

AIRMAN

SERVICE MANUAL

ENGINE GENERATOR

SDG25S-6A7
SDG45S-6A6
SDG65S-6A6
SDG100S-6A6
SDG125S-6A6
SDG150S-6A6



HOKUETSU INDUSTRIES CO., LTD.

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1. Specifications

1.1 Specifications

| Model | | | SDG25S-6A7 | | |
|------------------------|--|--------------------------|---|-----|---------|
| Generator | Exciting system | | Brushless | | |
| | Armature connection | | Star with Neutral | | ZigZag |
| | Phase number | | Three | | Single |
| | Power factor | % | 80 | | 100 |
| | Frequency | Hz | 60 | | |
| | Rated output | kVA | 25 | | 14.4 |
| | Rated output | kW | 20 | | 14.4 |
| | Voltage | V | 240 | 480 | 240/120 |
| | Current | A | 60 | 30 | 60 |
| Engine | Model | | ISUZU AA-4LE1 | | |
| | Type | | 4-cycle, water-cooled, swirl chamber type | | |
| | Number of cylinders | | 4 | | |
| | Total displacement | cu. in. (L) | 133 (2.179) | | |
| | Rated output | hp (kW) | 31.5 (23.5) | | |
| | Revolution per minute | rpm (min ⁻¹) | 1,800 (1,800) | | |
| | Lubricating oil capacity | gal. (L) | 2.1 (8) | | |
| | Coolant capacity (including radiator) | gal. (L) | 1.6 (6) | | |
| | Battery | | 80D26R-MF (12V) | | |
| General Specifications | Fuel tank capacity | gal. (L) | 17 (65) | | |
| | Overall length | in. (mm) | 67 (1,690) | | |
| | Overall width | in. (mm) | 28 (700) | | |
| | Overall height | in. (mm) | 37 (950) | | |
| | Net dry weight | lbs (kg) | 1,355 (615) | | |
| | Operating weight | lbs (kg) | 1,500 (680) | | |

1. Specifications

| Model | | | SDG45S-6A6 | | |
|------------------------|---------------------------------------|--------------------------|---|-----|---------|
| Generator | Exciting system | | Brushless | | |
| | Armature connection | | Star with Neutral | | ZigZag |
| | Phase number | | Three | | Single |
| | Power factor | % | 80 | | 100 |
| | Frequency | Hz | 60 | | |
| | Rated output | kVA | 45 | | 26 |
| | Rated output | kW | 36 | | 26 |
| | Voltage | V | 240 | 480 | 240/120 |
| | Current | A | 108 | 54 | 108 |
| Engine | Model | | NISSAN DIESEL 2A-BD30T | | |
| | Type | | 4-cycle, water-cooled, direct injection type with turbo charged | | |
| | Number of cylinders | | 4 | | |
| | Total displacement | cu. in. (L) | 180 (2.953) | | |
| | Rated output | hp (kW) | 58.3 (43.5) | | |
| | Revolution per minute | rpm (min ⁻¹) | 1,800 (1,800) | | |
| | Lubricating oil capacity | gal. (L) | 2.6 (10) | | |
| | Coolant capacity (including radiator) | gal. (L) | 2.9 (11) | | |
| | Battery | | 80D26R-MF (12V) | | |
| General Specifications | Fuel tank capacity | gal. (L) | 26 (100) | | |
| | Overall length | in. (mm) | 74 (1,870) | | |
| | Overall width | in. (mm) | 34 (860) | | |
| | Overall height | in. (mm) | 48 (1,220) | | |
| | Net dry weight | lbs (kg) | 2,040 (925) | | |
| | Operating weight | lbs (kg) | 2,260 (1,025) | | |

1. Specifications

| Model | | | SDG65S-6A6 | | |
|------------------------|---------------------------------------|--------------------------|---|-----|---------|
| Generator | Exciting system | | Brushless | | |
| | Armature connection | | Star with Neutral | | ZigZag |
| | Phase number | | Three | | Single |
| | Power factor | % | 80 | | 100 |
| | Frequency | Hz | 60 | | |
| | Rated output | kVA | 63 | | 36.5 |
| | Rated output | kW | 50 | | 36.5 |
| | Voltage | V | 240 | 480 | 240/120 |
| | Current | A | 152 | 76 | 152 |
| Engine | Model | | ISUZU EE-4BG1T | | |
| | Type | | 4-cycle, water-cooled, direct injection type with turbo charged | | |
| | Number of cylinders | | 4 | | |
| | Total displacement | cu. in. (L) | 264 (4.329) | | |
| | Rated output | hp (kW) | 77.7 (58) | | |
| | Revolution per minute | rpm (min ⁻¹) | 1,800 (1,800) | | |
| | Lubricating oil capacity | gal. (L) | 3.7 (14) | | |
| | Coolant capacity (including radiator) | gal. (L) | 4.0 (15) | | |
| | Battery | | 80D26R-MF × 2 (24V) | | |
| General Specifications | Fuel tank capacity | gal. (L) | 36 (135) | | |
| | Overall length | in. (mm) | 82 (2,090) | | |
| | Overall width | in. (mm) | 34 (860) | | |
| | Overall height | in. (mm) | 48 (1,220) | | |
| | Net dry weight | lbs (kg) | 2,600 (1,180) | | |
| | Operating weight | lbs (kg) | 2,855 (1,295) | | |

1. Specifications

| Model | | | SDG100S-6A6 | | |
|------------------------|---------------------------------------|--------------------------|---|-----|---------|
| Generator | Exciting system | | Brushless | | |
| | Armature connection | | Star with Neutral | | ZigZag |
| | Phase number | | Three | | Single |
| | Power factor | % | 80 | | 100 |
| | Frequency | Hz | 60 | | |
| | Rated output | kVA | 100 | | 58 |
| | Rated output | kW | 80 | | 58 |
| | Voltage | V | 240 | 480 | 240/120 |
| | Current | A | 241 | 120 | 242 |
| Engine | Model | | ISUZU EE-6BG1T | | |
| | Type | | 4-cycle, water-cooled, direct injection, turbo charged, intercooled | | |
| | Number of cylinders | | 6 | | |
| | Total displacement | cu. in. (L) | 396 (6.494) | | |
| | Rated output | hp (kW) | 150.2 (112) | | |
| | Revolution per minute | rpm (min ⁻¹) | 1,800 (1,800) | | |
| | Lubricating oil capacity | gal. (L) | 5.3 (20) | | |
| | Coolant capacity (including radiator) | gal. (L) | 6.3 (24) | | |
| | Battery | | 95D31R-MF × 2 (24V) | | |
| General Specifications | Fuel tank capacity | gal. (L) | 59.4 (225) | | |
| | Overall length | in. (mm) | 106 (2,700) | | |
| | Overall width | in. (mm) | 46 (1,180) | | |
| | Overall height | in. (mm) | 55 (1,400) | | |
| | Net dry weight | lbs (kg) | 3,880 (1,760) | | |
| | Operating weight | lbs (kg) | 4,390 (1,990) | | |

1. Specifications

| Model | | | SDG125S-6A6 | | |
|------------------------|---------------------------------------|--------------------------|---|-----|---------|
| Generator | Exciting system | | Brushless | | |
| | Armature connection | | Star with Neutral | | ZigZag |
| | Phase number | | Three | | Single |
| | Power factor | % | 80 | | 100 |
| | Frequency | Hz | 60 | | |
| | Rated output | kVA | 125 | | 72 |
| | Rated output | kW | 100 | | 72 |
| | Voltage | V | 240 | 480 | 240/120 |
| | Current | A | 300 | 150 | 300 |
| Engine | Model | | VOLVO TAD720GE | | |
| | Type | | 4-cycle, water-cooled, direct injection, turbo charged, intercooled | | |
| | Number of cylinders | | 6 | | |
| | Total displacement | cu. in. (L) | 436 (7.15) | | |
| | Rated output | hp (kW) | 190.4 (142) | | |
| | Revolution per minute | rpm (min ⁻¹) | 1,800 (1,800) | | |
| | Lubricating oil capacity | gal. (L) | 5.3 (20) | | |
| | Coolant capacity (including radiator) | gal. (L) | 6.6 (25) | | |
| | Battery | | 170F51 (12V) | | |
| General Specifications | Fuel tank capacity | gal. (L) | 66 (250) | | |
| | Overall length | in. (mm) | 119 (3,030) | | |
| | Overall width | in. (mm) | 46 (1,180) | | |
| | Overall height | in. (mm) | 58 (1,480) | | |
| | Net dry weight | lbs (kg) | 4,805 (2,180) | | |
| | Operating weight | lbs (kg) | 5,335 (2,420) | | |

1. Specifications

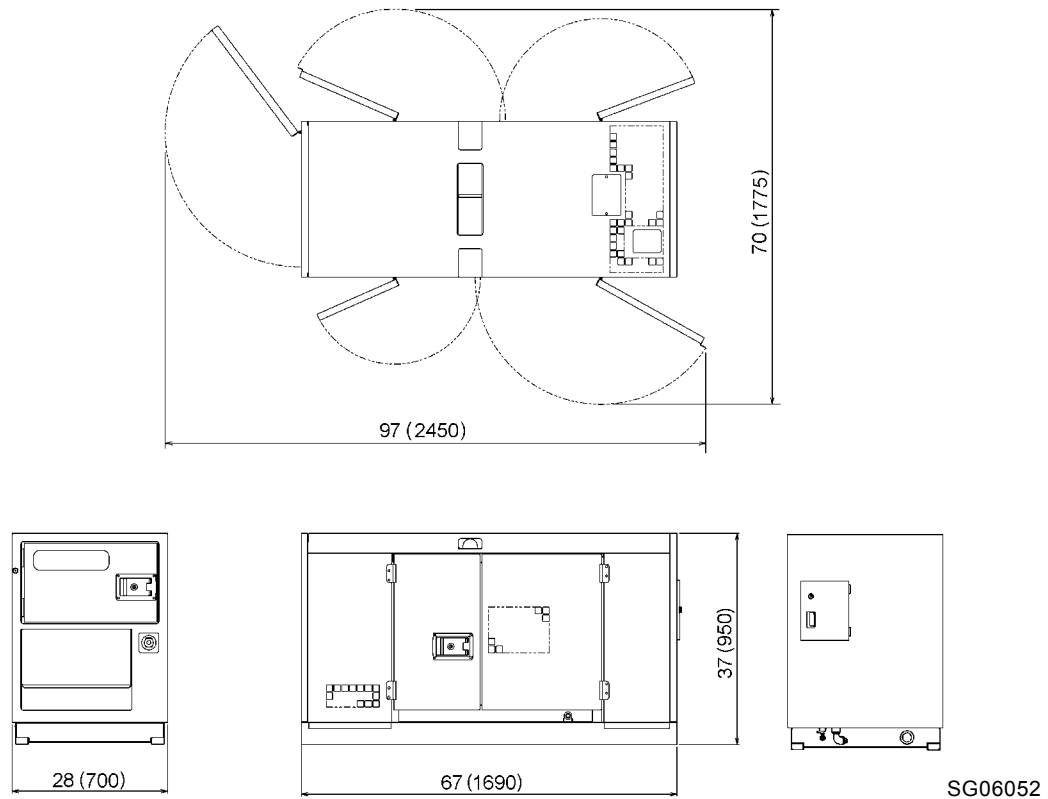
| Model | | | SDG150S-6A6 | | |
|------------------------|---------------------------------------|--------------------------|---|-----|---------|
| Generator | Exciting system | | Brushless | | |
| | Armature connection | | Star with Neutral | | ZigZag |
| | Phase number | | Three | | Single |
| | Power factor | % | 80 | | 100 |
| | Frequency | Hz | 60 | | |
| | Rated output | kVA | 150 | | 87 |
| | Rated output | kW | 120 | | 87 |
| | Voltage | V | 240 | 480 | 240/120 |
| | Current | A | 361 | 180 | 363 |
| Engine | Model | | VOLVO TAD720GE | | |
| | Type | | 4-cycle, water-cooled, direct injection, turbo charged, intercooled | | |
| | Number of cylinders | | 6 | | |
| | Total displacement | cu. in. (L) | 436 (7.15) | | |
| | Rated output | hp (kW) | 190.4 (142) | | |
| | Revolution per minute | rpm (min ⁻¹) | 1,800 (1,800) | | |
| | Lubricating oil capacity | gal. (L) | 5.3 (20) | | |
| | Coolant capacity (including radiator) | gal. (L) | 6.6 (25) | | |
| | Battery | | 170F51 (12V) | | |
| General Specifications | Fuel tank capacity | gal. (L) | 66 (250) | | |
| | Overall length | in. (mm) | 119 (3,030) | | |
| | Overall width | in. (mm) | 46 (1,180) | | |
| | Overall height | in. (mm) | 58 (1,480) | | |
| | Net dry weight | lbs (kg) | 5,137 (2,330) | | |
| | Operating weight | lbs (kg) | 5,665 (2,570) | | |

1. Specifications

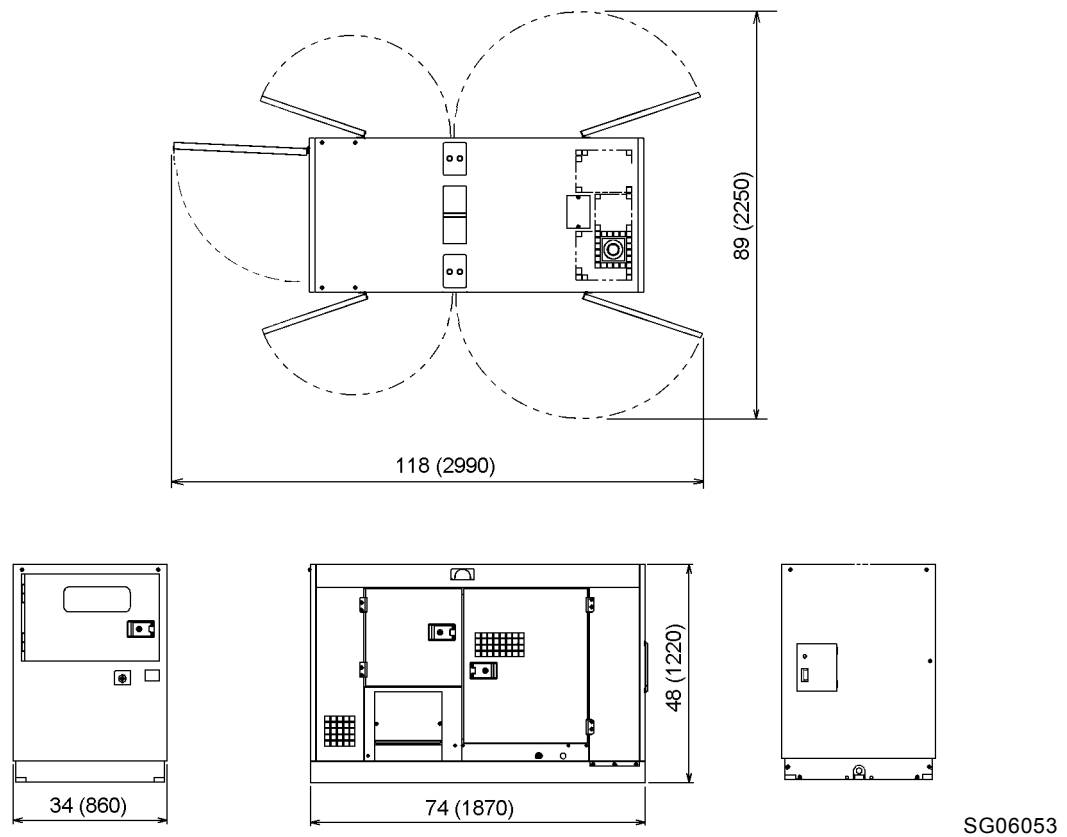
1.2 Outline Drawing

SDG25S-6A7

Unit : in. (mm)



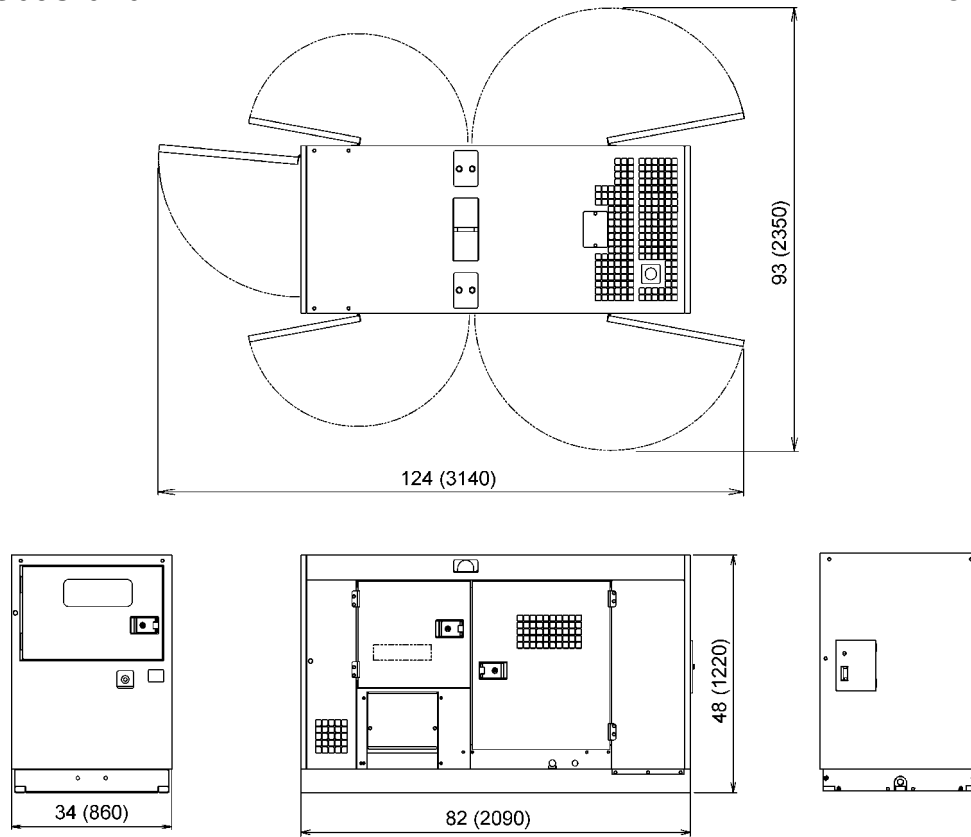
SDG45S-6A6



1. Specifications

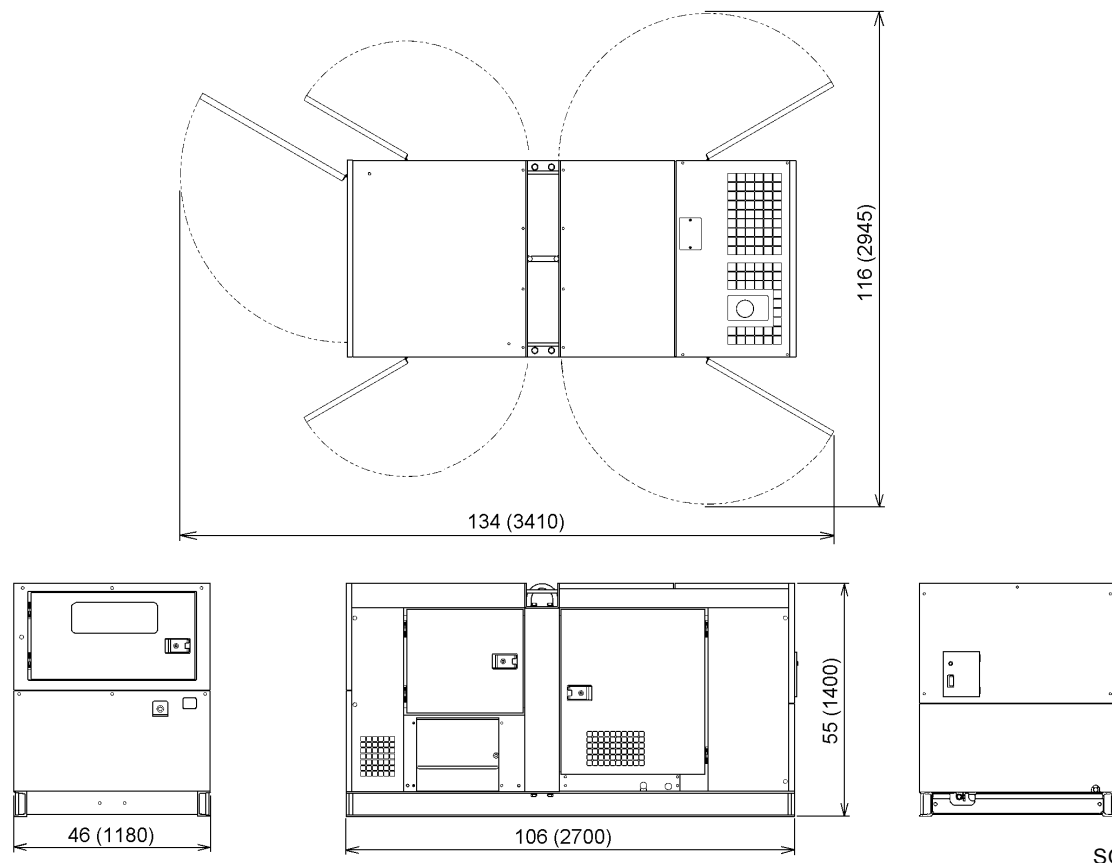
SDG65S-6A6

Unit : in. (mm)



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SDG100S-6A6

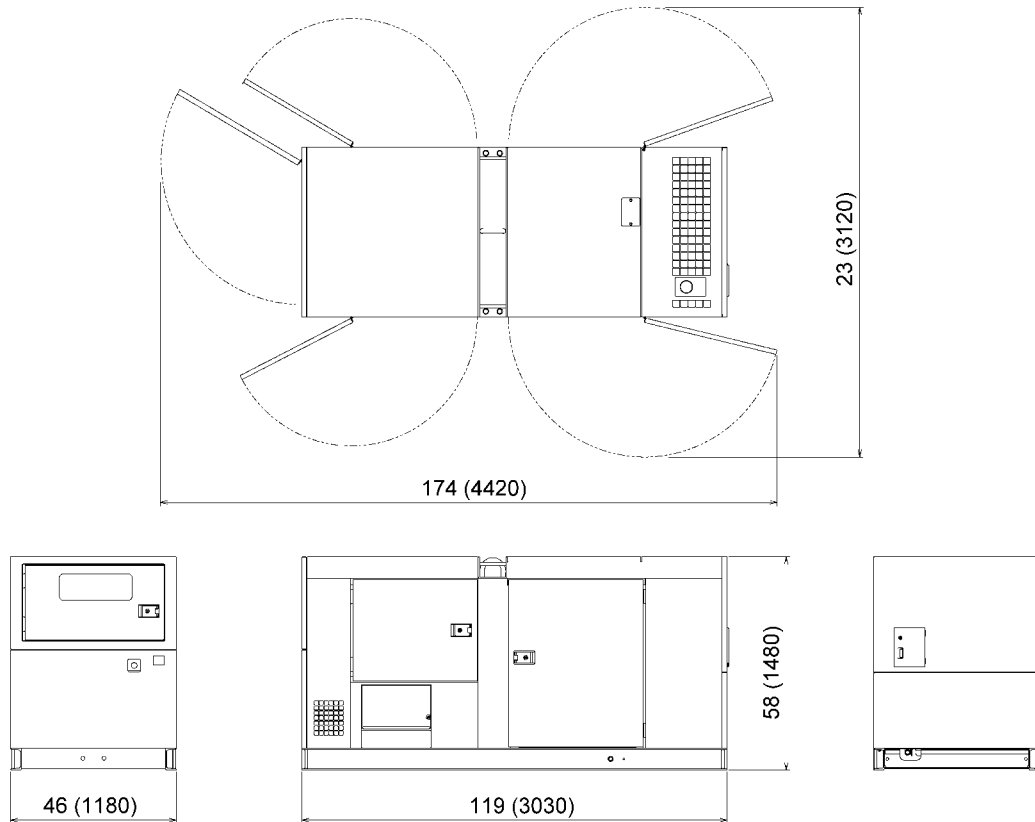


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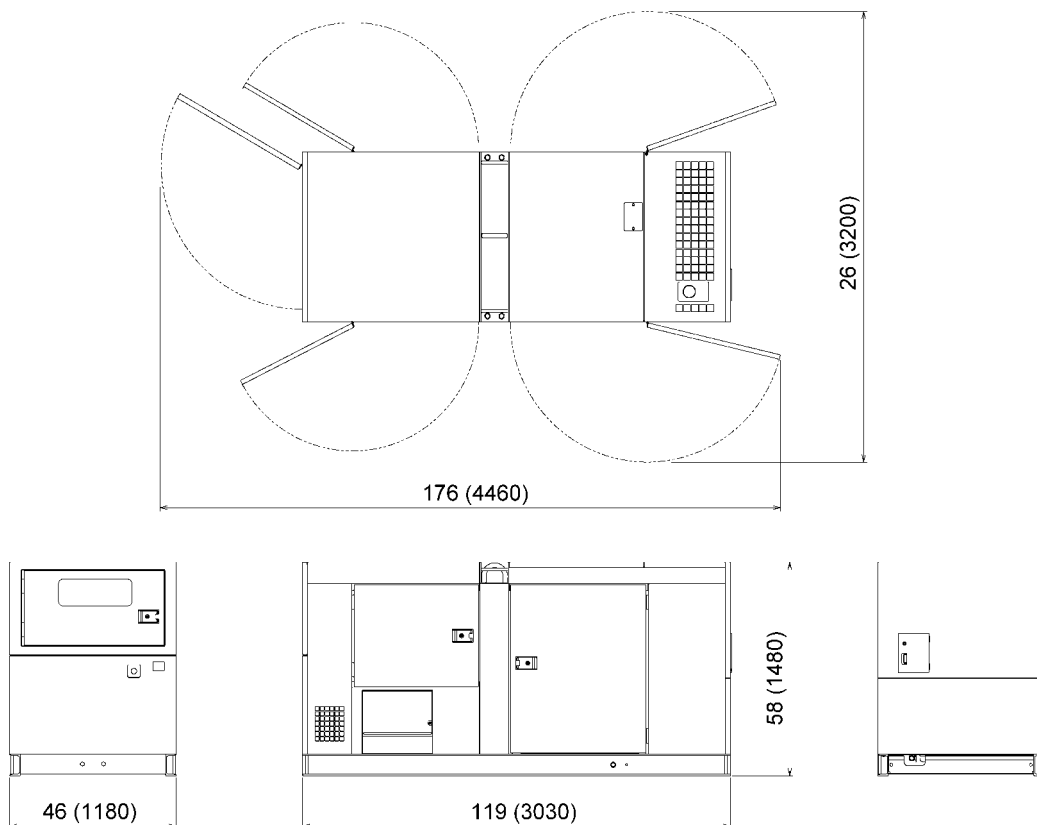
1. Specifications

SDG125S-6A6

Unit : in. (mm)



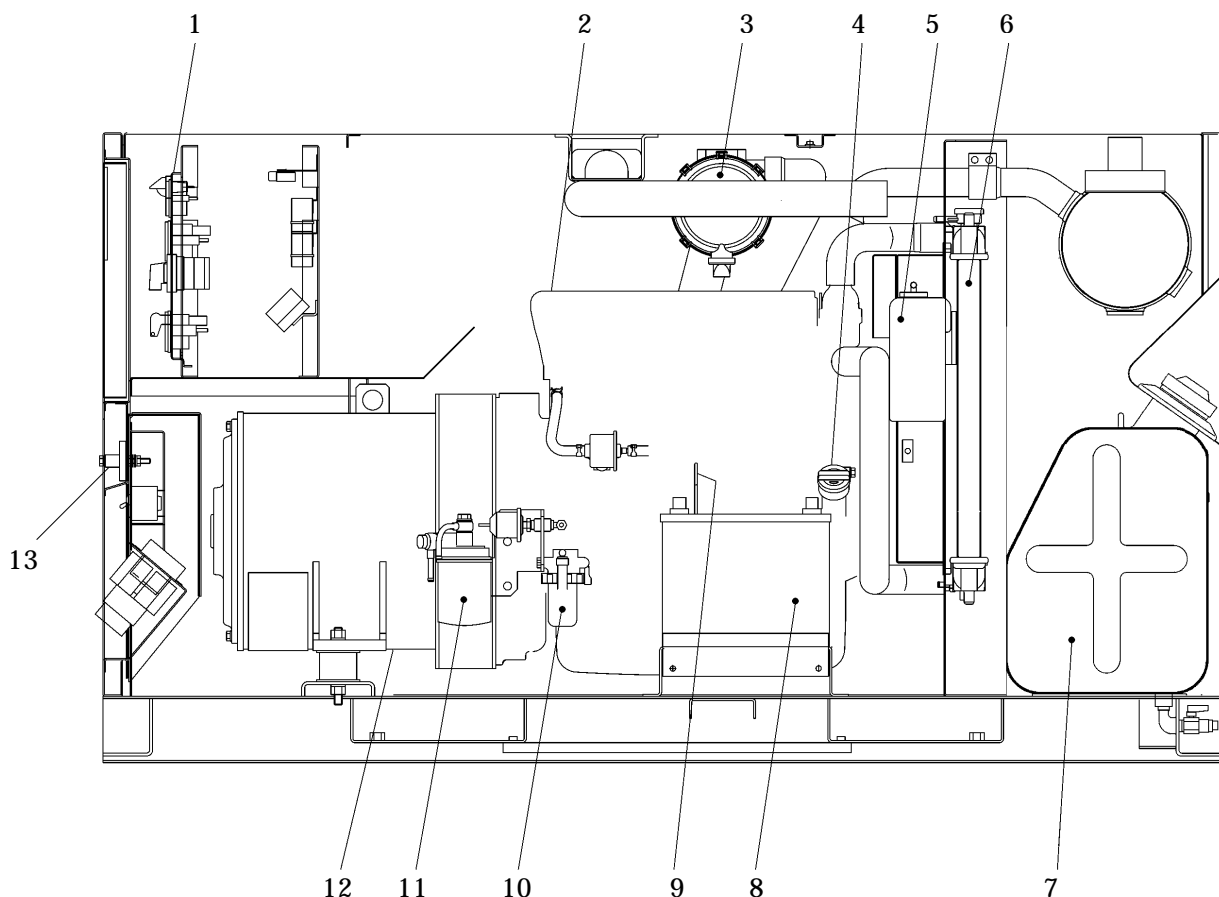
SDG150S-6A6



1. Specifications

1.3 Internal Components

SDG25S-6A7

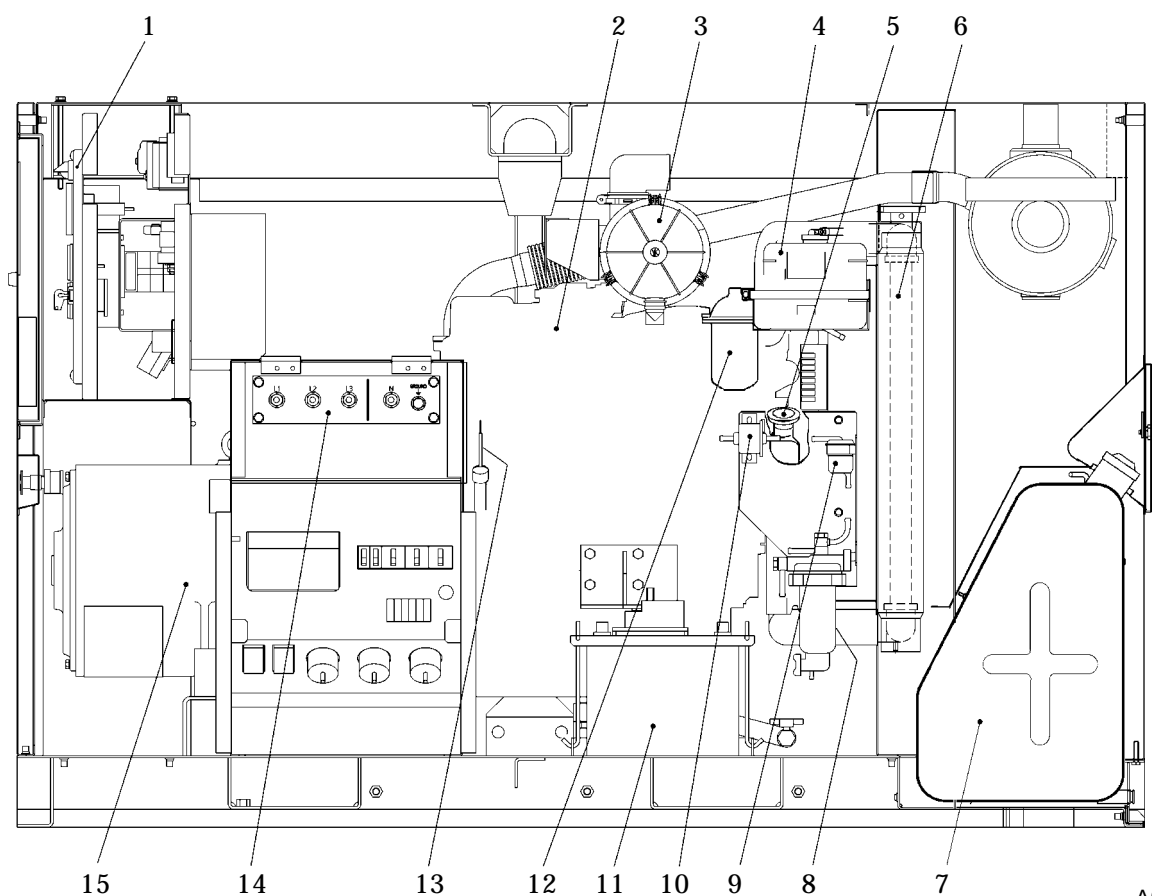


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- | | |
|---------------------------|---------------------------|
| 1. Control panel | 8. Battery |
| 2. Engine | 9. Engine oil level gauge |
| 3. Air filter | 10. Sedimenter |
| 4. Engine oil filler port | 11. Fuel filter |
| 5. Reserve tank | 12. Generator main unit |
| 6. Radiator | 13. Output terminals |
| 7. Fuel tank | |

1. Specifications

SDG45S-6A6

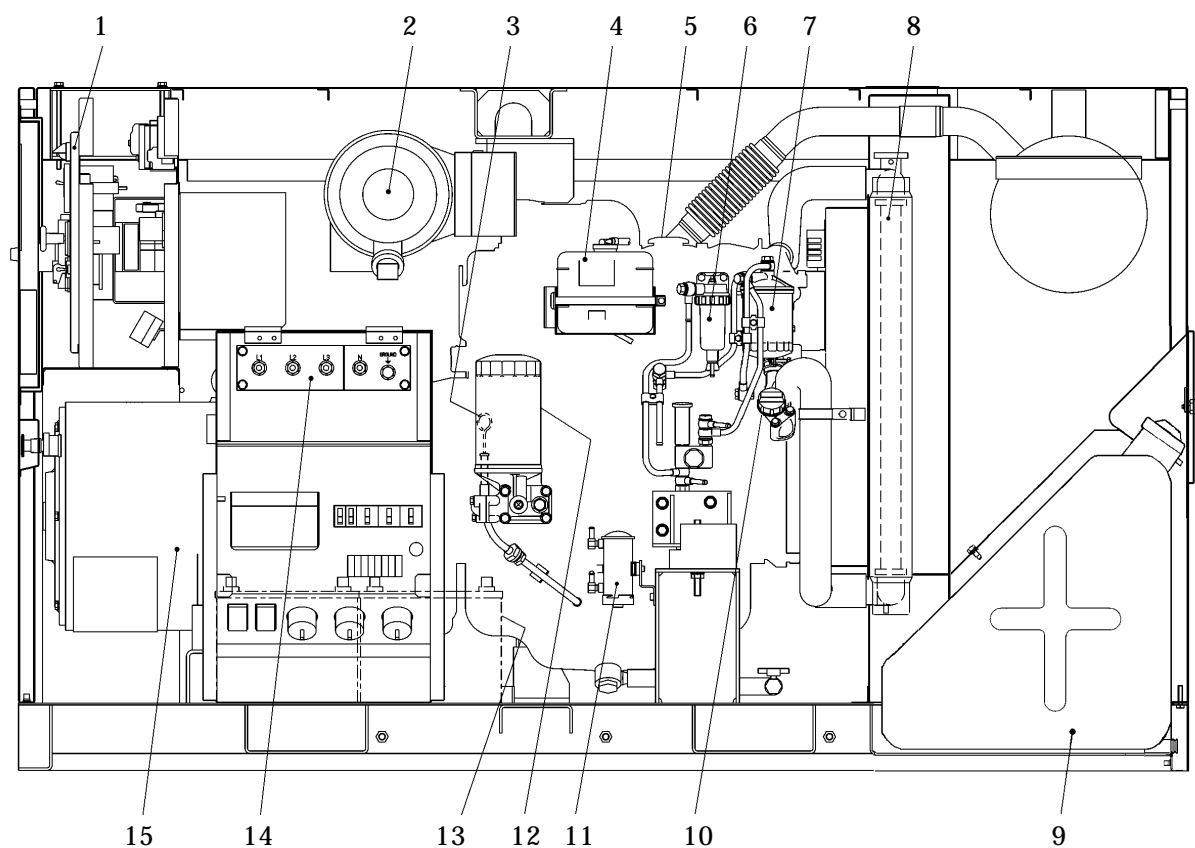


A040575

- | | |
|---------------------------|--|
| 1. Control panel | 9. Filter for electromagnetic pump |
| 2. Engine | 10. Fuel air-bleeding electromagnetic pump |
| 3. Air filter | 11. Battery |
| 4. Reserve tank | 12. Fuel filter |
| 5. Engine oil filler port | 13. Engine oil level gauge |
| 6. Radiator | 14. Output terminals |
| 7. Fuel tank | 15. Generator main unit |
| 8. Sedimenter | |

1. Specifications

SDG65S-6A6



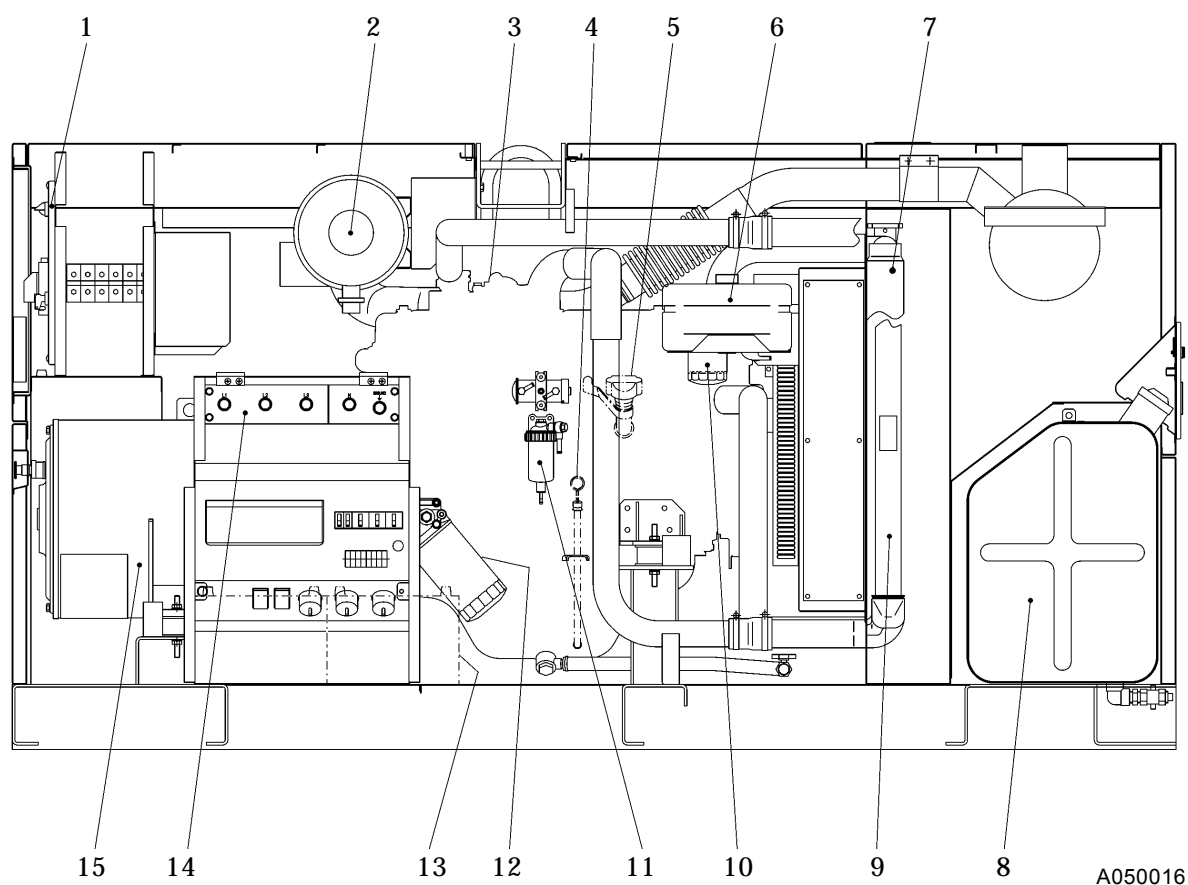
A040576

- | | |
|---------------------------|--|
| 1. Control panel | 9. Fuel tank |
| 2. Air filter | 10. Engine oil filler port |
| 3. Engine oil level gauge | 11. Fuel air-bleeding electromagnetic pump |
| 4. Reserve tank | 12. Engine oil filter |
| 5. Engine | 13. Battery |
| 6. Sediment | 14. Output terminals |
| 7. Fuel filter | 15. Generator main unit |
| 8. Radiator | |

Instrument 13 marked “ ” are provided on the other side (opposite side of maintenance).

