

# **DYNAWATT**<sup>®</sup>

**230V POWER SYSTEMS**



**DYNAWATT 4.0 & 5.0 – 230V 50HZ**

## **INSTALLATION MANUAL**

August 2018

Gratulations,

On your purchase of a DYNAWATT 230V POWER SYSTEM. You have now acquired a high quality, precision manufactured power supply system for mobile use.

Please read these operating instructions through carefully before using the system for the first time.

In any event, installation should only be carried out by a qualified technical workshop.

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## SYSTEM DATA

The DYNAWATT 230V Power System consists of three parts. They are:

- |                   |                     |
|-------------------|---------------------|
| 1. Control unit   | Page: 17            |
| 2. Generator      | Page: 18            |
| 3. Remote control | Page: 19 (optional) |

The basic system also comes with two installation brackets.

Please note the following information on your system.

Generator:                      Series No. ....

Control unit:                      Series No. ....

## SAEFTY PRECAUTION

- The DYNAWATT Power System generates an output voltage of 230V AC. When operating the system observe the general safety regulations for using electrical equipment. In other words e.g. do not allow any liquids to get into the housing, do not use any sharp instruments, in particular do not insert any metallic objects into the ventilation slot!
- The system is electrically insulated (galvanic separation between electronics and housing). There is no connection from earthed to the chassis.
- When the engine is running the electric circuit is alive. In order to ensure optimum cooling the unit must be installed vertically and the ventilation slots kept clear.
- All installation screws (installation kit) must be secured to prevent accidental loosening by using Loctite.

## IMPORTANT

Installation and maintenance of the system should only be carried out by trained personnel. Any faults which are attributable to the use of components other than the components supplied by Sterki, or the failure to observe the safety instructions as specified above, are not covered by warranty.

**Warning:** Never connect the control unit 230V output direct to the public grid. When a connection to the public grid is required, a “shore to land” power transfer switch must be installed between control unit and vehicle’s/boat’s electrical power system.

## LIST OF FIGURES

All figures can be found at the back of the manual

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## TECHNICAL SPECIFICATION

### CONTROL UNIT

|                      |   |
|----------------------|---|
| <b>Part No.</b>      | <b>P32310 – 4000 Watt</b>   |
| Output power:        | 4000 Watt intermittent<br>3500 Watt continuous  |
| <b>Part No.</b>      | <b>P52305 – 5000 Watt</b>   |
| Output power:        | 5000 Watt intermittent<br>4500 Watt continuous  |
| Output voltage:      | 230 – 233 Volt AC at no load<br>235 – 237 Volt AC at load                                   |
| Phases:              | 1 phase   |
| Frequency:           | 50 Hz $\pm$ 0.5% Hz   |
| Output wave:         | sine wave   |
| Start-up current:    | 70 Amp (5ms)  |
| Efficiency:          | 96%   |
| Weight:              | 9.0 kg  |
| Protection category: | IP 21   |
| System Protection:   | System automatically shuts off at: overload,<br>overheating or short circuit (double fault) |

### GENERATOR

|                      |  |
|----------------------|--|
| Part No.             | P30026E  |
| Power output:        | 5000 Watt max.                                   |
| Output voltage:      | 3 x 250V AC                                      |
| Output frequency:    | variable, between 300 and 1500 Hz                |
| Generator speed:     | 18,000 rpm intermittent<br>15,000 rpm continuous |
| Weight:              | 8.0 kg   |
| Belt pulley:         | DIA 57mm (2 x 9,5mm) belt or Micro V-Belt        |
| Efficiency:          | 70%  |
| Insulation category: | H (170°)   |
| Phase resistance:    | 2.7 Ohm $\pm$ 0.27(from phase to phase)          |
| Resistance rotor:    | 2.5 to 3.5 Ohm                                   |

### REMOTE CONTROL

|                   |   |
|-------------------|---|
| Part No:          | P30115  |
| Switch:           | STANDBY / ON                                  |
| Indicators        | add rpm, overload, overheating, short circuit |
| Connection cable: | shielded RJ 54 cable                          |

## ADDITIONAL COMPONENTS

### Power Transfer Switch

A Power Transfer Switch must be installed for switching over from an external power source (e.g. shore power 230V) to on board power source, Page 20.

## LIST OF PARTS SUPPLIED

1. Generator
2. Control unit
  - a. 2 pc. attachment brackets (loose)
  - b. 4 pc. M6 x 10mm attachment screws for brackets (on the back of Control Unit)
3. User manual
4. Remote control with connecting cable (optional)

## PARTS REQUIRED, NOT SUPPLIED

1. Three-conductor output power cable, min. 3x1.5mm<sup>2</sup>,
2. Vehicle engine installation kit are available on request.
3. 4 pc. mounting screws for the control unit
4. 10 pc crimp wire ferrules, size 2.5mm<sup>2</sup>, and crimping tool
5. 3 pc small wire stripe

## GENERATOR SPEED AND AVIABLE POWER

Calculation Sheet

### Generator speed

Belt pulley dia. generator side:  $R_a = \dots\dots\dots$  mm  
Belt pulley dia. motor side:  $R_m = \dots\dots\dots$  mm  
Engine speed idling:  $n_L = \dots\dots\dots$  rpm  
Engine speed max.:  $n_M = \dots\dots\dots$  rpm  
Belt pulley transmission:  $i_R = R_m : R_a = \dots\dots\dots$   
Generator idling rpm:  $NA \text{ idling} = (i_R) \times (n_L) = \dots\dots\dots$  rpm  
Generator max. rpm:  $NA \text{ max} = (i_R) \times (n_M) = \dots\dots\dots$  rpm

Available output in watts:

Read from the Curve of Figure 21

Power at engine idle speed (NA idling)  $\dots\dots\dots$  Watt

Minimum speed for full load  $\dots\dots\dots$  rpm

## INDRODUCTION

This manual covers: Operating Instructions, Installation Guidelines and Installation Instructions.

### SYSTEM DESCRIPTION

#### Generator and Control Unit

The system consists of a high performance generator which is belt-driven by the main engine and controlled by the control unit. Whenever the engine is running and the system a precisely controlled 230V power source with 50 Hz sine wave AC is available. Once the system is switched on the operation of the system is automatic. This includes automatic shutoff if overload, short circuit or high temperature occurs

#### Remote Control

The remote control provides a **POWER “ON”** and **STANDBY “OFF”** switch and has a four LED status and fault indicator.

#### Power Transfer Switch

A Power Transfer Switch is required for switching between an external power source (230V mains) and the DYNAWATT Power System.

### **WARNING**

Voltage must never be connected to the 230V output of the control unit .  
This will immediately result in control unit damaged.

