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User's Manual

Perforation detector

Perfomaster

simco.nl/0930

This manual was originally written in English.

The product may have undergone changes that are not reflected in this manual.

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Explanation of symbols

The following symbols may appear in this manual or on the product

WARNING Indicates special information to prevent injury or significant damage to the product or the environment

DANGER Indicates information for preventing electric shocks

SHARP EDGES Indicates information for preventing injury by sharp edges

NOTE Important information for making the most efficient use of the product and for preventing damage to the product or the environment

HINT Advice about the use of the product

CLASS II EQUIPMENT with functional earthing

MANUAL OPERATION The product is connected to a power source. Eventual communication takes place analogously via the connector.

Preface

This manual is intended for the installation and use of the perforation detector type Perfomaster.

This manual must always be accessible to the operating personnel.

Read this manual completely before installing and commissioning this product.

Instructions in this manual must be followed to ensure proper operation of the product and to make a warranty claim.
The warranty provisions are described in the General Terms and Conditions of Sale of Simco (Nederland) B.V.

NOTE

If there are any problems or doubts, please get in touch with Simco-ION Netherlands or the agent in your region.

NOTE

Product names may be abbreviated in the documentation.

Below the abbreviations and full product names with the link to the relevant documentation.

Abbreviated product name	Full Simco-ION product name	Documentation link
Perfomaster Also named: device, perforation detector, product	Perfomaster	0930

Introduction

Device applications

The Perfomaster is used to detect perforations in material webs. It can determine the exact location and/or the number of perforations that have passed through. When it detects perforations in the moving material, the Perfomaster emits an electrical signal, which can be used to activate a PLC.

The Perfomaster has an in-built high-voltage power unit that supplies the electrodes with high voltage. As detection occurs through high-voltage spark-over, the Perfomaster is only suitable for use with non-conductive materials, which can be transparent.

The Perfomaster can be installed in the location required using the nylon bolts. The supply and signal voltages are connected via a standard M12 connector.

The integrated high-voltage electrode head is removable and has replaceable electrodes.

Specific conditions of use

The product is intended to be a part of a machine or process.

The product must NOT be used in a fire or explosion-hazardous environment.

Device description

The device is equipped with an integrated high-voltage power supply, high-voltage emitter pins and a status LED.

The Perfomaster must be fitted in such a way that the electrodes sit directly above the material web. An earthed counter electrode must be installed on the other side of the material web. An earthed metal machine part, such as a roller, can be used for this purpose. A spark-over occurs from the electrodes to the counter electrode through the perforations in the material web.

The in-built high-voltage power unit operates at 24 V DC and delivers an output voltage of between 0 and 20 kV DC. This output voltage can be adjusted by means of an external input voltage of between 0 and 10 V DC (0—24 V DC optional). Thanks to this adjustable sensitivity, the Perfomaster can be used to detect perforations both in very thin films and in plastic several layers thick.

High-voltage discharges are detected by the Perfomaster; they are indicated by the colour of the LEDs briefly changing from green to red. This detection is also communicated by means of a PLC pulse of 15 ms.

The maximum detection speed is 25 detections a second (25 Hz). With higher web speeds (>25 Hz), not all perforations will be detected and communicated. An in-built algorithm ensures that a single PLC pulse is produced when a continuous, unbroken series of high-voltage discharges occurs.

Available device versions

The Perfomaster has the following device versions:

- 0930076101Perfomaster setpoint 0-24V
- 0930076100 Perfomaster setpoint 0-10V
- 0362909302 Perfomasterwith round electrodes included

Names and functions of the device parts

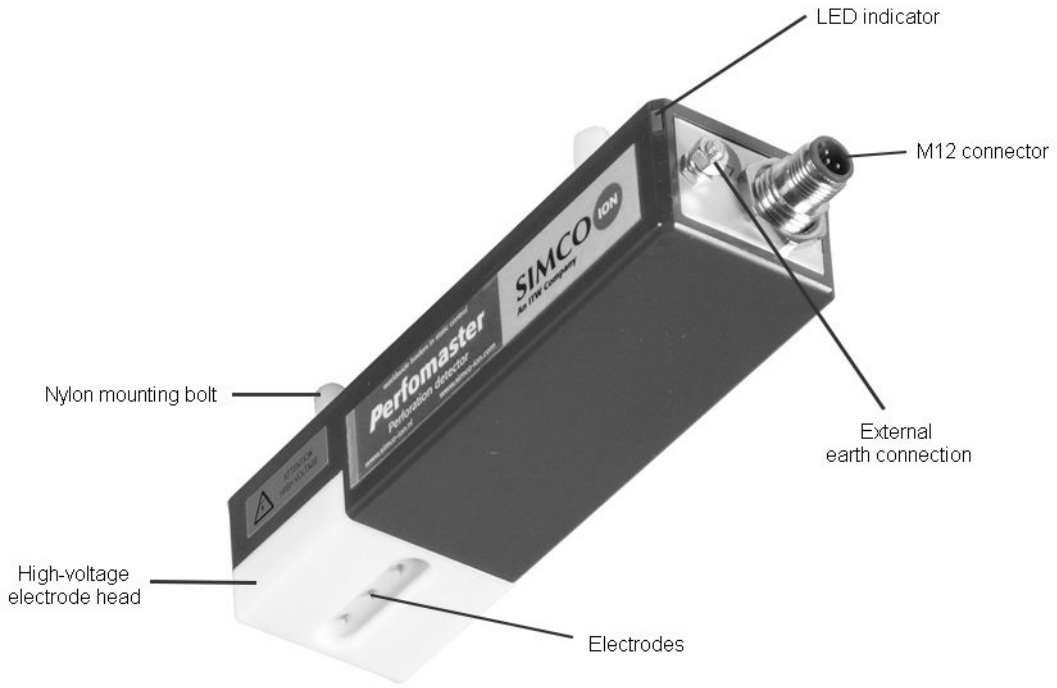


Figure: Perfomaster parts

Description and operation

Checking package contents

Device

Warranty card

Safety

The following safety guidelines must be observed in order to avoid injuries and damage to objects or the product.

