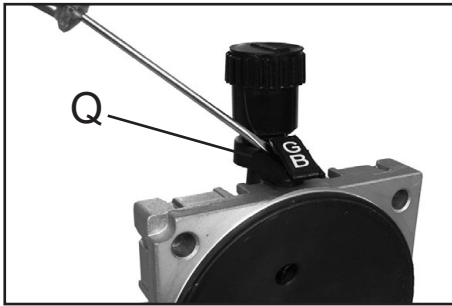
- ☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.
- ➔ Lift the diaphragm at the side. Place the diaphragm carefully together with diaphragm clamping disc and diaphragm support disc in the diaphragm key.
- ☞ Avoid damage of the diaphragm: Do not excessively bend or crease the diaphragm.



- ☞ Assemble the original number of washers (D) between diaphragm support disc (E) and connecting rod (B).
- ➔ Screw diaphragm clamping disc (G), diaphragm (F), diaphragm support disc (E), and washers (D) to connecting rod (B).

- ➔ Optimum torque for the diaphragm support disc: 4.4 ft·lb_f (6 Nm), it is recommended to use a torque wrench. Attach torque wrench to diaphragm key (hexagonal bolt 6 mm wide).
Note: Never use the diaphragm key with any additional tools like tongs or Allen keys without appropriate torque limitation.

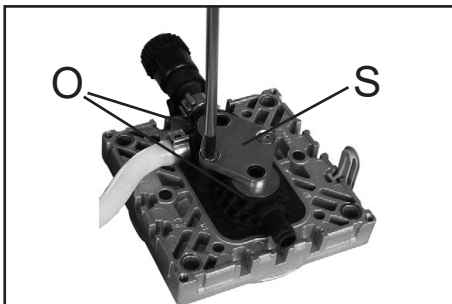
Replacing the valves



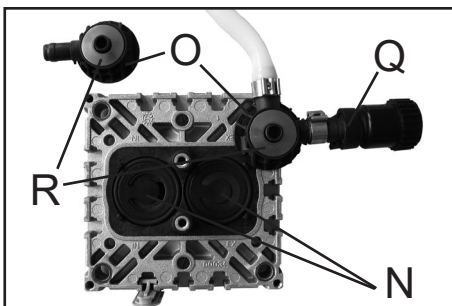
- ➔ Open the hinged cover of the connection fastener (Q) with a slotted screwdriver.



- Loosen connection fastener slightly.
- ➔ Turn the fillister head screw (L) with a Torx driver T20 at most one turn.
- ☞ Do not detach the fillister head screw from the square nut (K).

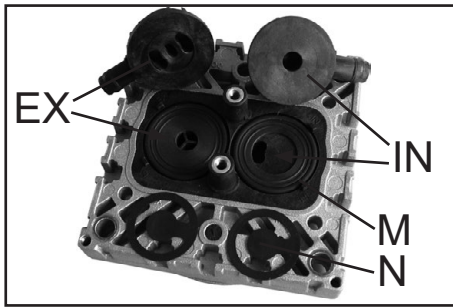


- Loosen the clamping brackets (S) on the valve heads (O).
- ➔ Unscrew at each clamping bracket the two countersunk screws with a Torx driver T20. Remove the clamping brackets.



- ➔ Remove valve heads (O) along with the disc springs (R), connection tube if applicable, hose nozzles (P) and connection fasteners (Q) or move the valve heads carefully aside. Note position and orientation of the valve heads.
- ☞ Note position and alignment of valves (N).

- ➔ Check valves (N) and O-rings (M) for damage and soiling.
- ➔ Replace valves or O-rings if necessary.
- ➔ Use petroleum ether or other industrial solvent to remove deposits. Do not inhale vapors.



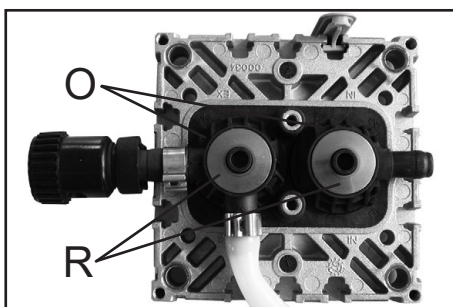
➔ Insert O-rings (M) and valves (N). See figure for the correct position of the valves:

☞ Inlet side (IN):

Marked "IN" next to the valve seat. The valve tongue points at the kidney-shaped orifice in the valve seat.

☞ Outlet side (EX):

Marked with "EX" next to the valve seat. The valve is oriented the same direction as the valve at the inlet side.



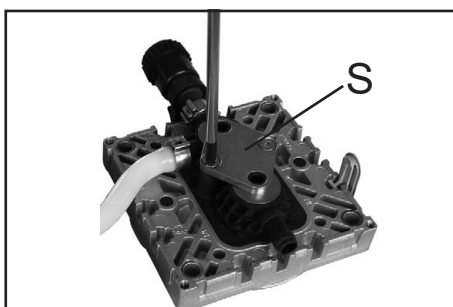
➔ Position valve heads (O), with hose nozzle (P), if applicable, connection tube or connection fastener (Q), and disc springs (R) on the valve seats. Position disc springs with large opening downwards. Pay attention to the correct orientation of the valve heads.

☞ Center the valve head with respect to the valve seat. The valve head must lie flat on the valve seat.

Valve head with gas ballast or hose nozzle connection:

➔ Insert square nut (K) in the groove of the head cover (J) or position square nut in the groove and then screw on connection fastener.

☞ Loosely fasten fillister head screw (L).



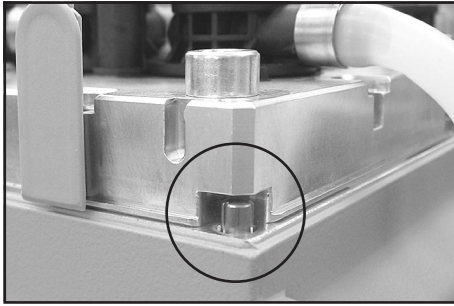
➔ Position clamping bracket (S) with countersunk bores facing upwards.

➔ Align the countersunk bores with the threaded pegs.

➔ Loosely fasten the countersunk screws and correct the alignment of the valve heads if necessary.

➔ Tighten countersunk screws with Torx screwdriver T20.

