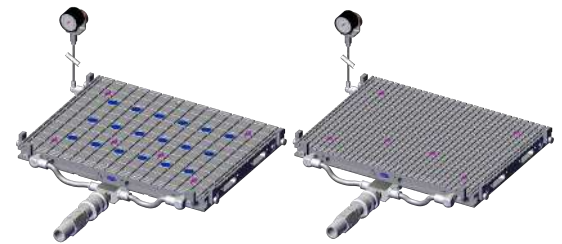


技術資料 Technische Documentatie **Documentation**
Documentação técnica Documentación técnica Documentazione tecnica
Technische Dokumentation Technical Documentation Техническая документация
Documentazione tecnica Technische documentatie
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Matrix-Plate MPL

Assembly Instructions

Note

The Assembly instructions were originally written in German. Store in a safe place for future reference. Subject to technical changes without notice. No responsibility is taken for printing or other types of errors.

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1 Important Information

1.1 The technical documentation is part of the product

1. For problem-free and safe operation, follow the instructions in the documents.
 2. Keep the technical documentation in close proximity to the product. The documentation must be accessible to personnel at all times.
 3. Pass on the technical documentation to subsequent users.
- ⇒ Failure to follow the instructions in these Assembly instructions may result in life-threatening injuries!
- ⇒ Schmalz is not liable for damage or malfunctions that result from failure to heed these instructions.

If you still have questions after reading the technical documentation, contact Schmalz Service at:

www.schmalz.com/services

1.2 Note on Using this Document

J. Schmalz GmbH is generally referred to as Schmalz in these Assembly instructions.

These Assembly instructions contain important notes and information about the different operating phases of the product:

- Transport, storage, start of operations and decommissioning
- Safe operation, required maintenance, rectification of any faults

The Assembly instructions describe the product at the time of delivery by Schmalz.

1.3 Warnings in This Document

Warnings warn against hazards that may occur when handling the product. The signal word indicates the level of danger.

Signal word	Meaning
DANGER	Indicates a high-risk hazard that will result in death or serious injury if not avoided.
WARNING	Indicates a medium-risk hazard that could result in death or serious injury if not avoided.
CAUTION	Indicates a low-risk hazard that could result in minor or moderate injury if not avoided.
NOTE	Indicates a danger that leads to property damage.

1.4 Symbol



This symbol indicates useful and important information.

- ✓ This symbol represents a prerequisite that must be met prior to an operational step.
- ▶ This symbol represents an action to be performed.
- ⇒ This symbol represents the result of an action.

Actions that consist of more than one step are numbered:

1. First action to be performed.
2. Second action to be performed.

2 Fundamental Safety Instructions

2.1 Intended Use

The Matrix-Plate is a clamping element and is used exclusively for clamping workpieces on a CNC machining center. A workpiece is secured to the Matrix-Plate by applying a vacuum and can then be machined from five sides.

The Matrix-Plate must be used with an operating vacuum of -750 mbar (guide value) (> See *ch. Pneumatic Connection*).

The product is intended for industrial use.

Intended use includes observing the technical data and the installation and operating instructions in this manual.

2.2 Non-Intended Use

Schmalz accepts no liability for damages caused by the use of the Matrix-Plate for purposes other than those described under Intended Use.

Non-intended use includes the following:

- In potentially explosive atmospheres
- Unauthorized refits

2.3 Danger Zone

Hazards arise when the Matrix-Plate is clamped to a machine table and a workpiece is being processed. Due to the function of the Matrix-Plate in connection with the machine table and the tool in use, constant vibrations occur. As a result, mechanical and fluid connections may loosen or even become disconnected.

Measures for avoiding accidents:

- Ensure that no persons are present in the danger zone.
- Ensure that no persons enter the danger zone during operation.



⚠ CAUTION

Vacuum close to the eye

Severe eye injury!

- ▶ Wear eye protection.
- ▶ Do not look into vacuum openings such as suction lines and hoses.



⚠ CAUTION

Noise pollution caused by exhaust air or leakage during operation

Hearing damage

- ▶ In the event of leakage, check connections and lines and remedy leakages
- ▶ Wear ear protectors.

2.4 Environmental and Operating Conditions

The Matrix-Plate must **not** be operated under the following conditions:

- In potentially explosive atmospheres
- Use in an environment with acidic or alkaline media

The Matrix-Plate is installed with a separate vacuum supply on a machine tool or machining center.



To ensure that the workpiece is securely held on the clamping plate, you must check the vacuum level directly on the clamping device.



⚠ DANGER

Flying workpiece due to insufficient clamping force during machining, resulting from insufficient vacuum or excessive machining forces.

Risk of injury or death due to flying workpiece

- ▶ Monitor the vacuum value as close to the clamping location as possible.
- ▶ Wear personal protective clothing.

- ▶ If in doubt, consult Schmalz before the start of operations.

2.5 Personnel Qualifications

Unqualified personnel cannot recognize dangers and are therefore exposed to higher risks!

The operating company must ensure the following points:

- The personnel must be commissioned for the activities described in these operating instructions.
- The staff must be at least 18 years of age and physically and mentally capable.
- The product must be operated only by persons who have undergone appropriate training.
- Personnel must receive regular safety briefings (frequency as per country-specific regulations).
- Installation, maintenance, and repairs must be carried out only by specialists from J. Schmalz GmbH or by persons who can prove that they have undergone appropriate training at Schmalz.

The following target groups are addressed in these operating instructions:

- Persons trained in operating and cleaning the product.
- Specialists in mechanics who are responsible for troubleshooting and maintaining the product.

The operator of the system must comply with country-specific regulations regarding the age, ability and training of the personnel.

Valid for Germany:

A qualified employee is defined as an employee who has received technical training and has the knowledge and experience – including knowledge of applicable regulations – necessary to enable him or her to recognize possible dangers and implement the appropriate safety measures while performing tasks. Qualified personnel must observe the pertinent industry-specific rules and regulations.

2.6 Personal Protective Equipment

To avoid injury, always use appropriate protective equipment that is suitable for the situation.

Observe the notes on protective equipment in the corresponding chapters and any country-specific regulations.

2.7 Technical Condition

If the product is operated while in a defective state, safety and function will be impaired.

- The product must only be operated when in perfect technical working order – i.e., in its original condition.
- Follow the maintenance plan (> See *ch. Maintenance*).
- Use only original spare parts from Schmalz.
- If the operating behavior should change, check the product for faults. Rectify faults immediately.
- Unauthorized conversion or modification of the product is prohibited.

- Safety features must not be disabled under any circumstances.

Schmalz assumes no liability for consequences of modifications over which it has no control.

2.8 Responsibility of the Operating Company

The operating company is obligated to perform a risk assessment for the environmental conditions at the installation location.

The operating company is responsible for mounting the Matrix-Plate on the machine table. It is therefore responsible for ensuring that the Matrix-Plate is correctly mechanically attached, that the pneumatic connections are in good condition and that pneumatic monitoring (gauge) is working.

