GOUDSMIT MAGNETICS

User Manual

Pneumatic self-cleaning Cascade Magnet, series SxKP…

- Fe separator by magnetic force –

Suitable *for Fe separation out of granulates, powders and short-cutted product flows*
Not suitable *for bad flowing and or sticky product flows*




The descriptions and pictures in this manual, used for explanation, may differ from your execution.
We have enclosed the as-built drawing of the delivered article.

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CE

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Versions overview of standard 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 renewed version of the manual.
1.2	29-05-2006	Atex remarks added.
1.3	18-12-2006	Revisions page added.
1.4	02-12-2008	Chapter Trouble shooting changed to Malfunctions/Service
2.0	04-11-2009	Specifications sheet and declaration by the manufacturer separated from manual
2.1	06-2014	Description ambient temperature ATEX Ta added
2.2	11-2019	New logo + small text changes

Introduction

Read this manual and make sure that you fully understand its contents before commissioning and operating the machine.

If you have any queries or require further explanation regarding any subject related to the machine, please do not hesitate to contact **GOUDSMIT Magnetic Systems B.V.**

The user manual can be ordered together with the device description and/or the article number as well as the order number (ORxxxxxx).

- This manual and the declaration by the manufacturer are part of the machine.
- They must remain with the machine, even if it is sold.
- The manual must be made available to all operators, service technicians, and others who work with the machine throughout its life cycle.

List of contents

General

This manual contains information for the correct operation and maintenance of your device. It also contains instructions for avoiding possible injury and serious damage and it allows a safe and as trouble-free functioning of the product as possible. Read this manual thoroughly before putting the device into operation, familiarise yourself with the operation and control of the device and follow all instructions precisely.

- *The data published in this manual is based on the available information at the time of delivery. This is issued subject to later amendment.*
- *We retain the right to amend or modify the construction and/or model of our products at any time whatsoever without any obligation to modify any previously supplied products accordingly.*

Ferromagnetism

The working principle of the device rests on (Ferro)magnetism.

Ferromagnetism is the basic mechanism by which certain materials such as iron cobalt and nickel can get magnetized when exposed to an externally applied magnetic field. Materials that remain magnetized 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 like AISI304 or AISI316 are only slightly magnetic.

Because in most cases it will be Fe parts that will be Ferro-magnetically influenced, we will use the term ‘Fe’ in this user manual when we mean ferromagnetic material

Conditions of supply and guarantee

The conditions of supply are the **"General Conditions for the supply and erection of mechanical, electrical and electronic products" (SE01)**, published by ***Orgalime***, in Brussels.
These conditions can also- if desired – be requested by writing to Goudsmit Magnetic Systems B.V., as also mentioned in our written quotation.

The guarantee prescriptions are mentioned in these conditions.

The guarantee on your equipment will be void if:

- Service and maintenance are not performed in accordance with the instruction manual or by servicemen who are not especially trained to do the work. We strongly recommend that specific magnetic service and maintenance be carried out by Goudsmit personnel).
- Modifications are made to the equipment without our prior written permission.
- Non-original parts or non 100% exchangeable parts are used.
- Lubrication products other than those prescribed are used.
- The equipment is used injudiciously, incorrectly, negligently or not in accordance with its intent and/or purpose (see chapter "Intended use / user instructions").

All parts that are subject to wear are excluded from the guarantee.

Remaining remarks / warnings

- Use the device only for the application for which it has been designed (see chapter *"Intended use / user instructions"*).
- Use the device only when it is in technically perfect condition, and ensure that all protective hoods or inspection covers, including all safety circuits, have been fitted and installed in the correct manner.
- Ensure that device maintenance is appropriate and in accordance with the instructions provided in this user manual.
- Any eventual faults, in particular those that may influence safety, should be attended to immediately and remedied before renewed operation. Should you, after estimating the risks of an unsolved fault, still think it is safe to keep the device into operation, then warn the operators and maintenance staff of these faults and the danger(s) caused by these faults.

Delivery

General

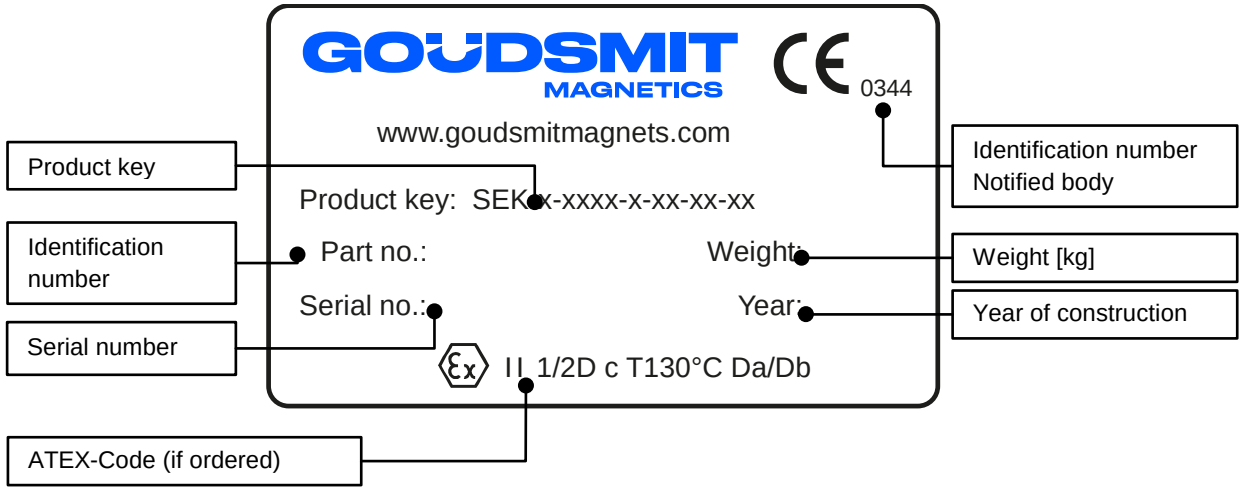
Check the shipment immediately on delivery for:

- Possible damage and/or shortcomings as a result of transport. If so, ask the transporter to draw up a transport damage report.
- Completeness of the delivery/deliveries, the absence of anything (additionally) ordered.

Always immediately contact **GOUDSMIT magnetic systems** in the event of any damage and/or mistaken delivery.

Identification plate

On the device you will find an identification plate as pictured below. **Information on this plate is of great importance in case of service**. That is why we advise to maintain this plate on the device at all times. Ensure that it is always legible by cleaning regularly.



Don't forget to make note of the Serial and Identification number in case of breakdown(s) and or delivery of spare parts.
If your identification plate is damaged, contact us and we will send a new one as soon as possible.

ATEX Markings (if applicable)

When the equipment is suitable for use in potentially explosive atmospheres (ATEX) the type plate will feature an Ex Marking specifying the specific device category and other criteria that the equipment satisfies.

- Code example:  II 1/2D c T130°C Da/Db
- Explanation:

II ➔ explosion group (I is underground mining, II is other)

1/2D ➔ Equipment Category (Ignition protection level: 1 = very high, 2 = high, 3 = normal)

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

1D inside device / 2D outside device

c ➔ Type of Ex protection

c = constructional safety

t = protection by enclosure

h = non-electrical equipment (protection method not specified further)

T130°C ➔ Maximum surface temperature
Da/Db ➔ Equipment Protection Level (EPL).

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

Da inside device / Db outside device

Ta ➔ Ambient temperature range; only displayed when the range deviates from the standard temperature range for ATEX of -20 … +40°C

If the device is externally certified, then the ATEX certificate number is added to the type plate. Next to the CE mark the identification number of the Notified Body that certified our ATEX quality assurance system is displayed.

In case the equipment contains no ‘own ignition sources’ and therefore is not under scope of the ATEX Directive, then the equipment will not get an EX marking and wil be supplied with a Statement of Exclusion, in which this is stated and also the EX zones are listed in which it can be safely used.

ATEX explosive zone measures

- If the device has been ordered for use in a potentially explosive area, make sure that no higher surface temperature arises then permitted by ATEX.

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

  Make sure no particles > 10 mm are present in the product flow.
  These can damage the magnet or extractor bars or cause impact sparks.
  If necessary install a mechanical filter (sieve) before the separating equipment!

- The ATEX certified magnetic device requires additional purchase parts to be certified to the ATEX Directive. This includes control units, connection box(es), switch(es), sensor(s) and pneumatic parts, etc. Make sure that these are fitted by qualified personnel!
- If the device is placed in storage or has a longer standstill, make sure the device is emptied and cleaned.
- The device must be grounded, if a gasket is used between the device and the larger installation. Attach a metal strip between the housing of the device and the installation, to make sure the device is grounded.
- All screw connections inside the device must be secured against loosening.

  The ATEX purchase parts are provided with their own ATEX markings.

Safety

Regularly check that all warning pictograms are still present and legible, and clean if necessary. Make sure that new pictograms are applied at their correct locations if they have been lost or damaged.

General

The device is provided with safeguards where necessary. Make sure every person who comes in contact with the device, wears adequate personal protection (overalls, safety glasses, hearing protectors, helmet, steel-toed safety shoes etc.).
Areas of the device considered dangerous are marked with warning pictograms.
If the device remains easily accessible to persons, then extra safety precautions (e.g. fencing) must be installed. When safeguards are not possible, make sure clear instructions are given to people using the device.

Danger of magnetic field

The magnets generate a powerful magnetic field that strongly attracts ferromagnetic (Fe) materials. Always take into account that these materials may suddenly be drawn towards the magnet, very powerfully. This applies to steel workbenches and steel tools, but also to Ferromagnetic materials carried on your person, such as coins in your wallet or your keys. Make use of non-magnetic tools and workbenches fitted with a wooden worktop and preferably a non-Fe frame (for instance stainless steel).

! Always be aware that Ferromagnetic parts will be attracted - even personal items - if you are closer than 0.3 meter to a magnet.

Danger - strong magnetic field!

