

User manual

Pneumatic self-cleaning cascade magnet, series SxKP...

- Ferro separator by magnetic force -

Suitable for ferrous separation from granulates, powders and short-cut product flows Not suitable for poorly flowing and sticky product flows



The descriptions and illustrations in this user manual, used for clarification, may differ from your version. We have attached the as-built drawing of the delivered item.

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Version overview standard user manual

Version	Date	Description
1.0	03-03-2000	First version of the English version of the user manual.
1.1	01-12-2003	Complete updated version of the user manual.
1.2	29-05-2006	Atex notes added.
1.3	18-12-2006	Review page added.
1.4	02-12-2008	Chapter Troubleshooting changed to Malfunctions/service
2.0	04-11-2009	Specification sheet and manufacturer's declaration separate from the user manual
2.1	06-2014	Description ambient temperature ATEX Ta added
2.2	11-2019	New logo + minor text changes
2.3	09-2024	Installation requirement for maximum free fall height
2.4	04-2025	Terminology correction



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Introduction



Read this user manual and make sure you fully understand its contents before commissioning and using the device.

If you have any questions or require further explanation on any subject related to the device, please contact GOUDSMIT Magnetic Systems B.V.

All technical information in this user manual, together with all relevant drawings and technical descriptions we provide, remain our property. It may not be duplicated or disclosed without our prior written consent.

The user manual can be ordered together with the device description and/or article number and order number.

- This user manual and the manufacturer's declaration are part of the device.
- The documentation should remain with the device even if it is sold.
- The user manual should be made available to all operators, service technicians and others working with the equipment throughout its service life.



General

General

This user manual contains information for the proper operation and maintenance of your device. It also contains instructions to prevent possible injury and serious damage and enables safe and as trouble-free operation of the product as possible. Please read this user manual thoroughly before using the device, familiarize yourself with the operation and control of the device and follow all instructions carefully.

- The data published in this user manual are based on the information available at the time of delivery. It is issued subject to subsequent changes.
- We reserve the right to change or modify the construction and/or model of our products at any time without any obligation to adjust previously delivered products accordingly.

Ferromagnetism

The working principle of the device is based on (ferro)magnetism.

Ferromagnetism is the basic mechanism that allows certain materials such as iron, cobalt and nickel to become magnetised when exposed to an externally applied magnetic field. Materials that remain magnetised after the external magnetic field is removed are called permanent magnets. Most magnetic materials lose their magnetism after the external magnetic field is removed. Most alloys of iron, cobalt and nickel are magnetic. However, some stainless steel alloys such as AISI304 or AISI316 are only slightly magnetic.

Since in most cases ferrous parts are ferromagnetically affected, we use the term 'ferrous' when referring to ferromagnetic material in this user manual.

Delivery terms and warranty

The delivery conditions are the 'General conditions for the supply and assembly of mechanical, electrical and electronic products' (SE01), published by *Orgalime* in Brussels. If desired, these conditions can also be requested in writing from Goudsmit Magnetic Systems B.V., as also stated in our written quote.

The warranty requirements are stated in these terms and conditions.

The warranty on your device is void if:

- Service and maintenance are not performed according to the instruction manual or by service personnel not specially trained to perform the work. We strongly recommend that specific magnetic service and maintenance be carried out by Goudsmit Magnetics personnel).
- Changes are made to the device without our prior written consent.
- Non-original parts or non- 100% replaceable parts are used.
- Lubricants other than those prescribed are used.
- The device is used improperly, incorrectly, negligently or not in accordance with the intention and/or purpose.

All parts subject to wear and tear are excluded from the warranty.



Other comments / warnings

- Only use the device for the application for which it is designed (see section 'Intended use / user instructions').
- Only operate the device when it is in technically perfect condition and ensure that all protective covers or inspection hatches, including all safety circuits, are properly fitted and installed.
- Make sure the device is maintained properly and according to the instructions in this user manual.
- Any faults, especially those that may affect safety, must be rectified immediately before the device is returned to operation. If, after assessing the risks of an unresolved fault, you still think it is safe to keep the device in operation, warn the operators and maintenance personnel of these faults and the dangers caused by them.