**NO WARRANTY**

At full output the system delivers 4.0kW or 5.0kW and can deliver higher peak output on a temporary basis. However, the system automatically shuts off in the event of a continuous overload. This chapter explains how the user can avoid this situation arising. It deals with four areas.

1. Engine speed - pulley ratio
2. Overload
3. Start phase
4. Remote control

### **Engine speed**

At idling speed the generator delivers a percentage of its potential output. Generation of the maximum output requires a higher engine speed. Page 16 shows a performance curve for calculating the drive ratio, the output available from the system on idling speed and the minimum engine speed required in order to achieve the system's maximum output.

### **Overload**

With most overload situations there are three adjustment options.

1. Reduce the electrical load
2. Increase the motor speed slightly
3. Shut off the entire power consumption temporarily by switching off the control unit or switch to STANDBY on the remote control. The load must then be reduced or engine speed needs to be increased. Switch on the control unit again.

### **Start phase**

Electrical consumers (in particular electric motors) take up far more current when they are switched on than when in operation. Electric motors are amongst the biggest 'consumers of electricity', e.g. an air conditioning system which requires 6 - 7 amps when running operation can require a starting current of up to 50 amps. The DYNAWATT system delivers up to 70 amps starting current. In some situations the user will have to follow the start-up procedure as shown below:

1. Switch off all loads
2. Switch on the largest load first
3. Switch on the remaining small loads.

If the starting current for a load is too high then a soft start can be connected between the DYNAWATT and the user. The soft start reduces the starting current by up to 70% by electronically slowing down the start-up speed of the user. This enables motors with considerably higher starting currents to be operated.

## Remote control (optional)



### Power OFF

The system is switched 'OFF' by pressing the toggle switch. In this state there is no output and the 'OFF' LED light comes on.

### POWER ON

Pressing the toggle switch to 'POWER ON' activates the system. The 'ON' LED light comes on if the system is switched on.

**Note:** The control unit main switch must be switched to ON (blue LED) if the remote control is used. Otherwise it will not function.



### OVERLOAD

Under a heavy load the control unit limits the output current and the voltage drops. As a result the OVERLOAD LED goes on. The system can however still continue to be operated without any problem although the OVERLOAD LED is on.

If voltage drops below 190V for more than 5 sec. Output is cut off and OVERLOAD LED blinks.

If there is a sudden heavy load increase the system automatically shuts off and the OVERLOAD LED light blinks..

**Remedy:** Reduce load and reset system by switching OFF and ON again.



### INCREASE SPEED

The control unit continuously measures the power output. If the voltage drops by more than 5% under load because the generator speed is no longer sufficient for the current level of consumption, then the control unit increases the magnetising voltage. Once this reaches the maximum of 14V and the voltage generated is still below 215 Volt then the 'ADD RPM' LED light comes on.

**Remedy:** Increase engine speed  
Check belt tension for slippage, tighten or replace belt



## **HIGH TEMPERATURE** Overheating

A continuously high load or bad ventilation can cause the control unit to overheat. If the system reaches a temperature of **62°C** the 'HIGH TEMPERATURE' LED **light starts to flash**. At **65°C** the system automatically **shuts off**. The system only switches back on automatically once it has cooled down to 52°C. The cause of the overheating can be either incorrect installation, inadequate cooling, high ambient temperature or a defective fan.

**Remedy:** Check that the control unit is well ventilated. Test the fan operation.



## **SHORT CIRCUIT**

Under the event of a short circuit or a very high sudden load (>70 amps) the control unit automatically switches off and the 'SHORT CIRCUIT' LED light comes on.

**Remedy:** Switch OFF the unit and rectify the fault. Then switch the unit back ON again. The system does not switch back on automatically after a short circuit.

## **System ON and OFF**

If the system has been turned off by engine shut down the ON/OFF switch must be rest to OFF and ON again otherwise the system will not start.

# PERIODIC MAINTENANCE

## **V-Belt**

The system does not need any periodic maintenance with the exception of checking the V-belts which are used to drive the generator. We strongly recommend purchasing replacement belts. Where a twin belt system is used both belts must be replaced simultaneously. **Only high performance belts should be used, such as e.g. GATES Type ESC or CONTI Industry.**

**Note:** A new V-belt will expand during the first hours of operation and the tension must therefore be subsequently adjusted after the first 10 hours.

## **Generator Bearings and Brushes**

Depending upon the load and the extent to which the system is used the brushes and bearings should be replaced after approx. 1000 hrs or 80,000 km. Please contact your nearest DYNAWATT dealer for replacements.

### IMPORTANT

It is essential for the system to be installed professionally to ensure reliable operation over a long period of time. The mechanical installation of the generator is of particular importance. To avoid problems such as temperature, noise levels, vibration, wear out etc. the instructions in this manual must be followed. In the event of any problems occurring please contact your DYNAWATT dealer.

### GENERATOR

A number of factors must be taken into account to ensure the generator is correctly installed. Particular attention must be paid to a proper location for the generator. The generator is fitted as an additional alternator. It must be securely and permanently installed since the drive takes two to three times more power than factory fitted standard alternator

Mounting position; mount the generator high enough to avoid damage from dirt (salt) and gravel from the road. In some application we recommend to use generator PN: P30016A. This generator is a closed design and better protected against harsh environmental conditions.

**Note:** The generator cable should be laid in a separate protective conduit to safeguard it from mechanical effects. All installation screws must be secured by using Loctite to prevent accidentally working loose.

### Determine the pulley diameter design

Fig 4. Performance curve shows the available power corresponding to the generator speed. First you need to know the engine idle and full load speed. The pulleys should be selected in a way that at low speed the generator can deliver the required power.

Example: Assume that 2kW power is needed at stationary speed; according to the graph the generator must run @ 3100 rpm. When the engine speed is only 880 rpm the pulley ratio must be 3.5. However the maximal continuous generator speed must not exceed 15000 rpm. When the max engine speed is 4200 rpm; the generator speed at full engine speed will be 14700 rpm (3.5 x 4200)

The DYNAWATT 4000 needs 4500rpm to generate 4kW. In some cases another generator model could be used. In this case the rpm must be calculated according to the selected generator's performance curve.

To achieve the best results the system should reach a minimum generator speed of 3000 rpm at engine idle

**Generator maximum speed:** 15,000 rpm continuous  
18,000 rpm maximum (5 min per hrs)

## Fitting the generator cover (only for PN: P30016A & E generator model)

The generator cover must be positioned in such a way that the generator is able to take in dry, cool air via the intake opening (DIA. 55 mm). If this is not possible then a **suction hose must be connected to the opening** to provide dry, cool air and must be fitted in an appropriate position in the vehicle. The higher the air intake temperature the greater the heat related loss of generator performance.