! People fitted with pacemakers should on no account enter the magnetic field (within a radius of at least 1 meter).

Prohibited for people with pacemakers!

! Credit cards, chip cards, computer disks/tapes, computer screens, watches, etc. may be damaged or destroyed if they enter the magnetic field (within a radius of at least 0.5 meter).

Danger for magnetic cards!

Danger of external moving parts

The magnets are moved by air cylinders, which are installed externally. Keep your fingers / hands away from the cylinders and magnets during the operation especially during the cleaning process. Do not wear or bring loose garments near to the cylinders and magnets to eliminate the danger of being caught by moving parts that may cause serious injuries.

BEWARE!: The magnets will close against the housing automatically during the electrical malfunction or shutdown. Extra precaution needs to be taken during maintenance routines or emergency situations.

! Under no circumstances should you stick your hands behind the yellow safety covers or the cylinders covers during the déferrisation process.

Danger - being caught by moving parts

To reduce injury risks due to free accessibility areas to workers, an extra precaution of placing fence under the device is highly recommended. Ensure that comprehensive directions are given, possibly supplemented by work instructions, part of which could be formed by this manual.

Danger of high voltage

When installing and electrically connecting the device, make sure the activities are performed by qualified personnel.

! *Switch off the electrical power supply before performing activities to the device!*

Danger – Risk of an electric shock!

Always use the main power switch (on the control box) to switch off the installation in the event of a dangerous situation.
Do not restore power until the dangerous situation has been resolved!

If your cascade is suited with a complete 24VDC control unit and a 24VDC power supply, then the unit on the cascade is not dangerous.

If your cascade is suited with a dangerous power supply voltage – for instance 230VAC / 50 Hz - then take extra care.

Danger of dust explosion

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

! *Make sure that the device complies to the correct explosion category*.

Danger – dust explosion!
(no sticker on device)

Also check if **the identification plates of mounted parts** show the correct Ex-category for the Ex zone in which the device will be used.

Device description

Intended use / user indications

Products

Suited for separation of ferromagnetic (Fe) particles out of large quantities of free flowing powder and granular products, grain size up to **50 mm**, such as grain, sugar, coffee beans, cocoa, etc.

Not suited for use in (moist) products that are (too) sticky and/or badly flowing

Fe parts

Suited for product flows with Fe particles of **0,5 mm** and larger.

Temperatures

Suited for:

- Outside temperatures of -20 °C to +40 °C.
- Product temperatures up to +80 °C when Neoflux® magnets and max. +100 °C when only ferrite magnets are used.

The magnet is to be protected against higher temperatures than prescribed, because the magnet might **lose magnetic force permanently** when exposed to high temperatures

Free space

Make sure that there is approximately 1 meter of free space around the cascade magnet to perform and ease the inspection and maintenance operation.

Noise level

The noise level of the device is less than 70 dB at delivery. Should it become higher, then the device has to be checked on a failure / breakdown immediately.

Pressure inside product chute

Not suited for overpressure or underpressure inside the product chute. If you have overpressure or underpressure in the product chute, please contact our sales department.

Vibrations

The magnet is to be protected against strong external vibrations, because the magnet might **lose magnetic force permanently** and or the brittle ceramic magnet material might break.

The only vibrations caused by the cascade magnet are forced by the moving magnets, when cleaning them, and the flap. The product channel in which the cascade magnet is placed, has to be stiff enough to damp out the forces of these movements.

Cleaning

Minimum 2x per day cleaning (Fe disposal) of the device is advised for an optimal magnetic filtering and to prevent Fe accumulation on the magnets and the problems that can be caused by that. Clean magnets have the best filtering result. So, make sure you clean a little more than you think is necessary, to achieve a satisfactory result of the magnet device.

For dirt cleaning, see chapter *Maintenance*

Use in Ex zone

If this device is made according to an Ex category, then the Ex category is described on the identification plate ➔ see also chapter General \ Identification plate.

Deliverable specials

Higher product temperatures

For higher product temperatures then +80 °C (Neoflux®) or +100 °C (Ferrite) there is the possibility of using other magnet material than these standard magnet materials. For instance Neoflux® High Temp magnets up to 180°C.