1. Specifications

SDG100S-6A6

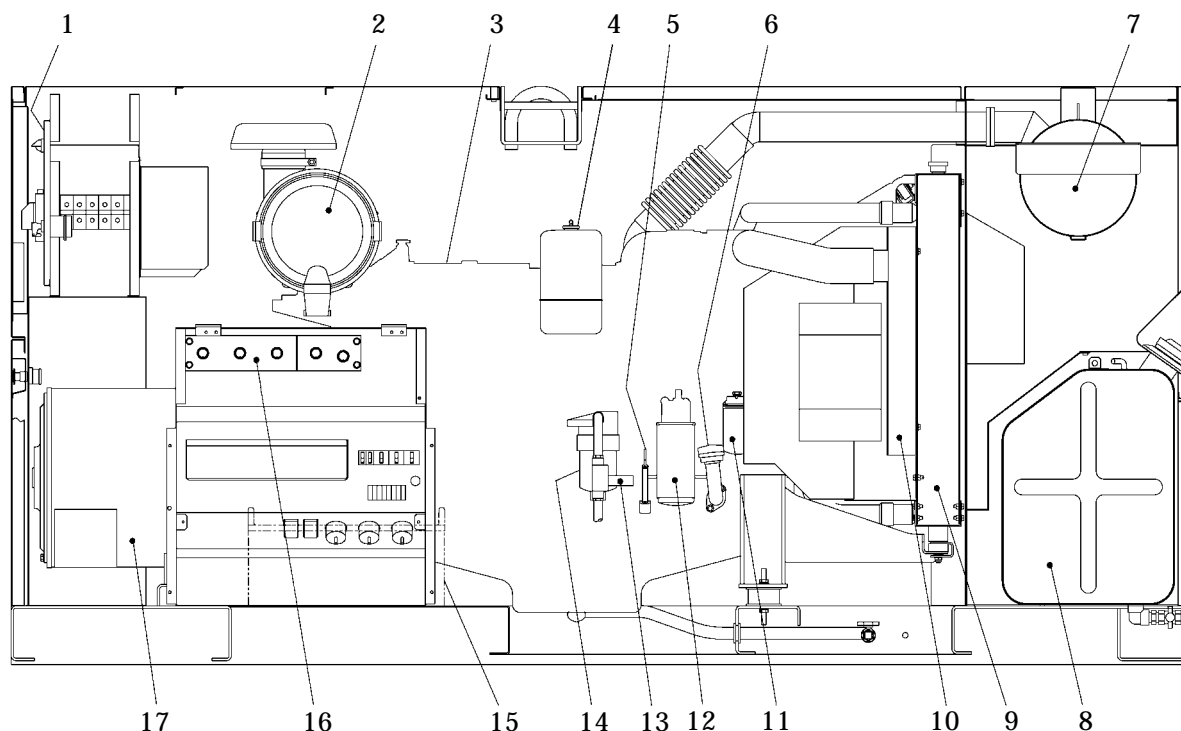


- | | |
|---------------------------|-------------------------|
| 1. Control panel | 9. Intercooler |
| 2. Air filter | 10. Fuel filter |
| 3. Engine | 11. Sedimenter |
| 4. Engine oil level gauge | 12. Engine oil filter |
| 5. Engine oil filler port | 13. Battery |
| 6. Reserve tank | 14. Output terminals |
| 7. Radiator | 15. Generator main unit |
| 8. Fuel tank | |

Instrument 4,5,7,13 marked “ ” are provided on the other side (opposite side of maintenance).

1. Specifications

SDG125S-6A6



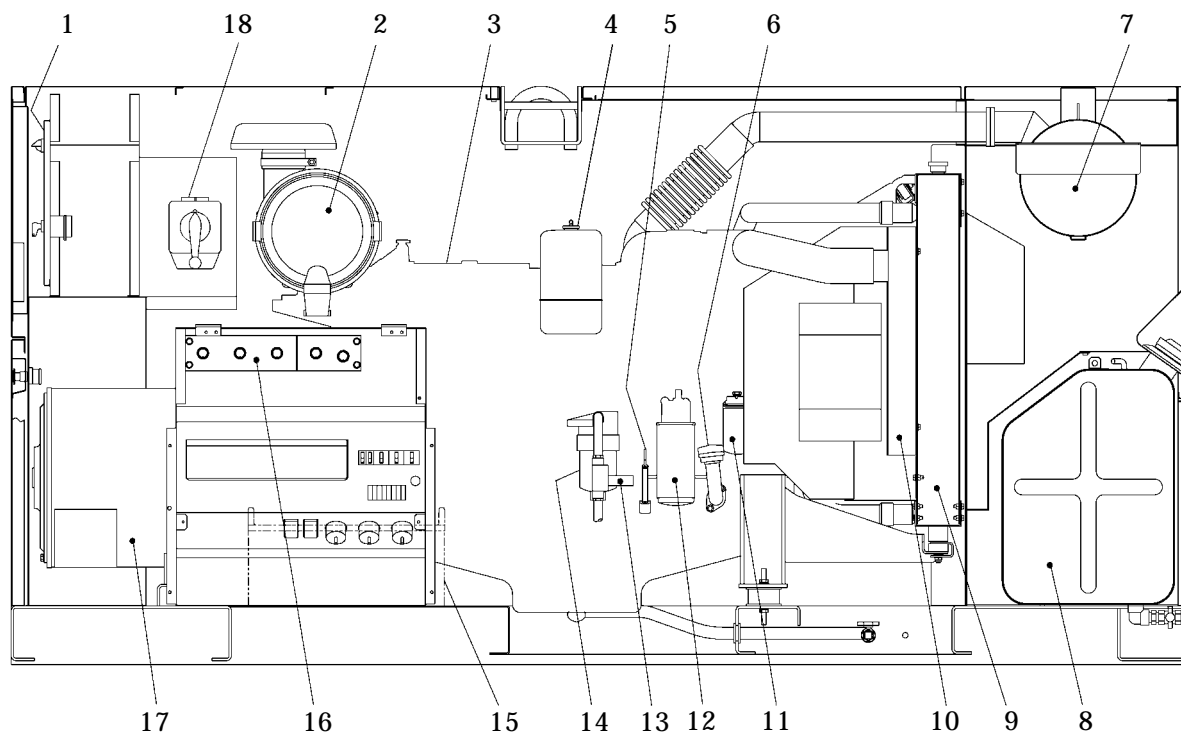
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- | | |
|---------------------------|-------------------------|
| 1. Control panel | 10. Intercooler |
| 2. Air filter | 11. Fuel filter |
| 3. Engine | 12. Engine oil filter |
| 4. Reserve tank | 13. Fuel pump |
| 5. Engine oil level gauge | 14. Fuel pre- filter |
| 6. Engine oil filler port | 15. Battery |
| 7. Exhaust muffler | 16. Output terminals |
| 8. Fuel tank | 17. Generator main unit |
| 9. Radiator | |

Instrument 15 marked “ ” are provided on the other side (opposite side of maintenance).

1. Specifications

SDG150S-6A6



A050585

- | | |
|---------------------------|-----------------------------|
| 1. Control panel | 10. Intercooler |
| 2. Air filter | 11. Fuel filter |
| 3. Engine | 12. Engine oil filter |
| 4. Reserve tank | 13. Fuel pump |
| 5. Engine oil level gauge | 14. Fuel pre- filter |
| 6. Engine oil filler port | 15. Battery |
| 7. Exhaust muffler | 16. Output terminals |
| 8. Fuel tank | 17. Generator main unit |
| 9. Radiator | 18. Voltage selector switch |

Instrument 15 marked “ ” are provided on the other side (opposite side of maintenance).

2. Overhauling

2.1 Cautions for Overhauling

2.1.1 Precautions before starting work

- (1) Work to be performed
It is very important to always plan in advance what facilities, tools, instruments, materials, oil, etc. you will need to use; the exact locations and methods of performing inspection, adjustment, or disassembly; and the key points of any repair work to be performed.
- (2) Care not to spill oil
Use a pan to collect used engine oil when changing the oil or attaching or detaching an oil line. If a large volume of oil is expected to flow out make sure to drain any accumulated oil from the engine oil pan in advance.
- (3) Care when detaching parts
When disassembling a complicated part, put a matching mark to indicate the position of detached parts for future reference. Make sure that the negative cable is detached from the battery terminals before starting repair work.
- (4) Tools to be prepared
 1. Measuring instruments (e. g. tester, insulation resistance gauge etc.)
 2. Tools
 3. Torque wrenches
 4. Jigs and specialized tools
 5. Solder and soldering iron
 6. Sealing tape
 7. Molybdenum sulfide (tube type)
 8. Lithium-base grease
 9. Diesel oil (cleaning solvent)
 10. Cleaning cloths
 11. Literatures (such as manuals etc.)

2. Overhauling

2.1.2 Disassembly and assembly

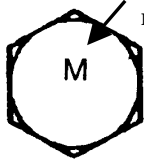

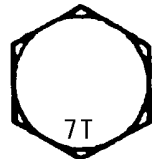
- (1) Wash dirt, dust and grime off vinyl tube and fuel hose before removing it, and take necessary steps to cover or tape the openings of vinyl tubes or fuel hoses to prevent any dirt from entering them.
- (2) Perform disassembly work in a dust-free location whenever possible.
- (3) When disassembling parts, wash their outer surface and place them on a clean sheet of paper or cloth, taking care not to contaminate or damage them.
- (4) Wash disassembled parts with diesel oil (cleaning solvent) after checking for contamination or discoloration. However, do not wash rubber parts with diesel oil.
- (5) Be careful not to damage disassembled parts, they are precision built.
- (6) Replace consumables such as oil seals, O-rings, filters, oil, etc. with new items when reassembling parts.
- (7) Apply a coating of clean grease to O-rings when installing them in the machine.
- (8) When reassembling parts, place each part in the order of assembly and take care that no parts are missing or misassembled.
- (9) When reassembling an assembled part (set part), be sure to replace it as an assembly.
- (10) Contamination or rusting may occur due to dust or humidity if parts are left in disassembled or partly disassembled condition for a long time. Therefore, be careful to prevent dust or rust from affecting parts if you have to leave the repair incomplete for a long period of time.
- (11) Check tightening torque and clearance when assembling parts.
- (12) Check the direction of rotation, speed, and oil leakage after assembly.
- (13) Before starting the machine after disassembly, run it at low idle to check for unusual noises, etc. to prevent engine or generator damage.

2. Overhauling

2.2 Tightening Torque

2.2.1 General tightening torque of bolts and nuts

Fasten all the bolts and nuts with the specified tightening torque when assembling.

| <div> <div>Strength, classification, and indication example</div> <div>Torque</div> <div>Nominal diameter (mm)</div> </div> | Type | Low or medium carbon steel bolt (SS400B, etc.) | | High strength steel bolt (SCM435, etc.) | |
|---|------|---|--------------|---|--------------|
| | | 4.6 - 6.8 (4T - 6T)  Hexagon headed bolt | | 8.8 - 12.9 (7T - 12T)   Socket bolt Hexagon headed bolt | |
| | | lbw•ft | N•m (kgf•cm) | lbw•ft | N•m (kgf•cm) |
| 6 | | 3.7 | 5 (51) | 7.2 | 10 (100) |
| 8 | | 9.0 | 12 (124) | 18 | 25 (245) |
| 10 | | 18 | 25 (245) | 35 | 49 (485) |
| 12 | | 31 | 43 (425) | 61 | 85 (845) |
| 14 | | 49 | 68 (675) | 98 | 135 (1350) |
| 16 | | 76 | 106 (1055) | 152 | 210 (2100) |
| 18 | | 105 | 145 (1450) | 210 | 290 (2900) |
| 20 | | 148 | 205 (2050) | 297 | 410(4100) |
| 22 | | 203 | 280 (2800) | 405 | 560 (5600) |
| 24 | | 250 | 345 (3450) | 514 | 710 (7100) |
| Applied sections. | | For general sections such as bonnet and frame. | | For specified sections. | |

IMPORTANT

- Each clamping torque listed in the above-mentioned table applies to bolts being used for generators.
- The list shows normal clamping torque. In some sections, special specified torque is required. In such a case, use the specified torque only.
- Make sure to remove rust and dust before tightening.

2. Overhauling

2.2.2 Tightening torque for terminal plate

IMPORTANT

- When connecting the output terminals of the generator, it is important to tighten the screws, according to the designated torque.
Since the terminal is so small, it could be burned or damaged without the proper torque.

| Bolt size | Tightening torque |
|-----------|-----------------------|
| | lbw·ft [N·m (kgf·cm)] |
| M3.5 | 0.7 [1.0 (10)] |
| M4 | 1.1 [1.5 (15)] |
| M5 | 2.2 [3 (30)] |
| M6 | 3.7 [5 (51)] |
| M8 | 7.2 [10(100)] |
| M10 | 12.7 [18(175)] |
| M12 | 25 [35(350)] |

2. Overhauling

2.3 Disassembly/Reassembly of Generator Main Unit and Connection of Generator Main Unit and Engine

2.3.1 Disassembly of generator main unit

IMPORTANT

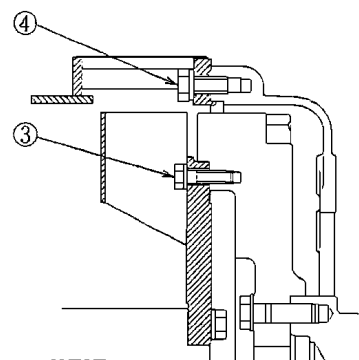
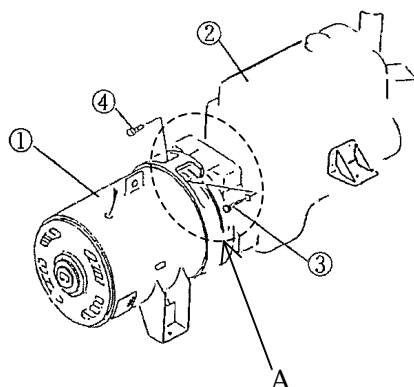
- The generator main unit is unilaterally mounted and the clearance is small, so it must be handled with extreme care to avoid the possibility of damage to the rotor or stator.
- Use hoisting equipment of sufficient capacity when it is necessary to lift up the engine and the generator main unit.

Lifting weight

Unit : lbs (kg)

| | SDG25S -6A7 | SDG45S -6A6 | SDG65S -6A6 | SDG100S -6A6 | SDG125S -6A6 | SDG150S -6A6 |
|-------------------------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|
| Weight of generator main unit | 320 (145) | 452 (205) | 595 (270) | 794 (360) | 980 (445) | 1,224 (555) |
| Weight of engine | 392 (178) | 550 (250) | 810 (368) | 1,036 (470) | 1,500 (680) | 1,500 (680) |

Generator main unit
Engine
Bolts (for coupling of the engine flywheel and the generator coupling)
Bolts (for connection of the engine flywheel housing and the generator main unit frame)



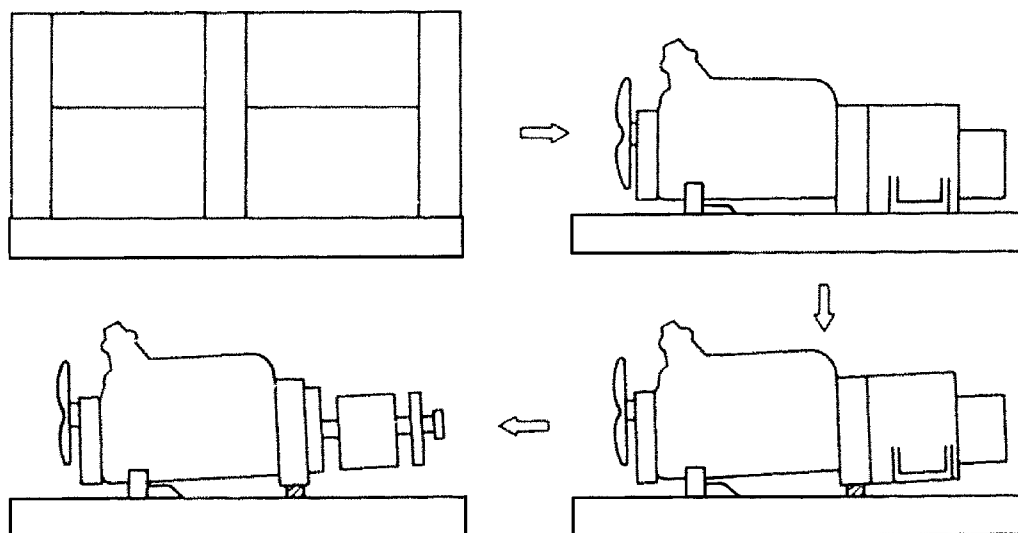
A section (coupling) details

SG05046

2. Overhauling

(1) Procedures of disassembly

1. Remove cables from battery (-) terminal.
2. Remove brackets (or fittings for muffler, air filter and etc.) equipped on the bonnet.
3. Remove top cover and dismantle such parts on the bonnet so that generator main unit can be pulled out.
4. Remove cables and pipes.
5. Remove mounting bolts of generator main unit and engine.
6. Remove engine cooling fan guard and fan shroud.
7. If necessary, remove radiator, radiator hoses, fuel tank and battery.
8. Insert a angle timber under the engine housing for inclining the engine.
9. Separate engine housing and generator stator.
10. Separate engine flywheel and generator rotor.



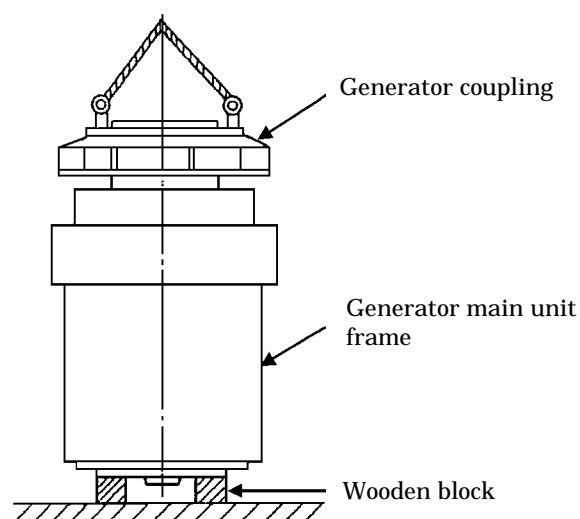
If insulation film is damaged by contact of stator and rotor during disassembly of generator main unit, perform varnish drying treatment to such portion.

(2) Demounting stator and rotor at the same time from engine

When demounting stator and rotor of generator main unit at the same time from engine, place the generator main unit with the engine coupling face upward, and pull out the rotor.

At this time, stabilize the generator main unit frame padded by wooden block at the bearing side face.

(The generator main unit separated from engine should be kept firm with the rotor in the stator fastened by wire or rope to prevent them from moving. Then start this job.)



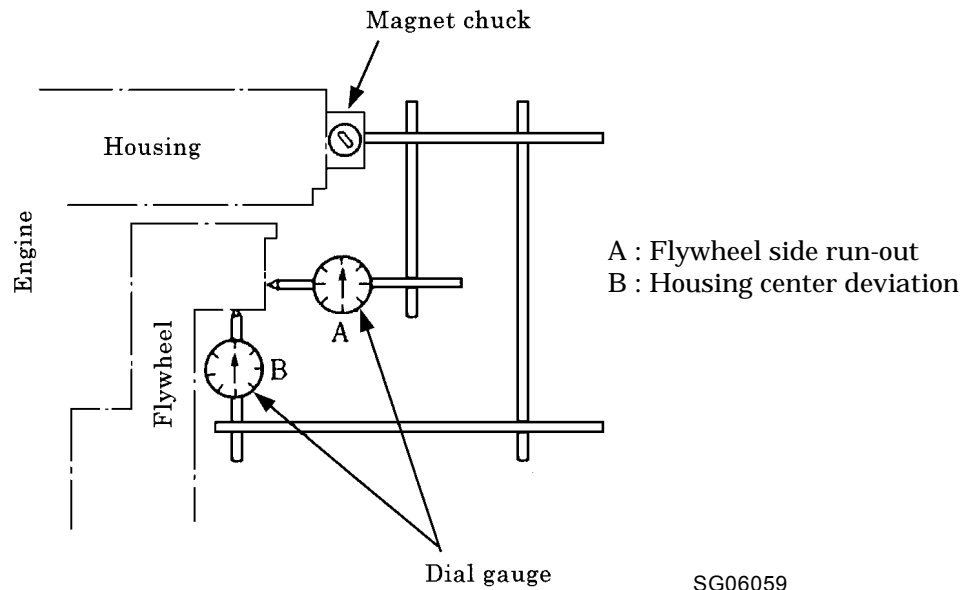
SG06058

2. Overhauling

2.3.2 Measuring center deviation and surface deviation

Measure them with a dial gauge pressed to the flywheel.

- (1) Measuring the center deviation, turn the rotor with the dial gauge pressed to the circumference of the coupling flange. If the biggest value measured on the same circumference exceeds 0.008in. (0.2mm), it is necessary to repair it.
- (2) Measuring the side run-out, turn the rotor with the dial gauge pressed vertically to the coupling flange. If the biggest value measured on the same diameter exceeds 0.008in.(0.2mm), it is necessary to repair it.



2. Overhauling

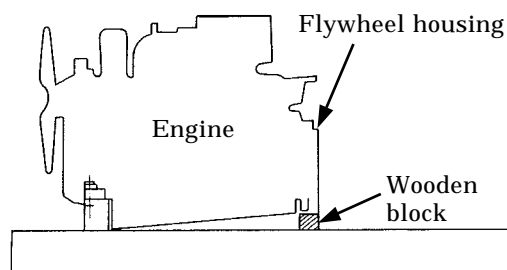
2.3.3 Assembly of engine flywheel and generator coupling (rotor)

IMPORTANT

- The mounting holes are not equally spaced along the circumference. Therefore, position the holes in advance so as to match the coupling counterpart by turning and adjusting the engine flywheel.
- Use guide bolts while centering to mount the assembly.
- Tighten the bolts to the specified torque.

(1) Mounting engine

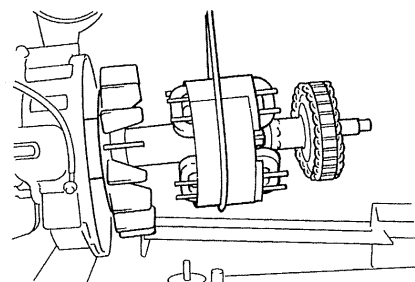
Mount the engine on the vibration isolator rubber at the frame side of engine. Put angle wooden block under the engine housing and incline the engine a little.



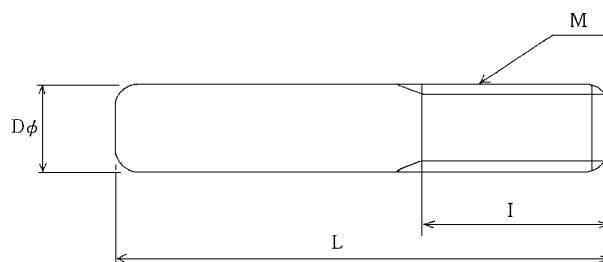
(2) Install rotor

1. Hang the center of the rotor with jute rope and bring it near to the flywheel.
2. Match the rotor coupling plate to the engine flywheel and then combine them, tightening the coupling connecting bolts.

The coupling connecting bolts shall be high tensile bolts 7T or more. (Use 2 guide bolts for this job.)



Size of guide bolt



SG05047

(mm)

| | SDG25S-6A7 | SDG45S-6A6 | SDG65S-6A6 | SDG100S-6A6 | SDG125S-6A6 | SDG150S-6A6 |
|---|------------|------------|------------|-------------|-------------|-------------|
| D | 7.5 | 9.5 | | | | |
| L | 60 | 75 | | 65 | 75 | |
| I | 25 | | | | | |
| M | M8 × 1.25 | M10 × 1.5 | | | | |

Tightening torque of generator coupling (rotor) (See of 2.3.1 bolts)

| | | SDG25S-6A7 | SDG45S-6A6 | SDG65S-6A6 | SDG100S-6A6 | SDG125S-6A6 | SDG150S-6A6 |
|-------------------|-----------------------------|-----------------------|-----------------------|--------------|--------------|--------------|-------------|
| Bolt size | | M8 × 1.25-30 | M10 × 1.5-40 | M10 × 1.5-30 | M10 × 1.5-50 | M10 × 1.5-20 | |
| Quantity | | 8 | | | 9 | 8 | |
| Tightening torque | lbw·ft [N·m] (kgf·cm) | 23.5 [33] (325) | 46 [62.8] (640) | | | | |

2. Overhauling

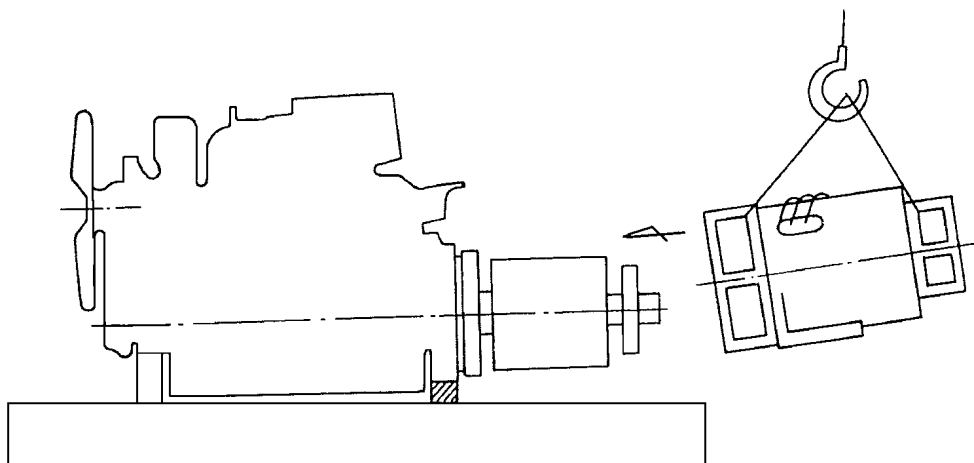
2.3.4 Assembly of flywheel housing and generator main unit frame (stator)

IMPORTANT

- Handle the stator with care after fastening the engine flywheel and generator coupling, to avoid damage to either the rotor or stator.
- Tighten the connections to the specified torque.
- For connection of flywheel housing and generator main unit frame (stator), coat anti-corrosion agent "METAL CLEAR" on the connecting faces to prevent rust and corrosion.

Install the stator

1. Carefully push into the stator, preventing the stator and rotor from rubbing each other.
2. Install the flywheel housing and the stator, tightening the connecting bolts.
The bolts should be high tensile 7T or more.
3. Remove the angle wooden block from under the flywheel housing, and place the generator main unit and engine horizontally.



SG06060

Tightening torque of generator main unit frame (stator) connecting bolts. (See of 2.3.1 Bolts)

| | | SDG25S -6A7 | SDG45S -6A6 | SDG65S -6A6 | SDG100S -6A6 | SDG125S -6A6 | SDG150S -6A6 |
|-------------------|----------|----------------|----------------|----------------|-----------------|-----------------|-----------------|
| Bolt size | | M10 × 1.5-25 | M10 × 1.5-30 | | | M10 × 1.5-30 | |
| Quantity | | 12 | | | | | |
| Tightening torque | lbw·ft | 18 | | | | | |
| | [N·m] | [24] | | | | | |
| | (kgf·cm) | (245) | | | | | |

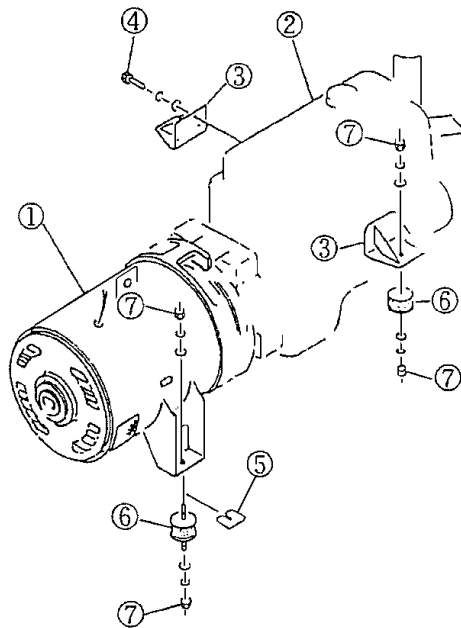
2. Overhauling

2.3.5 Mounting of generator main unit and engine on frame

IMPORTANT

- Perform centering carefully, to avoid deviation in the horizontal leveling caused by distortion of the frame or inaccurate mounting of the generator main unit and engine.
- Running the machine without accurate centering may cause abnormal vibrations.

Generator main unit
Engine
Bracket
Bolt
Shim
Cushion rubber
Nut

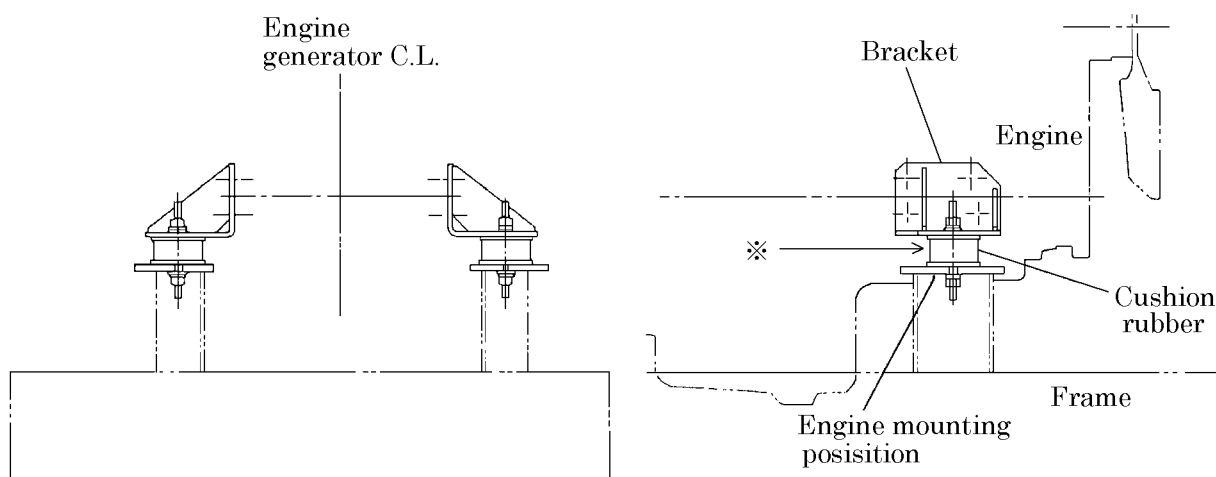


SG05048

2. Overhauling

(1) Centering method

1. Mount the brackets on the engine secured to the generator main unit.
(Use only genuine fastening bolts.)
2. Place four assembly level plates on the points for mounting the engine and the generator main unit onto the frame.
3. Place the generator main unit with the engine mounted onto it on the assembly level plates on the frame.
4. Use shims for adjustment if joint gaps are found at any of the four places where the brackets and assembly level plates are to be fixed.
5. Lift the engine mounted onto the generator main unit, leaving the shims in the four places after adjustment.
6. Remove the assembly level plates and place the cushion rubbers in their respective places on the frame.
(Insert or place adjusting shims on the vibration isolator rubber of both engine and generator main unit.)
7. Place the engine with the generator main unit on the cushion rubbers and fasten it with nuts.
(Placing vibration isolator rubber for SDG25S,65S, make sure to put plain washers on the rubber. If not, the vibration isolator rubber is left loose. So vibration could damage vibration isolator rubber and machine.)
8. Make sure to coat the bolts with anti-corrosion agent "Metal Clear" which are tightened for vibration isolators. (8 points consisting of upper side 4 pieces and under side 4 pieces.)



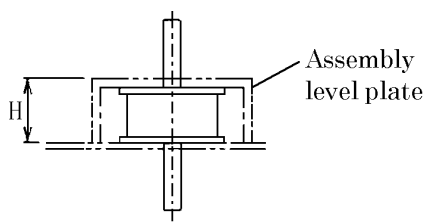
SG05049E

Before installing vibration isolators, place assembly level plate on the position of generator main unit and engine connection and then adjust the clearance between engine mounting bracket and assembly level plate.

Assembling level plates size

Unit : in. (mm)

| | SDG25S -6A7 | SDG45S -6A6 | SDG65S -6A6 | SDG100S -6A6 | SDG125S -6A6 | SDG150S -6A6 |
|----------------|----------------|----------------|----------------|-----------------|-----------------|-----------------|
| Generator side | 1.24 (31.5) | 2.21 (56) | 2.24 (57) | 2.56 (65) | 1.9 (48) | |
| Engine side | 0.98 (25) | 2.21 (56) | 2.24 (57) | 2.56 (65) | 1.85 (47) | |



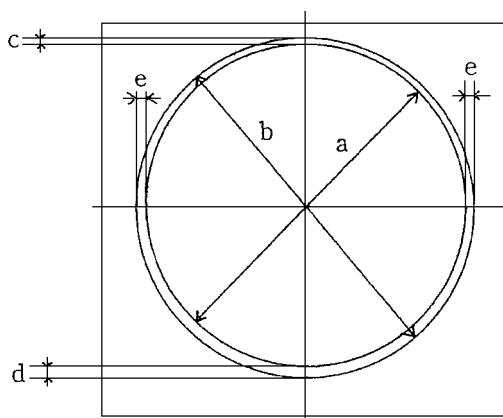
SG05100E

2. Overhauling

(2) Check the gap between the cooling fan and fan shroud

IMPORTANT

- Maintain an adequate gap in both the vertical and horizontal directions.
- If the fan is mounted incorrectly so that it leans toward one side wall of the shroud, leading to a smaller gap in one direction, the fan may produce abnormal noise due to rubbing against the shroud during starting or stopping and may also overheat.



SG05050

Gap size

Unit : in. (mm)

| | | SDG25S -6A7 | SDG45S -6A6 | SDG65S -6A6 | SDG100S -6A6 | SDG125S -6A6 | SDG150S -6A6 |
|-----------------------|-----|----------------|----------------|----------------|-----------------|-----------------|-----------------|
| Fan outer diameter | (a) | 16.9 (430) | | 19.7 (500) | 22.8 (580) | 21.5 (546) | |
| Shroud inner diameter | (b) | 17.7 (450) | | 20.5 (520) | 24.0 (610) | 22.3 (566) | |
| Top gap | (c) | 0.28 (7) | 0.28 (7) | | 0.47 (12) | 0.28 (7) | |
| Bottom gap | (d) | 0.5 (13) | | | 0.7 (18) | 0.5 (13) | |
| Side gap | (e) | 0.4 (10) | | | 0.6 (15) | 0.4 (10) | |

2. Overhauling

2.3.6 Changing the bearings in the generator main unit

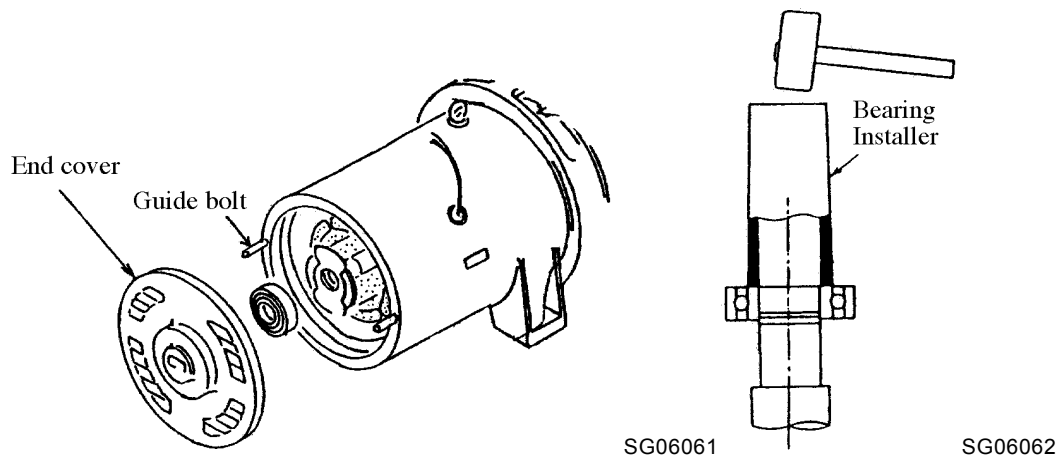
IMPORTANT

- Use guide bolts to avoid the danger of dropping the bearing shield and to prevent the rotor and stator from rubbing against each other. (Use the guide bolts used to mount the generator main unit.)
- Do not hit the bearing outer race when installing or the bearing may be damaged.

The generator main unit is quipped with fully sealed bearing. It is not necessary to supply grease. But the machine life (4 years or 15,000 ~ 20,000 hours of operation) may change, depending upon the conditions such as vibration, ambient temperature and humidity. So always make sure to check for any abnormal noise of the bearings and also to check for any abnormal rise of temperature. Should it become necessary to replace the bearings, follow the under mentioned procedures.

Replacement of bearings

1. Remove bearing shield (end cover).
2. Pull out the bearing from the shaft, using bearing removing tools (gear puller).
3. Clean the surface of the shaft and check for any damages.
4. Prepare a new bearing, and check it by turning it by hand before installing it.
5. Heat the bearing in the oil bath at average 100 to 118 (Never heat it over 120 or partially.) and then install the bearing using a bearing installer (Heated bearing can be installed to the shaft.)
6. Set guide bolts to the generator main unit frame.
7. Push in the bearing shield (end cover), hitting it with a plastic hammer evenly.



2. Overhauling

2.3.7 Changing the rotary rectifier

IMPORTANT

- Care must be taken not to damage the rotary rectifier when mounting it on the conductive plate.
- When a soldering iron must be used on the rotary rectifier, make the contact time as short as possible.
- Degrease the portion where it should be coated with screw lock agent "Screw Loctite" for prevention of loose installation.
- The surge suppressor is integrated with the insulating plate and cannot be replaced separately.

Tightening torque

| | | | SDG25S -6A7 | SDG45S -6A6 | SDG65S -6A6 | SDG100S -6A6 | SDG125S-6A6 SDG150S-6A6 |
|-------------------|-------------------|-----------------------------|----------------------------|----------------|----------------|----------------------------|----------------------------|
| Rotary rectifier | Screw size | | M6-20 | | | | |
| | Tightening torque | lbw·ft [N·m] (kgf·cm) | 3.0 [4.1] (42) | | | | |
| | Screw-lock agent | | Three Bond 1402B | | | | |
| Conductive plate | Screw size | | M6-25,16 | | | | M6-20 |
| | Tightening torque | lbw·ft [N·m] (kgf·cm) | 3.0 [4.1] (42) | | | | |
| | Screw-lock agent | | Three Bond 1402B | | | | |
| Silicon rectifier | Model | | SID01-09(K) ERD51-09(J) | | | SIE01-12(K) ERE51-12(J) | |
| | Tightening torque | lbw·ft [N·m] (kgf·cm) | 1.5 [2.0] (20) | | | 2.9 [3.9] (40) | |
| | Screw-lock agent | | Three Bond 1402B | - | - | - | - |

Replacement of rotary rectifier

1. Pull out the rotor in accordance with the procedures mentioned in 2.3.1.
2. Remove the bearing from the shaft with bearing puller (gear puller).
3. Record or mark the portion at which the rotary rectifier is installed.
4. Remove the rotary rectifier after removing all the cables connected to it.
5. Remove the silicon rectifier.
6. Install a new silicon rectifier.
As for the silicon rectifier, forward direct direction polarity at K side and reverse direction polarity at J side are used. Make sure not to make a mistake in the direction polarity. (See 3.2.1 Rotary rectifier, D of 4.5 "Checking Rotary Rectifier (Diode)" and also E of 4.5 "Checking Varistor")
7. Fasten the silicon rectifier with the nuts, using a torque wrench, according to the tightening torque in the above table.
8. Connect the cable soldered to the silicon rectifier.
9. Install the rotary rectifier in the reverse turn to its removal procedures.