The operating company is also responsible for third parties in the working area of the machining center and the Matrix-Plate. The operating company must ensure that they have the appropriate qualifications and skills.

- Ensure that the Matrix-Plate cannot be started up by unauthorized persons.
- Ensure that the machining center cannot be operated during maintenance or repair work on the Matrix-Plate.
- Clearly define the responsibilities for the various activities performed with the gripper.
- Ensure that these responsibilities are observed.

2.9 Country-Specific Regulations for the Operating Company

1. Observe the country-specific regulations regarding accident prevention, safety testing and environmental protection.
2. The product is used in combination with a machine tool/machining center.
Ensure that the appropriate country-specific regulations and safety regulations are adhered to.

3 Product Description

3.1 Description of the Matrix-Plate

The Matrix-Plate consists of an aluminum plate with grooves milled into the surface. It is used to clamp and secure flat workpieces that are level on one side using a vacuum. For this to be possible, the workpiece must be at least partially vacuum-tight.

The workpieces are machined exclusively on a CNC machining center.

The vacuum holding force that acts on the flat surface ensures that the workpiece is secured with little tension and can be machined from five sides. The Matrix-Plate is particularly suitable for clamping soft or thin workpieces for which mechanical or magnetic clamping is not possible.

The grid milled on the surface serves two functions:

- Depending on the geometry of the workpiece to be processed, a sealing gasket is used to create a space that can be evacuated.
- Distributing the vacuum

The Matrix-Plate is attached to the machine table using clamping claws, a machine vise or a zero point clamping system and connected to the vacuum supply. When the vacuum is applied, the space between the sealing gasket, workpiece and Matrix-Plate is evacuated and the workpiece is clamped.

Stops for positioning the workpiece can be attached to all four side surfaces of the Matrix-Plate. These absorb lateral forces during machining.

The required clamping surface can be extended as required by combining several Matrix-Plates using special hollow bolts (> See *ch. Accessories*). All plates can be connected to one another on all four sides, also enabling larger workpieces to be clamped. The outer dimensions of the Matrix-Plates do not matter, as long as the Matrix-Plates have the same grid groove dimensions.

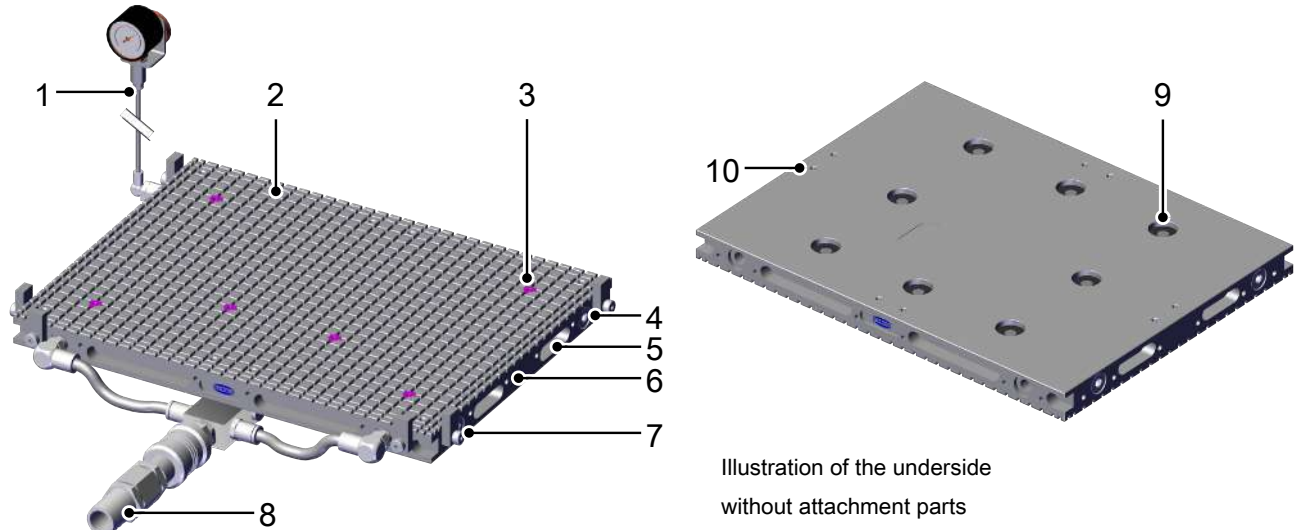


Illustration of the underside
without attachment parts

1	Gauge connection kit	2	Matrix-Plate with groove grid
3	Vacuum vents with filter and 1/8" plugs	4	Lateral vacuum vents with 1/4" plugs
5	Slot for holding clamping claws	6	Additional thread for side stops
7	Side stops	8	Connection kit for hose connection
9	M12 thread for connecting zero point clamping system	10	Mounting holes for connection kit for hose connection

3.2 Variants and Type Key

The Matrix-Plate MPL is available in six different versions. The version is indicated in the item designation. The item designation is composed as follows:

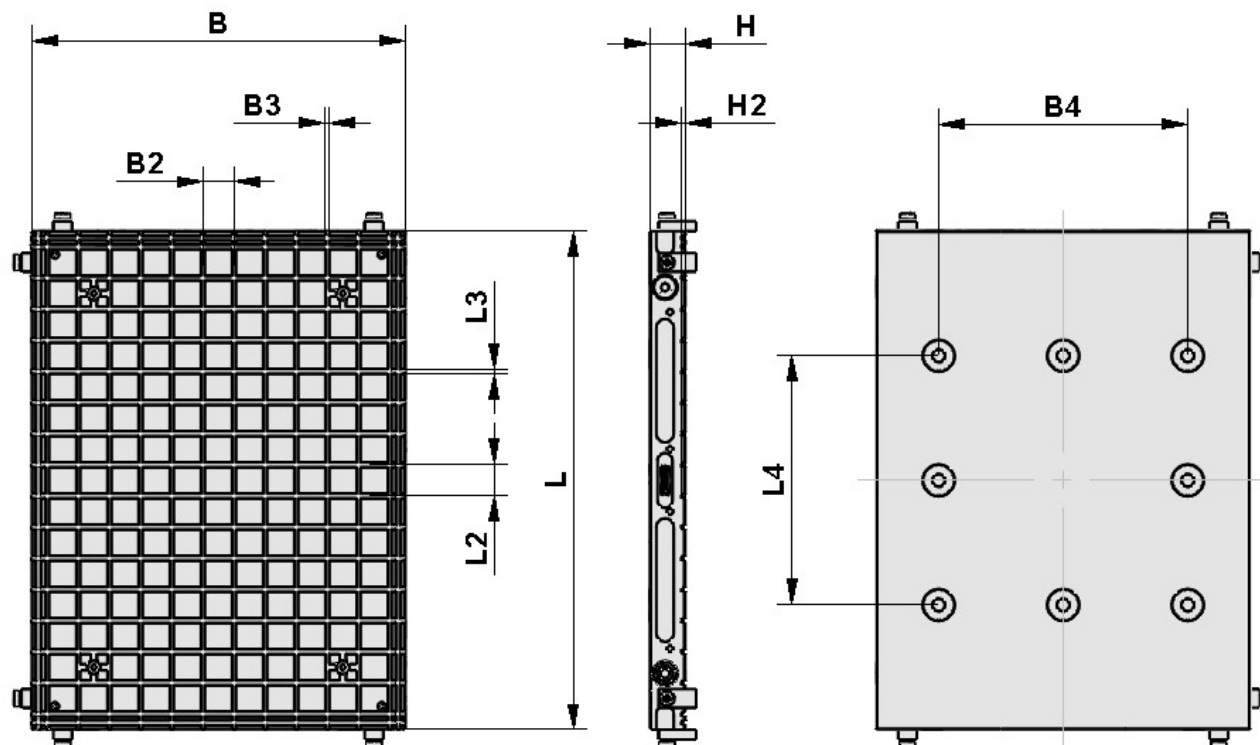
Part number	Abbreviated designation	Dimensions [mm]	Grid spacing [mm]	Slot width/depth [mm]	Friction pad	Number of vacuum vents
10.01.27.01749	MPL	600x400x28	25x25	3x3	RI	12
10.01.27.01750	MPL	600x400x28	25/12.5	3x3	---	12
10.01.27.01751	MPL	400x300x28	25x25	3x3	RI	8
10.01.27.01752	MPL	400x300x28	12.5x12.5	3x3	---	8
10.01.27.01753	MPL	300x200x28	25x25	3x3	RI	4
10.01.27.01754	MPL	300x200x28	12.5x12.5	3x3	---	4

