

# Installation, Operation and Maintenance Instructions



## MODEL FF4 METAL SEPARATOR

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WORLD AUTHORITY IN ADVANCED TECHNOLOGY FOR MAGNETIC, VIBRATORY and INSPECTION APPLICATIONS

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# Introduction

The texts and illustrations in this instruction manual are for the exclusive purpose of explaining how to operate and handle the metal separator. Based on the data in this instruction manual the manufacturer accepts no responsibility for direct or consequential damage resulting from the use or misuse of this equipment. All appropriate safety rules and regulations for the use of this equipment must be adhered to. If you should have any questions with regard to the installation and operation of this equipment please do not hesitate to contact us.



## **CAUTION**

**Safety labels must be affixed to this product.  
Should the safety label(s) be damaged, dislodged  
or removed, contact Eriez for replacement.**

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# General Information

## FIELDS OF APPLICATIONS

The FF4 Metal Separator is used for the inspection of gravity-fed bulk materials in the plastics and food industry. It detects all magnetic and non-magnetic metal contaminants (steel, stainless steel, aluminium) even if they are encapsulated in the product. Metal contaminations are separated by the reject unit. The FF4 Metal Separator primarily is used in industries with no or low hygienic demands; non-washdown applications.

## APPLICATION REASONS

- Product liability
- ISO 9000
- TQM (Total Quality Management)
- Protection of machines and quality assurance

## SYSTEM IDENTIFICATION

The information in this instruction manual only applies to the FF4 Metal Separator. A label with the respective data is attached at every system.

## SYMBOLS USED

Symbol	Signal Word	Meaning
	Danger	Warning: Possibility of severe or even fatal personal injuries.
	Danger	The lightning symbol is an explicit warning that there is danger from electric current.
	Warning	Warning: Possibility of minor personal injuries or property damage.
	Caution	Warning: Possibility of defects or destruction of the equipment.
	Important Information	Indicates important information for the function.
	Important Hint	Indicates an important hint for the function.

## IMPORTANT FUNCTIONAL NOTES

The stated detection sensitivity (ferrous ball Ø in in/mm) applies for nonconductive products at the standard operation frequency and refers to the center of the detection aperture (most disadvantageous position). Products that show intrinsic conductivity due to moisture content, electrolytes or other conductive contents may reduce the sensitivity as well as variations of product temperature, environmental effects (mechanical shocks and vibrations, electromagnetic pollution) or the set product angle. The detectable size of metal particles depends on their nature, shape and position while passing the metal detector. The metal separator is designed and built to provide optimum detection and separation of metal contaminants.

However, it is important to be aware of the circumstances in which metal detection may be compromised when conveying and processing bulk materials.

- Accumulation of metal residues.
- Accumulation of metal particles in a batch of bulk material. This may occur with ground or shredded material if a larger metal piece has been ground.
- Turbulence in the reject unit and reject flap reaction time.
- If there is an accumulation of metal particles the flap cannot react to the control signals without delay, this occurs when recycled or reground material is processed, even when blended with virgin material.
- Conveying rate or fall velocity too high or too low.
- Type, size, and position of the metal contamination.



## IMPORTANT INFORMATION

**For these reasons no general guarantee can be given that the unit will operate with 100% accuracy.**

For bulk materials containing a high proportion of metal contaminants it is recommended that two separators are connected one after the other and additional permanent magnets are installed in freefall pipes or hoppers. Contact your local Eriez representative for further information on these products. Suitable metal separators and magnet systems are also available for pre-separation in vacuum and pressure pipes.



# Design & Method of Operation

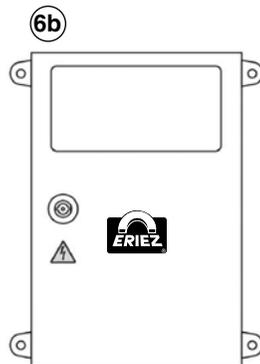
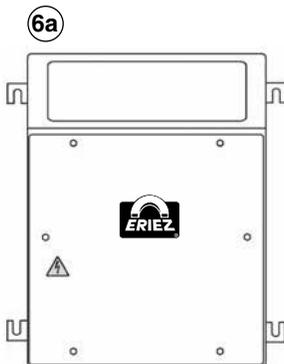
## CONTROL ELEMENTS/COMPLETE UNIT

### BASIC ELEMENTS

- ① Inlet
- ② Reject outlet
- ③ Good material outlet
- ④ Detection unit
- ⑤ Diverter unit (rotating)
- ⑥ Control unit G (6a) or S (6b)

### ACCESSORIES (NOT SHOWN)

- ⑦ Signaling device (audible alarm, visual alarm or combination alarm)
- ⑧ Intermediate pipe for larger fall heights
- ⑨ Filter control valve
- ⑩ Counter (detection counter) in a separate housing
- ⑪ Button for manual rejection in a separate housing
- ⑫ Button for functional test in a separate housing
- ⑬ Test samples
- ⑭ Compressed-air monitor in electronics housing
- ⑮ Monitor system for separation unit
- ⑯ Cable set for remote control unit 9.84', 19.69', 32.81', and 49.21'. (3 m, 6 m, 10 m and 15 m)
- ⑰ Bulk material temperatures of up to 284°F (140°C)
- ⑱ Direct contact with food
- ⑲ Enhanced wear protection



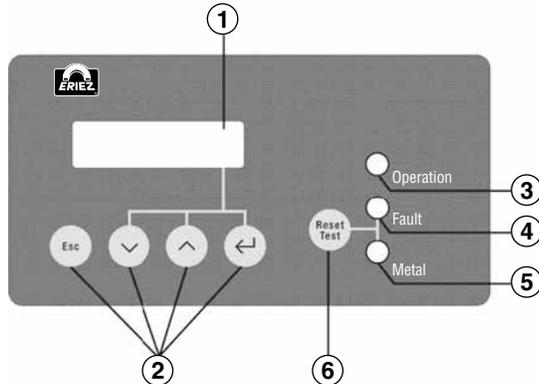
# Design & Method of Operation (cont.)

## CONTROL ELEMENTS/CONTROL UNITS

The FF4 Metal Separator can be equipped with two different control units.

### CONTROL UNIT - S

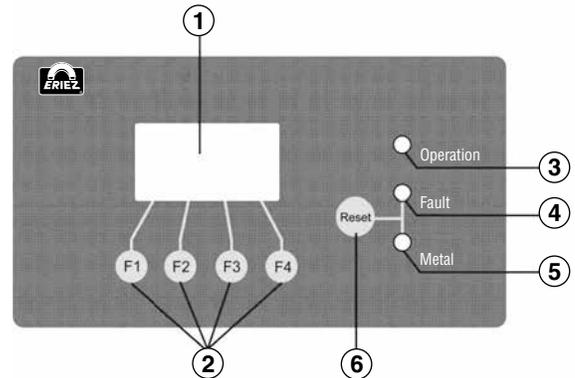
Used mainly in food and plastics industry. Equipped with 28 product memory.



- ① LCD-display: two-line, 32-digit display
- ② Operator keys: ESC, UP, DOWN and ENTER
- ③ Green lamp: Operation
- ④ Red lamp: Fault
- ⑤ Yellow lamp: Metal
- ⑥ Function key: Reset/Test

### CONTROL UNIT - G

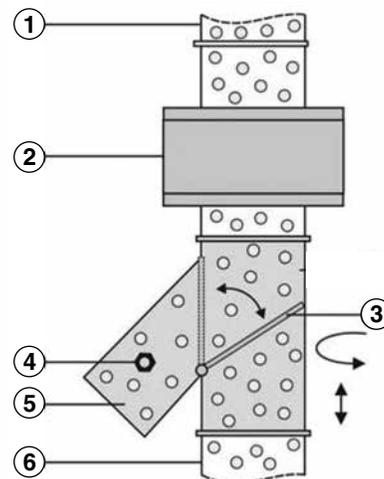
Used mainly for food and pharmaceutical industry applications. Equipped with 200 product memory.