WARNING

- All work on the electrical system, including installation and repair, must be carried out by trained personnel in accordance with national and local regulations.
- Metal parts in the vicinity of the product, including machine frames, must be earthed to prevent unwanted charging of the metal parts
- Touching the sharp emitter pins may cause injury.
- A small amount of ozone is emitted during the operation of the product. The ozone concentration is so low that no damage to health can occur.
- The product must not be used in a fire or explosion-hazardous environment.

DANGER

- Never use a damaged product. Touching the live parts will cause an electric shock.
- The power must be turned off before any work on the equipment is started to prevent electric shock.
- The equipment must be properly earthed. Earthing is necessary to ensure proper and safe operation and to prevent electric shocks upon contact.
- Touching high-voltage parts will result in an electric shock. An electric shock can cause a shock reaction, including from areas with contact-protected high voltage.
- High-voltage can be dangerous for people with a pace maker.

NOTE

- Making modifications, adjustments, etc., without prior written consent or carrying out repairs using non-original parts will invalidate the equipment's guarantee and withdraw the CE approval for the product.

Technical specifications

Required power supply	
Supply voltage	21 – 27 V DC
Current consumption	Max. 0,5 A DC
Vset bias voltage	0-10 V DC (0-24 V DC optional)
Vset selectricity consumtion	Max. 1 mA
Connection	M12 connector, 5-pin
Output	
Output voltage	0-20 kV DC positive
Output current	Max. 10 mA (peak)
Signalling	
PLC connection	Open optocoupler output
Voltage (Vceo)	Max. 35 V
Switching current (Ic)	Max. 50 mA
Pulse duration	15 ms ± 300 µs
Frequency	Max. 25 detections a second
Signalling (Status LED)	See chapter Functional check for all indications
Green	Supply voltage present
Red	Perforation detected

Mechanical

Dimensions (lxwxh)	153 x 45 x 32 mm (excluding connector, earth connection and fastening bolts)
Operating distance	<5 mm
Max. material speed	25 Hz
Weight	0.36 kg

Material

Device part	**Material**
Casing	ABS
Electrode head	PTFE
Mounting bolt	Nylon

Ambient conditions

Use	Industrial, indoor use
Ingress Protection class	IP54
Temperature Ambient (Tamb)	0–55°C

Dimensions

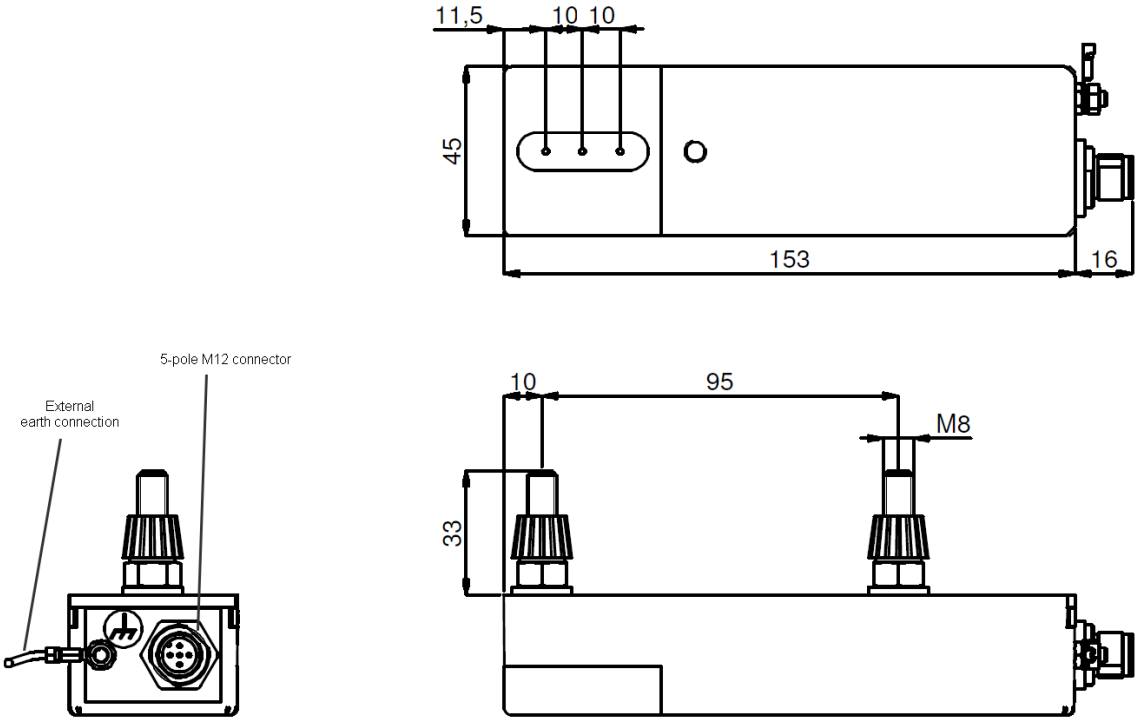


Figure: Dimensions Perfomaster

Installation precautions

Checks

- Check that the device is undamaged and that the correct version has been received.
- Check whether the necessary accessories are included.
- Check whether the details of the packing slip correspond to the details of the product received.