2. Overhauling

2.4 Engine Maintenance Standards

| | | SDG25S-6A7 | |
|---------------------------------|----------------------------------|-------------------------|---|
| Engine model | | ISUZU AA-4LE1 DA-05 | |
| Tightening torque of head bolts | | lbw·ft [N·m(kgf·cm)] | Tighten M12 bolt according to the tightening torque of 61.5 ~ 68.7lbw·ft [83.4 ~ 93.2N·m(850 ~ 950kgf·cm)] and further turn the bolt by 60 ~ 90 ° angle. Then tighten M8 bolt according to the torque of 18.1 ~ 25.3lbw·ft [24.5 ~ 34.3N·m(250 ~ 350kgf·cm)]. |
| Valve clearance | Air intake | in. (mm) | 0.016 (0.4) [normal temperature] |
| | Discharge | in. (mm) | 0.016 (0.4) [normal temperature] |
| Firing order | | 1-3-4-2 | |
| Injection timing (BTDC) | | 12 | |
| Nozzle injection pressure | | 1,920 (13.24) | |
| Compression | Standard | psi (MPa) | 441 (3.04) [Rotation speed 250rpm(250min ⁻¹)] |
| | Working limit | psi (MPa) | Limited value 370 (2.55) |
| | | | Each cylinder limit value 42 (0.29) |
| Thermostat | Temperature for start of release | ' F (°C) | 180 (82) |
| | Full open temperature | ' F (°C) | 203 (95) |
| | Valve lift | in. (mm) | 0.31 (8) |

| | | SDG45S-6A6 | |
|---------------------------------|----------------------------------|-------------------------|---|
| Engine model | | NISSAN 2A-BD30T 15 | |
| Tightening torque of head bolts | | lbw·ft [N·m(kgf·cm)] | First time 28.9 ~ 32.5 [39 ~ 44 (400 ~ 450)] |
| | | | Second time 39.8 ~ 43.4 [54 ~ 59 (550 ~ 600)] |
| | | | Third time 90° ± 10° (Angle tightening) |
| Valve clearance | Air intake | in. (mm) | 0.014 (0.35) [while it is still hot] |
| | Discharge | in. (mm) | 0.014 (0.35) [while it is still hot] |
| Firing order | | 1-3-4-2 | |
| Injection timing (BTDC) | | 10 | |
| Nozzle injection pressure | | 2,631 (18.14) | |
| Compression | Standard | psi (MPa) | 426 (2.94) [Rotation speed 200rpm(200min ⁻¹)] |
| | Working limit | psi (MPa) | Limited value 370 (2.55) |
| | | | Each cylinder limit value 42 (0.29) |
| Thermostat | Temperature for start of release | ' F (°C) | 180 (82) |
| | Full open temperature | ' F (°C) | 203 (95) |
| | Valve lift | in. (mm) | 0.35 (9) |

2. Overhauling

| | | | SDG65S-6A6 |
|---------------------------------|----------------------------------|-------------------------|--|
| Engine model | | | ISUZU EE-4BG1TRD-02 |
| Tightening torque of head bolts | | lbw·ft [N·m(kgf·cm)] | First time 50.6 [69 (700)] |
| | | | Second time 65.1 [88 (900)] |
| | | | Third time 90° ~ 120° (Angle tightening) |
| Valve clearance | Air intake | in. (mm) | 0.016 (0.4) [normal temperature] |
| | Discharge | in. (mm) | 0.016 (0.4) [normal temperature] |
| Firing order | | | 1-3-4-2 |
| Injection timing (BTDC) | | ° | 9 |
| Nozzle injection pressure | | psi (MPa) | 2,631 (18.14) |
| Compression | Standard | psi (MPa) | 441 (3.04) [Rotation speed 200rpm (200min ⁻¹)] |
| | Working limit | psi (MPa) | 313 (2.16) [Rotation speed 200rpm (200min ⁻¹)] |
| Thermostat | Temperature for start of release | ' F (°C) | 180 (82) |
| | Full open temperature | ' F (°C) | 203 (95) |
| | Valve lift | in. (mm) | 0.39 (10) |

| | | | SDG100S-6A6 |
|---------------------------------|----------------------------------|-------------------------|--|
| Engine model | | | ISUZU EE-6BG1TRD-04 |
| Tightening torque of head bolts | | lbw·ft [N·m(kgf·cm)] | First time 50.6 [69 (700)] |
| | | | Second time 65.1 [88 (900)] |
| | | | Third time 90° ~ 120° (Angle tightening) |
| Valve clearance | Air intake | in. (mm) | 0.016 (0.4) [normal temperature] |
| | Discharge | in. (mm) | 0.016 (0.4) [normal temperature] |
| Firing order | | | 1-5-3-6-2-4 |
| Injection timing (BTDC) | | ° | 9 |
| Nozzle injection pressure | | psi (MPa) | 2,417 ~ 2,843 (16.67 ~ 19.61) |
| Compression | Standard | psi (MPa) | 441 (3.04) [Rotation speed 200rpm (200min ⁻¹)] |
| | Working limit | psi (MPa) | 370 (2.55) [Rotation speed 200rpm (200min ⁻¹)] |
| Thermostat | Temperature for start of release | ' F (°C) | 180 (82) |
| | Full open temperature | ' F (°C) | 203 (95) |
| | Valve lift | in. (mm) | 0.39 (10) |

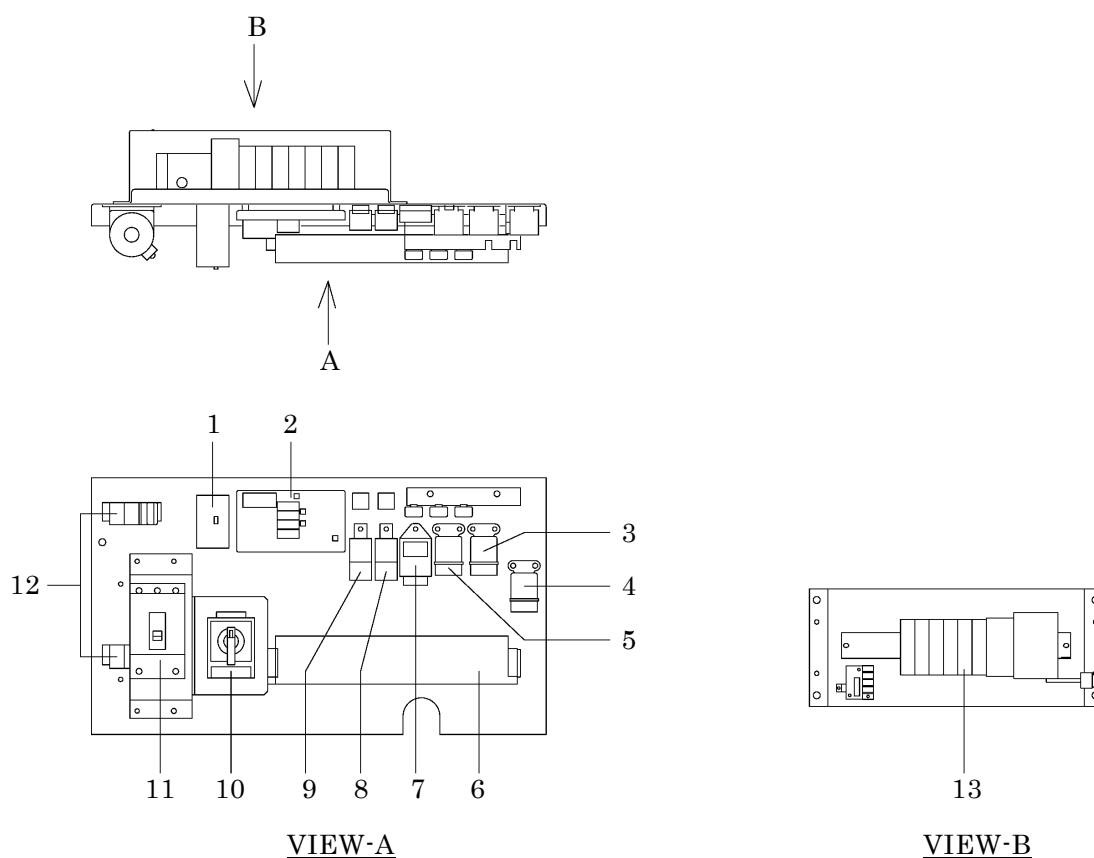
2. Overhauling

| | | | SDG125S/150S-6A6 |
|---------------------------------|----------------------------------|-------------------------|---|
| Engine model | | | VOLVO TAD-720GE |
| Tightening torque of head bolts | | lbw·ft [N·m(kgf·cm)] | First time 37 [50 (510)] |
| | | | Second time 96 [130 (1326)] |
| | | | Third time 90° (Angle tightening) |
| Valve clearance | Air intake | in. (mm) | 0.014 (0.35) |
| | Discharge | in. (mm) | 0.022 (0.55) |
| Firing order | | | 1-5-3-6-2-4 |
| Injection timing (BTDC) | | ° | 2 |
| Nozzle injection pressure | | psi (MPa) | 3,988 + 116 ~ 4,060 + 116 (27.5 + 0.8 ~ 28.0 + 0.8) |
| Compression | Standard | psi (MPa) | 435 ~ 551 (3 ~ 3.8) |
| | Working limit | psi (MPa) | 367 ~ 468 (2.55 ~ 3.23) |
| Thermostat | Temperature for start of release | ° F (°C) | 181 (83) |
| | Full open temperature | ° F (°C) | 203 (95) |
| | Valve lift | in. (mm) | 0.315 (8) |

3. Electrical Parts

3.1 Installation Positions of Electrical Appliances

SDG25S-6A7

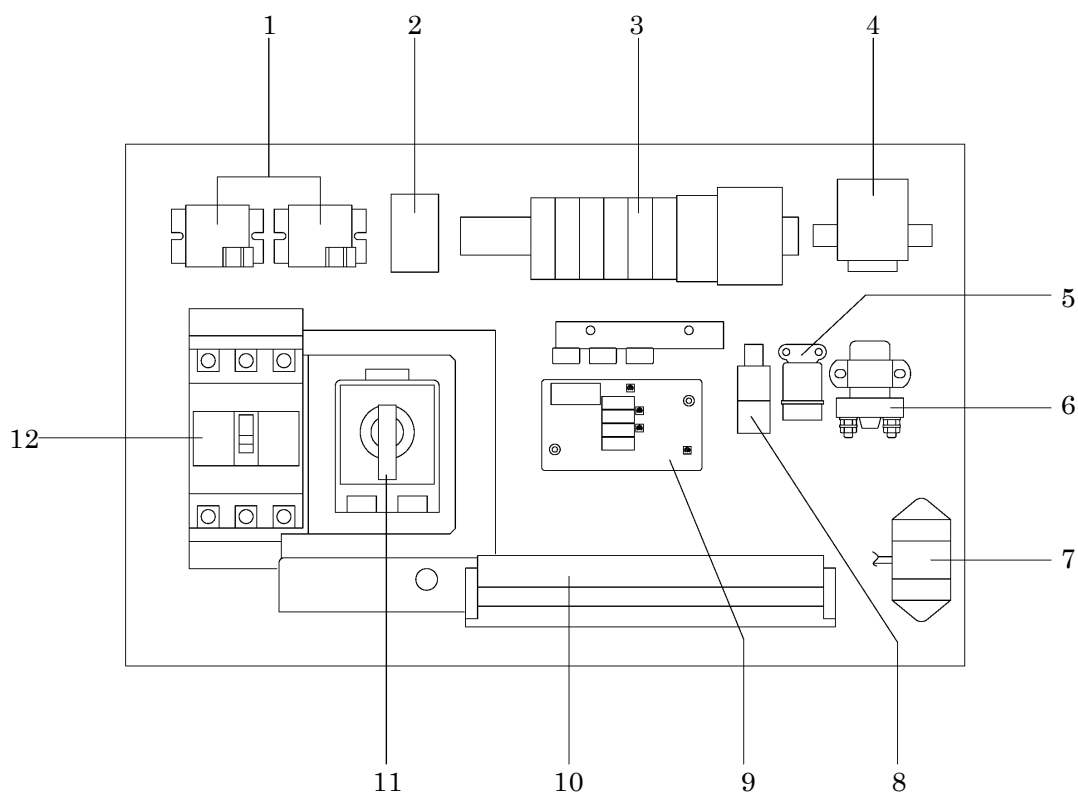


SG06008

- | | |
|--------------------------------------|---------------------------------|
| 1. Thermal relay | 8. Solenoid relay |
| 2. Automatic voltage regulator (AVR) | 9. Safety relay |
| 3. Starter relay | 10. Voltage selector switch |
| 4. Magnetic switch | 11. Three-phase circuit breaker |
| 5. Glow relay | 12. Current transformer |
| 6. Terminal plate | 13. Automatic operation unit |
| 7. Time relay | |

3. Electrical Parts

SDG45S-6A6

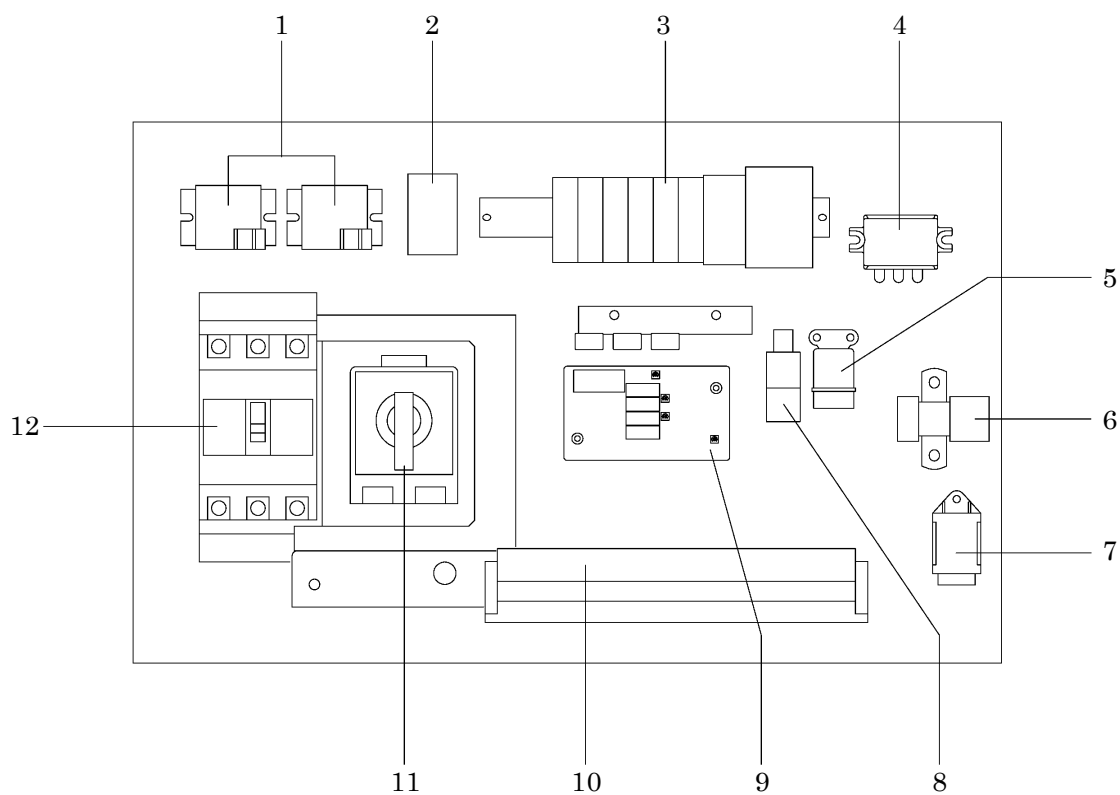


SG06009

- | | |
|-----------------------------|--------------------------------------|
| 1. Current transformer | 7. Safety relay |
| 2. Thermal relay | 8. Solenoid relay |
| 3. Automatic operation unit | 9. Automatic voltage regulator (AVR) |
| 4. Time relay | 10. Terminal plate |
| 5. Magnetic switch | 11. Voltage selector switch |
| 6. Heater relay | 12. Three-phase circuit breaker |

3. Electrical Parts

SDG65S-6A6

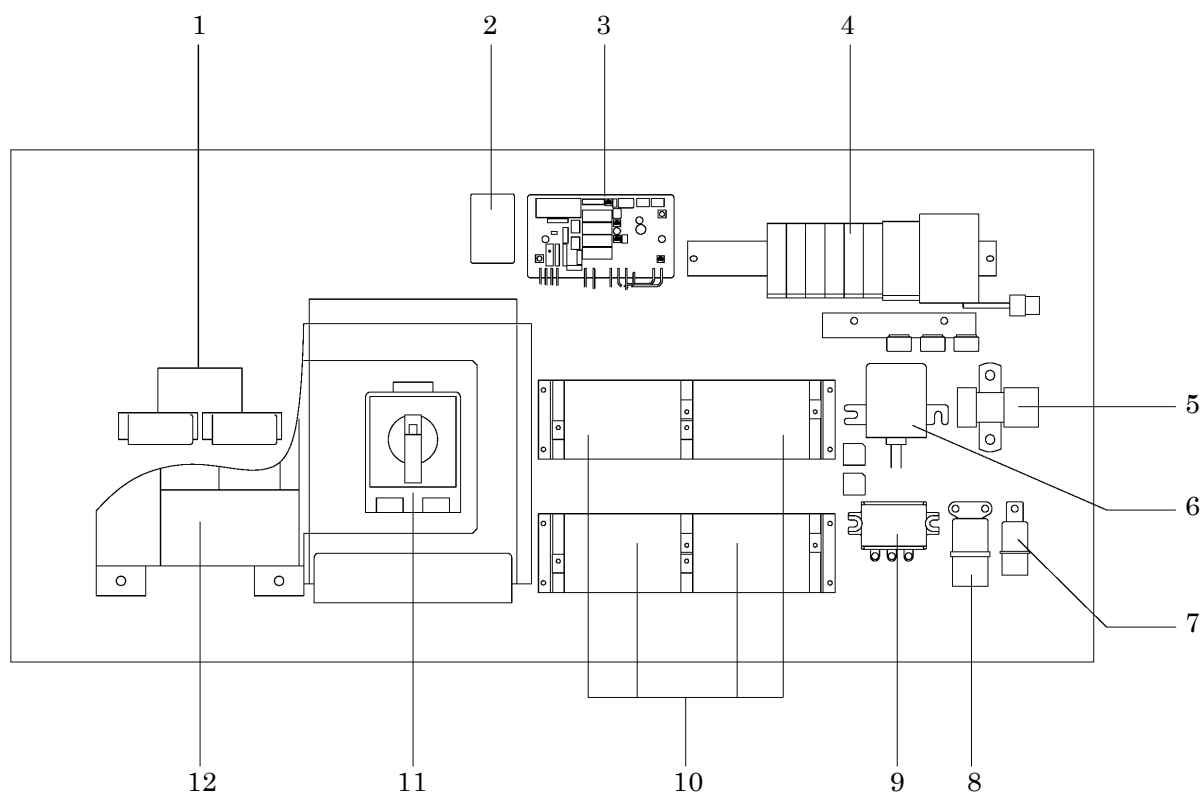


SG06010

- | | |
|-----------------------------|--------------------------------------|
| 1. Current transformer | 7. Time relay |
| 2. Thermal relay | 8. Motor stopper relay |
| 3. Automatic operation unit | 9. Automatic voltage regulator (AVR) |
| 4. Magnetic switch | 10. Terminal plate |
| 5. Glow relay | 11. Voltage selector switch |
| 6. Safety relay | 12. Three-phase circuit breaker |

3. Electrical Parts

SDG100S-6A6

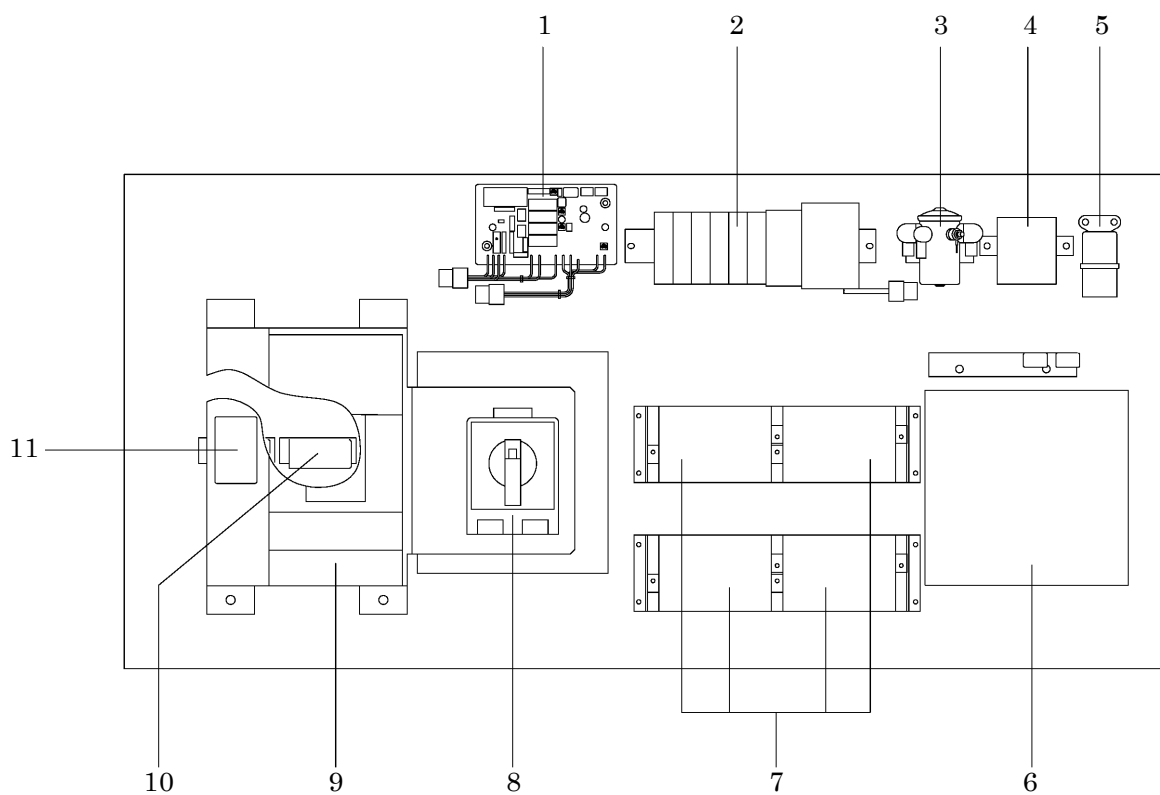


SG06011

- | | |
|--------------------------------------|---------------------------------|
| 1. Current transformer | 7. Motor stopper relay |
| 2. Thermal relay | 8. Glow relay |
| 3. Automatic voltage regulator (AVR) | 9. Magnetic switch |
| 4. Automatic operation unit | 10. Terminal plate |
| 5. Safety relay | 11. Voltage selector switch |
| 6. Time relay | 12. Three-phase circuit breaker |

3. Electrical Parts

SDG125S/150S-6A6



SG06012

- 1. Automatic voltage regulator (AVR)
- 2. Automatic operation unit
- 3. Magnetic switch
- 4. Glow relay
- 5. Starter relay
- 6. Controller (Control unit EDC 4)

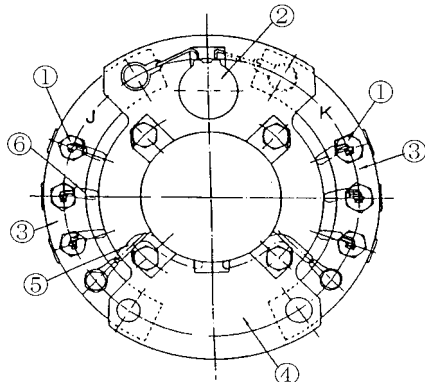
- 7. Terminal plate
- 8. Voltage selector switch
- 9. Three-phase circuit breaker
- 10. Current transformer
- 11. Thermal relay

The voltage selector switch of SDG150S-6A6 is provided on the output terminal plate of the right bonnet.

3. Electrical Parts

3.2 Electrical Parts of Generator

3.2.1 Rotary rectifier



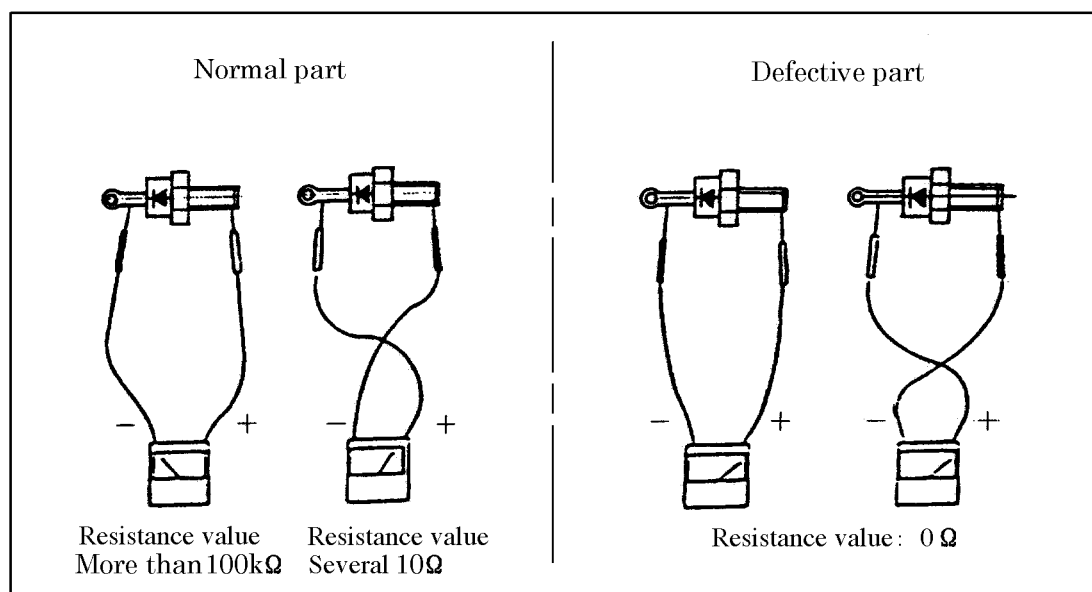
AS-016



- 1.Silicon rectifier
- 2.Varistor
- 3.Conductive plate
- 4.Insulating plate
- 5.Lead wire (alternator)
- 6.Lead wire (Exciter)

How to check whether silicon rectifier (diode element) functions correctly or not

Check the silicon rectifier (diode element) according to the resistance range of circuit meter. When the anode side of normal functioning silicon rectifier is connected to the plus of the circuit meter and cathode side connected to the minus side (in reverse direction), the circuit meter indicates more than 100Ω and vice versa connected, the meter indicates 10Ω.

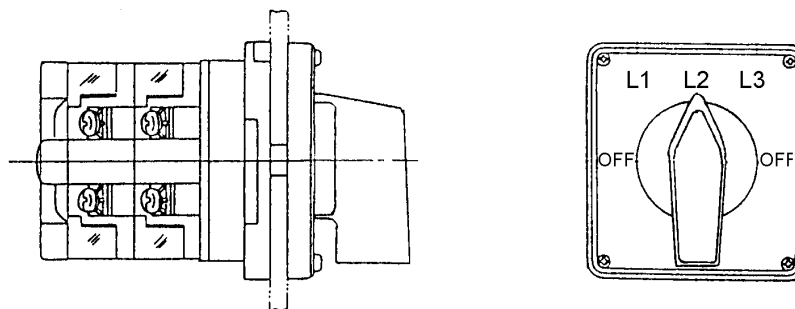


SG06013

Note: The rotary rectifier is equipped with 3 sets of silicon rectifiers of forward direct polarity at the K side and 3 of reverse direction polarity at the J side. So take care not to make a mistake in the polarities.

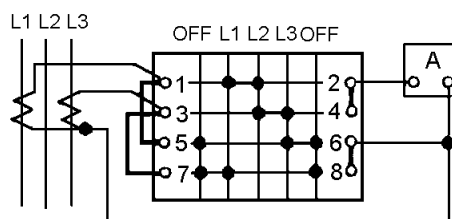
3. Electrical Parts

3.2.2 AS (Ammeter change-over switch)



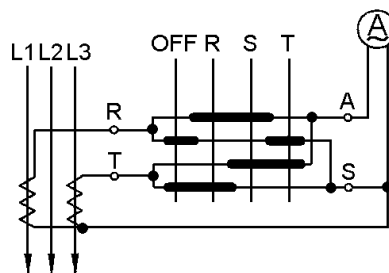
SG06014

Diagram: AS for SDG25S/100S/125S



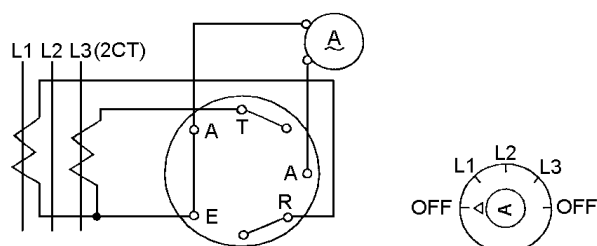
SG06015

Diagram: Interior cable connection for SDG25S/100S/125S



SG06068

Diagram: Interior cable connection for SDG45S/65S

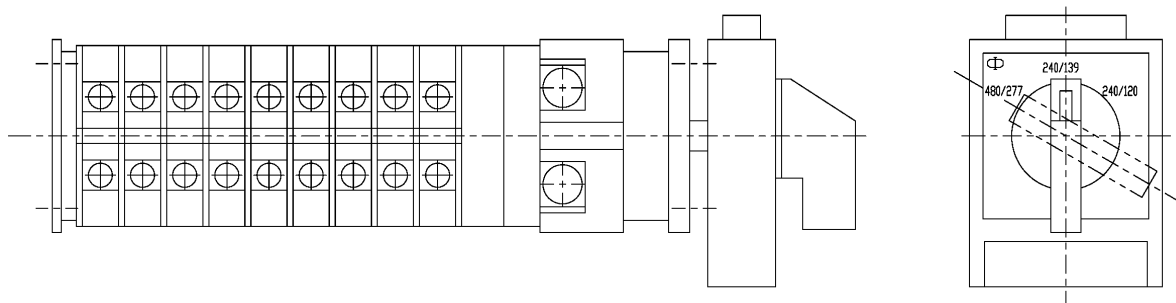


SG06069

Diagram: Interior cable connection for SDG150S

3. Electrical Parts

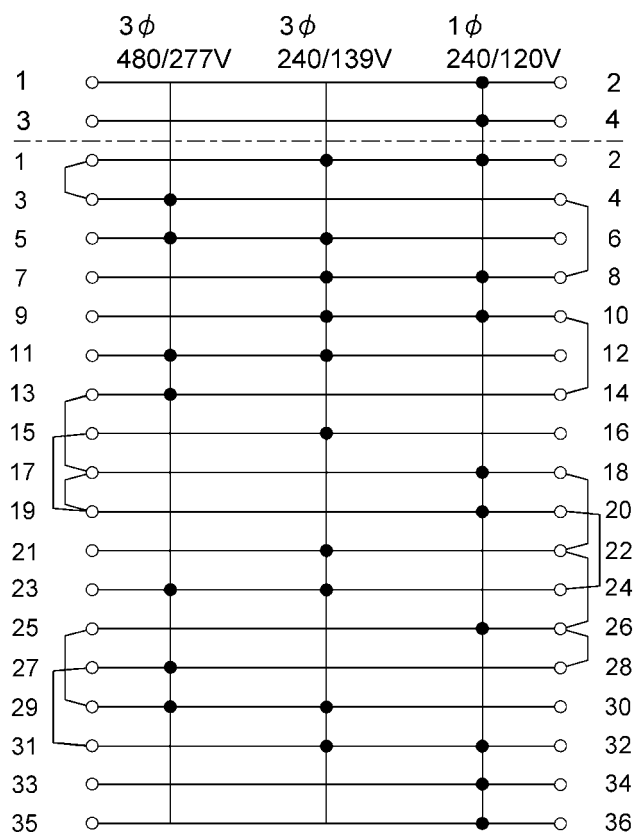
3.2.3 Voltage selector switch



SG06016

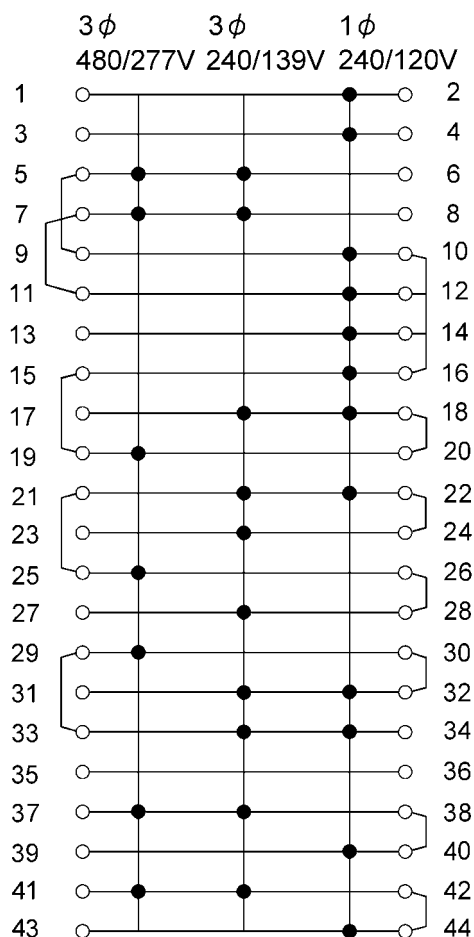
System of contacts arrangement

SDG25S-6A7, SDG45S/65S-6A6



SG06017

SDG100S/125S/150S-6A6



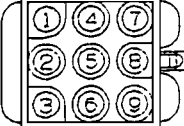
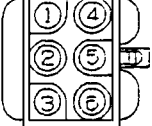
SG06018

3. Electrical Parts

3.2.4 AVR (Automatic voltage regulator)

SDG25S-6A7, SDG45S - 150S-6A6 (AVR model : DST-100-2FA/2FA4)



| 9 Pin (female) | 6 Pin (female) |
|--|--|
|  |  |

| 9 Pin(female) | | | 6 Pin(female) | |
|---------------|----------|----------|---------------|----------|
| 1:Brown | 4:Yellow | 7:Purple | 1:Brown | 4:Yellow |
| 2:Red | 5:Green | 8:Gray | 2:Red | 5:Green |
| 3:Orange | 6: / | 9: / | 3:Orange | 6: / |

SG06019

| | Name | Function |
|-----|--------------------|--|
| (1) | V. F. ADJ | V/Hz adjust variable resistor |
| (2) | VOLT. ADJ | Voltage setting variable resistor |
| (3) | STAB. ADJ | Stability adjust variable resistor |
| (4) | CPR | Over-excitation protection circuit protector |
| (5) | Time constant, ADJ | Time constant adjustment |

AVR CONNECTOR

| | Line color | Connection | Remarks |
|-----------------|------------|----------------------|---|
| 6 pins (female) | 1 Brown | Hand trimmer | Variable resistor 2k 5W |
| | 2 Red | Hand trimmer | |
| | 3 Orange | NIL | |
| | 4 Yellow | No.5 of connector 6P | To get corner frequency 57Hz, No.5 connector 6P and No.4 connector 6P short circuited |
| | 5 Green | No.4 of connector 6P | |
| | 6 | NIL | |
| 9 pins (female) | 1 Brown | Generator cable No.3 | |
| | 2 Red | Generator cable No.4 | AVR power supply (Generator cable No.3 & No.4) |
| | 3 Orange | Generator cable E3 | Detect generator output voltage between generator cable No.3 and E3 |
| | 4 Yellow | Generator cable J | Field winding of exciter |
| | 5 Green | Generator cable K | Field winding of exciter |
| | 6 | NIL | |
| | 7 Purple | Generator cable U | Auxiliary winding |
| | 8 Gray | Generator cable V | Auxiliary winding |
| | 9 | NIL | |

3. Electrical Parts

AVR is adjusted and set prior to delivery from factory. Accordingly, it is not necessary to adjust it unless the machine equipped with a new AVR functions abnormally. If upon test operation, there is any trouble such as voltage hunting, adjust it according to the following procedures.

Adjustment of AVR

1. Start engine, and adjust the frequency to 62.5Hz at no load operation.
2. Turn the voltage adjuster (hand trimmer) on the instrument panel fully to the right to the maximum position.
3. Under this condition, turn the voltage adjuster of AVR in the control panel, using a driver, so that the upper value of voltage may meet the value mentioned in the following table.

Notching position of voltage adjustment (VOLT.ADJ): 6.5/10

| Voltage Frequency | 240V | 480V |
|----------------------|------|------|
| 62.5Hz | 252V | 504V |

4. The driver slot of voltage adjusting volume of AVR should be coated with silicon caulking paste and fully sealed.

Adjustment of stability

It is possible to adjust the response speed of generator output voltage at no load operation by the adjusting volume knob of stability.

1. Turning the volume knob of stability adjustment clockwise reduces the response speed, and voltage overshoot value becomes a little (in the direction of stability).
2. Turning it counterclockwise raises the speed and voltage shooting value becomes bigger (in the direction of instability).

Notch position of stability adjusting volume (STAB.ADSJ) : 4/10

Adjusting time constant

Instantaneous characteristic is set at the best point. So it is not necessary to adjust it. (Adjustment is prohibited.)

The notching position of time constant adjustment volume : 1/10

Protection against excessive exciting current

A circuit protector (CPR) is built-in in the power supply for prevention of AVR damage due to the excessive exciting current caused by wrong cable connection or disconnection to detective inlet terminal of AVR.

If this device functions, the white push button at the top of CPR is kept pressed up. In order to reset it, push the white button on after getting rid of the cause of the excessive exciting current flow.

:Position of notching

The top of volume resistance is marked "arrow" at the one of the variable cross holes for showing the set up position.

3. Electrical Parts

Adjusting V/Hz characteristic

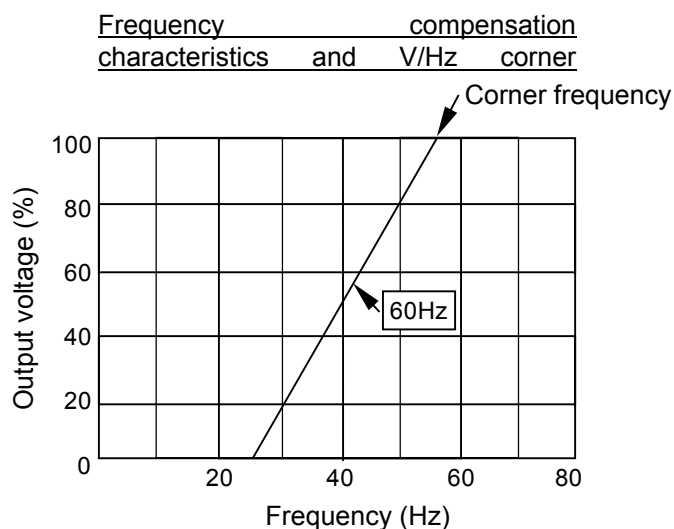
If at the start stage of engine, voltage adjustment and stability adjustment have been already done, it is not necessary to adjust the V/Hz characteristic. But if at no load operation any trouble of voltage adjustment function occurs, or voltage disappears, adjust V/Hz characteristics, according the following procedures.

1. Turn V/Hz characteristics volume knob (V.F.ADJ) fully clockwise. (Notching position ;10/10)
2. Start engine and adjust the frequency to 57Hz and then slowly turn V/Hz characteristic volume knob (V>F>ADJ) counterclockwise to set it at the position of voltage drop approx. 1% of the rated voltage (see the table undermentioned).

Notching position of V/Hz characteristics volume (V.F.ADJ) : 3/10

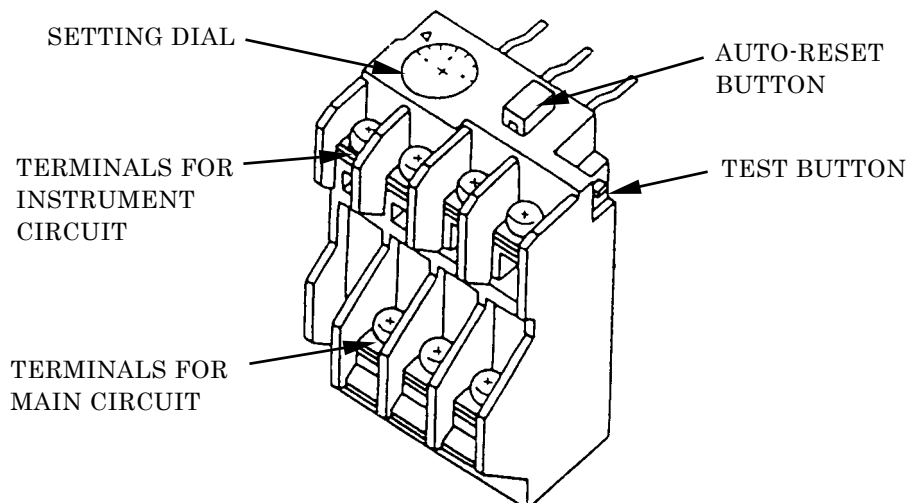
| Voltage Frequency | 240V | 480V |
|----------------------|------|------|
| 57Hz | 238V | 475V |

3. The frequency compensation characteristic and V/Hz corner frequency are shown in the following table.



3. Electrical Parts

3.2.5 Thermal relay



Thermal relay set value

| | unit | SDG25S-6A7 | | SDG45S-6A6 | | SDG65S-6A6 | |
|--|------|------------|-----|------------|-----|------------|-----|
| Rated voltage | V | 240 | 480 | 240 | 480 | 240 | 480 |
| Rated current | A | 60 | 30 | 108 | 54 | 152 | 76 |
| Detected current at rated operation | A | 30 | | 54 | | 76 | |
| CT ratio | | 5/100 | | 5/150 | | 5/100 | |
| Wound rolls (Rolls of cables through CT) | | 2 rolls | | 2 rolls | | 1 roll | |
| Set value | A | 3.0 | | 3.3 | | 3.5 | |

| | unit | SDG100S-6A6 | | SDG125S-6A6 | | SDG150S-6A6 | |
|--|------|-------------|-----|-------------|-----|-------------|-----|
| Rated voltage | V | 240 | 480 | 240 | 480 | 240 | 480 |
| Rated current | A | 241 | 120 | 300 | 150 | 361 | 180 |
| Detected current at rated operation | A | 120 | | 150 | | 180 | |
| CT ratio | | 5/200 | | 5/200 | | 5/300 | |
| Wound rolls (Rolls of cables through CT) | | 1 roll | | 1 roll | | 1 roll | |
| Set value | A | 2.8 | | 3.5 | | 2.8 | |

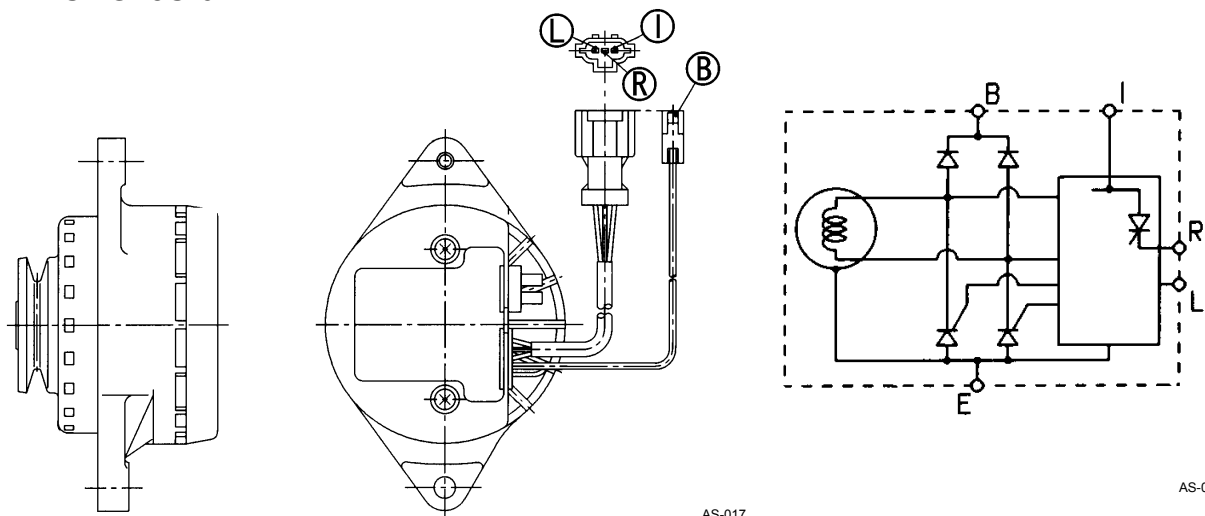
Tripping of over current is set to be reset automatically.