All specifications are in mm (except number of vacuum vents).

* = On the Matrix-Plate 10.01.27.01750, a quarter of the area is designed in a 12.5x12.5 grid and the remaining area in a 25x25 grid.

4 Technical Data

4.1 Dimensions and Weights



Part number	L	L2	L3	L4	B	B2	B3	B4	H	H2	Weight [kg]
10.01.27.01749	600	25	3	200	400	25	3	200	28	3	16
10.01.27.01750	600	25/12.5*	3	200	400	25/12.5*	3	200	28	3	16
10.01.27.01751	400	25	3	200	300	25	3	200	28	3	8
10.01.27.01752	400	12.5	3	200	300	12.5	3	200	28	3	8
10.01.27.01753	300	25	3	200	200	25	3	---	28	3	4
10.01.27.01754	300	12.5	3	200	200	12.5	3	---	28	3	4

All specifications are in mm (except weight).

* = On the Matrix-Plate 10.01.27.01750, a quarter of the area is designed in a 12.5x12.5 grid and the remaining area in a 25x25 grid.

5 Transport and Storage

5.1 Checking the Delivery

The scope of delivery can be found in the order confirmation. The weights and dimensions are listed in the delivery notes.

1. Compare the entire delivery with the supplied delivery notes to make sure nothing is missing.
2. Damage caused by defective packaging or occurring in transit must be reported immediately to the carrier and J. Schmalz GmbH.

The following are included in the delivery:

- Mounted Matrix-Plate
- Workpiece stops
- Vacuum supply connection kit
- Gauge connection kit
- Sealing gasket

6 Installation

6.1 Installation Instructions

The preferred installation position for the Matrix-Plate is horizontal on the machine table of a machining center.



If a different installation position is selected or if the installation position changes (for example, in the case of swiveling machine tables), gravity also acts against the clamping force. If the vacuum drops, there is a risk that the workpiece will fall.

Note:

If you wish to connect several Matrix-Plates, first consult section 6.4 (> See *ch. Connecting Several Matrix-Plates*).

6.2 Mechanical Attachment

In principle, the Matrix-Plate can be adapted to any of the following machine table variants:

- Machine table with T-slots
- Machine table with vises
- Machine table with zero point clamping system

Preparation

- Clean the machine table (remove chips, cooling lubricant residue).
- Connect the hose connection kit to the Matrix-Plate.
 - In the case of a machine table with a zero point clamping system, the hose connection kit must be attached to the underside of the Matrix-Plate.
 - In the case of a machine table with T-slots or with vises, the distributor of the hose connection kit must be attached separately to the machine table.
- Position and align the Matrix-Plate on the machine table.
- Connect the gauge connection kit to the Matrix-Plate and attach the gauge at an appropriate position in/on the machine so that it can be read easily.

Mounting on the machine table

- Mounting using clamping claws
Use the side grooves in the Matrix-Plate.
- Mounting using a vise
The Matrix-Plate is clamped directly in the vise.
- Mounting using a zero-point clamping system
There are threads for holding clamping bolts on the underside of the Matrix-Plate.

6.3 Pneumatic connection

Matrix-Plate	Recommended suction capacity of the vacuum generator	Recommended vacuum generator
1x MPL 300x200	At least 6 m ³ /h or 100 l/min	VAGG 6
1x MPL 400x300	At least 12 m ³ /h or 200 l/min	VAGG 18
1x MPL 600x400	At least 24 m ³ /h or 400 l/min	VAGG 40
2x MPL 600x400	At least 48 m ³ /h or 800 l/min	VAGG 63

The vacuum generator used should achieve the specified suction capacity.



The specified suction capacities are guide values.
 The required suction capacity depends primarily on the total surface area of the Matrix-Plate(s) used.
 Special circumstances such as porous, uneven or poorly sealing workpieces require a more powerful vacuum generator.

This vacuum must be constantly monitored using appropriate safety features.
 The Schmalz vacuum unit (> See ch. Accessories)) intended for operation with the Matrix-Plate is already equipped with the necessary safety features.

- Connect the mounted Matrix-Plate to the vacuum generator. Use the vacuum connection kit included in the delivery for this purpose.
- Mount the gauge connection kit on a vacuum connection on the side of the Matrix-Plate.
- Mount the gauge in the gauge connection kit at a suitable position in/on the machine so that the vacuum level can be read and checked.
 The gauge must not be located in the path of flying chips or in the cooling lubricant stream.

1. Shorten the hoses and pipelines as much as possible.
2. If the machine table is driven and can be moved or swiveled, the travel path must be taken into account when routing the hose line.
3. Keep hose lines free of bends and crimps.
4. Lay hose lines in such a way that they do not rub.



CAUTION

Vacuum close to the eye

Severe eye injury!

- ▶ Wear eye protection.
- ▶ Do not look into vacuum openings such as suction lines and hoses.



If a large suction volume is required (e.g. in the case of leakage or porous workpieces), it can make sense to use an additional vacuum connection particularly for larger Matrix-Plate variants.

A larger or an additional vacuum generator may also be used if necessary.

Note:

If the Matrix-Plate is used in wet areas, we strongly recommend connecting a water separator upstream of the vacuum generator to prevent damage to the vacuum generator. This function is already integrated into the Schmalz vacuum units.

6.4 Connecting Several Matrix-Plates

The required clamping area can be increased as required by combining several Matrix-Plates with each other. All plates with the same slot size can be added to each other on all four sides, enabling larger workpieces to be clamped without any problems. The outer dimensions of the Matrix-Plates are irrelevant here.

