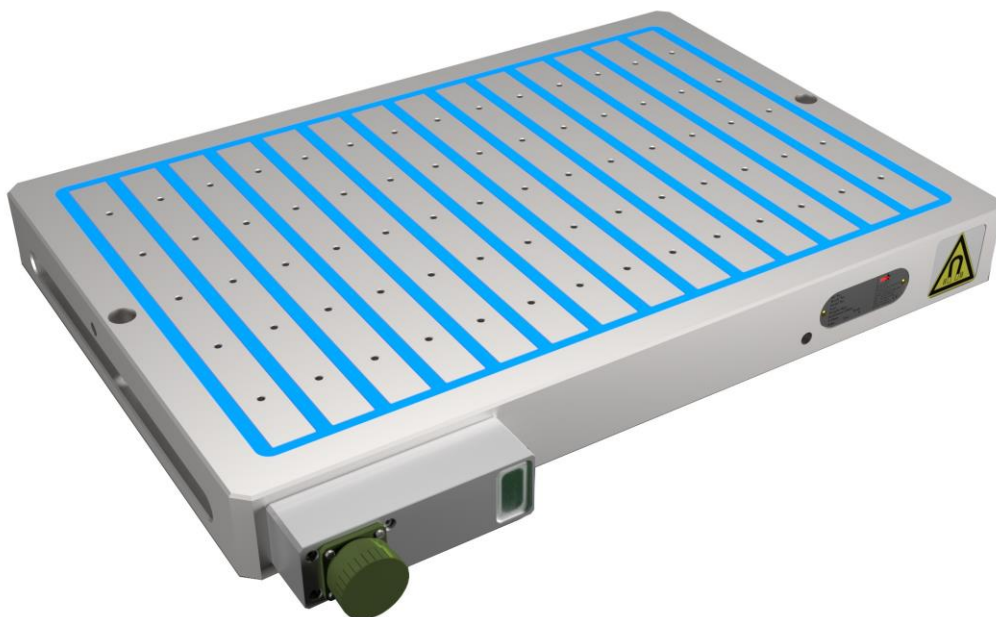


Milling electro-permanent magnetic chucks **MFP series**

Assembly and operating manual



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Technical changes:

We reserve the right to make alterations for the purpose of technical improvement.

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Dear Customer,

Congratulations for choosing an SCHUNK product, thus choosing maximum precision, high quality and better service.

The features of the product and valid support provided by the detailed assembly and operating manual enhance the safety of the production process and provide better processing, resulting in full customer satisfaction.

If you have any further questions, contact us at any time, even after buying the product.

Kindest regards

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1 About this manual

This manual is an integral part of the product and contains important information for a safe and proper assembly, commissioning, operation, maintenance and ensures easier troubleshooting.

Before using the product, carefully read the instructions, especially chapter 2 "Basic safety notes".

1.1 Warnings

The following signal words and symbols are used to highlight hazards.

1.1.1 Signal words

HAZARD	Dangers for persons. Non-compliance will inevitably cause irreversible injury or death.
WARNING	Dangers for persons. Non-compliance can cause irreversible injury or death.
CAUTION	Dangers for persons. Non-observance may cause minor injuries.
ATTENTION	Information about avoiding material damage

1.1.2 Symbols



Warning about a danger point



Warning about dangerous electrical voltage



Magnetic field hazard



Falling pieces hazard



General mandatory sign to prevent material damage

2 Basic safety notes

2.1 Intended use

The intended use of the electro-permanent magnetic chucks for milling is to block any ferromagnetic material being processed on milling cutters, work centres etc., making use of magnetic force.

This series of chucks, by guaranteeing an extremely high magnetic sealing force, allows you to perform high-speed milling processes exploiting the full potential of the tool machines.

The ease with which the workpiece is anchored and released also considerably increases the productivity of the tool machines avoiding equipment clamping and changes.

The electro-permanent characteristic of this magnetic chuck also allows it to operate in full safety in case of a sudden power failure. This is because the system only needs to be powered when magnetising and demagnetising the chuck. Therefore during an eventual power failure, the tool machine would stop while the magnetic chuck remains magnetised.

The requirements of the applicable standards must be observed and complied with. The chucks must be used only in the context of their defined application parameters.

To use this unit as intended, it is also essential to observe the technical data and installation and operation notes in this manual and to comply with the maintenance intervals.



ATTENTION

The electro-permanent chucks **must not** be put into service until the machine tool, for which the chucks were provided, meets the requirements of the Machinery Directive 2006/42/EC!!

2.2 Environmental and operating conditions

- Only use the electro-permanent magnetic chucks within their defined application parameters. See "Technical data" ([👉 5, Page 11](#)).
- Make sure that the environment is clean and the ambient temperature corresponds to the specifications.

