

These operating instructions apply to:

PKL 190  
PKL 450  
PKL 740

PKL 1000  
PKL 2100  
PKL 5000  
PKL 10000



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**Scope of delivery**

Please refer to the delivery note for the scope of delivery.  
Check the packaging for possible transport damage. In the event of damage to the packaging, check the contents for completeness and possible damage. Inform the carrier in the case of damage.

**Designation**

The pneumatic impactors of the series PKL are hereafter referred to as "PKL".

**Version of document**

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## 1 General information


<b>Use and storage</b>	Before installing the PKL read these instructions carefully. It is the basis for any action when dealing with the PKL, and may be used for training purposes. The instructions should be subsequently stored at the operation site.
<b>Target group</b>	The target group for these instructions is technical staff, who have basic knowledge in pneumatics and mechanics. Only complying technical staff may work on the PKL. The PKL may only be installed, put into operation, maintained, troubleshot and disassembled by persons authorised by the operator.
<b>Copyright</b>	This documentation is protected by copyright. <i>NetterVibration</i> reserves all rights such as translations, reprinting and reproduction of the instructions, as well as parts thereof.
<b>Limitation of liability</b>	All technical information, data and instructions for installation, operation and maintenance in these instructions are based on the latest information available at the time of printing and take our past experience to the best of our knowledge into account. No claims can be derived from the information, illustrations and descriptions in these operating instructions. The manufacturer does not assume liability for damages resulting from: <ul style="list-style-type: none"><li>• failure to observe the instructions,</li><li>• improper use,</li><li>• unauthorised repairs,</li><li>• technical modifications,</li><li>• use of non-permissible spare parts.</li></ul> Translations are made to the best of our knowledge. <i>NetterVibration</i> does not assume liability for translation errors, even if the translation was made by us or on our behalf. Only the original German text remains binding.
<b>Directives / standards observed</b>	The pneumatic impactors of the series PKL comply with the EC Machinery Directive 2006/42/EC. In particular, the standard EN ISO 12100 has been observed.


**Instruction and warning symbols**

The following instruction and warning symbols are used in these instructions:

**Personal injuries**

<b>⚠ DANGER</b>	
	signifies an immediate danger. Disregard of this notice will result in death or severe bodily injuries.

<b>⚠ WARNING</b>	
	signifies a potential danger. Disregard of this notice can result in death or severe bodily injuries.


<b>⚠ CAUTION</b>	
	signifies a potentially dangerous situation. Disregard of this notice can result in minor or moderate bodily injuries.

**Material damages**

<b>NOTICE</b>	
signifies potential material damage. Disregard of this notice can result in material damage.	

**Notes**

<b>IMPORTANT</b>	
indicates actions, methods or notes that are not relative to safety, e.g. useful information and tips.	

	<b>Environmentally safe disposal</b> indicates the obligation of environmentally safe disposal.
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## 2 Safety

### Intended use

General areas of application of the PKL are for knocking off adhesive bulk materials from container walls (e.g. silos, hoppers, filter outlets, pipelines and reactors) and for emptying residues from weighing containers. The PKL also prevent bridging and rat-holing, so that the material can continuously flow.

The PKL can also be used outdoors as well as in dusty or dump environments, however not in water or any other liquids.

PKL may only be operated with a timed on/off sequence.

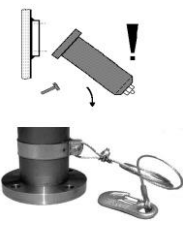
Any other use is considered improper.

### Qualification of qualified personnel

Installation, commissioning, maintenance and troubleshooting of the PKL may only be performed by authorised qualified personnel.

All handling of the PKL is the responsibility of the operator.


### Falling parts

<b>⚠ WARNING</b>	
	<p><b>Falling parts</b></p> <p>The PKL, construction parts as well as fastening screws can come loose due to vibration. Falling parts can lead to severe personal injuries.</p> <ul style="list-style-type: none"> <li>➤ Use only Netter fastening kits (NBS) to fasten the PKL.</li> <li>➤ The PKL 190, PKL 450 and PKL 740 are open on the side of impaction. During installation ensure that the impact piston remains in the housing.</li> <li>➤ Mount the PKL 1000, PKL 2100, PKL 5000 and PKL 10000 additionally with an impact plate and two damper rings (flange and impact plate) or with an EE kit and a damper ring (flange).</li> <li>➤ Check the fastening screws after one hour of operation and thereafter at regular intervals (generally monthly).</li> <li>➤ Retighten the fastening screws, if necessary.</li> <li>➤ A safety device with a safety cable is mandatory for critical mounting situations.</li> </ul>

**Compressed air**

<b>⚠ WARNING</b>	
<b>Compressed air</b>	
A loosened hose which is under pressure can lead to personal injuries.	
<ul style="list-style-type: none"> <li>➤ Screw the hose lines on carefully.</li> <li>➤ Check the hose lines and connections after one hour of operation and thereafter regularly (generally monthly).</li> <li>➤ Retighten the hose lines, if necessary.</li> <li>➤ Ensure that the compressed air is disconnected from the supply lines during all work on the PKL.</li> <li>➤ Prevent the PKL from being switched back on during all work.</li> </ul>	

**Sound level**

<b>⚠ WARNING</b>	
	<b>Sound level</b> Near the PKL or near constructions connected to the PKL E the sound pressure level may exceed 80 dB(A). Human hearing can be permanently damaged by high noise levels. <ul style="list-style-type: none"> <li>➤ Use hearing protection during work in a noisy area if 80 dB(A) is exceeded.</li> <li>➤ Mount the PKL preferably with an EE kit.</li> </ul>

**Heavy parts**

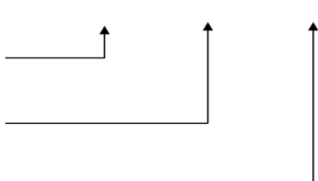
<b>⚠ WARNING</b>	
<b>Risk of injury while handling heavy parts</b>	
Risk of serious injury due to weight during transport and installation of the PKL.	
<ul style="list-style-type: none"> <li>➤ Observe the weight information in Chapter Technical data, from page 7 on.</li> <li>➤ Only qualified personnel may transport and install the PKL.</li> <li>➤ Use suitable load handling devices and slinging equipment.</li> <li>➤ Wear suitable personal protective equipment.</li> </ul>	

**Loose parts**

<b>⚠ CAUTION</b>	
<b>Loose parts</b>	
The PKL are not mechanically closed on the side of impact. The impact piston and/or the impact plate are loosely mounted. Falling parts can lead to personal injuries and material damage.	
<ul style="list-style-type: none"> <li>➤ Ensure that the impact piston and/or impact plate remain in the housing when mounting and dismantling.</li> </ul>	

### 3 Technical data

**Permissible operating conditions**

Drive medium	The PKL must be operated with clean compressed air or nitrogen, preferably oiled, according to the following specification:	
	ISO 8573-1	[ 5 : 6 : 4 ]
Filter ≤ 5 µm		
	Humidity, pressure dew point ≤ +10 °C	
Total oil content ≤ 5 mg/m <sup>3</sup>		
Lubrication	ISO viscosity class in accordance with DIN ISO 3448, VG 5 to 15 Fill mist lubricator with acid- and resin-free compressed air oil.	
	Recommendation for temperatures of up to 60 °C: Klüber "AIRPRESS 15"	Recommendation for temperatures over 60 °C with HT-versions: Aral "Farolin U" lubrication oil
Ambient temperature*	Standard: -20 °C to 60 °C	HT versions: -5 °C to 160 °C depending on version
Operating pressure*	2.5 to 7.0 bar The actual air pressure set on the regulator must not exceed the optimum operating pressure by more than 1 bar.	
Impact frequency	The following impact sequence must not be exceeded: Maximum 10 strokes in sequence at an impact frequency of 15 strokes/min and 180 strokes/h.	