NOTE

If there are any problems or doubts, please get in touch with Simco-ION Netherlands or the agent in your region.

Installation precautions

Device installation location

Install the Perfomaster:

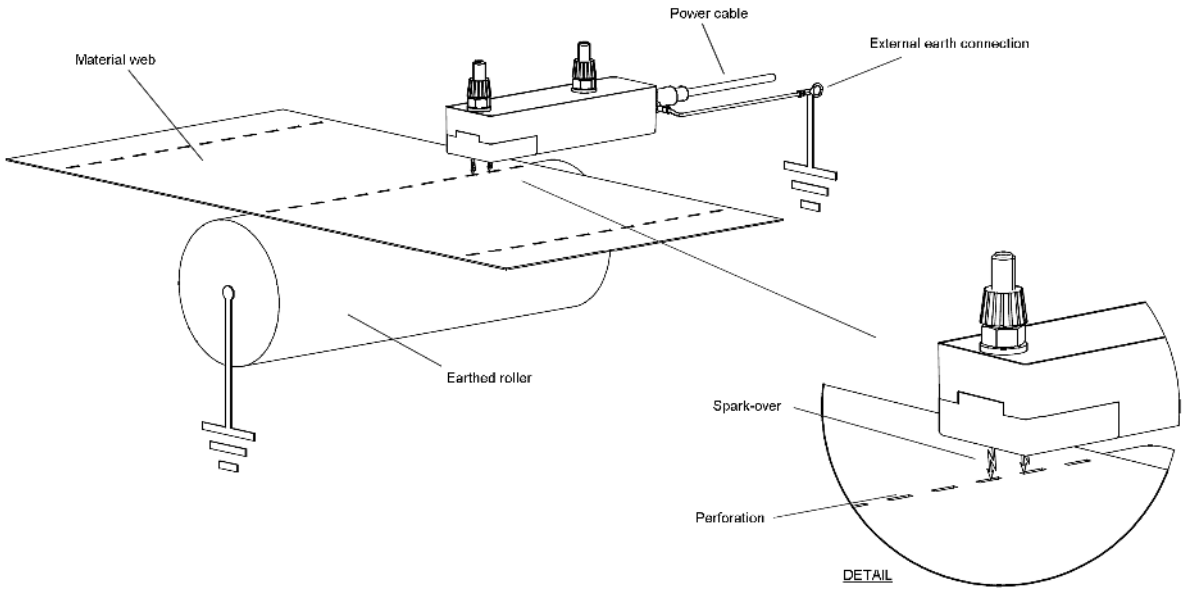
- In the location where you want it to perform perforation detection
- At a stable location on the machine, using the nylon bolts, and the nuts and rings supplied
- With the electrode(s) opposite an earthed counter electrode; an earthed roller in the machine can be used for this purpose. For optimal operation, the distance between the electrode(s) and the counter electrode must be no more than 5 mm
- In such a way that the electrodes cannot be touched by operating staff when the Perfomaster is in operation
- Preferably in such a way that the electrode head can be removed without having to dismantle the entire Perfomaster (see 8 Maintenance)

Mechanical installation

Mounting thePerfomaster

NOTE

The Perfomaster must not come into contact with the moving material. If these touch each other it will cause unnecessary wear both to the Perfomaster and to the material.



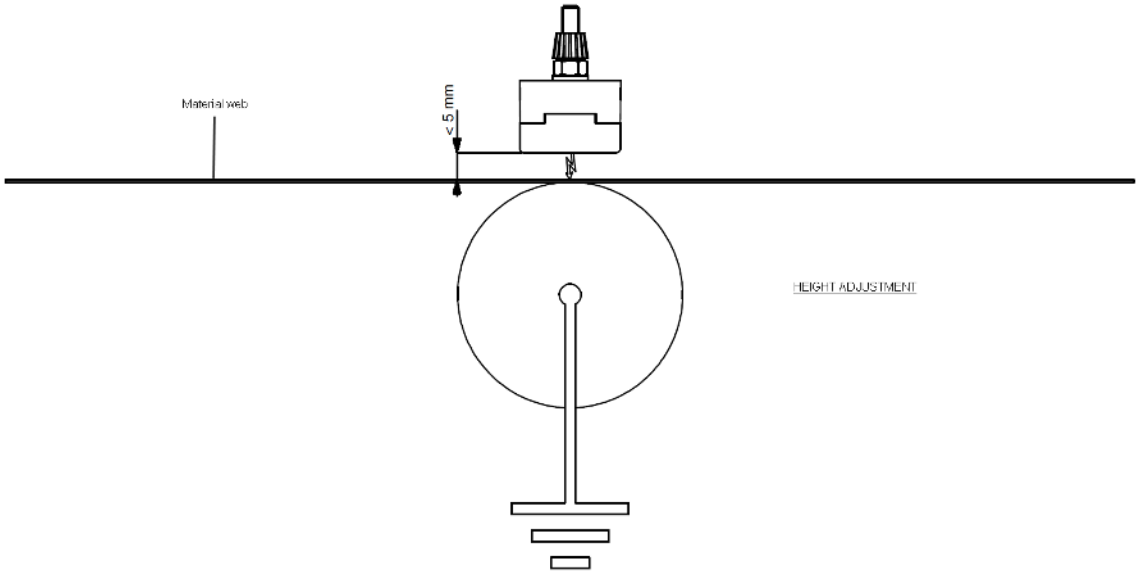


Figure: Perfomaster installation

Electrical connection

Connecting the Perfomaster

NOTE

- Always use a device connector suitable for the device type.
- When connecting the device connector to the device, never use a torque higher than 0,5 Nm (hand-tight). A higher torque may damage the connector or the device.
- The device male input connector can NOT be rotated. Rotating the connector will damage the device.