2.3 Product safety

Using electro-permanent chucks can be dangerous if:

- the electro-permanent chucks are not used as intended.
- installation and maintenance of the electro-permanent chuck are not carried out properly.
- the safety and installation notes are not observed.

Avoid any working method that may interfere with the function and operational safety of the electro-permanent chucks.

Wear protective equipment.

NOTE

More information is contained in the relevant chapters.

2.4 Personnel qualification

Assembly, commissioning, maintenance and repair of the electro-permanent chucks may be performed only by trained specialist personnel. Every person called upon by the operator to work on the electro-permanent chucks must have read and understood the assembly and operating manual in its entirety, especially the chapter "Basic safety notes" ([👉 2, Page 5](#)). This applies particularly to personnel only used occasionally, such as maintenance personnel.

	HAZARD Hazard due to a magnetic field. Since these are electro-permanent chucks of magnetic systems, the following categories of people are strictly prohibited from coming into contact with them: • Persons with pacemakers. • People with metallic or electronic prostheses. • People using insulin pumps. • People with muscular stimulation systems. • Pregnant women. These persons must always keep a safe distance of at least 2m from the electro-permanent chucks.
	HAZARD Electric shock hazard. The electro-permanent chucks are electrically powered systems, often in contact with emulsified water or different types of liquids. It is therefore strictly prohibited to touch the magnetic chuck or any part connected to it (circular connector, for example) when being magnetised and demagnetised.

2.5 Using personal protective equipment

When using this product, observe the relevant industrial safety regulations and use the personal protective equipment (PPE) required!

- Use protective gloves, safety shoes and safety goggles.
- Observe safe distances.
- Minimal safety requirements to use the equipment.

2.6 Notes on specific risks

- Perform any installation, modifications, maintenance or adjustments with the magnetic chuck demagnetised
- Always make sure that no residual magnetic energy remains in the system.
- Perform maintenance, modifications and integrations outside the danger zone.

- For all work, secure the electro-permanent chucks against accidental operation.

3 Warranty

The warranty is valid for 12 months from the delivery date of the product under the following conditions:

- Intended use in 1 work shift.
- Comply with the maintenance and lubrication intervals
- Observe the environmental and operating conditions

Parts touching the work piece and parts subject to wear are excluded from the warranty.

Procedure in the event of a warranty claim The buyer agrees to send a written detailed report on defects detected on the magnetic chuck to SCHUNK within 10 days after identification.

4 Scope of supply



Fig. 1

The supply includes:

- 1) Magnetic chuck
- 2) Pole extensions (on-demand)

5 Technical Data

Series MFP-A1-L30					
Model	Dimensions			No. poles	Weight kg
	Length	Width	Height		
MFP-A1-L30-030-030	315	315	66	6	45
MFP-A1-L30-040-040	430	380	66	8	75
MFP-A1-L30-050-050	525	500	66	10	120
MFP-A1-L30-060-030	630	351	66	14	90
MFP-A1-L30-060-040	630	430	66	14	120
MFP-A1-L30-080-040	820	430	66	18	160
MFP-A1-L30-100-050	1000	500	66	22	225

5.1 Rating plate

The rating plate is on the side of the electro-permanent chuck:
It bears the following information:

Information	Description
Id. No.	Product code
Work no.	Product production no.
Serial No.	Product serial no.
Year	Year of manufacture
Weight	Weight
Resistance	Ohmic Resistance
Voltage	Mains voltage
Watt	Power (not provided)
Amp. for. s	Current per second (not even)

The rating plate must never be removed!

Please always have the serial no. at hand when contacting S.P.D SPA about technical matters.

6 Description

6.1 Description of the product and its use

The electro-permanent magnetic chucks are capable of blocking all ferromagnetic materials. However they do not block the following materials:

- Aluminium and its alloys
- Bronze
- Brass
- Non-magnetic cast-iron
- Some STAINLESS steels (such as austenitic, though they can be slightly magnetisable following hardening due to plastic deformation).

Even among ferromagnetic materials, the greater or lesser clamping force of the piece on the chuck depends on the reluctance of the part to be anchored.

This reluctance depends on the structural composition of the material. This composition comes from the chemical properties and transformation processes (mainly thermal) and can cause considerable reductions (up to 60%) of the maximum attraction force value which mild steel can reach.

The following table shows some indicative average values by ferrous alloy class. Please contact the manufacturer for more specific details

Material	Efficiency
Mild carbon steel (Fe 360 - C40)	100%
Annealed low alloy steel	75-80%
Tempered low alloy steel	65%
Hardened tool steel	50%
Non-hardened magnetic stainless steel	80%
Hardened magnetic stainless steel	45 %
Cast-iron	50-60%

Thermal treatments carried out on workpiece.

