Hei-VAC Vario Station

heidolph
research made easy

Instruction manual

[GB] It is imperative to read this instruction manual prior to initial operation! Comply with safety instructions!
Keep for further use!
This documentation is not subject to revision service!

⚠ DANGER

➡ Danger! Immediate danger. Death or severe injuries as well as damage to equipment and environment can occur.

⚠ WARNING

☞ Warning! Possible danger. Severe injuries as well as damage to equipment and environment can occur.

⚠ CAUTION

• Caution! Possible danger. Slight injuries as well as damage to equipment and environment can occur.

NOTICE

Note. Disregarding of notes may cause damage to the product.

Caution! Hot surface!

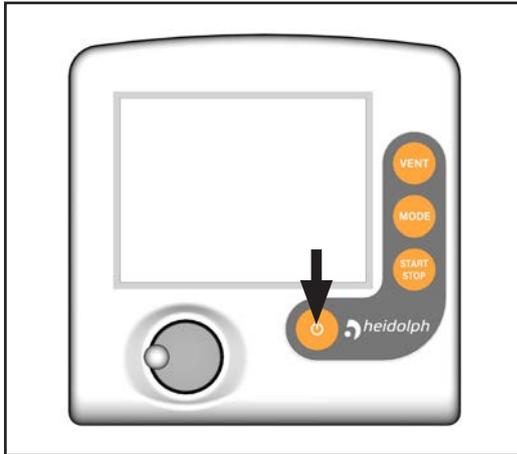Isolate equipment from mains before removing the cover.

Electronic components must not be disposed of in the domestic waste at the end of their service life. Used electronic devices contain harmful substances that can cause damage to the environment or human health. End users are legally obliged to take used electric and electronic devices to a licensed collection point.
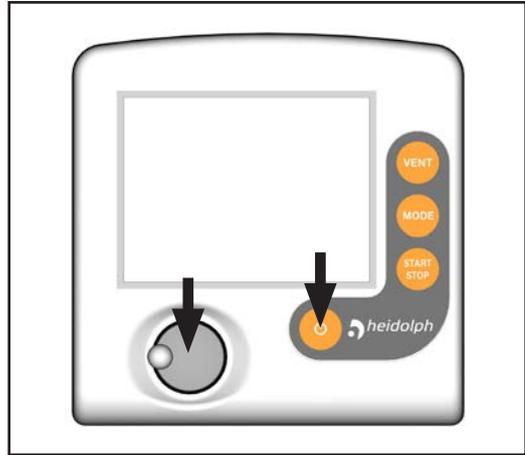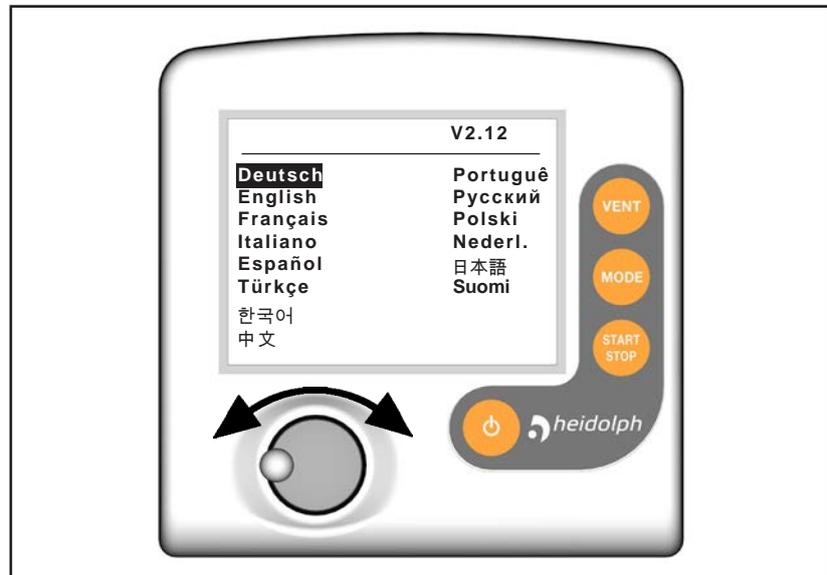

Reset / Language selection

1   switch off

2   press both ↓ ↓

3   turn

V2.12

Deutsch   Portuguê
English   Русский
Français   Polski
Italiano   Nederl.
Español   日本語
Türkçe   Suomi
한국어
中文

4   press ↓

V2.12

Deutsch   Portuguê
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Español   日本語
Türkçe   Suomi
한국어
中文

Contents

Safety information!

1.1 General information

NOTICE

Read and comply with this manual before installing or operating the equipment.

Remove all packing material, remove the product from its packing-box, remove the protective covers from the inlet and outlet ports and keep, inspect the equipment.
If the equipment is damaged, notify the supplier and the carrier in writing within three days; state the item number of the product together with the order number and the supplier's invoice number. Retain all packing material for inspection.
Do not use the equipment if it is damaged.
If the equipment is not used immediately, replace the protective covers. Store the equipment in suitable conditions.

1.2 Intended use

WARNING

☞ The pump and all system parts must not be used on humans or animals.
☞ Prevent any part of the human body from coming in contact with vacuum.
☞ Ensure that the individual components are only connected, combined and operated according to their design and as indicated in the instructions for use.
☞ Comply with notes on correct vacuum and electrical connections, see section "Use and operation".

CAUTION

• The pumps are designed for **ambient temperatures** during operation between +10°C and +40°C. Check the maximum temperatures if installing the pump in a cabinet or a housing and make sure ventilation is adequate. Install an external automatic ventilation system if necessary. If pumping hot process gases make sure that the maximum permitted gas inlet temperature, which depends on several parameters like inlet pressure or ambient temperature (see "Technical data"), is not exceeded.
• Particles and dust must not be aspirated.

NOTICE

Use the equipment **for the intended use only**, i.e. for generation, control and measurement of vacuum in vessels designed for that purpose.

1.3 Setting up and installing the equipment

DANGER

➡ Equipment must be connected only to a **suitably fused and protected electrical supply** and a suitable earth point. Failure to connect the motor to ground may result in deadly electrical shock.
The mains cable may be fitted with a moulded European IEC plug or a plug suitable for your local electrical supply. If the plug has been removed or has to be removed, the cable will contain wires colour coded as follows: green or green and yellow: earth; blue or white: neutral; brown or black: live.

WARNING

☞ Due to the high compression ratio of the pump, the pressure at the outlet port might get higher than the maximum permissible pressure compatible with the mechanical stability of the system.
☞ Do not permit any **uncontrolled pressurizing** (e. g. make sure that the exhaust pipeline cannot become blocked). If there is an exhaust isolation valve, make sure that you cannot operate the equipment with the valve closed. **Risk of bursting!**

☞ Always provide a free and pressureless exhaust pipeline.
☞ Max. **permitted pressure at the pressure transducer:** 1.5 bar (absolute).
☞ Avoid overpressure of more than 0.2 bar in case inert gas is connected to the pump, the gas ballast connection or to a venting valve.

⚠ CAUTION

- Comply with **maximum permissible pressures** at inlet and outlet and pressure differences, see section "Technical data". Do not operate the pump with overpressure at the inlet.
- Check that mains voltage and current conform with the equipment (see rating plate).
- Connect pipes gas tight at inlet and outlet of the pump.
- **Attention:** Flexible elements tend to shrink when evacuated.

NOTICE

Provide a firm level platform for the equipment and check that the system to be evacuated is mechanically stable and that all fittings and hose connections are secure. Ensure a stable position of the pump without any mechanical contact except of the pump feet. Comply with all applicable safety regulations.

Keep a distance of minimum 20 cm between fan and ambient parts (e.g. housing, walls, ...). Check fan regularly for dust/dirt, clean if necessary to avoid a cutback of ventilation.

If the equipment is brought from cold environment into a room for operation, allow the equipment to warm up (pay attention to water condensation on cold surfaces).

The diameter of the inlet and outlet pipeline should be at least as large as the diameter of the pump connection pipelines.

Comply with all **applicable and relevant safety requirements** (regulations and guidelines), **implement the required actions and adopt suitable safety measures**.

1.4 Ambient conditions

NOTICE

To the best of our knowledge the equipment is in compliance with the requirements of the applicable EC-directives and harmonized standards (see "Declaration of conformity") with regard to design, type and model. Directive EN 61010-1 gives in detail conditions under which the equipment can be operated safely (see also IP degree of protection).
Adopt suitable measures in case of differences, e. g. using the equipment outdoors, installation in altitudes of more than 1000 m above mean sea level, conductive pollution or bedewing.
Pay attention to the **permissible maximum ambient and gas inlet temperatures** (see "Technical data").

1.5 Operating conditions

⚠ DANGER

➡ **The pumps have no approval for operation in or for pumping of potentially explosive atmospheres.**

➡ The pumps are **not suitable** to pump
   - **unstable substances** and substances which react explosively under **impact** (mechanical stress) and/or when being exposed to **elevated temperatures** without air,
   - **self inflammable** substances,
   - substances which are **inflammable without air** and
   - **explosive substances**.

⚠CAUTION

- The pumps are **not suitable** for pumping substances which may form **deposits** inside the pump. Deposits and condensate in the pump may lead to increased temperatures even to the point of excessing the maximum permitted temperatures!

- If there is a danger of formation of **deposits** in the pump chamber (check inlet and outlet of the pump), inspect the pump chambers regularly and clean if necessary.

- The pumps are **not suitable** for pumping dust and have **no approval** for operation below ground.

NOTICE

If pumping **different substances**, it is recommended to purge the pump with air or inert gas prior to changing the pumped media in order to pump out residues and to avoid reactions of the pumped substances with each other and with the pump materials.
Take into consideration interactions and chemical reactions of the pumped media. Ensure that the materials of the **wetted part**s are compatible with the pumped substances, see section "Technical data".

1.6 Safety during operation

⚠ DANGER

➡ Adopt suitable measures to prevent the release of dangerous, toxic, explosive, corrosive, noxious or polluting fluids, vapours and gases. In case install an appropriate collecting and disposal system and take protective action for pump and environment.

➡ Prevent any part of the human body from coming into contact with vacuum.

➡ The user must take suitable precautions to prevent any formation of explosive mixtures in the expansion chamber or at the outlet. In case of e.g. a diaphragm crack, mechanically generated sparks, hot surfaces or static electricity may ignite these mixtures. Use inert gas for gas ballast or venting if necessary.
➡ Potentially explosive mixtures at the outlet of the pump have to be drained appropriately, sucked off or diluted with inert gas to non-explosive mixtures.

☞ Pay attention to the symbol "hot surfaces" on the equipment. Adopt suitable measures to prevent any danger arising from the formation of hot surfaces or electric sparks. Provide a suitable protection against contact if necessary.

⚠WARNING

☞ Ensure that the exhaust pipeline is always free and pressureless.
☞ Pumping at **high inlet pressure** may lead to overpressure at the gas ballast valve. Pumped gases or condensate might be pushed out in case the valve is open. If an inert gas supply is connected, ensure that the inlet pipeline is not contaminated.
☞ **Attention:** If the pressure is higher than approximately 1080 mbar the pressure reading becomes incorrect (saturation of the pressure transducer). The display flashes. **Immediate pressure relief necessary! Risk of bursting!**

⚠ CAUTION
- Comply with applicable regulations when disposing of chemicals. Take into consideration that chemicals may be polluted.
  Take adequate precautions to protect people from the effects of dangerous substances (chemicals, thermal decomposition products of fluoroelastomers), wear appropriate safety-clothing and safety glasses.
- Use only **genuine spare parts and accessories.** Otherwise safety and performance of the equipment as well as the electromagnetic compatibility of the equipment might be reduced.
  Possibly the CE mark or the C/US conformity becomes void if not using genuine spare parts.

- Switching of an in-line valve or opening of a venting valve by the controller must not lead to a critical dangerous situation under any circumstances.
- **Attention:** If **Auto-Start** is preselected, the process starts immediately after a power failure without pressing any further key. It is the user's responsibility to ensure that no dangerous status of the system due to the automatic start-up can occur and to provide appropriate safety measures. If necessary, the user has to check **prior to starting process control** whether the option "Auto-Start" is enabled.

NOTICE

Do not start the pump if the pressure difference between inlet and outlet port exceeds 1.1 bar at maximum.
Prevent any backpressure of gases and the backflow of condensates.
Never suck liquids or dust into the pump.

Provide appropriate protective measures (i.e precautions which allow for the requirements of the respective application) even for the case of failure and **malfunction**.
Failure of the pump (e.g. due to power failure) or of connected components, of parts of the supply or change of parameters must not lead to a critical dangerous situation under any circumstances. In case of diaphragm cracks or leaks in the manifold pumped substances might be released into the environment or into the pump housing or motor. Comply especially with notes on operation and use and maintenance.

Due to the residual **leak rate of the equipment**, there might be an exchange of gas, albeit extremely slight, between the environment and the vacuum system.
Adopt suitable measures to prevent contamination of the pumped substances or the environment.

The controller is powered by a **short circuit proof wide-range power supply** with integrated overload protection.

The motor is protected by a **temperature sensor at the circuit board:** Current limitation if the temperature at the circuit board is higher than 70°C, switching off the pump if the temperature is higher than 85°C. In case of blockade of the motor (after 10 attempts to start-up) the pump is switched off.
If the pump is switched off due to safety measures, manual reset is necessary. Isolate the pump from mains. Eliminate the cause of failure before restarting the pump.

1.7 Maintenance and repair

NOTICE

⚠WARNING

⚠CAUTION

Wear parts have to be replaced regularly. In case of normal wear the lifetime of the diaphragms and valves is > 10000 operating hours. Bearings have a typical durability of 40000 h.

➡ **Isolate equipment from mains** and **wait two minutes** before starting maintenance to allow the capacitors to discharge.

☞ Ensure that the pump cannot be operated accidentally. Never operate the pump if covers or other parts of the pump are disassembled. Never operate a defective or damaged pump.

☞ **Attention**: The pump might be contaminated with process chemicals which have been pumped during operation. Ensure that the pump is decontaminated before maintenance and take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred.

• Before starting maintenance vent the pump, isolate the pump and other components from the vacuum system. Allow sufficient cooling of the pump.

Ensure that **maintenance** is done only by suitably trained and supervised technicians. Ensure that the maintenance technician is familiar with the safety procedures which relate to the products processed by the pumping system.

In order to comply with law (occupational, health and safety regulations, safety at work law and regulations for environmental protection) vacuum pumps, components and measuring instruments returned to the manufacturer can be repaired only when certain procedures (see section **"Notes on return to the factory"**) are followed.

