

Installation and operating instructions

SMPL

Matrix-Plate

Original operating instructions

Hand in hand for tomorrow

Imprint

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Technical changes:

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Dear Customer,

Dear Customer,

Thank you for showing your trust in our products and our family business as a leading technology supplier for robots and production machines.

Our team is always available to answer any questions you may have about this product and our other solutions. Ask us, and challenge us. We are here to solve your problem!

Kind regards,

Your SCHUNK team

Customer Management

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Please read the operating instructions in full and keep them close to the product.

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1 General

1.1 About these instructions

These instructions contain important information for safe and proper use of the product.

These instructions are an integral component of the product and must be stored in such a way that personnel can access them at any time. Before beginning any work, personnel must read these instructions and understand them. The prerequisite for safe work is complying with all of the safety information in these instructions. Illustrations in these instructions serve purposes of basic understanding and may vary from the actual version. In addition to these instructions, the documents listed in the section ▶ 1.3 [6] apply.

1.2 Depiction of Warnings

To elucidate hazards, the warnings use the following signal words and symbols.



⚠ DANGER

Hazards for people!

Non-compliance will certainly lead to irreversible injuries, up to and including death.



⚠ WARNING

Hazards for people!

Non-compliance can lead to irreversible injuries, up to and including death.



⚠ CAUTION

Hazards for people!

Non-compliance can lead to minor injuries.

NOTICE

Damage to property!

Information about avoiding damage to property.

1.3 Associated Documentation

- General terms and conditions *
- Catalog data sheet of the product purchased *
- Assembly and operating instructions for accessories *

The documents marked with an asterisk (*) can be downloaded on [schunk.com](https://www.schunk.com).

1.4 Warranty

The warranty is 12 months as of the ex-works delivery date in the event of proper use under the following conditions:

- Adhere to the environmental and operating conditions, Environmental and Operating Conditions.
- Follow the stipulated maintenance intervals, Maintenance.

Parts that come into contact with workpieces and wearing parts are not covered by the warranty.

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 the chapter "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

SCHUNK 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:

- Use 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 SCHUNK 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 SCHUNK or by persons who can prove that they have undergone appropriate training at SCHUNK.

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.

Applicable 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 employees must observe the relevant 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 schedule Maintenance.
- Use only original spare parts from SCHUNK.
- 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.

SCHUNK 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 quick-change pallet 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 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.

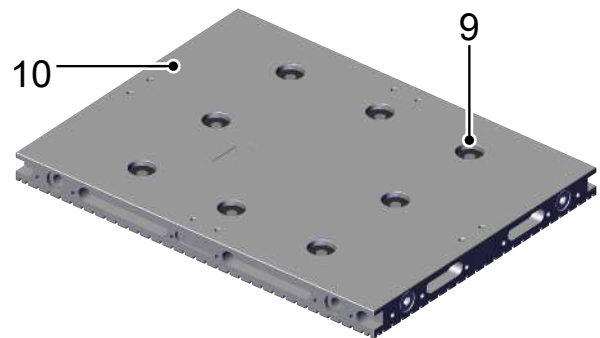
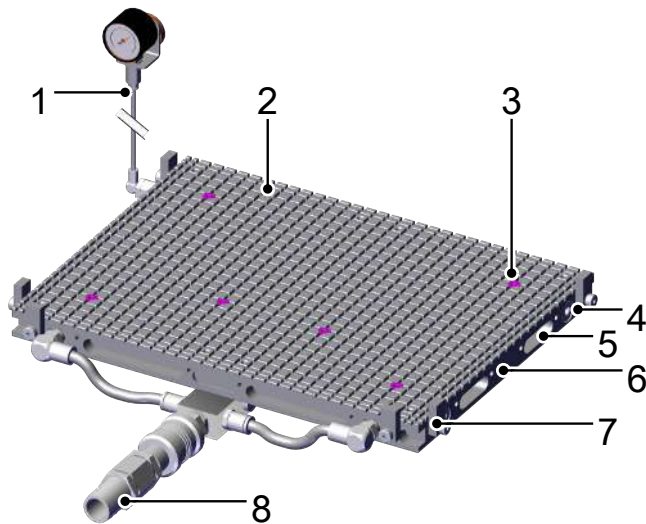


