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Agricultural generator sets

# 1. INTRODUCTION

Dear Customer, thank you for putting Your trust in us and purchasing a high quality FOGO® power generator. We believe that by cooperating with top worldwide manufacturers of subassemblies and using innovative technological solutions we have developed a product which sets the standards in terms of safety and reliability. We do hope that you will be satisfied with its day-to-day use, and the large reserve of power will guarantee long life and reliability.



## Read the operation manual before starting the generator set for the first time!

Safety of the user and all people present in the vicinity of the device is of paramount importance. There is information in the manual and on the genset which must be familiarized with in order to avoid accidents and ensure correct operation and maintenance, thus increasing the genset life.

*Agregaty Fogo Sp. z o.o.*

**In order to prove that our power generators comply with the UE safety requirements, they have been evaluated for conformity by an external Notification Body.**

The FOGO® gensets comply with all European Standards and other specialist requirements in the area of design, safety, operation and environmental protection.

**Each genset is supplied with the EC Declaration of Conformity.**

## 2. BASIC RULES OF OPERATION

- Use tractors with adequate reserve of power. When choosing a tractor, use the minimum power values given in table 1 of electrical and mechanical values.
- Do not exceed the shaft speed specified in the table of electrical and mechanical values. Excessive speed may damage the generator winding and the measuring instrument of electrical parameters, and, as a result, may invalidate the warranty.
- Do not stop and start the genset when loads are connected to the outlets or when the switches are in the ON position.
- If the genset is stopped for reasons independent of the user, e.g. lack of fuel, immediately disconnect all loads. Failure to observe this may make it difficult or impossible to restart the genset.
- The gensets are equipped with residual current devices. Faulty electrical installation or incorrect connection may result in power supply to the loads being switched off.
- During operation the genset must be placed on the ground.
- When the genset is transported on a tractor, disconnect the power-take off shaft (PTO).
- Do not start the genset in the environment of escaping gases, vapours of paints, thinners or other flammable materials.
- Do not start the genset when wet or damp
  - **hazard of electric shock or even electrocution!!!**
- Before starting work, check the technical condition of the genset, particularly the protections and cable insulation.
- Do not touch the rotating parts when the genset is running – **hazard of limb or general injury!!!**
- When the genset is running, pay attention to children and animals in its vicinity.
- Do not use oil non-conforming to the operation manual or in a wrong amount (check after each 50 hours of operation; top up, if necessary, using oil of identical parameters).



**NOTE: observing the above-mentioned rules does not relieve the user from the obligation to study the operation manual.**

**In order to ensure correct and trouble-free operation of the genset, observe all recommendations included in this manual.**

**AGREGATY FOGO SP. Z O.O. WILL NOT BE RESPONSIBLE FOR DAMAGE TO PROPERTY OR INJURIES TO PERSONS OCCURRING AS A RESULT OF INCORRECT OPERATION, OPERATION NON-CONFORMING TO THE RECOMMENDATIONS INCLUDED IN THE OPERATION AND MAINTENANCE MANUAL, WITHOUT TAKING THE PRECAUTIONS APPROPRIATE TO WORK WITH ELECTRICAL DEVICES AND IN DEFIANCE OF APPLICABLE REGULATIONS.**

**The operation manual is an integral part of the genset and must be referred to before, during and after its use.**

Read the manual in its entirety before starting to use the genset. This will help you operate it effectively.

Observing the recommendations included in the manual and an adequate level of experience guarantee a safe operation of the genset.

This manual has been written according to the requirements of the directive 98/37/EEC, as amended.

Particular emphasis in the manual has been placed on safety recommendations and precautions.

Keep the manual until the genset is disposed of; the manual should be easily available and protected against damage (kept in a dry place) at all times, so that the operator can refer to it at any time while using the equipment.

### 3. WARRANTY

Agregaty Fogo Sp. z o.o. guarantees quality, safety and capacity of its products, provided they are operated correctly.

The warranty, which covers the genset defects or malfunctions caused by design or material errors, is granted for 24 months from the date of purchase. The warranty period will not be extended under any circumstances, even if the genset was not used for some time.