\* Higher operating pressures and temperatures are permitted only after consultation with and written consent by the application technicians of **NetterVibration**.

**Type designation**

The type designations of the PKL have the suffix /3, /4, /5 or /6. The suffix is derived from the optimum operating pressure, i.e. the PKL 740/4 achieves the optimal effect at an operating pressure of 4 bar. In this case, increasing the pressure does not increase the impact energy.

Special versions for operating under temperatures outside the standard temperature range are additionally marked with HT for high temperature or NT for low temperature.

**Sound level**

The sound pressure level of the PKL may exceed 80 dB(A) (single sound incident). Depending on the impact sequence the continuous sound level is below this value.

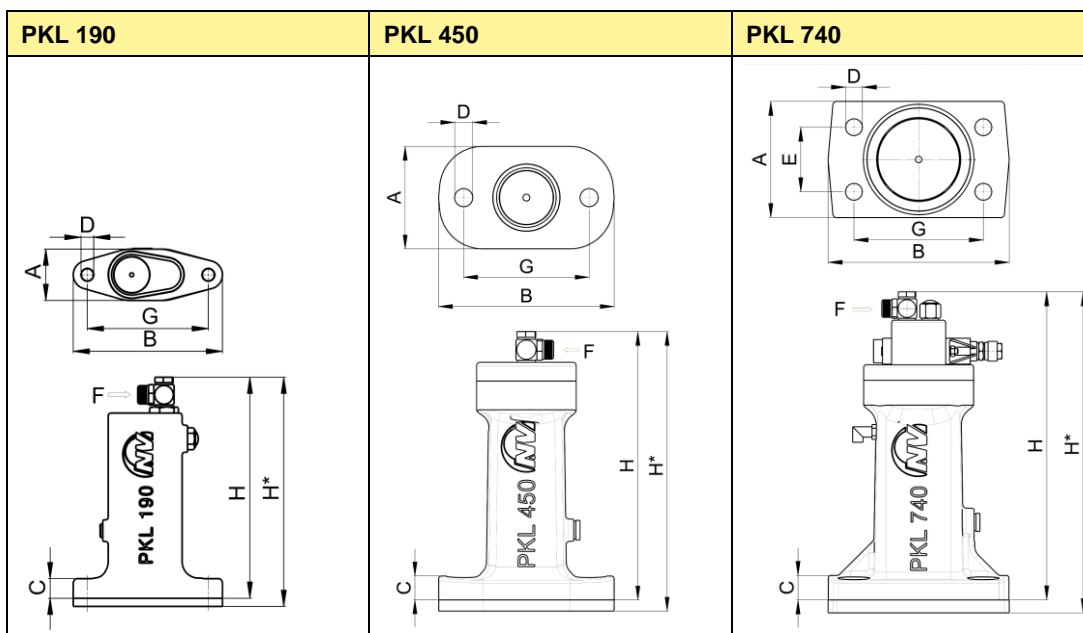
The PKL should be preferably mounted with the EE kit. The reduction of the sound pressure level is about ca. 5 dB(A) (single sound incident).

The sound emitted by the PKL can be dampened by coverings. The sound pressure level is reduced only with simultaneous insulation of the applied sheets.

**Parameters**

Type: PKL ...	Weight of piston [kg]	Force of impact * [kg]	Optimum operating pressure [bar]	Air consump- tion/impact at opti- mum pressure [NI]	Overall weight [kg]	Suitable for wall thickness of... [mm]
190/4	0.19	0.43	4.0	0.20	0.8	1 - 2
190/6	0.19	0.60	6.0	0.20	0.8	1 - 2
450/4	0.44	0.56	4.0	0.40	1.6	1 - 3
450/6	0.44	0.92	6.0	0.60	1.6	1 - 3
740/3	0.74	1.30	3.0	0.50	2.6	2 - 4
740/4	0.74	1.80	4.0	0.70	2.6	2 - 4
740/5	0.74	2.10	5.0	0.80	2.6	2 - 4
740/6	0.74	2.70	6.0	1.00	2.6	2 - 4
1000/4	1.00	2.80	4.0	2.70	5.7	2 - 4
1000/6	1.00	4.30	6.0	4.00	5.8	3 - 5
2100/4	2.10	4.20	4.0	5.20	6.7	3 - 5
2100/5	2.10	6.20	5.0	6.50	6.9	3 - 5
5000/4	4.96	6.60	4.0	5.70	16.0	4 - 8
5000/6	4.96	10.60	6.0	8.60	16.5	6 - 12
10000/6	10.00	17.50	6.0	15.10	34.0	> 10

\* The force of impact corresponds to the impact of the given weight falling from a height of 1 m.