☞ Torque: 2.2 ft·lb_f (3 Nm).

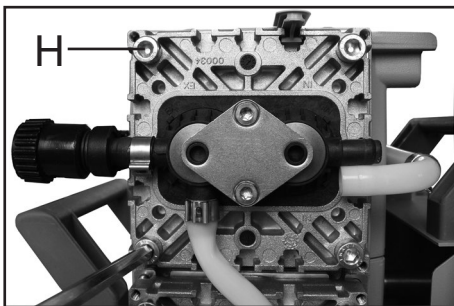


- ➔ Bring the diaphragms (F) into a position, in which they are in contact with the housing (C) and centered with respect to the bore.
- ➔ Put on head cover (J) with valve heads (O) and connections attached.

☞ Pay attention to the correct orientation of the head covers:

Housing with head alignment pin: The head alignment pin (A) at the pump housing (C) has to fit into the recess at the head cover (J).

Housing with mark (A): Align the recess at the head cover with the mark at the pump housing.



- ➔ Loosely screw in the Allen head screws (H) at the head covers diagonally at first slightly with a 5 mm wide Allen key, then tighten.
- ☞ Recommended torque: 8.9 ft·lb_f (12 Nm).

- ➔ Slide the caps (I) into the head cover.

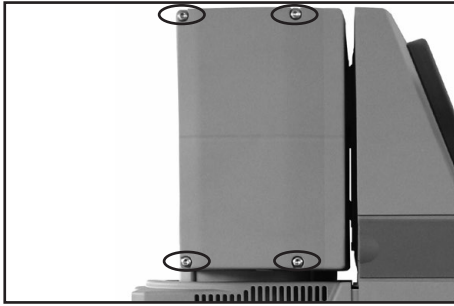


Affix the connection tube (V) to the other side of the pump at the valve head (O).

PC 3002/3003/3004:

Affix the connection tube (V) to the other side of the pump, as well as the hose connection to the inlet or outlet of the vacuum system at the valve head (O).

- ➔ Slip connecting tube (V) onto hose connection of valve head.
- ➔ Slide on the tube and the hose clip (U) until touching the nose at the valve head.
- ➔ Close hose clip (U) with flat pliers.

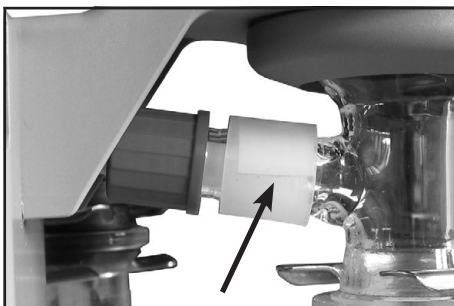


- ➔ Put head cover cowling on.
- ➔ Slide the head cover cowling in the grooves of the caps (I) and under the connection fasteners (Q).
- ➔ Install the washers. Use a Torx driver T20 to attach the 4 screws holding the head cover cowling.



- ➔ Tighten the fillister head screws (L) of the connection fasteners (Q) with a Torx driver T20.
- ➔ Close the hinged covers.

Replace diaphragms and valves of the opposite side of the pump in the same way.



PC 3002/3003/3004 VARIO:

- ➔ Check the overpressure safety relief device at the exhaust waste vapor condenser.
- ➔ If necessary, pull off the old pressure relief valve and install the new one. Check for correct position of the PTFE-foil under the pressure relief valve.



- ➔ Feed the PTFE hose into the inlet of the exhaust vapor condenser. Mount the condenser with the counter holder (Torx screws T10) to the pump. Fasten union nut.



➔ Assemble catchpots (14) with joint clips.

Checking the ultimate vacuum

➔ After any intervention at the equipment (e.g., repair / maintenance) the ultimate vacuum of the pump has to be checked. Only if the pump achieves its specified ultimate vacuum, the pump's leak rate is low enough to ensure that no explosive atmospheres will occur in the interior of the equipment.

After any intervention at the vacuum sensor the leak rate of the equipment has to be checked.

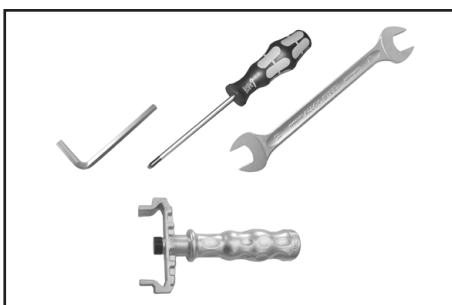
If the pump does not achieve the ultimate vacuum:

- Whenever the diaphragms and valves have been replaced, a break-in period of several hours is required before the pump achieves its ultimate vacuum.
- In case of an unusual noise, switch off pump immediately and check clamping disc positions.

If the specified ultimate vacuum is not achieved, and if this does not change after the break-in period:

Check hose connectors at pump heads for leaks. If necessary recheck valve seats and pump chambers.