If defects in material or workmanship are discovered during the warranty period, Agregaty Fogo Sp. z o.o. will replace or repair the defective parts as soon as possible. The warranty claim may be rejected if the guarantor is not notified about the defect immediately after its occurrence. The repair works performed at the costs of Agregaty Fogo Sp. z o.o. must be carried out in the manufacturer's plant. The warranty claim will be rejected and the warranty invalidated if a defect, failure or malfunction is a result of operating the genset contrary to its intended use, in particular contrary to the recommendations included herein. The basis for invalidating the warranty and rejecting all warranty claims is also unauthorized technical modifications of the genset by the user, sending the genset for the repair in the disassembled condition, and destruction of the rating plate. When delivering the genset for the warranty repair, the user should observe the procedure described in the generator manual.

## 4. TECHNICAL INFORMATION

The generator is a device which converts mechanical energy to electric energy.

In this case the mechanical energy is received from the tractor by means of the Cardan joints.

The Cardan shaft is connected to the gear unit, which adapts the tractor shaft speed to the speed required by the generator.

**The voltage and frequency obtained from the generator depend directly on its speed; consequently, they must be kept constant regardless of the load.**

**NOTE: we recommend using tractors with power rating given in table 1 of electrical and mechanical values.** Then, the tractor engine speed control system gives a slight drop of speed between idling and rated load. Therefore, it is recommended to set the idling speed 3-4% above the rated speed. In other words, the speed at the tractor shaft should be set at the level which makes the frequency meter at the control panel display 52 Hz (=50Hz + 4%). At such speed the no-load voltage will be 400-410V.

**In case of the tractor with power rating lower than recommended, check the speed after each change of the genset load. Otherwise, the change of speed can cause the voltage to increase or decrease, damaging the genset or connected loads.**

The generator is of the self-excited type with automatic voltage control. The control system keeps the voltage (at the constant speed and balanced load) within the +/-5% range.

The generator windings have been star-connected in the factory. This allows to supply the 400V three-phase loads by connecting to three terminals U1-V1-W1, and the 220V single-phase loads by connecting to one of the above-mentioned terminals and to the neutral terminal. The rated power is achieved for 3 phases only, maximum 1-phase power is 40% of the rated value.

**Connecting a single-phase load creates a significant imbalance between all three phases, so when supplying single- and three-phase loads at the same time, make sure that all three phases are evenly loaded.**

The genset protection rating is IP23. This means it is protected against solid bodies above 12mm in diameter (e.g. a finger) and water dripping vertically.

**The genset is not adapted to operation without a canopy, when it is raining.**

In such case provide a suitable protection (canopy), ensuring an adequate airflow at the same time.

The rated power is guaranteed at ambient temperatures up to 40°C.

## 5. INSTALLATION

The AGROVOLT genset is an electrical device which must be operated, installed, started, supervised and repaired **only by qualified staff** who need to:

- have adequate technical training,
- know and understand the principle of operation of the genset,
- know the rules of safe operation of the genset and other electrical devices.

The AGROVOLT genset is connected to another mechanical device. Therefore, the genset operator must know and understand the rules of safe operation of this mechanical device. In particular, this relates to avoiding an accidental contact with moving articulated parts and live parts.

## 6. DELIVERY, UNPACKING, STORAGE

6.1 After the delivery, check the genset for possible transport damage.

6.2 When handling, use the equipment with adequate lifting capacity and protect against rain and moisture. **For transport, disconnect the power-take off shaft to avoid damaging the Cardan shaft or its connections to the tractor or generator.**

6.3 When unpacking, keep all packaging materials away from children, as they are potentially hazardous.

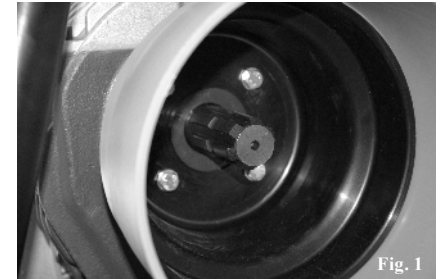
6.4 Store the genset indoors, in a dry and clean room. After longer periods of storage it is recommended to check the insulations of all cabling. **The insulation resistance should be above 1M $\Omega$ .**

**Otherwise, dry the machine at about 50-60°C.**

## 7. STARTING

7.1 Before starting, check:

a) if the protective hood shown in fig. 1 is fastened, in good condition and adequately secured. The hood must cover the Cardan connection for at least 50 mm and must prevent an accidental contact with moving parts;



b) if the generator rotor and the gear unit are aligned with the tractor PTO shaft;

c) if the connections for the three-point hitch (fig. 3) are well fastened and secured. **A genset which is incorrectly fastened may fall and be a serious hazard for the user.**