**Dimensions**
**PKL  
190 /  
450 /  
740**


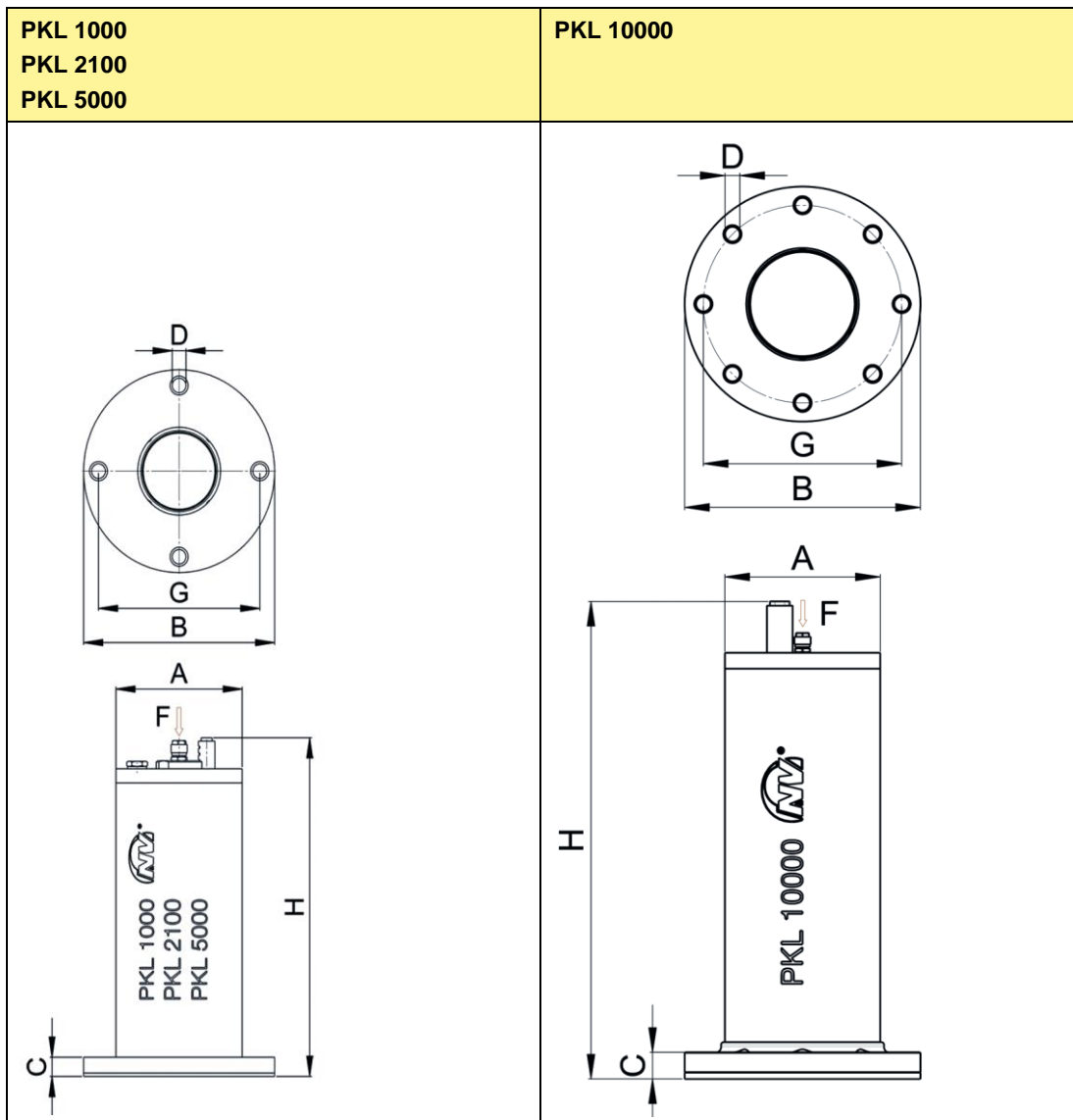
Type: PKL ...	A [mm]	B [mm]	C [mm]	Ø D [mm]	E [mm]	F <sup>1</sup>	G [mm]	H [mm]	H* [mm]
190	38.0	111	15	9.0	-	G 1/8, DN 6 × 1	90.0	163.5	169.5
450	73.5	126	14	13.0	-		90.0	192.0	200.0
740	90.0	140	15	13.0	50		100.0	238.5	248.5

\* with EE kit

<sup>1</sup> DN = nominal diameter



**Dimensions**  
**PKL**  
**1000 /**  
**2100 /**  
**5000 /**  
**10000**

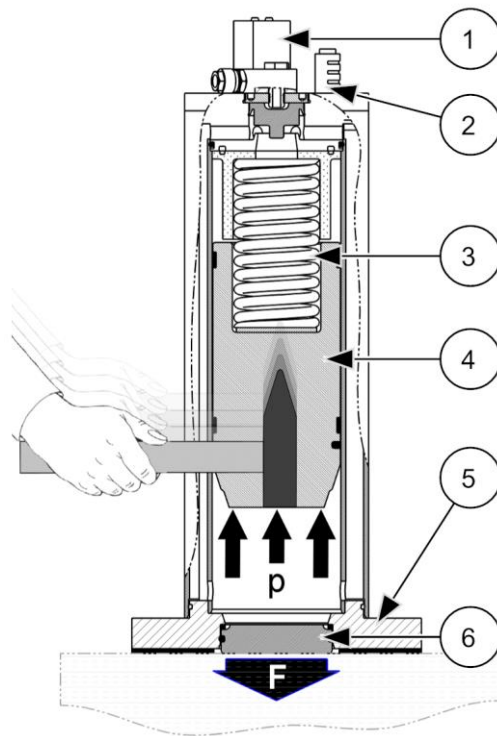


Type: PKL ...	Ø A [mm]	Ø B [mm]	C [mm]	Ø D [mm]	E [mm]	F <sup>1</sup>	Ø G [mm]	H [mm]
1000	88.9	140	13	13	-	G 1/8, DN 6 × 1	116	266
2100	120.0	180	17	13.0	-		152	300.5
5000	114.3	180	22	17.0	-		152	376.5
10000	145.0	220	25	17.0	-		185	445.0

<sup>1</sup> DN = nominal diameter

## 4 Design and function

### Design



- 1 Quick air-exhaust valve
- 2 Silencer
- 3 Springs
- 4 Piston
- 5 Flange
- 6 Impact plate
- p Pressure
- F Impact force

### Function

The PKL is a pneumatic "hammer". Compressed air goes under the piston (4) and presses it against one or two springs (3).

When exhausting, the air chamber beneath the piston empties abruptly via the quick air-exhaust valve (1).

The piston (4) (hammer) is struck by the spring force against an impact plate (6), which then passes the impact force (F) on. For PKL without an impact plate (PKL 190, PKL 450 and PKL 740), the piston strikes directly against the fastening surface. The PKL 1000, PKL 2100, PKL 5000 and PKL 10000 have an impact plate.

The air escapes via the silencer (2).

The PKL only work when mounted, as the piston chamber is then sealed by a built-in O-ring in the mounting surface (until PKL 740) or by a damper ring (flange; from PKL 1000 on).

### Features of PKL 740

A quick-air exhaust valve and a 3/2-way valve are integrated in the valve head of the PKL 740. Therefore, the control valve on the customer's site can be mounted at any distance away from the PKL 740.

The control air must be connected at the side. A silencer is mounted on the exhaust air outlet.

### ST kit

The ST kit allows a continuous impact sequence with permanent compressed air supply.

### EE kit

The EE kit generates a "rubber hammer effect" and reduces the noise level.

## 5 Transport and storage



Observe the safety instructions in Ch. Safety, from page 5 on.

### Transport conditions

Special transport conditions are not required.

When moving the PKL 10000, use the mounted transport lugs at the top of the housing.

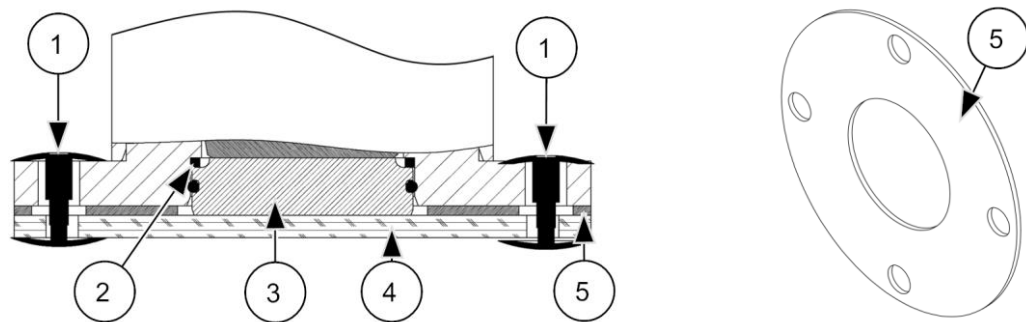
### Packaging

The PKL are packed and ready for assembly. Accessories and add-on parts are delivered unmounted, unless otherwise agreed upon.

