



# OPERATIONS & MAINTENANCE MANUAL

## ESI DESIGNED AND BUILT

Kubota 03 Series Diesel Engine  
Mecc Alte ECP or ECO Gen End

## APPLICABLE MODELS

KPG-14-D15-MR2S

KPG-15-D17-MR2S

KPG-18-V20-MR2S

KPG-20-V22-MR2S

KPG-23-V20T-MR2S

KPG-24-V24-MR2S



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5064 Bennett Loop  
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**Equipment Source, Inc.**



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# General Information & Warranty

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# OPERATORS MANUAL

## KPG Generator

Kubota Powered Generators by ESI

### SPECIFICATIONS

See product specification sheet for product specifications



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# 1 Introduction

**WARNING**

Read and understand this manual before operating the machine to avoid serious injury or death.

## 1.1 General Description

ESI built KPG generators come in a variety of configurations and sizes. Refer to unit specifications and manual components for specific details. General operation and maintenance remains the same for all of these units.

## 1.2 Manual Applicability

This manual is applicable to the following Equipment Source Incorporated (ESI) machine models:

| Model                | Description                    |
|----------------------|--------------------------------|
| KPG Series           | Skid mounted ESI Generators    |
| KPG Enclosure Series | ESI Generators with Enclosures |

This manual should be kept with the machine at all times. Immediately contact Equipment Source Incorporated (manufacturer) or an authorized dealer to obtain a copy of this manual if missing or damaged. Refer to [www.equipmentsourceinc.com](http://www.equipmentsourceinc.com) for current contact information.

## 1.3 Manual Scope

This manual contains basic operating and maintenance instructions for the above listed product. For detailed service instructions concerning specific electrical or mechanical components, refer to the operation and maintenance manual provided by the manufacture of the specific component or contact an authorized service provider. Operation and Maintenance instructions for the generator controller can be found in the separate controller manual included with the generator.

## 1.4 Warranty

Review the warranty before operating or working on the unit. The warranty contains important safety and operational requirements. Contact ESI for the latest warranty information.

## 1.5 Installation

Review the installation requirements before installing, operating or working on the unit. The installation requirements contain important information and must be adhered to in order to maintain warranty. Contact ESI for the latest installation requirements.



## 2 IMPORTANT SAFETY INSTRUCTIONS

### WARNING

- SAVE THESE INSTRUCTIONS. This manual contains important instructions that should be followed during the operation and maintenance of the generator, battery and heater.

### 2.1 Training

- Never allow untrained personnel to operate or service the machine. Take time to read the manual and discuss safe practices with jobsite personnel.
- Read and understand the operating section of this manual.
- Take time to familiarize yourself with the controls and instructional placards before operating or servicing.
- Contact your dealer or service provider if additional training is necessary.

### 2.2 Operating

- Some components are hot while in operation. Keep clothing and combustibles away.
- Wear protective clothing, such as gloves, appropriate to the jobsite.
- Observe changes in the operating environment and respond accordingly.
- Generators vibrate in normal use. During and after the use of the generator, inspect the generator as well as extension cords and power supply cords connected to it for damage resulting from vibration. Have damaged items repaired or replaced as necessary. Do not use plugs or cords that show signs of damage such as broken or cracked insulation or damaged blades.

### 2.3 Service

- Only trained service technicians should attempt to service the machine.
- Properly shutdown the machine and let cool completely before attempting to service any component.
- Never defeat the safety devices
- Never modify the machine

## 3 Transporting

### 3.1 Lifting

#### CAUTION

- Ensure that any equipment used to lift the unit is rated for the weight of the unit.

### 3.2 Transporting

1. Lift the machine following the guidelines presented below.
2. If applicable: ensure all doors are closed and latched.
3. Remove any hoods in the way before lifting.
4. Lift the unit using ONLY designated lifting points or fork pockets.

### 3.3 Storage

Units placed in storage must be stored out of the elements and protected from rain, snow and sunlight. The warranty will be voided for units left exposed to the elements during storage. ESI built unit enclosures provide sufficient protection when properly closed.

#### 3.3.1 Short-Term Storage (less than 90 days)

1. Shutdown the machine
2. Close all doors (if applicable)

#### 3.3.2 Long-Term Storage (greater than 90 days)

1. Shutdown the machine
2. Verify that the main breaker and control switches are in the off position
3. Disconnect the battery
4. Drain water from fuel filters.
5. Secure/Close vents and openings (if applicable).

## 4 Operation

### 4.1 System Operation

Refer to individual component manuals for operation of those components. This unit should only be operated by trained personnel familiar with the operation of the entire system. Refer to the PRE-OPERATION CHECK portion of the Engine Manual

### 4.2 Recommended Fuels and Fueling Instructions

**⚠ CAUTION** Do not overfill tank. Tank should be filled to only 90% of the full volume to allow thermal expansion.

Use ULSD No.1 or ULSD No.2. For continuous duty operation, a refilling schedule should be established.

### 4.3 Engine Heat - 120V Power Input

If a cold start is required, use the 120V engine pre-heat circuit to warm the engine block and engine oil prior to starting. The engine should be pre-heated for approximately 4-hours if the ambient temperature is below -7°C (20°F). Longer preheat cycles may become necessary in extremely cold conditions.

Use a grounded flexible extension cord rated at 15A minimum to connect the machine to a 120V power supply. There is an orange, three-prong “Y” located on each of the generators.

### 4.4 Monitoring and Operation

#### 4.4.1 Minimum Loading of Diesel Engines

Diesel generator engines require that a minimum average load be maintained. An average load of 75% of the rated output of the generator must be maintained to avoid damaging the unit (often referred to as “Wet-Stacking”). Prolonged use of the generator at loads less than 75% of rated output will void the warranty, reduce the life span of the engine and cause damage to the unit. Refer to the ESI Warranty Summary for further details. Consider using a load bank to maintain minimum loading on the engine.

#### 4.4.2 Daily Inspection & Startup Inspection (required)

- Conduct general inspection of the unit
- Listen for abnormal sounds
- Check fluid levels
- Check all hoses for damage (including but not limited to fuel lines and coolant lines)
- Check engine temperature
- Check containment for accumulation of liquids.
- Check vents for icing or other obstructions (if applicable)
- Observe recommended maintenance schedule
- Check for error codes on control units for KPG and any other equipment associated with the unit.

#### 4.5 Long Run Oil Tank (LRT)

- A LRT equipped ESI generator has increased service intervals up to 3000 hours
  - Oil change intervals should be determined using an oil sample analysis at regular intervals to determine maximum service interval.
  - Operating conditions may affect the service interval of the LRT.
- The service interval of the LRT may change if operating conditions change
- Prefill oil filters with oil when completing an oil change on a LRT equipped unit. This reduces the likelihood of damaging air bubbles in the oil system.
- Users can expect some oil seeping between engine base and long run oil pan on LRT installations. This is a normal condition for operating the LRT and is not warrantable.
- Great care should be taken to limit vibration of the generator. Excessive vibration will cause premature failure of LRT seals and is not warrantable. See warranty and installation instructions for further details.



## 5 Maintenance

**⚠ CAUTION** Some of the following maintenance operations should only be completed by a trained technician. Do not attempt to open electrical panels unless you are a trained technician. Maintenance schedule must be adhered to and documented in order to maintain warranty. Maintenance programs should be tailored to the specific generator, environment and operating conditions.

### 5.1 Maintenance Schedule

**Table 1. Maintenance Schedule**

| Interval                                                                             | Maintenance Instruction                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Notes                                                                                                                              |
|--------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
| Daily                                                                                | <ul style="list-style-type: none"> <li>See section 4.4.2 of this manual for additional requirements</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Complete at every inspection                                                                                                       |
| Every 50 hours                                                                       | <ul style="list-style-type: none"> <li>Check of fuel pipes and clamp bands</li> <li>Check radiator hoses and clamp bands</li> <li>Drain water separator</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                    |
| Varies by model                                                                      | <p>Engine Oil Change and Oil Replacement Intervals</p> <ul style="list-style-type: none"> <li>Standard Oil Pan (Kubota Recommendation)               <ul style="list-style-type: none"> <li>Initial Oil Change: 50 hours</li> <li>Interval:                   <ul style="list-style-type: none"> <li>KPG-06 to KPG-24: 200 hours</li> <li>KPG-28 &amp; KPG-36: 250 hours</li> <li>KPG-45: 500 hours</li> </ul> </li> </ul> </li> <li>Long Run Oil Pan (LRT) Option               <ul style="list-style-type: none"> <li>Interval: 3,000 hours</li> </ul> </li> </ul> | <p>Engine oil must meet API Spec: CF, CF-4, CG-4, CH-4 or CI-4</p> <p>See section 4.5 for additional notes on LRT oil changes.</p> |
| Every 200 hours (KPG-06 to KPG-24)<br><b>OR</b><br>Every 250 hours (KPG-28 & KPG-45) | <ul style="list-style-type: none"> <li>Clean air cleaner element</li> <li>Change Engine Oil and Oil Filter (KPG-06 to KPG-36)</li> <li>Check and clean fuel filter</li> <li>Check battery electrolyte level</li> <li>Check fan belt tightness</li> <li>Check intake air line</li> <li>Inspect generator (see generator section of this manual)</li> </ul>                                                                                                                                                                                                            |                                                                                                                                    |
| Every 500 hours                                                                      | <ul style="list-style-type: none"> <li>Change Engine Oil and Oil Filter Cartridge (KPG-45, standard oil pan)</li> <li>Replace fuel filter cartridge</li> <li>Remove sediment in fuel tank</li> <li>Clean water jacket (radiator interior)</li> <li>Replace fan belt</li> <li>Clean water separator</li> </ul>                                                                                                                                                                                                                                                        |                                                                                                                                    |
| Every one or two months                                                              | <ul style="list-style-type: none"> <li>Charge battery as needed</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                    |

|                              |                                                                                                                                                                                                                                                                                                                    |                                                                                            |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| Every Year                   | <ul style="list-style-type: none"> <li>▪ Replace air cleaner element</li> <li>▪ Clean Generator (blow out with air) and inspect</li> <li>▪ Change Engine Oil and Oil Filter</li> </ul>                                                                                                                             | Air filter element may need cleaning more frequently depending on environmental conditions |
| Every 800 hours              | <ul style="list-style-type: none"> <li>▪ Check valve clearance</li> </ul>                                                                                                                                                                                                                                          |                                                                                            |
| Every 1500 hours             | <ul style="list-style-type: none"> <li>▪ Check fuel injectors</li> </ul>                                                                                                                                                                                                                                           |                                                                                            |
| Every 3000 hours             | <ul style="list-style-type: none"> <li>▪ Change Engine Oil and Oil Filter Cartridge (units equipped with LRT)</li> <li>▪ Check turbo charge (if unit is equipped with a turbo)</li> <li>▪ Check supply pump</li> </ul>                                                                                             |                                                                                            |
| Every Two Years              | <ul style="list-style-type: none"> <li>▪ Change radiator coolant</li> <li>▪ Replace battery</li> <li>▪ Replace radiator hoses and clamp bands</li> <li>▪ Replace fuel pipes and clamp bands</li> <li>▪ Replace intake air line</li> <li>▪ Replace fan belt (or every 500 hours, whichever occurs first)</li> </ul> |                                                                                            |
| Every 10,000 hours / 2 years | <ul style="list-style-type: none"> <li>▪ Inspect Generator sealed bearings</li> </ul>                                                                                                                                                                                                                              |                                                                                            |
| At 30,000 hours              | <ul style="list-style-type: none"> <li>▪ Replace Generator sealed bearings</li> </ul>                                                                                                                                                                                                                              |                                                                                            |

## 5.2 Engine Service

Use engine operator's or service manual provided for further instruction on how to complete routine service or trouble shooting.

## 5.3 Battery Service

The engine starting circuit is supplied by a single 12V battery. No maintenance is required other than normal charging and occasional replacement.

To replace the battery, sequentially remove the negative ground lead, positive power lead and the bracket holding the battery in the tray. Replace the battery by securing in the tray, connecting the positive lead and then connecting the ground lead.

## 6 Maintenance Records

Table 2. Machine Data

|                         |  |
|-------------------------|--|
| Machine Serial Number   |  |
| Engine Serial Number    |  |
| Generator Serial Number |  |

Table 3. Maintenance Records

|                                                                                                                                      |                               |
|--------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| <ul style="list-style-type: none"><li>▪ Date</li><li>▪ Engine Hours</li><li>▪ Service Personnel</li><li>▪ Service Location</li></ul> | Description of work completed |
|                                                                                                                                      |                               |
|                                                                                                                                      |                               |
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## Commonly Replaced KPG Parts

See next page for LRT options and remote fuel filters when applicable

| Engine Series | Model     | Kubota Engine | Oil Filter  | Air Filter                                 | Fuel Filter           | Oil Capacity           |
|---------------|-----------|---------------|-------------|--------------------------------------------|-----------------------|------------------------|
|               | KPG-05    | Z482          | 15426-32430 | P822686                                    | 12581-43012           | 2.6 Liters / 0.69 Gal  |
|               | KPG-06-NG | DG972         | HH150-32430 | 1G659-11222                                | N/A                   | 3.4 Liters / 0.90 Gal  |
|               | KPG-06-LP | WG972         |             |                                            |                       | 3.4 Liters / 0.90 Gal  |
| 05 Series     | KPG-06-MQ | D1005         | HH160-32093 | 15741-11083                                | 15221-43170           | 5.1 Liter / 1.35 Gal   |
|               | KPG-06    | D1005         |             |                                            |                       | 5.1 Liter / 1.35 Gal   |
|               | KPG-08    | D1105         |             |                                            |                       | 5.1 Liters / 1.35 Gal  |
|               | KPG-10    | D1305         |             |                                            |                       | 5.7 Liters / 1.50 Gal  |
|               | KPG-12    | V1505         |             |                                            |                       | 5.7 Liters / 1.50 Gal  |
| 03 Series     | KPG-14    | D1503         | HH164-32430 | 70000-11081                                | HH166-43560           | 7.0 Liters / 1.85 Gal  |
|               | KPG-15    | D1703         |             |                                            |                       | 7.0 Liters / 1.85 Gal  |
|               | KPG-18    | V2003         |             |                                            |                       | 9.5 Liters / 2.50 Gal  |
|               | KPG-20    | V2203         |             |                                            |                       | 9.5 Liters / 2.50 Gal  |
|               | KPG-24    | V2403         |             |                                            |                       | 9.5 Liters / 2.50 Gal  |
| V3 Series     | KPG-28    | V3300         | HH1C0-32430 | 3A111-19130 (inner)<br>59800-26110 (outer) | HH166-43560<br>& R60S | 13.2 Liters / 3.50 Gal |
|               | KPG-36    | V3600         |             | R2401-42280 (inner)                        |                       | 13.2 Liters / 3.50 Gal |
|               | KPG-45    | V3800         |             | 59700-26112 (outer)                        |                       | 13.2 Liters / 3.50 Gal |

## Long Run Oil Option (LRT)

Replaces standard oil filter and oil capacity from chart above for units with LRT installed

| Model            | LRT Model | LRT Size  | Oil Filter (2ea.) | Oil Capacity       |
|------------------|-----------|-----------|-------------------|--------------------|
| KPG-06 to KPG-12 | 05SMLRT   | 9 Gallon  | 16121-32430       | 32 Quarts / 8 Gal  |
| KPG-06 to KPG-12 | 05LRT     | 19 Gallon |                   | 48 Quarts / 12 Gal |
| KPG-15 to KPG-24 | 03LRT     | 19 Gallon |                   | 48 Quarts / 12 Gal |
| KPG-28 to KPG-45 | V3LRT     | 26 Gallon |                   | 64 Quarts 16 Gal   |

## Remote Racor Fuel Filter

In addition to fuel filters from above chart for units with auxiliary Racor Fuel filter installed.

| Model                   | Filter Part Number |
|-------------------------|--------------------|
| 120AS Racor Fuel Filter | R12S               |
| 660R2 Racor Fuel Filter | R60S               |

Part numbers may vary for non-standard products. Always have unit Stock # available when calling for parts.

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# KPG Model Breakdown

## ESI Generators

KPG - 18 - V20 - MR8S - AR2

### Type

KPG = Kubota Power Generator  
 FPG = Fiat Powered Generator  
 CPG = Cat Powered Generator  
 JPG = John Deere Powered Gen.  
 IPG = Isuzu Powered Generator

### Output

Nominal Output (KW)

### Engine

Z48 = Kubota Z482  
 DG97N = Kubota DG972 NG  
 WG97P = Kubota WG972 LP  
 WG97G = Kubota WG972 Gas  
 WG16P = Kubota WG1605 LP  
 WG16G = Kubota WG1605 Gas  
 WG25G = Kubota WG2503 Gas  
 D10 = Kubota D1005  
 D11 = Kubota D1105  
 D13 = Kubota D1305  
 V15 = Kubota V1505  
 D15 = Kubota D1503  
 4V18 = Kubota D1803 T4F  
 4V24 = Kubota V2403 T4F  
 4V38 = Kubota V3800 T4F

### T3 & Flex

D17 = Kubota D1703  
 V20 = Kubota V2003  
 V20T = Kubota V2003T  
 V22 = Kubota V2203  
 V24 = Kubota V2403  
 V33 = Kubota V3300  
 V36 = Kubota V3600  
 V38 = Kubota V3800  
 N45 = Fiat N45SM2X.A008  
 N6 = Fiat N67TM1X.A008

### Spec Built Generators (Examples)

ATT = Misc AT&T Spec Generators  
 TERRA= GCI Terra Project  
 GCI = Misc GCI Spec Generators  
 TCC = TCC Clinic Back Up

### Gen End Make

M = Mecc Alte  
 S = Stamford  
 A = Marathon

### Enclosures & Accessories

ME1 = Modular Enclosure Size 1  
*6kw to 12kw*  
 ME2 = Modular Enclosure Size 2  
*14kw to 24kw*  
 AR2 = Arctic Re-Air Size 2  
*14kw to 24kw*  
 AR3 = Arctic Re-Air Size 3  
*28kw to 45kw*  
 ENC = Misc. Enclosure  
 BR = Bull Rail Trailer  
 F120 = Skid Mounted Fuel Tank  
*Size in Gallons*  
 LRT = Long Run Oil Tank

### Generator End Model

#### MeccAlte

MR8S = ECP28-S or ECO28-S  
*6KW to 12KW*  
 MR2S = ECP32-S or ECO32-S  
*14KW to 24KW*  
 MR2L = ECP32-L or ECO32-L  
*28KW to 45KW*  
 MREC = NPE32-C/4 (Pancake)  
*6KW*  
 MREF = NPE32-F (Pancake)  
*26.5kw*  
 M16F = S16F-150 (3600 RPM)  
*4KW to 6KW & APU*

#### Marathon

AS36 = 361PSL1652  
*50KW 3P Dual Voltage*

#### Stamford

S11L BCI164A1L  
*6kw*

### Generator End

M R 8S

### Phase Configuration

R = Reconnectable 12-Lead  
 1 = Dedicated Single Phase  
*4-Lead*  
 3 = Dedicated Three Phase  
 S = Dedicated Three Phase  
 Switchable: 208/240 to 240/480



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**WARRANTY****EQUIPMENT SOURCE INC.  
LIMITED WARRANTY****INFORMATION**

Equipment Source Inc. (ESI) warrant to you, the original purchaser, that all parts (except those 3<sup>rd</sup> party components listed below) of your new ESI product purchased from an Authorized ESI Distributer or from ESI directly will be free from defects in materials or workmanship for 1 (one) year/2,000 hours (whichever occurs first) from invoice date. Additional component warranties are listed below.

Summary of major component warranties (see component sections of this manual for further details and additional warranties). Warranty periods are from invoice date. Not all of the following components are applicable to every product. All warranty time periods begin at invoice date:

1. Engine – 2 (two) years / 2,000 hours, whichever occurs first (please refer to the Kubota Engine Warranty sheet enclosed in this manual).
2. Generator and Controls – Free from defects in materials or workmanship for 1 (one) year / 2,000 hours.
3. Flagro Heater / Fire Box - 1 (one) year / 2,000 hours
4. ESI Manufactured Firebox– free from defects in materials or workmanship for 3 (three).
5. Pump – 1 (one) year (please refer to the pump warranty sheet enclosed in this manual), wear parts are not covered under warranty.
6. Buderus Boiler – 2 (two) years limited warranty, please refer to Buderus warranty sheet enclosed in this manual.

In order to obtain warranty repairs, you must deliver the product, at your expense, together with proof of purchase to 1919 Van Horn Road, Fairbanks, AK 99701 (907.458.9049) or 7780 Old Seward Highway, Anchorage, AK 99518 (907.341.2250). Call 907.458.9049 from outside Alaska. Offsite warranty may be performed if customer pays all travel and shipping expenses.

No person, agent or dealer is authorized to give any warranties on the behalf of ESI, nor is to assume for this company any other liability in connection with any of ESI's products unless made in writing and signed by an officer of ESI. This warranty supersedes and is in lieu of all other warranties, expressed or implied including terms and

conditions of Purchase Orders. The company must be notified within 5 (five) business days, in writing of any product failure and warranty claim.

**WHAT THE WARRANTY DOES NOT COVER**

This warranty **does not** cover:

1. Damage, malfunction or failures resulting from accidents, abuse, misuse, modifications, alteration, improper servicing or lack of performance of required maintenance service voids the warranty including but not limited to regularly scheduled oil changes and filter changes.
2. Damage, malfunction or failures resulting from underloading of the engine (also known as wet stacking) voids the warranty. Refer to the Operations and Maintenance manual for proper engine loading requirements.
3. Normal maintenance services or replacement of maintenance items such as light bulbs, preheater plugs, heater nozzles, filter elements, lubricants, oils, coolant, belts, tires, or other wear items.
4. This warranty does not cover cosmetic damage.
5. 3<sup>rd</sup> party parts installed on ESI products. Unauthorized modifications to the unit will void the warranty and may impair function.
6. Failure of or damage caused by ancillary systems. These include but are not limited to failures of the fuel or oil system (not provided by ESI), HVAC system, building / structure or other systems.
7. Units placed in storage must be stored out of the elements and protected from rain, snow and sunlight. The warranty will be voided for units left exposed to the elements during storage. ESI built unit enclosures provide sufficient protection when properly closed.
8. Improperly installed products. Operating the unit on or in the packing pallet or crate or improperly mounted skid generator (including installation of isolators between the skid and mounting surface) voids the warranty. Consult the product operator's manual for required installation procedures.
9. Installation of electrical components by anyone other than a licensed electrician voids the warranty.

10. Use of the unit for application other than what the product was meant for voids the warranty.
11. Warranty coverage expires whenever the client, for whatever reason, is late in payment.
12. The warranty does not cover repairs or modifications for small oil weeps on Long Run Oil Tanks (if installed). A small amounting of weeping during break in and use is expected and does not warrant repairs.

#### **LIMITATION ON ESI's RESPONSIBILITY**

Our responsibility for any and all losses and damages resulting from any cause whatsoever, including our negligence, alleged damage or defective goods, whether such defects are discoverable or latent, shall be limited to the repair or replacement of defective parts. IN NO EVENT WILL ESI BE LIABLE FOR LOSS OF USE, LOSS OF PROFITS, LOSS OF OR DAMAGE TO OTHER PROPERTY, INCONVENIENCE, COMMERCIAL LOSS, ENVIRONMENTAL CLEANUP OR OTHER SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER. ESI will in no event be liable for fuel, oil, coolant or other spills or cleanup regardless of cause or fault. Proper containment and monitoring is the sole responsibility of the end user. In no event shall ESI's liability ever exceed the purchase price of the specific unit in questions.

#### **MONITORING REQUIREMENTS**

Frequent monitoring of equipment is vital for proper operation and maintenance of the equipment. All equipment must be monitored daily by trained technicians (or more frequently if indicated in the Operation Manual). Monitoring can be achieved via electronic monitoring systems for remote installations (unless otherwise noted in the Operation Manual). The following unit conditions must be monitored on a daily basis, failure to do so will void all warranties. Additional monitoring may be required depending on site specific requirements.

- General inspection of unit to include: inspection for leaks, damage to unit, improper operation, malfunctioning equipment, error codes or other issues.
- Inspect coolant level and condition. Add coolant as needed to maintain proper coolant levels. Replace coolant if coolant condition has degraded.
- Inspect oil level and condition. Add oil as needed to maintain proper oil levels. Replace oil at recommended service intervals or if oil is found to have degraded.

- Inspect Engine temperature and engine speed.
- Inspect containment, check for leaks and presence of fluids in containment

Maintenance logs must be maintained for the unit and provided to ESI for warranty claims. ESI offers monitoring equipment for electronic monitoring.

#### **OPERATION & SAFETY REQUIREMENTS**

Failure to adhere to these requirements will void all warranties.

- Read and understand carefully all components of the Operator's Manual prior to starting or operating the unit.
- Learn how to operate and work safely. Know your equipment and its limitations. Always keep the engine in good condition.
- Do not carry out maintenance on a running or hot unit. Keep hands away from moving parts.
- Do not climb on top of the unit to perform work of any kind.
- When lifting the unit, ensure that the lifting device is rated for the unit weight. Only lift the unit with provided lifting rings or fork pockets.
- In case of emergency, shut off the engine and notify the person in responsible charge.
- Follow all applicable laws and regulations regarding operation and maintenance of the unit.
- For Trailer Mounted Units:
  - o Ensure that the trailer is registered with an applicable transport authority before towing.
  - o Complete a thorough walk around inspection of the unit before towing. Inspect for damage or abnormalities and repair as needed before travel.
  - o Disconnect the trailer from the tow vehicle, place wheel chocks behind the wheels and level prior to running or operating the unit.
- Refer to the various component sections of the Operator's Manual for proper maintenance and service intervals.

Failure to adhere to any of the above requirements or the requirements of Installation Instructions or Operations and Maintenance Manual will void all warranties. ESI reserves the right to update or modify this warranty at time. Contact ESI for a current warranty.



**KUBOTA ENGINE AMERICA CORPORATION  
LIMITED WARRANTY ON INDUSTRIAL ENGINES  
AND REPLACEMENT PARTS EFFECTIVE JANUARY 1, 2009**

**OUR WARRANTY TO YOU**

We warrant to you, the original purchaser, that all parts (except those referred to below) of your new Kubota industrial engine and replacement parts purchased from an Authorized Kubota Industrial Engine Distributor or OEM Distributor in the United States will be free from defects in materials or workmanship during the following periods.

1. Industrial Engines for 2 years or 2,000 hours, whichever occurs first.
2. Industrial Engines Major Component Warranty (MCW), 3 years or 3000 hours, whichever occurs first, parts only.

**MCW covers** cylinder block, cylinder head, crankshaft, camshaft, gears, pistons, rods, flywheel, flywheel housing, oil pump, pulleys, governor, intake manifold, oil pan, ignition distributor.

**MCW does not cover** rings, bearings, water pump, any electrical component, valve train components, accessory parts, seals, gaskets, carburetors, exhaust manifold, hoses, all fuel system components, muffler, any filters, radiator, fan, belts, thermostat, spark plugs, fuel transfer pumps.

3. Replacement parts for 1 year.

**WHAT WE WILL DO**

We will, at our option, repair or replace any part covered by this warranty which becomes defective, malfunctions or otherwise fails to conform with this warranty under normal use and service during the term of the warranty at no charge for parts or labor. (Parts only for MCW)

**WHAT YOU MUST DO TO OBTAIN WARRANTY SERVICE**

In order to obtain warranty repairs, you must deliver the product, together with proof of purchase, to an Authorized Kubota Industrial Engine Distributor or Dealer at your expense. The names and addresses of such Authorized Kubota Industrial Engine Distributors can be found on the internet at [www.kubotaengine.com](http://www.kubotaengine.com), by calling 1-800-532-9808 or by contacting:

Kubota Engine America Corporation  
505 Schelter Road  
Lincolnshire, IL 60069

**WHAT THE WARRANTY DOES NOT COVER**

This warranty **does not** cover:

1. Damage, malfunctions or failures resulting from accidents, abuse, misuse, modifications, alteration, improper servicing, or lack of performance of required maintenance service.
2. Normal maintenance services or replacement of maintenance items such as light bulbs, preheater plugs, indicator and resistant coils, filter elements, lubricants, oils, spark plugs, coolant, or belts.
3. Installation of replacement parts, unless originally installed by an Authorized Kubota Industrial Engine Distributor or Dealer.
4. Non-genuine Kubota parts.
5. Any engines damaged by use of ether or any starting aid, or greater than a 50/50% solution of antifreeze and water.
6. Injection nozzle wear or any engine damage caused by injection nozzle wear or sticking.
7. Damage caused by water entering the engine due to any cause.
8. Used Products.
9. Any damage caused by overheating that is not a direct result of a defect in materials or workmanship.
10. Any Engine not application reviewed.

engine installation to optimize functionality/performance within the OEM's equipment in order to maintain durability, customer satisfaction, and reduce warranty failures and expenses. Kubota cannot anticipate all potential failures and issues that may occur with the engine or product in the field during an application review. Therefore, machine durability testing by the OEM either in a test facility and/or in the field is critical to further reduce the potential for field failures.

The amount of time spent by KEA on an application review is significantly less than the amount of time spent by the OEM's design engineers on the application. Because of this, the KEA application review is intended to identify issues that are within the scope of the application review testing performed and in some cases recommend possible solutions. The KEA application review should never take the place of proper design and testing of the finished product by the OEM.

The KEA application review does not in any way express or imply any additional warranty coverage other than what is stated in Kubota's Limited Warranty Agreement. Kubota and its subsidiary companies are not responsible for (including, but not limited to): failures resulting from any components that are not manufactured by Kubota, misrepresented or incorrect information provided from an OEM, any changes made without KEA's knowledge, any decision by the OEM not to follow KEA's recommendations, or any application related problems or deficiencies that may arise that were not found by KEA's limited application review or the OEM's durability testing.

**THIS IS THE ONLY EXPRESS WARRANTY ON OUR PRODUCTS**

We neither assume nor authorize anyone to assume for us any other express warranty. The Kubota Distributor/ Dealer has no authority to make any representation or promise on behalf of Kubota Engine America Corporation or to modify the terms or limitations of this warranty in any way.

**LIMITATIONS ON OUR RESPONSIBILITY WITH RESPECT TO PRODUCTS PURCHASED AND USED FOR PERSONAL, FAMILY OR HOUSEHOLD USE.**

Our responsibility is to repair or replace defective parts as stated above. We will not be responsible for any other expenses, losses or inconvenience which you may sustain as a result of the purchase, use, malfunction or defective condition of our products. ANY IMPLIED WARRANTIES INCLUDING WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE SHALL BE LIMITED IN DURATION TO THE PERIOD SET FORTH ABOVE AND IN NO EVENT WILL WE BE LIABLE FOR ANY SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER. Some states do not allow limitations on how long an implied warranty lasts or the exclusion or limitation of incidental or consequential damages, so the above limitations or exclusions may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

**LIMITATIONS ON OUR RESPONSIBILITY WITH RESPECT TO PRODUCTS USED FOR RENTAL OR FOR COMMERCIAL, INDUSTRIAL OR AGRICULTURAL PURPOSES.**

This warranty is in lieu of all other warranties, express or implied, and of any other obligations or liability on our part. IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE EXCLUDED. Our responsibility for any and all losses and damages resulting from any cause whatsoever, including our negligence, alleged damage or defective goods, whether such defects are discoverable or latent, shall be limited to the repair or replacement of defective parts as stated above. IN NO EVENT WILL WE BE LIABLE FOR LOSS OF USE, LOSS OF PROFITS, LOSS OF OR DAMAGE TO OTHER PROPERTY, INCONVENIENCE, COMMERCIAL LOSS, OR OTHER SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES WHATSOEVER.

**APPLICATION REVIEW PROCESS:** The Kubota Engine America (KEA) application review process is intended to assist the OEM with



## **INSTALLATION REQUIREMENTS FOR ESI OPEN SKID GENERATORS KPG AND ALL OTHER SERIES GENERATORS**

The installation and commissioning of a generator is never a Plug n Play event. Proper professional review is always needed for proper operation, personal safety and to maintain warranty. All applicable codes and laws must be adhered to for proper installation.

All electrical connections must be reviewed and confirmed at the time of installation by a licensed electrician. Compatibility and configurations of system components such as but not limited to: generator, fuel systems, enclosures, switchbox, controllers and service panels must be reviewed by a qualified professional at the point of installation. All wires and hoses must have protection from chaffing as needed. An adequate and safe 12v power, fuel supply and exhaust must be provided.

Proper installation of the skid mounted generator must include a solid platform for support. The skid must be secured to prevent the unit from walking and to prevent excess vibration. The generator must be removed from the shipping pallet, crate or other shipping materials for proper installation. The open skid generator is provided with isolator mounts between the engine/genset and skid. The mass of the skid is not adequate to provide vibration isolation for the supported components without proper installation. The installation of additional isolators between the skid and mounting surface will create excess vibration and voids all warranties.

The skid must be securely attached to a concrete floor, metal structure or reinforced wooden floor designed for the application and load. All installations must be reviewed by a professional shortly after commissioning to ensure compliance with these installation requirements.

ESI highly recommends that skid mounted generators be installed with adequate fluid containment and other safeties including but not limited to remote monitoring. The installer and operator of the generator must adhere to all laws and regulations governing the installation and operation of the generator. The installer and operator must follow industry best practices where they meet or exceed the requirements laid in these instructions, the Warranty Summary or the Operations and Maintenance Manual.

Improper installation or failure to adhere to these instructions will void the warranty, may promote the risk of injury and reduce the useful life of the unit. See Warranty Summary and Operations and Maintenance Manual for further details and requirements.

Contact ESI for the latest Installation Requirements, Warranty Summary or Operations and Maintenance Manual.

### **Anchorage:**

7780 Old Seward Hwy  
Anchorage, AK 99518  
(907) 341-2250 | (877) 341-2250

### **Fairbanks:**

1919 Van Horn Road  
Fairbanks, AK 99701  
(907) 458-9049 | (888) 868-9049

### **Seattle:**

17660 W. Valley Hwy  
Tukwilla, WA 98188  
(425) 251-6119

### **Williston:**

5064 Bennett Loop  
Williston, ND 58801  
(701) 774-5312



[ESlAlaska.com](http://ESlAlaska.com)

# Alternator Manual

**Anchorage:**

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Anchorage, AK 99518  
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Williston, ND 58801  
(701) 774-5312

Equipment Source, Inc.



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**I**

## **ALTERNATORI AUTOREGOLATI SERIE ECO-ECP**

ISTRUZIONI PER L'USO E LA MANUTENZIONE

**GB**

## **SELF-REGULATING ALTERNATORS SERIES ECO-ECP**

OPERATING AND MAINTENANCE INSTRUCTIONS

**F**

## **ALTERNATEURS AUTO - REGULES SERIE ECO-ECP**

MANUEL D'INSTRUCTION ET DE MAINTENANCE

**D**

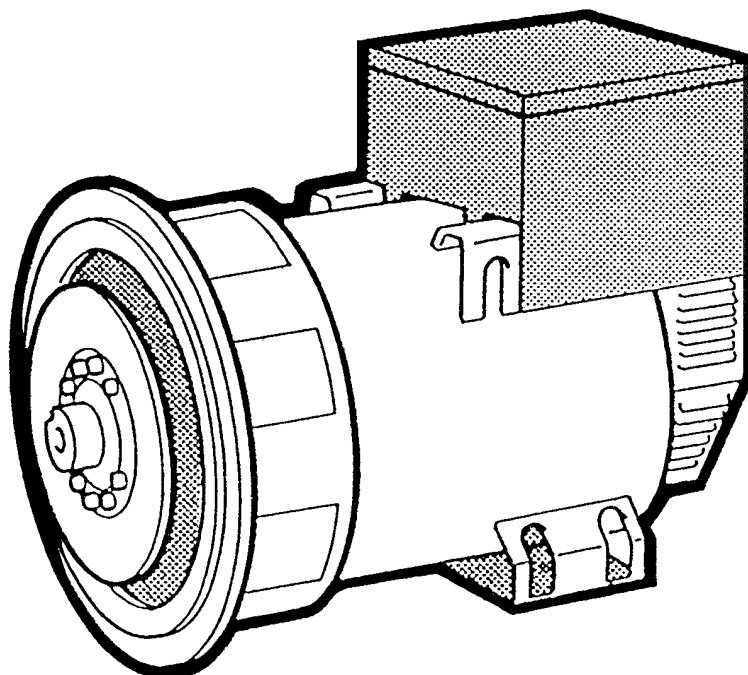
## **SELBSTREGELNDER GENERATOR SERIE ECO-ECP**

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**E**

## **ALTERNADORES AUTOREGULADOS SERIE ECO-ECP**

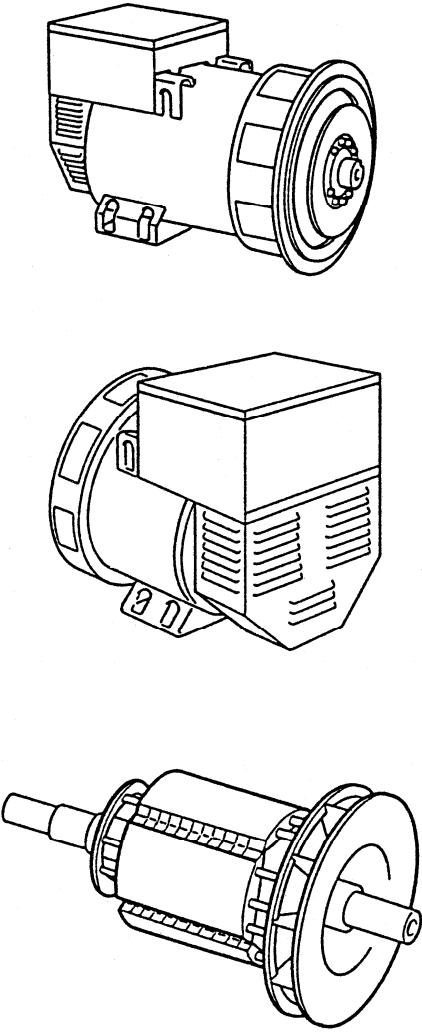
INSTRUCCIONES PARA USO Y MANTENIMIENTO



# **ECO ECP**



**US**  
INSULATION SYSTEM

| INDICE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | PAG                                                                                  | INDEX                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
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| <b>DESCRIZIONE<br/>MACCHINA</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                      | <b>MACHINE<br/>DESCRIPTION</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <p>I generatori della serie ECO-ECP sono autoregolati, brushless a 2 e 4 poli. Hanno induttore rotante provvisto di gabbia di smorzamento e indotto fisso a cave inclinate.</p> <p>Gli avvolgimenti sono a passo raccorciato per ridurre il contenuto armonico.</p> <p>I generatori sono costruiti in conformità alle direttive CEE 2006/42, 2006/95, 2004/108 e relative modifiche, alle norme CEI 2-3, EN 60034-1, IEC 34-1, VDE 0530, BS4999-5000, CAN/CSA-C22.2 N°14 - N°100.</p> <p>Le prove per la verifica della compatibilità elettromagnetica sono state eseguite nelle condizioni prescritte dalle norme, con il neutro collegato a terra.</p> <p>Esecuzioni in accordo ad altre specifiche possono essere eseguite su richiesta del cliente.</p> <p>La struttura meccanica, sempre molto robusta, consente un facile accesso ai collegamenti e permette di eseguire le verifiche nelle diverse parti altrettanto facilmente.</p> <p>La carcassa e' realizzata in acciaio, gli scudi in ghisa, l'albero in acciaio C45 con ventola calettata.</p> <p>Il grado di protezione e' IP21 (a richiesta e' possibile realizzare un grado di protezione superiore).</p> <p>Gli isolamenti sono eseguiti in classe H, le impregnazioni con resine epossidiche per le parti rotanti e trattamenti sottovuoto per le parti di piu' elevata tensione, quali gli statori (a richiesta trattamenti speciali).</p> |  | <p>ECO-ECP 2 and 4 pole alternators are brushless, self-regulating and incorporate a rotating inductor with damper cage winding and a fixed stator with skewed slots.</p> <p>The stator windings have a shortened pitch to reduce the harmonic content of the output waveform.</p> <p>The alternators are made in compliance with the 2006/42, 2006/95, 2004/108 CEE directives and their amendments, and the CEI 2-3, EN 60034-1, IEC 34-1, VDE 0530, BS4999-5000, CAN/CSA-C22.2 N°14 -N°100 regulations.</p> <p>Tests to verify the electromagnetic compability have been carried out in the foreseen conditions by the standards with the neutral connected to the earth.</p> <p>On customer's request alternators can be manufactured according to different specifications.</p> <p>The robust mechanical construction gives good access to the generator output connections, and allows the user to inspect the various components with ease.</p> <p>The casing is made of steel, the shields of cast iron, and the shaft of C45 steel and it has a keyed fan.</p> <p>The mechanical protection level meets standard IP21 (upon request higher levels of protection can be supplied).</p> <p>Insulation materials meet Class H requirements, and all rotating components are epossy resins impregnated; higher voltage parts, such as the stators, are vacuum-treated (special treatments are available on request).</p> |

## PREMESSA

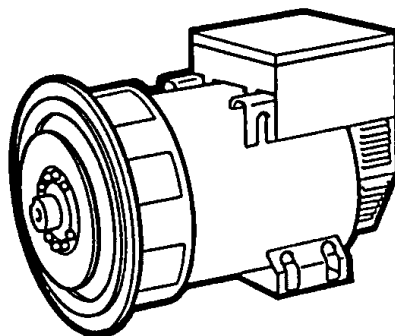
I generatori della serie ECO-ECP, rispondono alle direttive CEE 2006/42, 2006/95, 2004/108 e relative modifiche; pertanto non presentano pericolo per l'operatore, se installati, usati, mantenuti secondo le istruzioni fornite dalla Mecc Alte e a condizione che i dispositivi di sicurezza siano tenuti in perfetta efficienza.

Per questa ragione occorre attenersi scrupolosamente alle istruzioni indicate in questo manuale.

E' vietata qualsiasi riproduzione di questo manuale.

## IDENTIFICAZIONE MACCHINA

Per qualsiasi comunicazione con la Mecc Alte o con i centri di assistenza autorizzati, citare sempre il tipo e il codice del generatore.



## INTRODUCTION

The ECO-ECP alternators comply with the EEC 2006/42, 2006/95, 2004/108 directives and their amendments; therefore they pose no danger to the operator if they are installed, used and maintained according to the instructions given by Mecc Alte and provided the safety devices are kept in perfect working conditions.

Therefore a strict observance of these instructions is required.

Any reproduction of this manual is forbidden.

## MACHINE IDENTIFICATION

Always indicate the generator type and code when contacting Mecc Alte or the authorized after-sales service centres.

|               |                    |                                                                                          |                     |       |            |
|---------------|--------------------|------------------------------------------------------------------------------------------|---------------------|-------|------------|
| Mecc Alte spa |                    | Via Rome n.20, 36051<br>Tel. 0444/396111-R.A.<br>CREAZZO VICENZA ITALIA Fax. 0444/296166 |                     | CE    |            |
| TYPE          | ECO 40-15/4        | N.                                                                                       | 0000792970          | PHASE | 3          |
| KVA           | 400                | 480                                                                                      | COSPHI              | 0.8   | INS. CL. H |
| R.P.M.        | 1500               | 1800                                                                                     | Hz                  | 50/60 |            |
| V             | 115/200/230/400    |                                                                                          | 138/240/276/480     |       |            |
| A             | 2008/1155/1004/577 |                                                                                          | AMBIENT TEMPERATURE | 40°C  |            |
| CONNECTION    | TT/SS/T/S          |                                                                                          | IP                  | 21    |            |
| SERV.         | V.exec.            | 35.0                                                                                     | I.exc.              | 3.64  |            |
| KG            | 1024               | J                                                                                        | 5.45                | COD.  | ECO4015    |
| CUSCINETTI    | 6318 2RS1          |                                                                                          | DATE                | 1999  | MECC       |
| ROLLMENTS     |                    |                                                                                          |                     |       | IN ITALY   |

18V OVERLAP FOR 2 h. IN A 24 h PERIOD  
ALTERNATORE AUTOREGOLATO-SELF REGULATED ALTERNATOR-ALTERNATEUR AUTOREGULE  
EN 60034-1 CET 2-3 - IEC 34-3 - VDE 0530 - BS4999-5449 - NF 61-111

## VERIFICA ALLA CONSEGNA

Alla consegna del generatore controllare con la bolla di accompagnamento che non ci siano danni o parti mancanti; nel caso informare immediatamente lo spedizioniere, l'assicurazione, il rivenditore o la Mecc Alte.

|                                            |  |  |  |
|--------------------------------------------|--|--|--|
| mecc alte spa                              |  |  |  |
| Via Roma, 20 - 36051 Creazzo (VI) - Italia |  |  |  |
| Tel. 0444/396111 - Fax 0444/296166         |  |  |  |
| E-mail: info@meccalte.it                   |  |  |  |
| Web: www.meccalte.it                       |  |  |  |
| Data: 21/11/00                             |  |  |  |
| Firma: [Signature]                         |  |  |  |
| Stampa: [Stamp]                            |  |  |  |
| Descrizione: [Text]                        |  |  |  |
| Quantita': [Text]                          |  |  |  |
| Destinazione: [Text]                       |  |  |  |
| Note: [Text]                               |  |  |  |
| Firma Cliente: [Text]                      |  |  |  |
| Data Cliente: [Text]                       |  |  |  |

## INSPECTION ON DELIVERY

When the alternator is delivered, check that unit conforms with the delivery note and ensure that there are no damaged or defective parts; should there be any, please inform the forwarding agent, the insurance company, the seller or Mecc Alte immediately.

## PRESCRIZIONI DI SICUREZZA

Prima di qualsiasi intervento di pulizia, lubrificazione o manutenzione assicurarsi che il motore primario a cui e' collegato il generatore non sia in funzione, ma fermo e isolato dalle sue fonti di energia.

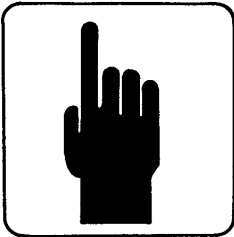
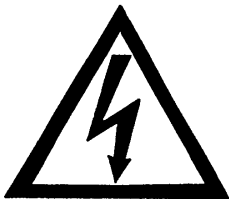
Per fermare il generatore occorre seguire scrupolosamente la procedura di arresto del sistema di trascinamento; il generatore non e' previsto di Stop/Emergenza, ma si arresta istantaneamente in relazione al sistema di arresto predisposto dall'installatore.



## SAFETY REQUIREMENTS

Before any cleaning, lubrication or maintenance operation, ensure that the generator is stationary and disconnected from the power supply.

When stopping the generator, ensure the compliance with the procedures for stopping the prime mover.  
The generator, in fact, has no Emergency Stop, but is controlled by the device arranged by the installer.

| PRESCRIZIONI<br>DI SICUREZZA                                                                                                                                                                                                                                     | SAFETY<br>REQUIREMENTS                                                                                                                                                                                                        |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Durante la consultazione del presente manuale d'uso e manutenzione troverete alcuni simboli; questi hanno un preciso significato qui di seguito illustrato.</p>                                                                                               | <p>In consulting this use and maintenance manual, you will find several symbols, which have a specific meaning, as illustrated below.</p>                                                                                     |
| <p><b>SIMBOLOGIA CONVENZIONALE<br/>E SUA DEFINIZIONE</b></p>                                                                                                                                                                                                     | <p><b>CONVENTIONAL SYMBOLS AND<br/>SYMBOL DESCRIPTION</b></p>                                                                                                                                                                 |
| <p><b>IMPORTANTE</b><br/>Segnala al personale interessato che l'operazione descritta presenta un rischio che può avere come conseguenza un danno alla macchina, se non effettuata nel rispetto delle normative di sicurezza.</p>                                 | <p><b>IMPORTANT</b><br/>This symbol warns the personnel concerned that the described operation may cause damages to the machine if it is not carried out according to the safety standards.</p>                               |
| <p><b>ACCORTEZZA</b><br/>Segnala al personale interessato che l'operazione descritta presenta un rischio che può avere come conseguenza un danno alla macchina e/o lesioni al personale stesso, se non effettuata nel rispetto delle normative di sicurezza.</p> | <p><b>CAUTION</b><br/>This symbol warns the personnel concerned that the described operation may cause damages to the machine and/or injures to the personnel if it is not carried out according to the safety standards.</p> |
| <p><b>AVVERTIMENTO</b><br/>Segnala al personale interessato che l'operazione descritta presenta un rischio che può avere come conseguenza lesioni gravi o morte, se non effettuata nel rispetto delle normative di sicurezza.</p>                                | <p><b>WARNING</b><br/>This symbol warns the personnel concerned that the described operation may cause serious injuries or death to the personnel if it is not carried out according to the safety standards.</p>             |
| <p><b>PERICOLO</b><br/>Segnala al personale interessato che l'operazione descritta presenta un rischio immediato che ha come conseguenza lesioni gravi o morte, se non effettuata nel rispetto delle normative di sicurezza.</p>                                 | <p><b>DANGER</b><br/>This symbol warns the personnel concerned that the described operation may immediately cause serious injuries or death to the personnel if it is not carried out according to the safety standards.</p>  |
| <p>IMPORTANTE<br/>IMPORTANT<br/>WICHTIG</p>                                                                                                                                                                                                                      |                                                                                                                                                                                                                               |
|                                                                                                                                                                                |                                                                                                                                                                                                                               |
|                                                                                                                                                                               |                                                                                                                                                                                                                               |
|                                                                                                                                                                               |                                                                                                                                                                                                                               |

## PRESCRIZIONI DI SICUREZZA

### ADDETTO ALLA MOVIMENTAZIONE

Identifica il tipo di operatore a cui è riservato l'intervento trattato.

Questa qualifica presuppone una piena conoscenza e comprensione delle informazioni contenute nel manuale d'uso del costruttore oltre che competenze specifiche dei mezzi di sollevamento, dei metodi e delle caratteristiche d'imbragatura e della movimentazione in sicurezza.



### MANUTENTORE MECCANICO

Identifica il tipo di operatore a cui è riservato l'intervento trattato.

Questa qualifica presuppone una piena conoscenza e comprensione delle informazioni contenute nel manuale d'uso del costruttore oltre che competenza specifica per effettuare gli interventi di installazione, regolazione, manutenzione, pulizia e/o riparazione.



### MANUTENTORE ELETTRICO

Identifica il tipo di operatore a cui è riservato l'intervento trattato.

Questa qualifica presuppone una piena conoscenza e comprensione delle informazioni contenute nel manuale d'uso del costruttore oltre che competenza specifica per gli interventi di natura elettrica di collegamento, regolazione, manutenzione e/o riparazione.

**E' in grado di operare in presenza di tensione all'interno di armadi e quadri elettrici.**



Nel caso di interventi straordinari e su autorizzazione scritta del servizio assistenza rivolgersi ai centri autorizzati Mecc Alte.

## SAFETY REQUIREMENTS

### HANDLER

This symbol identifies the type of operator in charge of the operation described.

This qualification requires a complete knowledge and understanding of the information contained in the manufacturer's instruction manual as well as specific skills about the hoisting means, slinging methods and features and safe handling procedures.

### MECHANICAL SERVICE MAN

This symbol identifies the type of operator in charge of the operation described.

This qualification requires a complete knowledge and understanding of the information contained in the manufacturer's instruction manual as well as specific skills necessary to perform installation, adjustment, maintenance, cleaning and/or repair operations.

### ELECTRICAL SERVICE MAN

This symbol identifies the type of operator in charge of the operation described.

