Operation Manual

Laboratory - Vacuum - Systems

Ultimate pressure 8 mbar

Types	**unregulated**	**LVS 101 Z**
	regulated	**LVS 110 Z**

115022
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1 Important Information

1.1 General Information

The ILMVAC Laboratory-Vacuum-Systems conform to the

- 2006/95/EC Low Voltage Directive
- 2006/42/EC Machinery Directive
- 2004/108/EC Electromagnetic Compatibility Directive

The CE sign is located on the rating plate. Observe the binding national and local regulations when fitting the pump into installations.

Our products are sold worldwide and can therefore be equipped with the typical national plugs and for the various voltages. You will find more information about the available designs under http://www.ilmvac.de.

1.2 Target Groups

This Operating Manual is intended for the personnel planning, operating and maintaining ILMVAC Laboratory-Vacuum-Systems. This group of people includes:

- Designers and fitters of vacuum apparatus,
- Employees working on commercial laboratory and industrial vacuum technology applications and
- Service personnel for laboratory-vacuum-systems.

The personnel operating and maintaining the laboratory vacuum systems must have the technical competence required to perform the work that has to be done.
The user must authorize the operating personnel to do the work that has to be done.
The personnel must have read and understood the complete Operating Manual before using the laboratory-vacuum-systems.
The Operating Manual must be kept at the place of use and be available to the personnel when required.

1.3 Intended Use

- The laboratory-vacuum-system may only be operated under the conditions stated
  - in the "Technical Data" section,
  - on the type plate, and
  - in the technical specification for the order concerned.
- Laboratory-vacuum-systems are approved for extracting, pumping and compressing gases and vapours. If these gases and vapours are toxic or explosive, then the user must observe the currently valid safety regulations for this application. Special types of diaphragm pumps are available for aggressive and explosive gas mixtures.
- Laboratory-vacuum-systems are intended for generating vacuums with ultimate pressures of around 8 mbar.
- The in-built diaphragm pump has been designed to have high resistance to aggressive gases.

1.4 Use for an Unauthorized Purpose

It is forbidden to use the pump for applications deviating from the technical data stated on the type plate or the conditions stated in the supply contract, or to operate it with missing or defective protective devices.

1.5 Safety Devices

Measures such as the following are for the safety of the operating personnel:

- electrical connection with a protective conductor (operating mode S1) and an earthing plug,
- Motor protection switch (thermal),
- “Hot Surface" label on the pump body (warning notice),
- motor hood on the motor fan and
- glass components with a transparent plastic coating which protects them against bursting and cracking

The laboratory-vacuum-system must not be operated without these elements.

1.6 Meaning of the Warning notes

Take note of the warning notices. They are in the following box:

CAUTION ! / WARNING !

Hazard which may lead to serious injuries or material damage.

1.7 Product Standards, Safety Regulations

ILMVAC Laboratory-Vacuum-Systems meet the following product standards:

DIN EN ISO 12100-1 : 2004 DIN EN ISO 12100-2 : 2004	Safety of machines, basic terminology
DIN EN 1012-2 : 1996	Compressors and vacuum pumps
DIN EN 60204-1 : 2006	Electrical equipment of machines
EN 50110-1 (DIN VDE 0105-100)	Operation of electrical installations
EN 61010-1	Safety for laboratory devices
EN 50081-1-2	Electromagnetic compatibility (EMC) Generic specification - Interference resistance for residential, business and industrial areas, and small businesses
EN 50082-1-2	Electromagnetic compatibility (EMC) Generic specification - Interference emission for residential, business and industrial areas, and small businesses
EN 55014	Radio disturbance characteristics of electrical equipment and systems
EN 61000-3-2/3	Electromagnetic compatibility (EMC)
Directive 2006/42/EC	Law and Administration Regulations relating to Machinery
Directive 2002/95/EC	RoHS Restriction of use of certain hazardous substances

The following additional safety regulations apply in the FR Germany:

BGV A2	Electrical equipment and operating materials
VBG 5	Power-driven machines
BGR 120	Guidelines for laboratories
BGI 798	BG hazard assessment in the laboratory
BGG 919	Accident prevention regulations for "compressors"
BGR 189 (BGR 195; 192; 197)	Use of protective working clothes

Observe the standards and regulations applying in your country when you use the laboratory-vacuum-systems.

2 Basic Safety Instructions

2.1 General Information

	**CAUTION !**
Warning notices must be observed. Disregarding them may lead to damage to health and property.	

The laboratory vacuum systems must be operated by personnel who can detect impending dangers and take action to prevent them from materialising.

The user/operator is responsible for correct installation and safe operation.

Prevent condensate collecting in the pump. When pumping vapours which tend to condense, please ensure that the pump is at operating temperature and that the gas ballast valve is open when the pump is switched on.

If there is more than one load on one LVS, they must be separated by check valves.

After finishing work with the diaphragm pump, run it for about 10 minutes with an open gas ballast valve.

The manufacturer or authorized authorised workshops will only service or maintain the laboratory vacuum system if it is accompanied by a fully completed damage report. Precise information about the contamination (also negative information if necessary) and thorough cleaning of the laboratory vacuum system are legally binding parts of the contract.

Contaminated laboratory vacuum systems and their individual parts must be disposed of in accordance with the legal regulations.

The local regulations apply in foreign countries.

2.2 Electricity

The Laboratory Vacuum Systems are supplied for operating mode S1. Please note that the testing must be repeated in accordance with DIN EN 0105, DIN EN 0702 and BGV A2 in case of portable devices.

The local regulations apply in foreign countries.

Please note the following when connecting to the electrical power supply system:

- The electrical power supply system must have a protective connector according to DIN VDE 0100-410 (IEC 60364-4-41).
- The protective connector must not have any breaks.
- The connecting cable must not be damaged.
- All interfaces are under low voltage according to DIN VDE 0100-410.

2.3 Mechanical Systems

Improper use can lead to injuries or material damage. Observe the following instructions:

- Only operate the laboratory vacuum systems with hoses of the specified dimensions.
- The maximum permissible pressure of 1 bar at the suction connection must not be exceeded.
- Hazardous substances must be separated out as far as this is technically possible before they reach the pump.
- External mechanical stresses and vibrations must not be transmitted to the pump. Only use flexible laboratory hoses for connecting laboratory vacuum systems.
- The overpressure generated at the pressure port must not exceed 1 bar.
- The pump must not be used to suck up fluids. Lay the exhaust pipe so that it slopes downwards, so allowing condensate to flow out of the pump. Collect the condensate and dispose of it in an environmentally compatible manner.

CAUTION !

Solid particles in the pumping medium impair the pumping action and can lead to damage. Prevent solid particles penetrating into the pump.

When handling glass vessels, pay attention to:

- Only use glass vessels with a plastic coating for splinter protection.
- Only use vessels which are suitable for use with vacuums (e.g. round-bottomed flasks). We recommend that only glass components supplied by the manufacturer are used. Do not use Erlenmeyer flasks.
- Before each evacuation, check glass vessels for damage which might impair their strength, replace them if any such damage is found.
- Do not heat glass vessels on one side only.
- Retardation of the boiling of the gases to be pumped can lead to a sudden pressure increase. Prevent retardation of boiling by means of suitable measures (e.g. turbulent agitation).

2.4 High Temperatures

The diaphragm pump may heat up as a result of the temperature of the gas being pumped and through compression heat.
Prevent the following maximum permissible temperatures from being exceeded.

- + 40 °C for the environment, and
- + 60 °C for the gas to be pumped.

The motor for single phase alternating current is protected against overload by an integrated motor protection switch.

2.5 Hazardous Substances

The operating company bears the responsibility for the use of the laboratory vacuum system.

Hazardous and harmful substances must be effectively prevented from escaping.
Ensure that all lines and connections are leak tight.
Handle exhaust gases in accordance with the requirements of the emission protection regulations.
Do not operate the laboratory vacuum system without a separator without a emission condenser. The separator can onl y be em ptied after the apparatus has been vented.
Dispose the condensate in an environmentally compatible manner!

The emission condenser has a safety valve. The air evacuation duct with hose must be kept clear and lead into a suitable air evacuation duct. Throttling the air evacuation duct can damage the valves of the diaphragm pump.

Hazardous substances in the gases to be pumped can cause personal injuries and property damage. Pay attention to the warning notices for handling hazardous substances.

The local regulations apply in foreign countries.

Combustible Gases

Examine before switching on whether that can form gas combustible gas/air mixtures which can be promoted! Consider the regulations of the guideline 1999/92/EC.

Explosive gases

The diaphragm pumps is not certified according to ATEX guidelines 94/9/EC.

Aggressive gases

An MPC series diaphragm pump is used for extracting vapours and aggressive gases.

The warranty shall lapse if the LVS is used with diaphragm pumps from other manufacturers.

Especially aggressive gases have to be explicitly checked for material resistance as described *in chapter 3.1.2* and, if necessary, modified.

Poisonous gases

Use a separator when pumping poisonous or harmful gases. Prevent such substances from leaking out of the appliance or pump. Treat these substances according to the applicable environmental protection regulations.

The diaphragm pump, control valves and hose lines can be damaged by poisonous or aggressive gases.

Test the strength and leak-tightness of the connecting lines and the connected apparatus. Prevent environmental poisons, e.g. mercury, getting into the diaphragm pumps.

Fulfil the requirements, for example:

- German Hazardous Substances Regulation (GefStoffV) of 23. December 2004
- Regulations 2006/121/EC (classification, packaging and identification of hazardous substances),
- Manufacturer's safety data sheets on hazardous substances.

3 Description

3.1 Design and Function

3.1.1 Laboratory-Vacuum-Systems

The Laboratory Vacuum Systems are supplied as a ready-mounted unit.
The chemical-resistant diaphragm pump **(4)** is fitted to the base plate of the column **(3)** and attached on the suction-side to the separator **(7)** to protect the pump from foreign matter and on the pressure-side to the KD 500/5 emission condenser **(6)** to recover the condensate. This ensures that hazardous substances are separated out. The safety valve on the emission condenser protects against an impermissibly high operating pressure on the outgoing air end.
The complete vacuum controller, with sensor, venting valve and power unit **(5)**, is fitted in the column **(3)**. (The non-controlled LVS-variant does not have a controller.)
All exposed glass components **(6, 7)** are coated with transparent plastic as protection against bursting. The emission condenser is supplied with insulation.

The power switch **(12)** and the plug for the power cable **(11)** as well as the membrane pump **(10)**, the PC **(13)** control lead **(14)** and the water valve (option) **(15)** are located on the right of the column.
The LVS types are specially preconfigured according to model.

1	**Pressure side connection** hose nozzle for hose DN8
2	**Control valve** (controlled in the case of the LVS)
3	**Column complete** on swivelling foot
4	**Diaphragm pump MPC 101 Z** with gas ballast valve and main switch
5	**Vacuum controller 521**
6	**Emission condenser, short** **KD 500/5 insulated** at the pressure side with safety valve and cooling water connections
7	**Separator** (round-bottomed flask) suction side
8	**Cooling water** (feed flow/back flow)
9	**Connection outgoing air** hose nozzle for hose DN8
10	**Connection Pump** (pump)
11	**Connection non-heating device power cable** (main in)
12	**Main switch** (power)
13	**Connection PC** (RS 232)
14	**Connection control cable** controlled LVS (sensor)
15	**Connection water valve**
16	**Connection inert gas**
17	**Gas ballast valve**

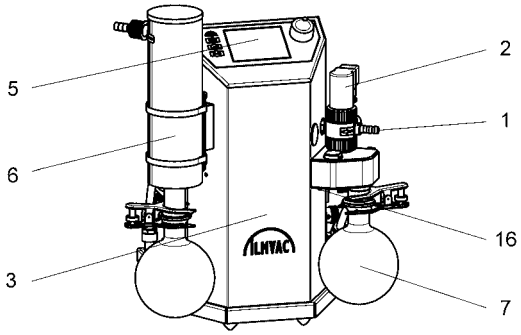


Fig. 1a LVS 110 Z - Front view

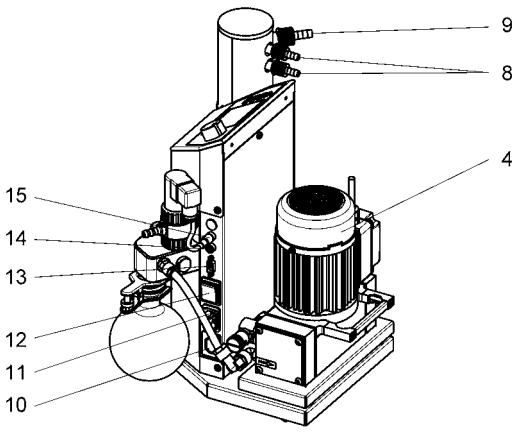


Fig. 1b LVS 110 Z - Rear view

3.1.2 Diaphragm pump

Design:

The diaphragm pump consists of a pump body and a drive motor.

The pump body consists of a drive shaft and two pump heads. Both pump head contains a diaphragm and the work valves. The two pump heads are arranged opposite each other. In the two-stage (Z) diaphragm pump, both pump heads are connected in series.

The pump heads are driven via an eccentric shaft with a connecting rod.

Function:

Motor, eccentric shaft and connecting rod set the diaphragms in stroke movement. This changes the size of the space between the diaphragms and pump head (pump chamber).