- ① LCD display
- ② Function keys F1 - F4
- ③ LED: Operation (green)
- ④ LED: Fault (red)
- ⑤ LED: Metal (yellow)
- ⑥ Resetting of the metal and alarm signal

## FUNCTIONAL PRINCIPLE DESIGN

Metal separator comprising two modules, a detection module with the attached control unit S or G and a separation module connected by a pull ring. Inlet and outlets made according to Jacob pipe system.



*Note: The diverter is shown in reject position.*

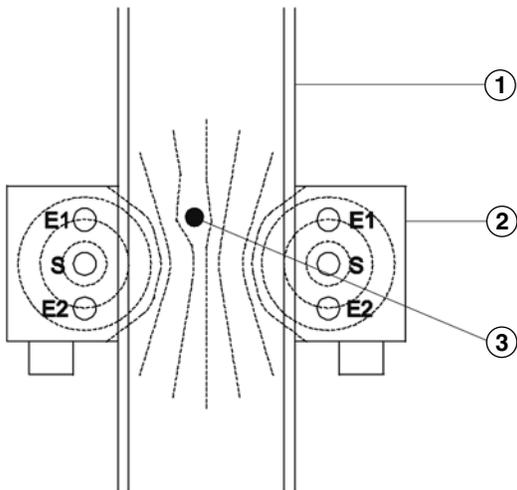
- ① Inlet
- ② Detection coil
- ③ Diverter flap
- ④ Metal impurity
- ⑤ Reject outlet
- ⑥ Material outlet



## TECHNICAL DESCRIPTION

The FF4 Metal Separator is used to inspect bulk goods under free-fall conditions. It detects all magnetic and non-magnetic metal contaminations (steel, stainless steel, aluminium) – even when encapsulated in the product. Metal contaminations are rejected through the “Quick Flap” reject unit (See Important Functional Notes).

Detection is performed by a search coil that comprises a transmitter and two receiver coils and operates according to the transmitter-receiver principle. The excitation frequency for the transmitter coil is between 16 kHz and 300 kHz. Identical voltages are induced in the two receiver coils on the left and right side of the transmitter coil. When a metal particle passes through the search coil, it unbalances first the inductive field of receiver 1 and then of receiver 2. These small voltage changes are evaluated by the control unit, which generates a metal signal and triggers a separation process.



- |                          |                    |
|--------------------------|--------------------|
| ① Scanning pipe          | Ⓔ Receiver coil 1  |
| ② Detection coil housing | Ⓕ Receiver coil 2  |
| ③ Metal contaminant      | Ⓖ Transmitter coil |

Due to their intrinsic conductivity that is caused i.e. by moisture, metal oxides, grease, salts, etc. many bulk materials have a so-called “product effect.” For being able to detect metal contaminations the control unit must suppress or reduce this product effect. This “suppression” of product effects may lead to a reduction of the stated scanning sensitivity.

## DIMENSIONS & TECHNICAL DATA

Technical data sheet, see annex.

## SUPPLY CONNECTIONS

Technical data sheet, see annex.

## ENVIRONMENTAL CONDITIONS FOR OPERATION, STORAGE, AND TRANSPORT

The environment of the metal separator should be dry, dust-free, free of vibrations, of other influencing magnetic fields, of chemical vapors such as softeners, chlorine and similar substances. The metal separation unit must not be exposed to direct sunlight or to other environmental influences (rain, snow, storm). For ambient temperature conditions for operation, storage, and transport, please refer to the technical data sheet in the annex.

## NOISE LEVELS

Sound pressure level measurements  
(in acc. with DIN 45 635).

Peak value of sound pressure level at a distance of 3.28' (1m) from the machine surface and 5.25' (1.60m) above the floor, LpA, 3.28' (1m), max.

### Result:

Idling: < 70 dB  
Activated: < 90 dB

**We reserve the right to change the contents due to product innovation or technical improvement.**

# Safety

The manufacturer equipment conforms with all official technical safety regulations. However, as a manufacturer we believe it is our duty to make you aware of the following information.

## WARNING

The following safety and danger notes are intended for your protection, for the protection of third parties, and for the protection of the equipment. The safety notes therefore should always be observed! Please also observe the chapter on safety in the operating instructions of the control unit!

## INTENDED USE

The equipment is designed for the use in gravity feed conveying systems for the food, chemical and pharmaceutical industry, as well as other industries with similar applications. Feeding and outlets for the material to be inspected have to be installed carefully. The free fall height of the material should not exceed 17.71" (450mm) for the FF4G versions. The free fall height of the material should not exceed 19.69" (500mm) for the FF4S versions. Inlets and outlets should be connected to funnels, hoppers, pipes etc. to avoid injuries of hands during operation.

No chemically aggressive bulk material should be fed through the equipment. Ensure that the installation area is free from steam, plasticizers or other materials that may damage the PVC cable sheathing.

If there is a high proportion of metal contaminants or the bulk materials being inspected are abrasive, it is likely that any surfaces in contact with the product (i.e. scanning pipe) will show signs of wear and tear (i.e. reject flap, pneumatic cylinder etc). In this case it is important that surfaces in contact with the product (i.e. scanning pipe, adaptors, reject device, drive unit, etc.) are checked at regular weekly or monthly intervals. Worn parts must be replaced immediately to ensure the machine functions properly.

**Please note that any preventative measures which may have been taken at the time of construction will merely delay the onset of wear and tear but will not eliminate it completely. The metal separator may only be operated with a corresponding Control Unit.**

## SAFETY SIGNS

Warning signs attached at the system:

The purpose of these symbols is to draw the attention of the system operator to the text of the respective safety notes.

Symbol	Signal Word	Location	Meaning
	Mains voltage	Cover of the electronics housing	This symbol indicates that mains voltage is used in the electronics housing, and that any connected external circuits (i.e. at the metal relay) also may be energized. There is danger of electric shocks due to the presence of mains voltage.
	Danger of crushing	Normal outlet, reject outlet	This symbol refers to risks for the hands on account of the pneumatically operated diverter flap.
		In the pneumatics housing	This symbol indicates that there is danger of crushing your fingers due to the movement of the pneumatic cylinder.
<b>Option: High temperature version</b>			
	Burn hazard	Pipes	This symbol indicates that at the pipes there is danger of burning due to the high product temperature.

** DANGERS ARISING FROM NON-COMPLIANCE WITH SAFETY NOTES**  
Any non-observance of safety notes constitutes a danger for life and health.



### **SAFETY INFORMATION FOR OPERATORS**

The FF4 Metal Separator may only be operated in the intended purpose and in a perfect functioning condition, especially all the covers have to be closed during operation. When the reject flap is operating there is danger of crushing your fingers. With passage openings larger than 2.76" (70 mm), it is possible to reach into the danger spot. Therefore, a pipe of 1.64" (0.5 m) must be flanged at the inlet, and pipes of 2.95" (0.9 m) at the outlets, or other measures must be taken to prevent any reaching into the reject mechanism. If the product temperature is higher than 140°F (+60°C) there is danger of burning at parts in contact with the product. It is recommended to use a kind of enclosure or another measure to prevent touching of the danger spots. All the safety and warning signs at the system must not be removed and must be kept in well recognizable condition. The operating instructions always have to be in a legible condition and complete available. The owner may only appoint qualified personnel for operation, maintenance and repair work. During works on the pneumatic or the electric section power supply and compressed air supply have to be interrupted or disconnected.



### **SAFETY INFORMATION FOR COMMISSIONING, OPERATION, MAINTENANCE AND CLEANING**

The mechanism of the separation unit is covered by a screwable protective cover. Due to the cylinder movements there is danger of hand injuries in the separation unit. If the protective cover of the separation unit is removed, the compressed air supply must first be interrupted and the air tubes must be vented. Compressed air supply may only be connected again after the protective cover has been successfully closed again. The protective cover of the separation unit must always be kept closed during operation.

