ESE generators

TRANSLATION OF THE ORIGINAL OPERATING MANUAL

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Notes on printing

All descriptions, technical details and illustrations refer to the version of the generator for printing.

We reserve the right to make modifications in terms of ongoing technical development. This operating manual does not include technical modifications that occurred after printing.

The colours in this operating manual do not always comply completely with the actual designs due to technical printing reasons.

Table of Contents

1 Directories

1.1 List of illustrations

1.2 List of tables

2 About this manual

We would like to explain to you the safe and correct use of your generator in the best possible way through this operating manual. To do this we have oriented ourselves to the new European standard DIN EN 82079-1 for preparing the user manuals.

It is absolutely essential for safe and appropriate use that you read through this manual very carefully and understand it before using the device for the first time.

Your observance of it creates the foundation for,

- avoiding dangers for yourself and others,
- reducing repair costs and downtimes as well as
- increasing the reliability and service life of the generator.

Not only this manual but also the laws, regulations, guidelines, and standards applicable in the country of use must be observed.

This document only describes the safe operation of the generator when used as a complete unit. The following also includes detailed technical operating instructions that are binding with regard to using the device's specific components.

This documentation and also the product described in it are subject to a continuous improvement process. In doing this we ensure that the full product is compliant with the current safety requirements and the current state-of-the-art. The respective most up to date language version of the operating manual and the original operating manual can be found on our website

www.endressparts.com

2.1 Constituent parts of the documentation

Apart from these operating instructions, the following documents are needed to ensure that you have the all of the documentation for your device:

- Operating and maintenance instructions for the engine
- Electric generator's documentation
- Starter battery handling instructions (electric start)
- EU Declaration of Conformity
- Generator's test report

NOTICE!

The complete documentation is an integral part of the device and you must adhere to it.

► All of the integral parts of the documentation must always be accessible to the operating personnel and they should be kept with the device.

2.2 Using this operating manual

In order to increase the legibility, comprehensibility and transparency of the document, certain information is highlighted or identified according a uniform system. The following particularly belong in this category:

signs warning a bout dangers to life and limb

Safety and warning notices are necessary at all locations where there is potential danger from the device which cannot be eliminated by design or operational measures. We restricted ourselves to the permitted minimum in order to place the required distinctive warning notices at the correct point in time without impairing the legibility and comprehensibility of the operating manual. This is according to the regulations contained in the international standard DIN ISO 3864 describes a fixed rule for all safety and warning notices, as shown in the following example.

Examples:

Signal Word

Hazard Type
Hazard Consequence

► Hazard Avoidance

⚠ DANGER!

Electrical voltage

Risk of suffering potentially deadly electrocution by touching live parts

► Only use undamaged connecting lines

► Avoid all damp / wetness when connecting consumers

► Never operate the power generator with an opened control panel

The previously mentioned standard classifies the safety risks into different hazard potentials. It is essential that you read the information in Chapter 4 in order to understand and avoid any dangers to health or life.

Safety symbols

These warning notices are usually used in a safety symbol which also emphasises the type of danger; see next example. A list of the safety symbols used in this operating manual can be found in Chapter 4.1 . The safety symbols never stand alone.

Notices on avoidance of damage to the device

According to DIN ISO 3864, notices that warn against false operation and possible damage to the device or to the equipment used should be clearly distinguishable from previously named warning notices in as far there is no danger to health. An example of such a notice can be seen here:

Signal Word

Type and Consequence of Improper Use

► Intended Use

NOTICE!

Use of wrong or outdated fuel damages or destroys the engine.

► Only use approved fuel.

► Observe the shelf life of the fuel according to the supplier.

► Observe the Operating manual from the engine manufacturer

Symbols and formatting in the text

In order to increase the legibility, comprehensibility and transparency of the document, various information and activities are awarded uniformly repeating bullets or formatting. The following example shows presentation of a sequence of actions with established work steps:

Example:

✓ Prerequisites that must be fulfilled before starting any sequence of actions

1. Action steps according to a fixed sequence.
2. The action steps must be fully completed.
   Interim result of an action step sequence
3. The sequence must be observed.

Results of the actions that should be realised after completing the sequence of action steps.

Additional notices for operation or for function of a unit are marked with the adjacent symbol.

NOTICE!

The adjacent symbol is situated anywhere where the supplier documentation must be read and observed and refers to,

- ► appropriate information,
- ► tasks or
- ► action steps.

References to details and components in figures are made with blue bordered position numbers in the text such as the example of CE signs on the type plate demonstrates, see Fig. 3-1 .

3 Product identification

3.1 Welcome to ENDRESS!

We are pleased that you have made the decision to purchase a ENDRESS power generator. You have purchased a high-performance product into which we have embodied decades of our experience and have integrated many functions oriented on daily use. Through careful selection of high quality components and materials in combination with the proverbial Swabian engineering performance you have in your possession a device which will operate reliably for many years, also under the hardest of operating conditions.

3.2 Your product

Customer service

In order to precisely identify your device there is a type plate attached to the Generators (see Fig. 3-5), which includes details about the device designation and "S/N" serial number. If you have any questions about device details, functions or notices concerning operation, please contact our

Customer service: Tel. +49 (0)7123 9737-44

Email: service@endress-stromerzeuger.de

You will find competent contact persons there, also concerning original spare parts and wear parts. (see also Chapter 15)

Type plate

The type plate shown below is a representation of the adhesive label placed on the device. Please be prepared, when contacting our service team, to assist us in exactly identifying your device.

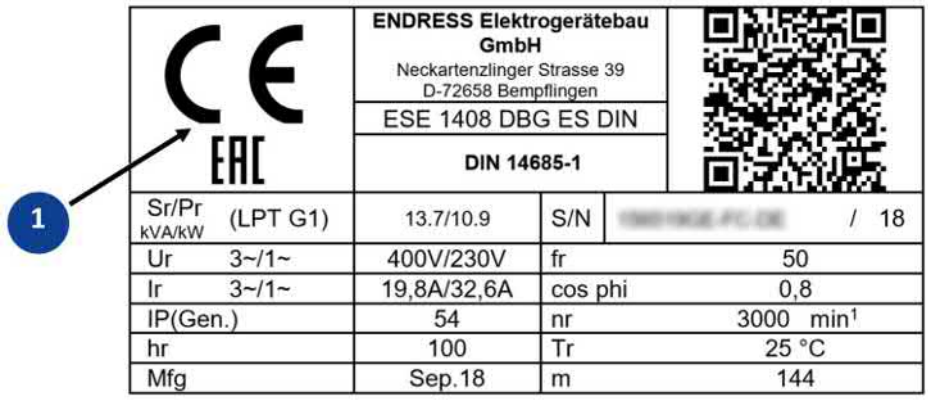


Fig. 3-1 Example of a type plate

3.2.1 A device description and intended use

The generator is used to supply electrical equipment for authorities and organisations with safety tasks such as fire brigades, the technical emergency service, German red Cross and other aid organisations.

Your device consists of an AC generator driven by a combustion engine that is bolted onto it. This unit is mounted elastically inside a closed, sound-insulated housing, and vibration dampers are used to ensure low vibration.

The unit generates AC (three-phase) current with a nominal voltage of 400 V at 50 Hz. More detailed technical data can be found in Chapter 14 . An integrated voltage regulator ensures that the stability of the generated voltage is within the nominal rotational speed range.

The generator is only to be used outdoors within the indicated voltage, output, and nominal RPM ranges (see type plate).

You are also allowed to use it on a vehicle extension platform or swivelling compartment when it is extended or swivelled out. The condition here is that air must be able to flow around the generator unhindered on all sides and, in particular, that discharging its exhaust is ensured. This is especially relevant as there must be unrestricted access to the end with the instrument panel and the end with the exhaust gas connection.

An installation where these ends are facing the vehicle will require written consent from the distributor and it must be included with the generator.

The generator is not to be connected up to other energy distribution systems (e.g. public power supply) or to other energy generation systems (e.g. other generators).

The generator is not to be used in explosion-prone environments.

The generator is not to be used in environments where there is a risk of fire.

The generator must be operated according to the specifications in the technical documentation.

Every inappropriate use or all activities on the generator which are not described in these instructions is forbidden misuse outside the legally defined limits of liability of the manufacturer.

3.2.2 Foreseeable misuse

Apart from the description of appropriate use, the lawmaker also requires concrete references to the results of “reasonably foreseeable misuse“. In a case of incorrect use or inappropriate handling of the generator the manufacturer's EU Declaration of Conformity, and automatically thereby also the operating licence, are nullified. For products with a manufacturer’s warranty the manufacturer will reject any claims made under warranty for damages which were caused by misuse and its direct as well as indirect consequences.

In particular unauthorised misapplications include:

- operation of the generator takes place without valid checks for
  - electrical safety
  - checking that the stipulated servicing and maintenance work has been done
- operation of the generator taking place without the protective equipment installed by the manufacturer
- constructional or electrical modifications were made to the generator
- software was modified or changes were made to the generator's factory settings
- use of the generator by inadequately instructed operating personnel

Furthermore at all costs avoid the following Misuses:

- Never refuel the generator’s own tank when the engine is running. The vibrations and strong exhaust streams during operation can lead to fuel spillage. This leads to an increased risk of explosion and fire and therefore danger to operating personnel, the environment and the device.
- Never refuel the generator’s own tank when it is hot. Overflowing fuel and exhaust fuel vapours can ignite on hot parts of the device.
- Never open the generator’s tank cover whilst it is running or if it is hot. Overflowing hot fuel and escaping fuel vapours can ignite on the device’s hot parts.

- The generator is never to be connected up to another energy distribution system (e.g. public power supply) or to other power generating systems (e.g. other generators, solar plants, etc.). To start with this is usually not permitted by . In both cases this will inevitably lead to severe damage and possibly also severe injury.
- Never place the generator in explosion-prone environments. The individual components of the generator are not designed to be EX-protected.
- Never operate the generator in rooms, narrow pits or vehicles. The combustion exhaust gases contain poisonous substances including the odourless but deadly gas carbon monoxide (CO) which, when breathed in, can accumulate in cases of poor air circulation to reach deadly concentrations. Also a lack of fresh air circulation leads to overheating and possible damage to the generator right through to destruction.
- For the same reasons of risk, never divert exhaust gases for the purposes of heating rooms or vehicles.
- Never clean the generator with the aid of a high pressure cleaner or a strong jet of water.
- Never allow water to find its way inside the generator. Never pour water over the generator and never clean it using a water hose or a high pressure cleaner.
- Never operate the generator in any area where it could be flooded by high water or any other events. The device's protection class (see Chapter 14) allows operation with spray water, however not in the case of floods.

3.3 Scope of delivery of your generator

Apart from the technical documentation mentioned in Chapter 2.1 the following articles are Scope of delivery of your generator:

Included with delivery

Fig. 3-2 Included with delivery

Item	Name
1	Spark plug wrench
2	Operating manual and supplier documentation
3	Spare2 x spark plugs

These supplied products can be found in a separate storage compartment 2 under the protective cover 1 next to the circuit breaker viewing window (see Fig. below). This operating manual should also be kept in this compartment so that it is protected by being inside the device and is always available.

Open the protective cover by pressing it down firmly. The snap-lock will open with a click. You can then lift up the protective cover.

Fig. 3-3 Document and tool kit compartment

Special accessories

The following articles are supplied as special accessories:

Fig. 3-4 Special accessories

Item	Name
1	Refuelling device
2	Standard 20 litre fuel can
3	150 cm / Ø 50 mm exhaust hose as per DIN 14572

3.4 Labels on the generator

Important parts of the operating manual can be found as labels and notices fitted on your generator. These labels must not be removed and must always be maintained in a legible condition. In the event of damage, new labels can be ordered from our customer service team. The following Figs and tables show the stipulated attachment points and give a brief explanation of the labels.

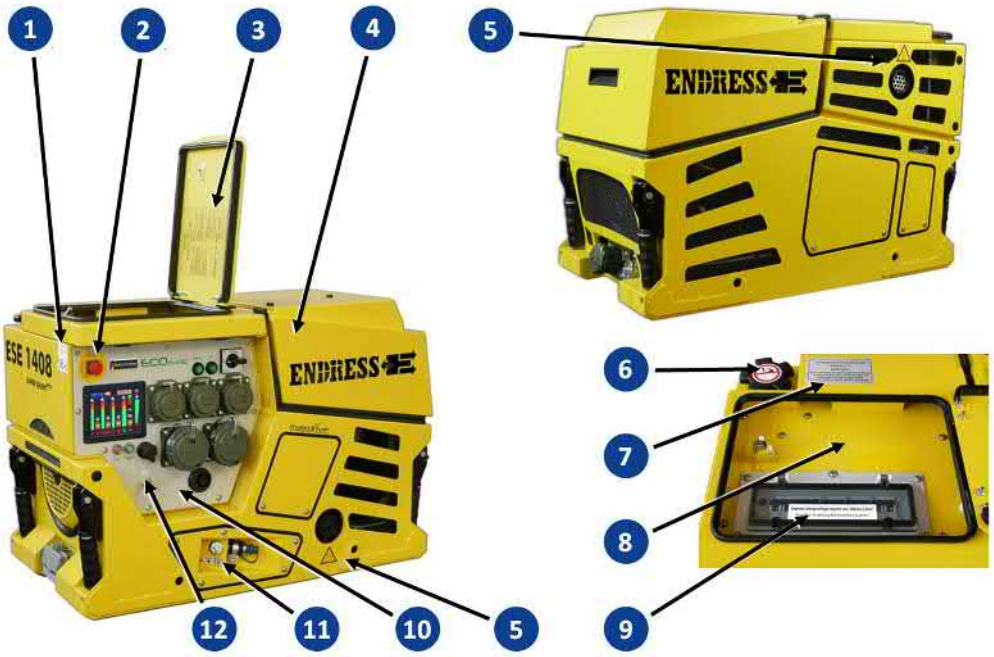
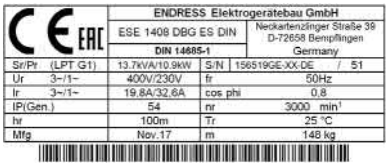


Fig. 3-5 Labels on the device

Item	Name	Meaning
1		Note Noise emissions
2		EMERGENC-STOP smash button, see Chapter 7.6
3		Short operating instructions

Item	Name	Meaning
4		Remote-controlled unit starts up without a warning
5		Note: Do not touch! - Hot surface when running
6		Note No naked flames
7	Normalbenzin ROZ 95 DIN EN 228 Tankinhalt ca. 13 l ACHTUNG: NICHT WÄHREND DES BETRIEBES NACHTANKEN. ZUM NACHTANKEN, MOTOR ABSTELLEN UND EINIGE MINUTEN ABKÜHLEN LASSEN. NICHT IN UNBELÜFTETEN RÄUMEN BETREIBEN.	Note Fuel quality and Tank capacity
8		Type plate
9	Gesamtes Leitungsverlängerungsnetz max. 100m bei 2,5mm² Bei größerer Ausdehnung Betriebsanleitung beachten!	Refers to the line network's maximum extension
10		Note Read the operating manual before starting up
11		Note 3-way fuel valve positions
12		Note Potential equalisation connection

Tab. 3-1 Labels on the device

4 For your safety

The following chapter describes basic Safety instructions for safe operation of your generator. Your device is a very high-performance electrical machine which is potentially dangerous when operated if it has not been installed, commissioned, used, serviced and repaired according to the operating manual. If necessary, the operating manual will also include different supplements that depend on the country of use, in addition to the present one.

Operation, use, servicing as well as any work with or on the generator is therefore only permitted by such persons who have read this chapter and have put its provisions into practice!

Concrete warning notices can also be found regarding basic safety instructions further on in this operating manual. These are always placed in an explanatory text immediately before the description of work steps which can be dangerous if the warning notice is not observed. Read the following sections for correct and rapid understanding of these safety and warning notices. They describe their systematic structure as well as the meaning of markings and symbols.

4.1 Safety symbols

The safety symbol indicates graphically that a source of danger exists. We use the internationally valid safety symbols from ISO 7010 for rapid and unique classification of the respective dangerous situation. In the following there is a description of the warning symbols used in this operating manual with an explanation about the respective dangerous situations.

Warning of a general hazard

This warning symbol indicates activities where several causes can lead to risks. The concrete danger must be respectively more clearly specified by further notices.

Warning of a dangerous electrical voltage

This warning symbol is indicates activities where the danger of electric shock exists, possibly with lethal consequences.