Increasing the size of the pump chamber opens the inlet valve while the outlet valve is closed (intake process). Decreasing the size of the pump chamber ejects the gas through the outlet valve.

The valves are actuated by the gas being pumped. A large proportion of fluid in the diaphragm pump minimizes the pumping efficiency.

Component	Materials
Connection- / pump head	PTFE with carbon-fibre reinforcing
Seal	EPDM
Screw fitting	PVDF / PP
Valves	PEEK
Diaphragm	fabric reinforced with a PTFE layer
Connecting elements	PP

PTFE with carbon-fibre reinforcement, electrically conductive (with manufacturer's certificate of electrical conductivity).

Material resistance to aggressive media see: “Kunststoff Kautschuk Produkte“, Jahreshandbuch der Verarbeiter 2000/2001 ("Plastic, Rubber Products“, Annual Handbook of the Processor 2000/2001), Publisher Hoppenstedt Darmstadt, Vienna, Zurich.

Gas ballast :

Opening the gas ballast valve **(17)** in the suction line of the last pump stage allows air to flow into the pump chamber. This prevents condensation and flushes the pump clear.

Operation leads to:
- Increasing the ultimate pressure and
- Increasing the operating temperature.

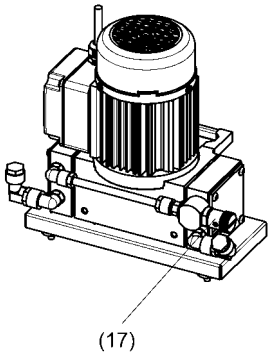


Fig. 2 Diaphragm pump MPC 101 Z

3.1.3 Vacuum Controller 521

In the case of controlled models for laboratory vacuum systems LVS, the vacuum controller, complete with sensor, venting valve and power unit, is fitted in the device column. The operating and display elements are on the top surface of the column. Description and operation are to be found *in chapter 6* of this operating manual.
The Laboratory Vacuum Systems is supplied with complete internal electric wiring.

Technical data: *see chapter 4.3.1*

3.2 Overview of the variants

Part	Laboratory-Vacuum-Systems LVS	
	piece per LVS	
	101 Z	**110 Z**
Suction side connections for hose DN 8	1 unregulated	1 regulated
Control valve	-	1
Column complete	1	1
Diaphragm pump	1	1
Vacuum controller 521	-	1 (cv)
Emission condenser	1	1
Separator	1	1
Pressure side connection for hose DN 8	1	1

3.3 Areas of Application

The Laboratory-Vacuum-Systems is intended for:

- vacuum filtration, vacuum distillation and vacuum drying.
- use in physical and chemical laboratories in trade and industry.
- pumping and compressing neutral and aggressive gases and vapours.
- generating a vacuum up to an ultimate pressure of around 8 mbar without using the lubricant oil.

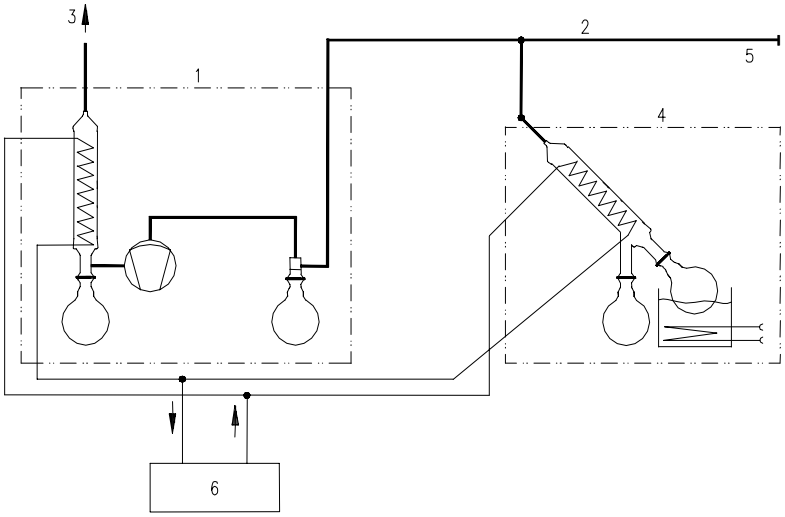
Special designs:

- Special LVS can be supplied after consultation with the manufacturer or for a corresponding supply contract.
- Motors for different voltages.

3.4 Scope of Delivery

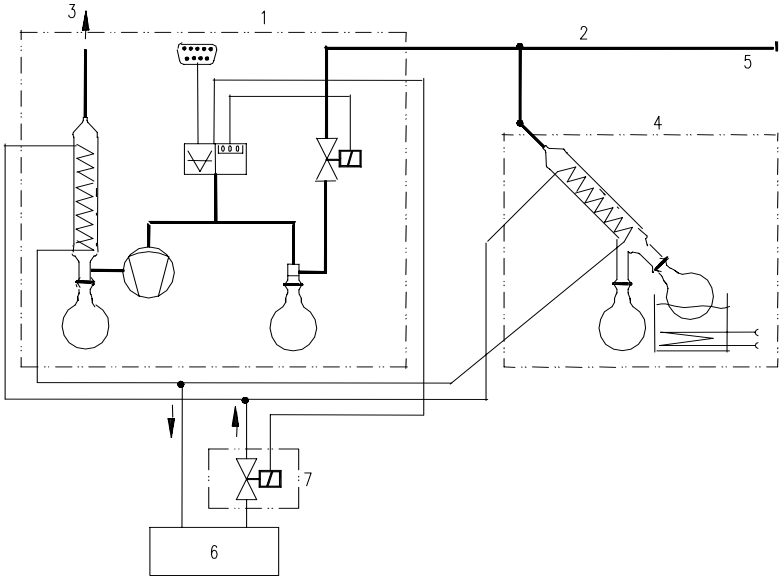
The scope of delivery is specified in the supply contract.

3.5 Examples of application



1	LVS without vacuum controller	**5**	Capable of expansion up to 4 loads
2	Suction line *	**6**	Coolant system, un pressurised run back *
3	Outgoing air	**7**	Water valve WV *
4	Rotary vaporizer *		

Fig. 3 Example of application - LVS unregulated



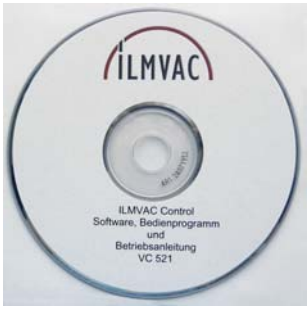
1	LVS with vacuum controller and control valve (cv)	**4**	Rotary vaporizer *
		5	Capable of expansion up to 4 loads
2	Suction line *	**6**	Coolant system, un pressurised run back *
3	Outgoing air	**7**	Water valve WV *

Fig. 4 Example of application – LVS regulated (Control valve) „cv“

3.6 Accessories

The use of chemical-resistant vacuum connections „netvac“ is recommended for extending the application range of a vacuum generator to several workstations.

Here is a selection:



"ILMVAC-Control 521" operating software on CD

to connect the vacuum controller to the PC

Order no. 620637

netvac set M02+ / R04
with integrated Kalrez - check valve and ball tap

Area of application: laboratory work bench
Suction connector: for hose DN 8
Port thread: 3/8 “ – outside
Valve body material: polypropylene (PP)
Dimensions (W/D/H): 55 x 40 x 150 mm
Fitting borehole: A = Ø 26 to Ø 35 mm

Designation: netvac set M02+ / R04
Order no. 700532-03

netvac set M04+ / R01
with integrated Kalrez - check valve and fine regulating valve

Area of application: laboratory work bench
Suction connector: for hose DN 8
Port thread: 3/8 “ – outside
Valve body material: polypropylene (PP)
Dimensions (W/D/H): 95 x 40 x 75 mm
Fitting borehole: A = Ø 26 to Ø 35 mm

Designation: netvac set M04+ / R01
Order no. 700534

netvac - check valve
The check valve prevents other tapping points from being influenced.

for PTFE vacuum connection,
Outside diameter: 10 / 8x1

Designation: netvac M12
Order no. 700440

Vacuum Control-Box VCB 521 cv

Table model as digital, chemical-resistant vacuum regulator.
With integrated sensor, airing -, control- and check valve.

Connection vacuum apparatus: DN 8
Connection vacuum pump: DN 8
Connection inert gas: DN 4
Connection water valve: Binder plug 4-pole 24V DC

Order no. 600053

Please state the length you want to order.

Vacuum hose PTFE 10/ 8x1

Order no. 828332

4 Technical Data

4.1 View of device and dimensions

The main dimensions are identical for all types stated here.

Fig. 5 View of device LVS 110 Z and dimensions (see chapter 4.3)

4.2 Intake Pressure / Pumping Speed – Diagram

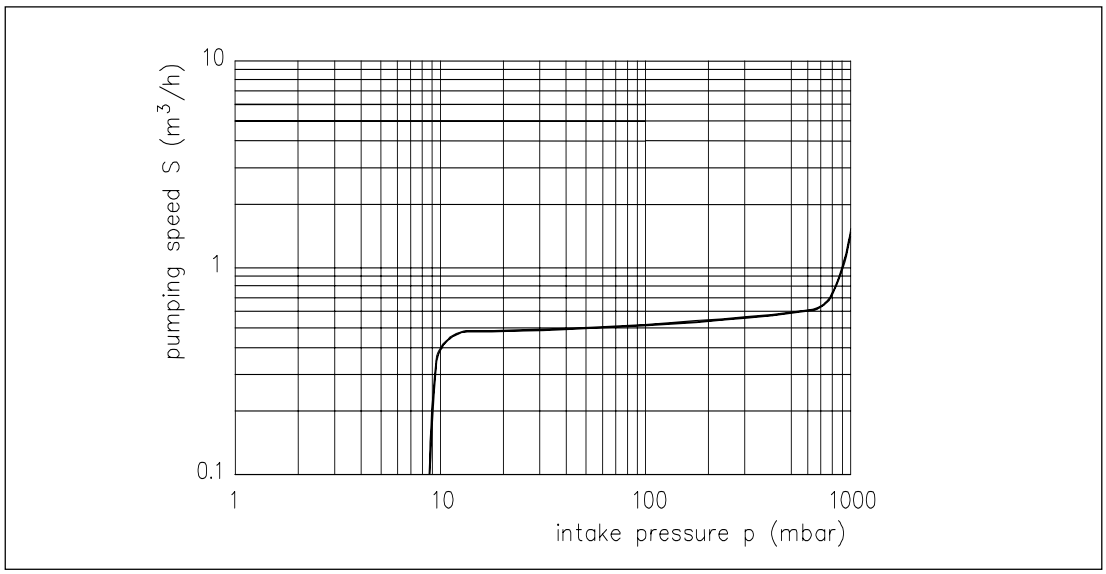


Fig. 6 Intake Pressure / Pumping Speed – Diagram

4.3 Device Data LVS

Parameter	Unit	LVS 101 Z	LVS 110 Z
Pumping speed 50/60 Hz DIN 28432 at speed of 1500 rpm	m^3 / h	1.0 / 1.1	
Ultimate pressure at speed of 1500 rpm	mbar	< 8	
Ultimate pressure with gas ballast at speed of 1500 rpm		18	
Max. inlet pressure	bar	1	
Max. outlet pressure		1	
Intake and pressure ports	-	Hose nozzle DN 8 for hose inside diameter 8 mm	
Ambient temperature	°C	+ 10 to + 40	
Max. Operating gas temperature		+ 60	
Bearing	-	maintenance-free	
Reference surface sound pressure level DIN 45635 part 13	dB (A)	< 44	
Voltage / Frequency (different data upon customer request)	V, Hz	230, 50/60 (115, 50/60) (generally with motor protection switch, switch and cable)	
Power	kW	0.06	
Operating mode	-	S 1	
Type of protection (motor) DIN EN 60529		IP 54	
Class of insulation DIN EN 600034-1		F (160°C)	
Dimensions (W/D/H)	mm	360 / 310 / 445	
Weight	kg	11.6	13.1
Order numbers for :	-		
- Mains connection cable IEC with plug CEE (D)		825885	
- Mains connection cable IEC with plug BS (UK)		825878	
- Mains connection cable IEC with plug type 12 (CH)		825877	
- Mains connection cable IEC with plug NEMA 1-15 (US)		825903	
Order numbers for :			
- LVS 230 V ***without*** *mains connection cable*		115022	115024
- LVS 115 V ***without*** *mains connection cable*		115022-01	115024-01

4.3.1 Device Data – Vacuum Controller 521

Parameter	LVS 110 Z	Unit
Sensor	integrated	
Sensor type	ceramic sensor	-
Measuring range	1 - 1100	mbar
Measuring uncertainty	±2; FS	
Controller		
Sensor interface :	3 conductor interface	-
- Scan frequency	10	Hz
- Resolution ADC	12	Bit
- Power supply	+ 5 stabilized	V
- Sensor signal	0.5 to 4.5 *(optionally also 0..5 V or 4..20 mA possible)*	
Pressure indicator	digital; red, 9 mm high digits in mbar, torr or psi	-
Switching accuracy/ control accuracy	±1	digit
Switching outputs :	digital	-
- Voltage level	0; 24	V
- Control power, single	12	W
- Control power, total	24	
Switching outputs used :	3	-
- Control valve	x	
- Ventilation valve	x	
- Water valve	x	
- Pump net connection	-	
Communication interfaces	RS 232 , *RS 485 (optional)*	
Power consumption Controller in normal operation	max. 20 *(depends upon the control power)*	W
Fuse (internal controller)	5	A
Power pack	internal	
Operating voltage	90 .. 264	V AC
Operating frequency	50 / 60	Hz
Output voltage	24	V DC
Output current	1.25	A
Output power	30	W
Entire unit		
Protective system	IP 20	-
Working temperature	15 - 40	°C
Connections		
IN/OUT: RS 232	SUB-D plug 9-pole	-
OUT: Control valve	Control valve integrated	
OUT: Water valve	Binder socket 4-pole, 24 V DC	
Connection : Inert gas	integrated, Hose nozzle DN 4	

5 Assembly and Installation

5.1 Unpacking

Carefully unpack the laboratory-vacuum-system.