Delivery

General

Check the shipment immediately after delivery for:

- Possible damage and/or deficiencies due to conveying. If this is the case, ask the transporter to
 prepare a transport damage report.
- Completeness of delivery(s), lack of anything (extra) ordered.

In the event of damage and/or incorrect delivery, always contact **GOUDSMIT Magnetic Systems** immediately.

Identification plate

There is an identification plate on the device as shown below. **The information on this plate is very important in case of service**. We therefore recommend always leaving this plate on the device. Make sure it is always legible by cleaning it regularly.



Do not forget to note the serial number and identification number in case of malfunctions and/or delivery of spare parts.

If the identification plate is damaged, please contact us and we will send a new one as soon as possible.



ATEX markings (if applicable)

If the equipment is suitable for use in a potentially explosive environment (ATEX), the identification plate has an Ex marking that indicates the specific equipment category and other criteria the equipment meets.

- <u>Code example:</u> II 1/2D c T130°C Da/Db
- Explanation:
 - → Explosion group (I is underground mining, II is other)
 - 1/2D

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→ Equipment category (Ignition protection level: 1 = very high, 2 = high, 3 = normal)

Equipment category	1D	2D	3D
Suitable for ATEX zone(s)	20 (21, & 22)	21 (22)	22

1D inside device / 2D outside device

- c \rightarrow Type of Ex protection
 - c = structural safety
 - t = protection by enclosure
 - h = non-electric equipment (safety method not specified)
- T130°C → Maximum surface temperature
- Da/Db → Equipment protection level (EPL).

EPL	Da	Db	Dc
Suitable for ATEX zone(s)	20 (21, & 22)	21 (22)	22

Da inside device / Db outside device

Ta → Ambient temperature range. Only displayed if the range differs from the standard temperature range for ATEX of -20 ... +40°C

If the device is externally certified, the ATEX certificate number is added to the identification plate. Next to the CE marking is the identification number of the Notified body that certified our ATEX quality assurance system.

If the device does not contain 'own ignition sources' and is therefore not covered by the ATEX directive, the device is not given an EX marking and is supplied with an Exclusion Statement, which states this and also lists the EX zones in which the device can be used safely.



Measures for hazardous areas (ATEX)

• If the device has been ordered for use in an area with a risk of explosion, ensure that no higher surface temperature is generated than is allowed according to ATEX.

The ATEX marking on the Goudsmit Magnetics identification plate is only applicable to the product produced by Goudsmit Magnetic Systems B.V..

Ensure that no particles > 10 mm are present in the product flow. These may damage the magnets or cause impact sparks. If necessary, install a **mechanical filter (sieve)** in front of the cascade magnet.

- The ATEX-certified magnetic device requires additional purchase parts to be certified according to the ATEX directive. This includes control units, connection box, switch(es), sensor(s) and pneumatic parts, etc. Make sure these are fitted by qualified personnel!
- If the device is stored away or left idle for an extended period, make sure it is emptied and cleaned.
- The device must be earthed if a gasket is used between the device and the larger installation. Attach a metal strip between the device casing and the installation to ensure that the device is earthed.
- All screw connections in the device must be secured against loosening.

The ATEX purchase parts carry their own ATEX markings.



Safety

Safety

This chapter describes the safety hazards of your device. Where necessary, warning pictograms are attached to the device. This chapter clarifies the meaning of these pictograms.

Know your pictograms

Check regularly that all warning pictograms are still present and legible and clean them if necessary. Ensure that new pictograms are placed in the right place if they are lost or damaged. Before installing the device, note where the pictograms were originally placed.