## Choice of Belt

The power which is transferred via the belt depends upon the belt width, wrap-around angle, the number of belts and the belt tension. The service life of a single belt system is considerably less than that of a twin belt or Micro V-Belt system.

| Min. Ø pulley | Belt size | Type              | Qty. | Max output cont. |
|---------------|-----------|-------------------|------|------------------|
| 65 mm         | 12.5mm    | 12.5 ESC toothed  | 1    | 3000 Watt        |
| 57 mm         | 9.5mm     | 9.5 ESC toothed   | 2    | 5000 Watt        |
| 50 mm         | Micro-V   | Micro-V 6 grooved | 1    | 5000 Watt        |

## Belt Pulley Alignment

Nothing is more important for the service life of a belt than the alignment of the generator pulley and engine pulley. Both pulleys must be absolutely parallel and flush aligned. If a pulley is positioned at an angle to or slightly behind the other this can lead at least to a material related reduction in the useful life of the belt. In addition the belt may slip out of the grooves.

## Generator Magnetization

The generator must be magnetized before installing it otherwise the system may not operate at all.

Feed the generator with 12V DC from a battery for approx. 30 seconds.  
Black **No. 4 (+) positive**, and Y/G **(-) negative** NOTE: Make sure of right polarity!



## **WARNING**

On no account must this be carried out whilst the engine is running and the control unit connected. The control unit will be immediately damaged by high voltage. **NO WARRANTY**

## Engine rpm control

To enable the idling speed to be increased we recommend fitting a hand throttle or an automatic engine speed accelerator. Most of today's electronic controlled engine have such a function already available. Talk to your car dealer about this possibility.

## Control Unit mounting

The control unit is to be installed in a well ventilated, dry place with average temperature levels. See page 17. The ideal position is against a wall, cable connections at the bottom. Use the two steel brackets, supplied separately. Use the four screws and connected to the rear of the control unit. **The control unit must not be installed horizontally**, it is important to ensure that the cooling air can circulate through the control unit. Three fan's are located on the top of the control unit.

### **WARNING**

The brackets must only be fitted to the rear of the Control Unit by using the supplied M6 screws, with a maximum length of 10 mm.

## Connection the generator cable

The five conductor generator cable has to be prepared as shown on page 21. Open the front cover of the control unit (undo three screws, Torx 10) and insert the cable into the housing through the metal fitting. Lead the numbered cables (1-5) to the correct terminal number and attach. To attach the cable press the terminal clamp down by using a small screwdriver. Ensure the cables are securely clamped.

| Cable function: | No.     | Function                | Terminal No. | Voltage  |
|-----------------|---------|-------------------------|--------------|----------|
|                 | 1 black | 1st Phase               | L (1)        | 230V AC  |
|                 | 2 black | 2nd Phase               | L (2)        | 230V AC  |
|                 | 3 black | 3rd Phase               | L (3)        | 230V AC  |
|                 | 4 black | (+) magnetizing current | + (4) red    | +12V DC  |
|                 | 5 y/g   | (-) magnetizing current | - (5) blue   | - 12V DC |

## 230V Connection

Follow Instruction page.  
Use minimum wire size 1,5mm<sup>2</sup>.

## **STARTING THE SYSTEM**

The following must be checked before starting the system:

- that the generator cable has been correctly installed
- that the V-belt tension has been correctly set
- that all installation screws have been tightened
- that the cables have been connected to the correct terminals and are securely clamped.
- when unit is switched ON, check if fan is operating at first start speed up the engine to 1500 rpm momentary.

## TROUBLESHOOTING

- The system doesn't work  
No voltage from generator.  
Generator not running.  
Check the condition and tension of the V-belts  
Check the cable and terminal connections.
- LEDs on the remote control  
faint but no power  
Low voltage from generator.  
Check to see whether cable 4 (+) and 5 (-)  
have been connected the wrong way around.  
Magnetized generator again, page 12
- Increase speed light comes on  
Generator not delivering enough power.  
V-belt slipping. Check tension and condition,  
adjust tension.  
Check generator.

## TESTING THE GENERATOR

- With generator running  
@ min 1000rpm.  
Control unit ON, no load :  
230V AC must be measured on the terminal from  
phase to phase (1-2-3). **(Warning, high voltage)**
- With generator stationary:  
The resistance on the terminal from phase to phase  
(1-2-3) must be 2.7 ohms +/- 0.27 (measured on the  
generator clamp)
- If fault displayed:  
Contact supplier
- Rotor resistance:  
2.5 to 3.5 ohms between cable no. 4 (+) and 5 (-)
- If fault displayed:  
Check generator carbon brushes and collector ring.  
Clean collector ring with fine sandpaper if  
necessary

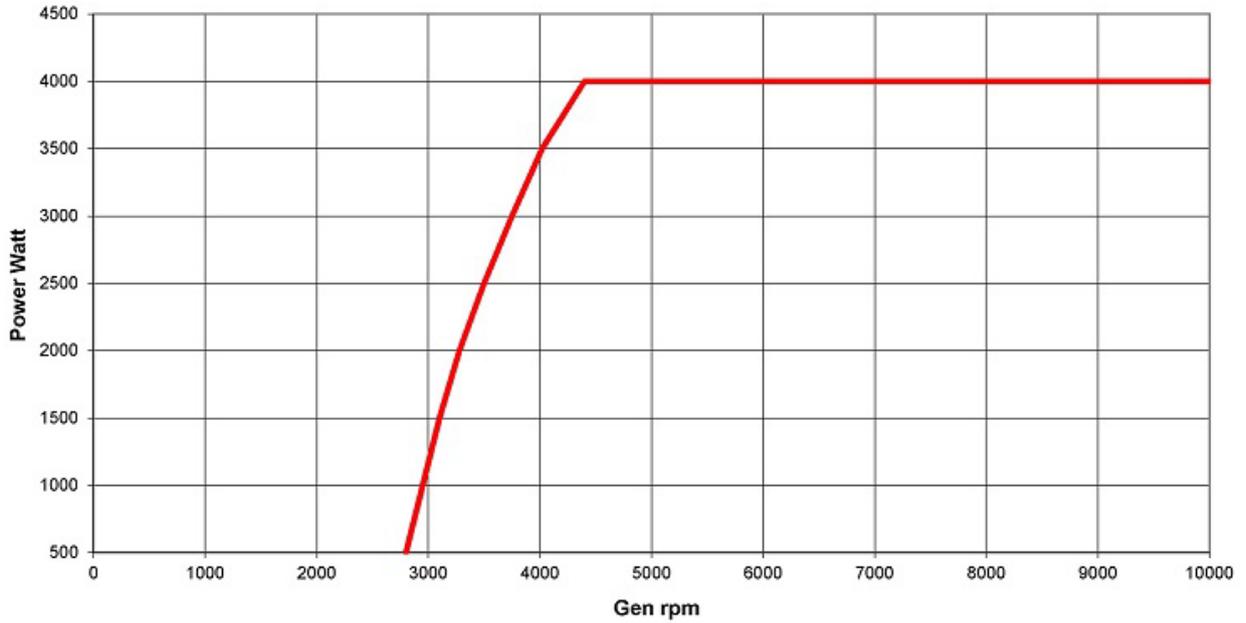
## (A) WARRANTY TERMS

1. This warranty applies to new products and accessories sold by STERKI AG. The system is guaranteed for material and production defects.
2. Coverage Duration:  
24 months beginning of the date of delivery to the first user
3. The product must be used and installed in accordance with the details contained in the DYNAWATT operating instruction manual.
4. The warranty only covers the unit itself and not any consequential damage

