MAXIMATOR®

Maximum Pressure.

Hochdrucktechnik • Prüftechnik • Hydraulik • Pneumatik

» Air Amplifiers

Instructions acc. to Machinery Directive &
Operating Instructions acc. to ATEX Directive

Read the instructions before commencing any work!

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Abbreviations and formula symbols used

i	-	Übersetzungsverhältnis
L_{eq}	-	Lärmemission
P_A	-	Gasvordruck
P_B	-	Betriebsdruck
P_L	-	Antriebsdruck
P_1, P_2	-	Druck
T_1, T_2	-	Temperatur
χ	-	Isotropenexponent

1 General Information

1.1 Information about these instructions

Maximator air amplifiers (hereinafter referred to as PLV) are used to compress pre-compressed air to a desired higher pressure. The PLVs are driven by compressed air at a range of 1 to 10 bar.

These instructions enable the PLV to be handled safely and efficiently. The instructions are part of the PLV and must be kept in its direct vicinity, accessible to personnel at all times.

Personnel must have carefully read and understood these instructions before commencing work. A basic prerequisite for safe work is compliance with all specified safety information and handling instructions in these operating instructions.

In addition, local occupational safety provisions and general safety regulations apply to the area in which the PLV is used.

The purpose of illustrations in these instructions is to aid general understanding and they may differ from the actual implementation. Furthermore, technical data and measurement and weight information apply to the day on which these assembly instructions were printed. They may differ in detail from a particular implementation, without fundamentally changing the objective information and thereby losing validity. Differences in textual and pictorial statements depend on equipment and accessories, which means that no claims arising from this can be asserted.

The documents on fitted components contained in the Annex and all other supplied documents apply in addition to these instructions.

The operating instructions for Maximator products are available as a digital download in many languages at

» http://www.maximator.de/Dokumente-Bedienungsanleitungen.

1.2 Explanation of symbols

Safety information

Safety information in these instructions is marked by symbols. The safety information is introduced by signal words that express the extent of the hazard.

WARNING!

This combination of symbol and signal word refers to possible hazardous situations that can lead to minor, slight or serious injuries or even death if they are not avoided.

NOTE

This combination of symbol and signal word refers to possible hazardous situations that can lead to material and environmental damage if they are not avoided.

Special safety information

The following symbols are used in safety information to draw attention to particular hazards.

WARNING!
This combination of symbol and signal word identifies contents and instructions for intended use in potentially explosive atmospheres.

If a note marked like this is not heeded, there is an increased explosion hazard and serious or even fatal injuries may result.

Safety information in handling instructions

Safety information may relate to particular individual handling instructions. Such safety information is embedded in the handling instructions so that it does not interrupt reading flow when performing the action. The previously mentioned signal words are used.

Example:

1.► Undo screw.

2.► 

WARNING!
Jamming hazard at lid!

Close the lid carefully.

3.► Tighten screw.

Tips and recommendations

This symbol highlights useful tips, recommendations and information for efficient and trouble-free operation.

Other marking

To highlight handling instructions, results, lists, references, and other elements, the following marking is used in these instructions.

Marking	Explanation
1.►	Step-by-step handling instructions
⇨	Results of handling steps
»	References to sections in these instructions and other applicable documents
•	Lists without defined sequence

1.3 Customer service

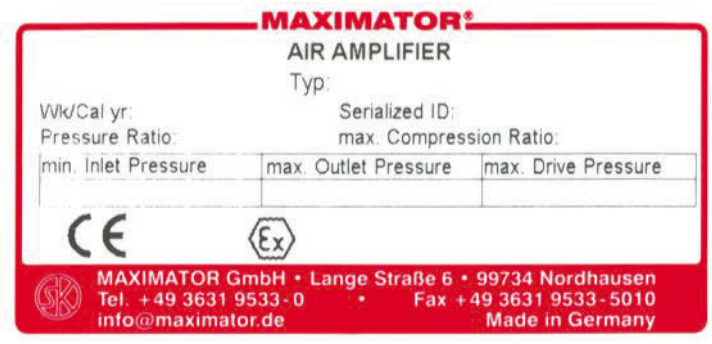
Our customer service is available for technical information and repairs:

Address	Maximator GmbH Ullrichstraße 1-2 99734 Nordhausen
Customer service phone Mon. – Thu.: 7am – 5pm CET; Fri.: 7am – 2pm CET	+49 (0) 3631 9533-5444
Customer hotline telephone (charged) Mon. – Thu.: 5pm – 10pm CET Fri.: 2pm – 10pm CET Saturday, Sunday, and holidays: 8am to 8pm CET	+49 (0) 1805 629 462 867
Fax	+49 (0) 3631 9533-5065
E-Mail	service@maximator.de
Internet	www.maximator.de/service

Furthermore, we are always interested in information and application-based experiences, which may be valuable in terms of improving our products.

1.4 Nameplate

The nameplate is located in the centre of the PLV's drive unit and contains the following information:



- Manufacturer
- Type (information from type designation code)
- Calendar week/year of construction
- Serial number
- Transmission ratio
- Maximum compression ratio
- Minimum inlet pressure
- Maximum outlet pressure
- Maximum drive air pressure
- ATEX marking

1.5 Type designation code

The type designation code for the respective PLV models consists of the designation of the PLV type and the variant codes attached to it. In the designation of the PLV type, the leading letters refer to the PLV series, e.g. MPLV, SPLV or GPLV. The number that follows refers to the transmission ratio of the relevant PLV. Further options may then be indicated, separated by hyphens.

2 Safety

This section provides an overview of all important safety aspects for the protection of personnel as well as safe and trouble-free assembly. Further task-related safety information is contained in the sections for the individual service life phases.

2.1 Intended use

The PLVs describes in these assembly instructions (see » chapter 3.4 "Models") are intended to be used in compressed air networks. The air amplifiers are used solely for compressing pre-compressed air or nitrogen.

The PLVs are driven, as standard, by means of compressed air or nitrogen at a maximum drive pressure of 10 bar.

If ATEX marking has been affixed to the nameplate and a declaration of conformity has been supplied, the PLVs may be used in potentially explosive atmospheres.

Intended use also includes compliance with all information in these instructions.

Any usage beyond the intended use or any other type of use counts as improper use.

2.2 Warranty and liability

In principle, the "General Terms and Conditions of Sale and Delivery" supplied by the manufacturer of the PLVs shall apply. The "General Terms and Conditions of Sale and Delivery" can be viewed on Maximator's website » http://www.maximator.de.

Any warranty and liability claims are precluded if they are due to one or more of the causes mentioned in these operating instructions and explicitly identified below:

- Improper use of the air amplifiers.
- Incorrect commissioning, operation or maintenance of the PLVs.
- Modifications to the air amplifiers and improper repair work.
- Operating the air amplifiers with defective safety equipment or incorrectly installed safety and protective equipment.
- Failure to comply with the information in these operating instructions in respect of commissioning, operation and maintenance.
- Inadequate monitoring of PLV parts that are subject to wear and tear.

2.3 Foreseeable misuse

WARNING!
Misuse hazard!
Misusing the PLVs may result in hazardous situations.

- Use only pre-compressed compressed air or nitrogen to operate the PLVs.
- Never operate the air amplifiers in enclosed vessels.
- Never perform any unauthorized conversions or technical modifications to the air amplifiers.
- Never use the PLVs in any way other than that described in these operating instructions.
- Never exceed the technical limits or pressures stated in these operating instructions.
- Operate the PLVs only when in perfect technical condition.
- Always observe all information on installation, maintenance and troubleshooting contained in these operating instructions.
- PLVs cannot be used for
- creating pharmaceutical products with direct contact
- creating / machining / processing food

2.4 General hazards

The following section lists residual risks that may emanate from the air amplifiers even if they are used as intended.

In order to reduce the risks of personal injury and material damage and to avoid hazardous situations, all safety information listed here and the safety information in further sections of these instructions must be observed.

2.4.1 Pressurized gas hazards

Pressurized components

WARNING!
Injury hazard due to pressurized components!

Compressed air or gas may escape from pressure lines, screw connections or pressurized components if the PLVs are used incorrectly. This compressed air or these gases may cause eye injuries, swirl up dust, cause uncontrolled movements in the lines and result in serious injuries.

Defective pressurized components may also cause uncontrolled movements that can lead to severe injuries.

- Before assembling or dismantling hoses, lines, screw connections or quick couplings, always make sure that they are depressurized.
- Wear personal protective equipment at all times.

Ensure that defective components to which pressure is applied during operation are immediately replaced by qualified personnel (mechanical or system engineers).

2.4.2 Low temperature hazards

Cold surfaces

WARNING!
Injury hazard due to cold and icy surfaces!

Components such as exhaust air silencers may ice over due to expanding air or gas. Skin contact with cold surfaces may cause skin irritations. Ice particles may be detached and fly around in an uncontrolled manner.

- Always wear protective work clothing, protective goggles and protective gloves when working near to cold or icy surfaces.

Make sure that all surfaces have warmed to ambient temperature before commencing any work.

2.4.3 General hazards at the workplace

Noise

WARNING!
Injury hazard due to noise!

The noise level occurring in the work area can cause major hearing damage, depending on the installation type and expanding air.

- Always wear personal protective equipment when working on PLVs in operation.
- Only remain in the danger zone to the extent necessary.

The noise level depends on the installation situation and can be determined only in the installed state.

Flying ice crystals and accumulations of fluid

WARNING!
Flying ice crystals and accumulations of fluid

Components such as exhaust air silencers may ice over due to expanding air or gas. Ice particles may be ejected and tossed around by the expanding exhaust air. The ejected ice crystals may cause eye injuries and accumulations of fluid on the floor.