Abrasive products

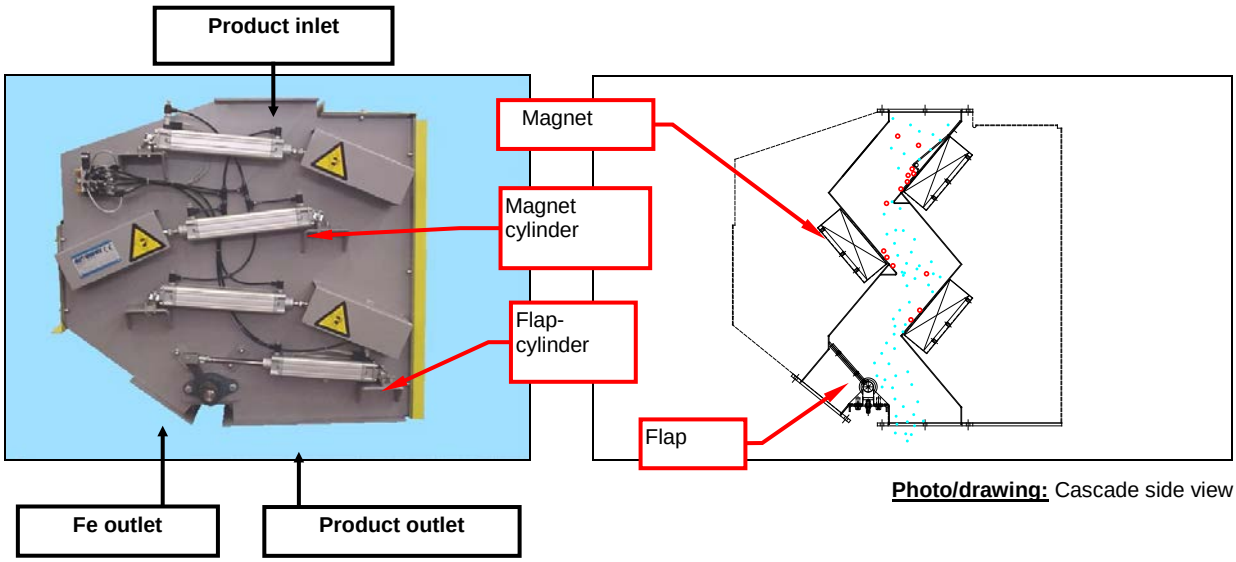
If you have an abrasive product, we can supply the magnets and /or inside housing with a protective coating, like for instance a tungsten carbide or PU coating.

Use in FOOD product flows

The cascade magnet can be adapted so that it can be (easier) used in food streams. It's standard execution already has little gaps in the product channel housing. The product channel (or even complete housing + magnets outside) can be delivered in SS AISI304 or AISI316, or in combination with other – for instance prescribed or delivered by customer – food improved materials. Surface treatments like electrolytic polishing, staining, etc. are naturally possible.

Basic operation

The cascade magnet is specially designed for separation of Fe particles contained in non-sticky, granular and pulverised products, for example in milling plants and hammer mills. Fe particles may damage machine equipment and degrade the quality of the harvest products such as grain, flour etc.



Photo/drawing: Cascade side view

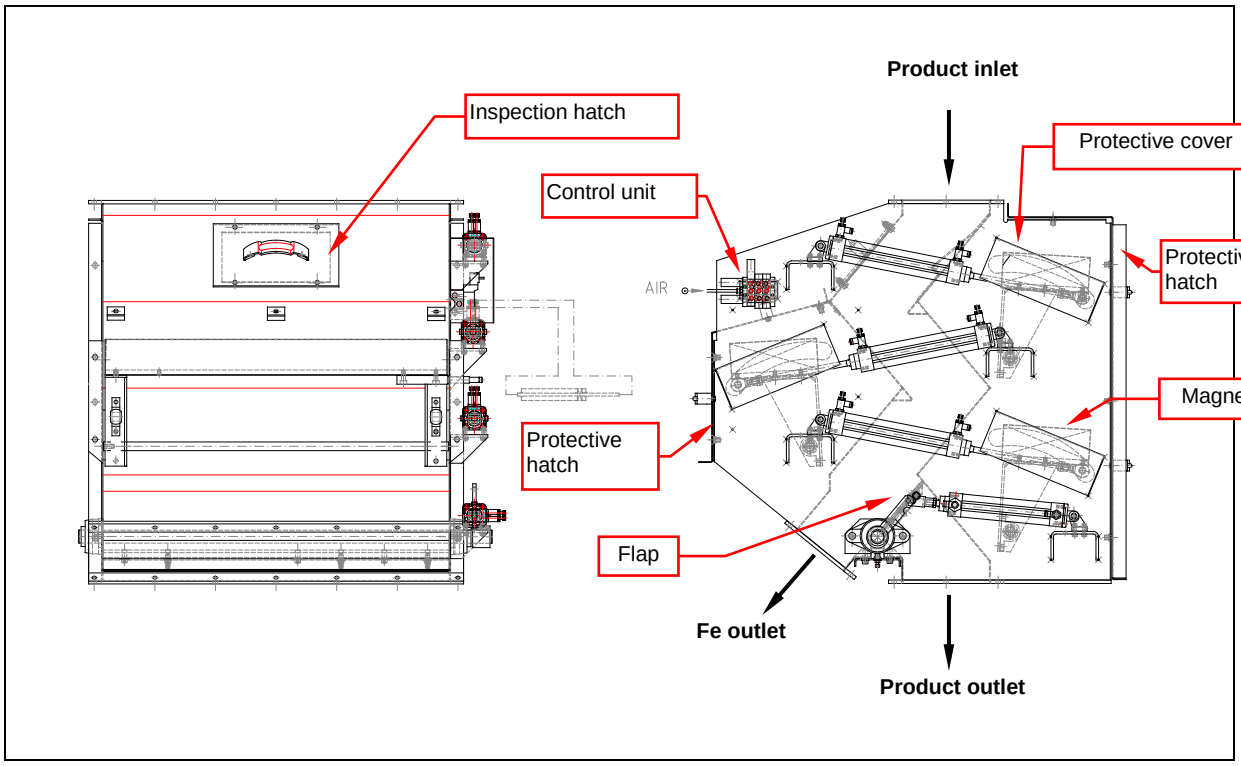
- Product flow enters the cascade magnet through the Product inlet opening
- Product will flow – forced by the shape of the cascade – close near the magnets and therefore have a very good déferrisation grade.