Illustration of the underside without attachment parts

- | | | | |
|---|---|----|---|
| 1 | Gauge connection kit | 6 | Additional thread for side stops |
| 2 | Matrix-Plate with groove grid | 7 | Side stops |
| 3 | Vacuum vents with filter and G1/8 plugs | 8 | Connection kit for hose connection |
| 4 | Vacuum vents with G1/4 plugs | 9 | M12 thread for connecting quick-change pallet system |
| 5 | Slot for holding clamping claws | 10 | Mounting holes for connection kit for hose connection |

3.2 Variants and Type Key

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

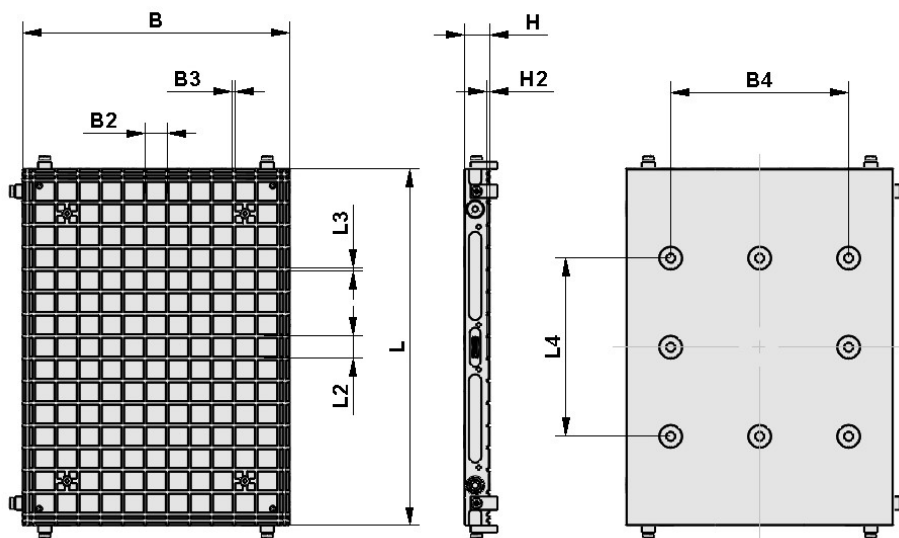
Part number	Short description	Dimensions [mm]	Grid spacing [mm]	Slot width x depth [mm]	Friction on pad	Number of vacuum openings
1487757	SMPL	600x400x28	25x25	3x3	RI	12
1487758	SMPL	600x400x28*	25/12.5	3x3	---	12
1487755	SMPL	400x300x28	25x25	3x3	RI	8
1487756	SMPL	400x300x28	12.5x12.5	3x3	---	8
1487754	SMPL	300x200x28	12.5x12.5	3x3	---	4

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

* = On Matrix-Plate 1487758, 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]
1487757	600	25	3	200	400	25	3	200	28	3	16
1487758	600	25/12.5*	3	200	400	25/12.5*	3	200	28	3	16
1487755	400	25	3	200	300	25	3	200	28	3	8
1487756	400	12.5	3	200	300	12.5	3	200	28	3	8
1487754	300	12.5	3	200	200	12.5	3	---	28	3	4

All specifications are in mm (except for weights).

* = On Matrix-Plate 1487758, a quarter of the area is designed in a 12.5x12.5 grid and the remaining area in a 25x25 grid.