Check the system for:

- Transport damage,
- Conformity with the specifications of the supply contract (type, electrical supply data),
- Completeness of the delivery.

Please inform ILMVAC GmbH without delay if there are discrepancies between the delivery and the contractually agreed scope of delivery, or if damage is detected.

Please take note of the general terms of business of ILMVAC GmbH.

In case of a claim under warranty, the device must be returned in packaging that is suitable for protecting it during transport.

5.2 Installation and Connection

- Set the laboratory-vacuum-system on a flat and horizontal surface.
- Remove the protective caps on the connections.
- Connect the suction connector of the LVS to your apparatus with vacuum hose DN8.
- Connect the cooling water tube to the emission condenser.
- The cooling water return flow must be unpressurized.
- Connect the air exhaust to the central air exhaust system.
- Connect the laboratory-vacuum-system to the power supply.
- Check that the connections are properly seated.

5.2.1 General instructions

Observe the basic safety instructions when using the LVS.

The pressure device regulation 97/23/EC must be observed if devices with an overpressure of 0.5 bar or more are connected.

The pressures at the suction and pressure sides of the diaphragm pump at the time it is switched on must correspond to the specifications of DIN 28432.

In order to avoid pumping speed losses, all the vacuum connecting hoses used should have a large nominal diameter and should be laid out so that the lengths are as short as possible. Avoid rigid connections. They must be assembled carefully in order to achieve a low leak rate.

We recommend fitting **non-return valves** (order no. 720327) for applications with several consumers.

The upstream **separator** on the suction-side serves to protect the diaphragm pump and the vacuum sensor from condensates and mechanical contamination. It must be used for an application. The level in the separator must be monitored and the separator emptied regularly. The currently valid regulations must be observed when disposing of waste. The separator on the suction-side can only be removed and emptied after the system has been vented.

The **emission condenser** enables a 100 per cent recovery of the solvents led through the vacuum pump. Cooling takes place via the DN 8 hose nipples. Ensure that the outflow is clear. The **safety valve** is located at the gas inlet. The rubber valve seal must be checked for cracks at regular intervals and exchanged when necessary. The exhaust connection must be unpressurized. The exhaust can be led off through a DN 10 hose into a suitable evacuation duct. There is common solvent reclamation for all the connected systems. Mixing media must not lead to a hazard for persons, the environment of for the equipment.

Condensable vapours may only be extracted when the pump is at operating temperature. When doing so, the **gas ballast valve** should be opened and/or a quantity of air, which is to be calculated by the user, allowed to enter via the suction port valve. The pressure values may be increased when doing so. The diaphragm pump's maximum tolerance of water vapour pressure can be improved or a cleaning run can be made after finishing work by opening the gas ballast valve (this significantly reduces the pumping speed and ultimate pressure). The vacuum ducts must always be laid sloping downwards so that condensates can flow into the relevant separators.

In case of soiling by solid matter, the pump heads must be opened and the entire interior space, including valves and diaphragm, cleaned mechanically (*see chapter 7.2.1)*.

5.3 Storage

The pumps are to be stored in a low-dust, interior room within the temperature range from + 5 to + 40 °C and at a relative air humidity < 90%.

Leave the protective elements on the suction and pressure ports. Another equally good protection may be used.

5.4 Scrap Disposal

<table>
<tr><td>  </td><td>CAUTION !</td></tr>
<tr><td colspan="2">The laboratory-vacuum-systems must be disposed of in accordance with the 2002/96/EC guideline and the specific national regulations.

Contaminated pump systems must be decontaminated according to the laws.</td></tr>
</table>

6 Operation

6.1 LVS without vacuum controller

Switch the device (LVS 101 Z) on using the main switch. Vacuum is generated immediately and without regulation.

6.2 LVS with vacuum controller

The Vacuum Controller is switched on by the rocker switch **POWER** located on the device.

The device is ready for operation after a short initializing routine, during which a signal tone sounds and all light elements light up briefly.

6.3 Operating modes of the Controller

The following modes are available:

0 -	STOP	Controller is inactive and can be configured
1 -	Manual operation	With specification of the setpoint and, if required, lowering
2 -	Automatic operation	The setpoint is detected automatically from the pressure development
3 -	Ultimate pressure	Pumping out at maximum motor output

6.3.1 Mode 1, Manual operation

The vacuum valve is closed when the pressure reaches the setpoint. Closed-loop control between the set hysteresis and the setpoint has been started.

For operation with a frequency changer, an analog voltage is output, which controls the speed according to the standard tolerance. If the set pressure is not reached, the speed is automatically adjusted to the pressure loss.

If the pressure is actively lowered, after the setpoint has been reached for the first time, it is lowered still further within a settable timeframe. The number of ramps can be set up to a maximum of 3. Each ramp starts with a holding time. The setpoint then falls in one step to the defined starting pressure. The setpoint then falls to the final value over the set time.

After the last ramp, there is a waiting time until the automatic STOP (0 – the last set pressure is held indefinitely until STOP is pressed manually).

The closed-loop control and hysteresis are always related to the current (reduced) setpoint. The changed setpoint always applies until the STOP button is pressed, then the configuration value applies once more. When the pressure reduction has finished, the control is stopped, and the system waits until the STOP button is pressed.

6.3.2 Mode 2, Automatic operation

After selection of the operating mode, the controller starts the evacuation. The pressure drop per minute is determined during this process. If the rate rises above the automatic threshold, the current pressure is taken as a setpoint, and the system changes into normal closed-loop control.

6.3.3 Mode 3, Ultimate pressure

By pressing of the key **P min** evacuation takes place at maximum pump speed until the user presses **STOP**.

6.4 Monitoring by Level Sensor

If the level sensor input is activated (optional), the device goes into **STOP** status when "Tank full" is signalled. The water volume should amount to 20%.

6.5 Calibrating the Pressure Sensor

A two-point calibration is made with a comparison measurement device.

Calibration at ambient pressure:	**Calibration at ultimate pressure:**
➢ The diaphragm pump is switched off.	➢ The diaphragm pump is switched on.
➢ The venting valve is open.	➢ The venting valve will be closed.
➢ The vacuum valve ist closed.	➢ The vacuum valve will be open.
➢ The ambient pressure to set.	➢ The ultimate pressure to set.

⚠	**CAUTION !**
Instead of measuring the pressure with a comparison measurement device, the ultimate pressure of the pump used may also be input if this is known with sufficient accuracy (take note of evacuation time). Ensure that the set pressure is also present at the sensor.	

6.6 Handling

6.6.1 Control panel

1	START / STOP
2	AIR - Venting
3	P min - pressure drop
4	Encoder (turn / press)
4a	Marking point on encoder
5	Display

Fig. 7 Control panel

6.6.2 Operating via Buttons and Encoder

The menu is operated with the encoder.
The menu option is selected by turning the encoder anticlockwise, and then confirmed by pressing.
A pop-up window is provided for changing numerical values. They are accepted by pressing the encoder.
The process can be cancelled by pressing **START/STOP**.

Key:	**Meaning**
AIR	- Switches the venting valve on if the control is inactive.
	- Opens the venting valve as long as the button remains pressed while control is active.
P min	- Starts "ultimate pressure" mode directly.
START/STOP	- Starts the operating mode currently selected in the main menu and the corresponding set value.
	- Starts the operating mode manually with the currently selected setpoint in the solvent table, *see chapter 6.9.*
	- Stops the active mode
	- Cancels the input in the pop-up window.
	- Jumps back to the main menu from submenus.
Encoder:	**Meaning**
	- *Turn* to select the operating mode.
	- *Press* to select the setting menu for the corresponding operating mode.
	- *Turn* to select menu items.
	- *Press* to open Change pop-up window.
	- Turn to change values.
	- Press to confirm the changed value.
	- When active: *Turn* to change setpoint.
	- When active: *Press* to accept current value as setpoint.

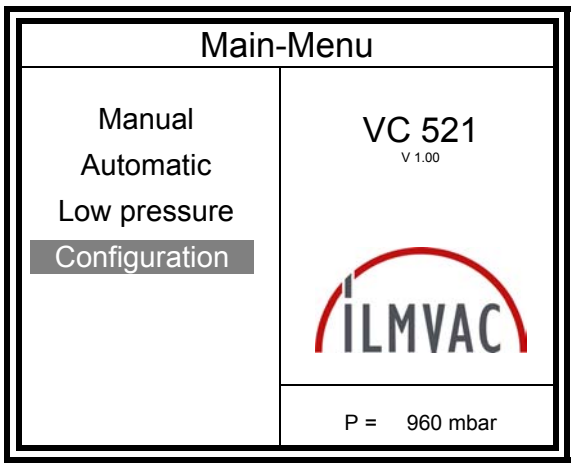
After the current operating mode has been stopped by pressing **STOP**, the vacuum valve is closed.
The venting valve takes the selected status (Option: **AIR_ON_STOP**).
The originally selected values are retained on **START**.

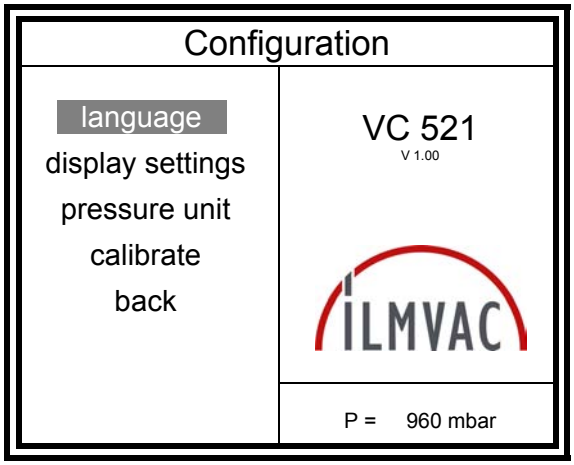
6.6.3 Menu Guidance

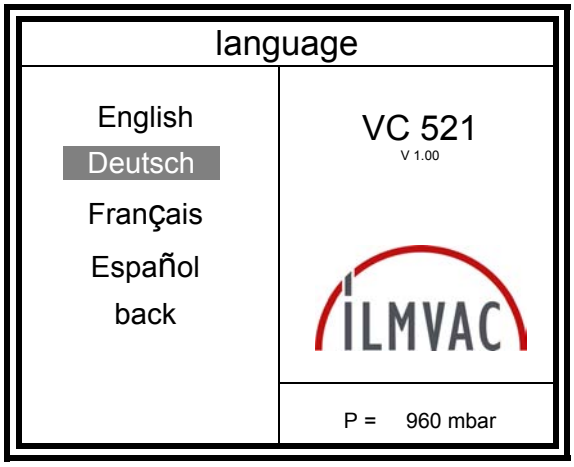
After the start, the main menu appears with its four submenus, which are shown below:

- Configuration
- Ultimate pressure
- Automatic
- Manual

Configuration: language

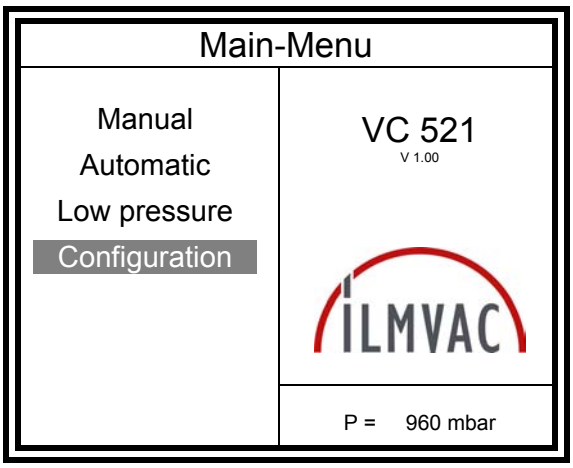


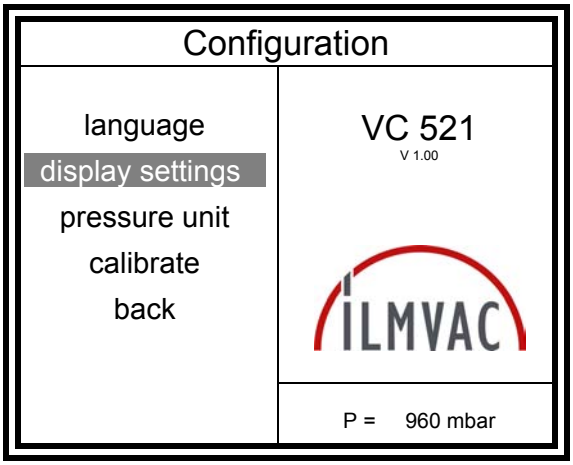


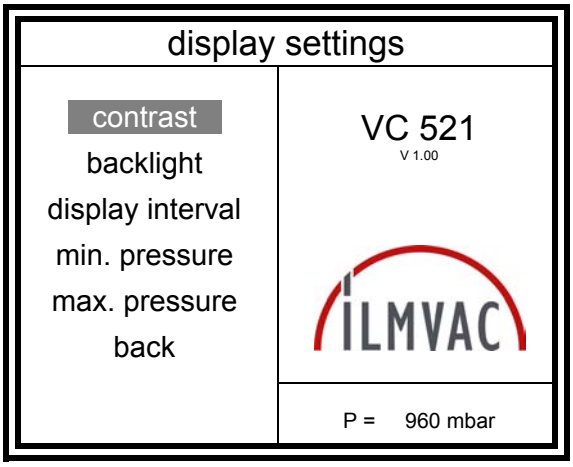


- Select one of the available languages

Configuration: display settings

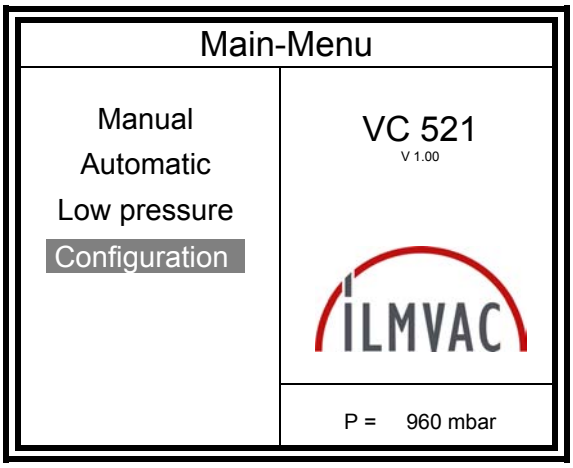


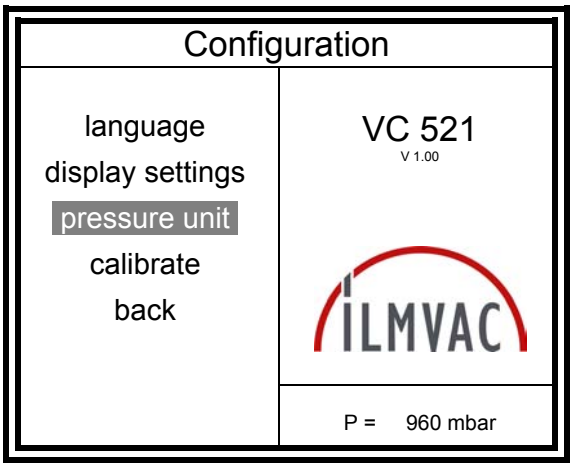


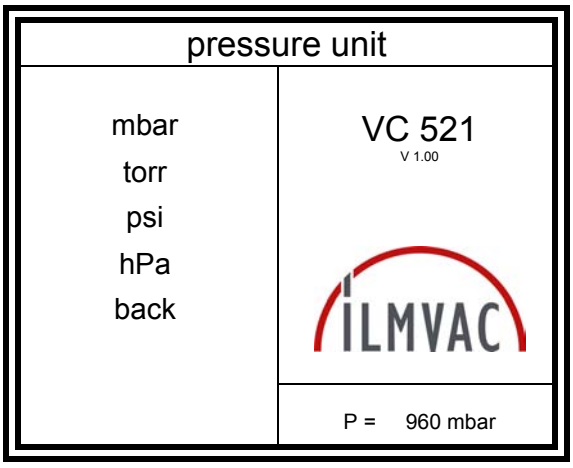


- Select contrast in the display
- Select illumination in the display
- Graphic display:
  - Number of measurements per second
  - Display of min. pressure
  - Display of max. pressure

Configuration: pressure unit

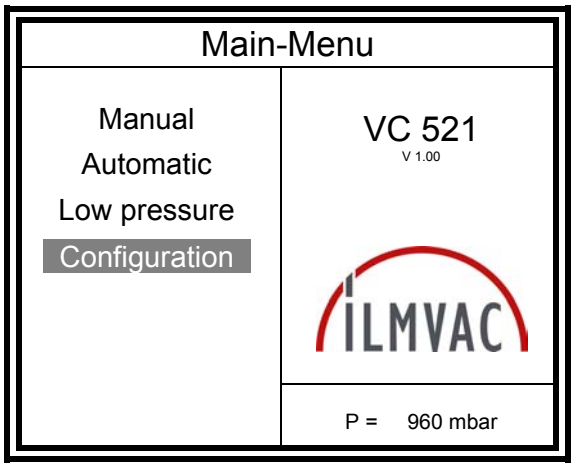


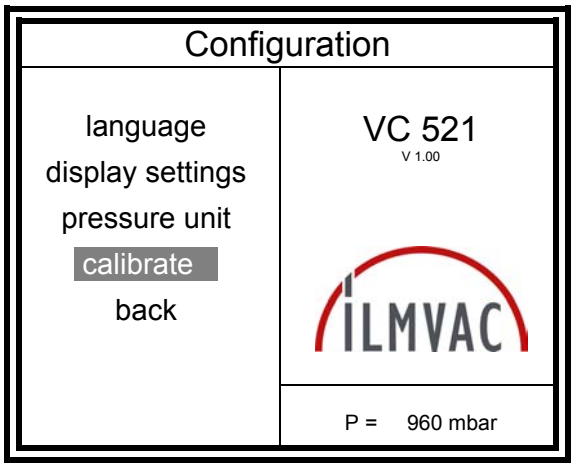


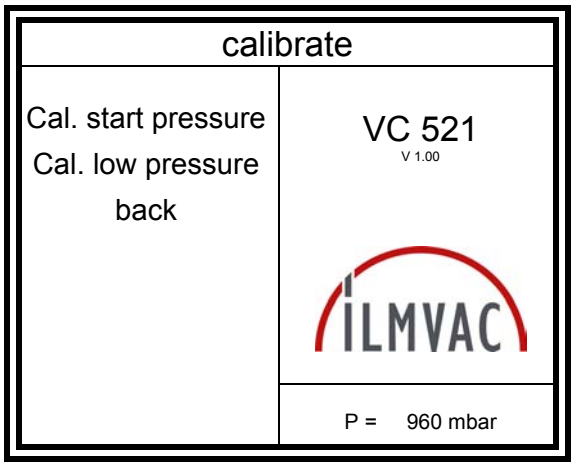


- Select measured values for display

Configuration: calibrate



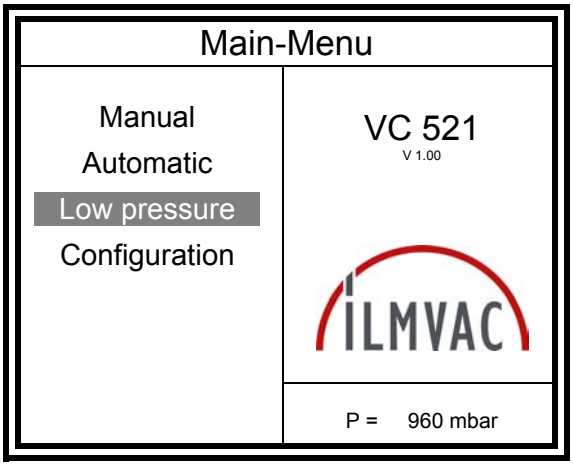




- Selection of the upper pressure value
- Calibration of the lower pressure value

The current value of the comparison measurement device must always be entered for calibration. The correction values are then calculated from this. It is recommended to always make both calibrations.

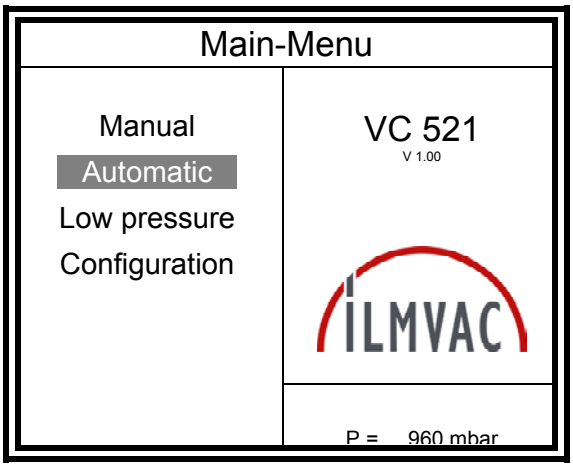
Low pressure:

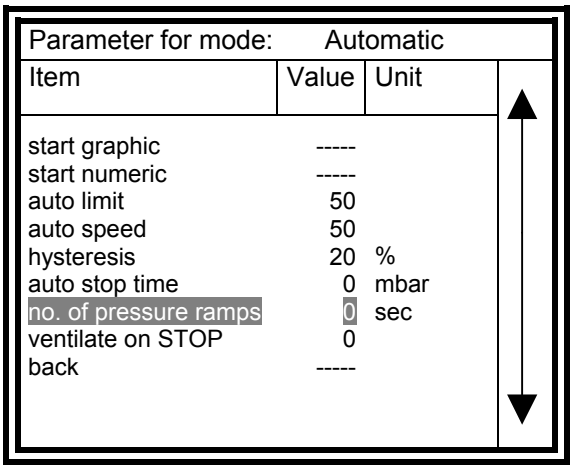


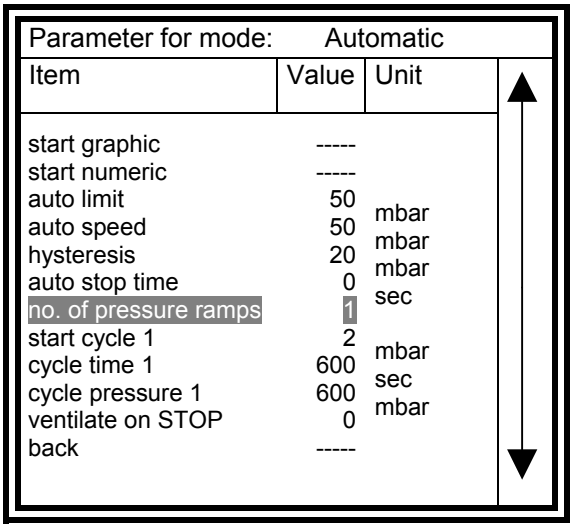
- Starting the pump system

All control settings are ignored (P min).

Automatic:

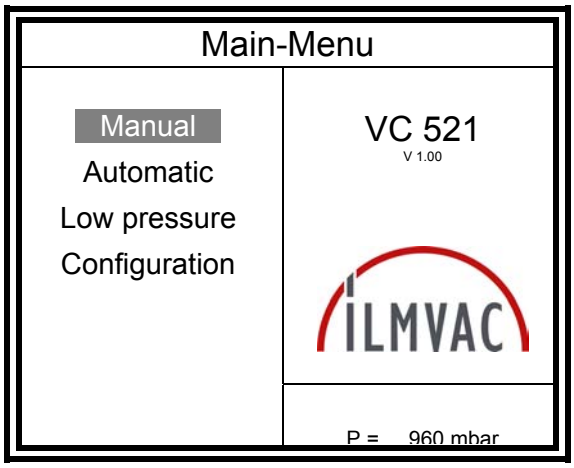


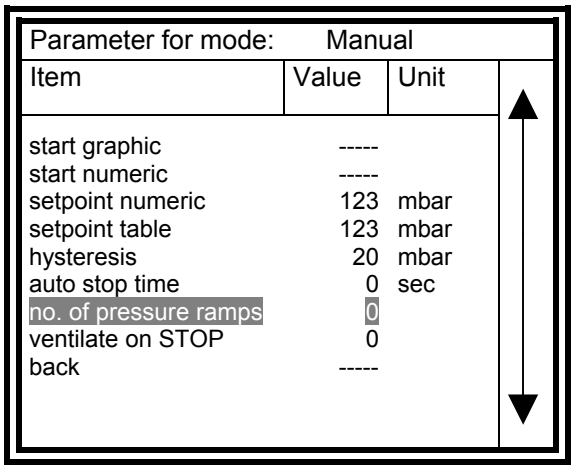


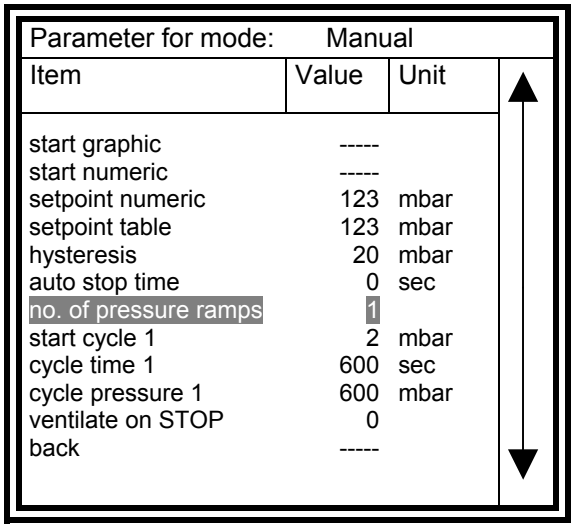


- Select and set the displayed values. Values that are not required are not displayed.

Manual:







- Select and set the displayed values. Values that are not required are not displayed.