Warning of potentially explosive materials

This warning symbol indicates activities where the danger of an explosion exists, possibly with lethal consequences.

Warning of toxic substances

This warning symbol indicates activities where a risk of poisoning exists, possibly with lethal consequences.

Warning of corrosive substances

This warning symbol indicates activities where a risk of chemical burns to the environment as well as people exists, possibly with lethal consequences.

Warning of environmentally damaging substances

This warning symbol indicates activities where a risk of contaminating the environment exists, possibly with catastrophic consequences.

Warning of hot surfaces

This warning symbol indicates activities during which there is the danger of burns, possibly with lasting consequences.

Warning of a suspended load

This warning symbol indicates activities where the danger of falling loads exists, possibly with lethal consequences.

Warning of automatically starting machines

This warning symbol indicates activities where a danger of being injured by self-starting machines exists, possibly with lethal consequences.

4.2 General safety instructions

ENDRESS Generators are designed to operate electrical equipment with appropriate power output requirements. Other uses can lead to severe injury to operating personnel and people nearby. There is also increased risk of damage to the generator and further property damage.

⚠ DANGER!

Mortal danger due to an electric shock if live parts are touched.

- ► Never operate the device if it is in a damaged condition.
- ► Never operate the electrical consumers and connecting cable (power consuming equipment) in a damaged condition.
- ► Never feed directly into existing networks that are already connected to a power source (e.g. power supplier, solar plant, etc.).
- ► Never operate the device with wet hands.

Most injuries and equipment damage can be avoided if all instructions given in this manual and all instructions attached to the device are followed.

The Generators must not be modified in any way, not even temporarily. This pose a death hazard to operating and deployed personnel and damage to the generator and the consumers being used.

Operating company and Operating personnel are to use the Generators only according to regulations contained in the entire technical documentation (hereinafter referred to as appropriate use).

Every instance of inappropriate use and all activities on the Generators that are not described in this manual are prohibited misuse beyond the legally defined limits of the manufacturer's liability. In return all claims for damages and warranty claims against ENDRESS-Elektrogerätebau GmbH that are associated with misuse are null and void.

4.3 Residual risks

As a manufacturer of EU-compliant machines, ENDRESS make great efforts to create designs which already eliminate possible risk potentials at the design stage. If this is not possible without significantly impairing the functions of a device, we implement suitable protective measures protect the user from injury.

If there are still some residual risks associated with working with the device, we clearly advise the user about these sources of danger, possible consequences as well as measures to avoid such dangers.

The residual dangers were analyzed and Residual dangers identified during the development and design of your Generators by means of a danger analysis according to DIN EN 60204, DIN EN ISO 12100 and DIN EN ISO 8528-13.

References to general sources of danger can be found in chapters 4 and 5 . From Chapter 6 one can find concrete warning notices placed before every action step which represents a residual risk.

The exact structure and contents of warning notices are defined in the ISO 3864 series of standards and follow an established identification marking required to immediately be able to estimate the degree of the respective danger. Exactly impress upon yourself the identification marking of the

four different danger levels in order to be able to reliably assess the dangers associated with the individual operating states and action steps when reading the operating manual.

⚠ DANGER!

DANGER describes a danger which represents a high level of risk,which can lead to death or severe injuries,when not avoided.

- ► The individual points provide instructions and
- ► notices as aids to avoid the danger
- ► or to reduce the risk to an acceptable level.

⚠ WARNING!

WARNING describes a danger which represents a medium level of risk,which can lead to death or severe injuries,when not avoided.

- ► The individual points provide instructions and
- ► notices as aids to avoid the danger
- ► or to reduce the risk to an acceptable level.

⚠ CAUTION!

CAUTION describes a danger which represents a low level of risk,which can lead to minor or medium level injurieswhen not avoided.

- ► The individual points provide instructions and
- ► notices as aids to avoid the danger
- ► or to reduce the risk to an acceptable level.

NOTICE!

ATTENTION! describes a situation or action that might result in damage to equipment and/or malfunctions if it is not prevented.

- ► The individual points provide instructions and notices
- ► as an aid to avoid or prevent damage to equipment.

⚠ DANGER!

Mortal danger due to an electric shock if live parts are touched.

- ► Never operate the device if it is in a damaged condition.
- ► Never operate the electrical consumers and connecting cable (power consuming equipment) in a damaged condition.
- ► Never feed directly into existing networks that are already connected to a power source (e.g. power supplier, solar plant, etc.).
- ► Never operate the device with wet hands.

DANGER!

Engine exhaust gases contain poisonous and partially invisible gases such as carbon monoxide (CO) and carbon dioxide (CO2).

Risk of death due to poisoning or asphyxiation.

- ► Ensure that there is good ventilation during the whole period of operation.
- ► Only operate the generator in the open.
- ► Never direct the exhaust gases into rooms or pits.

DANGER!

Danger of severe or mortal injuries being incurred from falling loads.

- ► Never stand under or close to a suspended load, also not to provide assistance.
- ► Ensure that there is no person in the area of swivel of the lifting device.
- ► Use all suitable measures to prevent the suspended load from swaying.

DANGER!

Leaking engine oil and fuel can burn or explode.

A risk of suffering severe even deadly burns.

- ► Prevent engine oil or fuel from leaking out.
- ► Never open the tank cover during operation or when it is hot.
- ► Remove leaked operating fluids immediately and appropriately.
- ► Never use an additional starting aid.
- ► Smoking, naked flames and sparks are forbidden.

DANGER!

Hot parts can ignite flammable and explosive materials.

A risk of suffering severe even deadly burns.

- ► Never operate the generator in the vicinity of combustible or flammable materials.
- ► Never operate the generator in an environment prone to an explosion.

WARNING!

There is a risk of explosion and fire in the case of inappropriate handling and spark development when working with the battery.

Danger from spraying sulphuric acid. Danger of suffering severe even deadly burns and chemical burns. Danger of being blinded.

- ► Never lay electrically conductive parts on the starter battery.
- ► Flames, sparks, an open light and smoking are prohibited.
- ► Avoid sparks when handling cables and electrical devices, as well as electrostatic discharge.
- ► Avoid short-circuits.
- ► Wear acid-resistant protective clothing.

⚠ WARNING!

Escaping corrosive acid fumes or sulphuric acid during and after the charging process. A risk of suffering severe or even deadly burns.

- ► Only work with acid-resistant protective equipment.
- ► Clean surfaces covered in acid immediately using adequate amounts of water.
- ► Only charge the starter battery in a well ventilated environment.

⚠ CAUTION!

Certain surfaces on the device can get very hot whilst it is running.

Risk of burns

- ► Never touch any engine parts (in particular the exhaust system) for a few minutes after ceasing operation.
- ► Always leave hot engine parts to cool down before touching them.

⚠ CAUTION!

A high device weight. Risk of crushing from improper handling during operation or transport.

- ► Only lift the generator with the aid of all handles provided or by using a suitable hoist.
- ► During transport on vehicles, ensure that there is the prescribed load securing in place.
- ► With it in a raised condition, never come close to or stand under the generator.

NOTICE!

Leaking engine oil and operating fluids can contaminate the soil and groundwater.

- ► Ensure that the generator is transported horizontally and mounted.
- ► Make all efforts, at all costs, to prevent escaping of operating fluids.
- ► Dispose of contaminated soil immediately and according to regulations.

NOTICE!

Use of wrong or outdated fuel damages or destroys the engine.

- ► Only use the fuel displayed on the sign (Tab. 3-1).
- ► Observe the possibly enclosed documentation for the fuel release of the engine manufacturer
- ► Observe the shelf life of the fuel according to the supplier.
- ► Observe the engine operating manual.

NOTICE!

Excessive heat or moisture can destroy the device.

- ► Always ensure that there is a good supply of air and heat removal.
- ► Never operate the generator in rooms or narrow pits.
- ► Never clean the device with the aid of a strong jet of water or high pressure cleaner.
- ► Never allow water to find its way inside the generator.

4.4 Authorised operating personnel – qualifications and obligations

Your Generators is a complex machine, the operation and maintenance of which requires exact knowledge of its functions and danger potentials. Therefore any work with or on the device, of any kind, may only be performed by authorised and instructed operating personnel.

Quite apart from the authorisation which the operating company of the device must issue, only such persons may operate or service the device who fulfil the following criteria. They are designated in this operating manual as operating personnel.

The authorised operating personnel must:

- be of age.
- be trained in First Aid and be able to provide it.
- be familiar with the accident prevention regulations and safety instructions relevant to the Generators and be able to apply them.
- have read Chapter 4 , have understood the contents and are able to use and implement them in practice.
- be trained and instructed according to the rules of conduct in the case of malfunctions.
- have the physical and mental abilities to carry out their responsibilities, tasks, and activities on the Generators.
- be trained and instructed in their responsibilities, tasks and activities on the Generators.
- have understood the entire technical documentation concerning their responsibilities, tasks and activities on the Generators and be able to implement these in practice.

4.5 Danger zones and work areas

In order to be able to consider all of a machine's safety aspects and to comply with the safety and health protection requirements of the applicable standards and EU directives, we have assessed the use of your Generators in all of the phases that it will go through during its product service life (product life cycle). The following zones were defined on the Generators for this purpose: The danger zones and work places (work areas) around the generator are determined by the activities to be undertaken within the various phases in individual life cycles:

- **Working zone:** In this zone on and around the Generators (approx. 1 metre radius) the trained operating personnel (see Chapter 4.4) may operate and inspect the device in compliance with all of the safety and operating instructions given in the technical documentation. All other people (especially minors and people with disabilities) must remain outside this working zone.
- **Danger zone:** This zone must be kept free of all personnel during all phases of use and service life of the device. Any work in this zone is only to be undertaken by specially trained specialists if it is essential for the fulfilling of the task and if all of the protective equipment (PPE) needed is used. You must always comply with the following limits:

Product's service life phase	Danger zone
Transport and installation	within a radius of 1m around or below the device
Operation	within the outer limits of the device
Service and maintenance	Within the outer limits of the device when switched on Generators

Tab. 4-1 Danger zone on Generators

5 Checking the electrical safety

Checking the electrical safety needs different measures that are only to be undertaken by authorised personnel. In doing so the pertinent VDE provisions, EN and DIN standards, in their valid versions, must be observed. You must abide by additional regulations if it is being used by authorities for organisational and security tasks. They stipulate special protective measures and rules of conduct for the operating and the periodic testing as well as having the appropriate labelling on the device.

In particular, you must never use defective or damaged consumers, cable connections or plug connectors, etc. (current-consuming equipment). They must be checked for proper condition at regular intervals (see Tab. 5-1).

Earthing

Your Generators has been designed for manual or automatic operation (remote start) with one or more electrical consumers. To protect against electric shock (current flow through your body), the protective separation measure with equipotential bonding according to DIN VDE 0100-551: 2017-02 is used. The protective conductor system for the attached consumer equipment takes over the potential equalisation device function. The terminal (Fig. 6-4) is connected to this potential equalisation device. An earthing is not necessary. It might be necessary to use a potential equalisation connection for discharging static electricity caused by the application.

⚠ DANGER!

Dangerous electrical voltages will be present if several consumables are connected up without a working personal safety device.

Mortal danger from electrocution

- ► Never use several consumer appliances Generators without tested insulation monitoring (see Chapter 8.3.1).
- ► Check the personal protection according to the check intervals given in Tab. 5-1 .

In addition to the details given above, the electrical safety of the generator is to be checked by a qualified electrician at regular intervals. The periods between testing must be established in such a way that the generator and all work equipment to be connected can, according to the general status of knowledge, operational experiences or on the basis of specific evidence, be safe to use in the period between the two inspections. (Examples in TRBS 1201, implementation instructions re §5 of BGV/GUV-V A3, BGI 594, BGI 608, Annex 2, recommendation of BGI/GUV-I 5090 “Repeated testing of mobile electrical equipment“).

NOTICE!

The operator is responsible for defining and adhering to the test intervals . Above all one must ensure observance of the respectively valid national regulations.

This responsibility also extends to any additional equipment installed in conjunction with the device.

We recommend the following checks and deadlines as general guideline values:

When	What / how	Who
First start-up at the operating location	• See Chapter 7 and also abide by the operating manual provided by the engine manufacturer • Visual inspection for externally visible defects such as transport damage.	Operating personnel
Start-up on a daily basis	• See Chapter 7.4 and also abide by the operating manual provided by the engine manufacturer • Visual inspection for externally visible defects (such as damaged insulation, connectors, cable; leaks, noise) • If the generator is fitted with insulation monitoring and/or an RCD, then the operating personnel must run protective device functional tests (see Chapter 8.3 and Chapter 9.5) every working day. The operating personnel must be trained to do this.	Operating personnel
Retest at the latest once every six months	• According to BGI/GUV-I 5090 “Repeated testing of mobile electrical equipment“) • Sample test report according to DGUV information 203-032 *)	Qualified electrician
	*) Download as a text file under → www.dguv.de Webcode: d138299	

Tab. 5-1 Recommended test intervals

6 Description of the device

6.1 Views

The following section provides an overview of the designation and location of the most important components of your generator. It is important that you familiarise yourself with it so that you will be able to understand and safely carry out the functions and operating steps described below. Ignoring this manual can cause severe injury or death, and/or damage to the power generator and connected consumers.

To make it easy to find the operating controls, the individual views of the power generator are designated throughout the following descriptions and instructions, as can be seen in the following illustration.

Fig. 6-1 Views of the generator

6.2 Components on the connecting side

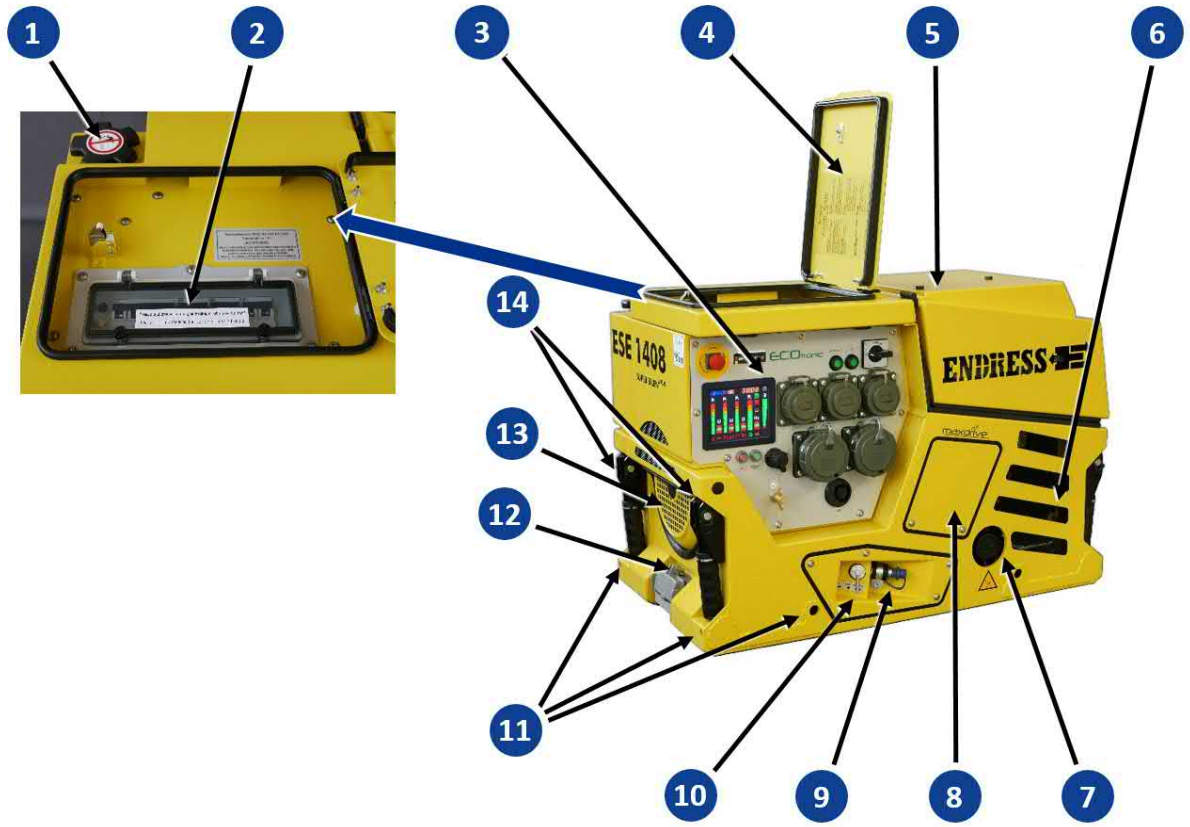


Fig. 6-2 Components on the connecting end

1	Filling opening Fuel tank	2	Fuse box with circuit breakers
3	Control panel	4	Fuses / manual protective cover
5	Engine hood	6	Engine cooling exhaust outlet
7	Exhaust outlet (when converted as per Chapter 10.5)	8	Oil filter maintenance hatch
9	External connection Refuelling device	10	3-way fuel valve
11	Fastening points according to DIN 14685-1	12	HARTING remote start socket
13	Generator with air intake	14	Folding handles