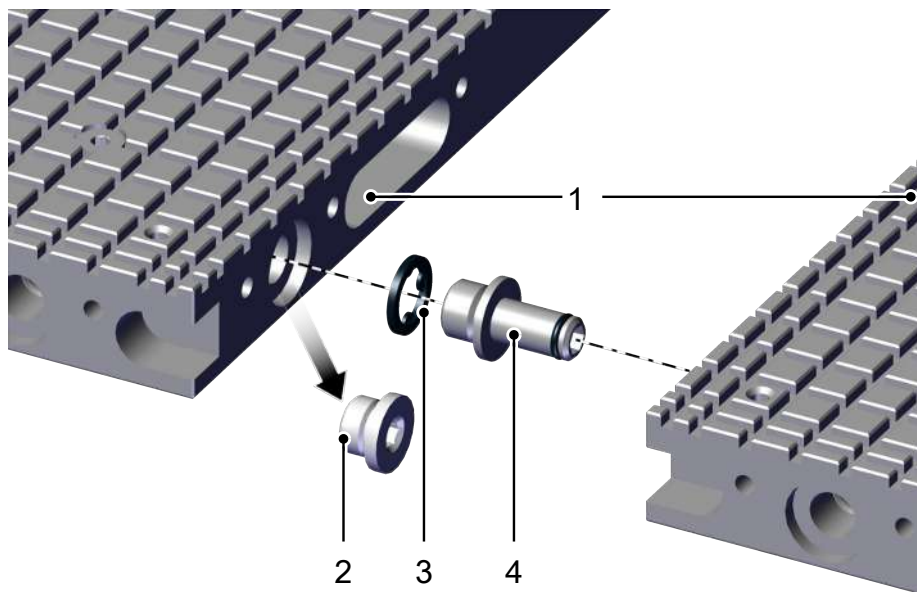
The following steps describe the process for connecting several Matrix-Plates (1):

1. On the side at which another Matrix-Plate is to be connected, remove the side stops including the knurled nuts and the set screws.

2. Remove at least one of the front-side sealing screws with collar (2) from the vacuum ducts and screw in the hollow bolt (4), which is available as an accessory, with the sealing ring (3). The sealing screws on the second Matrix-Plate must also be removed. These bores remain open, however, and are closed later with the hollow bolt when connecting the Matrix-Plates together.
3. Push the second Matrix-Plate up to the first Matrix-Plate until the gap between the Matrix-Plates is minimal. Make sure that the surfaces are as level as possible.
4. Attach the second Matrix-Plate to the machine table.



If a high suction volume is required, hose connection sets can also be connected to both (or several) Matrix-Plates to increase the flow rate.



To prevent leakage where the Matrix-Plates adjoin, we recommend that a separate vacuum chamber be delimited on each Matrix-Plate using the sealing gaskets.

7 Start of Operations

7.1 Personnel Qualification

Unqualified personnel cannot recognize dangers and are therefore exposed to higher risks!

1. Only instruct qualified personnel to perform the tasks described in these operating instructions.
2. The product may only be operated by persons who have undergone appropriate training.
3. Electrical work and installations may only be carried out by qualified electrical specialists.
4. Assembly and maintenance work must only be carried out by qualified personnel.

7.2 Before Initial Start of Operations

Before the initial start of operations following installation, repair, servicing or maintenance work, you must check the following:

- All mechanical connectors are properly attached and secured.
- All screws and nuts are tightened to specified torques.
- All components are installed.
- The safety distances have been maintained.
- The electrical cable and supply hoses are properly routed.
- The EMERGENCY STOP switch for the overall system is working.



⚠ CAUTION

Noise pollution due to incorrect installation of the pressure and vacuum connections

Hearing damage

- ▶ Correct installation.
- ▶ Wear ear protectors.



⚠ CAUTION

Vacuum close to the eye

Severe eye injury!

- ▶ Wear eye protection.
- ▶ Do not look into vacuum openings, e.g. suction cups.



⚠ CAUTION

Risk of crushing if the suction cup is abruptly attached to a workpiece

- ▶ Do not place any body parts between the suction cup and the workpiece

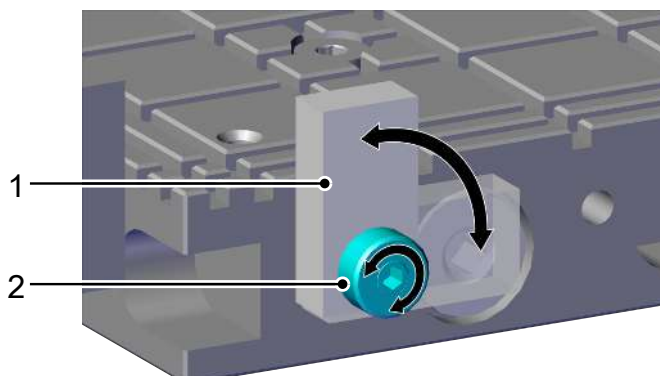
7.3 Preparations for Picking up the Workpiece

7.3.1 Side Stops

The side stops consist of a set screw (not shown), stop (1) and knurled nut (2) and are mounted as follows:

1. Screw the set screw into any M6 thread on the Matrix-Plate and hand-tighten.
2. Attach the stop (1).
3. Screw the knurled nut (2) onto the set screw.

The stops can be raised or folded down as required.



The stops have two functions:

- Positioning aid for aligning the workpiece
- Absorbing horizontal lateral forces when machining the workpiece.
We recommend having the stops raised up during machining.

Note:

When machining a workpiece, make sure that the chipping forces act in the direction of the side stops. If a stop is located in the collision area, it must be folded down or removed to protect it from damage.



NOTE

Metal chips and dirt between the stop and the Matrix-Plate

Contamination can affect the position of the workpiece zero point.

- ▶ Check that the space between the stop and the Matrix-Plate is clear before each clamping process.

If the stops included in the delivery are insufficient or are damaged during processing, they can be ordered as spare parts (> See *ch. Spare and Wearing Parts*).

7.3.2 Calculating the Clamping Force

It is not possible to specify any general clamping forces for Matrix-Plates. Actual values can deviate from theoretical values, and vary greatly from application to application.

The following example calculation shows how holding forces are generated and the parameters on which they depend.

The normal force acting on the workpiece during clamping depends on the clamping area and the vacuum or pressure difference. Both the vacuum level and the clamping surface should be maximized as far as possible.

Therefore, the following applies: **The aim is always to achieve the highest possible vacuum.**

Example calculation:

P = pressure [N/mm²]

F = force [N]

A = area [mm²]

μ = static friction coefficient (dependent on the material pairing and surface quality)

A rectangle measuring 300 x 200 mm has a theoretical suction area of 60,000 mm².