Some thermal treatments reduce the magnetic attraction properties. Therefore pay the utmost attention to materials which have undergone one of the following treatments:

- Hardening in all possible variants
- Tempering
- Cementing
- Nitriding

Pole clamping force and minimum dimensions of the pieces

Performance in terms of clamping force can be defined starting from the Specific rated force, defined as the detachment force perpendicular to the pole surface per cm^2 in the following conditions:

1. Iron or steel piece, thick enough for the pole pitch
2. Direct clamping on the chuck in total absence of air gap
3. Load applied without blows and with controlled incremental speed.

The following are the values declared for MFP chucks (daN / cm^2)

Magnetic chuck	Specific force	Min recommended thickness of the piece (mm)	Ideal thickness of the piece (mm)
MFP-A1-L30	16 daN / cm^2 polar	7	15

These values must be corrected considering the material the piece to be clamped is made of, together with the following values:

- ideal piece thickness: namely the minimum that always guarantees the maximum exploitation of the magnetic flux, therefore the maximum clamping force that can be expressed
- minimum weakness suggested for 50% of the possible force
- magnetic efficiency of the material the piece is made of.

To take the greatest advantage of the magnetic force, pay attention to:

- a. The positioning of the piece on the magnetic chuck.
Take special care of:
 - The magnetic balancing of the piece - chuck contact:
N Pole No. = S Pole No.
 - the number of poles implicated in the contact: maximum possible, take best advantage of the hinge effects and concentration of the magnetic flux.
- b. The contact surface between the piece to be clamped and the magnetic chuck:
always use the entire surface available of the piece
- c. The thickness of the piece in relation to the pole pitch, to guarantee correct short-circuiting of the flux
- d. The air gap value (non-magnetic space between the chuck and piece to be attracted): as the air gap increases, the expressed clamping force decreases

The polar arrangement of the magnetic chucks for milling at parallel pole is represented below:

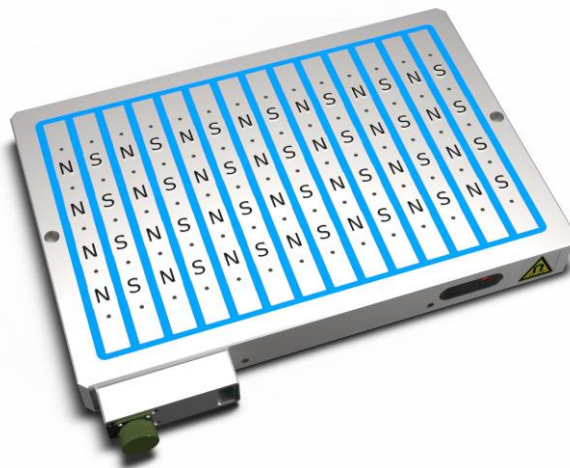


Fig. 2

Here is some piece positioning examples:

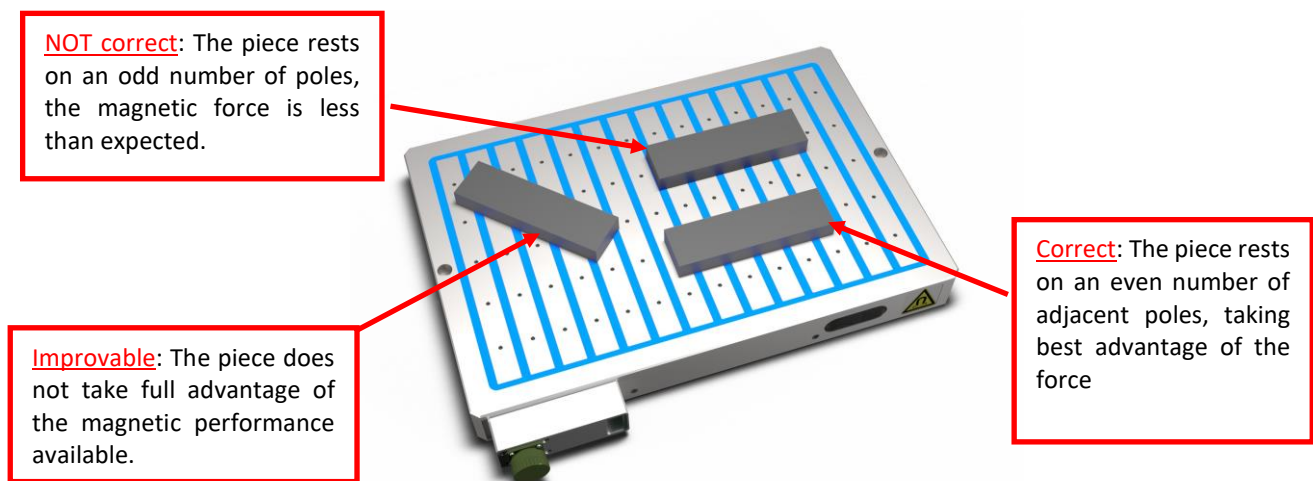


Fig. 3

We must mention the phenomena of the magnetic flux concentration, which allows to take full advantage of the specific force available; the compression is easily exploited on MFP chucks with parallel pole whenever pole portions are used