This qualification requires a complete knowledge and understanding of the information contained in the manufacturer's instruction manual as well as specific skills necessary to perform electrical operations such as connections, adjustment, maintenance and/or repair.

**The electrical service man must be able to work even in case electrical cabinets and panels are live.**

In case of exceptional operations and upon written request of servicing operations please apply to Mecc Alte authorized centers.

## PRESCRIZIONI DI SICUREZZA

Al momento dell'installazione le norme prevedono che il generatore sia collegato a terra.

Per questa ragione assicurarsi che l'impianto di messa a terra sia efficiente ed in conformità con le direttive del paese dove il generatore sarà installato.

### ATTENZIONE

**L'INSTALLATORE FINALE E' RESPONSABILE DELLA PREDISPOSIZIONE DI TUTTE LE PROTEZIONI (DISPOSITIVI DI SEZIONAMENTO, PROTEZIONI CONTRO I CONTATTI DIRETTI E INDIRETTI, PROTEZIONI CONTRO SOVRACORRENTI E SOVRATENSIONI, ARRESTO DI EMERGENZA ECC.) NECESSARIE PER RENDERE CONFORME IL MACCHINARIO E L'IMPIANTO UTILIZZATORE, ALLE VIGENTI NORME DI SICUREZZA INTERNAZIONALI/EUROPEE.**

Per la movimentazione dei generatori di simballati usare sempre ed esclusivamente gli appositi golfari.

Utilizzare funi di portata adeguata senza sollevare il generatore troppo dal pavimento (max 30 cm.).

Alla fine del periodo di vita della macchina, rivolgersi alle agenzie di smaltimento materiali ferrosi e non disperderne parti nell'ambiente.

Gli addetti all'installazione, conduzione e manutenzione del generatore devono essere tecnici adeguatamente qualificati e che conoscano le caratteristiche dei generatori.

Le persone addette alla movimentazione devono sempre indossare guanti da lavoro e scarpe antinfortunistiche.

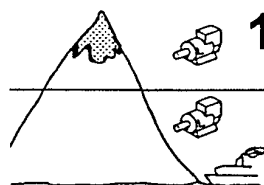
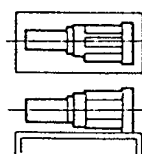
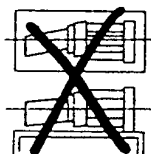
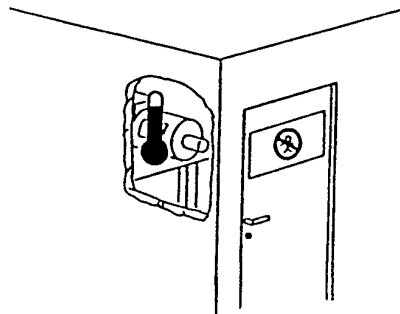
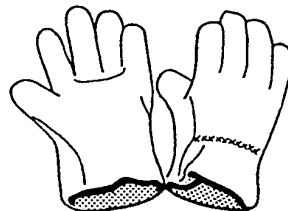
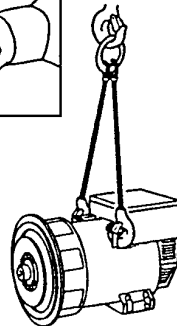
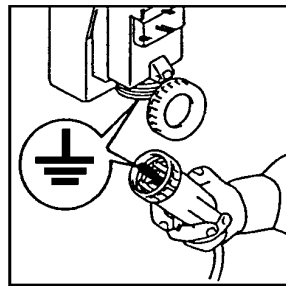
Qualora il generatore o l'intero impianto debba essere sollevato da terra, gli operatori devono usare un casco protettivo.

Il generatore va installato in un ambiente aerato. Se non c'è sufficiente aria oltre al mal funzionamento esiste pericolo di surriscaldamento (tab. 25 pag. 73). Sulla porta di ingresso del locale ci deve essere un cartello indicante il divieto di accesso alle persone non autorizzate.

Assicurarsi che il basamento del generatore e del motore primario sia calcolato per sopportare il peso e tutti gli eventuali sforzi dovuti al funzionamento.

E' responsabilità dell'installatore il corretto accoppiamento del generatore al motore, mettendo in atto tutti quegli accorgimenti necessari per garantire il corretto funzionamento del generatore ed evitare anomale sollecitazioni che possono danneggiare il generatore (come vibrazioni, disallineamenti, strane sollecitazioni etc.).

La macchina è stata progettata per garantire la potenza nominale in ambienti con temperatura massima di 40 °C e altitudine inferiore ai 1000 metri (EN60034-1), se non diversamente indicato. Per condizioni diverse vedere il catalogo commerciale (depliant).



1000m

40° C

## SAFETY REQUIREMENTS

Before installing the generator, arrangements must be made to earth the machine. This is the reason why you must make sure that the grounding system is in good conditions and in compliance with the regulations of the country where the generator will be installed.

### CAUTION

**THE FINAL INSTALLER IS RESPONSIBLE FOR THE INSTALLATION OF ALL THE PROTECTIONS (SECTIONING DEVICES, PROTECTIONS AGAINST DIRECT AND INDIRECT CONTACTS, OVERCURRENT AND OVERVOLTAGE PROTECTIONS, EMERGENCY STOP, ETC.) NECESSARY FOR THE MACHINE TO COMPLY WITH THE EXISTING INTERNATIONAL/EUROPEAN SAFETY REGULATIONS.**

For handling the unpacked generators, always use the special eyebolts only; use ropes having a suitable carrying capacity and do not lift the generator too much from the floor (max 30 cm.).

When the machine is worn out, contact the companies in charge of the disposal of ferrous material and do not throw away its parts into the environment.

The operators in charge of the installation, operation and maintenance of the generators must be skilled technicians who know the characteristics of the generators.

The people in charge of the handling must always wear work gloves and safety shoes. In case the generator or the whole plant must be lifted from the floor, the operators must wear a safety helmet.

The generator must be installed in an airy room. If there is not enough air, a malfunction or an overheating may occur (table 25 pag. 73). All entry doors into generator room should be clearly marked "Authorized persons only".

Make sure that gen-set foundations and baseframe are suitable to bear the combined weight of the alternators and prime mover.

The installer is responsible for the correct coupling of the generator to the engine and for the performance of all precautions necessary to guarantee the correct operation of the generator and avoid abnormal stress, which could damage the generator (such as vibrations, misalignment, strange noises or vibrations, etc.).

The machine was designed to guarantee the nominal power in environments with a maximum temperature of 40° C, at altitudes lower than 1000 m asl (EN60034-1), unless otherwise specified; for different operating conditions, see the commercial catalogue (brochure).

## PRESCRIZIONI DI SICUREZZA

Nelle vicinanze della macchina non ci devono essere persone con indumenti svolazzanti tipo: sciarpe, fular, bracciali, etc e qualsiasi indumento deve essere chiuso con elastici alle estremità'.

I generatori non devono mai e per nessuna ragione funzionare con le seguenti protezioni aperte:

- ) copertura morsetti.
- ) coperchi frontali.
- ) protezioni delle ventole.

Nelle fasi di montaggio e smontaggio della rete, assicurarsi di tenere in posizione con le mani la stessa per evitare che l'elasticità della rete possa colpire l'operatore o chi è nelle vicinanze.

In alcuni tipi di generatore i regolatori sono corredati di 3 led visibili dall'esterno (standard per macchine grandi e opzionale per macchine piccole):

- Verde** - funzionamento regolare
- Giallo** - intervento protezione sovraccarico
- Rosso** - intervento protezione bassa velocità'.

I generatori sono rumorosi (tav. 25 pag. 73); anche se il livello acustico è sicuramente inferiore a quello del motore primario, devono essere installati in ambienti isolati (stanza, sala macchine, etc.) e chi vi accede deve munirsi di cuffie antirumore.

I generatori sviluppano calore anche elevato in funzione della potenza generata. Pertanto non toccare il generatore se non con guanti antiscottatura e attendere, una volta spento, che esso raggiunga la temperatura ambiente.

Anche se la macchina è protetta in tutte le sue parti evitare di sostare nelle sue vicinanze.

Per nessuna ragione appoggiarsi o sedersi sul generatore.

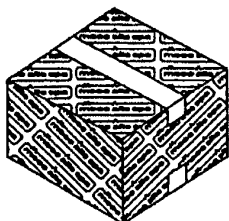
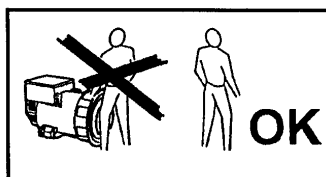
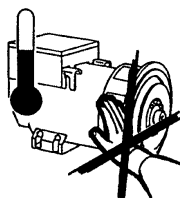
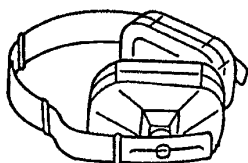
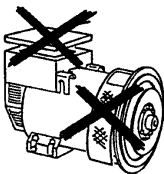
Non togliere per nessuna ragione le etichette, anzi richiederne la sostituzione in caso di necessità'.

### PERICOLO DI CORTO CIRCUITO

Il generatore è costruito con grado di protezione IP21; pertanto è fatto divieto di utilizzare qualsiasi tipo di idropulitrice e di spruzzare liquidi sopra le parti elettriche.

In caso di sostituzione di pezzi di ricambio richiedere esclusivamente ricambi originali.

Per la sostituzione di parti usurate comportarsi rigorosamente come descritto al capitolo manutenzione; queste manutenzioni devono essere eseguite da tecnici adeguatamente qualificati.



## SAFETY REQUIREMENTS

No person must wear fluttering clothes (such as scarves, etc.) near the machine and any garment must be fastened with elastic bands at its ends.

The generators must never and for no reason run with following guards removed:

- ) terminals cover
- ) front covers
- ) fan guards.

During assembling and disassembling operations, hold carefully both ends of the protection grid as the related material elasticity can be harmful.

In some machines the regulators are equipped with 3 leds which can be seen from the outside (as standard equipment on large machines, as optional equipment on small machines):

- Green led** - correct operation
- Yellow led** - overload protection on
- Red led** - low speed protection on.

The generators are noisy (table 25 pag. 73); even if the sound level is certainly lower than that of the prime motor, they must be installed in soundproof rooms (room, engine room, etc.) where it is necessary to wear antinoise protectors.

The generators produce heat proportional to the output.

Therefore, do not touch the generator if you do not wear antiscorch gloves and, after switching it off, do not touch it until it has cooled down.

Even if all the machine components are protected, keep away from the machine.

Do not lean or sit on the generator for whatever reason.

Do not remove the labels for whatever reason; on the contrary, if necessary, replace them.

### DANGER OF SHORT CIRCUIT

the degree of protection of the generator is IP21; therefore it is made prohibition to use whichever type of hydrocleaner and to spray liquids over the parts containing electrical components.

In case of replacement of spare parts, use original spare parts only.

For the replacement of worn parts, carefully follow the maintenance instructions; these operations must be carried out by skilled technicians.

## PERICOLO DANGER



## GEFAHR PELIGRO

In funzione della destinazione, gli alternatori possono essere imballati per la spedizione in vari modi.

In ogni caso per movimentarli, osservare nella bolla di accompagnamento, il peso, e con mezzi adeguati, sollevarli da terra il meno possibile.

Nel caso che l'imballo debba essere movimentato con carrelli, occorre che le forche siano tenute piu' larghe possibile, in modo da evitare cadute o scivolamenti.

In caso di immagazzinamento, gli alternatori imballati e non, devono essere depositati in un locale fresco e asciutto e comunque mai esposto alle intemperie.

Una volta disimballato il generatore, (mono-supporto) non scollegare il sistema di fissaggio rotore, in quanto quest'ultimo potrebbe scivolare.

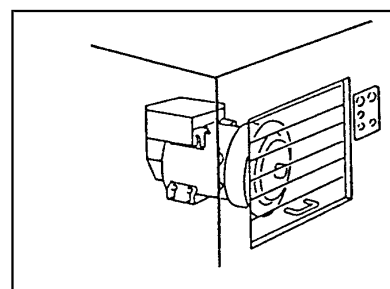
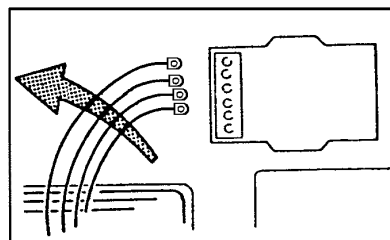
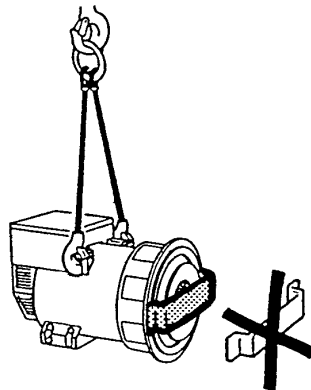
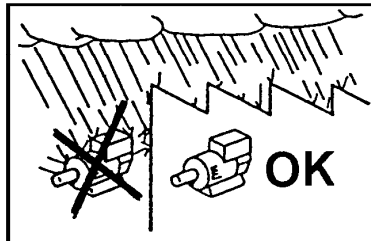
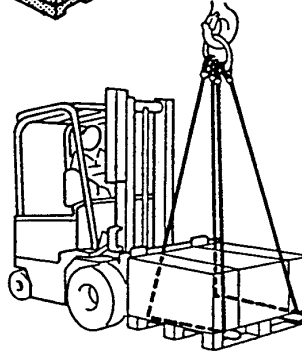
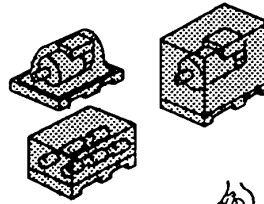
Per la movimentazione al fine dell'installazione, sollevare i generatori, sempre, attraverso i propri golfari (tav. 25 pag. 73).

### IMPORTANTE:

**DOPO LUNGHI PERIODI DI IMMAGAZZINAMENTO O IN PRESENZA DI SEGNI EVIDENTI DI UMIDITA' / CONDENSA, VERIFICARE LO STATO D'ISOLAMENTO.**

**LA PROVA DI ISOLAMENTO DEVE ESSERE ESEGUITA DA UN TECNICO ADEGUATAMENTE QUALIFICATO.**

**PRIMA DI ESEGUIRE TALE PROVA E' NECESSARIO SCONNETTERE IL REGOLATORE DI TENSIONE; SE LE PROVE DARANNO UN RISULTATO TROPPO BASSO (INFERIORE A 1 MΩ)(EN60204-1) SI DOVRA' ASCIUGARE L'ALTERNATORE IN UN FORNO A 50 - 60°C.**



Alternators will be packed for shipment in a manner suitable to their mode of transport and final destination.

Prior to handling goods, please ensure that lifting equipment is of sufficient capacity. Under lifting conditions machinery should be elevated to a minimal distance from the ground.

When lifting or moving goods by forklift apparatus, care should be taken to ensure that forks are correctly positioned to prevent slipping or falling of pallet or crate.

Both packed and unpacked alternators shall be stored in a cool and dry room, and shall never be exposed to the inclemency of the weather.

With regard to single bearing alternators (form MD35) please ensure that the rotor securing device is in place. Failure to do so may lead to slippage or assembly.

When installing the alternators, always lift them by using their eyebolts (table 25 pag 73).

### IMPORTANT :

**AFTER PROLONGER STORAGE OR IF THE MACHINES SHOW SIGNS OF CONDENSATION, ALL WINDINGS SHOULD BE SUBJECTED TO INSULATION TESTS PRIOR TO OPERATING.**

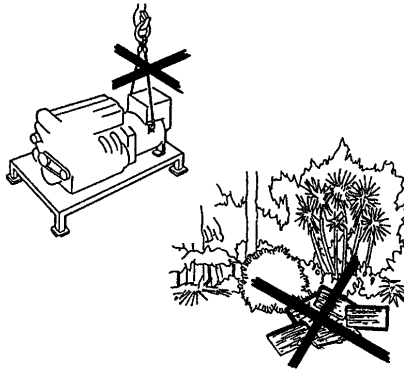
**THE INSULATION TEST SHALL BE MADE BY SKILLED PERSONNEL.**

**BEFORE CARRYING OUT THE TEST, THE VOLTAGE REGULATOR MUST BE DISCONNECTED; IF THE TEST RESULTS ARE TOO LOW (LOWER THAN 1 MΩ)(EN60204-1) THE ALTERNATOR MUST BE DRIED IN AN OVEN AT 50-60°C.**

## TRASPORTO E IMMAGAZZINAMENTO

Ricordarsi che, una volta che il generatore sarà accoppiato al motore primario, o montato su un basamento, o installato in un telaio in modo da formare un corpo unico, non dovrà più essere sollevato dai propri golfari ma si dovranno seguire le indicazioni dell'installatore.

Non disperdere l'imballo nell'ambiente, ma rivolgersi alle agenzie di smaltimento.



## TRANSPORT AND STORAGE

Once the generator is coupled with an engine, mounted on a baseframe, or installed on a complete generating set, it cannot be lifted by its lifting bolts. The relevant instructions for lifting complete generating set should be followed.

Any packing materials should be disposed of via correct waste disposal methods. Do not discard waste materials into the environment.

## ACCOPPIAMENTO MECCANICO

Con il fine di proteggere, durante il trasporto e l'immagazzinamento, la flangia di accoppiamento o la estremità d'albero (a seconda della forma costruttiva del generatore) a tali parti meccaniche viene applicata una vernice antiruggine facilmente rimovibile. Tale sostanza DEVE ESSERE assolutamente RIMOSSA prima dell'assemblaggio finale.

L'accoppiamento del generatore al motore primo è a cura dell'utilizzatore finale ed è eseguito secondo la sua sola discrezione (per le coppie di serraggio vedere tabella 24 pag. 72).

Un allineamento impreciso può causare vibrazioni e danneggiamenti dei cuscinetti. È consigliabile inoltre verificare la compatibilità delle caratteristiche torsionali del motore / generatore (a cura del cliente).

I dati sul generatore necessari per tale verifica sono disponibili nella relativa documentazione tecnica.

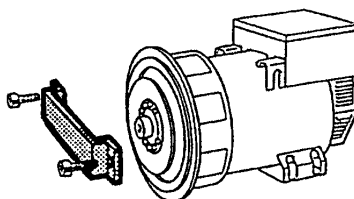
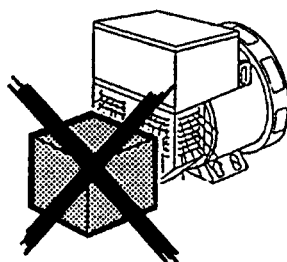
Le attenzioni richieste sono:

NELLA MESSA IN SERVIZIO AVER CURA CHE LE APERTURE DI ASPIRAZIONE E SCARICO DELL'ARIA DI RAFFREDDAMENTO SIANO SEMPRE LIBERE.

IL LATO DI ASPIRAZIONE NON DEVE ESSERE VICINO A SORGENTI DI CALORE. IN OGNI CASO, SE NON SPECIFICAMENTE CONCORDATO, LA TEMPERATURA DELL'ARIA DI RAFFREDDAMENTO DEVE ESSERE QUELLA AMBIENTE E COMUNQUE NON SUPERIORE A 40°C.

NELLE FASI DI MONTAGGIO E SMONTAGGIO DELLA RETE, ASSICURARSI DI TENERE IN POSIZIONE CON LE MANI LA STESSA PER EVITARE CHE L'ELASTICITÀ DELLA RETE POSSA COLPIRE L'OPERATORE O CHI È NELLE VICINANZE.

**IN CASO DI GENERATORI MONO-SUPPORTO IN FASE DI ACCOPPIAMENTO CON IL MOTORE PRIMO, FARE ATTENZIONE CHE IL ROTORE NON SI SFILI; TOGLIERE IL SISTEMA DI FISSAGGIO ROTORE, SE PRESENTE.**



## MECHANICAL COUPLING

For transit and storage purposes the generator flange spigot and the generator end shaft (for the generators in B3-B14 construction form) have been coated with a rust preventer that can be removed easily.

This **MUST BE** removed before assembling to the engine.

The mechanical coupling is under the sole responsibility of the final user, and has to be done at his discretion (for tightening torque see tab. 24 pag. 72).

A bad alignment may cause vibrations and bearing damages. It is advisable to verify the compatibility of the engine / generator torsional characteristics (by the customer).

The necessary data for this verification are available on the concerning documentation.

Warnings:

**BEFORE STARTING THE ALTERNATOR, CHECK THAT THE AIR INLETS AND OUTLETS ARE FREE OF ANY OBSTRUCTIONS.**

**THE AIR INLETS SHOULD NOT BE NEAR ANY HEATING SOURCES.**

**IN ANY CASE, IF NOT SPECIFICALLY REQUESTED, THE COOLING AIR TEMPERATURE MUST BE EQUAL TO THE ENVIRONMENT TEMPERATURE AND NEVER HIGHER THAN 40°C.**

**DURING ASSEMBLING AND DISASSEMBLING OPERATIONS, HOLD CAREFULLY BOTH ENDS OF THE PROTECTION GRID AS THE RELATED MATERIAL ELASTICITY CAN BE HARMFUL.**

**BEFORE MECHANICAL COUPLING OF SINGLE BEARING ALTERNATORS REMOVE THE ROTOR SECURING DEVICE, IF FITTED, PLACED THERE TO PREVENT ROTOR FROM SLIPPING.**

## ACCOPPIAMENTO MECCANICO

### ISTRUZIONI PER MONTAGGIO IN FORMA COSTRUTTIVA MD35.

Un allineamento impreciso può causare vibrazioni e danneggiamenti dei cuscinetti. E' consigliabile inoltre verificare la compatibilità delle caratteristiche torsionali del motore / generatore (a cura del cliente).

I dati sul generatore necessari per tale verifica sono disponibili nella relativa documentazione tecnica.

Per l'accoppiamento del generatore con forma costruttiva MD35, procedere come segue:

a) verificare il corretto posizionamento dei dischi (quota "L") in funzione del tipo di accoppiamento considerato (tavola 24 pag. 72); se necessario ripristinare la quota "L" spostando leggermente e assialmente il rotore. In posizione corretta il cuscinetto posteriore deve avere un gioco assiale da 0,5 a 2 mm.

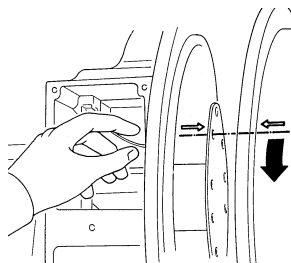
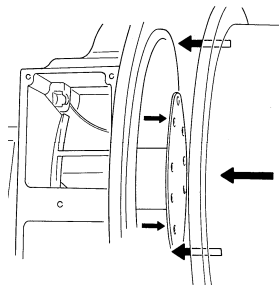
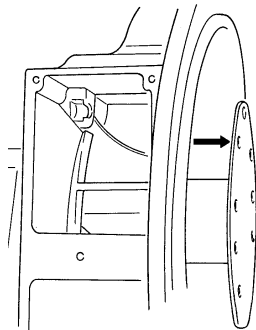
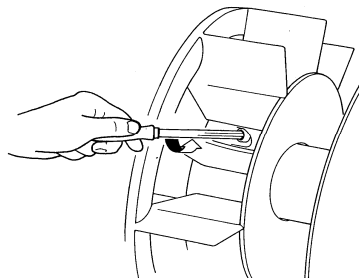
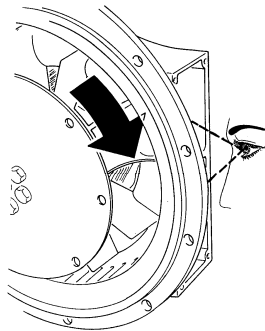
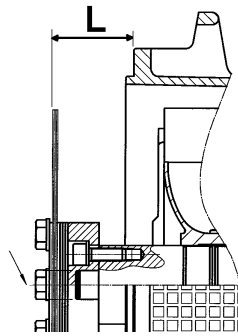
b) (Per serie 28) attraverso una delle due aperture laterali e ruotando manualmente il rotore, individuare sul mozzo della ventola, la relativa vite di bloccaggio

c) (Per serie 28) rendere la ventola libera di ruotare allentando la vite M8 di bloccaggio, utilizzando una chiave esagonale possibilmente con testa snodata

d) (Per serie 28) posizionare uno dei fori dei dischi in prossimità della parte alta di una delle aperture laterali e posizionare lo scarico realizzato su una delle pale della ventola, nella stessa posizione

e) avvicinare l'alternatore al motore di accoppiamento

f) allineare uno dei fori di fissaggio dei dischi del volano con il foro dei dischi precedentemente posizionato (punto "d")



## MECHANICAL COUPLING

### INSTRUCTIONS FOR THE ASSEMBLING OF GENERATORS WITH MD35 FORM.

A bad alignment may cause vibrations and bearing damages. It is advisable to verify the compatibility of the engine / generator torsional characteristics (by the customer).

The necessary data for this verification are available on the concerning documentation.

For the coupling of a generator with MD35 form, proceed as follows:

a) according to the type of the coupling, verify the correct placement of the discs (dimension "L") (table 24 pag. 72); if necessary restore the "L" dimension moving gently and axially the rotor. In the right position the clearance of rear bearing should be from 0.5 to 2 mm.

b) (For series 28) through one of the two lateral openings, and by manually rotating the rotor, detect the relevant clamp screw on the fan hub

c) (For series 28) let the fan be free to rotate by slackening the M8 screw by means of an hexagonal wrench, possibly having an articulated head

d) (For series 28) position one of the disk holes near the upper part of one of the side openings and place the slit that is on one of the fan blades, in the same position

e) move the generator close to the coupling engine

f) align one of the flywheel disk fastening holes with the holes of the previously positioned disks (point "d")

## ACCOPPIAMENTO MECCANICO

g) inserire ed avvitare parzialmente la relativa vite che blocca i dischi al volano. Tenendo ferma la ventola (ECP28), ruotare il volano affinché altri due fori si ripresentino nella stessa posizione ed avvitare parzialmente la relativa vite. Ripetere detta operazione per tutti gli altri fori

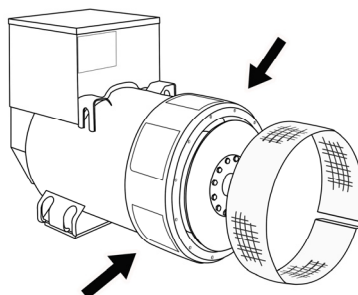
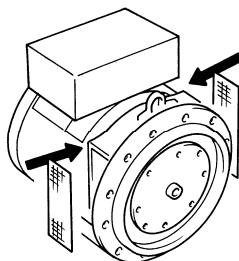
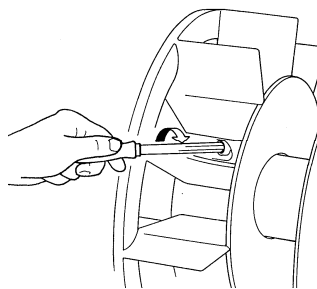
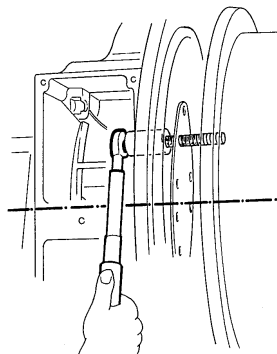
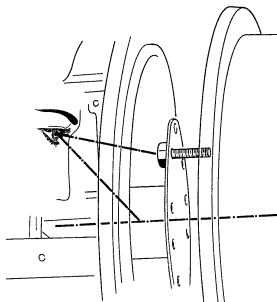
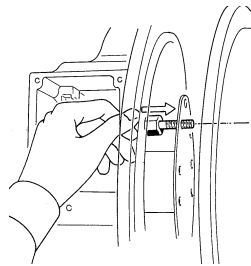
h) dopo aver verificato il corretto centraggio dei dischi nel volano motore, bloccare definitivamente dette viti

i) (Per serie 28) terminata l'operazione di bloccaggio dischi, ribloccare la ventola serrando la relativa vite con una coppia di serraggio pari a  $16 \text{ Nm} \pm 10\%$ ; la posizione radiale della ventola non è vincolante per il corretto funzionamento del sistema

l) montare le retine di protezione, fornite a corredo del generatore.

L'osservanza delle prescrizioni dei punti "i" ed "l" è di fondamentale importanza onde evitare seri danni del generatore e situazioni pericolose per cose e persone.

Solamente dopo che il generatore è stato ben fissato meccanicamente procedere all'accoppiamento elettrico.



## MECHANICAL COUPLING

g) Insert and partially tighten the screws that lock the disks to the flywheel. Keeping the fan still (ECP28), turn the flywheel until another two holes are in the same position and partially tighten the screw. Repeat this operation for all the other holes

h) after inspecting the correct centring of the disks on the engine flywheel, the screws must be completely tightened

i) (For series 28) once the clamping of the disks is over, stop the fan once again by tightening the screw with a torque wrench setting adjusted at  $16 \text{ Nm} \pm 10\%$ ; the radial position of the fan is not binding for the correct operation of the system

l) fix the protection grids supplied with the generator.

Compliance with items "i" and "l" is of the utmost consequence in order to avoid serious damages to the generator or hazardous situations for people or objects.

Only after a correct mechanical coupling, proceed with the electrical connections.

## PERICOLO DANGER



## GEFAHR PELIGRO

L'accoppiamento elettrico e' a cura dell'utilizzatore finale ed e' eseguito secondo la sua sola discrezione.

Per l'ingresso nella scatola morsetti si raccomanda di utilizzare passacavi e serracavi in accordo con le specifiche del paese di esportazione.

### COLLEGAMENTO AVVOLGIMENTI

Sono previsti entrambi i collegamenti, stella con neutro (Y) e triangolo (Δ) in tutti gli alternatori (tav. 2 pag. 60).

Per passare da un collegamento Y a Δ (es. da 400V a 230V) e' sufficiente spostare i ponti sulla morsettiera principale (vedere schema tav. 2 pag. 60).

Nessun intervento e' richiesto sul regolatore di tensione.

I generatori sono costruiti di serie con 12 cavi di uscita per consentire di ottenere tensioni diverse (es. 230 / 400 / 460 / 800V).

I generatori, vanno sempre collegati a terra con un conduttore di adeguata sezione utilizzando uno dei due (interno/esterno) appositi morsetti.

Per il collegamento elettrico utilizzare cavi adeguati in funzione della potenza del generatore ed effettuare le connessioni ai morsetti come indicato nelle tavole 12 o 17.

Dopo aver eseguito il collegamento (per le coppie di serraggio vedere tabella 24 pag.72) rimontare il coperchio scatola morsetti.

### IMPORTANTE: variazioni di frequenza.

La macchina fornita per funzionare a 50Hz puo' funzionare anche a 60Hz (o viceversa); e' sufficiente tarare il potenziometro al nuovo valore nominale di tensione.

Passando da 50Hz a 60Hz, la potenza puo' aumentare del 20% (corrente invariata), se la tensione aumenta del 20%; se la tensione rimane invariata la potenza, puo' aumentare del 5% per effetto della migliore ventilazione.

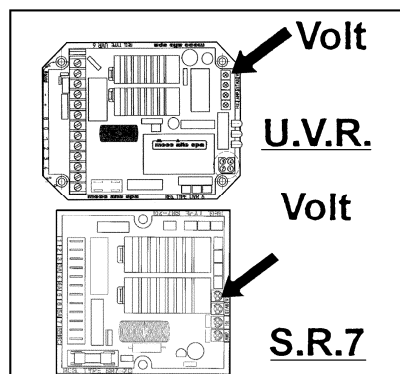
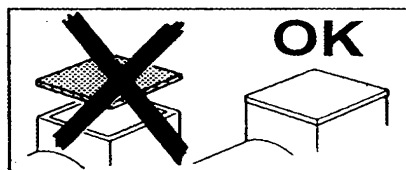
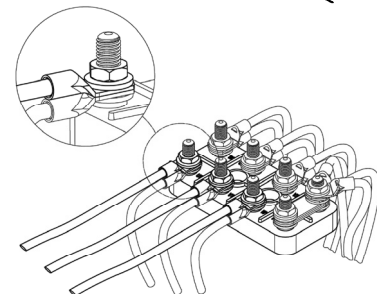
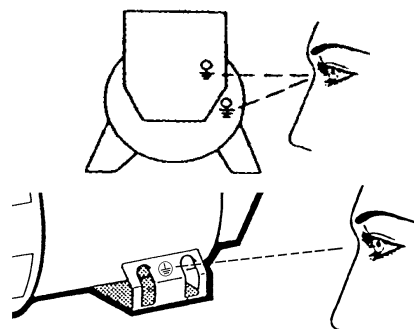
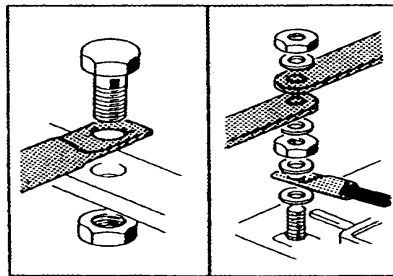
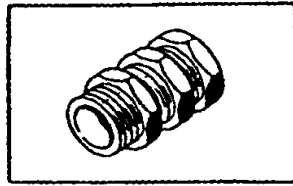
Per generatori costruiti appositamente per una frequenza di 60Hz nel passaggio a 50Hz, la tensione e la potenza devono necessariamente diminuire del 20% rispetto a quella riferita a 60Hz.

### REGOLATORI (tav. 3 pag 60)

I regolatori tipo U.V.R.6/1-F e S.R.7/2-G possono essere indifferentemente usati nella serie ECO-ECP senza modificare le prestazioni.

L'U.V.R.6/1-F e' montato di serie nelle tipologie 38 - 40 - 43 - 46, mentre l'S.R.7/2-G nelle serie 28-31-32-34.

I due regolatori sono perfettamente uguali nelle prestazioni, ma si differenziano nelle segnalazioni e nel riferimento.



All electrical output connections are the responsibility of, and are at the discretion of, the end user.

When making terminal box connections, all cable and terminal lugs should meet the relevant standards of the country of final destination.

### WINDINGS CONNECTION

All alternators feature both star with neutral (Y) and delta (Δ) connections (table. 2 pag.60).

To reconnect from a star to delta connection (for ex. from 400V to 230V), modify the linking arrangements on the output terminal board (see diagram on table 2 page 60).

It is not necessary to adjust the voltage regulator.

Standard alternators are equipped with 12 cables to offer different voltages (ex. 230 / 400 / 460 / 800V).

The alternator must always be earthed by sufficiently rated cable, using one of the inside or outside terminals. For the electrical connections use wires suitable for the power of the generator and connect them to the terminal board as indicated on table 12 or 17.

After completing output connections (for tightening torque see tab. 24 pag. 72), ensure that the terminal box cover is securely in place.

### IMPORTANT: frequency variations.

A standard production machine wound for 50 Hz can also function at 60 Hz (and vice versa) by resetting the A.V.R. voltage potentiometer to the new nominal voltage value. When changing from 50 to 60 Hz the alternator power, and nominal voltage will increase by 20%, but the current does not change from 50 Hz value. Should voltage stay at 50 Hz nominal value, then the output power may be increased by 5% due to improved ventilation.

For machines wound for 60 Hz, changing to 50 Hz, the voltage and power values have to decrease by 20% of 60 Hz value.

### REGULATORS (table. 3 pag 60)

Either U.V.R.6/1-F and S.R.7/2-G regulators can be used on the ECO-ECP series without affecting performances.

The U.V.R.6/1-F is a standard feature on the 38-40-43-46 models whereas the S.R.7/2-G is standard on the 28-31-32-34 series.

The two regulators ensure the same level of performance but have different signal systems and references.

## ACCOPIAMENTO ELETTRICO

### IMPORTANTE :

il controllo di tensione va eseguito a vuoto con l'alternatore funzionante a frequenza nominale.

Agendo sul potenziometro tensione dei regolatori elettronici si può ottenere la regolazione della tensione entro il  $\pm 5\%$  del valore nominale.

E' possibile ottenere la regolazione della tensione a distanza in un range di  $\pm 5\%$  inserendo negli appositi morsetti un potenziometro da 100K (per le macchine a 6 morsetti) o un potenziometro da 100K con in serie una resistenza da 100K (per le macchine a 12 morsetti).

Istruzioni per il collegamento del potenziometro esterno :

**ATTENZIONE:** quando si collega il potenziometro esterno è necessario seguire la procedura sottoriportata per ottenere un corretto funzionamento dell'alternatore.

- 1) Ruotare il trimmer VOLT nel regolatore elettronico completamente in senso antiorario
- 2) Posizionare il potenziometro esterno a metà corsa e connetterlo agli appositi morsetti del regolatore elettronico
- 3) Tramite il trimmer VOLT del regolatore elettronico tarare la tensione al valore nominale.

### PROTEZIONI

#### U.V.R.6/1-F - S.R.7/2-G

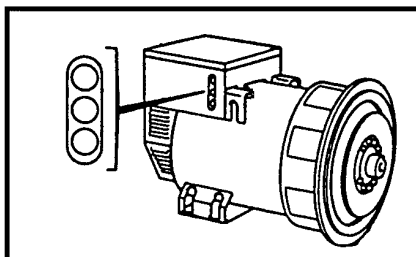
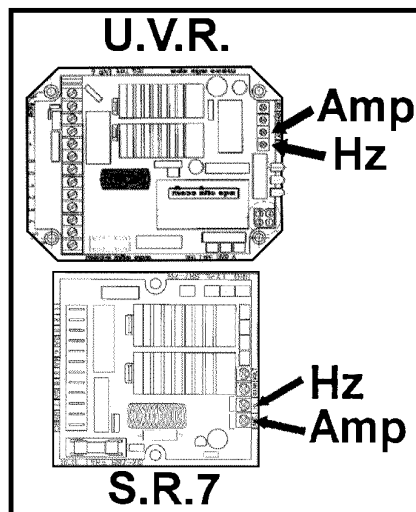
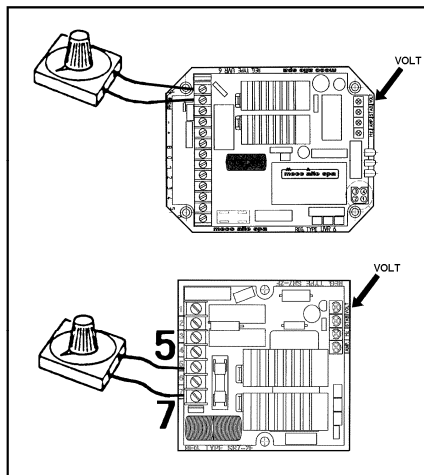
Entrambi i regolatori sono provvisti di una protezione di bassa velocità la cui soglia di intervento e' regolabile tramite il potenziometro "Hz". L'intervento di tale protezione e' istantaneo riducendo la tensione di macchina quando la frequenza scende sotto il 10% di quella nominale. I regolatori prevedono anche una seconda protezione (protezione di sovraccarico), che sente la tensione parzializzata che va al campo di statore dell'eccitatrice e se essa supera per più di 20 sec il valore stabilito, abbassa la tensione di macchina limitando la corrente di eccitazione entro valori di sicurezza.

Il ritardo appositamente inserito consente lo spunto del motore che normalmente si avvia in 5 - 10 sec. Anche la soglia di intervento di questa protezione e' regolabile tramite il potenziometro "AMP".

#### U.V.R.6/1-F

Il regolatore U.V.R.6/1-F aggiunge alle prestazioni prima descritte, le seguenti caratteristiche:

- 1 - possibilità di avere il riferimento trifase oltre che monofase.
- 2 - segnalazioni a led di autodiagnostica che indicano le condizioni di funzionamento della macchina: un led verde, che normalmente acceso indica il funzionamento normale del generatore; un led rosso che indica l'intervento della protezione di bassa velocità, un led giallo che indica l'intervento della protezione di sovraccarico.



## ELECTRICAL CONNECTIONS

### IMPORTANT :

the generator output voltage must be checked under no-load conditions, with the correct setting of frequency.

The voltage may be adjusted by  $\pm 5\%$  of the nominal, by acting upon the voltage potentiometer on the electronic regulators.

It is possible to get a remote voltage regulation of  $\pm 5\%$  inserting in the proper terminals a 100K potentiometer (for the 6 lead units) or a 100K potentiometer with a 100K resistance in series (for the 12 lead units).

Instructions to follow for the external potentiometer connection:

**CAUTION:** in order to get a correct working of the alternator, it is necessary to follow the following procedure, connecting the external potentiometer.

- 1) Turn the VOLT trimmer of the electronic regulator completely anticlockwise.
- 2) Set the external potentiometer at half turn and connect it to the proper terminals of the electronic regulator.
- 3) Adjust the voltage at the nominal value by the VOLT trimmer of the electronic regulator.

### PROTECTIONS

#### U.V.R.6/1-F - S.R.7/2-G

Both regulators are provided with an underspeed protection with an intervention threshold which can be adjusted by the potentiometer marked "Hz". This protection intervenes instantaneously by reducing the alternator voltage to a safe value when frequency falls below 10% of the nominal value. These regulators also have inherent overload protection which senses the exciter field voltage value. Should this field voltage value exceed the nominal value for a period of more than 20 seconds, then again the alternator voltage is automatically reduced to a safe operating level. This overload function has a built-in delay to allow for the overload when starting motors (normally 5-10 seconds). The operating threshold of this protection device is adjustable by the potentiometer marked "AMP".

#### U.V.R.6/1-F

Aside from the above mentioned characteristics, the U.V.R.6/1-F regulator also offers the following:

- 1 - possibility to have single-phase as well as three-phase sensing
- 2 - led indicators for self-diagnosis which indicate the unit's operational conditions: a green led which when lit confirms the alternator's normal functioning; a red led indicates the underspeed protection is on; a yellow led indicates the overload protection is on.

## ACCOPPIAMENTO ELETTRICO

### IMPORTANTE

Nel funzionamento normale del generatore deve essere acceso solamente il led verde. Tutte queste segnalazioni possono essere remote a distanza e manipolate per usi diversi tramite l'utilizzo del dispositivo chiamato SPD96/A, disponibile a richiesta.

### CAUSE CHE PROVOCANO L'INTERVENTO DELLE PROTEZIONI.

#### Intervento istantaneo protezione bassa velocità:

1 - velocità ridotta del 10% rispetto ai dati di targa.

#### Intervento ritardato protezione sovraccarico :

- 2 - sovraccarico del 20% rispetto ai dati di targa.
- 3 - fattore di potenza ( $\cos \varphi$ ) inferiore ai dati di targa.
- 4 - temperatura ambiente oltre i 50°C.

#### Intervento di entrambe le protezioni:

5 - combinazione del fattore 1 con i fattori 2, 3, 4.

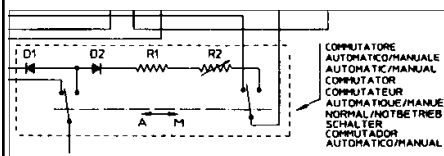
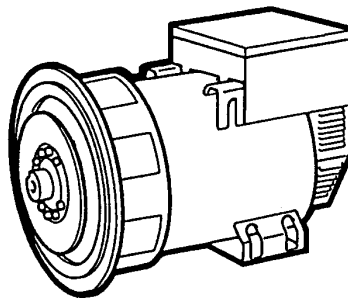
Nel caso di intervento delle protezioni, la tensione erogata dall'alternatore scenderà fino ad un valore che dipenderà dall'entità dell'anomalia.

La tensione tornerà automaticamente al suo valore nominale qualora venga a cessare l'inconveniente.

Per maggiori dettagli sui regolatori consultare il manuale specifico.

### OPTIONALS :

Tutti gli alternatori della serie ECO-ECP possono anche funzionare con regolazione manuale, senza l'ausilio di sorgenti esterne ma con il solo utilizzo di un reostato (tav. 10-11 pag. 65).



## ELECTRICAL CONNECTIONS

### IMPORTANT

In normal functioning, only the green led has to be lit.

All these indicators can be remotely controlled and adjusted, for any type of use, by utilizing the SPD96/A accessory which is available on request.

### INTERVENTION OF PROTECTION DEVICES CAUSES.

#### Underspeed protection instantaneous intervention :

1 - speed reduced by 10% of nominal RPM

#### Delayed intervention of overload protection :

- 2 - overload by 20% of nominal rating.
- 3 - power factor ( $\cos \varphi$ ) lower than the nominal one.
- 4 - ambient temperature above 50°C.

#### Intervention of both protections :

5 - combination of factor 1 with factors 2, 3, 4.

In case of intervention the output voltage will drop down to a value which will depend on the fault.

The voltage will return automatically to its nominal value as soon as the fault is removed.

For further details on regulators, please see the specific manual.

### OPTIONALS :

All ECO-ECP series alternators can function with manual regulation, without assistance from any external source, by using a rheostat (tab. 10-11 pag. 65).

## ACCOPPIAMENTO ELETTRICO

### FUNZIONAMENTO IN PARALLELO

Nel caso si voglia far funzionare dei generatori in parallelo e' necessario montare un dispositivo che assicura un identico statismo sulla caratteristica esterna.

Questo significa che se le macchine lavorassero separatamente si avrebbe una uguale caduta di tensione (circa 4%) passando da vuoto a pieno carico.

Questo dispositivo e' montato di serie sulle grandezze 40 - 43 - 46, per cui, quando due o piu' di queste macchine devono lavorare in parallelo e' sufficiente togliere il ponticello che cortocircuita il secondario del dispositivo di parallelo.

Per le grandezze inferiori il dispositivo viene montato a richiesta o puo' essere montato (ad eccezione del tipo ECP28/4) dal cliente stesso secondo le tav.14-16-18-20. Dopo aver montato il dispositivo e' necessario verificare l'esatto collegamento; si dovra' controllare cioe' che le macchine lavorando singolarmente presentino una caduta di tensione di circa il 4% passando, a velocita' nominale e  $\cos \varphi$  0.8, da vuoto a pieno carico.

### MONTAGGIO DI UN DISPOSITIVO DI PARALLELO

Riferendosi alle tavole 14-16-19 montare il trasformatore di parallelo come illustrato.

Collegare le spire di potenza in serie alla fase.

Il numero delle spire da eseguire sul trasformatore saranno indicate sulle istruzioni allegate al trasformatore stesso.

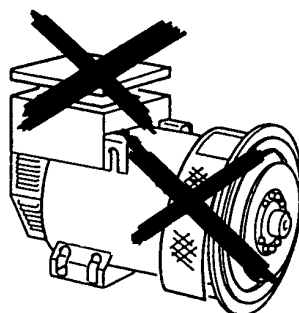
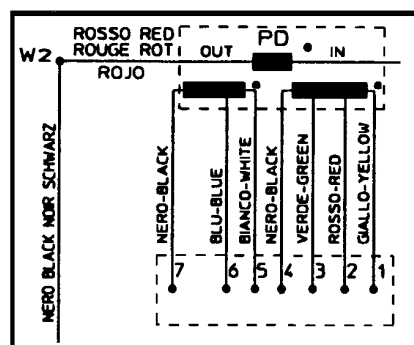
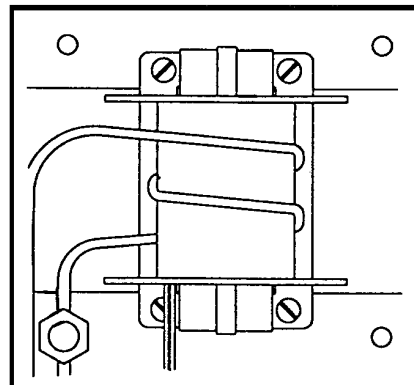
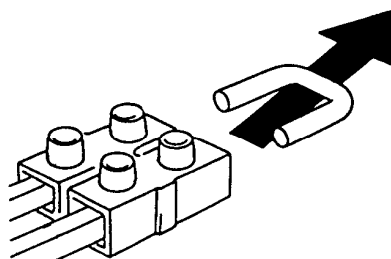
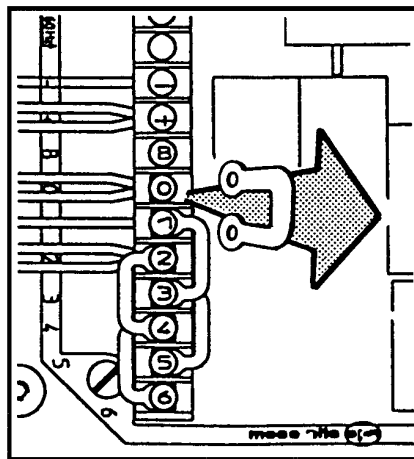
Il secondario del trasformatore di parallelo va connesso in serie al riferimento del regolatore elettronico come mostrato nelle tavole 4 e 5 pag. 61.

Per abilitare il dispositivo di parallelo rimuovere il ponticello che cortocircuita il secondario del dispositivo stesso come mostrano gli schemi sopra indicati.

### NOTA

Alla richiesta del dispositivo di parallelo e' indispensabile conoscere i dati nominali dell'alternatore su cui andra' applicato.

Dopo aver eseguito tutti i collegamenti elettrici e **solo dopo aver chiuso tutte le protezioni** e' possibile effettuare la prova di primo avviamento del sistema.



## ELECTRICAL CONNECTIONS

### PARALLEL OPERATION

Should the alternators be required to operate in parallel, it is necessary to add a paralleling device to ensure equal droop of generator output voltages.

This ensures that if the machines are operated separately, the voltage droop (4% approx.) is equal when switching from no-load to full load.

The parallel device is fitted as standard on 40-43-46 models, therefore when two or more of these units must function in parallel, it is sufficient to remove the bridge which shortcircuits the secondary winding of the parallel device.

On smaller models this device is mounted on request or it can be added (except for ECP28/4) by the client himself following the instructions of tables 14-16-18-20.

After the device has been mounted, check whether the connection has been properly made; make sure that there is a voltage drop of approximately 4% in the machines when they function individually switching at rated speed and  $\cos \varphi$  0.8 from no-load to full load operation.

### HOW TO MOUNT THE PARALLEL DEVICE

Referring to tables 14-16-19 mount parallel device as indicated.

Connect the power turns in series with phase. The numbers of turns to be wound on the transformer will be indicated in the instruction accompanying the transformer itself. The secondary winding of the parallel transformer must be connected in series to the sensing of the electronic regulator as shown on tables 4 - 5 page 61.

In order to activate the parallel device remove the bridge which shortcircuits the secondary winding of the device itself as shown in the above mentioned tables.

### NOTE

When requesting a parallel device, it is necessary to indicate the nominal data of the alternator on which the device will be applied.

After all the electric connections have been made and **only after all the protections have been put in place**, can the system be started.

## AVVIAMENTO E ARRESTO

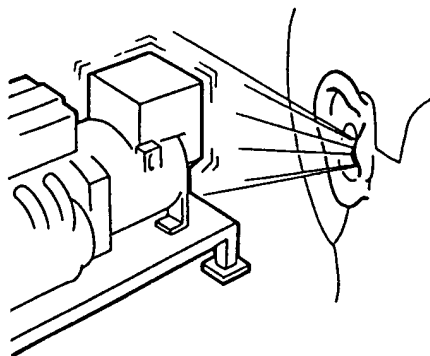
La strumentazione per l'avviamento, la conduzione e l'arresto del sistema e' a carico dell'installatore.

**LE OPERAZIONI DI AVVIAMENTO, CONDUZIONE E ARRESTO DEVONO ESSERE ESEGUITE DA PERSONALE ADEGUATAMENTE QUALIFICATO E CHE ABBA LETTO E COMPRESO LE PRESCRIZIONI DI SICUREZZA ALL'INIZIO DEL MANUALE.**

### IMPORTANTE :

Durante il primo avviamento, che deve essere eseguito a velocita' ridotta, l'installatore dovra' verificare che non si presentino rumori anomali.