2 Standard items and options

	Item	qty	P/N EU version	P/N US version
	Hei-VAC Vario Station	1	591-00142-00-2	591-00142-01-2
Standard items Hei-VAC Vario Station				
	Hei-VAC Vario Station	1		
	Power cord	1	14-007-003-81	14-007-003-89
	Instruction manual	1	01-005-006-88-0	
	Warranty card / Confirmation of condition of unit	1	01-006-002-58	

Accessories (optional)

	Item	P/N
	Hei-VAC Vario Station condensate cooler	591-00084-00

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3 Technical data

Type		Hei-VAC Vario Station
Maximum pumping speed (ISO 21360)	m³/h	1.7
Ultimate vacuum (absolute) without gas ballast*	mbar	5
Ultimate vacuum (absolute) with gas ballast*	mbar	7
Maximum permissible inlet pressure (absolute)	bar	1.1
Maximum permissible outlet pressure (absolute)	bar	1.1
Maximum permitted pressure difference between inlet and outlet		1.1
Maximum permissible pressure (absolute) at gas ballast valve	bar	1.2

Permissible ambient temperature
  storage
  operation
	°C
	°C
		-10 to +60
		+10 to +40

Permissible relative atmospheric moisture during operation (no condensation)	%	30 to 85
Rated power	kW	0.16
No-load speed**	min⁻¹	0 - 2400
Maximum permissible range of supply voltage (+/- 10%) **Attention: Observe specifications of rating plate!**		100-240 V~ 50/60 Hz

Maximum rated current at:
  100-120 V~ 50/60 Hz
  200-230 V~ 50/60 Hz
	A
	A
		1.6
		0.7

Motor protection		temperature sensor on the pcb (current limitation)
Degree of protection IEC 529		IP 20
Inlet		hose nozzle DN 8/10 mm
Outlet		hose nozzle DN 8 mm
A-weighted emission sound pressure level*** (uncertainty K_{pA}: 3 dB(A))	dB(A)	42
Dimensions L x W x H approx.	mm	294 x 192 x 299
Weight approx.	kg	6.0

*   Ultimate vacuum with function "Pumpdown" and at speed "HI"

** Note: In the motor speed range between **0 and approx. 200 rpm** the pump is running automatically in a cycled interval operation.

*** Measurement according to EN ISO 2151:2004 and EN ISO 3744:1995 at 1500rpm and ultimate vacuum with exhaust tube at outlet.

We reserve the right for technical modifications without prior note!

Controller	
Pressure transducer	ceramic diaphragm (alumina), capacitive, absolute pressure, gas type independent
Display	LCD graphic display, illuminated
Pressure units / scale (selectable)	mbar, Torr or hPa
Measuring range (absolute)	1080 mbar - 0.1 mbar (810 Torr - 0.1 Torr)
Maximum control range with internal pressure transducer (absolute)*	1060 mbar – 1 mbar (795 Torr – 1 Torr), Turbo-Mode (<1 mbar / Torr)
Resolution	0.1 mbar
Maximum permissible pressure at pressure transducer (absolute)	1.5 bar (1125 Torr)
Maximum permissible temperature of gaseous media	continuous operation: 40°C, for short periods up to 80°C
Measurement uncertainty (absolute) after careful adjustment and at constant temperature	<±1 mbar (0.75 Torr)
Temperature coefficient	<± 0.07 mbar/K (0.05 Torr/K)
Ambient temperature range (operation)	10°C to +40°C
Ambient temperature range (storage)	-10°C to +70°C
Permitted relative atmospheric moisture during operation (no condensation)	30% to 85%
Maximum permitted current of connected valves (connected components)	4 A
Venting connection	hose nozzle for hose 4-5 mm
Maximum admissible pressure at venting connection	1.2 bar absolute
Degree of protection according to IEC 529 (front side)	IP 42
Interface	RS 232 C

*   The actual vacuum control range in your special application might be reduced due to ultimate vacuum of the pump, quantity of gas occurring etc.

3.1 Gas inlet temperatures

Operating condition	Inlet pressure	Permitted range of gas temperatures at inlet
Continuous operation	> 100 mbar (high gas load)	+10°C to +40°C
Continuous operation	< 100 mbar (low gas load)	0°C to +60°C
Short-time (< 5 minutes)	< 100 mbar (low gas load)	-10°C to +80°C

We reserve the right for technical modification without prior notice!

3.2 Wetted parts

Components	Wetted materials
Pump	
Housing cover	PTFE
Head cover	ETFE carbon fibre reinforced
Diaphragm clamping disc	ETFE carbon fibre reinforced
Diaphragm	PTFE
Valves	FFKM / PTFE
Inlet	PP, stainless steel, FPM
Distributor (at inlet)	PP
O-ring	FPM
Outlet	ETFE
Tubing	PTFE
Screw-in fittings	ETFE / ECTFE
Controller	
Sensor	Aluminium oxide ceramic
Sensor housing	PPS / glass fibre
Sensor seal	Chemically resistant fluoroelastomer
Venting valve seal	FFKM

We reserve the right for technical modification without prior notice!

3.3 Pump parts

Position	Component	Position	Component
1	chemistry diaphragm pump	8	control cable
2	controller	9	condensate cooler
3	mains connection	10	catchpot
4	ON/OFF switch	11	coolant inlet
5	inlet	12	coolant outlet
6	outlet	13	overpressure safety relief device
7	gas ballast valve	14	accessory foot

Hei-VAC Vario Station

Rear side controller

jacks for connection of
VACUU•BUS components (e.g.,
coolant valve) external venting
valve)

connection plug of the
VACUU • BUS line to VARIO pump

venting connection

serial interface
RS 232 C

rating plate

vacuum connection
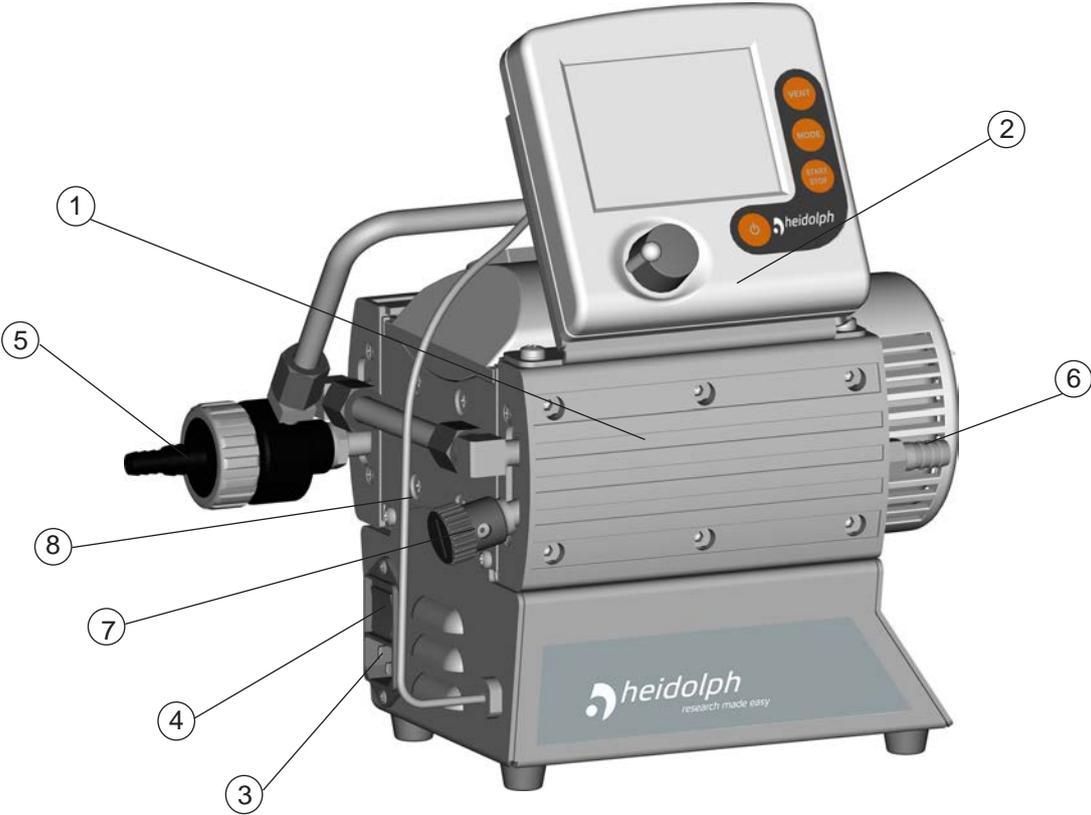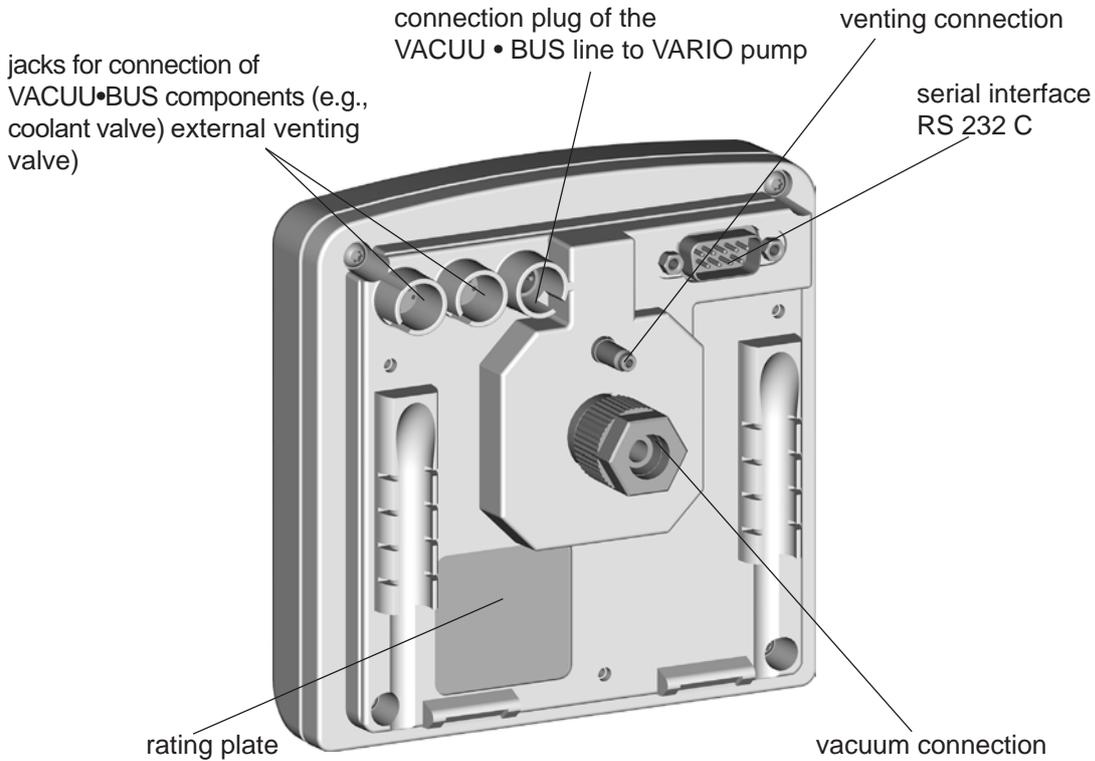
Hei-VAC Vario Station with condensate cooler (accessory)
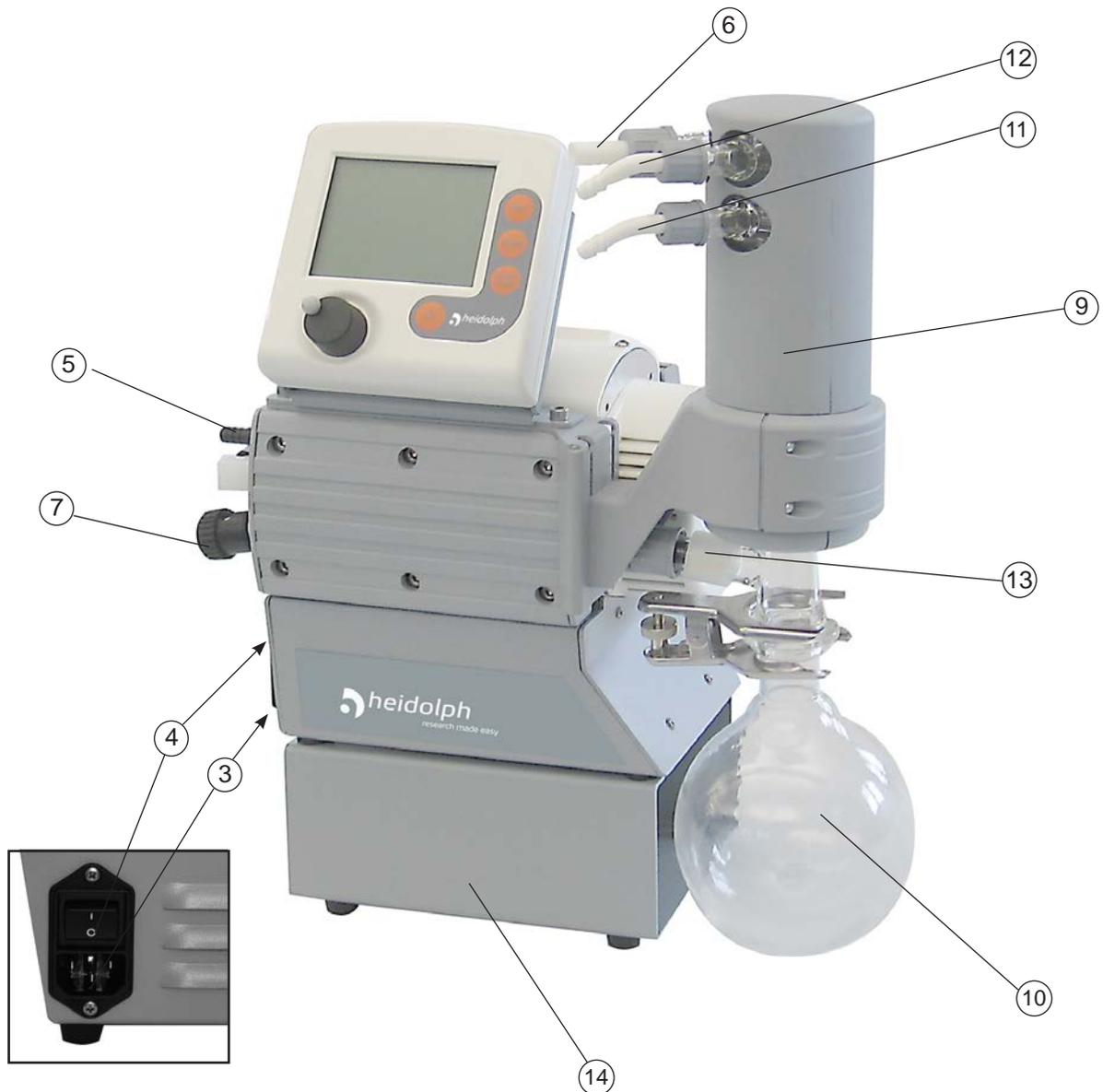
4 Use and operation

When switching on the controller for the very first time, a menu to select the language of the controller menu is displayed. Select the desired language (e.g. "*English*") by turning the selection knob and press to confirm. Then select the pressure unit ("*mbar*", "*Torr*" or "*hPa*") in the same way.
It is possible to access the language selection menu at any time by switching on the controller while keeping the selection knob pressed.