Cleaning the magnets / Fe disposal

1. Stop the product flow!
2. The flap cylinder closes the product canal (after START cleaning signal) by its flap, so no Fe parts are able to fall through it, and opens the Fe outlet accordingly.
3. When the flap is in its closed position, then the magnet cylinders will move the magnets away from the cascade housing. The Fe will fall off the inside housing, down into the Fe outlet.
4. After a certain time (LOGO! control) or when the cleaning signal falls away (sequence control; should stay on for minimum 10 seconds), the magnet cylinders will close the magnets to the cascade housing again.
5. When the last magnet is back against the housing, then the flap cylinder will move the flap back into the production position and close the Fe outlet.
6. Start the product flow!

Regularly cleaning of the magnet will secure optimum déferrisation result. Magnets that are contaminated with Fe lose (part of) their magnetic force!

Construction



Drawing: Pneumatic cascade with sequence control unit

- The cascade magnet is to be connected to the **product inlet- and outlet flange** of your canal construction.
- The cascade is also equipped with an **Fe outlet flange**, to which you can easily mount an Fe outlet construction.
- On the opposite side to where the upper magnet is, an **inspection hatch** is placed. By its opening it is possible to check all magnets.
- A **flap**, placed after the last magnet, shuts off either the product- or the Fe outlet. Problems with the flap are easiest to inspect via the Fe outlet opening.
- 2 big **protective hatches** are optional for protecting you against the (moving or not moving) magnets. Additionally, these hatches protect the magnets against on-falling ferromagnetic parts, which are able to damage the magnets and/or the cascade housing and can cause a worse magnet working.
- At the side plate of the cascade **protective covers** are placed for protecting your fingers against getting stuck by moving cylinders.
- The **control unit** is placed at the side plate of the cascade, at that side where the cylinders are mounted. This unit is standard delivered as a:
  - sequence control unit (3 valves and a zero pressure switch on a magnet);
  - controlled by a logical control interface (Siemens LOGO!) in a Legrand plastic housing and additionally an air preparation unit, both on a stainless steel plate.

ATEX (dust explosion protected) execution

✓ All used materials, produced and purchase parts in specified ATEX execution.

Installation

Placing and transport of the cascade

The cascade magnet is always to be lifted with 4 eye bolts!
Mount these eye bolts at the corner holes of the upper flange.

Due to the unequal weight distribution, the use of all 4 eye bolts on each corner is necessary for a stable lifting process.

Use all 4 eye-bolts!

Drawing: View without protective hatch over the magnet

- Spacious installation area is preferred to ease the transport process.
- Use suitable transport and lifting equipment for transport of the cascade magnet.

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

- Ensure that the outlet and inlet canals are strong enough to support the cascade magnet. If these are not strong enough, then reinforce them before installation.
- Avoid any impacts during transport to prevent damage.
- Clear the area under the magnet during the transport process.
- Bolt the cascade magnet's flanges to the output and input channels tidily to avoid product leakage.

Electrical connections general

Make sure that the electrical power supply is switched off while you work on the device and can't be re-enabled without your knowledge.

Make sure that all electrical connections are made by qualified personnel and conform to all the applicable standards. Check that the device is suitable for connection.

The electrical connection values are indicated on the nameplate and/or on the supplied electrical drawings. Before connection, check the supplied devices for the locally valid connected loads and ensure that the appropriate connection cables are designed for the electrical power to be drawn.