When the reject flap is operating, there is danger of crushing between reject flap and the housing panel. During operation all the protective devices that prevent any reaching into the inlet, normal

outlet, or reject outlet must always be attached. The reject unit must be firmly connected to the conveyor pipe. If the separation unit or protective devices are removed from the conveyor pipe for maintenance or cleaning purposes, the compressed air supply must first be interrupted and the compressed air tubes must be vented. Compressed air supply may only be connected again when the protective devices have been attached again and the separation unit has been successfully mounted to the conveyor pipe again.



### **WARNING**

If the reject unit should be removed from the conveyor pipe for maintenance or cleaning purposes, always observe the following information relating to the own weight of the reject unit. Always first support the reject unit with suitable lifting means, and only then loosen the fastening screws at the clamping ring.



### **BURN HAZARD**

In case of product temperatures of more than 140°F (+60°C) there is danger of burning at parts in contact with the product. During operation, suitable protective facilities must be attached that prevent any touching of the danger spots. The product flow must be interrupted before any maintenance or cleaning work is started. Any such work may only be performed after the parts in contact with the product have cooled down.



### **SAFETY INFORMATION FOR INSTALLATION AND DISMANTLING**

In case of incorrect installation, the own weight of the machine may lead to personal injuries. Always use suitable lifting means to transport the machine to the intended place, and screw it to a wall, ceiling, or frame using the four fastening screws. Only remove the lifting means after all four fastening screws have been tightened. Dismantling is done in reverse order.



### **SAFETY INFORMATION FOR STORAGE AND TRANSPORT**

Always observe the information in Shipping, Preservation, Waste Disposal, Transport and Storage to avoid any transport damage and personal injuries.

## Safety (cont.)

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### NOTES OF RESIDUAL RISKS

Possibly installed compressed air tanks can still contain pressure in spite of interruption of compressed air supply. Where appropriate, vent!



### NOTES ON STABLE STANDING REQUIREMENTS

To avoid any loss of stable standing, the information for transport, commissioning and operation must always be observed. If the metal separator is not mounted at a wall, it is to be stored in lying condition.



### CONSEQUENCES OF UNAUTHORIZED MODIFICATION

In case of unauthorized modification or repair work, all the declarations and guarantees given by the manufacturer will become void.



### INADMISSIBLE OPERATION

The FF4 Metal Separator is not intended for any other applications than mentioned under Intended Use – any other applications will be regarded as inadmissible operation.

Inadmissible is the operation out of the specifications given in the technical data and the operation under high mechanical static or dynamic loads (i.e. heavy system parts or strong vibrations). Also inadmissible is the examination of aggressive materials such as materials containing alkaline solutions, acids and solvents, of materials that are sensitive to electromagnetic fields, and of living people and animals.

The standard version of the metal separator must not be operated in explosive “hazardous environments”. Operation in explosive “hazardous environments” only is permissible with the special Atex version of the metal separator, which is dealt with separately. Contact the factory for details.

It is possible to also use the system in other applications than the intended use stated herein, but such applications always require the prior consultation and approval of Eriez Manufacturing Company.

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## Installation Advice

### MOUNTING

- Use only the provided bore holes to fasten the device. See operating instructions.
- The place of installation has to be as stable as possible.
- Please be sure to abide by the stated fall heights of these units; see technical data sheets.
- In case of strong vibrations, connect the device via flexible collars.
- The contaminated bulk material (reject) must flow without disturbance into a close, de-aerated container (no backlog).
- The fitting position is vertical. Angular installation can lead to erosion in parts of the detection pipe.
- Detection and separation unit are separated for the FF4 Metal Separator. Advantage: Should the free-fall height exceed the defined limits, the Jacob pipe work above the rejection unit (point 5) height adjustment. For adjustment of the pipe work, please contact Eriez.
- The separation unit is turnable and can be adjusted to the position of the reject container.
- Outdoor protection: The metal detector must be protected from rain, snow, sun, and other weather effects if installed outdoors.

### PRODUCT TO BE INSPECTED

- The bulk material has to pass the metal separator in free-fall. Please prevent backlogs.
- No pressure to be used for material feed.
- Products with product effects (conductivity of bulk material e.g. caused by dampness) can affect the sensitivity, depending on the intensity. Pre-analysis of material samples in our laboratory is recommended.
- Depending on intensity, the product effect and required sensitivity, the S and G control units can be used.
- Maximum bulk material temperature of 176°F (80°C). For higher material temperatures, suitable machinery options are available.



## AMBIENCE

- The equipment meets the CE-guidelines, which includes particularly the EMC standards. This standard, EN 61000-6-2, sets the intensity of magnetic stray fields to 30 A/m. Do not mount the equipment close to electromagnetic noise sources like electric motors, power supplies for electric motors, and power frequency converter drives.
- Avoid big moving metallic parts close to the detector head like chain drives, rollers or even a fork lift.
- When using two or more detectors in one room or hall, detection performance might be influenced.
- Ambient temperature 14°F to 122°F (-10°C to 50°C).

## ELECTRIC INSTALLATION

- Static: To prevent detection faults, please be sure to ground the device on the designated spots (see manual).
- The control unit is not to be integrated into other switchboards as this might cause technical failure.
- When running connection cables, please be sure to separate them from other cables and use tubes or cable trenches.
- Connection cables (special cables) between detection coil and evaluation electronic must only be changed in agreement with Eriez.
- For all cables leading outside, only use screened cables. Screens are to be connected directly to the cable connection of the housing.
- Mains cable and cable connections must not be removed – component of the EMV concept. Should the mains plug not be required, a joint box is to be used.
- Do not run actuation feeders and control cables near the device.
- Operational voltage, protection type and further technical data (see data sheet).
- For different mains voltage, a suitable transformer (external housing) is to be used.

## PNEUMATIC CONNECTION

- Air pressure 87-116 PSI (6-8 bar).
- Filtered compressed air, free from water and oil.
- Air pressure connection, pneumatic hose .24"/.31"(6/8mm).
- Air pressure usage, depending on type of device, between .11 and .71 gals (0.4 and 2.7 liters) per switching operation.

## IMPORTANT INFORMATION ON MACHINERY USE

The metal separator offers highest security for detection and rejection of metal contamination. The device was designed for the control of bulk material and **not** for sorting purposes.

In case of a high amount of metal contamination within the bulk material, the number of metal detections increases, which might cause the reject flap, actuation, etc. to abrade. The loss of "good material" increases accordingly.

Even in case of successful metal detection, metal contamination might not be rejected due to the following:

- Occurring metal herds: Aggregation of numerous metal particles in a charge of bulk material. Often found during grinding and milling of bulk material when a larger metal piece was crushed.

The following numerous detections and switching cause swirls in the separation unit.

- Reaction time of pneumatic cylinders (to operate detection flap) in case of numerous, quickly following detections.
- Backlog in metal separator (separation flap hits product column).
- Conveyer pipe highly filled.
- Conveying or fall speed too fast.

Due to these circumstances, a guarantee for 100% metal separation in all cases cannot be given.

For bulk material with high metal contamination, two solutions have proven to be most effective:

- Pre-separation of metal with the use of a magnetic Grate-In-Housing.
- The use of two or more free-fall metal separators to a cascade.

Please also refer to our storage, installation, and activation directives in the manuals.

# Installation

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## MECHANICAL INSTALLATION

**Only connect the compressed air supply when all the covers have been closed, all the required protective measures have been taken, and the machine has been properly installed in the conveyor line.**

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It is important to pay attention to the following items:

- **The free fall height** of the fed product should not exceed the value stated in the technical datasheet.
- Solid and vibration-free mounting.
- Avoid electromagnetic interferences in the surrounding of the detector, i.e. caused by electric motors, frequency converters, power lines etc.
- Carefully install the cables of the pneumatic valve and detector head. Do not bend the cable and do not damage the PVC insulation.
- Indoor mounting and operation (cover and on site weather protection is necessary).
- Provide working platform for maintenance and repairs.
- Prevent electrostatic charging by earthing the frame.
- Apertures of more than 3.15" (80 mm) must be connected to an inlet pipe of 1.64" (0.5 m) and outlet pipes of 2.95" (0.9 m) (or other preventative measures must be taken) to prevent anyone reaching inside.