3. Electrical Parts

3.3 Electric Parts of Engine

3.3.1 Alternator

SDG25S-6A7



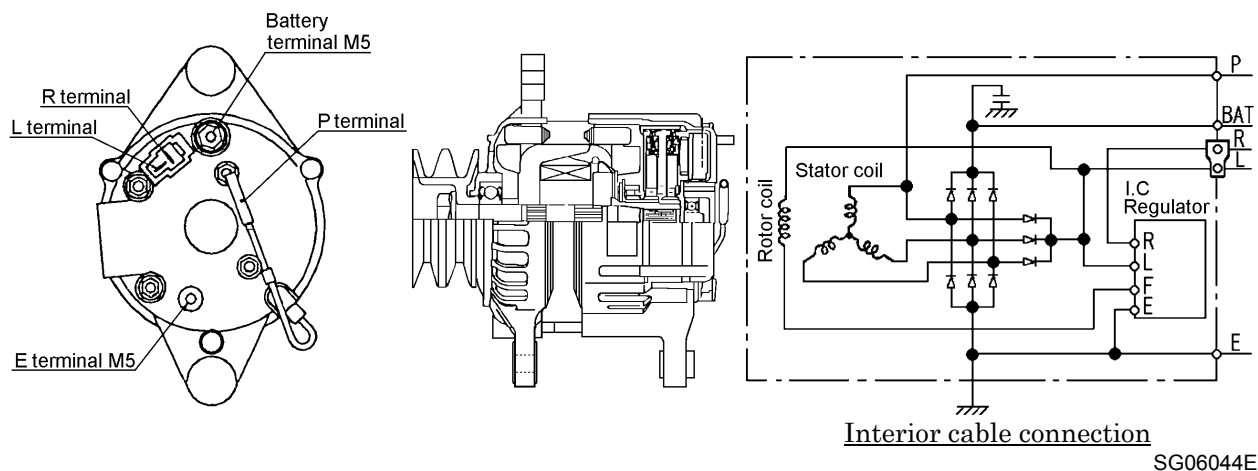
AS-017

AS-006

| | |
|----------------------------|--------------------|
| Voltage - Current | 12 V - 20 A |
| Regulator adjusted voltage | 13.8 V \pm 0.5 V |

3. Electrical Parts

SDG45S-6A6



(1) List of functions

| Pin No. | Line color | Connection | Explanation of function |
|---------|------------|--|--|
| BAT | R | Charge relay 2nd terminal | Power for charging voltage |
| R | R/W | Fuse 10A | Detect output voltage from alternator and adjust the current flowing to rotor coil |
| L | W | Tachometer with hour meter CN6-1 terminal | Power for hour meter functioning |
| | | Controller CN2-6 terminal | For switching off warning lamp for charging battery |
| | | Time relay (QHS controller) CN1-6 terminal | Power for stopping after-heat |
| 1 P | Y/B | Safety relay CN4-1 terminal | For separating starter When the frequency of P terminal exceeds $190 \pm 10\text{Hz}$, safety relay contact changes and separates starter motor. |
| E | B | Grounding | |

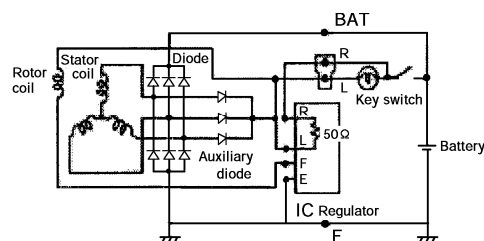
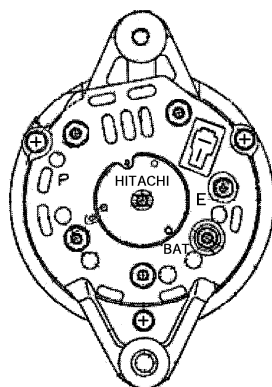
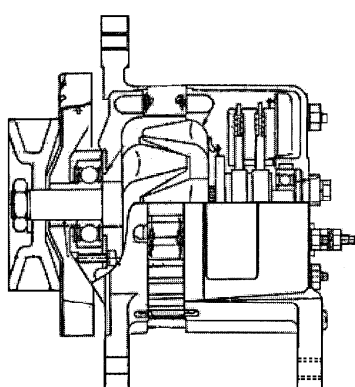
1 : For failure diagnosis of P terminal, the generated voltage between P-E terminals will be normal if it reaches about DC7.2V.

(2) Judgement of alternator functions

| | |
|--|------------------------|
| Checking method by measuring battery terminal at full load operation | Normal Value |
| Measure the battery terminal voltage at full load operation. | $14.4 \pm 0.3\text{V}$ |

3. Electrical Parts

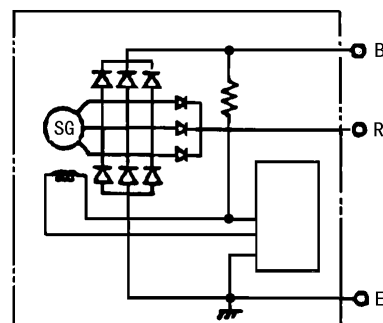
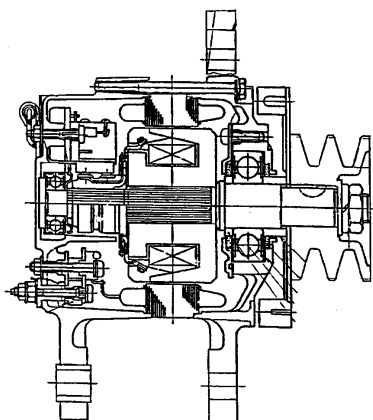
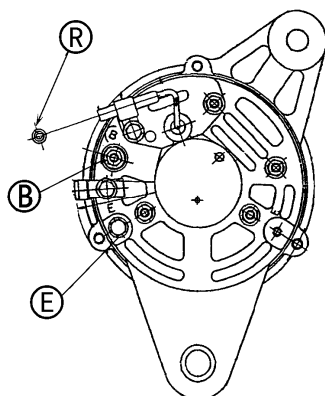
SDG65S-6A6



SG15004E

| | |
|----------------------------|--------------------|
| Voltage — Current | 12 V — 35 A |
| Regulator adjusted voltage | 14.5 V \pm 0.3 V |

SDG100S-6A6



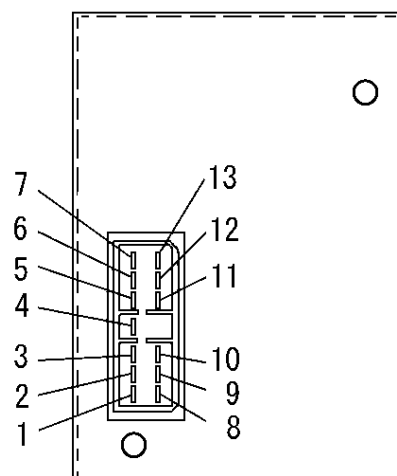
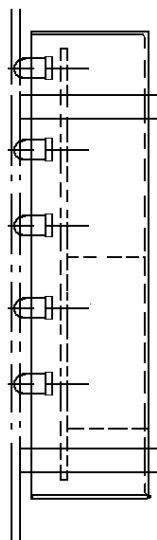
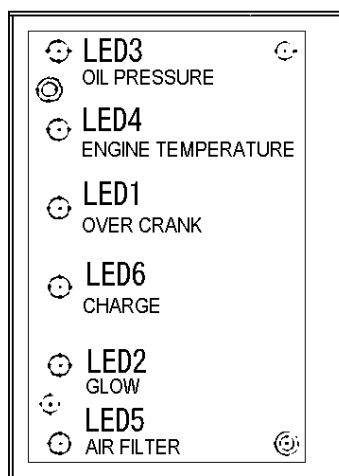
SDG-004

| | |
|----------------------------|------------------|
| Voltage — Current | 24 V — 25 A |
| Regulator adjusted voltage | 28.5 V \pm 1 V |

AS-018

3. Electrical Parts

3.3.2 Controller



SG06045E

SDG25S-6A7,45S ~ 100S-6A6(Emergency controller)

List of functions

| Pin No. | Line color | Connection | Function |
|---------|-------------------|--|---|
| 1 | 1 L/R (Y/R) | 2 Solenoid (motor stopper) relay No.1 terminal | During normal operation the interior contact is ON between No.1 terminal and No.8 terminal. When emergency stop device functions, the interior contact will be OFF between No.1 terminal and No.8 terminal, and it cuts the output to solenoid (motor stopper) relay to perform emergency stop. |
| 2 | W/R | Three phase breaker (via diode) Auto start unit No.3 terminal | During normal operation, the interior contact between No.2 and No.9 terminal is OFF. When emergency stop device functions in case of engine failure, the contact between No.2 terminal and No.9 terminal is ON, and voltage is added to the shunt coil and makes the breaker OFF. Also engine abnormal signal is sent to the auto start unit No.3 terminal. |
| 3 | B | Grounding | |
| 4 | - | NIL | |
| 5 | L/Y | 3 Time relay No.5 (No.6) terminal | While electrically conducted, pre-heater lamp is ON. When controller No.10 is electrically conducted, voltage will be applied to time relay No.5 (No.6) from No.5 terminal, and it ignites pre-heating lamp. The pre-heating time will be controlled by time relay. |
| 6 | W | 4 Alternator R (L) terminal | When voltage is applied from alternator R (L) terminal, charging warning lamp goes off, and about 10 seconds later the circuit of abnormality detecting oil pressure drop begins to function. |

3. Electrical Parts

| Pin No. | Line color | Connection | Function |
|---------|------------|--|---|
| 7 | G/W | Engine water temperature switch for emergency stop | During normal operation, engine water temperature switch is kept ON. The contact between No.1 and No.8 terminals becomes OFF at the condition OFF of engine water temperature switch, it cuts electric supply to solenoid (motor stopper) relay so that engine can be stopped. Emergency stop setting temperature SDG25S,45S : 230°F (110) SDG65S,100S : 221°F (105) |
| 8 | R/Y | Starter switch ACC terminal Auto start unit No.7 terminal | Power supply for excitation of solenoid (motor stopper) relay |
| 9 | R/W | 10A fuse | Power supply for output to 3 phase breaker shunt coil and auto start unit No.3 terminal |
| 10 | R/Y | Starter switch ACC terminal Auto start unit No.7 terminal | Power supply |
| 11 | L/W | Auto start unit No.4 terminal | During normal operation, there is no conductivity. During auto start operation, even after cranking operation is performed three times, it will not start. When it becomes difficult to start, starting difficulty signal begins from auto start unit No.4 terminal. Controller No.11 terminal receives this signal to ignite overcrank warning lamp. |
| 12 | G/Y | Air filter differential pressure indicator | During normal operation, air filter differential pressure indicator becomes OFF. When air filter differential pressure indicator goes ON to ignite air filter clogging lamp. Set differential pressure for actuation : more than 6.2kPa |
| 5 13 | G/R | Emergency stop engine oil pressure switch | During normal operation, engine oil pressure is ON. When No.6 terminal receives generation signal of alternator, and engine oil pressure is OFF, contact between No.1 terminal and No.8 terminal becomes OFF and it cuts conductivity to solenoid (motor stopper) relay for engine emergency stop. Set pressure for emergency stop SDG25S, 65S,100S : less than 14.2psi (0.1MPa) SDG45S : less than 21.3psi (0.15MPa) |

1 : Color in parenthesis shows the line color of SDG100S.

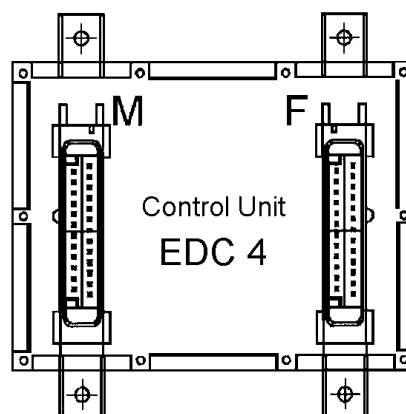
2 : Connection point in parenthesis shows that of SDG65S/100S.

3 : Connection point in parenthesis shows that of SDG100S.

4 : Connection point in parenthesis shows that of SDG45S/65S.

5 : Abnormality detection by No.13 terminal is performed by delay timer at start up and alternator generation signal is inputted to CN2-6 terminal. Then after about 10 seconds later, the abnormal detection circuit begins to function.

3. Electrical Parts



SG06063

SDG125S/150S-6A6(Control unit EDC 4)

List of functions

| Pin No. | Line color | Connection | Function | | | | | | | | | | | |
|---------------|---|--|--|------|---|--|-----|----|-------------|----|----|---------------|-----|----|
| M-1 | - | NIL | | | | | | | | | | | | |
| M-2 | - | NIL | | | | | | | | | | | | |
| M-3 | L/Y | Glow relay No.2 terminal | When pre-heating is done, the contact between M-3 terminal and F-1 terminal is ON, and electrically conducted. | | | | | | | | | | | |
| | | Emergency indicator CN16-5 terminal | | | | | | | | | | | | |
| M-4 | - | NIL | | | | | | | | | | | | |
| M-5 | - | Fuel temperature sensor No.1 terminal | Detect fuel temperature between M-5 and M-8 terminals. | | | | | | | | | | | |
| M-6 | - | NIL | | | | | | | | | | | | |
| M-7 | - | NIL | | | | | | | | | | | | |
| M-8 | - | Fuel temperature sensor No.2 terminal | Grounding | | | | | | | | | | | |
| | | Coolant temperature sensor No.2 terminal | | | | | | | | | | | | |
| M-9 | - | Coolant temperature sensor No.1 terminal | Detect coolant temperature between M-9 and M-8 terminals. | | | | | | | | | | | |
| | | | Characteristics of pre-heating and after-heating Times of pre-heating and after-heating are controlled by Control unit EDC4 according to the coolant water temperature at engine starting. The characteristics by the coolant water temperature are as mentioned the below table. | | | | | | | | | | | |
| | | | <table><tr><th rowspan="2">Item</th><th colspan="2">Time (second) of electricity according to the coolant water temperature</th></tr><tr><th>-30</th><th>10</th></tr><tr><td>pre-heating</td><td>50</td><td>38</td></tr><tr><td>after-heating</td><td>180</td><td>35</td></tr></table> | Item | Time (second) of electricity according to the coolant water temperature | | -30 | 10 | pre-heating | 50 | 38 | after-heating | 180 | 35 |
| Item | Time (second) of electricity according to the coolant water temperature | | | | | | | | | | | | | |
| | -30 | 10 | | | | | | | | | | | | |
| pre-heating | 50 | 38 | | | | | | | | | | | | |
| after-heating | 180 | 35 | | | | | | | | | | | | |
| | | | Time of electricity to the heater changes straight from -30 to 10 of coolant water temperature. Pre-heating is not working on the coolant water temperature more than 10 at the starting. | | | | | | | | | | | |

3. Electrical Parts

| Pin No. | Line color | Connection | Function |
|---------|------------|-------------------------------------|---|
| M-10 | - | Speed sensor (option) No.1 terminal | Grounding |
| M-11 | - | Speed sensor (option) No.2 terminal | Detect engine speed between M-11 and M-10 terminals. |
| M-12 | - | Speed sensor No.1 terminal | Grounding |
| M-13 | - | Speed sensor No.2 terminal | Detect engine speed between M-13 and M-12 terminals. |
| M-14 | - | Speed regulator No.1 terminal | See Workshop Manual EDC 4 (BY VOLVO PENTA) |
| M-15 | - | Speed regulator No.2 terminal | |
| M-16 | - | Shielded cable | |
| M-17 | - | Speed regulator No.3 terminal | |
| M-18 | - | Speed regulator No.6 terminal | |
| M-19 | - | Speed regulator No.4 terminal | |
| M-20 | - | Oil pressure sensor No.3 terminal | Grounding |
| M-21 | - | Oil pressure sensor No.2 terminal | Detect engine oil pressure between M-21 and M-20 terminals. |
| M-22 | - | Oil pressure sensor No.1 terminal | +5V |
| M-23 | - | NIL | |
| M-24 | - | NIL | |
| M-25 | - | NIL | |

For the details of each function, see Workshop Manual of Control unit EDC4 by VOLVO PENTA.

| Pin No. | Line color | Connection | Function |
|---------|------------|-------------------------------------|--|
| F-1 | B | Grounding | |
| F-2 | - | NIL | |
| F-3 | G/W | Emergency indicator CN16-7 terminal | When engine water temperature rises, the interior contact between F-3 and F-1 terminals becomes ON and electrically conducted. Then the warning lamp for engine water temperature rise goes on. Lamp for temperature rise : 230°F (110) Temperature for emergency stop : 235°F (113) Temperature for lamp OFF : 228°F (109) |
| F-4 | L/B | Emergency indicator CN16-6 terminal | During normal operation, no electric conductivity exists. When engine is in trouble, it is electrically conducted to make the emergency diagnosis lamp flicker. |
| F-5 | - | NIL | |
| F-6 | - | NIL | |
| F-7 | - | NIL | |
| F-8 | B/L | Connector fitting | See Workshop Manual EDC 4 (BY VOLVO PENTA) |
| F-9 | B/W | Connector fitting | |
| F-10 | - | NIL | |
| F-11 | - | NIL | |
| F-12 | - | NIL | |
| F-13 | - | NIL | |

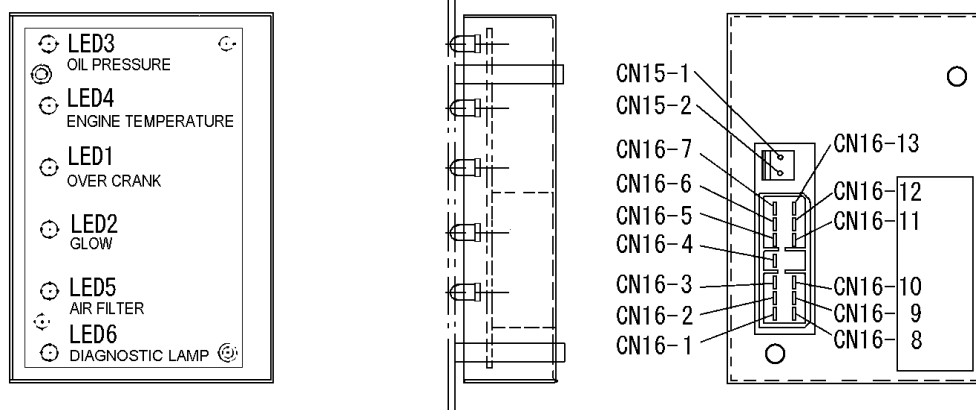
3. Electrical Parts

| Pin No. | Line color | Connection | Function |
|---------|------------|---|--|
| F-14 | R/Y | Starter switch ACC terminal Auto start unit CN6-7 terminal | Power supply |
| F-15 | G/R | Emergency indicator CN16-13 terminal | When engine oil pressure drops, the interior contact between F-15 and F-1 terminals becomes ON and electrically conducted. Then the warning lamp for engine oil pressure drops goes on. Lamp for engine oil pressure drops : less than 35.6psi (0.25MPa) Set pressure for emergency stop : less than 28.4psi (0.2MPa) |
| F-16 | - | NIL | |
| F-17 | Y/B | Emergency indicator CN16-4 terminal | During normal operation, no electric conductivity exists. When engine is in disorder electricity is supplied to this terminal. Also output signals to emergency Indicator CN16-4 terminal, depending on the abnormal conditions. While the diagnostic lamp of emergency indicator is flickering, press the diagnostic button to indicate the flickering patterns showing the degree of abnormal conditions. (For the details, see Workshop Manual EDC4 by VOLVO PENTA) |
| F-18 | - | NIL | |
| F-19 | - | NIL | |
| F-20 | - | NIL | |
| F-21 | - | NIL | |
| F-22 | - | Shielded cable | |
| F-23 | B | Speed control knob (Engine speed potentiometer) (-) terminal | Grounding |
| F-24 | W | Speed control knob (Engine speed potentiometer) signal input terminal | Engine speed can be adjusted minutely by changing resistance between F-24 and F-23 terminals. |
| F-25 | R | Speed control knob (Engine speed potentiometer) (+) terminal | +5V |

For the details of each function, see Workshop Manual of Control unit EDC4 by VOLVO PENTA.

3. Electrical Parts

3.3.3 Emergency indicator



SG06064

SDG125S/150S-6A6

List of functions

| Pin No. | Line color | Connection | Function |
|---------|------------|--------------------------------|--|
| CN15-1 | L | Auto start unit CN7-6 terminal | Put in the engine revolution pulse converted for tachometer by PLC unit of auto start unit. Revolution ratio (pulse type): 2 revolutions per 1 pulse |
| CN15-2 | W/G | Tachometer No.4 terminal | Output the engine revolution pulse to tachometer No.4 terminal. Revolution ratio (pulse type): 2 revolutions per 1 pulse |

List of functions

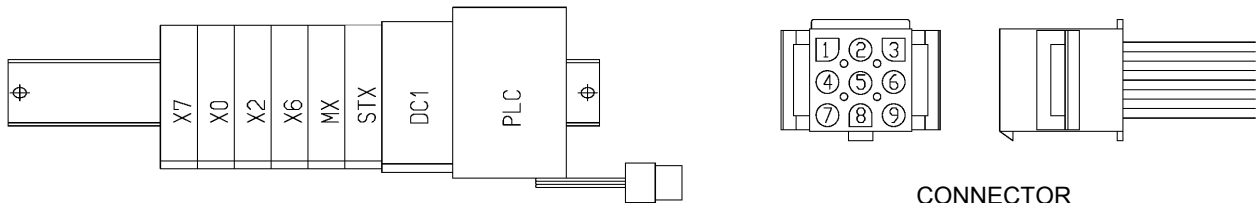
| Pin No. | Line color | Connection | Function |
|---------|------------|---|---|
| CN16-1 | Y/L | Auto start unit CN7-3 terminal | Output to auto start unit the engine revolution pulse detected by alternator W terminal. Revolution ratio (pulse type): 1 revolution per 6 pulses |
| CN16-2 | W/Y | Alternator W terminal | Detect engine revolution pulse. Revolution ratio (pulse type): 1 revolution per 6 pulses |
| CN16-3 | B | Grounding | |
| CN16-4 | Y/B | Controller F-17 terminal | During normal operation, it is not conducted electrically. Depending upon abnormal conditions, it inputs applicable signals from controller F-17 terminal. While the diagnostic lamp of emergency indicator is flickering, push a diagnostic button to indicate adequate flickering patterns depending the abnormal symptoms. [For the details, see Workshop Manual EDC 4 (BY VOLVO PENTA)] |
| CN16-5 | L/Y | Glow relay No.2 terminal Controller M-3 terminal | While engine is pre-heated, it is electrically conducted between controller M-3 terminals. Glow lamp goes on. |
| CN16-6 | L/B | Controller F-4 terminal | In case of engine trouble, it is electrically conducted to make diagnostic lamp flicker. |

3. Electrical Parts

| Pin No. | Line color | Connection | Function |
|---------|------------|--|---|
| CN16-7 | G/W | Controller F-3 terminal | When engine water temperature rises, it is electrically conducted to make warning lamp glow. |
| CN16-8 | B/Y | Auto start unit CN7-9 terminal | Grounding |
| | | Air filter differential pressure indicator | |
| CN16-9 | G/L | Auto start unit CN7-1 terminal | Power supply (DC24V power) for engine revolution pulse between CN16-1 and CN16-8 terminals. |
| CN16-10 | R/Y | Starter switch ACC terminal | Power supply |
| | | Auto start unit CN6-7 terminal | |
| CN16-11 | L/W | Auto start unit CN7-7 terminal | Starting difficulty signal input terminal. The signal of starting difficulty from auto start unit CN7-7 makes overcrank warning lamp glow. |
| CN16-12 | G/Y | Auto start unit CN7-5 terminal | When air filter differential pressure indicator gets clogged, electricity flows. Then air filter clogging warning lamp glows. |
| CN16-13 | G/R | Controller F-15 terminal | When engine oil pressure drops, electricity flows. Then engine oil pressure drop warning lamp glows. |

3. Electrical Parts

3.3.4 Auto start unit (Automatic operation unit)



SG06026

SDG25S-6A7,45S ~ 100S-6A6

List of functions

| Pin No. | Line color | Connection | Function |
|---------|-------------------|--------------------------------|--|
| 1 | 1 R/Y (Y/R) | Manual-Auto selector switch | Power for auto start unit. With No.1 terminal of auto start unit electrically conducted, when remote start/stop switch (exterior output terminal plate between A1-A2 terminals) is switched ON, XO relay begins to function. |
| 2 | W | 2 Alternator R (L) terminal | Input alternator generating signal. When generating signal is input from alternator R (L) terminal, X2 relay functions and voltage is applied to X2 terminal of PLC unit. When X2 terminal is electrically conducted, the interior contact of Y3 terminal switches OFF to cut the output to starter (safety) relay from No.8 terminal of auto start unit to stop auto start cranking function. |
| 3 | W/R | Controller No.2 terminal | Input engine trouble signal. When engine trouble signal is inputted from controller No.2 terminal, X6 relay begins to function and voltage is applied to X6 terminal of PLC unit to make the interior contact of Y3 terminal of the unit OFF to cancel auto re-start function. |
| 4 | L/W | Controller No.11 terminal | Output difficulty signal in starting. At auto start-up, the interior contact of PLC unit Y3 terminal becomes ON, and in case that within 10 seconds after start signal is given to starter (safety) relay, no voltage is applied to X2 terminal and auto start cranking function will not be carried out satisfactorily, make the interior contact of Y2 and Y3 terminals OFF once, and then repeat auto start operation according to the specified time. In case engine will not start even after three times repetition of this operation, the interior contact of PLC unit Y4 terminal becomes ON, output difficulty signal is starting to controller No.11 terminal. |

3. Electrical Parts

| Pin No. | Line color | Connection | Function |
|---------|------------|---|--|
| 5 | Y/W | Remote start/stop switch (Exterior output terminal plate through A1 terminal) | Remote start/stop switch connection terminal. When the remote start/stop switch is switched ON with No.1 terminal of auto start unit conducted electrically, XO relay begins to function. Consequently, the relay is put in order and power is supplied to PLC unit through 3 [voltage regulator (VR1)] and DC-DC converter (DC1). Further, by function of XO relay, voltage is applied to PLC unit XO terminal, and the interior contact of Y2 terminal becomes ON (pre-heating operation begins) and then after 4 seconds the interior contact of Y3 terminal becomes ON (starter motor begins cranking). Thus engine starts. When remote start/stop switch is switched OFF, also XO relay switch becomes OFF. But as electricity is supplied 5 seconds from PLC unit P3 terminal to PLC unit itself, the interior contact becomes OFF after engine cooling down operation continues 5 seconds, and engine stops. In case the emergency stop button on operation panel is pressed, engine stops immediately because the power for auto start unit No.1 terminal is cut off. |
| 6 | - | NIL | |
| 7 | R/Y | Starter switch ACC terminal | Power supply for engine start at auto start-up. When PLC unit XO terminal is electrically conducted with remote start/stop switch ON, the interior contact of PLC unit Y2 terminal becomes ON, and auto start unit No.7 terminal is electrically conducted after 2 seconds to start pre-heating operation. |
| | | Magnetic switch | |
| | | Controller No.8 and No.10 terminal | |
| 8 | R/L | Starter switch C terminal | Output start signal at auto start-up. When PLC unit XO terminal is electrically conducted with remote start/stop switch ON, the interior contact of PLC unit Y3 terminal becomes ON and start signal is outputted to starter (safety) relay from auto start unit No.8 terminal. |
| | | Starter (Safety) relay Start signal input terminal 4 | Regarding the output of start signal, after alternator generating signal is given to auto start unit No.2 terminal, and PLC unit X2 terminal is electrically conducted, the interior contact of Y3 terminal becomes OFF and cuts the output. Consequently auto start cranking operation stops. |
| 9 | B | Grounding | |
| T7 | - | Generator unit T7 terminal | Detect generating power from generator unit (L1-L3). |
| T9 | - | Generator unit T9 terminal | Without no electrical conductivity, on X7 relay at auto start-up and voltage applied to X7 terminal, switch OFF the interior contact of Y2 and Y3 to stop engine start function and to cancel the auto re-start function. |

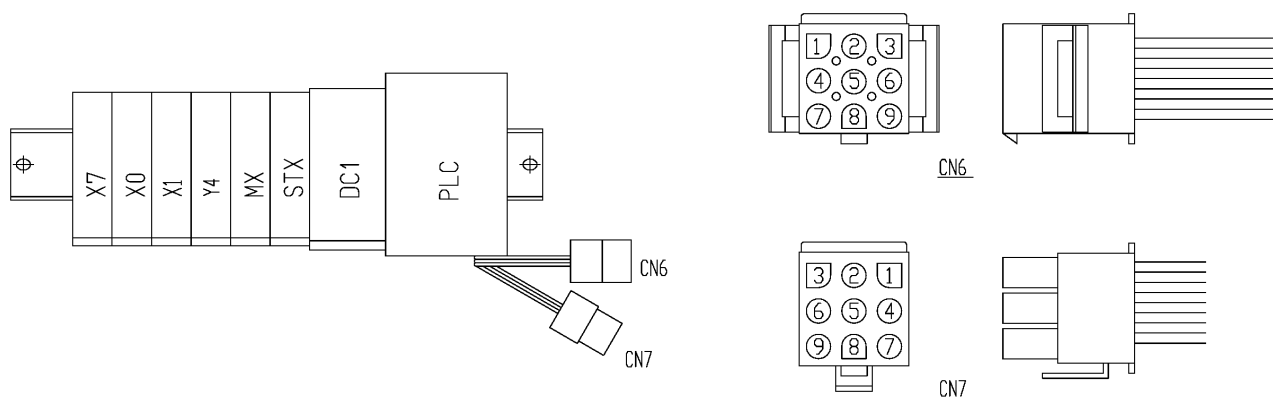
1 : The colours in the parenthesis show those of SDG45S/65S/100S.

2 : The connection in the parenthesis shows that of SDG45S/65S.

3 : The device in the parenthesis shows that only SDG25S is equipped with this device.

4 : The device in the parenthesis shows that of SDG45S/65S/100S.

3. Electrical Parts



CONNECTOR

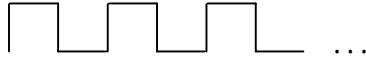
SG06027

SDG125S/150S-6A6-

List of functions

| Pin No. | Line color | Connection | Function |
|---------|------------|---|--|
| CN6-1 | Y/R | Manual-Auto selector switch | Power for XO relay of remote start /stop switch. With auto start unit No.1 terminal electrically conducted, when remote start/stop switch (exterior output terminal plate between A1-A2 terminals) is switched ON, XO relay begins to function. |
| CN6-2 | W | Tachometer No.2 terminal | Power for hour meter functioning signal. When the engaging (starting) signal from starter motor is given to CN7-4 terminal, X1 relay functions, and voltage is applied to PLC unit X1 terminal. And then the interior contact of Y4 terminal becomes ON. Consequently, the hour meter starting signal is outputted to tachometer No.2 terminal from auto start unit No.2 terminal. |
| CN6-3 | L/R | Starter relay No.2 terminal | Overrun and re-entry prevention circuit of starter motor. |
| CN6-4 | - | NIL | |
| CN6-5 | Y/W | Remote start/stop switch (Exterior output terminal plate via A1 terminal) | <p>Remote start/stop switch connecting terminal. When remote start/stop switch is switched ON with auto start unit No.1 terminal electrically connected, XO relay functions. Consequently, the relay will be switched ON and then electricity is supplied to PLC unit through DC12V-DC24V converter (DC1). Further, voltage is applied to PLC unit XO terminal, and the interior contact becomes ON 2 seconds later (pre-heating starts) and the interior contact of Y3 terminal becomes ON after 4 seconds (starter motor begins cranking) and engine starts.</p> <p>When remote start/stop switch is switched OFF, XO relay switch is also switched OFF, but electricity is supplied 5 seconds from PLC unit P3 terminal to PLC unit itself, engine will stop after the interior contact between P1-P3 terminals becomes OFF after 5 seconds engine cooling down operation.</p> <p>When the emergency stop button on operation panel is pressed, power supply to auto start unit No.6 terminal is cut, and engine stops immediately.</p> |

3. Electrical Parts

| Pin No. | Line color | Connection | Function |
|---------|------------|--------------------------------------|--|
| CN6-6 | B/R | 15A fuse | Power supply for auto start unit. |
| CN6-7 | R/Y | Starter switch ACC terminal | Manual starting operation Power supply for auto start unit. During manual operation, power is supplied to hour meter functioning signal output, engine revolution speed detection and change, prevention of starter motor overrun and re-entry, air filter clogging detection are performed by auto start unit. |
| | | Controller F-14 terminal | During automatic operation Power supply for engine starting. When remote start/stop switch is switched ON and PLC unit XO terminal is electrically conducted, the interior contact of Y2 terminal becomes ON after 2 seconds, auto start unit No.7 terminal is electrically conducted to start pre-heating operation. |
| | | Emergency indicator CN16-10 terminal | |
| CN6-8 | R/L | Starter switch C terminal | Output start signal at auto start-up. When PLC unit XO terminal is electrically conducted with remote start/stop switch ON, the interior contact of PLC unit Y3 terminal becomes ON after 4 seconds and start signal is outputted to starter relay from auto start unit No.8 terminal. Regarding the output of start signal, after starter motor engaging signal (starting) is given to auto start unit CN7-4 terminal, and PLC unit X1 terminal is electrically conducted, the interior contact of Y3 terminal becomes OFF and cuts the output. Consequently auto start cranking operation stops. After the output of start signal, in case of no input signal of starter motor engaging indication to CN7-4 terminal (no engagement), the interior contact of Y3 terminal turns ON and OFF every one second, and the output of start signal is repeated. Even after repeated it for 10 seconds and in case of no input signal of starter motor engaging indication to CN7-4 terminal, the interior contact of Y2 and Y3 terminals becomes OFF once, and try again auto start operation at the designated timing. |
| | | Starter relay No.1 terminal | <Movement of the interior contact of Y3 terminal > one second ON OFF  ... one second 10 seconds |
| CN6-9 | B | Grounding | |

3. Electrical Parts

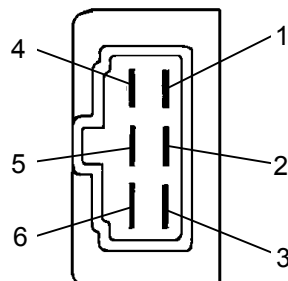
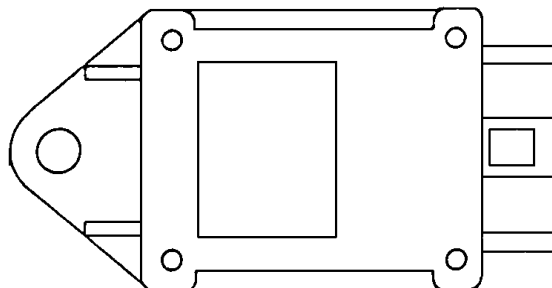
List of functions

| Pin No. | Line color | Connection | Function |
|---------|------------|---|--|
| CN7-1 | G/L | Emergency indicator CN16-9 terminal | Power supply (DC24V) for output of engine revolution pulse outputted between emergency indicator CN16-1 and CN16-8 terminals. |
| CN7-2 | Y/G | Air filter differential pressure indicator | Detection of air filter differential pressure indicator clogging. |
| CN7-3 | Y/L | Emergency indicator CN16-1 terminal | Input of engine revolution pulse. Revolution ratio (pulse type): 1 revolution per 6 pulses |
| CN7-4 | W/L | Starter motor | Input of starter motor engaging indication signal (starting). |
| CN7-5 | G/Y | Emergency indicator CN16-12 terminal | Output of air filter clogging warning signal. |
| CN7-6 | L | Emergency indicator CN15-1 terminal | Outputting engine revolution pulse converted for tachometer by PLC unit. Revolution ratio (pulse type): 2 revolutions per 1 pulse |
| CN7-7 | L/W | Emergency indicator CN16-11 terminal | Output of starting difficulty signal. During automatic starting operation, the interior contact of PLC unit Y3 terminal becomes ON and after start signal is outputted to starter relay, within 10 seconds no voltage is applied to X1 terminal, and auto start cranking is finished unsuccessfully, the interior contact of Y2 and Y3 terminals should be OFF once, and try again auto start operation timely. In case that engine will not start even after three times trials, the interior contact of PLC unit Y5 terminal should be switched ON and starting difficulty signal should be outputted. |
| CN7-8 | - | NIL | |
| CN7-9 | B/Y | Emergency indicator CN16-8 terminal Air filter differential pressure indicator | Grounding |
| T7 | - | Generator unit T7 terminal | Detection of generation of generator unit (L1-L3). |
| T9 | - | Generator unit T9 terminal | When engine is automatically started, it is not electrically conducted to X7 relay and also no voltage is applied to X7 terminal, the interior contact of PLC unit Y2 and Y3 terminals should be switched OFF to stop engine and at the same time its auto re-start function should be cancelled. |

3. Electrical Parts

3.3.5 Glow timer

SDG25S-6A7,SDG65S-6A6(QOS timer)



(1) List of functions

| Pin No. | Line color | Connection | Function |
|---------|------------|--------------------------------|---|
| 1 | B | Grounding | |
| 2 | G/R | Glow relay | For exciting glow relay For pre-heating function, it forms excitation circuit with connection of No.1 terminal (grounding). When starter switch is switched ON, pre-heat lamp goes on and pre-heating starts. While starter motor starting signal is inputted to No.6 terminal from safety relay No.6 (C) terminal, the pre-heating operation continues irrespective of cooling water temperature. |
| 3 | B/W | Water temperature sensor | Detection of water temperature |
| 4 | R/W | 10A fuse | Power supply |
| 5 | L/Y | Controller No.5 terminal | Pre-heating LED glows. During pre-heating operation, LED glows, connected to No.1 terminal (grounding). |
| 6 | W | Safety relay No.6 (C) terminal | Detection of start signal |

The items in the parenthesis show the connection points of SDG65S.

3. Electrical Parts

(2) Characteristics of water temperature and glowing time (Key OFF ON)

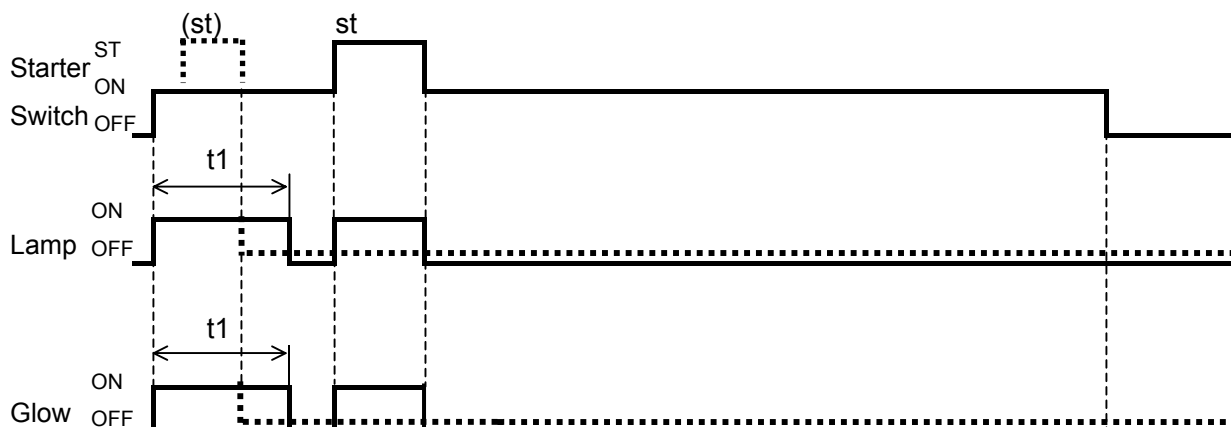
SDG25S-6A7

| Water temperature [°F ()] | Lamp glows• Glowing time t1 (seconds) |
|-------------------------------|---------------------------------------|
| 5 (-15) | 5 |
| 68 (20) | 2 |
| 122 (50) | 1 |

SDG65S-6A6

| Water temperature [°F ()] | Lamp glows• Glowing time t1 (seconds) |
|-------------------------------|---------------------------------------|
| 5 (-15) | 5 |
| 41 (5) | 1 |
| 104 (40) | 0.5 |

(3) Chart of function



(st) shows the chart of function at which the starter switch is located at the st point.

(4) Cooling water temperature sensor (for automatic pre-heater)

SDG25S-6A7

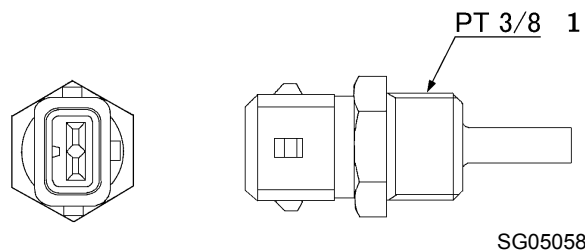
Water temperature and resistance characteristics

| Water temperature [°F ()] | Resistance (kΩ) |
|-------------------------------|-----------------|
| 14 (-10) | 1.0 |
| 68 (20) | 2.5 |
| 122 (50) | 0.785 |

SDG65S-6A6

Water temperature and resistance characteristics

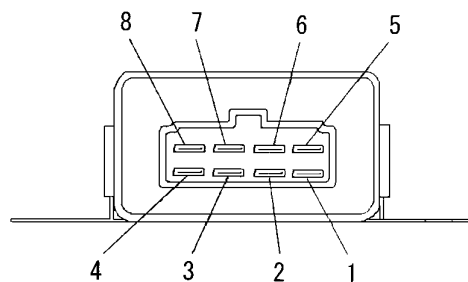
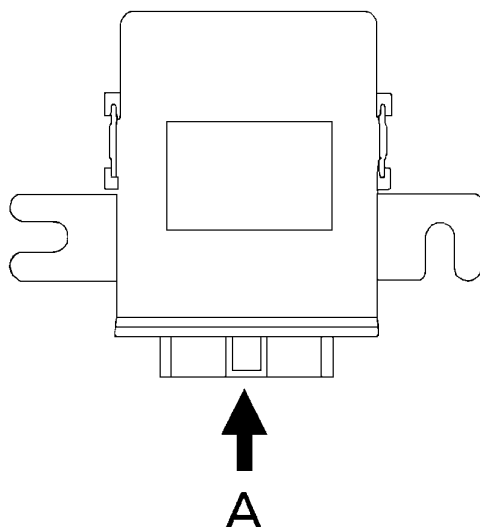
| Water temperature [°F ()] | Resistance (kΩ) |
|-------------------------------|-----------------|
| -4 (-20) | 16.1 |
| 68 (20) | 2.37 |
| 176 (80) | 0.29 |



1: All the threaded portions should be covered with sealing agent. (Vibra-seal 516 made by LOCTITE)

3. Electrical Parts

SDG45S-6A6 (QHS controller)



Connector View A- arrow

SG06065

(1) List of functions

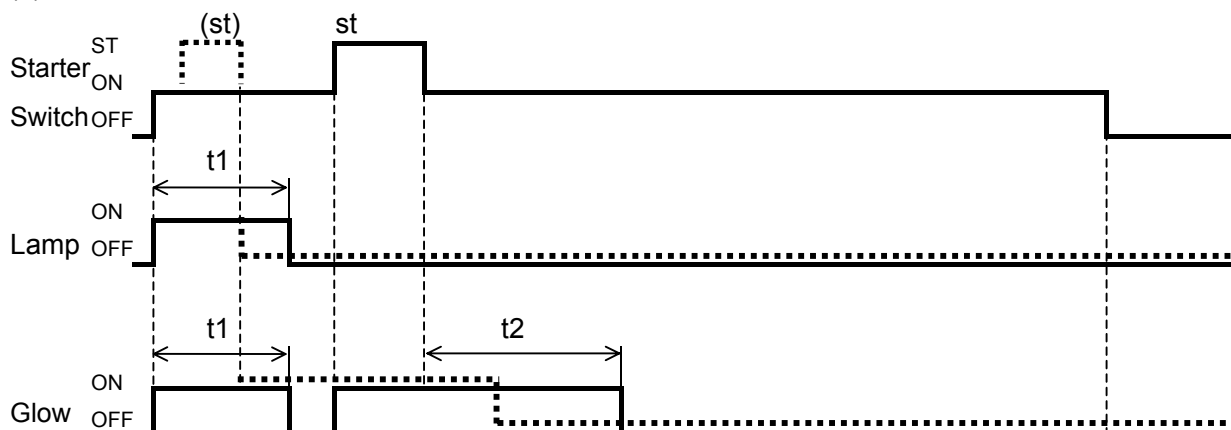
| Pin No. | Line color | Connection | Function |
|---------|------------|------------------------------|--|
| 1 | - | NIL | |
| 2 | R/W | 10A fuse | Power supply |
| 3 | W | Alternator L terminal | Detection of generation signal In case that no start signal is sent to No.3 terminal after No.8 terminal detects start signal, it cuts the output of No.4 terminal, and it will not perform after heating. |
| 4 | G/R | Heater relay excitation coil | Power supply for excitation of heater relay When start signal is inputted to No.8 terminal, it begins pre-heating irrespective of water temperature. |
| 5 | L/Y | Controller No.5 terminal | While electricity flows, pre-heat lamp glows. When electricity is given to No.2 terminal, the contact between No.6 and No.5 terminals becomes ON for a certain time (t1) and the pre-heating lamp glows. Further, while the pre-heating lamp glows, if start signal reaches No.8 terminal, the contact between No.6 and No.5 terminals gets OFF, and then the lamp goes off. |
| 6 | B | Grounding | |
| 7 | B/W | Water temperature sensor | Detection of water temperature |
| 8 | R/L | Starter switch C terminal | Detection of starter signal |

3. Electrical Parts

(2) Water temperature and glow time characteristics (Key OFF ON)

| Water temperature [°F ()] | Lamp glows and glowing time t1 (seconds) | Time of afterheating t2 (seconds) |
|-------------------------------|---|--------------------------------------|
| 5 (-15) | 19 | 190 |
| 32 (0) | 2 | 75 |
| 50 (10) | 1 | 48 |

(3) Chart of function



The location marked **st** shows the chart of function located at the point where the starter switch is located at the position (st).