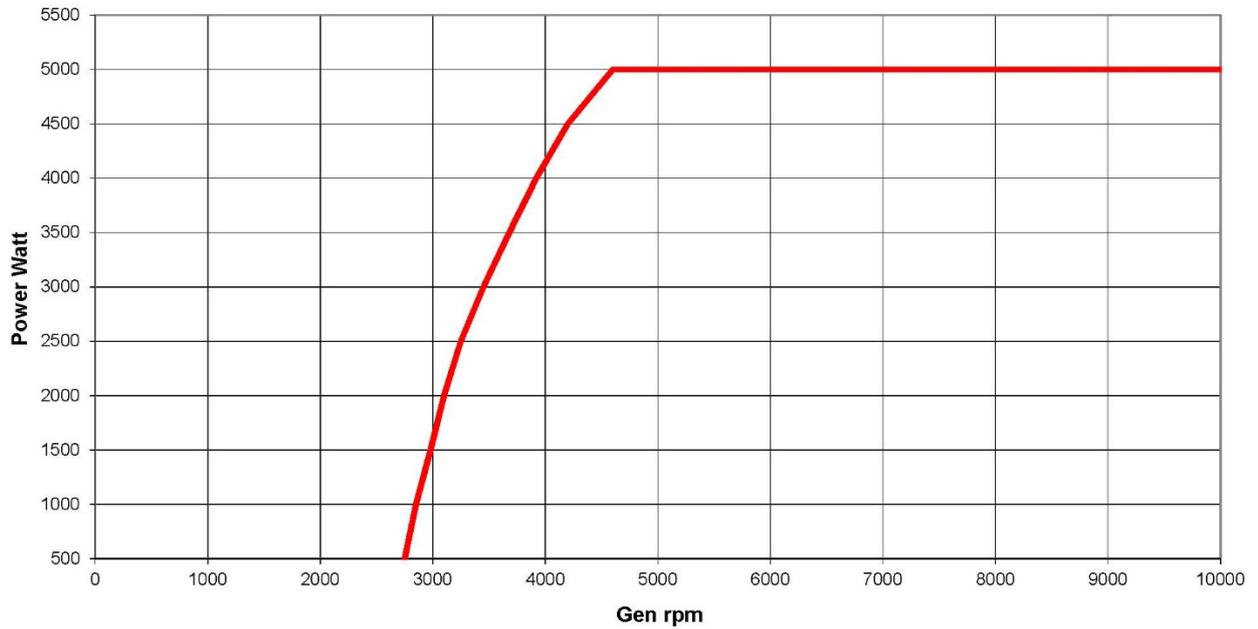
### **Not covered under warranty:**

- R&R (remove and reinstall) cost and travel expenses, are to be borne by the applicant unless expressly agreed otherwise.
- faults and repair costs caused as a result of improper use, modifications or incorrect installation
- injuries and indirect damage to vehicles etc.
- consequential costs and costs incurred due to loss of vehicle
- moving parts such as V-belts, LED's, plastic components etc.

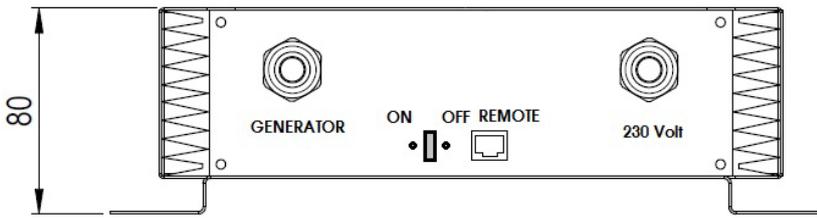
**Performance Curve with 4000 Watt Control Unit 230V - 50 Hz  
Generator P30026E**



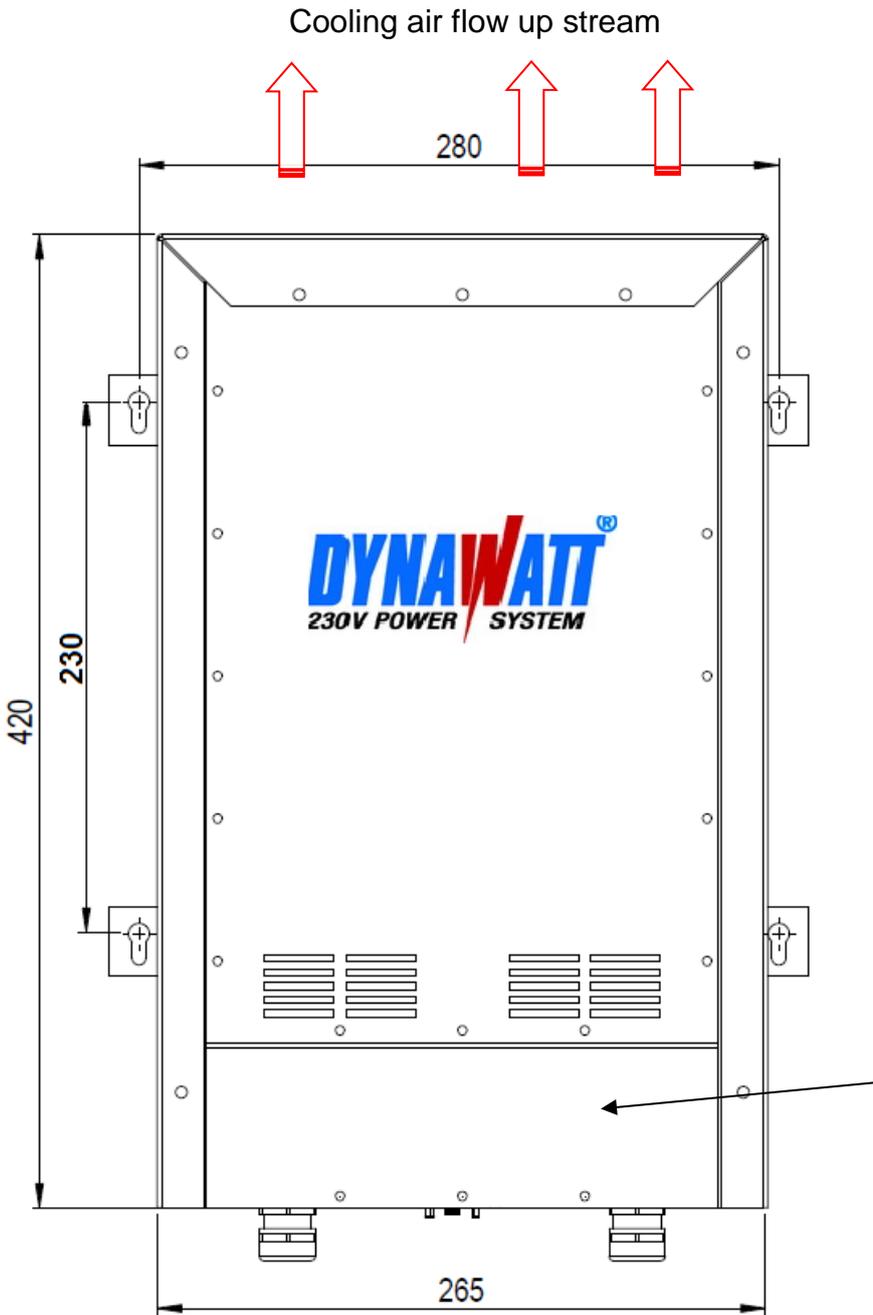
**Performance Curve with 5000 Watt Control Unit 230V - 50 Hz  
Generator P30026E**