6.3 Components on the maintenance side

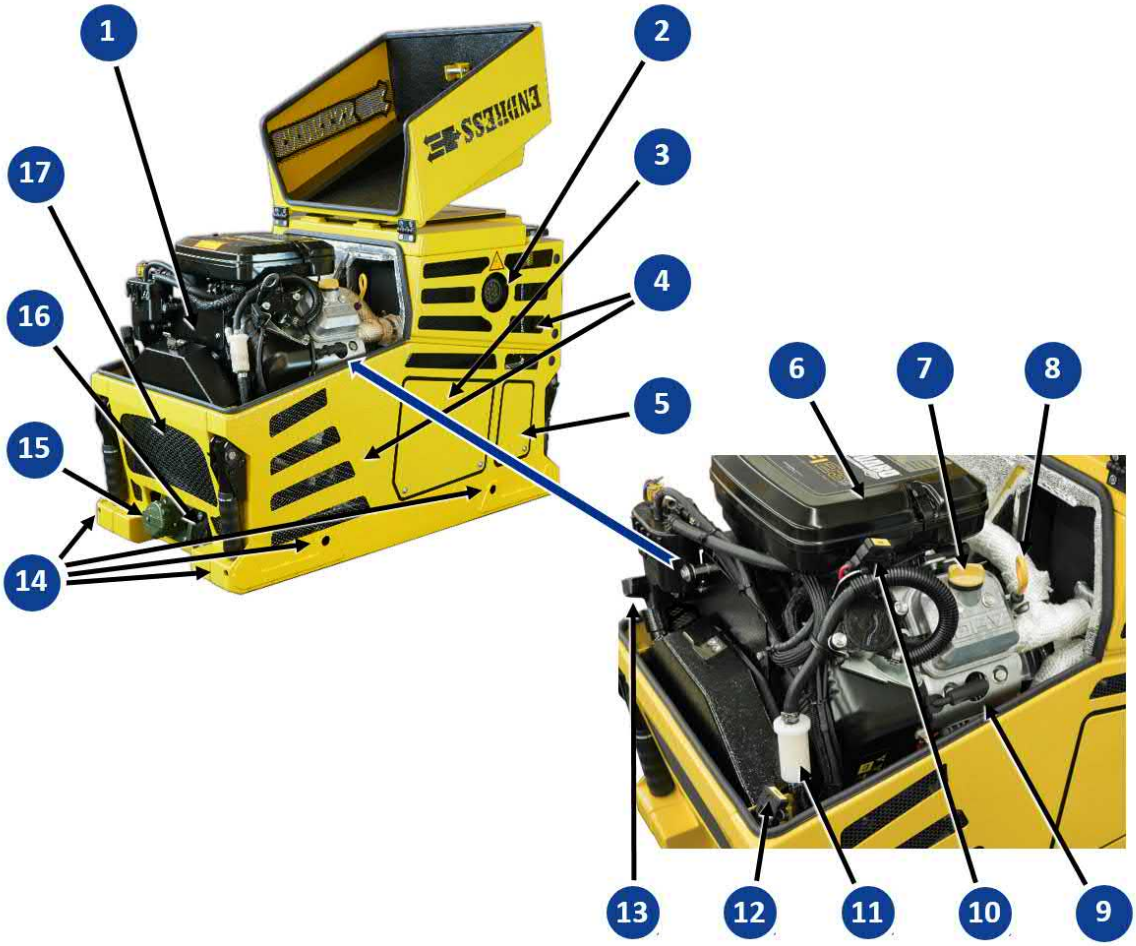


Fig. 6-3 Components on the maintenance side

1	Drive engine	2	Exhaust outlet (standard version)
3	Maintenance cover 12V starter battery	4	Engine cooling exhaust outlet
5	Maintenance cover	6	Engine air filter
7	Engine oil filling opening	8	Engine oil dipstick
9	Spark plug connector	10	20A fuse for 12V power supply
11	Fuel filter	12	15A fuse for charging current socket (optional)
13	Grab handle Cable pull starter	14	Fastening points according to DIN 14685
15	External start socket (option)	16	Charging socket
17	Engine cooling air intake		

6.4 Control panel components

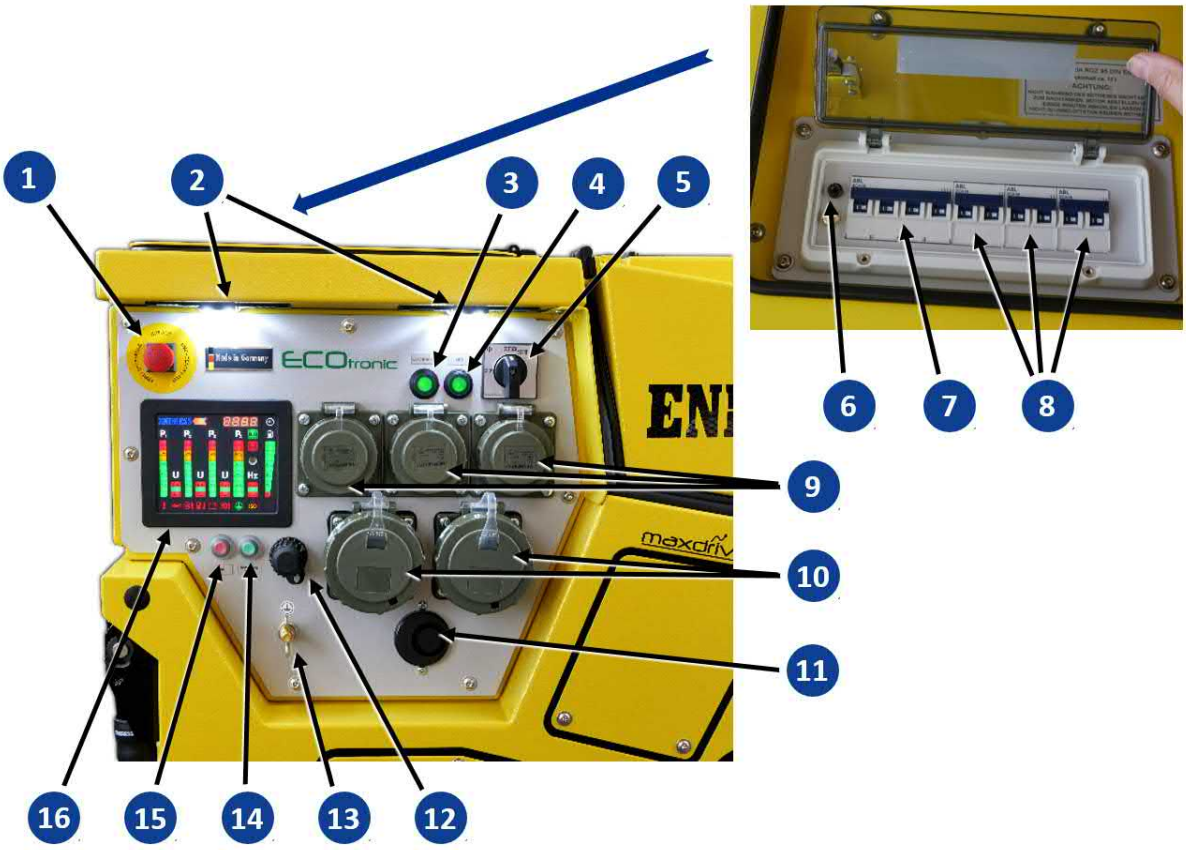


Fig. 6-4 Control panel and fuse box components

1	EMERGENCY STOP smash button	2	Control panel lighting,
3	ECOtronic On/Off	4	Control panel lighting ON/OFF
5	Engine start switch	6	Test socket Protective earthing conductor test
7	Circuit breaker for 400V CEE socket	8	Circuit breaker for 230V Schuko sockets
9	Schuko16 A sockets	10	CEE/ 16 A / 3~ sockets
11	Warning horn	12	FIRECAN socket (option)
13	Connection Potential equalisation / earthing	14	Reset button ISO monitoring
15	ISO monitoring test button	16	Multifunction display E-MCS 4.0

NOTES

7 Commissioning

The following chapter describes the basic procedure for first time or repeated putting into operation of the generator in "On-site operation" mode. Follow the working steps described below when you put your generator into operation for the first time or restart it again after transporting it.

7.1 Initial start-up

Fig. 7-1 Initial start-up

You must carry out the following preparatory steps after you have unpacked your generator from the delivery packaging and are going to run it for the first time:

Conditions

- ✓ The generator must be fully unpacked.
- ✓ Suitable engine oil must be ready for use (see Chapter 10.4).
- ✓ Suitable fuel must be ready for use (see Chapter 7.4).

1. Open the engine hood Fig. 6-2 5.
2. Fit the enclosed 20 A fuse 1 in the fuse holder to create the power supply from the starter battery.
3. Turn the oil filling cover counter-clockwise to release the filling opening.
4. Fill the engine with a suitable engine oil (see the enclosed operating and maintenance instructions from the engine manufacturer).
5. Turn the oil filling cover clockwise to reseal the opening.

The generator is now ready to be started.

7.2 Transporting and preparing your generator

The following requirements must be fulfilled before you can transport the generator:

Requirements:

- ✓ the ground at the installation site must be even and capable of taking the load
- ✓ the generator must be switched off
- ✓ the generator must be cooled down
- ✓ if fitted, the fuel valve must be in the “OFF” position
- ✓ if connected, the external refuelling device must be disconnected

NOTICE!

Leaking engine oil and operating fluids can contaminate the soil and groundwater.

- ► Ensure that the generator is transported horizontally and mounted.
- ► Make all efforts, at all costs, to prevent escaping of operating fluids.
- ► Dispose of contaminated soil immediately and according to regulations.

Manual transporting

⚠ WARNING!

Danger due to the device’s heavy weight.

Risk of crushing through sliding or a falling machine

- ► Take note of the empty weight up to 144 kg.
- ► Use personal protection equipment.
- ► The device must be carried by four people.
- ► Only lift the device using the carrying handles.
- ► Raise / lower the device evenly.
- ► Walk slowly.

Carrying the generator

1. Fold out the four Carrying handles on the engine side and the generator side must be fully out.
2. Lift the generator simultaneously and evenly from all four sides.
3. Carry the generator slowly to its place of use.
4. Lower the device evenly.
5. Fold in the carrying handles so that they are fully in

The unit has been carried to its site and it has been positioned.

7.3 Refuelling your generator

Proceed as follows to fit the generator's own tank: the generator.

Conditions

- ✓ the generator is turned off
- ✓ the generator has cooled down
- ✓ there must be an adequate air supply and air removal
- ✓ all power consuming equipment must be disconnected or switched off

⚠ DANGER!

Leaking engine oil and fuel can burn or explode.

A risk of suffering severe even deadly burns.

- ► Prevent engine oil or fuel from leaking out.
- ► Never open the tank cover during operation or when it is hot.
- ► Remove leaked operating fluids immediately and appropriately.
- ► Never use an additional starting aid.
- ► Smoking, naked flames and sparks are forbidden.

NOTICE!

Leaking fuel can contaminate soil and groundwater.

- ► Take note of the residual quantity in the tank and its maximum filling capacity.
- ► Always bear in mind that the fuel gauge reacts only after a time delay.
- ► Fill the tank to a maximum of 95%.
- ► Always use a filling aid (e.g. funnel).

NOTICE!

Use of wrong or outdated fuel damages or destroys the engine.

- ► Only use the fuel displayed on the sign (Tab. 3-1).
- ► Observe the possibly enclosed documentation for the fuel release of the engine manufacturer
- ► Observe the shelf life of the fuel according to the supplier.
- ► Observe the engine operating manual.

Refuelling the generator

1. Unscrew the tank cover Fig. 6-4 .
2. Insert the filler nozzle into the filling opening.
3. Fill with fuel slowly and evenly.
4. Take note of the tank's fuel level indicator Fig. 6-4 as well as the fuel level at the filling opening to ensure that you do not overfill the tank.
5. Remove the filler nozzle.
6. Refit the tank cover.

The generator is now refuelled.

7.4 Starting the generator

How to start the Generators for manual operation with fuel supplied from its own tank is explained here. See Chapter 9.3 for automatic remote starting. See Chapter 8.5 for supplying the fuel from an external refuelling device.

Conditions

- ✓ electrical safety has been checked (see Chapter 5).
- ✓ the fuel tank is full enough.
- ✓ external refuelling device, if being used, is connected (see Chapter 8.5).
- ✓ oil level is sufficient (fill with engine oil before initial use, see Chapter 10.4.1 and the engine operating and maintenance instructions).
- ✓ there is an adequate air supply and air removal.
- ✓ if necessary the existing exhaust hose (special accessory) is attached.
- ✓ all power consuming equipment is disconnected or switched off.

⚠ DANGER!

Leaking engine oil and fuel can burn or explode.

A risk of suffering severe even deadly burns.

- ► Prevent engine oil or fuel from leaking out.
- ► Never open the tank cover during operation or when it is hot.
- ► Remove leaked operating fluids immediately and appropriately.
- ► Never use an additional starting aid.
- ► Smoking, naked flames and sparks are forbidden.

⚠ DANGER!

Engine exhaust gases contain poisonous and partially invisible gases such as carbon monoxide (CO) and carbon dioxide (CO2).

Risk of death due to poisoning or asphyxiation.

- ► Ensure that there is good ventilation during the whole period of operation.
- ► Only operate the generator in the open.
- ► Never direct the exhaust gases into rooms or pits.

NOTICE!

Frequent brief operations and/or long operating times without a load will have a negative effect on the operational readiness and the generator's service life.

- ► Try to avoid frequent brief operations, otherwise the starter battery will not be sufficiently charged and it might fail.
- ► Always ensure that the battery is well charged by prolonging the operating phase whenever necessary or by recharging externally.
- ► Avoid long operating times without a load.

Proceed as follows to manually start the Generators from its control panel (to start via a remote control, see Chapter 9.3):

Starting the engine

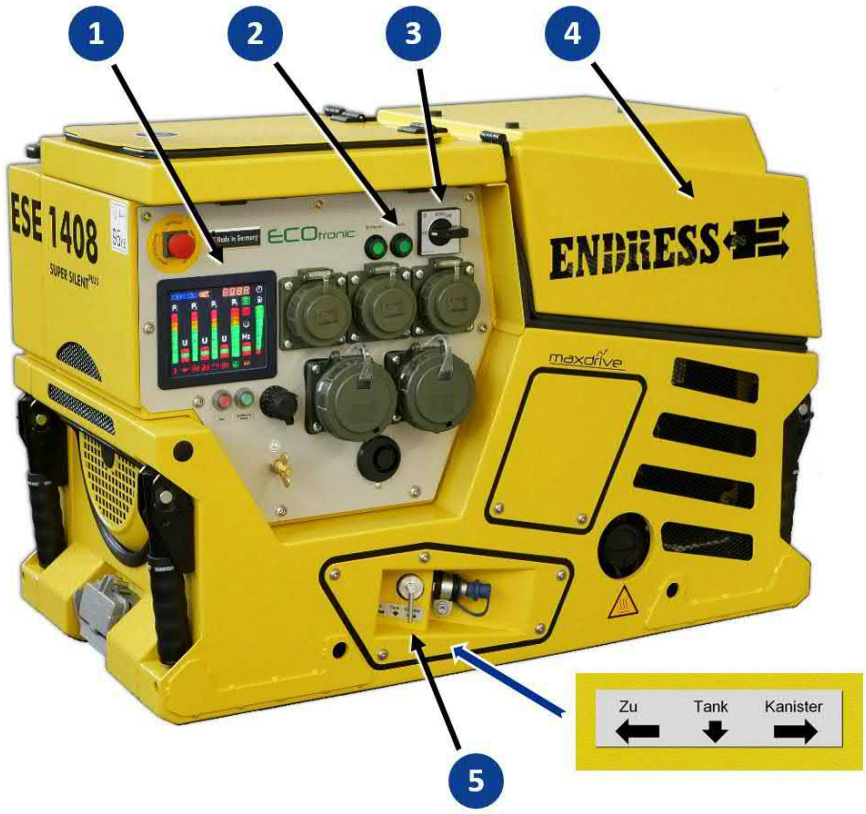


Fig. 7-2 Electrical start controls

Electrical start

1. Turn the lever on the fuel valve 3 into the “Tank” position.
   The generator will be supplied with fuel from its own tank.
2. Turn the engine start switch 3 into the “ON” position.
   a) In poor lighting conditions, press the push button 2 to switch the control panel lighting Fig. 6-4 2 on.
   The multifunction display 1 will start a test run.
3. Turn the engine start switch 3 in the “START" position.
   The engine will start.
4. Release the engine start switch and it will spring back into the "ON" position.