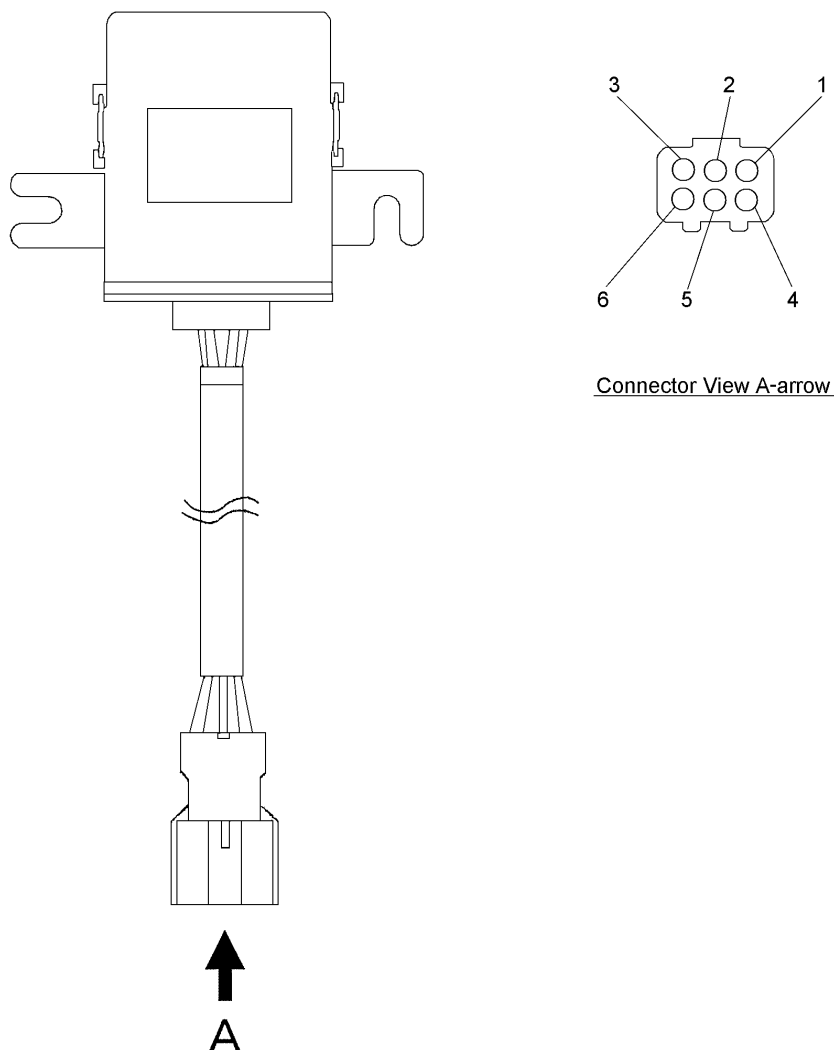
(4) Cooling water sensor (for automatic pre-heating)

Water temperature and resistance characteristics

| Water temperature [°F ()] | Resistance (kΩ) |
|-------------------------------|-----------------|
| -22 (-30) | 26.7 |
| 68 (20) | 2.5 |
| 122 (50) | 0.84 |
| 176 (80) | 0.325 |

3. Electrical Parts

SDG100S-6A6(QOS)



SG06046E

(1) List of functions

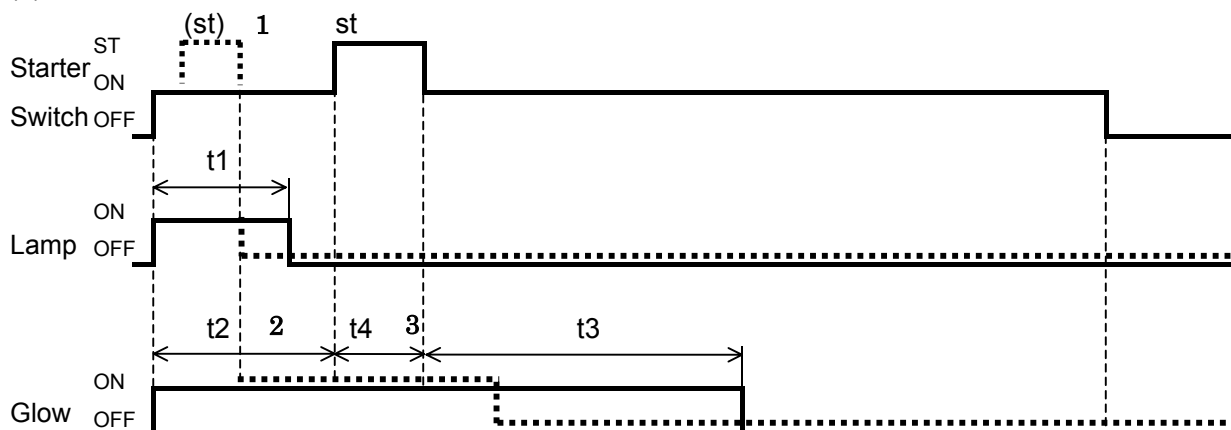
| Pin No. | Line color | Connection | Function |
|---------|------------|--------------------------|---|
| 1 | R/W | 10A fuse | Power supply |
| 2 | B/W | Water temperature switch | Detection of water temperature |
| 3 | W/Y | Safety relay C terminal | Detection of start signal |
| 4 | G/R | Glow relay | Power supply for excitation of glow relay When start signal is inputted to No.3 terminal, it preheats irrespective of water temperature. |
| 5 | B | Grounding | |
| 6 | L/Y | Controller No.5 terminal | While is electrically conducted, pre-heating lamp glows. When electricity is given to No.1 terminal, the contact between No.5 and No.6 terminals becomes ON and the pre-heat lamp glows. Further, while pre-heat lamp glows, and when start signal is inputted to No.3 terminal, the contact between No.5 and No.6 terminals becomes OFF and lamp goes off. |

3. Electrical Parts

(2) Water temperature and glow time characteristics (Key OFF ON)

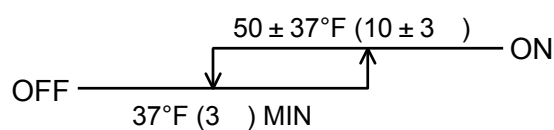
| Water temperature | Lamp lighting time t1 (seconds) | Pre-glow time t2 (seconds) | After glow time t3 (seconds) |
|--|---------------------------------|----------------------------|------------------------------|
| Within $50 \pm 37^{\circ}\text{F}$ (10 ± 3) | 8 | 30 | 30 |
| More than $50 \pm 37^{\circ}\text{F}$ (10 ± 3) | 0.3 | 0 | 0 |

(3) Chart of function




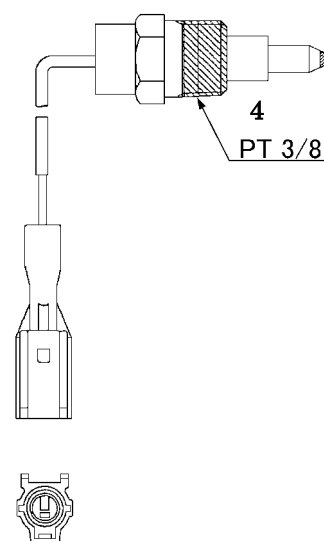
- 1 : (st) shows the chart of function at the location where the starter switch is positioned.
- 2 : In case that water temperature is less than $50 \pm 37^{\circ}\text{F}$ (10 ± 3), even after the preheating lamp goes off, pre-glow continues 22 seconds. However, when you start (cranking)(t4) engine during pre-glowing operation (t2), it will be switched to the after-glow (t3) after engine starts.
- 3 : While engine is cranking(t4), preheating functions irrespective of water temperature.

(4) Water temperature switch characteristics



- 4 : Upon installation, the screwing portion should be coated with sealant "SEALOCK #10 THREEBOND". Use torque wrench or nut runner. (Do not use impact wrench influencing percussion.)

 : $25.3 \pm 3.6\text{lbw}\cdot\text{ft}$ [$34.3 \pm 4.9\text{N}\cdot\text{m}$ ($350 \pm 50\text{kgf}\cdot\text{cm}$)]

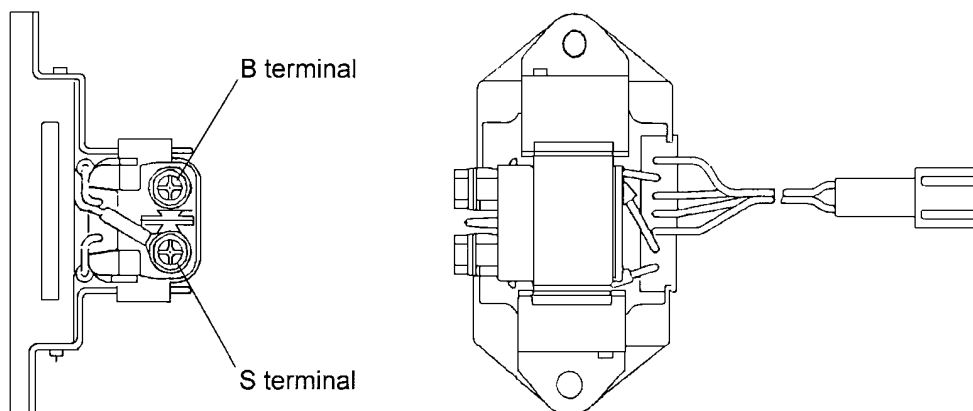


SG05059

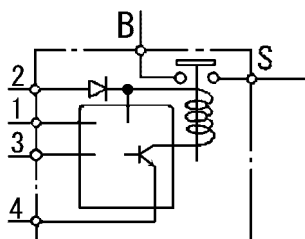
3. Electrical Parts

3.3.6 Safety relay

SDG45S-6A6



SG06023E



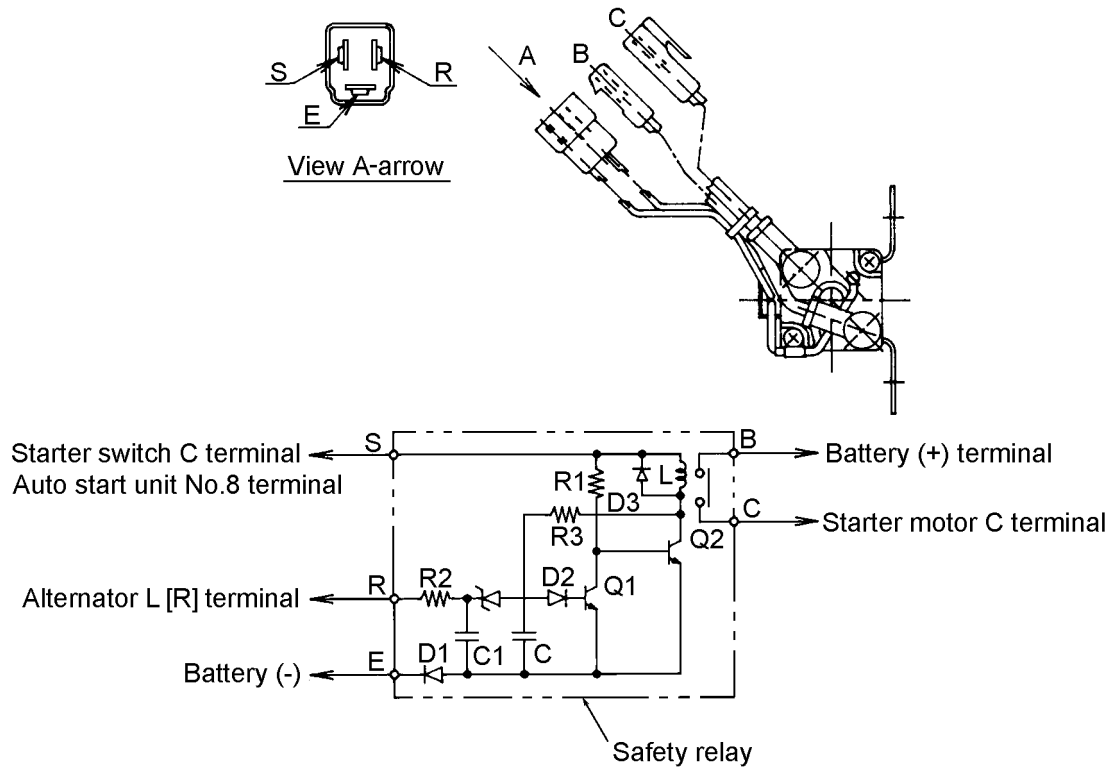
SG06024

List of functions

| Pin No. | Line color | Connection | Function |
|---------|------------|-------------------------------|--|
| B | Y | Starter motor B terminal | Power supply for starting of starter motor |
| | | Battery (+) | |
| S | W | Starter motor S terminal | When voltage is applied to No.1 terminal, the contact between B-S terminals turns ON, it applies voltage to starter terminal. |
| 1 | R/L | Starter switch C terminal | For input terminal of start signal |
| | | Auto start unit No.8 terminal | |
| 2 | Y/B | Alternator P terminal | Detecting alternator frequency, and the frequency exceeding $190 \pm 10\text{Hz}$, the contact between B-S terminals turns OFF. |
| 3 | B | Grounding | |
| 4 | R/W | 10A fuse | For power supply |

3. Electrical Parts

SDG65S/100S-6A6



SG06025E

The R in the parenthesis shows connection point of SDG100S.

Function

1) Starting operation while stopping

- When voltage is applied to S terminal from starter switch or auto start unit No.8 terminal, the input from B terminal will be outputted from C terminal, and starter begins to rotate and then engine starts.
- When the output voltage DC21.5V of alternator is applied to R terminal after engine starts, the input from B terminal will not be outputted from C terminal so that the starter stopper rotation.

2) Starting operation during operation

- While engine is running, the output voltage (more than DC22.5V) is applied to R terminal. So even after voltage is applied to S terminal from starter switch the starter will not rotate because the input from B terminal is not outputted from C terminal.

3. Electrical Parts

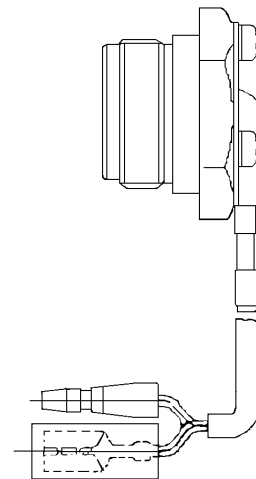
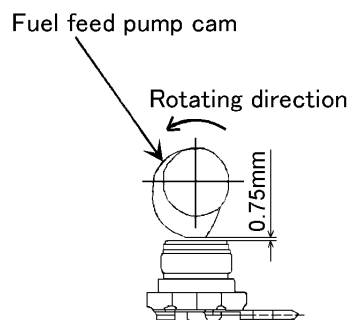
3.3.7 Tachosensor

SDG65S-6A6

(1) Checking whether voltage generated between terminals is proper or not

| | |
|--|---|
| During operation at the rated conditions | With the clearance of 0.0295in. (0.75mm) between the feed pump cam and the extreme end of tachosensor, it is proper if the voltage generated between tachosensor terminals is more than 1.4V. |
|--|---|


To measure the voltage generated between tachosensor terminals, measure it using ACV range of digital tester.



SG05081E

(2) Installation

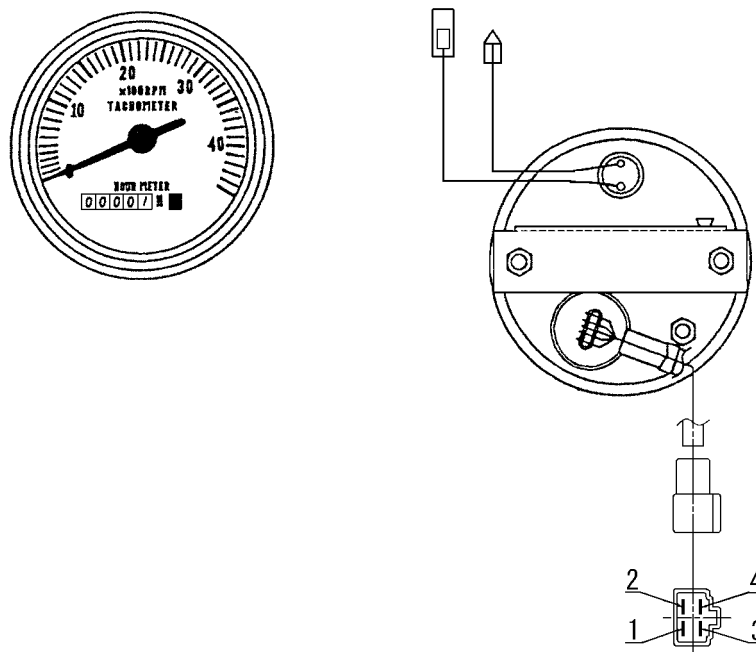
Screw in the tachosensor to the indicated position under the feed pump and tighten it according the specified tightening torque. Consequently, the clearance of 0.0295in. (0.75mm) between the extreme end of the tachosensor and feed pump cam is secured.

 : 39.8 ~ 54.2lbw·ft [53.9 ~ 73.5N·m (550 ~ 750kgf·cm)]

3. Electrical Parts

3.3.8 Tachometer (with hour meter)

SDG25S-6A7,SDG45S ~ 150S-6A6



The figure shows the tachometer at of SDG25S/45S/125S/150S

SG06028

(1) Specifications

| | SDG25S/45S/125S/150S | SDG65S/100S |
|-------------------------------|---------------------------|-------------|
| Operation voltage | 10 ~ 16V | 20 ~ 30V |
| Operation temperature | -4 ~ 140°F (-20 ~ 60) | |
| Revolution ratio (pulse type) | 2 revolutions per 1 pulse | |

(2) List of functions

| Pin No. | Line color | Connection | Function |
|----------------|--------------|---|-------------------------------------|
| 1 | B | Grounding | |
| 2 | W | Alternator [Auto start unit CN6-2 terminal] | Input of hour meter function signal |
| 3 | R/W | 10A fuse | Power supply for tachometer |
| 4 | G/W (W/G) | Tachosensor + terminal [Emergency indicator CN15-2 terminal] | Detection of engine revolutions |
| Male coupler | Y/W | Panel light switch | Power supply for lighting |
| Female coupler | B | Grounding | For lighting |

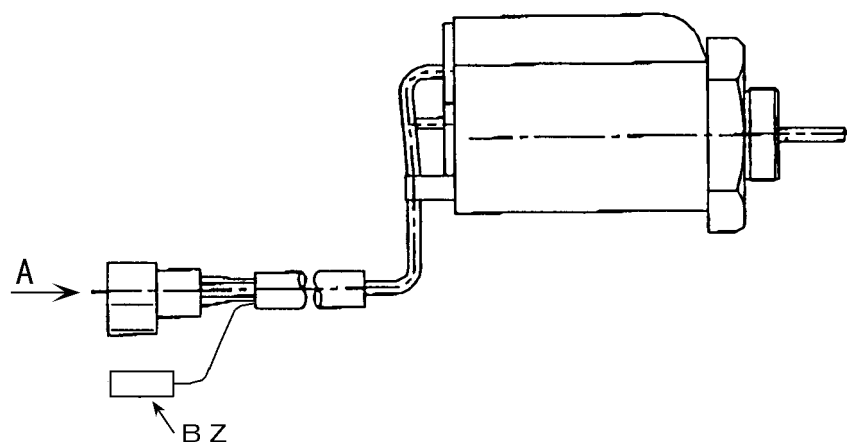
The connection in parenthesis [] shows that of SDG125S/150S.

The line colors in parenthesis () shows those of SDG100S/125S/150S.

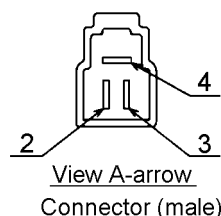
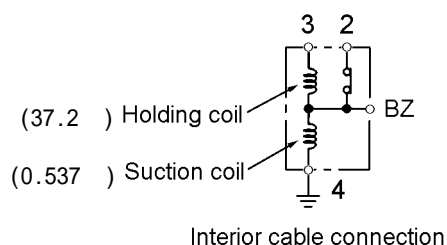
3. Electrical Parts

3.3.9 Stop solenoid

SDG25S-6A7

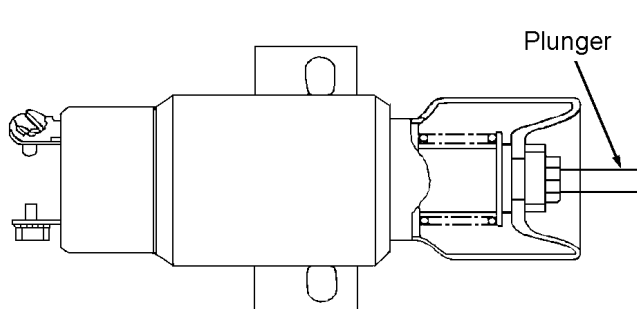


SDG-006

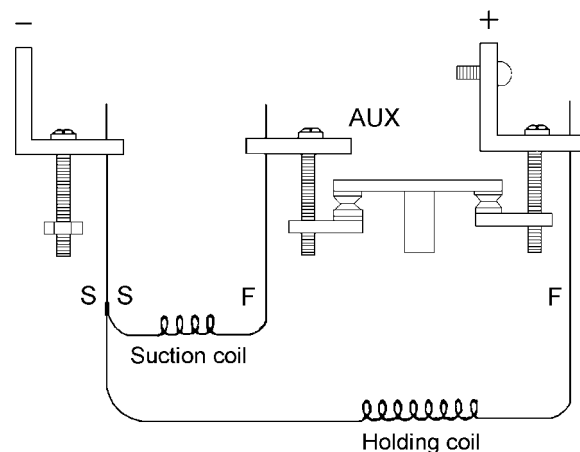


SG06029E

SDG45S-6A6



SG06030E



SG06031E

(1) Specifications

| | |
|--------------|-------|
| Suction coil | 41A |
| Holding coil | 0.75A |

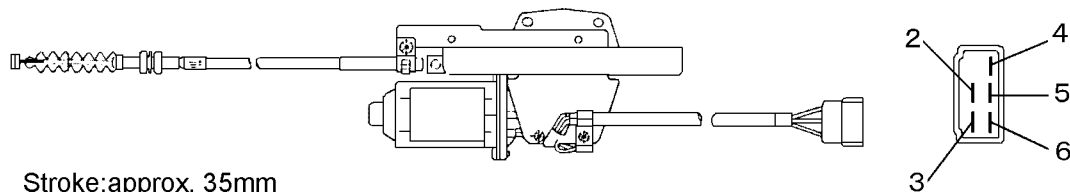
(2) Function

Turning starter switch ON, voltage is applied to plus (+) terminal, and current flows to parallel circuit of suction coil and holding coil to pull the plunger for stop solenoid at once. When the plunger is pulled, the contact between plus (+) terminal and AUX (auxiliary) terminal turns OFF and sends electricity to the holding coil only.

3. Electrical Parts

3.3.10 Motor stopper

SDG65S/100S-6A6



Stroke: approx. 35mm

SG06032E

(1) List of functions

| Pin No. | Line color | Connection | Function |
|---------|------------|---|------------------|
| 2 | L/B (L/W) | Motor stopper relay No.5 terminal (NO) | |
| 3 | G/L (L) | Motor stopper relay No.3 terminal (COM) | |
| 4 | B | Grounding | |
| 5 | Y/R (L/Y) | Motor stopper relay No.6 terminal (NC) | |
| 6 | W/G (L/R) | 10A(20A) fuse | For power supply |

The line colors in parenthesis show those of SDG100S.

(2) Function of motor stopper

1. Before engine starts

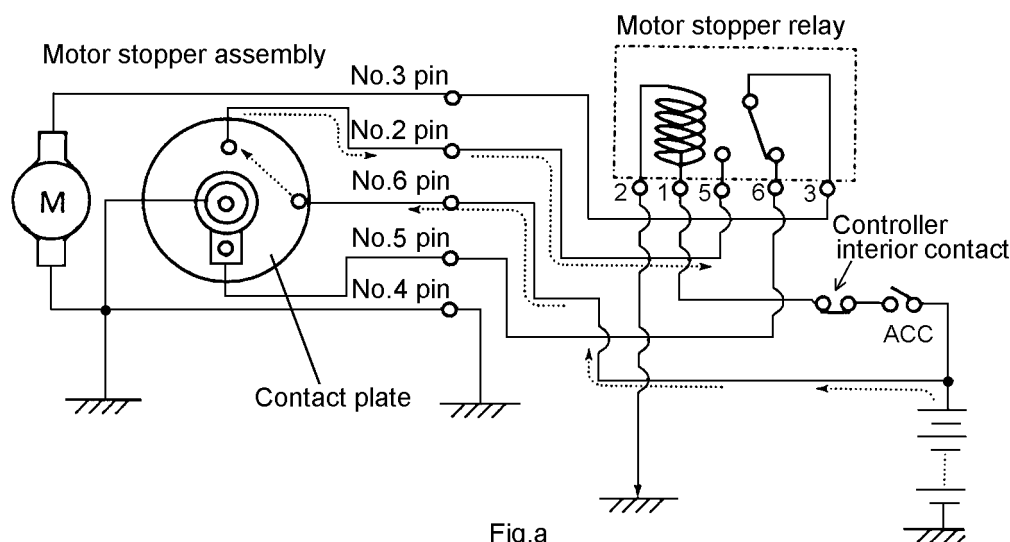


Fig.a

SG06033E

- 1) Before starting engine, the contact ACC of starter switch is kept open, and so excitation current will not be sent to motor stopper relay so that the interior contact is positioned at the condition shown in Fig a.
- 2) When the contact plate inside the motor stopper assembly is positioned shown in Fig a, there is electrical conductivity between connector No.6 terminal and No.2 terminal. Accordingly, battery voltage will be applied to motor stopper relay No.5 terminal.

3. Electrical Parts

2. Engine starts

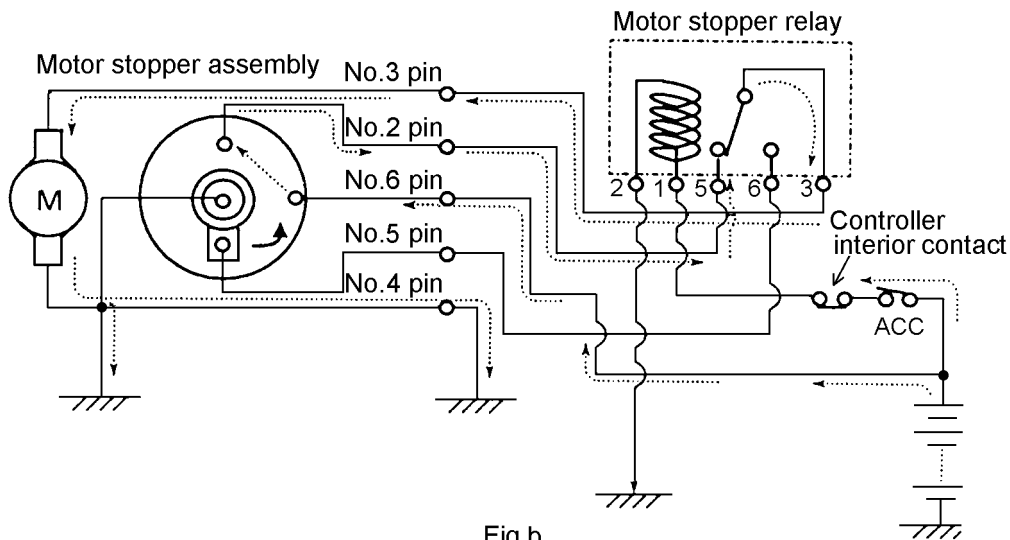


Fig.b

SG06034E

- 1) When closing ACC contact ("operation" position) for starting engine by handling starter switch, the following circuit will be formed ; controller interior contact → motor stopper relay No.1 terminal → excitation coil → motor stopper relay No.2 terminal → grounding and then the excitation coil of motor stopper relay will be excited. Consequently, the motor stopper relay contact begins to function.
- 2) As voltage is already applied to the motor stopper relay No.5 terminal, the following circuit will be formed: motor stopper relay No.5 terminal → motor stopper relay No.3 terminal → motor stopper assembly No.3 terminal → motor → grounding. Accordingly, the motor begins to rotate.

3. Electrical Parts

3. Rotation of contact plate

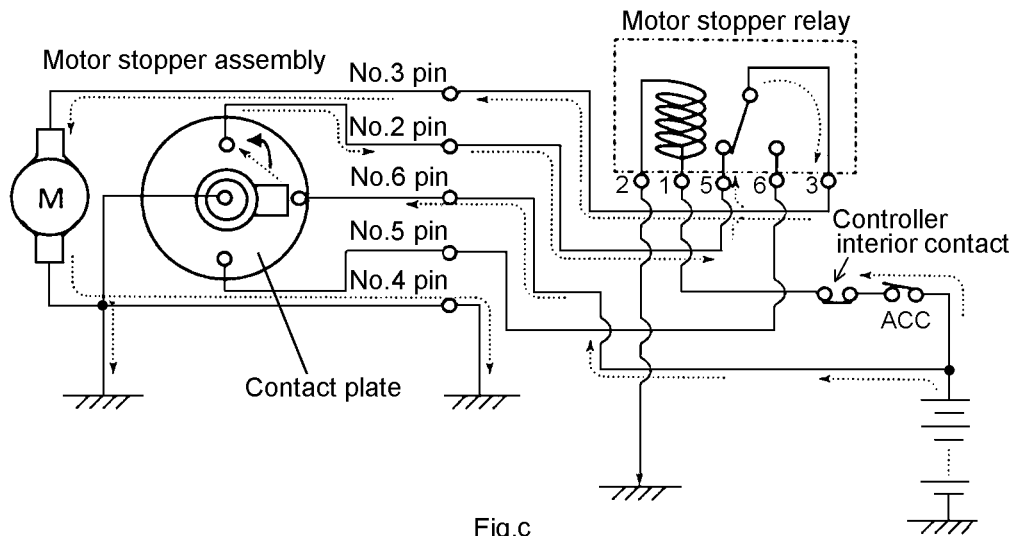


Fig.c

SG06035E

- 1) When motor begins to rotate, the worm fitted to the motor shaft rotates and at the same time worm wheel rotates.
- 2) The worm wheel and contact plate are interconnected and so it continues to rotate as shown in Fig c.

4. Stop of contact plate rotation

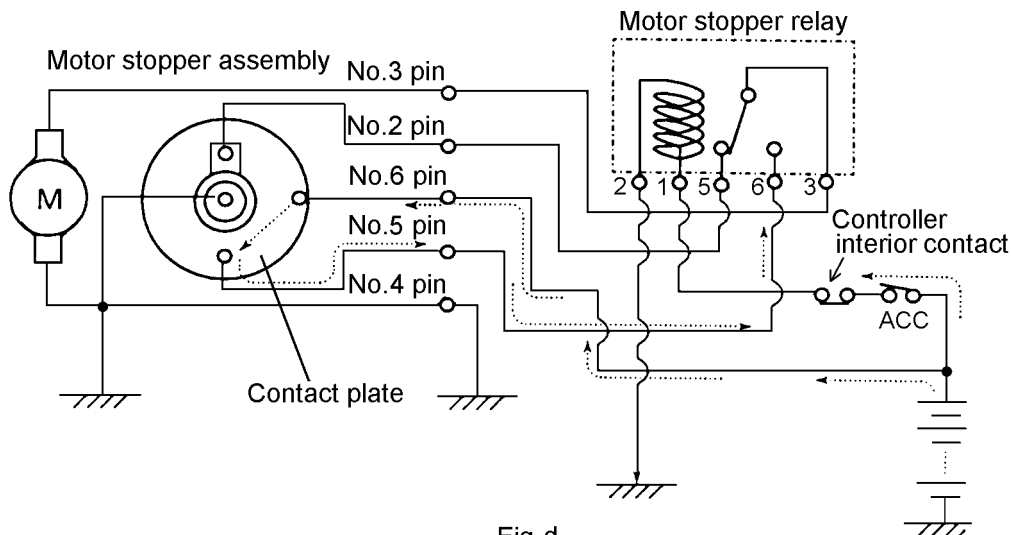


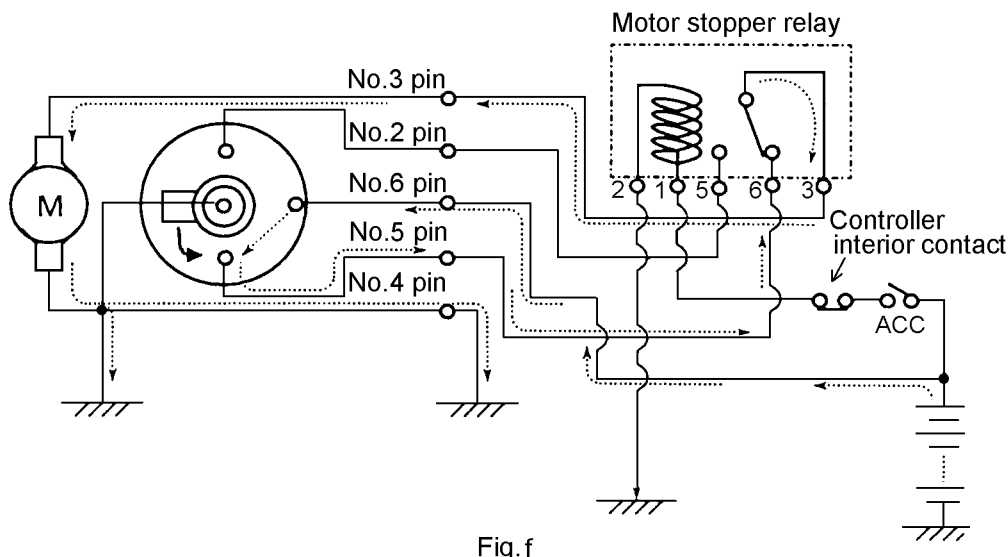
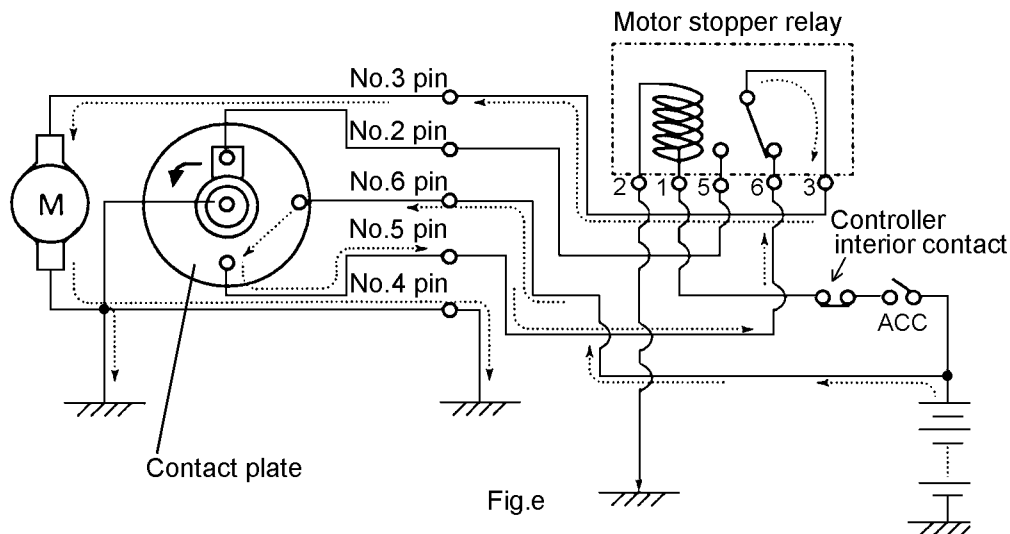
Fig.d

SG06036E

- 1) When contact plate turns to 180° from the position at which it does not begin to rotate, there will be no conductivity between No.6 and No.2 terminals, and then No.2 terminal will be connected to the grounding. Also the armature of motor will get short-circuited to electrically brake. Accordingly the contact plate will stop at the specified position.
- 2) At the same time worm rotation is reduced by worm wheel, and further the rotation will be changed for reciprocal movement via the lever. The stroke extends the wire to move the fuel lever fitted at the injection pump to open the fuel circuit.
- 3) When the contact plate is positioned in Fig d, there is no conductivity between No.6 and No.5 terminals, and battery voltage is applied to the motor stopper relay No.6 terminal.

3. Electrical Parts

5. Engine stops (normal stop)



SG06037E

- 1) To stop engine, handle starter switch to open BR contact ("Stop" position) so that excitation circuit of motor stopper relay may be released to move the contact point as shown in Fig e.
- 2) As battery voltage is applied to motor stopper relay No.6 terminal, the following circuit is formed: motor stopper relay No.3 terminal → motor stopper assembly No.3 terminal → motor → grounding, and motor rotates and contact plate rotates.
- 3) The contact plate continues to turn from 180° position shown Fig e to the 360° position in Fig a via Fig f position. At the same time when the contact plate rotates the wire is pulled to close fuel line circuit by the fuel line connected to injection pump to close the fuel circuit to stop engine.
- 4) Motor and contact plate stop to rotate at specified position in Fig a, and return to the position in the clause "1. Before engine starts".

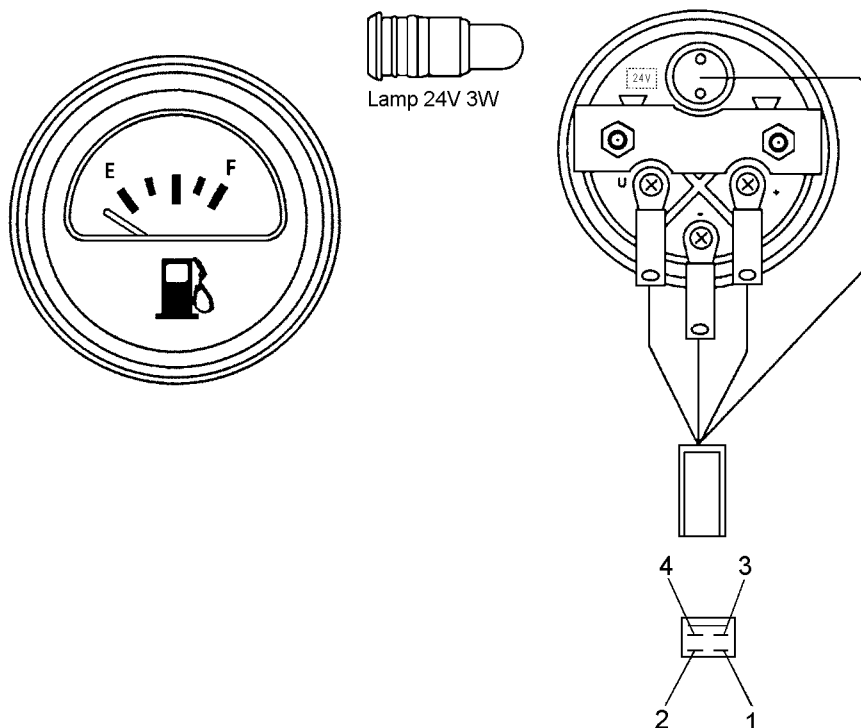
6. Emergency stop

- 1) In case of abnormal conditions such as engine oil pressure drop, engine water temperature drop, emergency stop circuit if controller functions to open the contact between controller No.8 and No.1 terminals to release excitation circuit of motor stopper relay. The process of engine stopping is the same process which is mentioned from 2) "5. Engine stops (normal stop)".

3. Electrical Parts

3.3.11 Fuel gauge

SDG25S-6A7, SDG45S ~ 150S-6A6



SG06038E

(1) Position of meter pointer

| Pointer position | Resistance value () | Remaining fuel [gal. (L)] |
|------------------|----------------------|---------------------------|
| E | 95 | approx. 4.6 (17.5) |
| 1/2 | 32.5 | 9.9 (37.5) |
| F | 7 | approx. 17.0 (64.5) |

marked : The figures of the remaining fuel in the table are for model SDG25S-6A7.