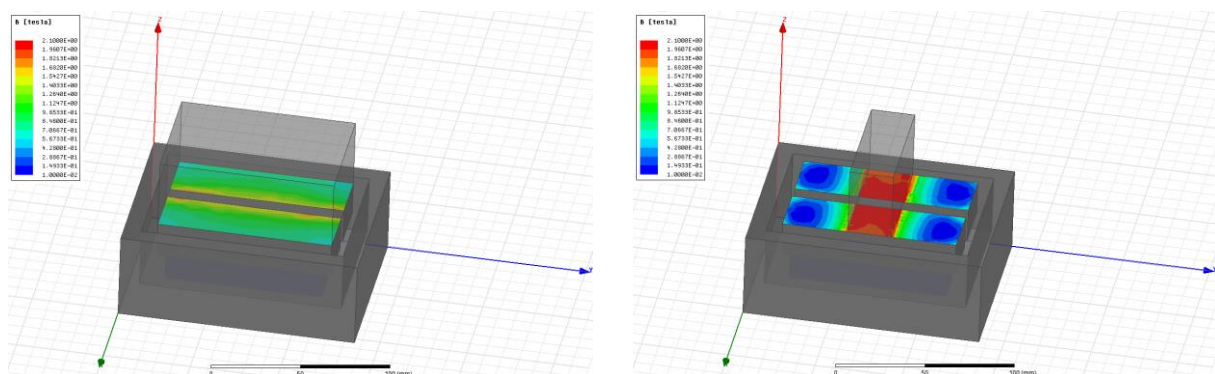
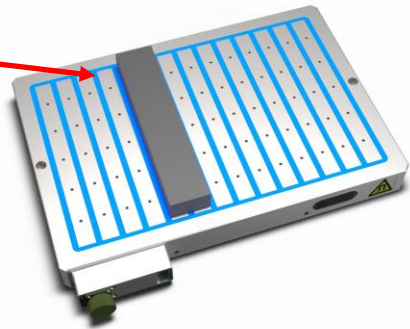


Fig. 4

The image above shows the concentration of the flux (with corresponding higher specific force) in the red zones of the piece shorter than the poles, respect to the complete coverage situation (image to the left).

The consequence is that, for a piece with the same support surface, contact with several poles guarantees a higher specific force (therefore even a total force).

Improvable: Positioning is basically correct because it respects the pole balancing.
The clamping force can be increased



Correct: Ideal positioning is achieved when the support surface of the same piece partially crosses several poles.
This takes advantage of the concentration of the flux.

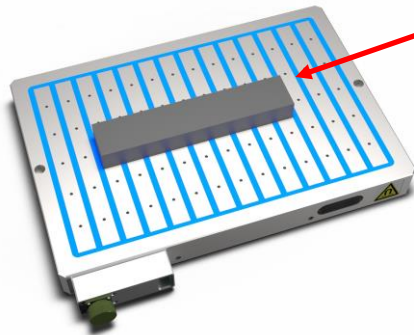


Fig. 5

The piece has a limited surface and only rests on some strongly limited magnetic attraction points of force



Fig. 6

Given the following definitions regarding the contact surfaces of the piece on the magnetic equipment:

- Finished surface: prefinished or finished by the tool, laminated or extruded, without extended dents or crusts.
- Unfinished surfaces: forged, melted, with evident marks from cutting, crusts, filth or extended defects.

The parallel pole in milling applications has advantages over other poles when the piece:

- has clamping surfaces with “hollow” geometry which could easily lead to poor N and S balancing.
- has a geometry which can easily obtain the compression conditions of the flux; e.g. long and narrow pieces

6.2 Mechanical devices

Striker washers or adjustable mechanical stops (optional) are supplied for some magnetic chucks as safety elements with the task of “helping” the chuck to hold the piece against possible sliding on the chuck due to the machining it undergoes.

6.3 Pole extensions

The main accessory for milling chucks is the pole extension which can either be fixed or mobile.

Fixed extensions

The fixed extensions are used to lift the piece from the magnetic chuck, transmitting the flux in an ideal way. They enable to perform contouring of the piece, of the through holes in the piece, processing on five square sides without damaging the surface of the magnetic chuck.