The packaging protects the PKL from transport damage. The packaging material has been selected from an environmentally safe and technically disposable point of view and is therefore recyclable.

The return of packaging to the material cycle conserves raw materials and reduces the amount of waste.

### Transport safety device PKL 1000 / 2100 / 5000 / 10000



- |                               |                             |
|-------------------------------|-----------------------------|
| 1 Plastic fastening           | 3 Impact plate              |
| 2 Damper ring (impact plate)* | 4 Corrugated cardboard disc |
|                               | 5 Damper ring (flange)      |

\* for steel impact plate

The PKL 1000, PKL 2100, PKL 5000 and PKL 10000 are delivered with a transport safety device at the bottom. The transport safety device consists of two plastic fastenings (1) and a corrugated cardboard disc (4). It prevents the impact plate (3) from falling out during transport and must be removed before installation. Take care that the impact plate and damper ring (flange; 5) retain their position on the PKL, as they must be mounted with the PKL.

### Storage conditions

- Store the PKL in a dry and clean environment.
- Protect the PKL from UV-exposures, weather and ozone.
- The storage temperature is between -20 °C and +60 °C.
- Close all openings when re-storing.
- Preserve the PKL before storage:
  1. Mount the PKL on a plate. The impact plate of the PKL 1000, PKL 2100, PKL 5000 and PKL 10000 must be inserted.
  2. Apply anti-corrosion oil to the air inlet and briefly activate the PKL.

## 6 Installation



Observe the safety instructions in Ch. Safety, from page 5 on.

### Procedure

When installing the PKL carry out the following steps in succession:

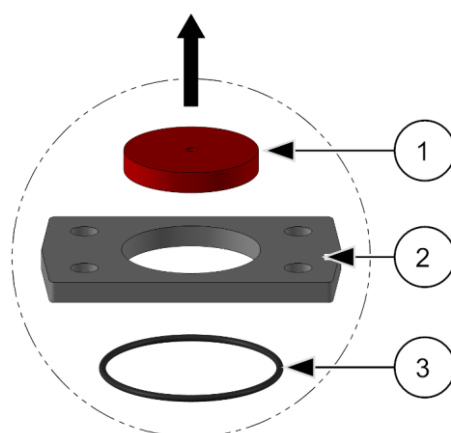
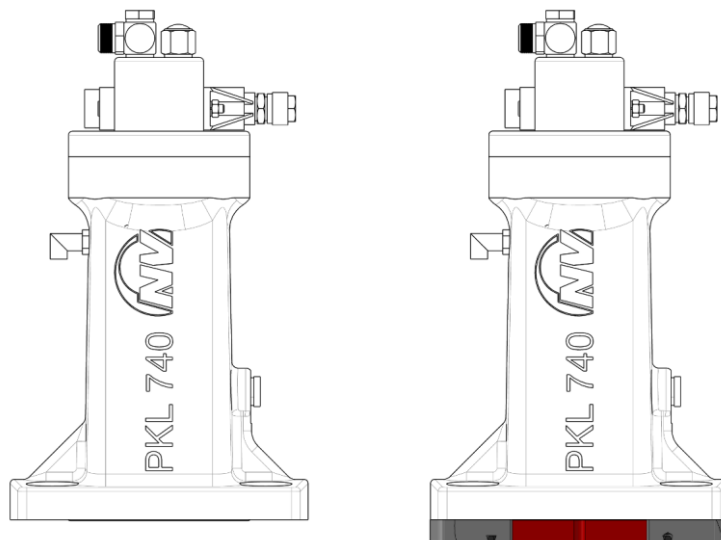
### Instructions for EE kit

PKL  
190 /  
450 /  
740

Install the EE kit on the PKL 190 / 450 / 740 between the flange of the PKL and the mounting surface so that

- the piston of the PKL strikes the elastomer disc (1).
- the O-ring (3) is between the spacer plate (2) and the mounting surface.

The spacer plate is supplied with the O-ring mounted.



EE kit:

- 1 Elastomer disc
- 2 Spacer plate
- 3 O-ring

*Example: PKL 740*

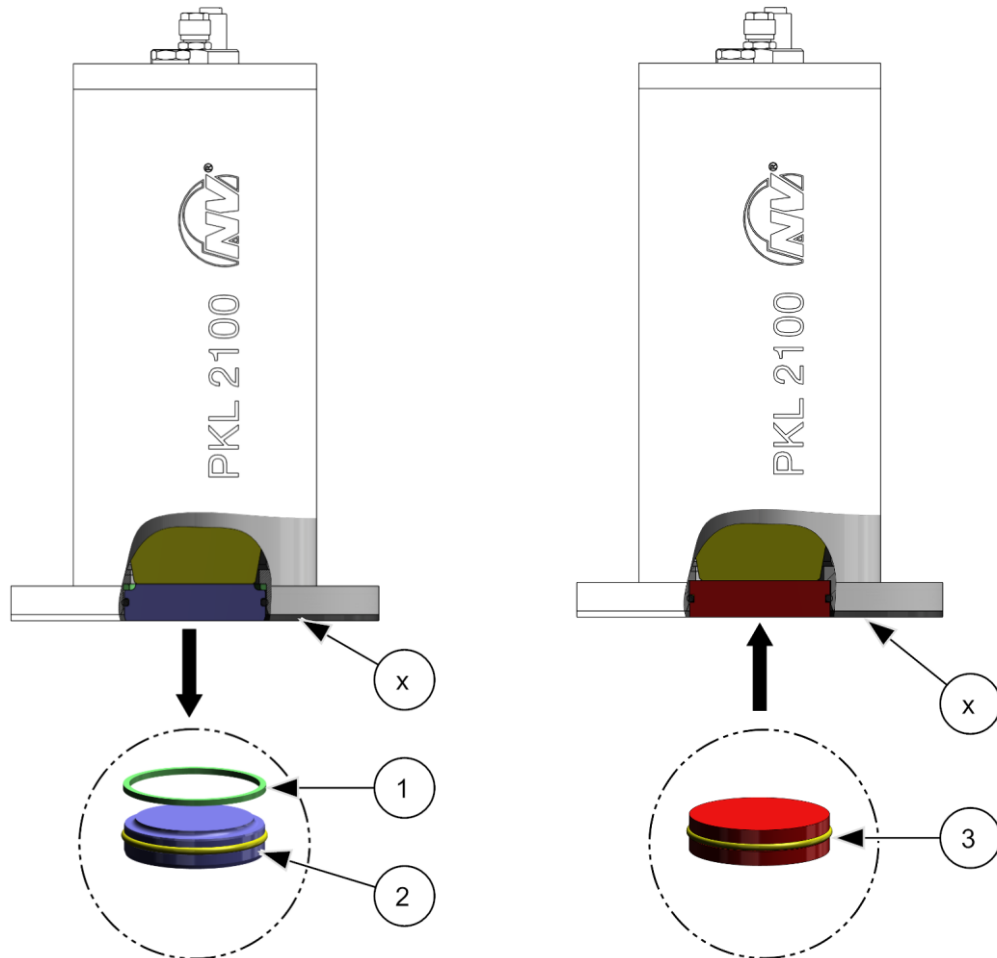
For detailed information, please refer to the mounting instructions for the respective PKL type.