If the system has a vacuum of -0.8 bar (=0.08 N/mm²), the formula

$$p = F / A \implies F = p * A$$

gives a theoretical normal/suction force of:

$$F_N = 0.08 \text{ N/mm}^2 * 60,000 \text{ mm}^2$$

$$F_N = 4,800 \text{ N}$$

The horizontal friction force can then be determined using the formula

$$F_R = \mu * F_N$$

With an assumed value for μ=0.21 (guide value for aluminum on aluminum, guide value for steel on aluminum = 0.19), the normal force calculated above results in a friction force (horizontal force) of:

$$F_R = 0.21 * 4,800 \text{ N} = 1,008 \text{ N}$$

Note:

The specified values are intended purely as examples for the calculation.

Users must verify these theoretical values in relation to the respective application by carrying out their own tests.

The material, cutting material, machine data (speed, feed, cutting speed) etc. all need to be taken into account.

The process parameters must always be selected such that the machining forces are kept as low as possible and safe processing with sufficient buffer is always possible.

Calculating and assessing the clamping situation

Specialist personnel should always check whether a vacuum can be used effectively with clamping or handling devices.

With large clamping areas, very large clamping and holding forces can be achieved, while with small clamping areas, the forces must be correspondingly smaller.

This requires a certain amount of experience and clear judgment.

The following factors must be considered when using vacuum clamping systems:

- Contact surfaces wetted with cooling lubricant can significantly reduce the friction coefficients.
- Size of the clamping area (available clamping area in mm²)
- Available vacuum (vacuum in mbar)
- Available suction volume of the vacuum generator (suction volume in m³/h)
- Type, properties and condition of the workpiece (porous, firm, hard, soft, tough, brittle, air-permeable)
- Type, properties and condition of the tool (prescribed cut data, tool diameter, cutting forces)
- Processing speed (speed in rpm, feed in mm/min, feed per tooth)
- Machining cross-sections (infeed depth, chip volume)
- The point of application of the clamping force is at the center of gravity of the workpiece. This can result in an unfavorable leverage effect of the machining force especially with elongated workpieces.

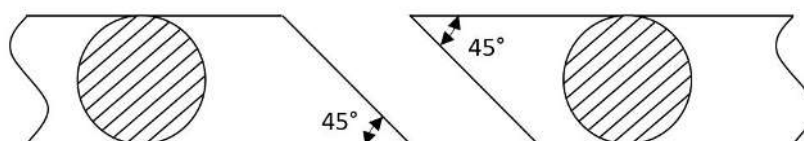
The vacuum clamping force cannot be increased or multiplied at will. Therefore, the specialist personnel responsible should select the processing parameters such that the cutting forces acting on the workpiece are minimal.

7.3.3 Preparing the Sealing Gasket

To prevent leaks, the sealing gasket must be inserted into the grid groove of the Matrix-Plate carefully and without any gaps. This means that the start and end of the sealing gasket must also fit cleanly with one another. To minimize leakage at this joint, it is recommended to glue the ends of the sealing gasket, thus creating a sealing ring.

Carry out the following steps:

1. Mount the sealing gasket in such a way that it is not under any tension (not stretched and not twisted)
2. Using a sharp knife, cut the start and end of the sealing gasket at a 45° angle to each other (see figure)
3. Apply special instant adhesive 401 (Schmalz part no.: 10.07.08.00258) to the cut surfaces. The connection remains permanently elastic and ensures a long service life of the seal (temperature range: -10° C to +80° C)



7.3.4 Inserting the Sealing Gasket into the Matrix-Plate



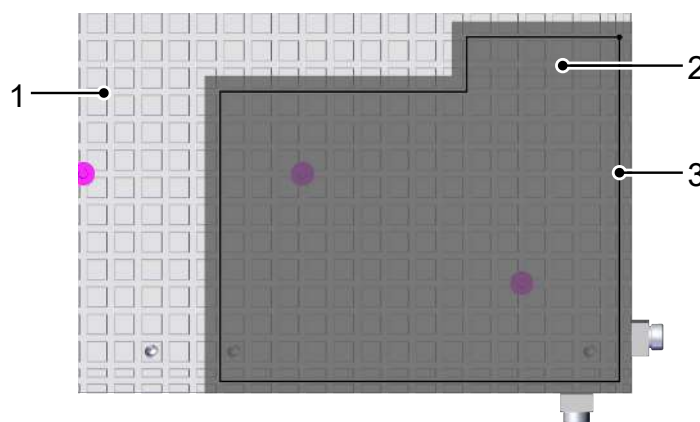
NOTE

Metal chips and contamination in the grid grooves and on the sealing gasket

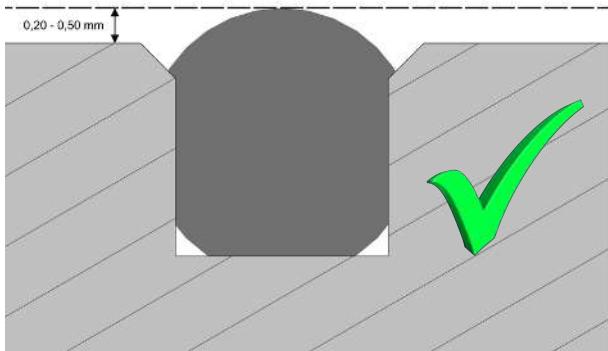
Contamination reduces accuracy and friction forces.
Leakage at the inserted sealing gasket

- ▶ Check that the grid grooves, the sealing gasket and the workpiece are clean before each clamping process.

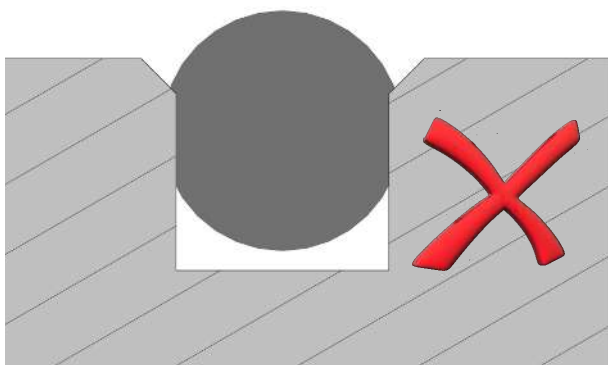
The sealing gasket (3) included in the delivery must be inserted into the grid grooves of the Matrix-Plate (1) to define the necessary clamping area. The outer contour of the workpiece (2) must be mapped as precisely as possible in order to generate the maximum achievable clamping force. Any gaps in the workpiece must be sealed. Where possible, smaller ridges should also be taken into account when inserting the sealing gasket, otherwise the workpiece may vibrate at this point during subsequent machining.



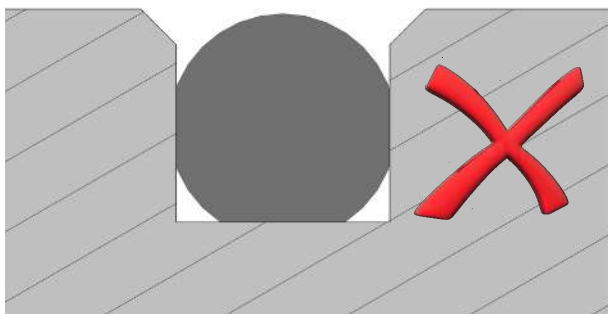
When inserting the sealing gasket, ensure that it extends to the bottom of the grid groove and protrudes at least 0.2 mm and by a maximum of 0.5 mm over the top edge of the Matrix-Plate. Pulling the sealing gasket makes it easier to insert, but also reduces the diameter. This can cause the sealing gasket to no longer protrude over the upper edge of the Matrix-Plate, which also leads to leakage.