The engine has started.

NOTICE!

Only activate the starter briefly (max. 5-10 seconds). Never start or run the engine with the battery disconnected.

If the starter battery is weak or the starter circuit is defective then the Generators can be started manually using the recoil starter (emergency starter). Proceed as follows to do this:

Conditions

✓ The starter battery must still have enough residual energy to supply the multifunction display and the engine controller with power.

Fig. 7-3 Manually starting the recoil starter

Manual start

1. Open the engine hood Fig. 7-2 -4.
2. Turn the lever on the fuel valve Fig. 7-2 5 into the “Tank” position.
   The generator will be supplied with fuel from its own tank.
3. Turn the engine start switch Fig. 7-2 -3 into the “RUN” position.
   The multifunction display 1 will start a test run.
4. First pull the recoil starter lightly 1 until you feel resistance and then let it slide back slowly.
   The engine will now be in its start position.
5. Now pull hard on the recoil starter 1 to start the engine.
   The engine will start.
6. Let the handle of the recoil starter slide slowly back into the housing.
7. In poor lighting conditions, press the push button Fig. 7-2 2 to switch the control panel lighting Fig. 6-4 2 on.
8. Close the engine hood Fig. 7-2 4.

The engine has started.

NOTICE!

Do not apply load to the generator immediately after a cold start.

► Allow the generator engine to warm up for a few minutes before switching on a load when the generator has not been operating for more than eight hours (or for very low external temperatures).

NOTICE!

If the oil pressure warning light on the multifunction display lights up during the start process Fig. 8-1 13 then the engine's oil level is too low. The automatic low-oil system prevents the motor from starting.

- ► First refill up to the engine oil level (see Chapter 10.4.1), before you restart the engine.
- ► The automatic low-oil system cannot stop the engine from being damaged due to a low oil level in all cases. Never start the engine without checking the oil level beforehand!

7.5 Turning off your power generator

Proceed as follows to switch off the generator:

Conditions

- ✓ All of the connected consumers must be disconnected or switched off

⚠ CAUTION!

Certain surfaces on the device can get very hot whilst it is running.

Risk of burns

- ► Never touch any engine parts (in particular the exhaust system) for a few minutes after ceasing operation.
- ► Always leave hot engine parts to cool down before touching them.

Switching the generator off

Proceed as follows to switch off your Generators:

1. Continue to run the engine without load for about two minutes.
2. Turn the engine switch (Fig. 7-2) up to the left stop in the "STOP" position. Special aspects must be taken into consideration (see Chapter 9.3) for a remote start.
   The engine will stop.
3. Turn the lever on the fuel valve Fig. 7-2 3 into the “Shut” position.

The Generators has been switched off.

The fuel supply has been shut off.

⚠ DANGER!

Explosion hazard due to escaping fuel or fuel vapours.

A risk of suffering severe even deadly burns.

- ► After stopping the generator, close the fuel valve (fuel feed) as soon as possible.
- ► Close the fuel valve (fuel feed) at the latest after ceasing to use the device. **BEFORE** transport.

7.6 Turn off your generator in the event of an EMERGENCY

Your Generators is fitted with an EMERGENCY-STOP smash button, (this depends on the version) (1) . It enables you to immediately switch the device off in an EMERGENCY.

⚠ CAUTION!

The EMERGENCY-STOP smash button is only to be used in the event of a dangerous situation arising in an emergency.

Risk of injuries if consumers are suddenly switch off.

► Always switch off the generator normally as described in Chapter 7.5 .

Conditions

Actuating the EMERGENCY-STOP smash button must always be possible without any preconditions. Ensure that the EMERGENCY-STOP smash button is easily accessible at all times.

Proceed as follows to switch off your Generators in an EMERGENCY:

EMERGENCY STOP

1. Push down or hit the red EMERGENCY-STOP smash button Fig. 6-4 (1) .

The engine stops.

The EMERGENCY STOP smash button's latching function is blocking a Generators restart.

The EMERGENCY-STOP smash button is locked in place in its actuated state. The generator can only be switched back on again after the hazard has been eliminated and if the EMERGENCY STOP smash button is unlocked manually. How to unlock the EMERGENCY STOP smash button:

Conditions

✓ The hazard or cause of the EMERGENCY STOP process has been eliminated.

✓ All of the connected consumers are disconnected or switched off.

Unlocking the EMERGENCY-STOP

1. Turn the EMERGENCY-STOP's red smash button Fig. 6-4 -(1) slightly to the left or to the right.

This will unlock the red smash button and it will spring back up into its normal position.

The Generators is now ready for operation again and it can be restarted, see Chapter 7.4 .

7.7 Connection of power consuming equipment

⚠ DANGER!

Mortal danger due to an electric shock if live parts are touched.

- ► Never operate the device if it is in a damaged condition.
- ► Never operate the electrical consumers and connecting cable (power consuming equipment) in a damaged condition.
- ► Never feed directly into existing networks that are already connected to a power source (e.g. power supplier, solar plant, etc.).
- ► Never operate the device with wet hands.

Proceed as follows to connect a consumer to the generator:

Conditions

- ✓ The generator is started and brought up to operating temperature (see Chapter 7.4).
- ✓ All power consuming equipment is disconnected or switched off.
- ✓ The circuit breaker is in the “1/ON” position.

Connecting the consumers

1. Turn the splash guard cover on the relevant socket counter-clockwise up to its stop to release it.
2. Now pull off the cover from the socket.
3. Insert the plug on the power consuming equipment to be connected all the way into the socket.

The consumer is now to the generator and ready to use.

You can connect consumers with Schuko or CEE plugs to the following sockets:

Fig. 7-4 Connecting consumers

1	Schuko 230V / 16 A / 1~ sockets

2	CEE 400 V / 16 A / 3~ socket

⚠ CAUTION!

Danger due to malfunctioning of the protective measures against hazardous shock voltages with an extended supply network!

- ► Keep the length of the connecting line as short as possible.
- ► Use as few sub-distributions as possible.
- ► Take note of the table below.

Line	max. Line length	Unit
H07RN-F (NSH öu) 1.5 mm^2	60	m
H07RN-F (NSH öu) 2.5 mm^2	100	m

8 The device in-use

8.1 Multi-function display

The E-MCS 4.0 multifunction display enables you to monitor all of the relevant operating statuses as well as the status messages. This gives you an overview of many parameters such as current power output, fuel level, operating hours, warning messages and more.

The multifunction display will start a self-test as soon as the engine start switch is in the "OPERATION" position. All of the indicators light up simultaneously for approx. 2 seconds to check that they are working. The display will then switch over to normal operational readiness. You can read the fuel level for about 30 seconds. The multifunction display will switch off afterwards to prevent the starter battery from discharging. You must now move the engine start switch back into the "STOP" position to be able to start the generator.

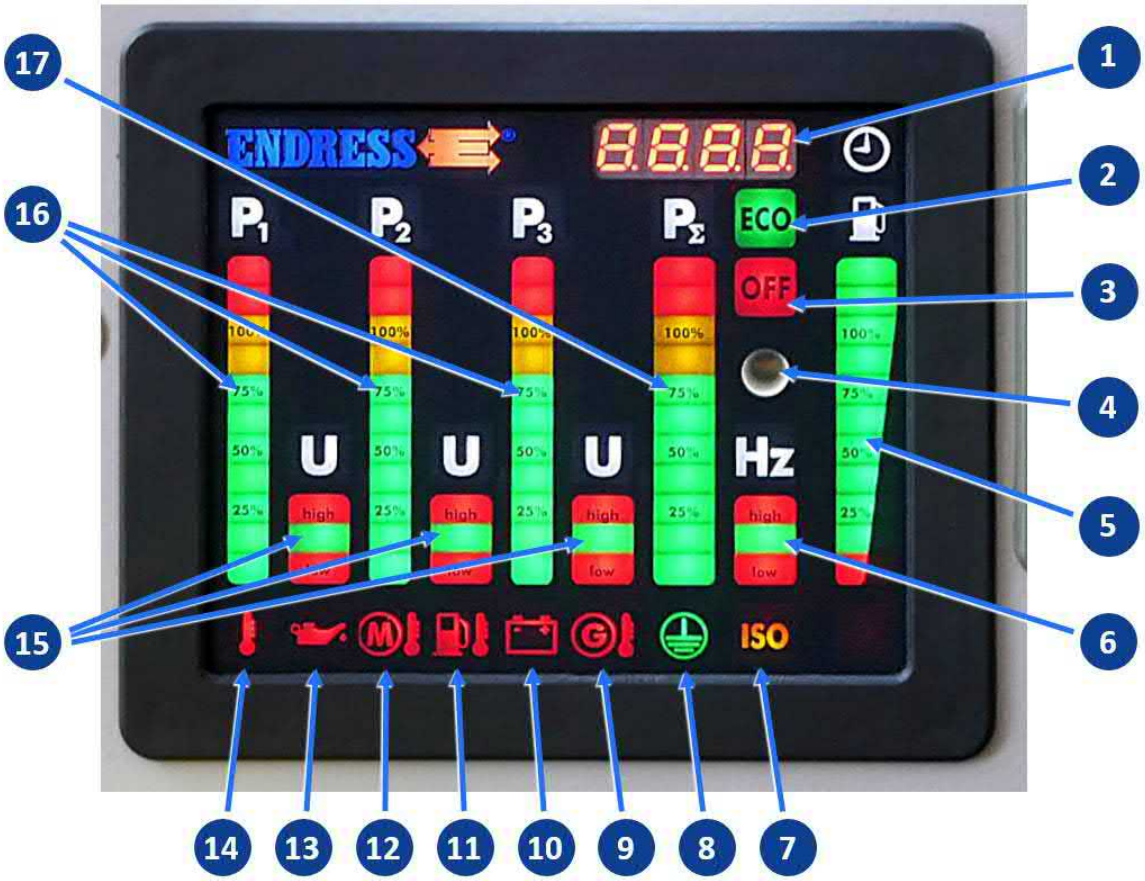


Fig. 8-1 Multifunction display E-MCS 4

1 Operating hours

The completed operating hours are displayed when the engine start switch is turned into the "OPERATION" position (approx. 30 seconds) and when the generator is started.

2 ECOtronic

The display lights up green for as long as the ECOtronic (speed reduction, see Chapter 8.2) is switched on.

3 EMERGENCY STOP

The display will lights up red if the generator has been stopped by the EMERGENCY STOP smash button (see Chapter 7.6).

4 Light sensor

The integrated light sensor controls the display's brightness depending on the ambient light.

5 Tank capacity

The display gives an approximate indication of the fuel level in the tank. If the tank capacity drops below approx. 20%, the indicator will then flash alternately green/red. If the fuel level continues to drop, then the indicator's flashing will only be in red and this means that you must refuel immediately.

6 Output voltage frequency

The segment display indicates whether the frequency of the outgoing AC voltage lies within the permitted tolerance range (47.5 Hz < > 52.5 Hz). The segment will light up green if it is. If the red "high" segment lights up instead, then the output frequency is too high; if the "low" segment lights up, then it is too low.

7 Insulation monitoring

The display indicates the insulation monitoring status (see Chapter 8.3.1). If the display flashes yellow or lights up in red then an insulation fault exists in the device or in the connected consumables.

8 Protective earthing conductor test

The display indicates the result of the protective earthing conductor test (see Chapter 8.4). If the indicator lights up green during the protective earthing conductor test, then this tells you that the protective conductor function of the connected consumables is OK. If the indicator does not light up, then the protective earthing conductor function is not being fulfilled.

9 Generator temperature warning

The indicator will light up red if the generator's operating temperature rises above a critical value.

10 Battery charge check

The indicator will light up red if the drive engine's charging circuit is defective or if the starter battery is no longer sufficiently charged.

If the indicator flashes red then the alternator's charge voltage is too high.

11 Fuel temperature warning

The indicator will light up red if the temperature of the fuel in the generator's tank rises above a critical value.

12 Drive engine temperature warning

The indicator will light up red if the drive engine's operating temperature rises above a critical value.

13 Oil pressure check

The indicator will light up red if the oil pressure in the drive engine's oil circuit drops below a critical value.

The automatic low-oil system will switch off the generator automatically.

14 Ambient air temperature warning

The indicator will light up red if the ambient air temperature around the generator rises above a critical value.

15 Output voltage V for phases L_1, L_2 and/or L_3

When the generator is running, the segment display indicates whether the output voltages for the relevant L_1, L_2 and L_3 phases lie within the permitted tolerance range. The segment will light up green if it is. If the “high” segment light up red, then the output voltage for the relevant phase is too high; if the “low” segment lights up red, then it is too low.

16 Load indicator P for the L_1, L_2 and/or L_3 phases

When the generator is running, the segment display indicates the real-time power output of the relevant L_1, L_2 and L_3 phases in 10% increments. The green segments will light up if the load is below 80%. The yellow elements will also light up if the load is between 80% and 100%. In the event of an overload (greater than 100%), the red elements will also light up.

17 Asymmetric load indicator (relative load display P_Σ)

When the generator is running, the segment display indicates the real-time asymmetric load between the specific phases in 10% increments. This will occur if the specific phases are loaded unequally (e.g. when several single-phase consumer appliances are connected to a single socket). The green segments will light up if the asymmetric load is below 80%. The yellow elements will also light up if the load is between 80% and 100%. The red elements will also light up if the asymmetric load is greater than 100%.

Distribute the consumables more evenly over the phases if the asymmetric load becomes too great.

8.2 ECOtronic speed reduction

The ECOtronic system ensures that the generator's engine speed is automatically reduced to approx. 1,800 min^{-1} as soon as all of the connected consumers are switched off or disconnected. This extra function is available when the engine is at operating temperature (about 5 minutes after starting the engine). The engine speed is immediately increase to nominal speed as soon as a consumable is switched on. The engine always runs within its nominal speed range when ECOtronic is switched off.

Proceed as follows to operate the generator with idling speed reduction.

Conditions

- ✓ the generator is running (see Chapter 7.4)
- ✓ the generator is at its operating temperature (heating up phase is approx. 5 minutes).

Fig. 8-2 ECOtronic idle speed reduction

Switching on ECOtronic

Switch on the idle engine speed reduction as follows:

1. Press the 1 button.
   The indicator light in the button is green.

Idle speed reduction is activated. The engine speed will drop automatically as soon as the conditions for speed reduction are met (engine at operating temperature, all consumables switched off).

Turning off ECOtronic

Switch the idle down off as follows:

1. Press the 1 button again.
   The indicator light in the button goes out.

Idle speed reduction is now switched off.

8.3 Insulation monitoring

8.3.1 Standard version, cannot be switched off

The insulation monitoring system provides electrical safety for the generator and to all connected consumers and cable connections during continuous operation.

Acoustic and visual warnings will be generated if an insulation fault occurs.

NOTICE!

The operating personnel must check the function before every start-up by pressing the insulation monitoring test button (see Chapter 5 Checking the electrical safety as well).

Proceed as follows to test the insulation monitoring function:

Conditions

✓ The generator has started and is running.

Fig. 8-3 Insulation monitoring

Testing the insulation monitoring system

1. Disconnect all of the consumers from the generator's sockets.
2. You must ensure that all of the line circuit breakers (see Fig. 6-4 7 and 8) are switched on (switch in “1/ON” position).
3. Press the test button 2.
   The lamp 1 and the warning horn Fig. 6-4 11 show the result of the test according to the table below.
4. After you have read the test result, you must press the reset button 3 just once.
   The warning horn will stop (acknowledge).
5. Now press the reset button 3 a second time.
   The lamp 1 will go out (reset).