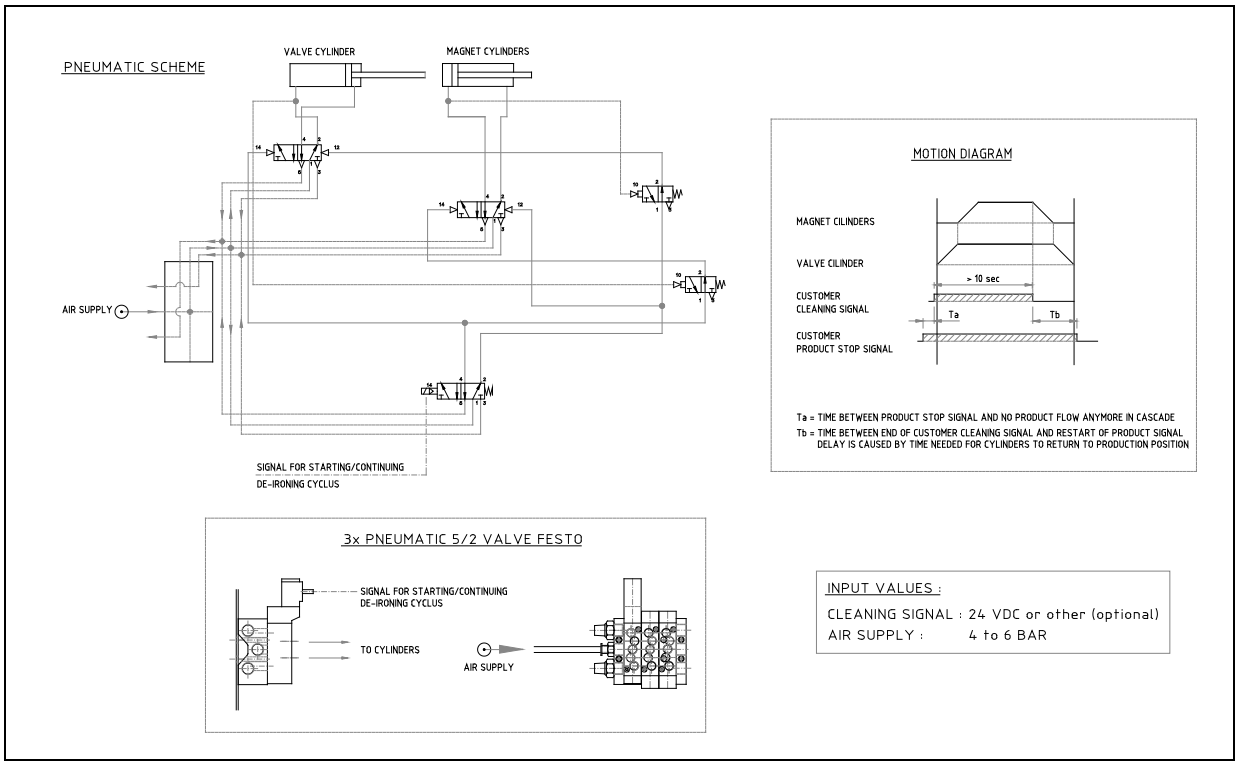
Ensure that all electrical connections are checked/tightened after delivery and regularly thereafter (e.g. once a year).

The connection details of the control box supplied (if present) can be found in the enclosed diagrams.

The cascade magnet Fe separator is equipped with one of 2 following control units:

- **A.** control unit with solenoid sequence control
- **B.** control unit with Siemens LOGO! PLC control