Sealing gasket extends to the bottom of the groove and protrudes 0.2 to 0.5 mm over the top edge of the Matrix-Plate.



Sealing gasket does not extend all the way to the bottom of the groove. Intersecting grooves can lead to connections to the atmosphere and allow cooling lubricants or dirt particles to enter the system.



Sealing gasket does not extend over the upper edge of the Matrix-Plate. A vacuum cannot be generated.

Position the workpiece on the Matrix-Plate and correct the position of the sealing gasket if necessary. Ensure that the sealing gasket is completely covered by the workpiece. This is the only way to ensure that the required vacuum can be built up.

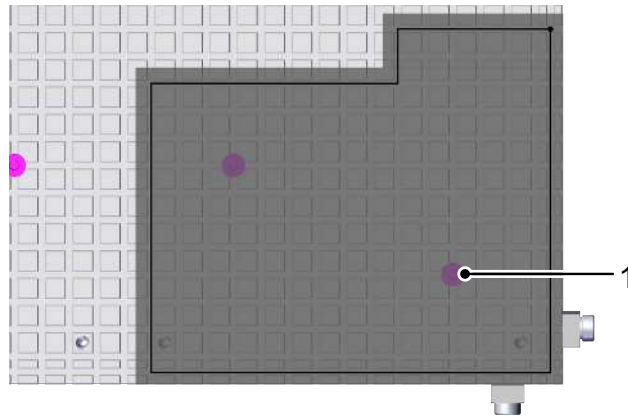
Note:

If several Matrix-Plates are connected to one another, we recommend inserting a separate sealing gasket for each Matrix-Plate.

If the sealing gasket is laid over the joint, this must be sealed (e.g. with silicone).

7.3.5 Clamping the Workpiece

Once the sealing gasket has been inserted according to the workpiece geometry, at least one vacuum vent (1) must be opened within the area limited by the sealing gasket. When the plugs are removed, the operating vacuum is fed from the Matrix-Plate to the surface.



If an open vacuum vent is outside the mapped workpiece contour, the required vacuum will not be reached. The workpiece may become loose during processing or will not be clamped at all.

- To ensure the vacuum supply, at least one vacuum vent must be located within the workpiece contour.
- There must be no open vacuum vents outside the workpiece contour.
- Unused vacuum vents must be closed with the corresponding plugs.

The operating vacuum can now be activated. The workpiece may need to be pressed slightly onto the Matrix-Plate until the operating vacuum has been established.

7.3.6 Checking the System for Leaks

The supplied gauge must be used to check whether the intended operating vacuum is reached. The Schmalz vacuum units designed for operation of the Matrix-Plates support the monitoring process with audible and electronic warning devices.

8 Operation

8.1 Preparations

- ▶ The product must be operated only by persons who have undergone appropriate training.

Operators must have sufficient understanding of the following points before commencing processing:

1. How the Matrix-Plate works
2. How the vacuum generator works
3. How the machine works
4. The safety features on the machine
5. Measures to be taken in the event of an emergency

Carry out the following tasks before each machine start:

1. Check that the Matrix-Plate is in perfect technical condition.
2. Check that the Matrix-Plate is securely attached to the machine table.
3. Check the sealing gasket for damage or wear.
4. Check that the vacuum vents on the Matrix-Plate are clean and the screw-in filters are screwed in.
5. Ensure that all safety and monitoring equipment is present and fully functional.
6. Check that the gauge is working properly.
7. Check whether the required operating vacuum of -750 mbar is achieved.
8. Check whether the stops (> See ch. side stops) on the Matrix-Plate are in the collision area of the machining tools.
The stops may need to be lowered, if so.
9. Ensure that only authorized personnel are present in the working area of the machine or system and that no other personnel are put in danger by switching on the machine.

8.2 Processing



DANGER

Flying workpiece due to insufficient clamping force during machining, resulting from insufficient vacuum or excessive machining forces.

Risk of injury or death due to flying workpiece

- ▶ Monitor the vacuum value as close to the clamping location as possible.
 - ▶ Wear personal protective clothing.
-

Processing steps in chronological order:

1. Place the workpiece on the Matrix-Plate.
2. Activate the vacuum using the manual slide valve. Support suctioning of the workpiece, if necessary, by pressing it onto the Matrix-Plate.
3. Check that the workpiece is securely held.
4. Start processing according to the machine specifications.
5. Once processing is complete, deactivate the vacuum using the manual slide valve. The Matrix-Plate is vented automatically and the workpiece can be removed.

To process workpieces on the complete machine, an operating vacuum of at least -750 mbar is recommended. This is monitored by the gauge. This does not mean that processing cannot also be carried out at a lower vacuum level. To measure the vacuum, the gauge must be connected directly to the Matrix-Plate.

Note:

A vacuum drop may cause the workpiece that is being machined on the machine table to move or even be released.

Possible causes for a vacuum drop include:

- Power failure
- Sudden leakage
- Line break
- Malfunction
- Perforation in the workpiece due to machining
- Contaminated filter on the vacuum vent

**⚠ CAUTION****Injury to persons and/or damage to property due to unexpected malfunctions**

- ▶ Following a vacuum supply system failure or malfunction, carry out the process of clamping the workpiece again from the very start.
- ▶ Restore the vacuum supply.
- ▶ Check the system for software errors (machine controller switching functions).

Note:

If a VAGG from Schmalz is used to generate the vacuum, note that the warning devices are set to -600 mbar.

Nevertheless, we recommend an operating vacuum of at least -750 mbar. This may need to be taken into account during monitoring.

9 Troubleshooting

9.1 Safety

Maintenance work may only be carried out by qualified personnel.



⚠ WARNING

Risk of injury due to incorrect maintenance or troubleshooting

- ▶ Check the proper functioning of the product, especially the safety features, after every maintenance or troubleshooting operation.



⚠ CAUTION

Improper installation or maintenance

Personal injury or damage to property

- ▶ Prior to installation and before maintenance work, the product must be disconnected from the power supply, depressurized (vented to the atmosphere) and secured against unauthorized restart.