Connections to the Perfomaster:

- Ensure that the earth wire (included in the delivery) is securely attached to the Perfomaster
- Connect the earth wire to a guaranteed earthing point to which the counter electrode is also connected. Ensure that the earth connection between the Perfomaster and the counter electrode is as short as possible; if necessary shorten the earth wire
- Connect the M12 connector from the power cable with the Perfomaster
- Feed the power cable safely to the 24 V power supply
- Connect the cable to the power supply as shown in the figure

Table: *M12 connections*

Pin	Name	Std. cable colour
1	+24 V DC	Brown
2	Detector +	White
3	0 V/GND	Blue
4	Detector -	Black
5	V_{set}	Yellow/Green - Grey

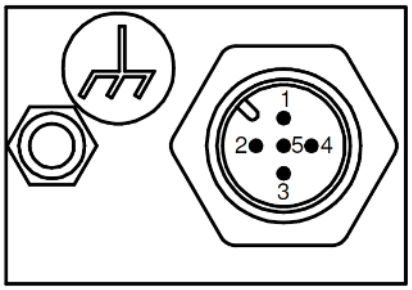


Figure: M12 connector

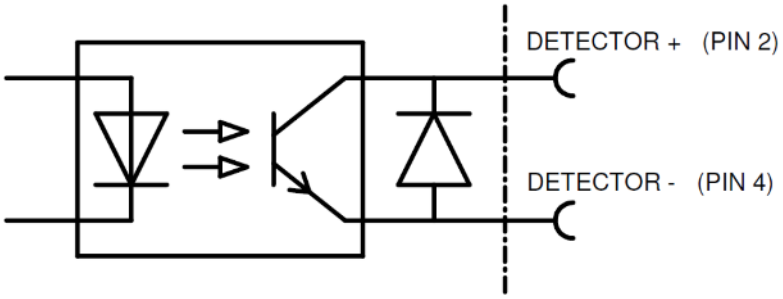


Figure: Electrical connection

NOTE

To ensure correct and safe operation, the blue core (0 V) of the power cable and the external earth wire (GND) must both be connected to earth.

Supplying Vset bias voltage

The level of the output voltage is set with the VSET bias voltage.

The output voltage is linearly proportional to the input voltage, so with VSET = 0 V there is no voltage on the output and with maximum VSET there is +20 kV DC on the output.

Possible ways of providing the bias voltage:

- By means of an external analogue voltage,for instance a programmable analogue output from a PLC
- By using the supply voltage and branching this off using a resistor divider

Connecting the VSET with extra analogue voltage

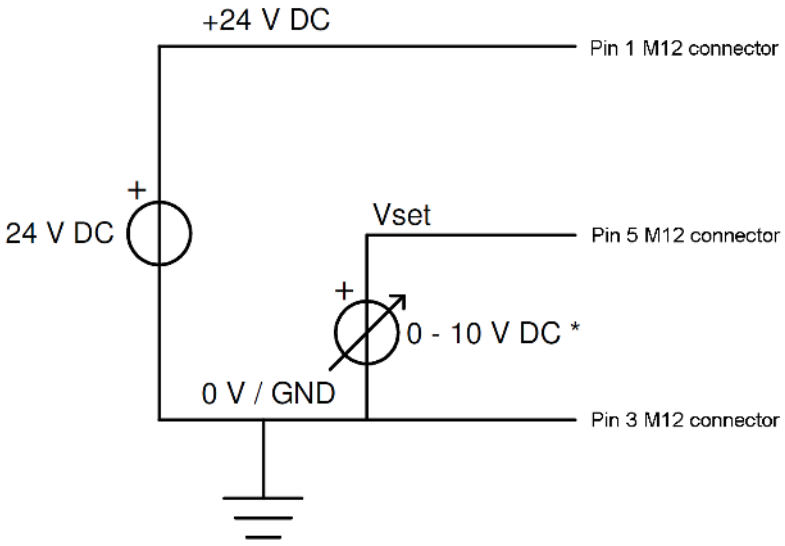


Figure: sample diagram for bias voltage provisions via extra analogue voltage (Application Note)