**NOTE:** It is recommended to place a lockable opening in the pipe in front of the detector (inlet). This opening allows to put in test samples for performance checks of the equipment.

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## CONNECTIONS

**Electrical work should only be carried out by qualified personnel. Before removing cover plates etc. make sure the equipment is isolated from mains or external voltage.**

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- Ground the frame of the metal separator at the grounding terminal.
- Check the cable connection to the pneumatic valve and detector head.

- Connect the air supply.
- Check the air pressure. Adjust it to 87 PSI (6 bars) if necessary.

**NOTE:** Reliable metal separation is only guaranteed if the air pressure always is above 72.5 PSI (5 bars). For electrical power connection see attached manual for the control unit.

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## SETTING OF OPERATING PARAMETERS

**Close the cover of the control unit and the cover of the reject mechanism.**

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After correct installation and connection of power supply voltage (115 VAC or 230 VAC; 50/60Hz) and compressed air 87 PSI (6 bars) supply, check the reject mechanism manually by activating the pneumatic valve (S Control, test button; G Control, use menu command).

Activate the conveying and adjust the metal detector such (see operating instructions of the respective control unit) that no malfunctions occur. If appropriate, eliminate reasons for malfunction.

Convey a suitable test sample, i.e. a plastic ball with included metal part of the desired size, which should be rejected. If necessary, adjust the reject duration time.

# Errors & Fault Rectification

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## WARNING

**If products should get jammed, disconnect the system from the mains supply and turn off the compressed air supply and vent the air tubes. The jammed products can then be removed without danger.**

## WARNING

**If you should have any questions, or if there should be any malfunctions, please contact Eriez Manufacturing.**

## WARNING

**If you have any questions, please state the equipment type and serial number!**

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# Maintenance

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## WARNING

Prior to any maintenance and cleaning work, disconnect the device from the mains supply and turn off the compressed air supply and vent the air hoses. Always observe the safety information.

## IMPORTANT INFORMATION

If there is a high proportion of metal contaminants or the bulk materials being inspected are abrasive, it is likely that any surfaces in contact with the product will show signs of wear and tear (i.e. reject flap, pneumatic cylinder etc).

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## GENERAL NOTES

In appropriate periods of time (i.e. every week or month):

- Perform a visual inspection of all the parts in contact with the product, such as scanning pipe, transitions, reject mechanism and drive elements.
- Replace worn parts to ensure proper function.
- Check all the screws and nuts for tightness, and tighten them if necessary.

## CLEANING ADVICE

Please ensure you follow the instructions below.

- Specific machine components must be cleaned with specific substances. Please use the correct materials and clean at regular intervals as suggested.
- Prior to any cleaning work, disconnect all the supply lines and the compressed air supply.
- If the building is being cleaned, ensure the machines are covered up.

The following must not be used for cleaning:

- Sharp, hard or pointed objects.
- Water or steam jet appliances.
- Compressed air.
- Hazardous and solvent-containing materials.
- Cleaning agents that may attack the materials used.

## CLEANING INSTRUCTIONS

- Cleaning the metal separator:  
We recommend cleaning the “food” area with a soft, lint-free cloth using warm water and the appropriate cleaning agent. After cleaning, wipe up any remaining water with a dry, lint-free cloth.

From time to time treat the stainless steel body with a maintenance oil such as i.e. Nirostol 55 (food-compliant polishing and maintenance oil).

- Cleaning the separation unit:  
First remove the cover of the diverter unit. The pneumatic components are now accessible and can be checked cleaned or replaced. If the diverter flap has to be replaced, remove first the reject outlet pipe adapter. Remove then the spring locked bolt between lever and pneumatic cylinder. Unscrew the center bolts in the shaft pieces left and right side and remove the shaft pieces. The diverter flap can be removed through the reject outlet. The reassembling is done in the reverse order.

Condensate in the maintenance unit of the compressed air line must be drained in regular intervals.

## CARE ADVICE FOR STAINLESS STEEL

Only high-quality stainless steel is used in the systems. To prevent rust on the high grade steel parts, do not use substances containing chloride (i.e. cleaning or disinfecting products) or operate the machine in an atmosphere containing chloride. If this is unavoidable, the steel parts must be thoroughly rubbed down immediately afterwards with cleaning oil i.e. Nirostol 55 cleaning and maintenance oil.

## IMPORTANT INFORMATION FOR STAINLESS STEEL MODELS

Stainless steel models are extremely weatherproof and are, therefore, able to withstand most environmental conditions. However, even stainless steel can be susceptible to a slight film of rust. These deposits are caused by contact corrosion and can be removed by following the instructions below:

- Use a stainless steel cleaner. In principle, any stainless steel cleaner may be used. Please ensure you read the instructions prior to use.
- Use only cleaning agents that are halogen-free (i.e. without chlorides and fluorides), and salt and hydrofluoric acid free.
- After each cleaning, rinse the machine thoroughly with tap water.
- Do not use the following: non-alloy materials or substances, abrasive cloths, cleaning agents containing salt or hydrofluoric acid, chrome, silver or brass cleaners.

## Maintenance (cont.)

### PERFORMANCE CHECK

The performance check of the control unit is carried out by pressing the test button (optional on control unit G) or by selecting the respective menu item in the control unit G. It is recommended to use a test ball containing a test piece that is inserted into the conveying pipe. This procedure ensures that both the detection and the separation unit are checked. If the unit works properly the test ball must be separated.

The interval for the performance check depends on the contamination level of the inspected bulk material and on the specifications of quality assurance.

If necessary, a performance check should be performed every day, the minimum interval is every two weeks.

## Spare Parts

If you should have any questions, please give equipment type and serial number!

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### IMPORTANT INFORMATION

Spare parts and wearing parts must always be obtained from the manufacturer or a supplier that is certified by the manufacturer.

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Contact Eriez for assistance.

## Shipping, Preservation, Waste Disposal, Transport, Storage

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### SHIPPING, PRESERVATION, WASTE DISPOSAL

#### WARNING

Choose packing that is suitable for the type and size of unit, taking into account whether the shipment is for export by sea or airfreight, or for national or international road transport. The packing material must protect the goods from all damage under normal transport conditions.

#### WARNING

Depending on the size, weight and nature of the goods, packing in cardboard boxes, boxed pallets etc. is only suitable for road transport. Use reinforced cardboard, corrugated cardboard, blister packing and shredded paper to fill and protect the goods.

Electrostatic sensitive components (electronic boards, electronic modules, etc.) must be packed in antistatic foil or foil bags prior to packing! (This is essential!) Stick additional warning labels on the outside of the packaging (i.e. "Attention, electronic equipment, do not drop," etc.) The packing should be sealed with adhesive tape and, where the weight exceeds 110 lbs (50 kg) additionally with wrapping tape.

#### WARNING

When packing for international road transport, use the instructions above. Larger and heavier shipments must also be protected as for export in wooden crates. Care must be taken to ensure that the goods inside the package are protected against corrosion. Any parts that will corrode easily must be wrapped in oil paper or corrosion-protective foil. Care must be taken to prevent the components from moving around within the packaging.

#### WARNING

International air freight shipments must be packed in wooden crates or on export pallets. Care must be taken that the goods are secure and well protected inside the packing. Any parts liable to corrode must be wrapped in oil paper, protective foil or sprayed with anti-corrosion spray.

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**⚠ WARNING**

Sea freight must be packed in seaworthy export crates. These crates can be obtained from specialist suppliers. The crates must be lined with oil paper to make them resistant to sea water and prevent corrosion. In addition, the goods must be protected against corrosion by use of a spray or be wrapped in protective foil. Care must be taken to ensure that the goods cannot move around inside the crate. After packing, the sea freight crates must be properly closed. The sea crates must also be fastened externally with securing tapes. During loading, care must be taken not to damage the external packaging. The carrier must certify that the shipment has been accepted and loaded correctly by detailing this on the bill of lading, loading list, etc.