9.2 Faults, Causes, Solutions

Fault	Possible cause	Solution
The workpiece is not picked up or the vacuum does not build up.	The sealing gasket is not forming a seal between the workpiece and the Matrix-Plate.	Insert the sealing gasket in the groove as described in section 7.3.4 (a sealing gasket with a different diameter may be required).
	The workpiece is curved and does not lie flat on the Matrix-Plate.	Press down on the workpiece so that the sealing gasket forms a seal and a vacuum is created. Once the vacuum has built up, the workpiece will automatically lie flat against the Matrix-Plate.
	There is no open vacuum vent within the vacuum area bordered by the sealing gasket.	Open at least one vacuum vent within the vacuum area bordered by the sealing gasket. If there are no vacuum vents within the enclosed area, the sealing gasket must be moved to a different position on the MPL.
	There is no vacuum at the Matrix-Plate.	Check the vacuum supply. If necessary, activate the vacuum generator, open the valves and check the hose line.
The workpiece moves or tears off during processing.	Vacuum drops during machining due to leakage that occurs when material is removed (workpiece perforation, machining of the outer contour, etc.).	Compare the course of the sealing gasket with the machining program. If necessary, outline any perforations in advance with additional sealing gasket.
	Clamping force too low. This depends on the vacuum level, the clamping area and the friction coefficient.	See the following errors: "vacuum level is too low," "clamping surface is too small" and "friction coefficient between the workpiece and the Matrix-Plate is too low."

Fault	Possible cause	Solution
	Machining forces are too high.	Change the machining parameters to reduce the machining forces (infeed, speed, feed, tool, etc.).
	Workpiece or machining is not suitable for clamping with a vacuum because the machining forces are too high and the vacuum clamping force is subject to physical restrictions (see section 7.3.2 Calculating the Clamping Force).	Support with mechanical clamping force if possible or change the machining process. Not every workpiece can be clamped and machined using solely a vacuum.
The vacuum level is too low	The leakage in the system is too large and cannot be compensated for by the vacuum generator.	Reduce leakage: <ul style="list-style-type: none"> • Check the sealing gasket (bond seam or joint, damage, diameter compared to the groove, position compared to the workpiece, etc.), see sections 7.3.3 and 7.3.4 • Check tightness of hoses and sealing screws. • Close any vacuum vents that are not required or are outside of the sealing gasket. • Remove any contamination such as chips. These can prevent a clean seal on the sealing gasket.
	The sealing gasket is partially outside the workpiece contour.	Adjust the course of the sealing gasket to the workpiece contour. Take account of any openings in the workpiece.
	The vacuum generator does not have sufficient suction capacity.	Select a more powerful vacuum generator.
	The vacuum generator does not achieve a sufficient vacuum level.	Allow the vacuum generator to suction to the block and check the maximum vacuum level of the generator. If the vacuum generator does not achieve a sufficient vacuum level, it should be serviced, repaired or replaced.
	The hoses for supplying the vacuum to the Matrix-Plate are not sufficiently dimensioned.	Select a larger hose diameter or lay several hoses from the distributor to the Matrix-Plate.
	There is a bottleneck in the hoses or in the clamping system.	Check the hoses for kinks or similar and remove if required. Check whether the lines and filter screens are dirty and clean if necessary. Open further vacuum vents on the Matrix-Plate to the workpiece.
The clamping surface is too small	The maximum possible clamping surface of the workpiece has been used but is still too small.	See "Workpiece or machining is not suitable for clamping with a vacuum."
	The sealing gasket is not laid optimally and is not at the outermost point of the workpiece geometry.	Lay the sealing gasket so that it runs along the outermost edges of the workpiece and the possible clamping surface is used to the maximum.
	The clamping area is not effective in its entirety because vacuum is not applied everywhere.	Check whether the air can be extracted from every area of the clamping surface. There must always be a free grid

Fault	Possible cause	Solution
		<p>groove leading to the clamping surfaces within the sealing gasket, otherwise no air can be extracted.</p> <p>There is no vacuum vent within the clamping surface. Either re-lay the sealing gasket or remove plugs from the vacuum vent.</p>
<p>The friction coefficient between the workpiece and the Matrix-Plate is too low.</p>	<p>The friction coefficient is reduced by cooling lubricant or other contaminants.</p> <p>The friction coefficient of the material pairing is too low.</p>	<p>Remove any cooling lubricant from the Matrix-Plate and workpiece, for example, using a cloth.</p> <p>Increase the friction coefficient using the Schmalz elastomer FlexMat, the Schmalz vacuum block Innospann ISBL with rubber friction pad or the Schmalz Matrix-Plate with elastomer friction pads.</p>

10 Maintenance

10.1 Safety

Maintenance work may only be carried out by qualified personnel.



⚠ WARNING

Risk of injury due to incorrect maintenance or troubleshooting

- ▶ Check the proper functioning of the product, especially the safety features, after every maintenance or troubleshooting operation.



⚠ CAUTION

Improper installation or maintenance

Personal injury or damage to property

- ▶ Prior to installation and before maintenance work, the product must be disconnected from the power supply, depressurized (vented to the atmosphere) and secured against unauthorized restart.

10.2 Cleaning

The Matrix-Plate must be cleaned before each machining process.

Visible contamination must be suctioned or blown off, and then the Matrix-Plate wiped down with a slightly damp cloth.

10.3 Wear of the Sealing Gasket

If the sealing gasket has any cracks or any other damage, it must be replaced or the damaged part replaced.

10.4 Milling the Matrix-Plate

To ensure maximum precision during subsequent processing, the Matrix-Plate can be milled (even several times) when it is clamped on the machine table. This can also be useful to obtain a new flat surface if the surface of the Matrix-Plate becomes damaged.

Note the following:

- The zero point of the system changes.
- The groove depth of the grid is reduced.
- If more than 0.5 mm of material is removed, a sealing gasket with $\varnothing = 3$ mm must be used. This prevents the sealing gasket from being compressed between the Matrix-Plate and the work-piece, resulting in inaccuracies.
- If the sealing gasket protrudes more than 0.5 mm over the upper edge of the Matrix-Plate, a smaller sealing gasket diameter must be selected (see accompanying document on Spare and Wearing Parts).



NOTE

Sealing problems due to milling of the Matrix-Plate

- ▶ Do not mill the Matrix-Plate by more than 0.7 mm (resulting groove depth 2.3 mm).
- ▶ The edges of the groove must be deburred if the Matrix-Plate has been milled by more than 0.4 mm (groove depth \leq 2.6 mm).

10.5 Accessories, Spare Parts and Wearing Parts

Accessories, spare parts and wearing parts can be requested from the Schmalz service team using the order number, product key or product service number.