6.7 Electrical parameters

6.7.1 Printed circuit board – Controller 521

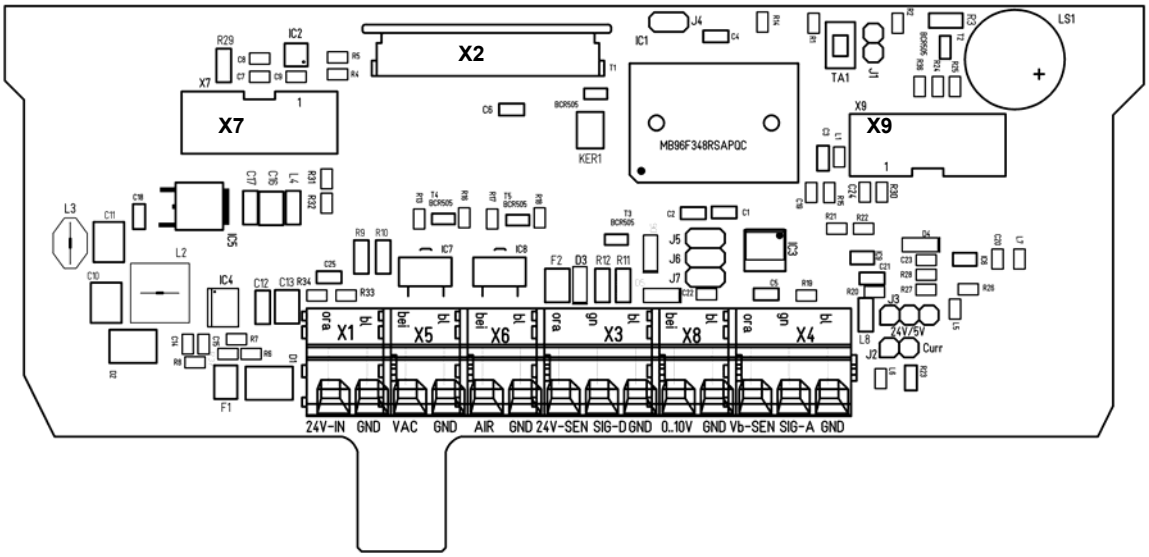


Fig. 8 Positions of components and interfaces

The device is supplied with 24 V DC.

X1 Power supply input
Spring contact clamp Wago type 236 / 2-pole

Pin no.	Function	Specification	Comment
1	GND		reverse polarity protected / blue
2	Primary power supply	24V DC ± 10%, 1.5A	reverse polarity protected / orange

X2 LCD Display BP320240E / INTERNAL
FFC Würth 686124144 24-pole / RM 1mm

Pin no.	Function	Specification	Comment
1	RESET		
2	/RD		
3	/WR		
4	/CS		
5	A0		
6	D0		
7	D1		
8	D2		
9	D3		
10	D4		
11	D5		
12	D6		
13	D7		
14	VDD		
15	VSS		
16	VLCD		
17	free		
18	SK/X1		
19	D0/X2		
20	D1/Y1		
21	CS/Y2		
22	INT		
23	LED+		
24	LED-		

X3 PLC input 1- Level sensor
Spring contact clamp Wago type 236 / 3-pole

Pin no.	Function	Specification	Comment
1	GND		bl
2	SENSOR 1 or PCL input 1	I in approx. 10mA / $U_{threshold}$ approx. 13V	gn
3	Sensor supply	Corresponds to the voltage at X1/ protected by 200 mA self-resetting circuit-breaker	orange

X4 Pressure sensor 1 input
Spring contact clamp Wago type 236 / 4-pole

Pin no.	Function	Specification	Comment
1	GND		blue
2	SENSOR 1 Signal	0..5V or 0..20mA	Resolution 5mV/ green
3	Sensor supply	5V ± 5% or Corresponds to the voltage at X1/ protected by 200 mA self-resetting circuit-breaker	Not fused / beige

The input can be configured with jumper **J2**:

- J2 open: (Default) Voltage: 0..5V
- J2 plugged: current 0..20mA

The sensor supply voltage can be configured with jumper **J3**:

- J3 1-2: 24V needed for current output
- J3 2-3: 5V (Default) needed for voltage output (depending on sensor data sheet)

X5 PLC output 1 – vacuum valve

X6 PLC output 2 – venting valve
Spring contact clamp Wago type 236 / 2-pole

Pin no.	Function	Specification	Comment
1	GND output		bl
2	Output	Corresponds to the voltage infeed at X1 / pnp max. 0.5A	with freewheeling diode / orange

X7 RS232 to the PC
Tub plug connector, 10 pin via FB to Sub-D-plug, 9-pin (Würth 618009221823)

Function	PIN at tub plug connector	PIN at SUB - D	Comment
RXD	3	2	
TXD	5	3	
GND	9	5	

X8 Analog output 1 – Frequency converter pump speed
Spring contact clamp Wago type 236 / 2-pole

Pin no.	Function	Specification	Comment
1	GND		bl
2	Output 1	0..10V max. 10mA	Resolution 2mV/ gr

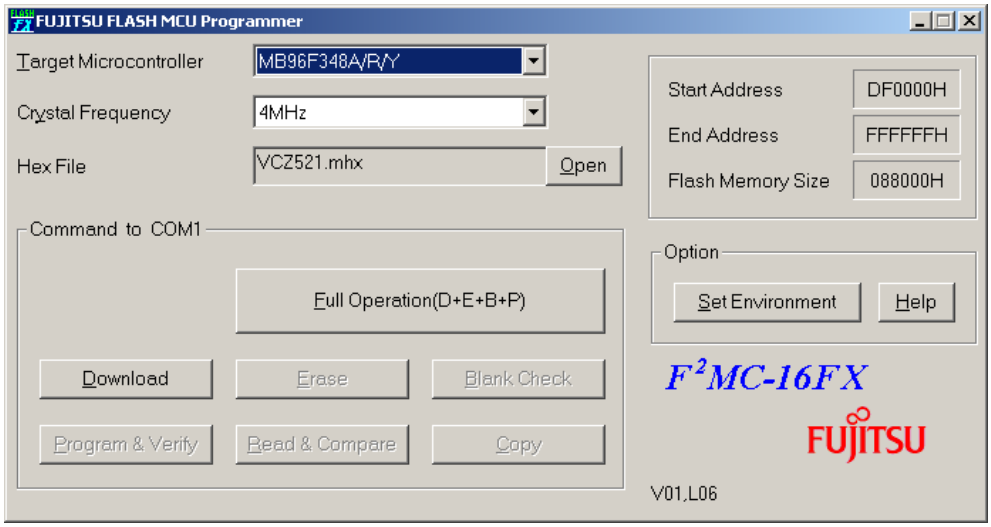
X9 DEBUG / INTERNAL
Tub plug connector, 10 pin / RM 2.5mm

Pin no.	Function	Specification	Comment
1			
2			
3			
4			
5	Level converter supply	5V ± 5%	not fused
6			
7			
8	TXD	5V level	
9	RXD	5V level	
10	GND		

6.8 Software update

The software in the controller can be updated.

It can be re-input by the user. The Fujitsu Flash tool must be used for the Fujitsu 16FX CPU range.



The following steps must be carried out:

- Switch off the controller
- Call the flash program.
- Select the processor MB96F348A/R/Y
- Select the quartz frequency 4 MHz
- Select the program file
- Select the serial interface used (Option / Set Environment)
- Start the programming with "Full Operation"
- Confirm the Box (PC) „Reset ...“ with OK
- Switch on the controller (don't forget timeout of approx. 15 seconds!)
- The programming runs automatically.
- Switch off the controller again after the OK message
- Switch on, and check the functions of the device

	**CAUTION !**
The controller should be switched off during each interruption.	

6.9 Operation using the "ILMVAC-Control 521" PC program

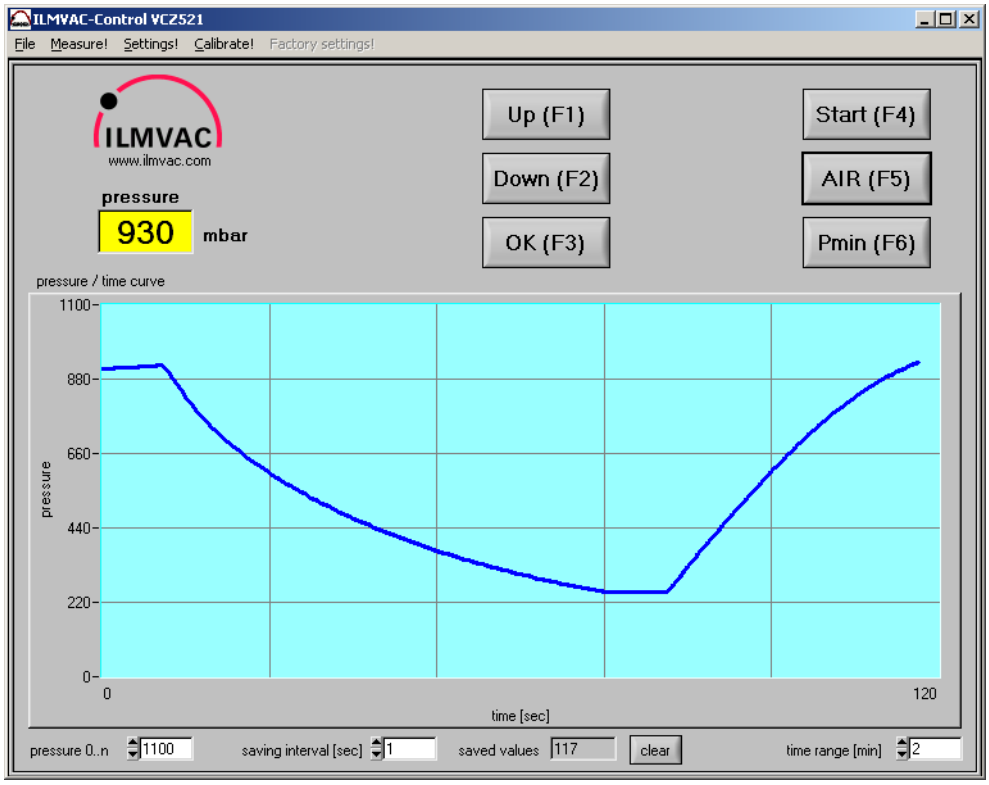
The "ILMVAC-Control" enables the vacuum controller to be operated simply and easily from the PC. The program can be purchased and installed as an option.
Make the cable connection (O-Modem) between PC and controller.

PC program	Version	Order no.
ILMVAC-Control 521	10.3	620637

The program attempts to find a switched-on controller on COM 1 to 20.
A COM port 1 to 255 can also be defined as a command line parameter:
VCZ521.EXE 2 -> select COM 2

If a controller cannot be found, the program goes into offline mode.
Here, a previously saved curve can be reloaded and printed out.

The following screen appears after the start:



The graph shows the pressure development. Both the chronological and the pressure display range can be set. Data can also be recorded in the PC memory, which can then be stored as an ASCII file in the "File / Save memory" menu.

In the PSI pressure range, the pressure values for the curve are multiplied by 100 to remain with integers.

The curve can be printed out by the system printer via the "File / Print curve" menu.

The buttons largely correspond to the buttons on the controller. However, the buttons cannot be held down.

- In active MODE, the AIR button can be used with the mouse like on the controller. Pressing the mouse button opens the valve, releasing it closes the valve again.
  However, this only works if the mouse pointer is still on the AIR button.
- The UP and DOWN arrow buttons change the temporary setpoint in active MODE.
- The OK button only works in active MODE, and sets the current pressure as the new set value.
- The START button starts or ends in the current operating mode.
- The Pmin button functions the same as without a controller.

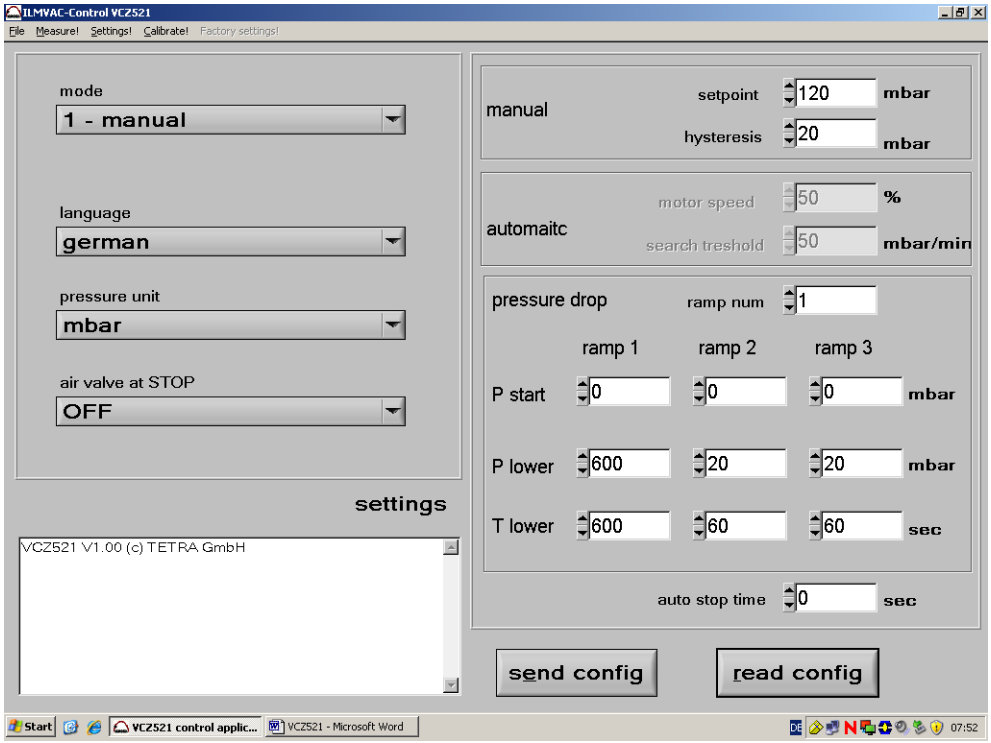
The following menu items can be selected from the menu bar:

- File
- Measure !
- Settings !
- Calibrate !
- Factory settings !