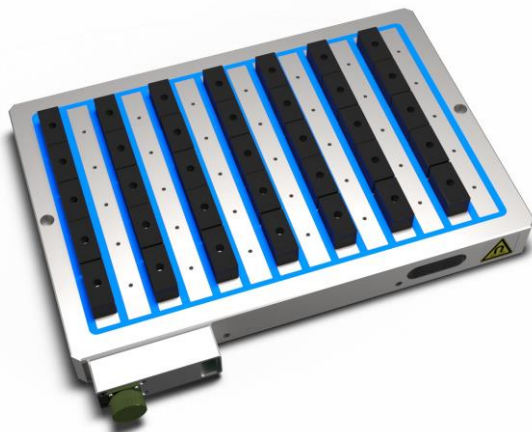
Furthermore, if shaped properly, they can obtain a negative imprint of the piece to be processed, thus enhancing the magnetic grip



Fig. 7

The correct use of the extensions depends on their correct positioning. Each extension must be mounted on a single pole using the supplied screw. The extension must not rest on two poles, as it would close the magnetic circuit without transmitting it to the piece. It is recommended to mount a sufficient number of fixed extensions to cover the entire surface of the workpiece. Make sure to distribute an equal number of pole extensions on the positive and negative poles of the magnetic chuck to achieve ideal magnetic balancing.

Incorrect distribution; evident pole unbalance



Correct distribution

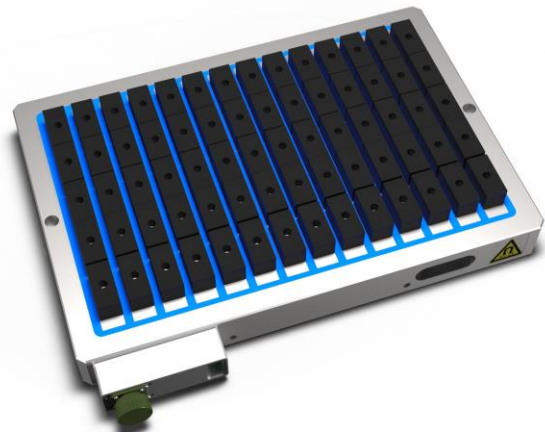


Fig. 8

Piece lifted up: to contour, drill, square, make through grooves, etc.

Processing with magnetic striker shoulder

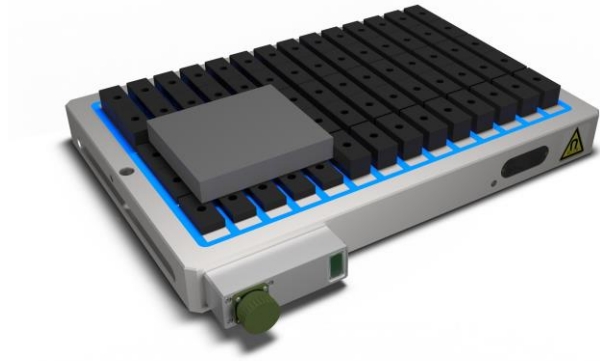
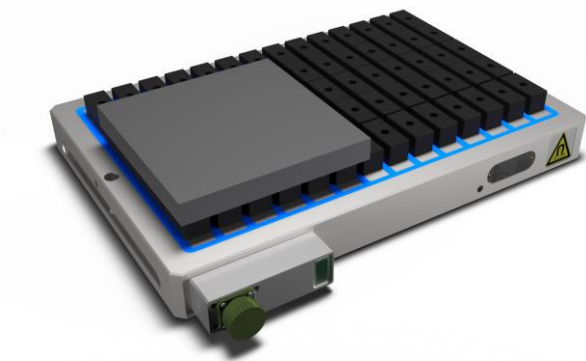


Fig. 9

Mobile extensions

These extensions are used to level warped plates or to process shaped plates. Their flexible self-levelling system allows them to adapt themselves to the curvature of the plate to be processed.

N.B. Using mobile extensions always requires the presence of at least 3 fixed extensions which serve as a fixed reference chuck and must be placed to guarantee the necessary stability. For especially large and/or deformable pieces, it could be necessary to add a fourth adjustable extension or other fixed points

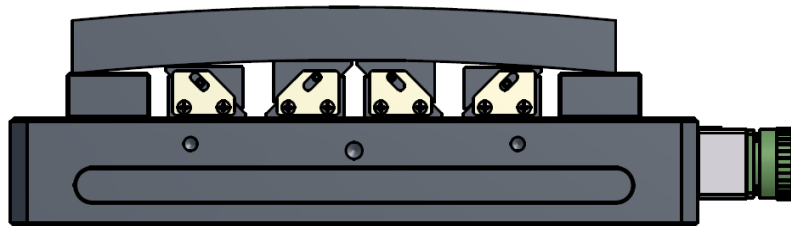


Fig. 10

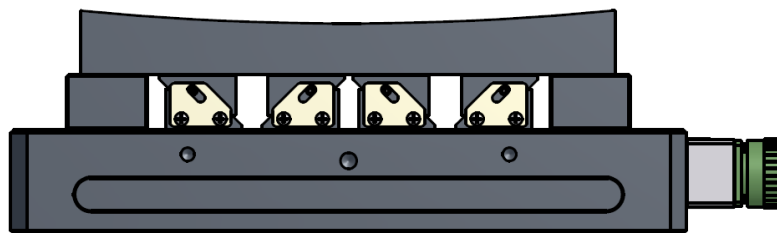
These extensions make it possible to achieve centesimal linearity in just two operations:

- 1- Levelling the upper surface of the deformed plate;
- 2- Turning the plate over and levelling the other side

First Processing of the deformed plate



Second Processing of the deformed plate



Final result

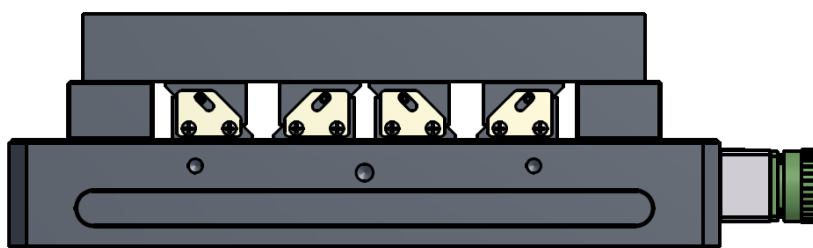


Fig. 11

Note:

Using pole extensions can decrease the magnetic chuck force.
For further information, contact technical support, giving them the data of the magnetic chuck and the type of process you want to carry out.

7 Installation

- 1 Check the packaging of the electro-permanent magnetic chuck.
- 2 Open the package and take the magnetic chuck out
- 3 Check to make sure that the electro-permanent magnetic chuck was not damaged during transport!
- 4 Compare the electro-permanent magnetic chuck with the specifications given in the order!
- 5 Clean any rustproof oil from the electro-permanent magnetic chuck.
- 6 Fasten the electro-permanent magnetic chuck to the flatbed of the vehicle with screws or brackets as needed. Use the side slots or fixing holes provided to fasten the magnetic chuck (according to the model).



ATTENTION

Use class 8.8 clamping screws making sure to tighten them at a maximum torque of 86 Nm with a torque wrench

To avoid excessive deformation of the magnetic chuck, the machine board on which the magnetic chuck will be attached must have a maximum planarity of 0.05

- 7 After installation, check that the chuck is fixed securely without being able to move in any direction.



WARNING

Dangers caused by short-circuit.

Never power the electro-permanent magnetic chuck if you detect any damage!

- Inform the carrier or SCHUNK immediately if you detect damage and/or missing components (with all the relevant details)!

8 Commissioning and normal operation

8.1 Commissioning

Connect the control unit to the electric mains as indicated in the manual of the electronic equipment.

After performing the connection to the electric mains, check the following operation:

- 1 Ensure that the magnetic chuck is not magnetised; you can do this with the steel tip of a screwdriver.

NOTE

There may be a slight residual magnetisation upon delivery, e.g. due to the handling of the chucks with magnetic lifters.

	 WARNING Danger due to suspended loads. If the workpiece handling requires the use of lifting equipment, cranes etc., please keep the respective safety distances!
--	---

- 2 Position one or more pieces on the magnetic chuck, paying attention to the instructions in chapter 6 ([6, Page 13](#)).. For a reliable test of the attraction force of the magnetic chuck, you must have a mild steel plate (we recommend UNI Fe 360 steel) at least 30 mm thick and sized 150 x 250 mm.
- 3 The contact area between the magnetic plate and the discharge cable (reinforced) must be free of metal, chips and dirt in general. The area must also be absolutely dry. If there is dirt, water or chips, carefully clean the connecting elements and contact surfaces and remove any causes of problems.
- 4 Remove the protective cap from the connection plug of the magnetic chuck and ensure that it is free of chips, dirt and liquids. Otherwise remove carefully anything that could cause problems to the electromechanical properties of the connection plug.
- 5 Connect the discharge cable (reinforced) of the control unit with the magnetic chuck using the quick coupling.

	 CAUTION
	Danger due to faulty connection. Problems may arise due to partial (de)magnetisation. • The connector of the discharge cable must be properly fixed to the magnetic system! For correct contacting, the connector of discharge cable must be inserted into the connector of magnetic chuck, and the ring nut must be turned clockwise as far as it will go.

	 HAZARD
	Electric shock hazard due to a faulty connection. Touching live parts can cause death by electric shock. • The following step may only be taken after a correct installation and inspection of the protective devices (7.2, Page 21).

- 6 Follow the instructions in the control unit manual to magnetise the magnetic chuck.