General

The device is equipped with safeguards where necessary. Ensure that anyone coming into contact with the device wears adequate personal protection (overalls, safety glasses, hearing protection, helmet, steel-toed safety shoes, etc.). Parts of the device considered dangerous are marked with warning pictograms. If the device remains easily accessible to persons, additional safety measures (e.g. a fence) should be installed. If safeguards are not possible, provide clear instructions for people using the device.

Magnetic field hazard

The magnets generate a powerful magnetic field that strongly attracts ferromagnetic (ferrous) materials. Always keep in mind that these materials can suddenly be drawn to the magnet very forcefully. This applies to steel workbenches and steel tools, but also to ferromagnetic materials that one carries, such as money coins in one's wallet or keys. Use non-magnetic tools and workbenches with a wooden worktop and preferably a non-ferrous frame (e.g. stainless steel).



Persons with active implanted medical devices (e.g. pacemaker, defibrillator, insulin pump) must on no account enter the magnetic field within **1 metre**.



Life-threatening for persons with implanted medical devices

Credit cards, chip cards, computer disks/tapes, computer screens, watches, etc. may be damaged beyond repair if they come within **0.5 metres** of the magnetic field.



General public and pregnant personnel should maintain a minimum distance of **0.25 metres** from the magnet.



Safety

Danger from external moving parts

The magnets are moved by air cylinders installed on the outside of the device. Keep your fingers/hands away from the cylinders and magnets during operation, especially during the cleaning process. Do not wear loose clothing near the cylinders and magnets to avoid the risk of being caught by moving parts and causing serious injury.

Note: The magnets automatically close against the housing during an electrical fault or shutdown. Take extra precautions during maintenance or emergency situations.



To reduce the risk of injury due to free access by workers, an additional precautionary measure, i.e. placing a fence under the device, is strongly recommended. Provide comprehensive instructions, possibly supplemented by work instructions, of which this user manual can be a part.

Danger of high voltage

When installing and electrically connecting the device, have all work carried out by qualified personnel.



Switch off the electric power supply before carrying out any activities on the device.

If the cascade magnet is equipped with a standard 24 V_{DC} control unit and a 24 V_{DC} power supply, the unit on the cascade magnet is not dangerous.

If the cascade magnet is equipped with a higher supply voltage - e.g. 230 V_{AC} / 50 Hz - be extra careful.

Dust explosion hazard

If this device is manufactured according to an EX dust category (1D/2D/3D, according to ATEX directive 2014/34/EU), it can be used accordingly in a dust zone (20/21/22, according to ATEX workplace directive 99/92/EC). The Ex category is then described on the identification plate.

Make sure the device is suitable for the correct ATEX environment (dust) and has the right equipment category for your application.



Danger - Dust explosion!

Also check that **the identification plates of the assembled components** indicate the correct Ex category for the Ex zone in which the device will be used.



Device description

Intended use/user indications

Products

Suitable for separating ferromagnetic (ferrous) particles from large amounts of free-flowing powder and granular products with grain sizes up to **10 mm**, such as cereals, sugar, coffee beans, cocoa beans, etc.

Not suitable for use in (moist) products that are (too) sticky and/or flow poorly.

Ferrous parts

Suitable for product flows with ferrous particles of **0.5 mm** and larger.

Temperatures

Suitable for:

- Ambient temperatures from -5 °C to +40 °C.
- Product temperatures up to +80 °C

The magnet should be protected from higher than prescribed temperatures, as the magnet **may lose permanent magnetic force** when exposed to high temperatures.

Free space

Make sure there is about 1 metre of free space around the cascade magnet to perform and facilitate inspection and maintenance work.

Noise level

The noise level of the unit is less than 70 dB on delivery. Should it become higher, the unit should be checked immediately for a malfunction or defect.

Pressure in the product chute

Not suitable for gauge or negative pressure in the product chute. Please contact our sales department if you have overpressure or underpressure in the product chute.

Vibrations

The magnet must be protected from strong external vibrations, as the magnet **may lose permanent magnetic power** or the brittle ceramic magnet material may break.