- Wear protective goggles at all times during work.
- Immediately use suitable media to absorb accumulations of fluid.
- Wear anti-slip safety footwear at all times.

Attach warning signs and instructions at or near to the area where accumulations of fluid may occur on the floor or ice crystals may fly around.

2.4.4 Explosion hazards

Explosion protection

When working in an explosion zone, adhere to the national or international regulations for behaviour in potentially explosive atmospheres.

2.4.5 Safety at the installation location

The PLVs must not be operated in enclosed vessels. The escaping drive air may cause the vessel to burst. The screw connections at inlet and outlet glands must not be loosened. The screw connections must be tight to prevent leaks and damage. The booster must be installed in a way that keeps the actuators and screw connections freely accessible at all times

2.5 Fluid and substance hazards

Compressed fluid

WARNING!

Injury hazard due to incorrect handling of compressed fluid!

Incorrect handling of compressed fluid may cause serious poisoning or even fatal injury or illness.

- Always pay attention to the manufacturer's safety data sheet.
- Always ensure that there is sufficient ventilation when working with gases.
- Do not smoke inside the danger zone or its immediate vicinity. Avoid all naked flames, fire and sources of ignition.
- Always keep self-contained breathing apparatus ready for emergencies.
- In the event of signs of asphyxiation, immediately provide the affected person with self-contained breathing apparatus, put him or her in the recovery position in the fresh air and keep him or her warm. Initiate first aid measures involving artificial respiration if the person stops breathing. Seek immediate medical assistance.

2.6 Duties of the manufacturer of complete machinery

2.6.1 Safety equipment

Before the PLV is commissioned, it needs to be installed and integrated into the safety system.

2.6.2 Work and hazard areas

The danger zone is located around the entire PLV.

2.6.3 Manufacturer

The following section defines a manufacturer as the entity that incorporates the air amplifiers into complete machinery.

The manufacturer must observe additional duties arising from the incorporation of the air amplifier into a plant or system:

- The manufacturer must ensure that, when incorporating the PLV into a plant or a system, an overall risk assessment is drawn up and the required hazard removal measures are initiated.
- The manufacturer must ensure that the PLV is integrated into the emergency-stop concept of the plant/ system.
- The manufacturer must ensure that all pressure hoses, pressure lines, couplings, screw connections and other system components are designed and dimensioned for the pressure ranges of the air amplifier.

2.6.4 Manufacturer's duties

Information that needs to be securely transferred to the operator.

The PLV is used in the commercial sphere. The operator of the PLV is therefore subject to the statutory obligations regarding occupational safety.

In addition to the safety information contained in these instructions, the safety, work protection and environmental regulations applicable to the deployment area of the PLV must be complied with.

The following applies, in particular:

- The operator must find out about the applicable occupational safety regulations and additionally determine, in a risk assessment, risks that may arise due to the special working conditions at the location in which the PLV is used. It must implement them in the form of instructions for operating the PLV.
- During the entire service life of the PLV, the operator must check whether the operating instructions prepared by it comply with the current status of regulations and adapt them if necessary.
- The operator must clearly lay down and define who is responsible for installation, operation, troubleshooting, maintenance and cleaning.
- The operator must ensure that all persons using the PLV have read and understood these instructions. Furthermore, the operator must train staff, and inform them about hazards, at regular intervals.
- The operator must provide personnel with the necessary protective equipment and give binding instructions on wearing the necessary protective equipment.

The operator is also responsible for ensuring that the PLV is always in perfect technical condition. The following therefore applies:

- The operator must ensure that the PLV is integrated into the emergency-stop equipment or the safety chain of the system into which the PLV is incorporated.
- The operator must ensure that the operating media (compressed air, nitrogen) are installed and stored in the approved manner.
- The manufacturer must ensure that all pressure hoses, pressure lines, couplings, screw connections and other system components are designed and dimensioned for the pressure ranges of the PLV.
- The operator must ensure that suitable fluid ports exist and that they can be secured by means of a separate shut-off valve.
- The operator must ensure that the ports for the compressed fluid (compressed air, nitrogen) work correctly.
- The operator must ensure that the PLV is always kept and operated in perfect technical condition.

- The operator must ensure that sufficient lighting is always available in the PLV working area.
- The operator must ensure that all fault removal and repair work is carried out exclusively by personnel trained by Maximator.
- The operator must ensure that all warning, information and safety signs on the PLV are kept complete and legible at all times
- The operator must perform prior checks to ensure that the PLV is not damaged and is in proper condition whenever it is put into service.

Additional operator duties with regard to explosion protection

The operator has additional duties arising from the EC Directive on improving the safety and health protection of workers potentially at risk from explosive atmospheres.

This includes the following organizational measures:

- Marking of explosive areas
- Clear signs in relation to all prohibitions
- Preparation of explosion protection documentation for each zone
- Issuing a prohibition on access by unauthorized persons

2.6.5 Personnel requirements

Qualifications

WARNING!
Injury hazard in the event of inadequate personnel qualifications!

There is a risk of serious injury and considerable damage if unqualified personnel carries out work on the PLV or remains in the danger zone around the PLV.

Only let personnel trained by MAXIMATOR carry out activities.

Keep unqualified personnel away from the hazard areas. These instructions specify personnel qualifications for the various areas of activity, as stated below:

Mechanical and system engineers shall be capable of carrying out the work assigned to them on account of their professional training, knowledge and experience as well as knowledge of the relevant regulations. Furthermore, the mechanical and system engineer shall be familiar with the installation, assembly and combination of machinery, able to identify possible hazards independently and know how to avoid them.

Personnel shall consist only of individuals who are expected to perform their work reliably. Individuals whose reactions are affected, e.g. by drugs, alcohol or medication, shall not be permitted to carry out work on the PLV.

Observe the age and job-specific regulations applicable at the installation location when choosing personnel.

2.7 Personal protective equipment

The purpose of personal protective equipment is to protect personnel against safety and health hazards at work.

Personnel must wear personal protective equipment, to which separate reference is made in individual sections of these instructions, during various activities on and with the PLVs.

Description of personal protective equipment

Protective workwear

Protective workwear is tight-fitting work clothing with low tear strength, tight sleeves and no protruding parts.

Protective goggles

Protective goggles are intended to protect eyes against flying parts and fluid spatter.

Protective gloves

Protective gloves are intended to protect the hands against friction, abrasions, punctures, or more severe injuries as well as against contact with hot or cold surfaces.

Safety footwear

Safety footwear protects the feet against crushing, falling parts, and slipping on slippery sub-surfaces

Hearing protection

Hearing protection is intended to protect against continuous noise that exceeds the permitted noise level and could thereby cause permanent hearing damage.

2.8 Spare parts

WARNING!

Hazard due to the use of incorrect spare parts!

Use of the incorrect or faulty spare parts may cause malfunctions. This may cause severe injuries or even death as well as significant material damage.

Use only Maximator original spare parts or spare parts explicitly approved by Maximator.

Contact Maximator in the event of a lack of clarity.

2.9 Environmental protection

NOTE!

Risk to the environment due to incorrect handling of environmentally hazardous substances!

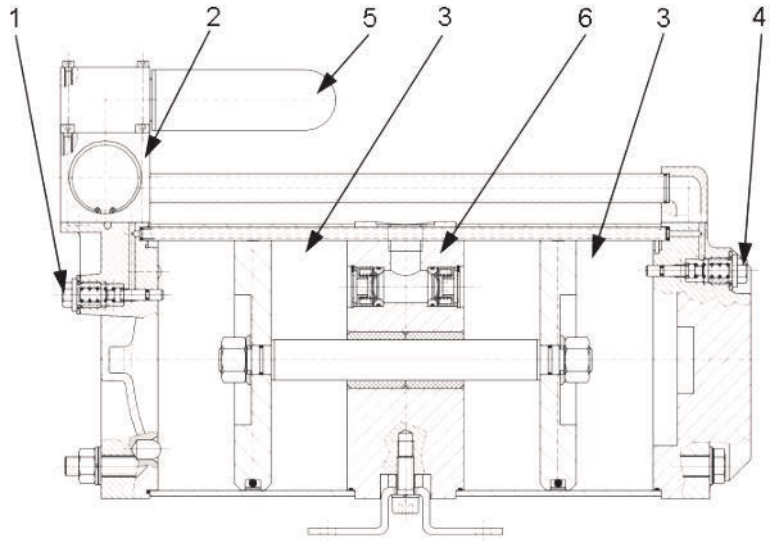
Incorrect handling, especially incorrect disposal, of environmentally hazardous substances may cause significant environmental damage.

Follow the manufacturer's instructions on handling environmentally hazardous substances and their disposal.

If environmentally hazardous substances accidentally enter the environment, take appropriate measures immediately. If in doubt, inform the responsible local authorities about the damage and ask about suitable measures that can be taken.