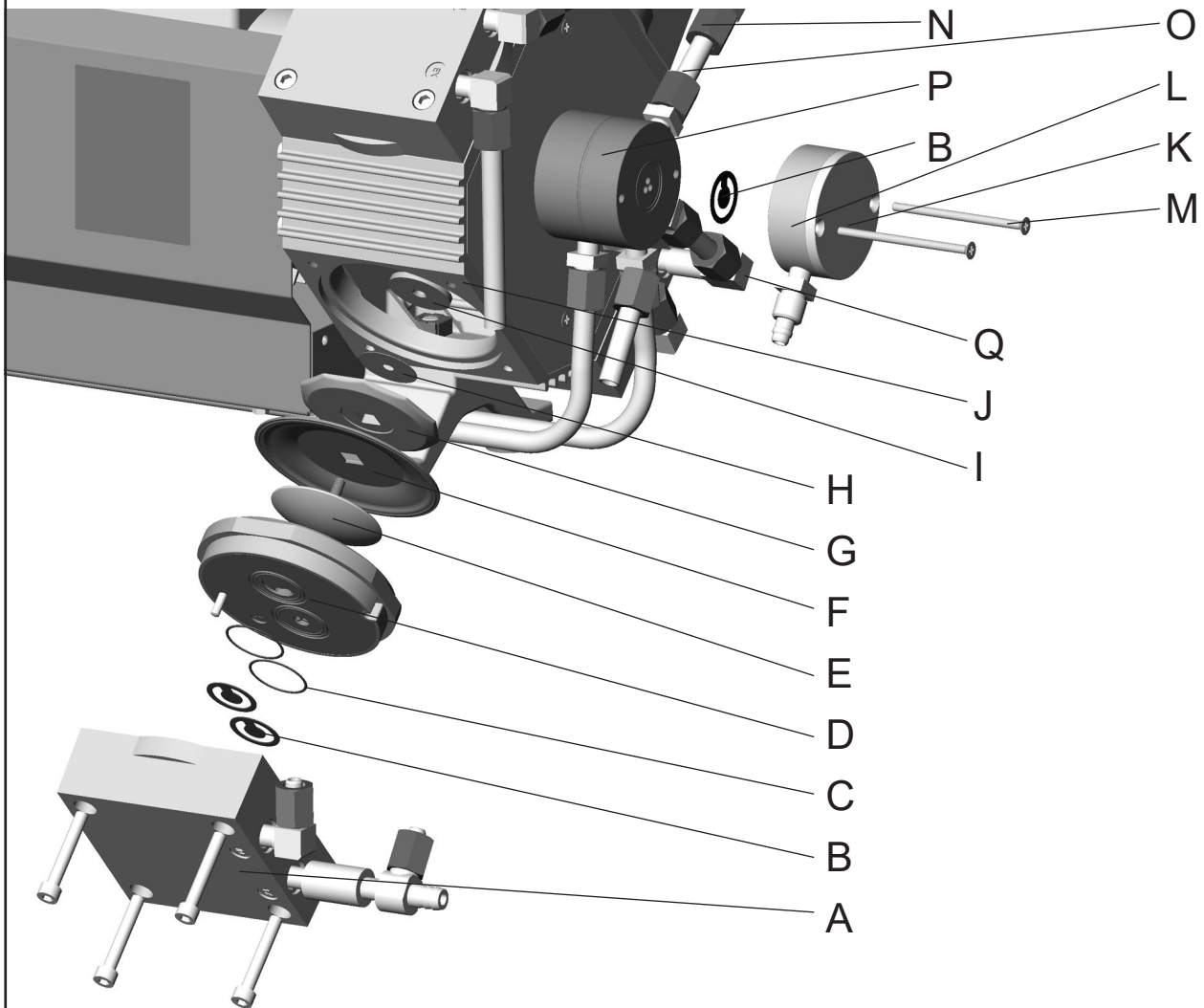
Cleaning and inspecting the pump heads (pumps VARIO-B / PC 301x VARIO)



Tools required (metric):

- Phillips screw driver size 2
- Open-ended wrench w/f 10/14/16/17
- 5 mm wide Allen key
- Diaphragm key width 66 mm

View of the disassembled pump head parts



Pump head parts:

A: Housing cover with housing cover insert

B: Valves

C: O-rings

D: Head cover

E: Diaphragm clamping disc with square head screw

F: Diaphragm

G: Diaphragm support disc

H: Washer

I: Connecting rod

J: Housing

K: Cover plate

L: Manifold cover (only at outlet)

M: Countersunk screw

N: Union nut

O: Connecting hose

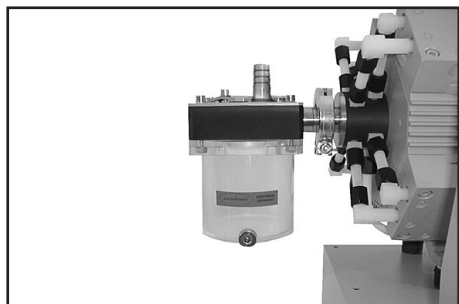
P: Distributor

Q: Fitting

This labeling is used throughout the following pages.

Disassembling the pump from the pumping unit (PC 3010/3012 VARIO)

- ➔ Disconnect controller from pump (VACUU•BUS cable).



- ➔ Detach separator (18) from pump inlet (open clamping ring).
- + Avoid the release of pollutants.
- ➔ Observe applicable regulations when disposing of condensate which may be contaminated by pumped chemicals.

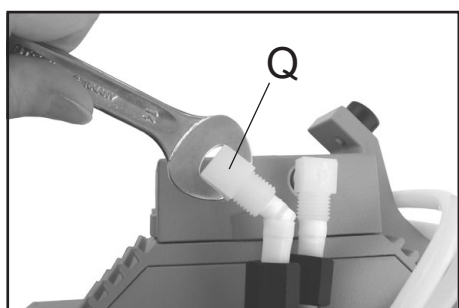
- ➔ Disconnect hose connection between pump and exhaust waste vapor condenser. Loosen union nut at exhaust waste vapor condenser and pull hose out of the inlet of the condenser.
- ➔ Collecting flask at the outlet: Remove joint clip, remove flask and drain condensate. Observe applicable regulations when disposing of condensate which may be contaminated by pumped chemicals.

Disassembling pump from base plate:

- ➔ For maintenance, lay the pumping unit on its side with the rating plate of the pump and the exhaust waste vapor condenser at the top. Support the pumping unit appropriately.
- ➔ Remove the hex nuts underneath the base plate with an open ended wrench (w/f 10) from the feet of the pump (pay attention to serrated washers). Take the pump off the base plate.