**Instructions  
for EE kit  
PKL  
1000 /  
2100 /  
5000 /  
10000**

Install the EE kit on the PKL 1000 / 2100 / 5000 / 10000 as follows:

1. Remove the steel impact plate with the O-ring (2) and the damper ring (impact plate) (1).
2. Insert the EE impact plate with the O-ring (3) in such a way that the piston of the PKL strikes against the EE impact plate (3).

Ensure that the damper ring (flange) (x) is between the flange of the PKL and the mounting surface.



- 1 Damper ring (impact plate)
- 2 Steel impact plate with O-ring
- x Damper ring (flange)

- 3 EE kit: EE impact plate with O-ring
- x Damper ring (flange)

*Example: PKL 2100*

For detailed information, please refer to the EE kit mounting instructions for the respective PKL type.

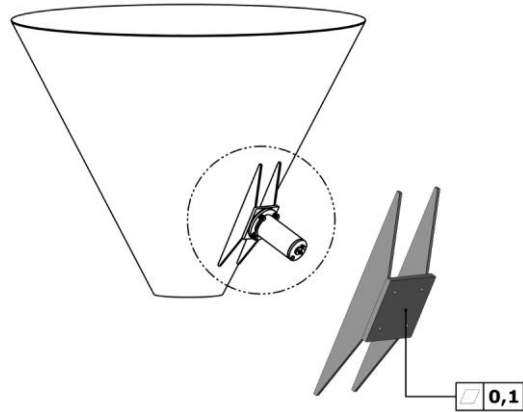
**Fixing devices**

Appropriate fixing devices ( $\pm 0.1$  mm flatness):  
weld-on consoles, weld-on plates, glueing consoles

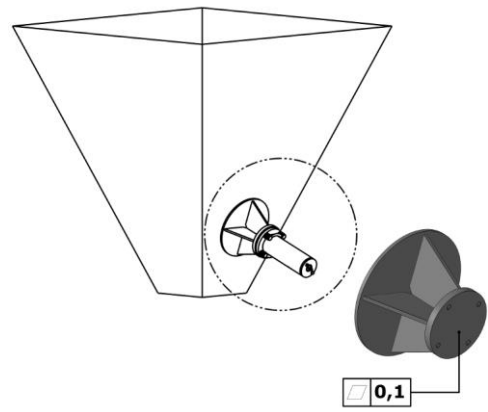
- Weld the weld-on consoles directly onto the container walls.
- Weld the plates onto previously mounted saddle plates (1.5 times the sheet thickness of the container).
- Glue the glueing consoles directly to container walls.

Examples:

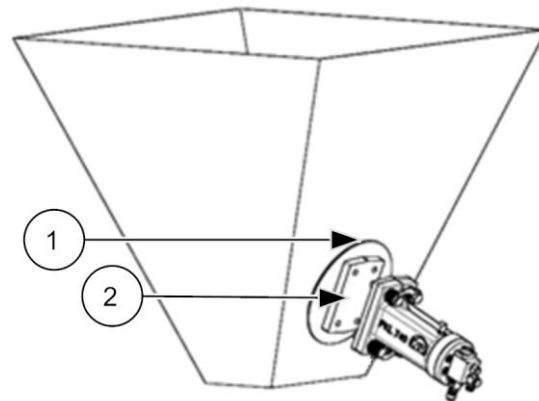
*Weld-on console, plane*



*Weld-on console, round*

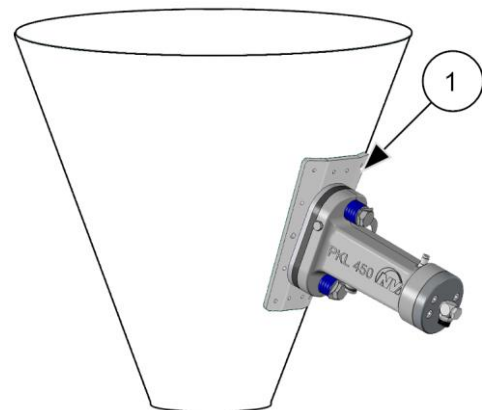


*Weld-on plate*



- 1 Saddle plate
- 2 Weld-on plate

*Glueing console, conical*



- 1 Glueing console

**Fastening kits NBS**

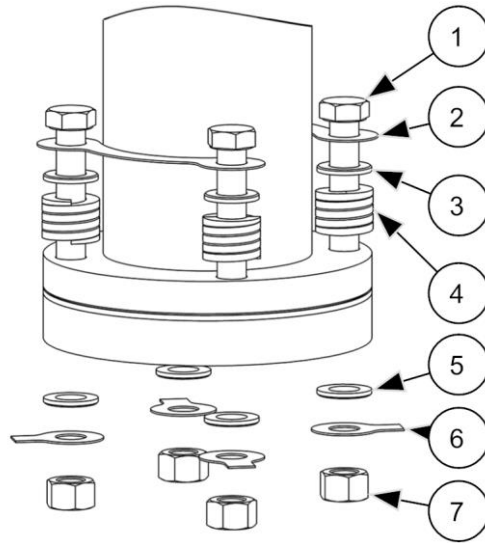
For safe and permanent fixation of the PKL to the fixing device use the compulsory fastening kits.

The following fastening kits are available for every PKL type:

Description	Difference
NBS ... G (e.g. NBS 5000 G)	For tapped hole
NBS ... D (e.g. NBS 740 D)	For through-hole
NBS ... (e.g. NBS 190)	Without screws

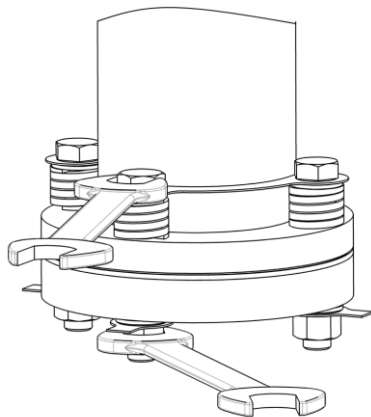
... corresponds to the PKL type: 190 / 450 / 740 / 1000 / 2100 / 5000 / 10000

**Instructions  
fastening kit  
NBS**



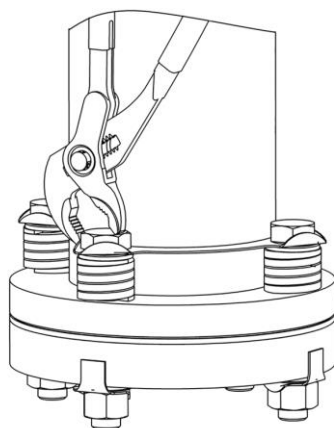
Components of the fastening kit using the example NBS D:

- 1 Hexagon bolt
- 2 NBS lock plate
- 3 Washer
- 4 Damper spring
- 5 Washer (only for NBS D)
- 6 Tab washer with long tap (here only for NBS D)
- 7 Nut (only for NBS D)

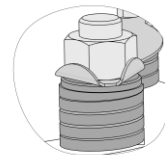


The damping springs must be mounted on the flange of the PKL.