In caso di rumori anomali provvedere a fermare immediatamente il sistema e intervenire per migliorare l'accoppiamento meccanico.



## STARTING AND STOPPING OPERATIONS

All the instrumentation for starting, running and stopping the system shall be provided by the installer.

**THE STARTING, RUNNING AND STOPPING OPERATIONS MUST BE CARRIED OUT BY SKILLED PERSONNEL WHO HAVE READ AND UNDERSTOOD THE SAFETY INSTRUCTIONS AT THE BEGINNING OF THIS MANUAL.**

### IMPORTANT :

When the system is set to work for the first time, which has to be done at a reduced speed, the operator shall check that no anomalous noises can be detected.

If an anomalous noise is detected, stop the system immediately and improve the mechanical coupling.

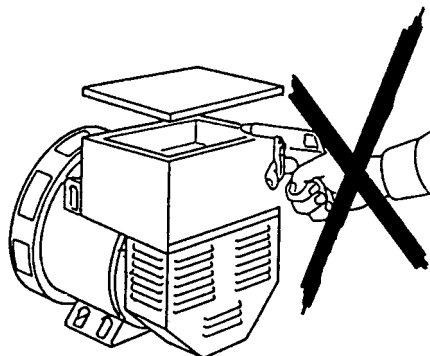
## PULIZIA E LUBRIFICAZIONE

Prima di avvicinarsi al generatore assicurarsi che sia a stato energetico zero e a temperatura ambiente; a questo punto e' possibile pulirlo esternamente con aria compressa.

**NON UTILIZZARE MAI LIQUIDI O ACQUA.**

**NON PULIRE CON ARIA COMPRESSA LE PARTI ELETTRICHE INTERNE, POICHE' POSSONO VERIFICARSI CORTOCIRCUITI O ALTRE ANOMALIE.**

Per la lubrificazione dei cuscinetti consultare la tabella 23 pag. 71.



## CLEANING AND LUBRICATION

Prior to approaching or touching the alternator, ensure that it is not live and it is at room temperature; at this stage it is possible to clean it on the outside using compressed air.

**NEVER USE LIQUIDS OR WATER.**

**DO NOT CLEAN THE INSIDE ELECTRIC COMPONENTS WITH COMPRESSED AIR, BECAUSE THIS MAY CAUSE SHORT-CIRCUITS OR OTHER ANOMALIES.**

For the lubrication of bearings, see table 23 on page 71.

## MANUTENZIONE

## MAINTENANCE

**PERICOLO  
DANGER**



**GEFAHR  
PELIGRO**

I generatori della serie ECO-ECP sono costruiti per lavorare a lungo senza manutenzione.

**PRIMA DI ESEGUIRE QUESTA OPERAZIONE LEGGERE MOLTO ATTENTAMENTE LE PRESCRIZIONI DI SICUREZZA ALL'INIZIO DI QUESTO MANUALE.**

The alternators series ECO-ECP are designed to give a long maintenance free working life.

**BEFORE PERFORMING THIS OPERATION, READ THE SAFETY REQUIREMENTS AT THE BEGINNING OF THIS MANUAL CAREFULLY.**

## MANUTENZIONE

Gli interventi di manutenzione sul generatore Mecc Alte si possono dividere in ordinari e straordinari; in ogni caso qualsiasi intervento deve essere autorizzato dal responsabile della sicurezza, a macchina ferma e isolata elettricamente dall'impianto o dalla rete. La manutenzione e la ricerca guasti deve essere eseguita da personale elettricamente/meccanicamente qualificato in quanto ogni operazione a seguito descritta presenta pericoli per il personale.

Si raccomanda inoltre che siano prese tutte le precauzioni per impedire che la macchina venga riavviata inavvertitamente durante le fasi di manutenzione e ricerca guasti.

Gli interventi di manutenzione ordinaria possono essere riassunti in :

- verifiche condizioni avvolgimenti dopo lunghi periodi di immagazzinamento o di sosta
- verifiche, ad intervalli regolari, del corretto funzionamento (assenza di rumori o vibrazioni anomale)
- verifiche meccaniche su tutti i bulloni di fissaggio ed in particolare delle connessioni elettriche
- pulizia esterna del generatore

### a) Verifiche condizioni avvolgimenti dopo lunghi periodi di immagazzinamento o di sosta.

La condizione degli avvolgimenti può essere verificata mediante la misura della resistenza di isolamento verso terra. Tale misura si esegue con uno strumento "Megger" o similari a 500V di tensione continua; è importante che prima di eseguire la prova, il regolatore di tensione (fig. a), il ponte diodi rotante (fig. b), i filtri anti disturbi radio (fig. c) e tutti gli eventuali dispositivi connessi elettricamente agli avvolgimenti da verificare, vengano scollegati.

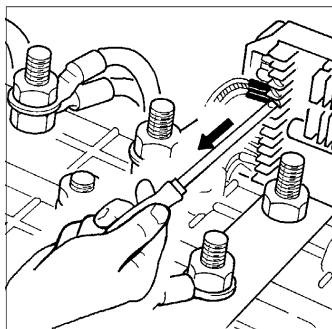
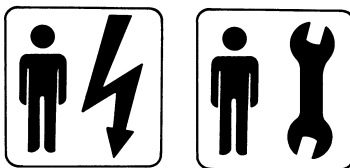


fig. a

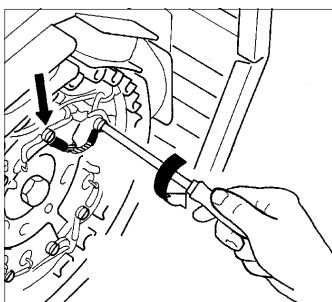


fig. b

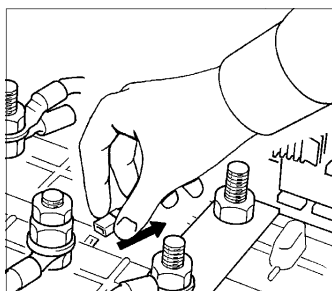


fig. c

## MAINTENANCE

Maintenance operations on Mecc Alte generators can be divided into routine and extraordinary maintenance operations; in both cases, all operations must be authorised by the safety representative and they must be carried out when the machine is turned off and insulated from the electric installation or from the power mains.

High-qualified mechanical or electrical technicians must carry out maintenance operations and any fault search since all operations described hereunder could put personnel in serious danger.

It is also highly recommended to take all the necessary precautions so as to prevent an inadvertent starting of the machine during maintenance and fault search operations.

Routine maintenance operations can be summed up as follows:

- Assessment of windings conditions after long periods of storage or inactivity
- Assessment, on a regular basis, of correct functioning (absence of anomalous noises or vibrations)
- Mechanical inspections on all fastening bolts and, in particular, on electric connections
- external cleaning of generator

### a) Assessment of windings conditions after long periods of storage or inactivity.

Measuring the insulating earth resistance can assess the condition of the windings. This measurement can be carried out with a "Megger" device, or similar, with a 500V direct-current voltage. It is very important to disconnect the voltage regulator (fig. a), the rotating diode bridge (fig. b) and the radio-interference filter (fig. c), as well as any other device connected to the windings to be checked, before carrying out the measurement.

## MANUTENZIONE

Il valore misurato di resistenza verso terra di tutti gli avvolgimenti deve essere superiore a  $1\text{M}\Omega$ .

Nell'ipotesi in cui il valore misurato sia inferiore a quanto sopra riportato, gli avvolgimenti devono essere opportunamente asciugati. Tale operazione può essere eseguita indirizzando un getto di aria calda a circa  $50-60^\circ\text{C}$ , negli ingressi o nelle uscite dell'aria del generatore.

In alternativa a quanto sopra, gli avvolgimenti di statore possono essere collegati elettricamente e fatti attraversare da una corrente mediante un alimentatore in continua; il valore di corrente da fare circolare negli avvolgimenti dipenderà dalle dimensioni dell'alternatore e comunque dovrà essere stabilito in accordo ai valori nominali riportati nella targhetta.

### b) Verifiche del corretto funzionamento (assenza di rumori o vibrazioni anomale).

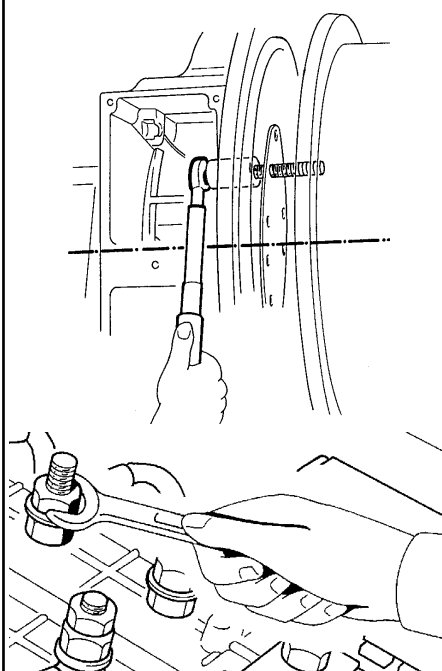
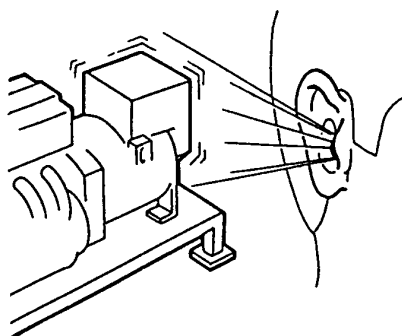
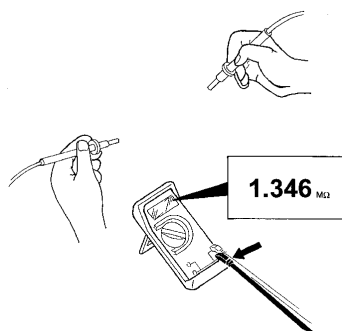
Ad intervalli regolari raccomandiamo di verificare che il generatore funzioni regolarmente senza rumori o vibrazioni anomale; tali presenze potrebbero denotare il danneggiamento dei cuscinetti.

Ricordiamo che l'alternatore a sé stante non presenta vibrazioni particolari in quanto le parti rotanti sono perfettamente bilanciate. Premesso che la bilanciatura del rotore non sia stata alterata e che i cuscinetti dell'alternatore non siano danneggiati, le cause delle vibrazioni presenti sul gruppo elettrogeno saranno da ricercare negli allineamenti degli accoppiamenti, nelle sollecitazioni del motore termico o nei supporti antivibranti.

Si raccomanda inoltre di verificare i dati funzionali che devono risultare in linea con quanto riportato nella targhetta del generatore.

### c) Verifiche meccaniche su tutti i bulloni di fissaggio ed in particolare delle connessioni elettriche.

Ad intervalli regolari raccomandiamo di verificare che tutti i bulloni di fissaggio siano adeguatamente stretti; una particolare attenzione deve essere rivolta alle connessioni elettriche, operazione che deve essere eseguita con la assoluta certezza di assenza di tensione. Nel manuale del generatore sono indicate le corrette coppie di serraggio delle varie dimensioni di bullone.



## MAINTENANCE

The figure resulting from the measurement of the windings' earth resistance must be over  $1\text{M}\Omega$ .

Should the figure be smaller than the above-mentioned one, the windings must be adequately dried up. This can be done by directing a jet of hot air of about  $50-60^\circ\text{C}$  into the generator's air inlets or outlets; alternatively, the stator's windings can be electrically connected and a voltage can be passed through them by means of a direct-current power supply. The amount of current in the windings depends on the generator size, even though it must be fixed according to the nominal values stated on the plate.

### b) Assessment of current functioning (absence of anomalous noises or vibrations).

We recommend users to check regularly the correct functioning of the generator, and to verify that there are no anomalous noises or vibrations; their presence might indicate damage of bearings.

May we remind you that the alternator itself has no particular vibration since the rotating parts are perfectly balanced. Provided that the rotor balancing has not been altered and that the rotor's bearings have not been damaged, vibrations in the generator set may occur due to alignments of couplings, due to stress upon the combustion engine, or to vibration mounts.

We also recommend checking of performance data which must comply with the data on the generator's plate.

### c) Mechanical checks of fastening bolts and, in particular, of electric connections.

We recommend a regular check of all fastening bolts, which must be perfectly tightened up. Special attention should be paid to all electric connections; this inspection must be carried out in the complete absence of voltage. To choose the correct tightening wrenches suitable for the different sizes of the bolts, see generator manual.

## MANUTENZIONE

### d) Pulizia esterna ed interna del generatore.

Per la pulizia esterna del generatore è possibile utilizzare dell'aria compressa; vietiamo assolutamente l'uso di qualsiasi tipo di idropulitrice e di liquidi detergenti; il grado di protezione standard del generatore è IP21 e pertanto utilizzando liquidi potrebbero verificarsi delle anomalie o anche cortocircuiti.

Gli interventi di manutenzione straordinaria possono essere riassunti in:

- manutenzione dei cuscinetti ed eventuale sostituzione
- pulizia dei filtri aria (se presenti)
- pulizia degli avvolgimenti
- sostituzione del ponte a diodi
- sostituzione dell'eccitatrice
- sostituzione del regolatore di tensione
- controllo della tensione residua

### a) Manutenzione dei cuscinetti ed eventuale sostituzione.

Tutti i cuscinetti sono ingrassati in fase di montaggio; il grasso impiegato normalmente è del tipo SKF28 o equivalenti.

Tutti i generatori ad eccezione dei tipi ECO40, ECO43N ed ECO46, montano cuscinetti di tipo stagno; per tali tipi di cuscinetti non sono necessarie manutenzioni per tutto il periodo di funzionamento (stimabile in circa 30.000 ore).

Per i generatori tipo 40, 43 e 46, ad intervalli regolari (vedere tabella cuscinetti) occorre procedere all'ingrassaggio dei cuscinetti mediante un apposito ingrassatore a pressione.

Controlli periodici durante il periodo di funzionamento, devono essere eseguiti per verificare eventuali surriscaldamenti o rumori; eccessive vibrazioni possono essere causate da una usura anomala del cuscinetto.

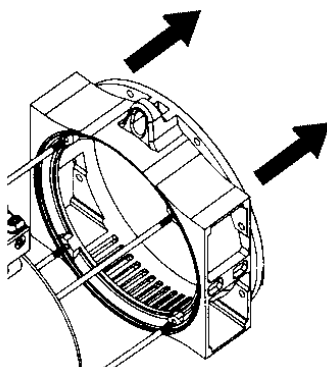
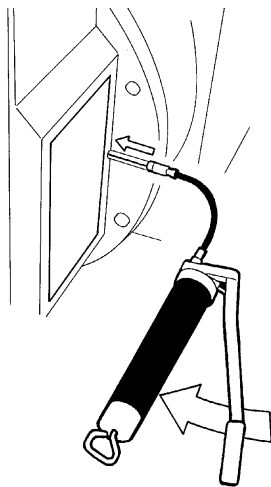
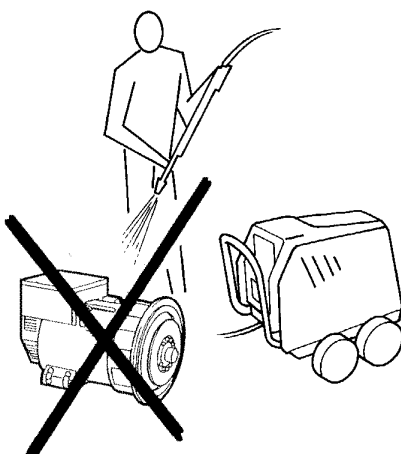
In tal caso, il cuscinetto deve essere smontato per essere esaminato ed eventualmente sostituito.

Qui di seguito viene descritta la procedura per sostituire il cuscinetto.

### Generatore tipo 28-31-32-34.

Per smontare l'alternatore della serie 28-31-32-34, attenersi alle seguenti istruzioni:

-) togliere il coperchio anteriore



## MAINTENANCE

### d) Internal and external cleaning of the generator.

For the external cleaning of the generator, you can use compressed air. The use of hydro-cleaners and detergent fluids is strictly forbidden. The standard protection degree of the generator is IP21; therefore, use of fluids could cause anomalies or even short-circuits.

Extraordinary maintenance operations can be summed up as follows:

- Maintenance and replacement (if necessary) of bearings
- Cleaning of air filters (if available)
- Cleaning of windings
- Replacement of diode bridge
- Replacement of exciter
- Replacement of voltage regulator
- Check of residual voltage

### a) Maintenance and replacement (if necessary) of bearings.

During the assembling phase, all bearings are greased with SKF28 grease, or similar.

All generators, except the ECO40, the ECO43N and ECO46 versions, are equipped with sealed bearings; for this kind of bearing, no maintenance is required for the total operating time (estimated: 30.000 hours).

Bearings of alternator versions 40, 43 and 46 must be greased on a regular basis by means of a pressure grease cup (see bearings chart).

During the operating time, checks to detect presence of either overheating, or noises, must be carried out on a regular basis. If the bearing is worn off, it can cause excessive vibrations. In such a case, the bearing must be removed, examined, and if necessary, replaced.

A description of the procedure for a bearing replacement.

### Generator versions: 28-31-32-34.

To disassemble alternator versions 28-31-32-34, follow these instructions:

-) Remove front cover

## MANUTENZIONE

-) sfilare il rotore utilizzando un mezzo di sollevamento con funi morbide ma di portata adeguata; verificare che i mezzi di sollevamento predisposti siano comunque adeguati per i pesi dei componenti da movimentare

-) per estrarre il cuscinetto deve essere utilizzato un apposito estrattore

-) per il montaggio del nuovo cuscinetto, riscaldare lo stesso con un apposito dispositivo magnetico

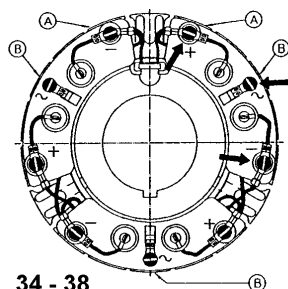
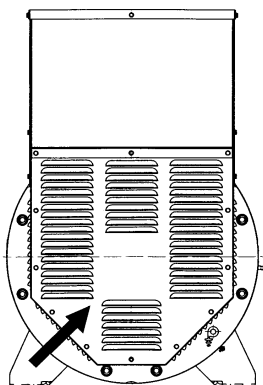
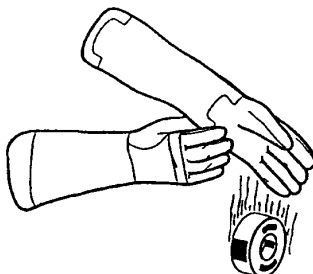
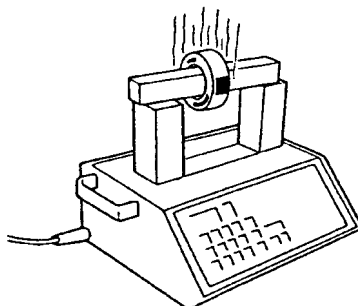
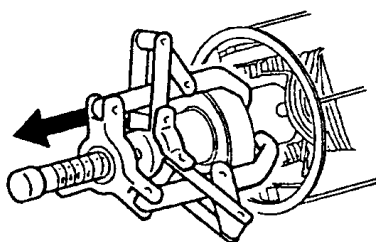
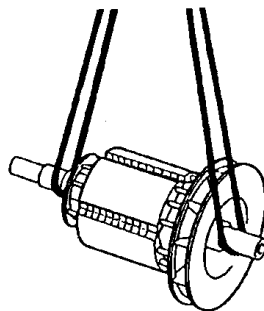
-) indossando gli appositi guanti anti-scottatura, montare il cuscinetto nella sua sede

### Generatore tipo 38-40-43-46.

Per smontare l'alternatore della serie 38-40-43-46, è necessario rimuovere l'eccitatrice, pertanto attenersi alle seguenti istruzioni :

-) togliere la chiusura posteriore

-) sconnettere i cinque fili del ponte diodi rotante "A" e "B".



34 - 38

## MAINTENANCE

-) Use a lifting device equipped with soft ropes of an adequate lifting capacity to extract rotor. Make sure that the lifting devices are suitable for the weight of the parts to be shifted;

-) To pull the bearing out, use a puller

-) To insert new bearing, heat it with a suitable magnetic device

-) Put on safety gloves and insert bearing into its place

### Generator versions: 38-40-43-46.

To disassemble alternator versions 38-40-43-46, remove exciter as follows:

-) Remove rear seal

-) Disconnect the five wires of the rotating diode bridge "A" and "B".

## MANUTENZIONE

-) nel caso di alternatori della serie 38, togliere le viti di bloccaggio dei settori porta diodi del ponte rotante, mentre nel caso di alternatori della serie 40-43-46 togliere il bullone di bloccaggio e tirando leggermente togliere il ponte diodi

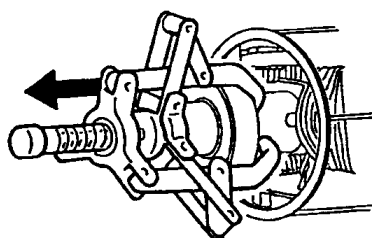
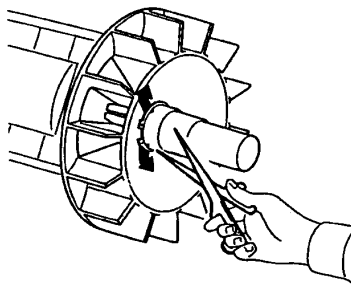
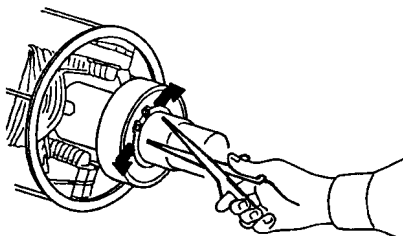
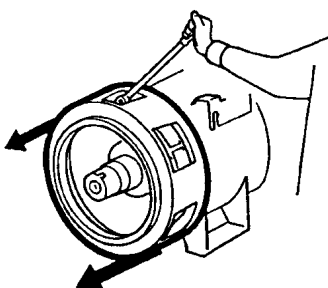
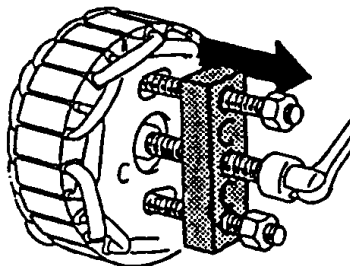
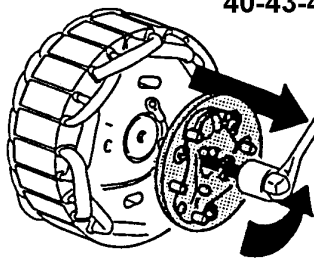
-) inserire un adeguato estrattore per sfilare il rotore eccitatrice

-) dal lato accoppiamento sfilare il rotore principale; nel caso in cui il diametro del coperchio anteriore fosse minore del diametro esterno della ventola, togliere il coperchio stesso per sfilare il rotore

-) togliere gli anelli seeger servendosi di una pinza adeguata

-) per estrarre il cuscinetto deve essere utilizzato un apposito estrattore

40-43-46



## MAINTENANCE

-) When dealing with versions 38, remove clamp screws from the diodes area of the rotating bridge, whilst when dealing with versions 40, 43 and 46, remove clamp bolt and, by pulling it gently, remove Diode Bridge

-) Insert an adequate puller to pull out exciter rotor

-) Pull out rotor from the drive-end side; should the front lead diameter be smaller than the impeller's external diameter, remove lid to pull out rotor

-) Use a pair of suitable pliers to remove seeger rings

-) Use a suitable puller to remove bearing

## MANUTENZIONE

-) per il montaggio del nuovo cuscinetto, riscaldare lo stesso con un apposito dispositivo magnetico

-) indossando gli appositi guanti anti-scottatura, montare il cuscinetto nella sua sede

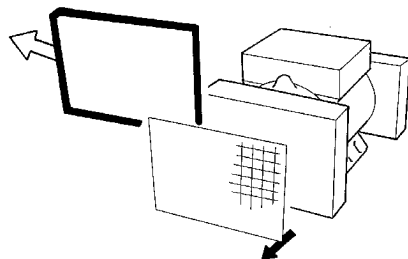
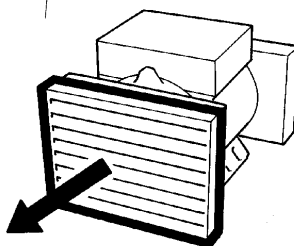
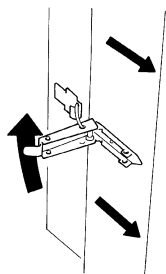
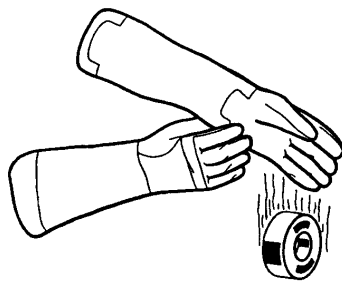
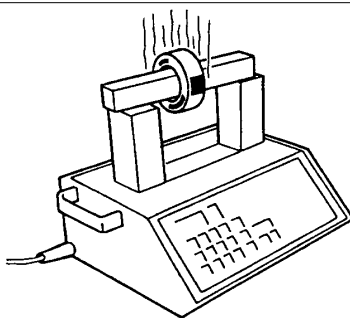
### b) Pulizia dei filtri aria (se presenti)

I filtri aria sono degli accessori che vengono montati su richiesta dei clienti; tali dispositivi devono essere periodicamente puliti in quanto al loro interno è situata una retina a maglie che deve essere mantenuta pulita per garantire l'efficienza del filtro. La periodicità di intervento sui filtri aria dipenderà dalla severità delle condizioni del luogo di installazione; in ogni caso una regolare ispezione di questi componenti permetterà di stabilire se sarà il caso di intervenire. E' importante ricordare che la pulizia di questi elementi deve essere eseguita con il generatore non in servizio, in quanto la rimozione consente l'accesso a parti che potrebbero trovarsi in tensione.

### c) Pulizia degli avvolgimenti

La durata degli avvolgimenti e quindi del generatore stesso, può essere migliorata da una corretta manutenzione e pulizia; un programma di ispezione e manutenzione dovrebbe essere stabilito tenendo presente che la frequenza di tali verifiche dipenderà dalle condizioni effettive dell'ambiente di utilizzo.

Se il generatore lavora in ambienti asciutti e puliti, un'ispezione all'anno può essere sufficiente; al contrario, se le condizioni sono più severe, è opportuno aumentare la frequenza delle ispezioni.



## MAINTENANCE

-) To insert new bearing, heat it with a suitable magnetic device

-) Put on safety gloves and insert bearing into its place

### b) Cleaning of air filters (if available)

Air filters are optional parts that are supplied upon request; these devices must be cleaned on a regular basis; inside these filters there is a mesh net that has to be kept clean in order to ensure a good performance of the filter. The time interval between each cleaning operation depends on the conditions of the installation site. A frequent inspection of these parts will establish if any cleaning is required. Make sure you turn off the generator set when performing cleaning operations of such parts as their removal entails contact with live parts.

### c) Cleaning of windings

Both windings and generator will last longer with a correct maintenance and cleaning; an inspection and a maintenance schedule should be established by keeping in mind that the frequency of these inspections depends on the conditions of the site where the generator is being used.

If the generator is used in a dry and clean environment, an inspection a year is enough; in case of severe conditions, inspections must be carried out more frequently.

## MANUTENZIONE

In ogni caso, indipendentemente dal programma stabilito, raccomandiamo di procedere a tale manutenzione nelle seguenti ipotesi :

- ) presenza di ruggine
- ) segni evidenti di corrosione
- ) deterioramento dell'isolamento
- ) presenza di polvere sulla superficie degli avvolgimenti

Gli avvolgimenti possono essere puliti utilizzando degli appositi solventi come ad esempio "l'acqua ragia" o il "solvesso"; tali sostanze, avendo un alto grado di evaporazione, permettono una pulizia adeguata senza intaccare il grado di isolamento degli avvolgimenti.

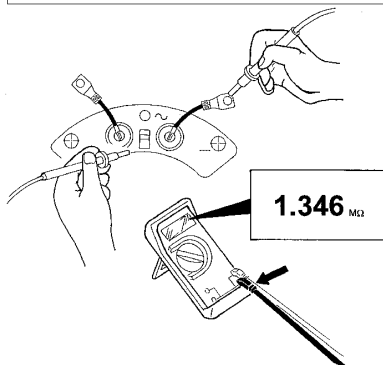
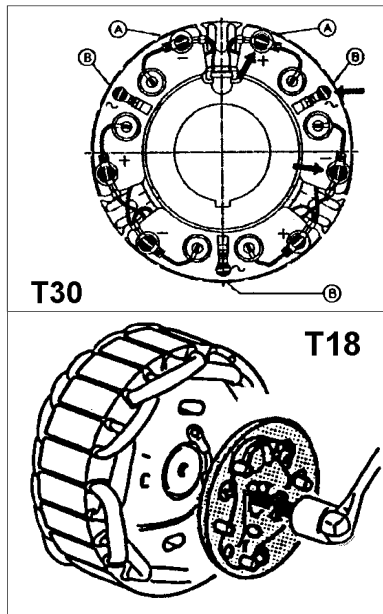
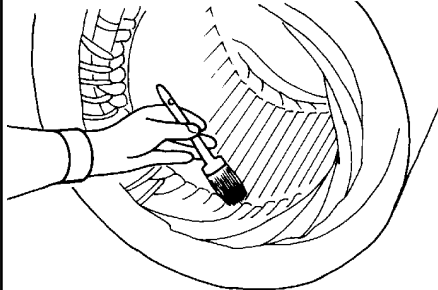
A pulizia ultimata, raccomandiamo di controllare che non vi siano segni di sovrariscaldamenti ed eventuali tracce di carbonizzazioni.

Inoltre si consiglia di asciugare gli avvolgimenti a circa 60-80°C e se si notano degradamenti della vernice degli avvolgimenti, procedere ad una ulteriore verniciatura degli stessi.

### d) Sostituzione del ponte a diodi

A seconda del tipo di alternatore, il ponte a diodi può essere composto o da tre settori separati su ognuno dei quali sono fissati due diodi (T30) oppure da un blocco unico circolare (T18) con sei diodi. La prima configurazione (T30) viene installata nei generatori tipo 34-38 mentre la seconda (T18) viene installata nei generatori tipo 40-43-46.

Ciascun singolo diodo può essere verificato molto facilmente con un multimetro; è sufficiente scollegare il cavetto del diodo in esame e controllarne la resistenza nei due sensi. Un diodo che funziona correttamente indicherà una resistenza molto alta in un senso e molto bassa nel senso opposto. Un diodo guasto avrà o una resistenza molto bassa o una resistenza infinita in entrambi i sensi. Una volta sostituito il settore o l'intero ponte vi raccomandiamo di serrare le relative viti con le corrette coppie di fissaggio e di rispettare le polarità secondo gli schemi e le tabelle forniti da Mecc Alte.



## MAINTENANCE

However, we recommend that a check should be done, regardless of the schedules, in the following cases:

- ) in case of rust
- ) in case of corrosion
- ) when the insulation is damaged
- ) when there is dust on the surface of the windings

To clean windings, use solvents like oil of turpentine or "Solvesso" solvent. Cleaning with such substances, which contain a high evaporation level, will not damage the isolation level of the windings. When cleaning is over, please look out for any overheating or carbonisation signs.

We also recommend drying up of windings at 60-80°C and if you notice that the varnish of windings is not in good shape, then have them varnished again.

### d) Replacement of diode bridge

The diode bridge varies according to the model of the generator. It can have three separate sectors with two diodes fixed on each sector (T30), or one circular body (T18) with 6 diodes. The first type (T30) is used in the alternator models 34-38, whereas the second one (T18) is used in the 40,43 and 46 versions.

Diodes can be easily inspected with a multimeter: simply disconnect the wire of the particular diode and check its resistance on both directions. A perfectly functioning diode will show a very high resistance in one direction and a very low resistance in the opposite direction. A faulty diode will show either a very low resistance, or an infinite resistance in both directions. Once the whole sector, or the whole bridge, is replaced, remember to tighten the screws with a suitable tightening wrench and to strictly comply with the polarities and the diagrams indicated by Mecc Alte.

## MANUTENZIONE

### Generatore tipo 28-31-32.

#### Procedura di verifica per diodi rotore eccitatrice.

Strumentazione necessaria :

- batteria 12V
- lampada 12V-21W (o in alternativa resistenza 6.8Ω-30W)
- voltmetro (Ex. Multimetro su scala VOLT d.c.)

**Importante: Prima di eseguire le operazioni seguenti sconnettere i due cavi di collegamento del rotore principale al ponte diodi (+ e -).**

#### TEST DEI DIODI SUL "NEGATIVO"

- Connettere gli strumenti come indicato in figura A (tabella 26 pag. 74)
- Fissare il cavo connesso alla lampada al morsetto negativo del ponte come indicato in figura A (tabella 26 pag. 74)
- Connettere il terminale "Probe" ai punti A1, A2 ed A3 in sequenza per verificare rispettivamente i diodi 1, 2 e 3. Verificare la lettura sul voltmetro in relazione a quanto indicato in tabella (tabella 26 pag. 74).

#### TEST DEI DIODI SUL "POSITIVO"

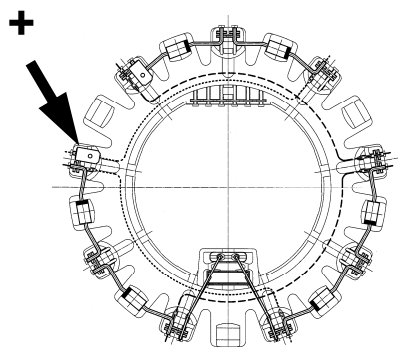
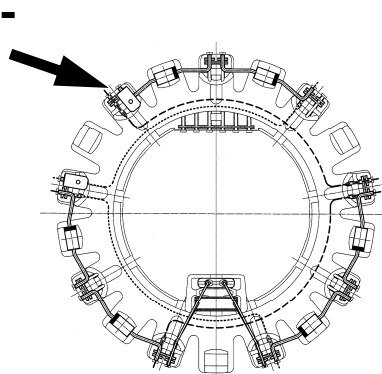
- Connettere gli strumenti come indicato in figura B (tabella 26 pag. 74)
- Fissare il cavo connesso al negativo della batteria al morsetto positivo del ponte come indicato in figura B (tabella 26 pag. 74)
- Connettere il terminale "Probe" ai punti A4, A5 e A6 in sequenza per verificare rispettivamente i diodi 4, 5 e 6; verificare la lettura sul voltmetro in relazione a quanto indicato in tabella (tabella 26 pag. 74).

#### ISTRUZIONI PER LA SOSTITUZIONE DEL DIODO.

Qualora i valori riscontrati indichino un diodo danneggiato, occorrerà procedere alla sostituzione del componente.

A tale scopo si raccomanda di non estrarre i reofori dalle rispettive sedi ma di tagliarli in prossimità del corpo del componente; inserire il nuovo componente rispettando le polarità e saldare a stagno accuratamente i reofori con gli spezzoni rimasti nelle sedi.

**IMPORTANTE  
IMPORTANT  
WICHTIG**



## MAINTENANCE

### Generator versions: 28-31-32.

#### Procedure to check the diodes of the exciter rotor.

Necessary equipment :

- 12V battery
- 12V-21W lamp (or alternatively 6.8Ω-30W Resistance)
- Voltmeter (for instance, multimeter on scale VOLT d.c.)

**Warning: before performing the following actions, it is necessary to disconnect the 2 cables connecting the main rotor to the diode bridge (+and-)**

#### TEST OF THE DIODES ON THE "NEGATIVE"

- Connect the equipment, as it is pointed out in the picture A (table 26 page 74)
- Fix the cable connected to the lamp to the negative terminal of the bridge, as it is pointed out in the picture A (table 26 page 74)
- Connect the terminal "Probe" to the point A1 (it is checked the diode 1), then to the point A2 (it is checked the diode 2) and finally to the point A3 (it is checked the diode 3); check the readings on the voltmeter in relation with what is reported on the table (table 26 page 74).

#### TEST OF THE DIODES ON THE "POSITIVE"

- Connect the equipment, as it is pointed out in the picture B (table 26 page 74)
- Fix the cable connected to the negative terminal of the battery to the positive terminal of the bridge, as it is pointed out in the picture B (table 26 page 74)
- Connect the terminal "Probe" to the point A4 (it is checked the diode 4), then to the point A5 (it is checked the diode 5) and finally to the point A6 (it is checked the diode 6); check the readings on the voltmeter in relation with what is reported on the table (table 26 page 74).

#### INSTRUCTIONS TO REPLACE THE DIODE

When the values measured point out a diode damaged, it is necessary to replace the component.

For this purpose it is recommended to not pull the rheophores out from their locations, but to cut them near to the body of the component; then fit in the new component respecting the polarity and soft-solder accurately the rheophores with the pieces remained in their locations.

## MANUTENZIONE

### e) Sostituzione dell'eccitatrice Generatore tipo 28-31-32-34.

Per smontare l'eccitatrice dell'alternatore della serie 28-31-32-34, attenersi alle seguenti istruzioni :

-) togliere il coperchio anteriore

-) sfilare il rotore utilizzando un mezzo di sollevamento con funi morbide ma di portata adeguata; verificare che i mezzi di sollevamento predisposti siano comunque adeguati per i pesi dei componenti da movimentare

-) per estrarre il cuscinetto deve essere utilizzato un apposito estrattore

-) per smontare il rotore eccitatrice, inserire un adeguato estrattore facilmente costruibile o reperibile presso la nostra sede.

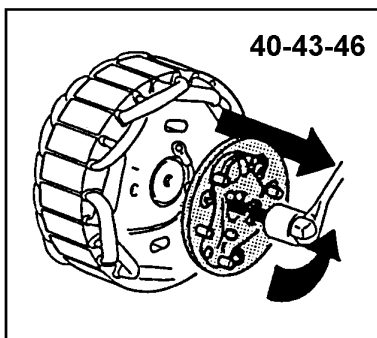
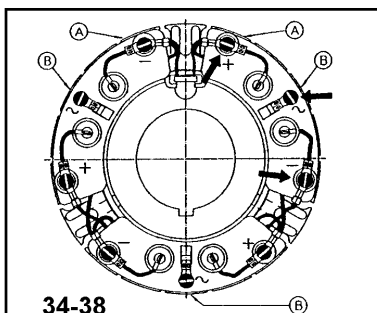
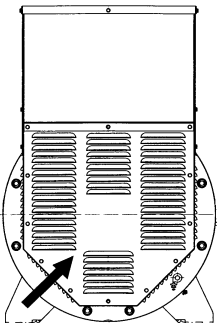
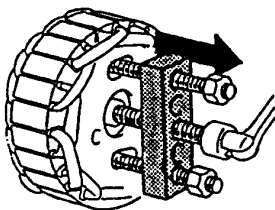
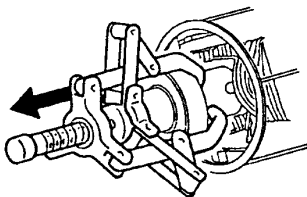
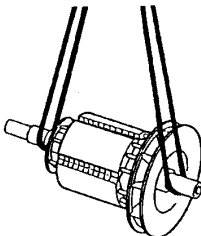
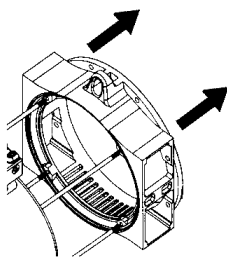
### Generatore tipo 38-40-43-46.

Per smontare l'eccitatrice dell'alternatore della serie 38-40-43-46, non è necessario smontare l'intero alternatore, pertanto attenersi alle seguenti istruzioni:

-) togliere la chiusura posteriore

-) sconnettere i cinque fili del ponte diodi rotante

-) nel caso di alternatori della serie 38, togliere le viti di bloccaggio dei settori mentre nel caso di alternatori della serie 40-43-46 togliere il bullone di bloccaggio e tirando leggermente togliere il ponte diodi



## MAINTENANCE

### e) Replacement of exciter Generator versions: 28-31-32-34

Follow these instructions to remove exciter of the 28-31-32-34 versions:

-) remove front lead

-) Use a lifting device equipped with soft ropes of an adequate lifting capacity to extract rotor. Make sure that the lifting devices are suitable for the weight of the parts to be shifted

-) Use a puller to pull out bearing

-) To remove the exciter rotor, use a suitable puller, which can be easily constructed or forwarded by the manufacturer upon request.

### Generator versions: 38-40-43-46.

To remove exciter of the 38-40-43-46 versions, there is no need to disassemble the entire generator, however, you must follow the instructions below:

-) Remove rear seal

-) Disconnect the five wires of the rotating diode bridge

-) When dealing with the 38 versions, remove clamp screws from sectors; whilst when dealing with the 40-43-46 versions, remove clamp bolt and, by pulling it gently, pull out diode bridge

## MANUTENZIONE

-) per smontare il rotore eccitatrice, inserire un adeguato estrattore facilmente costruibile o reperibile presso la nostra sede

### f) Sostituzione del regolatore di tensione

I generatori sono provvisti di regolatore automatico di tensione; a seconda del tipo di alternatore, i regolatori elettronici possono essere di due tipi : SR7/2-G, UVR6/1-F.

L'SR7/2-G è montato di serie nelle tipologie 28-31-32-34, l'UVR6/1-F è montato nelle tipologie 38-40-43-46.

Nel caso in cui si riscontrassero dei comportamenti anomali vi preghiamo di consultare il manuale specifico o di contattare il nostro servizio di assistenza tecnica.

Una volta stabilito che il regolatore deve essere sostituito, procedere come segue :

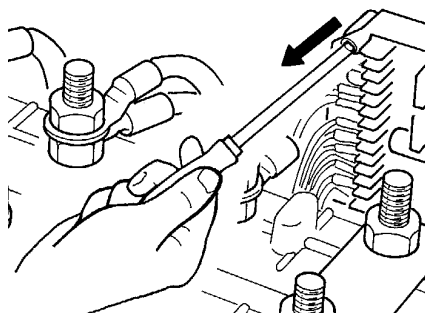
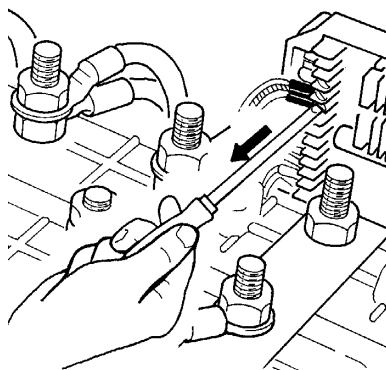
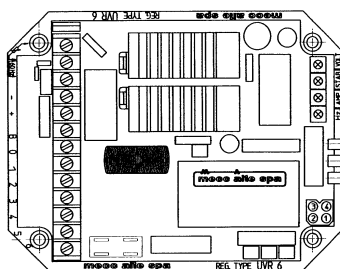
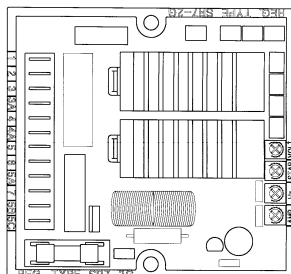
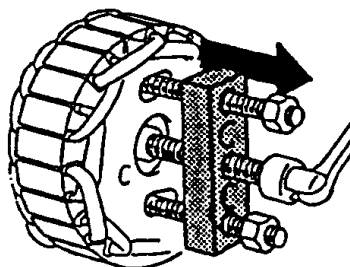
-) scollegare tutti i cavetti di collegamento in morsettiera

-) svitare le 2/4 viti di bloccaggio del regolatore

-) collocare il nuovo regolatore nella posizione prevista

-) fissare il nuovo regolatore con le viti precedentemente raccolte

-) ricollegare tutti i cavi alla morsettiera del regolatore, servendosi in caso di bisogno, degli schemi forniti da Mecc Alte.



## MAINTENANCE

-) To insert exciter rotor, use a suitable puller, which can be easily constructed or forwarded by the manufacturer upon request.

### f) Replacement of voltage regulator

All generators are equipped with an automatic voltage regulator; depending on the alternator model, electronic regulators can be of two different types: SR7/2-G, UVR6/1-F.

The SR7/2-G is an integral part of the 28-31-32-34 generators; the UVR6/1-F is supplied with the 38-40-43 and 46 versions. Should some anomalous functioning be detected, please consult our technical manual or contact our technical assistance service.

Once it has been ascertained that the regulator needs to be replaced, proceed as follows:

-) Disconnect all terminal board wires

-) Unscrew the 2/4 clamp screws of the regulator

-) Set new regulator in the usual position

-) Tighten the new regulator with the previously unscrewed screws

-) Connect again all wires to the terminal board of the regulator. Follow diagrams supplied by Mecc Alte, if necessary.

## MANUTENZIONE

### g) Controllo della tensione residua

La seguente procedura è applicabile ai generatori muniti di regolatore elettronico e deve essere applicata nell'eventualità che il generatore non si autoecciti (in tale condizione, pur ruotando alla velocità nominale, non è presente tensione nella morsettiera principale del generatore):

-) con il generatore fermo, rimuovere il coperchio di chiusura della scatola morsetti

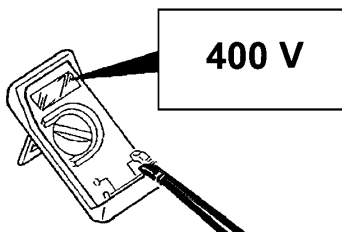
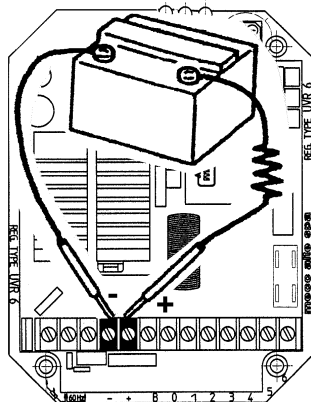
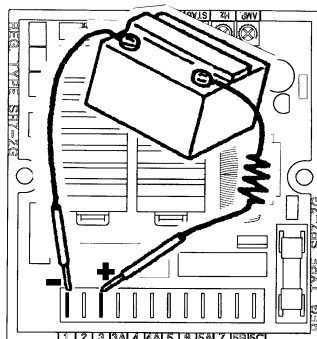
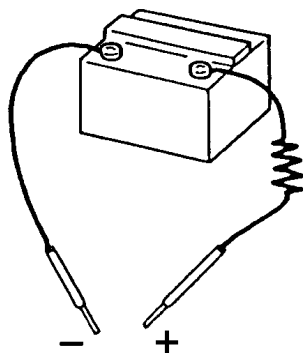
-) predisporre due terminali collegati ad una batteria da 12 Vdc con in serie una resistenza da 30  $\Omega$

-) individuare con l'ausilio degli schemi elettrici forniti da Mecc Alte, i morsetti "+" e "-" del regolatore elettronico

-) avviare il generatore

-) applicare per un istante i due terminali ai morsetti precedentemente individuati facendo molta attenzione nel rispettare le polarità (morsetto "+" del regolatore con morsetto "+" della batteria, morsetto "-" del regolatore con morsetto "-" della batteria)

-) verificare con un voltmetro o con la relativa strumentazione da quadro, che il generatore generi la tensione nominale prevista nella targhetta.