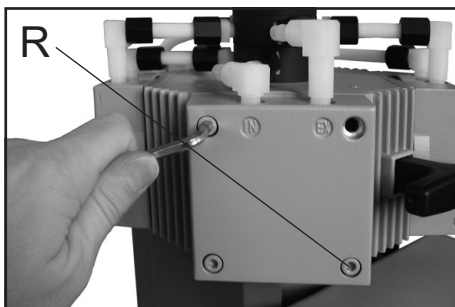
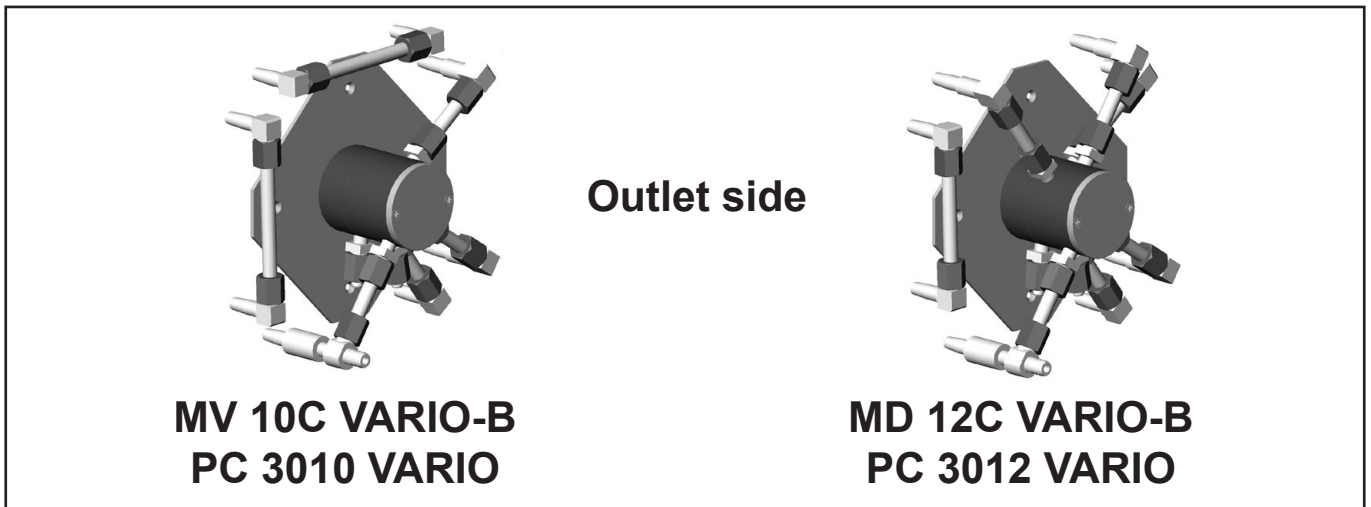
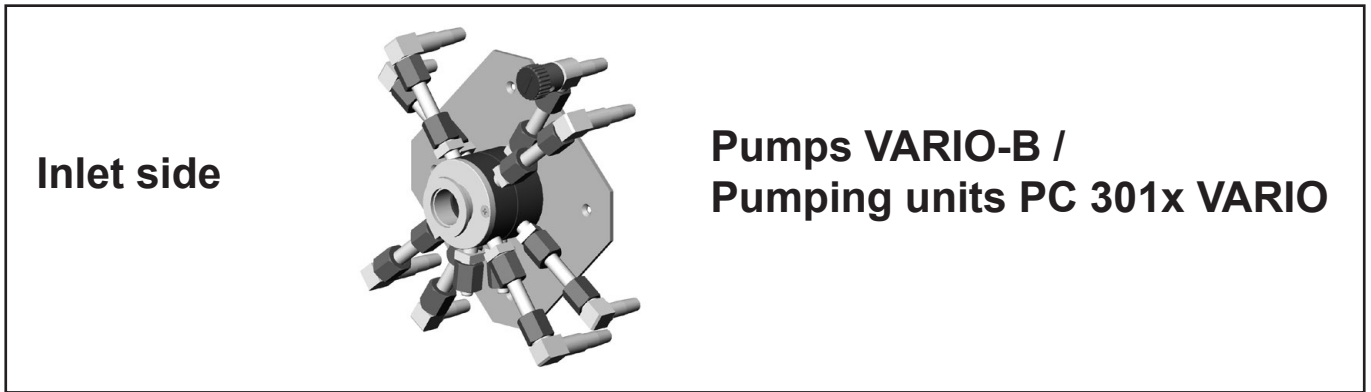


- ➔ Loosen the union nuts (N) of the hose connections at the pump heads with an open-ended wrench (w/f 17).



- ➔ Turn the fittings (Q) with an open-ended wrench (w/f 14, at outlet w/f 16) to detach the hoses from the pump heads (1/4 of a turn at maximum).
- ☞ Do not remove the elbow fittings from the pump heads; during reassembly a leak may result.

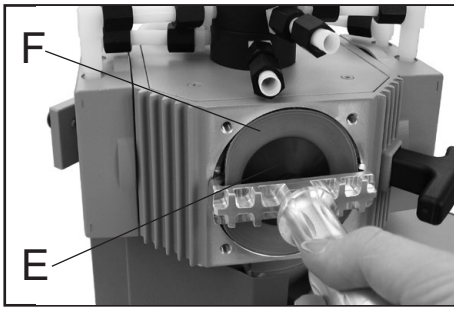
Fittings and tubing of the different pump models:



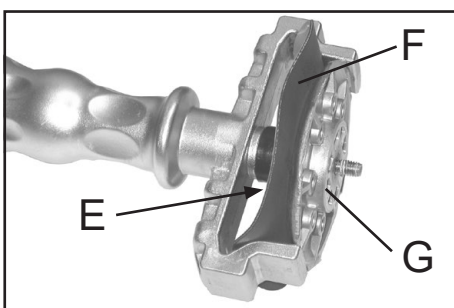
- ➔ Disassemble the housing covers (A) to check the diaphragms and valves.
- ➔ Unscrew four Allen screws (R) with a 5mm wide Allen key. Remove the housing cover with housing cover insert (A) together with the head cover (D), the valves (B) and the O-rings (C) (head cover with valves and O-rings will remain within the housing cover).

- ☞ Never remove parts by using a pointed or sharp-edged tool (e.g., screw driver). We recommend to use a rubber mallet or compressed air (to be blown carefully into port).
- ➔ Remove the head cover (D) carefully from the housing cover. Note the position and orientation of the valves (B) and remove them.
- ➔ Replace valves and/or O-rings if necessary.
- ☞ Use petroleum ether or industrial solvent to remove deposits. Do not inhale vapors.