The insulation monitoring function has been successfully tested.

Signal	Meaning
Lamp 1 lights red, warning horn sounding	Insulation monitoring is OK, lamp and warning horn are also OK.
Lamp 1 does not light up, warning horn is silent	Insulation monitoring is defective or lamp and warning horn are defective
Lamp 1 does not light up, warning horn sounding	Insulation monitoring is OK lamp is defective
Lamp 1 lights up red, warning horn is silent	Insulation monitoring is OK warning horn is defective

Insulation monitoring during operation

With the following working steps you will learn how your generator can detect an insulation fault of a connected consumable during operation and how it protects you.

Conditions

✓ The generator has started and is running.

✓ Circuit breaker is in the “1/ON” position.

1. Use a socket to connect a consumer to the generator.
   The lamp 1 and the warning horn Fig. 6-4 11 show the result of the test according to the table below.

Signal	Meaning
Lamp 1 flashes yellow, warning horn is silent	Insulation fault ≤ 46 kΩ is present, a consumer is defective
Lamp 1 lights red, warning horn sounding	Insulation fault ≤ 23 kΩ is present, a consumer is defective
Lamp 1 does not light up, warning horn is silent	Consumer is OK

If an insulation fault is present, even though the generator was OK during the previous test (see above) without a consumer device, then the insulation in the connected consumer or the sub-distribution being used is defective and they must not be used any longer.

1. Now press the reset button 3.
   The warning horn will stop.
2. Use its operating switch to switch off the consumable.
3. Disconnect the consumer from the generator's socket.

Your generator is ready to use again.

⚠ WARNING!

Risk of touching surfaces that are live due to faulty insulation.

Danger of electric shock if a second insulation fault occurs.

- ► The relevant consumable is not to be used any more after an insulation fault has been determined.
- ► Secure the defective consumable effectively against reuse by third parties.
- ► Replace the consumer or have it repaired by a qualified electrician.

8.3.2 Special version, can be switched off

The insulation monitoring system with switching off provides electrical safety for the generator and to all connected consumers and cable connections during continuous operation.

If an insulation fault occurs, then the circuit breaker in the affected circuit will trip out (switched off) in addition to a visual warning being generated. The switching off function is only available at the express request of the customer, as is the horn warning signal.

NOTICE!

The operating personnel must check the function before every start-up by pressing the insulation monitoring test button (see Chapter 5 Checking the electrical safety as well).

Proceed as follows to test the insulation monitoring function:

Conditions

✓ The generator has started and is running.

Fig. 8-4 Insulation monitoring

1. Disconnect all of the consumers from the generator's sockets.
2. You must ensure that all of the line circuit breakers (see Fig. 6-4 7 and 8) are switched on (switch in “1/ON” position).

3. Press the test button 2.
   The lamp, 1 the warning horn and the circuit breaker's position Fig. 6-4 7 and/or 8 show the result of the test:
4. After you have read the test result, you must press the reset button 3 just once.
   The warning horn will stop (acknowledge).*
5. Now press the reset button 3 a second time.
   The lamp 1 will go out (reset).
6. Move the circuit breaker back into its "1/ON" position so that you can operate the consumable again.

The insulation monitoring function has been successfully tested.

NOTICE!

The circuit breaker must not be switched on ("1/ON" position) whilst the lamp is still 1 lit.

► Now press the reset button 3 to reset the fault message (the lamp 1 will go out).

Signal	Result	Meaning
Lamp 1 lights red warning horn sounding*	Circuit breaker jumps into its “0/OFF” position	Insulation monitoring is OK
Lamp 1 does not light up, warning horn is silent*	Circuit breaker stays in its “1/ON” position	Insulation monitoring is defective
Lamp 1 does not light up, warning horn sounding*	Circuit breaker jumps into its “0/OFF” position	the lamp is defective
Lamp 1 lights up red warning horn is silent*	Circuit breaker jumps into its “0/OFF” position	Warning horn is defective

Insulation monitoring during operation

With the following instructions you will learn how your generator detects an insulation fault of a connected consumable during operation and how it protects you.

Conditions

✓ The generator has started and is running.
✓ Circuit breaker is in the “1/ON” position.

1. Use a socket to connect a consumer to the generator.
   The lamp, 1 the warning horn and the circuit breaker's position Fig. 6-4 7 and/or 8 show the result of the test according to the table below:

Lamp	Result	Meaning
Lamp 1 flashes yellow, warning horn is silent*	Circuit breaker jumps into its “0/OFF” position	Insulation fault ≤ 46 kΩ is present, a consumer is defective

Lamp	Result	Meaning
Lamp 1 lights red warning horn sounding*	Circuit breaker jumps into its “0/OFF” position	Insulation fault ≤ 23 kΩ is present, a consumer is defective
Lamp 1 does not light up, warning horn is silent*	Circuit breaker stays in its “1/ON” position	Consumer does not have an insulation fault

If an insulation fault is present, even though the generator was OK during the previous test (see above) without a consumer device, then the insulation in the connected consumer or the sub-distribution being used is defective and they must not be used any longer.

1. Now press the reset button 3.
   *The warning horn will stop.**
2. Use its operating switch to switch off the consumable.
3. Disconnect the consumer from the generator's socket
4. Now press the reset button 3 button again.
   The lamp 1 will go out. Insulation monitoring has been reset.
5. Move the circuit breaker back into its "1/ON" position.

Your generator is ready to use again.

** The warning horn is optional.*

⚠ WARNING!

Risk of touching surfaces that are live due to faulty insulation.

Danger of electric shock if a second insulation fault occurs.

- ► The relevant consumable is not to be used any more after an insulation fault has been determined.
- ► Secure the defective consumable effectively against reuse by third parties.
- ► Replace the consumer or have it repaired by a qualified electrician.

NOTICE!

The circuit breaker must not be switched on ("1/ON" position) whilst the lamp is still 1 lit.

- ► Now press the reset button 3 to reset the fault message (the lamp 1 will go out).

8.4 Check the protective conductor

Your generator is fitted with a device for checking the correct protective conductor connection between the generator and the connected consumables. This allows you to create additional safety for triggering this protective measure in the event of a fault.

NOTICE!

The previously required protective conductor test device has been deleted in the new version of DIN 14685-1: 2015-12, as it is not suitable for running a qualitative test. The test described in this chapter is based on common practice and it can only indicate an interrupted protective conductor connection. However, this is no guarantee of a working protective function in the event of a fault. You can find details about standardised equipment testing in Chapter 5 .

Proceed as follows to check the protective conductor connection between the generator and a connected consumer.

- ✓ The generator is running (see Chapter 7.4).
- ✓ The consumer* that has to be tested is connected to the generator (see Chapter 7.7).
- ✓ The consumer is switched off.

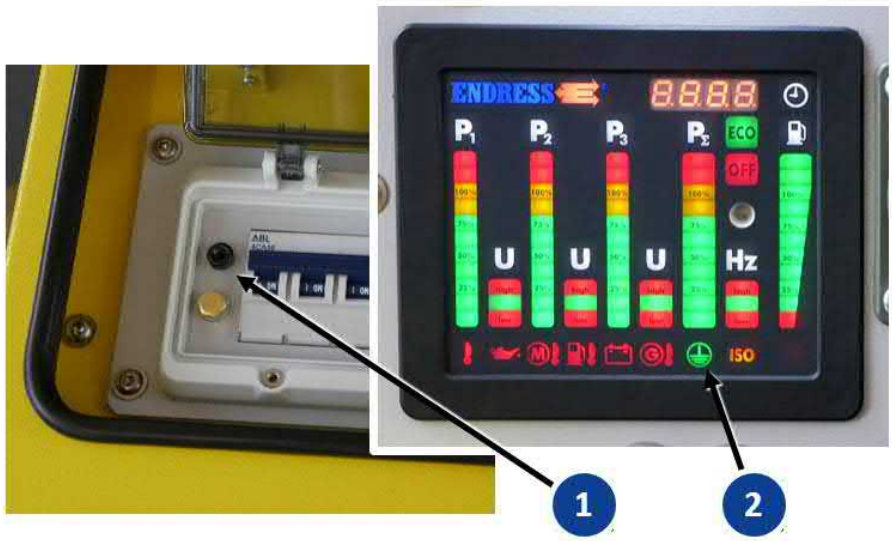


Fig. 8-5 Connection socket for the protective conductor test

1. Insert the plug on the optional test cable in the test socket Fig. 8-5 1.
2. Press the test cable's tip onto a clean metallic point on the consumable.

The test lamp Fig. 8-5 2 on the multifunction display indicates the test result:

Test lamp	Significance
lights up green	Protective conductor is OK
stays off	Protective conductor is defective or is not fitted*

* Only consumers with a protective contact in the connecting plug (Schuko & CEE plugs) have this protective function.

Testing the protective conductor or potential equalisation connection for this consumable has been completed.

DANGER!

Lethal contact voltage will exist if the protective conductor connection is defective

Danger of an electrical shock.

► Never use a consumable with a defective protective conductor connection.

WARNING!

Electric arcs can occur due to electrostatic charges

Danger of being burnt or an explosion

► If the possibility of an electrostatic charge exists, you should only use consumables with potential equalisation through the intact protective conductor connection.

► If necessary, you should also connect other conductive devices (e.g. an emergency vehicle) to the potential equalisation screw on the generator.

8.5 3-way fuel valve

The 3-way fuel valve gives you the option of switching the fuel supply between your own tank and an external refuelling device during operation. This will prevent you from having to switch off the generator for refuelling during long periods of use. The refuelling device's coupling system stops any fuel from leaking when it is used as intended.

Do as follows to operate the power generator with an external refuelling device:

Conditions

- ✓ An external fuel tank fitted with a refuelling device (see Fig. 3-4) is available.
- ✓ The fuel tank is full enough.
- ✓ The power generator's internal tank is full enough.

⚠ DANGER!

Fire and explosion hazard from leaking fuel

Risk of severe to deadly burns.

- ► Prevent fuel from leaking.
- ► Keep the refuelling device's fuel cannister firmly closed.
- ► When changing the fuel cannister, stay as far away as possible from the power generator.
- ► Remove unneeded fuel cannisters from the power generator's work area immediately.
- ► Smoking, naked flames and sparks are forbidden.

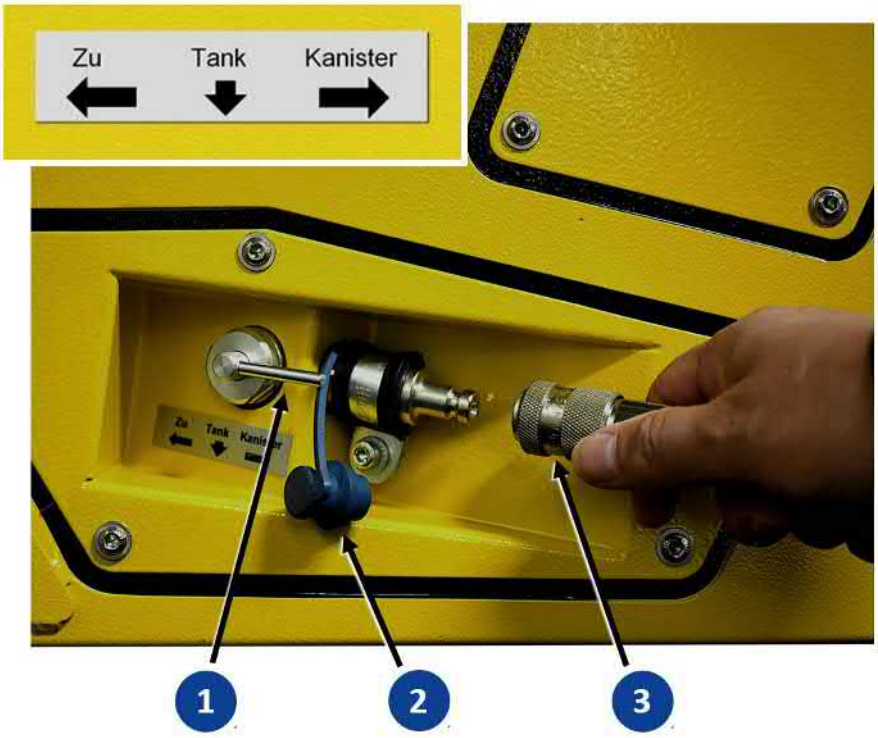


Fig. 8-6 Refuelling device connection

Connecting the refuelling device

1. Pull off the dust cap (2) on the 3-way valve connection.
2. Press the refuelling device's coupling (3) firmly onto the 3-way valve connection.
   The coupling will engage with an audible click.
3. Pull gently on the refuelling device's hose to ensure that the coupling is securely engaged.
4. Turn the lever on the fuel valve (1) into the “Can” position.

The refuelling device is now connected. The generator will be supplied with fuel through the refuelling device.

Proceed as follows to replace an empty fuel can with a full one during operation:

Conditions

- ✓ the generator’s own tank is full
- ✓ a full is ready for use

Changing the can

1. Place the full fuel can immediately next to the empty can.
2. Turn the lever (1) on the 3-way fuel valve into the “Tank” position.
   The engine will be supplied with fuel from its own tank.
3. Remove the suction end of the refuelling device from the empty can.
4. Ensure that the empty fuel can is securely closed.
5. Now insert the suction end in the full can.
6. Turn the lever (1) on the 3-way fuel valve into the “Can” position.
   The engine will be supplied with fuel from the refuelling device (can).

NOTICE!

Air might get into the fuel system and stall the engine when you connect up an external refuelling device or replace the can.

- ► Ensure that there is no air in the fuel supply that will be connected up.
- ► Only change the can when the lever (4) on the 3-way valve is in the “INSIDE” position.
- ► Follow the instructions given in the engine manufacturer's operating manual if you have to bleed air out of the engine.

Proceed as follows to disconnect the refuelling device:

Conditions

- ✓ The internal tank is full enough. or
- ✓ The power generator is switched off.

Disconnecting the refuelling device

1. Turn the lever (1) on the 3-way fuel valve into the “Tank” position.
   The engine is supplied with fuel from its own tank.
2. Pull the locking sleeve on the coupling (3) towards the hose (away from the 3-way valve).
   This sleeve frees the coupling.
3. Pull off the refuelling device’s hose from the 3-way valve.

The refuelling device is disconnected.

9 Optional fittings

9.1 Battery charge maintenance

The battery recharger allows you to recharge the starter battery on the generator using an external charging device and this will ensure that you have a full charge at all times. There a various different standardised sockets available for connection which is described as follows.

⚠ CAUTION!

Escaping corrosive acid fumes or sulphuric acid during and after the charging process. Danger of burns and deflagration.

- ► Always wear acid-proof protective equipment when working on the starter battery.
- ► Clean surfaces covered in acid immediately using adequate amounts of water.
- ► Only charge the starter battery in a well ventilated environment.

9.1.1 DIN 14690 12V connection for maintaining the charge

Proceed as follows to recharge your Generators's starter battery using the optional 12V connection as per DIN 14690:

Fig. 9-1 12V power socket as per DIN 14690

Conditions

- ✓ The Generators is ready to operate.
- ✓ The starter battery is connected as specified to the drive engine's current circuit.
- ✓ An external recharging device with an DIN 14690 plug is ready for use.

1. Turn the protective cap (2) counter-clockwise so that you can remove it.
2. Align the DIN 14690 plug from the external recharging device with the contact pins in the 12V connection on the (1) generator.
3. Press the plug in up to the stop in the 12V connector.

4. Turn the plug's locking ring clockwise up to the stop.

The connection for recharging the starter battery is established.

9.1.2 BEOS charging current socket

Proceed as follows to recharge your Generators's starter battery using the optional BEOS charging current socket:

Fig. 9-2 BEOS charging current socket

Conditions

- ✓ The Generators is ready to operate.
- ✓ The starter battery is connected as specified to the drive engine's current circuit.
- ✓ An external recharging device with an BEOS power plug is ready for use.

1. Turn the protective cap 2 counter-clockwise so that you can remove it.
2. Align the plug from the external recharging device with the contact pins in the BEOS charging socket on the 1 generator.
3. Press the plug in up to the stop in the BEOS charging socket.
4. Turn the plug's locking ring clockwise up to the stop.

The connection for recharging the starter battery is established.

9.1.3 MagCode charging current socket

Proceed as follows to recharge your Generators's starter battery using the optional MagCode® charging current socket:

Fig. 9-3 MagCode® charging current socket

Conditions

- ✓ The Generators is ready to operate.
- ✓ The starter battery is connected as specified to the drive engine's current circuit.
- ✓ An external recharging device with a MagCode®plug is ready for use.