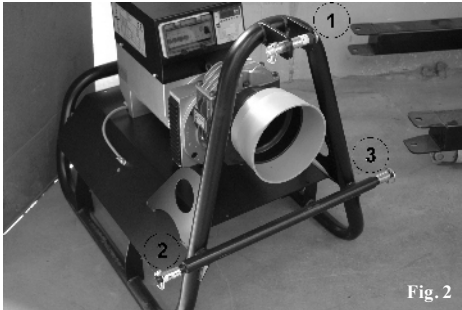


Fig. 2

**7.2 During the first starting the gear unit must be filled with oil (0.6 l), which must be changed after the first 60 motor-hours of operation.** The Agrovolt gensets are filled with oil in the factory, but the user must check the oil level before the first start.



Fig. 3

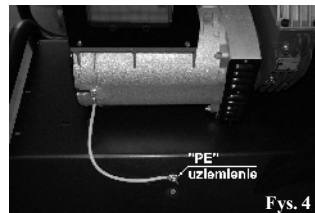
Check the oil level regularly. In the versions with a sight glass, the oil level should be near the middle. Top up oil if the level is too low. To drain oil quickly and completely, remove both screws – top (venting) and bottom (drain) – see fig. 3.

**Use only Shell SPIRAX G80W90 gear oil.** Store the used oil in accordance with applicable standards and regulations. Before starting, check if all connections are correct, free of obstacles, if all moving parts can rotate freely and safely. Make sure the air inlets are not blocked and are suitably cleaned.

**7.3** Make sure the genset does not take hot air or exhaust gases from the tractor.

**7.4** All electrical connections must conform to the applicable regulations. Check if the data on the rating plate correspond to the data of the supplied loads.

**Earth the genset by connecting the earthing rod to the connection on the genset frame – see fig. 4.**



Fys. 4

**7.5** Check if all switches are in the OFF position and if all protections are working, both in the tractor and the genset – see fig. 5



Fig. 5

## 8. USING THE GENSET



**NOTE!!!** This device includes moving parts, in particular quick rotating parts.

Consequently:

- **incorrect operation,**
- **removing the shields and protections,**
- **failure to perform check-ups and repairs**

can result in equipment damage and personal injury of the operator or other people.

Therefore, it is recommended that a genset is operated by qualified personnel.

All maintenance operations involving disassembly, lubrication and installation of the Cardan joint **should be performed in accordance with the OH&S regulations.**



Fig. 6

8.1 Install the gear unit connection between the tractor and the genset (the tractor engine must be off), making sure that the fixing is correct so that there is no vibration when the genset is operated at idling speed and under load – fig. 6.

8.2 Carefully mount the genset using the three-point hitch and delivered pins. Any mistakes in installation can cause damage for which the manufacturer will not be responsible – fig. 2.

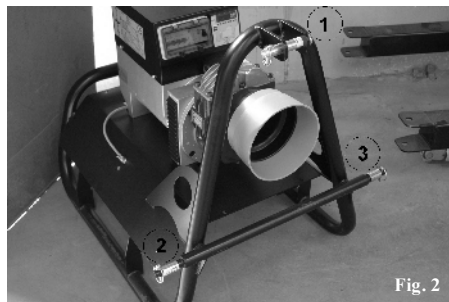


Fig. 2

8.3 Make sure that the genset frame stands on the ground. Never use the genset when it is lifted. Vibration can cause an incorrect operation and be a hazard to the users.

8.4 Put the switches in the OFF position – fig. 5.



Fig. 5

Start the tractor engine and gradually increase revs, starting from minimum, so that the voltmeter indicates 400V (fig. 7), and then press the MEASUREMENT (POMIAR) button on the control panel twice – the display should show about 52 Hz (fig. 8) at no-load operation. If it shows a different value, adjust the tractor revs to obtain 52 Hz on the display. It is recommended to recheck the voltage.