Dimension Control Unit 4000 and 5000 W



Blue LDE = ON  
Green LED = OFF



Mount the control unit in an up-right position as shown.

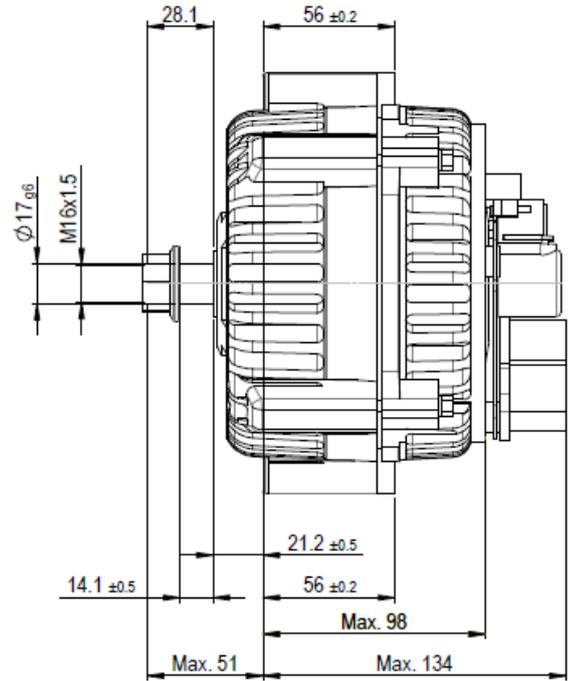
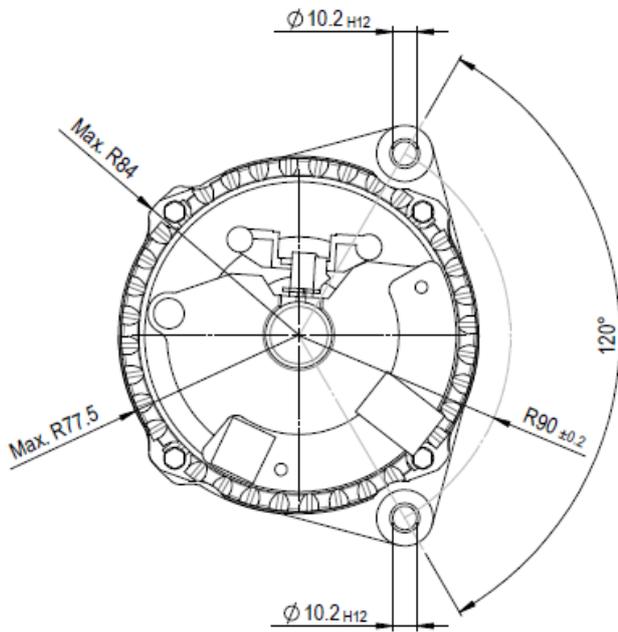
Make sure there is a minimum of 100mm free room on top of the control unit to allow sufficient air flow

Do not mount the unit in a horizontal position, bad cooling!

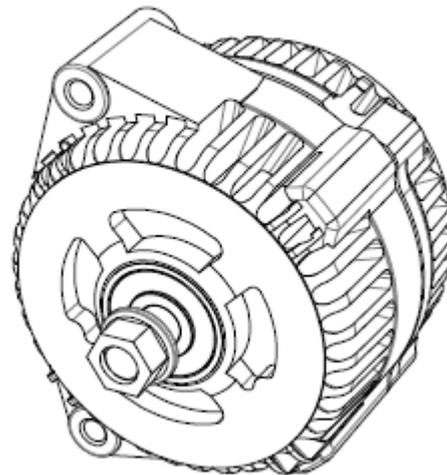
Front cover (open for installation)

IP class: 21

## Generator Dimension P30026E



Moment of inertia: 48kgcm<sup>2</sup> (rotating parts without pulley)  
 Weight: 7kg  
 EEC type approval: e1  
 IP class: 21  
 Torque Nut, M16: 50Nm



Remote control (optional)