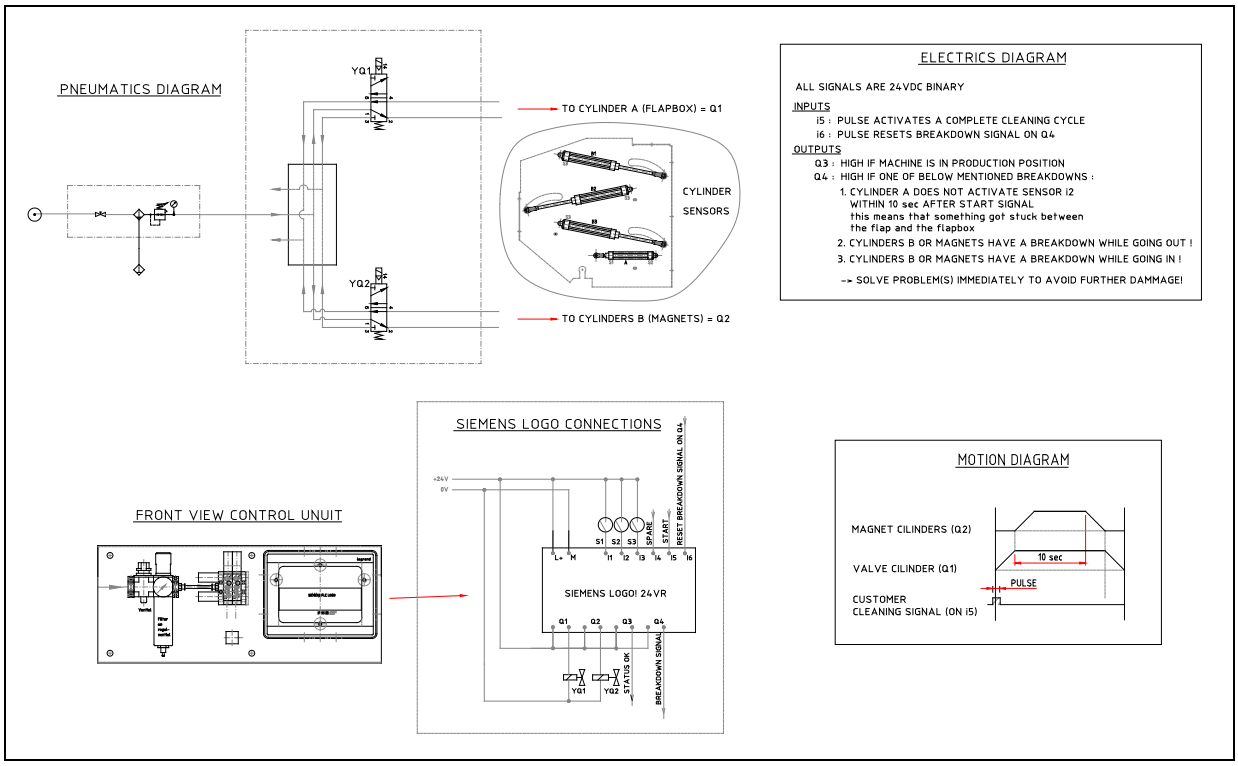
A. Solenoid sequence control unit



The **sequence control unit** is the basic control unit for the cascade. To start the cleaning cycle a signal must be generated of 24VDC or 230V-50Hz (standard options) or other if so specifically ordered, to the solenoid valve. Obviously, to this solenoid you connect your central or local control signal.

Air: The air supply is to be connected to the valve block (4 to max. 10 bar).

B. Siemens LOGO! PLC control unit



The **LOGO! control unit** is the luxurious control unit for the cascade. It consists of an air preparation unit and a LOGO! unit. The LOGO! is a PLC resembling unit from Siemens. The air preparation unit contains a start/stop valve and a filter/reducer.

Advantage to the sequence control unit:

- Possibility for simple modification of cleaning cycle, for instance the time that the magnets are away from the housing;
- The LOGO! generates a failure signal on output Q4 when the cleaning cycle is not working as programmed. This gives extra control possibilities, for instance from a central control room;
- Possibility to (temporarily) modificate or close the air supply by the start/stop valve or the reducer of the air preparation unit.

Connection

Electrical:
On the LOGO!: 24VDC to **L+** and ground to **M**.
If there is no 24VDC available on the spot, but 120/230V-50/60Hz is, then you can use the power supply (Power 1.3) that is mounted to the LOGO!. This power supply can change your supply signal. Connect your supply signal to **L1** for this purpose and **N** to neutral.

Air: The air supply is to be connected to the central valve (4 bar to max. 10 bar).

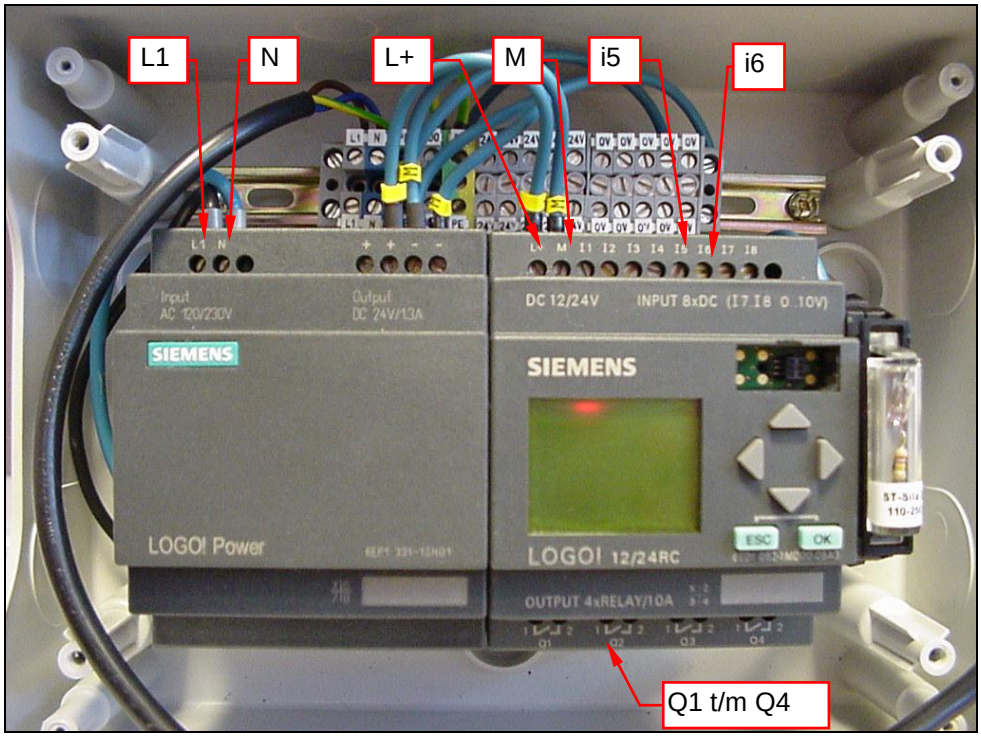


Photo: Siemens LOGO! with Power 1.3 inside control box

Inputs:

- To start the cleaning-(déferrisation-) cycle a start signal has to be given of **24 VDC** on input **i5** of LOGO!
- To 'reset' the breakdown signal on output Q4 a signal has to be given of **24 VDC** on input **i6** of LOGO!.