## MAINTENANCE

### g) Check of residual voltage

For generators equipped with an electronic regulator, you must perform the following procedure. This must be applied to ensure that the generator is not over-excited (in such a condition, though it still rotates at nominal velocity, no voltage is present in the generator's main terminal board):

-) When the generator is switched off, remove lid from the terminals case

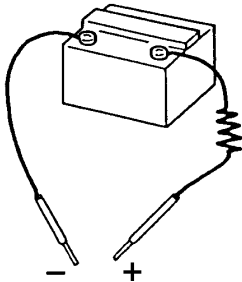
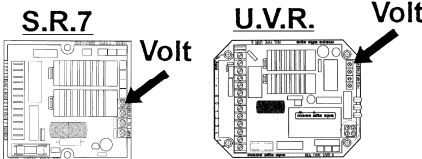
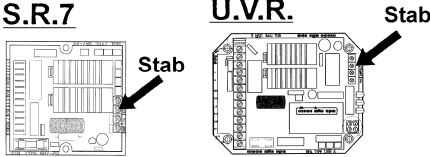
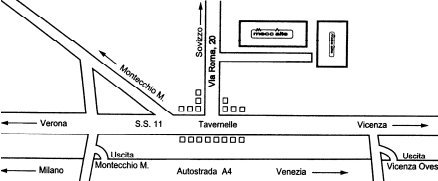
-) Connect two connecting wires to a 12 Vdc battery with a 30  $\Omega$  in-series resistance

-) Follow the electrical diagrams supplied by Mecc Alte, to locate positive and negative terminals of electronic regulator

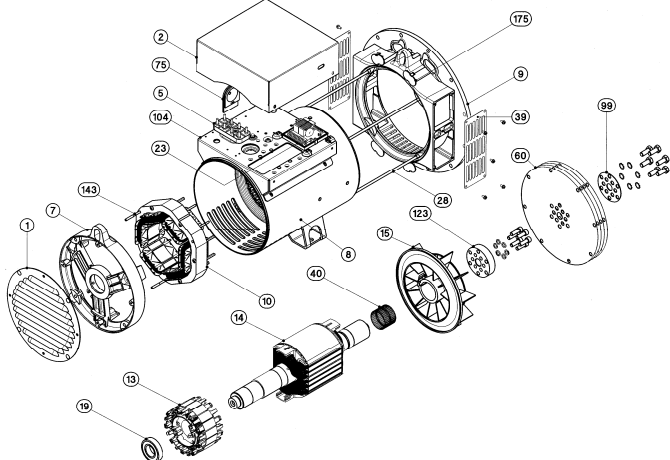
-) Start generator

-) Connect, only for a moment, the two connecting wires to the previously located terminals. Make sure to match polarities (positive terminal of regulator with positive terminal of battery, negative terminal of regulator with negative terminal of battery)

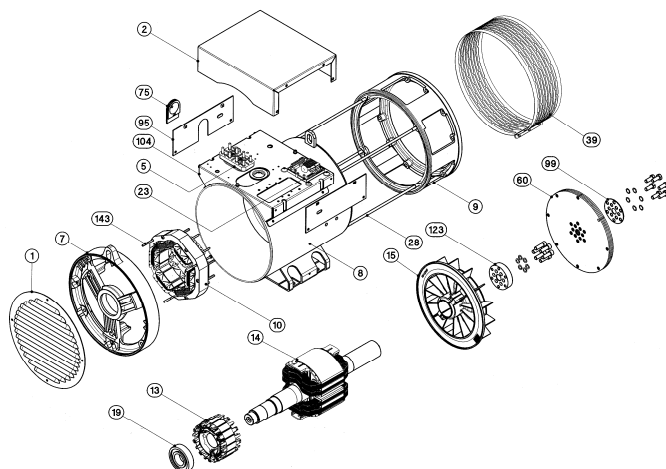
-) Use a voltmeter or the right instrument panel, to check whether the generator is producing the nominal voltage indicated on the plate.

| ANOMALIE E RIMEDI                                                                                                                                                                                                                                                                                                                                           |                                                                                      | DEFECTS AND REMEDIES                                                                                                                                                                                                                                                                                                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>IL GENERATORE NON SI ECCITA</b> <ul style="list-style-type: none"> <li>- Controllare il fusibile.</li> <li>- Aumentare la velocità del 15%.</li> <li>- Applicare per un istante al “+” e al “-” del regolare elettronico, una tensione di 12 V di una batteria con in serie una resistenza di 30 <math>\Omega</math> rispettando le polarità.</li> </ul> |     | <b>ALTERNATOR DOES NOT EXCITE</b> <ul style="list-style-type: none"> <li>- Substitute fuse.</li> <li>- Increase speed by 15%.</li> <li>- For an instant apply on “+” and “-” of the electronic regulator a 12 V battery voltage with a 30 <math>\Omega</math> resistor in series, respecting the polarities.</li> </ul> |
| <b>DOPO ECCITATO SI DISECCITA</b> <ul style="list-style-type: none"> <li>- Controllare i cavi di collegamento servendosi dei disegni allegati.</li> </ul>                                                                                                                                                                                                   |                                                                                      | <b>AFTER BEING EXCITED ALTERNATOR DOES NOT EXCITE</b> <ul style="list-style-type: none"> <li>- Check connection cables as per attached drawings.</li> </ul>                                                                                                                                                             |
| <b>A VUOTO TENSIONE BASSA</b> <ul style="list-style-type: none"> <li>- Ritarare la tensione.</li> <li>- Controllare il numero di giri.</li> <li>- Controllare gli avvolgimenti.</li> </ul>                                                                                                                                                                  |                                                                                      | <b>LOW VOLTAGE AT NO LOAD</b> <ul style="list-style-type: none"> <li>- Reset voltage potentiometer.</li> <li>- Check speed.</li> <li>- Check windings.</li> </ul>                                                                                                                                                       |
| <b>A VUOTO TENSIONE TROPPO ALTA</b> <ul style="list-style-type: none"> <li>- Ritarare la tensione.</li> <li>- Sostituire il regolatore.</li> </ul>                                                                                                                                                                                                          |                                                                                      | <b>HIGH VOLTAGE AT NO LOAD</b> <ul style="list-style-type: none"> <li>- Reset voltage potentiometer.</li> <li>- Substitute regulator.</li> </ul>                                                                                                                                                                        |
| <b>A CARICO TENSIONE INFERIORE ALLA NOMINALE</b> <ul style="list-style-type: none"> <li>- Ritarare la tensione.</li> <li>- Corrente troppo alta, <math>\cos \varphi</math> inferiore a 0.8, velocità inferiore del 4% della nominale.</li> <li>- Sostituire il regolatore.</li> <li>- Controllare i diodi scollegando i cavi.</li> </ul>                    |  | <b>AT LOAD CONDITIONS, VOLTAGE LOWER THAN RATED VALUE</b> <ul style="list-style-type: none"> <li>- Reset voltage potentiometer.</li> <li>- Current too high, power factor lower than 0.8, speed lower than 4% of rated speed.</li> <li>- Substitute regulator.</li> <li>- Check diodes, disconnect cables.</li> </ul>   |
| <b>A CARICO TENSIONE SUPERIORE ALLA NOMINALE</b> <ul style="list-style-type: none"> <li>- Ritarare la tensione.</li> <li>- Sostituire il regolatore.</li> </ul>                                                                                                                                                                                             |                                                                                      | <b>AT LOAD CONDITIONS, VOLTAGE HIGHER THAN RATED VOLTAGE</b> <ul style="list-style-type: none"> <li>- Reset voltage potentiometer.</li> <li>- Substitute regulator.</li> </ul>                                                                                                                                          |
| <b>TENSIONE INSTABILE</b> <ul style="list-style-type: none"> <li>- Controllare uniformità di rotazione.</li> <li>- Regolare la stabilità del regolatore agendo sul potenziometro “STAB”.</li> </ul>                                                                                                                                                         |  | <b>UNSTABLE VOLTAGE</b> <ul style="list-style-type: none"> <li>- Check uniformity of rotation.</li> <li>- Regulate stability of regulator by acting on “STAB.” potentiometer.</li> </ul>                                                                                                                                |
| <p>Per qualsiasi altra anomalia rivolgersi al rivenditore, ai centri di assistenza autorizzati o direttamente alla Mecc Alte .</p>                                                                                                                                                                                                                          |  | <p>For any other defect, please contact the seller, the after-sales service or Mecc Alte directly.</p>                                                                                                                                                                                                                  |

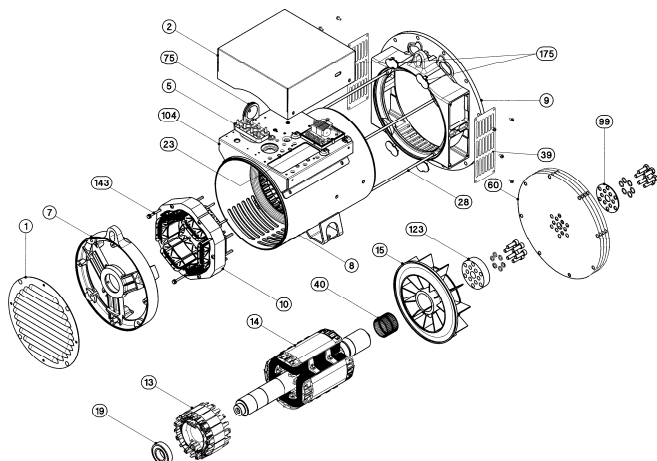
## ECP 28/2



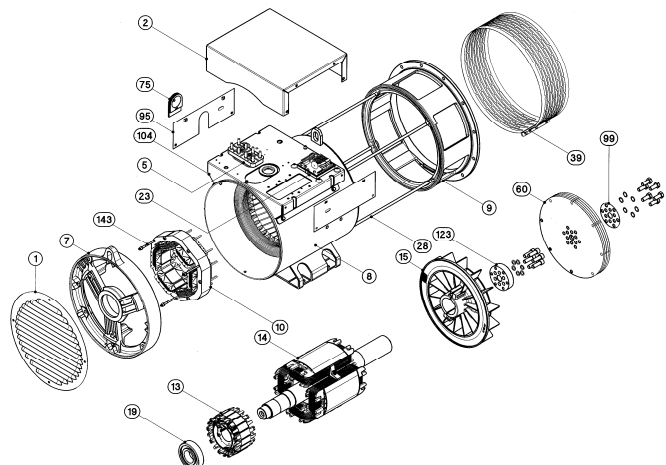
## ECO 31N/2



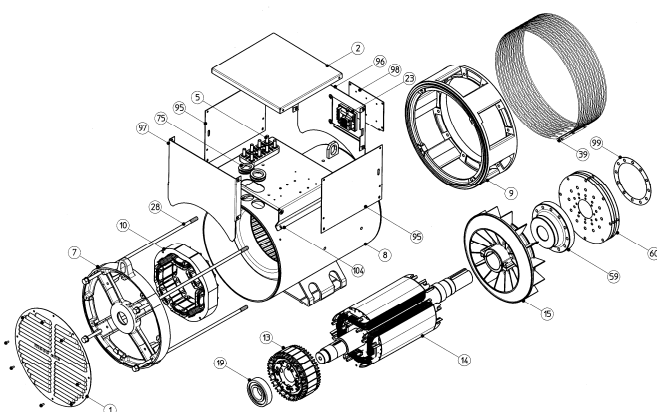
## ECP 28/4



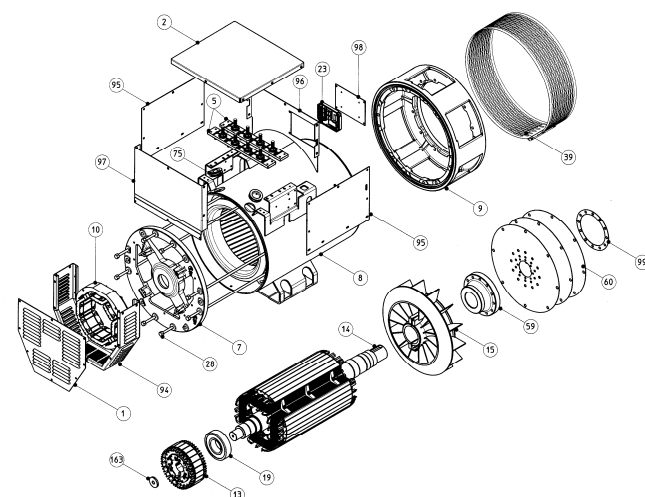
## ECO 32/4



## ECP 34



## ECO 38N

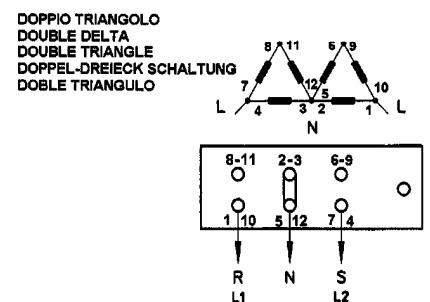
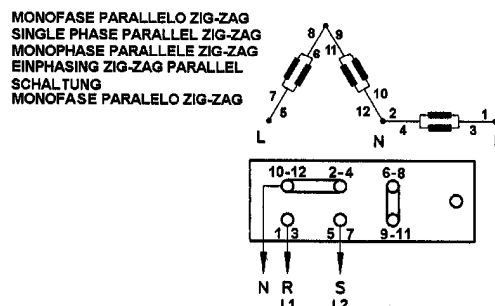
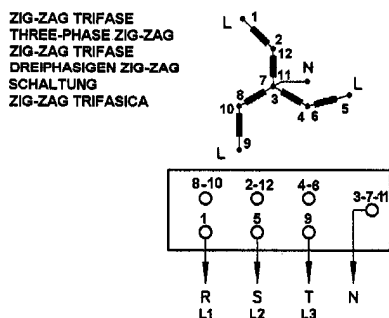
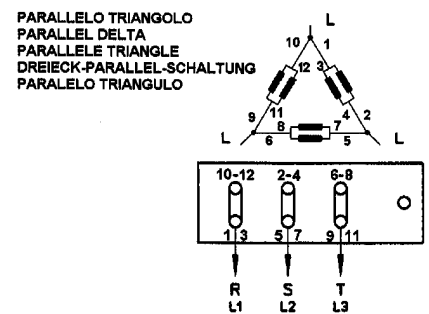
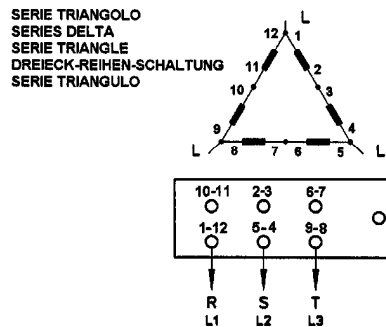
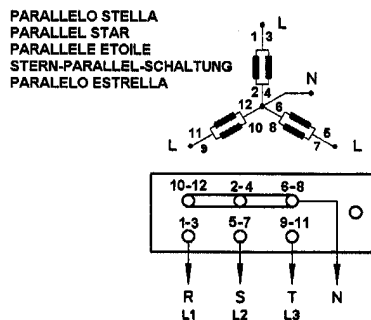
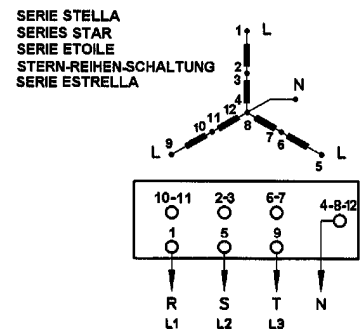
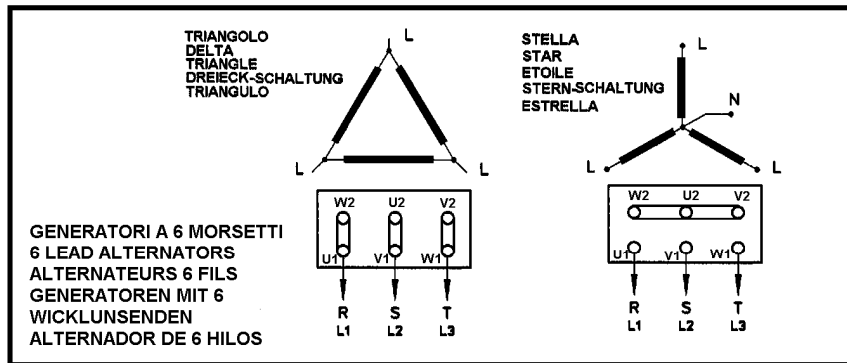


**GENERATORI 4 POLI - 4 POLE GENERATORS - ALTERNATEURS 4 POLES****GENERATOREN 4 POLIG - GENERADORES 4 POLOS**

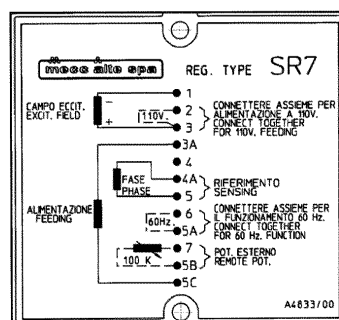
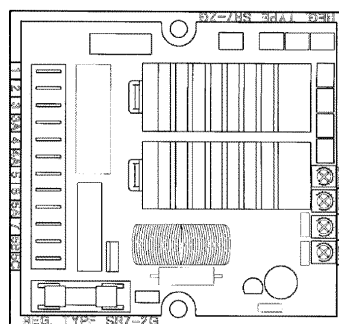
| TIPO<br>TYPE<br>TYP | V / Hz             | GENERATORE GENERATOR<br>PARTIE PUISSANCE GENERADORES |                 |                                                                                              | ECCITATRICE EXCITER<br>EXCITATRICE ERREGER |                                             |
|---------------------|--------------------|------------------------------------------------------|-----------------|----------------------------------------------------------------------------------------------|--------------------------------------------|---------------------------------------------|
|                     |                    | STATORE<br>STATOR<br>1-2                             | ROTORE<br>ROTOR | AVVOLGIMENTO<br>AUSILIARIO<br>AUXILIARY<br>WINDING<br>HILFS WICKLUNG<br>BOBINADO<br>AUXILIAR | STATORE<br>STATOR                          | ROTORE<br>FASE-FASE<br>ROTOR<br>PHASE-PHASE |
|                     |                    |                                                      |                 |                                                                                              |                                            |                                             |
|                     |                    | Ω                                                    | Ω               | Ω                                                                                            | Ω                                          | Ω                                           |
| ECP 28 1VS          | 115/200/230/400-50 | 0,951                                                | 0,911           | 3,753                                                                                        | 10,60                                      | 0,417                                       |
| ECP 28 2VS          | 115/200/230/400-50 | 0,582                                                | 1,032           | 3,225                                                                                        | 10,60                                      | 0,417                                       |
| ECP 28 0S           | 115/200/230/400-50 | 0,430                                                | 1,13            | 2,957                                                                                        | 10,60                                      | 0,417                                       |
| ECP 28 S            | 115/200/230/400-50 | 0,283                                                | 1,260           | 4,060                                                                                        | 10,60                                      | 0,417                                       |
| ECP 28 1L           | 115/200/230/400-50 | 0,198                                                | 1,396           | 2,250                                                                                        | 10,60                                      | 0,417                                       |
| ECP 28 2L           | 115/200/230/400-50 | 0,128                                                | 1,670           | 2,150                                                                                        | 10,60                                      | 0,417                                       |
| ECP 28 VL           | 115/200/230/400-50 | 0,106                                                | 1,860           | 2,170                                                                                        | 10,60                                      | 0,417                                       |
| ECO 32 2S           | 115/200/230/400-50 | 0,097                                                | 2,010           | 1,098                                                                                        | 10,60                                      | 0,417                                       |
| ECO 32 3S           | 115/200/230/400-50 | 0,078                                                | 2,163           | 0,929                                                                                        | 10,60                                      | 0,417                                       |
| ECO 32 1L           | 115/200/230/400-50 | 0,061                                                | 2,473           | 0,993                                                                                        | 11,35                                      | 0,442                                       |
| ECO 32 2L           | 115/200/230/400-50 | 0,041                                                | 2,861           | 0,909                                                                                        | 11,35                                      | 0,442                                       |
| ECO 32 3L           | 115/200/230/400-50 | 0,035                                                | 3,171           | 0,790                                                                                        | 11,35                                      | 0,442                                       |
| ECP 34 1.5VS        | 115/200/230/400-50 | 0,045                                                | 2,248           | 1,04                                                                                         | 15,28                                      | 0,410                                       |
| ECP 34 1S           | 115/200/230/400-50 | 0,030                                                | 2,477           | 1,43                                                                                         | 15,28                                      | 0,410                                       |
| ECP 34 2S           | 115/200/230/400-50 | 0,020                                                | 2,951           | 1,35                                                                                         | 15,28                                      | 0,410                                       |
| ECP 34 1L           | 115/200/230/400-50 | 0,018                                                | 3,165           | 1,18                                                                                         | 15,28                                      | 0,410                                       |
| ECP 34 2L           | 115/200/230/400-50 | 0,015                                                | 3,577           | 1,05                                                                                         | 15,28                                      | 0,410                                       |
| ECP 34 3L           | 115/200/230/400-50 | 0,015                                                | 4,35            | 0,855                                                                                        | 15,28                                      | 0,410                                       |
| ECO 38 1SN          | 115/200/230/400-50 | 0,0130                                               | 3,905           | 0,854                                                                                        | 15,28                                      | 0,685                                       |
| ECO 38 2SN          | 115/200/230/400-50 | 0,0105                                               | 4,133           | 0,845                                                                                        | 15,28                                      | 0,685                                       |
| ECO 38 3SN          | 115/200/230/400-50 | 0,0085                                               | 4,449           | 0,778                                                                                        | 15,28                                      | 0,685                                       |
| ECO 38 1LN          | 115/200/230/400-50 | 0,0065                                               | 4,887           | 0,796                                                                                        | 15,28                                      | 0,685                                       |
| ECO 38 2LN          | 115/200/230/400-50 | 0,0055                                               | 5,604           | 0,751                                                                                        | 15,28                                      | 0,685                                       |
| ECO 38 3LN          | 115/200/230/400-50 | 0,0042                                               | 6,780           | 0,700                                                                                        | 15,28                                      | 0,685                                       |
| ECO 40 1S           | 115/200/230/400-50 | 0,0048                                               | 4,488           | 0,558                                                                                        | 8,85                                       | 0,317                                       |
| ECO 40 2S           | 115/200/230/400-50 | 0,0074                                               | 4,881           | 0,521                                                                                        | 8,85                                       | 0,317                                       |
| ECO 40 3S           | 230/400/460/800-50 | 0,0106                                               | 5,176           | 0,540                                                                                        | 8,85                                       | 0,317                                       |
| ECO 40 1L           | 115/200/230/400-50 | 0,0055                                               | 6,025           | 0,476                                                                                        | 8,85                                       | 0,317                                       |
| ECO 40 1.5L         | 230/400/460/800-50 | 0,0087                                               | 1,376           | 0,550                                                                                        | 8,85                                       | 0,050                                       |
| ECO 40 2L           | 115/200/230/400-50 | 0,0042                                               | 1,500           | 0,481                                                                                        | 8,85                                       | 0,050                                       |
| ECO 40 VL           | 230/400/460/800-50 | 0,0104                                               | 1,592           | 0,300                                                                                        | 8,85                                       | 0,050                                       |
| ECO 43 1SN          | 230/400/460/800-50 | 0,0109                                               | 2,100           | 0,440                                                                                        | 10,63                                      | 0,130                                       |
| ECO 43 2SN          | 230/400/460/800-50 | 0,0086                                               | 2,300           | 0,413                                                                                        | 10,63                                      | 0,130                                       |
| ECO 43 1LN          | 230/400/460/800-50 | 0,0078                                               | 2,500           | 0,713                                                                                        | 10,63                                      | 0,130                                       |
| ECO 43 2LN          | 230/400/460/800-50 | 0,0058                                               | 2,800           | 0,677                                                                                        | 10,63                                      | 0,130                                       |
| ECO 43 VL           | 230/400/460/800-50 | 0,0046                                               | 2,886           | 0,40                                                                                         | 10,63                                      | 0,130                                       |
| ECO 46 1S           | 230/400/460/800-50 | 0,0057                                               | 3,050           | 0,414                                                                                        | 12,90                                      | 0,120                                       |
| ECO 46 1.5S         | 230/400/460/800-50 | 0,0034                                               | 3,319           | 0,35                                                                                         | 12,90                                      | 0,120                                       |
| ECO 46 2S           | 230/400/460/800-50 | 0,0039                                               | 3,500           | 0,330                                                                                        | 12,90                                      | 0,120                                       |
| ECO 46 1L           | 230/400/460/800-50 | 0,0032                                               | 3,977           | 0,360                                                                                        | 12,90                                      | 0,120                                       |
| ECO 46 1.5L         | 230/400/460/800-50 | 0,0027                                               | 4,27            | 0,40                                                                                         | 12,90                                      | 0,120                                       |
| ECO 46 2L           | 230/400/460/800-50 | 0,0024                                               | 4,500           | 0,390                                                                                        | 12,90                                      | 0,120                                       |

**GENERATORI 2 POLI - 2 POLE GENERATORS - ALTERNATEURS 2 POLES****GENERATOREN 2 POLIG - GENERADORES 2 POLOS**

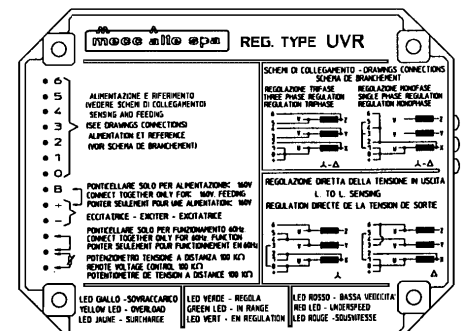
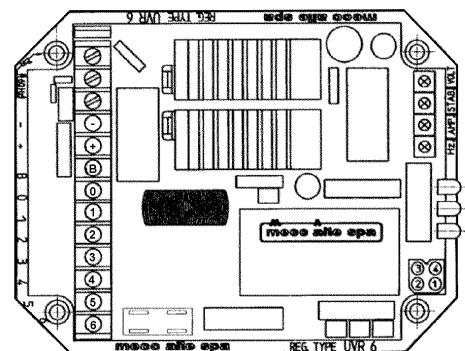
|            |                    |        |       |       |       |       |
|------------|--------------------|--------|-------|-------|-------|-------|
| ECP 28 1L  | 115/200/230/400-50 | 0,1480 | 4,877 | 2,706 | 10,60 | 0,417 |
| ECP 28 2L  | 115/200/230/400-50 | 0,0863 | 5,523 | 1,173 | 10,60 | 0,417 |
| ECP 28 3L  | 115/200/230/400-50 | 0,0860 | 5,848 | 1,087 | 10,60 | 0,417 |
| ECP 28 VL  | 115/200/230/400-50 | 0,056  | 6,500 | 0,690 | 10,60 | 0,417 |
| ECO 31 2SN | 115/200/230/400-50 | 0,110  | 3,650 | 1,553 | 10,60 | 0,417 |
| ECO 31 3SN | 115/200/230/400-50 | 0,046  | 4,071 | 1,403 | 10,60 | 0,417 |
| ECO 31 1LN | 115/200/230/400-50 | 0,043  | 4,301 | 1,358 | 11,35 | 0,475 |
| ECO 31 2LN | 115/200/230/400-50 | 0,034  | 4,680 | 1,141 | 11,35 | 0,475 |

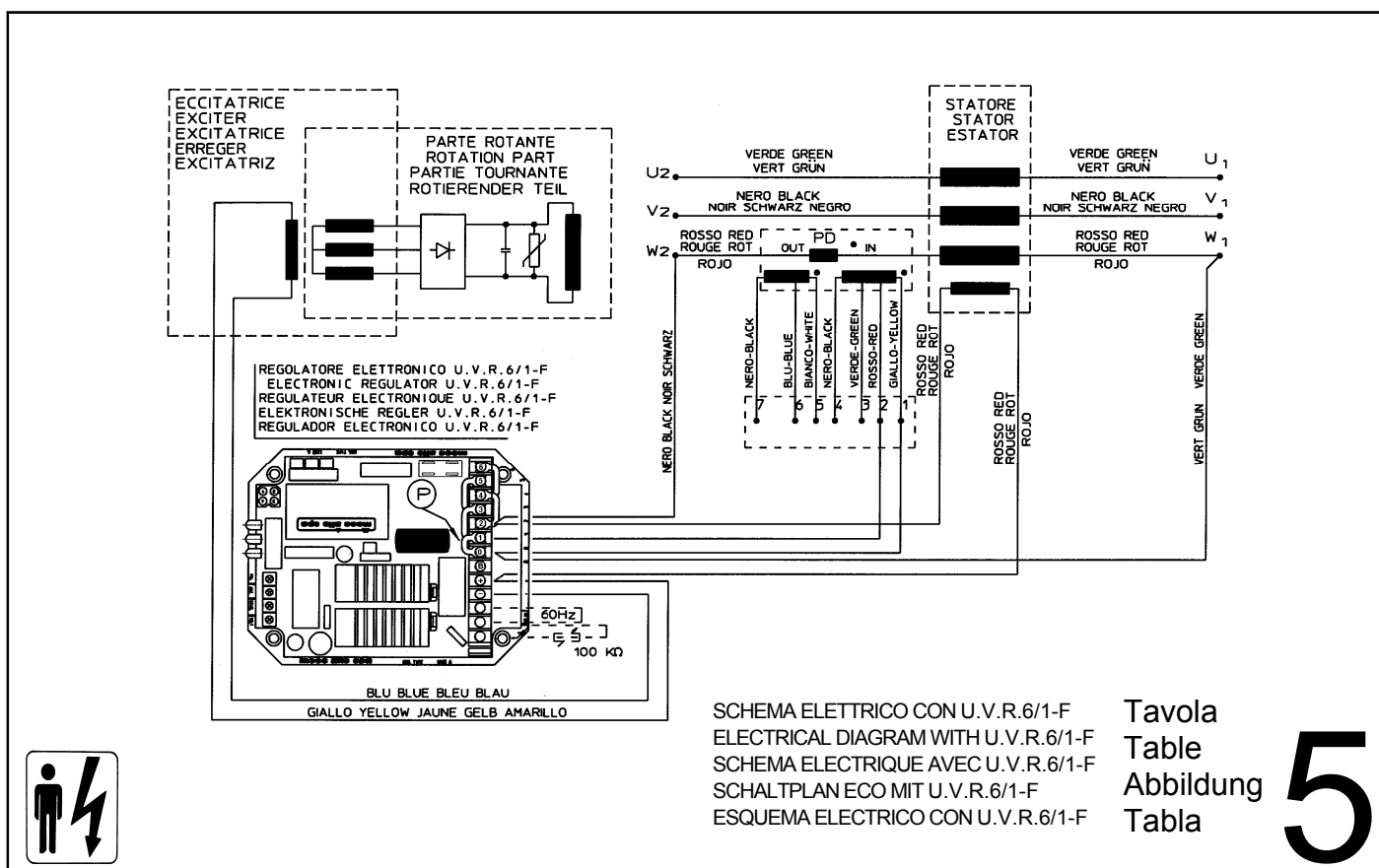
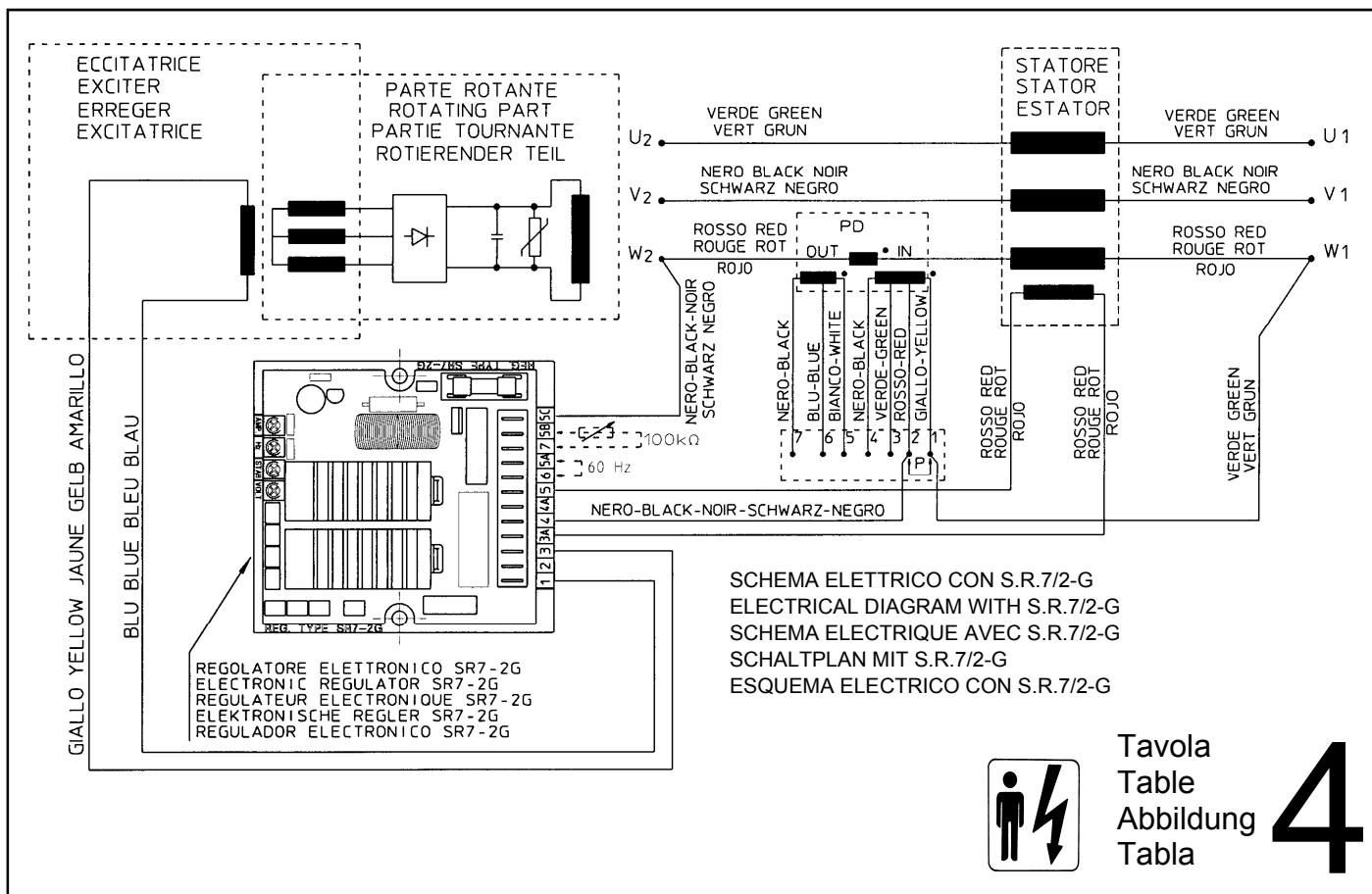


S.R.7/2-G

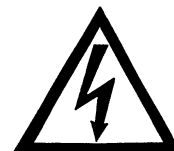


U.V.R.6/1-F

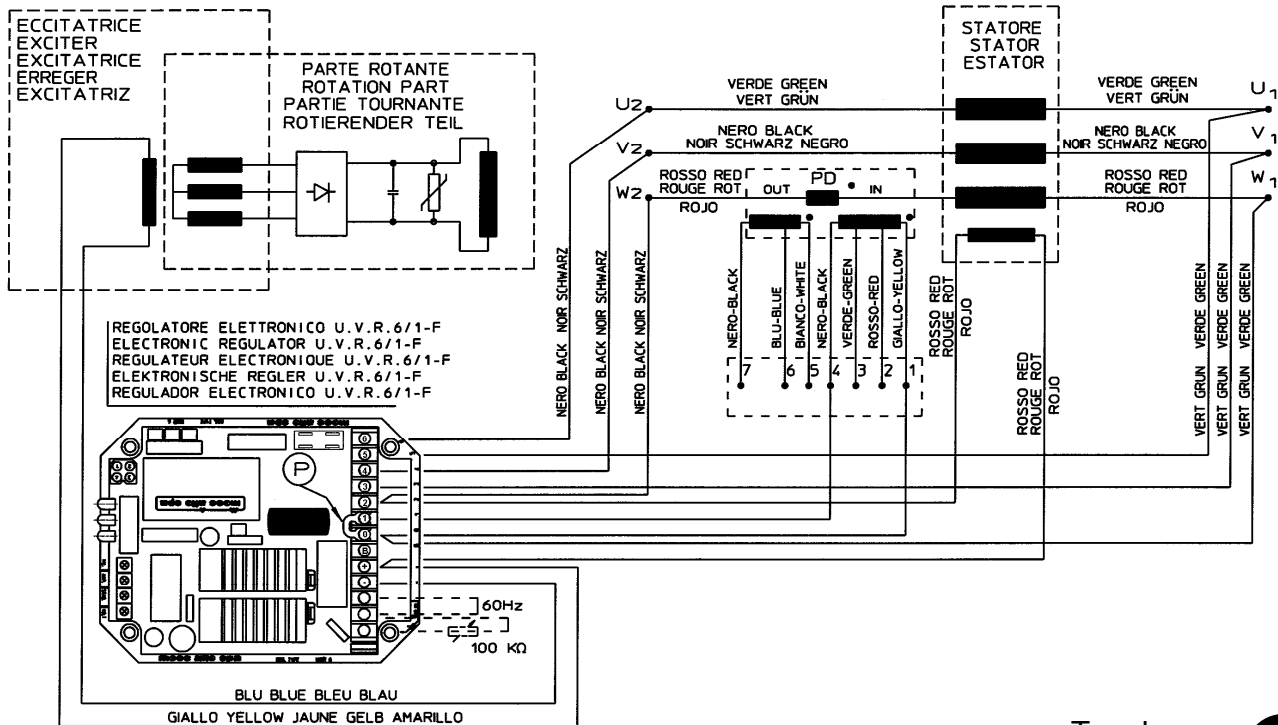




Note : Il dispositivo di parallelo PD è opzionale fino a 350 kVA.  
Il ponticello P abilita o disabilita il dispositivo di parallelo se presente.  
The parallel device PD is optional up to 350 kVA.  
The link P activates or de-activates the parallel device, if it is present.  
Le dispositif de parallele PD est en option jusqu'à 350 kVA.  
Le pont P met ou supprime le circuit du dispositif de parallele.  
Die Parallelvorrichtung PD ist bis zu 350 kVA optional.  
Die Brücke P deaktiviert die Parallelvorrichtung, sofern vorhanden.  
El dispositivo de paralelo PD es opcional hasta 350 kVA.  
El puentecillo P, si esta presente, activa o desactiva el dispositivo de paralelo.



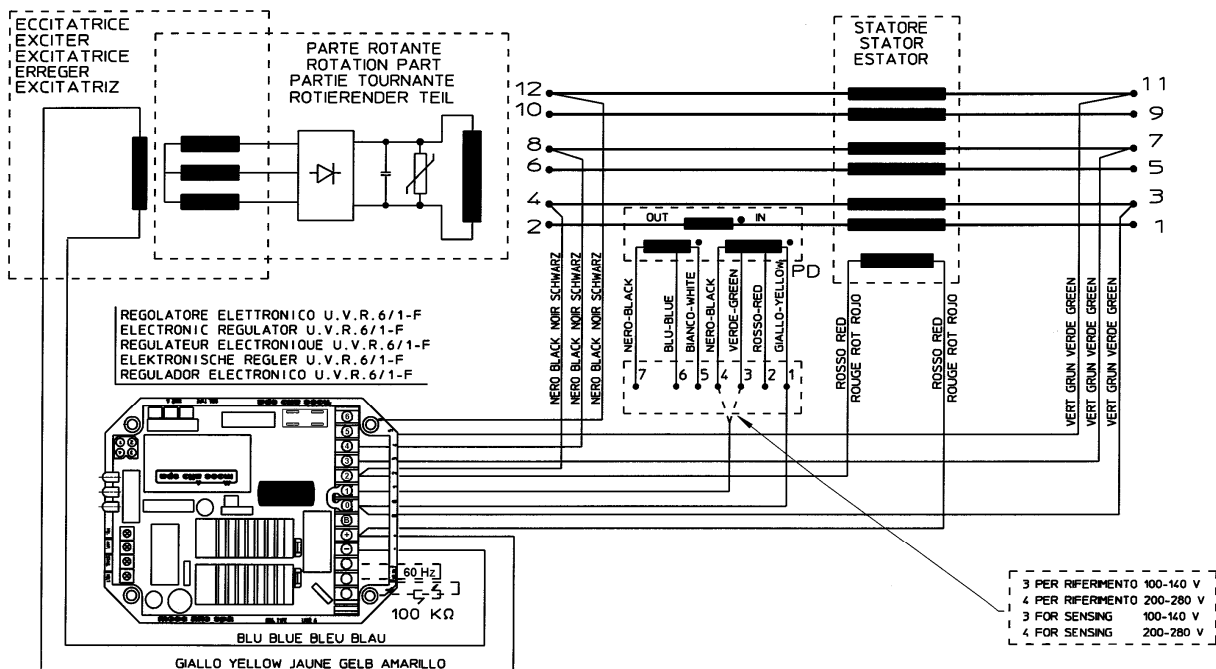




SCHEMA ELETTRICO RIFERIMENTO TRIFASE  
ELECTRICAL DIAGRAM WITH THREEPHASE SENSING  
SCHEMA ELECTRIQUE REFERENCE TRIPHASE  
SCHALTPLAN MIT DREIPHASIGEN ISTWERT  
ESQUEMA ELECTRICO CON REFERENCIA TRIFASICA

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Abbildung  
Tabla

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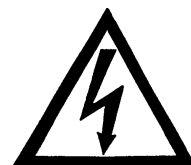


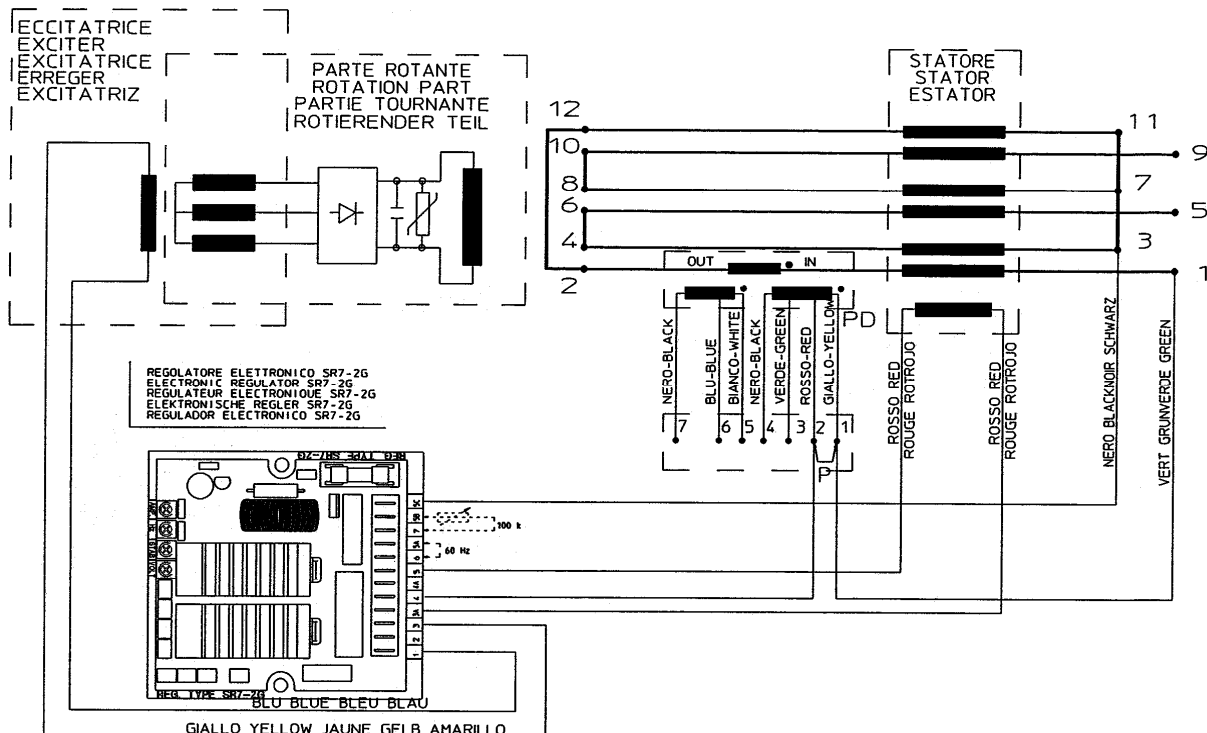
SCHEMA ELETTRICO 12 MORSETTI RIFERIMENTO TRIFASE  
12 WIRES ELECTRICAL DIAGRAM WITH THREEPHASE SENSING  
SCHEMA ELECTRIQUE 12 BORNES REFERENCE TRIPHASE  
SCHALTPLAN MIT 12 KLEMMEN UND DREIPHASIGEN ISTWERT  
ESQUEMA ELECTRICO 12 HILOS CON REFERENCIA TRIFASICA

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Table  
Abbildung  
Tabla

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Note : Il dispositivo di parallelo PD è opzionale fino a 350 kVA.  
Il ponticello P abilita o disabilita il dispositivo di parallelo se presente.  
The parallel device PD is optional up to 350 kVA.  
The link P activates or de-activates the parallel device, if it is present.  
Le dispositif de parallele PD est en option jusqu'à 350 kVA.  
Le pont P met ou supprime le circuit du dispositif de parallele.  
Die Parallelvorrichtung PD ist bis zu 350 kVA optional.  
Die Brücke P deaktiviert die Parallelvorrichtung, sofern vorhanden.  
El dispositivo de paralelo PD es opcional hasta 350 kVA.  
El puentecillo P, si esta presente, activa o desactiva el dispositivo de paralelo.

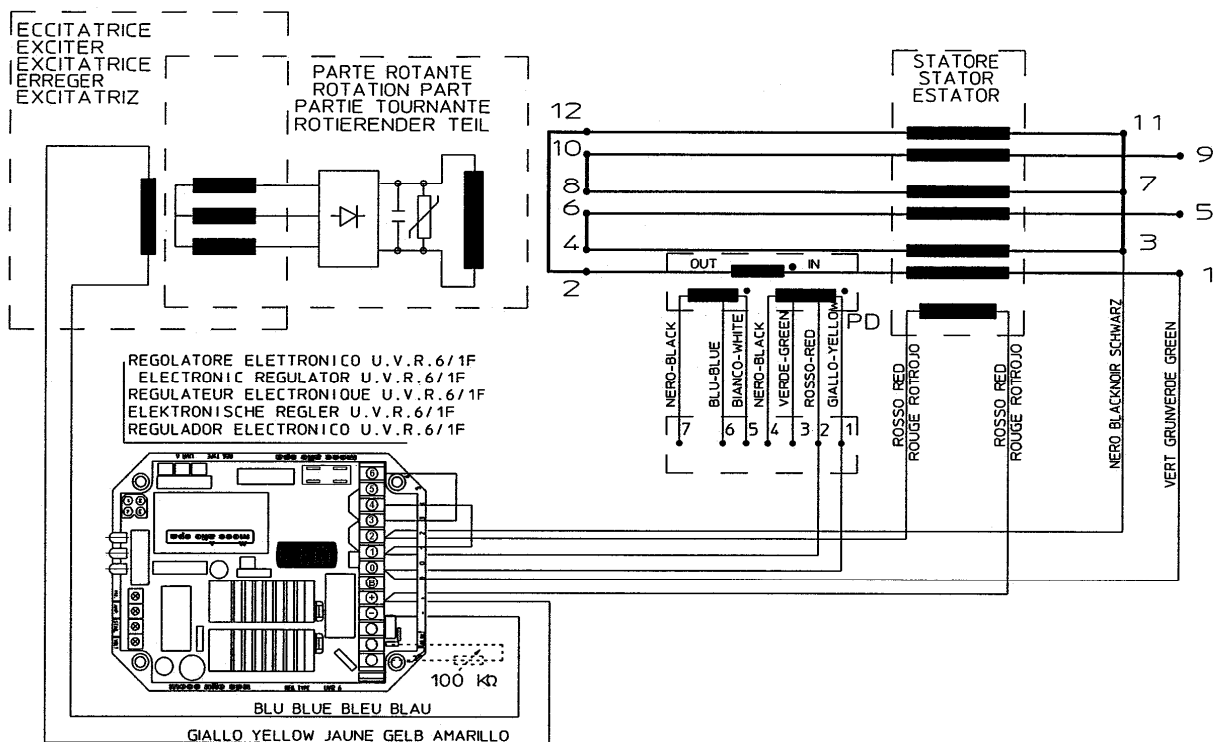




SCHEMA ELETTRICO 12 MORSETTI CON S.R.7/2-G (ZIG-ZAG)  
 12 WIRES ELECTRICAL DIAGRAM WITH S.R.7/2-G (ZIG-ZAG)  
 SCHEMA ELECTRIQUE 12 BORNES AVEC S.R.7/2-G (ZIG-ZAG)  
 SCHALTPLAN MIT 12 KLEMMEN UND S.R.7/2-G (ZIG-ZAG)  
 ESQUEMA ELECTRICO 12 HILOS CON S.R.7/2-G (ZIG-ZAG)

Tavola  
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 Abbildung  
 Tabla

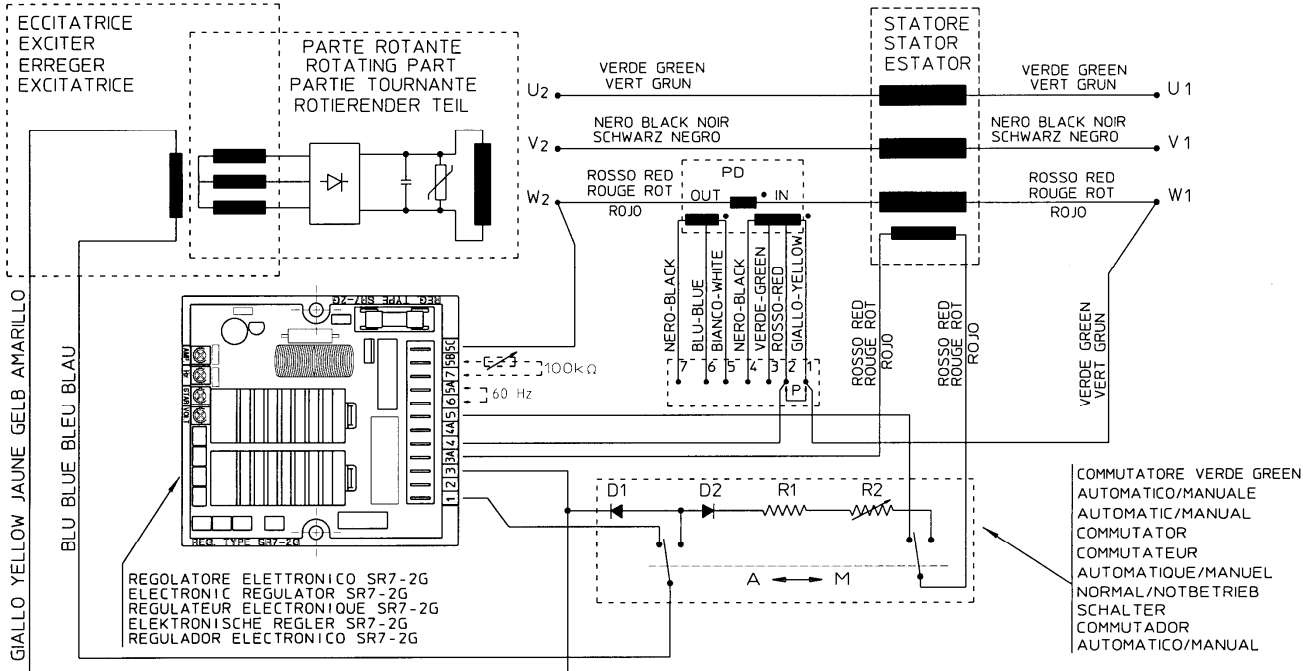
8



SCHEMA ELETTRICO 12 MORSETTI CON U.V.R.6/1-F (ZIG-ZAG)  
 12 WIRES ELECTRICAL DIAGRAM WITH U.V.R.6/1-F (ZIG-ZAG)  
 SCHEMA ELECTRIQUE 12 BORNES AVEC U.V.R.6/1-F (ZIG-ZAG)  
 SCHALTPLAN MIT 12 KLEMMEN UND U.V.R.6/1-F (ZIG-ZAG)  
 ESQUEMA ELECTRICO 12 HILOS CON U.V.R.6/1-F (ZIG-ZAG)

Tavola  
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 Abbildung  
 Tabla

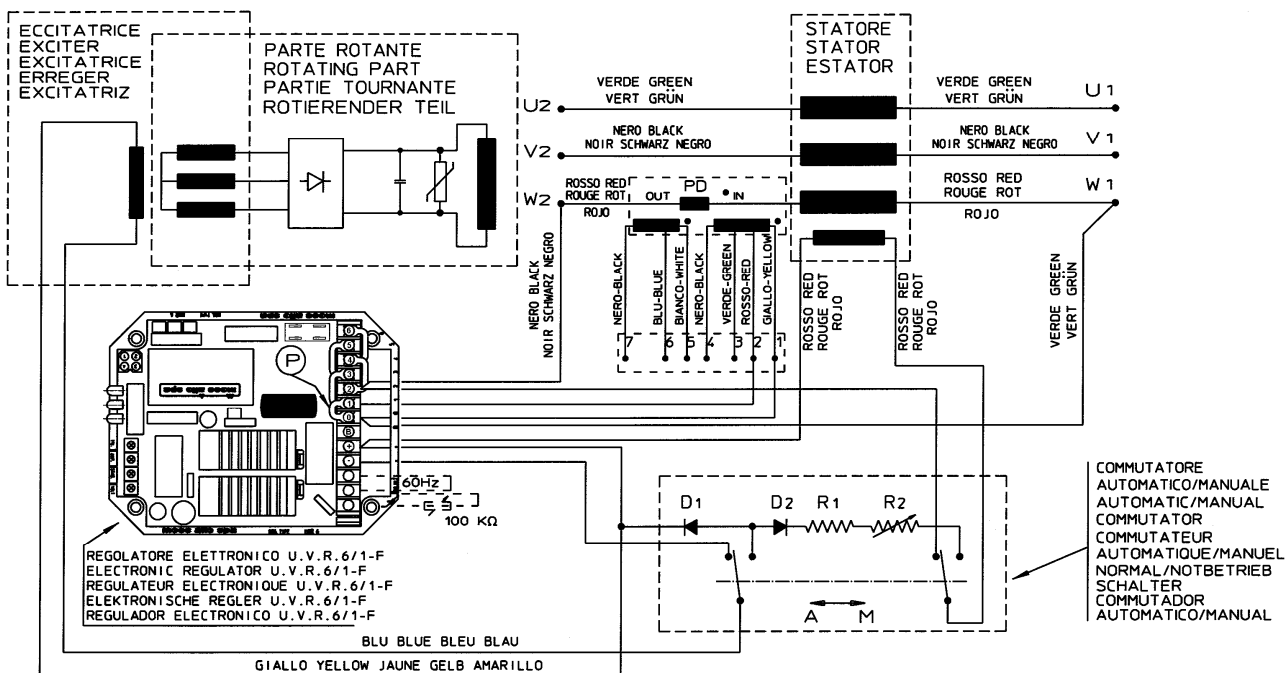
9



COMANDO MANUALE/AUTOMATICO CON REGOLATORE S.R.7/2-G  
AUTOMATIC/MANUAL COMMAND WITH S.R.7/2-G REGULATOR  
COMMANDE MANUELLE/AUTOMATIQUE AVEC REGULATEUR S.R.7/2-G  
UMSCHALTER MANUELL/AUTOMATISCH MIT S.R.7/2-G REGLER  
COMANDO MANUAL/AUTOMATICO CON REGULADOR S.R.7/2-G

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Abbildung  
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COMANDO MANUALE/AUTOMATICO CON REGOLATORE U.V.R.6/1-F  
AUTOMATIC/MANUAL COMMAND WITH U.V.R.6/1-F REGULATOR  
COMMANDE MANUELLE/AUTOMATIQUE AVEC REGULATEUR U.V.R.6/1-F  
UMSCHALTER MANUELL/AUTOMATISCH MIT U.V.R.6/1-F REGLER  
COMANDO MANUAL/AUTOMATICO CON REGULADOR U.V.R.6/1-F

Tavola  
Table  
Abbildung  
Tabla

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Note : Il dispositivo di parallelo PD è opzionale fino a 350 kVA.  
Il ponticello P abilita o disabilita il dispositivo di parallelo se presente.  
The parallel device PD is optional up to 350 kVA.  
The link P activates or de-activates the parallel device, if it is present.  
Le dispositif de parallele PD est en option jusqu'à 350 kVA.  
Le pont P met ou supprime le circuit du dispositif de parallele.  
Die Parallelvorrichtung PD ist bis zu 350 kVA optional.  
Die Brücke P deaktiviert die Parallelvorrichtung, sofern vorhanden.  
El dispositivo de paralelo PD es opcional hasta 350 kVA.  
El puentecillo P, si esta presente, activa o desactiva el dispositivo de paralelo.