	 CAUTION
	Risk of injury due to workpieces coming undone as a result of faulty displays of the magnetic clamping system. • Ensure that the workpiece is now properly clamped on the magnetic chuck. Take suitable safety precautions when doing so!

- 7 Manually check that the pieces are secured stably to the chuck. Do not hit the chuck with a hammer to test clamping of the piece. In that case the force would not be equally distributed on the piece but would be concentrated at one sole point, making the test unreliable.
- 8 Demagnetise the chuck and check that the piece detaches.
- 9 The contact area between the magnetic plate and the discharge cable (reinforced) must be free of metal, chips and dirt in general. The area must also be absolutely dry. If there is dirt, water or chips, carefully clean the connecting elements and contact surfaces and remove any causes of problems.
- 10 Disconnect the discharge cable (reinforced) of the control unit from the magnetic chuck turning the ring nut anti-clockwise.
- 11 Put back the protective cap to protect the connector of the magnetic chuck from dirt, liquids, chips etc.

	 WARNING
	Suspended loads hazard. If this work requires the use of lifting equipment, cranes etc., please keep the required safety distances!

- 12 Remove the workpiece from the magnetic chuck.
- 13 Please contact SCHUNK if the expected results are not achieved, even if you carefully followed the steps described.

8.2 Normal operation

To guarantee proper magnetisation or demagnetisation, please follow the following steps:

1. Ensure that the magnetic chuck is not magnetised; you can do this with the steel tip of a screwdriver.

	 WARNING
	Suspended loads hazard. If the workpiece handling requires the use of lifting equipment, cranes etc., please keep the respective safety distances!

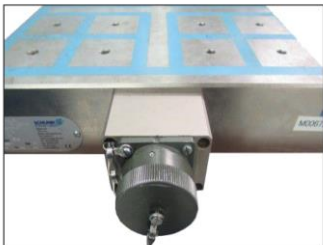
2. Position one or more pieces on the magnetic chuck, paying attention to the instructions in chapter 6.
3. The contact area between the magnetic plate and the discharge cable (reinforced) must be free of metal, chips and dirt in general. The area must also be absolutely dry. If there is dirt, water or chips, carefully clean the connecting elements and contact surfaces and remove any causes of problems.
4. Remove the protective cap from the connector of the magnetic chuck and ensure that it is free of chips, dirt or liquids. Otherwise remove carefully anything that could cause problems to the electromechanical properties of the connection plug.
5. Connect the discharge cable (reinforced) of the control unit with the magnetic chuck using the quick coupling.

	 CAUTION
	Faulty connection hazard. Problems may arise due to partial magnetisation or demagnetisation. • The connector of the discharge cable must be properly fixed to the magnetic system! For correct contacting, the connector of discharge cable must be inserted into the connector of magnetic chuck, and the ring nut must be turned clockwise as far as it will go.

6. Follow the instructions in the control unit manual to magnetise the magnetic chuck.

	 CAUTION
	Risk of injury due to workpieces coming undone as a result of faulty displays of the magnetic clamping system. • Ensure that the workpiece is now properly clamped on the magnetic chuck. Take suitable safety precautions when doing so!

7. Manually check that the pieces are secured stably to the chuck. Do not hit the chuck with a hammer to test clamping of the piece. In that case the force would not be equally distributed on the piece but would be concentrated at one sole point, making the test unreliable.
8. Remove the discharge cable from the magnetic chuck; turning the ring nut anti-clockwise.
9. Put back the protective cap to protect the magnetic chuck connector from dirt, liquids, chips etc. Ensure that the cap snaps in properly and sits correctly.

	ATTENTION
	Damage to the product due to use with the discharge cable connected. The magnetic chuck is designed to be used, during mechanical processing, with the discharge cable disconnected and the cap correctly inserted on the connector. Only under these conditions is it possible to have an IP67 degree of protection of protection.   If the discharge cable is left connected during processing, the magnetic chuck will have an IP20 degree of protection and there is a risk of damaging the magnetic chuck or the connected control unit.  

10. The workpiece can now be machined.
11. Remove the protective cap from the magnetic chuck and re-connect control unit's connector to magnetic chuck's connector.
12. Demagnetise the chuck according to the instructions in the control unit manual and check that the piece detaches.
13. Remove the discharge cable from the magnetic chuck; turning the ring nut anti-clockwise.
14. Put back the protective cap to protect the magnetic chuck connector from dirt, liquids, chips etc. Ensure that the cap snaps in properly and sits correctly.

	 WARNING Suspended loads hazard. If the workpiece handling requires the use of lifting equipment, cranes etc., please keep the respective safety distances!
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15. Remove the workpiece from the magnetic chuck.
16. Please contact SCHUNK if the expected results are not achieved, even if you carefully followed the steps described.