1. Align the external recharging device's MagCode® plug with the guide slot in the MagCode® socket (1) .
2. Press the plug into the socket in this position.
   The plug will be held in the socket by magnetic force.

The connection for recharging the starter battery is established.

9.2 DIN 14690 12V connection

Apart from recharging, the 12V connection socket as per DIN 14690 also gives you the option of supplying suitable accessories with a 12V DC voltage.

Proceed as follows to supply an external 12V accessory with power at the 12V connection socket:

Fig. 9-4 12V power socket as per DIN 14690

Conditions

- ✓ the generator is ready for operation
- ✓ a suitable accessory device is present, is ready-to-use and switched off
- ✓ the generator's starter battery is fully charged

1. Turn the protective cap 2 counter-clockwise so that you can remove it.
2. Align the accessory device's DIN 14690 12V plug with the contact pins in the the 12V connection on the 1 generator.
3. Press the plug in up to the stop in the 12V connector.
4. Turn the plug's locking ring clockwise up to the stop.

The connected 12V accessory device is ready to use.

NOTICE!

The starter battery discharges when the 12V accessory is being used and the generator is switched off. The generator can only be started electrically if the battery is discharged!

- ► When using take account of the current consumption and period of use of the accessory.
- ► If necessary start the generator before operating the respective accessory.

9.3 Remote start device

9.3.1 HARTING remote starting device

The optionally installed HARTING® socket allows you to turn your power generator on and off remotely in connection with a suitable external installation (such as a control station).

⚠ WARNING!

Beware of machines starting in automatic mode.

Risk of severe injury or death.

- ► Do not make the remote start connection unless the power generator is completely ready to operate and all maintenance covers and hoods are closed.
- ► Only then, start the controls in automatic mode.
- ► Take suitable measures to make nearby operating personnel aware of the automatic operation.

NOTICE!

Important information in the documentation for the additional components.

- ► Always observe the further instructions and handling guidelines in the documentation for the external component or installation.

Setting up the remote start connection

Do as follows to operate the power generator from the remote starting device:

Fig. 9-5 Remote starting device with HARTING® socket

Conditions

- ✓ The power generator is ready for operation.
- ✓ The engine start switch Fig. 7-2 (2) is in the “STOP" position
- ✓ All of the consumers are switched off or disconnected from the generator.

1. Press the locking bracket Fig. 9-5 (2) forcefully towards the generator.
2. Fold the protective cap Fig. 9-5 (1) on the HARTING® socket upwards.

3. Push the HARTING® plug of the external connection cable onto the HARTING® socket until the stop.
4. Pull the locking bracket Fig. 9-5 (2) in the direction of the HARTING® plug to lock it in place.
5. Turn the engine start switch Fig. 7-2 (2) into the “ON” position.

The remote starting device is ready to operate.

NOTICE!

Further steps for starting and stopping the power generator are in the operating manual for the external component or installation.

NOTICE!

Only activate the starter briefly (max. 5-10 seconds). Never unclamp the starter battery when the engine is running.

When the remote start device is connected up, the generator can NO LONGER be switched off using the engine start switch Fig. 7-2 (2) . Use the EMERGENCY-STOP smash button if an emergency occurs (see Chapter 7.6).

Disconnecting the remote start connection

Do as follows to disconnect the remote start connection remote control after the generator has been switched off:

1. Press the locking bracket Fig. 9-5 (2) forcefully towards the generator.
2. Pull the HARTING® plug on the external connection cable out of the HARTING® socket.
3. Fold the protective cap Fig. 9-5 (1) on the HARTING® socket down.
4. Pull the locking bracket Fig. 9-5 (2) towards you to lock the safety cap.

The remote start connection is disconnected.

9.3.2 FireCAN remote start device

The CPC socket that can be optionally installed with a standard FireCAN, when used in conjunction with a suitable external installation, allows you to remotely control and monitor your generator (e.g. from an emergency vehicle).

FIRECAN
CAN-Schnittstelle nach DIN 14700-7

Fig. 9-6 Remote starting device used with a standard FireCAN

Setting up the remote start connection

Proceed as follows to operate the generator using a FireCAN remote starting device:

Conditions

- ✓ the power generator is ready for operation.
- ✓ the engine start switch 2 is in the “STOP" position
- ✓ all of the consumers are switched off or disconnected from the generator

1. Turn the protective cap on the FireCAN socket 1 counter-clockwise so that you can remove it.
2. Align the plug on the external FireCAN connection cable with the keyway.
3. Push the plug on the external FireCAN connection cable into the FireCAN socket and up to the stop 1.
4. Turn the locking ring on the external FireCAN plug clockwise to lock the plug connection in place.
5. Turn the engine start switch 2 into the “ON” position.

The remote starting device is ready to operate.

NOTICE!

Further steps for starting and stopping the power generator are in the operating manual for the external component or installation.

NOTICE!

Only activate the starter briefly (max. 5-10 seconds). Never unclamp the starter battery when the engine is running.

When the remote start device is connected up, the generator can NO LONGER be switched off using the engine start switch Fig. 9-6 (2) . Use the EMERGENCY-STOP smash button if an emergency occurs (see Chapter 7.6).

Disconnecting the remote start connection

Proceed as follows to disconnect the FireCAN remote start connection after the generator has been switched off:

1. Turn the locking ring on the external FireCAN plug counter-clockwise to unlock the plug connection.
2. Pull the plug on the external FireCAN connection cable out of the FireCAN socket (1) .
3. Now turn the protective cap on the FireCAN socket clockwise (1).

The remote start connection is disconnected.

9.4 Remote starting device

The remote starting device enables you to start your generator from an external starting device when the starter battery is weak or discharged. To do this you need a suitable 12V DC source (e.g. from the emergency vehicle) and a suitable connection cable ("NATO plug").

NOTICE!

Never use a power source with a different voltage or current type. This would inevitably result in the drive engine's 12V on-board network being severely damaged.

Remotely starting the generator

Proceed as follows to start the generator using a remote starting device:

Fig. 9-7 Remote starting device

Conditions

- ✓ the generator is ready for operation (see operating manual)
- ✓ a suitable DC source is available
- ✓ you have connected up a suitable remote starting cable

1. Release the sealing cap Fig. 9-7 (2) on the remote start socket by turning it counter-clockwise and then fold it down.
2. Align the plug on the remote start cable with the lower guide slot and then push the plug into the socket.
3. Lock the plug in place by turning the locking ring clockwise up to the stop.
4. Proceed accordingly for the power source (e.g. emergency vehicle).
5. Ensure that there is an adequate power supply from the power source (e.g. by starting the emergency vehicle).
   The remote starting device is ready-to-use.
6. Start the generator(see Chapter 7.4).
7. Disconnect the remote starting cable from the generator's remote start socket and the external voltage source.

8. Replace the sealing cap Fig. 9-7 (2) on the remote start socket and turn it clockwise to tighten it in place.

The remote start process has been completed.

9.5 Residual current circuit breaker (RCD)

The RCD (Residual Current Device) protects against dangerous body currents in compliance with DIN VDE 0100 0100-551 in networks with a TN-S system. This option is only available ex works.

The RCD needs the generator to be earthed in compliance with the regulations so that it can detect a residual current. This is absolutely necessary even though it differs from the description given in Chapter 5 Checking the electrical safety.

⚠ DANGER!

There will be no RCD personal protection during operation if the earthing of the Generators is faulty.

Mortal danger from electrocution

- ► The use of an RCD (FI circuit breaker) for personal protection requires proper earthing of the Generators and this must be undertaken by a qualified electrician before the initial commissioning.
- ► The effectiveness of this protective measure should be regularly checked by an electrician.
- ► Check the personal protection according to the check intervals given in Tab. 5-1 .

Earthing conditions

- ✓ The device's earthing connection clamps must also be connected to the supplied earthing spike using the supplied earthing cable (green/yellow, Ø 16 mm^2).
- ✓ The spike must have been driven into the ground.
- ✓ The effectiveness of the protective measure must have been tested by a qualified electrician (an earthing resistance of ≤ 50Ω is recommended as per BGI 867).
- ✓ Alternatively, a proper earthing device conforming to VDE 0100-540 can be used (e.g. the main earthing line in buildings).

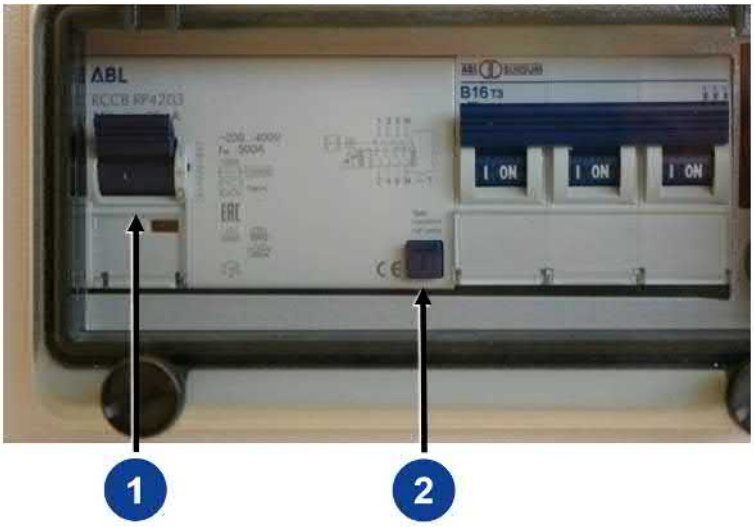


Fig. 9-8 FI circuit breaker (RCD)

The operating personnel must also check the mechanical triggering function every time the device is used. Proceed as follows to do this:

Conditions

- ✓ the generator is running (see Chapter 7.4)

Testing the RCD

1. You must ensure that the Fig. 9-8 (1) RCD switch is in POS 1.
2. Press the test knobFig. 9-8 (2) .
   The switch position Fig. 9-8 (1) shows you the result (see table below).
3. Turn the switchFig. 9-8 (1) back into POS 1 so that you can operate consumers from the generator again.

The device has been tested in compliance with DIN VDE 0100-551.

Item	Meaning
POS 1	The switch does not trigger. The RCD is defective. There is no protection for the personnel.
POS 0	The switch triggers. The RCD works OK.

9.6 Polarity changer

Three-phase CEE sockets are wired in as the standard fitting for a clockwise rotating field. The optionally installed polarity changing switch allows you to adapt a specific CEE socket on your power generator to use with consumers with a counter-clockwise rotating field.

Proceed as follows to run a consumer with a counter-clockwise rotating field:

- ✓ The generator is running (see Chapter 7.4).
- ✓ The protective conductor test was run successfully (see Chapter 8.4).
- ✓ The consumer is switched off.

Fig. 9-9 Polarity changer switch (example)

1. Turn the polarity changing switch Fig. 9-9 (1) into the “0“ position.
   All of the poles in the CEE socket Fig. 9-9 (2) are only disconnected in this position!
2. Connect the consumer with the counter-clockwise rotating field to the CEE socket Fig. 9-9 (2).
3. Turn the polarity changing switch Fig. 9-9 (1) into the “2“ position.
   Power will now be supplied to the CEE socket Fig. 9-9 (2) .
4. Now switch the consumer on.

The consumer will be supplied with a counter-clockwise rotating field.

NOTICE!

Never change the rotating field under load. You must only proceed as described below if the wrong rotating field is set up by mistake.

1. Switch off the consumer immediately.
2. Turn the polarity changing switch Fig. 9-9 (1) into the “0“ position.
3. You should wait until the incorrectly started consumer has stopped.

4. Turn the polarity changing switch Fig. 9-9 1 to the correct rotating field.
   The rotating field has been changed.
5. Now switch the consumer back on.

The consumer will be supplied with the correct rotating field.

9.7 Using an exhaust hose

The silencer's exhaust tailpipe has a connection for attaching an optionally available exhaust hose. This will enable you to discharge the engine exhaust gases away from the generator's immediate vicinity.

⚠ DANGER!

Engine exhaust gases contain poisonous and partially invisible gases such as carbon monoxide (CO) and carbon dioxide (CO2).

Risk of death due to poisoning or asphyxiation.

- ► Ensure that there is good ventilation during the whole period of operation.
- ► Only operate the generator in the open.
- ► Never direct the exhaust gases into rooms or pits.

⚠ DANGER!

The exhaust hose does not provide protection against toxic exhaust gases! The connection and version are not designed to be gas-tight.

Danger of asphyxiation or poisoning!

- ► Never use the exhaust hose to channel the exhaust gas away from rooms or pits.
- ► Only use an exhaust hose that has been approved by us.
- ► Never extend the exhaust hose.

⚠ WARNING!

The exhaust hose heats up its surrounding section. Danger from hot device parts and hot operating materials.

Danger of being burnt by hot device parts and hot operating materials.

- ► Never use the exhaust hose to route the exhaust gases over the device and out on the device's opposite side.
- ► Route the exhaust hose so that it does not touch any of the device's parts and so that air can flow around it unhindered.
- ► You must ensure that the exhaust hose does not touch any flammable or combustible materials during operation.

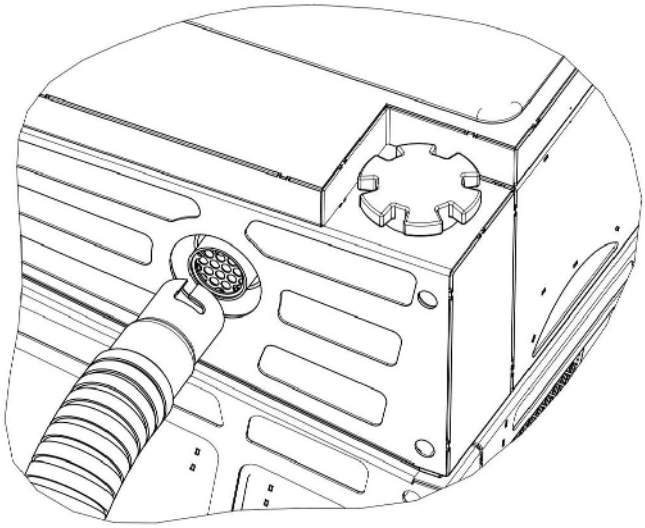


Fig. 9-10 Connecting up the exhaust hose

Proceed as follows to connect up the optional exhaust gas hose (see Fig. 3-4) to your generator:

Conditions

- ✓ Generator is ready for operation
- ✓ The generator is switched off.

Connecting up the exhaust hose

1. Push the mounting end of the exhaust hose onto the connection on the silencer.
2. Turn the exhaust hose clockwise until it comes up against the stop.

The exhaust hose is now connected up according to the regulations.

Proceed as follows to disconnect the exhaust hose from the generator:

Conditions

- ✓ The generator is switched off.
- ✓ The exhaust hose has cooled down sufficiently.

⚠ CAUTION!

The surface of the exhaust hose can get very hot during operation.

Danger of burns

- ► Never touch the exhaust hose (especially in the exhaust system section) for a few minutes after ceasing operation.
- ► Always leave the hot exhaust hose to cool down before you touch it.

Disconnecting the exhaust hose

1. Turn the exhaust hose counter-clockwise until it comes up against the stop.
2. Use the handle to pull the exhaust hose away from the silencer's connection.
3. Put the exhaust hose down so that there is no risk of burns.

The exhaust hose is now been disconnected according to the regulations.

10 Maintenance

Generators maintenance is described in this section. It may only be performed by qualified specialist personnel.

Maintenance and repair which is neither described in this operating manual nor in the possibly also delivered operating and maintenance instructions may only be undertaken by authorized service personnel from the manufacturer.

10.1 Maintenance plan

Generator maintenance mainly involves working on the drive engine as well as some work on the other devices.

NOTICE!

Always follow the accompanying operating and maintenance manual provided by the engine manufacturer doing maintenance on the drive engine.

You can find an overview of the time plan and scope of the required maintenance work in the following maintenance schedule.

Alle 8 Stunden oder täglich
• Motorölstand prüfen • Bereich um Schalldämpfer und Bedienungselemente reinigen
Alle 100 Stunden oder jährlich
• Zündkerzen austauschen • Motoröl wechseln • Ölfilter (falls vorhanden) austauschen • Luftfilter warten [1] • Vorfilter (falls vorhanden) reinigen [1] • Auspuffanlage warten
Alle 250 Stunden
• Ventilspiel kontrollieren. Bei Bedarf einstellen.
Alle 400 Stunden oder jährlich
• Luftfilter austauschen • Kraftstofffilter austauschen • Kühlsystem warten [1] • Ölkühlerrippen reinigen [1]

[1] Bei hohem Staubaufkommen oder Fremdkörpern in der Luft häufiger reinigen.