1. Tighten the screw connections evenly, until the damping springs are completely pressed together.
2. Loosen the screw connections by one revolution.



Then fold **all** protruding roundings of the lock plates towards all bolt heads, with NBS D also towards all nuts, as follows:



For NBS D fold all long taps of the tab washers towards the mounting plate.

For detailed information, please refer to the respective Mounting Instructions (NBS G mounting kits or NBS D mounting kits).

**Instructions  
for ST kit**

The ST kit connects the control port to the piston chamber. The PKL equipped with the ST kit strikes as long as there is compressed air.

- For PKL 190 / 450 proceed as follows:
  - Mount the ST screw fitting (after the NBS).
  - A 3/2-way valve with air supply is necessary.
- For PKL 740 proceed as follows:
  - Replace the silencer with the compressed air connection.
  - Only one air supply is necessary.
- Order the PKL 2100 directly with the ST control.
- For PKL 5000 proceed as follows:
  - Mount the control valve of the ST control to the PKL.
  - The control valve is connected internally to the piston chamber, the ST control is integrated in the PKL.

For detailed information, please refer to the Assembly Instructions for the ST kit.

**Components  
for all  
installations**

For all installations, use a ball valve to shut off the main line and a maintenance unit.

The maintenance unit should comprise a filter, a regulator and a mist lubricator (see page 7; "Drive medium").

Connect the PKL with the pneumatic hose according to the following depicted pneumatic circuit diagrams.

Define the impact sequence of the PKL with an electrical control, e.g. the Netter Electronic Timer AP 117.

**Specifications  
for valves and  
hoses**

Recommended cross-sections for control lines, control valves and main air supply: DN 6 × 1

To connect the control valve to the PKL:

- DN 6 should be used and
- a length of 15 m should not be exceeded.

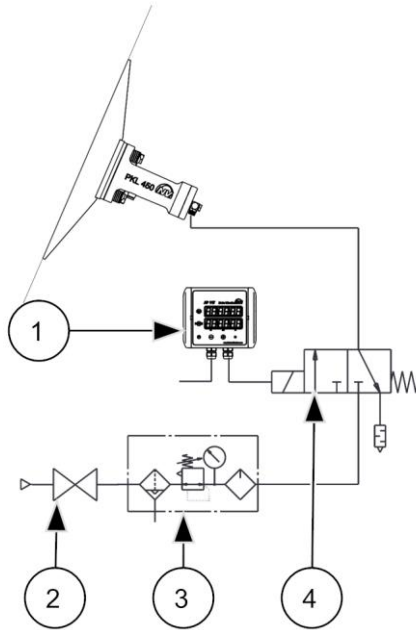
For simultaneous operation of several PKL

- larger cross-sections are to be provided for the main line up to distribution to the individual PKL.
- the total length of the compressed air supplies is max. 50 m.



**Standard installation all types of PKL except 740**

Example: PKL 450



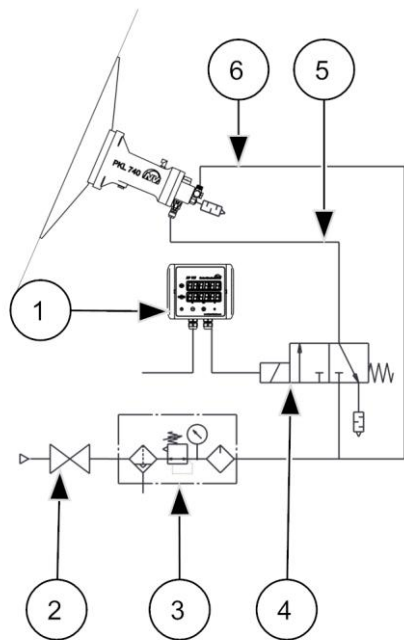
- 1 Electronic Timer AP
- 2 Ball valve
- 3 Maintenance unit
- 4 3/2-way valve

Use a 3/2-way valve (4) for actuation.

By switching the valve, the piston chamber is vented and exhausted and the PKL therefore strikes.

Mount the 3/2-way valve (4) at a distance of max. 15 m.

**Standard installation PKL 740**



- 1 Electronic Timer AP
- 2 Ball valve
- 3 Maintenance unit
- 4 Actuating valve on customer's site
- 5 Control line
- 6 Main air

The PKL 740 is the only PKL with a 3/2-way valve integrated in the valve head.

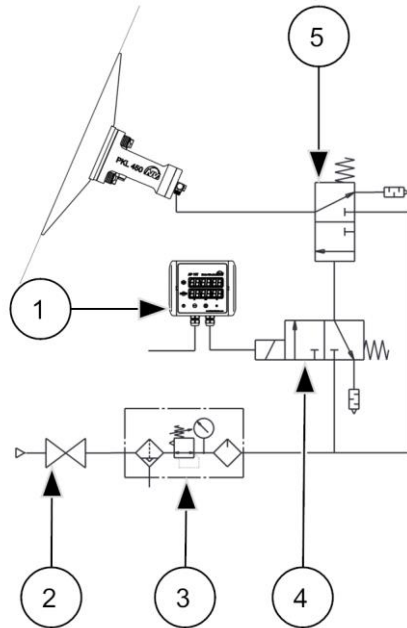
By switching the valve, the piston chamber is vented and exhausted and the PKL therefore strikes.

The main air (6) is present at the valve head. The control line (5) from the actuating valve on the customer's site (4) to the PKL may be very long (e.g. 50 m). The charging time of the PKL is several seconds for longer supply and control lines.

For long air lines, set a pause and duty time on the Electronic Timer AP (1) to a minimum of at least 5 s. If shorter lines are used, reduce these times accordingly, e.g. to 2-3 s.

**Installation with long supply line all types of PKL except 740**

*Example: PKL 450*



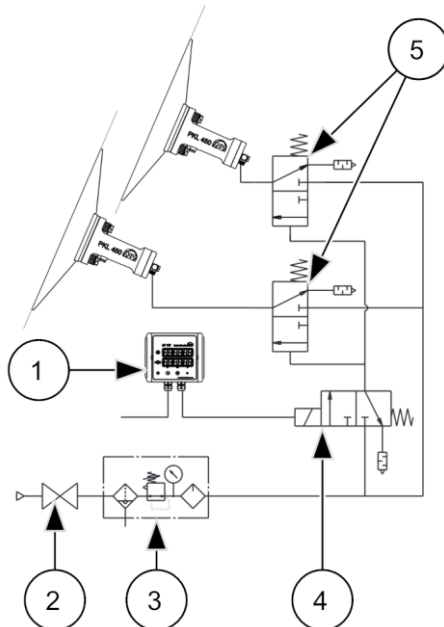
- 1 Electronic Timer AP
- 2 Ball valve
- 3 Maintenance unit
- 4 Actuating valve on customer's site
- 5 3/2-way valve (pneumatic)

The main air is always at the 3/2-way valve (5) max. 1 m away from the PKL. The control line from the actuating valve (4) on the customer's site to the PKL may be longer (e.g. 50 m).