6.9.1 Menu item: „File“

File	
Save settings	- Saving the Settings dialog settings in a file
Load settings	- Loading the Settings dialog settings from a file
Print settings	- Printing out an image of the Settings dialog on the standard printer
Save memory	- Saving the pressure data in a file
Load memory	- Load the print data from a file
Print curve	- Printing out the current pressure curve on the standard printer
Password	- Changing the basic setting of the controller is password-protected. Release is given by inputting the date as a hex number. **Example : 13.02.2009 = 130209 = 1FC9D** *(Required for activating the "Calibrate" and "Factory settings" menus and the direct input of pressure offset und pressure factor in the „Calibrate“ Dialog)*
Info	- Information about the program version
Exit <ESC>	- Exit program

6.9.2 Menu item: „Settings!“

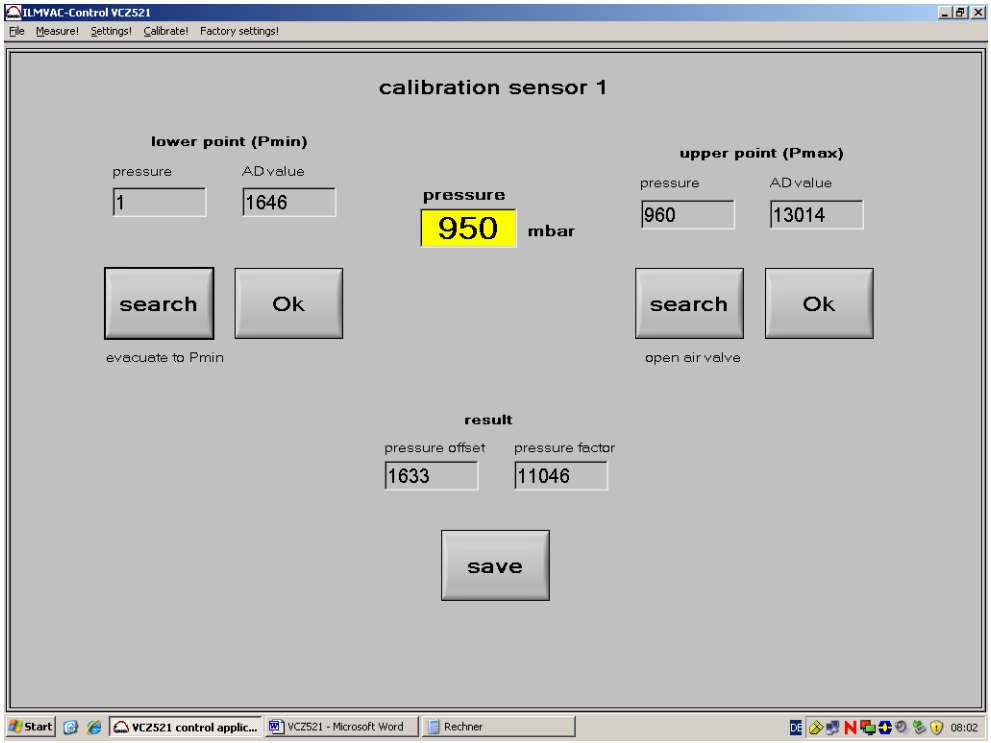


	CAUTION !
Settings not required for the selected operating mode are disabled and greyed out in the display. Appropriate error messages are displayed if the data ranges are exceeded or if inputs are illogical.	

Settings required for the control behaviour of the controller:

Designation		Explanation
ILMVAC-Control 521	**Control panel at the controller**	
Main Menu	Main Menu	1 - Manual (manual pressure setting for boiling pressure)
		2 - Automatic (automatic finding of the boiling pressure)
		3 - Low pressure Operation without regulation
		There is only the modes meaningful for their application adjustable.
Configuration, Language	Configuration, Language	English, Deutsch, Français, Español
Pressure unit	Pressure unit	mbar, Torr, psi, hPa
air valve at STOP	-	ON - automatic venting after STOP is on
		OFF - automatic venting after STOP is off
-	Ventilate on STOP	0 = closed, 1 = open
Manual	Setpoint	Enter a setpoint pressure value between 0 and 1100 mbar.
	Hysteresis	Enter a hysteresis value between 0 and 1100 mbar.
No. of pressure ramps	No. of pressure ramps	Number of possible ramps 1, 2 , 3
Start cycle P start	Start cycle 1	in adjusted pressure value (example: mbar)
Cycle time P lower	Cycle time 1	in second absolute
Cycle pressure T lower	Cycle pressure 1	in adjusted pressure value absolute (example: mbar)
AutoStop time	AutoStop time	Hunting time in second
Auto limit	Auto limit	Threshold value for detecting the boiling point (unit of pressure/ min)
Auto speed	Auto speed	0 ... 100% Reduces the frequency of rotation / rotational speed to a percentage of the maximum speed of the pump motor in order to determine the boiling point smoothly.
send	-	Values changed in the Settings dialog are stored in the controller. The controller confirms reception with a signal tone.
read	-	Read out current parameter values from the controller and display in the Settings dialog.

6.9.3 Menu item: „Calibrate“



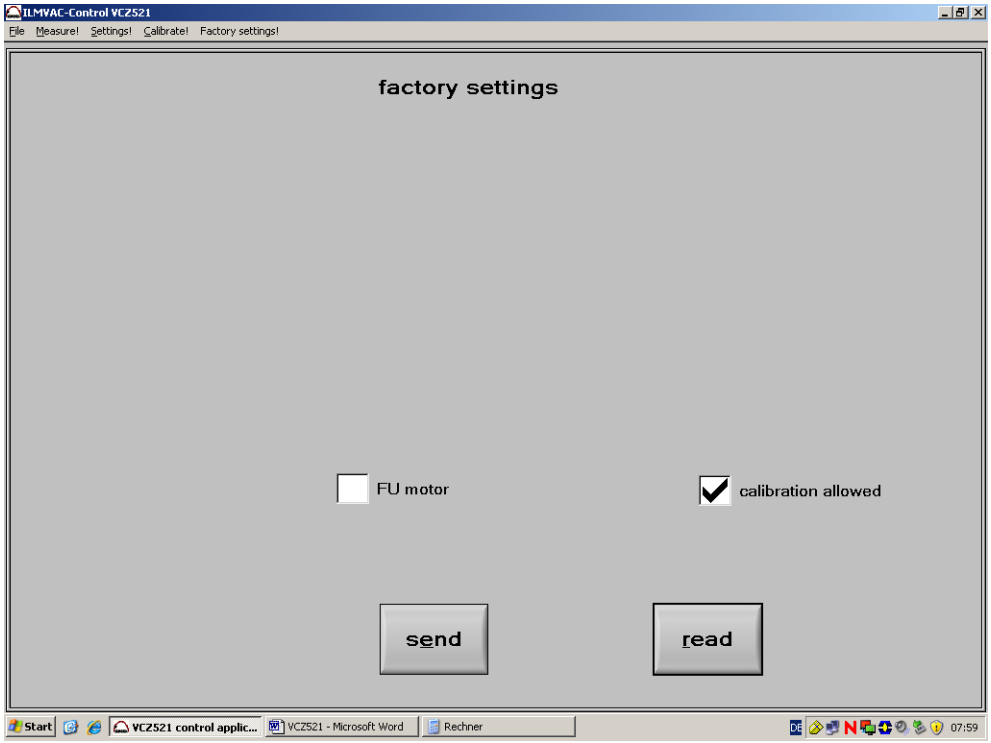
Calibration

When SEARCH (**lower point**) is activated, evacuation is to the lower point. If the pressure does not fall any further, the pressure value can be entered by using a comparison measurement device and confirmed with OK. For the **upper point** the same is valid. The ambient barometric pressure is entered. Do not confirm until the value has been established.
If the controller is integrated in a complete system or pump system (LVS), evacuation and venting take place automatically when the stated buttons are pressed.
The calculated correction values are displayed and can be stored with Save.

⚠	**CAUTION !**
Ensure that the set pressure is also present at the sensor.	

Designation		Explanation
ILMVAC-Control 521	**Control panel at the controller**	
Lower point	CL	at low pressure - pressure of comparison measurement device (at lowest possible pressure, e.g. 10 mbar)
Upper point	CH	at normal pressure (high) - barometric pressure

6.9.4 Menu item: „Factory settings“



Designation		Explanation
ILMVAC-Control 521	Control panel at the controller	
FU motor	not settable	analog output active
calibration allowed	not settable	x = present = not present
send	not settable	Transmission of changed values to the controller Confirmation of acceptance by signal tone
read	not settable	Reading the set values Confirmation of acceptance by signal tone

CAUTION !

These settings are adapted by the manufacturer to match the supplied configuration. The user can change the settings after inputting the password (“File” menu item).

6.10 Table of solvents

Solvent	Formula	Vacuum (mbar) for boiling point at 40 °C
Acetone	C_3H_6O	556
n-amyl alcohol, n-pentanol	$C_5H_{12}O$	11
Benzole	C_6H_6	236
n-butanol	C_4H_{10}	25
tert-butyl alcohol, 2-methyl-2-propanol	$C_4H_{10}O$	130
Tetrachlorometane	CCl_4	271
Chlorobenzene	C_6H_5Cl	36
Chloroform	$CHCl_3$	474
Cyclohexane	C_6H_{12}	235
Diethyl ether	$C_4H_{10}O$	kein Vakuum
1, 2, -dichlorethane	$C_2H_4Cl_2$	210
1, 2, -dichlorethylene (cis)	$C_2H_2Cl_2$	479
1, 2, -dichlorethylene (trans)	$C_2H_2Cl_2$	751
Diisopropyl ether	$C_6H_{14}O$	375
Dioxan	$C_4H_8O_2$	107
DMF	C_3H_7NO	11
Ethanol	C_2H_6O	175
Ethyl acetate	$C_4H_8O_2$	240
Heptane	C_7H_{16}	120
Hexane	C_6H_{14}	335
Isopropyl alcohol	C_3H_8O	137
Isoamyl alcohol, 3-methyl-1-butanol	$C_5H_{12}O$	14
Ethyl methyl keton	C_4H_8O	243
Methanol	CH_4O	337
Methylene dichloride, dichloromethane	CH_2Cl_2	no vacuum
Pentane	C_5H_{12}	no vacuum
n-propyl alcohol	C_3H_8O	67
Pentachlorpethane	C_2HCl_5	13
1, 1, 2, 2, -tetrachloroethane	$C_2H_2Cl_4$	35
1, 1, 1, -trichloroethane	$C_2H_3Cl_3$	300
Tetrachloroethylene	C_2Cl_4	53
THF	C_4H_8O	357
Toluol	C_7H_8	77
Trichloroethylene	C_2HCl_3	183
Water	H_2O	72
Xylol	C_8H_{10}	25

Vacuum in Torr/mmHg = X mbar x 0.75

7 Maintenance and Servicing

7.1 General Requirements

Repairs of the Laboratory-Vacuum-Systems may only be performed by the manufacturer or authorized workshops.

The prerequisites are a complete and factually correct damage report, and a clean and, if necessary, a decontaminate device.

The operator may perform maintenance work to the extent indicated below:

7.2 Maintenance Performed by the User

WARNING !

Only perform the work that is described here, and that which is permitted to be done by the user.
All other maintenance and service work may only be performed by the manufacturer or a dealer authorized by him.
Beware of the pump parts being possibly contaminated by hazardous substances. Wear protective clothing if there is contamination.

7.2.1 Maintenance of the diaphragm pump

- Check the pump daily for unusual running noises and heat building up on the surface of the pump.
- We recommend changing the diaphragm after 10,000 operating hours. The user may specify that the exchange be made earlier, depending upon the application process.
- Check the electrical and vacuum connections daily.

Scope of permissible work:

- Loosen and remove the hoses
- Open and remove the pump heads
- Inspect the pump chambers, diaphragms and valves
- Deposits in the inside of the pump must be cleaned out
- Change the diaphragms, valves and seals

Tools required:

The tool kit, order No. 402106

consists of:

- Order no. 826801 Pin type face wrench, adjustable, size 3,
- Order no. 826801-6 Allan key, size 4,
- Order no. 826801-5 Open spanner, size 17.

7.2.1.1 Disassembly

- Disconnect the power supply and ensure that it cannot be switched on again.
- Open the screw clamps of the hoses on the pump body with the SW 17 open spanner.
- Remove four machine screws **(1)** from each connection head with an Allan key, size 4.
- Lift off the pressure plate **(2)**, the connection head **(3)** and the pump head **(6)**. The valve gasket **(5)** and diaphragm **(8)** are now freely exposed.
- Loosen the diaphragm **(8)** at the strain washer **(7)** by turning the size 3 pin type face wrench anti-clockwise.
- Clean the valve gasket **(5)** and the diaphragm **(8)** with a soft cloth and acetone.