4.1 Using a Hei-CHILL reflux cooler

If using the Hei-VAC Vario Station together with the Hei-CHILL reflux cooler, place the Hei-VAC Vario Station directly on top of the Hei-CHILL.
If using the Hei-VAC Vario Station without the Hei-CHILL reflux cooler, an extra foot has to be installed for operation with the condensate cooler (14; included in the scope of delivery of the condensate cooler). Position the Hei-VAC Vario Station simply on the extra foot, thereby placing the pump's feet in the four hollows of the extra foot.
Install the coolant hoses in such a way that the stability of the pump is assured even with a full catchpot


4.2 Installing in a vacuum system

⚠CAUTION

- Connection lines at the pump inlet have to be gas tight. Particles and dust must not be aspirated, the user has to provide appropriate filters if necessary. The user must ensure their suitability concerning gas flow, chemical resistance and safeness against clogging prior to use.
- Connect an exhaust line gas tight at the pump outlet if necessary. Always dispose of exhaust gases appropriately (e.g. into a fume hood). If there is risk of release of dangerous or polluting fluids, install an appropriate system to catch and dispose of those fluids.
- Reduce the transmission of vibration and prevent loading due to rigid pipelines. Insert elastic hoses or flexible elements as couplings between the pump and rigid pipes. **Attention:** Flexible elements tend to shrink when evacuated.
- The exhaust line has always to be free (pressureless) to ensure an unimpeded discharge of gas.
- Especially if the gas ballast valve is open, a power failure may cause unintentional ventilation of the pump and the vacuum system. In case this constitutes a potential source of danger, take appropriate safety measures.
- Make sure ventilation is adequate if the pumping unit is installed in a housing or if ambient temperature is elevated. Provide external venting if necessary. Keep a distance of minimum 20cm between fan and ambient parts.

NOTICE

After switching off the pump, wait 60 sec. minimum until next switching on.
Avoid throttling losses by using connecting pipes with large diameter and keep them as short as possible.
In case of perturbing exhaust noise connect an exhaust hose.
Install outlet pipelines always falling to avoid backflow of condensate towards the pump.
When assembling, ensure **vacuum-tightness**. After assembly, check the complete system for leaks.
Secure hose connections at the pump appropriately against accidental detaching.

The controller can only be operated with components which are compatible to the BUS system, e. g. optional coolant and venting valves.

vacuum connection
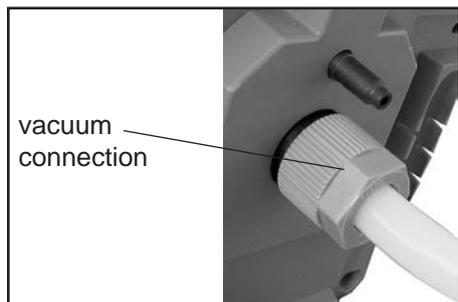
Pressure transducer of the controller:
Max. permitted pressure at the pressure transducer: 1.5 bar (absolute).
☞ The display flashes at a pressure higher than 1080 mbar. Release pressure immediately. **Risk of bursting!**
☞ Condensate and deposits in the pressure transducer affect the measuring result.
☞ Clean pressure transducer if necessary.

4.3 Condensate cooler (accessory)

overpressure safety relief device

catchpot at the outlet
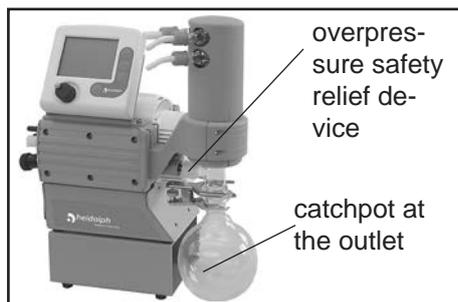
Catchpot:
The round bottom flask is coated with a protective layer to prevent disintegration in case of breakage or implosion.
➡ Assemble the catchpot using the joint clip.

outlet (gas!; hose nozzle 10 mm)

(2)

(1)
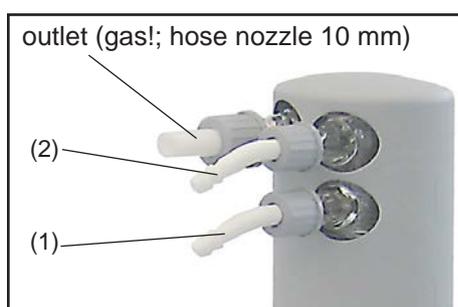
Condensate cooler:
➡ Assemble hose nozzles for coolant inlet (1) and coolant outlet (2) pipelines at the condensate cooler.
The **condensate cooler** enables an efficient condensation of the pumped vapors at the outlet.
☞ No backflow of condensates.
☞ Controlled recovery of condensates.
☞ Next to 100% solvent recovery.
☞ The isolation cover protects against glass splinters in case of breaking, acts as thermal isolation to avoid condensation of humidity and is intended to absorb shocks.

NOTICE

Attach the pipelines of the coolant circuit to the respective hose nozzles (hose nozzles 6-8 mm, see image) at the waste vapor condenser. Check hose connections prior to starting operation of the cooling system.
Secure coolant hoses at the hose nozzles (e.g. with hose clip) to prevent their accidental slipping.

⚠ CAUTION

- The gas outlet (hose nozzle 10 mm) must not be blocked. The exhaust pipeline has always to be free and pressureless to enable an unhindered discharge of gases.
- If necessary connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapors to the surrounding atmosphere.
- **Attention**: Install hoses of the cooling system in a way to avoid flow / dropping of condensed water onto the pumping unit (especially cables and electronic parts).
- Ensure that the **coolant outlet pipeline** is always free and that it cannot get blocked.
- Maximum permissible coolant pressure at the condensate cooler: 6 bar (absolute)
- Install coolant valves always in the supply line of the waste vapor condenser only.
- Comply with the maximum permissible coolant pressures of additional components in the coolant circuit (e.g cooling water valve).
- Avoid overpressure in the coolant circuit (e.g. caused by blocked or squeezed coolant hoses).

4.4 During operation

⚠ CAUTION

- **Maximum ambient temperature**: 40 °C
- Make sure ventilation is adequate if pump is installed in a housing or if ambient temperature is elevated.
- **Potentially dangerous gases or vapours** at the outlet of the pump have to be drained and disposed appropriately.
- Due to the high compression ratio of the pumps, pressure at the outlet port might be generated being higher than the maximum permissible pressure compatible with the mechanical stability of the system. Ensure that the pump outlet cannot become blocked or restricted.

NOTICE

If pumping condensable vapours (water vapour, solvents, ...), let the pump run with **gas ballast** to reduce condensation in the pump.

If pump is installed in altitudes of more than 1000 m above mean sea level check compatibility with applicable safety requirements, e. g. IEC 60034 (motor may overheat due to insufficient cooling).
Do not start the pump if the **pressure at outlet port** exceeds **maximum 1.1 bar (absolute)**. Attempts to start the pump at higher pressures may cause blockade and damage of the motor.
Check compatibility with **maximally permitted pressure** at inlet and outlet.

Prevent internal condensation, transfer of liquids or dust. The diaphragm and valves will be damaged, if liquids are pumped in significant amounts.
Check the pump regularly for external soiling and deposits, clean if necessary to avoid an increase of the pump's operating temperature.

The motor is protected by a **temperature sensor at the circuit board:** Current limitation if the temperature at the circuit board is higher than 70°C, switching off the pump if the temperature is higher than 85°C. In case of blockade of the motor (after 10 attempts to start-up) the pump is switched off.
If the pump is switched off due to safety measures, manual reset is necessary. Isolate the pump from mains. Eliminate cause of failure before restarting the pump.
Avoid high heat supply (e. g. due to hot process gases).

A warm up period (approx. 15 min.) is required to ensure that rated ultimate vacuum and pumping speed are attained.

4.5 Attention: Important notes regarding the use of gas ballast

DANGER

➡ When using air rather than inert gas, risk of significant damage to equipment and/or facilities, risk of personal injury or even loss of life exists due to the formation of hazardous and/or explosive mixtures if air and pumped media react inside or at the outlet of the pump.

WARNING

➡ Make sure that air/gas inlet through the gas ballast valve never leads to hazardous, explosive or otherwise dangerous mixtures. If in doubt, use inert gas.
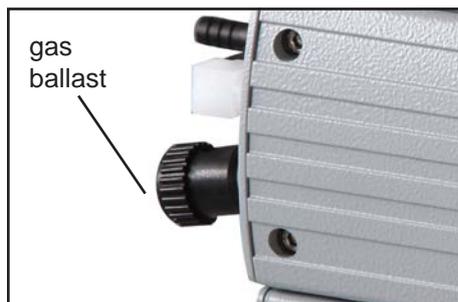
gas ballast

In case of **condensable vapors** (water vapor, solvents, ...):
☞ Do not pump vapor until the pump has reached its operating temperature.
☞ Open gas ballast valve.
☞ The gas ballast valve is open if the arrow on the gas ballast cap points upwards.

☞ With gas ballast valve open ultimate vacuum will be reduced, pumping speed is decreased.
☞ Use inert gas at the air inlet to avoid the formation of explosive mixtures.
☞ Close gas ballast valve by turning it 180°.

In case of low boiling solvents when the formation of condensate is unlikely, the use of gas ballast might be unnecessary.
Operating the pump without gas ballast increases the solvent recovery rate at the condensate cooler (accessory).

Attention: Notes concerning the operation of the condensate cooler (accessory)

WARNING

☞ The gas outlet (hose nozzle 10 mm) must not be blocked. The exhaust pipeline has always to be free and pressureless to enable an unhindered discharge of gases.
☞ Connect the exhaust to a suitable treatment plant to prevent the discharge of dangerous gases and vapors to the surrounding atmosphere.
☞ Ensure that the **coolant outlet pipeline** is always free and that it cannot get blocked.

CAUTION

• Check the overpressure safety relief device at the condensate cooler regularly, replace if necessary. Check especially for conglutination and cracks.
• Maximum permissible coolant pressure at the condensate cooler: 6 bar (absolute).
• Comply with the maximum permissible coolant pressures of additional components in the coolant circuit (e.g coolant valve).
• Install optional coolant valves always in the supply line of the waste vapor condenser only.
• Avoid overpressure in the coolant circuit (e.g. caused by blocked or squeezed coolant hoses).

• In case of **condensation**: Check liquid level in the catchpot during operation. Avoid overflowing of the catchpot.

NOTICE	Do not allow the catchpot to get overfilled. Maximum liquid level approx. 80% to avoid problems when removing the catchpot. Check liquid level in the catchpot regularly and drain catchpot in time. Permissible range of coolant temperature at the condensate cooler: -15°C to +20°C. Check hose connections prior to starting operation of the cooling system. Check coolant hoses regularly during operation.

Removing the catchpot:
Remove joint clip, remove catchpot and drain condensate.

- Reassemble drained catchpot.

NOTICE	**Important:** Comply with regulations when disposing solvents/condensates. Reuse if possible, purify if contaminated.

4.6 Shutdown

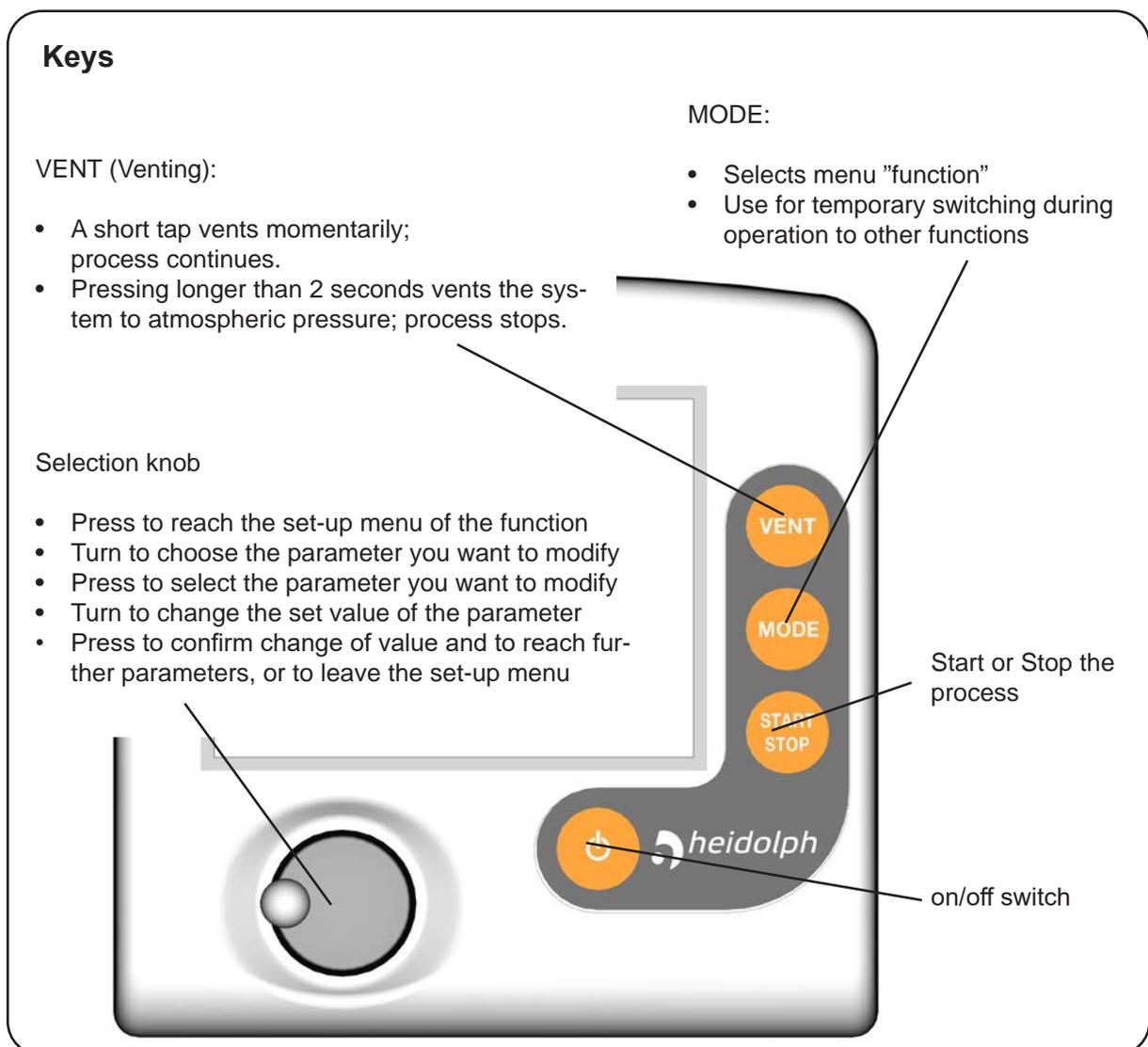| **NOTICE**	**Short-term:** Has the pump been exposed to condensate? - Allow the pump to continue to run at atmospheric pressure for a few minutes Has the pump been exposed to media which may damage the pump materials or forms **deposits**? - Check and clean pump heads if necessary.

Long-term:
- Take measures as described in section short-term shutdown.
- Separate pump from the application.
- Drain catchpot.
- Close inlet and outlet port (e. g. with transport caps).
- Close gas ballast.
- Store the pump in dry conditions.

5 Controller

When switching on the controller for the very first time, a menu to select the language of the controller menu is displayed. Select the desired language e.g., "*English*" by turning the selection knob and press to confirm. Then select the pressure unit ("*mbar*", "*Torr*" or" *hPa*") in the same way.
It is possible to access the language selection menu at any time by switching on the controller while keeping the selection knob pressed.

After switching on the device the **version number of the software** is displayed, then the preselected function with the pressure reading.

Keys

VENT (Venting):

- A short tap vents momentarily; process continues.
- Pressing longer than 2 seconds vents the system to atmospheric pressure; process stops.