The only vibrations caused by the cascade magnet are caused by the moving magnets during cleaning and by the valve. The product chute in which the cascade magnet is placed must be stiff enough to dampen the forces of these movements.

Cleaning

Cleaning (ferro-removal) of the unit **at least twice a day** is advised for optimal magnet filtration and to prevent ferro build-up on the magnets and the problems that can result. Clean magnets have the best filtering performance. Be sure to clean a little more than you think is necessary to achieve a satisfactory result from the magnet unit. See section 'Maintenance' for cleaning dirt.

Air supply

The recommended compressed air pressure at the inlet is 6 bar. The maximum allowable pressure is 10 bar. The air shall comply with ISO 8573-1:2010 [7:4:4]. Solid particles: $7 = 5 < Cp \le 10 \text{ mg/m}^3$ Water content: $4 = \text{dew point} \le +3 \text{ °C}$ Oil content: $4 = \le 5 \text{ mg/m}^3$

Device description

Standard control

The cleaning cycle is controlled by a solenoid valve. The standard voltage is 24 V_{DC} . The length of the signal should be at least 15 seconds.

Use in Ex-zone

If this device is made according to an Ex category, the Ex category is described on the identification plate.

Max particle size is 10 mm in the product flow, max height for free-fall is 10 metres at the inlet.

Specials to be supplied

Higher product temperatures

For higher product temperatures than +80 °C, it is possible to use magnetic materials other than these standard magnetic materials.

Abrasive products

If you have an abrasive product, we can supply enclosures with protective replaceable wear plates. These can be fitted as required. Protection can be on the magnets and sides. The standard material is manganese steel or stainless steel. The flap (on the product side) can be protected by PU coating or by a wear plate made of manganese or stainless steel.

Air preparation unit

It is recommended if you want to set the inlet pressure more precisely. The air preparation unit reduces the pressure and includes a manual start/stop valve.

Use in food streams

The cascade magnet can be adapted so that it can be used (more easily) in food flows. The standard version already has small gaps in the product channel housing. The product channel (or even the complete housing and the outside of the magnets) can be supplied in stainless steel AISI304 or AISI316.



Basic operation

The cascade magnet is specially designed for separating ferrous particles in non-sticky, granular and pulverised products, e.g. in mills and hammer mills. Ferrous particles can damage the device equipment and affect the quality of harvest products such as grain, flour, etc.



Photo: side view of cascade magnet

- The product flow enters the cascade magnet through the product inlet opening.
- The product forced by the shape of the cascade flows closely passing the magnets and therefore has a very good degree of deferrization (ferrous separation).

Cleaning cycle / ferrous discharge

- 1. Stop the product flow.
- 2. Start the signal for cleaning (standard 24 V_{DC})
- 3. The flap cylinder closes the product channel with its flap, preventing ferrous parts from falling through, and thereby opens the ferrous outlet at the same time.
- 4. When the flap is in the closed position, the magnet cylinders move the magnets away from the cascade housing. The ferrous contamination falls off the casing down into the ferrous outlet.
- 5. After about 15 seconds, the signal stops (no voltage) and the magnet cylinders move the magnets back against the cascade housing.
- 6. When the last magnet is against the housing, the flap cylinder moves the flap back to the production position and closes the ferrous outlet.
- 7. Start the product flow.

Regular cleaning of the magnet ensures optimal deferrization results. Magnets contaminated with ferrous material lose (partly) their magnetic power !



Construction



Picture: Pneumatic cascade magnet with sequential control unit (view without pneumatic cover)

- The cascade magnet must be connected to **the product inlet and outlet flange** of your duct construction.
- The cascade magnet is also equipped with a **flange at the ferrous outlet**, on which a ferrous outlet channel/construction can easily be mounted.
- On the opposite side, other than where the upper magnet is located, an **inspection hatch** has been placed. By opening it, it is possible to inspect all the magnets.
- A **flap**, placed after the lowest magnet, closes either the product outlet or the ferrous outlet. Problems with the flap are most easily inspected through the ferrous outlet.
- Two large **protection covers** for protection against the magnets (moving or otherwise). In addition, these covers protect the magnets from falling ferromagnetic parts, which can damage the magnets and/or the cascade housing and cause poor magnetic performance.
- A **protection cover for the pneumatic components** is placed on the side plate of the cascade magnet to protect against the risk of injury from moving cylinders.
- The **sequence switch (control unit)** is placed on the side plate of the cascade magnet, on the same side where the cylinders are mounted.