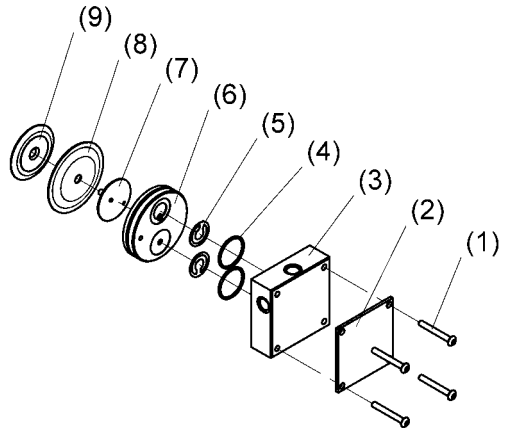


Fig. 9 Disassembly, assembly

	WARNING !
Renew defective parts, if necessary ! Wear protective gloves! **Parts must be renewed at the intervals stated in this Operating Manual or as specified by the user internally.** **Do not clean with compressed air !**	

7.2.2 Assembly *(Fig. 9)*

- Place the pump so that the diaphragm is lying in a horizontal position.
- Use the size 3 pin-type face wrench to tighten the pressure disc **(9)**, the diaphragm **(8)** and the strain washer **(7)** with the correct torque of 2 - 4 Nm.
- Bring the connecting rod **(5)** *(see fig. 13)* and the diaphragm **(8)** into the central position.
- Replace the pump head **(6)**.
- Insert the valve **(5)** and the O-ring **(4)**.
  Ensure that they are lying completely flat. Do not insert the burred side facing the sealing surface. Align the connection head flush with the pin.
- Replace the pressure plate **(2)** and insert and tighten the 4 machine screws with a torque of 3 - 4 Nm.
- Reattach the hose connections with clamping ring screw fittings.

7.2.2.1 Test

- Connect a vacuum measuring device to the suction connector and measure the ultimate pressure. If the device is working properly, then the figure stated in the technical data must be attained within a maximum of one minute.
- The pump must not make any abnormal noises.
- Moving parts must not touch each other.

7.2.3 Maintenance of the vacuum controller

The vacuum controller is maintenance-free. In case of damage, return the device to the manufacturer or to an authorized workshop.

7.2.4 Maintenance of other components

- Empty the glass drip pan in a timely manner, observe all disposal specifications as applicable to hazardous substances.
- Screw connections must be checked for tightness and tightened when necessary.
- Check vacuum hoses for leaks and, if necessary, replace them.
- Check that the glass vessels is undamaged and if necessary replace.
- Check rubber gasket of the safety valve at the emission condenser and, if necessary, replace it.

7.3 Maintenance by the Manufacturer

Repairs and maintenance going beyond the extent of the work described *in chapter 7.2* or reconditioning or modification may only be performed by the manufacturer or authorized workshops.

	**WARNING !**
The user shall be liable for the consequences of an incorrect damage report or a contaminated pump. The statements in the damage report are legally binding.	

7.4 Damage Report

You find the form of the damage report to the Download on our web page http://www.ilmvac.de and/or. http://www.ilmvac.com in the menu "service" and "Downloads".

If you should not have an entrance to the Internet, you can request the form also gladly with us, company ILMVAC GmbH.

	**WARNING !**
Incomplete or incorrectly completed damage reports may endanger the service personnel! **Provide full information about contamination, and clean the pump thoroughly before handing it over to third parties.**	

8 Troubleshooting

Only ILMVAC GmbH and authorized service workshops may work on (carry out repairs, modifications etc.) the diaphragm pump, vacuum controller and their accessories during the warranty period.

Trouble	Cause	Action
Diaphragm pump does not start	No power supply to the motor	Electrical system to be checked by a qualified electrician.
	Motor defective	Exchange by service shop.
	Pump body defective	Exchange or repair by service shop.
The diaphragm pump does not generate a vacuum or only an inadequate one.	Connected apparatus leaks, connecting elements leak	Identify and seal the leak, replace the seals and hoses if necessary.
	Diaphragm pump leaks (pipes or hoses)	Check the hose connections between the pump heads, replace the hoses and screwed clamping rings if necessary.
	Pump head	Repair by service shop.
	Diaphragm defective	Repair by the service workshop or the user.
	Valves are dirty	Clean condensates and foreign objects out of the valves. Cleaning by the service workshop or the user.
	Valves defective	Replace valves. Repair by the service workshop or the user.
	Diaphragm pump is dirty	Cleaning by the service workshop or the user.
No pressure indicated on the controller	No power supply to the motor	Electrical system to be checked by a qualified electrician.
Controller cannot be set or programmed	Electronics / display are defective	Repair by authorized service shop.
Missing control signal	Incorrect input	Check the input and correct if necessary.
	Controller defective	Switch the device off, and switch it on again after three seconds.
		Replace the controller.

9 Spare Parts Overview

The spare parts list contains all the spare parts and all the information necessary for ordering.

When ordering, please quote the description, quantity, serial number and order number!

	**CAUTION !**
ILMVAC is not liable for any damage caused by the installation of any parts not supplied by the manufacturer.	

9.1 Maintenance kit - Diaphragm Pump

Designation	Order no.
Maintenance kit	402008

The maintenance kit consists of:

Designation	Piece	Order no.
O-ring EPDM ø 12 x 2	5	829217-3
O-ring EPDM ø 28 x 2	4	829252-2
Valve	4	400656
Diaphragm	2	400822-2

9.2 Spare parts view LVS 101 Z

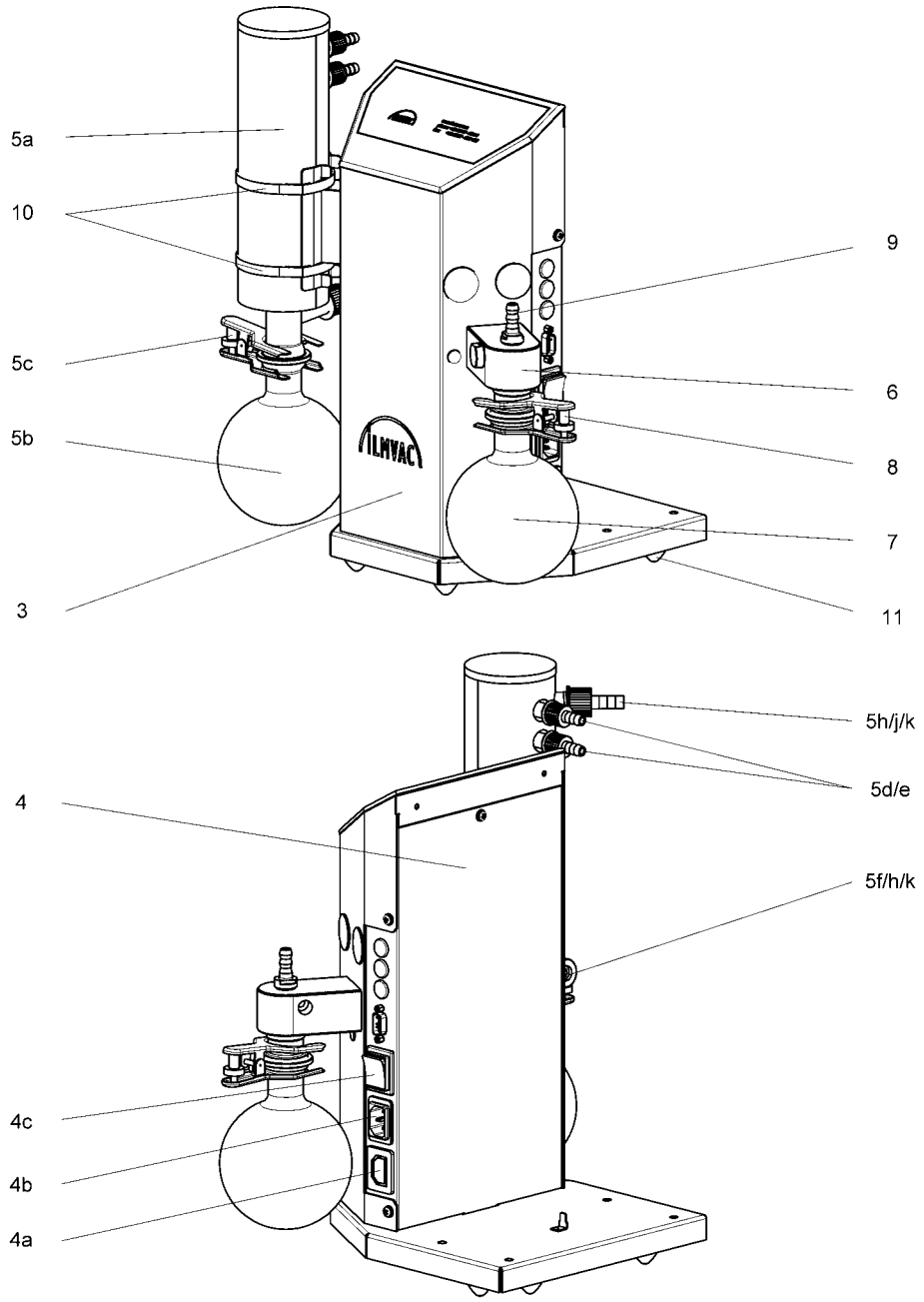


Fig. 10 Front- and rear unit – LVS 101 Z (without item no. 1)

9.2.1 Spare parts list LVS 101 Z

Item no.	Designation	Piece	Order no.
1	**Diaphragm pump MPC 101 Z** (230V) *(consisting of: – see chapter 9.4)*	**1**	**412522-05**
	Diaphragm pump MPC 101 Z (115V) *(consisting of: – see chapter 9.4)*	**1**	**41252-06**
2	**Straight threaded joint with seal edge PVDF, 10 – 1/4”**	**1**	**829931**
3	**Column 2 complete** *(consisting of position: 4 – 11)*	**1**	**115502-01**
4	**Rear panel 1 complete** *(consisting of position: 4a – 4c)*	**1**	**115503**
4a	- Socket for non-heating apparatus	1	825274-7
4b	- Device plug combination with system filter	1	825297
4c	- Switch green 2 pole	1	825184
5	**Emission condenser short complete KD 500/5 insulated** *(consisting of position: 5a – 5k)*	**1**	**700183-08**
5a	- Intensive cooler short with isolation	1	720480
5b	- Round-bottomed flask 500 ml – KS 35	1	828839
5c	- Ball and socket clamp – KS 35	1	828845
5d	- Screw cap GI 14	2	828872
5e	- Hose nozzle GI 14	2	828872-1
5f	- Safety valve	1	100838-01
5g	- Vacuum hose PTFE, 10/ 8x1 *(sold be the metre)*	0,15 m	828332
5h	- Screw cap GI 18	2	828876
5j	- Hose nozzle GI 18	1	828876-1
5k	- Silicon sealing GI 18	1	828876-2
6	**Valve seat complete**	**1**	**113528-1**
7	**Round-bottomed flask 500 ml – KS 35**	**1**	**828839**
8	**Ball and socket clamp – KS 35**	**1**	**828845**
9	**Hose nozzle DN 8 – G ¼“**	**1**	**710798-06**
10	**Retaining strap 70 – 75 mm**	**2**	**824130**
11	**Rubber metal-pad**	**6**	**829138-1**

9.3 Spare parts view LVS 110 Z

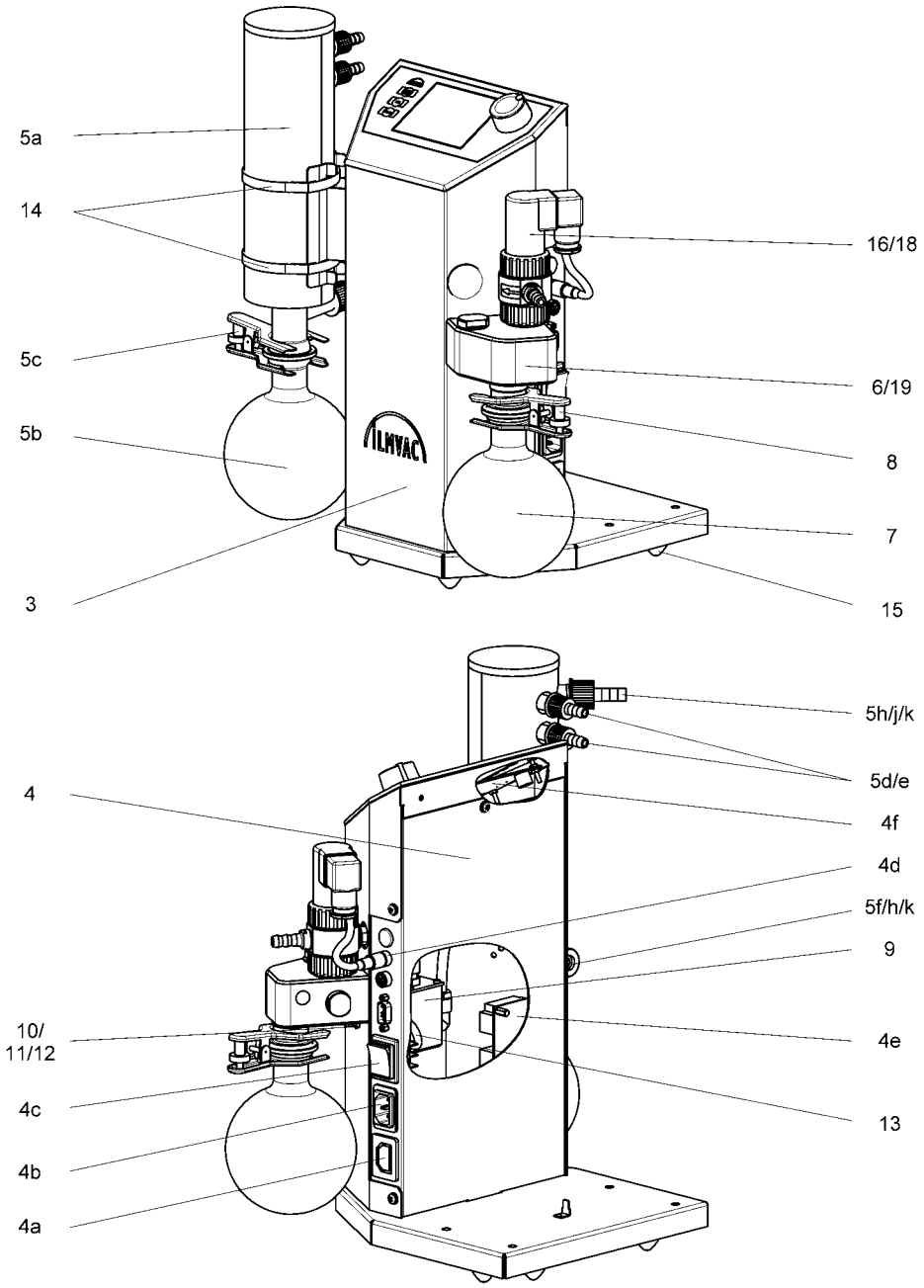


Fig. 11 Front- and rear unit – LVS 110 Z (without item no. 1)