MODE:

- Selects menu "function"
- Use for temporary switching during operation to other functions

Selection knob

- Press to reach the set-up menu of the function
- Turn to choose the parameter you want to modify
- Press to select the parameter you want to modify
- Turn to change the set value of the parameter
- Press to confirm change of value and to reach further parameters, or to leave the set-up menu

Start or Stop the process

on/off switch

Display and symbols

Vac control

100 ↓
10   100

1013.2
mbar
1   1000
VAC   ATM

Function of the device:
(displayed in the upper left corner)

Pump down
Vac control
Auto mode
Program
Configuration

1013.2	Actual absolute pressure at the pressure transducer
mbar	
Torr	Preselected pressure unit
hPa	

Symbol	Description
100	Vacuum control to a preset vacuum value (here 100 mbar/Torr/hPa)
	Actual pressure = set vacuum
↑	flashing: actual pressure > preset maximum value ("*Maximum*")
↓	Minimum value ("*Minimum*") reached
00:00:00	Process runtime (only if process control is running)
↓	Pump down (continuous pumping)
50%	Pump symbol is displayed when pump is running. The pump's motor speed in % is displayed additionally
5	Time meter is running (in function "VACUULAN"), remaining time in minutes is displayed
	Venting valve switched on
	Coolant valve switched on
	PC symbol: controller is in remote operation
	Control is running
	Warning notice (if necessary in combination with other symbols), flashing
	Level sensor activated
	Emission condenser Peltronic connected

Notes on selecting the function

The controller can be adapted to the specific application by choosing the appropriate function depending on the connected components and the requirements of the application.

Automatic detection of the components
When switching on the controller the actual configuration of the connected components is checked automatically.
Connected components are **detected automatically** and used and supervised until the controller is switched off. Switch off/on the controller to renew the configuration.
The last mode of operation and the preselected values (e. g. for pressure, speed or time for switching off) are stored.
In case of similar operation conditions it is possible to start immediately, if the preselections are chosen appropriately.

The controller features **functions and a configuration menu**, see section "Menu guide". Each of these functions includes specific preselection possibilities and is adapted automatically with regard to the connected components.
Depending on the connected components (e. g. valves) some menu items might not be active!

Changing the function:
➡ Switch controller on.
➡ Press START/STOP to terminate control in case control is running.
➡ Press key MODE.
➡ Select function with knob and press to confirm.
☞ Depending on the selected function the controller controls different components:

"Pump down"
• Pumping unit depending on pressure and time preselections with continuous speed control
• Coolant valve (optional)

"Vac control"
• Pumping unit with pinpoint precision according to pressure preselection
• Coolant valve (optional)

"Auto mode"
• Pumping unit with pinpoint precision with fully automatic boiling point determination and adaptation
• Coolant valve (optional)

"Program"
• Pumping unit depending on pressure and time preselections or "Auto mode"
• Coolant valve (optional)

"VACUULAN"
• Pumping unit depending on pressure and time preselections with continuous speed control
• Coolant valve

"Configuration"
Preselections for
• Adjustment of the pressure transducer
• Interface RS-232
• Sensors (configuration and switching between several sensors)
• Display (brightness and contrast of the display, language, sound)
• Autostart (automatic restart after power failure)
• Defaults (Resetting the controller is to factory set values)

☞ The menu "Configuration" is also accessible by pressing the selection knob while the start display is shown.

5.1 Menu guide

Pump down

Speed	HI
Minimum	Off
Delay	Off
Duration	Off

- - - - - - Graphic - - - - - -
- - - - - - - Back - - - - - - -

Vac control

Set vacuum	100 mbar
Speed	HI
Maximum	Off
Delay	Off
Duration	Off

- - - - - - Graphic - - - - - -
- - - - - - - Back - - - - - - -

Pump down

10   100

1013.2
1   1000
VAC   mbar   ATM

Vac control

10   100

1013.2
1   1000
VAC   mbar   ATM

MODE   MODE

Configuration

Adjustment	1013 mbar
RS-232...	
Sensors...	
Display...	
Autostart	Off
Defaults	Cancel

- - - - - - Back - - - - - - -

Function

Pump down
Vac control
Auto mode
Program
VACUULAN
Configuration
- - - - - Back - - - -

MODE

Auto mode

10   100

1013.2
1   1000
VAC   mbar

Auto mode

Sensitivity	normal
Speed	HI
Minimum	Off
Delay	Off
Duration	Off

- - - - - - Graphic - - - - - -
- - - - - - - Back - - - - - - -

MODE   MODE

VACUULAN

10   100

1013.2
1   1000
VAC   mbar   ATM

Program

10   100

1013.2
1   1000
VAC   mbar   ATM

VACUULAN

Set vacuum	25 mbar
Switch on	200 mbar
Delay	15 min

- - - - - - Graphic - - - - - -
- - - - - - - Back - - - - - - -

Program

Edit	
Open	0
Store	0
Delay	Off

- - - - - - Graphic - - - - - -
- - - - - - - Back - - - - - - -

5.2 Function Pump down

➡ **Continuous pumping with pressure and time settings**

• **Operation on demand of a speed controlled pumping unit**

Preselections

☞ Use the selection knob to select the parameters. All parameters can be altered even while operation control is running.

☞ *Speed:* Preselection of the motor speed for pump down. The selection "HI" effects the maximum speed and best ultimate vacuum of the pump (with automatic speed reduction at ultimate vacuum). The "*Speed*" is adjustable in a range of 1-100% and to "HI".

☞ *Minimum:* The controller switches the pump off once the preset value for "*Minimum*" has been reached.
"*Minimum*" is adjustable in a range of 1-1060 mbar or can be set to "Off".
A preset "*Duration*" (process time) is without effect, if the process is stopped due to a preset "*Minimum*" before "*Duration*" is reached.

☞ *Delay:* "*Delay*" determines the time the coolant valve is running on after the process has been stopped.
The "*Delay*" is adjustable in a range of 1-300 minutes or can be set to "Off".

☞ *Duration:* "*Duration*" determines the total process time since control start.
The process time is adjustable between 1-1440 minutes (24 h) or can be set to "Off". "Off" indicates that no endpoint for pump down is determined.
If a "*Duration*" is preset, the controller switches off the pump when the preset process time is reached, also if a preset "*Minimum*" is still not reached.

☞ If neither "*Minimum*" nor "*Duration*" are preset, process control has to be stopped by pressing key "STOP".

The screen-shot shows the factory-set values.

Pump down	00:00:00
Speed	HI
Minimum	Off
Delay	Off
Duration	Off
- - - - - - Graphic - - - - - - -	
- - - - - - - Back- - - - - - - -	
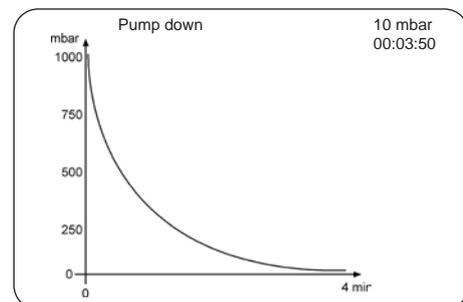
When selecting "*Graphic*" the display shows a pressure vs. time curve.

The timeline in the diagram adapts automatically to the process time.
☞ Press the selection knob twice to return to the standard display.

Temporary switching from "Pump down" to "Vac control" or "Auto mode" (only if control is running):
☞ Press key "MODE". The controller switches to function "Vac control", the current vacuum is used as set value.
☞ Pressing key "MODE" again switches to function "Auto mode". The controller adapts the boiling pressure starting from the current vacuum.
☞ The preset function of the controller does not change due to this temporary switching. When pressing key "STOP" the controller is set again to the function "Pump down".

Adapting the pumping speed during pump down:
☞ Press the selection knob and turn.
☞ Turning the knob to the left reduces the speed.
☞ Turning the knob to the right increases the speed.

5.3 Function Vac control

➡ **Vacuum control to a preset vacuum value**

• **Operation on demand of a speed controlled pumping unit**

Preselections

☞ Use the selection knob to select the parameters. All parameters can be altered even while operation control is running.

☞ **Set vacuum:** The "*Set vacuum*" is the set point for vacuum control with pinpoint precision. The selection "Turbo" leads to the optimum backing pressure for a turbomolecular pump.
The "*Set vacuum*" is adjustable in a range of 1 - 1060 mbar or can be set to "Turbo".

☞ **Speed:** The maximum motor speed can be preselected (to control the pumping speed).
The selection "HI" (recommended) provides the optimum pumping speed of the pump and therefore an optimum ultimate vacuum.
The "*Speed*" is adjustable in a range of 1-100% or can be set to "HI".

☞ **Maximum:** An upper pressure limit can be preselected. The pump switches off if the pressure limit is exceeded, e. g. at the end of suctions or filtrations. The pressure limit is only active once the pressure has gone below "*Maximum*".
The "*Maximum*" is adjustable in a range of 1059 - 1 mbar (at the least 1 mbar higher than the "set vacuum") and to "Off". "Off" means that no "Maximum" value is preset.

☞ **Delay:** "*Delay*" determines the time the coolant valve is running on after the process has been stopped.
The "*Delay*" is adjustable in a range of 1-300 minutes or can be set to "Off".

☞ **Duration:** "*Duration*" determines the total process time since control start.
A preset "*Duration*" (process time) is without effect, if the process is stopped due to a preset "*Maximum*" before "*Duration*" is reached.
The "*Duration*" is adjustable between 1-1440 minutes (24 h) or can be set to "Off". "Off" means that no endpoint of the process is defined.

The screen-shots show the factory-set values.
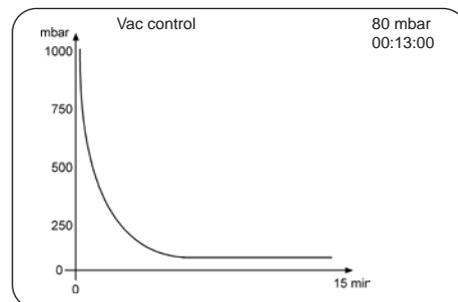
When selecting "*Graphic*" the display shows a pressure vs time curve.

The timeline in the diagram adapts automatically to the process time.

☞ Press the selection knob twice to return to the standard display.

Temporary switching from "*Vac control*" to "Auto mode" while process control is running:

☞ Press key MODE. The controller switches to "Auto mode" and adapts the boiling pressure starting with the actual set value. The preset function of the controller does not change due to this switching. When pressing key "STOP" the controller is in function "Vac control" again.

Adjustment of the set vacuum during vacuum control:

Dynamic, interactive adaptation:
☞ Press the selection knob and keep pressed.
☞ Turning the knob for a 1/4 turn to the left causes pump down.
☞ Turning the knob for a 1/4 turn to the right causes venting.
☞ When the knob is released the current pressure value is used as new set value.

Alternatively:
Fine tuning:
The set vacuum can be adapted simply by turning the selection knob while process is running.
☞ Turn the selection knob.
☞ A full turn causes a change of the set vacuum of 12 mbar.
☞ Turning the knob for one detent causes a change of the set vacuum of 1 mbar.

5.4 Function Auto mode

➡ **Control of a pump in function auto mode: Automatic determination of the boiling vacuum and automatic adaptation of the boiling vacuum in case of changing process parameters.**

Preselections
☞ Use the selection knob to set the parameters.

☞ *Sensitivity***:** The "*Sensitivity*" of the control effects the control speed. High sensitivity leads to a reduced pumping down speed, e. g. for small amounts of solvents or foaming processes. Use a low sensitivity for "uncritical" processes to reduce process time. Usually setting the "*Sensitivity*" to "normal" is appropriate.
The "*Sensitivity*" is adjustable to "high", "normal" or "low".

☞ *Speed:* The maximum motor speed can be preselected (to limit the pumping speed). The selection "HI" (recommended) causes an automatic limitation of the adaptation depending on parameters determined during the process. Only in case of very sensitive processes it is advisable to reduce the maximum speed.
The "*Speed*" is adjustable in a range of 1-100% or can be set to "HI".

☞ *Minimum***:** If the vacuum value reaches "*Minimum*" the process is stopped. Use "*Minimum*" for automatic process termination. When selecting "Auto" the controller switches off automatically at the end of the process (boiling plateau), recommended only for large amounts of solvents.
The "*Minimum*" is adjustable in a range of 2 - 1060 mbar, or can be set to "Auto" or to "Off".

☞ *Delay:* "*Delay*" specifies the time the coolant valve continues to run after process stop.
The "*Delay*" is adjustable in a range of 1-300 minutes or can be set to "Off".

☞ *Duration:* "*Duration*" determines the total process time since control start.
The "*Duration*" is adjustable between 1-1440 minutes (24 h) or can be set to "Off". A preset "*Duration*" (process time) is without effect, if the process is stopped earlier by reaching the preset "*Minimum*".

The screen-shot shows the factory-set values.

Auto mode	00:00:00
Sensitivity	normal
Speed	HI
Minimum	Off
Delay	Off
Duration	Off
- - - - - - Graphic - - - - - -	
- - - - - - - Back - - - - - - -	
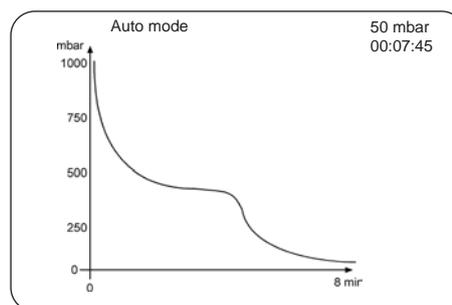
When "*Graphic*" is selected the display shows a pressure vs. time curve (right screen-shot).

The timeline in the diagram adapts automatically to the process time.
☞ Press the selection knob twice to return to the standard display.

Temporary switching from "Auto mode" to function "Vac control"
☞ Press key "MODE". The controller switches to "Vac control" . The current pressure value is used and held as new set point.
☞ The preset function of the controller does not change due to this temporary switching. When pressing key "STOP" the controller is set again to the function "Auto mode".

5.5 Function Program

➡ **Ten programs with up to ten program steps with preset values for vacuum and time can be set and stored.**

☞ **Edit:**
Preset values for the process run can be edited:
Time: Process runtime for each program step to reach a preset vacuum level or if setting "Step" runtime after having achieved the vacuum level. The summed up total process runtime is shown in the base line. Attention: A preset runtime of 99:59:59 hours in the final program step will cause the process to run endlessly. Termination of the process by pressing key STOP.
Vacuum: Vacuum level to be attained.
Venting valve: Operating a venting valve to reach a preset vacuum level.
"Step": "Step" causes pump down as fast as possible to the preset vacuum level. As soon as the vacuum level is reached the time meter starts running.
"Auto": Auto = ⬇: automatic determination of a boiling point and adaptation to changes of the boiling point within the preselected time interval. Auto = ➤ : only automatic adaptation to changes of the boiling point. The program step is finished when the selected time or pressure value has been reached.
Selecting "Auto" in combination with "Step" in one program step is not possible.

☞ **Open:** Open programs (Program 0 - 9).

☞ **Store:** This command stores an edited program or the program of the last process to one of the storage spaces 0 - 9.

☞ **Delay:** "*Delay*" specifies the time the coolant valve continues to run after process stop.
The "*Delay*" is adjustable in a range of 1-300 minutes or can be set to "Off".

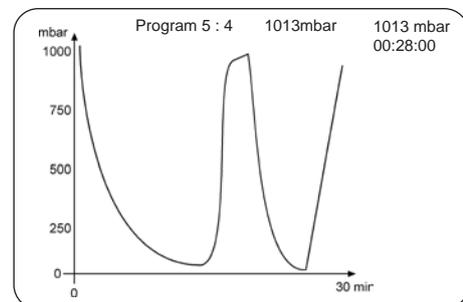**Editing:**
☞ To select row: turn and press selection knob.
☞ Turning the selection knob: adjust parameter.
☞ Pressing the selection knob: confirm parameter, jump to next parameter.
☞ After 5 seconds without change the parameter is quit automatically.