5 Transportation 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 SCHUNK GmbH & Co. KG.

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 chapter 6.4 ("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 vacuum generator	Recommended vacuum generator
1x SMPL 300x200	At least 6 m ³ /h or 100 l/min	SVAGG 10
1x SMPL 400x300	At least 12 m ³ /h or 200 l/min	SVAGG 10 / SVAGG 21
1x SMPL 600x400	At least 18 m ³ /h or 300 l/min	SVAGG 21 / SVAGG 40
2x SMPL 600x400	At least 48 m ³ /h or 800 l/min	SVAGG 40 / SVAGG 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 SCHUNK vacuum unit (> see 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:

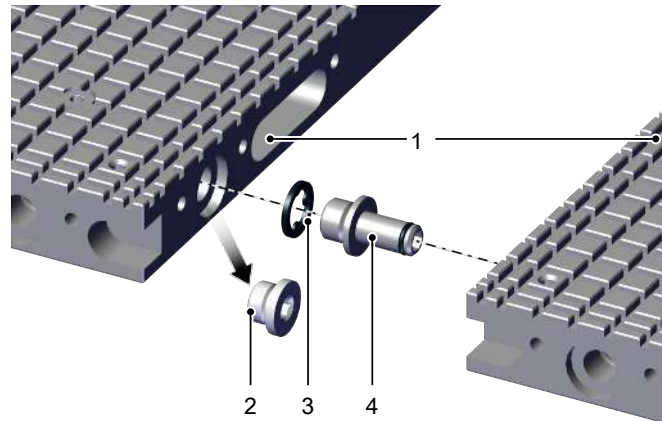
If the Matrix-Plate is used in wet areas, we strongly recommend connecting a water separator upstream of the vacuum generator to prevent damage to the vacuum generator. This function is already integrated into the vacuum units from SCHUNK.

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 the load!

- Do not place any body parts between the suction cup and load.
- Do not place any body parts between the suction plate and load.

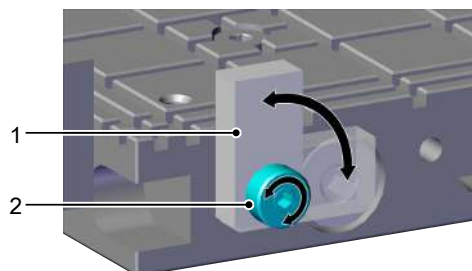
7.3 Preparations for Picking up the Workpiece

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.

NOTICE**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 the chapter "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 $\mu=0.21$ (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 Inserting the Sealing Gasket into the Matrix-Plate

NOTICE

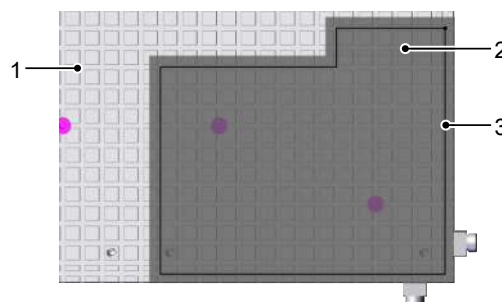
Metal chips and contamination in the grid grooves and on the sealing gasket

Contamination reduces accuracy and friction forces.

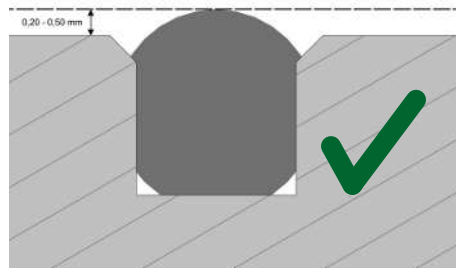
Leakage at the inserted sealing gasket

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

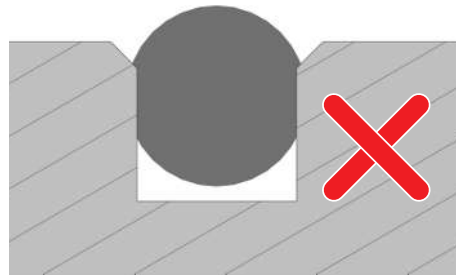
The sealing gasket (3) included in the delivery must be inserted into the grid grooves of the Matrix-Plate (1) to define the necessary clamping area. The outer contour of the workpiece (2) must be mapped as precisely as possible in order to generate the maximum achievable clamping force. Any gaps in 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.