Fig. 7



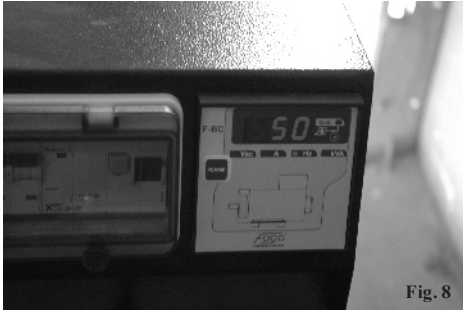


Fig. 8

8.5 Plug the loads into relevant outlets (fig. 9) before putting the switches into the ON position. Make sure that the rated voltage of connected loads corresponds to the genset output. Also make sure the loads are in

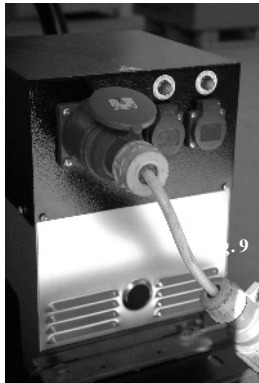


Fig. 9

good technical order to receive the power. **However, first of all make sure that no one is present in direct vicinity of moving or live parts.**



**NOTE!!!** The AV27 and AV38 gensets feature the outlets 63A 3P+N+PE+remote – fig. 10

This outlet has an additional protection against unplugging during the genset operation (this can cause an electric arc). This type of outlet requires a plug with an additional pin (fig. 11), otherwise the overcurrent protection will not be activated.



Fig. 10

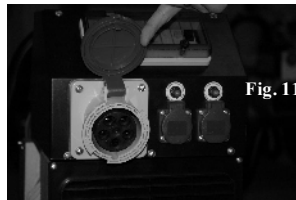


Fig. 11

8.6 Contact with moving parts can cause serious injuries, so it is prohibited to stay near the shaft during the genset operation. Make sure that no one is present in the direct vicinity of the genset during its operation, particularly in the area delimited by protections.

8.7 In order to supply power to the outlets (and to the loads), lift the lid above the switches and activate the residual current device first (put to the ON position – fig. 12) and then the overcurrent protection – fig. 13.

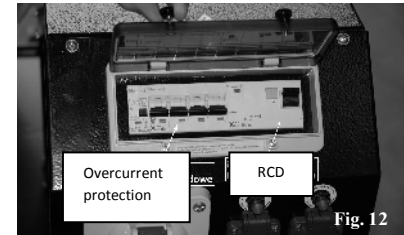


Fig. 12



Fig. 13

8.8 If the tractor engine's speed is insufficient under load and the frequency drops below 48.5 Hz, increase the revs slightly and restore the frequency of 50 Hz.

**Please remember that if you use a tractor with power lesser than recommended (see the table of electrical and mechanical values), not only will its revs drop under load, but the voltage and frequency may increase excessively when the loads are disconnected.** Such fluctuations may be dangerous for other simultaneously connected loads and **can damage the genset voltage and frequency meters.**

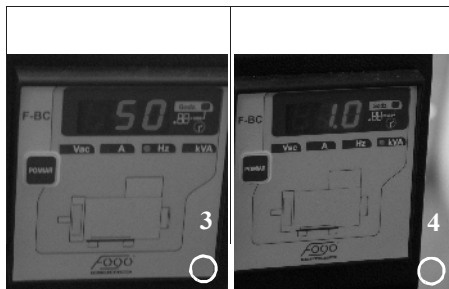
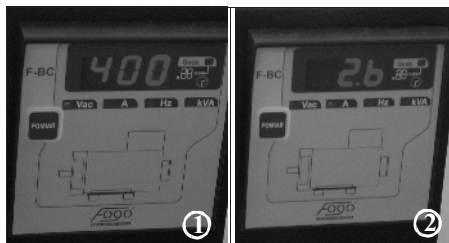
8.9 In order to stop the operation, switch off all loads (pay attention to the tractor engine revs – see section 8) starting from the smallest one, or put the genset main switch to the OFF position (fig. 14), stop the tractor engine and unplug all loads.



## 9. F-BC measuring instrument

The instrument measures the following parameters:

1. AC voltage in volts (V),
2. Current in amperes (A),
3. Frequency in hertz (Hz),
4. Apparent power in kilovolt-amperes (kVA),
5. Motor-hours (H).



There are two modes of measurement and display:

1. **Manual** – activated by pressing the MEASUREMENT (POMIAR) button. Keep pressing the button until the required value appears on the screen. In addition to being displayed on the screen, the selected value is also indicated by the lamp lit under it.
2. **Automatic** – sequential display of individual parameters with 3-second scanning. If you need to interrupt scanning, just press the MEASUREMENT (POMIAR) button.