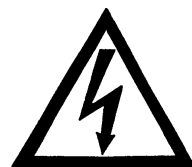
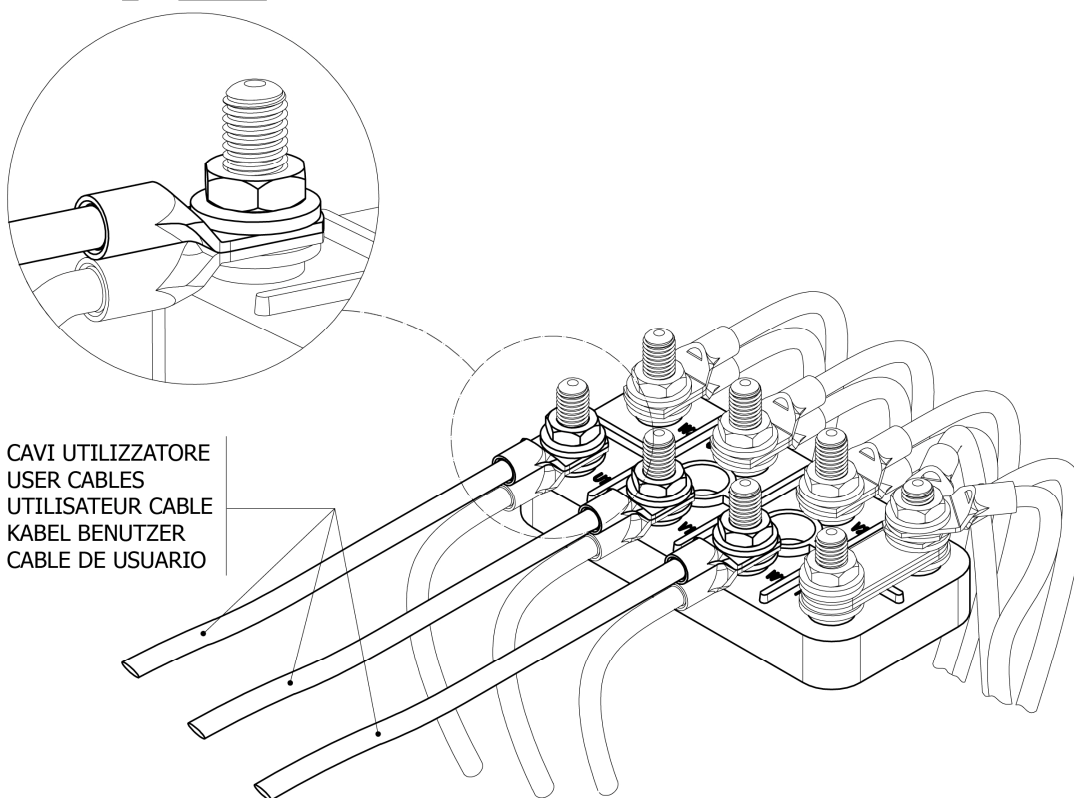


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# 12

COLLEGAMENTO CAVI UTILIZZATORE 28-31-32-34  
USER CABLES CONNECTION 28-31-32-34  
CONNEXION DES CÂBLES PAR L'UTILISATEUR 28-31-32-34  
VERBRAUCHERKABELANSCHLUSS 28-31-32-34  
CONEXIÓN CABLES USUARIO 28-31-32-34

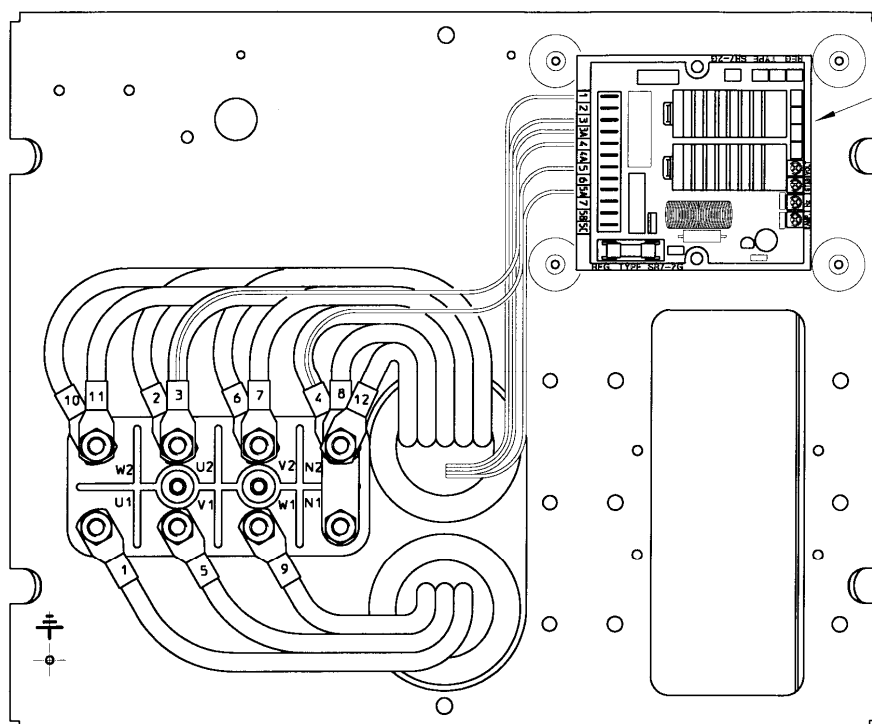


CAVI UTILIZZATORE  
USER CABLES  
UTILISATEUR CABLE  
KABEL BENUTZER  
CABLE DE USUARIO

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# 13

SCATOLA REGOLAZIONE 28-31-32  
TERMINAL BOX 28-31-32  
BOITIER DE REGULATION 28-31-32  
REGLERKASTEN 28-31-32  
CAJA DE REGULACION 28-31-32



REGOLATORE ELETTRONICO SR7-2G  
ELECTRONIC REGULATOR SR7-2G  
REGULATEUR ELECTRONIQUE SR7-2G  
ELEKTRONISCHE REGLER SR7-2G  
REGULADOR ELECTRONICO SR7-2G

Collegamento serie stella / Series star connection / Connection serie étoile / Stern-Reihen-Schaltung / Connexion en serie estrella

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Tabla

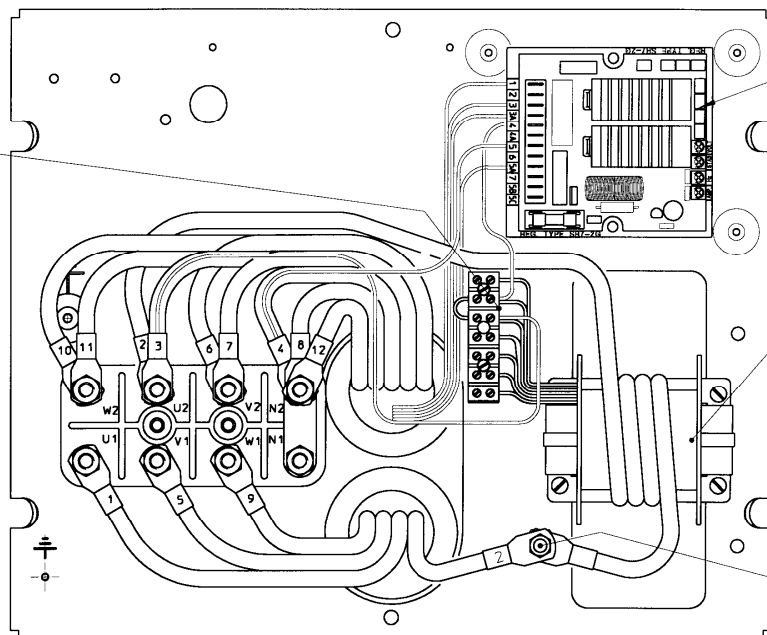
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SCATOLA REGOLAZIONE 28-31-32 CON DISPOSITIVO DI PARALLELO  
TERMINAL BOX 28-31-32 WITH PARALLEL DEVICE  
BOITIER DE REGULATION 28-31-32 AVEC DISPOSITIF DE PARALLELE  
REGLERKASTEN 28-31-32 MIT EINRICHTUNG FUR PARALLEL BETRIEB  
CAJA DE REGULACION 28-31-32 CON DISPOSITIVO DE PARALELO



RIMUOVERE IL PONTICELLO  
PER ABILITARE IL

DISPOSITIVO DI PARALLELO  
REMOVE THE LINK BRIDGE TO  
OPERATE THE PARALLEL DEVICE  
ENLEVER LE PETIT PONT POUR  
LE FONCTIONNEMENT DU  
DISPOSITIF DE PARALLELE  
BRUKE BEI PARALLEL BETRIEB  
ENTFERNT  
DESMONTAR EL PUENTICILLO  
PARA HABILITAR EL DISPOSITIVO  
DE PARALELO



REGOLATORE ELETTRONICO SR7-2G  
ELECTRONIC REGULATOR SR7-2G  
REGULATEUR ELECTRONIQUE SR7-2G  
ELEKTRONISCHE REGLER SR7-2G  
REGULADOR ELECTRONICO SR7-2G

DISPOSITIVO DI PARALLELO  
PARALLEL DEVICE  
DISPOSITIF DE PARALLELE  
STATIKWANDLER  
DISPOSITIVO DE PARALELO

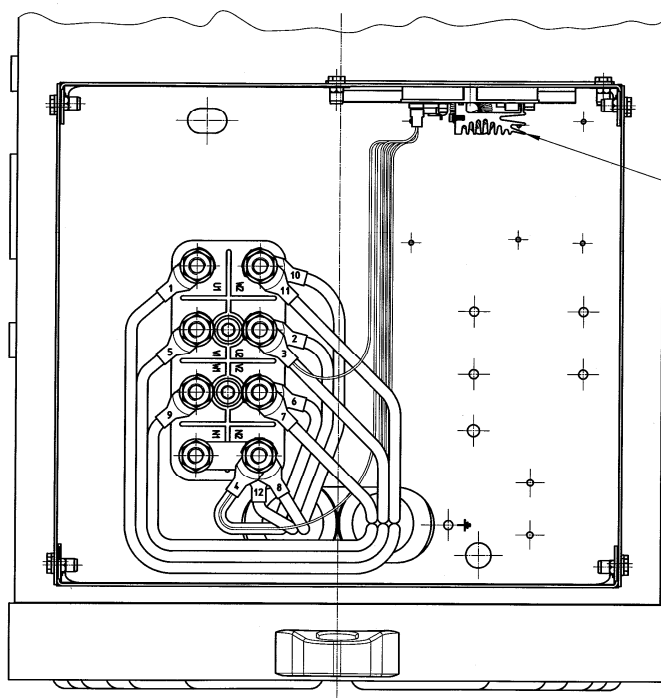
ISOLATORE  
INSULATOR  
ISOLATEUR  
ISOLATOR  
AISLADOR

Collegamento serie stella / Series star connection / Connection serie etoile / Stern-Reihen-Schaltung / Connexion en serie estrella

Tavola  
Table  
Abbildung  
Tabla

15

SCATOLA REGOLAZIONE 34  
TERMINAL BOX 34  
BOITIER DE REGULATION 34  
REGLERKASTEN 34  
CAJA DE REGULACION 34



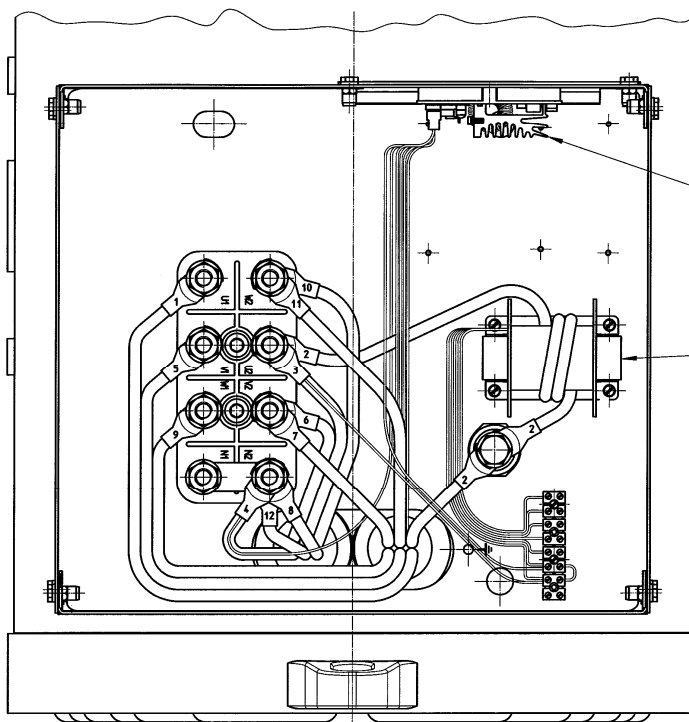
REGOLATORE ELETTRONICO SR7-2G  
ELECTRONIC REGULATOR SR7-2G  
REGULATEUR ELECTRONIQUE SR7-2G  
ELEKTRONISCHE REGLER SR7-2G  
REGULADOR ELECTRONICO SR7-2G

Collegamento serie stella / Series star connection / Connection serie etoile / Stern-Reihen-Schaltung / Connexion en serie estrella

Tavola  
Table  
Abbildung  
Tabla

# 16

SCATOLA REGOLAZIONE 34 CON DISPOSITIVO DI PARALLELO  
TERMINAL BOX 34 WITH PARALLEL DEVICE  
BOITIER DE REGULATION 34 AVEC DISPOSITIF DE PARALLELE  
REGLERKASTEN 34 MIT EINRICHTUNG FUR PARALLEL BETRIEB  
CAJA DE REGULACION 34 CON DISPOSITIVO DE PARALELO



REGOLATORE ELETTRONICO SR7-2G  
ELECTRONIC REGULATOR SR7-2G  
REGULATEUR ELECTRONIQUE SR7-2G  
ELEKTRONISCHE REGLER SR7-2G  
REGULADOR ELECTRONICO SR7-2G

DISPOSITIVO DI PARALLELO  
PARALLEL DEVICE  
DISPOSITIF DE PARALLELE  
STATIKWANDLER  
DISPOSITIVO DE PARALELO

Collegamento serie stella / Series star connection / Connection serie etoile / Stern-Reihen-Schaltung / Connexion en serie estrella

Tavola  
Table  
Abbildung  
Tabla

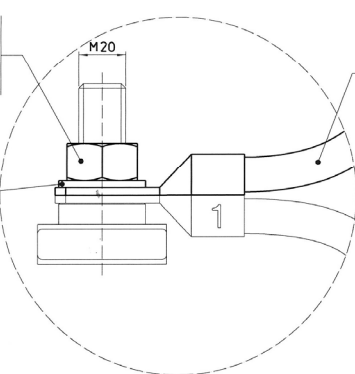
# 17

COLLEGAMENTO CAVI UTILIZZATORE 38-40  
USER CABLES CONNECTION 38-40  
CONNEXION DES CÂBLES PAR L'UTILISATEUR 38-40  
VERBRAUCHERKABELANSCHLUSS 38-40  
CONEXIÓN CABLES USUARIO 38-40



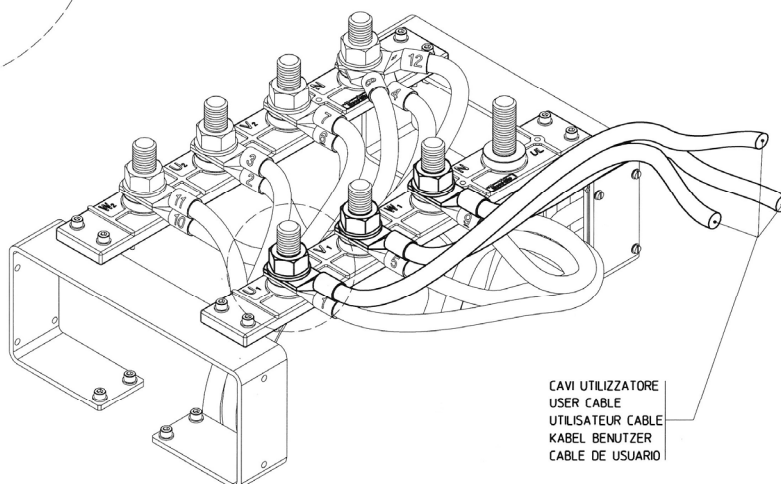
DADO ESAGONALE  
HEXAGON NUT  
ECROU HEXAGONAL  
NUSSE HEXAGONAL  
TUERCA HEXAGONAL

RONDELLA PIANA  
PLAIN WASHER  
RONDELLE  
UNTERLEGSCHIBE  
ARANDELA SENCILLA



CAVO UTILIZZATORE  
USER CABLE  
UTILISATEUR CABLE  
KABEL BENUTZER  
CABLE DE USUARIO

COLLEGAMENTO SERIE STELLA  
SERIES STAR CONNECTION  
CONNECTION SERIE ETOILE  
STERN-REIHEN-SCHALTUNG  
CONNEXION EN SERIE ESTRELLA

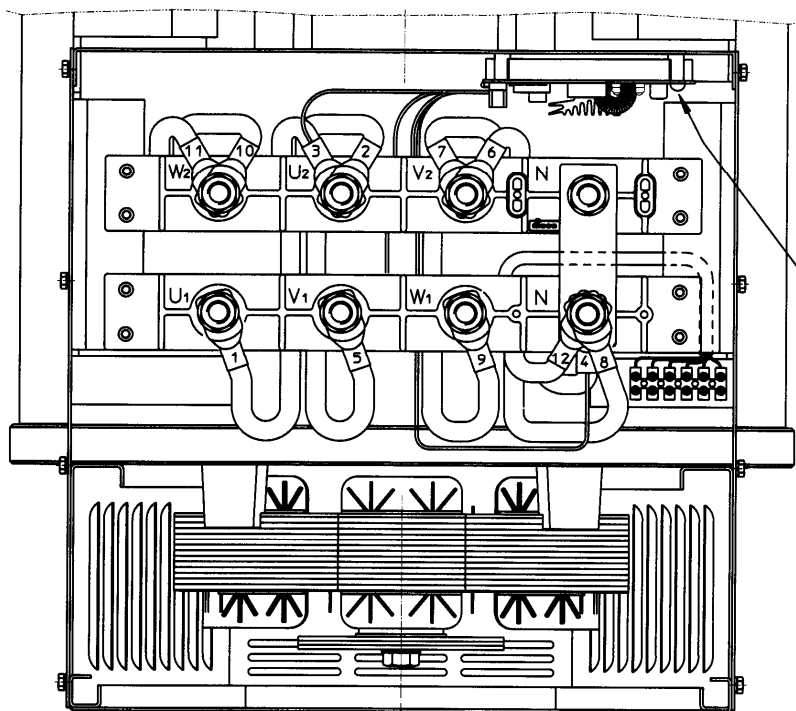


CAVO UTILIZZATORE  
USER CABLE  
UTILISATEUR CABLE  
KABEL BENUTZER  
CABLE DE USUARIO

Tavola  
Table  
Abbildung  
Tabla

# 18

SCATOLA REGOLAZIONE 38  
TERMINAL BOX 38  
BOITIER DE REGULATION 38  
REGLERKASTEN 38  
CAJA DE REGULACION 38



REGOLATORE ELETTRONICO U.V.R.6/1-F  
ELECTRONIC REGULATOR U.V.R.6/1-F  
REGULATEUR ELECTRONIQUE U.V.R.6/1-F  
ELEKTRONISCHER REGLER U.V.R.6/1-F  
REGULADOR ELECTRONICO U.V.R.6/1-F

Collegamento serie stella / Series star connection / Connection serie etoile / Stern-Reihen-Schaltung / Connexion en serie estrella

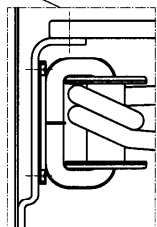
Tavola  
Table  
Abbildung  
Tabla

# 19

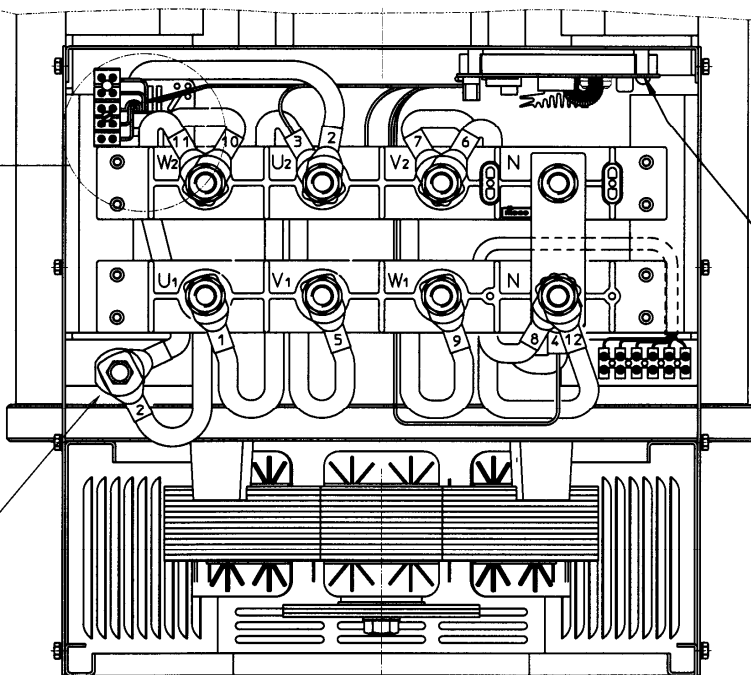
SCATOLA REGOLAZIONE 38 CON DISPOSITIVO DI PARALLELO  
TERMINAL BOX 38 WITH PARALLEL DEVICE  
BOITIER DE REGULATION 38 AVEC DISPOSITIF DE PARALLELE  
REGLERKASTEN 38 MIT EINRICHTUNG FUR PARALLEL BETRIEB  
CAJA DE REGULACION 38 CON DISPOSITIVO DE PARALELO



DISPOSITIVO DI  
PARALLELO  
PARALLEL DEVICE  
DISPOSITIF DE  
PARALLELE  
STATIKWANDLER  
DISPOSITIVO DE  
PARALELO

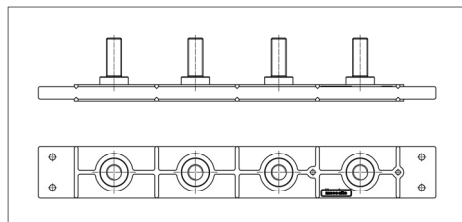
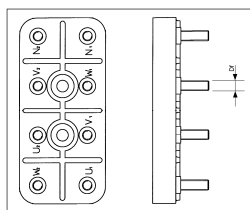


ISOLATORE  
INSULATOR  
ISOLATEUR  
ISOLATOR  
AISLADOR



REGOLATORE ELETTRONICO U.V.R.6/1-F  
ELECTRONIC REGULATOR U.V.R.6/1-F  
REGULATEUR ELECTRONIQUE U.V.R.6/1-F  
ELEKTRONISCHER REGLER U.V.R.6/1-F  
REGULADOR ELECTRONICO U.V.R.6/1-F

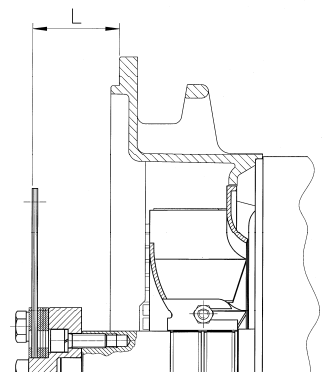
Collegamento serie stella / Series star connection / Connection serie etoile / Stern-Reihen-Schaltung / Connexion en serie estrella



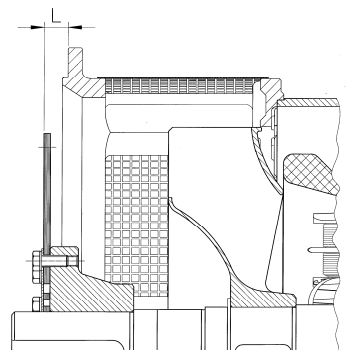
| DIAMETRO DI FILETTATURA Df<br>THREAD DIAMETER Df<br>DIAMETRE DE FILETAGE Df<br>GEWINDE DURCHMESSER Df<br>DIAMETRO DE FILETEADO Df | TIPO<br>TYPE<br>TYP | COPPIA DI SERRAGGIO (Nm)<br>TIGHTENING TORQUE (Nm)<br>COUPLE DE SERRAGE (Nm)<br>ANZUGSMOMENT (Nm)<br>PAR DE TORQUE (Nm) |
|-----------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------|
| M6                                                                                                                                | ECP 28              | 8 ± 7%                                                                                                                  |
| M8                                                                                                                                | ECO 32              | 18 ± 7%                                                                                                                 |
| M10 (Steel)                                                                                                                       | ECO43-ECO46         | 30 ± 7%                                                                                                                 |
| M12                                                                                                                               | ECP34               | 42 ± 7%                                                                                                                 |
| M14                                                                                                                               | ECO32-34 special    | 54 ± 7%                                                                                                                 |
| M16                                                                                                                               | ECO38               | 80 ± 7%                                                                                                                 |
| M20                                                                                                                               | ECO40               | 100 ± 7%                                                                                                                |

TABELLA COPPIE DI SERRAGGIO PER DISCHI  
COUPLING DISCS TIGHTENING TORQUE TABLE  
TABLEAU DE COUPLE DE SERRAGE POUR DISQUES  
KUPPLUNG AUZUGSMOMENT TABELLE  
TABLA PAR DE TORQUE POR DISCOS

## TIPO / TYPE / TYP 28 - 31 - 32

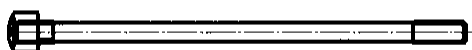


## TIPO / TYPE / TYP 34 - 38 - 40 - 43 - 46



| TIPO<br>TYPE<br>TYP | SAE  | L    | DIMENSIONE VITI<br>SCREWS DIMENSIONS<br>DIMENSIOIS VIS<br>SCHRAUBENBMESSUNGEN<br>DIMENSIONES TORNILLOS |             | COPPIA DI SERRAGGIO (Nm)<br>TIGHTENING TORQUE (Nm)<br>COUPLE DE SERRAGE (Nm)<br>ANZUGSMOMENT (Nm)<br>PAR DE TORQUE (Nm) |          |
|---------------------|------|------|--------------------------------------------------------------------------------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------|----------|
|                     |      |      | TE                                                                                                     | TCCEI       | CL. 8.8                                                                                                                 | CL. 12.9 |
| ECP28               | 6 ½  | 30,2 | M10x30-8.8                                                                                             | /           | 48                                                                                                                      | /        |
|                     | 7 ½  | 30,2 | M10x30-8.8                                                                                             | /           | 48                                                                                                                      | /        |
|                     | 8    | 62   | M12x30-8.8                                                                                             | M10x30-8.8  | 80-48                                                                                                                   | /        |
|                     | 10   | 53,8 | M12x30-8.8                                                                                             | M10x30-8.8  | 80-48                                                                                                                   | /        |
|                     | 11 ½ | 39,6 | M10x40-8.8                                                                                             | /           | 48                                                                                                                      | /        |
| ECO31-32            | 6 ½  | 30,2 | /                                                                                                      | M12x40-12.9 | /                                                                                                                       | 140      |
|                     | 7 ½  | 30,2 | /                                                                                                      | M12x40-12.9 | /                                                                                                                       | 140      |
|                     | 8    | 62   | M12x30-8.8                                                                                             | M12x40-12.9 | 80                                                                                                                      | 140      |
|                     | 10   | 53,8 | M12x30-8.8                                                                                             | M12x40-12.9 | 80                                                                                                                      | 140      |
|                     | 11 ½ | 39,6 | /                                                                                                      | M12x40-12.9 | /                                                                                                                       | 140      |
| ECP34               | 10   | 53,8 | M10x30-8.8                                                                                             | M10x40-8.8  | 48                                                                                                                      | /        |
|                     | 11 ½ | 39,6 | M10x45-8.8                                                                                             | /           | 48                                                                                                                      | /        |
|                     | 14   | 25,4 | M10x30-8.8                                                                                             | /           | 48                                                                                                                      | /        |
| ECO38-N             | 11 ½ | 39,6 | M12x45-8.8                                                                                             | /           | 80                                                                                                                      | /        |
|                     | 14   | 25,4 | M12x30-8.8                                                                                             | /           | 80                                                                                                                      | /        |
| ECO40               | 14   | 25,4 | M16x45-8.8                                                                                             | /           | 200                                                                                                                     | /        |
|                     | 18   | 15,7 | M16x40-8.8                                                                                             | /           | 200                                                                                                                     | /        |
| ECO43-N             | 14   | 25,4 | M16x55-8.8                                                                                             | /           | 200                                                                                                                     | /        |
|                     | 18   | 15,7 | M16x40-8.8                                                                                             | /           | 200                                                                                                                     | /        |
|                     | 21   | 0    | M16x40-8.8                                                                                             | /           | 200                                                                                                                     | /        |
| ECO46               | 18   | 15,7 | M16x40-8.8                                                                                             | /           | 200                                                                                                                     | /        |
|                     | 21   | 0    | M16x40-8.8                                                                                             | /           | 200                                                                                                                     | /        |

TABELLA COPPIE DI SERRAGGIO PER TIRANTI  
STAY BOLT TIGHTENING TORQUE TABLE  
TABLEAU DE COUPLE DE SERRAGE POUR TIGE  
TABELLE FUR DAS ANZUGSMOMENT VON ZUGSTANGEN  
TABLA PAR DE TORQUE POR TIRANTE



| DIAMETRO DI FILETTATURA Df<br>THREAD DIAMETER Df<br>DIAMETRE DE FILETAGE Df<br>GEWINDE DURCHMESSER Df<br>DIAMETRO DE FILETEADO Df | TIPO<br>TYPE<br>TYP | COPPIA DI SERRAGGIO (Nm)<br>TIGHTENING TORQUE (Nm)<br>COUPLE DE SERRAGE (Nm)<br>ANZUGSMOMENT (Nm)<br>PAR DE TORQUE (Nm) |
|-----------------------------------------------------------------------------------------------------------------------------------|---------------------|-------------------------------------------------------------------------------------------------------------------------|
| M8                                                                                                                                | ECP 28              | 17 ± 7%                                                                                                                 |
| M10                                                                                                                               | ECO 32              | 48 ± 7%                                                                                                                 |
| M14                                                                                                                               | ECP34               | 120 ± 7%                                                                                                                |
| M12                                                                                                                               | ECO38               | 80 ± 7%                                                                                                                 |
| M16                                                                                                                               | ECO40               | 180 ± 7%                                                                                                                |
| M14                                                                                                                               | ECO43-46            | 120 ± 7%                                                                                                                |

**GENERATORI A 4 POLI - 4 POLE GENERATORS  
ALTERNATEURS 4 POLES  
GENERATOREN 4 POLIG - GENERADORES 4 POLOS**

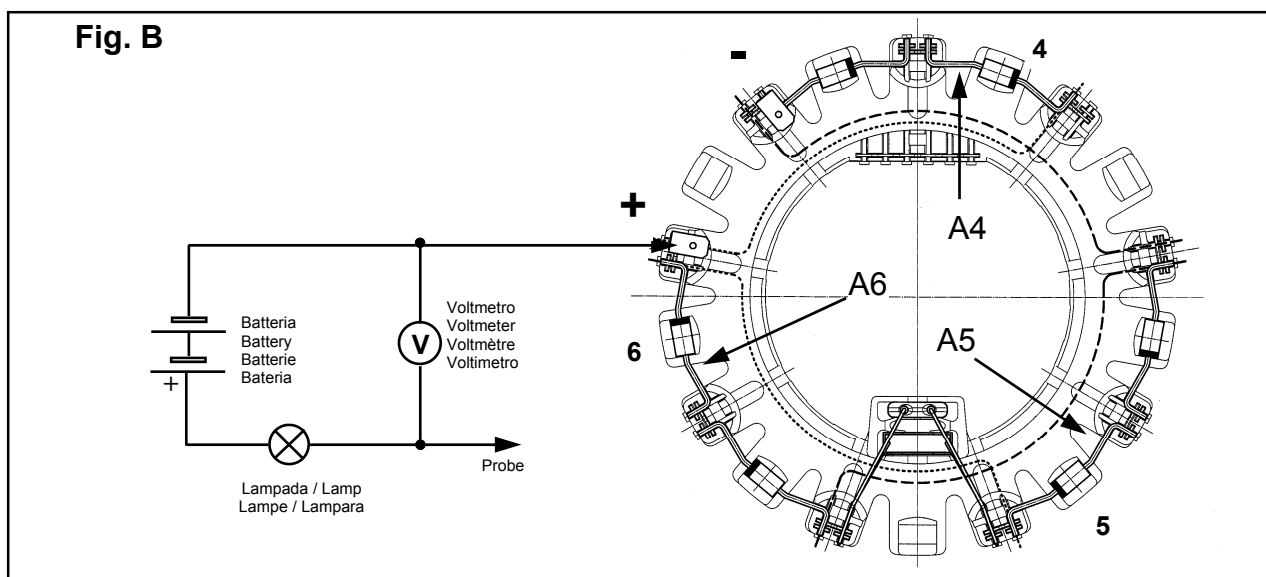
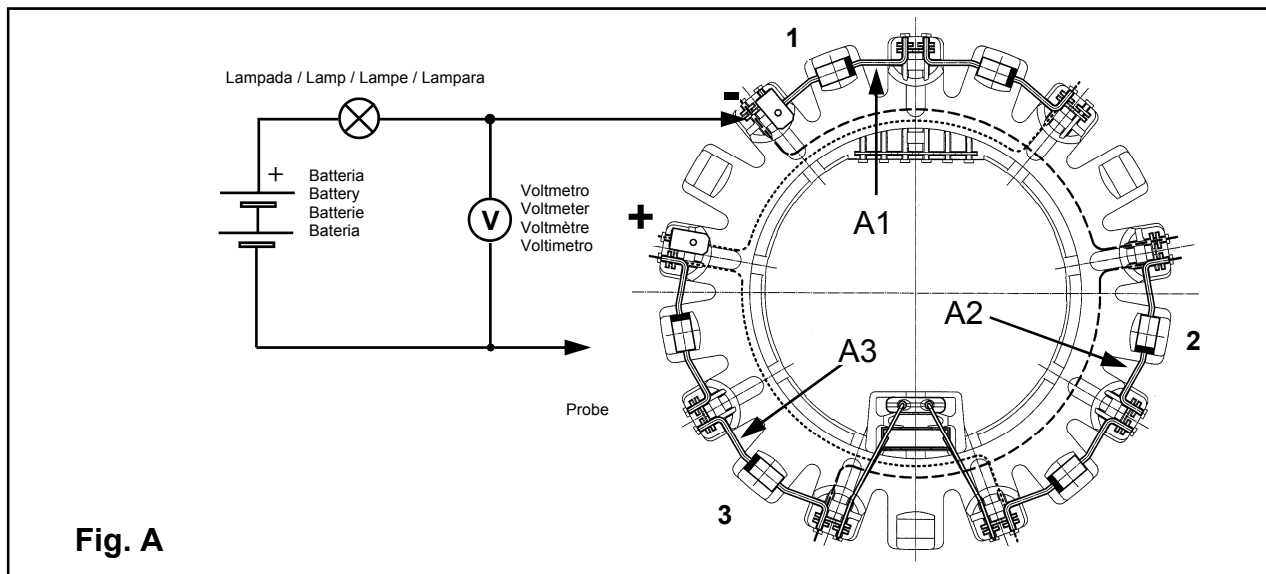
| TIPO<br>TYPE<br>TYP | Volume d'aria<br>Air flow<br>Volume d'air<br>Luftmenge<br>Volumen de aire |       | Rumore<br>Noise<br>Bruit<br>Gerausch<br>Ruido<br>dB(A) |    |       |    | Peso<br>Weight<br>Poids<br>Gewicht<br>Peso |
|---------------------|---------------------------------------------------------------------------|-------|--------------------------------------------------------|----|-------|----|--------------------------------------------|
|                     | m³/min                                                                    |       | 50 Hz                                                  |    | 60 Hz |    |                                            |
|                     | 50 Hz                                                                     | 60 Hz | 1m                                                     | 7m | 1m    | 7m |                                            |
| ECP 28 1VS          | 5,3                                                                       | 5,8   | 68                                                     | 57 | 71    | 61 | 82                                         |
| ECP 28 2VS          |                                                                           |       |                                                        |    |       |    | 89                                         |
| ECP 28 0S           |                                                                           |       |                                                        |    |       |    | 99                                         |
| ECP 28 S            |                                                                           |       |                                                        |    |       |    | 107                                        |
| ECP 28 1L           |                                                                           |       |                                                        |    |       |    | 122                                        |
| ECP 28 2L           |                                                                           |       |                                                        |    |       |    | 139                                        |
| ECP 28VL            |                                                                           |       |                                                        |    |       |    | 165                                        |
| ECO 32 2S           | 11,8                                                                      | 14,5  | 75                                                     | 60 | 79    | 64 | 199                                        |
| ECO 32 3S           |                                                                           |       |                                                        |    |       |    | 214                                        |
| ECO 32 1L           |                                                                           |       |                                                        |    |       |    | 248                                        |
| ECO 32 2L           |                                                                           |       |                                                        |    |       |    | 282                                        |
| ECO 32 3L           |                                                                           |       |                                                        |    |       |    | 298                                        |
| ECP 34 1.5VS        | 19,3                                                                      | 23    | 79                                                     | 65 | 83    | 69 | 310                                        |
| ECP 34 1S           |                                                                           |       |                                                        |    |       |    | 341                                        |
| ECP 34 2S           |                                                                           |       |                                                        |    |       |    | 419                                        |
| ECP 34 1L           |                                                                           |       |                                                        |    |       |    | 445                                        |
| ECP 34 2L           |                                                                           |       |                                                        |    |       |    | 491                                        |
| ECP 34 3L           |                                                                           |       |                                                        |    |       |    | 495                                        |
| ECO 38 1SN          | 32                                                                        | 39    | 82                                                     | 69 | 86    | 73 | 510                                        |
| ECO 38 2SN          |                                                                           |       |                                                        |    |       |    | 560                                        |
| ECO 38 3SN          |                                                                           |       |                                                        |    |       |    | 590                                        |
| ECO 38 1LN          |                                                                           |       |                                                        |    |       |    | 680                                        |
| ECO 38 2LN          |                                                                           |       |                                                        |    |       |    | 765                                        |
| ECO 38 3LN          |                                                                           |       |                                                        |    |       |    | 905                                        |
| ECO 40 1S           | 54                                                                        | 64,8  | 94                                                     | 82 | 98    | 88 | 1040                                       |
| ECO 40 2S           |                                                                           |       |                                                        |    |       |    | 1118                                       |
| ECO 40 3S           |                                                                           |       |                                                        |    |       |    | 1171                                       |
| ECO 40 1L           |                                                                           |       |                                                        |    |       |    | 1324                                       |
| ECO 40 1.5L         |                                                                           |       |                                                        |    |       |    | 1380                                       |
| ECO 40 2L           |                                                                           |       |                                                        |    |       |    | 1586                                       |
| ECO 40 VL           |                                                                           |       |                                                        |    |       |    | 1693                                       |
| ECO 43 1SN          | 90                                                                        | 108   | 95                                                     | 84 | 99    | 89 | 1870                                       |
| ECO 43 2SN          |                                                                           |       |                                                        |    |       |    | 2090                                       |
| ECO 43 1LN          |                                                                           |       |                                                        |    |       |    | 2395                                       |
| ECO 43 2LN          |                                                                           |       |                                                        |    |       |    | 2660                                       |
| ECO 43 VL           |                                                                           |       |                                                        |    |       |    | 2950                                       |
| ECO 46 1S           | 135                                                                       | 162   | 97                                                     | 86 | 100   | 91 | 2770                                       |
| ECO 46 1.5S         |                                                                           |       |                                                        |    |       |    | 3380                                       |
| ECO 46 2S           |                                                                           |       |                                                        |    |       |    | 3440                                       |
| ECO 46 1L           |                                                                           |       |                                                        |    |       |    | 3720                                       |
| ECO 46 1.5L         |                                                                           |       |                                                        |    |       |    | 4260                                       |
| ECO 46 2L           |                                                                           |       |                                                        |    |       |    | 4250                                       |

**GENERATORI A 2 POLI - 2 POLE GENERATORS  
ALTERNATEURS 2 POLES  
GENERATOREN 2 POLIG - GENERADORES 2 POLOS**

| TIPO<br>TYPE<br>TYP | Volume d'aria<br>Air flow<br>Volume d'air<br>Luftmenge<br>Volumen de aire |       | Rumore<br>Noise<br>Bruit<br>Gerausch<br>Ruido<br>dB(A) |    |       |    | Peso<br>Weight<br>Poids<br>Gewicht<br>Peso |
|---------------------|---------------------------------------------------------------------------|-------|--------------------------------------------------------|----|-------|----|--------------------------------------------|
|                     | m³/min                                                                    |       | 50 Hz                                                  |    | 60 Hz |    |                                            |
|                     | 50 Hz                                                                     | 60 Hz | 1m                                                     | 7m | 1m    | 7m |                                            |
|                     | Kg                                                                        |       |                                                        |    |       |    |                                            |
| ECP 28 1L           | 9,7                                                                       | 11    | 86                                                     | 74 | 90,5  | 78 | 129                                        |
| ECP 28 2L           |                                                                           |       |                                                        |    |       |    | 136                                        |
| ECP 28 3L           |                                                                           |       |                                                        |    |       |    | 141                                        |
| ECP 28 VL           |                                                                           |       |                                                        |    |       |    | 156                                        |
| ECO 31 2SN          | 22,4                                                                      | 27    | 88                                                     | 77 | 93    | 80 | 178                                        |
| ECO 31 3SN          |                                                                           |       |                                                        |    |       |    | 204                                        |
| ECO 31 1LN          |                                                                           |       |                                                        |    |       |    | 217                                        |
| ECO 31 2LN          |                                                                           |       |                                                        |    |       |    | 236                                        |



ALTERNATORE TIPO / ALTERNATOR TYPE / ALTERNATEUR TYPE / GENERATOR TYP / ALTERNADOR TIPO : 28-31-32

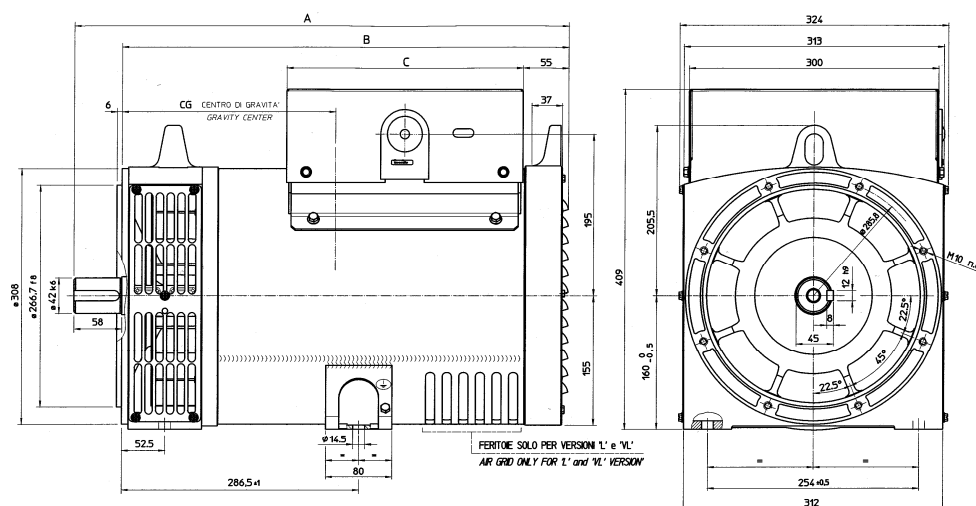


| 2 and 4 pole<br><br>ALTERNATORE TIPO<br>ALTERNATOR TYPE<br>ALTERNATEUR TYPE<br>GENERATOR TYP<br>ALTERNADOR TIPO | TENSIONE MISURATA / VOLTAGE MEASURED<br>TENSION MESUREE / GEMESSENE SPANNUNG<br>TENSION MEDIDA<br>(fig. A-B) |                                                                                                     |                                                                             |                                                                       |
|-----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|-----------------------------------------------------------------------|
|                                                                                                                 | Diodo buono<br>Good diode<br>Diode bonne<br>Diode gut<br>Diodo bueno                                         | Diodo in corto<br>Diode in short<br>diode en court-circuit<br>Diode in Kurzschlss<br>Diodo en corto | Diodo aperto<br>Diode open<br>diode ouverte<br>Diode offen<br>Diodo abierto |                                                                       |
| ECP28, ECO31-2SN, ECO31-3SN, ECO32-2S, ECO32-3S                                                                 | da 0,8V<br>from de<br>von de                                                                                 | a 1,2V<br>to à<br>bis a                                                                             | inferiore a<br>lower than<br>Inférieure à<br>Kleiner als<br>Inferior a      | superiore a<br>more than<br>supérieure à<br>grösser als<br>Superior a |
| ECO31-1LN, ECO31-2LN, ECO32-1L, ECO32-2L, ECO32-3L                                                              | da 0,8V<br>from de<br>von de                                                                                 | a 1,2V<br>to à<br>bis a                                                                             | inferiore a<br>lower than<br>Inférieure à<br>Kleiner als<br>Inferior a      | superiore a<br>more than<br>supérieure à<br>grösser als<br>Superior a |

# ECP 28

FORMA FORM FORME B3/B14

dimensions in mm



| TIPO / TYPE                             | A   | B   | C   |
|-----------------------------------------|-----|-----|-----|
| 28 1VS/4-2VS/4                          | 476 | 418 | 225 |
| 28 0S/4-S/4                             | 516 | 458 | 285 |
| 28 1L/4-2L/4<br>28 1L/2-2L/2<br>28 3L/2 | 596 | 538 | 285 |
| 28 VL                                   | 626 | 568 | 285 |

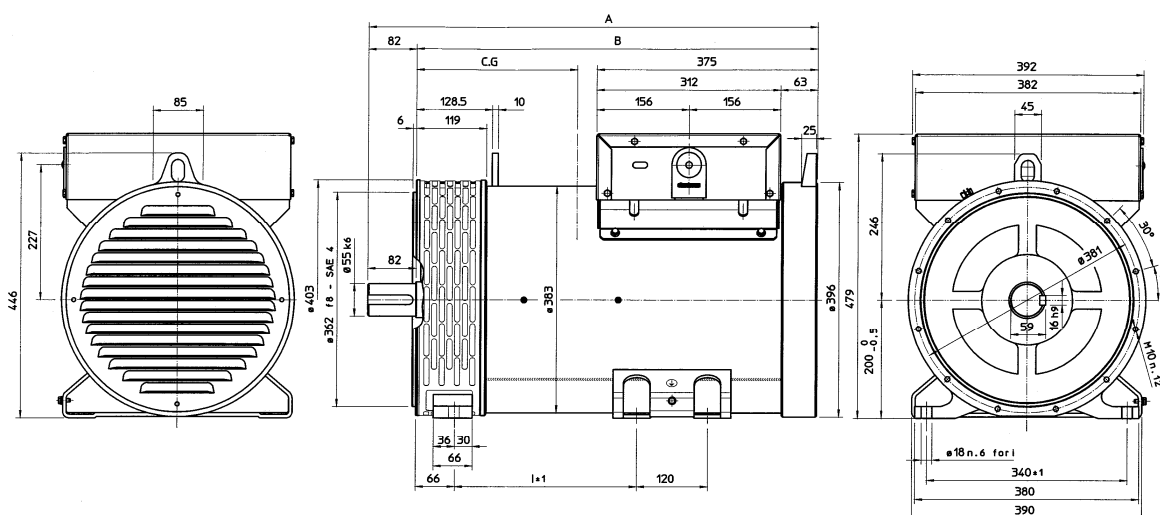
| TIPO / TYPE | CG* | TIPO / TYPE         | CG* |
|-------------|-----|---------------------|-----|
| 28-1VS/4    | 230 | 28-1L/2             | 267 |
| 28-2VS/4    | 230 | 28-2L/2             | 271 |
| 28-0S/4     | 235 | 28-3L/2             | 275 |
| 28-S/4      | 237 | 28-VL/2             | 291 |
| 28-1L/4     | 268 | * Center of Gravity |     |
| 28-2L/4     | 275 |                     |     |
| 28-VL/4     | 286 |                     |     |

\* Center of Gravity

# ECO 31N

FORMA FORM FORME B3/B14

dimensions in mm



| TIPO / TYPE | CG* |
|-------------|-----|
| 31-2S/2     | 272 |
| 31-3S/2     | 285 |
| 31-1L/2     | 311 |
| 31-2L/2     | 336 |

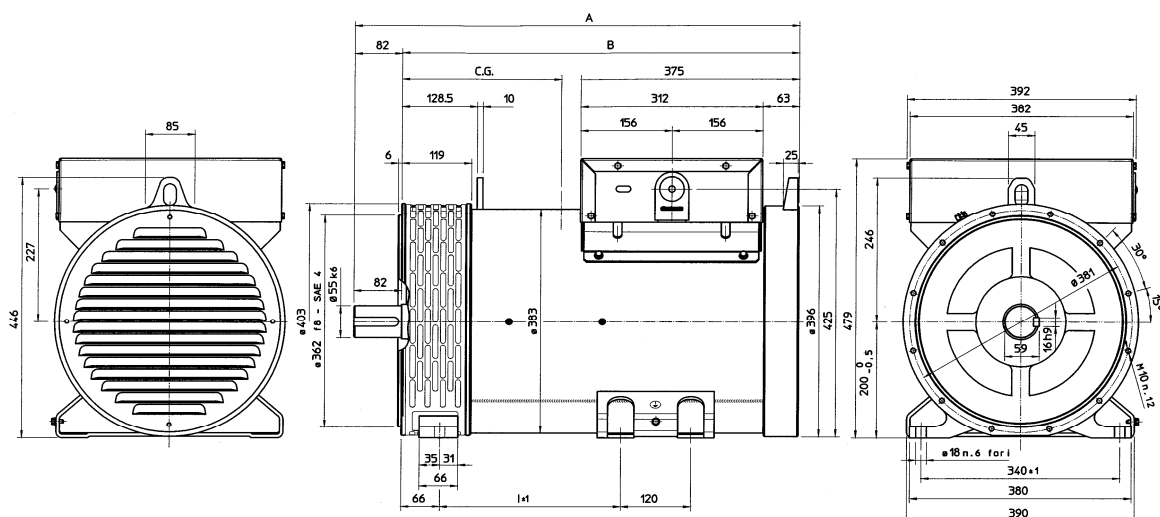
\* Center of Gravity

| TIPO / TYPE | A   | B   | I  |
|-------------|-----|-----|----|
| ECO 31 S    | 658 | 576 | 20 |
| ECO31 L     | 763 | 681 | 31 |