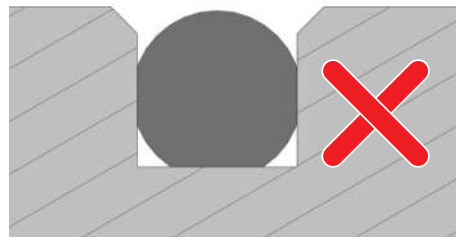
When inserting the sealing gasket, ensure that it extends to the bottom of the grid groove and protrudes at least 0.2 mm and by a maximum of 0.5 mm over the top edge of the Matrix-Plate. Pulling the sealing gasket makes it easier to insert, but also reduces the diameter. This can cause the sealing gasket 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 slot 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 slot. 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.

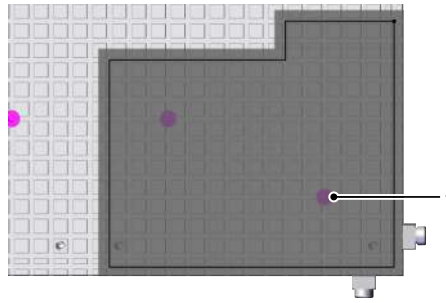
Note:

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).

7.3.4 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.

7.3.5 Checking the System for Leaks

The supplied gauge must be used to check whether the intended operating vacuum is reached.

The SCHUNK 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 only be operated 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 on the Matrix-Plate are in the collision area of the machining tools.
The stops may need to be lowered if this is the case.
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 an SVAGG from SCHUNK 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 slot 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 enclosed 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 SMPL.
	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.

Fault	Possible cause	Solution
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."
	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 vacuum clamping because the machining forces are too high and the vacuum clamping force is subject to physical restrictions (> see the chapter "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 slot, position compared to the workpiece, etc.), (> see chapters 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.

Fault	Possible cause	Solution
	<p>The vacuum generator does not achieve a sufficient vacuum level.</p>	<p>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.</p>
	<p>The hoses for supplying the vacuum to the Matrix-Plate are not sufficiently dimensioned.</p>	<p>Select a larger hose diameter or lay several hoses from the distributor to the Matrix-Plate.</p>
	<p>There is a bottleneck in the hoses or in the clamping system.</p>	<p>Check the hoses for kinks or similar and remove if required.</p> <p>Check whether the lines and filter screens are dirty and clean if necessary.</p> <p>Open further vacuum vents on the Matrix-Plate to the workpiece.</p>
<p>The clamping surface is too small</p>	<p>The maximum possible clamping surface of the workpiece has been used but is still too small.</p>	<p>See: "Workpiece or machining is not suitable for clamping with a vacuum."</p>
	<p>The sealing gasket is not laid optimally and is not at the outermost point of the workpiece geometry.</p>	<p>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.</p>
	<p>The clamping area is not effective in its entirety because vacuum is not applied everywhere.</p>	<p>Check whether the air can be extracted from every area of the clamping surface. There must always be a free grid 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>Remove any cooling lubricant from the Matrix-Plate and workpiece, for example, using a cloth.</p>
	<p>The friction coefficient of the material pairing is too low.</p>	<p>Increase the friction coefficient using the elastomer FlexMat from SCHUNK, the suction cup ISBL with rubber</p>

Fault	Possible cause	Solution
		friction pad from SCHUNK, or the Matrix-Plate with elastomer friction pads.

10 Maintenance

10.1 Safety Instructions for Maintenance

Maintenance work may only be carried out by qualified mechanics and electricians.

Personnel must have read and understood the instructions.



⚠ 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 workpiece, 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).

NOTICE

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 ≤ 2.6 mm).