Fig. 10-1 Vanguard™ maintenance plan, source Briggs & Stratton©

10.2 Maintenance work

Only authorised personnel are allowed to carry out maintenance tasks. Carry out all of the maintenance work listed in the maintenance plan according to the instructions given in the accompanying operating and main-

tenance instructions provided by the engine manufacturer. This operating manual merely describes the instructions that differ from or go beyond those instructions.

⚠ DANGER!

Mortal danger from unintentional generator start up.

Danger of burns and being caught by rotating parts.

► Before accessing the generator you must switch it off and secure it so that unintentional starting of the machine is prevented under all circumstances. (see Chapter 7.5 as well).

⚠ CAUTION!

Certain surfaces on the device can get very hot whilst it is running.

Risk of burns

► Never touch any engine parts (in particular the exhaust system) for a few minutes after ceasing operation.

► Always leave hot engine parts to cool down before touching them.

NOTICE!

Also always read about the checking and maintenance work which concerns the electrical safety of the generators in the chapter “Checking the electrical safety“.

10.3 Starter battery

Your Generators has a 12V for supplying power to the starter motor and the engine control unit of the drive engine. It is a VRLA-AGM accumulator, i.e. a valve-regulated lead acid accumulator in which the electrolyte (diluted sulphuric acid) is retained in a fleece inside the cells.

NOTICE!

Your Generators was fitted with a maintenance-free starter battery in the factory.

► It is imperative that you abide by the accompanying battery handling instructions.

10.3.1 Charging the battery

The starter battery can discharge if it is not used for a long period or if the generator’s control circuit is subjected to excessive power consumption. If your device is fitted with a charge retention device (see 9.1), **then preference should be given to using it. The following steps only apply to units without a charge retention device.**

Always remove the starter battery before recharging (see Chapter 10.3.2). Carefully follow the enclosed battery handling instructions. Wrong charging will destroy the battery!

⚠ WARNING!

There is a risk of explosion and fire in the case of inappropriate handling and spark development when working with the battery.

Danger from spraying sulphuric acid. Danger of suffering severe even deadly burns and chemical burns. Danger of being blinded.

- ► Never lay electrically conductive parts on the starter battery.
- ► Flames, sparks, an open light and smoking are prohibited.
- ► Avoid sparks when handling cables and electrical devices, as well as electrostatic discharge.
- ► Avoid short-circuits.
- ► Wear acid-resistant protective clothing.

Proceed as follows to recharge the removed starter battery:

Conditions

- ✓ the starter battery has been removed.
- ✓ The starter battery must be recharged in a well ventilated location.

1. Attach the starter battery according to the regulations from the battery and charger manufacturers.
2. Set a suitable charge current for the charger if necessary.
3. Switch off the charger of expiry of the charging time.
4. Disconnect the starter battery from the charger.
5. Allow the starter battery to rest for about thirty minutes.
6. Install the starter battery again in the generator (see Chapter 10.3.2).

The starter battery is charged.

If the generator cannot be started after fully charging the battery, there is a defect in the starter power circuit of the generator. Contact your service partner.

NOTICE!

The starter battery from the factory is maintenance-free throughout its entire service life.

- ► Never try to open the battery - risk of destruction.

10.3.2 Replacing the battery

⚠ WARNING!

There is a risk of explosion and fire in the case of inappropriate handling and spark development when working with the battery.

Danger from spraying sulphuric acid. Danger of suffering severe even deadly burns and chemical burns. Danger of being blinded.

- ► Never lay electrically conductive parts on the starter battery.
- ► Flames, sparks, an open light and smoking are prohibited.
- ► Avoid sparks when handling cables and electrical devices, as well as electrostatic discharge.
- ► Avoid short-circuits.
- ► Wear acid-resistant protective clothing.

Fig. 10-2 Accessing the starter battery

Proceed as follows to change the starter battery:

Conditions

✓ the generator is switched off

1. Undo the two screws in the maintenance cover Fig. 10-2 3 and then remove the cover.
2. Remove the heat shield 1.
3. Now tilt the starter battery 2 outward as shown in Fig. 10-2 .
4. Lift the starter battery out of the battery compartment and then place it next to it.
5. Pull off the black pole protection cap 4 from the battery's negative terminal and then disconnect the black cable from the battery FIRST.
6. Pull the red terminal protection cap off the positive terminal of the battery and THEN disconnect the red cable from the battery.
7. Remove the battery from the generator.

The starter battery is now removed.

Fig. 10-3 Replacing the starter battery

1. Prepare the new starter battery (follow the battery manufacturer’s handling instructions).
2. Place the starter battery alongside the battery compartment.
3. Attach the red cable to the battery's positive terminal FIRST and then pull the red protective cap over the terminal.
4. Attach the black cable to the battery's positive terminal LAST and then pull the black protective cap over the terminal.
5. Tilt the battery and then lift it bottom first into the battery compartment.
6. Slide the battery slightly to the right to make room for the heat shield.
7. Replace the heat shield Fig. 10-2 1 .
8. Refit the maintenance cover on the battery compartment.

The starter battery has been replaced. The generator can now be started.

10.4 Engine oil

The drive motor for your generator, like every internal combustion engine, requires the required engine oil for cooling and inner cooling. It is also very important to use the correct engine oil, both for refilling and when changing the oil, and to adhere the stipulated maintenance intervals. Refer to the accompanying operating and maintenance instructions provided by the engine manufacturer for all necessary information.

Your generator has an engine made by Briggs & Stratton fitted in it. This manufacturer recommends using the VANGUARD range of four-stroke engine oils that meet the requirements for API service classes SF, SG, SH, SJ or higher. The second criterion is the appropriate Viscosity class will depend on the ambient conditions (see Fig. 10-4). Briggs & Stratton recommend SAE 5W-30 synthetic oil for general use. Vanguard™ synthetic 15W-50 is recommended for devices that will be used in hot temperatures.

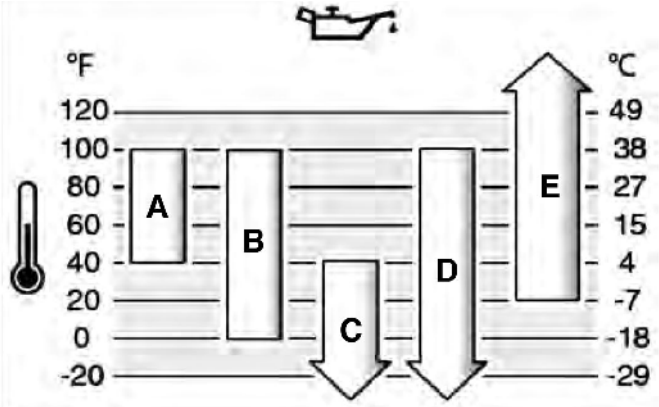


Fig. 10-4 Viscosity grade for the engine oil (source: Briggs & Stratton)

A	**SAE 30** - Using SAE 30 below 4°C will cause difficult starts.
B	**10W-30** - Using 10W-30 above 27°C might result in higher oil consumption. The oil level must be checked more frequently.
C	**5W-30**
D	**Synthetic 5W-30**
E	**Vanguard™ synthetic 15W-50**

10.4.1 Checking the oil level

Your generator is fitted with an automatic oil deficiency switching off system to prevent the engine from being damaged due to low oil pressure. It has two functions:

1) It prevents the engine from starting with an insufficient engine oil level
2) It switches off the drive engine whenever the engine oil level drops below the minimum value during operation.

Check the engine oil level before every start in order to avoid delays and interruptions during operation.

Conditions

Ensure that the following prerequisites are met before you check:

✓ ensure that the generator is mounted horizontally.

✓ wait after previous operation for about five minutes before checking until the engine oil has gathered again in the oil sump to obtain a correct measurement.

⚠ CAUTION!

The engine and operating equipment on the generator can get very hot while running.

Risk of burns

► Never touch any engine parts (in particular the exhaust system) for a few minutes after ceasing operation.

► Allow the engine to cool off for at least five minutes before changing or checking the engine oil.

Follow the instructions given in the accompanying operating and maintenance instructions provided by the engine manufacturer to ensure that the precise procedure is used.

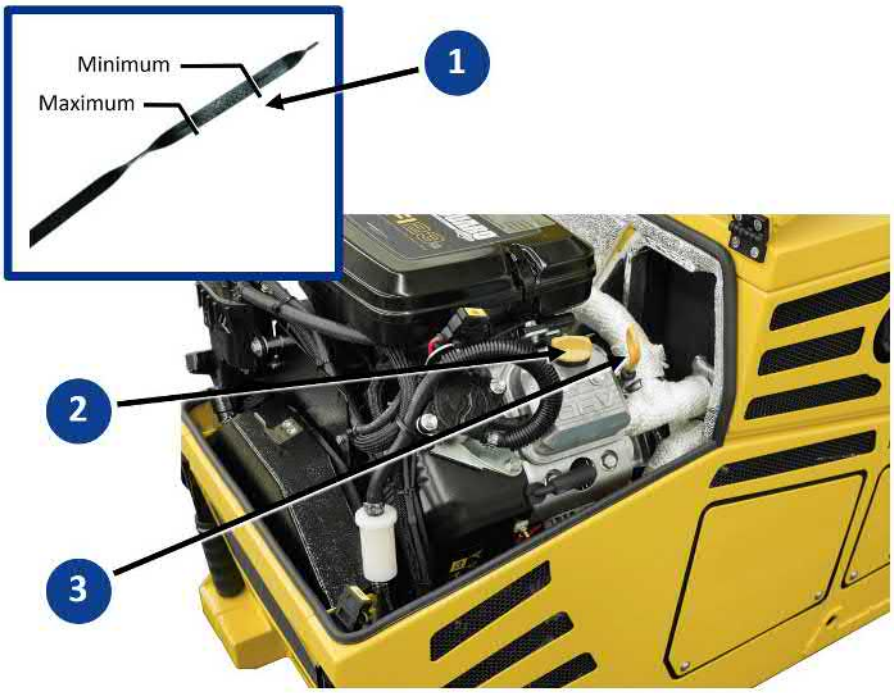


Fig. 10-5 Oil dipstick and oil filling opening

1	Markings on the oil dipstick
2	Oil filling inlet
3	Oil dipstick

10.4.2 Changing the engine oil

The engine oil changing process differs from the instructions given in the engine's operating and maintenance manual due to the soundproofing hood. The different steps are explained in the following chapter.

⚠ CAUTION!

The engine and operating equipment on the generator can get very hot while running.

Risk of burns

- ► Never touch any engine parts (in particular the exhaust system) for a few minutes after ceasing operation.
- ► Allow the engine to cool off for at least five minutes before changing or checking the engine oil.

NOTICE!

Leaking engine oil contaminates the soil and groundwater.

- ► Use a suitable oil catching receptacle.
- ► Old oil is a special waste and may only be disposed of over suitably qualified collection points.

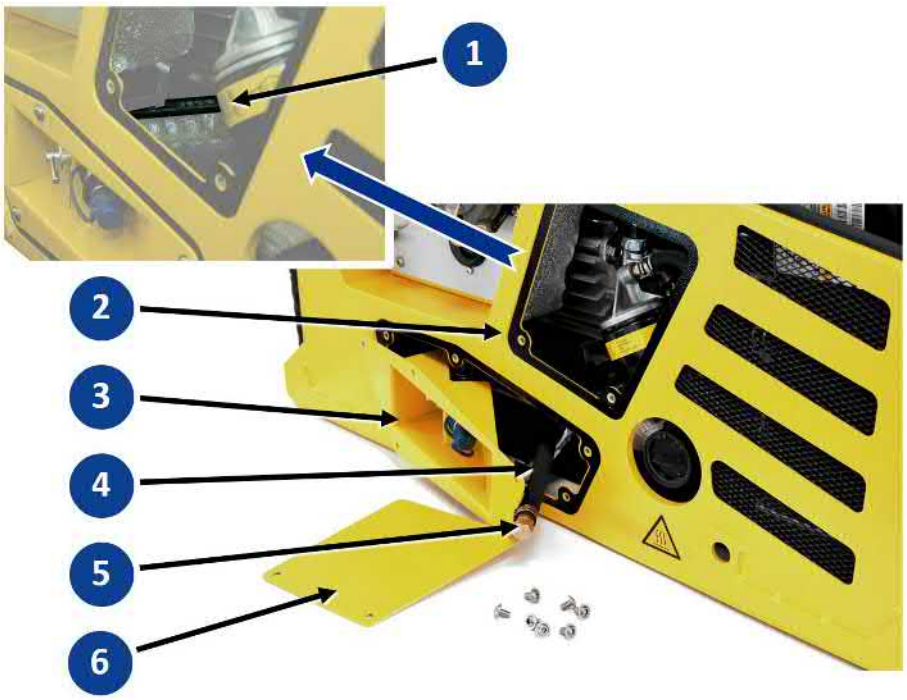


Fig. 10-6 Changing the engine oil

Proceed as follows to change the engine oil:

Conditions

- ✓ position the generator in such a way that a suitable catching pan can be placed underneath the oil drainage screw.
- ✓ ensure that the generator is mounted horizontally.
- ✓ wait after previous operation for at least five minutes before changing the oil to allow the oil to flow into the oil sump and for the engine oil to cool off.

Draining off old oil

1. Loosen the two screws on the maintenance opening 2 and then pull the maintenance cover 6 down.
2. Loosen the five screws around the 3-way fuel valve 3 and then pull the plate slightly forward as shown in Fig. 10-6 .

3. Reach in through the maintenance opening 2 and pull out the drainage hose that is stowed inside 1 out through the opening for the 3-way fuel valve.
4. Place a suitable oil collecting container under the drainage hose.
5. Carefully undo the sealing screw 5 on the drainage hose and ensure that the screw does not fall off.
   ATTENTION! Engine oil will start to flow out and into the collecting container as soon as the screw is removed.
6. When the used oil has completely drained out, screw the sealing screw 5 firmly back on the drainage hose.
7. Dispose of the old oil according to the regulations.

The old oil has been drained off.

NOTICE!

The engine manufacturer stipulates that the oil filter must be changed at every regular oil change.

► Always follow the engine manufacturer's operating and maintenance instructions when changing the oil filter.

► Always change the oil filter before you refill with new engine oil.

Refilling with new engine oil

1. To refill with fresh engine oil, proceed as described in Chapter 10.4.1 . Observe the instructions to select a suitable oil. The amount of oil needed is 1.4 litres.
2. Restow the drainage hose 1 carefully back in its original place.
3. Reattach the 3-way valve 3 using the five screws.
4. Reattach the maintenance cover 6 using the two screws.

The engine oil and the oil filter have been changed. Your generator is ready to use again.

10.5 Changing the exhaust gas routing

Your generator has been designed so tha the exhaust gas can be discharged from either the maintenance side or the connections end. The exhaust gas outlet is at the maintenance end ex works. The exhaust gas routing can be changed at any time by trained service personnel.