**⚠ WARNING**

Waste disposal: Observe the national waste disposal regulations.

**TRANSPORT**

**⚠ WARNING**

- In order to avoid injury or damage to the unit, it must be handled properly. In addition to following the instructions below, general health and safety, good practice, and specific accident prevention guidelines should be observed.
- For correct handling and storage, comply with the following symbols:

Symbol	Signal Word
	Protect against moisture
	Careful: glass
	Up
	Center of gravity

- Do not lift the metal separator at the reject mechanism.

- For lifting, attach strong lifting straps at the frame of the metal separator.
- Do not compress the side walls of the unit or any attached parts by pulling obliquely on ropes or chains.
- Only remove handling safeguards once all installation work has been completed.
- When handling in a loading area, make sure the unit cannot topple over or slip.
- Damage caused during transportation must always be reported to the manufacturer.

**STORAGE**

**⚠ WARNING**

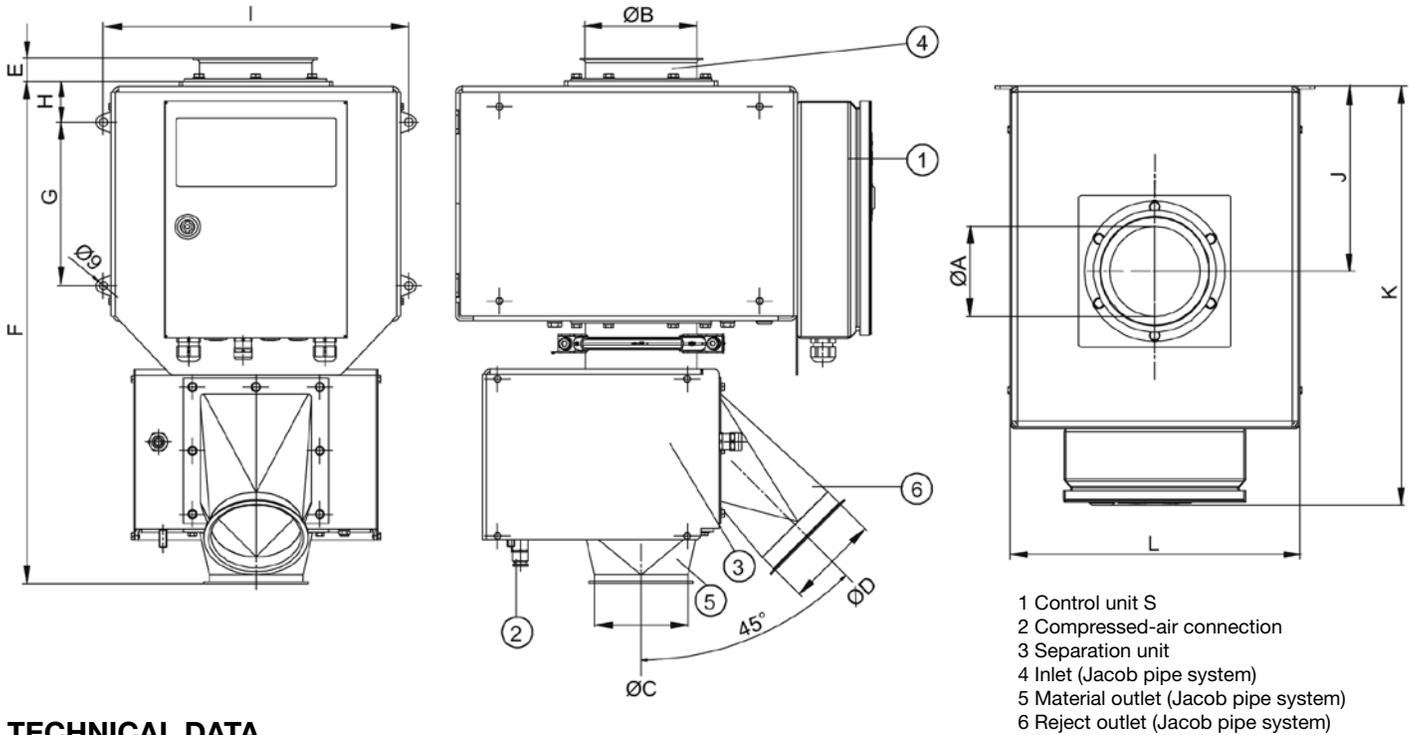
- If possible, the unit should be stored in a closed room until final installation.
- If the unit is stored in the open, it must be covered with tarpaulins and open underneath to allow condensation to drain off.
- Avoid any high temperature fluctuations. It is possible that condensed water that has formed in the packing cannot properly drain and may corrode equipment surfaces. If a formation of condensed water cannot be avoided, suitable desiccants (i.e. in the form of bags) must be placed in the packing.
- If the unit has been packed for transportation by sea, the packaging must not be damaged or opened during transit and storage.
- For storage temperature and permissible air humidity, please refer to the technical data sheet.
- For correct storage, comply with all storage and handling symbols:

Symbol	Signal Word
	Protect against moisture
	Careful: glass
	Up

# Annex

## TECHNICAL DATA SHEET FF4S

### DIMENSIONS—FF4S-80-120



### TECHNICAL DATA

Type	Maximum Sensitivity <sup>1</sup> Ø Ferrous Ball	Maximum Throughput <sup>2</sup>	Inlet Flange Plate, Effective ID of Inlet Pipe ØA	Inlet, Nominal Width ØB	Material Outlet, Nominal Width ØC	Reject Outlet, Nominal Width ØD	Weight Lbs/Kg
Model FF4S-80	0.59 mm	282 cu ft/hr / 8000 l/hr	3.07 in/78 mm	3.07 in/78 mm	3.07 in/78 mm	3.07 in/78 mm	61.73 lbs/28 kg
Model FF4S-100	0.74 mm	424 cu ft/hr / 12000 l/hr	3.90 in/99 mm	3.90 in/99 mm	3.90 in/99 mm	3.90 in/99 mm	68.34 lbs/31 kg
Model FF4S-120	0.79 mm	565 cu ft/hr / 16000 l/hr	4.69 in/119 mm	4.69 in/119 mm	4.69 in/119 mm	3.90 in/99 mm	68.34 lbs/31 kg

#### Dimensions in inches

Type	E	F	G	H	I	J	K	L
Model FF4S-80	1.38	20.67	7.09	1.77	13.23	8.03	18.19	12.54
Model FF4S-100	1.10	21.77	7.09	1.77	13.23	8.03	18.19	12.54
Model FF4S-120	1.10	21.77	7.09	1.77	13.23	8.03	18.19	12.54

#### Dimensions in millimeters

Type	E	F	G	H	I	J	K	L
Model FF4S-80	35	525	180	45	336	204	462	318.5
Model FF4S-100	28	553	180	45	336	204	462	318.5
Model FF4S-120	28	553	180	45	336	204	462	318.5