# ECO 32

FORMA FORM FORME B3/B14

dimensions in mm



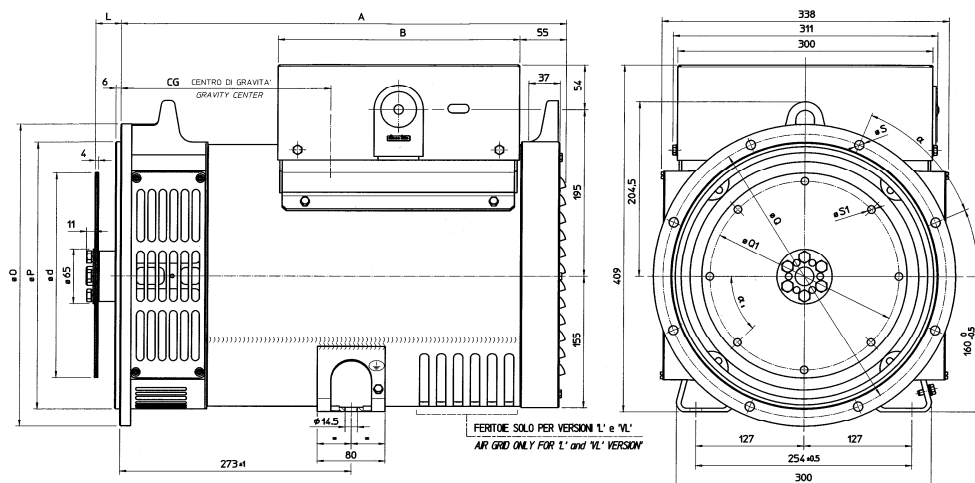
| TIPO / TYPE | CG* |
|-------------|-----|
| 32-2S/4     | 269 |
| 32-3S/4     | 274 |
| 32-1L/4     | 316 |
| 32-2L/4     | 330 |
| 32-3L/4     | 351 |

\* Center of Gravity

| TIPO / TYPE | A   | B   | I  |
|-------------|-----|-----|----|
| ECO 32 S    | 638 | 556 | 18 |
| ECO32 L     | 763 | 681 | 31 |

# ECP 28

FORMA FORM FORME MD35



dimensions in mm

| SAE N° | Giunti a dischi<br>Disc coupling<br>Disque de monopalerie<br>Scheibenkupplung |        |        |         |    |     |
|--------|-------------------------------------------------------------------------------|--------|--------|---------|----|-----|
|        | L                                                                             | d      | Q1     | N° fori | S1 | αl  |
| 6 ½    | 30,2                                                                          | 215,9  | 200    | 6       | 9  | 60° |
| 7 ½    | 30,2                                                                          | 241,3  | 222,25 | 8       | 9  | 45° |
| 8      | 62                                                                            | 263,52 | 244,47 | 6       | 11 | 60° |
| 10     | 53,8                                                                          | 314,32 | 295,27 | 8       | 11 | 45° |
| 11 ½   | 39,6                                                                          | 352,42 | 333,37 | 8       | 11 | 45° |

| Flangia / Flange |     |       |       |    |    |     |
|------------------|-----|-------|-------|----|----|-----|
| SAE N°           | O   | P     | Q     | N° | S  | α   |
| 5                | 356 | 314,3 | 333,4 | 8  | 11 | 45° |
| 4                | 403 | 362   | 381   | 12 | 11 | 30° |
| 3                | 451 | 409,6 | 428,6 | 12 | 11 | 30° |
| 2                | 490 | 447,7 | 466,7 | 12 | 11 | 30° |

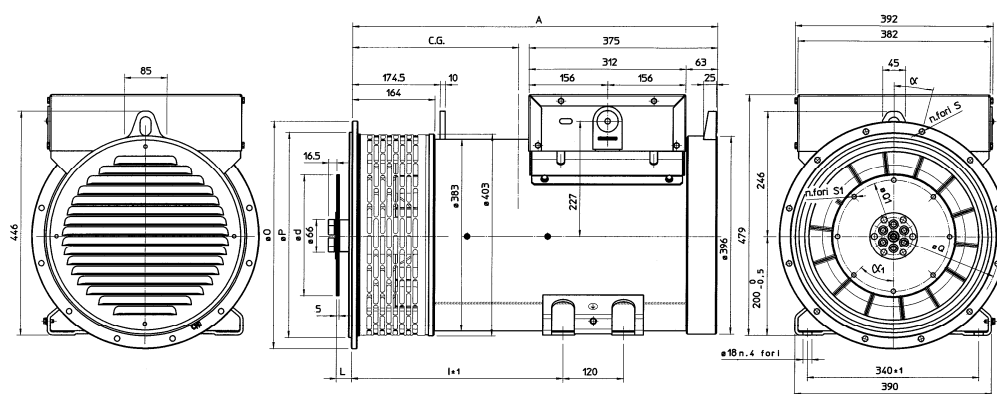
| TIPO TYPE | CG* | TIPO TYPE | CG* |
|-----------|-----|-----------|-----|
| 28-1L/2   | 242 | 28-1VS    | 200 |
| 28-2L/2   | 248 | 28-2VS    | 200 |
| 28-3L/2   | 254 | 28-0S     | 214 |
| 28-VL/2   | 273 | 28-S/4    | 217 |
|           |     | 28-1L/4   | 247 |
|           |     | 28-2L/4   | 254 |
|           |     | 28-VL/4   | 274 |

| TIPO TYPE         | A   | B   |
|-------------------|-----|-----|
| 28 1VS-2VS        | 405 | 225 |
| 28 0S-S           | 445 | 285 |
| 28 1L/2-2L/2-3L/2 | 525 | 285 |
| 28 1L/4-2L/4      |     |     |
| 28 VL             | 555 | 285 |

\* Center of Gravity

# ECO 31N

FORMA FORM FORME MD35



dimensions in mm

| SAE N° | Giunti a dischi<br>Disc coupling<br>Disque de monopalerie<br>Scheibenkupplung |        |        |         |    |     |
|--------|-------------------------------------------------------------------------------|--------|--------|---------|----|-----|
|        | L                                                                             | d      | Q1     | N° fori | S1 | αl  |
| 6 ½    | 30,2                                                                          | 215,9  | 200    | 6       | 9  | 60° |
| 7 ½    | 30,2                                                                          | 241,3  | 222,25 | 8       | 9  | 45° |
| 8      | 62                                                                            | 263,52 | 244,47 | 6       | 11 | 60° |
| 10     | 53,8                                                                          | 314,32 | 295,27 | 8       | 11 | 45° |
| 11 ½   | 39,6                                                                          | 352,42 | 333,37 | 8       | 11 | 45° |

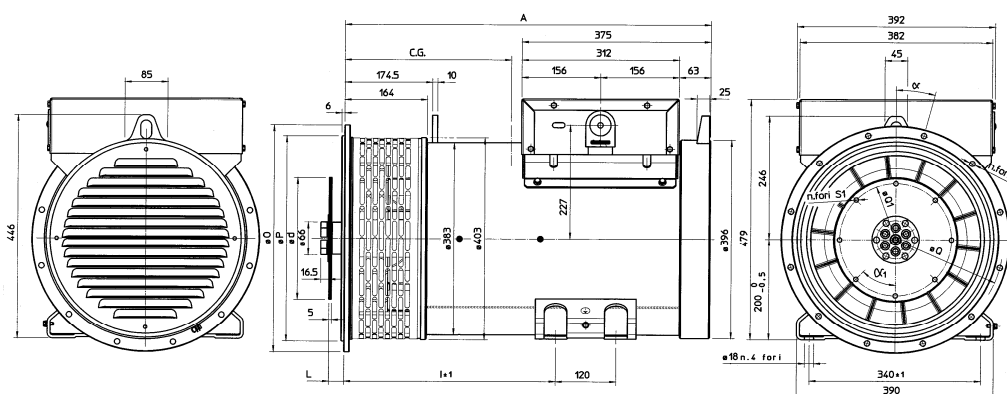
| Flangia / Flange<br>Bride / Flansch |     |       |       |         |    |     |
|-------------------------------------|-----|-------|-------|---------|----|-----|
| SAE N°                              | O   | P     | Q     | N° fori | S  | α   |
| 5                                   | 356 | 314,3 | 333,4 | 8       | 11 | 45° |
| 4                                   | 403 | 362   | 381   | 12      | 11 | 30° |
| 3                                   | 451 | 409,6 | 428,6 | 12      | 11 | 30° |
| 2                                   | 490 | 447,7 | 466,7 | 12      | 11 | 30° |
| 1                                   | 552 | 511,2 | 530,2 | 12      | 11 | 30° |

| TIPO TYPE | A   | B   |
|-----------|-----|-----|
| ECO 31 S  | 621 | 315 |
| ECO 31 L  | 726 | 420 |

\* Center of Gravity

# ECO 32

FORMA FORM FORME MD35



dimensions in mm

| SAE N° | Giunti a dischi<br>Disc coupling<br>Disque de monopalerie<br>Scheibenkupplung |        |        |         |    |     |    |
|--------|-------------------------------------------------------------------------------|--------|--------|---------|----|-----|----|
|        | L                                                                             | d      | Q1     | N° fori | S1 | αl  | F  |
| 6 ½    | 30,2                                                                          | 215,9  | 200    | 6       | 9  | 60° | 7  |
| 7 ½    | 30,2                                                                          | 241,3  | 222,25 | 8       | 9  | 45° | 7  |
| 8      | 62                                                                            | 263,52 | 244,47 | 6       | 11 | 60° | 2  |
| 10     | 53,8                                                                          | 314,32 | 295,27 | 8       | 11 | 45° | 10 |
| 11 ½   | 39,6                                                                          | 352,42 | 333,37 | 8       | 11 | 45° | 24 |

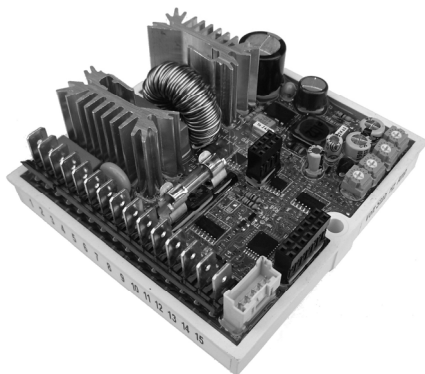
| Flangia / Flange<br>Bride / Flansch |     |       |       |         |    |     |
|-------------------------------------|-----|-------|-------|---------|----|-----|
| SAE N°                              | O   | P     | Q     | N° fori | S  | α   |
| 5                                   | 356 | 314,3 | 333,4 | 8       | 11 | 45° |
| 4                                   | 403 | 362   | 381   | 12      | 11 | 30° |
| 3                                   | 451 | 409,6 | 428,6 | 12      | 11 | 30° |
| 2                                   | 490 | 447,7 | 466,7 | 12      | 11 | 30° |
| 1                                   | 552 | 511,2 | 530,2 | 12      | 11 | 30° |

| TIPO TYPE | A   | I   |
|-----------|-----|-----|
| ECO 32 S  | 601 | 295 |
| ECO 32 L  | 726 | 420 |

\* Center of Gravity

## REGOLATORE DIGITALE DSR

## DSR DIGITAL REGULATOR



Ulteriori informazioni sul regolatore DSR sono scaricabili nell'area download del sito web al seguente indirizzo :

**www.meccalte.com**

Further information about DSR regulator are available in the web site download area at following address :

**www.meccalte.com**

### INSTALLAZIONE

Al ricevimento del regolatore digitale controllare visivamente che non ci siano danni dovuti al trasporto e alla movimentazione dell'apparato. Nel caso informare immediatamente lo spedizioniere, l'assicurazione, il rivenditore o Mecc Alte. Se il regolatore non viene installato immediatamente, immagazzinatelo nel suo imballo originale in un luogo privo di polveri e di umidità.

Il regolatore viene normalmente installato nella scatola morsetti del generatore. Viene fissato con due viti M4x20 o M4x25 e deve essere montato dove la temperatura ambiente non ecceda le condizioni ambientali previste.

### COLLEGAMENTI

I collegamenti al regolatore digitale dipendono dall'applicazione e dal sistema di eccitazione. **Un errore nei collegamenti può avere conseguenze serie per l'unità.** Controllate attentamente e assicuratevi che tutti i collegamenti siano esatti ed in accordo agli schemi allegati, prima di applicare potenza.

### TERMINALI

I collegamenti devono essere eseguiti utilizzando cavi di sezione minima pari a :

- 1,5 mm<sup>2</sup> per i cavi di potenza sui morsetti 1, 2, 3 e 9 (Exc-, Aux/exc+, Aux)
- 1 mm<sup>2</sup> per i cavi di segnale

### INGRESSI E USCITE : SPECIFICHE TECNICHE

### INSTALLATION

Upon receipt of the digital regulator, perform a visual inspection to ensure that no damage has been sustained during transportation and movement of the equipment. In the event of damage, advise the shipper, the insurance company, the seller or Mecc Alte immediately. If the regulator is not installed immediately, store it in its original packaging in a dust and humidity-free environment.

The regulator is normally installed in the generator terminal box. It is fixed with two M4x20 or M4x25 screws and must be installed in a location where the temperature does not exceed the environmental conditions foreseen.

### CONNECTIONS

The digital regulator connections depend on the application and excitation system. **An error in connection may have serious consequences for the unit.** Carefully check to make sure that all connections are precise and in accordance with the attached drawings, before turning on the power.

### TERMINALS

The connections must be made using cables having a minimum diameter:

- 1.5 mm<sup>2</sup> for power cables on terminals 1, 2, 3 and 9 (Exc-, Aux/exc+, Aux)
- 1 mm<sup>2</sup> for signal cables

### INPUTS AND OUTPUTS: TECHNICAL SPECIFICATIONS

TABELLA 1 : CONNETTORE CN1

| Morsetto<br>Terminal | Denominazione<br>Name | Funzione<br>Function                         | Specifiche<br>Specifications                                                                                                                                                                                                              |
|----------------------|-----------------------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1                    | Exc-                  | Eccitazione / Excitation                     | Reg. continuo/Continuous Rating : 4Adc max<br>Reg. transitorio/Transitory Rating : 12Adc di picco/peak                                                                                                                                    |
| 2                    | Aux/Exc+              |                                              |                                                                                                                                                                                                                                           |
| 3                    | Aux/Exc+              |                                              |                                                                                                                                                                                                                                           |
| 9                    | Aux/Neutral           | Alimentazione / Power                        | Frequenza/Frequency : da/from 12Hz a/to 72Hz<br>Range: 40Vac - 270Vac                                                                                                                                                                     |
| 4                    | F phase               | Sensing                                      | Range: 140Vac - 280Vac<br>Assorbimento/Burden : <1VA                                                                                                                                                                                      |
| 5                    | F Phase               |                                              |                                                                                                                                                                                                                                           |
| 6                    | H phase               |                                              |                                                                                                                                                                                                                                           |
| 7                    | H phase               | Sensing                                      | Range: 70Vac - 140Vac<br>Assorbimento/Burden : <1VA                                                                                                                                                                                       |
| 8                    | Aux/Neutral           |                                              |                                                                                                                                                                                                                                           |
| 10                   | Vext/Pext             | Ingresso per controllo remoto della tensione | Tipo/Type: Non isolato/Not isolated<br>Range: 0 - 2,5 Vdc o Potenziometro/Potentiometer 10K<br>Regolazione/Adjustment: da/from -10% a/to +10%<br>Assorbimento/Burden: 0 - 2 mA (sink)<br>Lunghezza massima/Max length: 30m <sup>(2)</sup> |
| 11                   | Common                | Input for remote voltage control             |                                                                                                                                                                                                                                           |
| 12                   | 50/60Hz               | Ingresso per jumper 50/60Hz                  | Tipo/Type: non isolato/not isolated<br>Lunghezza massima/Max length: 3m                                                                                                                                                                   |
| 13                   | Common                | Jumper Input 50/60Hz                         |                                                                                                                                                                                                                                           |
| 14                   | A.P.O.                | Uscita protezioni attive                     | Tipo/Type: Open collector non isolato/not isolated<br>Corrente/Current : 100mA<br>Tensione/Voltage: 30V<br>Lunghezza massima/Max length: 30m <sup>(2)</sup>                                                                               |
| 15                   | Common                | Active protections output                    |                                                                                                                                                                                                                                           |

**Nota 1)** Sono connessi assieme sulla scheda i morsetti: 2 con 3, 4 con 5, 6 con 7, 8 con 9, 11 con 13 e 15.

**Nota 2)** con filtro EMI esterno (3m senza filtro EMI)

A bordo di alternatori nuovi di fabbrica il DSR è già tarato, in caso di regolatori sciolti (ad es. ricambi) o qualora siano richieste variazioni di cablaggio o di taratura, per garantirne il corretto funzionamento esso dovrà essere accuratamente impostato.

Le impostazioni basilari possono essere effettuate direttamente sul regolatore tramite i 4 trimmers (VOLT - STAB - Hz - AMP), il jumper 50/60 e l'ingresso Vext. Impostazioni o misure più dettagliate possono essere effettuate esclusivamente via software utilizzando ad esempio l'interfaccia di comunicazione MeccAlte DI1 e il programma DSR\_Terminal o DSR\_Reader.

#### Ingresso Vext

L'ingresso Vext (connettore CN1 morsetti 10 e 11) permette il controllo remoto analogico della tensione di uscita tramite un potenziometro da 10Kohm con range di variazione programmabile via software (di default l'impostazione è  $\pm 5\%$ ) rispetto al valore impostato; qualora si volesse impiegare una tensione continua, essa avrà effetto se compresa nel range da 0V a +2,5V. L'ingresso tollera tensioni da -5V a +5V ma per valori che eccedono i limiti 0V / +2,5V (o in caso di sconnessione) esso non viene considerato e la regolazione della tensione ritorna sul valore impostato tramite trimmer.

**NOTA :** La sorgente di tensione continua deve essere in grado di assorbire almeno 2 mA.

#### Segnale 50/60

Un jumper posto sull'ingresso 50/60 (connettore CN1 morsetti 12 e 13) comporta la commutazione della soglia di protezione di bassa velocità da  $50 \cdot (100\% - \alpha\text{Hz}\%)$  a  $60 \cdot (100\% - \alpha\text{Hz}\%)$  dove  $\alpha\text{Hz}\%$  rappresenta la posizione relativa del trimmer Hz.

#### Contatto APO

Acronimo di **Active Protection Output** : (connettore CN1 morsetti 14 e 15) transistor open collector non isolato 30V-100mA, normalmente aperto, si chiude (con un ritardo programmabile via software da 1 a 15 secondi) quando, tra tutti gli allarmi, ne risultano attivi uno o più selezionabili via software separatamente.

Il trimmer **VOLT** permette una regolazione da circa 70V a circa 140V qualora per il sensing si utilizzino i morsetti 4 e 5, oppure da circa 140V a circa 280V qualora si utilizzino i morsetti 6 e 7.

Il trimmer **STAB** regola la risposta dinamica (statismo) dell'alternatore in condizioni transitorie.

Il trimmer **AMP** regola la soglia di intervento della protezione di sovraccorrente di eccitazione.

Per tarare la protezione di sovraccarico seguire la seguente procedura:

- 1) ruotare il trimmer Hz tutto in senso antiorario
- 2) applicare all'alternatore il carico nominale
- 3) diminuire la velocità del 10%
- 4) ruotare il trimmer AMP completamente in senso antiorario
- 5) dopo alcuni secondi, si dovrà notare una diminuzione nel valore della tensione del generatore, e l'attivazione dell'allarme 5 (visibile tramite un cambio del lampeggio del LED)
- 6) In queste condizioni, ruotare lentamente il trimmer "AMP" in senso orario fino a portare il valore della tensione di uscita al 97% del valore nominale: l'allarme 5 è ancora attivo.
- 7) Riportandosi alla velocità nominale, dopo alcuni secondi l'allarme 5 scompare e la tensione del generatore sale al valore nominale.
- 8) ritarare il trimmer Hz come indicato al seguente paragrafo.

Il trimmer **Hz** permette la taratura della soglia d'intervento della protezione di bassa velocità fino al -20% rispetto al valore di velocità nominale impostato dal jumper 50/60 (a 50 Hz la soglia può essere tarata da 40Hz a 50Hz, a 60 Hz la soglia può essere tarata da 48Hz a 60Hz).

L'intervento della protezione fa diminuire la tensione del generatore e la taratura si effettua come segue :

- 1) ruotare il trimmer Hz tutto in senso antiorario
- 2) se la macchina deve funzionare a 60 Hz, assicurarsi che sia inserito il ponticello tra i morsetti 12 e 13 del connettore CN1
- 3) portare il generatore ad una velocità pari al 90% di quella nominale
- 4) agire lentamente sul trimmer "Hz" ruotandolo in senso orario affinché la tensione del generatore inizi a diminuire e simultaneamente accertarsi che il LED inizi a lampeggiare velocemente
- 5) aumentando la velocità, la tensione del generatore si dovrà normalizzare e l'allarme dovrà scomparire
- 6) riportare la velocità al valore nominale.

Durante funzionamento normale un LED montato sulla scheda lampeggia con periodo pari a 2sec e duty cycle del 50%; in caso di intervento o segnalazione di allarme si hanno diverse modalità di lampeggio come indicato in figura 1.

**NOTA:** Pur continuando a regolare la tensione, il DSR si pone in modalità di spegnimento qualora la frequenza scenda sotto i 20Hz. Per il ripristino è necessario fermare completamente l'alternatore.

DSR regulator, on board of new generators, is already calibrated; in case of loose regulators (ie spare parts) or in case of wiring modifications or adjusting, to guarantee its correct working, it must be accurately set .

Basic settings can be done directly on the regulator by its four trimmers (VOLT - STAB - Hz - AMP), the jumper 50/60 and the Vext input. More detailed settings or measures can be done exclusively by software using for example the MeccAlte communication interface DI1 and the program DSR\_Terminal or DSR\_Reader.

#### Vext Input

The Vext input (connector CN1 – terminals 10 and 11) permits an analogical remote control of output voltage through a 10Kohm potentiometer with a programmable by software variation range (by default the setting is  $\pm 5\%$ ) with respect to the value set; if you want to use continuous voltage, it will be effective if it is in the range between 0V and +2,5V. The input tolerates voltages from -5V to +5V, but for values exceeding the limits of 0V / +2,5V (or in the event of disconnection) it is automatically disabled and the voltage adjustment goes back to the value set through the trimmer (if enabled).

**NOTE :** The DC voltage generator must be able to sink at least 2mA.

#### 50/60 Signal

A jumper is located on the 50/60 input (connector CN1, terminals 12 and 13); it provokes the commutation of the underspeed protection threshold from  $50 \cdot (100\% - \alpha\text{Hz}\%)$  to  $60 \cdot (100\% - \alpha\text{Hz}\%)$ , where  $\alpha\text{Hz}\%$  represents the position relative to the Hz trimmer.

#### APO Contact

The acronym **APO** stands for Active Protection Output: (connector CN1 – terminals 14 and 15) 30V-100mA non-insulated open collector transistor, normally opened, is closed (with a delay that can be programmed by software from 1 to 15 seconds) when, among all the alarms, one or more of the active ones can be selected separately by software.

The **VOLT** trimmer allows adjustment from about 70V to about 140V when using for sensing terminals 4 and 5, or from about 140V to about 280V when using terminals 6 and 7.

The **STAB** trimmer adjusts the dynamic response (statism) of the alternator under transient conditions.

The **AMP** trimmer adjusts the excitation overcurrent protection intervention threshold.

Use the following procedure in order to calibrate the overload protection:

- 1) Rotate the Hz trimmer entirely in the counter clockwise direction
- 2) Apply the nominal load to the alternator.
- 3) Decrease the speed by 10%
- 4) Rotate the AMP trimmer completely in the counter clockwise direction.
- 5) After a few seconds, there should be a decrease in the voltage value of the generator and alarm 5 should come on (visible due to a change in the flashing indicator light) .
- 6) Under these conditions, rotate the AMP trimmer slowly in the clockwise direction, until the output voltage value is 97% of the nominal value: alarm 5 is still activated.
- 7) Return to the nominal speed; alarm 5 should disappear in a few seconds and the generator voltage should increase to the nominal value.
- 8) Re-adjust the trimmer as indicated in the following paragraph.

The **Hz trimmer** allows to calibrate the threshold of the intervention of the under frequency protection up to -20% with respect to the nominal speed value set by jumper 50/60 (at 50 Hz the threshold can be calibrated from 40 Hz to 50 Hz, at 60 Hz the threshold can be calibrated from 48 Hz to 60 Hz).

The intervention of this protection reduce the output generator voltage and, to calibrate it, use the following procedure :

- 1) Rotate the Hz trimmer entirely in the counter clockwise direction.
- 2) If the machine has to operate at 60 Hz, ensure that the bridge is inserted between terminals 12 and 13 of the CN1 connector.
- 3) Bring the generator to 90% of the nominal speed.
- 4) Slowly turn the "Hz" trimmer, rotating it clockwise until the generator voltage begins to drop and ascertain that the indicator light simultaneously begins flashing rapidly.
- 5) By increasing speed, the generator voltage will normalise and the alarm will disappear.
- 6) Set the speed to the nominal value

During normal operation and a duty cycle of 50% an indicator light mounted on the board flashes every 2 seconds; it flashes differently in the event of intervention or alarm, as indicated in figure 1.

**NOTE:** Notwithstanding DSR maintains the voltage regulation, it goes in shutdown mode if the frequency decreases under 20Hz. The reset needs the Gen-Set switching off.

| N. | Descrizione evento<br><i>Description of event</i>             | Azione<br><i>Action</i>                                                        |
|----|---------------------------------------------------------------|--------------------------------------------------------------------------------|
| 1  | Checksum EEprom                                               | Ripristino dati default, Blocco<br>Reset default, Blockage                     |
| 2  | Sovratensione / <i>Overvoltage</i>                            | APO                                                                            |
| 3  | Sottotensione / <i>Under voltage</i>                          | APO                                                                            |
| 4  | Corto circuito / <i>Short circuit</i>                         | APO, Massima corrente, Blocco<br>APO, Maximum current, Blockage                |
| 5  | Sovracorrente di eccitazione<br><i>Excitation Overcurrent</i> | APO, Riduzione corrente di eccitazione<br>APO, Reduction of excitation current |
| 6  | Bassa velocità / <i>Underspeed</i>                            | APO, Rampa/Ramp V/F                                                            |
| 7  | Sovravelocità / <i>Overspeed</i>                              | APO                                                                            |

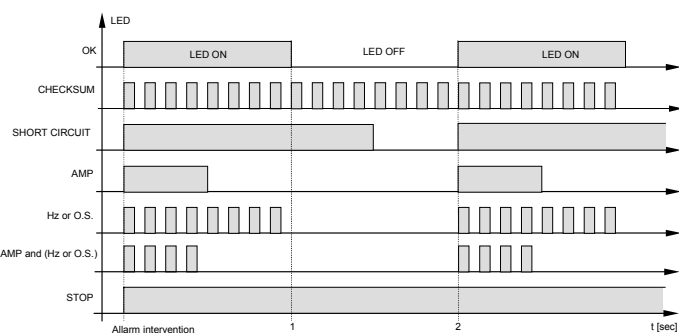
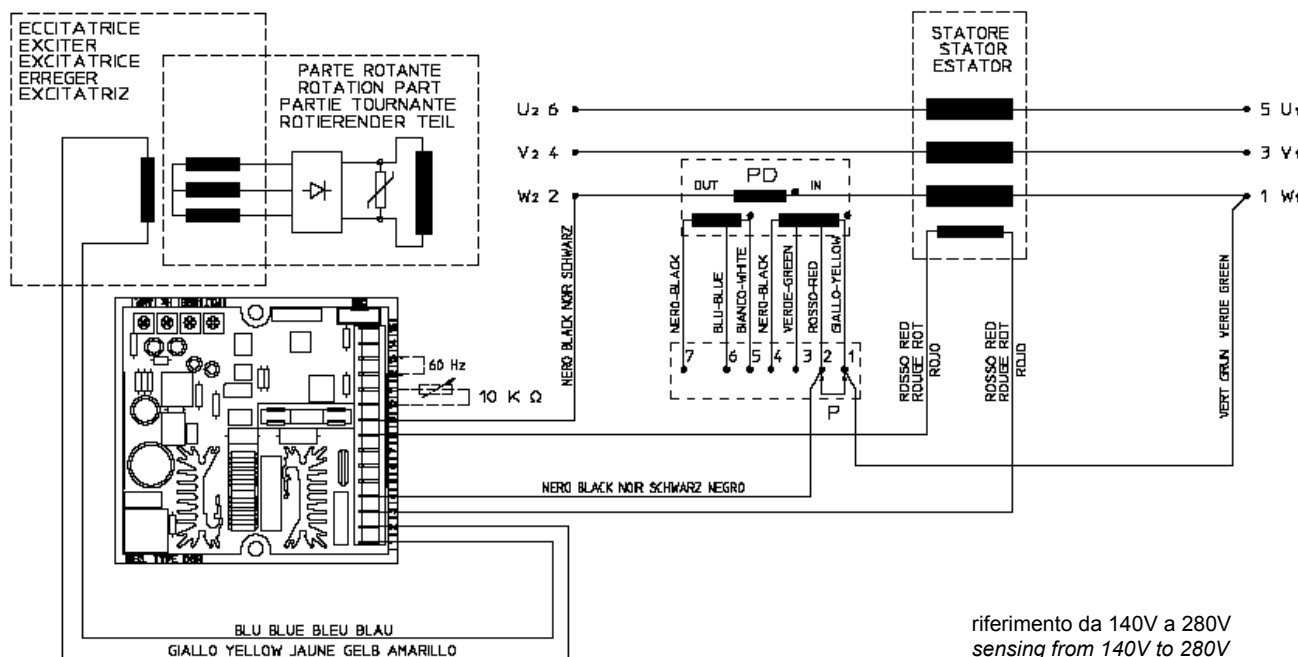


Fig. 1

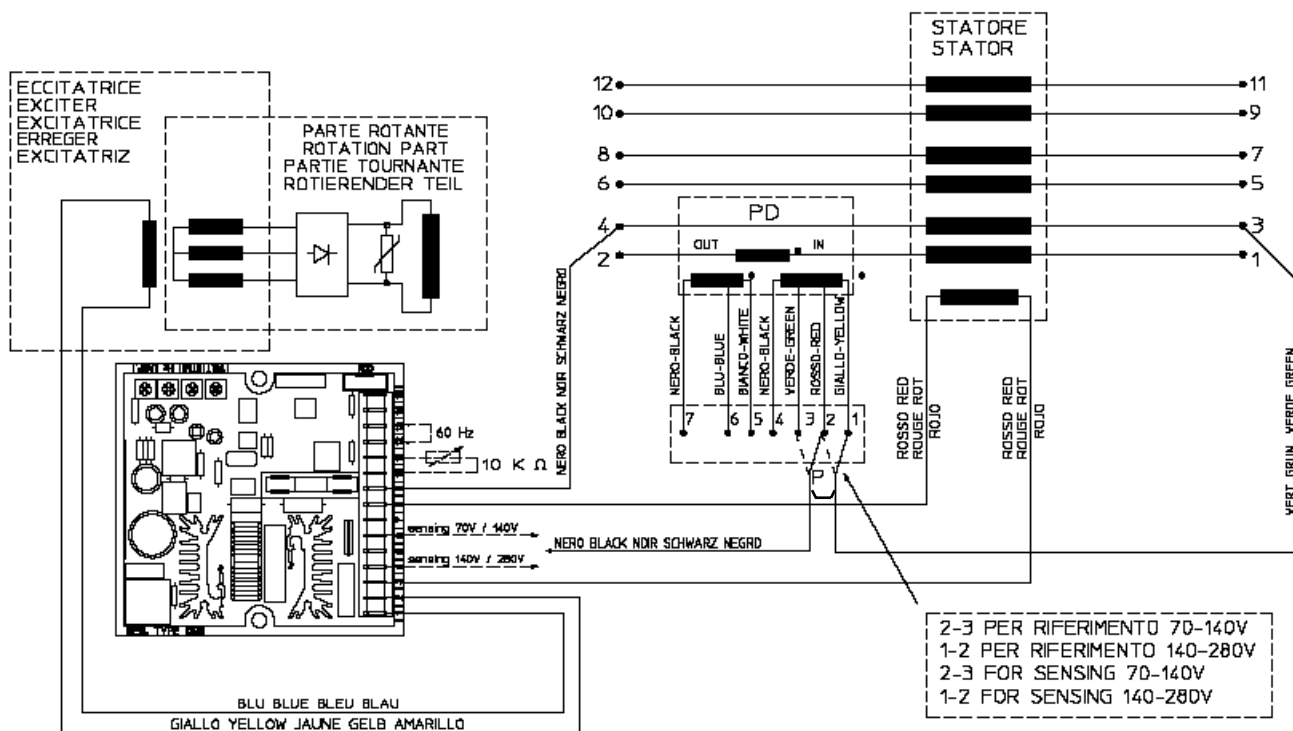
## Alternatori a 6 morsetti / 6 terminal alternators

SCC0061/02



## Alternatori a 12 morsetti/12 terminal alternators

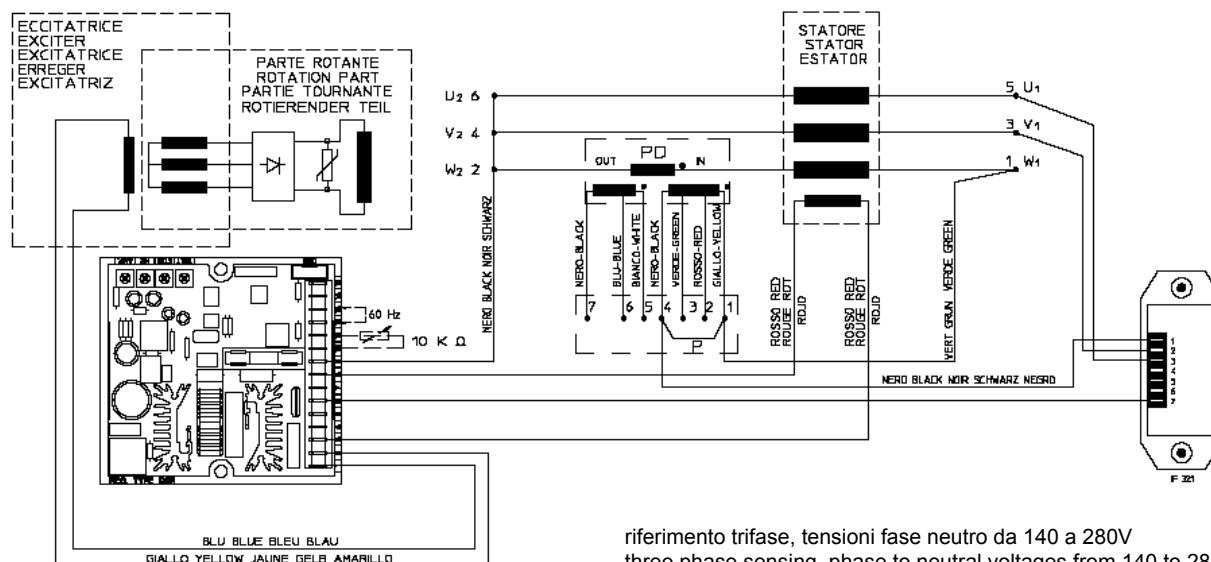
SCC0100/00



morsetto/terminal 4 : sensing 140V / 280V  
morsetto/terminal 6 : sensing 70V / 140V

# Alternatori a 6 morsetti, riferimento trifase/6 terminal alternators, three-phase sensing

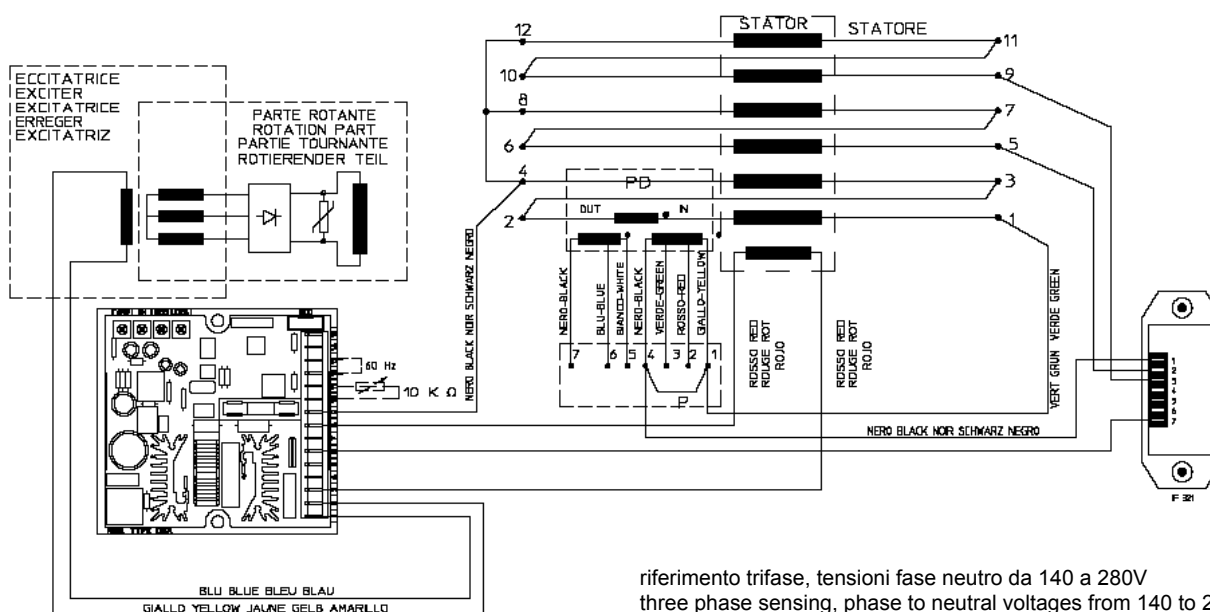
SCC0104/00



riferimento trifase, tensioni fase neutro da 140 a 280V  
 three phase sensing, phase to neutral voltages from 140 to 280V

# Alternatori a 12 morsetti, riferimento trifase/12 terminal alternators, three-phase sensing

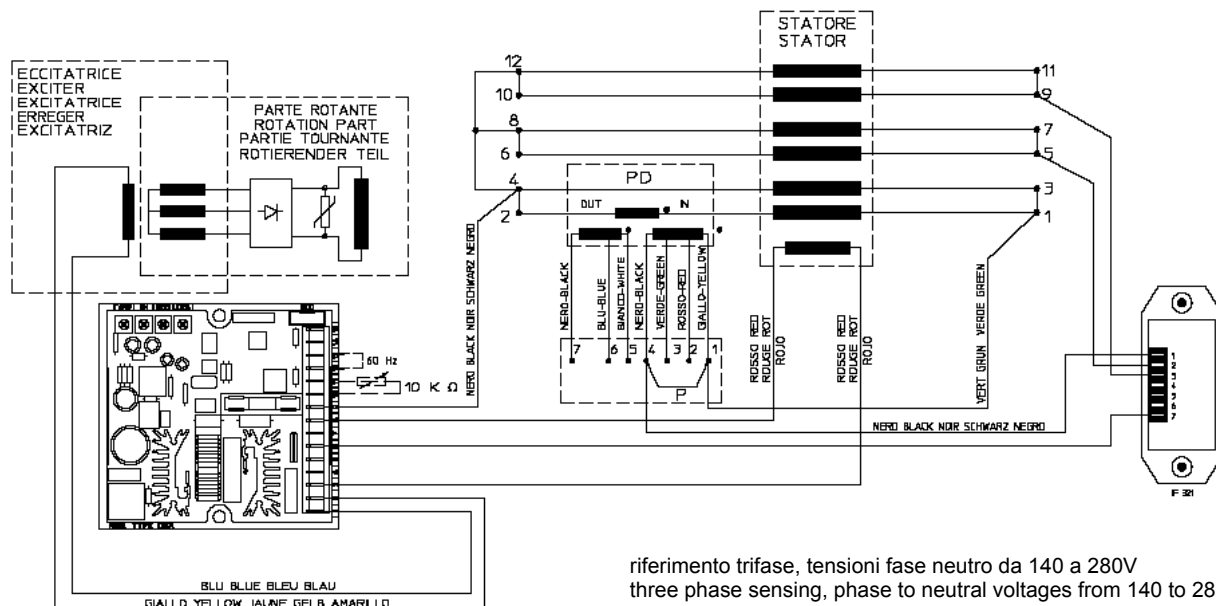
SCC0106/00



riferimento trifase, tensioni fase neutro da 140 a 280V  
 three phase sensing, phase to neutral voltages from 140 to 280V

# Alternatori a 12 morsetti, riferimento trifase/12 terminal alternators, three-phase sensing

SCC0105/00



riferimento trifase, tensioni fase neutro da 140 a 280V  
 three phase sensing, phase to neutral voltages from 140 to 280V

| GARANZIA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | WARRANTY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | GARANTIE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | GARANTIE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | GARANTIA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   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| <p><b>A</b><br/>La Mecc Alte garantisce la buona costruzione e qualita' dei propri alternatori per 24 mesi dalla data di spedizione dai propri stabilimenti o filiali.</p> <p><b>B</b><br/>Durante il suddetto periodo la Mecc Alte si impegna a riparare o sostituire (a proprie spese) nella propria sede, quelle parti che si fossero avariate, senza pero' essere tenuta a risarcimenti di danni diretti o indiretti.</p> <p><b>C</b><br/>La decisione sul riconoscimento o meno della garanzia e' riservata esclusivamente alla Mecc Alte previo esame delle parti avariate che dovranno per-venire in porto franco, alla sua sede di Vicenza.</p> <p><b>D</b><br/>Tutte le eventuali spese di viaggio, trasferta, trasporto, mano d'opera per lo smontaggio e rimontaggio dell'alternatore dall'apparecchiatura azionante sono sempre a carico dell'utente.</p> <p><b>E</b><br/>La garanzia decade se durante il periodo predetto, i prodotti fossero:</p> <ol style="list-style-type: none"> <li>1 immagazzinati in luogo non adatto;</li> <li>2 riparati o modificati da personale non autorizzato dalla Mecc Alte;</li> <li>3 usati o sottoposti a manutenzione non in base alle norme stabilite dalla Mecc Alte;</li> <li>4 sovraccaricati o impiegati in prestazioni diverse da quelle per le quali sono stati forniti.</li> </ol> <p>La garanzia cessa comunque qualora il cliente fosse inadempiente nei pagamenti per qualunque ragione.</p> | <p><b>A</b><br/>Mecc Alte warrants the good manufacture and quality of all its products for 24 months, starting from the time of shipment from our factories or our branches.</p> <p><b>B</b><br/>During said period Mecc Alte obliges to repair replace at its cost, at its works, all those parts which failed without any other liability of any type, direct or indirect.</p> <p><b>C</b><br/>The decision for warranty approval is Mecc Alte's exclusive right and subject to a previous examination of the failed parts which are to be forwarded fob Mecc Alte Italy for analysis.</p> <p><b>D</b><br/>All the eventual expenses concerning travel, board, transport, and labour for assembly/disassembly of alternator from the drive unit are always at the user's charge.</p> <p><b>E</b><br/>The warranty shall be void if during the above described period the following anomalies should occur:</p> <ol style="list-style-type: none"> <li>1 inadequate storage;</li> <li>2 repair or modification by unauthorized personnel;</li> <li>3 use or maintenance conditions which do not conform with norms established by Mecc Alte;</li> <li>4 overload or application other than what the product was meant for.</li> </ol> <p>Warranty coverage also expires whenever the client, for whatever reason, is late in payment.</p> | <p><b>A</b><br/>La société Mecc Alte garantit la bonne construction et qualité de ses produits pour une durée de 24 mois à compter de la date d'expédition de ses usines de fabrication ou filiales.</p> <p><b>B</b><br/>Durant la période indiquée, Mecc Alte s'engage à réparer ou à remplacer (à prix équivalent) dans la société, la partie qui serait endommagée sans toutefois être tenue de prendre en considération les frais directs ou indirects.</p> <p><b>C</b><br/>La décision sur la prise en charge ou non de la garantie est réservée exclusivement à Mecc Alte sur examen préalable des pièces endommagées qui devront parvenir en port Franco à l'usine de Vicenza.</p> <p><b>D</b><br/>Tout les éventuels frais de voyage, transfert, transport, main d'oeuvre pour le démontage de l'alternateur sont toujours à la charge de l'utilisateur.</p> <p><b>E</b><br/>La garantie ne s'applique pas si durant la période indiquée il y a:</p> <ol style="list-style-type: none"> <li>1 emmagasinement dans un local non adapté;</li> <li>2 réparations ou modifications personnelles non autorisées par Mecc Alte;</li> <li>3 usage et manutentions non conformes aux normes établies par Mecc Alte;</li> <li>4 surcharges et emplois des fonctions différentes de celles pour lequel ils sont fournis.</li> </ol> <p>Il est bien évident que la garantie ne s'applique que sur le matériel payé en totalité.</p> | <p><b>A</b><br/>Die Firma Mecc Alte gibt 24 Monate Garantie ab dem Zeitpunkt der Auslieferung vom Stammhaus oder einer ihrer Filialen auf die einwandfreie Konstruktion und Qualität ihrer Generatoren.</p> <p><b>B</b><br/>Während der genannten Periode repariert oder ersetzt Mecc Alte zu seinen Kosten alle fehlerhaften Teile, ohne Rücksicht ob direkt oder indirekt.</p> <p><b>C</b><br/>Mecc Alte behält sich das Recht vor, die fehlerhaften Teile frei Mecc Alte Vicenza zurückzufordern, zu Schadensuntersuchung</p> <p><b>D</b><br/>Alle eventuellen Kosten wie Transport, Fahrtkosten, Arbeitslohn für De-und Montage gehen zu Lasten des Kunden.</p> <p><b>E</b><br/>Die Garantie in O.A. Zeit wird für nachstehende Faktoren ausgeschlossen:</p> <ol style="list-style-type: none"> <li>1 nicht korrekte Lagerung;</li> <li>2 Reparatur oder Modifizierung durch nicht von Mecc Alte autorisiertem Personal;</li> <li>3 Gebrauch oder Einsatz bei Konditionen die nicht der Norm von Mecc Alte entsprechen;</li> <li>4 Überlast Gebrauch oder Montage anders als wofür das Produkt bestimmt ist.</li> </ol> <p>Die Garantie erlischt auch, wenn aus welchen Gründen auch immer, der Kunde in Zahlung überfällig ist.</p> | <p><b>A</b><br/>Mecc alte garantiza la buena construccion y calidad de los propios productos por 24 meses desde la fecha de salida de sus fabricas o de sus filiales.</p> <p><b>B</b><br/>Durante dicho periodo la Mecc Alte se obliga a reparar o sustituir a su cargo, en su establecimiento todas aquellas piezas que hubieran sido averiadas, sin hacerse cargo de otro tipo de danos, directos o indirectos.</p> <p><b>C</b><br/>La decision acerca del reconocimiento de garantia esta reservada exclusivamente a la Mecc Alte, previo examen de las partes averiadas que deberan permanecer en puerto franco o en su propia sede de Vicenza.</p> <p><b>D</b><br/>Todos los eventuales gastos de transporte, viaje, transferencia o mano de obra, para el desmontaje y nuevo montaje, del alternador o elemento accionante seran siempre a cargo del usuario.</p> <p><b>E</b><br/>La garantia caduca si durante el periodo descrito se produjeran las siguientes anomalias:</p> <ol style="list-style-type: none"> <li>1 almacenaje en lugar inadecuado;</li> <li>2 reparacion o modificacion por personal no autorizado por Mecc Alte;</li> <li>3 utilizacion o condiciones de manutencion que contravengan las normas establecidas por Mecc Alte;</li> <li>4 sobrecarga o empleo en prestaciones distintas de aquellas para las que ha estado suministrado.</li> </ol> <p>La garantia cesa igualmente en el momento que el cliente sea moroso de pago, cualquiera que sea la razon.</p> |



[ESlAlaska.com](http://ESlAlaska.com)

# Engine Manual

**Anchorage:**

7780 Old Seward Hwy  
Anchorage, AK 99518  
(907) 341-2250 | (877) 341-2250

**Fairbanks:**

1919 Van Horn Road  
Fairbanks, AK 99701  
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(425) 251-6119

**Williston:**

5064 Bennett Loop  
Williston, ND 58801  
(701) 774-5312

Equipment Source, Inc.



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California Proposition 65

**⚠ WARNING ⚠**

Engine exhaust, some of its constituents,  
certain vehicle components and fluids,  
contain or emit chemicals known to the  
State of California to cause cancer and birth  
defects or other reproductive harm.

# OPERATOR'S MANUAL

# KUBOTA DIESEL ENGINE

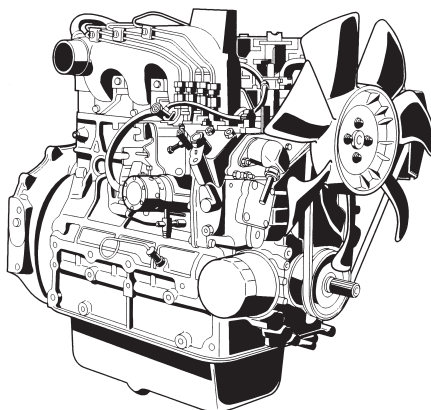
## MODELS

D1503-M-E3 · D1703-M-E3 · D1803-M-E3

V2003-M-E3 · V2203-M-E3 · V2403-M-E3 · V2403-M-T-E3

D1703-M-E3BG · V2003-M-E3BG · V2003-M-T-E3BG

V2203-M-E3BG · V2403-M-E3BG



D-2357

1J464-8916-4

READ AND SAVE THIS BOOK

Kubota

# FOREWORD

You are now the proud owner of a KUBOTA Engine. This engine is a product of KUBOTA quality engineering and manufacturing. It is made of fine materials and under a rigid quality control system. It will give you long, satisfactory service. To obtain the best use of your engine, please read this manual carefully. It will help you become familiar with the operation of the engine and contains many helpful hints about engine maintenance. It is KUBOTA's policy to utilize as quickly as possible every advance in our research. The immediate use of new techniques in the manufacture of products may cause some small parts of this manual to be outdated. KUBOTA distributors and dealers will have the most up-to-date information. Please do not hesitate to consult with them.



## SAFETY FIRST

This symbol, the industry's "Safety Alert Symbol", is used throughout this manual and on labels on the machine itself to warn of the possibility of personal injury. Read these instructions carefully. It is essential that you read the instructions and safety regulations before you attempt to assemble or use this unit.

**DANGER :**

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING :**

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION :**

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

**IMPORTANT :**

Indicates that equipment or property damage could result if instructions are not followed.

**NOTE :**

Gives helpful information.

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# SAFE OPERATION

Careful operation is your best assurance against an accident. Read and understand this section carefully before operating the engine. All operators, no matter how much experience they may have, should read this and other related manuals before operating the engine or any equipment attached to it. It is the owner's obligation to provide all operators with this information and instruct them on safe operation.