For PM2024 the bias voltage is 0-24 V DC

Table: Resistor division

Type	R
PM2010	6.8 kΩ
PM2024	0 Ω

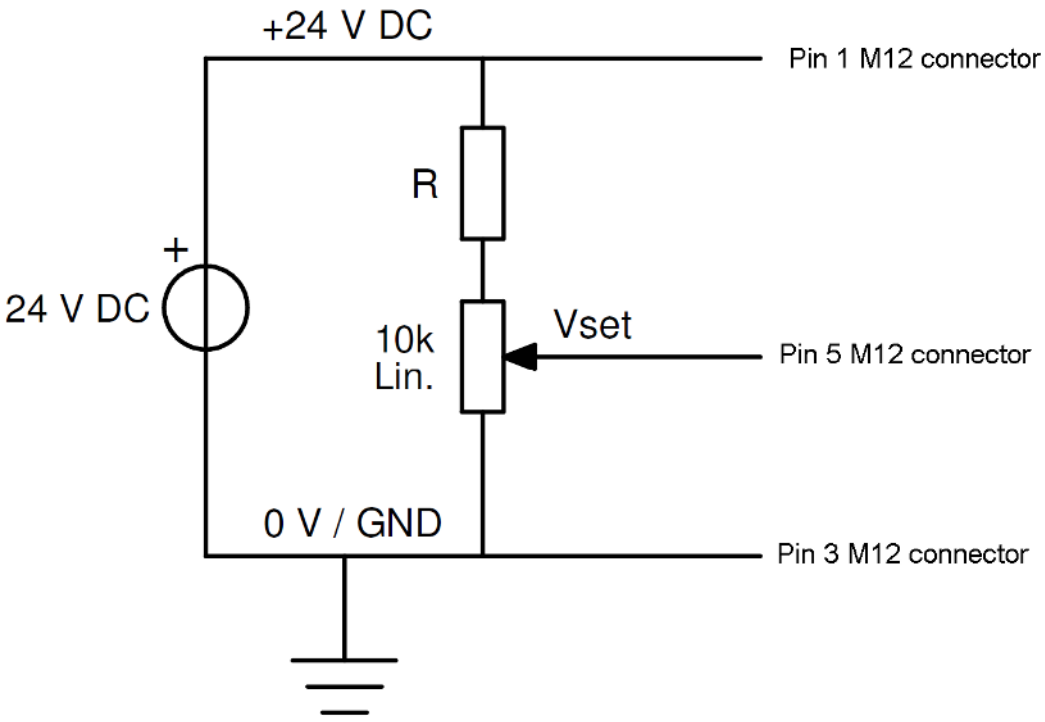


Figure: sample diagram for bias voltage provision via resistor division of the supply voltage (Application Note)

Commissioning

Checking Perfomaster functionality

- Ensure that the electrodes and the counter electrode are maximum 5 mm apart and that there is (initially) no isolating material between them
- It is recommended that the bias voltage (VSET) first be set to 0 V and then subsequently increased
- Switch on the supply voltage (24 V DC). The LEDs on the Perfomaster will light up green
- Increase the bias voltage until a high-voltage spark-over occurs near the uncovered counter electrode
- The LEDs on the Perfomaster light up red to indicate a high-voltage spark-over

NOTE

If there is no material present between the electrodes while the Perfomaster is switched on, there will be a continuous high-voltage spark-over. Thanks to an internal algorithm, a single PLC pulse of 15 ms is given in this situation

Fine-tuning the Perfomaster

- Feed through the material with the perforation to be detected between the electrodes and the counter electrode, so that you can set the bias voltage correctly
- Materials of different thicknesses require different bias voltages (VSET)
- Increase the bias voltage until the perforations can be reliably detected
- Set the bias voltage approx. 10% higher than absolutely necessary, in order to accommodate process fluctuations

NOTE

A bias voltage that is much too high leads to unnecessary wear to the electrodes and can lead to multiple PLC pulses for a single perforation

The Perfomaster is ready for use.

HINT

Switch the Perfomaster off when not in use. This prevents unnecessary wear to the electrode(s)

Functional check

The system is working correctly when the LEDs on the Perfomaster are green and briefly turn red at every perforation. A single PLC pulse is transmitted for every perforation, even when the material moves through slowly and the discharge caused by the perforation lasts longer than 15 ms.

NOTE

If the VSET regularly has to be set to a higher level than usual or if the maximum level is not sufficient, it may be that the electrodes are very dirty or significantly worn.

See chapter Maintenance.

Maintenance

General maintenance rules

- Keep the device clean and dry.
- Switch off the device before cleaning.
- Clean the device regularly to improve the operation.
- Check the connection cable(s) periodically for damage.

WARNING

Watch out for the (possibly) sharp electrode points during cleaning

Regular cleaning

NOTE

The cleaning interval time depends on the type and degree of contamination.

The higher the degree of environmental contamination, the shorter the cleaning interval must be.

- Brush the dirty parts with a hard, non-metallic brush.
- Vacuum the device or blow it off with clean compressed air (max. 6 bar).

NOTE

If the result of dry cleaning is not satisfactory, continue with wet cleaning.

Wet cleaning with a damp cloth

- Clean the device and the connection cable(s) with a suitable cleaning agent (e.g. isopropyl alcohol).

  Veconova 10 can also be used for stubborn dirt (www.eco-nova.nl).

- Only clean the outside of the device.
- Allow the device to dry completely before switching it on again.

NOTE

Do not damage the high-voltage electrodes

Allow the Perfomaster to dry completely before operating it again

Replacing the electrode head

Replacing lower head

1. Loosen the set screw on the side of the electrode head by 1 turn. To do so, use the 2-mm hex screwdriver supplied.
2. Slide the electrode head off the Perfomaster (see the figure).
3. Position another electrode head by inserting the head's contact pin into the connector of the Perfomaster.
4. Carefully slide the electrode into the housing until it clicks into place.
5. Manually tighten the set screw on the side of the electrode head.