3 Design and Function

3.1 Overview



Flg. Maximator air amplifier of type GPLV 2

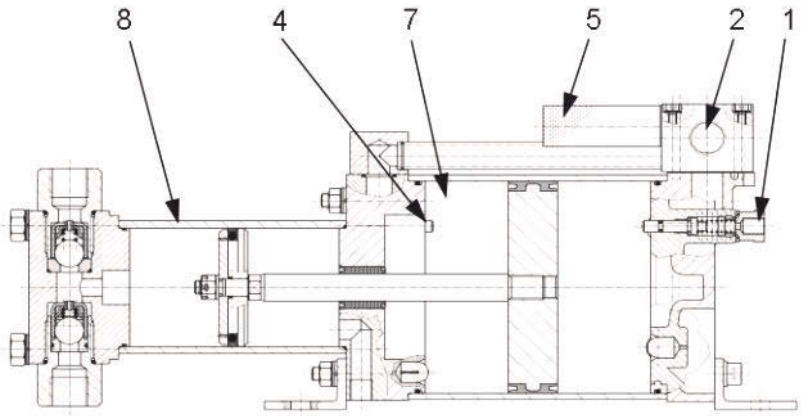


Fig. Maximator air amplifier of type SPLV 3

1 Pilot valve 1

2 Spool valve

3 Air cylinder

4 Pilot valve 2

5 Exhaust air silencer

6 Air separation cap

7 Drive unit

8 High-pressure unit

3.2 Brief description

The PLVs work on the principle of a pressure intensifier. They are used to compress pre-compressed air or nitrogen to higher pressures and are operated with a drive pressure of up to 10 bar of compressed air. The drive pressure is required to compress the respective gas to a higher operating pressure. The transmission ratio is derived from the piston surface pressurized on the drive side in relation to the high-pressure-side piston surface. The air drive pressure must be selected depending on the type of PLV (see » chapter 4.1 "Operating conditions").

3.3 Assembly description

Pilot valve

The purpose of the pilot valves is to enable the air piston to switch the stop positions over. The pilot valves are actuated in the stop positions by the air piston and transfer air impulses to the spool valve. This enables the pilot valves to ventilate and vent the actuator chamber of the spool valve. This moves the spool valve from one stop position to the other.

Spool valve

The spool valve is used to apply compressed air alternately to the top and bottom of the air piston. The spool valve is controlled by means of the pilot valves and ensures that the drive air reaches the opposite side of the air piston.

Air cylinder (applies only to xPLV 2)

The drive piston operates back and forth in the air cylinders of xPLV 2 air amplifiers. In this process, the compressed air or nitrogen to be compressed alternately enters the two middle compartments, is compressed there and exits from them again through the outlet valve. The two outer compartments are used to drive the air amplifier and are pressurized with compressed air, depending on spool valve position.

Drive unit (does not apply to xPLV 2)

The drive unit is used to take up the drive air (compressed air or nitrogen) and actuate the air amplifier's high-pressure unit via a piston rod, thereby compressing the compressed air or nitrogen in the high-pressure unit to a higher pressure.

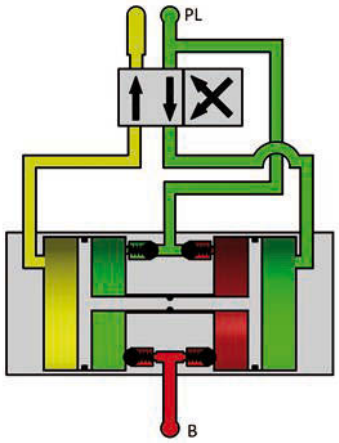
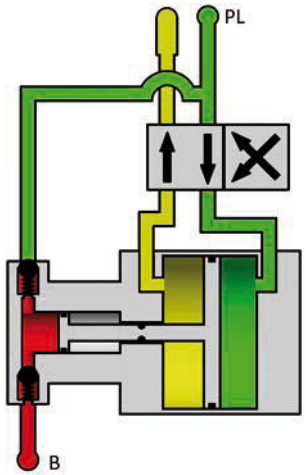
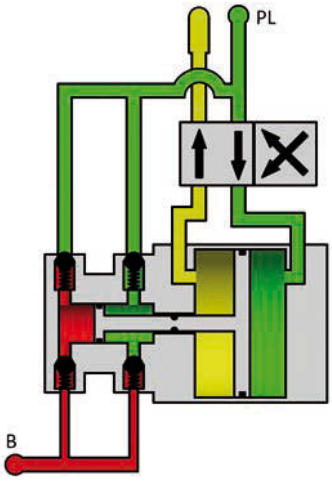
High-pressure unit (does not apply to xPLV 2)

The air amplifier's high-pressure unit serves to compress the compressed air or nitrogen. The high-pressure unit consists of the pressure cylinder, gas booster with inlet and outlet valves and the high-pressure piston with seal and guide elements.

Exhaust air silencer

The exhaust air silencer serves to reduce noise when expanding drive air is discharged from the air amplifier. On completion of its task, the drive air exits the booster via the exhaust air silencer. The exhaust air silencer may be made of plastic or aluminium, depending on the air amplifier model.

3.4 Models

Models	Graphical representation
Single-stage, double-acting types: • MPLV 2 • SPLV 2 • GPLV 2	
Single-stage, single-acting types: • MPLV 2,5 • SPLV 3 • MPLV 4 • MPLV10	
Single-stage, double-acting types: • GPLV 5	

Key

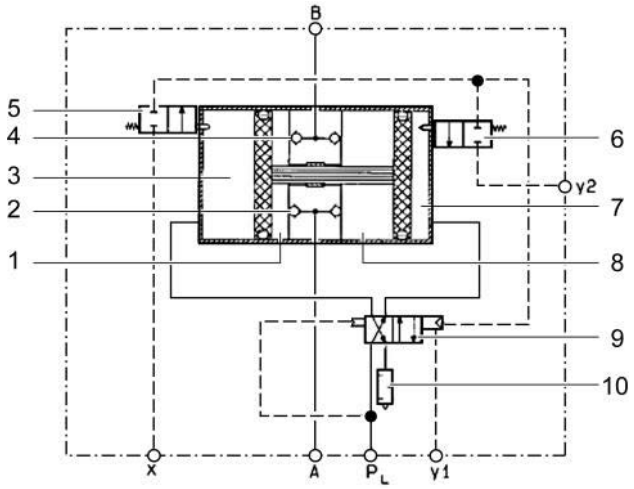
PL = Air drive

B = Operating pressure

= Exhaust air

3.5 How the PLV works

3.5.1 MPLV 2, SPLV 2 and GPLV 2 air amplifiers



1	Compression chamber II	9	Spool valve
2	Inlet valves	10	Silencer
3	Drive chamber II	P_L	Drive pressure inlet
4	Outlet valves	A	Boost pressure inlet
5	Pilot valve	B	Pressure outlet
6	Pilot valve	Y1	Control valve exhaust air
7	Drive chamber I	Y2	Pilot valve exhaust air
8	Compression chamber I	X	Pilot line (not with all types)

Fig. Connection diagram for MPLV 2, SPLV 2 and GPLV 2 air amplifiers

Explanation of how the PLV works

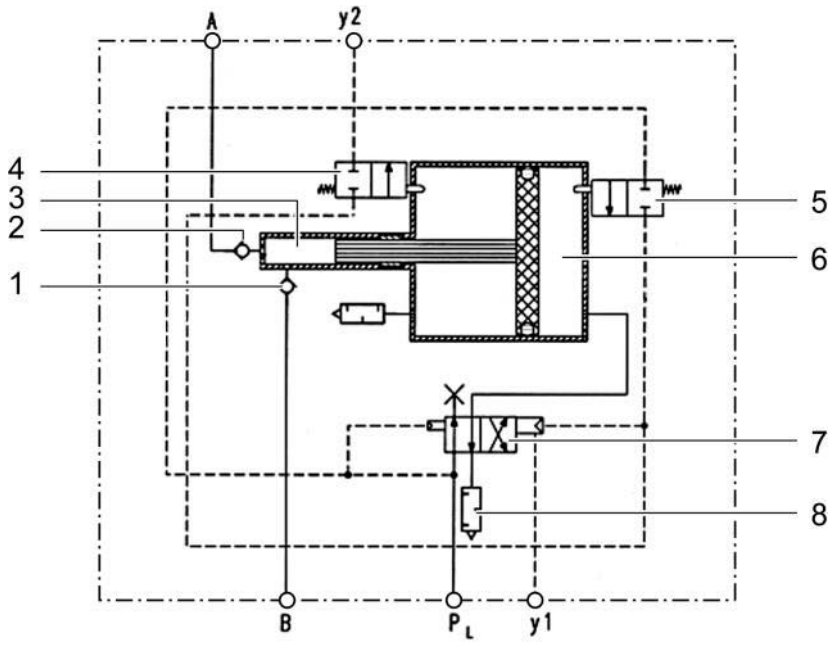
The boost air flows into compression chambers I and II (1 and 8) from port A via the inlet valves (2). The drive pressure PL simultaneously fills drive chamber I (7) via the spool valve. Drive chamber II (3) is de-pressurized. The piston moves to the left, causing the boost air in compression chamber I (8) to be compressed, while at the same time boost air flows into compression chamber II (1). Operating pressure is conveyed to the outlet of the device (port B) through the check valve (4).

When the end position is reached, the pilot valve (5) is actuated and opened. The direct pilot valve air thereby accesses the large side of the air amplifier's spool valve (9) and switches the spool valve (9) to the opposite switch position.

The drive air now flows into drive chamber II (3), while drive chamber I (7) is de-pressurized via the silencer (10). The air piston moves to the right-hand side of the drive unit, causing the boost air in compression chamber II (1) to be compressed, while at the same time boost air flows into compression chamber I (8). Operating pressure is conveyed to the outlet of the device (port B) through the check valve (4). When the end position is reached, the pilot valve (6) is actuated. The large side of the spool valve (8) is thereby relieved, and the spool valve switches back to its original position. The cycle begins over again.

3.5.2 MPLV 2.5 and MPLV 4 air amplifiers

The connection diagram of the air amplifiers is represented graphically below.