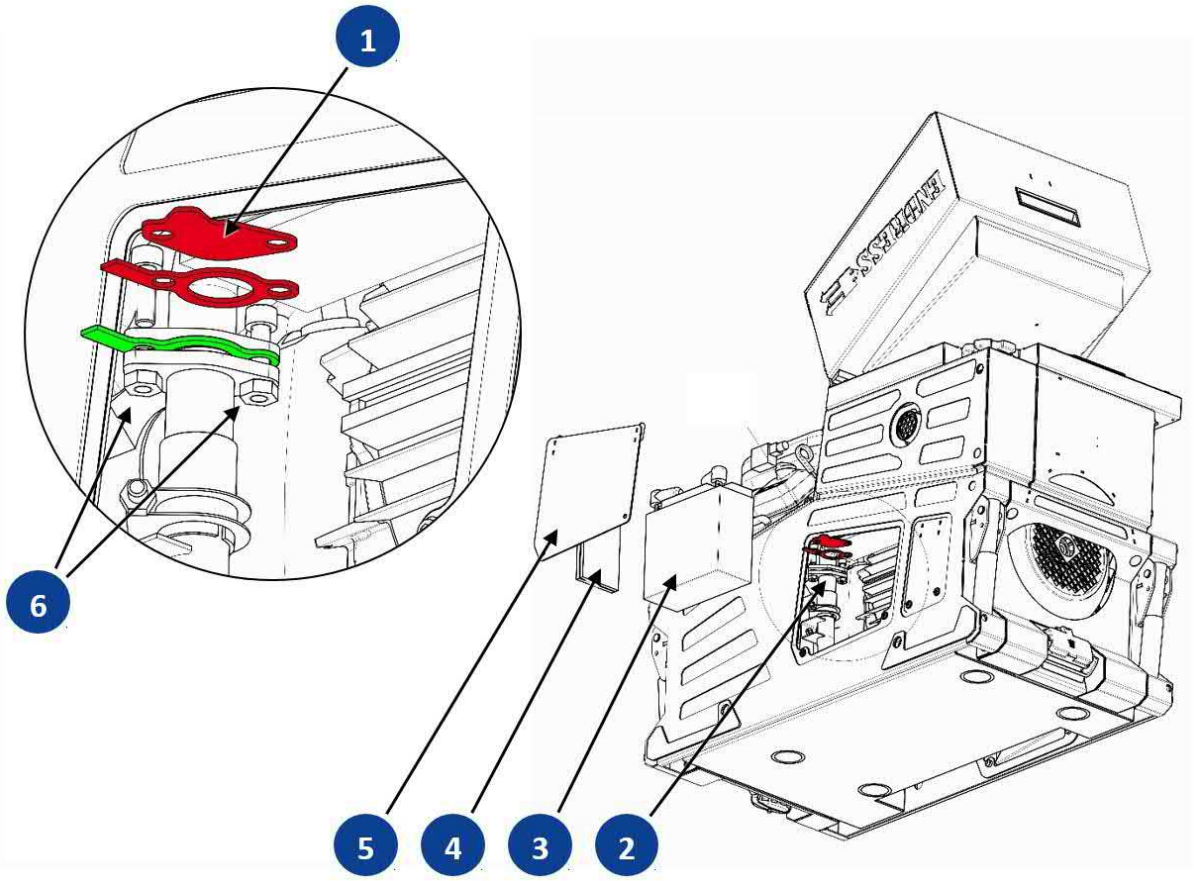


Fig. 10-7 Changing the exhaust gas routing

Proceed as follows to change the exhaust gas outlet at the connections end:

⚠ CAUTION!

Danger of bring burnt by the generator's very hot surfaces, especially in the exhaust gas system section.

Danger of burns, cuts and impact injuries.

► Leave your generator to cool down completely.

► Wear suitable protective gloves

Conditions

✓ the generator must be switched off

✓ the generator must be on solid and clean ground

1. Remove the starter battery 3 and heat shield 4 as described in Chapter 10.3.2 .
   You can now access the exhaust gas routing.
2. Undo and remove both screws 6 from the exhaust gas routing.
3. Remove the sealing plate 1 with the old exhaust gasket between the two flanges (parts marked in red).
   a) Keep the sealing plate in a safe place in case you want to reverse the change later on.
4. Place the supplied replacement gasket between the two flanges (part marked in green).
5. Insert the screws 6 and then tighten them
6. Refit the starter battery 3 and the heat shield 4 as described in Chapter 10.3.2 .
   The exhaust gas routing has been changed.

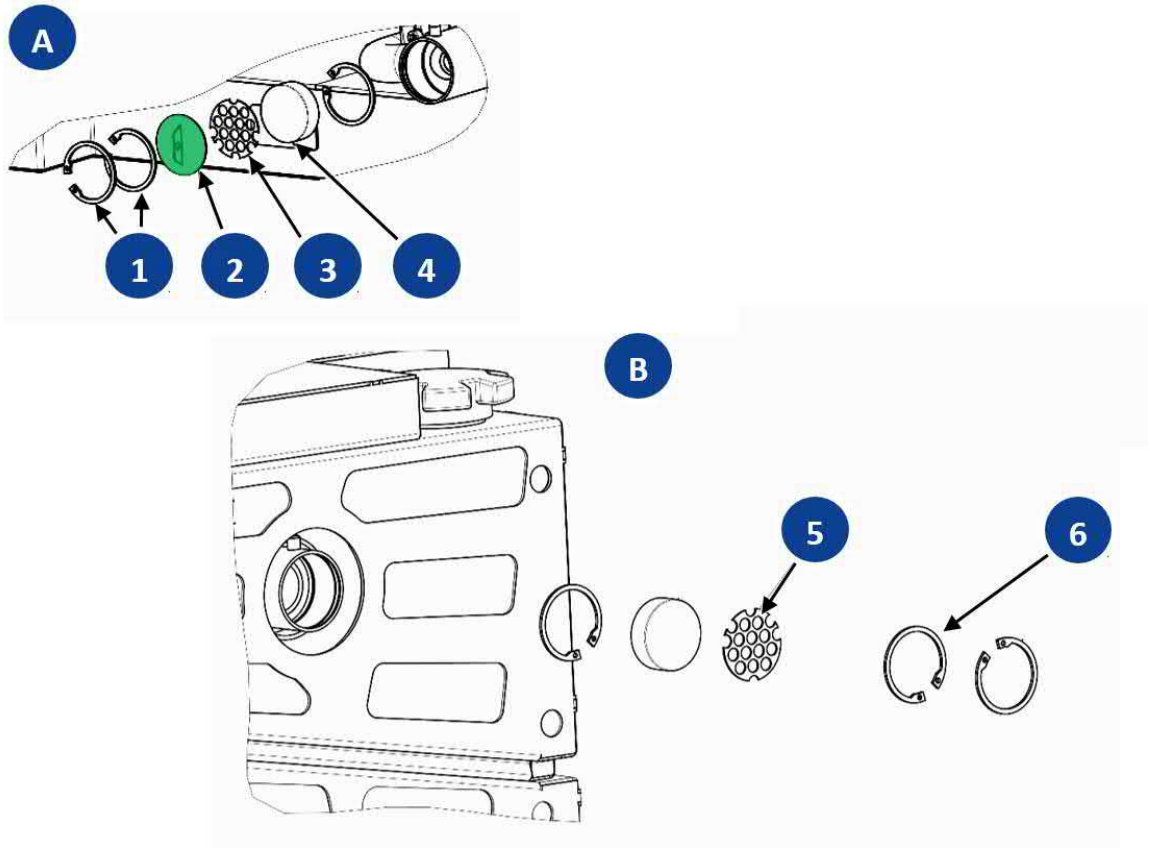


Fig. 10-8 Changing the exhaust gas outlet

1. Remove the two circlips from the exhaust gas outlet at the connections end (detail A) 1.
2. Remove the sealing plate 2. (marked in green).
3. Ensure that the sieve 3 remains in the exhaust gas pipe.
4. Refit the two circlips.
5. Ensure that the open ends of the two circlips face each other.

6. Remove the two circlips from the exhaust gas outlet on the maintenance side (detail B) 6.
7. Replace the sealing plate that was removed in Step 2 2 back in the exhaust gas outlet.
8. Ensure that the sieve 3 remains in the exhaust gas pipe.
9. Refit the two circlips 6 .
10. Ensure that the open ends of the two circlips face each other.
11. Start the generator(see Chapter 7.4 .
12. Check the changed exhaust gas routing and the exhaust gas outlet on the maintenance side for leaks.

The exhaust gas outlet is now at the connections end of the generator.

NOTES

11 Storage

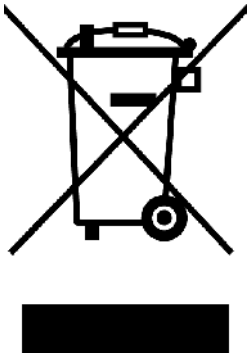
It is important to store the device at a suitable storage location as soon as your generator is no longer being used.

- The storage location must be roofed and must not be subjected to standing water, aggressive vapours or soiling as well as major accumulation of dust.
- Protect your device with a cover made out of breathable material.
- Ensure that the storage temperature and air humidity lie within the specified limits (see Technical data).

NOTICE!

Due to the limited shelf life of the different operating fluids, it is important for decommissioning for more than one month that additional measures for storage are taken. While doing this observe the instructions given in the attached operating and maintenance instructions from the engine manufacturer.

12 Disposal



Your device, which is an electrical or electronic device, is subject to European Directive 2012/19/EU (“WEEE directive“) which is implemented in Germany in national law through the decree regulating the use of dangerous substances in electrical and electronic equipment (ElektroStoffV). This regulates disposal and use of recycling waste electrical equipment. The adjacent icon with a crossed-out wastebasket on your device states that it must not be disposed of in the household waste at the end of its service life.

As a private end-user (a so-called b2c customer) there are free collecting points (recycling centre) near you for electrical equipment as well as possible also other collection points available for reuse of devices. The addresses can be obtained from your city or communal authority. In as far as the old electrical and electronic equipment contains personal data, you are responsible yourself for its deletion before giving it back.

Pure b2b devices (devices which, for appropriate use, or exclusively are only used the commercial area) must not be disposed of over public collecting points in Germany and further EU countries. Speak to your authorised ENDRESS generator dealer about handing back your recycling waste electrical equipment. The dealer is also your point of contact for any differing regulations on the respective country of deployment. There are also possible agreements in the purchase contract to observe.

Please observe the pertinent environmental protection regulations when disposing of the old oil. We recommend bringing the oil in a closed container to an old oil collection centre for disposal. Never put used engine oil in the domestic waste. Storage or introduction of old oil into nature is associated with very high fines.

An inappropriately disposed of battery can greatly damage the environment. Give back your old battery directly free of charge to your dealer when purchasing a new one.

Always observe the valid local regulations and laws concerning correct disposal of all old parts and operating materials. Please contact your ENDRESS service partner for a replacement.

13 Troubleshooting

The following table is an aid for you to use in a case where faults arise during use. Based on experience a number of malfunctions can already be removed by operating personnel or the possible causes limited. In all other cases contact your service partner as described in the table. The same applies for faults which are not listed in the table.

If a fault cannot be rectified using the measures described here, you must shut down your Generators and secure it against further use. Contact your service partner and give him an explanation, not only of the symptoms but also the possible causes which you can already exclude based upon the table. The fault can often be identified over the telephone or through a written exchange with our specialists.

NOTICE!

The following table does not make any claims to completeness and does not mention any faults which can be caused by operating error.

- ► In order to avoid operating errors, please exactly follow the instructions in the existing and delivered documentation.
- ► See the event and error lists in the Appendix.

Malfunction	Possible cause	Correction
The engine turns but does not start (electrical start).	The controller is being operated incorrectly.	Look at the operating instructions.
	Maintenance of the engine was inadequate.	Look at the engine maintenance instructions.
	The oil level monitor actuates.	Check oil level and refill if necessary.
	Too little fuel in the tank.	Refuel
	The fuel filter is clogged.	Replace the fuel filter.
	Bad fuel in the tank.	Replace the fuel, change the fuel filter and clean out the fuel tank if necessary
	The EMERGENCY-STOP button is still locked in place	Unlock the EMERGENCY-STOP button.
The engine turns but does not start (manual start).	The battery connecting cables are unclamped.	Clamp or screw on the battery connecting cables.
	Starter battery is discharged	Recharge the starter battery
The engine starts briefly and then shuts down.	Too little fuel in the tank.	Refuel:
	Tank ventilation is blocked.	Contact your service partner.
	The oil level is too low.	Add oil.
	The fuel filter is clogged.	Replace the fuel filter.

Malfunction	Possible cause	Correction
The engine does not rotate	The starter battery is discharged or defective (only for electrical starting)	Clean the battery poles, check teh starter battery and recharge or replace, check the recharging circuit
	Starter defective	Replace the starter
	Engine is mechanically blocked	Contact your service partner
No or insufficient voltage available during idling without a load.	The rotational speed of the engine was adjusted afterwards.	Contact your service partner.
	The electronic controller has been altered.	Contact your service partner.
	The electronic controller is defective.	Contact your service partner.
Strong voltage fluctuations occur.	The engine runs irregularly.	Contact your service partner.
	Speed controller working erratically or insufficiently.	Contact your service partner.
The engine smokes.	Too much oil in the engine.	Drain off an excess oil.
	Paper element of the air filter is dirty or oil-soaked.	Clean paper element or replace if necessary.
	Foam element of the air filter is dirty or dry.	Clean foam element and if necessary moisten.
The power output remains significantly below the nominal output	Operation under extreme climatic conditions	Adapt the usage for the climatic conditions or terminate it
	The generator has been poorly serviced	Perform maintenance work
	The generator has reached its wear limit.	Contact your service partner
Generator is not running smoothly.	The generator is loaded beyond its nominal output load.	Reduce power draw.
The oil pressure is too low.	Insufficient engine oil in the engine.	Refill with engine oil.
Generator does not start automatically.	Remote start connection is faulty or connection has not been made	Remake the remote start connection

Tab. 13-1 Troubleshooting

Please contact our customer service for further fault diagnosis as well as procurement of original spare parts and wear parts at

Customer service: Tel. +49 7123 973744

Email: service@endress-stromerzeuger.de

Have the item and serial number of your device ready for identification. You will find these details on the type plate (see Fig. 3-5).

14 Technical data

The following table contains the technical data for your generator.

Name	Value	Unit
	ESE 1408 DBG ES DIN Super Silent Plus	
Continuous power output [PRP] 3~ [1)]	13.7 / 10.9	[kVA / kW]
Continuous power output [PRP] 1~ [1)]	7.5 / 6.7	[kVA / kW]
Nominal output factor ~3 / 1~	0.8 / 0.9	[cosφ]
Nominal frequency	50	[Hz]
Nominal speed	3,000	[min^{-1}]
Nominal voltage 3~ / 1~	400 / 230	[V]
Nominal current [PRP] 3~ / 1~	19.8 / 32.6	[A]
Approx. weight	144	[kg]
Tank capacity	12	[l]
Fuel consumption (at a 75% load) [2)]	3.4	[l/h]
Running time (at 75% load) approx. [2)]	3.5	[h]
Length	820	[mm]
Width	440	[mm]
Height	580	[mm]
Noise pressure level at the workplace L_{pA} [3)]	88	[db (A)]
Sound pressure level at a distance of 7m L_{pA} [4)]	71	[db (A)]
Sound power level L_{WA} [3)]	96	[db (A)]
Protection Class for the generator	IP 54	
[1)] Measured under standard reference conditions [2)] Average value; deviations might occur in specific cases, and therefore they are non-binding [3)] Measured at a distance of 1 m and a height of 1.6 m in accordance with ISO 3744 (Part 10) [4)] Measured in accordance with ISO 3744 (Part 10)		

Tab. 14-1 Power generator technical data

15 Replacement parts

Maintenance and replacement parts can be obtained quickly and easily from your responsible ENDRESS service partner or ENDRESS dealer. You can alternatively obtain support from our central customer service

by telephone: +49 (0) 71239737-44

by email: service@endress-stromerzeuger.de

Have the item and serial number of your device ready for identification.

As a registered user you can obtain rapid and uncomplicated access to a range of services over our home page to obtain suitable original spare parts for maintenance and repair work. Using your internet browser please go to

https://endressparts.com

and click on the area “Documentation and replacement parts“.

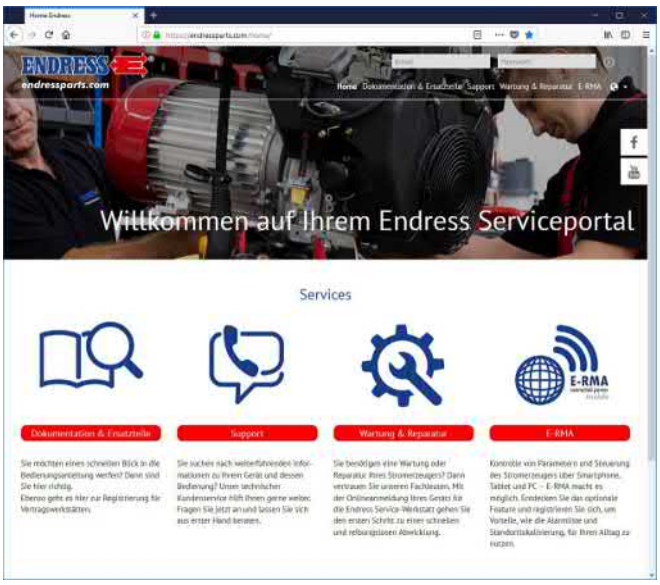


Fig. 15-1 Spare parts over endressparts.com

NOTES

Keyword index

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