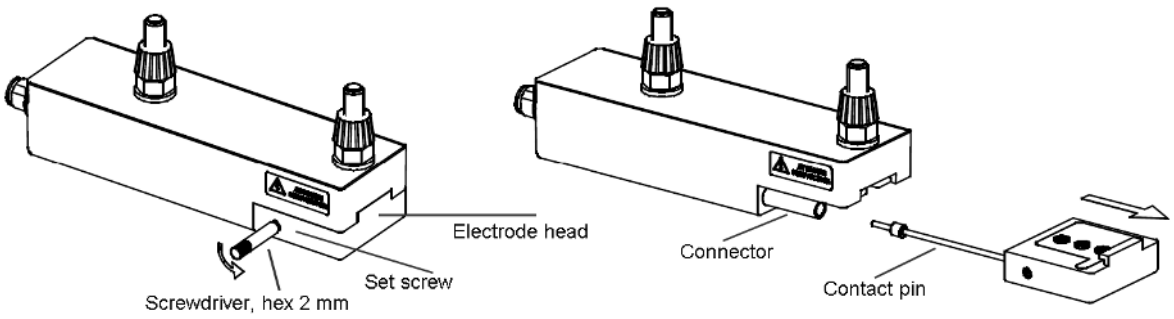


Figure: replacing the standard lower electrode head

Replacing upper head

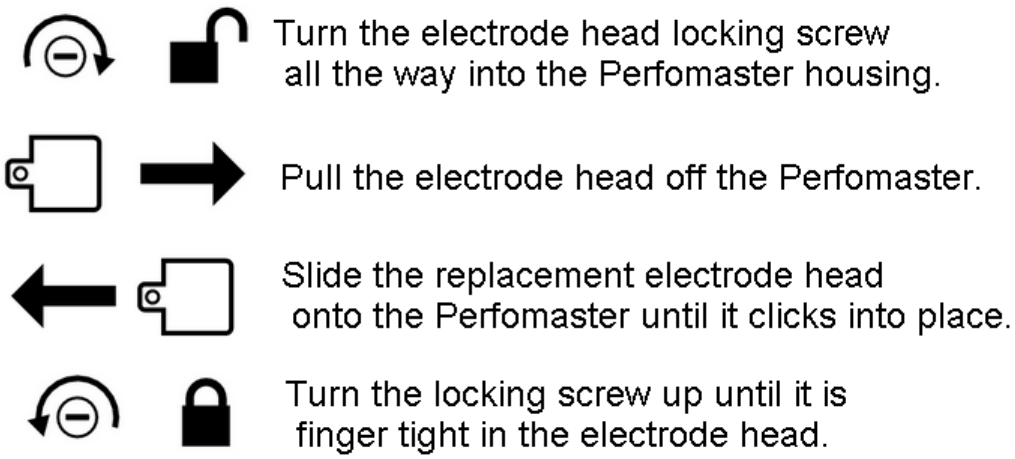


Figure: replacing the upper head

1. Remove the electrode head from the Perfomaster (see figure replacing the standard lower electrode head).
2. Unscrew the screws in the back of the electrode head. To do so, use the 2-mm hex screwdriver supplied.
3. Press on the electrode points with a hard object (such as the hex screwdriver supplied) until they fall out of the back.
4. Position the new electrode(s) in the electrode head from the back.
5. Lock the electrodes again using the set screws. Tighten these manually.
6. Position the electrode head back on the Perfomaster (see figure replacing the standard lower electrode head).

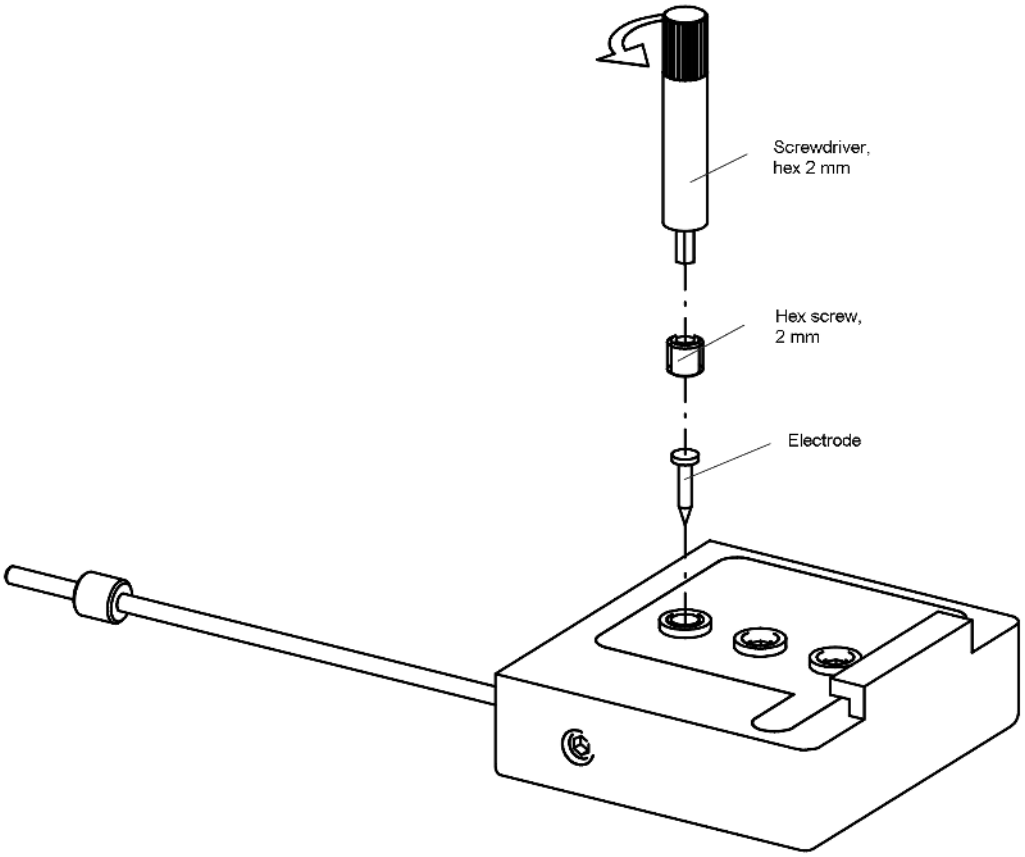


Figure: replacing electrodes

Troubleshooting

WARNING

Disconnect the power supply before carrying out work on the unit

Work must only be carried out on the equipment by an electrical engineer with the relevant training and qualifications