1	Outlet valve	8	Silencer
2	Inlet valve	P_L	Drive pressure inlet
3	Compression chamber	A	Boost pressure inlet
4	Pilot valve	B	Pressure outlet
5	Pilot valve	Y1	Control valve exhaust air
6	Drive chamber	Y2	Pilot valve exhaust air
7	Spool valve		

Fig. Connection diagram for MPLV 2.5 and MPLV 4 air amplifiers

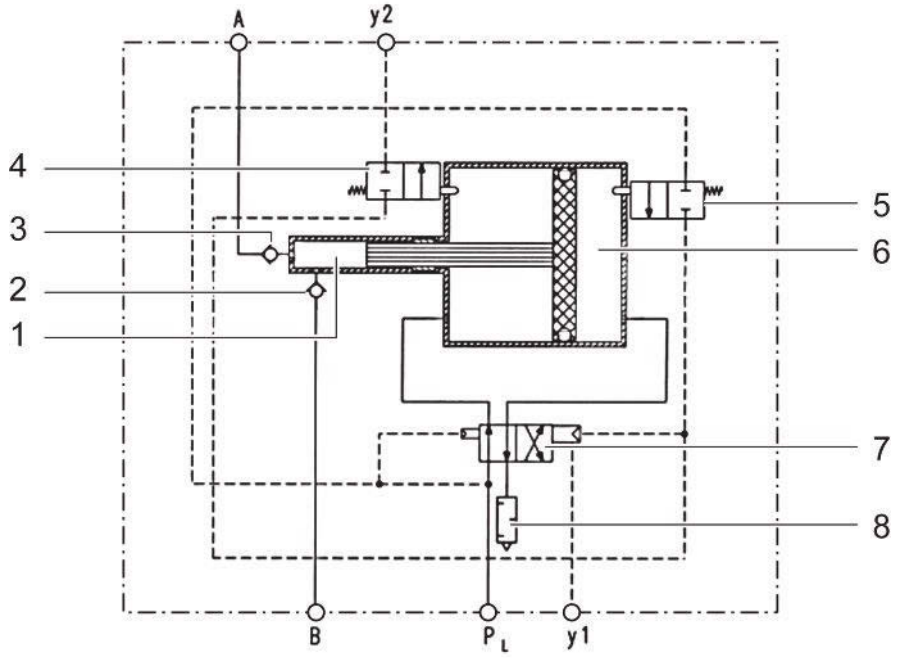
Explanation of how the PLV works

The boost air flows into the compression chamber (3) from port A via the inlet valve (2). The drive chamber (6) is de-pressurized. The piston moves to the right due to the pressure of the inflowing boost air. When the end position is reached, the pilot valve (5) is actuated and opened. The control air thereby accesses the large side of the spool valve (7) via the pilot line and switches the spool valve (9) to the opposite switch position.

The drive air now flows into the drive chamber (6). The air piston moves to the left, causing the boost air in the compression chamber (3) to be compressed. Operating pressure is conveyed to the outlet of the device (port B) through the check valve (1). When the end position is reached, the pilot valve (4) is actuated. The large side of the spool valve (8) is thereby relieved, with the spool valve switching back to its original position. The cycle begins over again.

3.5.3 MPLV 4L, SPLV 3 and SPLV 10 air amplifiers

The connection diagram of the air amplifiers is represented graphically below.



1	Compression chamber	8	Silencer
2	Outlet valve	P_L	Drive pressure inlet
3	Inlet valve	A	Boost pressure inlet
4	Pilot valve	B	Pressure outlet
5	Pilot valve	Y1	Control valve exhaust air
6	Drive chamber	Y2	Pilot valve exhaust air
7	Spool valve	X	Pilot line (not with all types)

Fig. Connection diagram for MPLV 4L, SPLV 3 and SPLV 10 air amplifiers

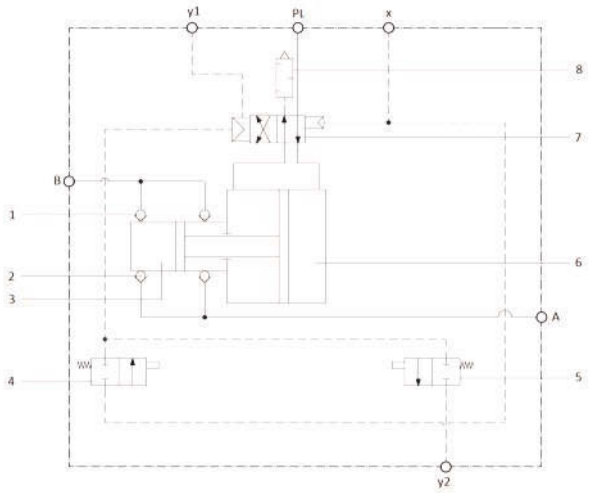
Explanation of how the PLV works

The drive air flows from the drive air port PL into the chamber at the rear of the air piston. This causes the piston to move to the right, with a suction stroke being performed. The inlet valve (2) is opened and the compressed air (the nitrogen) flows into the compression chamber (3). When the end position is reached, the pilot valve (5) is actuated and opened. The control air thereby accesses the large side of the spool valve (7) and switches the spool valve (9) to the opposite switch position.

The drive air now flows into the drive chamber (6). The air piston moves to the left, causing the boost air in the compression chamber (3) to be compressed. Operating pressure is conveyed to the outlet of the device (port B) through the check valve (1). When the end position is reached, the pilot valve (4) is actuated. The large side of the spool valve (8) is thereby relieved, with the spool valve switching back to its original position. The cycle begins over again.

3.5.4 GPLV 5 air amplifier

The connection diagram of the air amplifier is represented graphically below.



1	Outlet valves	8	Silencer
2	Inlet valve	P_L	Drive pressure inlet
3	Compression chamber	A	Boost pressure inlet
4	Pilot valve	B	Pressure outlet
5	Pilot valve	Y1	Control valve exhaust air
6	Drive chamber	Y2	Pilot valve exhaust air
7	Spool valve	X	Pilot line

Fig. Connection diagram for GPLV 5 air amplifier

Explanation of how the PLV works

The drive air flows from the drive air port PL into the right-hand compartment of the drive chamber. This causes the piston to move to the left. A pressure stroke is performed in the left-hand part of the compression chamber. The air is compressed. Operating pressure is conveyed to the outlet of the device (port B) through the check valve (1). A pressure stroke is performed in the right-hand part of the compression chamber (3). The inlet valve (2) is opened and the compressed air (the nitrogen) flows into the compression chamber (3).

When the end position is reached, the pilot valve (5) is actuated and opened. The control air thereby accesses the large side of the spool valve (7) and switches the spool valve (9) to the opposite switch position.

The drive air now flows into the left-hand compartment of the drive chamber (6) and the right-hand compartment is de-pressurized. The air piston moves to the right-hand side. A pressure stroke is performed in the left-hand part of the compression chamber (3).

The inlet valve (2) is opened and the compressed air (the nitrogen) flows into the compression chamber (3). The boost air in the right-hand compartment of the compression chamber (3) is compressed. Operating pressure is conveyed to the outlet of the device (port B) through the check valve (1).

When the end position is reached, the pilot valve (4) is actuated.

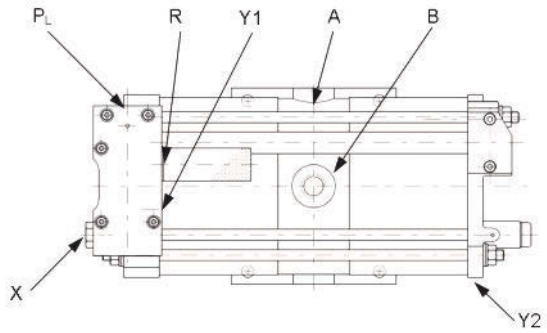
The large side of the spool valve (8) is thereby relieved, and the spool valve switches back to its original position. The cycle begins over again.

3.6 Ports

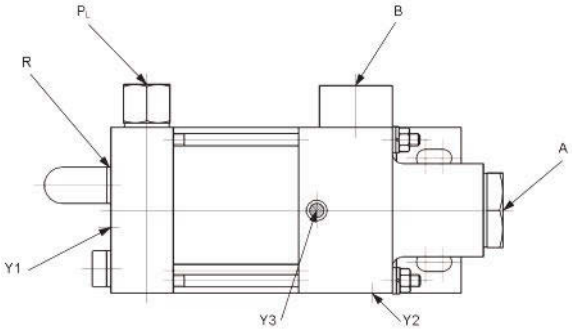
Ports

The air amplifiers are supplied without any pipelines or screw connections. The information about port values must be observed for all interface connections. The port for pilot line X is not available with all types. Annex III "Overview of Ports" contains an overview of the inlet and outlet ports that are installed as standard, the recommended pipe inner diameters and other port options. A connection drawing for all ports that need to be fitted is always enclosed with the PLV.