Be sure to observe the following for safe operation.

## 1. OBSERVE SAFETY INSTRUCTIONS

- Read and understand carefully this "OPERATOR'S MANUAL" and "LABELS ON THE ENGINE" before attempting to start and operate the engine.
- Learn how to operate and work safely. Know your equipment and its limitations. Always keep the engine in good condition.
- Before allowing other people to use your engine, explain how to operate and have them read this manual before operation.
- DO NOT modify the engine. UNAUTHORIZED MODIFICATIONS to the engine may impair the function and/or safety and affect engine life. If the engine does not perform properly, consult your local Kubota Engine Distributor first.



1AAACAAAP008B

## 2. WEAR SAFE CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT (PPE)

- DO NOT wear loose, torn or bulky clothing around the machine that may catch on working controls and projections or into fans, pulleys and other moving parts causing personal injury.
- Use additional safety items-PPE, e.g. hard hat, safety protection, safety goggles, gloves, etc., as appropriate or required.
- DO NOT operate the machine or any equipment attached to it while under the influence of alcohol, medication, or other drugs, or while fatigued.
- DO NOT wear radio or music headphones while operating the engine.



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### 3. CHECK BEFORE STARTING & OPERATING THE ENGINE

- Be sure to inspect the engine before operation. Do not operate the engine if there is something wrong with it. Repair it immediately.
- Ensure all guards and shields are in place before operating the engine. Replace any that are damaged or missing.
- Check to see that you and others are a safe distance from the engine before starting.
- Always keep the engine at least 3 feet (1 meter) away from buildings and other facilities.
- DO NOT allow children or livestock to approach the machine while the engine is running.
- DO NOT start the engine by shorting across starter terminals. The machine may start in gear and move. Do not bypass or defeat any safety devices.



1BAABADAP0010

### 4. KEEP THE ENGINE AND SURROUNDINGS CLEAN

- Be sure to stop the engine before cleaning.
- Keep the engine clean and free of accumulated dirt, grease and trash to avoid a fire. Store flammable fluids in proper containers and cabinets away from sparks and heat.
- Check for and repair leaks immediately.
- DO NOT stop the engine without idling; Allow the engine to cool down, first. Keep the engine idling for about 5 minutes before stopping unless there is a safety problem that requires immediate shut down.



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### 5. SAFE HANDLING OF FUEL AND LUBRICANTS -KEEP AWAY FROM FIRE

- Always stop the engine before refueling and/or lubricating.
- DO NOT smoke or allow flames or sparks in your work area. Fuel is extremely flammable and explosive under certain conditions.
- Refuel at a well ventilated and open place. When fuel and/or lubricants are spilled, refuel after letting the engine cool down.
- DO NOT mix gasoline or alcohol with diesel fuel. The mixture can cause a fire or severe engine damage.
- Do not use unapproved containers e.g. buckets, bottles, jars. Use approved fuel storage containers and dispensers.



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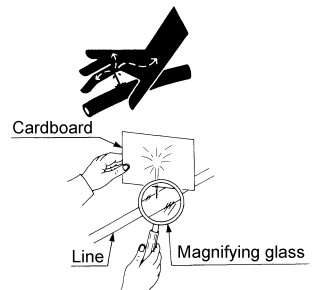
## 6. EXHAUST GASES & FIRE PREVENTION

- Engine exhaust fumes can be very harmful if allowed to accumulate. Be sure to run the engine in a well ventilated location and where there are no people or livestock near the engine.
- The exhaust gas from the muffler is very hot. To prevent a fire, do not expose dry grass, mowed grass, oil or any other combustible materials to exhaust gas. Keep the engine and muffler clean at all times.
- To avoid a fire, be alert for leaks of flammable substances from hoses and lines. Be sure to check for leaks from hoses or pipes, such as fuel and hydraulic fluid by following the maintenance check list.
- To avoid a fire, do not short across power cables and wires. Check to see that all power cables and wirings are in good condition. Keep all electrical connections clean. Bare wire or frayed insulation can cause a dangerous electrical shock and personal injury.



## 7. ESCAPING FLUID

- Relieve all pressure in the air, the oil and the cooling systems before disconnecting any lines, fittings or related items.
- Be cautious of possible pressure relief when disconnecting any device from a pressurized system that utilizes pressure. DO NOT check for pressure leaks with your hand. High pressure oil or fuel can cause personal injury.
- Escaping fluid under pressure has sufficient force to penetrate skin causing serious personal injury.
- Fluid escaping from pinholes may be invisible. Use a piece of cardboard or wood to search for suspected leaks: do not use hands and body. Use safety goggles or other eye protection when checking for leaks.
- If injured by escaping fluid, see a medical doctor immediately. This fluid can produce gangrene or severe allergic reaction.



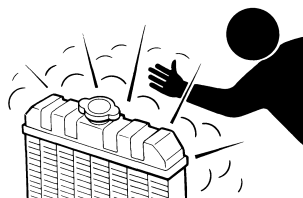
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## 8. CAUTIONS AGAINST BURNS & BATTERY EXPLOSION

- To avoid burns, be cautious of hot components, e.g. muffler, muffler cover, radiator, hoses, engine body, coolants, engine oil, etc. during operation and after the engine has been shut off.
- DO NOT remove the radiator cap while the engine is running or immediately after stopping. Otherwise hot water will spout out from the radiator. Wait until the radiator is completely cool to the touch before removing the cap. Wear safety goggles.
- Be sure to close the coolant drain valve, secure the pressure cap, and fasten the pipe band before operating. If these parts are taken off, or loosened, it will result in serious personal injury.
- The battery presents an explosive hazard. When the battery is being charged, hydrogen and oxygen gases are extremely explosive.
- DO NOT use or charge the battery if its fluid level is below the LOWER mark.  
Otherwise, the component parts may deteriorate earlier than expected, which may shorten the service life or cause an explosion. Immediately, add distilled water until the fluid level is between the UPPER and LOWER marks.
- Keep sparks and open flames away from the battery, especially during charging. DO NOT strike a match near the battery.
- DO NOT check the battery charge by placing a metal object across the terminals. Use a voltmeter or hydrometer.
- DO NOT charge a frozen battery. There is a risk of explosion. When frozen, warm the battery up to at least 16°C (61°F).



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## 9. KEEP HANDS AND BODY AWAY FROM ROTATING PARTS

- Be sure to stop the engine before checking or adjusting the belt tension and cooling fan.
- Keep your hands and body away from rotating parts, such as the cooling fan, V-belt, fan drive pulley or flywheel. Contact with rotating parts can cause severe personal injury.
- DO NOT run the engine without safety guards. Install safety guards securely before operation.



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## 10. ANTI-FREEZE & DISPOSAL OF FLUIDS

- Anti-freeze contains poison. Wear rubber gloves to avoid personal injury. In case of contact with skin, wash it off immediately.
- DO NOT mix different types of Anti-freeze. The mixture can produce a chemical reaction causing harmful substances. Use approved or genuine KUBOTA Anti-freeze.
- Be mindful of the environment and the ecology. Before draining any fluids, determine the correct way to dispose of them. Observe the relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters and batteries.
- When draining fluids from the engine, place a suitable container underneath the engine body.
- DO NOT pour waste onto the ground, down a drain, or into any water source. Dispose of waste fluids according to environmental regulations.



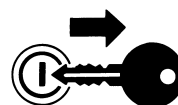
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## 11. CONDUCTING SAFETY CHECKS & MAINTENANCE

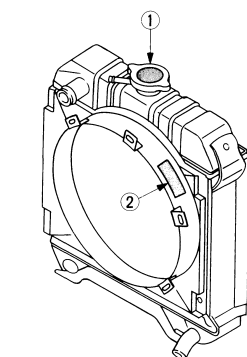
- When inspecting the engine or servicing, place the engine on a large flat surface. DO NOT work on anything that is supported ONLY by lift jacks or a hoist. Always use blocks or the correct stands to support the engine before servicing.
- Disconnect the battery from the engine before conducting service. Put a "DO NOT OPERATE!" tag on the key switch to avoid accidental starting.
- To avoid sparks from an accidental short circuit always disconnect the battery's ground cable (-) first and reconnect it last.
- Be sure to stop the engine and remove the key when conducting daily and periodic maintenance, service and cleaning.
- Check or conduct maintenance after the engine, coolant, muffler, or muffler cover have cooled off completely.
- Always use the appropriate tools and fixtures. Verify that they are in good condition before performing any service work. Make sure you understand how to use them before service.
- Use ONLY correct engine barring techniques for manually rotating the engine. DO NOT attempt to rotate the engine by pulling or prying on the cooling fan and V-belt. This practice can cause serious personal injury or premature damage to the cooling fan and belt.



1BJABAAAP0200

- Replace fuel pipes and lubricant pipes with their hose clamps every 2 years or earlier whether they are damaged or not. They are made of rubber and age gradually.
- When servicing is performed together by two or more persons, take care to perform all work safely.
- Keep a first aid kit and fire extinguisher handy at all times.

## 12. WARNING AND CAUTION LABELS



1ABAAAAAP1480

- ① Part No.19077-8724-1 or 16667-8724-1  
(55mm in diameter) (37mm in diameter)



1ABACAAAP036K

- ② Part No.TA040-4957-1  
Do not get your hands close to engine fan and fan belt.



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## 13. CARE OF WARNING AND CAUTION LABELS

1. Keep warning and caution labels clean and free from obstructing material.
2. Clean warning and caution labels with soap and water, dry with a soft cloth.
3. Replace damaged or missing warning and caution labels with new labels from your local KUBOTA dealer.
4. If a component with warning and caution label(s) affixed is replaced with a new part, make sure the new label(s) is (are) attached in the same location(s) as the replaced component.
5. Mount new warning and caution labels by applying to a clean dry surface and pressing any bubbles to the outside edge.

# SERVICING OF THE ENGINE

Your dealer is interested in your new engine and has the desire to help you get the most value from it. After reading this manual thoroughly, you will find that you can do some of the regular maintenance yourself.

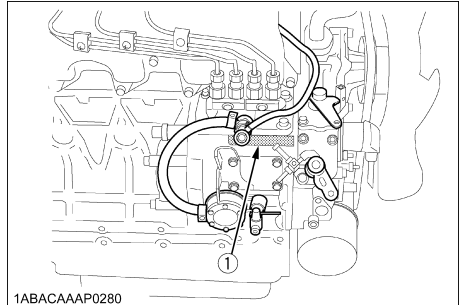
However, when in need of parts or major service, be sure to see your KUBOTA dealer.

For service, contact the KUBOTA Dealership from which you purchased your engine or your local KUBOTA dealer.

When in need of parts, be prepared to give your dealer the engine serial number.

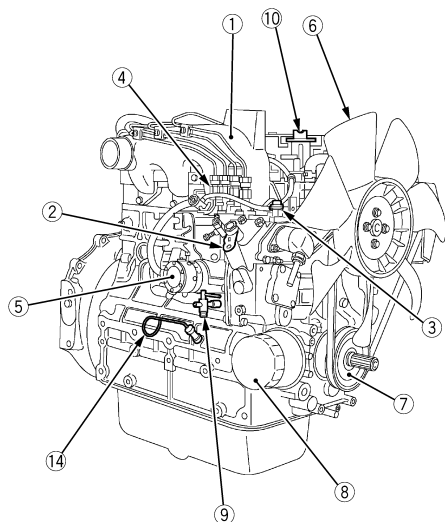
Locate the serial number now and record them in the space provided.

|                                | Type | Serial No. |
|--------------------------------|------|------------|
| Engine                         |      |            |
| Date of Purchase               |      |            |
| Name of Dealer                 |      |            |
| (To be filled in by purchaser) |      |            |



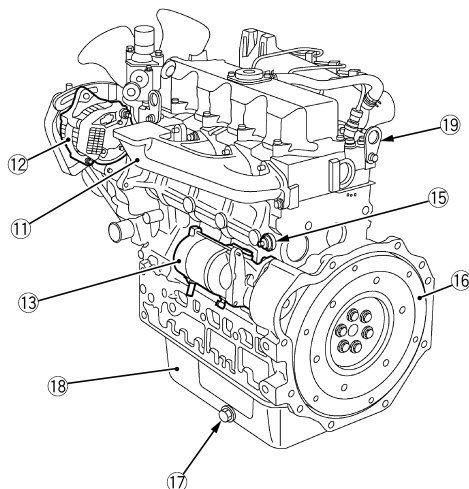
(1) Engine serial number

# NAMES OF PARTS



1ABACAAAP0020

- (1) Intake manifold
- (2) Speed control lever
- (3) Engine stop lever
- (4) Injection pump
- (5) Fuel feed pump
- (6) Cooling fan
- (7) Fan drive pulley
- (8) Oil filter cartridge
- (9) Water drain cock



1ABACAAAP0300

- (10) Oil filler plug
- (11) Exhaust manifold
- (12) Alternator
- (13) Starter
- (14) Oil level gauge
- (15) Oil pressure switch
- (16) Flywheel
- (17) Oil drain plug
- (18) Oil pan
- (19) Engine hook

# PRE-OPERATION CHECK

## BREAK-IN

During the engine break-in period, observe the following by all means:

1. Change engine oil and oil filter cartridge after the first 50 hours of operation. (See "ENGINE OIL" in "PERIODIC SERVICE" section.)
2. When ambient temperature is low, operate the machine after the engine has been completely warmed up.

## DAILY CHECK

To prevent trouble from occurring, it is important to know the conditions of the engine well. Check it before starting.



### CAUTION

To avoid personal injury:

- Be sure to install shields and safeguards attached to the engine when operating.
- Stop the engine at a flat and wide space when checking.
- Keep dust or fuel away from the battery, wiring, muffler and engine to prevent a fire. Check and clear them before operating everyday. Pay attention to the heat of the exhaust pipe or exhaust gas so that it can not ignite trash.

| Item                                             |                                                                          | Ref. page |
|--------------------------------------------------|--------------------------------------------------------------------------|-----------|
| 1. Parts which had trouble in previous operation |                                                                          | -         |
| 2. By walking around the machine                 | (1) Oil or water leaks                                                   | 15 to 20  |
|                                                  | (2) Engine oil level and contamination                                   | 15,16     |
|                                                  | (3) Amount of fuel                                                       | 12        |
|                                                  | (4) Amount of coolant                                                    | 18 to 20  |
|                                                  | (5) Dust in air cleaner dust cup                                         | 21        |
|                                                  | (6) Damaged parts and loosened bolts and nuts                            | -         |
| 3. By inserting the key into the starter switch  | (1) Proper functions of meters and pilot lamps; no stains on these parts | -         |
|                                                  | (2) Proper function of glow lamp timer                                   | -         |
| 4. By starting the engine                        | (1) Color of exhaust fumes                                               | 7         |
|                                                  | (2) Unusual engine noise                                                 | 7         |
|                                                  | (3) Engine start-up condition                                            | 5         |
|                                                  | (4) Slow-down and acceleration behavior                                  | 7         |

# OPERATING THE ENGINE

## STARTING THE ENGINE(NORMAL)



### CAUTION

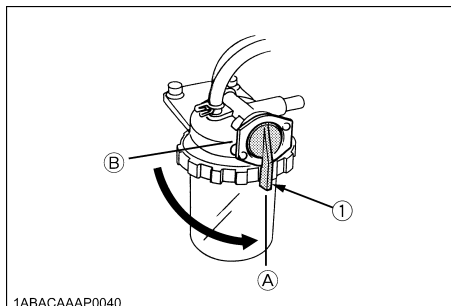
To avoid personal injury:

- Do not allow children to approach the machine while the engine is running.
- Be sure to install the machine on which the engine is installed, on a flat place.
- Do not run the engine on gradients.
- Do not run the engine in an enclosed area. Exhaust gas can cause air pollution and exhaust gas poisoning.
- Keep your hands away from rotating parts (such as fan, pulley, belt, flywheel etc.) during operation.
- Do not operate the machine while under the influence of alcohol or drugs.
- Do not wear loose, torn or bulky clothing around the machine. It may catch on moving parts or controls, leading to the risk of accident. Use additional safety items, e.g. hard hat, safety boots or shoes, eye and hearing protection, gloves, etc., as appropriate or required.
- Do not wear radio or music headphones while operating engine.
- Check to see if it is safe around the engine before starting.
- Reinstall safeguards and shields securely and clear all maintenance tools when starting the engine after maintenance.

### IMPORTANT :

- Do not use ether or any starting fluid for starting the engine, or a severe damage will occur.
- When starting the engine after a long storage (of more than 3 months), first set the stop lever to the "STOP" position and then activate the starter for about 10 seconds to allow oil to reach every engine part.

1. Set the fuel lever to the "ON" position.

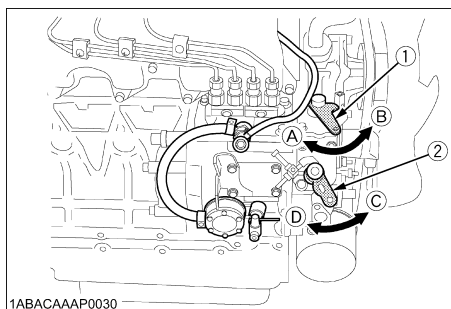


1ABACAAAP0040

(1) Fuel lever

(A) "ON"  
(B) "OFF"

2. Place the engine stop lever to the "START" position.
3. Place the speed control lever at more than half "OPERATION".

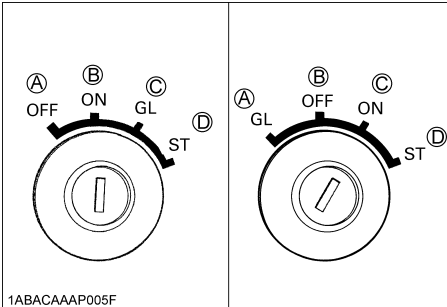


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(1) Engine stop lever  
(2) Speed Control lever

(A) "STOP"  
(B) "START"  
(C) "IDLING"  
(D) "OPERATION"

4. Insert the key into the key switch and turn it to the "OPERATION" position.



(A) "OFF" SWITCHED OFF  
(B) "ON" OPERATION  
(C) "GL" PREHEATING  
(D) "ST" STARTING

(A) "GL" PREHEATING  
(B) "OFF" SWITCHED OFF  
(C) "ON" OPERATION  
(D) "ST" STARTING

5. Turn the starter switch to the "PREHEATING" position to allow the glow lamp to redden.

**NOTE :**  
(with lamp timer in use)

- The glow lamp goes out in about 5 seconds when the lamp timer is up. Refer to this for pre-heating. Even with the glow lamp off, the glow plug can be pre-heated by turning the starter switch to the "PREHEATING" position.

6. Turn the key to the "STARTING" position and the engine should start. Release the key immediately when the engine starts.
7. Check to see that the oil pressure lamp and charge lamp are off. If the lamps are still on, immediately stop the engine, and determine the cause. (See "CHECKS DURING OPERATION" in "OPERATING THE ENGINE" section.)

**NOTE :**

- If the oil pressure lamp should be still on, immediately stop the engine and check;
  - if there is enough engine oil.
  - if the engine oil has dirt in it.
  - if the wiring is faulty.

8. Warm up the engine at medium speed without load.

**IMPORTANT :**

- If the glow lamp should redden too quickly or too slowly, immediately ask your KUBOTA dealer to check and repair it.
- If the engine does not catch or start at 10 seconds after the starter switch is set at "STARTING" position, wait for another 30 seconds and then begin the engine starting sequence again. Do not allow the starter motor to run continuously for more than 20 seconds.

## COLD WEATHER STARTING

If the ambient temperature is below  $-5^{\circ}\text{C}$  ( $23^{\circ}\text{F}$ )\* and the engine is very cold, start it in the following manner: Take steps (1) through (4) above.

5. Turn the key to the "PREHEATING" position and keep it there for a certain period mentioned below.

**IMPORTANT :**

- Shown below are the standard preheating times for various temperatures. This operation, however, is not required, when the engine is warmed up.

| Ambient temperature                                                                            | Preheating time    |
|------------------------------------------------------------------------------------------------|--------------------|
| Above $10^{\circ}\text{C}$ ( $50^{\circ}\text{F}$ )                                            | NO NEED            |
| $10^{\circ}\text{C}$ ( $50^{\circ}\text{F}$ ) to $-5^{\circ}\text{C}$ ( $23^{\circ}\text{F}$ ) | Approx. 5 seconds  |
| *Below $-5^{\circ}\text{C}$ ( $23^{\circ}\text{F}$ )                                           | Approx. 10 seconds |
| Limit of continuous use                                                                        | 20 seconds         |

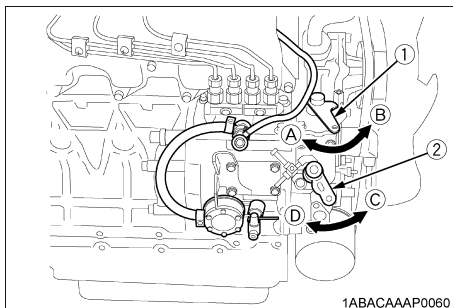
6. Turn the key to the "STARTING" position and the engine should start. (If the engine fails to start after 10 seconds, turn off the key for 5 to 30 seconds. Then repeat steps (5) and (6).)

**IMPORTANT :**

- Do not allow the starter motor to run continuously for more than 20 seconds.
- Be sure to warm up the engine, not only in winter, but also in warmer seasons. An insufficiently warmed-up engine can shorten its service life.
- When there is fear of temperature dropping below  $-15^{\circ}\text{C}$  ( $5^{\circ}\text{F}$ ) detach the battery from the machine, and keep it indoors in a safe area, to be reinstalled just before the next operation.

## STOPPING THE ENGINE

1. Return the speed control lever to low idle, and run the engine under idling conditions.
2. Set the engine stop lever to the "STOP" position.
3. With the starter switch placed to the "SWITCHED OFF" position, remove the key. (Be sure to return the engine stop lever to the "START" position to be ready for the next start.)



(1) Engine stop lever  
(2) Speed control lever

(A) "STOP"  
(B) "START"  
(C) "IDLING"  
(D) "OPERATION"

### IMPORTANT :

- If equipped with a turbo-charger, allow the engine to idle for 5 minutes before shutting it off after a full load operation. Failure to do so may lead to turbo-charger trouble.

## CHECKS DURING OPERATION

While running, make the following checks to see that all parts are working correctly.

### ■ Radiator Cooling water(Coolant)



### WARNING

To avoid personal injury:

- Do not remove radiator cap until coolant temperature is well below its boiling point. Then loosen cap slightly to the stop position, to relieve any pressure, before removing cap completely.

If the coolant temperature warning lamp lights up or if steam or coolant does not stop squirting from the radiator overflow pipe, turn off the load and **keep the engine idling (COOLING-DOWN) for at least 5 minutes** to let it cool down gradually. Then stop the engine and take the following inspection and servicing.

1. Check to see if the coolant runs short or if there is any coolant leak;
2. Check to see if there is any obstacle around the cooling air inlet or outlet;
3. Check to see if there is any dirt or dust between radiator fins and tube;
4. Check to see if the fan belt is too loose; and
5. Check to see if radiator water pipe is clogged.

### ■ Oil pressure lamp

The lamp lights up to warn the operator that the engine oil pressure has dropped below the prescribed level. If this should happen during operation or should not go off even after the engine is accelerated more than 1000rpm, immediately stop the engine and check the following:

1. Engine oil level (See "ENGINE OIL" in "PERIODIC SERVICE" section.)

## ■ Fuel

**CAUTION**

To avoid personal injury:

- Fluid escaping from pinholes may be invisible. Do not use hands to search for suspected leaks; Use a piece of cardboard or wood, instead. If injured by escaping fluid, see a medical doctor at once. This fluid can produce gangrene or a severe allergic reaction.
- Check any leaks from fuel pipes or fuel injection pipes. Use eye protection when checking for leaks.

Be careful not to empty the fuel tank. Otherwise air may enter the fuel system, requiring fuel system bleeding. (See "FUEL" in "PERIODIC SERVICE" section.)

## ■ Color of exhaust

While the engine is run within the rated output range:

- The color of exhaust remains colorless.
- If the output slightly exceeds the rated level, exhaust may become a little colored with the output level kept constant.
- If the engine is run continuously with dark exhaust emission, it may lead to trouble with the engine.

## ■ Immediately stop the engine if;

- The engine suddenly slows down or accelerates.
- Unusual noises are suddenly heard.
- Exhaust fumes suddenly become very dark.
- The oil pressure lamp or the water temperature alarm lamp lights up.

**REVERSED ENGINE REVOLUTION AND REMEDIES****CAUTION**

To avoid personal injury:

- Reversed engine operation can make the machine reverse and run it backwards. It may lead to serious trouble.
- Reversed engine operation may make exhaust gas gush out into the intake side and ignite the air cleaner; It could catch fire.

Reversed engine revolution must be stopped immediately since engine oil circulation is cut quickly, leading to serious trouble.

## ■ How to tell when the engine starts running backwards

1. Lubricating oil pressure drops sharply. Oil pressure warning light, if used, will light.
2. Since the intake and exhaust sides are reversed, the sound of the engine changes, and exhaust gas will come out of the air cleaner.
3. A louder knocking sound will be heard when the engine starts running backwards.

## ■ Remedies

1. Immediately set the engine stop lever to the "STOP" position to stop the engine.
2. After stopping the engine, check the air cleaner, intake rubber tube and other parts, and then replace parts as needed.

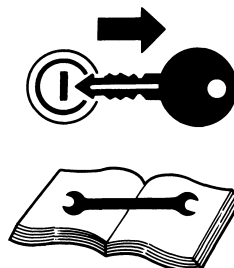
# MAINTENANCE



## CAUTION

To avoid personal injury:

- Be sure to conduct daily checks, periodic maintenance, refueling or cleaning on a level surface with the engine shut off and remove the key.
- Before allowing other people to use your engine, explain how to operate, and have them read this manual before operation.
- When cleaning any parts, do not use gasoline but use regular cleanser.
- Always use proper tools, that are in good condition. Make sure you understand how to use them, before performing any service work.
- When installing, be sure to tighten all bolts lest they should be loose. Tighten the bolts by the specified torque.
- Do not put any tools on the battery, or battery terminals may short out. Severe burns or fire could result. Detach the battery from the engine before maintenance.
- Do not touch muffler or exhaust pipes while they are hot; Severe burns could result.



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# SERVICE INTERVALS

Observe the following for service and maintenance.

| Interval                                   | Item                                                           | Ref. page |    |   |
|--------------------------------------------|----------------------------------------------------------------|-----------|----|---|
| Every 50 hours                             | Check of fuel pipes and clamp bands                            | 14        |    | @ |
| See NOTE                                   | Change of engine oil (depending on the oil pan)                | 15 to 17  | ☉  |   |
| Every 100 hours                            | Cleaning of air cleaner element                                | 21        | *1 | @ |
|                                            | Cleaning of fuel filter                                        | 14        |    |   |
|                                            | Check of fan belt tightness                                    | 22        |    |   |
|                                            | Draining water separator                                       | -         |    |   |
| Every 200 hours                            | Replacement of oil filter cartridge (depending on the oil pan) | 17        | ☉  |   |
|                                            | Check of intake air line                                       | -         |    | @ |
| Every 200 hours of operation or six months | Check of radiator hoses and clamp bands                        | 19        |    |   |
| Every 400 hours                            | Replacement of fuel filter cartridge                           | 15        |    | @ |
|                                            | Cleaning of water separator                                    | -         |    |   |
| Every 500 hours                            | Removal of sediment in fuel tank                               | -         |    |   |
|                                            | Cleaning of water jacket (radiator interior)                   | 18 to 20  |    |   |
|                                            | Replacement of fan belt                                        | 22        |    |   |
| Every year                                 | Replacement of air cleaner element                             | 21        | *2 | @ |
| Every 800 hours                            | Check of valve clearance                                       | -         | *3 |   |
| Every 1500 hours                           | Check of fuel injection nozzle injection pressure              | -         | *3 | @ |
| Every 3000 hours                           | Check of turbo charger                                         | -         | *3 | @ |
|                                            | Check of injection pump                                        | -         | *3 | @ |
| Every two years                            | Change of radiator coolant (L.L.C.)                            | 18 to 20  |    |   |
|                                            | Replacement of radiator hoses and clamp bands                  | 19        |    |   |
|                                            | Replacement of fuel pipes and clamp bands                      | 14        | *3 | @ |
|                                            | Replacement of intake air line                                 | -         | *4 | @ |

**IMPORTANT :**

- The jobs indicated by ☉ must be done after the first 50 hours of operation.
- \*1 Air cleaner should be cleaned more often in dusty conditions than in normal conditions.
- \*2 After 6 times of cleaning.
- \*3 Consult your local KUBOTA Dealer for this service.
- \*4 Replace only if necessary.
- The items listed above (☉ marked) are registered as emission related critical parts by KUBOTA in the U.S. EPA nonroad emission regulation. As the engine owner, you are responsible for the performance of the required maintenance on the engine according to the above instruction.  
Please see the Warranty Statement in detail.

**NOTE :****● Changing interval of engine oil**

| Models     | *Oil pan depth    |                   |
|------------|-------------------|-------------------|
|            | 124 mm (4.88 in.) | *90 mm (3.54 in.) |
| All models | 200 Hrs           | 150 Hrs           |
| Initial    | 50 Hrs            |                   |

\* 90 mm (3.54 in.) oil pan depth is optional.

(Standard replacement interval)

- American Petroleum Institute (API) classification: above CF-4 grade
- Ambient temperature: below 35° C (95° F)

**NOTE :****Lubricating oil**

With strict emission control regulations now in effect, the CF-4 and CG-4 engine oils have been developed for use with low sulfur fuels, for On-Highway vehicle engines. When a Non-Road engine runs on high sulfur fuel, it is advisable to use a "CF or better" classification engine oil with a high Total Base Number (a minimum TBN of 10 is recommended).

- **Lubricating oil recommended when a low-sulfur or high-sulfur fuel is employed.**

○ : Recommendable X : Not recommendable

| Lubricating oil classification | **Fuel     |             | Remarks        |
|--------------------------------|------------|-------------|----------------|
|                                | Low-sulfur | High-sulfur |                |
| CF                             | ○          | ○           | *TBN $\geq$ 10 |
| CF-4                           | ○          | X           |                |
| CG-4                           | ○          | X           |                |
| CH-4                           | ○          | X           |                |
| CI-4                           | ○          | X           |                |

\* TBN: Total Base Number

**\*\*Fuel**

- Diesel Fuel Specification Type and Sulfur Content % (ppm) used, must be compliant with all applicable emission regulations for the area in which the engine is operated.
- Use of diesel fuel with sulfur content less than 0.10 % (1000 ppm) is strongly recommended.
- If high-sulfur fuel (sulfur content 0.50 % (5000 ppm) to 1.0 % (10000 ppm)) is used as a diesel fuel, change the engine oil and oil filter at shorter intervals. (approximately half).
- DO NOT USE Fuels that have sulfur content greater than 1.0 % (10000 ppm).
- Since KUBOTA diesel engines of less than 56 kW (75 hp) utilize EPA Tier 4 and Interim Tier 4 standards, the use of ultra low sulfur fuel is mandatory for these engines, when operated in US EPA regulated areas. Therefore, please use No.2-D S15 diesel fuel as an alternative to No.2-D, and use No.1-D S15 diesel fuel as an alternative to No.1-D for ambient temperatures below -10 °C (14 °F).  
No.1-D or No.2-D, S15 : Ultra Low Sulfur Diesel (ULSD) 15 ppm or 0.0015 wt. %
- CJ-4 classification oil is intended for use in engines equipped with DPF (Diesel Particulate Filter) and is Not Recommended for use in Kubota E3 specification engines.

- Oil used in the engine should have API classification and Proper SAE Engine Oil according to the ambient temperatures as shown below:

|                              |                            |
|------------------------------|----------------------------|
| Above 25°C (77°F)            | SAE30, SAE10W-30 or 15W-40 |
| -10°C to 25°C (14°F to 77°F) | SAE10W-30 or 15W-40        |
| Below -10°C (14°F)           | SAE10W-30                  |

- Recommended API classification

Refer to the following table for the suitable American Petroleum Institute (API) classification of engine oil according to the engine type (with internal EGR, external EGR or non-EGR) and the Fuel Type Used : (Ultra Low Sulfur or High Sulfur Fuels).

| Fuel type                                                                         | Engine oil classification (API classification)                                                                                                                      |                                                                                                      |
|-----------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
|                                                                                   | Engines with non-EGR<br>Engines with internal EGR                                                                                                                   | Engines with external EGR                                                                            |
| High Sulfur Fuel<br>[0.05 % (500 ppm) ≤<br>Sulfur Content <<br>0.50 % (5000 ppm)] | <b>CF</b><br>(If the "CF-4, CG-4, CH-4 or CI-4" engine oil is used<br>with a high-sulfur fuel, change the engine oil at shorter<br>intervals. (approximately half)) | ---                                                                                                  |
| Ultra Low Sulfur Fuel<br>[Sulfur Content <<br>0.0015 % (15 ppm)]                  | <b>CF, CF-4, CG-4, CH-4 or CI-4</b>                                                                                                                                 | <b>CF or CI-4</b><br>(Class CF-4, CG-4 and CH-4 engine, oils<br>cannot be used on EGR type engines.) |

EGR: Exhaust Gas Re-circulation

# PERIODIC SERVICE

## FUEL

Fuel is flammable and can be dangerous. You should handle fuel with care.



### CAUTION

To avoid personal injury:

- Do not mix gasoline or alcohol with diesel fuel. This mixture can cause an explosion.
- Be careful not to spill fuel during refueling. If fuel should spill, wipe it off at once, or it may cause a fire.
- Do not fail to stop the engine before refueling. Keep the engine away from the fire.
- Be sure to stop the engine while refueling or bleeding and when cleaning or changing fuel filter or fuel pipes. Do not smoke when working around the battery or when refueling.
- Check the fuel systems at a well ventilated and wide place.
- When fuel and lubricant are spilled, refuel after letting the engine cool off.
- Always keep spilled fuel and lubricant away from engine.

### Fuel level check and refueling

1. Check to see that the fuel level is above the lower limit of the fuel level gauge.
2. If the fuel is too low, add fuel to the upper limit. Do not overfill.

| Flash Point,<br>°C<br>(°F) | Water and<br>Sediment,<br>volume<br>% | Carbon<br>Residue on,<br>10 percent<br>Residuam,<br>% | Ash,<br>weight<br>% |
|----------------------------|---------------------------------------|-------------------------------------------------------|---------------------|
| Min                        | Max                                   | Max                                                   | Max                 |
| 52<br>(125)                | 0.05                                  | 0.35                                                  | 0.01                |

| Distillation<br>Temperatures,<br>°C (°F)<br>90%<br>Point |              | Viscosity<br>Kinematic<br>cSt or<br>mm <sup>2</sup> /s at<br>40 °C |     | Viscosity<br>Saybolt,<br>SUS at<br>37.8 °C (100 °F) |      |
|----------------------------------------------------------|--------------|--------------------------------------------------------------------|-----|-----------------------------------------------------|------|
| Min                                                      | Max          | Min                                                                | Max | Min                                                 | Max  |
| 282<br>(540)                                             | 338<br>(640) | 1.9                                                                | 4.1 | 32.6                                                | 40.1 |

| Sulfur,<br>weight<br>% | Copper<br>Strip<br>Corrosion | Cetane<br>Number |
|------------------------|------------------------------|------------------|
| Max                    | Max                          | Min              |
| 0.50                   | No. 3                        | 40               |

- Cetane Rating : The minimum recommended Fuel Cetane Rating is 45. A cetane rating greater than 50 is preferred, especially for ambient temperatures below -20°C (-4°F) or elevations above 1500 m (5000 ft).
- Diesel Fuel Specification Type and Sulfur Content % (ppm) used, must be compliant with all applicable emission regulations for the area in which the engine is operated.
- Use of diesel fuel with sulfur content less than 0.10 % (1000 ppm) is strongly recommended.
- If high-sulfur fuel (sulfur content 0.50 % (5000 ppm) to 1.0 % (10000 ppm)) is used as a diesel fuel, change the engine oil and oil filter at shorter intervals. (approximately half).
- DO NOT USE Fuels that have sulfur content greater than 1.0 % (10000 ppm).
- Diesel fuels specified to EN 590 or ASTM D975 are recommended.
- No.2-D is a distillate fuel of lower volatility for engines in industrial and heavy mobile service. (SAE J313 JUN87)
- Since KUBOTA diesel engines of less than 56 kW (75 hp) utilize EPA Tier 4 and Interim Tier 4 standards, the use of ultra low sulfur fuel is mandatory for these engines, when operated in US EPA regulated areas. Therefore, please use No.2-D S15 diesel fuel as an alternative to No.2-D, and use No.1-D S15 diesel fuel as an alternative to No.1-D for ambient temperatures below -10 °C (14 °F).
  - 1) SAE : Society of Automotive Engineers
  - 2) EN : European Norm
  - 3) ASTM : American Society of Testing and Materials
  - 4) US EPA : United States Environmental Protection Agency
  - 5) No.1-D or No.2-D, S15 : Ultra Low Sulfur Diesel (ULSD) 15 ppm or 0.0015 wt. %

**IMPORTANT :**

- Be sure to use a strainer when filling the fuel tank, or dirt or sand in the fuel may cause trouble in the fuel injection pump.
- For fuel, always use diesel fuel. You are required not to use alternative fuel, because its quality is unknown or it may be inferior in quality. Kerosene, which is very low in cetane rating, adversely affects the engine. Diesel fuel differs in grades depending on the temperature.
- Be careful not to let the fuel tank become empty, or air can enter the fuel system, necessitating bleeding before next engine start.

**■ Air bleeding the fuel system****CAUTION**

To avoid personal injury;

- Do not bleed a hot engine as this could cause fuel to spill onto a hot exhaust manifold creating a danger of fire.

Air bleeding of the fuel system is required if;

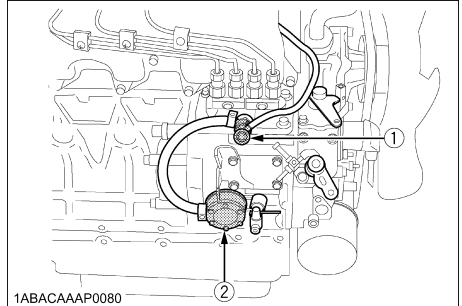
- after the fuel filter and pipes have been detached and refitted;
- after the fuel tank has become empty; or
- before the engine is to be used after a long storage.

**[PROCEDURE (A)] (gravity feed fuel tanks only)**

1. Fill the fuel tank to the fullest extent. Open the fuel filter lever.
2. Open the air vent cock on top of the fuel injection pump.
3. Turn the engine, continue it for about 10 seconds, then stop it, or move the fuel feed pump lever by hand (optional).
4. Close the air vent cock on top of the fuel injection pump.

**IMPORTANT :**

- Always keep the air vent cock on the fuel injection pump closed except when air is vented, or it may cause the engine to stop.

**[GRAVITY FEED SYSTEM]**

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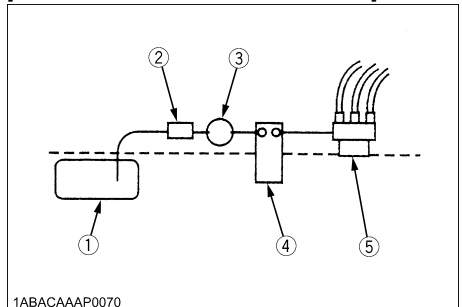
- (1) Air vent cock
- (2) Fuel feed pump

**[PROCEDURE (B)] (fuel tanks lower than injection pump)**

1. For fuel tanks that are lower than the injection pump. The fuel system must be pressurized by the fuel system electric fuel pump.
2. If an electric fuel pump is not used, you must manually actuate the pump by lever to bleed.
3. The primary fuel filter must be on the pressure side of the pump if the fuel tank is lower than the injection pump.
4. To bleed, follow (2) through (4) above.

**IMPORTANT :**

- Tighten air vent plug of the fuel injection pump except when bleeding, or it may stop the engine suddenly.

**[TANK BELOW INJECTION PUMP SYSTEM]**

1ABACAAAP0070

- (1) Fuel tank below injection pump
- (2) Pre-filter
- (3) Electric or Mechanical pump
- (4) Main Filter
- (5) Injection pump

## ■ Checking the fuel pipes



### CAUTION

To avoid personal injury;

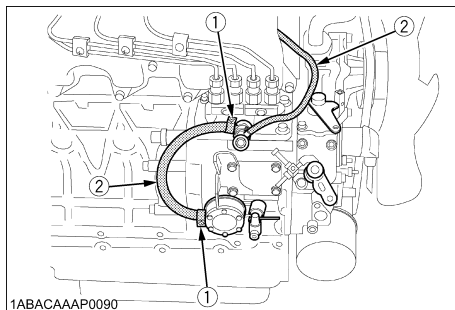
- Check or replace the fuel pipes after stopping the engine. Broken fuel pipes can cause fires.

Check the fuel pipes every 50 hours of operation. When if;

1. If the clamp band is loose, apply oil to the screw of the band, and tighten the band securely.
2. If the fuel pipes, made of rubber, become worn out, replace them and clamp bands every 2 years.
3. If the fuel pipes and clamp bands are found worn or damaged before 2 years' pass, replace or repair them at once.
4. After replacement of the pipes and bands, air-bleed the fuel system.

### IMPORTANT :

- When the fuel pipes are not installed, plug them at both ends with clean cloth or paper to prevent dirt from entering. Dirt in the pipes can cause fuel injection pump malfunction.



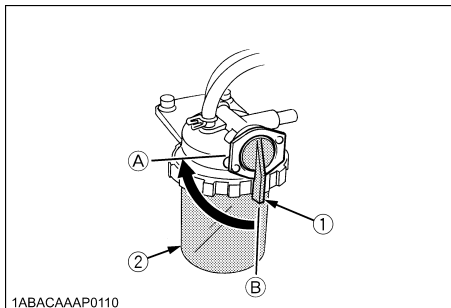
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- (1) Clamp band
- (2) Fuel pipe

## ■ Cleaning the fuel filter pot

Every 100 hours of operation, clean the fuel filter in a clean place to prevent dust intrusion.

1. Close the fuel filter lever.



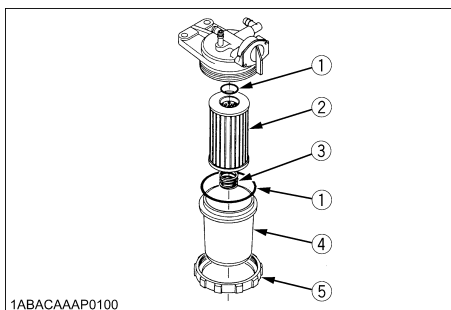
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- (1) Fuel filter lever
  - (2) Fuel filter pot
- (A) "OFF"  
(B) "ON"

2. Remove the top cap, and rinse the inside with diesel fuel.
3. Take out the element, and rinse it with diesel fuel.
4. After cleaning, reinstall the fuel filter, keeping out of dust and dirt.
5. Air-bleed the injection pump.

### IMPORTANT :

- Entrance of dust and dirt can cause a malfunction of the fuel injection pump and the injection nozzle. Wash the fuel filter cup periodically.



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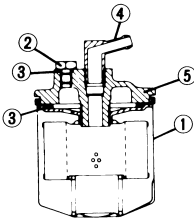
- (1) O ring
- (2) Filter element
- (3) Spring
- (4) Filter bowl
- (5) Screw ring

### ■ Fuel filter cartridge replacement

1. Replace the fuel filter cartridge with a new one every 400 operating hours.
2. Apply fuel oil thinly over the gasket and tighten the cartridge into position by hand-tightening only.
3. Finally, vent the air.

#### IMPORTANT :

- Replace the fuel filter cartridge periodically to prevent wear of the fuel injection pump plunger or the injection nozzle, due to dirt in the fuel.



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- (1) Fuel filter cartridge
- (2) Air vent plug
- (3) O ring
- (4) Pipe joint
- (5) Cover

## ENGINE OIL



### CAUTION

To avoid personal injury:

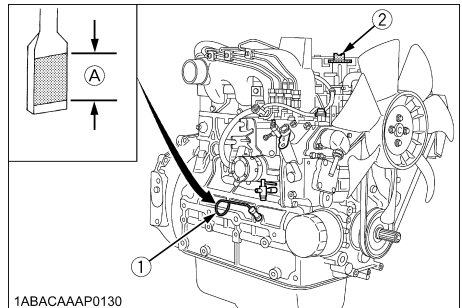
- Be sure to stop the engine before checking and changing the engine oil and the oil filter cartridge.
- Do not touch muffler or exhaust pipes while they are hot; Severe burns could result. Always stop the engine and allow it to cool before conducting inspections, maintenance, or for a cleaning procedure.
- Contact with engine oil can damage your skin. Put on gloves when using engine oil. If you come in contact with engine oil, wash it off immediately.

#### NOTE :

- Be sure to inspect the engine, locating it on a level place. If placed on gradients accurately, oil quantity may not be measured.

### ■ Checking oil level and adding engine oil

1. Check the engine oil level before starting or more than 5 minutes after stopping the engine.
2. Remove the oil level gauge, wipe it clean and reinstall it.
3. Take the oil level gauge out again, and check the oil level.



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- (1) Oil filler plug
- (2) Oil level gauge

[Lower end of oil level gauge]  
(A) Engine oil level within this range is proper.

- If the oil level is too low, remove the oil filler plug, and add new oil to the prescribed level.
- After adding oil, wait more than 5 minutes and check the oil level again. It takes some time for the oil to drain down to the oil pan.

## Engine oil quantity

| Models                                                                                                                   | *Oil pan depth            |                           |
|--------------------------------------------------------------------------------------------------------------------------|---------------------------|---------------------------|
|                                                                                                                          | 124 mm (4.88 in.)         | *90 mm (3.54 in.)         |
| D1503-M-E3<br>D1703-M-E3<br>D1803-M-E3<br>D1703-M-E3BG                                                                   | 7.0 L<br>(1.85 U.S.gals.) | 5.6 L<br>(1.48 U.S.gals.) |
| V2003-M-E3<br>V2203-M-E3<br>V2403-M-E3<br>V2403-M-T-E3<br>V2003-M-E3BG<br>V2003-M-T-E3BG<br>V2203-M-E3BG<br>V2403-M-E3BG | 9.5 L<br>(2.51 U.S.gals.) | 7.6 L<br>(2.01 U.S.gals.) |

\* 90 mm (3.54 in.) oil pan depth is optional.

Oil quantities shown are for standard oil pans.

**IMPORTANT :**

- Engine oil should be MIL-L-2104C or have properties of API classification CF or higher.  
Change the type of engine oil according to the ambient temperature.

|                                 |                                 |
|---------------------------------|---------------------------------|
| Above 25°C (77°F)               | SAE30 or SAE10W-30<br>SAE15W-40 |
| -10°C to 25°C<br>(14°F to 77°F) | SAE10W-30 or SAE15W-40          |
| Below -10°C (32°F)              | SAE10W-30                       |

- When using oil of different brands from the previous one, be sure to drain all the previous oil before adding the new engine oil.

## ■ Changing engine oil

**CAUTION**

To avoid personal injury:

- Be sure to stop the engine before draining engine oil.
- When draining engine oil, place some container underneath the engine and dispose it according to local regulations.
- Do not drain oil after running the engine. Allow engine to cool down sufficiently.

- Change oil after the initial 50 hours of operation and every 200 hours thereafter. (See table below.)

**NOTE :**

- Changing interval thereafter

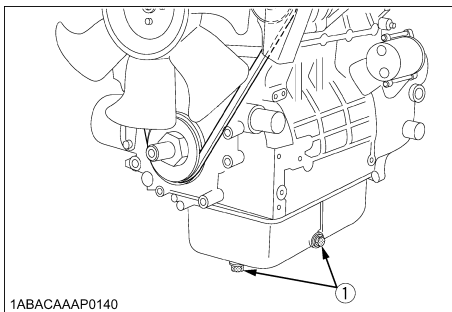
| Models     | *Oil pan depth    |                   |
|------------|-------------------|-------------------|
|            | 124 mm (4.88 in.) | *90 mm (3.54 in.) |
| All models | 200 Hrs           | 150 Hrs           |
| Initial    | 50 Hrs            |                   |

\* 90 mm (3.54 in) oil pan depth is optional.

(Standard replacement interval)

- API classification : above CF
- Ambient temperature : below 35°C (95°F)

- Remove the drain plug at the bottom of the engine, and drain all the old oil. Drain oil will drain easier when the oil is warm.



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(1) Oil drain plug

- Add new engine oil up to the upper limit of the oil level gauge.

## ■ Replacing the oil filter cartridge



### CAUTION

To avoid personal injury:

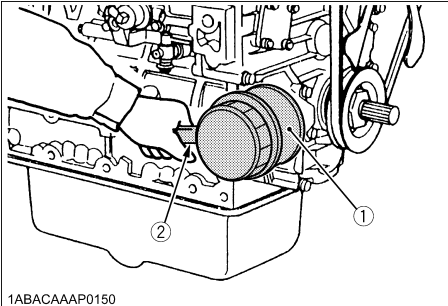
- Be sure to stop the engine before changing the oil filter cartridge.
- Allow engine to cool down sufficiently, oil can be hot and cause burns.

1. Replace the oil filter cartridge. Oil filter cartridge should be replaced, as following operation hours.

| Models     | *Oil pan depth    |                   |
|------------|-------------------|-------------------|
|            | 124 mm (4.88 in.) | *90 mm (3.54 in.) |
| All models | 200 Hrs           | 150 Hrs           |
| Initial    | 50 Hrs            |                   |

\* 90 mm (3.54 in.) oil pan depth is optional.

2. Remove the old oil filter cartridge with a filter wrench.
3. Apply a film of oil to the gasket for the new cartridge.
4. Screw in the cartridge by hand. When the gasket contacts the seal surface, tighten the cartridge enough by hand. Because, if you tighten the cartridge with a wrench, it will be tightened too much.



- (1) Oil filter cartridge  
 (2) Remove with a filter wrench  
 (Tighten with your hand)

5. After the new cartridge has been replaced, the engine oil level normally decreases a little. Thus, run the engine for a while and check for oil leaks through the seal before checking the engine oil level. Add oil if necessary.

### NOTE :

- Wipe off any oil sticking to the machine completely.

## RADIATOR

Coolant will last for one day's work if filled all the way up before operation start. Make it a rule to check the coolant level before every operation.



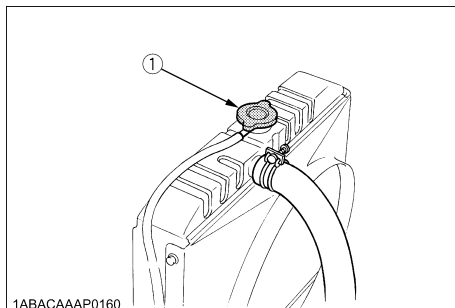
### WARNING

To avoid personal injury:

- Do not stop the engine suddenly, stop it after about 5 minutes of unloaded idling.
- Work only after letting the engine and radiator cool off completely (more than 30 minutes after it has been stopped).
- Do not remove the radiator cap while coolant is hot. When cool to the touch, rotate cap to the first stop to allow excess pressure to escape. Then remove cap completely. If overheats should occur, steam may gush out from the radiator or recovery tank; Severe burns could result.

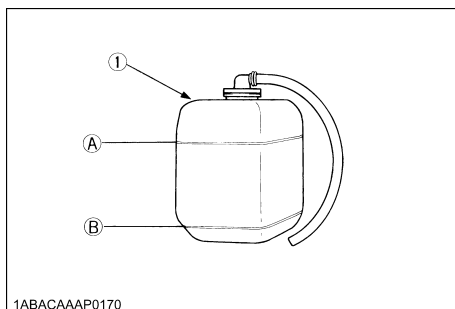
# ■Checking coolant level, adding coolant

1. Remove the radiator cap, after the engine has completely cooled, and check to see that coolant reaches the supply port.