To switch from the **manual** to **automatic** mode, press the MEASUREMENT (POMIAR) button for 3 seconds. To switch from the **automatic** to **manual** mode, just press the same button once.

### Screen test

The 2-second screen test to verify the correct operation of the genset is automatically activated after each start. When the test is completed, the instrument switches to the manual mode and measures the voltage.

### Motor-hours

The genset features the motor-hour meter to record the number of hours of its operation. The number of motor-hours is displayed as follows:

#### Displayed values:

**Values from 0 to 999 motor-hours "000 / 999"** are displayed without a decimal point (the resolution in the case is one hour).

**Values from 1000 to 9999 motor-hours "100./999."** are displayed with point after the last digit on the right (in this case the resolution is 10 hours).

Values from 10000 to max. 65535 motor-hours **"10.0 / 65.5"** are displayed with point after the second digit (here the resolution is 100 hours).

When the value of 65535 motor-hours has been exceeded, the meter starts counting from zero again. Please note that the value of 65535 motor-hours corresponds to continuous operation for 2730 days (about 7.5 years).

### DISPLAY OF MAXIMUM MEASURED VOLTAGE AND CURRENT VALUES

The device can display maximum measured voltage and current values.

To switch to the required value (V or A), press the MEASUREMENT (POMIAR) button and keep it pressed for 8 seconds. When the button is released, the device will display the maximum measured value. Display of maximum recorded values is signalled by a flashing lamp. After 10 seconds the device automatically returns to its normal mode of operation, the screen no longer shows the maximum value and the lamp will be lit continuously. These values will remain recorded even after the device is turned off.

## 10. MAINTENANCE AND SERVICING

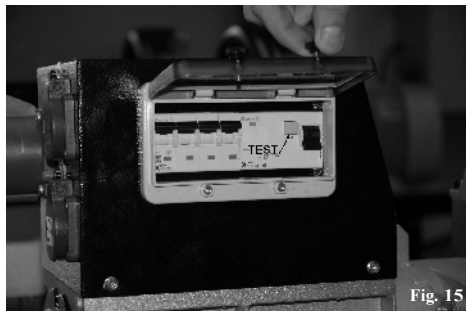


**NOTE:** Never perform any operations on the machine (using your hands or tools) when it is on. Before starting any maintenance work make sure the machine is off, disconnected from the tractor or the tractor engine is off and secured against an accidental start (key is removed from ignition), and that all switches are in the OFF position).

1. If you notice any defects in the machine operation, check if the reason is incorrect maintenance or absence of maintenance.
2. Mechanical checks:
  - 2.1 Once a month or during each start check for abnormal noise or vibration, which indicates a worn bearing. Check also if the air inlets and outlets are not blocked.
  - 2.2 Check oil in the gear unit from time to time. Change oil every 500 motor-hours or at least once a year (the first change after 50 motor-hours).

### 3. Electrical checks:

3.1 Once a month or during each start check the correct operation of protections: when the genset is operating (at the rated voltage), press the TEST button – the circuit must be interrupted. Check if earthing is adequate (fig. 15).



3.2 Every 500 motor-hours or at least once a year check the brushes and commutator for wear. Check the measuring instruments by comparing their indications with standard instruments.

4. Never wash the genset using water under pressure or any caustic products.

5. Never put any containers with liquid or flammable materials on the machine.

6. Keep away from moisture and never install in explosion hazard areas.

7. In the case of fire, use a dry-powder extinguisher.

### 10.1 USING THE SWITCHES

The overload protection can be triggered in two cases:

When connected loads require greater current than that allowed by the protection. As a result of short-circuit.

In the first case, just reduce the load and restart the generator. In the second case, find and remove the reason of short-circuit.

The residual current device is triggered in case of defects in the circuit insulation. This type of device (in combination with adequate earthing) guarantees the best protection against electric shock.

### 10.2 TOPPING UP OIL AND CHECKING THE BRUSHES

**NOTE: Perform all operations when the genset is disconnected from the tractor.**

#### Topping up oil in the gear unit:

Unscrew the oil filler plug A and the plug B (see fig. 3). Pour oil through the opening A until it appears in the opening B.