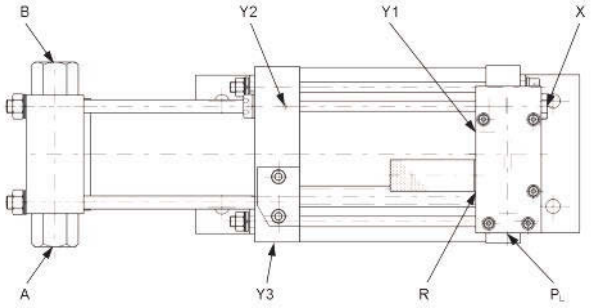
The air amplifiers have the following interfaces:

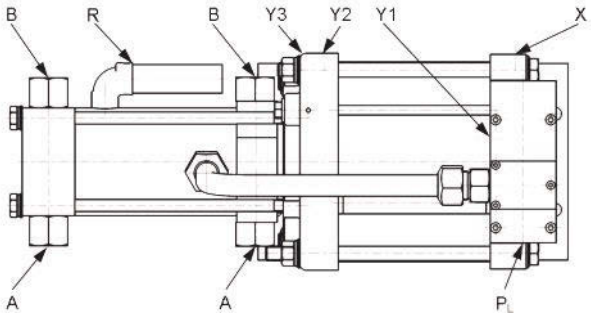


MPLV 2, SPLV 2 und GPLV 2



MPLV 2,5 und MPLV 4





MPLV 4L, SPLV 3 und SPLV 10

Drive air port PL	Input of drive pressure air (controlled and filtered) (max. 10 bar)
Inlet port A	Input of primary pressure
Outlet port B	Output of operating pressure
Port for exhaust air silencer R	Output of expanding drive air
Control air port X	Control air port (not with MPLV 4L)
Spool valve Y 1 ventilator port	Ventilation and bleeding of the spool valve (pulse-shaped air escape)
Pilot valve Y2 ventilator port	Bleeding of the pilot valve. This port can be used as a port for a stroke counter. The air exits in a pulsed manner here. The port must not be sealed.
High-pressure side Y3 ventilator and leakage port	Bleeding of the rear compression chamber. Air enters and exits cyclically here. Leaks also exit here in the event of seal leakage (not in the case of MPLV 4L)

3.7 Calculating the operating pressure

Before the PLV is commissioned, the operating pressure needs to be calculated. The PLV's static final pressure is calculated for the corresponding booster using the following formula:

$P_B = P_L * i$

P_B= operating pressure P_L= drive pressure i= transmission ratio

For the transmission ratio "i" applicable to the respective PLV, see » chapter 4.2 "Performance values, dimensions and weights" or the nameplate. The actually achievable operating pressure depends on other influencing factors (friction, type of fluid, etc.) and may perhaps be smaller.

3.8 Delivery

Scope of delivery:

Scope of delivery:	Quantity
Air amplifier	1
Assembly instructions and operating instructions for air amplifiers	1
Set of drawings (sectional drawing, parts list, port/ sectional drawing)	1
Declaration of incorporation in accordance with the Machinery Directive	1
Declaration of conformity in accordance with ATEX 2014/34/EU	1

3.9 Accessories

The following accessories are available for the air amplifiers.

Air control unit

Using the Maximator air control unit makes it easy to operate the air amplifier. The air control unit consists of a pressure filter, water separator, shut-off valve, pressure governor, pressure gauge and, where applicable, a safety valve.

Seal sets

The air amplifier's individual seal sets are available from Maximator as complete seal kits. These seal kits are required whenever faults are remedied. See also sectional drawings and parts list of the air amplifier.

4 Technical Data

4.1 Operating conditions

Ambient conditions

Specification	Value	Unit
Temperature range	-20 … + 60*	°C

* Temperature range taking compressed air quality into account.

Operating fluid

Specification	Value	Unit
Operating temperature, max.*	+60…+100	°C
Particle size, max.	10	µm

- Depending on the air amplifier type (see » Annex I "Performance Values" or data sheet).
-

Pneumatic (air quality in accordance with ISO 8573-1)

Specification	Value	Unit
Oil-free compressed air	*possible	
Max. compressed air cleanliness factor of oil (class 4)	5	mg/m³
Max. number of particles in the case of 0.1 – 0.5 µm size (class 3)	not specified	Stk
Max. number of particles in the case of 0.5 – 1.0 µm size (class 3)	90.000	Stk
Max. number of particles in the case of 1.0 – 5.0 µm size (class 3)	1.000	Stk
Max. solids, particle concentration (class 6)	5	mg/m³
Max. pressure dew-point with humidity (class 4)	+3	°C

* Maximator PLVs do not generally require a compressed air oiler, as they are treated with special grease during assembly. After an oiler has been used for the first time, however, the drive fluid always needs to be oiled, as the oil washes out the special grease.

To avoid damage to seals and their counter surface, a filter with a fineness of max. 10µm must be installed.

Oil in the oiler must comply with DIN 51524 – ISO VG 32.

Drive pressure

The air amplifiers can be operated with the drive pressures indicated in the table opposite.

Min. P_L	1 bar
Max. P_L	10 bar

Noise emission

Example: Air amplifier station at 10 bar drive pressure

Specification	Value	Unit
Noise emission (Leq)	83	dB(A)

Leq = equivalent continuous sound level (averaged over 30 seconds)

The noise emission measurement was performed at a height of 1.6 metres and at a distance of 1 metre from the test stand. The determined noise emission was measured without counter-pressure at full-load operation and may vary, depending on use and installation situation.

4.2 Performance values, dimensions and weights

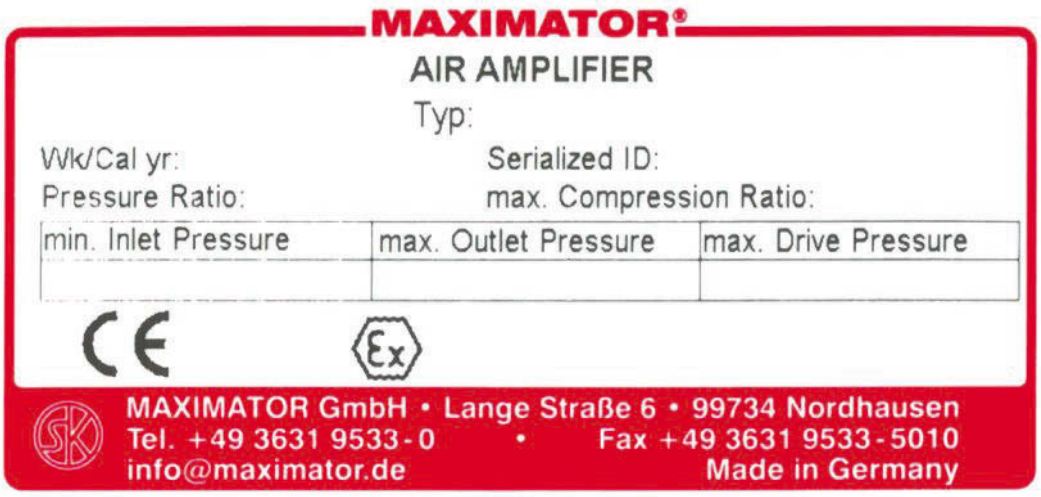
» Annex I "Performance Values" contains a list of performance values. » Annex II "Dimensions and Weights" contains a list of the dimensions and weights of all PLVs. The lists involve approximate specifications, which may vary slightly.

For more detailed information about the respective PLV, including characteristic curve and port drawing, please consult the respective data sheet on Maximator's website » http://www.maximator.de.

4.3 Explosion protection

Ex-marking

The Ex marking is located on the nameplate of the high-pressure pump's drive unit.



Marking	Designation	Meaning
CE Ex	CE mark, Ex mark	Conformity marking in accordance with Annex III of Directive 2004/42/EC and Article 16(4) of Directive 2014/34/EU.
II	Equipment group	The pump may be used in potentially explosive atmospheres, except in mining.
2D/2G	Equipment category	In the case of equipment categories 2G/2D, a potentially explosive atmosphere involving gases (G) and dust (D) may occasionally occur. The equipment guarantees a high level of safety and can be used in zone 1 and zone 2 / 21 and 22.
IIB	Explosion group	For use with substances from group IIB, e.g. propane
IIC	Explosion group	For use with substances from group IIC, e.g. hydrogen
C	Ignition protection type	Constructional safety for non-electrical equipment intended for use in potentially explosive atmospheres according to DIN EN 13463-5.
TX	Additional marking	The temperature depends on the operating parameters.

4.4 Operating instructions in accordance with the Explosion Protection Directive

If the air amplifiers bear an Ex mark and are supplied with a declaration of conformity in compliance with 2014/34/EU, they can be used in potentially explosive atmospheres. They correspond to Group II Category 2G/2D Explosion Group IIB constructional safety.

A prerequisite for safe operation is that the air amplifier is correctly connected to the earth potential.

Air amplifier temperature depends on the temperature of the fluid, the compression and other operating conditions.

The temperature that arises during compression must not exceed the maximum permitted temperature.

The maximum expected temperature can be calculated for ideal gases using the formula for adiabatic change:

$$T_2 = \left(\frac{P_2}{P_1} \right)^{\frac{\chi - 1}{\chi}} \cdot T_1$$

where

T_2 → Temperature after compression (in K)

T_1 → Temperature prior to compression (in K)

P_2 → Pressure after compression (in bar)

P_1 → Pressure prior to compression (in bar)

χ → Isentropic exponent

The isentropic exponent for standard gases can be derived from the following table or corresponding tables.

Gas	χ	Gas	χ
Argon	1,66	Helium	1,66
Carbon dioxide	1,3	Air	1,4
Nitrogen	1,4	Xenon	1,67

Isotropic exponent table

Due to the fact that the compression occurs in a heat exchange with the environment, the actual temperature will always remain below the calculated adiabatic temperature.

If the temperature of the compressed gas is below the maximum permitted temperature, care must be taken, depending on explosion zone, to ensure that these operating conditions do not change. A slight difference in pressure would result in a higher temperature!

Please note the following:

- Primary pressures on the PLVs must be monitored.
- Permitted compression ratios must not be exceeded

If the temperature of the compressed gas exceeds the maximum permitted temperature, the compression needs to run through several stages and be cooled between the individual compression stages. Sensor monitoring is necessary here.

Equipment must not be cleaned or maintained in the presence of a potentially explosive atmosphere. Take care, when cleaning, to ensure that the plastic surfaces and electrically non-conductive surfaces do not build up an electrostatic charge (use a moist cotton cloth).

No ignitable mixtures may be used as drive gas.

The assembly instructions pursuant to the Machinery Directive (2006/42/EC) are an integral part of these operating instructions.