(1) Radiator pressure cap

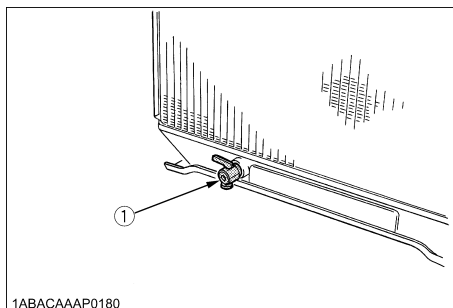
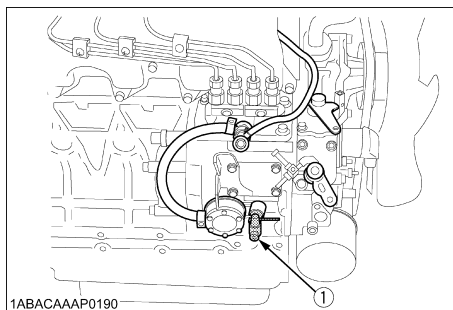
2. If the radiator is provided with a recovery tank, check the coolant level of the recovery tank. When it is between the "FULL" and "LOW" marks, the coolant will last for one day's work.



(1) Recovery tank

(A) "FULL"  
(B) "LOW"

3. When the coolant level drops due to evaporation, add water only up to the full level.
4. Check to see that two drain cocks; one is at the crankcase side and the other is at the lower part of the radiator as figures below.



(1) Coolant drain cock

## **IMPORTANT :**

- If the radiator cap has to be removed, follow the caution and securely retighten the cap.
- If coolant should be leak, consult your local KUBOTA dealer.
- Make sure that muddy or sea water does not enter the radiator.
- Use clean, fresh water and 50% anti-freeze to fill the recovery tank.
- Do not refill recovery tank with coolant over the "FULL" level mark.
- Be sure to close the radiator cap securely. If the cap is loose or improperly closed, coolant may leak out and decrease quickly.

### ■ Changing coolant

1. To drain coolant, always open both drain cocks and simultaneously open the radiator cap as well. With the radiator cap kept closed, a complete drain of water is impossible.
2. Remove the overflow pipe of the radiator pressure cap to drain the recovery tank.
3. Prescribed coolant volume (U.S.gallons)

| Models                                                                     | Quantity               |
|----------------------------------------------------------------------------|------------------------|
| D1503-M-E3<br>D1703-M-E3<br>D1703-M-E3BG                                   | 5.5 L (1.45 U.S.gals.) |
| D1803-M-E3                                                                 | 5.8 L (1.53 U.S.gals.) |
| V2003-M-E3<br>V2203-M-E3<br>V2003-M-E3BG<br>V2003-M-T-E3BG<br>V2203-M-E3BG | 8.1 L (2.14 U.S.gals.) |
| V2403-M-E3<br>V2403-M-T-E3<br>V2403-M-E3BG                                 | 8.4 L (2.22 U.S.gals.) |

#### NOTE :

- Coolant quantities shown are for standard radiators.

4. An improperly tightened radiator cap or a gap between the cap and the seat quickens loss of coolant.
5. Coolant (Radiator cleaner and anti-freeze)

| Season      | Coolant                                                                     |
|-------------|-----------------------------------------------------------------------------|
| All seasons | Pure water and anti-freeze<br>(See "Anti-freeze" in<br>"RADIATOR" section.) |

### ■ Remedies for quick decrease of coolant

1. Check any dust and dirt between the radiator fins and tube. If any, remove them from the fins and the tube.
2. Check the tightness of the fan belt. If loose, tighten it securely.
3. Check the internal blockage in the radiator hose. If scale forms in the hose, clean with the scale inhibitor or its equivalent.

### ■ Checking radiator hoses and clamp bands



#### CAUTION

To avoid personal injury:

- Be sure to check radiator hoses and clamp bands periodically. If radiator hose is damaged or coolant leaks, overheats or severe burns could occur.

Check to see if radiator hoses are properly fixed every 200 hours of operation or 6 months, whichever comes first.

1. If hose clamps are loose or water leaks, tighten hose clamp securely.
  2. Replace hoses and tighten hose clamps securely, if radiator hoses are swollen, hardened or cracked.
- Replace hoses and hose clamps every 2 years or earlier, if checked and found that hoses are swollen, hardened or cracked.

### ■ Precaution at overheating

The event that the coolant temperature is nearly or more than the boiling point is called "OVERHEATING".

While running, make the following checks to see that all parts are working correctly. **If anything is unusual, inspect it, referring to the relevant description in "MAINTENANCE" and "PERIODIC SERVICE" section.**

#### ◆ Coolant

If the coolant temperature warning lamp lights up or if steam or coolant does not stop squirting from the radiator overflow pipe, turn off the load and **keep the engine idling (COOLING-DOWN) for at least 5 minutes** to let it cool down gradually. Then stop the engine and take the following inspection and servicing.

1. Check to see if the coolant runs short or if there is any coolant leak;
2. Check to see if there is any obstacle around the cooling air inlet or outlet;
3. Check to see if there is any dirt or dust between radiator fins and tube;
4. Check to see if the fan belt is too loose; and
5. Check to see if radiator water pipe is clogged.

### ■ Cleaning radiator core (outside)

If dust is between the fin and tube, wash it away with running water.

#### IMPORTANT :

- Do not clean radiator with firm tools such as spatulas or screwdrivers. They may damage specified fin or tube. It can cause coolant leaks or decrease cooling performance.

### ■Cleaning the radiator (inside)

1. Clean up the coolant line inside in the following cases.
  - As per the SERVICE INTERVALS list.
  - When changing the coolant.
2. Use a **radiator cleaning agent**. This helps wash away scale deposits.

### ■Anti-freeze



## CAUTION

To avoid personal injury:

- When using anti-freeze, put on some protection such as rubber gloves (Anti-freeze contains poison.).
- If should drink anti-freeze, throw up at once and take medical attention.
- When anti-freeze comes in contact with the skin or clothing, wash it off immediately.
- Do not mix different types of anti-freeze. The mixture can produce chemical reaction causing harmful substances.
- Anti-freeze is extremely flammable and explosive under certain conditions. Keep fire and children away from anti-freeze.
- When draining fluids from the engine, place some container underneath the engine body.
- Do not pour waste onto the grounds, down a drain, or into any water source.
- Also, observe the relevant environmental protection regulations when disposing of anti-freeze.

Always use a 50/50 mix of long-life coolant and clean soft water in KUBOTA engines.

Contact KUBOTA concerning coolant for extreme conditions.

1. Long-life coolant (hereafter LLC) comes in several types. Use ethylene glycol (EG) type for this engine.
2. Before employing LLC-mixed cooling water, flush the radiator with fresh water. Repeat this procedure 2 or 3 times to clean up the radiator and engine block from inside.
3. Mixing the LLC  
Premix 50% LLC with 50% clean soft water. When mixing, stir it up well, and then fill into the radiator.
4. The procedure for the mixing of water and anti-freeze differs according to the make of the anti-freeze. Refer to SAE J1034 standard, more specifically also to SAE J814c.

| Vol %<br>Anti-freeze | Freezing Point |     | Boiling Point * |     |
|----------------------|----------------|-----|-----------------|-----|
|                      | °C             | °F  | °C              | °F  |
| 50                   | -37            | -34 | 108             | 226 |

\*At 1.013 x 10<sup>5</sup>Pa (760 mmHg) pressure (atmospheric). A higher boiling point is obtained by using a radiator pressure cap which permits the development of pressure within the cooling system.

5. Adding the LLC
  - (1) Add only water if the coolant level reduces in the cooling system by evaporation.
  - (2) If there is a coolant leak, add the LLC of the same manufacturer and type in the same coolant percentage.

\*Never add any long-life coolant of different manufacturer. (Different brands may have different additive components, and the engine may fail to perform as specified.)
6. When the LLC is mixed, do not employ any radiator cleaning agent. The LLC contains anti-corrosive agent. If mixed with the cleaning agent, sludge may build up, adversely affecting the engine parts.
7. Kubota's genuine long-life coolant has a service life of 2 years. Be sure to change the coolant every 2 years.

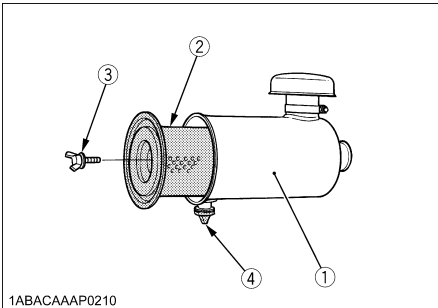
#### NOTE :

- The above data represents industry standards that necessitate minimum glycol content in the concentrated anti-freeze.

## AIR CLEANER

Since the air cleaner employed on this engine is a dry type, never apply oil to it.

1. Open the evacuator valve once a week under ordinary conditions - or daily when used in a dusty place. This will get rid of large particles of dust and dirt.
2. Wipe the inside air cleaner clean with cloth if it is dirty or wet.
3. Avoid touching the element except when cleaning.
4. When dry dust adheres to the element, blow compressed air from the inside turning the element. Pressure of compressed air must be under 205 kPa (2.1 kgf/cm<sup>2</sup>, 30 psi).
5. Replace the element every year or every 6 cleanings.



- (1) Air cleaner body  
(2) Element  
(3) Wing bolt  
(4) Evacuator valve

### IMPORTANT :

- Make sure the wing bolt for the element is tight enough. If it is loose, dust and dirt may be sucked in, wearing down the cylinder liner and piston ring earlier and thereby resulting in poor power output.
- Do not overservice the air cleaner element. Overservicing may cause dirt to enter the engine causing premature wear. Use the dust indicator as a guide on when to service.

### ■ Evacuator valve

Open the evacuator valve once a week under ordinary conditions - or daily when used in a dusty place - to get rid of large particles of dust and dirt.

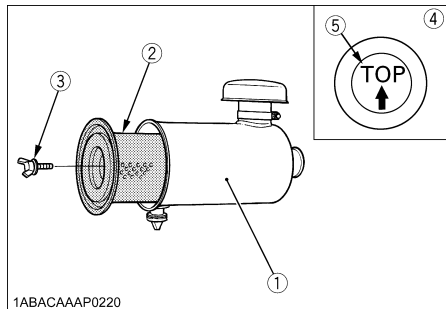
### ■ For the air cleaner with a dust cup (optional)

Remove and clean out the dust cup before it becomes half full with dust; usually once a week, or even every day if the working surroundings are dusty.

Install the air cleaner dust cup with "TOP" indicated on the rear of the cup in the up position. (However, it may be installed in either direction when the cover is placed at the lower part.)

### IMPORTANT :

- If the dust cup is mounted incorrectly, dust or dirt does not collect in the cup, and direct attachments of the dust to the element will cause its lifetime to shorten to a great extent.

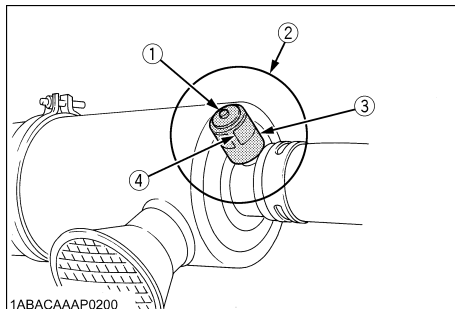


- (1) Air cleaner body  
(2) Element  
(3) Wing bolt  
(4) Dust cup  
(5) "TOP" mark

### ■ Dust indicator (optional)

If the red signal on the dust indicator attached to the air cleaner is visible, the air cleaner has reached the service level.

Clean the element immediately, and reset the signal with the "RESET" button.



- (1) "RESET" button
- (2) Dust indicator
- (3) Service level
- (4) Signal

## ELECTRIC WIRING



### CAUTION

To avoid personal injury:

◆ Shorting of electric cable or wiring may cause a fire.

- Check to see if electric cables and wiring are swollen, hardened or cracked.
- Keep dust and water away from all power connections.
- Loose wiring terminal parts, make bad connections. Be sure to repair them before starting the engine.

Damaged wiring reduces the capacity of electrical parts. Change or repair damaged wiring immediately.

## FAN BELT

### ■ Adjusting Fan Belt Tension



### CAUTION

To avoid personal injury:

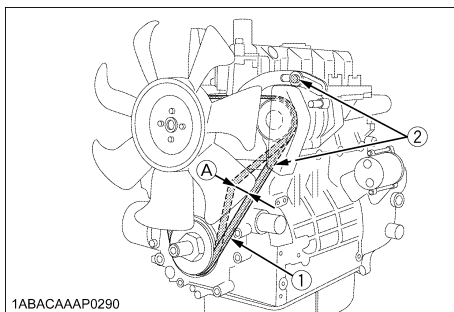
- Be sure to stop the engine and remove the key before checking the belt tension.
- Be sure to reinstall the detached safety shield after maintenance or checking.

|                         |                                                                                                          |
|-------------------------|----------------------------------------------------------------------------------------------------------|
| Proper fan belt tension | A deflection of between 7 to 9 mm (0.28 to 0.35 in.) when the belt is pressed in the middle of the span. |
|-------------------------|----------------------------------------------------------------------------------------------------------|

1. Stop the engine and remove the key.
2. Apply moderate thumb pressure to belt between the pulleys.
3. If tension is incorrect, loosen the alternator mounting bolts and, using a lever placed between the alternator and the engine block, pull the alternator out until the deflection of the belt falls within acceptable limits.
4. Replace fan belt if it is damaged.

#### IMPORTANT :

- If belt is loosen or damaged and the fan is damaged, it could result in overheats or insufficient charging. Correct or replace belt.



- (1) Fan belt
- (2) Bolt and nut
- (A) 7 to 9 mm (0.28 to 0.35 in.) (under load of 10 kgf (22.1 lbs))

# CARRIAGE AND STORAGE

## CARRIAGE



### CAUTION

To avoid personal injury:

- Fix the engine securely not to fall during operation.
- Do not stand near or under the engine while carrying it.
- The engine is heavy. In handling it, be very alert not to get your hands and body caught in.

1. Use carrier such as crane when carrying the engine, or hurt your waist and yourself. Support the engine securely with rope not to fall while carrying it.
2. When lifting the engine, put the hook securely to metal fittings attached to the engine. Use strong hook and fittings enough to hang the engine.

## STORAGE



### CAUTION

To avoid personal injury:

- Do not clean the machine with engine running.
- To avoid the danger of exhaust fume poisoning, do not operate the engine in a closed building without proper ventilation.
- When storing the engine just after running, let the engine cool off.

Before storing the engine for more than a few months, remove any dirt on the machine, and:

1. Drain the coolant in the radiator. Open the cock at the bottom of the radiator, and remove the pressure cap to drain water completely. Leave the cock open. Hang a note written "No water" on the pressure cap. Since water may freeze when the temperature drops below 0°C (32°F), it is very important that no water is left in the machine.

#### NOTE :

- When using anti-freeze, it is not necessary to take step (1) above.
2. Remove dirty engine oil, fill with new oil and run the engine for about 5 minutes to let the oil penetrate to all the parts.
  3. Check all the bolts and nuts, and tighten if necessary.
  4. Remove the battery from the engine, adjust the electrolyte level, and recharge it. Store the battery in a dry and dark place.
  5. When the engine is not used for a long period of time, run it for about 5 minutes under no load every 2 to 3 months to keep it free from rust. If the engine is stored without any running, moisture in the air may condense into dew over the sliding parts of the engine, resulting in rust there.
  6. If you forget to run the engine for longer than 5 to 6 months, apply enough engine oil to the valve guide and valve stem seal and make sure the valve works smoothly before starting the engine.
  7. Store the engine in a flat place and remove the key from engine.
  8. Do not store the engine in a place where has flammable materials such as dry grass or straw.
  9. When covering the engine for storage, let engine and muffler cool off completely.
  10. Operate the engine after checking and repairing damaged wirings or pipes, and clearing flammable materials carried by mouse.

# TROUBLESHOOTING

If the engine does not function properly, use the following chart to identify and correct the cause.

## ■ When it is difficult to start the engine

| Cause                                                            | Countermeasures                                                                                                                                                                                                                                                                                                                                                                                            |
|------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fuel is thick and doesn't flow.                                  | <ul style="list-style-type: none"> <li>* Check the fuel tank and fuel filter.</li> <li>* Remove water, dirt and other impurities.</li> <li>* As all fuel will be filtered by the filter, if there should be water or other foreign matters on the filter, clean the filter with kerosene.</li> </ul>                                                                                                       |
| Air or water mixed in fuel system                                | <ul style="list-style-type: none"> <li>* If air is in the fuel filter or injection lines, the fuel pump will not work properly.</li> <li>* To attain proper fuel injection pressure, check carefully for loosened fuel line coupling, loose cap nut, etc.</li> <li>* Loosen joint bolt stop fuel filter and air vent screws of fuel injection pump to eliminate all the air in the fuel system.</li> </ul> |
| Engine oil becomes thick in cold weather and engine cranks slow. | <ul style="list-style-type: none"> <li>* Change grade of oil according to the weather (temperature.)</li> </ul>                                                                                                                                                                                                                                                                                            |
| Battery is discharged and the engine will not crank.             | <ul style="list-style-type: none"> <li>* Charge battery.</li> <li>* In winter, always remove battery from machine, charge fully and keep indoors. Install in machine at time of use.</li> </ul>                                                                                                                                                                                                            |

## ■ When output is insufficient

| Cause                       | Countermeasures                                                                                                                                                                                                                                            |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fuel is insufficient.       | <ul style="list-style-type: none"> <li>* Check fuel system.</li> </ul>                                                                                                                                                                                     |
| Overheating of moving parts | <ul style="list-style-type: none"> <li>* Check lubricating oil system.</li> <li>* Check to see if lubricating oil filter is working properly.</li> <li>* Filter element deposited with impurities would cause poor lubrication. Change element.</li> </ul> |
| Air cleaner is dirty        | <ul style="list-style-type: none"> <li>* Clean the element every 100 hours of operation.</li> </ul>                                                                                                                                                        |
| Injection pump wear         | <ul style="list-style-type: none"> <li>* Do not use poor quality fuel as it will cause wear of the pump. Only use No. 2-D diesel fuel. (See "FUEL" in "PERIODIC SERVICE" Section)</li> </ul>                                                               |

## ■ When engine suddenly stops

| Cause                                                                                   | Countermeasures                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lack of fuel                                                                            | <ul style="list-style-type: none"> <li>* Check the fuel tank and refill the fuel, if necessary.</li> <li>* Also check the fuel system for air or leaks.</li> </ul>                                                                |
| Bad nozzle                                                                              | <ul style="list-style-type: none"> <li>* If necessary, replace with a new nozzle.</li> </ul>                                                                                                                                      |
| Moving parts are overheated due to shortage of lubrication oil or improper lubrication. | <ul style="list-style-type: none"> <li>* Check amount of engine oil with oil level gauge.</li> <li>* Check lubricating oil system.</li> <li>* At every 2 times of oil change, oil filter cartridge should be replaced.</li> </ul> |

## ■ When color of exhaust is especially bad

| Cause                              | Countermeasures                                                                                                      |
|------------------------------------|----------------------------------------------------------------------------------------------------------------------|
| Fuel is of extremely poor quality. | <ul style="list-style-type: none"> <li>* Select good quality fuel.</li> <li>Use No. 2-D diesel fuel only.</li> </ul> |
| Nozzle is bad.                     | <ul style="list-style-type: none"> <li>* If necessary, replace with new nozzle.</li> </ul>                           |

## ■ When engine must be stopped immediately

| Cause                                 | Countermeasures                                                                                                                                                                                                                        |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Color of exhaust suddenly turns dark. | <ul style="list-style-type: none"> <li>* Check the fuel injection system, especially the fuel injection nozzle.</li> </ul>                                                                                                             |
| Bearing parts are overheated.         | <ul style="list-style-type: none"> <li>* Check the lubricating system.</li> </ul>                                                                                                                                                      |
| Oil lamp lights up during operation.  | <ul style="list-style-type: none"> <li>* Check the lubricating system.</li> <li>* Check the function of the relieve valve in the lubricating system.</li> <li>* Check pressure switch.</li> <li>* Check filter base gasket.</li> </ul> |

### NOTE :

- If the cause of trouble can not be found, contact your KUBOTA dealer.

### ■ When engine overheats

| Cause                                             | Countermeasures                                                        |
|---------------------------------------------------|------------------------------------------------------------------------|
| Engine oil insufficient                           | * Check oil level. Replenish oil as required.                          |
| Fan belt broken or elongated                      | * Change belt or adjust belt tension.                                  |
| Coolant insufficient                              | * Replenish coolant.                                                   |
| Excessive concentration of antifreeze             | * Add water only or change to coolant with the specified mixing ratio. |
| Radiator net or radiator fin clogged with dust    | * Clean net or fin carefully.                                          |
| Inside of radiator or coolant flow route corroded | * Clean or replace radiator and parts.                                 |
| Fan or radiator or radiator cap defective         | * Replace defective parts.                                             |
| Thermostat defective                              | * Check thermostat and replace if necessary.                           |
| Temperature gauge or sensor defective             | * Check temperature with thermometer and replace if necessary.         |
| Overload running                                  | * Reduce load.                                                         |
| Head gasket defective or water leakage            | * Replace parts.                                                       |
| Unsuitable fuel used                              | * Use the specified fuel.                                              |

# SPECIFICATIONS

| Model                                                       | D1503-M-E3                                     | D1703-M-E3                   | D1803-M-E3                                    |
|-------------------------------------------------------------|------------------------------------------------|------------------------------|-----------------------------------------------|
| Type                                                        | Vertical, water-cooled, 4-cycle diesel engine  |                              |                                               |
| Number of cylinders                                         | 3                                              |                              |                                               |
| Bore and stroke<br>mm (in.)                                 | 83 x 92.4<br>(3.27 x 3.64)                     | 87 x 92.4<br>(3.43 x 3.64)   | 87 x 102.4<br>(3.43 x 4.04)                   |
| Total displacement<br>L (cu.in.)                            | 1.499<br>(91.44)                               | 1.647<br>(100.51)            | 1.826<br>(111.43)                             |
| Combustion chamber                                          | Spherical Type (E-TVCS)                        |                              |                                               |
| SAE NET Intermittent kW / rpm<br>H.P. (SAEJ1349) (HP / rpm) | 21.7 / 2800<br>(29.1 / 2800)                   | 24.3 / 2800<br>(32.6 / 2800) | 26.5 / 2700<br>(35.5 / 2700)                  |
| SAE NET Continuous kW / rpm<br>H.P. (SAEJ1349) (HP / rpm)   | 18.8 / 2800<br>(25.2 / 2800)                   | 21.1 / 2800<br>(28.3 / 2800) | 23.0 / 2700<br>(30.8 / 2700)                  |
| Maximum bare speed rpm                                      | 3000                                           |                              | 2900                                          |
| Minimum bare idling speed<br>rpm                            | 750 to 850                                     |                              |                                               |
| Order of firing                                             | 1-2-3                                          |                              |                                               |
| Direction of rotation                                       | Counter-clockwise (viewed from flywheel side)  |                              |                                               |
| Injection pump                                              | Bosch Type mini pump                           |                              |                                               |
| Injection pressure                                          | 13.73 MPa, 1991 psi (140 kgf/cm <sup>2</sup> ) |                              |                                               |
| Injection timing<br>(Before T.D.C.)                         | 0.28 rad<br>(16.25°)                           | 0.30 rad<br>(17.25°)         |                                               |
| Compression ratio                                           | 22.8                                           | 22.0                         | 24.3                                          |
| Fuel                                                        | Diesel Fuel No.2-D                             |                              |                                               |
| Lubricant<br>(API classification)                           | above CF                                       |                              |                                               |
| Dimension mm (in.)<br>(length x width x height)             | 572.1 x 499.0 x 643.0<br>(22.5 x 19.8 x 25.3)  |                              | 575.9 x 499.0 x 684.0<br>(22.7 x 19.8 x 27.0) |
| Dry weight (BB Spec.) kg (lbs.)                             | 148 (326.3)                                    |                              | 151 (332.9)                                   |
| Starting system                                             | Cell starter (with glow plug)                  |                              |                                               |
| Starting motor                                              | 12 V, 1.4 kW                                   |                              | 12 V, 2.0 kW                                  |
| Charging generator                                          | 12 V, 480 W                                    |                              |                                               |
| Recommended battery capacity                                | 12 V, 70 to 80 AH                              |                              | 12 V,<br>100 to 120 AH                        |

**NOTE :**

- Specifications are subject to change without notice.

| Model                                                       | V2003-M-E3                                     | V2203-M-E3                   |
|-------------------------------------------------------------|------------------------------------------------|------------------------------|
| Type                                                        | Vertical, water-cooled, 4-cycle diesel engine  |                              |
| Number of cylinders                                         | 4                                              |                              |
| Bore and stroke<br>mm (in.)                                 | 83 x 92.4<br>(3.27 x 3.64)                     | 87 x 92.4<br>(3.43 x 3.64)   |
| Total displacement<br>L (cu.in.)                            | 1.999<br>(121.94)                              | 2.197<br>(134.07)            |
| Combustion chamber                                          | Spherical Type (E-TVCS)                        |                              |
| SAE NET Intermittent kW / rpm<br>H.P. (SAEJ1349) (HP / rpm) | 29.8 / 2800<br>(39.9 / 2800)                   | 33.1 / 2800<br>(44.4 / 2800) |
| SAE NET Continuous kW / rpm<br>H.P. (SAEJ1349) (HP / rpm)   | 25.9 / 2800<br>(34.7 / 2800)                   | 28.7 / 2800<br>(38.5 / 2800) |
| Maximum bare speed rpm                                      | 3000                                           |                              |
| Minimum bare idling speed<br>rpm                            | 750 to 850                                     |                              |
| Order of firing                                             | 1-3-4-2                                        |                              |
| Direction of rotation                                       | Counter-clockwise (viewed from flywheel side)  |                              |
| Injection pump                                              | Bosch Type mini pump                           |                              |
| Injection pressure                                          | 13.73 MPa, 1991 psi (140 kgf/cm <sup>2</sup> ) |                              |
| Injection timing<br>(Before T.D.C.)                         | 0.30 rad<br>(17.25°)                           |                              |
| Compression ratio                                           | 22.8                                           | 22.0                         |
| Fuel                                                        | Diesel Fuel No.2-D                             |                              |
| Lubricant<br>(API classification)                           | above CF                                       |                              |
| Dimension mm (in.)<br>(length x width x height)             | 667.1 x 499.0 x 633.5<br>(26.3 x 19.8 x 24.9)  |                              |
| Dry weight (BB Spec.) kg (lbs.)                             | 180 (396.9)                                    |                              |
| Starting system                                             | Cell starter (with glow plug)                  |                              |
| Starting motor                                              | 12 V, 1.4 kW                                   |                              |
| Charging generator                                          | 12 V, 480 W                                    |                              |
| Recommended battery capacity                                | 12 V, 100 to 120 AH                            |                              |

**NOTE :**

- Specifications are subject to change without notice.

| Model                                                       | V2403-M-E3                                     | V2403-M-T-E3                                  |
|-------------------------------------------------------------|------------------------------------------------|-----------------------------------------------|
| Type                                                        | Vertical, water-cooled, 4-cycle diesel engine  |                                               |
| Number of cylinders                                         | 4                                              |                                               |
| Bore and stroke<br>mm (in.)                                 | 87 x 102.4<br>(3.43 x 4.04)                    |                                               |
| Total displacement<br>L (cu.in.)                            | 2.434<br>(148.53)                              |                                               |
| Combustion chamber                                          | Spherical Type (E-TVCS)                        |                                               |
| SAE NET Intermittent kW / rpm<br>H.P. (SAEJ1349) (HP / rpm) | 33.9 / 2700<br>(45.4 / 2700)                   | 41.2 / 2700<br>(55.2 / 2700)                  |
| SAE NET Continuous kW / rpm<br>H.P. (SAEJ1349) (HP / rpm)   | 29.4 / 2700<br>(39.4 / 2700)                   | 35.8 / 2700<br>(47.9 / 2700)                  |
| Maximum bare speed rpm                                      | 2900                                           | 2950                                          |
| Minimum bare idling speed<br>rpm                            | 750 to 850                                     | 850 to 950                                    |
| Order of firing                                             | 1-3-4-2                                        |                                               |
| Direction of rotation                                       | Counter-clockwise (viewed from flywheel side)  |                                               |
| Injection pump                                              | Bosch Type mini pump                           |                                               |
| Injection pressure                                          | 13.73 MPa, 1991 psi (140 kgf/cm <sup>2</sup> ) |                                               |
| Injection timing<br>(Before T.D.C.)                         | 0.30 rad<br>(17.25°)                           | 0.16 rad<br>(9.25°)                           |
| Compression ratio                                           | 23.2                                           | 22.5                                          |
| Fuel                                                        | Diesel Fuel No.2-D                             |                                               |
| Lubricant<br>(API classification)                           | above CF                                       |                                               |
| Dimension mm (in.)<br>(length x width x height)             | 670.9 x 499.0 x 684.0<br>(26.4 x 19.8 x 26.9)  | 670.9 x 499.0 x 724.6<br>(26.4 x 19.8 x 28.5) |
| Dry weight (BB Spec.) kg (lbs.)                             | 184.0 (405.7)                                  | 188.0 (414.5)                                 |
| Starting system                                             | Cell starter (with glow plug)                  |                                               |
| Starting motor                                              | 12 V, 2.0 kW                                   |                                               |
| Charging generator                                          | 12 V, 480 W                                    |                                               |
| Recommended battery capacity                                | 12 V, 100 to 120 AH                            |                                               |

**NOTE :**

- Specifications are subject to change without notice.

| Model                                              |            | D1703-M-E3BG                                  | V2003-M-E3BG                                |
|----------------------------------------------------|------------|-----------------------------------------------|---------------------------------------------|
| Type                                               |            | Vertical, water-cooled, 4-cycle diesel engine |                                             |
| Number of cylinders                                |            | 3                                             | 4                                           |
| Bore and stroke<br>mm (in.)                        |            | 87 x 92.4<br>(3.43 x 3.64)                    | 83 x 92.4<br>(3.27 x 3.64)                  |
| Total displacement<br>L (cu.in.)                   |            | 1.647<br>(100.51)                             | 1.999<br>(121.94)                           |
| Combustion chamber                                 |            | Spherical Type (E-TVCS)                       |                                             |
| SAE NET Continuous<br>H.P. (SAEJ1349)              | kW / rpm   | 15.1 / 1800 (20.2 / 1800)                     | 18.2 / 1800 (24.4 / 1800)                   |
|                                                    | (HP / rpm) | 12.8 / 1500 (17.2 / 1500)                     | 15.5 / 1500 (20.8 / 1500)                   |
| SAE NET Standby<br>H.P. (SAEJ1349)                 | kW / rpm   | 18.1 / 1800 (24.3 / 1800)                     | 21.8 / 1800 (29.2 / 1800)                   |
|                                                    | (HP / rpm) | 15.0 / 1500 (20.1 / 1500)                     | 18.1 / 1500 (24.3 / 1500)                   |
| Maximum bare speed<br>rpm                          |            | 1800 / 1500                                   |                                             |
| Order of firing                                    |            | 1-2-3                                         | 1-3-4-2                                     |
| Direction of rotation                              |            | Counter-clockwise (viewed from flywheel side) |                                             |
| Injection pump                                     |            | Bosch Type mini pump                          |                                             |
| Governor                                           |            | Electronic Governor                           |                                             |
| Injection pressure Mpa (kgf/cm <sup>2</sup> , psi) |            | 13.73 (140, 1991)                             |                                             |
| Injection timing (Before T.D.C.)                   |            | 0.27 rad (15.25°)                             |                                             |
| Compression ratio                                  |            | 22.0                                          | 22.8                                        |
| Fuel                                               |            | Diesel Fuel No.2-D (ASTM D975)                |                                             |
| Lubricant (API classification)                     |            | above CF                                      |                                             |
| Dimension<br>(length x width x height) mm (in.)    |            | 608.4 x 490 x 642.8<br>(24.0 x 19.3 x 25.3)   | 700.6 x 490 x 633.3<br>(27.6 x 19.3 x 24.9) |
| Dry weight (BB Spec.)<br>kg (lbs.)                 |            | 164 (361.6)                                   | 195 (430.0)                                 |
| Starting system                                    |            | Cell starter (with glow plug)                 |                                             |
| Starting motor                                     |            | 12 V, 1.4 kW                                  |                                             |
| Charging generator                                 |            | 12 V, 480 W                                   |                                             |
| Recommended battery capacity                       |            | 12 V, 70 to 80 AH,<br>equivalent              | 12 V, 100 to 120 AH,<br>equivalent          |

**NOTE :**

- Flywheel type is SAE clutch No. 7-1/2 or its equivalent.
- Flywheel housing type is SAE No. 4 or its equivalent.
- Continuous will operate at the stated rating continuously and have a 10% overload capability for one hour in 12 hours.
- Standby will operate at the stated full rating for one hour in 12 hours. No overload capacity is specified for this rating.
- Specifications are subject to change without notice.

| Model                                              |            | V2003-M-T-E3BG                                | V2203-M-E3BG               |
|----------------------------------------------------|------------|-----------------------------------------------|----------------------------|
| Type                                               |            | Vertical, water-cooled, 4-cycle diesel engine |                            |
| Number of cylinders                                |            | 4                                             |                            |
| Bore and stroke                                    | mm (in.)   | 83 x 92.4<br>(3.27 x 3.64)                    | 87 x 92.4<br>(3.43 x 3.64) |
| Total displacement                                 | L (cu.in.) | 1.999<br>(121.94)                             | 2.197<br>(134.07)          |
| Combustion chamber                                 |            | Spherical Type (E-TVCS)                       |                            |
| SAE NET Continuous<br>H.P. (SAEJ1349)              | kW / rpm   | 24.5 / 1800 (32.8 / 1800)                     | 20.2 / 1800 (27.1 / 1800)  |
|                                                    | (HP / rpm) | 20.4 / 1500 (27.3 / 1500)                     | 17.2 / 1500 (23.1 / 1500)  |
| SAE NET Standby<br>H.P. (SAEJ1349)                 | kW / rpm   | 27.1 / 1800 (36.3 / 1800)                     | 24.2 / 1800 (32.4 / 1800)  |
|                                                    | (HP / rpm) | 22.5 / 1500 (30.2 / 1500)                     | 20.1 / 1500 (26.9 / 1500)  |
| Maximum bare speed                                 | rpm        | 1800 / 1500                                   |                            |
| Order of firing                                    |            | 1-3-4-2                                       |                            |
| Direction of rotation                              |            | Counter-clockwise (viewed from flywheel side) |                            |
| Injection pump                                     |            | Bosch Type mini pump                          |                            |
| Governor                                           |            | Electronic Governor                           |                            |
| Injection pressure Mpa (kgf/cm <sup>2</sup> , psi) |            | 13.73 (140, 1991)                             |                            |
| Injection timing (Before T.D.C.)                   |            | 0.28 rad (16.25°)                             | 0.27 rad (15.25°)          |
| Compression ratio                                  |            | 21.7                                          | 22.0                       |
| Fuel                                               |            | Diesel Fuel No.2-D (ASTM D975)                |                            |
| Lubricant (API classification)                     |            | above CF                                      |                            |
| Dimension                                          | mm (in.)   | 700.6 x 490 x 674                             | 700.6 x 490 x 633.3        |
| (length x width x height)                          |            | (27.6 x 19.3 x 26.5)                          | (27.6 x 19.3 x 24.9)       |
| Dry weight (BB Spec.)                              | kg (lbs.)  | 208 (458.6)                                   | 195 (430.0)                |
| Starting system                                    |            | Cell starter (with glow plug)                 |                            |
| Starting motor                                     |            | 12 V, 1.4 kW                                  |                            |
| Charging generator                                 |            | 12 V, 480 W                                   |                            |
| Recommended battery capacity                       |            | 12 V, 100 to 120 AH, equivalent               |                            |

**NOTE :**

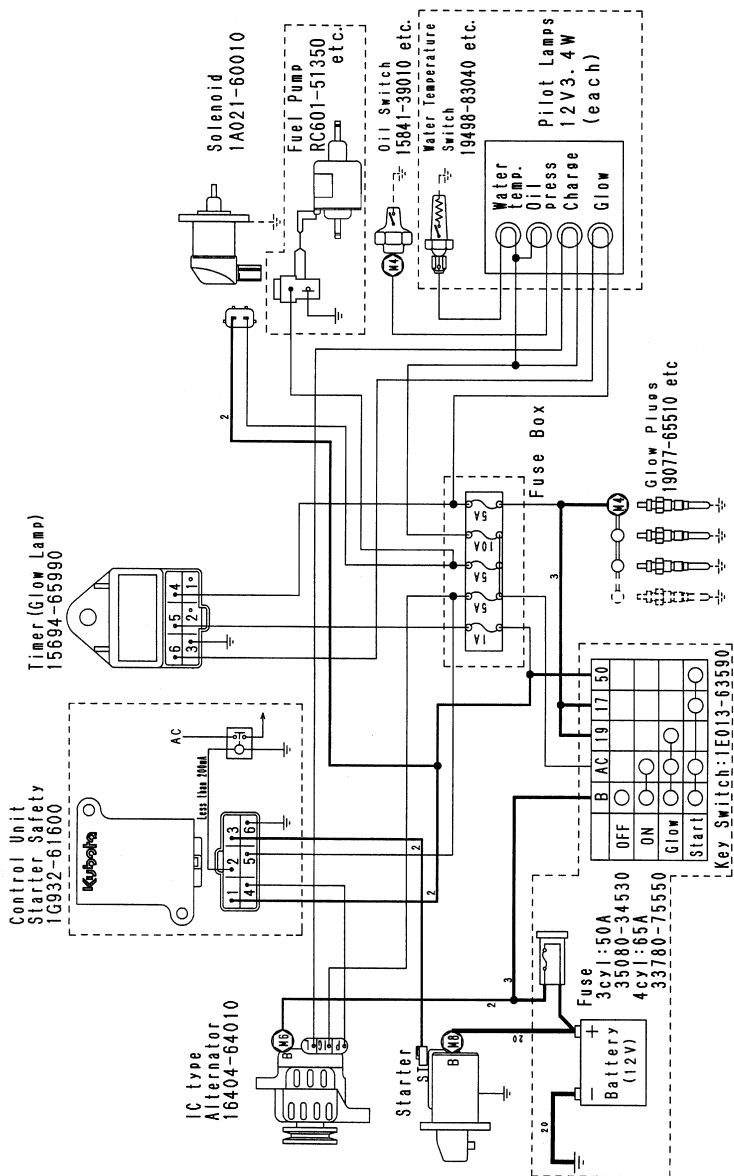
- Flywheel type is SAE clutch No. 7-1/2 or its equivalent.
- Flywheel housing type is SAE No. 4 or its equivalent.
- Continuous will operate at the stated rating continuously and have a 10% overload capability for one hour in 12 hours.
- Standby will operate at the stated full rating for one hour in 12 hours. No overload capacity is specified for this rating.
- Specifications are subject to change without notice.

| Model                                 |                                 | V2403-M-E3BG                                  |
|---------------------------------------|---------------------------------|-----------------------------------------------|
| Type                                  |                                 | Vertical, water-cooled, 4-cycle diesel engine |
| Number of cylinders                   |                                 | 4                                             |
| Bore and stroke                       | mm (in.)                        | 87 x 102.4<br>(3.47 x 4.04)                   |
| Total displacement                    | L (cu.in.)                      | 2.434<br>(148.53)                             |
| Combustion chamber                    |                                 | Spherical Type (E-TVCS)                       |
| SAE NET Continuous<br>H.P. (SAEJ1349) | kW / rpm                        | 22.1 / 1800 (29.6 / 1800)                     |
|                                       | (HP / rpm)                      | 18.8 / 1500 (25.2 / 1500)                     |
| SAE NET Standby<br>H.P. (SAEJ1349)    | kW / rpm                        | 26.5 / 1800 (35.5 / 1800)                     |
|                                       | (HP / rpm)                      | 22.0 / 1500 (29.5 / 1500)                     |
| Maximum bare speed                    | rpm                             | 1800 / 1500                                   |
| Order of firing                       |                                 | 1-3-4-2                                       |
| Direction of rotation                 |                                 | Counter-clockwise (viewed from flywheel side) |
| Injection pump                        |                                 | Bosch Type mini pump                          |
| Governor                              |                                 | Electronic Governor                           |
| Injection pressure                    | Mpa (kgf/cm <sup>2</sup> , psi) | 13.73 (140, 1991)                             |
| Injection timing (Before T.D.C.)      |                                 | 0.27 rad (15.25°)                             |
| Compression ratio                     |                                 | 23.2                                          |
| Fuel                                  |                                 | Diesel Fuel No.2-D (ASTM D975)                |
| Lubricant (API classification)        |                                 | above CF                                      |
| Dimension                             | mm (in.)                        | 700.6 x 490 x 684                             |
| (length x width x height)             |                                 | (27.6 x 19.3 x 26.9)                          |
| Dry weight (BB Spec.)                 | kg (lbs.)                       | 199 (438.7)                                   |
| Starting system                       |                                 | Cell starter (with glow plug)                 |
| Starting motor                        |                                 | 12 V, 2.0 kW                                  |
| Charging generator                    |                                 | 12 V, 480 W                                   |
| Recommended battery capacity          |                                 | 12 V, 100 to 120 AH, equivalent               |

**NOTE :**

- Flywheel type is SAE clutch No. 7-1/2 or its equivalent.
- Flywheel housing type is SAE No. 4 or its equivalent.
- Continuous will operate at the stated rating continuously and have a 10% overload capability for one hour in 12 hours.
- Standby will operate at the stated full rating for one hour in 12 hours. No overload capacity is specified for this rating.
- Specifications are subject to change without notice.

# WIRING DIAGRAMS



1ABACAAAP070A

★ The parts boxed in [ ] are reference, NOT equipped for standard engine spec.

★ Non marked wire dia. is 0.8 ~ 1.25 mm<sup>2</sup>.

1. Use automotive low voltage wire for harness.
2. Use wire and slow-blow fuse to protect the harness.
3. The wire and fuse size shown in this drawing are our recommendation, consider wire length and condition for actual production.
4. Allocate slow-blow fuse close to battery, fuse box close to key switch.
5. Do not directly connect induction device, such as motor, to AC line.
6. Use more than 0.5 mm<sup>2</sup> wire for unspecified wires in this drawing.



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## Accessories

**Anchorage:**

7780 Old Seward Hwy  
Anchorage, AK 99518  
(907) 341-2250 | (877) 341-2250

**Fairbanks:**

1919 Van Horn Road  
Fairbanks, AK 99701  
(907) 458-9049 | (888) 868-9049

**Seattle:**

17660 W. Valley Hwy  
Tukwilla, WA 98188  
(425) 251-6119

**Williston:**

5064 Bennett Loop  
Williston, ND 58801  
(701) 774-5312

Equipment Source, Inc.



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**CAUTION**

GASOLINE IS INVOLVED AND VAPORS WILL SETTLE IN LOW AREAS. WORK IN A WELL VENTILATED SPACE AWAY FROM SPARKS OR OPEN FLAME SUCH AS A PILOT LIGHT. HAVE A CLASS 'B' FIRE EXTINGUISHER CLOSE BY.

**CAUTION****CAUTION**

TO ELIMINATE THE CHANCE OF FIRE OR PERSONAL INJURY, THE FUEL SYSTEM PRESSURE MUST BE RELIEVED BEFORE SERVICING ANY FUEL SYSTEM COMPONENT.

## INSTALLATION INSTRUCTIONS FOR UNIVERSAL ELECTRIC FUEL PUMP

**NOTE:**

- Before replacing any electric fuel pump diagnose the cause of failure.
- Dirt is the major cause of pump failure, so the tank must be cleaned out or dirt may cause the replacement pump to fail as well.
- Exercise care so that no dirt falls into the tank during disassembly or reassembly.

***-For safety reasons, it is recommended an Oil Pressure Safety Switch be installed. This will prevent engine damage and reduce the chance of fire in the case that the engine stops without the ignition switch in the "off" position.***

- Installation of the replacement pump may require some of the mounting or electrical components be reused. Do not discard any parts.
- To prevent fuel pump failure, installation of a high quality fuel filter on the inlet side of the pump, is required.

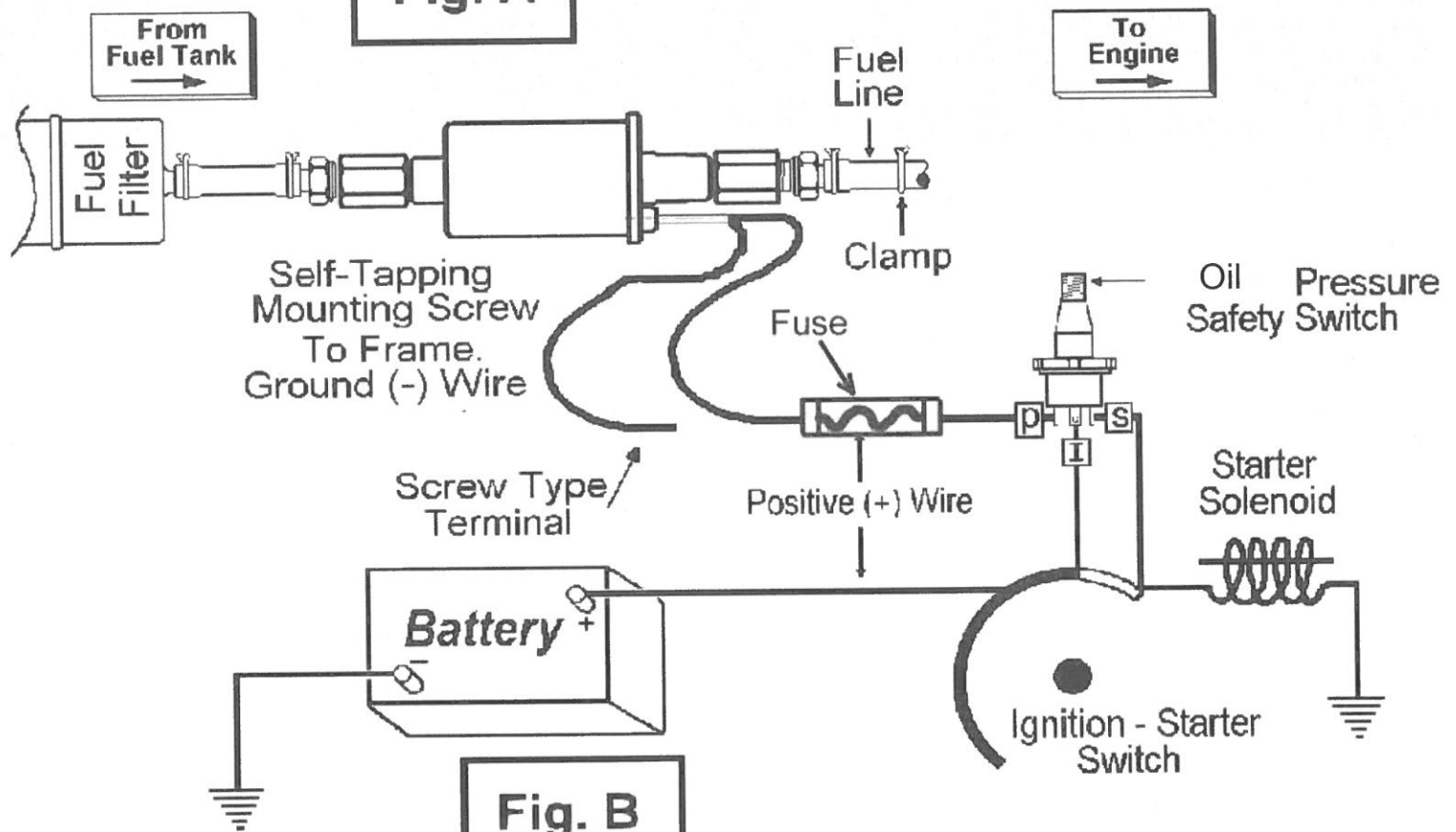
**A. FUEL PUMP INSTALLATION**

1. Disconnect the negative battery cable.
2. Mount the fuel pump close to the existing fuel lines and tank, but away from any exhaust system component. Place the pump and bracket assembly as near to the bottom of the fuel tank as possible, but never more than 24 inches above the top of the tank.
3. Remove a section of fuel line where the pump is to be mounted. (A tube cutter is recommended when cutting fuel lines. Flush the fuel line to prevent metal chips from entering the fuel system.)
4. If pump has rubber hose fittings proceed to next step. If using a pump with threaded inlet/outlet fittings, assemble the (supplied) fuel fittings to the fuel pump (See Fig. A). (This pump is equipped with dry-seal fuel fittings. Do not use Teflon tape or pipe sealant on pipe fittings, or pump breakage will occur.)
5. Install mounting bracket onto vehicle's chassis/frame with self-tapping screw(s).
6. Install the fuel pump on the mounting bracket with the outlet towards the engine. Place ground (-) wire from pump under mounting screw or bolt.
7. Connect the fuel lines to the fuel pump, using supplied rubber fuel line and clamps provided. (To prevent fuel pump failure, installation of a high quality fuel filter on the inlet side of the pump, is required.) (See Fig. A.)
8. Using #14 or larger (lower gauge #) gauge wire, follow the wiring diagram (See Fig. A & B) and connect the pump to the vehicle's electrical system. If the vehicle has a pre-existing oil pressure safety switch which operates either a warning light or gauge, it is recommended that a T-adapter be installed into the engine block and both the O.E. and the Oil Pressure Safety Switch be used (See Fig. C). A 10-amp fuse should be installed between the pressure safety switch and the electric pump. (Route wires away from heat and road hazards, and anchor securely to prevent vibration and chafing. Full battery voltage must be available to the pump when the ignition switch is "on". Pump ground must be the same as the battery ground.)
9. If this pump is being used to replace a defective in tank pump, and it is not going to be removed, make sure the defective pump does not restrict the fuel supply.
10. If this pump is being used to replace a defective mechanical pump, the fuel lines should bypass the mechanical pump. Fuel pushed through a defective mechanical pump can cause severe engine damage. If mechanical pump is not removed from the engine, the mechanical pump inlet should be plugged.

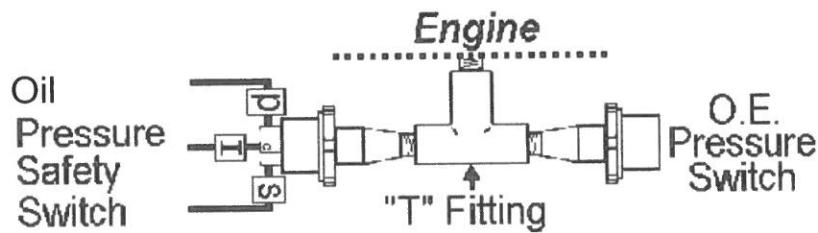
**WARNING****WARNING****WARNING**

NOT FOR USE IN AIRCRAFT OR OTHER NON-AUTOMOTIVE USE. THE USE OF A PUMP FOR OTHER THAN THE APPLICATIONS LISTED WILL VOID THE WARRANTY AND COULD DO SEVERE ENGINE DAMAGE.

**Fig. A**



**Fig. B**





## This image shows a blank sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

7780 Old Seward Hwy  
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