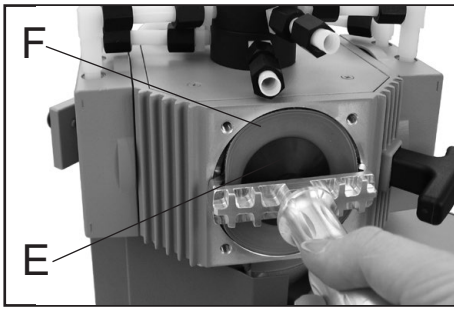
Replacing the diaphragm



- ☞ Check diaphragm (F) for damage and replace if necessary.
- ➡ Lift diaphragm carefully sidewise.
- ☞ Never use a pointed or sharp-edged tool to lift the diaphragm.
- ➡ Use the diaphragm key to grip the diaphragm support disc (G) below the diaphragm.
- ➡ Unscrew diaphragm support disc (G) with diaphragm (F) and diaphragm clamping disc (E).
- ➡ Check for washers (H) between the diaphragm support disc (G) and the connecting rod (I). Do not mix the washers from the different pump heads, since these are set at the factory to ensure proper pump performance. Make sure that the original number is reassembled at the individual pump head.
- ☞ Too few washers: The pump will not attain vacuum specification. Too many washers: Diaphragm clamping disc will hit head cover, causing noisy operation and possibly causing the pump to seize up.
- ☞ If the old diaphragm is difficult to separate from the diaphragm support disc, immerse assembly in naphtha or petroleum ether. Do not inhale vapors!



- ➡ Position new diaphragm (F) between diaphragm clamping disc with square head screw (E) and diaphragm support disc (G).
- ☞ **Note:** Position diaphragm with pale side towards diaphragm clamping disc (facing pump chamber).
- ☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.
- ➡ Lift the diaphragm at the side. Place the diaphragm carefully together with diaphragm clamping disc and diaphragm support disc in the diaphragm key.
- ☞ Avoid damage of the diaphragm; do not excessively bend or crease the diaphragm too much.



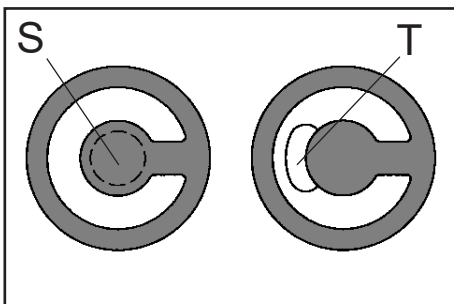
- ➔ Assemble the original number of washers (H) between diaphragm support disc (G) and connecting rod (I).
- ➔ Screw diaphragm clamping disc (E), diaphragm (F), diaphragm support disc (G) and washers (H) to connecting rod (B).

- ➔ Optimum torque for the diaphragm support disc: 4.4 ft·lb_f (6 Nm), it is recommended to use a torque wrench. Attach Allen key to diaphragm key (hexagonal bolt 6 mm wide).

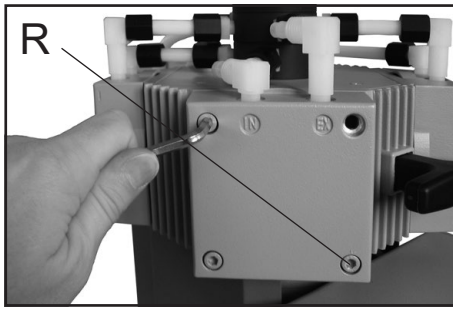
Note: Never use the diaphragm key with any additional tools like tongs or Allen keys without appropriate torque limitation.

Assembling the pump heads

- ➔ Place the pump in a way that the pump head to be assembled is at the top. Support the pump appropriately.
- ➔ Bring the diaphragm (F) into a position in which it is in contact with the housing (J) and centered with respect to the bore.
- ➔ Place the head cover (D) over the diaphragm. Check for its correct orientation by aligning it beforehand with the housing cover which has to be put over it later on.
- ☞ Pay attention that the diaphragm (F) stays positioned centrally so that it will become clamped uniformly between housing (J) and head cover (D).



- ➔ Place the valves (B) and the O-rings (C) at their respective positions on the head cover (D).
- ☞ Make sure that the valves are correctly seated. See figure for the correct position of the valves: Valves at the outlet with round centered opening (S) under valve; valves at the inlet with kidney-shaped opening (T) beside valve.
- ➔ Place the housing cover (A) with housing cover insert onto the head cover.



- ➔ Loosely screw in the Allen head screws (R) of the housing cover in a star pattern with a 5 mm wide Allen key, then tighten.
- ☞ Recommended torque: 8.9 ft·lb_f (12 Nm).

Individual performance check of a pump head:

Check the performance by measuring the vacuum at the inlet port of the individual pump head:

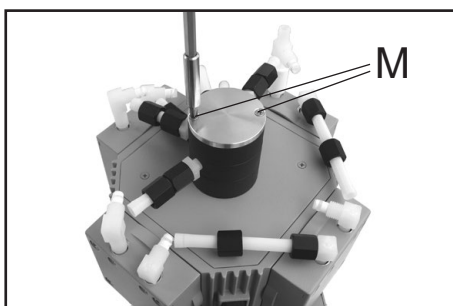
Use a suitable vacuum gauge (e.g., DVR 2pro, cat. no.: 20682906), being sure that it is correctly calibrated. Measure the vacuum at the inlet port (marked "IN"). A vacuum of less than 120 mbar should be achieved.

- ☞ If the reading is higher, recheck the pump chamber and make sure that the valves and the diaphragms are correctly seated (diaphragms concentric with bore).

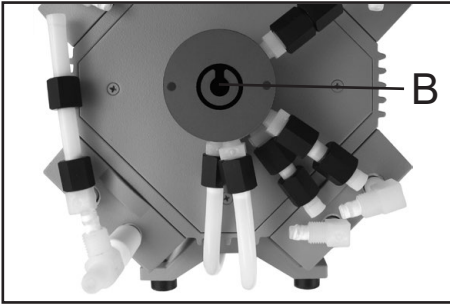
Replace diaphragms and valves of all eight pump heads in the same way.

Replacing the valve at the distributor (outlet side)

- ➔ Loosen the union nut of the hose running directly to the manifold cover (L) of the distributor (P) with an open-ended wrench (w/f 17). Loosen only the union nut at the pump head, not the one at the distributor.
- ➔ Turn the fitting (Q) with an open-ended wrench (w/f 14) to detach the hose from the pump head (1/4 of a turn at maximum).
- ☞ Do not remove the elbow fitting from the pump head; during reassembly a leak may result.