ATEX design (dust explosion protection)

All materials used, manufactured and purchased parts in specified ATEX design.



Installation

Installation

Placing and transporting the device

The cascade magnet must always be lifted with 4 lifting eyelets! Mount these eyelets on the corner holes of the upper flange.

Due to the uneven weight distribution, the use of all 4 eyelet at each corner is necessary for a stable lifting process.



Photo: Cascade magnet with lifting eyelets

- To facilitate the transport and installation, an area with plenty of space is preferred.
- Use suitable transport and lifting equipment for transporting the cascade magnet.

The weight of the cascade magnet is indicated on the *identification plate*

- Make sure the product outlet and inlet channels are strong enough to support the cascade magnet. If these are not strong enough, reinforce them before installation.
- Avoid shocks during transport to prevent damage.
- Clear the area around the cascade magnet during transport.
- Attach the flanges of the cascade magnet securely to the inlet and outlet flanges of your product channels to prevent product leakage. Misalignment and mounting can lead to raw material leakage.
- It is recommended to install the cascade magnet at a height accessible to operators. A good height facilitates the cleaning and maintenance process.
- When installing the cascade magnet, ensure that the free-fall height of your product **is a maximum of 0.4 metres**. A higher free-fall height will increase the speed of the product, resulting in poorer separation.
- Work carefully, provide enough working space, use good scaffolding, good ladder and good lifting tools to safely install the cascade magnet.

Electrical connections

Make sure that the power supply is switched off before starting work on the device and that it cannot be switched back on without your permission

Ensure that all electrical connections are carried out by qualified personnel and comply with all applicable standards and requirements. Check that the device is suitable for connection.

The standard electrical equipment is a 24 V_{DC} solenoid valve. Before connecting, check the devices supplied for locally valid connected loads and ensure that the appropriate connecting cables are designed for the electrical power to be used.

The cascade magnet can be equipped with different solenoids and some sensors can be added.

Ensure that all electrical connections are checked/tightened after installation and regularly thereafter (e.g. once a year).

The cascade magnet is equipped with the following electromagnetic sequential control unit:



To start the cleaning cycle, a signal of 24 V_{DC} or another signal, if specifically ordered, must be generated to the solenoid valve. Of course, you connect your central or local control signal to this solenoid valve.

Air: The air supply must be connected to the valve block (recommended 6 bar, min. 4 to max. 10 bar). The air should be dry and oil-free.

Commissioning

Before commissioning, check that:

- the device or installation has no damage or defects.
- all connections (electrical, mechanical, pneumatic) are made properly.
- the device or installation is correctly placed and situated.
- all protection covers are fitted correctly.
- that all objects larger than 10 mm are blocked so that they cannot enter the product channel.
- the device is thoroughly cleaned, both internally and externally.
- the product does not fall into the device from a height greater than 10 metres.
- no other sources of danger are present.

During commissioning, check that:

- the device or installation has no damage or defects.
- all other parts of the device or installation function as described.



Maintenance

Magnetic systems attract ferromagnetic particles. Regular cleaning is essential. A clean magnet works considerably better.

- All parts are best cleaned with compressed air and/or a soft cloth.
- Regularly check that all warning pictograms and the identification plate are in their correct locations on the device. If warning pictograms or the identification plate are lost or damaged, immediately affix new ones in their original locations.

GOUDS

• Always inform the operating personnel about scheduled inspections, maintenance, repairs or in case of malfunctions.