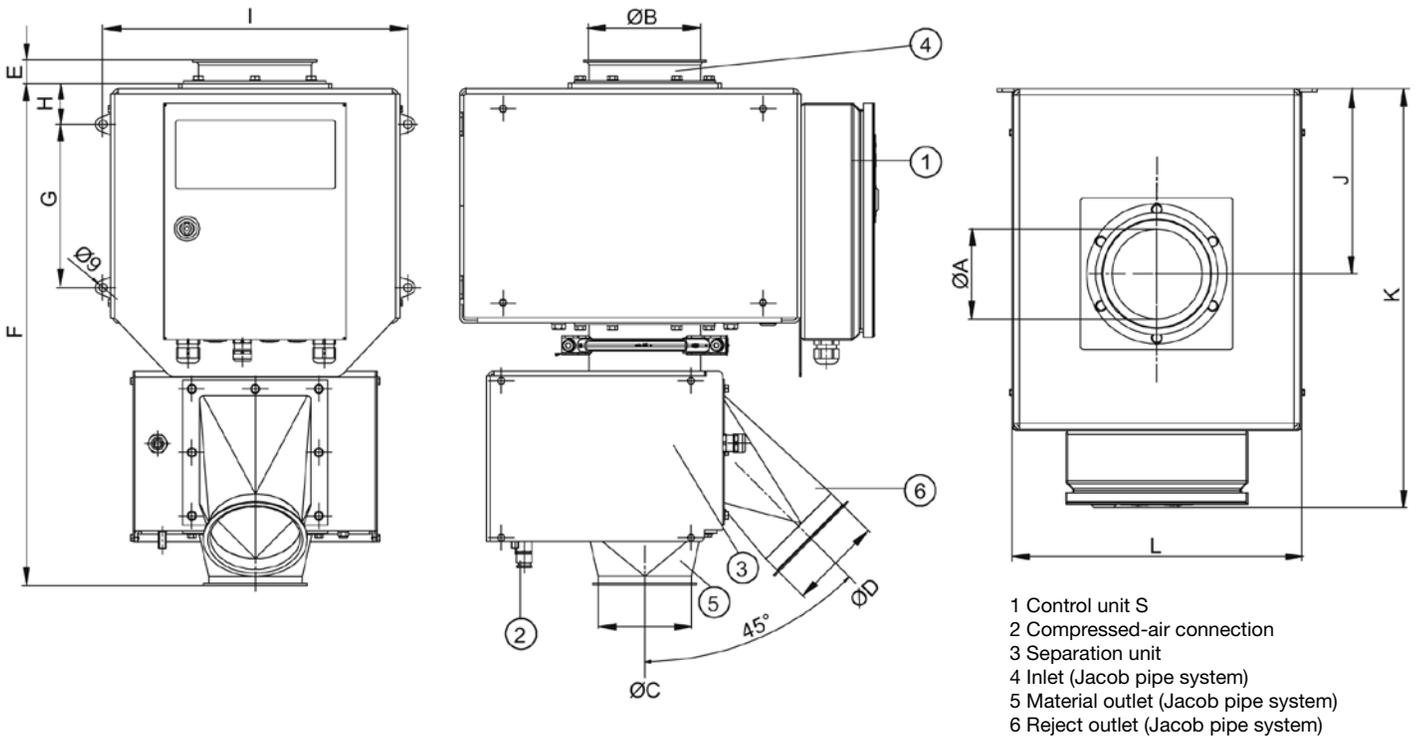
<sup>1</sup> The stated sensitivity (ferrous ball Ø in mm) applies for nonconductive products and refers to the center of the detection aperture (most disadvantageous position). Products that show intrinsic conductivity due to moisture content, carbon or metal oxide concentration may reduce the sensitivity as well as variations of product temperature, environmental effects (mechanical shocks, vibration, electromagnetic pollution) or the set product angle. The detectable size of metal particles depends on their type, shape and position while passing through the metal detector.

<sup>2</sup> The throughput rate depends on the flow characteristics and density of the bulk material, on the installation location of the metal separator, and on the possible presence of any upstream magnet systems.

Subject to change without notice!



## DIMENSIONS-FF4S-150



## TECHNICAL DATA

Type	Maximum Sensitivity <sup>1</sup> Ø Ferrous Ball	Maximum Throughput <sup>2</sup>	Inlet Flange Plate, Effective ID of Inlet Pipe ØA	Inlet, Nominal Width ØB	Material Outlet, Nominal Width ØC	Reject Outlet, Nominal Width ØD	Weight Lbs/Kg
Model FF4S-150	1.00 mm	883 cu ft/hr / 25000 l/hr	5.87 in/149 mm	5.87 in/149 mm	5.87 in/149 mm	5.87 in/149 mm	88.18 lbs/40 kg

### Dimensions in inches

Type	E	F	G	H	I	J	K	L
Model FF4S-150	1.42	25.55	8.46	1.77	15.75	7.48	18.19	14.70

### Dimensions in millimeters

Type	E	F	G	H	I	J	K	L
Model FF4S-150	36	649	215	45	400	190	462	373.5

<sup>1</sup> The stated sensitivity (ferrous ball Ø in mm) applies for nonconductive products and refers to the center of the detection aperture (most disadvantageous position). Products that show intrinsic conductivity due to moisture content, carbon or metal oxide concentration may reduce the sensitivity as well as variations of product temperature, environmental effects (mechanical shocks, vibration, electromagnetic pollution) or the set product angle. The detectable size of metal particles depends on their type, shape and position while passing through the metal detector.

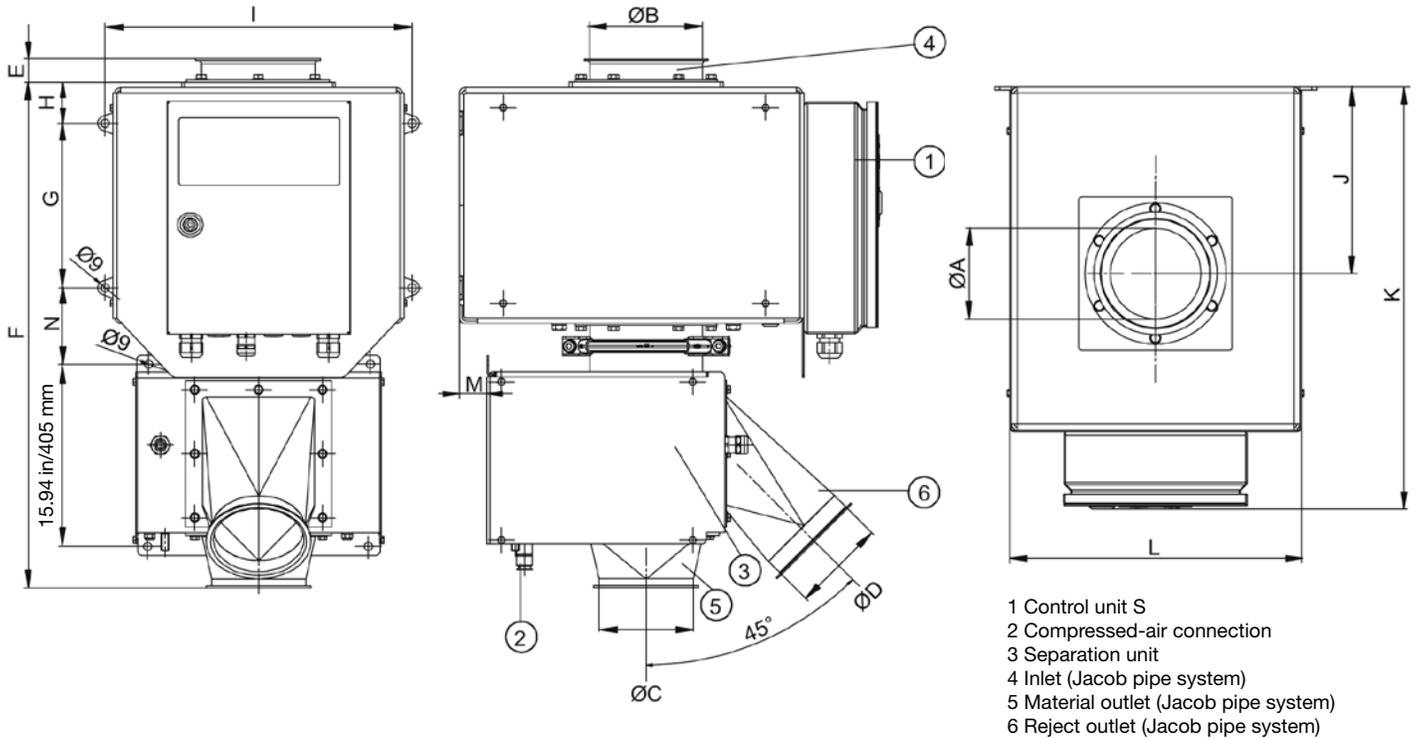
<sup>2</sup> The throughput rate depends on the flow characteristics and density of the bulk material, on the installation location of the metal separator, and on the possible presence of any upstream magnet systems.