(2) List of functions

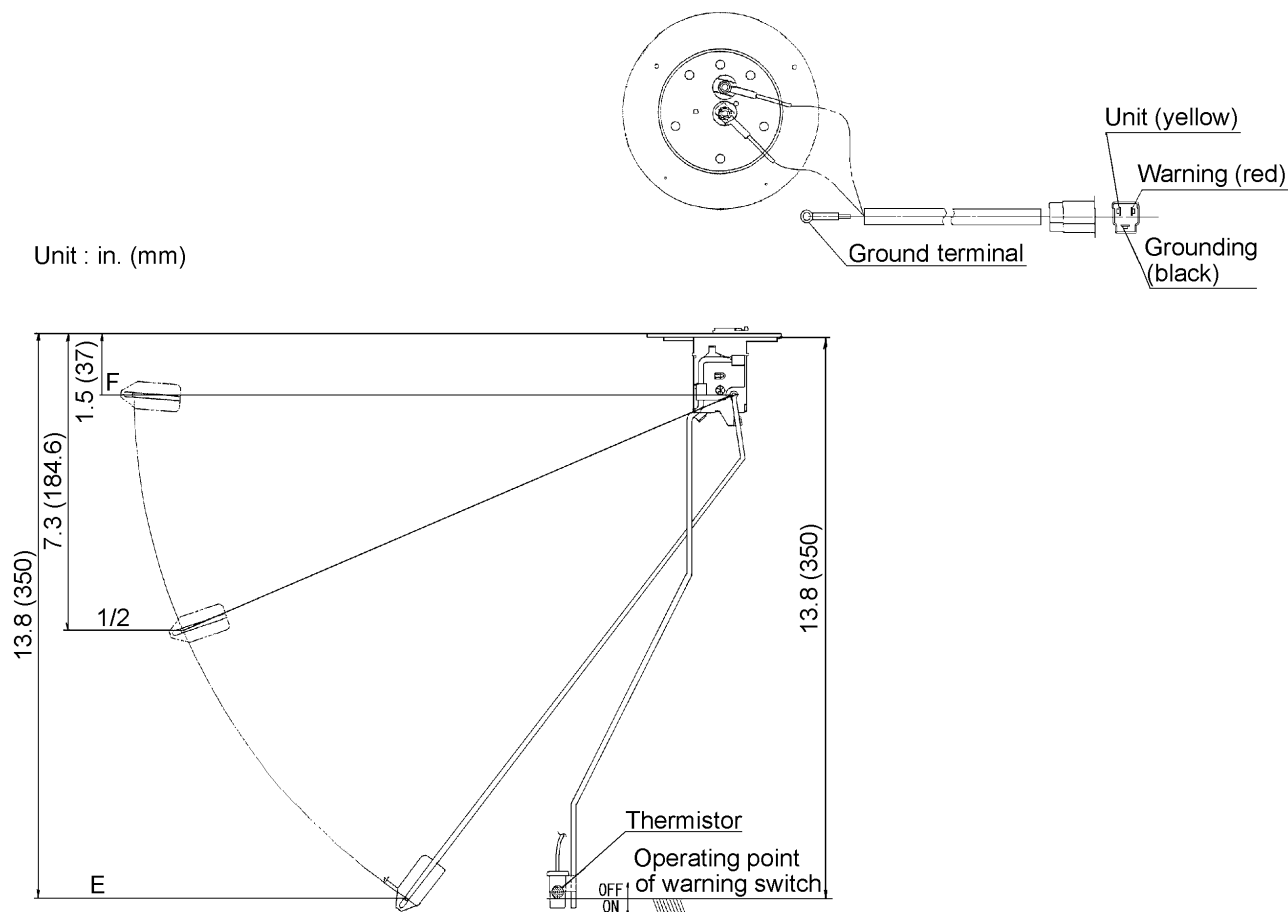
| Pin No. | Line color | Connection | Function |
|---------|------------|--------------------|-----------------------------|
| 1 | B | Grounding | |
| 2 | Y/W | Panel light switch | Power source for lighting |
| 3 | G (B) | Sending unit | Detector for remaining fuel |
| 4 | R/W | Fuse 10A | Power source for fuel gauge |

() marked indicates the line color for model SDG65S.

3. Electrical Parts

3.3.12 Sending unit

SDG25S-6A7 (equipped with thermistor sensor)



SG06066

(1) Position of meter pointer for resistance value

| Pointer position | Resistance value () | Remaining fuel [gal. (L)] |
|------------------|----------------------|---------------------------|
| E | 110 | 4.6 (17.5) |
| 1/2 | 32.5 | 9.9 (37.5) |
| F | 3 | 17.0 (64.5) |

(2) Specification of thermistor (for warning lamp indicating the shortage of remaining fuel)

| | |
|----------------|-------------|
| Rated voltage | DC 12V |
| Useful voltage | DC 11 ~ 15V |
| Rated load | DC12V 3.4W |

3. Electrical Parts

SDG45S ~ 150S-6A6

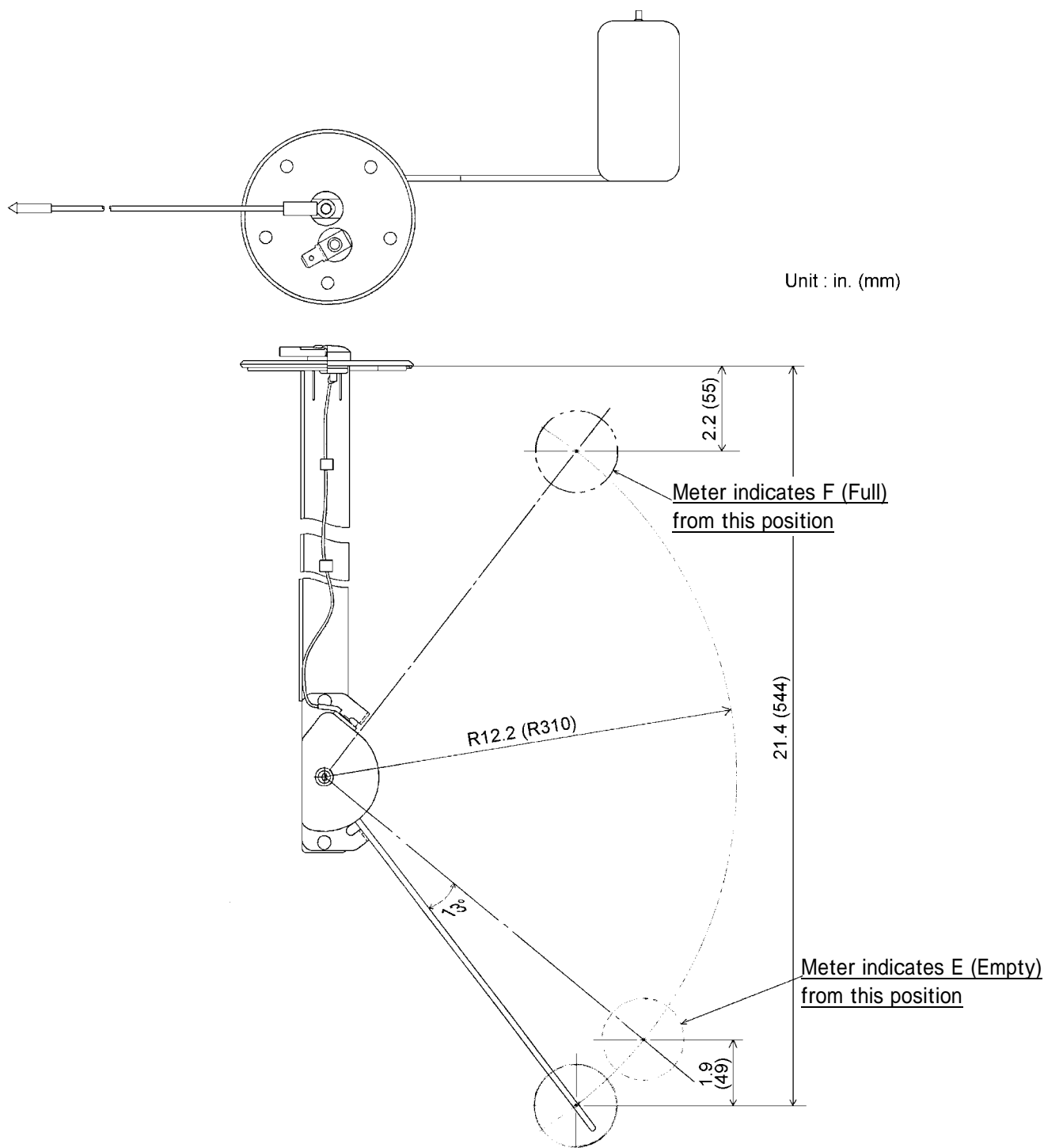


Diagram: Sending unit for SDG100S to SDG150S

SG06039

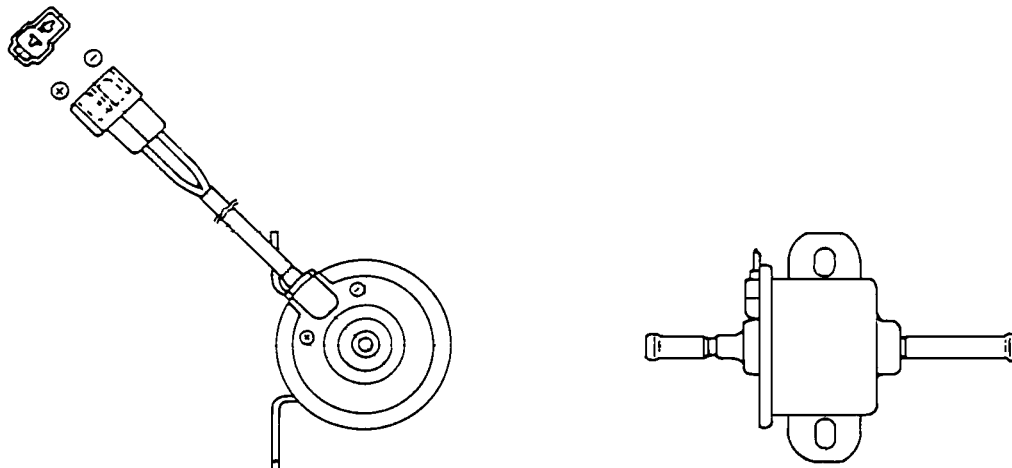
| Pointer position | Resistance value () | Remaining fuel [gal. (L)] | | | | |
|------------------|----------------------|---------------------------|------------|------------|------------|------------|
| | | SDG45S | SDG65S | SDG100S | SDG125S | SDG150S |
| E | 110 | 5.0 (19) | 3.7 (14) | 14.8 (56) | 11.1 (42) | 3.7 (14) |
| 1/2 | 32.5 | 15.6 (59) | 21.4 (81) | 35.7 (135) | 37.5 (142) | 41.0 (155) |
| F | 3 | 24.6 (93) | 31.4 (119) | 53.1 (201) | 60.0 (227) | 66.8 (253) |

3. Electrical Parts

3.3.13 Electro-magnetic pump for bleeding air from fuel line

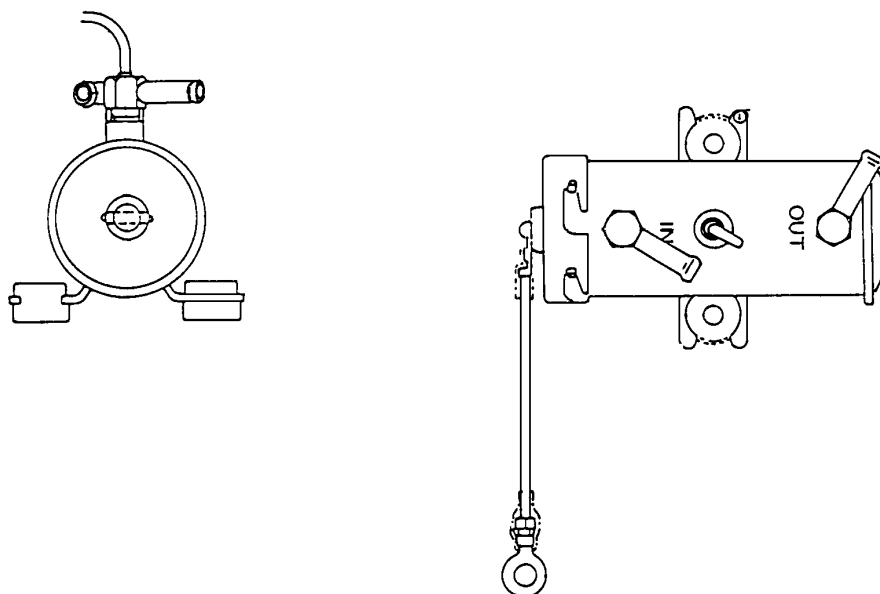
1. Type without filter

SDG25S-6A7,SDG45S-6A6



2. Type with built-in filter

SDG65S/100S-6A6



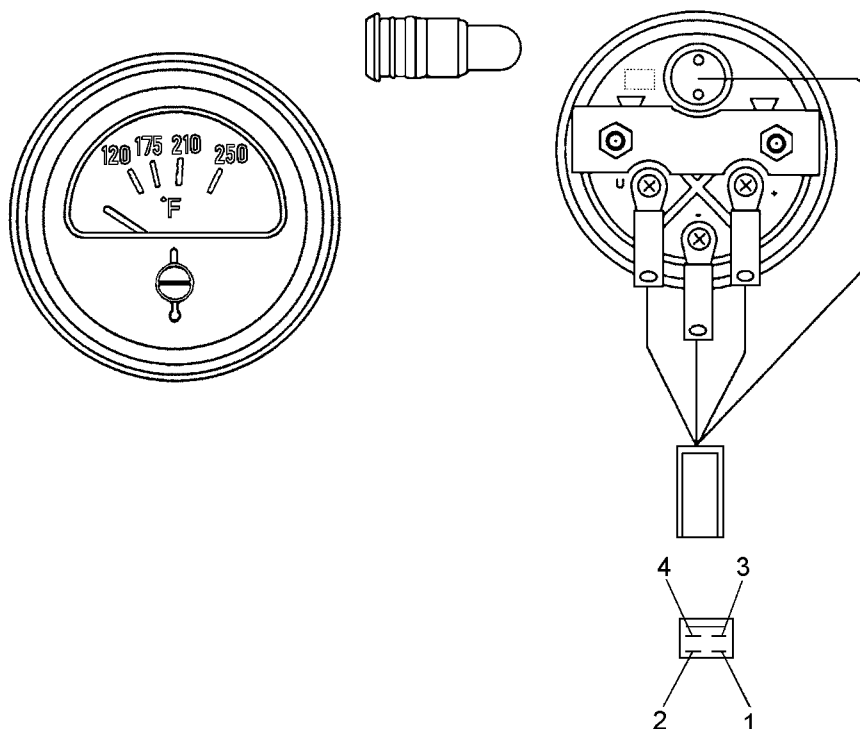
3. Specifications

| Model | SDG25S-6A7 | SDG45S-6A6 | SDG65S/100S-6A6 |
|-------------------|--|--|---|
| Rated voltage | 12V | 12V | 24V |
| Operating current | 1.5A (Max) | 1.5A (Max) | 1.5A (Max) |
| Delivery capacity | More than 0.21gal./min (0.8L/min) | More than 0.11gal./min (0.4L/min) | More than 0.37gal./min (1.4L/min) |

3. Electrical Parts

3.3.14 Coolant water temperature gauge

SDG25S-6A7,SDG45S ~ 150S-6A6



SG06040

(1) List of functions

| Pin No. | Line color | Connection | Function |
|---------|------------|--------------------------|--|
| 1 | B | Grounding | |
| 2 | Y/W | Panel light switch | Power source for lighting |
| 3 | W/B (Y) | Water temperature sensor | Detector for water temp |
| 4 | R/W | 10A fuse | Power source for water temperature gauge |

() marked indicates the line color for SDG45S.

(2) Temperature range and resistance value of sensor

SDG25S-6A7,SDG125S/150S-6A6

| Temperature range [°F ()] | Sensor resistance value () |
|-------------------------------|--------------------------------|
| 120 (49) | 156 |
| 175 (79) | 52.3 |
| 210 (99) | 28.4 |
| 250 (121) | 17 |

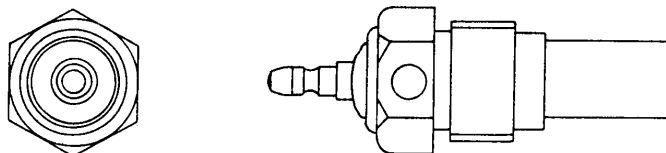
SDG45S/65S/100S-6A6

| Temperature range [°F ()] | Sensor resistance value () |
|-------------------------------|--------------------------------|
| 120 (49) | 350 |
| 160 (71) | 170 |
| 210 (99) | 63.5 |
| 250 (121) | 36.2 |

3. Electrical Parts

3.3.15 Thermo-sensor for water temperature gauge

SDG25S-6A7,SDG125S/150S-6A6



Characteristic of temperature resistance
SDG25S-6A7,SDG125S/150S-6A6

| Temperature [°F ()] | Resistance value () | Permissible value |
|-------------------------|-------------------------|----------------------|
| 122 (50) | (153.9) | |
| 176 (80) | 51.9 | ± 4.4 |
| 212 (100) | 27.4 | ± 1 |
| 248 (120) | (16.1) | |

SDG45S/65S/100S-6A6

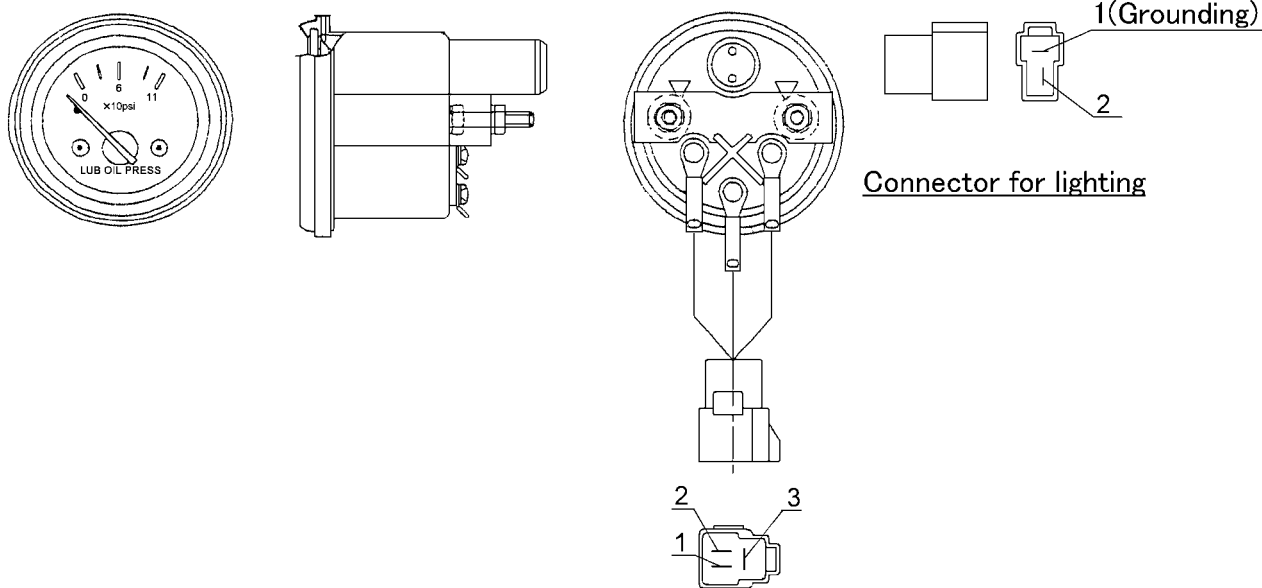
| Temperature [°F ()] | Resistance value () | Permissible value |
|-------------------------|-------------------------|----------------------|
| 95 (35) | (670.0) | |
| 176 (80) | 118.0 | ± 6.0 |
| 221 (105) | 54.5 | ± 2.7 |
| 239 (115) | (42.0) | |

() marked: reference value

3. Electrical Parts

3.3.16 Oil pressure gauge

SDG25S-6A7,SDG45S ~ 150S-6A6



SG06041E

(1) Indicated pressure and Standard current value

| | | | |
|--------------------------------|----|------------|-------------|
| Indicated pressure [psi (kPa)] | 0 | 56.8 (392) | 113.8 (785) |
| Resistance value () | 83 | 43 | 12.3 |

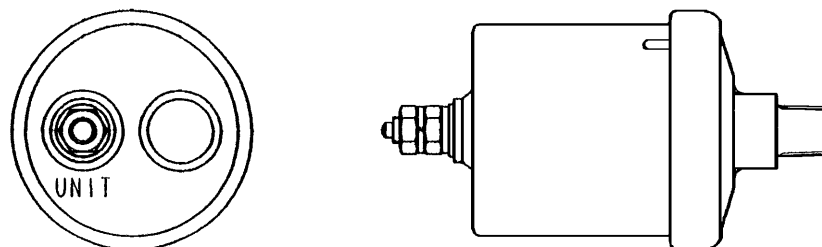
(2) List of functions

| Pin No. | Line color | Connection | Function |
|---------|------------|---------------------|-------------------------------------|
| 1 | R/W | 10A fuse | Power source for oil pressure gauge |
| 2 | G/B | Oil pressure sensor | Detector for oil pressure |
| 3 | B | Grounding | |

3. Electrical Parts

3.3.17 Oil pressure sensor for oil pressure gauge

SDG25S-6A7,SDG45S ~ 150S-6A6



SG06042

Standard pressure and Standard resistance value

| | | | |
|--------------------------|----|------------|-------------|
| STD pressure [psi (kPa)] | 0 | 56.8 (392) | 113.7 (784) |
| STD resistance value () | 83 | 43 | 12 |

3.3.18 Others

(1) Engine oil pressure switch (for emergency stop)

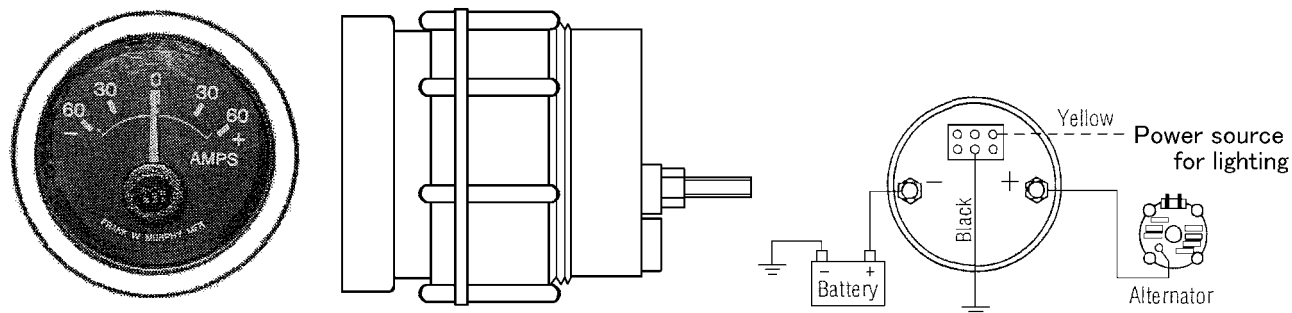
| | | |
|------------------|--|--|
| Model | SDG25S-6A7 SDG65S/100S-6A6 | SDG45S-6A6 |
| Setting pressure | OFF in case of less than 14.5psi (0.1MPa) | OFF in case of less than 21.75psi (0.15MPa) |

(2) Engine water temperature switch (for emergency stop)

| | | |
|---------------------|--|--|
| Model | SDG25S-6A7 SDG45S-6A6 | SDG60S-6A6 SDG100S-6A6 |
| Setting temperature | OFF in case of more than $230 \pm 35^{\circ}\text{F}$ (110 ± 2) | OFF in case of more than $221 \pm 35^{\circ}\text{F}$ (105 ± 2) |

3.3.19 Ammeter for battery charging

SDG25S-6A7,SDG45S ~ 150S-6A6



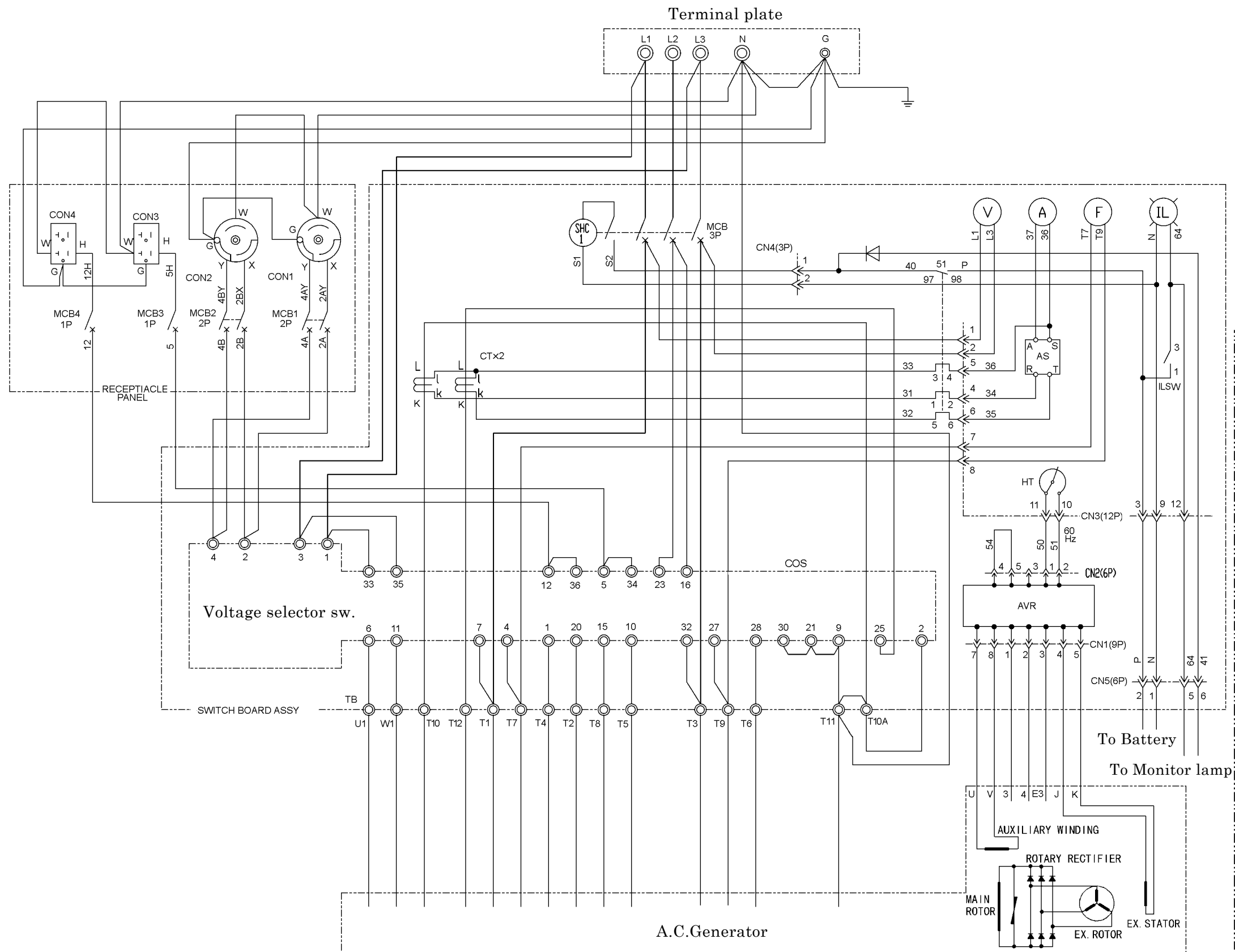
Wiring diagram

SG06043E

3. Electrical Parts

3.4 Generator Wiring Diagram

SDG25S -6A7



| | |
|--------|--|
| MCB | Molded case circuit breaker (three-phase) |
| MCB1-4 | Molded case circuit breaker (single-phase) |
| SHC | Shunt coil |
| A | Ammeter |
| V | Voltmeter |
| F | Frequency meter |
| IL | Illumination lamp |
| CT | Current transformer |
| 51 | Thermal relay |
| AVR | Automatic voltage regulator |
| HT | Hand trimmer (voltage regulator) |
| AS | Ammeter change-over switch |

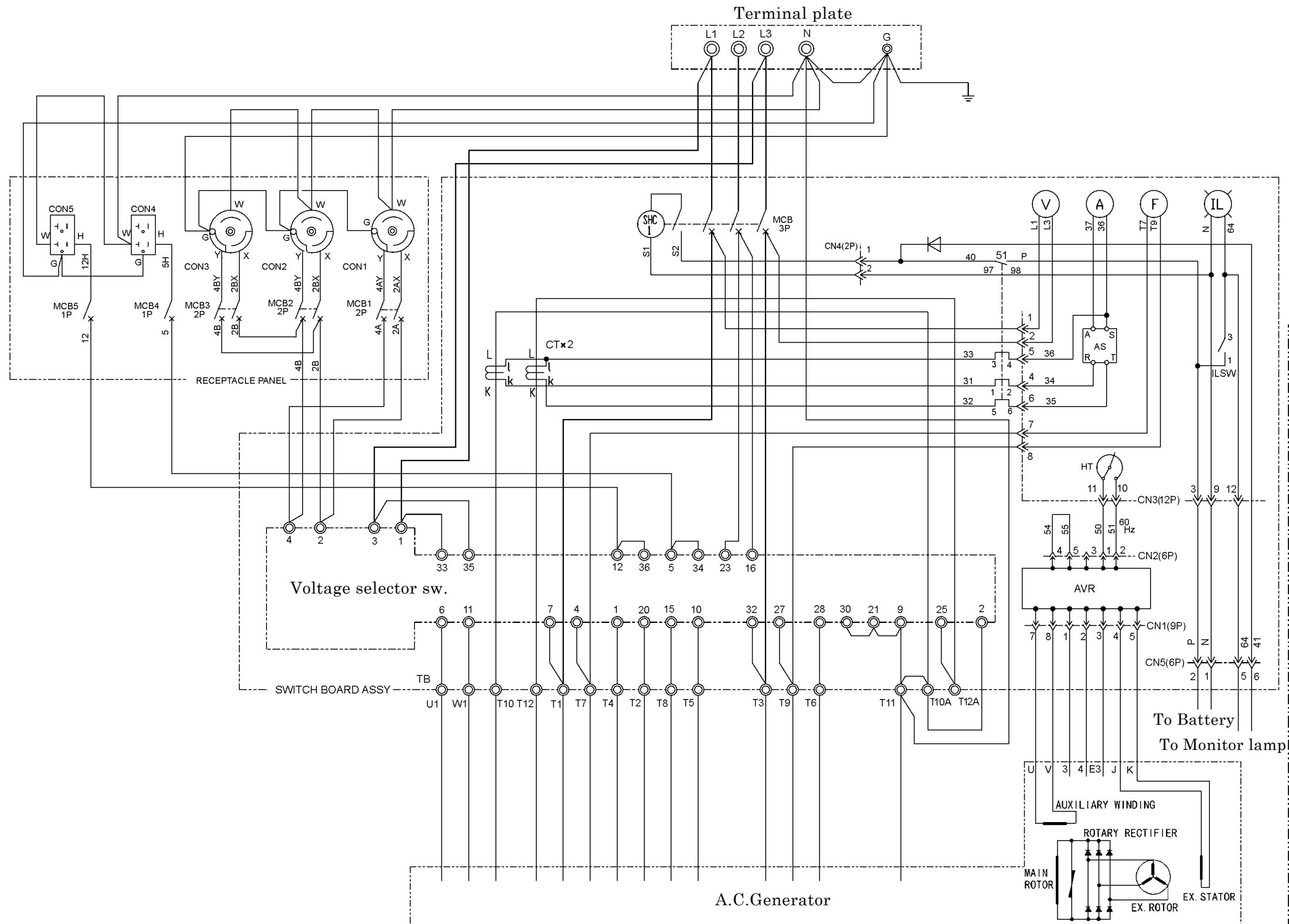
| Voltage Selector SW | Voltage/Winding Connection |
|-----------------------|---|
| 3 Phase 480/277V | 3 Phase 4 Wire Series Star |
| 3 Phase 240/139V | 3 Phase 4 Wire Parallel star |
| Single Phase 240/120V | Single Phase 2 or 3 Wire Parallel Zig-Zag |

SG06003

SG06001

3. Electrical Parts

SDG45S/65S-6A6



| | |
|--------|--|
| MCB | Molded case circuit breaker (three-phase) |
| MCB1-5 | Molded case circuit breaker (single-phase) |
| SHC | Shunt coil |
| A | Ammeter |
| V | Voltmeter |
| F | Frequency meter |
| IL | Illumination lamp |
| CT | Current transformer |
| 51 | Thermal relay |
| AVR | Automatic voltage regulator |
| HT | Hand trimmer (voltage regulator) |
| AS | Ammeter change-over switch |

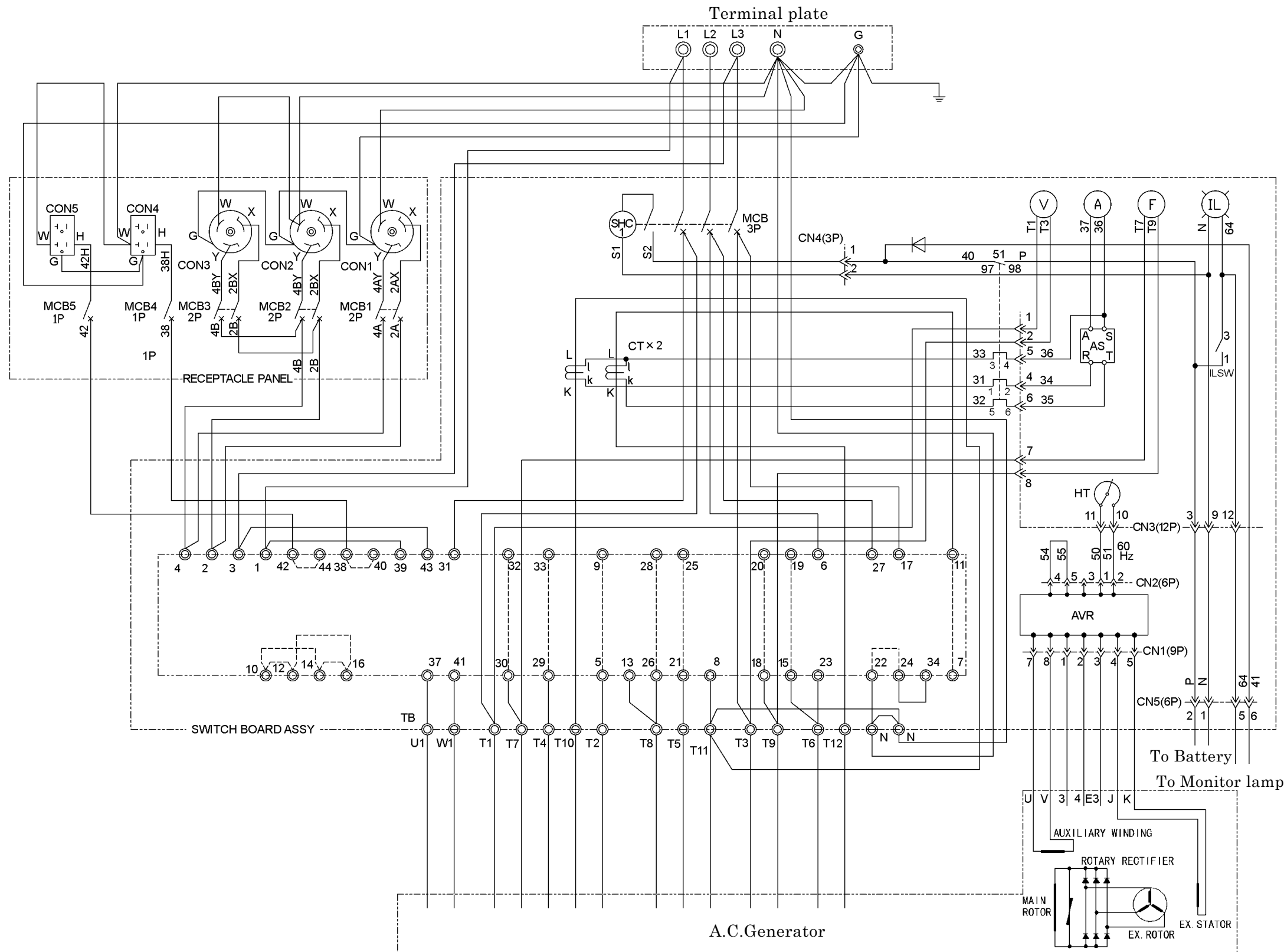
| Voltage Selector SW | Voltage/Winding Connection |
|---------------------------|---|
| 3 Phase 480/277V | 3 Phase 4 Wire Series Star |
| 3 Phase 240/139V | 3 Phase 4 Wire Parallel star |
| Single Phase 240/120V | Single Phase 2 or 3 Wire Parallel Zig-Zag |

SG06004

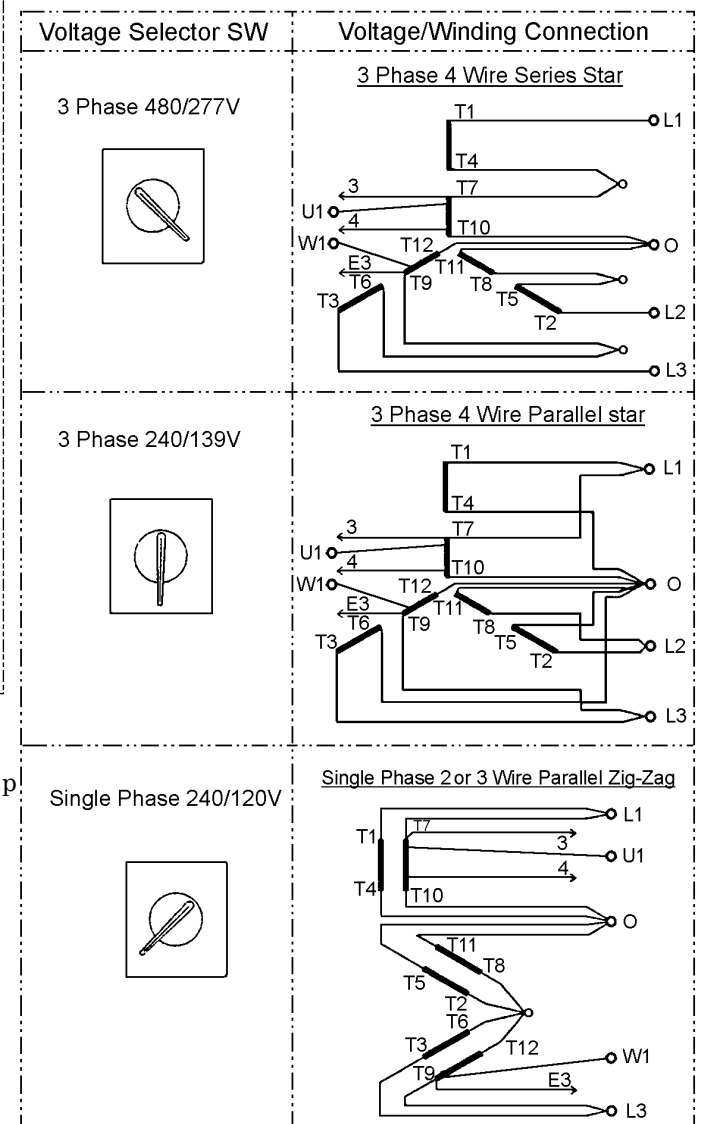
SG06001

3. Electrical Parts

SDG100S-6A6



| | |
|--------|--|
| MCB | Molded case circuit breaker (three-phase) |
| MCB1-5 | Molded case circuit breaker (single-phase) |
| SHC | Shunt coil |
| A | Ammeter |
| V | Voltmeter |
| F | Frequency meter |
| IL | Illumination lamp |
| CT | Current transformer |
| 51 | Thermal relay |
| AVR | Automatic voltage regulator |
| HT | Hand trimmer (voltage regulator) |
| AS | Ammeter change-over switch |

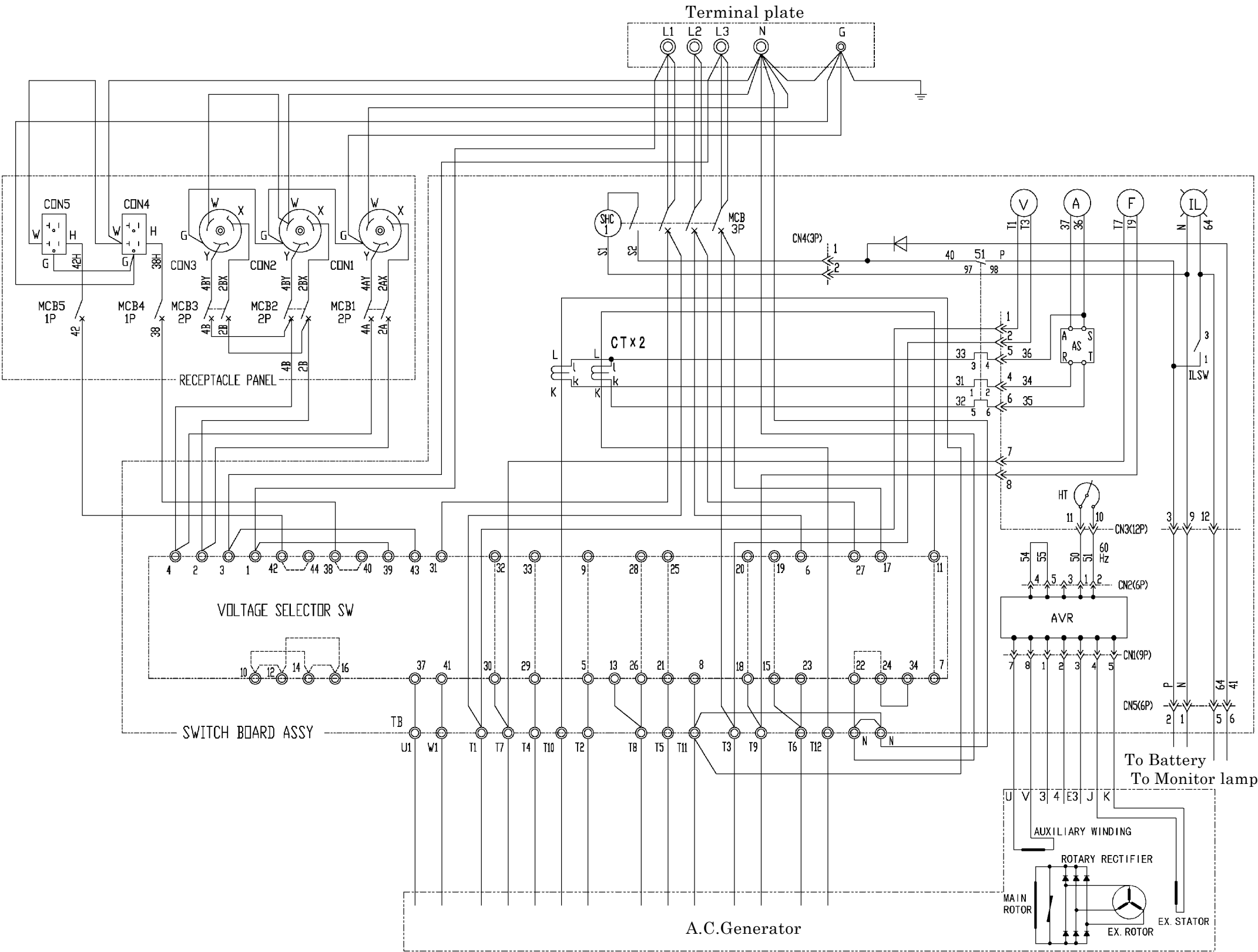


SG06005

SG06001

3. Electrical Parts

SDG125S-6A6



| | |
|--------|--|
| MCB | Molded case circuit breaker (three-phase) |
| MCB1-5 | Molded case circuit breaker (single-phase) |
| SHC | Shunt coil |
| A | Ammeter |
| V | Voltmeter |
| F | Frequency meter |
| IL | Illumination lamp |
| CT | Current transformer |
| 51 | Thermal relay |
| AVR | Automatic voltage regulator |
| HT | Hand trimmer (voltage regulator) |
| AS | Ammeter change-over switch |