Warnings (see also chapter "Safety")

Maintenance should only be carried out when the power supply and air supply are switched off. Note the magnetic force remains active even when the power supply is switched off. This may attract ferromagnetic materials near the magnets. We recommend using non-ferromagnetic tools/materials, such as AISI304 stainless steel or plastic or wood for maintenance and cleaning work. Keep all magnetically sensitive products, such as pacemakers, watches, phones, magnetic cards and credit cards, away from the magnets.

Check/replace wedge (wear) plate

Regularly check the wedge plate at the first magnet for wear. If it is worn, it can be replaced via the inspection hatch.



<u>Flap</u>

Regularly check the flap and gasket. Replace them if they are worn out.

Cleaning and condition

Clean all parts regularly and check their condition.



Malfunctions/Service



CAUTION!

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- Improper use of the magnetic device may result in damage. Potential danger to body or equipment!
 Repairs to GOUDSMIT MAGNETICS magnetic systems may only be carried out by qualified personnel.
 - Please note that permanent magnets attract ferromagnetic material with great force if it comes within the range of the magnetic field. Risk of trapping hazard.
- Consult the service department of GOUDSMIT Magnetic Systems.

Malfunctions

In case of malfunctions, refer to the following table to determine the cause of the malfunction and the possible solution. If a specific fault cannot be found in the table, please consult the service department of GOUDSMIT Magnetic Systems.

Malfunction	Possible cause	Possible solution
Magnet separates non- or poorly ferromagnetic parts from product flow.	Non-separated particles are non- ferromagnetic.	Check that the particles to be separated are ferromagnetic using a permanent magnet.
	Overloaded magnets.	Clean the magnets more often from separated ferrous parts.
	Magnet does not close properly against the housing.	Adjust the air pressure on the magnet cylinder(s) to (recommended = 4 to 8 bar, max = 10 bar) .
		Clean the surfaces on the closing sides of the magnet(s) and the housing.
The ferrous outlet flap of the integrated valve box does not close properly.	Blocking of ferrous or product outlet.	Remove the parts blocking the outlet(s).
The ferrous outlet flap does not move properly.	Air pressure is low or off.	Set the air supply pressure (recommended = 4 to 8 bar, max = 10 bar).
	Flap moves with too much friction.	Check the flap's closing rubber. If the rubber is broken, replace it with a new one.
	Air cylinder has severe wear.	Overhaul/replace cylinder.
Ferrous outlet flap does not move	Cleaning cycle stopped unexpectedly.	Restore the cycle, see procedure below.
	Pneumatic sensor not working.	Follow the procedure to restore the cleaning cycle and check if the sensor blows out air. If it does not, replace the sensor.
Magnets do not move or do	Air pressure is low or off.	Setting air pressure or adjusting air pressure.
should.	The duration of the cleaning signal is too short.	Check that the signal for cleaning lasts for about 15 sec. Adjust if necessary.
	Air cylinder is worn out.	Overhaul/replace cylinder.



Procedure for restoring the cleaning cycle



When there is air on it:

- 1. Mark the position of the sensor.
- 2. Unscrew the sensor.
- 3. Move it completely to the other side.
- 4. The valve should blow off and the bottom flap should start moving.
- 5. Move the sensor back and tighten it.

Customer service

Please have the following information available if you need help from customer service:

- Identification plate (complete)
- Nature and extent of the problem
- Time when the problem occurred and any additional circumstances
- Probable cause

Sealing material/earthing

The device must be connected to an equipotential bonding system.

Ensure that all sealing and/or packing material between the magnet device and your product channel has a surface resistance of less than 1 G Ω .

Storage and dismantling

Storage

If the device will not be used for an extended period, we recommend storing it in a dry, safe place and protecting fragile and/or sensitive parts.

Dismantling/disposal

When the device is recycled at the end of its technical service life, it must be disposed of properly and in accordance with local regulations. Always pay attention to the presence of magnetism.