3. Screw in both plugs.



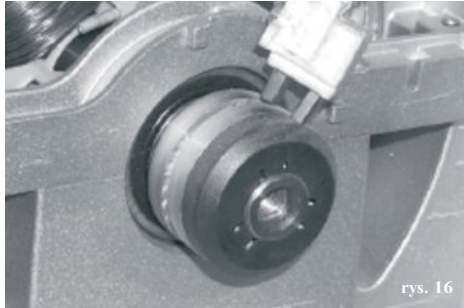
#### Check of the generator brushes:

1. Unscrew the fastening bolts and remove the front cover of the generator.

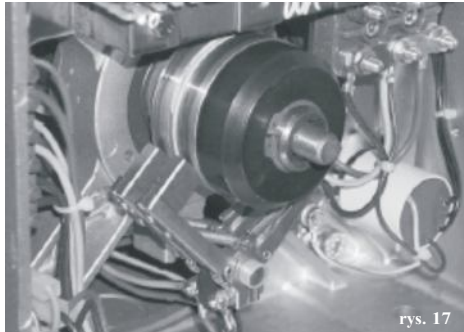
1. Measure the length of carbon brushes:

1.1 In the AV22, AV27, AV38 gensets (fig. 16), the brushes must protrude at least 10mm from the holder.

1.2 In the AV15, AV16, AV18 gensets (fig. 17), unscrew the nuts and remove the brush holder – the brushes must protrude at least 4mm.



rys. 16



rys. 17

2. Check the condition of cables, sockets, rings, particularly for possible burns, tarring, etc.
3. Replace the front cover.

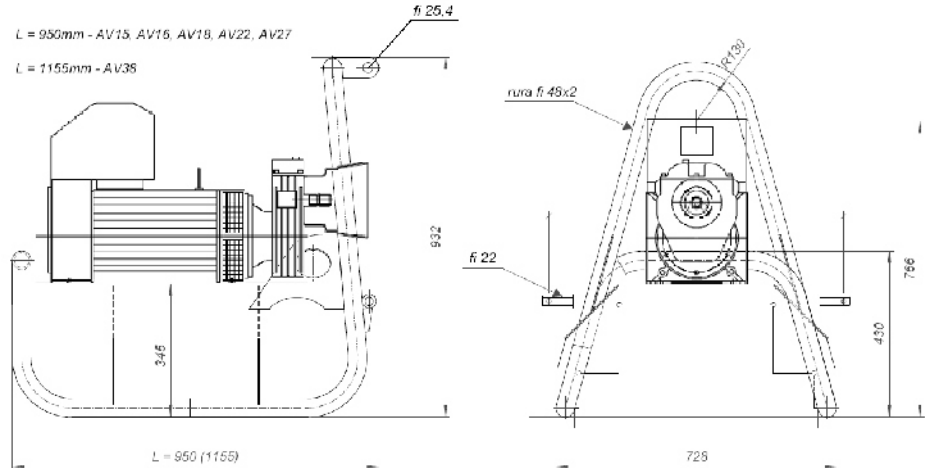
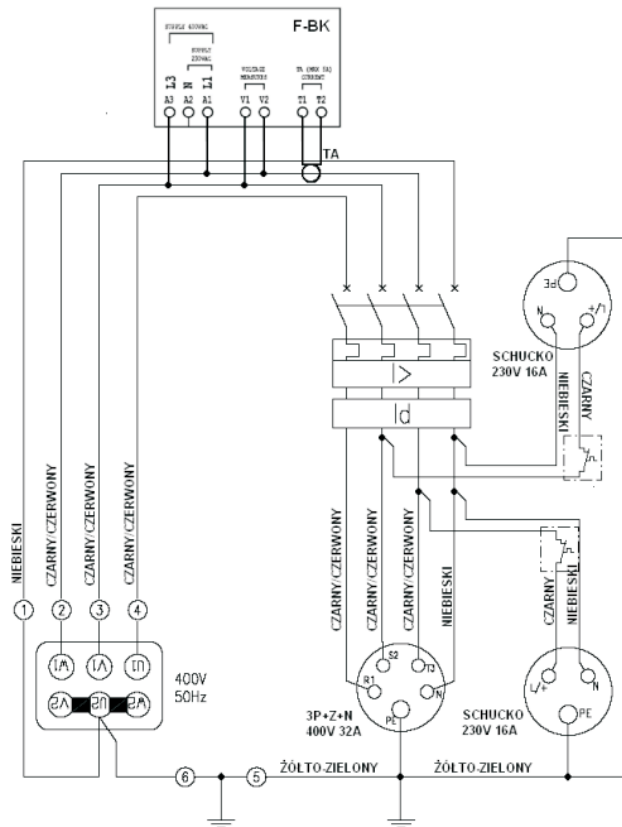