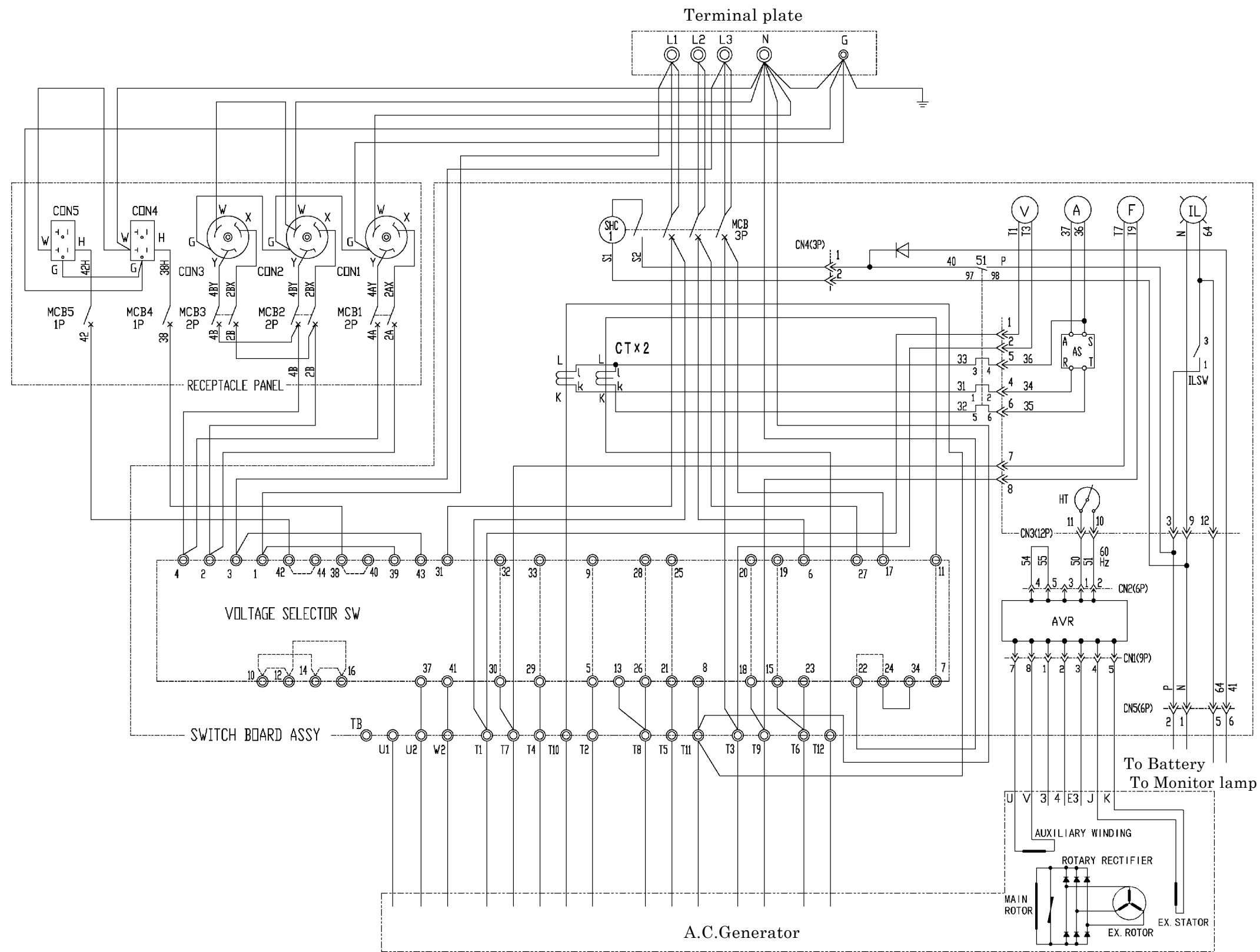
| Voltage Selector SW | Voltage/Winding Connection |
|---------------------------|---|
| 3 Phase 480/277V | 3 Phase 4 Wire Series Star |
| 3 Phase 240/139V | 3 Phase 4 Wire Parallel star |
| Single Phase 240/120V | Single Phase 2 or 3 Wire Parallel Zig-Zag |

SG06006

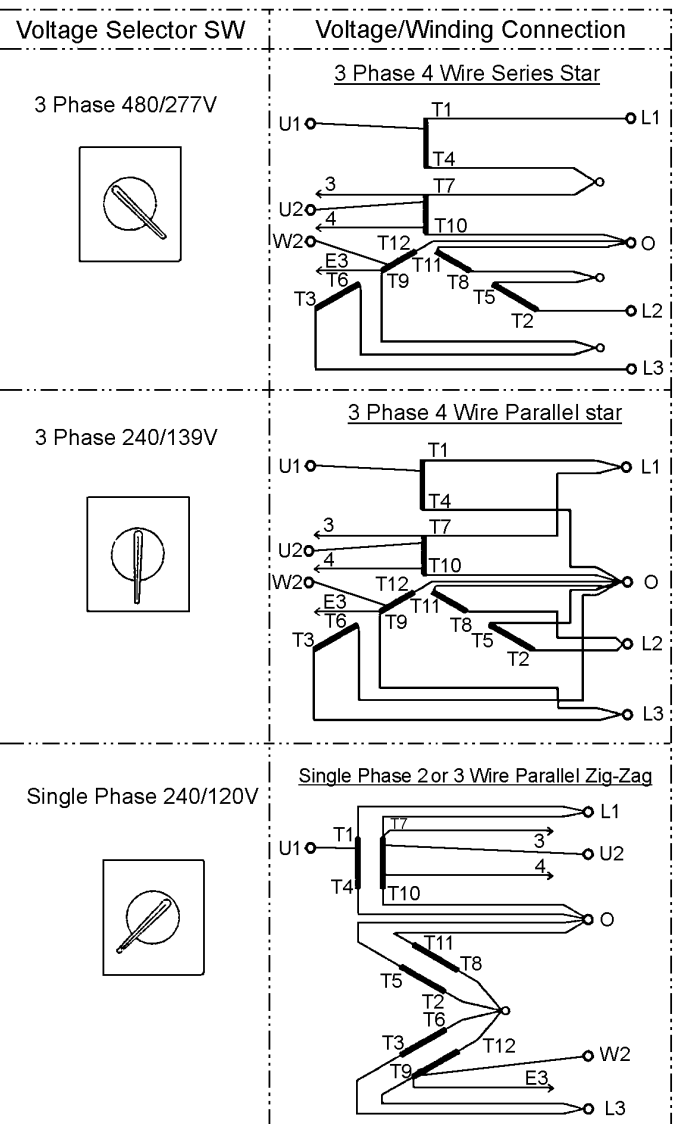
SG06001

3. Electrical Parts

SDG150S-6A6



| | |
|--------|--|
| MCB | Molded case circuit breaker (three-phase) |
| MCB1-5 | Molded case circuit breaker (single-phase) |
| SHC | Shunt coil |
| A | Ammeter |
| V | Voltmeter |
| F | Frequency meter |
| IL | Illumination lamp |
| CT | Current transformer |
| 51 | Thermal relay |
| AVR | Automatic voltage regulator |
| HT | Hand trimmer (voltage regulator) |
| AS | Ammeter change-over switch |



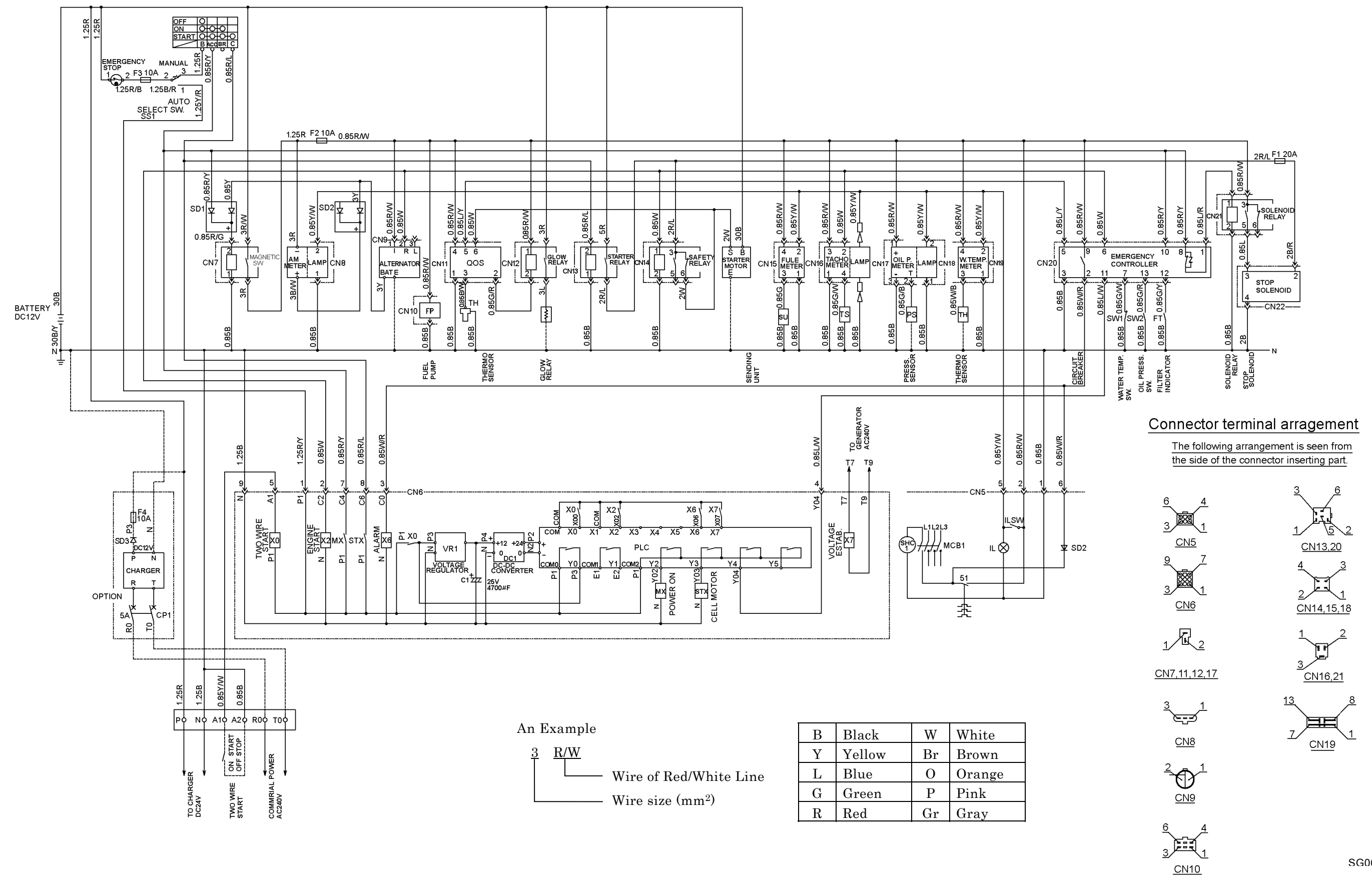
SG06007

SG06002

3. Electrical Parts

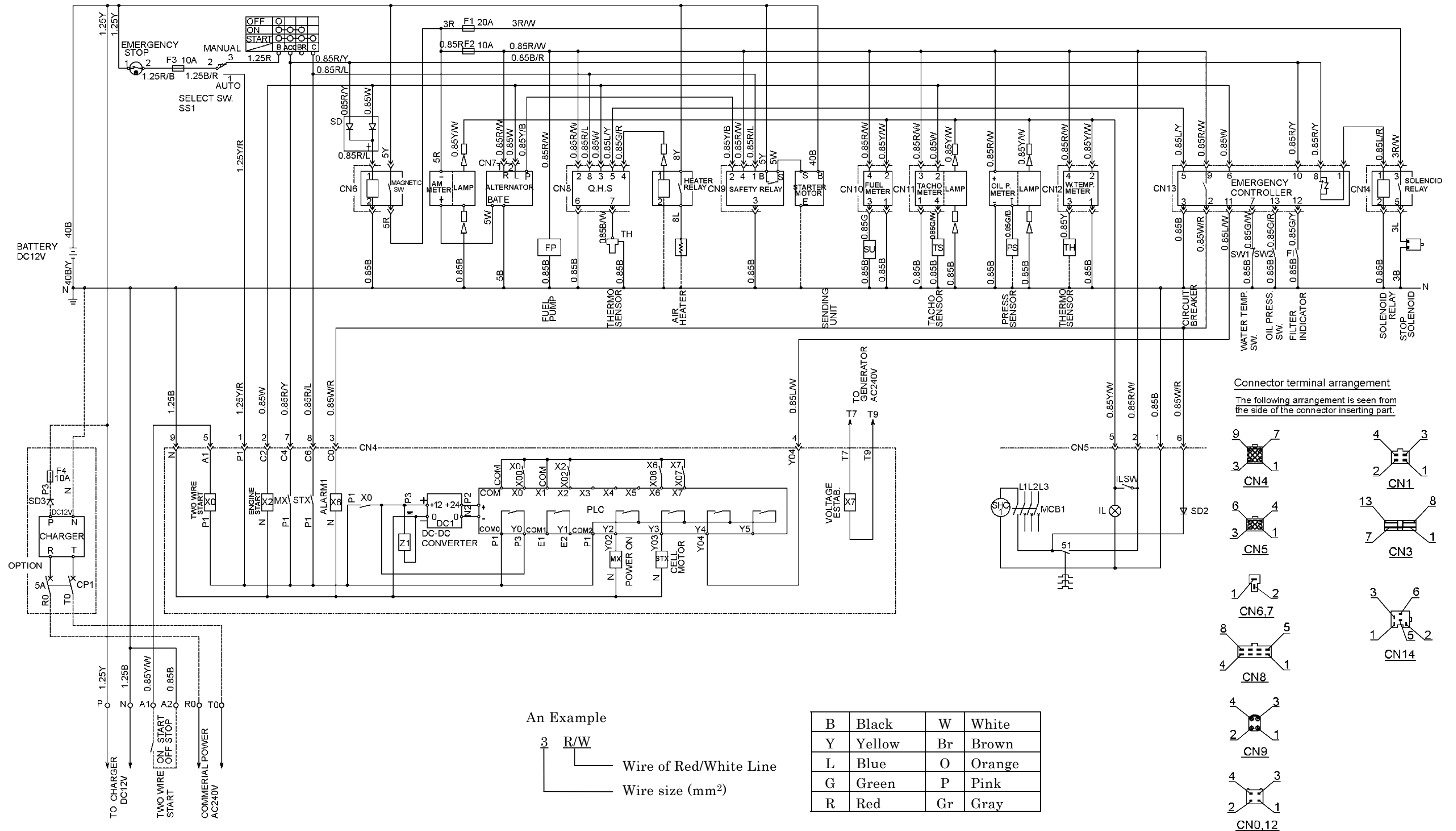
3.5 Engine Wiring Diagram

SDG25S-6A7



3. Electrical Parts

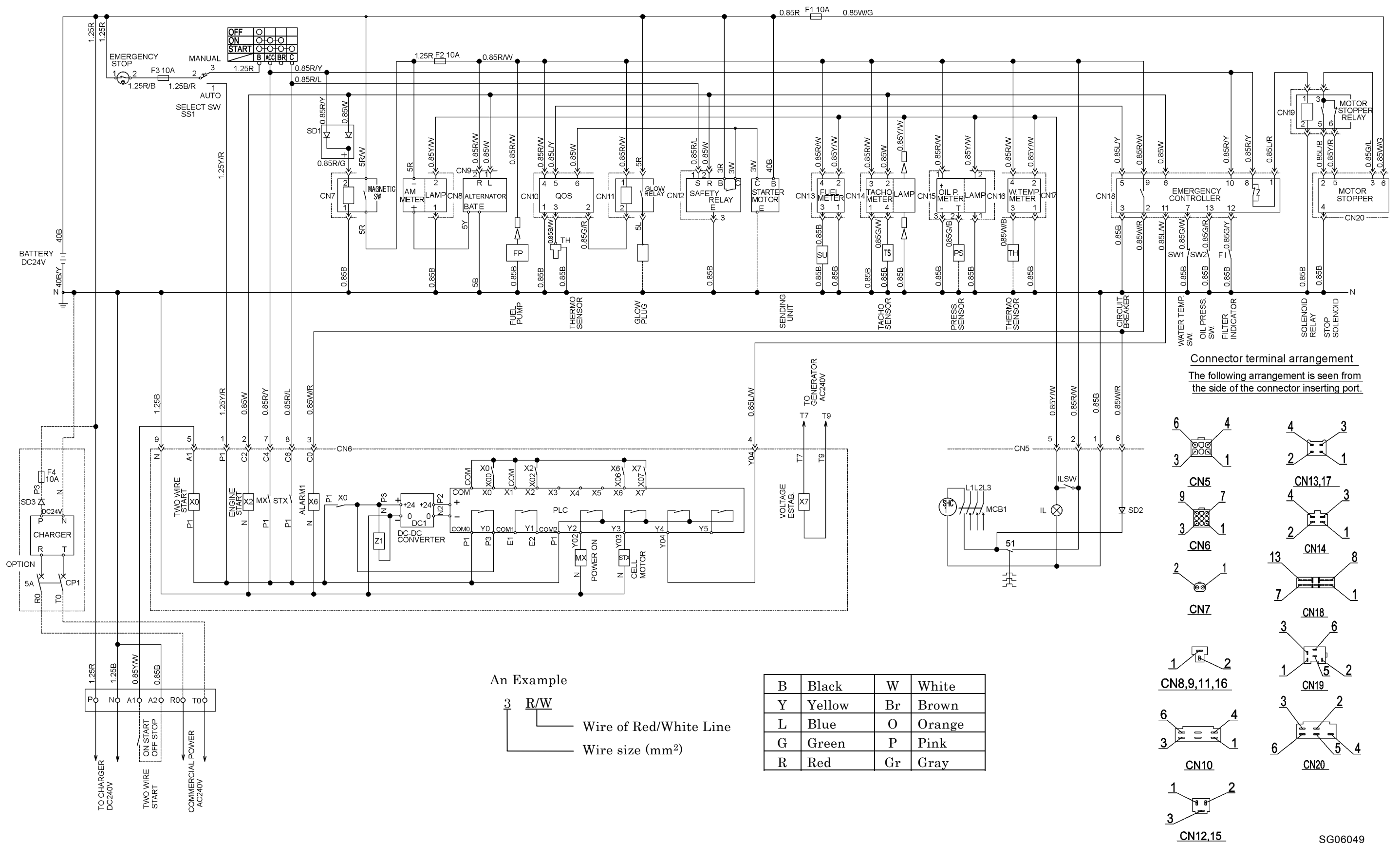
SDG45S-6A6



SG06048

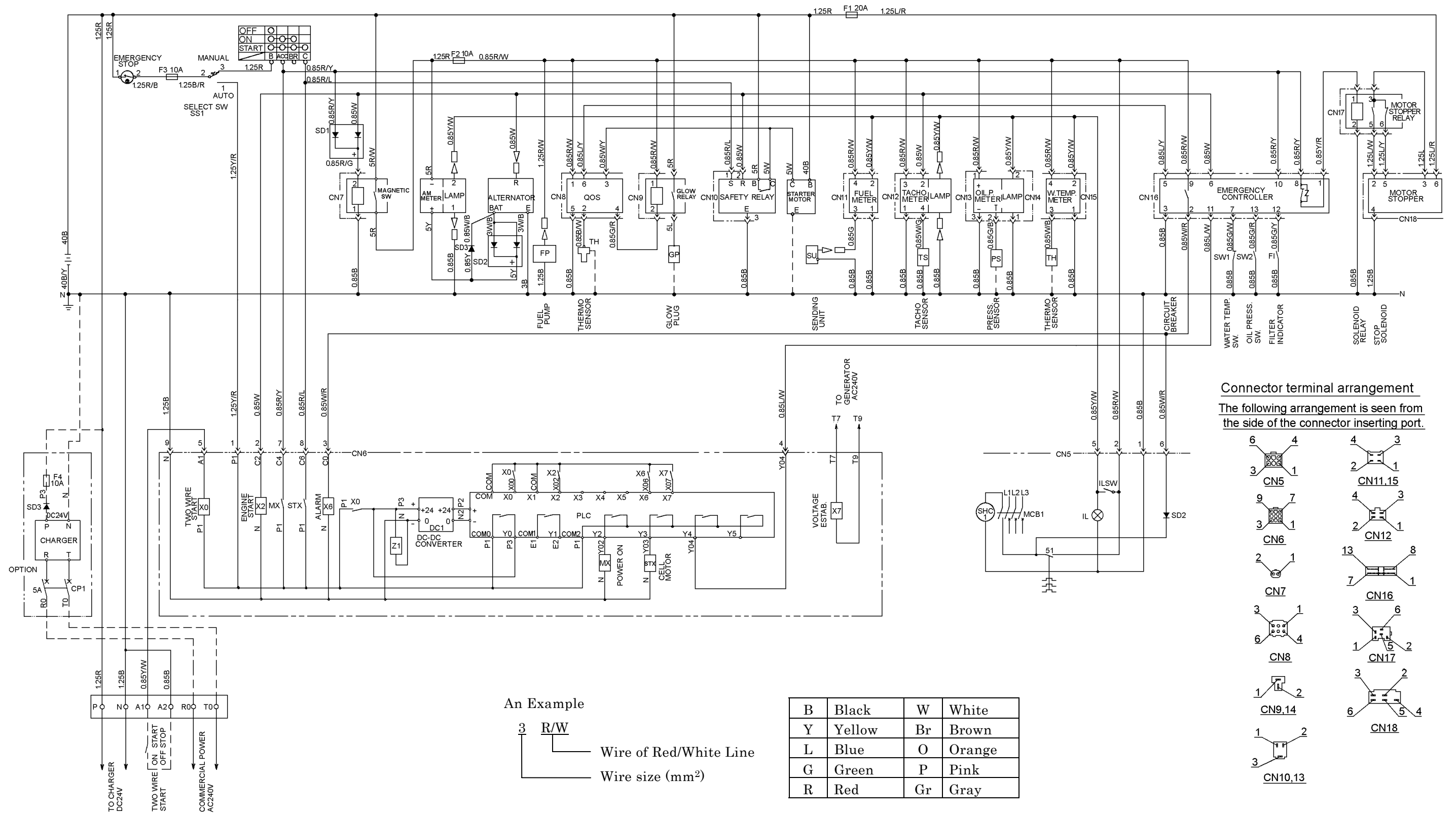
3. Electrical Parts

SDG65S-6A6



3. Electrical Parts

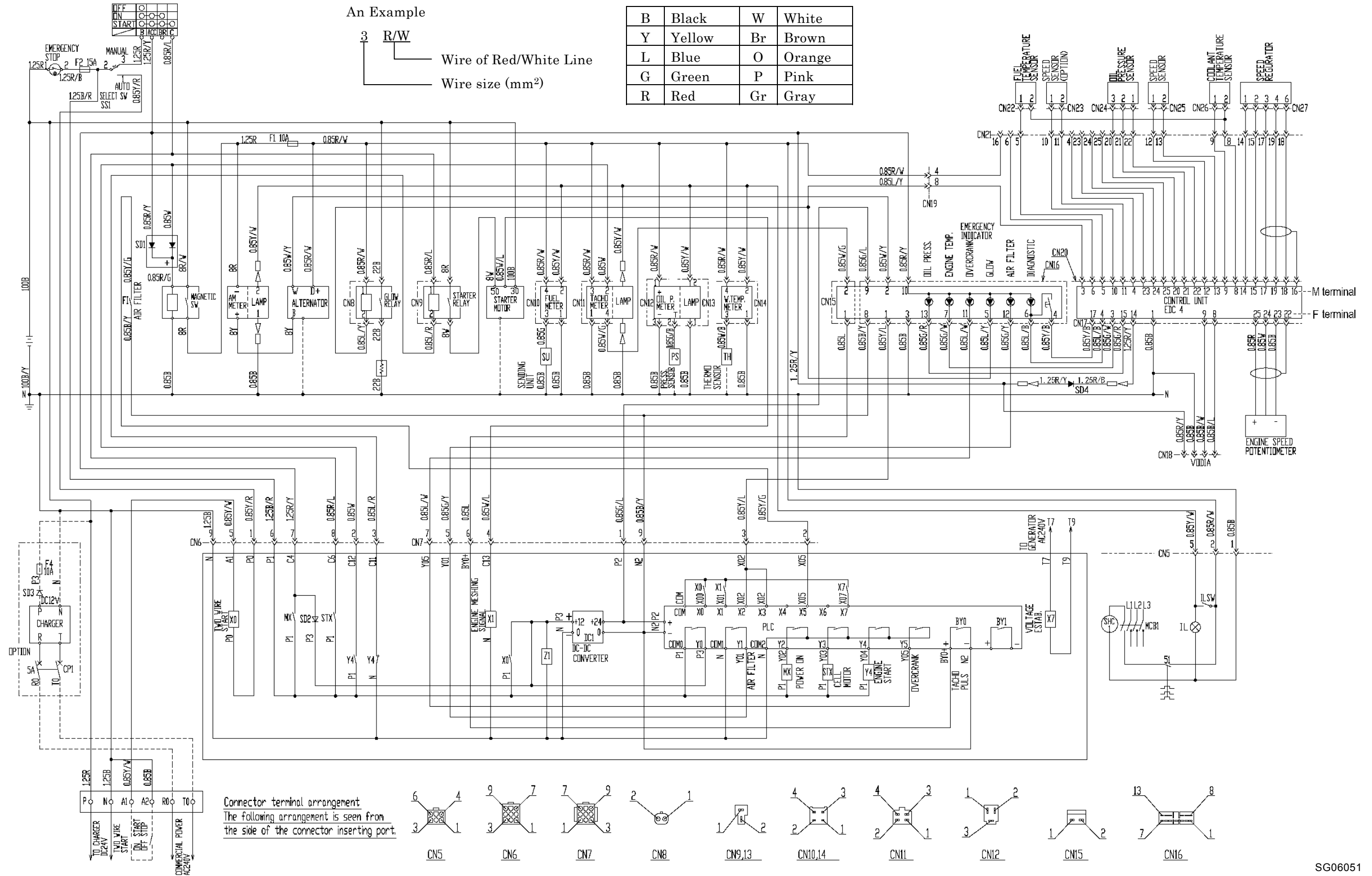
SDG100S-6A6



SG06050

3. Electrical Parts

SDG125S/150S-6A6



4. Troubleshooting

4.1 Repairing Procedures

When performing failure diagnosis, pay special attention to the followings, observing general cautions.

4.1.1 Safety caution

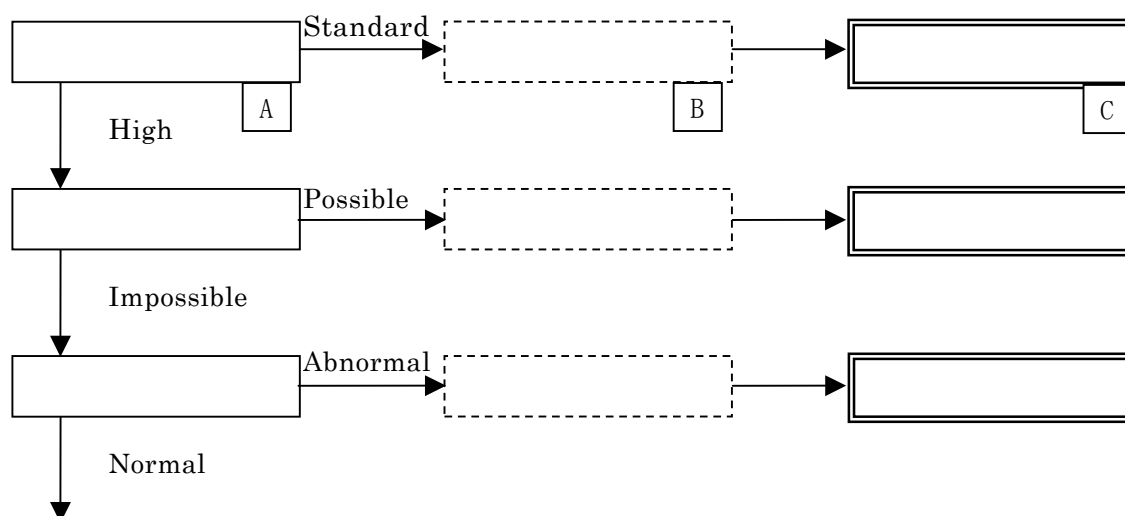
- (1) Removing such cap and/or plug for receiver tank, fuel tanks and pipes where pressure is loaded, stop the machine and relieve all the interior pressure. Install measuring instruments connected firmly.
- (2) When doing the job with co-worker(s) together, make sure to give signal to the other person(s) and do not allow other persons to come near to the job site.
- (3) Take care not to touch hot portions and not to be involved in turning portions.

4.1.2 Caution during failure diagnosis

- (1) Do not make haste to disassemble the unit
If the unit is disassembled urgently.
 1. You may disassemble the other portions which are not related with the trouble.
 2. The cause of trouble may be missing.The unnecessary reparations require more spare parts and man-hours, and reparation costs will increase more. What is worse, you will lose reliance or trust from clients, operators and users. Therefore, it is absolutely necessary to investigate the trouble more carefully in advance and to follow the required procedures for failure diagnosis.
- (2) Ask the clients about the trouble in details
In order to prevent misunderstanding and incorrect judgment about the trouble, it is necessary to ask users or operators about the following questions.
 1. Is there any other disorder than the trouble he has informed?
 2. Anything abnormal occurred before this trouble?
 3. Did this trouble happen unexpectedly? Or the unit had been operated in bad conditions before?
 4. When and how did this trouble occur?
 5. Had he repaired the unit before this trouble occurred?
 6. Did he not experience similar trouble before?
- (3) Inspection items before starting diagnosis
Sometimes such trouble may be caused owing to routine mishandling of the unit. Before starting failure diagnosis, check the following items.
 1. The engine runs short of engine oil or its oil is not dirty?
 2. Check each cable connection for any disconnection.
 3. Check the other portions for any damage.
- (4) Confirmation of trouble
Discuss with user(s) and/or operator(s) sufficiently about the trouble. As a result, judge whether their judgment is based on the numerical comparison or sentimental basis. Make him (them) understand well the reparation or correction you have finished.
Then check and confirm by yourself the cause of the trouble.
Note) Never proceed any investigation or measurement which may cause further greater damage.
- (5) Procedures of diagnosis
When you become well experienced, you can find out the cause easily during the process of confirmation (4). But easy understanding could cause unexpected failure. So check and judge it according to the following procedures.
 1. Check the easiest thing or portion first.
 2. Investigate the most possible cause.
 3. Check the other things connected to the trouble.
 4. Check for the possibility of any other troubles.
 5. Start proper and careful investigation on this trouble.
- (6) Prevention of repeated occurrence of similar trouble
Even if you have repaired the trouble, unless you get rid of the fundamental cause of the trouble, it will repeatedly occur. Therefore, perform full investigation of the trouble, and it is absolutely necessary to remove the basis of the trouble.

4. Troubleshooting

4.1.3 How to use the failure diagnosis



1. In the troubleshooting column something abnormal is mentioned in lined parenthesis.

2. In the troubleshooting column the cause of the said trouble is mentioned in dotted parenthesis.

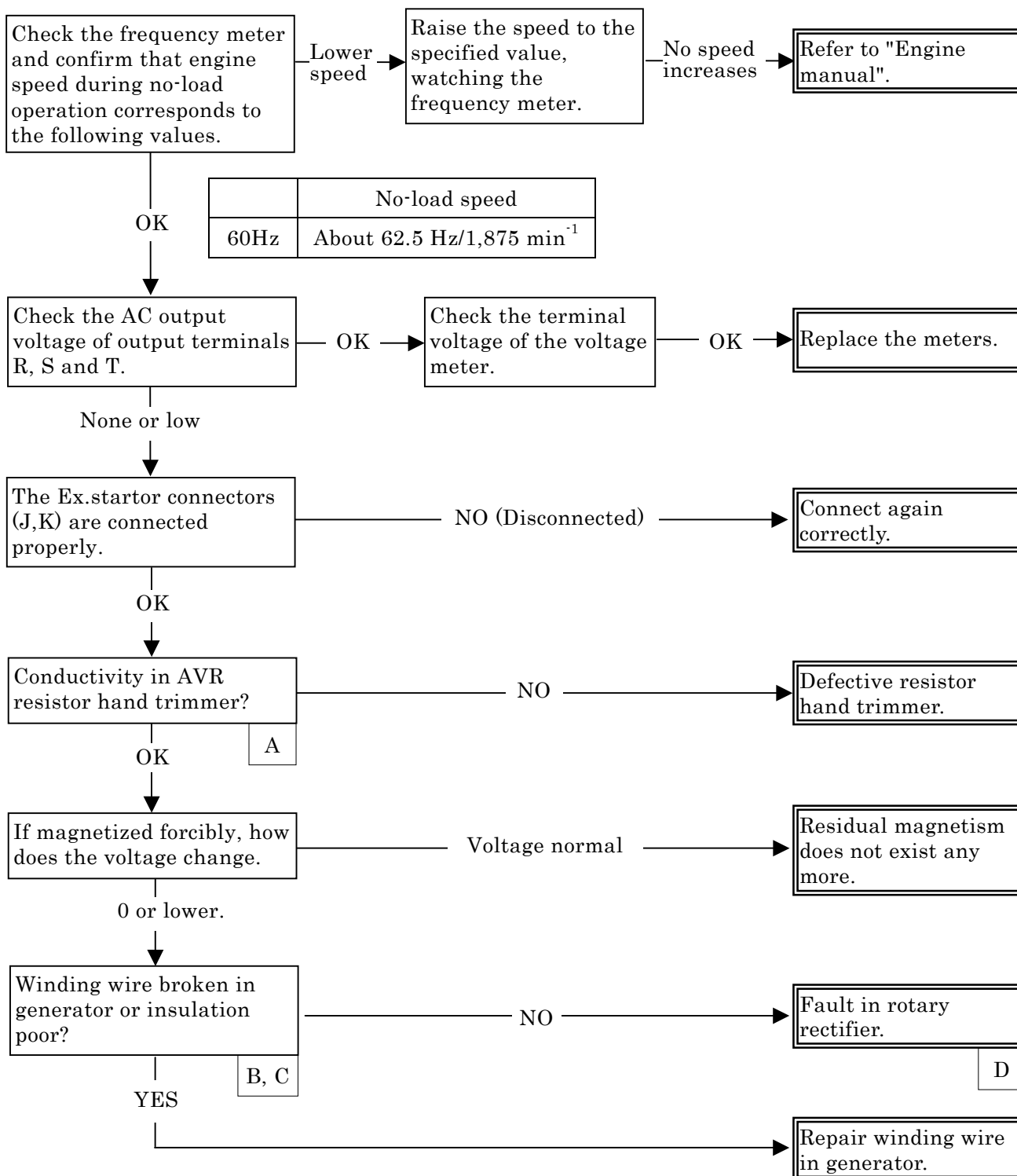
3. In the troubleshooting column the countermeasures or treatment are mentioned in the double lined parenthesis.