Attention: *The inputs of the LOGO! are potential bound and therefore need the same reference potential (ground) as the power supply..*

Outputs:

- Output Q1 controls the solenoid that opens/closes the déferrisation flap of the cascade;
- Output Q2 controls the solenoid valve that moves the magnet cylinders;
- Output Q3 creates a STATUS OK, which means that the magnets and the flap are definitely back in their "production position";
- Output Q4 creates a failure signal if:
  - the flap cylinder does not open/close the flap within 5 sec
    time parameter 5 sec. can be changed by changing program block B8
  - the magnet cylinders do not move the magnets away from the cascade housing within 5 sec. after activation
    time parameter 5 sec. can be changed by changing program block B14
  - the magnet cylinders are not back against the cascade housing within 5 sec. after return signal
    time parameter 5 sec. can be changed by changing program block B17

Start-up

Before start-up, make sure that:

- The device or the installation has no damages or malfunctions.
- All connections (electrical, mechanical, pneumatic) have been made properly.
- The device or the installation is placed and situated correctly.
- All protective covers (if applicable) have been fitted correctly.
- That all objects larger than 10mm are blocked from entering the product channel.
- The device is thoroughly cleaned, internally and externally.
- The product does not fall into the magnet device, from a greater height than 10 meters.
- There are no other sources of danger present.

During start-up, make sure that:

- The device or the installation has no damages or malfunctions.
- All other parts of the device or installation function as described.

Maintenance

Magnetic systems attract Ferromagnetic particles. Regular cleaning is essential.
A clean magnet functions considerably better

All parts are best cleaned with pressurized air and/or a soft cloth. It's also possible to deep clean with special cleaning fluids that do not harm the material. Ensure that these fluids do not contaminate the product

Regularly check that all warning pictograms and the identification plate are present at the correct locations on the device. If warning pictograms or the identification plate should get lost or damaged, immediately apply new ones to the original locations.

Always inform operating personnel regarding planned inspections, maintenance, repairs or if attending to breakdowns.

Warnings (see also chapter Safety):

Maintenance should only be executed with power supply and air supply switched off.
Be aware of the magnetic force that will stay active even if the power supply is switched off. Because of this ferromagnetic materials can be attracted towards the magnets if they are close to them. We advise to use non-ferromagnetic tools/materials, like stainless steel 304 or plastic or wood for maintenance and cleaning work. Keep all magnetic sensible products, like watches, magnet cards, credit cards, pacemakers and calculators away from the magnets.

Malfunctions/Service

CAUTION!

Improper handling of the magnet device may lead to damages.
Potential damage to body and or property!

- Any repair to GOUDSMIT magnet devices may be performed by qualified personnel only.
- Be aware that permanent magnets attract ferromagnetic material with great force when it gets in reach of the magnetic field ➔ danger of getting jammed**!**
- Consult GOUDSMIT MAGNETIC SYSTEMS service.

Malfunctions

In case of malfunctions, consult the following table in order to determine the cause of the malfunction and its possible remedy. In case a specific malfunction can't be found in the table, consult the GOUDSMIT Magnetic Systems service.

Malfunction	Possible cause	Possible remedy
Magnet does not separate ferromagnetic (Fe) particles, or separates them badly	Not separated particles are not ferromagnetic	Check if particles expected to be separated are ferromagnetic using a permanent magnet
	Overloaded magnet(s)	More often clean the magnet(s) of separated Fe particles.
	Magnet is not closed against the housing properly	Adjust air pressure on the magnet cylinder(s) (advise = 4 to 8 bar, max. = 10 bar)
		Clean the closure sides surfaces of the magnet(s) and housing
Fe disposal flap of integrated flap box is not closing properly	Blockage of Fe and/or product outlet	Remove parts that are blocking the outlet(s)
Fe disposal flap is not moving properly	Air pressure is low or off.	Set air pressure or adjust the air pressure on the flap cylinder (advise = 4 to 8 bar, max. = 10 bar)
	Flap moves with too much friction	Check the flap's closing rubber. If the rubber is broken, then exchange it with a new one.
	Air cylinder has severe wear	Revise/replace cylinder
Magnets do not move or do not move in/out as far as they should	Air pressure is low or off	Set air pressure or adjust air pressure
	Air cylinder is worn out	Revise/replace cylinder

Customer service

Please have the following information available if you require customer service assistance:

- Identification plate (complete)
- Type and extent of the problem
- Time the problem occurred and any accompanying circumstances
- Assumed cause

Spare parts

As a result of the robustness and quality of **GOUDSMIT magnetic systems** products the device possesses high operational reliability.

When however a specific component requires replacement, the correct component can be ordered by quoting the type number stated on the *identification plate* or on one of the drawing(s) added to this user manual in the added data sheet.

The spare parts are mostly wear parts, such as:
bearings, cylinders, flap wear plate and rubber parts.

Following mutual consultation Goudsmit magnetic systems will arrange rapid and correct delivery.

Storage and Dismantling

Storage

If the device will not be used for a long period of time, we advise to store the device in a dry, safe place and to conserve fragile and/or sensitive parts.

Dismantling / scrapping

On scrapping and/or disposal of the device's parts separately, take into account the different nature and dangers of the components (magnets, iron, aluminium, electrical parts, insulating materials, etc.) and ensure safe disposal. Preferably entrust the task to a specialised company, and always observe the local regulations in regard to disposal of industrial waste.