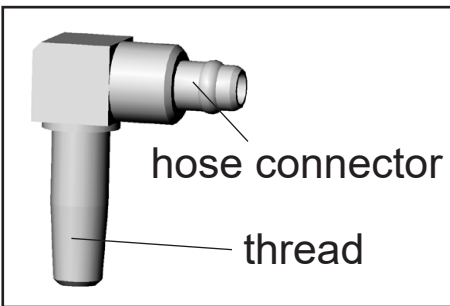


- ➔ Unscrew the two countersunk head screws (M) at the manifold cover with an Phillips screw driver. Remove cover plate and manifold cover.



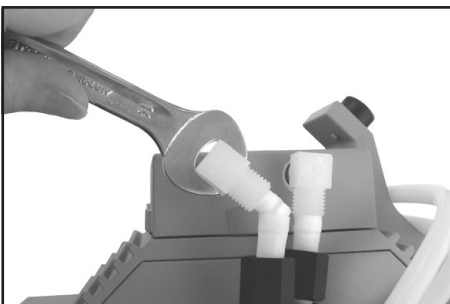
- ➔ Note the position and orientation of the valve (B) and remove.
- ☞ Check valve for damage and replace if necessary. Make sure that the valve is correctly seated.
- ➔ Reassemble manifold cover (L) and cover plate (K) and secure with countersunk screws (M).

Notes on assembling fittings and hose connections (only MV 10C VARIO-B, PC 3010 VARIO)



- The thread of the fittings at the pump heads, at the inlet and outlet distributors as well as the hose connectors are sealed with PTFE tape.
- ☞ If the fittings or the hoses have been removed, use new PTFE bond (included in set of seals) when reassembling.
 - ➔ Wind the thread of the fitting two times counterclockwise with PTFE bond, the hose connectors three times. Ensure that the PTFE bond ends flush with the fittings.

Assembling the connecting hoses



- ➔ Slip the hoses (O) onto the hose connectors by turning the fittings (Q) with an open-ended wrench w/f 14 (w/f 16 at outlet).



- ➔ Tighten the union nuts (N) of the hose connections at the pump heads with an open-ended wrench w/f 17.
- ☞ Tighten union nuts first by hand and then tighten one full turn using the open ended wrench.

Reassembling the pump with pumping units PC 3010/3012 VARIO:

- ➔ Lay the pump on its side with the rating plate of the pump at the top. Support pump appropriately.
- ☞ Note that to install the base plate, the exhaust waste vapor condenser and the condensate flask have to be on top.
- ➔ Push the console over the threads at the pump feet.
- ➔ Install the serrated washers. Install the hex nuts and tighten using an open-ended wrench (w/f 10). Place the pumping unit in normal operating position.
- ➔ Attach the connecting hose between the pump and the exhaust waste vapor condenser at the inlet of the condenser. Connect the exhaust waste vapor condenser to the coolant circuit. Plug VACUU•BUS cable into the controller.

Checking the ultimate vacuum

- ➔ After any intervention at the equipment (e.g., repair / maintenance) the ultimate vacuum of the pump has to be checked. Only if the pump achieves its specified ultimate vacuum, the pump's leak rate is low enough to ensure that no explosive atmospheres will occur in the interior of the equipment.
After any intervention at the vacuum sensor the leak rate of the equipment has to be checked.

If the pump does not achieve the ultimate vacuum:

- Whenever the diaphragms and valves have been replaced, a break-in period of several hours is required before the pump achieves its ultimate vacuum.
- In case of an unusual noise, switch off pump immediately and check clamping disc positions.

If the specified ultimate vacuum is not achieved, and if this does not change after the break-in period:

Check hose connectors at pump heads for leaks. If necessary recheck valve seats and pump chambers.

Replacing the overpressure safety relief device at the exhaust waste vapor condenser:

- ➡ Loosen the red union nut at the condenser. Remove hose from the inlet of the condenser.
- ➡ Pull off old overpressure safety relief device and install new one.
- ➡ Connect hose to the inlet of the exhaust waste vapor condenser and tighten union nut.

Overpressure safety relief device of waste vapor condenser.....**20638821**

Replacing the device fuse

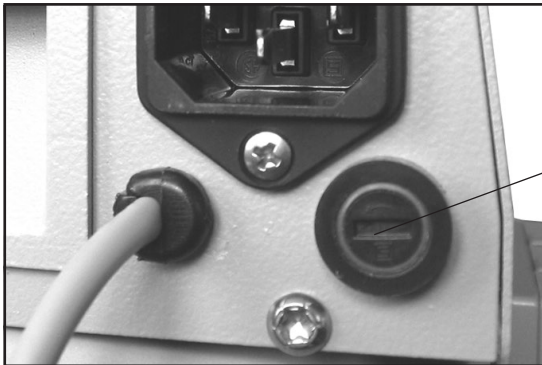
⚠ DANGER

➔ **Switch off the pump.**



➔ **Disconnect the electrical power cord** before unscrewing the fuse holder.

Identify and eliminate the cause of failure before switching on the pump again.

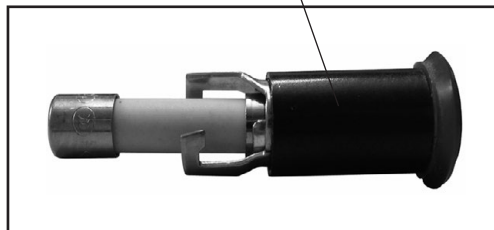


Pumps NT VARIO



Pumps VARIO-B /
PC 301x VARIO

fuse holder



- ➔ Unscrew the fuse holder using a slotted screw driver.
- ➔ Replace the defective fuse by a fuse of the same type (see “Technical data”, pg. 28). Reassemble holder with fuse to the pump.



PC 300x VARIO

fuse holder



- ➔ Keep the snap-fit squeezed and pull the fuse holder out.
- ➔ The fuse holder contains two fuses of the same type. Replace the defective fuse by a fuse of the same type (see “Technical data”, pg. 28).
- ➔ Insert the fuse holder into the housing of the pumping unit until it snaps.

Repair - Maintenance - Return - Calibration

IMPORTANT

Every employer (user) is held responsible for the health and safety of his employees. This also applies to service personnel performing repair, maintenance, return or calibration.

The **health and safety clearance form** informs the contractor about any possible contamination of the device and forms the basis for the risk assessment.