*Subject to change without notice!*

# Annex (cont.)

## TECHNICAL DATA SHEET FF4S

### DIMENSIONS—FF4S-200-250



### TECHNICAL DATA

Type	Maximum Sensitivity <sup>1</sup> Ø Ferrous Ball	Maximum Throughput <sup>2</sup>	Inlet Flange Plate, Effective ID of Inlet Pipe ØA	Inlet, Nominal Width ØB	Material Outlet, Nominal Width ØC	Reject Outlet, Nominal Width ØD	Weight Lbs/Kg
Model FF4S-200	1.25 mm	1554 cu ft/hr / 44000 l/hr	7.40 in/188 mm	7.83 in/199 mm	7.83 in/199 mm	7.83 in/199 mm	125.66 lbs/57 kg
Model FF4S-250	1.55 mm	2436 cu ft/hr / 69000 l/hr	9.21 in/234 mm	9.80 in/249 mm	9.80 in/249 mm	7.83 in/199 mm	138.89 lbs/63 kg

#### Dimensions in inches

Type	E	F	G	H	I	J	K	L	M	N
Model FF4S-200	1.38	36.65	9.45	2.17	19.09	9.76	23.11	18.05	1.85	5.31
Model FF4S-250	1.89	41.69	12.60	2.17	22.24	10.16	26.26	21.20	2.24	5.83

#### Dimensions in millimeters

Type	E	F	G	H	I	J	K	L	M	N
Model FF4S-200	35	931	240	55	485	248	587	458.5	47	135
Model FF4S-250	48	1059	320	55	565	258	667	538.5	57	148

<sup>1</sup> The stated sensitivity (ferrous ball Ø in mm) applies for nonconductive products and refers to the center of the detection aperture (most disadvantageous position). Products that show intrinsic conductivity due to moisture content, carbon or metal oxide concentration may reduce the sensitivity as well as variations of product temperature, environmental effects (mechanical shocks, vibration, electromagnetic pollution) or the set product angle. The detectable size of metal particles depends on their type, shape and position while passing through the metal detector.

<sup>2</sup> The throughput rate depends on the flow characteristics and density of the bulk material, on the installation location of the metal separator, and on the possible presence of any upstream magnet systems.

Subject to change without notice!



## CONDITIONS OF USE

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**Use:** For inspecting free falling bulk materials in the plastics industry and similar applications in other industries as well as applications with low hygienic requirements. System is wipedown only.

### Bulk material classification:

- Grain shape: Powder, granulates, flakes
- Max. grain size: Ball shape  $\varnothing < 0.31$ " (8 mm)
- Pourability: Good, medium
- Attributes: Dry, damp, not abrasive, product effects (material conductivity) can potentially be compensated
- Material flow: Free fall, falling height max 19.69" (500 mm) above top edge (no back draft of material)
- Bulk material temperature: Maximum 176°F/+80°C
- Ambient Conditions: 14°F – 122°F/-10°C to +50°C, 25% to 85% rH, no condensation

## SCOPE OF DELIVERY/DESIGN/CONNECTIONS

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- Scope of delivery:** Metal separator comprising two modules, a detection module with the attached control unit S and a separation module connected by a pull ring. Inlet and outlets made according to Jacob pipe system.
- Mechanical design:**
- Detection unit and electronics housing: Sheet steel, varnished, aluminium grey (RAL 9007)
  - Separation unit complete: Stainless steel 1.4301 (AISI 304), bead blasted
  - Scanning pipe: PE-EL (electrical conductive to avoid false tripping)
  - Parts in contact with product: Stainless steel 1.4301 (AISI 304), PE-EL, Teflon, PA
  - Compressed air connection: 72.52-116.03 PSI (5-8 bar);  
0.24/0.31" (6/8 mm) hose connection
  - Compressed air consumption: FF4S 120: approx 0.11 g (0.4 l)/switch operation  
FF4S 150: approx 0.13 g (0.5 l)/switch operation  
FF4S 200-250: approx 0.34 g (1.3 l)/switch operation
- Electrical design:**
- Operating voltage: 100-240 VAC ( $\pm 10\%$ ) 50/60 Hz
  - Current consumption: Approx 160 mA/80 mA
  - Mains cable: 1.8 m with plug
  - Ingress protection: IP 65, (rain shelter required if operated outdoor)
  - Reject duration (metal impulse): Adjustable from 0.05 to 29 sec
  - Self-monitoring system: Detection coil and outputs
  - Scanning sensitivity: Selectable with 8 adjustments
  - Operation: See technical data sheet for Control Unit S

## OPTIONS/ACCESSORIES

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- Visual alarm
  - Failure indication
  - Failure and metal indication
- Audible alarm
  - Failure indication
  - Failure and metal indication
- Combination alarm (visual alarm and audible alarm)
  - Failure indication
  - Failure and metal indication
- Filter control valve
- Counter (Detection counter) in a separate housing
- Push button for manual rejection in a separate housing
- Push button for functional test in a separate housing
- Test samples
- UL/CSA certificate
- Increased free fall height up to 3.28' (1 m)
- Compressed air monitor
- Monitor system for separation unit
- US-power cable
- Cable set for remote control unit: 9.84', 19.69', 32.81', and 49.21' (3, 6, 10, and 15 m)

## SPECIAL VERSIONS/SUPPLEMENTARY SYSTEMS

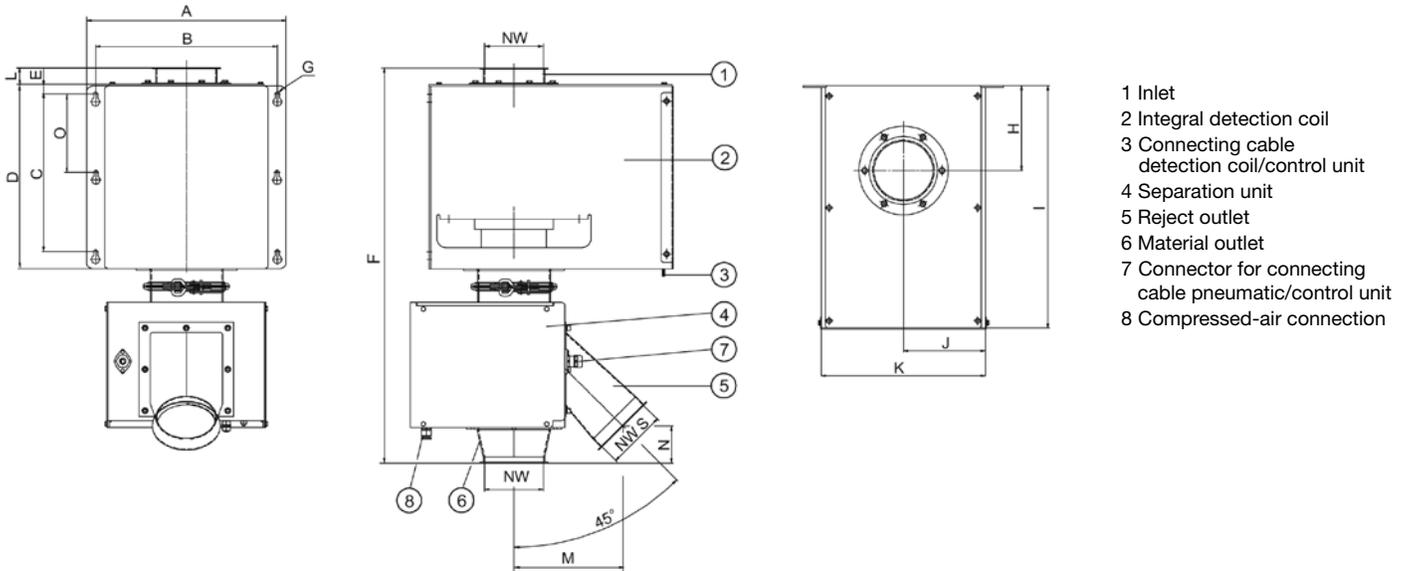
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- Explosion-proof version ATEX
- Design for bulk material temperatures up to 284°F/140°C
- Design suitable for direct contact with food products
- Model with improved wearout protection
- Pipe transition pieces, customized flanges