The screen-shot shows the factory-set values.

When "*Graphic*" is selected the display shows a pressure vs. time curve (right screen-shot).

The number of the program with program step, the set vacuum, the actual vacuum and the runtime are displayed.
The timeline in the diagram adapts automatically to the process time.
☞ Press the selection knob twice to return to the standard display.

The last process is stored in the temporary data memory as long as the controller stays switched on. This program can be transferred to a storage space and edited.

Once the program is finished, the clock symbol starts to flash. Confirm the end of the program by pressing START/STOP (clock symbol will disappear).

Attention: If *"Autostart"* is set to *"On"*, the program will start again (time will be reset to 00:00:00) after a power failure or after switching the controller off/on. Only if the end of the program (clock symbol flashing) has been confirmed by pressing START/STOP, the program will not start again.

Attention: If the controller is set to "*Defaults***": "On", all stored programs will be deleted.**

Example for use

Example: Degassing and automatic distillation with timing at a rotary evaporator:

No	hh:mm:ss	Vac	Vent.	Step	Auto
	Program				
01	00:00:00	ATM	✓	✓	
02	00:10:00	300		✓	
03	01:00:00	2			⬇ *
04	00:01:00	ATM	✓	✓	
05	00:00:00	0			
06	00:00:00	0			
07	00:00:00	0			
08	00:00:00	0			
09	00:00:00	0			
10	00:00:00	0			
- - - - - - - - - - - - back - - - - - - - - - - - - - -					
	01:11:00				

*   If the pressure difference between the vacuum for degassing and the expected vacuum for distillation is very small (distillation vacuum >75% of the degassing vacuum), select the function "Auto◄" instead of "Auto⬇" (adapting the vacuum).

Program step 1 should be always a definite initial state, here atmospheric pressure (ATM). To reach this state definitely, set a tickmark at "Vent." and "Step" (press selection knob).
In step 2 pumping down starts as fast as possible ("Step") to 300 mbar and the vacuum is kept for 10 minutes (degassing of the solvent).
In step 3 "Auto⬇" causes an automatic search of the boiling vacuum in the pressure interval between 300 mbar and 2 mbar and automatic adaptation to a changing boiling pressure. The following step starts if time is over (after 60 minutes) even if the preset pressure (2 mbar) is still not reached or if a vacuum of 2 mbar is reached even if the preset time has not passed.
Step 4 vents to atmospheric pressure as fast as possible and switches off the control after one minute.

5.6 Function VACUULAN

➥ **Optimised vacuum control for vacuum networks**

• **Operation on demand of a speed controlled pump (VARIO)**

Preselections
☞ Use the selection knob to select the parameters.

☞ *Set vacuum* (lower switch-off value): If the pressure drops below the "*Set vacuum*" a time-meter starts to run; additionally the motor speed is reduced. The time-meter is reset, if the pressure exceeds the pressure value for switching on again ("*Switch on*"). If the "*Set vacuum*" is not reached within 100 hours the controller signals an error.
The "*Set vacuum*" is adjustable in the range of 1 - 1060 mbar.

☞ *Switch on*: If the pressure exceeds the pressure for switching on, pumping down starts again.
The "*Switch on*" pressure is adjustable in the range of 1 - 1060 mbar.
In case of sudden high pressure increase pumping starts again even if the "*Switch on*" pressure has not been not reached (pressure increase control).

☞ *Delay:* If the vacuum is below "*Set vacuum*" for longer than the "*Delay*" time, the pump is stopped.
The pumping down is started again in case of rapid pressure increase or if the "*Switch on*" level is exceeded.
The "*Delay*" is adjustable in a range of 1-300 minutes or can be set to "Off".

The screen-shot shows the factory-set values.
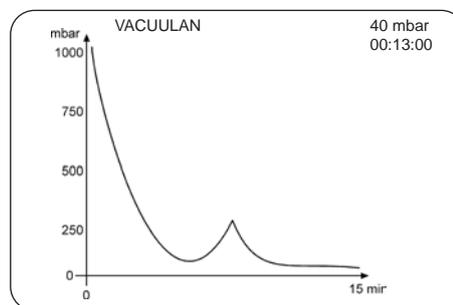
When "*Graphic*" is selected the display shows a pressure vs. time curve (right screen-shot).

The timeline in the diagram adapts automatically to the process time.
☞ Press the selection knob twice to return to the standard display.

5.7 Examples for use

Assembly of a vacuum system
☞ Assemble vacuum connection lines between controller, vacuum pump and apparatus.
☞ Assemble electrical connections.
☞ Connect coolant if necessary.

5.7.1 Vacuum for filtration and suction

☞ Select function "**Pump down**".
☞ If necessary set value for *"Speed"* (high or low pumping speed). Reduce the speed in case of fast sedimentation (formation of a filter cake).
☞ Set "*Minimum*" to a value which still does not lead to evaporation of the solvent.
☞ Start process by pressing key "START/STOP".

alternatively:

☞ Select function "**Vac control"**.
☞ If necessary set value for *"Speed"* (high or low pumping speed). Reduce the speed in case of fast sedimentation (formation of a filter cake).
☞ Set *"Maximum"* to switch off the pump at the end of the process or in case of a filter cake crack (pressure **increase**).
☞ Start process by pressing key "START/STOP".

☞ **Tip for filtration:** Adjust preset pressure to a value well above the boiling pressure of the solvent (e.g. water >>20 mbar). Set the maximum pressure to e.g. 500 mbar. Once the filtration has finished, the pressure increases and the pump is switched off automatically.

5.7.2 Vacuum for gel dryer, drying chambers and vacuum concentrators

☞ Select function "**Pump down**". "*Speed*": "HI" is recommended. For gel dryers set a lower speed if necessary if the gels tend to break.
☞ Set *"Minimum"* to prevent volatile components to evaporate. The process is stopped automatically as soon as "*Minimum*" is reached.
☞ Set a process time ("*Duration*") if necessary.
☞ Start process by pressing key "START/STOP".

alternatively:

☞ Select function **"Vac control"** to dry at a predetermined vacuum level.
☞ Set *"Set vacuum"* to the evaporation vacuum of the solvent.
☞ Set a process time ("*Duration*") if necessary.
☞ Start process by pressing key "START/STOP".

5.7.3 Vacuum for distillation and evaporation (e. g. rotary evaporator)

Semi-automatic distillation and evaporation
☞ Select function "**Pump down**".
☞ Start process by pressing key "START/STOP".
☞ Observe process. As soon as evaporation starts, press key "MODE" (switching to "Vac control"). The vacuum level is kept constant (at the boiling pressure). Fine tuning of the vacuum value is possible by turning the selection knob.
Pressing key "MODE" a second time switches to "Auto mode" causing the vacuum level to be automatically adapted to changes of the boiling pressure.

alternatively:

☞ Select function "**Vac control"**.
☞ Setting a maximum *"Speed"* leads to a faster or slower process.
☞ To set *"Maximum"* is usually not necessary because the pressure does not increase at the end of the evaporation.
☞ Set a value for *"Duration"* if the process should automatically be terminated at the end of a definite time.
☞ Set *"Set vacuum"* depending on the solvent and the temperature.
☞ Start process by pressing key "START".
☞ **Temporary switching to" Auto mode"**: Press key "MODE". The controller switches to "Auto mode". The setting of the controller does not change due to this switching. After pressing key "START/STOP" the controller is in "Vac control" again.

alternatively:

Fully automatic determination and adaptation of the boiling point (recommended)
☞ Select function "**Auto mode"**.
☞ Start process by pressing key "START/STOP".
☞ The function "Auto mode" allows a fully automatic distillation even if the boiling pressure is unknown. In case of solvent mixtures the vacuum is reduced until all solvents or volatile components are evaporated (with respect to the ultimate vacuum of the pump and the bath temperature).
☞ If *"Minimum"* is set the controller switches off the pump when the preset vacuum value is reached. The *"Minimum"* should be clearly below the boiling vacuum of the solvent to be evaporated and above the ultimate vacuum attainable in the apparatus. If the *"Minimum"* is set to *"Auto"*, the controller automatically switches off the pump at the end of the evaporation (recommended for large solvent quantities only). The setting of *"Duration"* (process runtime) is without effect if the pump is switched off due to *"Minimum"* before *"Duration"* is over.
☞ When setting a value for *"Duration"* the controller switches off the pump when *"Duration"* has passed even if a preset *"Minimum"* is still not reached.
☞ If neither *"Minimum"* nor *"Duration"* is preset, the process has to be finished by pressing key STOP.

5.7.4 Vacuum for VACUU•LAN networks

☞ Select function **VACUULAN**.
☞ Set *"Set vacuum"* to a pressure value which can be reached in the vacuum network reliably under consideration of the ultimate vacuum of the pump and the leak rate of the system in case of no vacuum demand.
☞ Choose the vacuum for switching on the pump again (*"Switch on"*) in order to ensure sufficient vacuum for all processes.
☞ Preset *"Delay"* if necessary.
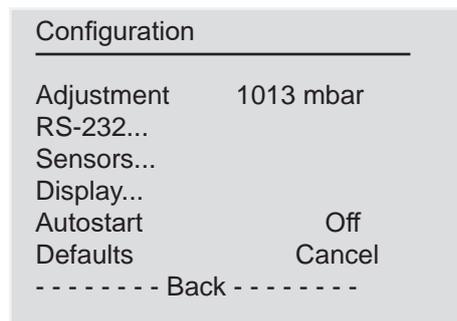☞ Start process by pressing key "START/STOP".

5.8 Function Configuration

In the menu "Configuration" the device parameters are preselected.

Preselections
☞ Use the selection knob to select the parameters.

☞ ***Adjustment*****:** Adjustment of the pressure transducer under vacuum and/or at atmospheric pressure, see also section "Readjustment the controller".
Adjustment at atmospheric pressure is carried out at an absolute pressure value between 1060 - 700 mbar and under vacuum at an absolute vacuum value between 0 - 20 mbar. In the range between 20 and 700 mbar no adjustment is possible; ---- mbar is displayed.

☞ ***RS-232*****:** Configuration of the interface, setting of parameters and commands, see section "Interface".
Baud rate can be set to 19200, 9600, 4800 or 2400, parity on "8-N-1", "7-O-1" or "7-E-1", Handshake on "no", "Xon-Xoff" or "RTS-CTS" and remote on "On" or "Off".

☞ ***Sensors*****:** Selection of the pressure transducer to be controlled (maximum 4 external sensors).

☞ ***Display*****:** Selection of the device parameters "*Brightness*" between 0 - 100%, "*Contrast*" between 0 - 100%, "*Sound*" "On" or "Off", "*Units*" "mbar", "hPa" or "Torr", "*Language*" "German", "English", "French", "Italian", "Spanish", "Turkish", "Korean", "Chinese", "Portuguese", "Russian", "Polish", "Dutch", "Japanese", "Finnish".

☞ ***Autostart*****:** If "*Autostart*" is set to "On" the controller restarts a running process automatically after a mains failure. If this is unwanted, set Autostart to "Off".
Attention: If "*Autostart*" is preselected, the process starts immediately after power failure without pressing any further key. It is the user's responsibility to ensure that no dangerous status of the system due to the automatic start-up can occur and to provide appropriate safety measures. If necessary, the user has to check **prior to starting the process** if the option "*Autostart*" is enabled.

☞ **Defaults**: If "*Defaults*" is set to "Load", the controller is reset to factory set values. All stored programs and parameters are deleted.

The screen-shot shows the factory-set values.

Configuration

Adjustment   1013 mbar
RS-232...
Sensors...
Display...
Autostart   Off
Defaults   Cancel
- - - - - - - - Back - - - - - - - -

---

6 Readjustment of the controller

NOTICE	The vacuum gauge was adjusted using factory standards, which are traceable through regular calibration in an accredited laboratory (German Calibration service) 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 certainly known. The adjustment mode can be activated only if the process control is inactive. Press key "START/ STOP" if necessary. In the range between 20 and 700 mbar no adjustment is possible; ---- mbar is displayed.

Adjustment at atmospheric pressure

→ **1013 mbar**
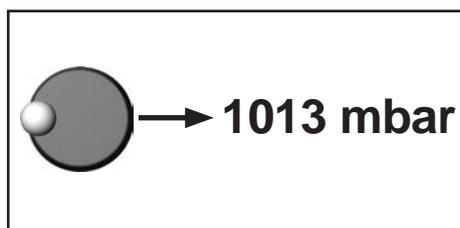
An adjustment at atmospheric pressure is only possible if the pressure is higher than 700 mbar.
Ventilate the measurement connection of the controller and/or the vacuum system. Make sure that the pressure transducer is at atmospheric pressure.

➡ In function "*Configuration*" select program "*Adjustmen*t" 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, the next airport.......(take into account the difference in altitude between e. g. airport and laboratory).
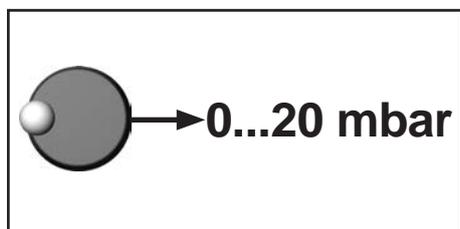
Adjustment under vacuum

0 mbar

An adjustment under vacuum is only possible if the pressure is lower than 20 mbar absolute.
Evacuate the measurement connection of the controller to a pressure < 0.1 mbar (e. g. by applying a good two-stage rotary vane pump).

➡ In function "*Configuration*" 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 mbar reduces the accuracy of the measurement. If the pressure is significantly higher than 0.1 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 mbar, adjustment to a precisely known reference pressure within the range of 0 ..... 20 mbar is possible. Evacuate the measurement connection of the controller to a pressure within 0 ..... 20 mbar

➡ In function "*Configuration*" 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 ..... 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).

7 Interface parameters

The controller is equipped with a serial interface (RS 232C, nine-pole 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.
☞ For optimal electromagnetic compatibility assemble an interface filter (cat. no.: 638235).

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

7.1 Setting of the interface

Set the interface parameters directly at the controller. The factory set values are underlined.
Edit and confirm the interface parameters in the function "Configuration" in the menu "RS-232" 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, "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. Therefore switch off the controller. Switch on the controller and press selection knob within 2s.
➡ A maximum of ten commands per second is possible.
➡ Read commands and commands "REMOTE", "CVC" and "STORE" can be sent always. 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 <CR><LF>.
➡ The answer of the controller is always terminated with <CR><LF>.
➡ Numerical values and parameters can be written without leading zeros.
➡ The answer of the controller is always with leading zeros.