Accessories

Part no.	Designation	Note
10.01.27.00163	Hollow bolt with collar SCHR G1/4x31 6.00	For connecting MPLs directly with each other
10.07.09.00006	Vacuum hose VSL 21-12 PVC-G	For MPL when used with VAGG 6 or VAGG 18
10.07.09.00041	Vacuum hose VSL 33-25 PVC-DS	For MPL 400x300 or 600x400 when used with VAGG 40 or VAGG 63
10.01.27.00009	Clamping claw SPAN-PRA-M12-MPL	For mounting MPL on a machine table
10.01.28.00018	Steel-Plate ISST-MPL-300X200X3	Steel-Plate for vacuum block ISBL
10.01.28.00019	Steel-Plate ISST-MPL 400x300x3	Steel-Plate for vacuum block ISBL
10.01.28.00020	Steel-Plate ISST-MPL-600X400X3	Steel-Plate for vacuum block ISBL
10.01.28.00021	Steel-Plate ISST-MPL-300X200X3	Steel-Plate for Flexmat SFM
10.01.28.00022	Steel-Plate ISST-MPL-400X300X3	Steel-Plate for Flexmat SFM
10.01.28.00023	Steel-Plate ISST-MPL-600X400X3	Steel-Plate for Flexmat SFM
10.01.28.00005	Schmalz FlexMat SFM-298.5x198.5	Flexmat for Steel-Plate
10.01.15.00654	Vacuum block Innospann ISBL 80x80x38;	Vacuum block for Steel-Plate
10.01.15.00655	Vacuum block Innospann ISBL 80x40x38;	Vacuum block for Steel-Plate
10.01.15.00656	Vacuum block Innospann ISBL 80x28x38;	Vacuum block for Steel-Plate
10.01.15.00657	Vacuum block Innospann ISBL 80x80x97	Vacuum block for Steel-Plate
10.01.15.00658	Vacuum block Innospann ISBL 80x40x97	Vacuum block for Steel-Plate
10.01.15.00659	Vacuum block Innospann ISBL 80x28x97	Vacuum block for Steel-Plate
10.01.27.00120	Vacuum unit VAGG 6 AC3 10;VAGG-6-L Basic-SCHMALZ	Recommended for 1x MPL 300x200

Part no.	Designation	Note
10.01.27.00121	Vacuum unit VAGG 18 AC3 30 VAGG-18-L Basic-SCHMALZ	Recommended for 1x MPL 400x300 (> See ch. <i>Pneumatic Connection</i>)
10.01.27.00122	Vacuum unit VAGG 40 AC3 80; VAGG-40-L Basic-SCHMALZ	Recommended for 1x MPL 600x400 (> See ch. <i>Pneumatic Connection</i>)
10.01.27.00123	Vacuum unit VAGG 63 AC3 80; VAGG-63-L Basic-SCHMALZ	Recommended for 2x MPL 600x400 (> See ch. <i>Pneumatic Connection</i>)

Spare and Wearing Parts

Part no.	Designation	Part type	Note
10.07.04.00091	Sealing gasket DI-SCHN 3.5 MOS CR-20	W	Standard sealing gasket
10.07.04.00088	Sealing gasket DI-SCHN 3 MOS CR-20	W	Thinner alternative for milled MPLs
10.07.08.00258	Adhesive KLEB-STOF CYANACRYL LOC-TITE-401 SPEZ	W	For sealing gaskets
10.08.06.00059	Sealing screw with collar VRS-SB G1/8-AG ISKT Di-ring	S	For vacuum vents
10.05.03.00008	Screen male thread SIEB G1/8x3.5 MS	S	For vacuum vents
10.01.27.00079	Matrix-Plate stop ANSG-MPL 8x15x25	S	Side stop, complete
10.01.27.00060	Friction pad REIB-INS 18x18 MPL	W	For MPL with friction pads
10.01.27.01733	Connection kit for gauge SET VC-MPL 4/2	S	For vacuum monitoring
10.01.27.01757	Connection kit for hose connection SET VC-MPL G1/4-IG	S	For MPL 300x200
10.01.27.01732	Connection kit for hose connection SET VC-MPL G1/2-IG	S	For MPL 400x300 and MPL 600x400
10.07.09.00001	Vacuum hose (meter) VSL 4-2 PU; 50 m ring	S	For gauge connection kit
10.07.09.00084	Vacuum hose (meter) VSL 10-7 PU; transparent	S	For vacuum connection kit
10.07.02.00046	Vacuum gauge VAM 40 V U; lower radial connection G1/8"	S	
10.05.07.00034	Manual slide valve HSV 7 3/2; range -1 to 10 bar	S	For MPL 300x200
10.05.07.00036	Manual slide valve HSV 12 3/2; range -1 to 10 bar	S	For MPL 400x300 and 600x400

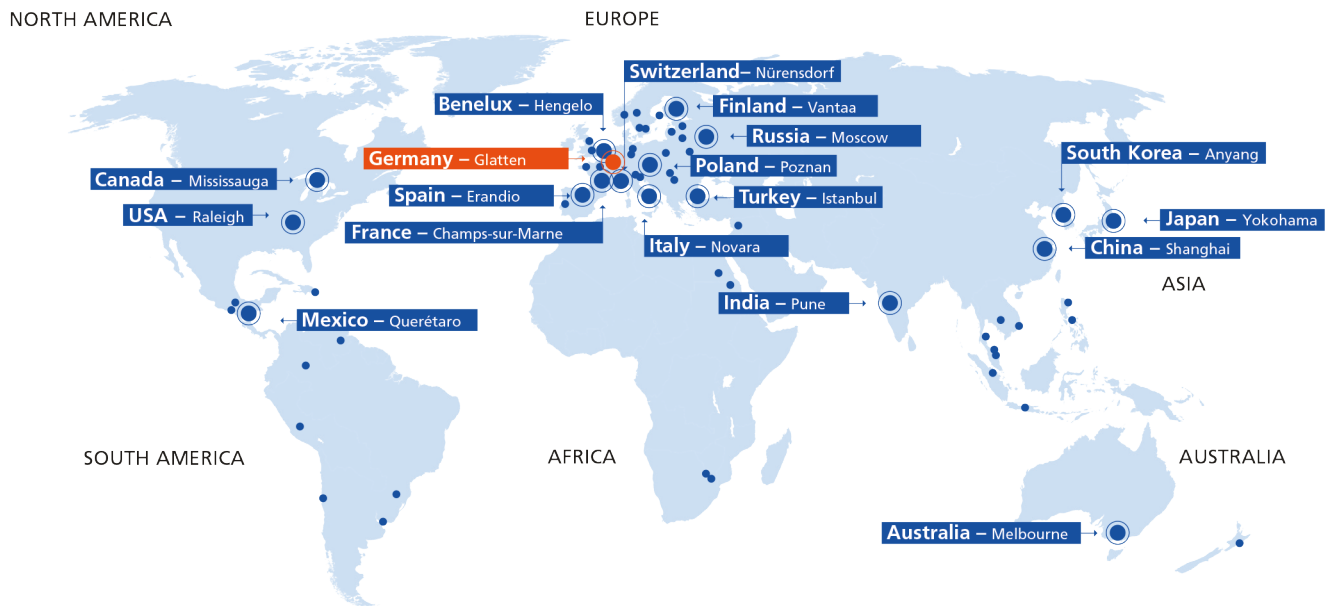
S = spare part, W = wearing part

11 Disposing of the Product

Recover the disassembled parts for recycling or reuse (provided no agreement on return or disposal has been made).

1. Dispose of the product properly after replacement or decommissioning.
2. Observe the country-specific guidelines and legal obligations for waste prevention and disposal.

At your side worldwide



● Headquarters

Schmalz Germany – Glatten

● Subsidiaries

Schmalz Australia – Melbourne
 Schmalz Benelux – Hengelo (NL)
 Schmalz Canada – Mississauga
 Schmalz China – Shanghai
 Schmalz Finland – Vantaa
 Schmalz France – Champs-sur-Marne
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