5 Transportation, Packaging and Storage

5.1 Transportation safety information

Incorrect transportation

Material damage due to incorrect transportation!

Incorrect transportation may cause significant damage.

- Proceed with caution when unloading transport items on delivery and in the case of transportation within the company and pay attention to the symbols and information on the packaging.
- Do not remove any packaging until shortly before assembly.

5.2 Packaging

The individual packages have been packed in accordance with the expected transportation conditions. Only environmentally friendly materials have been used for the packaging.

The packaging is intended to protect the individual components against transportation damage, corrosion and other damage until they are assembled. Therefore, do not destroy the packaging and do not remove it until shortly before assembly.

Dispose of packaging material in accordance with the currently applicable statutory provisions and local regulations.

5.3 Storage

Store packages under the following conditions:

- Do not store outdoors.
- Store in a dry and dust-free environment.
- Do not expose to aggressive fluids.
- Protect against sunlight.
- Avoid mechanical shocks.
- Storage temperature: -20 to 60°C
- Relative air humidity: max. 60%
- If the equipment is stored longer than 3 months, inspect the general condition of all parts and the packaging on a regular basis. If necessary, repair the parts.

The packages may contain storage information that goes beyond the requirements stated here. This information must be complied with accordingly.

6 Installation and Commissioning

6.1 Installation and commissioning safety information

Incorrect installation and commissioning

WARNING!
Injury hazard due to incorrect installation and commissioning!

Incorrect installation or commissioning may cause serious injuries and considerable material damage.

- Ensure that all installation work is carried out and completed in accordance with the specifications and information contained in these instructions.

Explosion protection

WARNING!
Explosion hazard during assembly!

Carry out assembly work only when no potentially explosive atmosphere is present.

Appropriate measures must be taken to ensure static discharge capability at all times. Failure to observe these instructions will result in loss of explosion protection.

Safety when compressing potentially explosive substances Avoidance of potentially explosive atmospheres in rooms and in the open air

The following conditions will prevent the formation of an explosive atmosphere in areas of systems at risk:

- Systems must be set up in well-ventilated areas (if possible, outdoors).
- Systems must be and remain airtight.
- Blow-out circuits of safety valves, leakage pipes etc. must be routed to the open air.
- For systems in rooms, it must be possible to shut off the gas supply coming from outside securely from a safe point.

Establish pipe connections to systems such that they ensure durable tightness of the connection.

6.2 Installation prerequisites

Install the PLV in a way that meets the following conditions:

- The assembly location must be level. Flatness less than 1 mm.
- The PLV must have a safe and fixed stand or seat.
- The PLV must not be exposed to any oscillations or vibrations.
- The PLV must be easily accessible on all sides.
- The PLV must be installed in a way that does not expose it to any external sources of heat.
- We recommend that the PLV be assembled in a dust-free environment.

6.3 Assembling the PLV

With regard to assembly, make sure you observe the safety information from » chapter 2 "Safety".

The PLV must be fixed to the designated mounting holes using at least 4.6 grade screws or bolts. The appropriate screw or bolt size must be determined from the set of drawings supplied.

The preferred installation position for the air amplifier is vertical.

6.4 Mounting connecting lines

The PLV is supplied without any screw connections or pipelines.

Follow the information in » chapter 3.6 "Ports" and the port drawing supplied.

Unforeseeable movements

WARNING!
Injury hazard due to unforeseeable movements of compressed air lines!

Lines in the internal compressed air network can move unpredictably in the event of a load change (hose rupture) and thereby cause injuries.

- Depressurize the connecting cable before commencing any assembly work.
- All piping must be safely anchored to the floor or walls.
- All piping must be laid so as to avoid any trip hazard.
- Wear personal protective equipment at all times.

Using incorrect connecting lines

WARNING!
Risk of material damage due to the use of incorrect connecting lines!

Use of incorrectly dimensioned pipelines or screw connections can lead to malfunctions and material damage to the PLV.

- The pipelines and lines must be adjusted to the PLV's maximum outlet pressure.
- The tightening torque of the respective screw connections must be complied with.

The cross-section of the high-pressure pipes and lines must not be smaller than the cross-section of the ports.

A prerequisite for correct installation is the existence of a professionally planned, installed and maintained compressed air network and a shut-off valve additionally installed at the compressed air network inlet.

6.4.1 Connecting the drive air

Depending on the model, the drive air connection on the PLV either needs to be fitted to the air drive port (PL) of the spool valve housing or to the compressed air control unit (accessories), if available. With regard to the use of drive air lines, hose connections and screw connections, follow the information about ports in » chapter 3.6 "Ports" and the port drawing supplied.

The following section describes how to fit the drive air.

WARNING!

Injury hazard due to pressurized components!

1.► Unscrew the sealing plug on the drive air connection (PL) of the spool valve housing or on the compressed air control unit.

2.► Suitably connect the air control unit's controlled compressed air outlet to the drive air port (PL) of the spool valve housing. *

3.► Suitably connect the drive air to the drive air port (PL) of the spool valve housing or to the compressed air control unit, if available, using a hose or pipe.

* If an air control unit exists (air control unit available as an option).

6.4.2 Control air

In the case of PLVs with a port for control air (direct pilot valve air) - the port is marked by "X" -, the control air must be connected before the pressure governor (or at the pressure governor's uncontrolled outlet). This enables the PLV to work better even at low drive pressures. If the control air is not connected, the booster does not work.

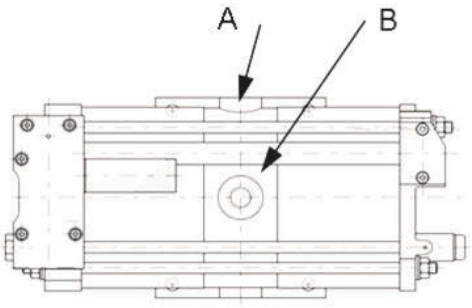
6.4.3 Connecting inlet and outlet pipes

Personnel: Mechanical and system

Protective : Personal protective equipment

1.► Remove sealing plug from the inlet and outlet ports (A and B).

2.► Piping for inlet and outlet lines in accordance with the port drawing.



6.5 Fitting the exhaust air silencer

The following section describes how to fit the exhaust air silencer.

The exhaust air silencer may be made of plastic or aluminium, depending on the PLV model. The exhaust air silencer is always fitted in the same way.

1.► Keep the exhaust air silencer ready.

2.► Unscrew the sealing plug from the exhaust air port.

3.► Place the exhaust air silencer on the exhaust air port and hand-tighten it.

6.6 Commissioning

The following section describes how to commission the PLV.

In order to keep the load on the PLV's components low during commissioning, we recommend that the drive air pressure be increased slowly.

This keeps the PLV's stroke frequency low. Otherwise, operating phases with very high clock frequencies may occur during the startup phase until the desired operating pressure has been reached.

It is, for example, possible to use the optionally available air control unit to control the drive air pressure.

Personnel:	Mechanical and system	
Protective equipment:	Protective workwear	
	Protective goggles	
	Safety footwear	
Special tool:	Leak detector spray	

1.► Check all ports to make sure that they have been installed correctly.

2.► Check all piping for mechanical damage.

3.► Open intake line

⇨ The compressed fluid will flow in.

4.► Controller button on air control unit is set to closed (0 bar). *

5.► Open the compressed air line of the compressed air network to the PLV.

6.► Pull controller button of the compressed air control unit upwards.*

⇨ The controller button audibly clicks out of the lock.

7.► Set the drive pressure you require on the controller button.*

⇨ The PLV will automatically start compressing.

8.► 

WARNING!
Injury hazard due to escaping compressed fluid;

perform leak test on all ports.

* If an air control unit exists (air control unit available as an option).

7. Operation

7.1 Operation safety information

7.1.1 General hazards at the workplace

Noise

WARNING!
Injury hazard due to noise!

The noise level occurring in the work area may cause serious hearing damage, depending on the installation type and expanding air.

- Always wear personal protective equipment when working on air amplifiers in operation.
- Only remain in the danger zone to the extent necessary.

The noise level depends on the installation situation and can be determined only in the installed state.

Flying ice crystals and accumulations of fluid

WARNING!
Injury hazard due to flying ice crystals and accumulations of fluid!

Ice ejected and tossed around by the expanding air may form on the PLV's exhaust air silencer during operation. The ejected ice crystals may cause eye injuries and accumulations of fluid on the floor.

- Wear protective goggles at all times during work.
- Immediately use suitable media to absorb accumulations of fluid.
- Wear anti-slip safety footwear at all times.

Attach warning signs and instructions at or near to the area where accumulations of fluid may occur on the floor or ice crystals may fly around.

Incorrect operation

WARNING!
Injury hazard due to incorrect operation!

Incorrect operation may cause serious injuries and significant material damage.

- Observe all specifications and information in accordance with these instructions.

7.1.2 Cleaning

Personnel: To be defined by the system engineer

Pressurized components

WARNING!
Injury hazard due to pressurized components!

Before commencing any cleaning work, shut down and depressurize the PLV

Operating fluid

WARNING!
Injury hazard due to operating fluid residues

If the PLV is operated by means of hazardous or environmentally harmful fluids, fluid residues may be present in the direct vicinity of the PLV. Relevant precautions (PPE, collecting vessel, etc.) must then be taken when cleaning.

Explosion protection

WARNING!
Explosion hazard during cleaning

Perform cleaning only when no potentially explosive atmosphere is present.

Appropriate measures must be taken to ensure static discharge capability at all times. Take care, when cleaning, to ensure that the plastic surfaces and electrically non-conductive surfaces do not build up an electrostatic charge (use a moist cotton cloth).

Failure to observe these instructions will result in loss of explosion protection.