7.2 Read commands

Operation	Command	Response	Description
current pressure	IN_PV_1	XXXX.X mbar/Torr/hPa	unit according to preselections
current speed	IN_PV_2	XXX%	1-100% or HI
time	IN_PV_3	XX:XX h:m	process runtime
pressure	IN_PV_X	XXXX.X XXXX.X ...mbar	pressure of all connected sensors
operation time of the controller	IN_PV_T	XXXXdXXh	operation time in days and hours
device set preselections	IN_CFG	XXXXXXXXXXXXXXX	

- 0: remote operation off
- 1: remote operation on
- 1.......9: sensor quantity
- 1.......9: sensor number
- 0: remote module not connected
- 1: remote module connected
- 0: level sensor not connected
- 1: level sensor connected
- 0: fault indicator not connected
- 1: fault indicator connected
- 0: venting valve not connected
- 1: venting valve connected
- 0: coolant valve not connected
- 1: coolant valve connected
- 0: in-line valve not connected
- 1: in-line valve connected
- 0: VMS not connected
- 1: VMS connected
- 0: VARIO pump not connected
- 1: VARIO pump connected
- 0: acoustic signal off
- 1: acoustic signal on
- 0: autostart off
- 1: autostart on
- 0: pressure unit mbar
- 1: pressure unit Torr
- 2: pressure unit hPa
- 0......D: language* (hexadecimal)
- 0: VACUULAN
- 1: Pump down
- 2: Vac control
- 3: Auto mode
- 4: Program
- 5: Measuring device

* Language:
0: German
1: English
2: French
3: Italian
4: Spanish
5: Turkish
6: Korean
7: Chinese
8: Portuguese
9: Russian
A: Polish
B: Dutch
C: Japanese
D: Finnish

Read commands

Operation	Command	Response	Description

Status process control — **IN_STAT** — **XXXXXX**

- 0 control off
- 1 pump down/ determining boiling point
- 2 set vacuum reached/ boiling pressure found
- 3 current pressure below set vacuum/ automatic switch-off

- 0 VACUULAN
- 1 Pump down
- 2 Vac control
- 3 Auto mode
- 4 Program
- 5 measurement device

- 0: venting valve closed
- 1: venting valve open

- 0: coolant valve closed
- 1: coolant valve open

- 0: in-line valve closed
- 1: in-line valve open

- 0: pump off
- 1: pump on

Fault status — **IN_ERR** — **XXXXXXXXX**

- 0: last interface command correct
- 1: last interface command incorrect

- 0: catchpot not full
- 1: catchpot full

- 0: no external fault
- 1: external fault

- 0: no fault at pressure transducer
- 1: fault at pressure transducer

- 0: no overpressure
- 1: overpressure

- 0: no fault at venting valve
- 1: fault at venting valve

- 0: no fault at coolant valve
- 1: fault at coolant valve

- 0: no fault at in-line valve
- 1: fault at in-line valve

- 0: no fault at pump
- 1: fault at pump

Read commands

Operation	Command	Response	Description
	IN_SP_1	XXXX mbar or XXXX Torr or XXXX hPa	set vacuum
	IN_SP_2	XXX%	maximum speed (100% = "HI")
	IN_SP_3	XXXX mbar or XXXX Torr or XXXX hPa	switching on pressure for VACUULAN or two point control
	IN_SP_4	XX:XX h:m	delay (00:00 = Off)
	IN_SP_5	XXXX mbar or XXXX Torr or XXXX hPa	switch off pressure ("Maximum" for "Vac control", "Minimum" for "Pump down")
	IN_SP_6	XX:XX h:m	process runtime
time	IN_SP_P1y	XX:XX:XX h:m:s	time in program step y (0.....9)
pressure	IN_SP_P2y	XXXX mbar	pressure in program step y (0.....9)
valve	IN_SP_P3y	X	0: no venting valve in program step y (0.....9) / 1: venting valve in program step y (0.....9)
Step	IN_SP_P4y	X	0: no "Step" in program step y (0.....9) / 1: "Step" in program step y (0.....9)
Auto	IN_SP_P5y	X	0: no "Auto" in program step y (0.....9) / 1: "Auto" in program step y (0.....9)
	IN_VER	CVC 3000 VX.XX	software version

Read commands

7.3 Write commands

Operation	Command	Parameter	Description
function	OUT_MODE	X	0: VACUULAN 1: Pump down 2: Vac control 3: Auto mode → 30: sensitivity: low / 31: sensitivity: normal / 32: sensitivity: high 4: Program (optional)

Attention: If control is running only switching from 1 to 2, 2 to 3 and 3 to 2 is possible with takeover of the set vacuum.

Operation	Command	Parameter	Description
configuration (bus monitoring)	OUT_CFG	XXXX	0: acoustic signal off / 1: acoustic signal on 0: Autostart off / 1: Autostart on 0: pressure unit mbar / 1: pressure unit Torr / 2: pressure unit hPa 0.....D: language*

* Language:
0: German
1: English
2: French
3: Italian
4: Spanish
5: Turkish
6: Korean
7: Chinese
8: Portuguese
9: Russian
A: Polish
B: Dutch
C: Japanese
D: Finnish

Operation	Command	Parameter	Description
set vacuum	OUT_SP_1	XXXX	unit according to preselection (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
set vacuum with venting	OUT_SP_V	XXXX	unit according to preselection (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
speed	OUT_SP_2	XXX	speed in %, (100% = "HI")
start-up pressure	OUT_SP_3	XXXX	unit according to preselection (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
delay	OUT_SP_4	XX:XX	hh:mm (hours:minutes)
switch off pressure	OUT_SP_5	XXXX	unit according to preselection (0001 to 1060 mbar (hPa) or 0001 to 0795 Torr)
switch-off time	OUT_SP_6	XX:XX	hh:mm (hours:minutes)
open program	OUT_SP_PL	X	programm 0.....9
store program	OUT_SP_PS	X	programm 0.....9
time	OUT_SP_P1y	XX:XX:XX +XX:XX:XX	total runtime until program step y (0.....9) or time for program step y (0.....9) (additive)
pressure	OUT_SP_P2y	XXXX	pressure at program step y (0.....9)
valve	OUT_SP_P3y	X	0: no venting valve in program step y (0.....9) / 1: venting valve in program step y (0.....9)
Step	OUT_SP_P4y	X	0: no "Step" in program step y (0.....9) / 1: "Step" in program step y (0.....9)
Auto	OUT_SP_P5y	X	0: no "Auto" in program step y (0.....9) / 1: "Auto⬇" in program step y (0.....9) / 2: "Auto⬅" in program step y (0.....9)

Write commands

Operation mode	Command	Parameter	Description
	START	X	1 started
	STOP	X	0 Stop and delete fault 1 Stop 2 Stop with adopting the set vacuum
	REMOTE*	X	0 Remote off 1 Remote on
	ECHO**	X	0 Echo off 1 Echo on, write command with return value
	OUT_VENT	X	0 venting valve closed 1 venting valve open 2 venting until atmospheric pressure
	STORE	X	store settings permanently, if Echo "1" after realisation
	OUT_SENSOR	X	1 internal sensor 2-9 external sensors (if connected)

*   If remote operation is selected or deselected, the user has to ensure that no dangerous status of the system due to the change of the mode of operation can occur and to provide appropriate safety measures, 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.
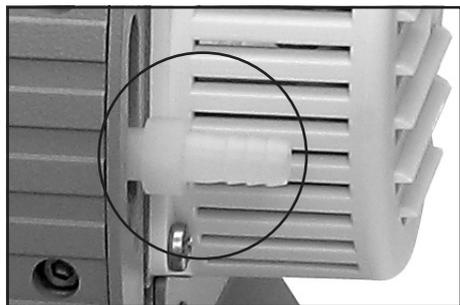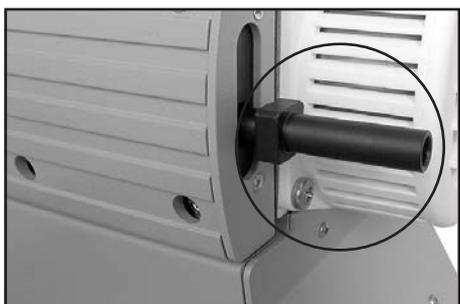
Connection plug arrangement
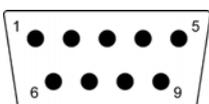
2: RxD   5: Mass
3: TxD   7: RTS
4: DTR   8: CTS
                9: +5V (Bluetooth)

8 Assembling the condensate cooler (accessory)

➡ Unscrew the hose nozzle at the outlet of the pump using an open-ended wrench.

➡ Screw hose connection of the condensate cooler to the outlet of the pump using an open-ended wrench.
☞ Align the square of the hose connection so that the mounting angle for the condenser can be assembled (see figure).

➡ Unscrew both Phillips screws at the fixing plate of the controller.

➡ Remove catchpot at the condenser.
➡ Loosen the union nut at the inlet of the condenser.
➡ Position mounting angle below the fixing plate of the controller on the housing cover of the pump as far as it will go (over the square of the hose connection). At the same time put the pump's outlet hose connection into the inlet of the condenser.
➡ Put Allen head screws through both plates and screw to the square nuts in the housing cover.
➡ Fasten the union nut at the inlet of the condenser.

➡ Assemble catchpot.

☞ In case, place the pump on the accessory foot enclosed.
☞ Install the coolant hoses in such a way that the stability of the pump is assured even with a full catchpot

9 Troubleshooting

Fault	Possible cause	Remedy
❏ No display.	➡ Mains not plugged in?	✔ Plug in mains plug.
	➡ Controller or pumping unit switched off?	✔ Switch device on.
	➡ BUS cable to internal power supply not plugged in?	✔ Plug in BUS cable at controller.
	➡ Other causes (device defective)?	✔ Contact local distributor.
❏ Display disappears.	➡ Short circuit at connected valves?	✔ Replace valves.
	➡ Short circuit at the RS 232 plug?	✔ Check plug and cable.
	➡ Other causes (device defective)?	✔ Contact local distributor.
❏ Pressure reading incorrect.	➡ Pressure transducer not adjusted?	✔ Readjust the controller.
	➡ Humidity inside the pressure transducer?	✔ Let the pressure transducer dry, e.g. by pumping. Readjust if necessary. Determine and eliminate the cause for humidity.
	➡ Pressure transducer contaminated?	✔ See „Cleaning the pressure transducer".
❏ Digital pressure reading is flashing, display shows "0.0".	➡ Pressure transducer not correctly adjusted under vacuum?	✔ Adjust controller correctly.
❏ No digital pressure reading.	➡ Pressure transducer defective?	✔ Contact local distributor.
❏ Digital pressure reading is flashing, one blip*.	➡ Overpressure at the pressure transducer, pressure > 1060 mbar?	✔ Release pressure immediately (risk of bursting)! ⚠
❏ 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.
❏ No digital pressure reading, warning triangle is flashing, seven blips*.	➡ Seven blips: Internal sensor defective?	✔ Contact local distributor.
❏ Warning triangle and pump symbol are flashing, six blips*.	➡ Fault at the pump?	✔ Check pump, restart controller.
❏ Clock symbol is flashing. Control is stopped.	➡ Preselected process time is over?	✔ Confirm by pressing key START/STOP.

* Blips only if in function "Configuration" sound is set to "On".

Fault	Possible cause	Remedy
❑ Internal venting valve does not respond, valve symbol is not displayed.	➡ External pressure transducer connected and active?	✔ Select internal pressure transducer or connect external venting valve.
❑ Venting valve does not respond, valve symbol is displayed.	➡ Valve soiled?	✔ Clean valve.
❑ Function "Vac control": Control stops, "arrow up" is flashing.	➡ Preset maximum pressure exceeded?	✔ Confirm by pressing key START/STOP. Adapt maximum pressure value if necessary.
❑ Function "Pump down": Control stops, "arrow down" is flashing.	➡ Pressure below preset minimum pressure?	✔ Confirm by pressing key START/STOP. Adapt minimum pressure value if necessary.
❑ Function is not displayed, no menu.	➡ No controllable device connected (valve, pump)?	✔ Connect devices or use controller as measuring device.
❑ Controller does not respond when pressing keys (except ON/OFF). PC symbol is displayed.	➡ Controller in remote mode?	✔ Control controller via interface or switch off remote mode.
❑ Controller does not respond when operating any keys. No change after switching off/on.		✔ Contact local distributor.
❑ Pump does not start or stops immediately. Warning triangle and pump symbol are flashing.	➡ Pump has been exposed to condensate?	✔ Allow pump to run for some minutes at maximum speed with atmospheric pressure at the inlet.
	➡ Overpressure in the exhaust line?	✔ Open exhaust line, ensure a free (pressureless) outlet line.
❑ Pump too noisy.	➡ Loud exhaust noise?	✔ Connect hose or silencer to pump outlet.
	➡ Diaphragm crack or diaphragm clamping disc loose?	✔ Perform maintenance.
	➡ Other than above mentioned causes?	✔ Contact local distributor.
❑ Pump seized.		✔ Contact local distributor.

Fault	Possible cause	Remedy
❑ Pump does not achieve ultimate vacuum or normal pumping speed.	➡ Wrong settings at controller?	✔ Select function "Pump down" with speed set to "HI" and check again.
	➡ Centring ring at a small flange connection not correctly positioned or leak in the pipeline or vacuum system?	✔ Check pump directly - connect controller directly at pump inlet - then check connection, pipeline and vacuum system if necessary.
	➡ Long, narrow vacuum line?	✔ Use lines with larger diameter, length as short as possible.
	➡ Pump has been exposed to condensate?	✔ Allow pump to run for some minutes with atmospheric pressure at the inlet.
	➡ Deposits have been formed inside the pump?	✔ Clean and inspect the pump heads.
	➡ Diaphragms or valves defective?	✔ Replace diaphragms and/or valves.
	➡ Outgassing substances or vapour generated in the process?	✔ Check process parameters.
	➡ Pump too hot?	✔ Allow pump to cool down. Determine and eliminate the cause of overheating.
	➡ Pressure for automatic switching off reached?	✔ Adapt pressure for automatic switching off, if necessary.

Attention: All error messages including a flashing warning triangle have to be confirmed (deleted) by pressing key START/STOP.

10 Cleaning the pressure transducer

The controller itself is maintenance free.
Contamination of the pressure transducer or deposits will influence the accuracy of measurement.

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

Clean a contaminated pressure transducer as follows:
➡ Disconnect vacuum connection.
➡ 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 gauge head chamber several times with alcohol in order to remove all solvent residues.
➡ Allow the pressure transducer to dry.
➡ Assemble vacuum connection.
➡ Readjust the pressure transducer if necessary.

vacuum
connection
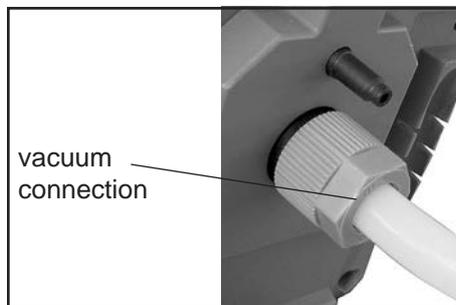
11 Replacing diaphragms and valves

WARNING

☞ **Before starting maintenance** isolate the pump from the electrical supply and wait **two minutes** after isolating the equipment from mains to allow the capacitors to discharge. Avoid the release of pollutants. Allow sufficient cooling of the pump.

☞ Ensure that the pump cannot be operated accidentally. **Never operate the pump if covers or other parts of the pump are disassembled. Never operate a defective or damaged pump.**

CAUTION

• **Attention**: The pump might be contaminated with the process chemicals that have been pumped during operation. Ensure that the pump is decontaminated before maintenance and take adequate precautions to protect people from the effects of dangerous substances if contamination has occurred. Ensure that the maintenance technician is familiar with the safety procedures which relate to the products processed by the pumping system.

• Wear appropriate safety-clothing when you come into contact with contaminated components. Avoid the release of pollutants.