10.5 Accessories, Spare Parts and Wearing Parts

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

Accessories

Part no.	Designation	Note
1457307	Hollow bolt with collar SCHR G1/4x31 6.00	For connecting SMPLs directly with each other
1487805	Vacuum hose SVSL 21-12 PVC-G	For SMPL when used with SVAGG-6-I Basic or SVAGG-18-L Basic
1487806	Vacuum hose SVSL 33-25 PVC-DS	For SMPL 400x300 or 600x400 when used with SVAGG-40-L Basic or SVAGG-63-L Basic
0425104	Clamping claw SPAN-PRA-M12-SMPL	For mounting SMPL on a machine table
1487787	Steel-Plate ISST-SMPL-300x200x3	Steel-Plate for suction cup ISBL
1487783	Steel-Plate ISST-SMPL 400x300x3	Steel-Plate for suction cup ISBL
1487784	Steel-Plate ISST-SMPL-600x400x3	Steel-Plate for suction cup ISBL

Part no.	Designation	Note
1487785	Steel-Plate ISST-SMPL-300x200x3	Steel-Plate for FlexMat SFM
1487786	Steel-Plate ISST-SMPL-400x300x3	Steel-Plate for FlexMat SFM
1487789	Steel-Plate ISST-SMPL-600x400x3	Steel-Plate for FlexMat SFM
1378520	FlexMat SFM-298.5x198.5	FlexMat for Steel-Plate
0425136	Suction cup ISBL 80x80x38	Suction cup for Steel-Plate
0425137	Suction cup ISBL 80x40x38	Suction cup for Steel-Plate
0425138	Suction cup ISBL 80x28x38	Suction cup for Steel-Plate
0425139	Suction cup ISBL 80x80x97	Suction cup for Steel-Plate
0425140	Suction cup ISBL 80x40x97	Suction cup for Steel-Plate
0425141	Suction cup ISBL 80x28x97	Suction cup for Steel-Plate
1563466	Vacuum unit SVAGG 10	Recommended for 1x SMPL 300x200 or 1x SMPL 400x300 > see Pneumatic Connection
1563467	Vacuum unit SVAGG 21	Recommended for 1x SMPL 400x300 or 1x SMPL 600x400 > see Pneumatic Connection
1563468	Vacuum unit SVAGG 40	Recommended for 1-2 SMPL 600x400 > see Pneumatic Connection
1563469	Vacuum unit SVAGG 63	Recommended for 2x SMPL 600x400 or larger dimensions > see Pneumatic Connection

Spare and Wearing Parts

Part no.	Designation	Type	Note
0425101	Sealing gasket DI-SCHN 3.5 MOS CR-20	W	Standard sealing gasket
0425100	Sealing gasket DI-SCHN 3 MOS CR-20	W	Thinner alternative for milled MPLs
1487810	Matrix-Plate stop ANSG-SMPL 8x15x25	S	Side stop, complete
0425106	Friction pad REIB-INS 18x18 SMPL	W	For SMPL with friction pads
1487803	Connection kit for gauge SET VC-SMPL 4/2	S	For vacuum monitoring
1487791	Connection kit for hose connection SET VC-SMPL G1/4-IG	S	For SMPL 300x200
1487790	Connection kit for hose connection SET VC-SMPL G1/2-IG	S	For SMPL 400x300 and SMPL 600x400
1487804	Vacuum hose (meter) SVSL 4-2 PU; 50 m ring	S	For gauge connection kit
1446204	Vacuum hose (meter) SVSL 10-7 PU; transparent	S	For vacuum connection kit
1487792	Vacuum gauge VAM-40-V-U; lower radial connection G1/8	S	
1458736	Manual slide valve HSV-7-3/2; range -1 to 10 bar	S	For SMPL 300x200
1458736	Manual slide valve HSV-12-3/2; range -1 to 10 bar	S	For SMPL 400x300 and 600x400