9.3.1 Spare parts list LVS 110 Z

Item no.	Designation	Piece	Order no.
1	**Diaphragm pump MPC 101 Z** (230V) *(consisting of: – see chapter 9.4)*	**1**	**412522-05**
	Diaphragm pump MPC 101 Z (115V) *(consisting of: – see chapter 9.4)*	**1**	**412522-06**
2	**Straight threaded joint with seal edge PVDF, 10 – 1/4"**	**1**	**829931**
3	**Column 4 complete** *(consisting of position: 4 – 18)*	**1**	**115502-03**
4	**Rear panel 1 complete** *(consisting of position: 4a – 4f)*	**1**	**115503-06**
4a	- Socket for non-heating apparatus	1	825274-7
4b	- Device plug combination with system filter	1	825297
4c	- Switch green 2 pole	1	825184
4d	- Sub miniature round plug - flange box 4 pole	2	825277-1
4e	- NT-switch power pack 24 V	1	827400-5
4f	- Circuit board VC 521	1	827429
5	**Emission condenser short complete KD 500/5 insulated** *(consisting of position: 5a – 5k)*	**1**	**700183-08**
5a	- Intensive cooler short with isolation	1	720480
5b	- Round-bottomed flask 500 ml – KS 35	1	828839
5c	- Ball and socket clamp – KS 35	1	828845
5d	- Screw cap GI 14	2	828872
5e	- Hose nozzle GI 14	2	828872-1
5f	- Safety valve	1	100838-01
5g	- Vacuum hose PTFE, 10 / 8x1 mm *(sold be the metre)*	0.15 m	828332
5h	- Screw cap GI 18	2	828876
5j	- Hose nozzle GI 18	1	828876-1
5k	- Silicon sealing GI 18	1	828876-2
6	**Valve seat complete**	**1**	**113522**
7	**Round-bottomed flask 500 ml – KS 35**	**1**	**828839**
8	**Ball and socket clamp – KS 35**	**1**	**828845**
9	**Sensor – built-in controller 521**	**1**	**620052-17**
10	**Screw in socket amended**	**1**	**160537**
11	**Screw in socket**	**1**	**828791**
12	**Distance piece M5/M5**	**1**	**160529**
13	**Silicone hose I ø 3 x 1.5 mm**	**0.2 m**	**H100086**
14	**Retaining strap 70 – 75 mm**	**2**	**824130**
15	**Rubber metal-pad**	**6**	**829138-1**
16	**Automatic valve VVC-E4**	**1**	**700425-01**
18	**Straight threaded joint with seal edge PVDF, 8 – 1/4"**	**1**	**829919-1**

9.4 Diaphragm pump MPC 101 Z

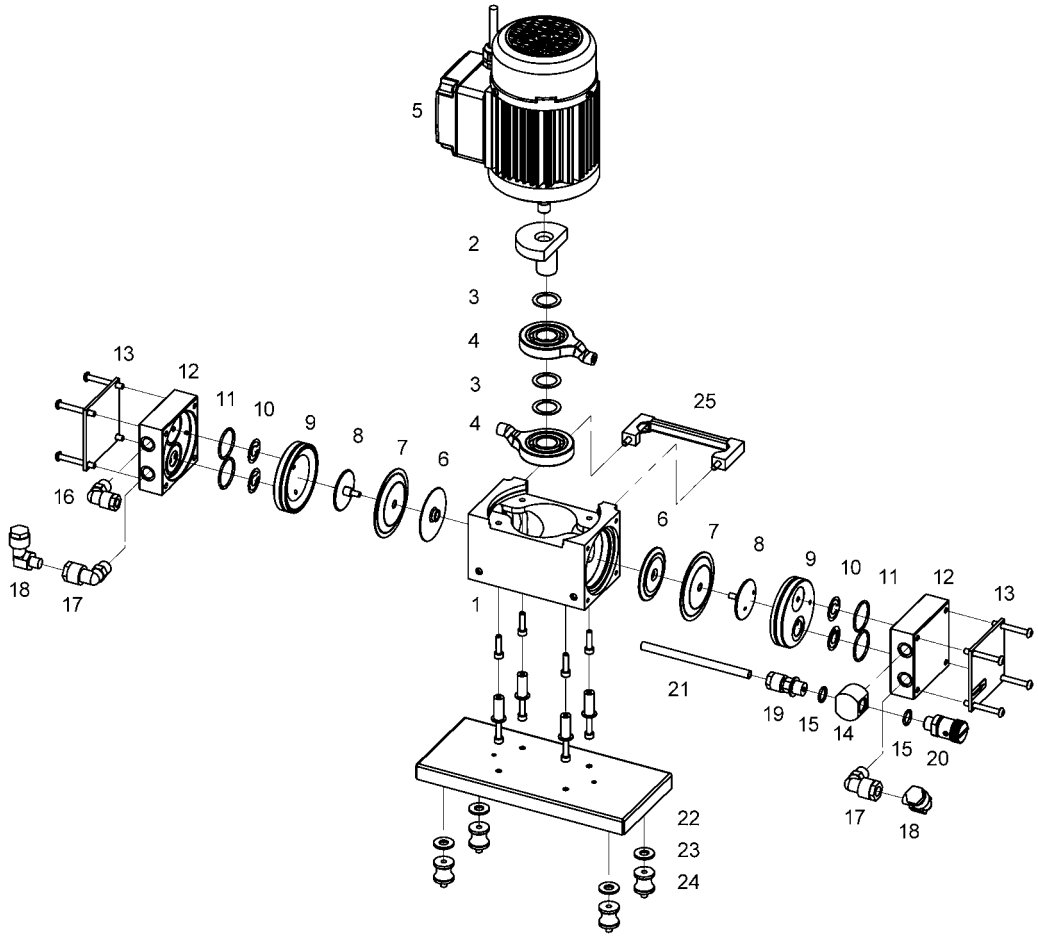


Fig. 12 Exploded view – MPC 101 Z

9.4.1 Spare parts list MPC 101 Z

Item no.	Designation	Piece	230 V	115 V
			Order no. 412522-05	Order no. 412522-06
			Order no.	**Order no.**
- ***)**	Basic pump complete *(consisting of position: 1 – 5)*	1	410301-02	410301-03
1	Pump casing	1	400764	400764
-	Drive complete *(consisting of position: 2 – 4)*	1	400763-01	400763-01
2	Eccentric	1	400770	400770
3	Close tolerance spacer 20 x 28 x 1	3	824957-2	824957-2
4	Piston rod with ball bearing	2	400771-01	400771-01
5	Alternating-current motor	1	826484-01	826484-02
	Motor operating condenser 30µF	1	-	825461
6	Pressure washer	2	400772-1	400772-1
7	Diaphragm	2	400822-2	400822-2
8	Tensioning washer	2	400773-3	400773-3
9	Pump head 1	2	400768	400768
10	Valve	4	400656	400656
11	O-ring EPDM Ø 28 x 2	4	829252-2	829252-2
12	Connection head 1	2	400767	400767
13	Pressure plate	2	400769	400769
14	Distributor	1	400790	400790
15	O-ring EPDM Ø 12 x 2	2	829217-3	829217-3
16	Threaded elbow joint PVDF, 8 – ¼“	1	829929	829929
17	Threaded elbow joint PVDF, 10 – ¼“	2	829984	829984
18	Plug for non-heating apparatus PVDF, 10 – A10	2	829913-1	829913-1
19	Straight threaded joint with seal edge PVDF, 8 – ¼“	1	829919-1	829919-1
20	Gas ballast valve	1	400599-01	400599-01
21	Vacuum hose PTFE, 8 / 6x1 mm	0,12 m	828331	828331
22	Pump bracket complete	1	115514	115514
23	Washer	4	112538	112538
24	Rubber metal-pad	4	829129	829129
25	Handle	1	828631	828631

***)** The "basic pump" module (items 1 - 5) can only be supplied complete under order number 410301-02 or 410301-03.

EG - Konformitätserklärung

EC Declaration of Conformity / CE Declaration de Conformite

DIN EN ISO/IEC 17050

Hiermit erklären wir

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unter eigener Verantwortung, dass nachstehendes Produkt aufgrund seiner Konzipierung und Bauart sowie in den von uns in Verkehr gebrachten Unterlagen den nachfolgend aufgeführten EG-Richtlinien und Normen entspricht. Bei einer nicht mit uns abgestimmten Änderung des Produkts verliert diese Erklärung ihre Gültigkeit.

We (ILMVAC GmbH) herewith declare under our sole responsibility that the product described below is in accordance with the following Directives standards and other technical specifications regarding design and version when delivered from our factory.
This declaration becomes invalid whenever the product has been modified without our consent.
Nous (ILMVAC GmbH) certifions par la presente, que le produit decrit ci-apres est conforme, tant dans sa conception que dans sa realis/ation, aux normes de securite et d'hygiene exigees par les standards de la CE. En cas de modification du produit sans notre accord, cette declaration devient caduque.

Bezeichnung des Produkts (Pumpen und Pumpstände) Description of product (vacuum plants) Description du produit (systeme de vacuum)	Labor-Vakuum-Systeme LVS 101 Z, LVS 110 Z
Artikel-Nr./ Fabrication No./ No. de fabrication	115022, 115022-01, 115024, 115024-01
Baujahr / Year of manufacture / Annee de fabrication	2010

Das Produkt entspricht folgenden Richtlinien und Normen / The product is in conformity with the following Directives and standards / Le produit est conforme aux directives et standards suivants:

- [X] Richtlinie 2006/42/EG / Maschinenrichtlinie / EC machinery standards / standards CE pour machines / in der Fassung vom 22.06.1998
- [X] Richtlinie 2006/95/EG / Niederspannungsrichtlinie / EC low voltage standards / standards CE pour basse tension / in der Fassung vom 12.12.2006
- [X] Richtlinien 89/336/EWG und 2004/108/EG / Elektromagnetische Verträglichkeit (EMV) / EC standards electromagnetic resistance / standards CE resistance electromagnetique / in der Fassung vom 03.05.1989 und 15.12.2004
- [X] Richtlinie 2002/95/EG, Gefährliche Stoffe in Elektro- und Elektronikgeräten (RoHS)
- [X] Richtlinie 2002/96/EG, Elektro- und Elektronik-Altgeräte (WEEE)
- [X] China - RoHS

Angewandte harmonisierte Normen / applied harmonized standards / standards appliques et harmonises

- [X] DIN EN ISO 12100-1 : 2004 und DIN EN ISO 12100-2 : 2004 ; Sicherheit von Maschinen; Grundbegriffe, allgemeine Gestaltungsleitsätze / Safety of machinery, instruments and systems / securite des machines, instruments et systemes
- [X] DIN EN 294:1992; Sicherheit von Maschinen; Sicherheitsabstände gegen das Erreichen von Gefahrstellen mit den oberen Gliedmaßen / safety distances from danger points / distances de securite par rapport aux endroits dangereux
- [X] DIN EN 1012-2:1996; Kompressoren und Vakuumpumpen, Sicherheitsanforderungen - Teil 2: Vakuumpumpen / safety of machinery (avoidance of crushing) / securite des machines (eviter les ecrasements)
- [X] DIN EN 60204-1:1998; Sicherheit von Maschinen - Elektrische Ausrüstung von Maschinen - Teil 1: Allgemeine Anforderungen / electrical equipment for machinery used in the industry / equipement electrique pour machines utilisees dans l'industrie
- [X] EN 61000-6-2 : 2005 Fachgrundnormen – Störfestigkeit für Industriebereiche

Geschäftsführer	Datum/date	2010
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