NOTICE

Before starting maintenance vent the pump and isolate it from the vacuum system and the electrical supply. Drain condensate if applicable, avoid the release of pollutants. Allow sufficient cooling of the pump. Separate pump from cooling water circuit (if applicable).

All bearings are encapsulated and are filled with long-life lubricant. Under normal operating conditions, the pump is maintenance free. The valves and diaphragms as well as the motor capacitors 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.

Depending on individual cases it may be efficient to check and clean the pump heads on a regular basis. In case of normal wear the lifetime of the diaphragms and valves is > 10000 operating hours.

- Prevent internal condensation, transfer of liquids or dust. The diaphragm and valves will be damaged, if liquids are pumped in significant amount.

If the pump is exposed to corrosive gases or vapor or in case of deposits, maintenance should be carried out frequently.

- Regular maintenance will improve the lifetime of the pump and also protect both man and environment.

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

order no.

Set of seals Hei-VAC Vario Station 11-300-00-40
(4 diaphragms, 8 valves, diaphragm key)

Valve 23-30-01-01-91
Diaphragm..23-30-01-01-92
Diaphragm key..02-07-02-01-13

NOTICE

The pump may contain black and white colored valves. In case of maintenance replace all valves by the black valves enclosed in the set of seals.


Tools required (metric):

- diaphragm key w/f 46 (enclosed in the set of seals)
- open ended wrench w/f 14 / 17
- hex key size 4
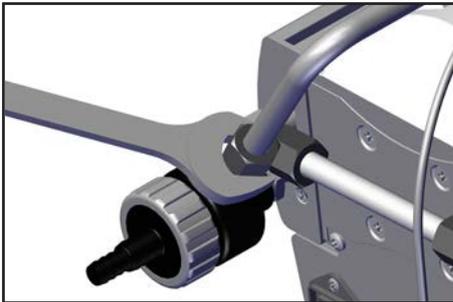- Phillips screw driver size 2

☞ **Please read section "Replacing diaphragms and valves" completely before starting maintenance.**
Partially the pictures show pumps in other versions. This doesn't influence replacing diaphragms and valves of the pump.
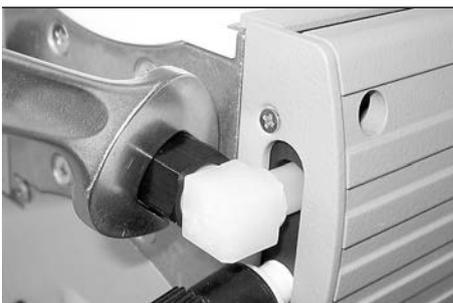
11.1 Cleaning and inspecting the pump heads
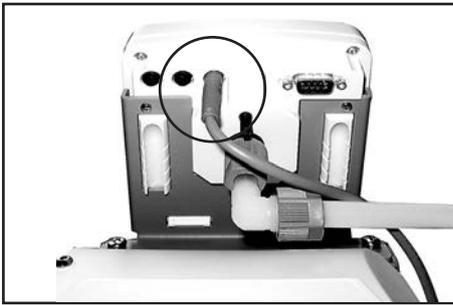
➡ Remove control cable at the rear side of the controller. Do not cant when removing plug connection!

➡ Use open-ended wrench (w/f 17) to loosen the union nut at the hose connection next to the inlet and remove hose.

➡ Use Phillips screw driver to remove both screws at the fixing plate of the controller and remove controller.

➡ Use open-ended wrench (w/f 17) to loosen the union nut at the hose connection next to the gas ballast.
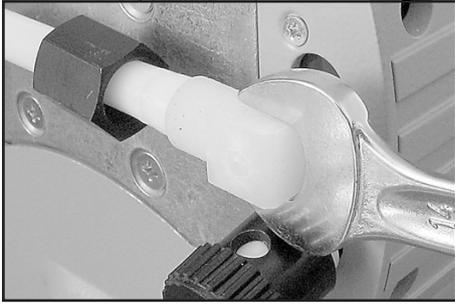
➡ Use open ended wrench (w/f 14) to turn the elbow fitting 1/4 of a turn, disconnect the hose. Do not remove the elbow fitting from the pump head.

☞ Through reassembly a leak may result.

## View of the disassembled pump head parts

10
9
8
7
6
5
4
3
2
1
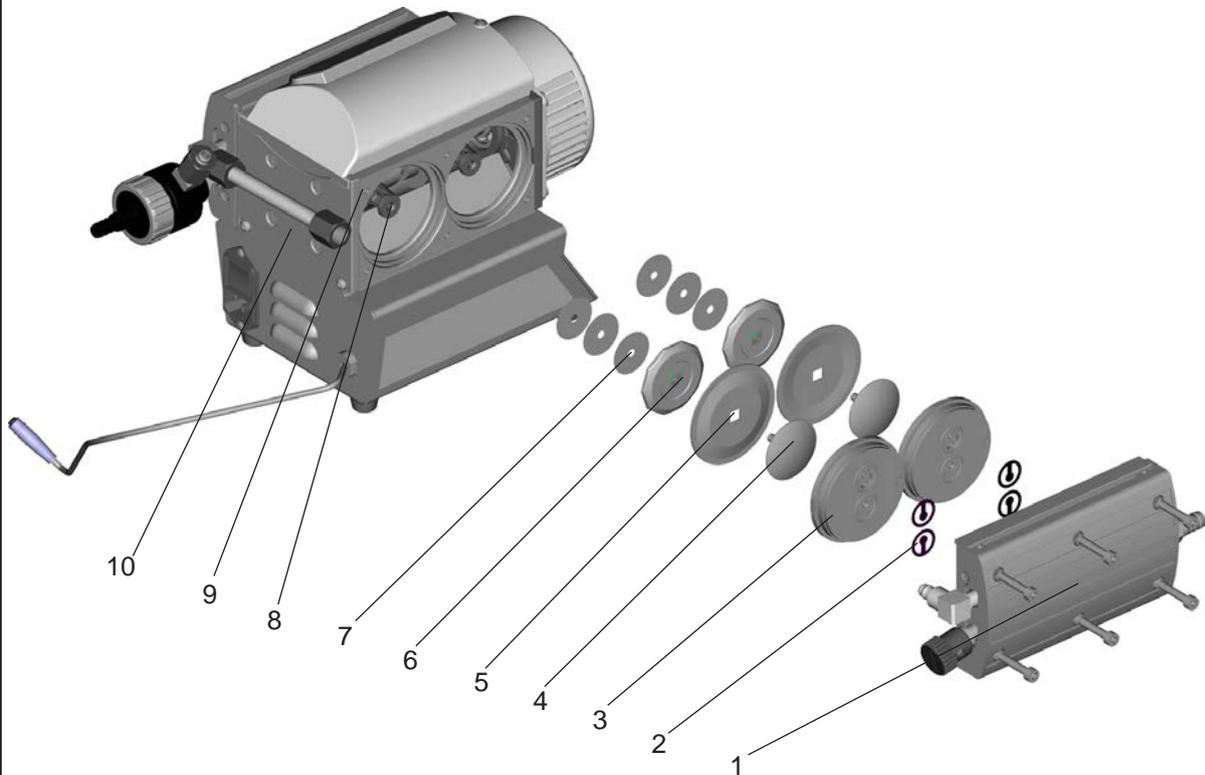
1: housing cover with inner part
2: valve
3: head cover
4: diaphragm clamping disc with connecting screw
5: diaphragm

6: diaphragm support disc
7: washers
8: rod
9: housing
10: bearing plate

➡ Use a hex key size 4 to loosen the six socket head screws at the pump head and remove the upper housing (housing cover with housing cover insert).

☞ Never remove parts using a spiky or sharp-edged tool (e. g. screw driver), we recommend to use a rubber mallet or compressed air (to be blown carefully into port).
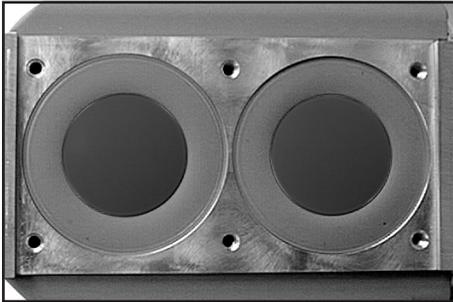
➡ Take the head covers carefully off the housing to check the valves.
Note the position of the valves and remove them.

☞ Replace valves if damaged.
Use petroleum ether or industrial solvent to remove deposits. Do not inhale.

➡ Check the diaphragms for damage and replace if necessary.

11.2 Replacing the diaphragm
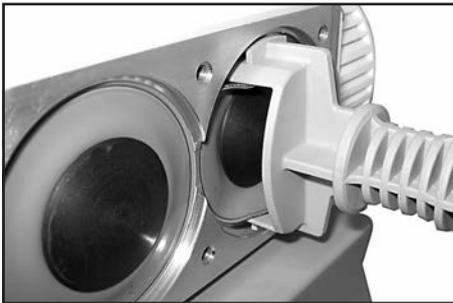
➡ Lift diaphragm carefully.

➡ Apply pressure to the adjacent clamping disc to bring connecting rod into upper turning point position if necessary.

☞ Never use a spiky or sharp-edged tool to lift the diaphragm.

➡ Use the diaphragm key to grip the diaphragm support disc below the diaphragm.

➡ Apply pressure to the diaphragm clamping disc to bring the diaphragm into the lower turning point position. Press diaphragm key against diaphragm clamping disc, unscrew and remove diaphragm support disc with diaphragm.

☞ If the old diaphragm is difficult to separate from the support disc, immerse assembly in naphtha or petroleum ether. Do not inhale!

☞ Check for washers under clamping disc. Do not mix the washers from the different heads. Make sure that the original number is reassembled at the individual pump head.

➡ Position new diaphragm between diaphragm clamping disc with square head screw and diaphragm support disc.

☞ Attention: Position diaphragm with pale side towards diaphragm clamping disc (to pump chamber).

➡ Lift diaphragm at the side and position carefully together with diaphragm clamping disc and diaphragm support disc in the diaphragm key.

☞ Avoid damaging the diaphragm: Do not bend diaphragm too much.

➡ Check for washers. Do not mix the washers from the different heads. Assemble the original number of washers between support disc and connecting rod at the individual pump head.

☞ Smaller number of washers: The pump will not attain final vacuum. More washers: Clamping disc will hit head cover; noise or even blockage of the pump.

11.3 Replacing the valves and assembly of the pump heads

☞ Make sure that the square head screw of the diaphragm clamping disc is correctly seated in the guide hole of the diaphragm support disc.

☞ Position washers between diaphragm support disc and rod.

➡ Assemble diaphragm clamping disc, diaphragm and diaphragm support disc to connecting rod.
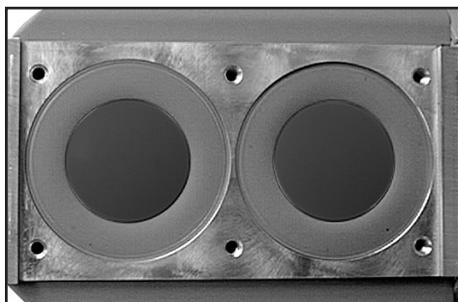
➡ Bring the diaphragms into a position in which they are in contact with the housing and centred with respect to the bore.

➡ Lay pump down and support appropriately.
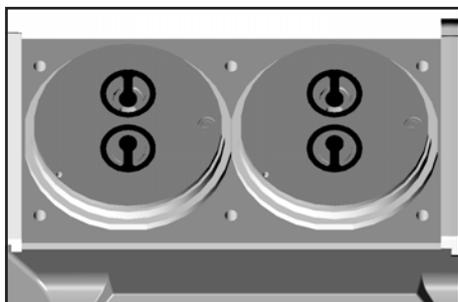
➡ Assemble head covers and valves.

☞ Check for correct position (see also fig. below).

It is absolutely essential to comply with the positions and orientations of the head covers and valves!

Scheme of pump head with head covers and valves

"side with hose connection"

valves at the inlet (kidney-shaped opening beside valve)

valves at the outlet (round centred opening under valve)

"motor side"
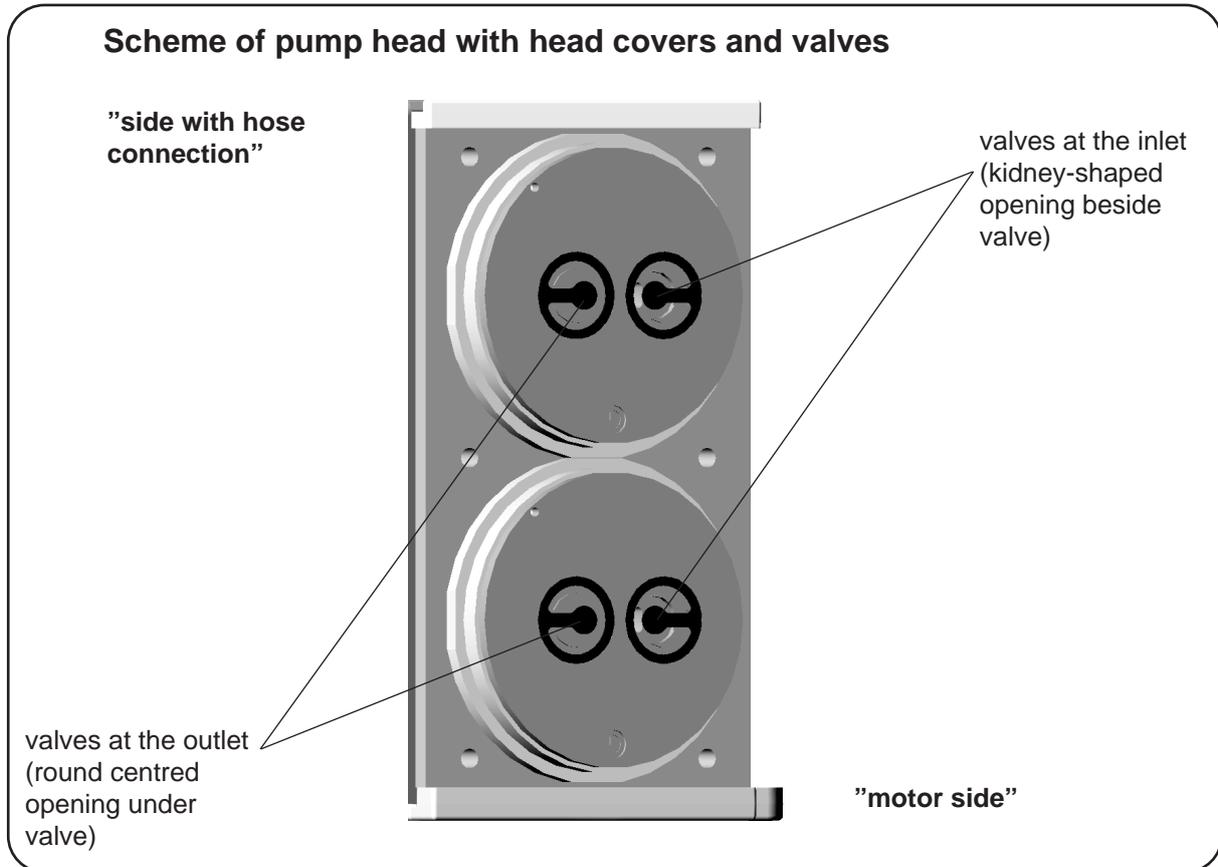
➡ Position housing cover.
☞ Move housing cover slightly to make sure that the head covers are correctly positioned.
➡ Screw in the six socket head screws fixing the housing cover crosswise first slightly, then tighten.
☞ Do not tighten until head cover is in contact with housing, **max. torque 6 Nm.**

Replace diaphragms and valves similarly on the other side of the pump (only ROTAVAC vario control).