In case of devices which have been in contact with biological substances of risk level 2 contact the VACUUBRAND service absolutely before dispatching the device. These devices have to be completely disassembled and decontaminated by the user prior to shipment. Do not return devices which have been in contact biological substances of risk level 3 or 4. These devices cannot be checked, maintained or repaired. Also decontaminated devices must not returned to VACUUBRAND due to a residual risk..

The same conditions apply to on-site work.

No repair, maintenance, return or calibration is possible unless the correctly completed health and safety clearance form is returned. Devices sent are rejected if applicable. Send a completed copy of the **health and safety clearance form** to us in advance. The declaration must arrive before the equipment. Enclose a second completed copy with the product.

Remove all components from the device that are no original VACUUBRAND components. VACUUBRAND will not be responsible for lost or damaged components that are no original components.

Drain the device completely of fluids and residues. Decontaminate the device. Close all openings airtight especially if using substances hazardous to health.

To expedite repair and to reduce costs, please enclose a detailed description of the problem and the product's operating conditions with every product returned.

If you do not wish a repair on the basis of our **quotation**, the device may be returned to you disassembled and at your expense.

In many cases, the components must be cleaned in the factory prior to repair.

For cleaning we use an environmentally friendly water based process. Unfortunately the combined attack of elevated temperature, cleaning agent, ultrasonic treatment and mechanical stress (from pressurised water) may result in damage to the paint. Please mark in the health and safety clearance form if you wish a repaint at your expense just in case such a damage should occur. We will also replace parts for cosmetic reasons at your request and at your expense.

Before returning the device

Pack the device properly, if necessary, please order original packaging materials at your costs.

Mark the package completely

Enclose the completed [health and safety clearance form](#).

Notify the carrier of any possible contamination if required.

Scrapping and waste disposal

Dispose of the equipment and any components removed from it safely in accordance with all local and national safety and environmental requirements. Particular care must be taken with components and waste oil which have been contaminated with dangerous substances from your processes. Do not incinerate fluoroelastomer seals and O-rings. You may authorize us to dispose of the equipment **at your expense**. Otherwise we return the device at your expense.



Warranty

VACUUBRAND shall be liable for insuring that this product, including any agreed installation, has been free of defects at the time of the transfer of risk.

VACUUBRAND shall not be liable for the consequences of improper handling, use, servicing or operation of this product or the consequences of normal wear and tear of wearing parts such as diaphragms, seals, valves, vanes, condensers, oil and the breakage of glass or ceramic parts, for the consequences of chemical, electrochemical or electrical influences or the failure to follow the instructions in this manual.

Claims for defects against VACUUBRAND shall be limited to one year from delivery. The same shall apply to claims for damages irrespective of legal grounds.

For further information on general terms and conditions refer to www.vacuubrand.com.

EG-Konformitätserklärung für Maschinen
EC Declaration of Conformity of the Machinery
Déclaration CE de conformité des machines



Hersteller / Manufacturer / Fabricant:

VACUUBRAND GMBH + CO KG · Alfred-Zippe-Str. 4 · 97877 Wertheim · Germany

Hiermit erklärt der Hersteller, dass das Gerät konform ist mit den Bestimmungen der Richtlinien:

Hereby the manufacturer declares that the device is in conformity with the directives:

Par la présente, le fabricant déclare, que le dispositif est conforme aux directives:

- 2006/42/EU
- 2014/30/EU
- 2014/34/EU
- 2011/65/EU, 2015/863

Chemie-Membranpumpe - Chemie-Pumpstand / Chemistry diaphragm pump - Chemistry pumping unit /

Pompe à membrane « chimie » - Groupe de pompage « chimie » :

Typ / Type / Type: **ME 4C NT VARIO / MZ 2C NT VARIO / MD 4C NT VARIO / PC 3002 VARIO / PC 3003 VARIO / PC 3004 VARIO**

Artikelnummer / Order number / Numéro d'article: **22613819 / 20732400, 20732401 / 20736500, 20736501 / 20733500, 20733501, 20733502 / 20738400, 20738401, 20738402 / 20737500, 20737501, 20737502**

Seriennummer / Serial number / Numéro de série: Siehe Typenschild / See rating plate / Voir plaque signalétique

Angewandte harmonisierte Normen / Harmonized standards applied / Normes harmonisées utilisées:

DIN EN ISO 12100:2011, DIN EN 1012-2:2011, DIN EN 61010-1:2020, IEC 61010-1:2010 (Ed. 3)

DIN EN 61326-1:2013

DIN EN 1127-1:2019, DIN EN ISO 80079-36:2016

DIN EN IEC 63000:2019

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen / Person authorised to compile the technical file / Personne autorisée à constituer le dossier technique:

Dr. Constantin Schöler · VACUUBRAND GMBH + CO KG · Germany

Ort, Datum / place, date / lieu, date: Wertheim, 13.10.2022

(Dr. Constantin Schöler)

Geschäftsführer / Managing Director / Gérant

ppa.

(Jens Kaibel)

*Technischer Leiter / Technical Director /
Directeur technique*

VACUUBRAND GMBH + CO KG

Alfred-Zippe-Str. 4
97877 Wertheim

Tel.: +49 9342 808-0

Fax: +49 9342 808-5555

E-Mail: info@vacuubrand.com

Web: www.vacuubrand.com

Declaration of Conformity



Manufacturer:

VACUUBRAND GMBH + CO KG · Alfred-Zippe-Str. 4 · 97877 Wertheim · Germany

Hereby the manufacturer declares that the device is in conformity with the directives:

- Supply of Machinery (Safety) Regulations 2008 (S.I. 2008 No. 1597, as amended by S.I. 2019 No. 696)
- Electromagnetic Compatibility Regulations 2016 (S.I. 2016 No. 1091, as amended by S.I. 2019 No. 696)
- The Equipment and Protective Systems Intended for Use in Potentially Explosive Atmospheres Regulations 2016 (S.I. 2016 No. 1107, as amended by S.I. 2019 No. 696)
- The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 (S.I. 2012 No. 3032)

Chemistry diaphragm pump - Chemistry pumping unit:

Type: **ME 4C NT VARIO / MZ 2C NT VARIO / MD 4C NT VARIO / PC 3002 VARIO / PC 3003 VARIO / PC 3004 VARIO**

Order number: **22613819 / 20732400, 20732401 / 20736500, 20736501 / 20733500, 20733501, 20733502 / 20738400, 20738401, 20738402 / 20737500, 20737501, 20737502**

Serial number: See rating plate

Designated standards applied:

EN ISO 12100:2010, EN 1012-2:1996+A1:2009, EN 61010-1:2010+A1:2019
EN 61326-1:2013
EN 1127-1:2019, EN ISO 80079-36:2016
EN IEC 63000:2018

Person authorised to compile the technical file:

Dr. Constantin Schöler · VACUUBRAND GMBH + CO KG · Germany

Place, date: Wertheim, 13.10.2022

(Dr. Constantin Schöler)

Managing Director

ppa.