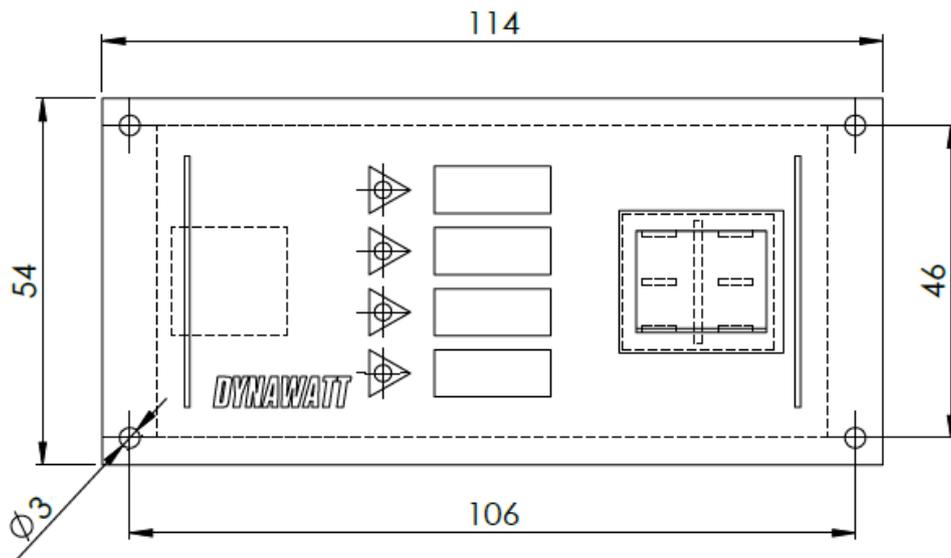


Figure shows dimensions remote control

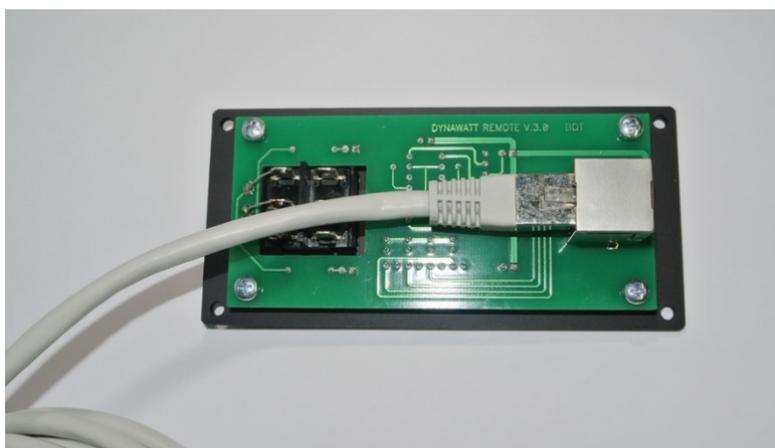
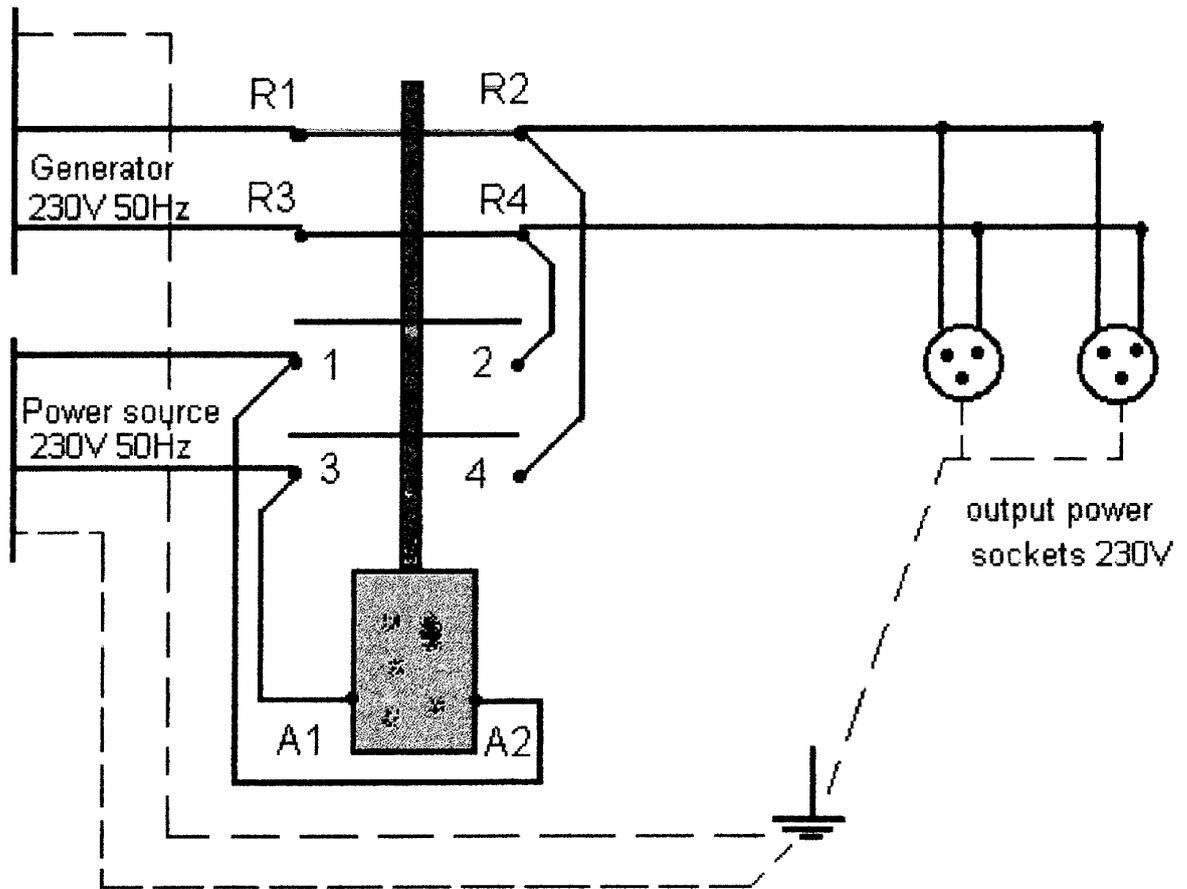


Figure shows connection of the remote control, back side, use only RJ45 cable Cat 5

Automatic power transfer switch for shore power (optional)

If the DYNAWATT system is connected to the public grid (shore or land power) a power source selector switch must be installed between the control unit and the vehicle / boat's electrical system. This switch must ensure that all AC consumers can be switched off at once. This can be done best by an automatic power transfer switch as shown blow.

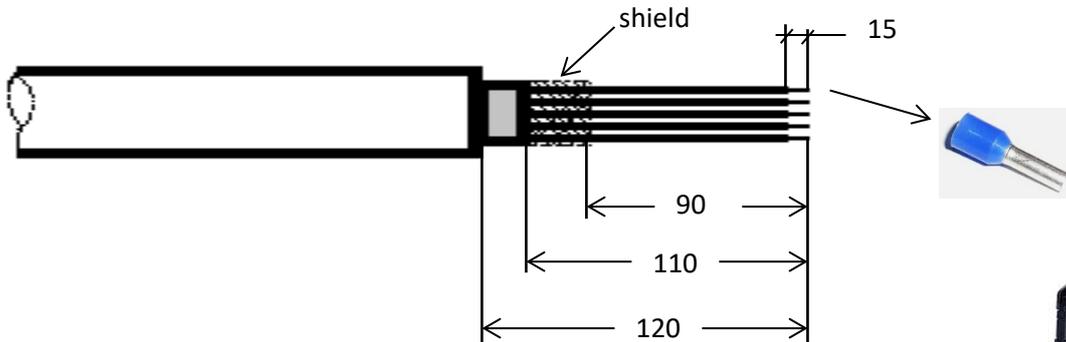
Install the power transfer switch at any dry place in the vehicle or boat. Connected as shown will have shore power at first priority source.