7.1.3 Inspection and maintenance intervals

Personnel:	to be defined by the system engineer
Protective equipment	Personal protective equipment

Maximator recommends the following inspection and maintenance intervals.

Maintenance interval	Maintenance step	
Before and after each use	1.►	Check system to ensure that it is functioning safely.
	2.►	Dehumidify the air system.
	3.►	Check ports for leaks.
	4.►	Check screw connections and piping for damage.
Every 3-6 months or every 20,000 strokes	1.►	Inspect and lubricate spool valve, pilot valve or o-rings in the drive unit: if necessary, replace.
	2.►	Check PLV for leaks.
	3.►	Check and, if necessary, tighten bolts, check valves and screw connections.
Every 6 months	1.►	Replace air filters.
Every 12 months	1.►	Carry out pressure test on PLV piping. (Leak detector spray)
	2.►	Inspect and, if necessary, replace check valves.
	3.►	Clean the PLV.
As required or following wear and tear (more than 500-1000 operating hours, 2,000,000 strokes or every 18 months)	1.►	Replace all seal and guide elements.

7.2 Fault analysis

7.2.1 Drive side

Possible fault	Cause of fault	Fault removal
PLV fails to work at low air pressure.	Friction of o-rings on the spool valve too high.	• Re-lubricate. • Replace o-rings on the spool valve.
	O-rings swell due to use of wrong oil or lubricant.	• Change o-rings. • Use acid-free and silicon-free lubricants.
PLV does not operate or operates only slowly.	Direct pilot valve air not connected.	• Connect control air
	Direct pilot valve air not sufficiently pressurized.	• Control air pressure must be at least the same as the drive pressure.
	Exhaust or spool valve covered with ice.	• Use water separator to dewater compressed air.
	Formation of residue in the silencer.	• Clean the silencer. Replace, where applicable.
PLV does not operate. Air escapes through the silencer.	O-rings on the spool valve defective.	• Change and grease o-rings.
	O-ring on air piston defective or worn	• Change and grease o-ring.
PLV does not operate. Air flows through small hole on spool valve housing.	Spool valve hangs.	• Clean spool valve and sleeve. • Check and, if necessary, replace o-rings and sleeve. • Lubricate.
PLV operates with high frequency and short strokes.	Pilot valve on the top and bottom flap defective	• Clean, grease and, if necessary, replace pilot valve.

7.2.2 High-pressure side

Possible fault	Cause of fault	Fault removal
PLV operates without compressing or operates irregularly. It does not achieve the calculated final pressure.	Failure of the check valves.	• Check, clean and, if necessary, replace check valves.

7.3 Repair

Maximator devices should be sent to your local Maximator representative for repairs. All information regarding this is available on Maximator's website » http://www.maximator.de/Inhouse+Reparaturen.

WARNING!
Injury hazard due to incorrect handling of compressed fluid!

If the Maximator PLV has come into contact with dangerous or environmentally hazardous compressed fluid, make sure that all measures are taken to render the PLV safe before repairing it. The safety data sheet of the compressed fluid and a clearance certificate must be enclosed.

8 Dismantling and Disposal

Safety information

At the end of the PLV's service life, it must be dismantled and disposed of in an environmentally friendly manner.

Explosion protection

WARNING!
Explosion protection during dismantling!

Introducing sources of ignition such as sparks, naked flames, and hot surfaces can lead to explosions in the explosion zone.

- Obtain written approval for work before beginning the dismantling operation.
- Flush the booster through with nitrogen before starting the dismantling operation so as to rinse out any residues of poisonous and flammable gases.
- Dismantle only when no potentially explosive atmosphere is present.
- Use only tools that have been approved for use in explosion protection. Failure

to observe these instructions will result in loss of explosion protection.

Incorrect dismantling

WARNING!
Injury hazard due to incorrect dismantling!

Residual risks such as sharp components, tips and corners on or in the high-pressure pump or on the required tools may cause injuries.

- Ensure that there is sufficient space before starting work.
- Shut off all operating fluid to the high-pressure pump.
- Make sure that the workplace is clean and tidy. Components and tools lying loosely on top of another or lying about are hazard sources.

Dismantling and Disposal

Consult the manufacturer in the event of any uncertainty.

Dismantling

1.► Shut the PLV down, depressurize it and fully release any stored pressure.

2.► Undo fastening screws.

3.► Clean assemblies and components professionally.

4.► Dismantle assemblies and components in accordance with applicable local occupational safety and environmental protection regulations.

Disposal

If no return or disposal agreement has been entered into, recycle the disassembled components in an appropriate manner.

Annex I: Performance Values

Type		MPLV 2	MPLV 2,5	MPLV 4	SPLV 2	SPLV 3	SPLV 10	GPLV 2	GPLV 5
Max. operating pressure P_B bar		20	25	40	20	32	100	20	60
Transmission ratio i		1:2	1:2,4	1:4	1:2	1:3	1:10	1:2	1:5
Drive air	max. P_L* bar	10	10	10	10	10	10	10	10
	min. P_L bar	1	1	1	1	1	1	1	1
Primary	max. P_A* bar	10	10	10	10	32	100	10	60
	min. P_A bar	1	2	2	1	1	1	1	2
Max. operating temperature		60	60	80	60	60	100	60	60
Max. compression ratio **		1:2	1:2,4	1:4	1:2	1:2	1:20	1:2	1:15
Stroke capacity cm^3		274	54	31	620	373	122	1900	746

* Maximum permitted pressure that may be applied to the booster 's high-pressure unit.

* Compression ratio = operating pressure PB / primary pressure PA

Annex II: Dimensions and Weights

Type	Length mm	Width mm	Height mm	Weight kg
MPLV 2	343	84	86	3,3
MPLV 2,5	233	102	85	2,9
MPLV 4	220	103	85	2,5
SPLV 2	324	145	187	7,8
SPLV 3	415	135	180	8,5
SPLV 10	446	132	165	10
GPLV 2	427	178	285	16,7
GPLV 5	471	176	371	14

Annex III: Overview of Ports

The following table lists the ports that are installed as standard and the corresponding recommended pipe internal diameters.

Type	Ports*				Recommended pipe internal diameter in mm		
	A	B	PL	X	Inlet	Outlet	Drive air
MPLV 2	G3/8	G3/8	G3/8	-**	9	9	9
MPLV 2,5	G3/4	G1/2	G3/8	-**	9	7	9
MPLV 4	G3/8	G1/2	G3/8	-**	9	7	9
SPLV 2	G1/2	G1/2	G1/2	G1/8	12	12	12
SPLV 3	G1/2	G1/2	G1/2	G1/8	12	12	12
SPLV 10	G1/4	G1/4	G1/2	G1/8	9	9	12
GPLV 2	G1/2	G1/2	G3/4	G1/8	12	12	12
GPLV 5	G1/2	G1/2	G3/4	G1/8	12	12	12

* see » Other ports

** Pilot port "X" available as a special option

For more detailed information about the respective PLV, including characteristic curve and port drawing, please consult the respective data sheet on Maximator's website » http://www.maximator.de.

The maximum output of the PLVs can be achieved if the recommended pipe inner diameters are complied with.

Other ports

The inlet and outlet ports listed in these instructions are standard ports. The following section lists other possible inlet and outlet as well as drive air ports.

These other possible ports must comply with the specifications contained in the type designation code. See » chapter 1.5 "Nameplate" in these operating instructions.

Port	Port designation in the type designation code
NPT	-NPT

Annex IV: Declaration of Incorporation

Einbauerklärung nach 2006/42/EG, Anhang II, Nr.1 B
Inhalt gemäß 2006/42/EG, Anhang II, Nr.1 B.
Anschrift Hersteller: MAXIMATOR GmbH
Lange Straße 6
99734 Nordhausen / Deutschland
Der Dokumentationsbeauftragte ist bevollmächtigt, die speziellen technischen Unterlagen nach Anhang VII B zusammenzustellen: dokumentationsbeauftragter@maximator.de / Tel.: 03631-9533-5109
Die Bauart von Druckluft-Nachverdichtern der Baureihe:

MPLV, SPLV, GPLV

ist eine unvollständige Maschine nach Artikel 2g und ausschließlich zum Einbau in oder zum Zusammenbau mit einer anderen Maschine oder Ausrüstung vorgesehen.
Grundlegende Sicherheits- und Gesundheitsschutzanforderung gemäß Anhang I dieser Richtlinie kommen zur Anwendung und wurden eingehalten :
Auflistung siehe separate Anlage
Die speziellen technischen Unterlagen gemäß Anhang VII B wurden erstellt und sie werden der zuständigen nationalen Behörde auf Verlangen in elektronischer Form übermittelt.
Diese unvollständige Maschine darf erst dann in Betrieb genommen werden, wenn festgestellt wurde, dass die Maschine, in die unvollständige Maschine eingebaut werden soll, den Bestimmungen der Maschinenrichtlinie entspricht.

Declaration of Incorporation acc. to 2006/42/EC, Annex II, Nr.1 B
Contents acc. to 2006/42/EC, Annex II, Nr.1 B.
Name and address of manufacturer: MAXIMATOR GmbH
Lange Straße 6
99734 Nordhausen / Germany
The documentation officer is authorised to compile the relevant technical documentation as set forth in Annex VII B:
dokumentationsbeauftragter@maximator.de / Tel.: +49(0)3631-9533-5109
The model of air amplifiers type:

MPLV, SPLV, GPLV

is a partly completed machinery as defined in Article 2g and exclusively envisaged for installation into or assembly with other machinery or equipment.
Essential health and safety requirements (EHSR) acc. to Annex I to this directive have been applied and complied with:
See separate Appendix
The relevant technical documentation according to Annex VII B was compiled and will be forwarded to the competent national authority in electronic format upon request.
The partly completed machinery must not be put into service until the final machinery into which it is to be incorporated has been declared in conformity with the provisions of the Directive on Machinery.