Table: Faults with the Perfomaster

Problem	Possible cause	Solution
LED's on Perfomasterdo not light up	No supply voltage	Switch on supply voltage
	Wiring fault	Find fault and rectify (see chapter Installation)
	Perfomaster has an internal fault.	Switch the supply voltage off and back on again after ± 5 seconds
LEDs do not light up red, only green	Perfomaster earth wire not connected	Connect Perfomaster earth wire (see chapter Installation)
	No earthed counter electrode or distance between elec-trodes and counter electrode too great (more than 5 mm)	Move the counter electrode to within the 5 mm of the elctrode points
	Output voltage too low	Increase output voltage by increasing bias voltage. (see chapter Commissioning)
	Electrode(s) dirty or electrically isolated	Clean electrode(s). (see chapter Maintenance) Remove insulation between electrodes and counter electrode
	Electrode(s) worn	Replace electrode(s). (see chapter Maintenance Replacing upper head) • Turn the electrode head locking screw all the way into the Perfomaster housing. • Pull the electrode head off the Perfomaster. • Slide the replacement electrode head onto the Perfomaster until it clicks into place.

Problem	Possible cause	Solution
		• Turn the locking screw up until it is finger tight in the electrode head.
LEDs remain constantly red	No material between electrodes and counter electrode	Add new material to machine
	Output voltage set too high	Reduce output voltage by reducing bias voltage. (see chapter Commissioning)
	Short circuit between electrode and counter electrode	Eliminate short circuit.
Output pulses are not detected	Output voltage too low	Increase output voltage by increasing bias voltage (see chapter Commissioning)
	Wiring fault	Find fault and rectify (see chapter Installation)
	Perfomaster output connected to wrong type of PLC input	The Perfomaster output acts as an electrical switch (optocoupler). Select an input on the PLC that is suitable for this purpose
Multiple output pulses for a single perforation	Output voltage set too high	Reduce output voltage by reducing bias voltage (see chapter Comissioning)
	Perfomasteroutput incorrectly connected.	Swap over "+" and " " of detector output (see chapter Installation)
Spark-over through material, not at the location of a perforation	Output voltage set too high	Reduce output voltage by reducing bias voltage (see chapter Comissioning)
	There are holes in the material or it is electrically conductive	Material not suitable for detecting perforations with Perfomaster

Warranty

The Simco-ION warranty conditions are described in and published on the internet.
These conditions can be viewed on:

https://www.simco-ion.co.uk/wp-content/uploads/Extended-warranty-conditions_GB.pdf

Simco-ION Warranty Conditions GB

Warranty Period

The device has a one-year warranty as standard, which commences on the invoice date.

The warranty becomes four years by registering the device on the Simco-ION website.

To register the device, it is necessary to state the serial number of the device. This information can be found on the device nameplate.

https://www.simco-ion.co.uk/warranty

Warranty registration site GB

Repairs

Review these conditions before submitting equipment for repair (RMA procedure) to Simco-ION.

NOTE

- Only Simco-ION can and may repair this product.
- In the event of a defect within or outside the warranty, the product can be offered to Simco-ION for repair.

- Refer to the problem analysis in chapter Troubleshooting, and follow the advice.
- If it is certain that the Simco-ION product causes the problem, offer it for repair.
- Use the RMA procedure before offering the product to Simco-ION.

Perfomasterparts cannot be repaired

Return Merchandise Authorisation

In case of problems and questions, please get in touch with Simco-ION or a Simco-ION representative in your region.

A malfunctioning or defective product can be returned to Simco-ION for repairs following the RMA (Return Merchandise Authorisation) procedure below.

RMA Request

- Fill in the Simco-ION RMA form at

  https://www.simco-ion.nl/repair or

  https://www.simco-ion.co.uk/repair
- By entering the item and serial numbers, you can determine whether your product will be repaired under warranty or if costs are involved.

Return sending

- Pack the defective product properly.
- Indicate the RMA number on the package.
- Send the package to the stated return address of Simco-ION.

Storage and disposal

Storage

Always store the Simco-ION products in a dry and cool place.

Disposal

- When disposing of the product, follow the local environmental regulations.
- Do not dispose the product with regular waste at the end of its life, but offer it at an official point. This way, you help to protect the environment.