TABLE OF ELECTRICAL AND MECHANICAL VALUES

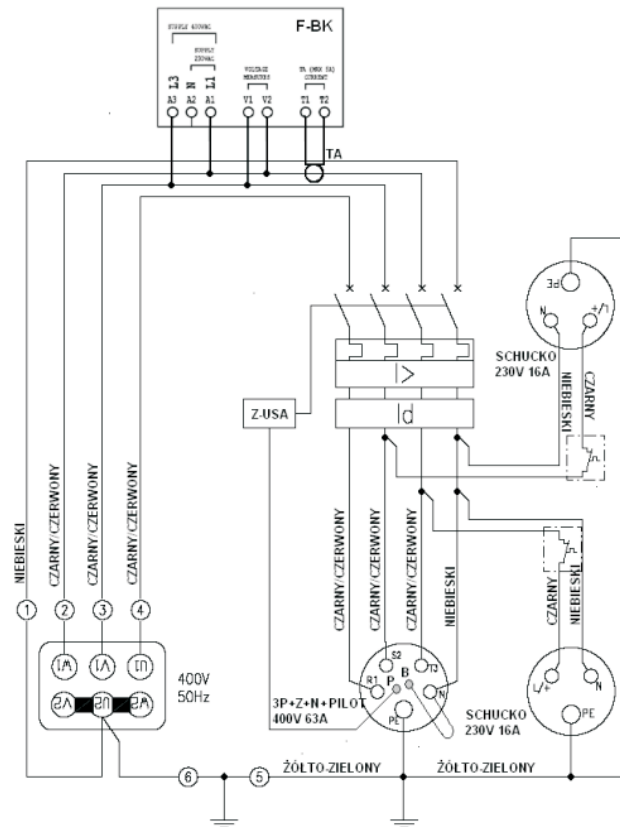
TYPE	Rated power 3~ kVA / kW	Rated power 1~ kW	Suggested tractor engine power HP / kW	Speed of power take-off shaft rpm	Power at the PTO shaft HP / kW	Min. strength of Cardan shaft HP / kW	Weight kg	Dimensions LxWxH
AV15	15/12	6	40/30	430	22 / 16	50 / 37	115	930x800x932
AV16	16/12,8	6,4	44/33	430	24/18	54/42	129	930x800x932
AV18	18/14,4	7,2	50/37	430	27/20	60/45	134	930x800x932
AV22	22/17,6	8,8	60/45	430	33/25	75/56	146	930x800x932
AV27	27/21,6	10,8	70/52	370	40/30	90/67	153	930x800x932
AV38	38/30,4	15,2	100/75	430	60/45	130/97	211	1130x800x932

## SERVICING

### ELECTRICAL DIAGRAM OF AV GENSETS UP TO 23 KVA



### ELECTRICAL DIAGRAM OF AV GENSETS FROM 27 TO 38 KVA



## ELECTRICAL PANELS IN GENSETS

Panel catalogue No.	Genset power rating (kVA)	Current of 4-pole circuit-breaker (A)	Current of thermal protection (A)
AG-SA15K	15	20	16
AG-SA16/18K	16	25	16
AG-SA16/18K	18	25	16
AG-SA-22K	22	32	16
AG-SA-27K	27	40	16
AG-SA-38K	38	50	16

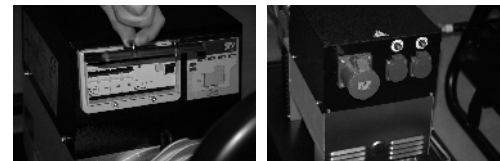
## ELECTRICAL PANEL IN AV15 GENSETS

Item	Catalogue No.	Part designation
1		Control panel cover
2		Outlet 3~ CEE 3P+N+PE 32A 400V (see table)
3		Control window IP54, 8 modules
4		4-pole RCD Id 40/4/0.03A (see table)
5		4-pole overcurrent circuit breaker B20/4 (see table)
6		F-BC measuring instrument of electrical parameters
7		Current transformer 100/5A
8		Outlet 1~ schuko 16A 230V
9		Thermal protection 16A