# Annex (cont.)

## TECHNICAL DATA SHEET FF4G

### DIMENSIONS--FF4G-80-250



### TECHNICAL DATA

Type	Nominal Passage Ø NW System Jacob	Nominal Passage Reject Outlet Ø NW "S" System Jacob	Maximum Scanning Sensitivity <sup>1</sup> Ø Fe- Ball	Maximum Throughput <sup>2</sup>	Weight Lbs/Kg
Model FF4G-80	3.15 in/80 mm	3.94 in/100 mm	0.45 mm	282 cu ft/hr / 8000 l/hr	143.30 lbs/65 kg
Model FF4G-100	3.94 in/100 mm	3.94 in/100 mm	0.57 mm	424 cu ft/hr / 12000 l/hr	154.32 lbs/70 kg
Model FF4G-120	4.72 in/120 mm	3.94 in/100 mm	0.60 mm	565 cu ft/hr / 16000 l/hr	165.35 lbs/75 kg
Model FF4G-150	5.91 in/150 mm	5.91 in/150 mm	0.77 mm	883 cu ft/hr / 25000 l/hr	209.44 lbs/95 kg
Model FF4G-200	7.87 in/200 mm	7.87 in/200 mm	0.95 mm	1554 cu ft/hr / 44000 l/hr	319.67 lbs/145 kg
Model FF4G-250	9.84 in/250 mm	7.87 in/200 mm	1.20 mm	2436 cu ft/hr / 69000 l/hr	396.83 lbs/180 kg

### Dimensions in inches

Type	A	B	C	D	E	F	G	H	I <sup>3</sup>	J	K	L	M	N	O*
Model FF4G-80	13.27	12.09	10.51	12.28	0.65	25.16	0.28	5.65	16.20	5.43	10.87	1.38	app. 6.22	app. 1.50	-
Model FF4G-100	13.27	12.09	10.51	12.28	0.65	25.98	0.28	5.65	16.22	5.43	10.87	1.10	app. 7.20	app. 1.97	-
Model FF4G-120	13.27	12.09	10.51	12.28	0.65	25.98	0.28	5.65	16.22	5.43	10.87	1.10	app. 7.20	app. 1.97	-
Model FF4G-150	16.38	15.20	15.75	18.70	1.26	34.72	0.35	6.89	18.70	6.61	13.23	1.42	app. 8.15	app. 2.36	7.87
Model FF4G-200	20.47	19.29	22.05	25.20	1.14	50.08	0.35	8.27	21.38	8.66	17.32	1.46	app. 13.39	app. 3.94	11.02
Model FF4G-250	22.83	21.26	27.95	31.85	1.14	58.66	0.35	10.04	25.01	9.65	19.29	1.89	app. 13.39	app. 4.65	13.98



## Dimensions in millimeters

Type	A	B	C	D	E	F	G	H	I <sup>3</sup>	J	K	L	M	N	O*
Model FF4G-80	337	307	267	312	16.5	639	7	143.5	411.5	138	276	35	app. 158	app. 50	–
Model FF4G-100	337	307	267	312	16.5	660	7	143.5	412.0	138	276	28	app. 183	app. 50	–
Model FF4G-120	337	307	267	312	16.5	660	7	143.5	412.0	138	276	28	app. 183	app. 50	–
Model FF4G-150	416	386	400	475	32.0	882	9	175.0	475.0	168	336	36	app. 207	app. 60	200
Model FF4G-200	520	490	560	640	29.0	1272	9	210.0	543.0	220	440	37	app. 340	app. 100	280
Model FF4G-250	580	540	710	809	29.0	1490	9	255.0	635.2	245	490	48	app. 340	app. 118	355

*Larger types on request* \* starting from size 5.91 in/150 mm

<sup>1</sup> The stated detection sensitivity (ferrous ball Ø in in/mm) applies for nonconductive products at the standard operation frequency and refers to the center of the detection aperture (most disadvantageous position). Products that show intrinsic conductivity due to moisture content, electrolytes or other conductive contents may reduce the sensitivity as well as variations of product temperature, environmental effects (mechanical shocks and vibrations, electromagnetic pollution) or the set product angle. The detectable size of metal particles depends on their nature, shape and position while passing through the metal detector.

<sup>2</sup> The stated throughput rate is based on well pourable granules. The shape of the particles and thus the flow characteristics of the bulk material determine the throughput rate, which can vary. Upstream installed magnet separators may also reduce the throughput rate due to reduction of the cross section.

<sup>3</sup> Observe the projection of the mechanical unit: NW 3.15 in/80 mm +.827 in/21 mm, NW 3.94 in/100 mm and 4.72 in/120 mm +1.26 in (32 mm).

*Subject to change without notice!*

## CONDITIONS OF USE

Use<sup>1</sup>: For inspecting free falling bulk materials in the plastics industry and similar applications in other industries as well as applications with low hygienic requirements.

### Bulk material classification:

- Grain shape: Powder, granulates, flakes
- Max. grain size: Ball Ø < 0.31" (8 mm)
- Pourability: Good, medium
- Attributes: Dry, damp, not abrasive, product effects (material conductivity) can potentially be compensated
- Material flow<sup>2</sup>: Free fall, falling height max 17.71" (450 mm) above equipment top edge (no back draft of material)
- Bulk material temperature: Maximum 176°F/+80°C
- Ambient temperature: 14°F – 131°F/-10°C to +55°C

<sup>1</sup>In vertical mounting position.

<sup>2</sup>The permissible drop height refers to standard overall heights. Larger drop heights also cause larger overall heights.

## SCOPE OF DELIVERY/DESIGN/CONNECTIONS

Scope of delivery:	Compact unit with integrated metal detector, separation unit and remote control unit FFG; Inlet and outlets designed according to the "Jacob" system.
Mechanical design:	Detection unit: stainless steel 1.4301 (AISI 304), glass bead blasted Control enclosure: stainless steel 1.4301 (AISI 304), glass bead blasted Separation unit: stainless steel 1.4301 (AISI 304), glass bead blasted Scanning pipe: PE-EL Parts in touch with material: stainless steel 1.4301 (AISI 304), PE-EL, Teflon, POM Compressed-air connection: 72.52-116.03 PSI (5-8 bar), 0.24/0.31" (6/8 mm) tube connection Compressed-air consumption: approx 0.13-0.79 gal (0.5-3.0 liter)/switch operation (depending on the size of the unit)
Electrical design:	Control unit: detached, cable length 9.84' (3 m) Operating voltage: 100-240 VAC (±10%) 50/60 Hz Current consumption: app. 200 mA/230 VAC or 400 mA/115 VAC Type of protection: IP 54 Reject duration (metal impulse): adjustable from 0.05 to 60 sec Self monitoring: detection coil and outputs Testing and manual rejection can be activated via control unit Operation: see technical data sheet for Control Unit G

# Annex (cont.)

## OPTIONS/ACCESSORIES

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- Visual alarm
  - Failure indication
  - Failure and metal indication
- Audible alarm
  - Failure indication
  - Failure and metal indication
- Combination alarm (visual alarm and audible alarm)
  - Failure indication
  - Failure and metal indication
- Compressed air monitor
- Filter control valve
- Monitor system for diverter
- Cable set for remote control unit:
  - 19.69' or 32.81' (6 m or 10 m)
- Dual frequency technology to optimize sensitivity (used in case of significantly different product effects)
- UL/CSA certificate
- US power cable
- Test samples

## SPECIAL VERSIONS/SUPPLEMENTARY SYSTEMS

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- Design for bulk material temperatures up to 284°F/140°C
- Design suitable for direct contact with food products
- Model with improved wearout protection
- Pipe transition pieces with flanges
- Explosion-proof version ATEX depending on zone
- Interfaces RS232, RS485, Ethernet, WLAN, USB



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