Spare parts

Table: spare parts

Part number	Description
3930000000	Perfomaster 4M7 electrode head with sharp electrodes
3930000001	Perfomaster 4M7 electrode head with round electrodes
3930000010	Perfomaster 1M electrode head with sharp electrodes
3930000011	Perfomaster 1M electrode head with round electrodes
3930000150	Perfomaster 4M7 upper electrode head with sharp electrodes
3930000151	Perfomaster 4M7 upper electrode head with round electrodes
3930000160	Perfomaster 1M upper electrode head with sharp electrodes
3930000161	Perfomaster 1M upper electrode head with round electrodes
3930000100	electrodes, sharp, set of 3
3930000101	electrodes, round, set of 3
7519020365	5 core cable with straight M12 connector, 5 m
7519020375	5 core cable with right-angled M12 connector, 5 m
7519020350	5 pole straight M12 connector
7519020355	5 pole right-angled M12 connector
9210518306	Set screw Nr. 8 32x1/8 Nylon

Spare parts can be obtained from the agent in your region or from Simco-Ion Netherlands.

Attachments

External Control Kit

Simco-Ion Netherlands
POBox 71, NL-7240 AB, LOCHEM - Netherlands
Telephone: +31(0)573 288333 Fax: +31(0)573 257319
general@simco-ion.nl
www.simco-ion.nl

Reference number	Reference name	Customer	Revision	Revision date	Page
9752093220	External Control Kit Perfomaster Quick Manual	Simco-Ion	0.6	28-07-2025	1 / 1

The Perfomaster External Control Kit consists of a control PCB and a separate LED for mounting in a panel of a control cabinet. It is used to control the high voltage of the Perfomaster and to indicate and to put through an output pulse from the Perfomaster to a PLC.

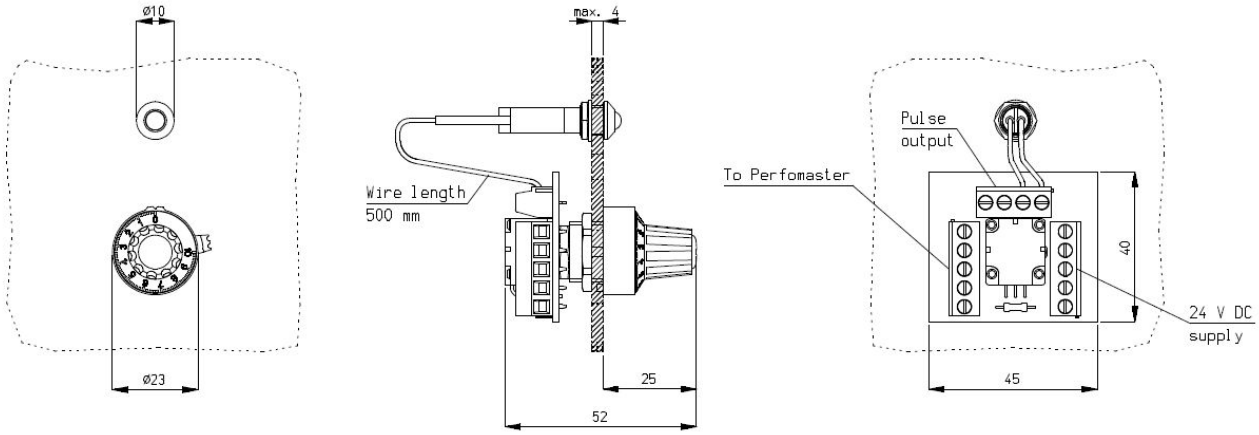


Figure 1: External Control Kit dimensions

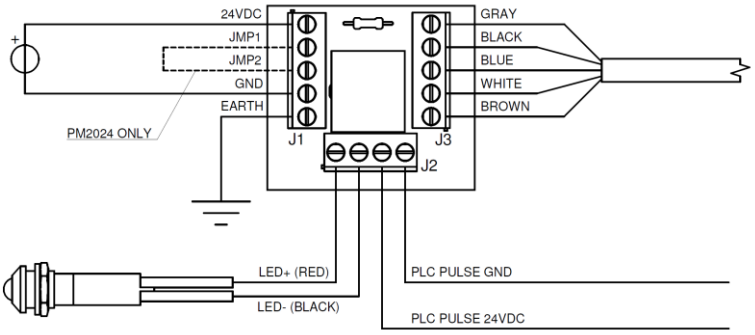


Figure 2: External Control Kit dimensions

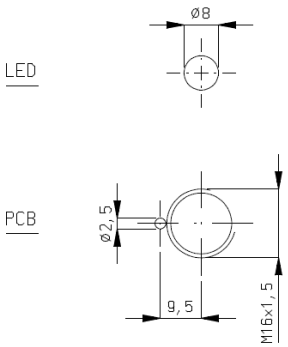
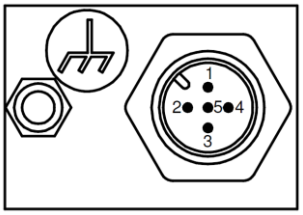


Figure 3: Panel cut-out

Wiring instructions:

- Only when a PM2024 Perfomaster is used: place a wire between JMP1 and JMP2 (connector J1). Do not place this wire when a PM2010 Perfomaster is used.
- Connect 24VDC and GND (connector J1) to a power supply (21 - 27V DC, min. 0,5 A).
- Connect EARTH (connector J1) to guaranteed earthing point.
- Connect the Perfomaster to connector J3.
  Figure 4 shows the Perfomaster connector and the colours of the standard Perfomaster connection cable.
- Connect the provided LED to connector J2.
- Connect the PLC input to connector J2.
  The +24 V DC pulse duration when a spark-over occured is 15 ms. The PLC detector output can deliver max. 30 mA.



Pin	Name	Colour
1	24 V DC	Brown
2	Detector +	White
3	0 V / GND	Blue
4	Detector -	Black
5	V_{set}	Green/Yellow - Gray

Figure 4: Perfomaster connections

Closing

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