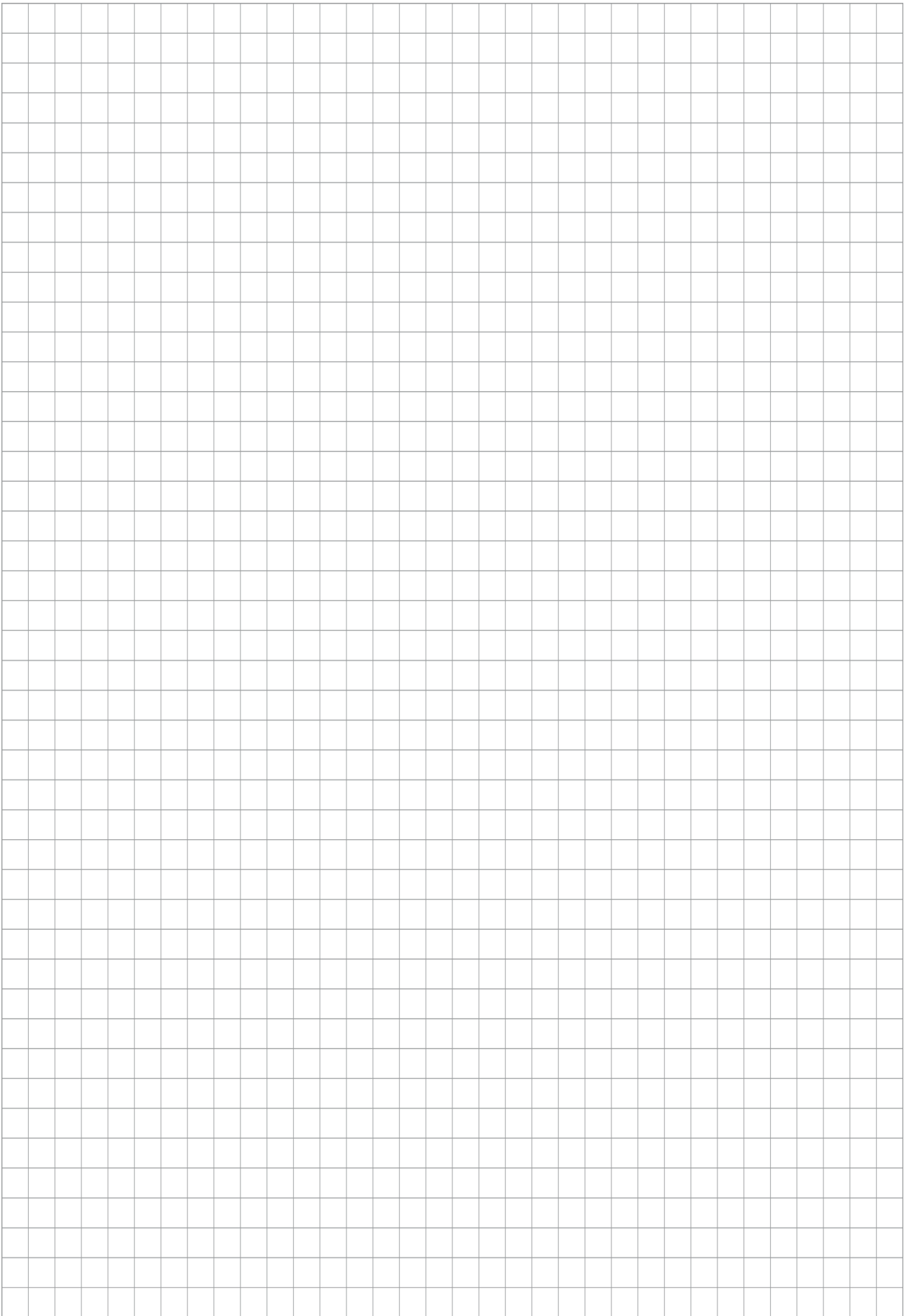
S = spare part, W = wearing part

11 Disposal

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.

For proper disposal, please contact a company specializing in the disposal of technical goods and instruct the company to observe the applicable disposal and environmental regulations. SCHUNK is happy to assist you in finding a suitable company.







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