For longer supply and control lines, the charging time of the PKL is several seconds. For long air lines, set a pause and duty time on the Electronic Timer AP (1) to a minimum of at least 5 s. If shorter lines are used, reduce these times accordingly, e.g. to 2-3 s.

**Installation of several PKL**

*Example: PKL 450*



- 1 Electronic Timer AP
- 2 Ball valve
- 3 Maintenance unit
- 4 Actuating valve on customer's site
- 5 3/2-way valve (pneumatic)

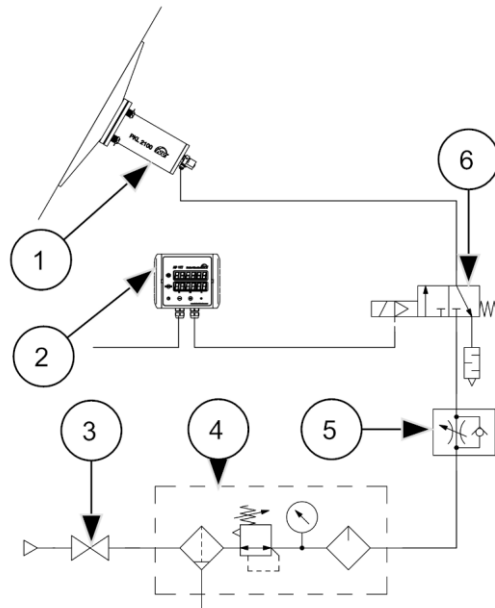
It is possible to operate several PKL in parallel with just one control and an actuating valve (4). The connection lines from the 3/2-way valve (5) to the PKL must be max. 1 m long, otherwise the membrane in the PKL moves too slowly and does not reach the end position.

If required, install the actuating valve (4) at a larger distance if additional 3/2-way valves (5) are used.

If several PKL are in operation, the supply line must not be longer than 50 m.

**Installation with ST kit**  
**PKL**  
**190 /**  
**450 /**  
**2100 /**  
**5000**

Example: PKL 2100

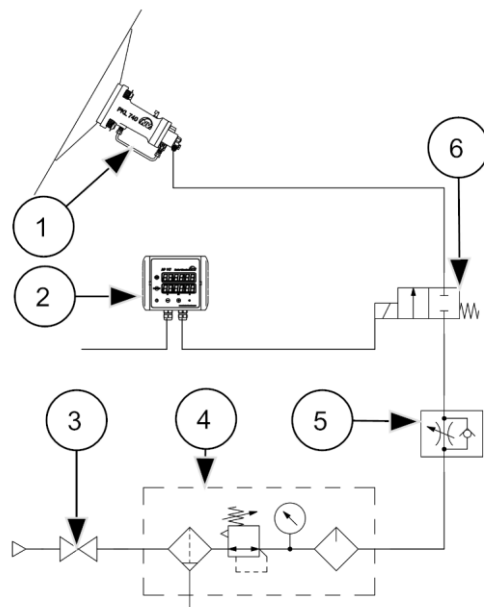


- 1 PKL with ST kit
- 2 Electronic Timer AP
- 3 Ball valve
- 4 Maintenance unit
- 5 Non-return throttle valve
- 6 3/2-way valve

The PKL, equipped with an ST kit (1), strikes as long as pressure is applied. The PKL thereby achieves a maximum impact frequency of up to one strike per second, which must be reduced to the permissible impact frequency (see Ch. Technical data, page 7, e.g. with a non-return throttle valve (5) inserted in the supply line).

A 3/2-way valve (6) enables operation of the PKL equipped with an ST kit at a larger distance (up to 50 m).

**Installation with ST kit**  
**PKL 740**



- 1 ST kit
- 2 Electronic Timer AP
- 3 Ball valve
- 4 Maintenance unit
- 5 Non-return throttle valve
- 6 2/2-way valve

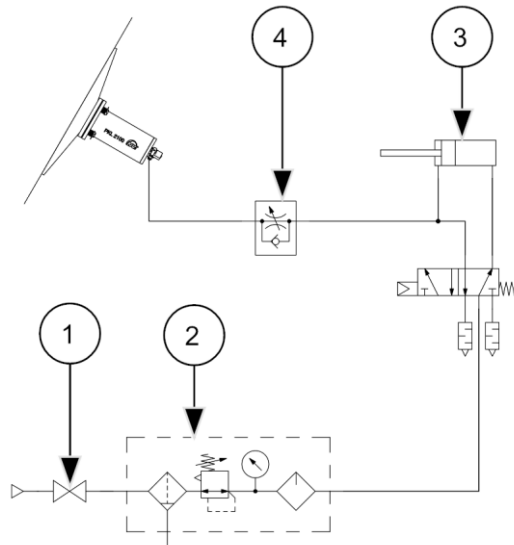
The PKL 740, equipped with an ST kit (1), strikes as long as pressure is applied.

The PKL 740 thereby achieves a maximum impact frequency of up to one strike per second, which must be reduced to the permissible impact frequency (see Ch. Technical data, page 7; e.g. with a non-return throttle valve (5) inserted in the supply line).

A 2/2- or 3/2-way valve (6) enables operation of the PKL 740 equipped with an ST kit at a larger distance (up to 50 m).

**Installation with coupling to other functions**

Example: PKL 2100



- 1 Ball valve
- 2 Maintenance unit
- 3 Opening cylinder
- 4 Non-return throttle valve

If the PKL is equipped with an ST kit, then it can be coupled with another function without a control or a pulse generator. The adjacent illustration shows the coupling with an opening cylinder (3) of a weighing container.

The PKL is now not actuated. When opened, it strikes at the set number of cycles on the non-return throttle valve (4), as long as the flap of the weighing container is open.

**Checklist installation**

Check that the following steps have been carried out:

- Permissible ambient temperatures observed?
- Fixing device mounted?
- PKL mounted onto the fixing device ( $\pm 0.1$  mm flatness) with NBS fastening set?
- PKL 1000, PKL 2100, PKL 5000 and PKL 10000 additionally mounted with damper ring (flange)?
- Ball valve, maintenance unit (filter, regulator, mist lubricator), valve and supply line mounted?
- Information on hose length and nominal width observed?
- Fastening screws secured with liquid safety agent, **if required**?
- Hose lines sealed with liquid sealant, **if required**?
- PKL in critical assembly situations secured against falling by means of a safety cable?