Déclaration d'incorporation de quasi-machines conformément à la Directive 2006/42/CE, Annexe II, Nr.1 B
Contenu conforme à la Directive 2006/42/CE, Annexe II, Nr.1 B.
Adresse du fabricant : MAXIMATOR GmbH
Lange Straße 6
99734 Nordhausen / Allemagne
La personne en charge de la documentation a procuration pour établir la documentation technique spéciale conformément à l'Annexe VII B : dokumentationsbeauftragter@maximator.de / Tél. : 03631-9533-5109
Le modèle de surpresseurs d'air type:

MPLV, SPLV, GPLV

est une quasi-machine conformément à l'Article 2g et elle est destinée uniquement à être intégrée ou dans une autre machine ou un autre équipement ou à réaliser avec ceux-ci un ensemble cohérent.
Les exigences essentielles de santé et de sécurité conformément à l'Annexe I de la Directive ont été appliquées et respectées :
Voir la liste en Annexe
La documentation technique spéciale conformément à l'Annexe VII B a été établie et sera transmise sous forme électronique, sur réquisition, aux services nationaux compétents.
Cette quasi-machine ne pourra être mise en service qu'après avoir constaté que la machine dans laquelle la quasi-machine est intégrée, satisfait aux prescriptions de la Directive sur les machines.

Nordhausen, den 20.04.2016 (Nordhausen, 20.04.2016) [Nordhausen, le 20.04.2016]

i.V.
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Steffen Roloff (Technischer Leiter) (Technical Director) [Directeur technique]

Declaration of Incorporation

Appendix to Declaration of Incorporation according to 2006/42/EC Annex II, No.1 B
Description of essential health and safety requirements as defined in 2006/42/EC, Annex I, which were applied and complied with:

No.	Essential requirements	Applicable	Complied
1.1.1.	Definitions	Yes	Yes
1.1.2.	Principles of safety integration	Yes	Yes
1.1.3.	Materials and products	Yes	Yes
1.1.4.	Lighting	No	
1.1.5.	Design of machinery to facilitate its handling	Yes	Yes
1.1.6.	Ergonomics	No	
1.1.7.	Operating positions	No	
1.1.8.	Seating	No	
1.2.	Control systems		
1.2.1.	Safety and reliability of control systems	Yes	No
1.2.2.	Control devices	No	
1.2.3.	Starting	Yes	No
1.2.4.	Stopping	Yes	No
1.2.4.1	Normal stop	Yes	No
1.2.4.2	Operational stop	No	
1.2.4.3	Emergency stop	Yes	No
1.2.4.4	Assembly of machinery	No	
1.2.5.	Selection of control or operating modes	No	
1.2.6.	Failure of the power supply	Yes	No
1.3.	Protection against mechanical hazards		
1.3.1.	Risk of loss of stability	Yes	No
1.3.2.	Risk of break-up during operation	Yes	Yes
1.3.3.	Risk due to falling or ejected objects	Yes	Yes
1.3.4.	Risks due to surface, edges or angles	Yes	Yes
1.3.5.	Risks related to combined machinery	No	
1.3.6.	Risks related to variations in operating conditions	No	
1.3.7.	Risks related to moving parts	Yes	Yes
1.3.8.	Choice of protection against risks arising from moving parts	No	
1.3.8.1	Moving transmission parts	No	
1.3.8.2	Moving parts involved in the process	No	
1.3.9.	Risks of uncontrolled movements	No	
1.4.	Required characteristics of guards and protective devices		
1.4.1.	General requirements	No	
1.4.2.	Special requirements for guards	No	
1.4.2.1	Fixed guards	No	
1.4.2.2	Interlocking movable guards	No	
1.4.2.3	Adjustable guards restricting acces	No	
1.4.3.	Special requirements for protective devices	No	
1.5.	Risks due to other hazards		
1.5.1.	Electricity supply	No	
1.5.2.	Static electricity	Yes	Yes
1.5.3.	Energy supply other than electricity	Yes	No
1.5.4.	Errors of fitting	Yes	Yes
1.5.5.	Extreme temperatures	No	
1.5.6.	Fire	Yes	Yes
1.5.7.	Explosion	Not applicable or certified	

Declaration of Incorporation

No.	Essential requirements	Applicable	Complied
1.5.8.	Noise	Yes	No
1.5.9.	Vibrations	No	
1.5.10.	Radiation	No	
1.5.11.	External radiation	Yes	Yes
1.5.12.	Laser radiation	No	
1.5.13.	Emissions of hazardous materials and substances	Yes	No
1.5.14.	Risk of being trapped in a machine	No	
1.5.15.	Risk of slipping, tripping or falling	Yes	No
1.5.16.	Lightning	No	
1.6.	Maintenance		
1.6.1.	Machinery maintenance	Yes	No
1.6.2.	Access to operating positions and servicing points	No	
1.6.3.	Isolation of energy sources	Yes	No
1.6.4.	Operator intervention	Yes	Yes
1.6.5.	Cleaning of internal parts	No	
1.7.	Information		
1.7.1.	Information and warnings on the machinery	No	
1.7.1.1	Information and information devices	No	
1.7.1.2	Warning devices	No	
1.7.2.	Warning of residual risks	No	
1.7.3.	Marking of machinery	Yes	Yes
1.7.4.	Instructions	No	
1.7.4.1	General principles for the drafting of instructions	No	
1.7.4.2	Contents of the instructions	No	
1.7.4.3	Sales literature	No	
2.	Supplementary essential health and safety requirements for certain categories of machinery	No	
2.1.	Foodstuffs machinery and machinery for cosmetics or pharmaceutical products	No	
2.2	Portable hand-held and/or hand-guided machinery	No	
2.2.1.	General		
2.2.2.	Portable fixing and other impact machinery	No	
2.3.	Machinery for working wood and material with similar physical characteristics	No	
3.	Supplementary essential health and safety requirements to offset hazards due to the mobility of machinery	No	
4.	Supplementary essential health and safety requirements to offset hazards due to lifting operations	No	
5.	Supplementary essential health and safety requirements for underground work	No	
6.	Supplementary essential health and safety requirements for machinery presenting particular hazards due to the lifting of person	No	

Annex V: EU Declaration of Conformity

EU-Konformitätserklärung
Im Sinne der EU-Richtlinie Explosionsschutz 2014/34/EU.
Anschrift Hersteller: MAXIMATOR GmbH
Lange Straße 6
99734 Nordhausen / Deutschland
Hiermit erklären wir, dass die Bauart von Druckluft-Nachverdichtern der Baureihe:
MPLV, SPLV, GPLV
in der gelieferten Ausführung folgenden einschlägigen Bestimmungen entspricht:
EU-Richtlinie Explosionsschutz 2014/34/EU
Angewendete harmonisierte Normen und technische Spezifikationen:
DIN EN 1127-1
DIN EN 13463-1
DIN EN 13463-5
Notifizierte Stelle: **0102 PTB - Braunschweig, (Bundesallee 100, 38116 Braunschweig)**
Eingeschaltet zur Aufbewahrung der Unterlagen nach 2014/34/EU
Weitere einschlägige Bestimmungen: EG Maschinenrichtlinie (2006/42/EG) (Unvollständige Maschine)

EC Declaration of Conformity
As defined by the regulations of the EC Explosion Protection Directive 2014/34/EC
Name and address of manufacturer: MAXIMATOR GmbH
Lange Straße 6
99734 Nordhausen / Germany
Herewith, we declare that the model of air amplifiers type:
MPLV, SPLV, GPLV
as supplied are in conformity with the following relevant regulations:
EC Explosion Protection Directive 2014/34/EU
Harmonised standards and technical specifications applied:
DIN EN 1127-1
DIN EN 13463-1
DIN EN 13463-5
Notified bodies: **0102 PTB - Braunschweig (Bundesallee 100, 38116 Braunschweig)**
Involved for preserving the documents in compliance with 2014/34/EC
Further likewise applicable directives: Machinery directive (2006/42/EC) (partly completed machinery)

Déclaration de conformité CE
Au sens de la directive CE atmosphères explosives 2014/34/UE
Adresse du fabricant : MAXIMATOR GmbH
Lange Straße 6
99734 Nordhausen / Allemagne
Nous certifions que le modèle de surpresseurs d'air type:
MPLV, SPLV, GPLV
est conforme, à sa livraison, aux spécifications applicables suivantes:
Directive CE atmosphères explosives 2014/34/UE
Normes harmonisées appliquées et préscriptions techniques:
DIN EN 1127-1
DIN EN 13463-1
DIN EN 13463-5
Services notifiés: **0102 PTB - Braunschweig (Bundesallee 100, 38116 Braunschweig)**
Chargé de conserver les dossiers conformément à 2014/34/UE
D'autres directives également applicables: Directive machines (2006/42/CE) (quasi-machine)

Nordhausen, den 20.04.2016 (Nordhausen, 20.04.2016) [Nordhausen, le 20.04.2016]

i.V.
.....
Steffen Roloff (Technischer Leiter) (Technical Director) [Directeur technique]

Notes

At your side, everywhere:

With our international partner companies, experienced specialists in high pressure technology are always available to assist you.

We have compiled detailed information about our international partners for you on our website at www.maximator.de/vertrieb+weltweit.

MAXIMATOR GmbH
Lange Straße 6, 99743 Nordhausen
Phone +49 (0) 3631 9533-0
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info@maximator.de

2016/03

» Also visit our website:
www.maximator.de