(Jens Kaibel)

Technical Director

VACUUBRAND GMBH + CO KG

Alfred-Zippe-Str. 4
97877 Wertheim

Tel.: +49 9342 808-0
Fax: +49 9342 808-5555
E-Mail: info@vacuubrand.com
Web: www.vacuubrand.com

DECLARATION OF CONFORMITY – China RoHS 2

VACUUBRAND GMBH + CO KG has made reasonable efforts to ensure that hazardous materials and substances may not be used in its products.

In order to determine the concentration of hazardous substances in all homogeneous materials of the subassemblies, a “Product Conformity Assessment” (PCA) procedure was performed. As defined in GB/T 26572 the “Maximum Concentration Value” limits (MCV) apply to these restricted substances:

- Lead (Pb): 0.1%
- Mercury (Hg): 0.1%
- Cadmium (Cd): 0.01%
- Hexavalent chromium (Cr(+VI)): 0.1%
- Polybrominated biphenyls (PBB): 0.1%
- Polybrominated diphenyl ether (PBDE): 0.1%

Environmentally Friendly Use Period (EFUP)

EFUP defines the period in years during which the hazardous substances contained in electrical and electronic products will not leak or mutate under normal operating conditions. During normal use by the user such electrical and electronic products will not result in serious environmental pollution, cause serious bodily injury or damage to the user’s assets. The Environmentally Friendly Use Period for VACUUBRAND products is 40 years.



MATERIAL CONTENT DECLARATION FOR VACUUBRAND PRODUCTS						
有毒有害物质或元素 Hazardous substances						
部件名称 Part name	铅 Pb	汞 Hg	镉 Cd	六价铬 Cr(+VI)	多溴联苯 PBB	多溴二苯醚 PBDE
包装 Packaging	0	0	0	0	0	0
塑料外壳 / 组件 Plastic housing / parts	0	0	0	0	0	0
真空油 Vacuum oil	0	0	0	0	0	0
电池 Battery	0	0	0	0	0	0
玻璃 Glass	X	0	0	0	0	0
电子电气组件 Electrical and electronic parts	X	0	0	0	0	0
控制器 / 测量设备 Controller / measuring device	X	0	0	0	0	0
金属外壳 / 组件 Metal housing / parts	X	0	0	0	0	0
电机 Motor	X	0	0	0	0	0
配件 Accessories	X	0	0	0	0	0

此表格是按照SJ/T 11364-2014中规定所制定的。
This table is created according to SJ/T 11364-2014.

- O: 表示该有毒有害物质在该部件所有均质材料中的含量均在GB/T 26572规定的限量要求以下。
O: Indicates that the above mentioned hazardous substance contained in all homogeneous materials of the part is below the required limit as defined in GB/T 26572.
- X: 表示该有毒有害物质至少在该部件某一均质材料中的含量超出GB/T 26572规定的限量要求。
X: Indicates that the above mentioned hazardous substance contained in at least one of the homogeneous materials of this part is above the required limit as defined in GB/T 26572.

电池、玻璃器皿和配件可能不属于所附设备所包含的内容，它们可能有各自单独的EFUP标记和/或可能正在维护其部件EFUP标记的更新。

Batteries, glassware and accessories might not be content of the enclosed device and may have its own EFUP-marking and/or might be maintaining parts with changing EFUP-marking.

除上表所示信息外，还需声明的是，这些部件并非是有意图用铅（Pb）、汞（Hg）、镉（Cd）、六价铬（Cr(+VI)）、多溴联苯（PBB）或多溴二苯醚（PBDE）来制造的。

Apart from the disclosures in the above table, the subassemblies are not intentionally manufactured or formulated with lead (Pb), mercury (Hg), cadmium (Cd), hexavalent chromium (Cr+VI), polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE).

Products manufactured by VACUUBRAND may enter into further devices (e.g., rotary evaporator) or can be used together with other appliances (e.g., usage as booster pumps).


With these products and appliances in particular, please note the EFUP labeled on these products.

VACUUBRAND will not take responsibility for the EFUP of those products and appliances.

Place, date: Wertheim, 06 September 2022



(Dr. Constantin Schöler)
Managing Director

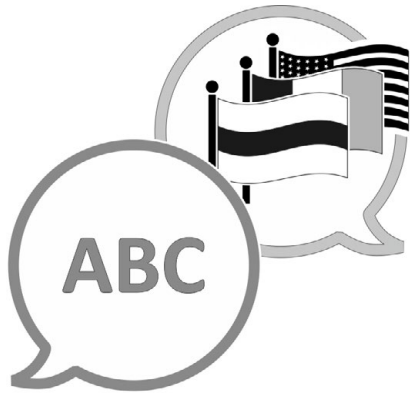


ppa. (Jens Kaibel)
Technical Director

VACUUBRAND GMBH + CO KG

Alfred-Zippe-Str. 4
97877 Wertheim
Germany

Tel.: +49 9342 808-0
Fax: +49 9342 808-5555
E-Mail: info@vacuubrand.com
Web: www.vacuubrand.com



[VACUUBRAND > Support > Manuals](#)

Manufacturer:

VACUUBRAND GMBH + CO KG
Alfred-Zippe-Str. 4
97877 Wertheim
GERMANY

Phone:

Head office +49 9342 808-0
Sales +49 9342 808-5550
Service +49 9342 808-5660

Fax: +49 9342 808-5555

Email: info@vacuubrand.com

Web: www.vacuubrand.com