N.B.: For ferromagnetic pieces in steel alloy or with particular chemical properties, it may be difficult to detach the pieces from the magnetic chuck especially after long processes. This is not an issue with demagnetisation of the magnetic chuck, but rather magnetisation of the metal workpiece which a careful analysis shows is likely to be affected by very high magnetic residue.

9 Troubleshooting

Fault detected	Possible Cause	Suggested intervention
The piece is not sufficiently anchored to the magnetic chuck	The control unit did not carry out the magnetisation phase correctly	See the use and maintenance manual of the unit
	The workpiece is not positioned properly	Check that recommended in chapter 6
The status of the magnetic chuck does not change	Problem depending on the electronic control unit	See the use and maintenance manual of the control unit

Should you have any problems or need any further information, please contact the technical assistance service.

10 Servicing and maintenance

It is recommended to check the status of the electro-permanent magnetic chuck on a regular basis. Thorough and regular maintenance is a decisive factor for optimum safety, operation and performance and a longer service life of the product.

To ensure optimum availability and reliability of the electro-permanent magnetic chuck in the long run, the parts exposed to the greatest strain during operation must be inspected regularly.

Please follow the instructions and maintenance intervals given in the table below so as to avoid repairs of the electro-permanent magnetic chuck and resulting down-times, failures and inconvenience.

Activity	Description	Frequency			
		Each time before use	Once a week	Once a month	Once a year
Cleaning the connector	Checked the connector for chips, dirt etc. and remove as necessary	•			
Checking connector cover	Check that the gasket of the connector cover is not worn or broken	•			
Checking the rating plate	Check that the rating plate is not damaged or illegible	•			
Inspect seals	Check all the seals of the system (connectors, caps, housings etc.).	•			
Check the fault current circuit breaker	Check proper functioning of the upstream protective system using suitable tests.	Test as often and with the method recommended by manufacturer.			

Defective electrical and electromechanical components must always be exchanged by SCHUNK Service personnel. If components are exchanged by the operator, this automatically renders the warranty invalid.

After maintenance and before reconnecting and restarting the electro-permanent magnetic chuck, reinstall all protective devices.

11 Transport and storage

11.1 Transport

The electro-permanent magnetic chuck can be lifted with a manually controlled magnetic lift of suitable capacity or else with eyebolts according to the holes applied on the sides.

	⚠ WARNING Risk of injury and risk of damage to the electro-permanent magnetic chuck if it falls during transport! The electro-permanent magnetic chuck could be very heavy and contain electric components. Persons may be injured and the electric components may get damaged! • Please consider the weight of the package stated on the side label for its handling and shipping. • Use the required personal protective equipment during its handling and shipping.
---	---

11.2 Storage

When storing the electro-permanent magnetic chuck for a longer period of time, observe the following instructions to ensure perfect operation up to the time of installation:

- Ensure correct packaging!
Recommendation: store the product in its original packaging.
- The electro-permanent magnetic chuck and packaging should be inspected at regular intervals.
- Check that the packaging has not deteriorated due to shocks or bad weather.
- Make sure that the temperature remains between 15°C and + 70°C so as not to damage the magnetic chuck.

**ATTENTION****Dispose of all packaging properly.**

- Unpacking and positioning the controller in the electric panel of the tool machine may require the operation of two or more persons and the use of handling equipment like hoists, cranes etc.

N.B.:

The presence of magnetic residue on the surface of the new chuck is determined by the use of magnetic lifts when inserting the modules into the crates. This residue disappears as soon as the first demagnetisation cycle is performed.

12 Disposal

This product is made of ferrous material, resin and electrical components. If it is taken out of operation, it has to be disposed of in compliance with the applicable regulations.

As soon as the end of the lifecycle has been reached, the electro-permanent magnetic chuck has to be decommissioned, i.e. put into a state in which it can no longer be used for its original intended use and in which it is still possible to recycle the raw materials contained.

NOTE

SCHUNK assumes no liability for material damage or personal injury that may result from reusing individual components of the electro-permanent magnetic chuck for other purposes than the original intended use! SCHUNK provides neither implicit nor explicit declarations about any possible usability of recycled components for specific use after decommissioning the electro-permanent magnetic chuck.

Procedure for final decommissioning and disposal of the electro-permanent magnetic chuck:

	 CAUTION
	Risk of injury Decommissioning, disassembly and disposal of the electro-permanent magnetic chuck must be performed by qualified persons using suitable tools.

- 1 Ensure that the machine tool has safely come to a halt. Disconnect all the electrical, hydraulic and pneumatic connections that could cause unexpected movements of the machine or its components;
- 2 Disconnect the product from all devices, etc.;
⇒ Have the electro-permanent magnetic chuck disposed of by a company that specialises in the disposal of electrical and magnetic equipment.

13 Spare parts

For spare parts, contact SCHUNK