4. A under each column means the index of explanation.

4. Troubleshooting

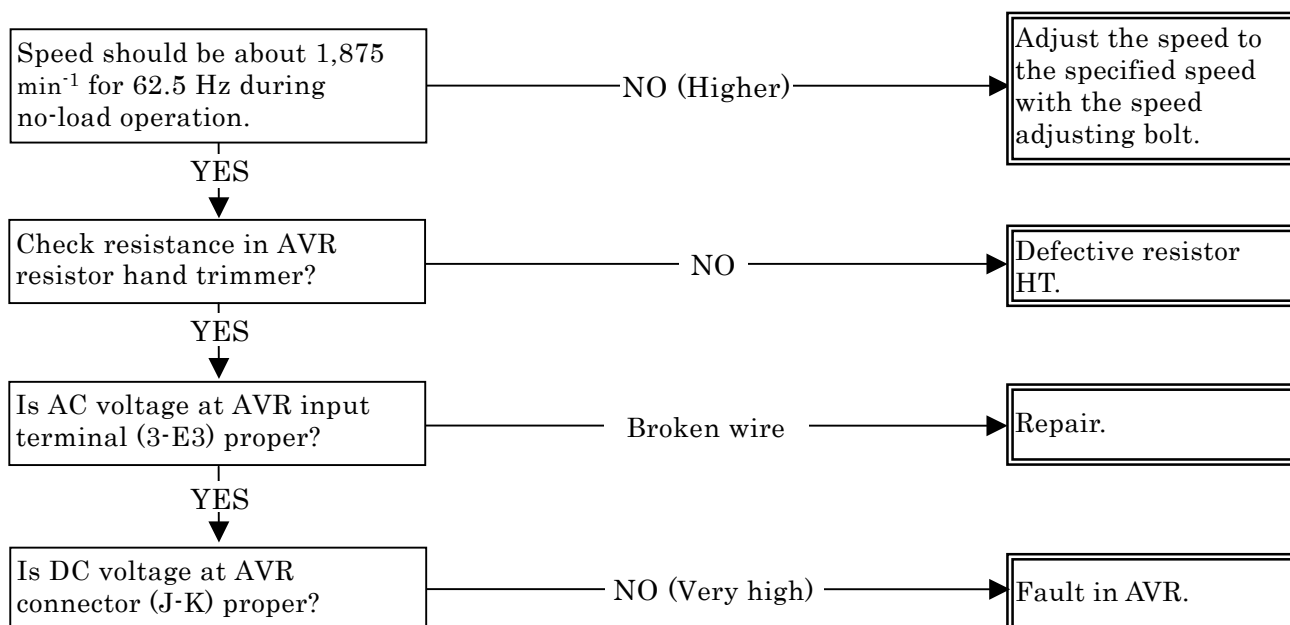
4.2 Generator Troubleshooting

4.2.1 No voltage is generated or voltage too low

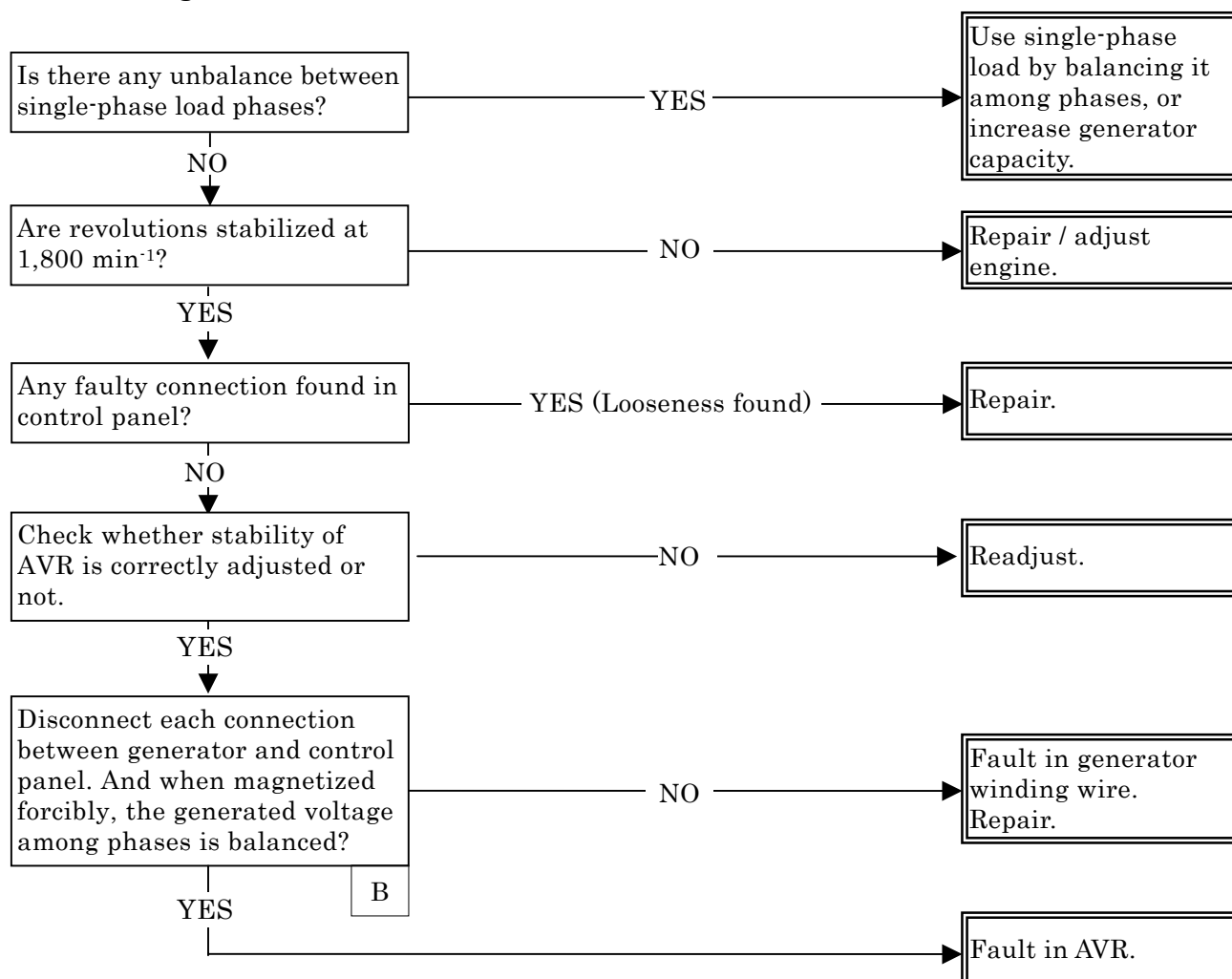


4. Troubleshooting

4.2.2 Voltage is very high or it cannot be adjusted

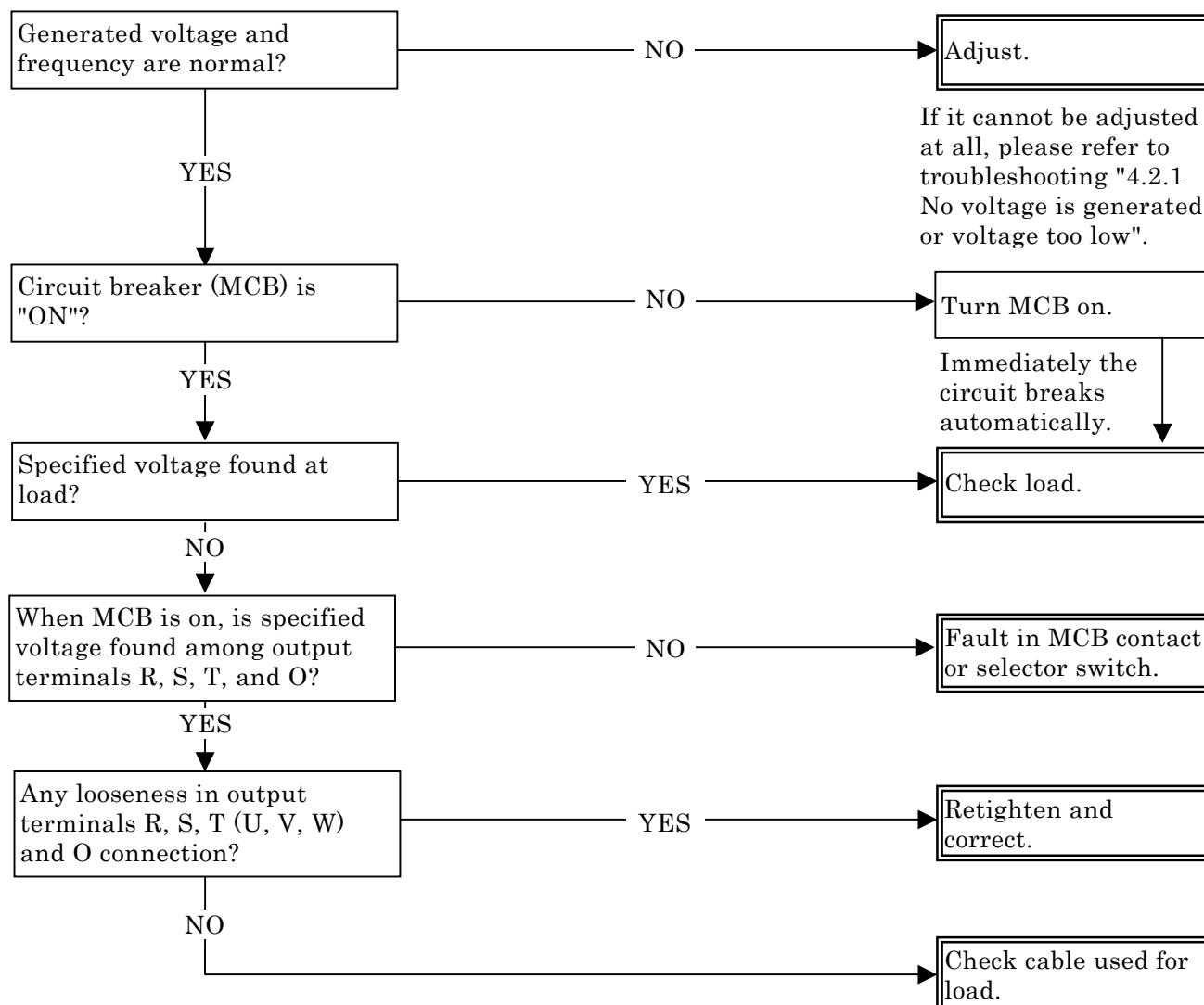


4.2.3 Voltage fluctuates

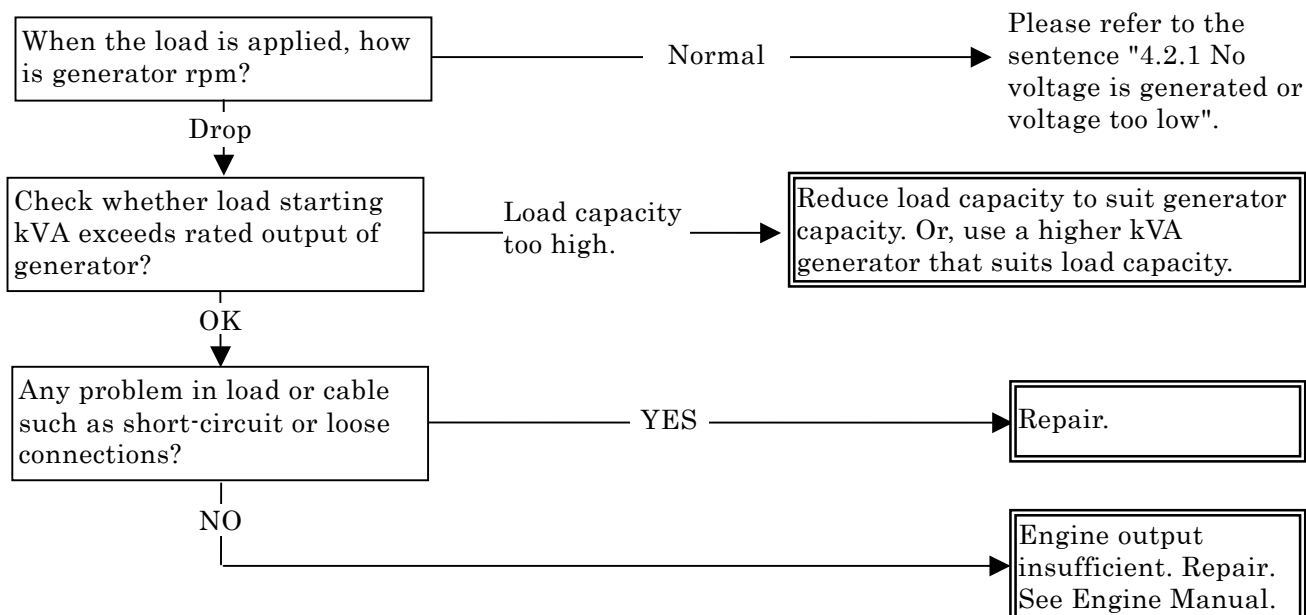


4. Troubleshooting

4.2.4 Load cannot be operated



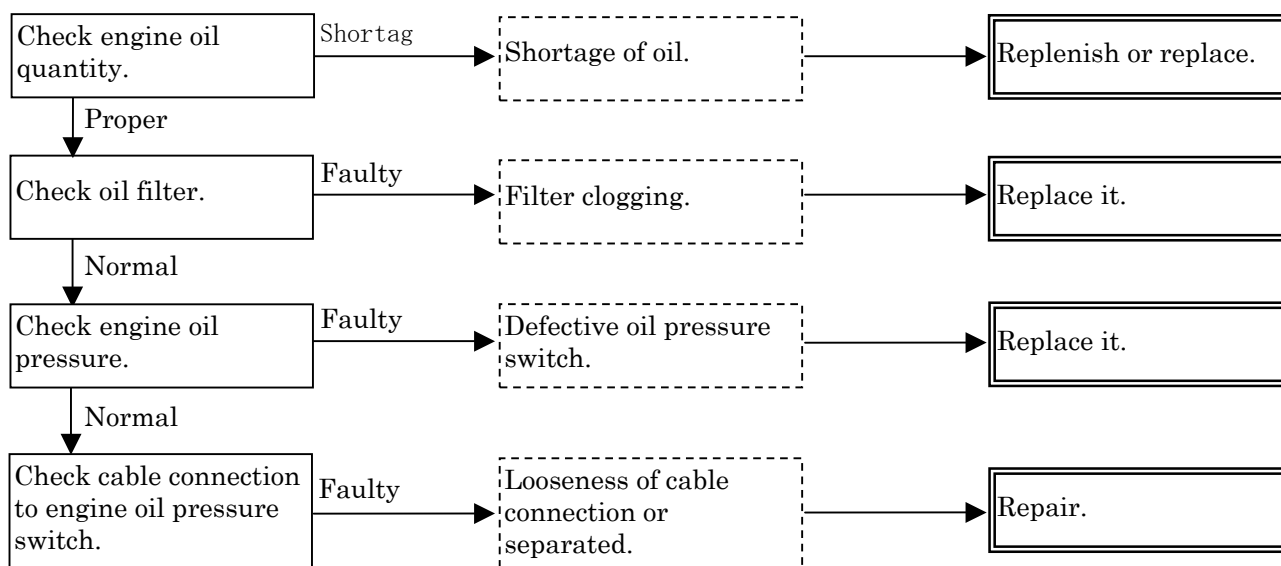
4.2.5 Voltage drops when load is applied



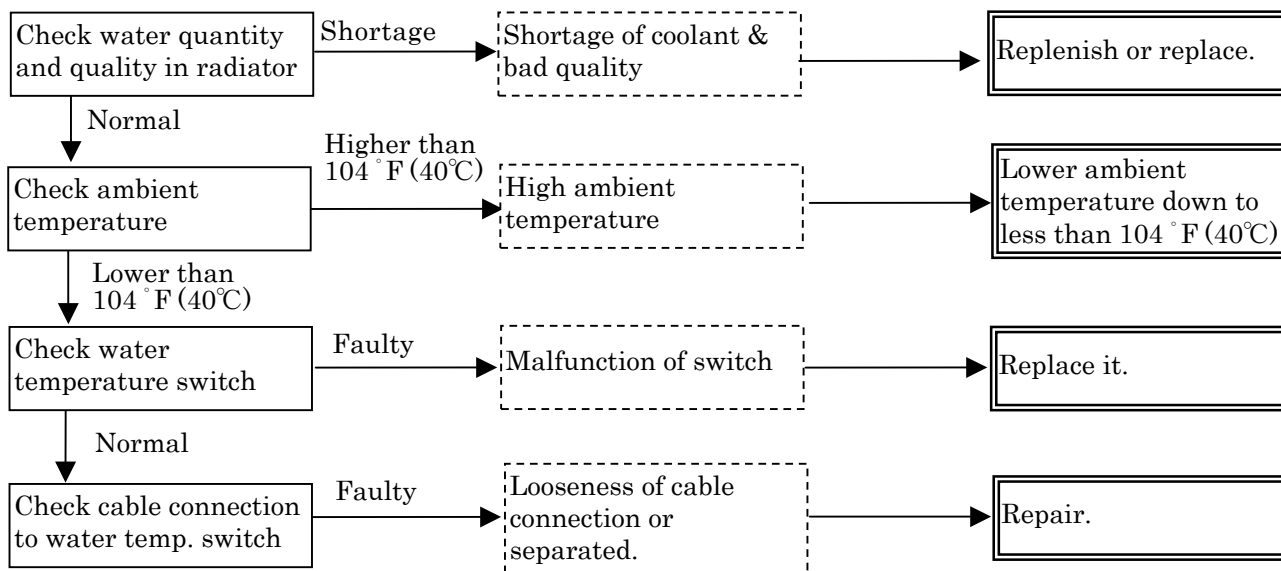
4. Troubleshooting

4.3 Emergency Switch Functions

4.3.1 Engine oil pressure drop is shown in monitor and it stops



4.3.2 Engine coolant temperature rise is displayed in monitor, and engine will stop.

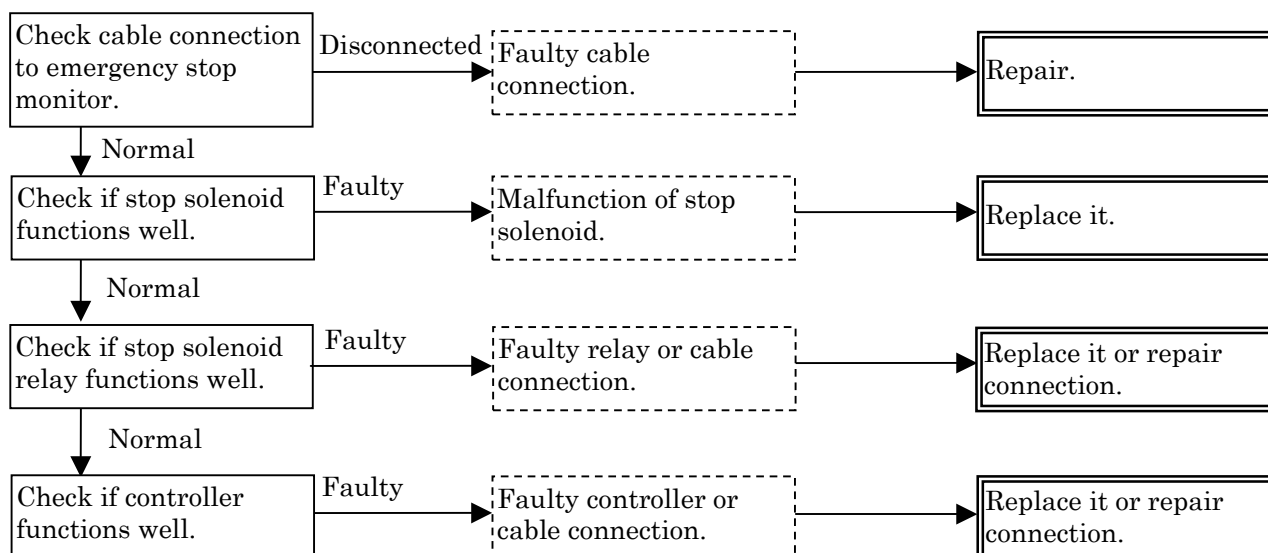


4. Troubleshooting

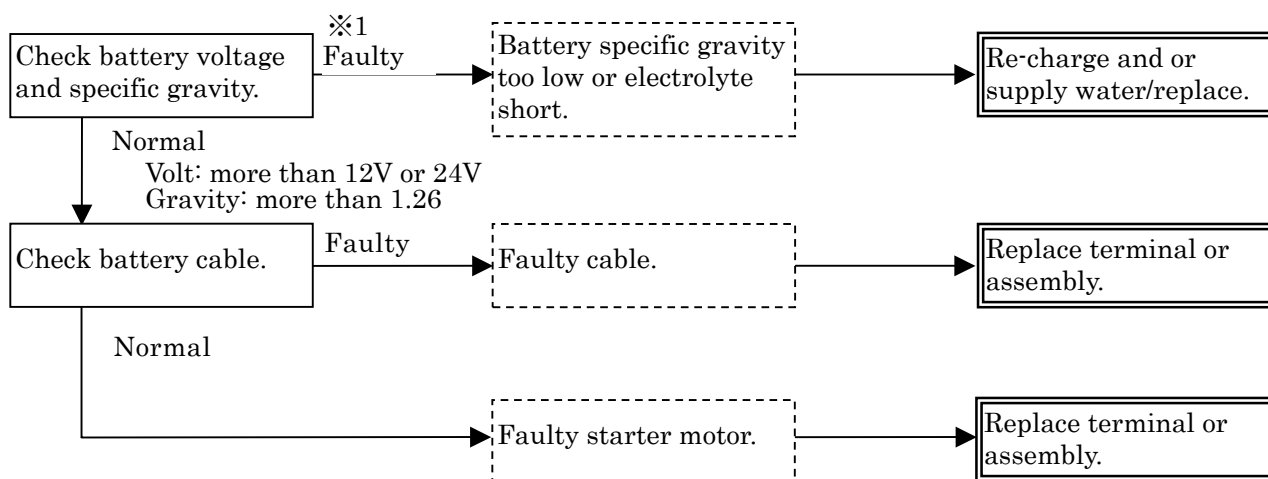
4.4 Engine Troubleshooting

4.4.1 Anything abnormal is not shown, but it sometimes stops without its cause shown

(Excluding the cases of faulty contact of starter switch and fuse broken)



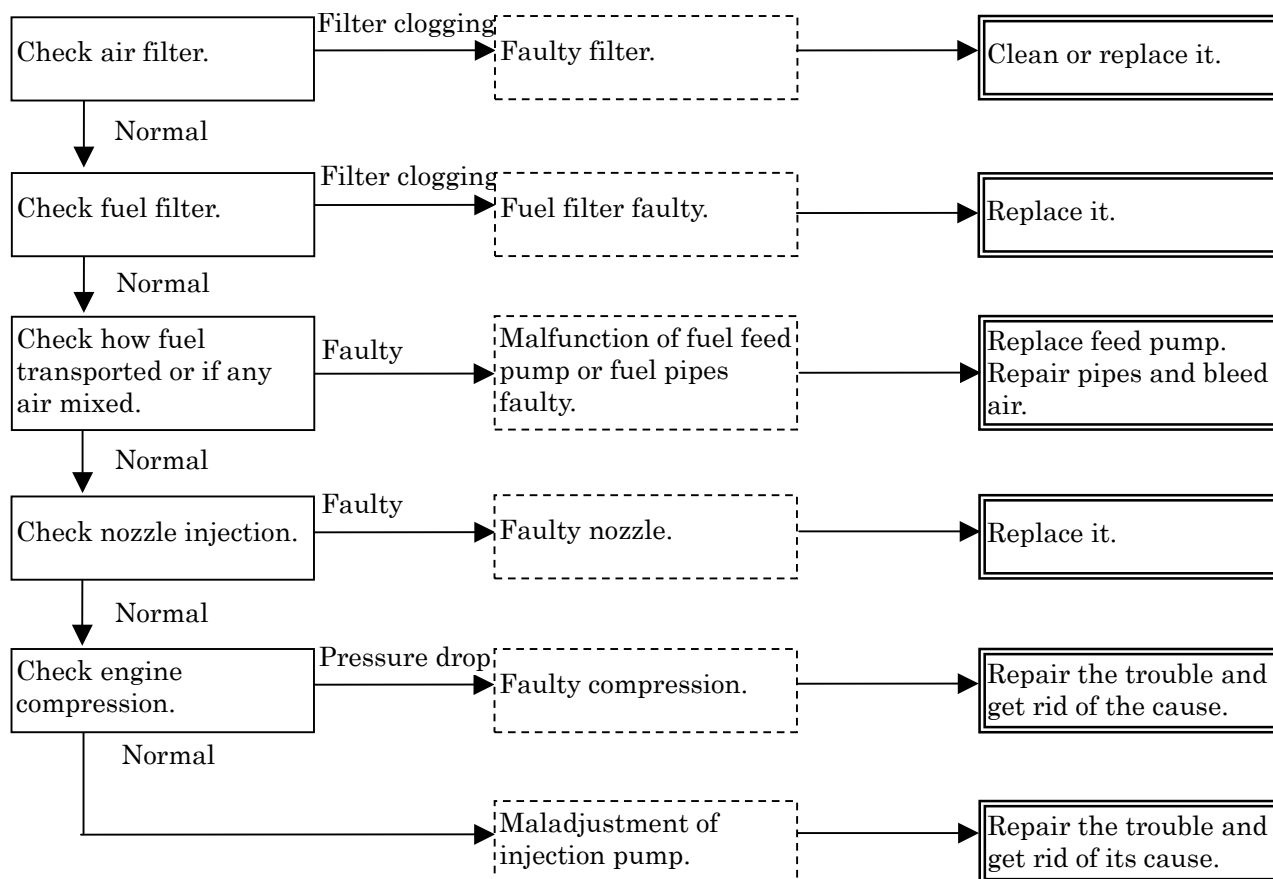
4.4.2 At start-up, starter rotates slowly



※1: When starter switch is placed at the “START” position, the battery is not normal if B terminal voltage decreases by 10V or 20V.

4. Troubleshooting

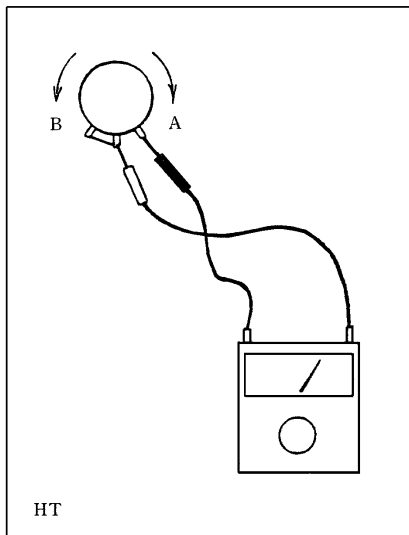
4.4.3 It will not speed up to rated speed



4. Troubleshooting

4.5 How to Check

[A] Checking for Disconnection of Voltage Adjusting Resistor Hand Trimmer



Turn the knob right and left, and check if the resistance changes. It is normal if the resistance value is within the following ranges.

Resistance value : several Ω - 5k Ω

The resistance decreases when the knob is turned in the direction of A.

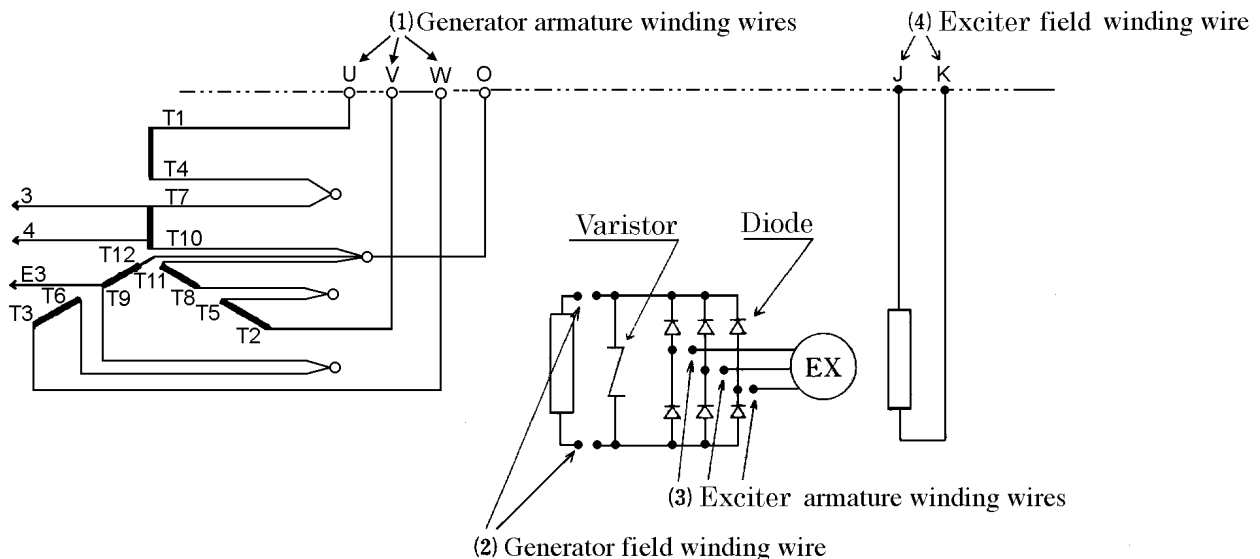
The resistance increases when the knob is turned in the direction of B.

Also make sure resistance varies smoothly.

SG06067

[B] Measurement of Generator Winding Wire Resistance

The standard resistance value of each wire includes the generator's winding wire resistance value. (Please refer to the sentence "5.1 Generator's Winding Wire Resistance Value".)



6-15-1

(1) Generator armature winding wires

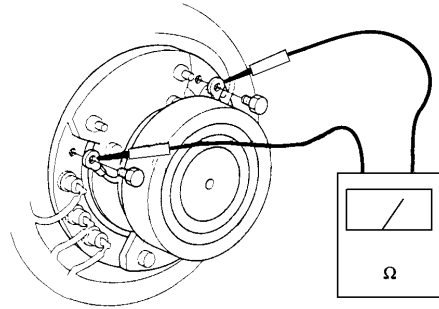
Remove all wires leading to the control panel terminal from the generator, and measure the resistance between the wires on the generator side. (Please explain how to check with voltage selector switch circuit.)

| | | | | | | |
|-------------|---|-------------|---|-------------|---|--------------|
| T1 terminal | - | T4 terminal | , | T7 terminal | - | T10 terminal |
| T2 terminal | - | T5 terminal | , | T8 terminal | - | T11 terminal |
| T3 terminal | - | T6 terminal | , | T9 terminal | - | T12 terminal |

4. Troubleshooting

(2) Generator field winding wire

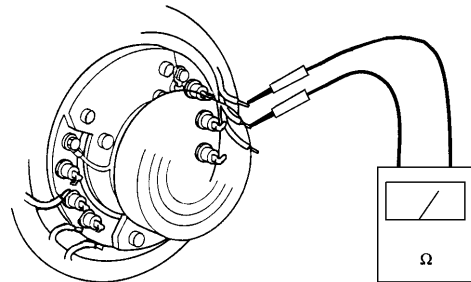
Disconnect the wires leading to the rotary rectifier, then measure the resistance between the wires.



6-15-2

(3) Exciter armature winding wires

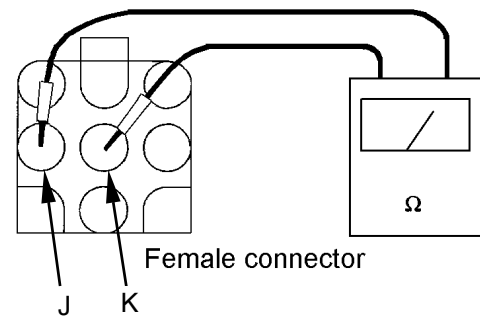
Disconnect the wires leading to the rotary rectifier, and measure the resistance between the wires.



6-15-3

(4) Exciter field winding wire

Disconnect 9P connector in the control panel, and measure the resistance at the connector on the generator side.



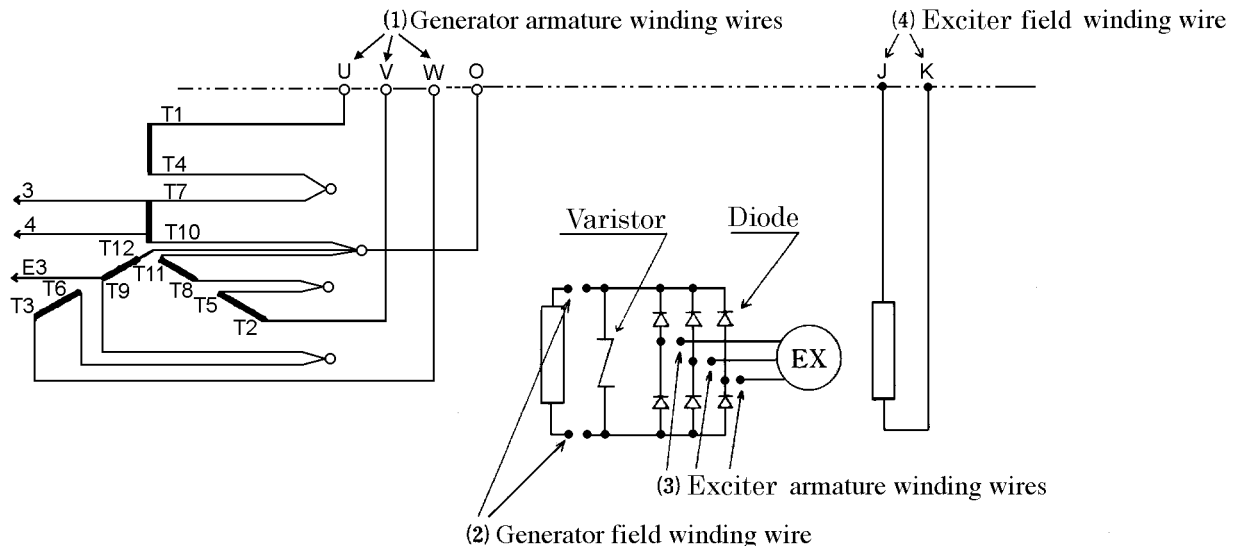
J terminal- between K terminal.

SG06020

4. Troubleshooting

[C] Measurement of Insulation Resistance of Generator Winding Wires

Measurement is performed with a 500V megger. The situation is considered to be satisfactory if the measurement produces a result of 1M or more, while a result of less than that value indicates failure.



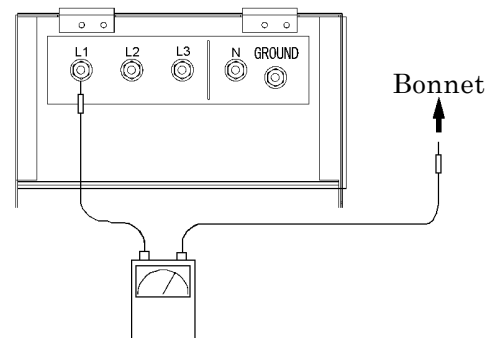
Voltage selection switch position 480/277V

6-17-1

(1) Generator armature winding wires

● (Procedure)(Megger tester required)

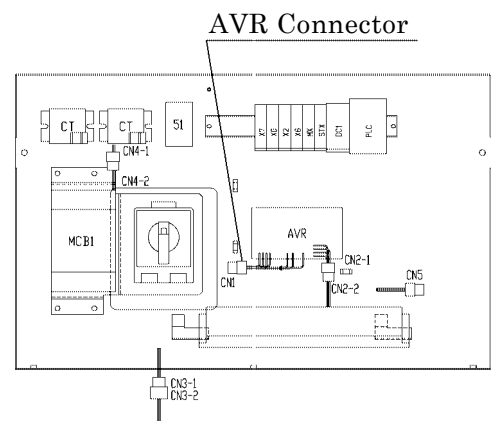
1. Remove the load side cable from the output terminal board.
2. Remove the cable between the terminal "N" and terminal "Ground" which are connected on the back of the output terminal plate.
3. Remove the AVR connector inside the generator control panel.
4. Switch ON the three-phase breaker, and then measure each insulation resistance between the terminals L1, L2, L3 terminal and bonnet.
5. Insulation resistance when measured with a 500V megger tester must be above 1 MΩ.
6. After finishing the measurement of insulation resistance, re-connect the cable between the terminal "N" and terminal "Ground".



A040180-1

WARNING

- After making sure that the insulation resistance of the generator is higher than 1 MΩ, be sure to re-connect the cable between the terminal "N" and terminal "Ground" just as it was originally connected. If it is left disconnected, the grounding becomes imperfect so that it could cause electric shock.

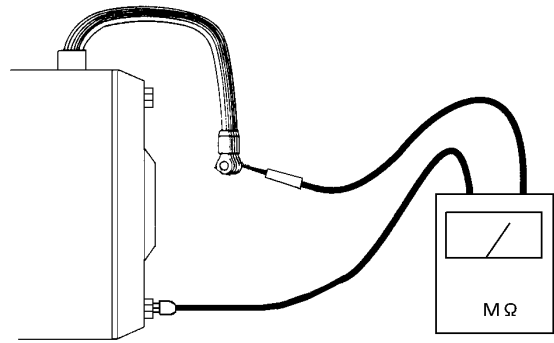


SDG45S/65S-6A6

A040179

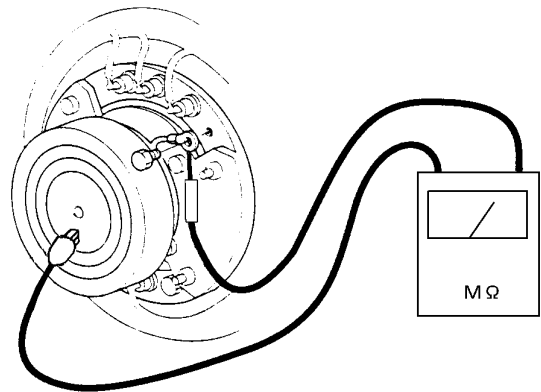
4. Troubleshooting

- Disconnect all wires leading from the generator to the control panel terminals and short-circuit them, then measure the insulation resistance between the wires and the generator body.



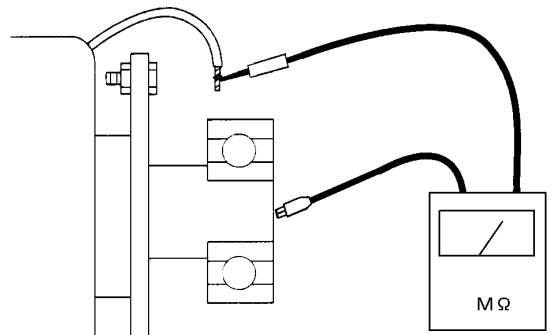
6-18-1

- (2) Generator field winding wire
Disconnect the wires leading to the rotary rectifier, then measure the insulation resistance between the disconnected wires and the shaft. (Do not megger the diodes)



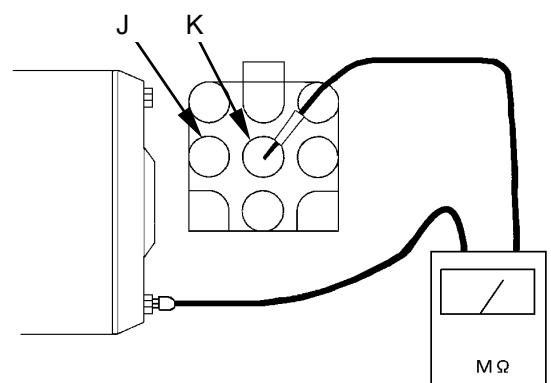
6-18-2

- (3) Exciter armature winding wires
Disconnect the wires and short-circuit them, then measure the insulation resistance between these wires and the shaft.



6-18-3

- (4) Exciter field winding wire
Disconnect the field connector (J,K) in the control panel, and measure the resistance at the connector on the generator side.



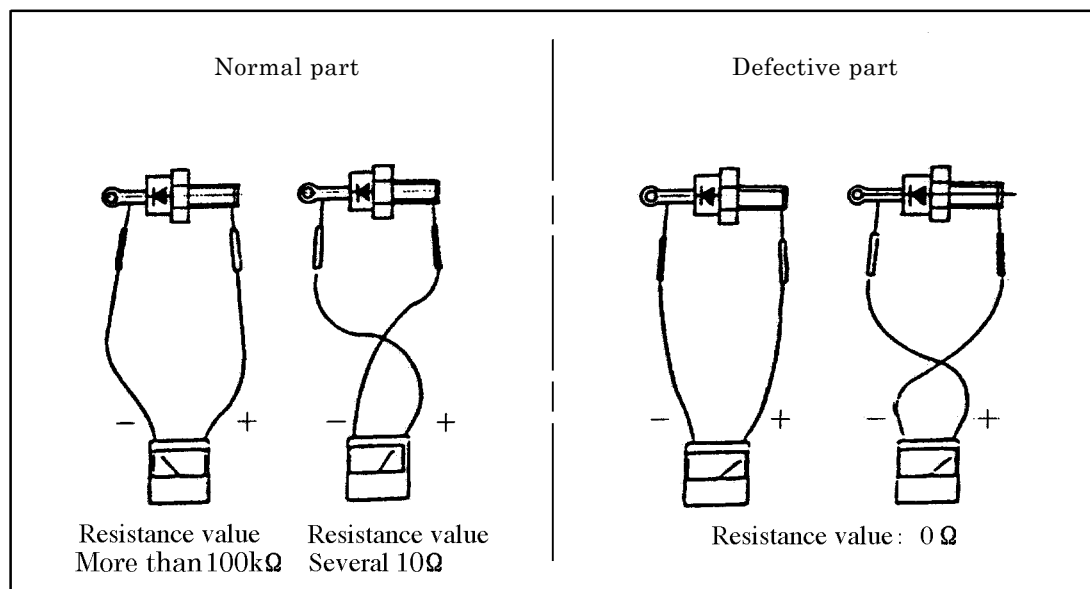
J terminal or K terminal-between body.

SG06021

4. Troubleshooting

[D] Checking Rotary Rectifier (Diode)

Remove the silicon rectifiers (diode) of rotary rectifier, and then measure them with a tester.

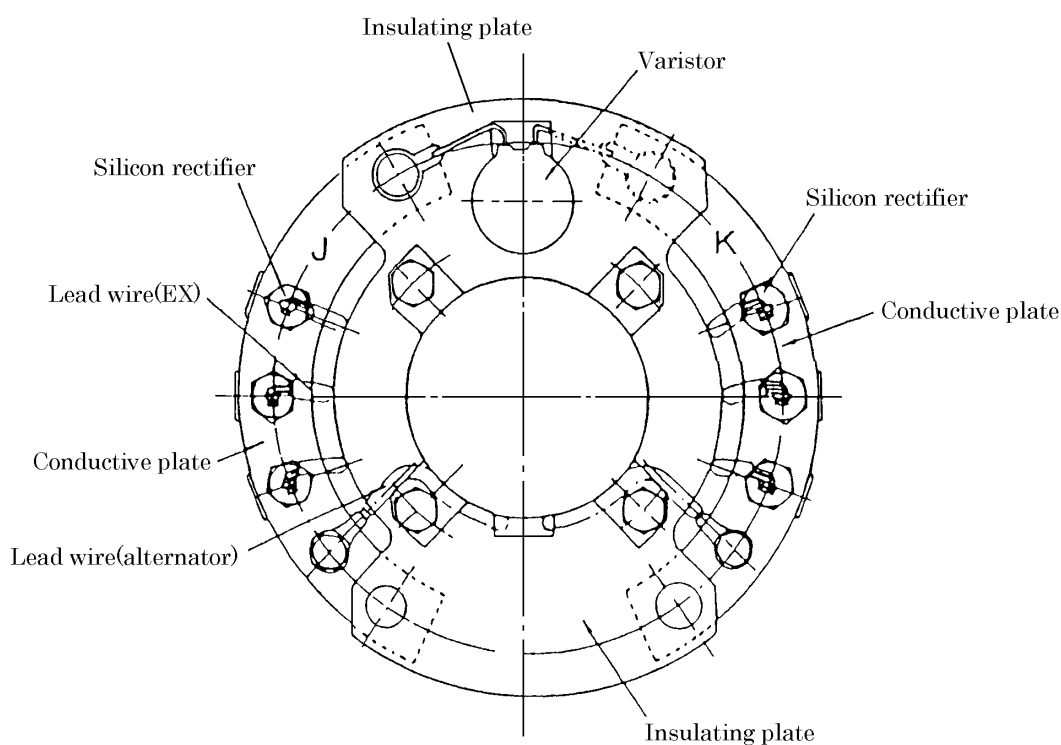


SG06013

Note: Rotary rectifier has 3 pieces of silicon rectifiers of forward polarity at K side and 3 pieces of silicon rectifier of reverse polarity at J side. Be care to distinguish the polarity. (positive and negative)

[E] Checking Varistor

Disconnect the terminals of surge absorber, then measure the resistance value between both terminals. Resistance value must be more than 100kΩ. (Range of tester × kΩ)



SG05092E

5. References

5.1 Generator's Winding Wires Resistance Value [At the Temperature of 68°F(20°C)]

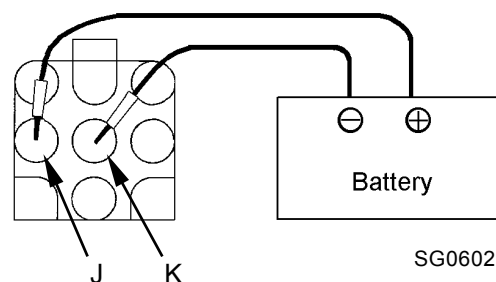
| | | | SDG25S -6A7 | SDG45S -6A6 | SDG65S -6A6 | SDG100S -6A6 | SDG125S -6A6 | SDG150S -6A6 |
|---|--|---|---|--|--|--|--|--|
| Generator armature winding wires | Voltage selection switch position 480/277V | Ω | 0.921 (T1-T2) (T2-T3) (T3-T1) | 0.374 (T1-T2) (T2-T3) (T3-T1) | 0.233 (T1-T2) (T2-T3) (T3-T1) | 0.114 (T1-T2) (T2-T3) (T3-T1) | 0.088 (T1-T2) (T2-T3) (T3-T1) | 0.069 (T1-T2) (T2-T3) (T3-T1) |
| | — | Ω | 0.23 (T1-T4) (T7-T10) (T2-T5) (T8-T11) (T3-T6) (T9-T12) | 0.094 (T1-T4) (T7-T10) (T2-T5) (T8-T11) (T3-T6) (T9-T12) | 0.058 (T1-T4) (T7-T10) (T2-T5) (T8-T11) (T3-T6) (T9-T12) | 0.029 (T1-T4) (T7-T10) (T2-T5) (T8-T11) (T3-T6) (T9-T12) | 0.022 (T1-T4) (T7-T10) (T2-T5) (T8-T11) (T3-T6) (T9-T12) | 0.017 (T1-T4) (T7-T10) (T2-T5) (T8-T11) (T3-T6) (T7-T12) |
| Generator field winding wires | | Ω | 2.293 | 2.378 | 3.024 | 2.219 | 2.72 | 1.62 |
| Exciter armature winding wires | | Ω | 0.522 | 0.522 | 0.571 | 0.415 | 0.44 | 0.18 |
| Exciter field winding wires | | Ω | 17.652 | 17.65 | 16.353 | 19.375 | 21.3 | 14.3 |
| Auxiliary winding wires | | Ω | 2.07 | 1.54 | 1.34 | 1.15 | ← | 1.0 |

5.2 Forced Excitation Method

1. Run the generator at the rated r.p.m.
2. Disconnect the field connector in the control panel, and apply the battery voltage to the exciter winding wire.

J and (+) terminal of battery

K and (-) terminal of battery



SG06022

3. Magnetize for 1 to 2 seconds, then remove the wires and check if voltage is generated.

Note: Thickness of lead wires between battery terminal and connector should be the same thickness as exciter field winding wires (J and K wires). It is dangerous that the wire may be overheating, if the wire is too small in thickness.

| Generated voltage from forced excitation (at 480V) (V) | | |
|--|---|-------------|
| | Voltage generated (V) [at the temperature of 104°F(40°C)] | |
| | Battery 12V | Battery 24V |
| SDG25S-6A7 | 440 | 570 |
| SDG45S-6A6 | 450 | 575 |
| SDG65S-6A6 | 450 | 575 |
| SDG100S-6A6 | 405 | 550 |
| SDG125S-6A6 | 400 | 555 |
| SDG150S-6A6 | 515 | 595 |

* The generating voltage is only for reference because it will change due to the ambient temperature.

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