➡ Use open ended wrench (w/f 14) to reconnect hose to elbow fitting.
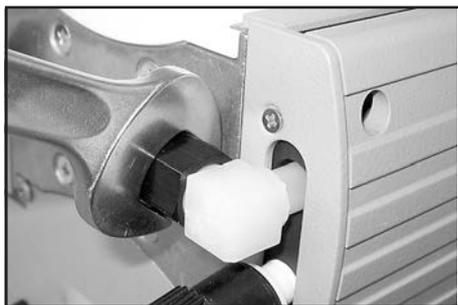
➡ Tighten union nut first by hand and then tighten one full turn using open ended wrench.

➡ Assemble controller: Use Phillips screw driver to screw both screws through the fixing plate in the square nuts in the housing cover.
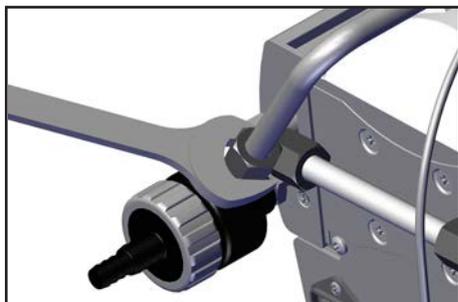
➡ Connect hose to the connection at the inlet of the pump. Tighten union nut first by hand and then tighten one full turn using open ended wrench.
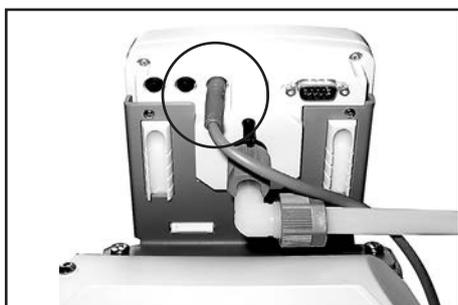
➡ Connect control cable to the rear side of the controller. Do not cant when assembling connection!

If the pump does not achieve the ultimate vacuum:

- In case the diaphragms and valves have been replaced, a run-in period of several hours is required before the pump achieves its ultimate vacuum.
- In case of 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 run-in period:
Check hose connectors at pump head for leaks. If necessary recheck valve seats and pump chambers.

11.4 Replacing the overpressure safety relief device at the condenser
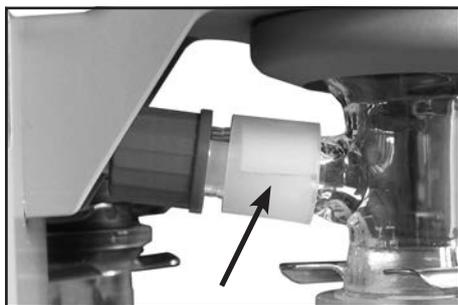
Overpressure safety relief device.......................................
....23-30-01-04-98

Round bottom flask 500 ml, coated ....
.... 514-83000-02

➡ Remove joint clip at the catchpot.

➡ Unscrew the four Torx screws at the counter holder of the condenser and remove condenser. Thereby remove the adapter from the inlet of the condenser.

➡ Pull off old overpressure safety relief device and install new one. Check for correct position of the PTFE-foil under the overpressure safety relief device.

➡ Reassembly in reverse order.

➡ Position adapter in the inlet of the condenser and screw condenser with counter holder to the pump (Torx screws). Fix with union nut.

12 Warranty, liability, copyright

Warranty
Heidolph Instruments provides a three-year warranty on the products described here (with the exception of glass and consumable parts) if registered with enclosed warranty card or via internet (www.heidolph. com). Warranty starts with the date of registration. Without registration warranty starts according to serial number. This warranty covers defects in materials and workmanship. Transit damage is excluded from this warranty.

To file for such warranty service, contact Heidolph Instruments or your local Heidolph Instruments Dealer. If defects in material or workmanship are found, your item will be repaired or replaced at no charge.
Misuse, abuse, neglect or improper installation are not covered by this warranty.
Alterations to the present warranty need Heidolph Instruments' consent in writing.

Exclusion clause
Heidolph Instruments cannot be held liable for damage from improper use or misuse. Remedy for consequential damage is excluded.

Copyright
Copyright in pictures and wording of the present Instruction Manual is held by Heidolph Instruments.

Service Tel.: 0800-588 97 08
Jahre Garantie
3
Years Warranty
Service Tel.: (+49)-9122 992068

13 FAQ / repair work

If any aspect of installation, operation or maintenance remains unanswered in the present manual, please contact the following address.

For repair services please call Heidolph Instruments or your local, authorized Heidolph Instruments Dealer.

Note: You will receive approval for sending your defective item to the following address:

Heidolph Instruments GmbH & Co. KG
Lab Equipment Sales
Walpersdorfer Str. 12
D-91126 Schwabach / Germany
phone: ++49–9122-9920-68
Fax: ++49–9122-9920-65
E-Mail: Sales@Heidolph.de

Safety Information
When shipping items for repair that may have been contaminated by hazardous substances, please:
- advise exact substance
- take proper protective measures to ensure the safety of our receiving and service personnel
- mark the pack IAW Hazardous Materials Act

13 FAQ / repair work

14 Certificate of Decontamination

CERTIFICATE OF DECONTAMINATION
IN CASE OF RETURNS

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Please fill in the required fields.
Note: The sender must package the goods properly and appropriately for transport.

Heidolph Instruments GmbH & Co. KG
Walpersdorfer Straße 12
91126 Schwabach, Germany

Phone: +49 (0) 9122 9920-380
Fax: +49 (0) 9122 9920-19
Email: service@heidolph.de

SENDER

Name _____   First name _____

Company/institution _____   Department _____

_____   Workgroup _____

Address _____

ZC/City _____

Country _____   Phone _____

Email _____

DEVICE DETAILS

Article number _____   **Serial no.** _____

Ticket number _____

Reason for sending in _____

_____

Has the device been cleaned, decontaminated/disinfected?   **Yes**   **No**   (Please mark as applicable)

If yes, which measures were carried out?

Does this device pose a risk to people and/or the environment due to the processing of substances that are hazardous to health, the environment and/or are biohazardous?   **Yes**   **No**   (Please mark as applicable)

If yes, with which substances did the device come into contact?

LEGALLY BINDING DECLARATION

The principal/consignor is aware that they are liable to the agent/consignee for losses or damage incurred due to incomplete and incorrect information.

_____   _____
Date   Signature   Company stamp

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EU-Konformitätserklärung
EU Declaration of conformity

$C\epsilon$ Vakuumpumpe
Vacuum pump

Wir, die Heidolph Instruments GmbH & Co. KG,
We, Heidolph Instruments GmbH & Co. KG,

Heidolph Instruments GmbH & Co. KG
Walpersdorfer Straße 12
91126 Schwabach / Deutschland

erklären, dass die nachstehend bezeichneten Geräte hinsichtlich ihrer Konzeption und Bauart - in der von uns in Verkehr gebrachten Ausführung - den grundlegenden Anforderungen aller nachfolgend angeführten EU-Richtlinien entsprechen. Bei einer mit uns nicht abgestimmten Änderung an dem Gerät verliert diese Erklärung ihre Gültigkeit.

hereby declare, that the product designated below is in compliance with the basic requirements of all applicable EU-directives stated below with regard to design, type of model sold and manufactured by us. This certificate will be invalid if the product is modified without the prior written consent and agreement of the manufacturer.

Hei-VAC Valve Control	591-00130-xx
Hei-VAC Valve Tec	591-00160-xx
Hei-VAC Vario Station	591-00142-xx
Hei-VAC Vario Control	591-00141-xx
Hei-VAC Vario Tec	591-00171-xx
Hei-VAC Valve Industrial	591-07210-xx

Maschinenrichtlinie / Machinery Directive 2006/42/EG
EMV-Richtlinie / Electromagnetic Compatibility Directive 2014/30/EU
Delegierte (RoHS-) Richtlinie / Delegated (RoHS) Directive 2015/863/EU
Angewandte (harmonisierte) Normen / (Harmonized) Standards applied:
EN ISO 12100: 2010, EN 61326-1: 2013, EN 61010-1: 2010, EN IEC 63000: 2018

Bevollmächtigter für die Zusammenstellung der technischen Unterlagen / Person
Authorized to compile the technical file: Jörg Ziel - Heidolph Instruments GmbH & Co. KG,
Walpersdorfer Straße 12, 91126 Schwabach / Germany

Schwabach, 25.06.2021

_____
Wolfgang Jaenicke
Geschäftsführer
Managing Director

_____
Jörg Ziel
Qualitätsmanager
Quality Manager

01-001-025-11-5

Declaration of Conformity

In accordance with UK Government guidance

This declaration is issued under the sole responsibility of the manufacturer,
Heidolph Instruments GmbH & Co. KG
Walpersdorfer Straße 12
91126 Schwabach / Germany

Product: Laboratory vacuum pump
Model:

Hei-VAC Valve Control	591-00130-xx
Hei-VAC Valve Tec	591-00160-xx
Hei-VAC Vario Station	591-00142-xx
Hei-VAC Vario Control	591-00141-xx
Hei-VAC Vario Tec	591-00171-xx
Hei-VAC Valve Industrial	591-07210-xx

Description:
Laboratory vacuum pump to work with laboratory evaporator

The object of the declaration described above is in conformity with the relevant
UK Statutory Instruments (and their amendments):

2008 No. 1597	*The Supply of Machinery (Safety) Regulations*
2008 2016 No. 1091	*The Electromagnetic Compatibility Regulations 2016*
2012 No. 3032	*The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012*

and complies with the following technical standards :
EN ISO 12100:2010, EN 61326-1:2013, EN 61010-1:2010, EN IEC 63000:2018

UK Authorised Representative (for authorities only):
ProductIP (UK) Ltd.
8. Northumberland Av.
London WC2N 5BY

Signed for and on behalf of Heidolph Instruments GmbH & Co. KG
Walpersdorfer Straße 12, 91126 Schwabach / Germany

Schwabach, 26.11.2021

Wolfgang Jaenicke
Managing Director

Jörg Ziel
Quality Manager

01-001-025-28-0

Documents are only to be used and distributed completely and unchanged. It is strictly the users´ responsibility to check carefully the validity of this document with respect to his product.

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Zertifikat

RoHS - Konformitätserklärung

Heidolph Instruments GmbH+ Co. KG / Walpersdorfer Straße 12 / D 91126 Schwabach

An die zuständige Person
To whom it may concern

Datum: **Juli 2019**

RoHS - Konformitätserklärung (Richtlinie 2011 / 65 / EU) und der Erweiterung 2015 / 863
RoHS - Declaration of conformity (Directive 2011 / 65 / EU) and the amended of directive 2015 / 863

Hiermit bestätigt Heidolph Instruments GmbH + Co. KG , dass entsprechend dem heutigen Wissenstand alle von Heidolph Instruments verkauften Laborgeräte der Richtlinie 2011 / 65 / EU (RoHS) und der Erweiterung 2015 / 863 entsprechen.
Diese Geräte erfüllen die derzeitigen Anforderungen der RoHS Direktive für folgende Materialien:
Max. 0,01% des Gewichtes in homogenen Werkstoffen für Cadmium und max. 0,1% des Gewichtes in homogenen Werkstoffen für Blei, Quecksilber, sechswertiges Chrom, polybromierte Biphenyle, polybromierte Diphenylether, Di (2-ethylhexyl) Phthalat, Butylbenzylphthalat, Dibutylphthalat, Diisobutylphthalat.
Bei einzelnen Baugruppen können Maximalkonzentrationsüberschreitungen im Rahmen der zulässigen Ausnahmen der Richtlinie möglich sein.

With this declaration, we confirm (according to current knowledge) that all sold laboratory devices by Heidolph Instruments GmbH & Co. KG fulfill the requirements of the EU directive 2011 / 65 / EU (RoHS) and the amended of directive 2015 / 863.
All devices are compatible with the requirement of the RoHS for the following materials:
Max. 0,01% of the weight in homogeneous material for cadmium and max. 0,1 % of the weight in homogeneous material for lead, mercury, hexavalent chromium, polybrominated biphenyl, polybrominated diphenyl ether, Di (2-ethylhexy l) phthalate, butyl benzyl phthalate, dibutyl phthalate, diisobutyl phthalate.
In the case of individual assemblies, maximum concentrations maybe exceeded within the permissible exceptions of the Directive.

Schwabach, 22.07.2019

Stefan Peters
Vice President Marketing, Innovation &
Technologie

Marcell Sarré
Vice President Quality Management
& Technical Service

Zchng.-Nr.

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China RoHS DECLARATION OF CONFORMITY

Heidolph Instruments 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 biphenlys (PBB):   0.1%
- Polybrominated diphenyl ether (PBDE): 0.1%

Environmental 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 Environmental Friendly Use Period for Heidolph Instruments GmbH & Co.KG products is 25 years.

此表格是按照 SJ/T 11364-2014 中规定制定。

This table is created according to SJ/T 11364-2014

MATERIAL CONTENT DECLARATION FOR Heidolph Instruments GmbH & Co. KG PRODUCTS							
	有毒有害物质或元素 Hazardous substances						
部件名称 Part name	铅 Pb	汞 Hg	铬 Cd	六价铬 Cr(VI)	多溴联苯 PBB	多溴二苯醚 PBDE	环保期限标识 EFUP
包装 Packaging	O	O	O	O	O	O	
塑料外壳/组件 Plastic housing / parts	O	O	O	O	O	O	
电池 Battery	O	O	O	O	O	O	
玻璃 Glass	O	O	O	O	O	O	
电子电气组件 Electrical and electronic parts	X	X	X	O	O	O	
控制器/测量设备 Controller / measuring device	X	O	X	O	O	O	
金属外壳/组件 Metal housing /parts	X	O	O	O	O	O	
电机 Motor	X	O	O	O	O	O	
配件 Accessories	X	O	O	O	O	O	

Page 1 of 2

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注释：此表格适用于所有产品。以上列出的原件或组件不一定都属于所附产品的组成。
Note: Table applies to all products. Some of the components or parts listed above may not be part of the enclosed product.

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.

除上表所示信息外，还需声明的是，这些部件并非是有意用铅(Pb)、汞(Hg)、铬(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 (CrVI), polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE).

Products manufactured by Heidolph Instruments GmbH & Co.KG may enter into further devices or can be used together with other appliances .
With these products and appliances in particular, Heidolph Instruments GmbH & Co.KG will not take responsibility for the EFUP of those products and appliances.

Place, date Schwabach, 19.09. 2019

_____
Wolfgang Jaenicke
Chief Executive Officer CEO

_____
Marcell Sarré
Vice President
Quality Management &
Technical Service

Page 2 of 2

Disclaimer: Our technical literature is only intended to inform our customer. The validity of general empirical values and results obtained under test conditions for specific applications depend on a number of factors beyond our control. It is therefore strictly the users´ responsibility to very carefully check the validity of application to their specific requirements. No claims arising from the information provided in this literature will, consequently, be entertained.

01-005-006-88-0   23/11/2022

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We reserve the right to make technical changes without prior announcement.

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