## Preparing cables for installation

### Cable 1: from generator to control unit

Type: Shielded cable with 5x 2.5mm<sup>2</sup> cables



Note: use wire ferrules at the cable end, 5pc type 2.5mm, use crimp tool as shown

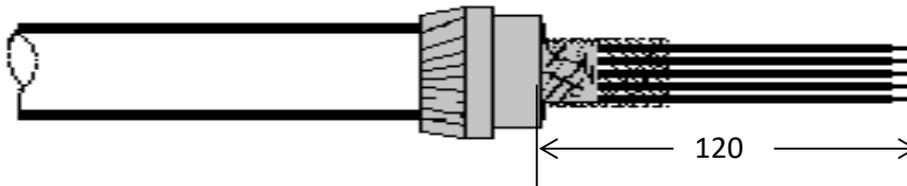


Fig. shows fully prepared generator cable ready to connect

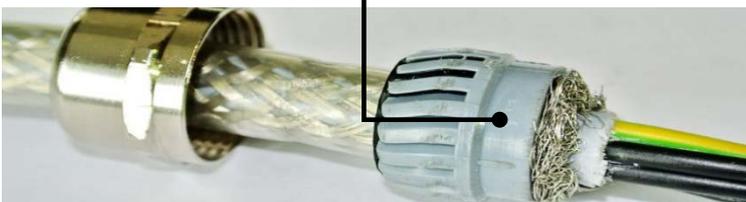
1. Slide nut and plastic bushing over the cable



2. Place plastic bushing at 120mm, it should match up with the end of the end of plastic isolation of the cable.

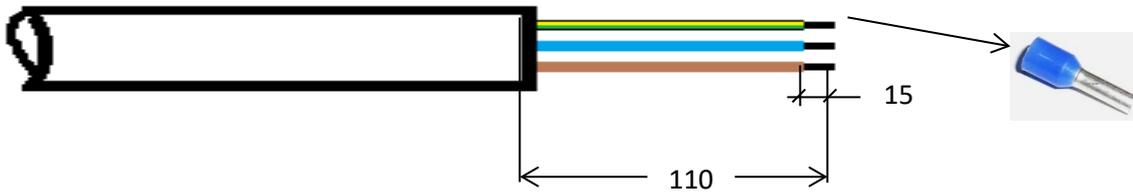


3. Push shield mesh back by hand as shown. Make sure that no small wires from the mesh are on this area,



Cable 2: 230V from control unit to power distribution

Type: PUR 3x 1.5mm<sup>2</sup> for 4kW (not supplied)  
PUR 3x 2.5mm<sup>2</sup> for 5kW (not supplied)



Note: use 3pc of 2.5mm<sup>2</sup> (or 3pc of 1.5mm<sup>2</sup>) wire ferrules at the cable end.

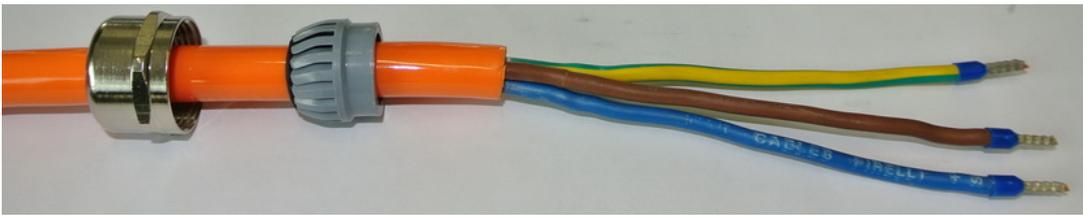


Fig. shows fully prepared 230V - 2.5mm<sup>2</sup> cable ready to connect

Connection of generator cable to control unit

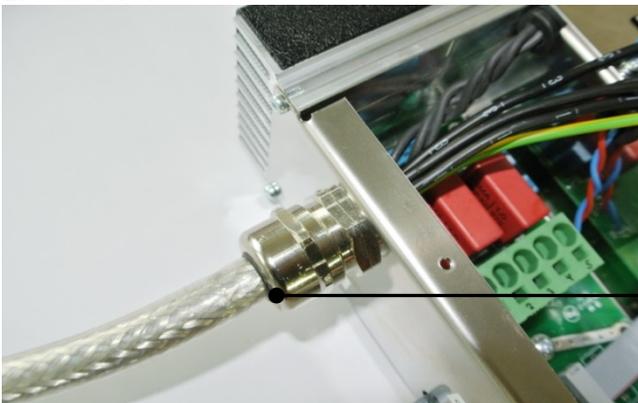
1. Pull generator cable through the connector



Pull the generator cable through the generator cable gland

Press grey bushing tight into the cable gland.

2. Fasten Nut

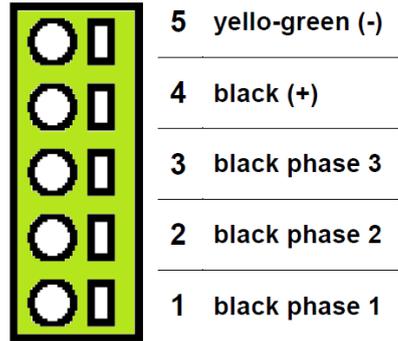


Position the nut on the thread. Use a **24mm** wrench to tight the nut.

Hold the cable with one hand so that it can't rotate.

Tight nut till the black rubber seal is visible

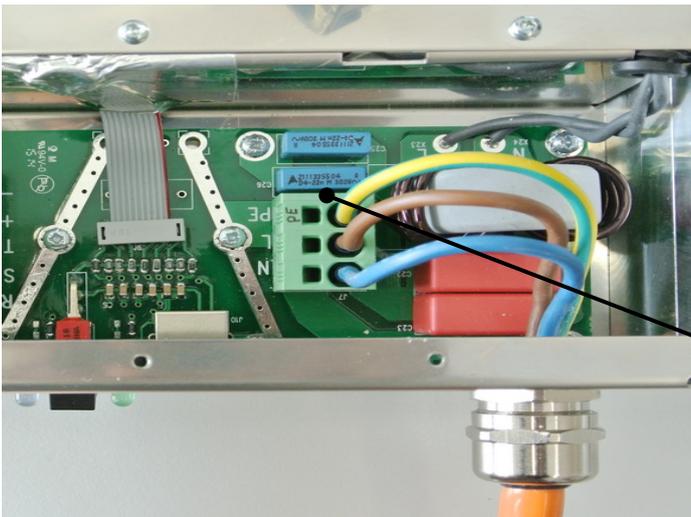
3. Clamp the wires in the terminal



Check the numbers on the wire and connect to the correct position. To open the terminal us a small screw driver No.1. Press the screw driver down to open the terminal. While pressing down slide the first wire yellow / blue into the terminal Pos-5. Release screw driver and check for good connection by pulling on the cable. Repeat till all wires are connected. Check all wires for correct position.