## 7 Start-up and operation



**Observe the safety instructions in Ch. Safety, from page 5 on.**

<b>Permissible operating conditions</b>	Please refer to Ch. Technical data, page 7 for permissible operating conditions.
<b>Design of mist lubricator</b>	For installation with mist lubricator: When selecting the mist lubricator, take into consideration that the air consumption of the PKL is very low. The choice of mist lubricator depends on how many PKL are operated simultaneously. 1/8"- or 1/4"-mist lubricators are recommended. Larger mist lubricators may not react.
<b>Setting mist lubricator</b>	For installation with mist lubricator: Set the mist lubricator to the smallest safely adjustable number of drops while the PKL is running.
<b>Regulation impact frequency</b>	PKL with ST control: impact frequency can be set by the non-return throttle valve. PKL without ST control: regulation of impact frequency is set by an external control, e.g. a 3/2-way valve and a Netter Electronic Timer (AP).
<b>Regulation impact force</b>	The impact force can be reduced by lowering the pressure (exception: PKL with ST kit). Throttling the air supply (by using a non-return throttle valve, shut-off valve, etc.) does not reduce the impact force but delays the charging time.
<b>Checklist start-up</b>	<p>Check that the following steps have been carried out:</p> <p>Hose connections checked before start-up? <input type="checkbox"/></p> <p>For installation without ST kit: Desired impact force set on pressure regulator? <input type="checkbox"/></p> <p>For installation with ST kit and impact frequency control with a non-return throttle valve: Impact frequency set optimally? <input type="checkbox"/></p> <p>Note that a high impact frequency reduces the service life and leads to a high sound level.</p> <p>For installation with mist lubricator: Mist lubricator set? <input type="checkbox"/></p> <p>After one hour of operation: Hose supply connections as well as fastening screws checked and tightened, if necessary? <input type="checkbox"/></p> <p>Observe the maintenance plan.</p>

## 8 Maintenance and servicing



Observe the safety instructions in Ch. Safety, from page 5 on.

### Maintenance plan

Maintenance of the PKL must be carried out as follows:

Interval	Action
After one hour of operation after initial commissioning	Check fastening screws.
	Check hose screw connections and hose connections and retighten, if necessary.
Monthly	Check fastening screws.
	Check fastening kit NBS.
	Check hose screw connections and hose connections and retighten, if necessary.
	Check hose supply connections for permeability and kinks. If necessary, clean and remove kinks.
	Check the function of the silencer.
	Check impact effect.
	For installation with mist lubricator: Ensure that mist lubricator operates according to regulations. Refill oil.
Empty the filter of the maintenance unit if necessary, clean the filter insert (wash out) and replace if necessary.	
At the latest after a total of 500,000 strokes	Carry out the general overhaul, in which all wear parts must be replaced.

### Cleaning

In the course of its service life, a film can form due to wear, which impairs functioning. If loss in performance or standstill is noticed, proceed as follows:

1. Remove piston.
2. Clean piston.
3. Replace guide ring and piston seal, if necessary.
4. Reinsert piston.

Special tools are needed for inserting piston, guide rings and piston seal (available on request).

### Maintenance intervals

The maintenance intervals depend essentially on the service life and how clean the drive medium is.

Unfiltered compressed air leads to high wear, silencer clogging or complete failure of the PKL.

### Implementation by Netter

Maintenance, repair and general overhaul of the PKL may alternatively be performed by **NetterVibration**.

## 9 Troubleshooting

### Malfunctions and causes

In the case of malfunctions of the PKL proceed as follows:

Malfunction	Possible causes	Corrective actions
Does not function	Mounting surface not flat, loss of pressure via O-ring	Establish $\pm 0.1$ mm flatness on mounting surface.
	Malfunction of valve and control	Check PKL without valve and control. Check valve and control, and replace if necessary.
	Compressed air supply	Check pressure and increase if necessary.
Check valve connection. Replace valve, if necessary.		
Does not function and has leakage at top	Wear of seals	Check seals of impact piston, replace if necessary.
	General wear (Housing and membrane)	Replace affected parts and seals.
Does not function and has leakage on mounting surface	PKL incorrectly mounted	Tighten fastening screws and replace, if necessary.
	Mounting surface not flat	Establish $\pm 0.1$ mm flatness on mounting surface.
		Check O-ring. Insert O-ring in groove, replace if damaged.
Does not function with ST kit	Operating pressure insufficient	Check PKL model. Check pressure and increase if necessary.
Impact weak	Compressed air supply	Check pressure and increase if necessary.
	Contamination of control valve	Clean control valve or replace, if necessary.
	Contamination of silencer	Clean silencer.
	Wear, leakage	Replace seals.

## 10 Spare parts and accessories

### Ordering of spare parts

Please provide the following details when ordering spare parts:

- required amount
- description and position of spare part
- type of PKL

### Possible accessories

Following accessories for the PKL are available:

Accessory	Description
NBS fastening sets	Compulsory for safe and permanent mounting (see Ch. Installation, page 14)
ST kit	Allows a continuous impact sequence with permanent compressed air supply; sufficiently long pauses must be maintained between the individual impact sequences (see page 7; "Impact frequency").
Hose material and hose screw connections	For air supply or discharge, available in different qualities and dimensions
Way valves	Electrical, pneumatical or manual
Non-return throttle valves	For clock control of PKL with ST kit
Maintenance units	Filter, control unit with manometer, mist lubricator
Netter Electronic Timers	Electrical or pneumatic, for clock control
Fixing devices	For temporary or permanent fixing
Sound protection hoods	Reduce the sound level
EE (HT) kit	Generates a "rubber hammer effect" (in high temperature areas)
Safety cable	Protects the PKL from falling down
Flange in other dimensions; NBS in stainless steel	Special versions; further information on request

### Special models


The following special models are available on request:

- PKL E for ATEX area,
- PKL HT / NT for application in high/low temperature areas,
- PKL 2100 S and PKL 5000 S in stainless steel version.



## 11 Disposal

### Prices

	All parts of the PKL must be properly disposed of according to the material specifications. The valid disposal prices of the PKL are available on request.
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### Material specifications

Type	Steel or stainless steel	Aluminium	Plastics
PKL 190	Impact piston, compression springs	Housing, EE spacer plate	Seals, membrane, spring guide, impact ring, EE impact plate
PKL 450 / 740	Impact piston, compression springs, screws	Housing, top cover, EE spacer plate	Seals, membrane, EE impact plate
PKL 1000	Impact piston, compression springs, impact plate, inner pipe, top cover, flange, outer pipe, reducer, screws		Seals, damper rings, EE impact plate
PKL 2100	Impact piston, compression springs, impact plate, ST pipe, top cover <sup>1</sup> , flange <sup>1</sup> , outer pipe <sup>1</sup> , reducer <sup>1</sup> , screws	Inner pipe, top cover, flange, outer pipe, reducer, ST ring, ST plate	Seals, damper rings, EE impact plate
PKL 5000	Impact piston, compression springs, impact plate, inner pipe, top cover, flange, outer pipe, reducer, ST pipe, ST plate, ST connection angle, screws		Seals, damper rings, EE impact plate
PKL 10000	Impact piston, compression springs, impact plate, inner pipe, top cover, flange, outer pipe, reducer, screws		Seals, damper rings, EE impact plate

<sup>1</sup> for PKL 2100 S

The valves and screw connections used for all types of PKL are made of plastics, brass and/or aluminium.

## **12 Annex**

Declaration of Incorporation