## ELECTRICAL PANELS IN AV18 GENSETS

Item	Catalogue No.	Part designation
1		Control panel cover
2		Outlet 3~ CEE 3P+N+PE 32A 400V (see table)
3		Control window IP54, 8 modules
4		4-pole RCD Id 40/4/0.03A (see table)
5		4-pole overcurrent circuit breaker B25/4 (see table)
6		F-BC measuring instrument of electrical parameters
7		Current transformer 100/5A
8		Outlet 1~ schuko 16A 230V
9		Thermal protection 16A



**ELECTRICAL PANEL IN AV22 GENSETS**

Item	Catalogue No.	Part designation
1		Control panel cover
2		Outlet 3~ CEE 3P+N+PE 32A 400V (see table)
3		Control window IP54, 10 modules
4		4-pole RCD Id 40/4/0.03A (see table)
5		4-pole overcurrent circuit breaker B32/4 (see table)
6		F-BC measuring instrument of electrical parameters
7		Current transformer 100/5A
8		Outlet 1~ schuko 16A 230V
9		Thermal protection 16A



**ELECTRICAL PANEL IN AV27 GENSETS**

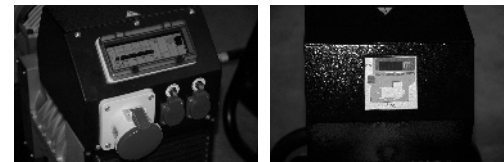
Item	Catalogue No.	Part designation
1		Control panel cover
2		Outlet 3~ CEE 3P+N+PE 63A 400V + REMOTE (see table)
3		Control window IP54, 10 modules
4		4-pole RCD Id 40/4/0.03A (see table)
5		4-pole overcurrent circuit breaker B40/4 (see table)
6		F-BC measuring instrument of electrical parameters
7		Current transformer 100/5A
8		Outlet 1~ schuko 16A 230V
9		Thermal protection 16A
10		Undervoltage release Z-USA





## ELECTRICAL PANEL IN AV38 GENSETS

Item	Catalogue No.	Part designation
1		Control panel cover
2		Outlet 3~ CEE 3P+N+PE 63A 400V + PILOT (see table)
3		Control window IP54, 10 modules
4		4-pole RCD Id 63/4/0.03A (see table)
5		4-pole overcurrent circuit breaker B50/4 (see table)
6		F-BC measuring instrument of electrical parameters
7		Current transformer 100/5A
8		Outlet 1~ schuko 16A 230V
9		Thermal protection 16A
10		Undervoltage release Z-USA



# Warranty claim sheet

(to be filled in by the claimant)

**GENSET DATA:**

**Model:** .....

**Genset No.:** .....

**Date of purchase:** .....

**Invoice No.:** .....

**Seller:** .....

**Motor-hours reading:** .....

**Description of malfunction:** .....

.....

.....

.....

.....

*If the genset is under warranty, please attach the original warranty card.  
Claims without warranty cards will be rejected.*

**CLAIMANT**

**Name:** .....

**Company:** .....

**Address:** .....

**Tax. No.:** .....

**Telephone:** .....

**STATEMENT:**

I agree to pay the costs of repair and transport in the case the warranty claim is not recognized.

I also agree to pay for change of the consumables (filters, spark plug, engine oil). Only correct check-ups ensure appropriate operation of the equipment.

All parts and services according to the valid price list of FOGO Sp. z o.o.

Please provide a previous estimate of the repair costs:

**YES / NO**

DATE:

.....

NAME:

.....

SIGNATURE:

.....



## Repair record

REPAIR ORDER NO.	DATE RECEIVED	DATE RETURNED	DESCRIPTION OF MALFUNCTION/ REPAIR	NOTES



We reserve our right to make modification within the process of technological improvement of our products. All information included herein is based on the product data available at the time of printing. Modifications may appear as a result of process of improvement and will be included in subsequent versions of the manual. If you find errors or inconsistencies in the manual, please kindly report them using the attached claim sheet or by e-mail to: [dominik@agregaty.pl](mailto:dominik@agregaty.pl) or tel. +48 (65) 534 11 80. No fragment of this publication may be copied without a written consent of Agregaty FOGO Sp. z o.o. The manual is an integral part of the equipment and must accompany it in case of resale or any other form of disposal.