Note: Check all wires for correct position. Do not miss match wires.

Connecting 230V cable to control unit



Pull 230V cable through the 230V cable gland.

Use screw driver No.1, to open clamp. Connect all three wires as shown

Tighten the nut by using a 24mm wrench

Check for good connection by pulling on each wire



Both terminals connected, close front cover.



## Connecting generator cable to generator

If a DYNAWATT supplied generator cable is used there is no need to prepare the cable on this side. The cable is already prepared. If the cable needs to be prepared it should be done as shown.

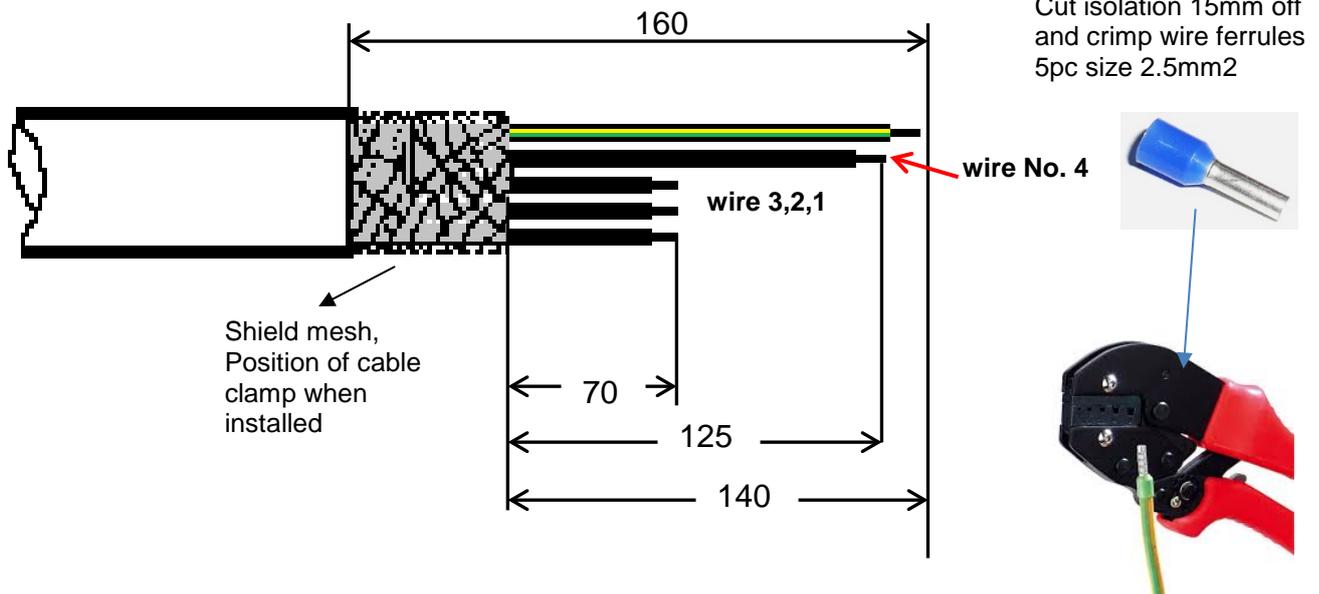
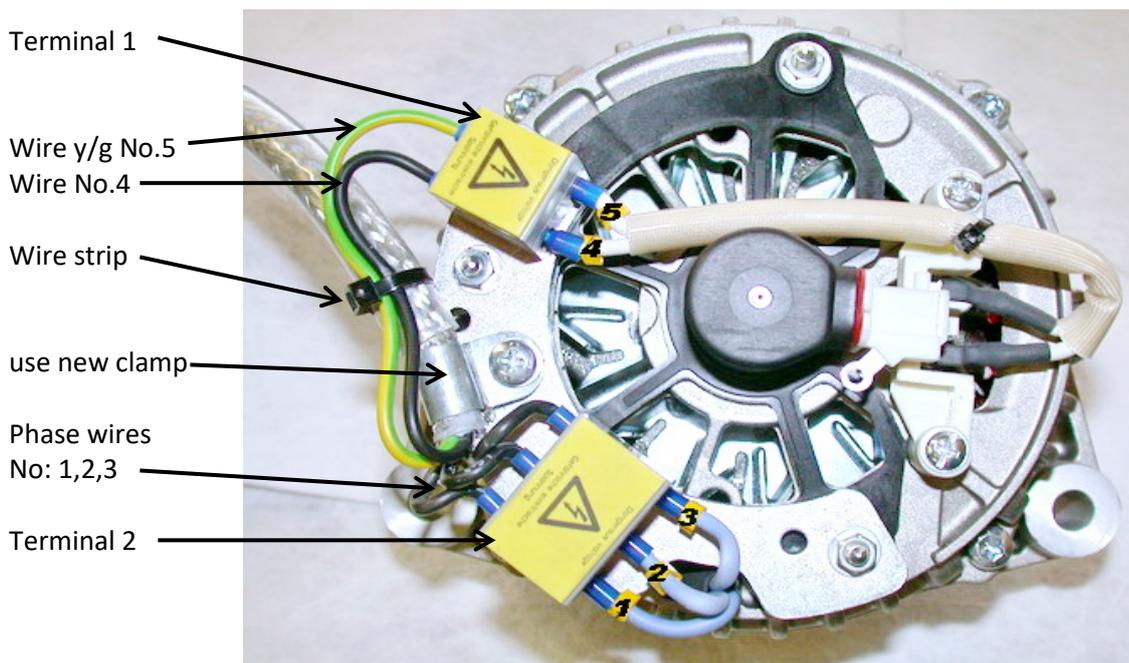


Fig. shows generator PN: P30026E



### How to connect:

1. Take off the two yellow plastic covers
2. Remove existing cable clamp
3. Connect wires to Terminal
  - a. wire 5 y/g and 4 to terminal 1
  - b. wire 3,2,1 (phases) to terminal 2
4. Use new larger cable clamp, supplied with generator, and mount the generator cable as shown
5. Use small cable stripe to fix wire 4 and y/g as shown
6. Check again if wire No. correspond than put yellow cover back on

DYNAWATT System Block Diagram

DYNAWATT 230V / 50 Hz

