

# USE AND MAINTENANCE MANUAL

## *TS 400 KS - KSX*

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# MOSA

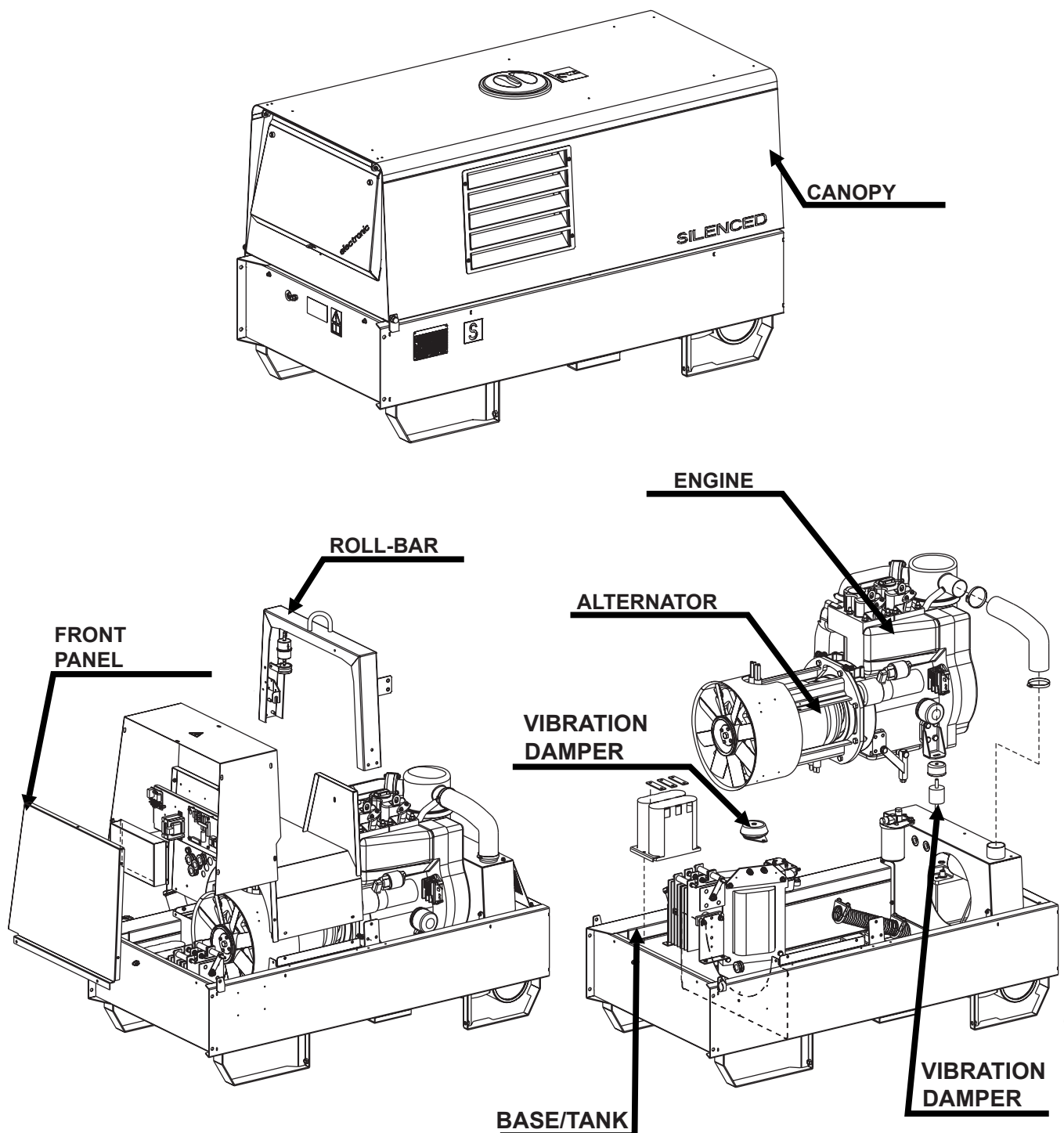


The TS 400 engine driven welder is a unit which ensures the function as:

- a) a current source for arc welding
- b) a current source for the auxiliary power generation

It is meant for industrial and professional use, powered by an endothermic engine; it is composed of various main parts such as: engine, alternator, electric and electronic controls, the fairing or a protective structure.

The assembling is made on a steel structure, on which are provided elastic support which must damp the vibrations and also eliminate sounds which would produce noise.







### UNI EN ISO 9001 : 2008

ISO 9001:2008 - Cert. 0192

MOSA has certified its quality system according to UNI EN ISO 9001:2008 to ensure a constant, high quality of its products. This certification covers the design, production and servicing of engine driven welders and generating sets.

The certifying institute, ICIM, which is a member of the International Certification Network IQNet, awarded the official approval to MOSA after an examination of its operations at the head office and plant in Cusago (MI), Italy.

This certification is not a point of arrival but a pledge on the part of the entire company to maintain a level of quality of both its products and services which will continue to satisfy the needs of its clients, as well as to improve the transparency and the communications regarding all the company's activities in accordance with the official procedures and in harmony with the MOSA Manual of Quality.

The advantages for MOSA clients are:

- Constant quality of products and services at the high level which the client expects;
- Continuous efforts to improve the products and their performance at competitive conditions;
- Competent support in the solution of problems;
- Information and training in the correct application and use of the products to assure the security of the operator and protect the environment;
- Regular inspections by ICIM to confirm that the requirements of the company's quality system and ISO 9001 are being respected.

All these advantages are guaranteed by the CERTIFICATE OF QUALITY SYSTEM No.0192 issued by ICIM S.p.A. - Milano (Italy) - www.icim.it

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## ATTENTION

This use and maintenance manual is an important part of the machines in question.

The assistance and maintenance personnel must keep said manual at disposal, as well as that for the engine and alternator (if the machine is synchronous) and all other documentation about the machine.

We advise you to pay attention to the pages concerning the security (see page M1.1).



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## INFORMATION

Dear Customer,  
We wish to thank you for having bought a high quality set.

Our sections for Technical Service and Spare Parts will work at best to help you if it were necessary.

To this purpose we advise you, for all control and overhaul operations, to turn to the nearest authorized Service Centre, where you will obtain a prompt and specialized intervention.

☞ In case you do not profit on these Services and some parts are replaced, please ask and be sure that are used exclusively original parts; this to guarantee that the performances and the initial safety prescribed by the norms in force are re-established.

☞ *The use of **non original spare parts will cancel immediately any guarantee and Technical Service obligation.***

## NOTES ABOUT THE MANUAL

Before actioning the machine please read this manual attentively. Follow the instructions contained in it, in this way you will avoid inconveniences due to negligence, mistakes or incorrect maintenance. The manual is for qualified personnel, who knows the rules: about safety and health, installation and use of sets movable as well as fixed.

You must remember that, in case you have difficulties for use or installation or others, our Technical Service is always at your disposal for explanations or interventions.

The manual for Use Maintenance and Spare Parts is an integrant part of the product. It must be kept with care during all the life of the product.

In case the machine and/or the set should be yielded to another user, this manual must also given to him.

Do not damage it, do not take parts away, do not tear pages and keep it in places protected from dampness and heat.

You must take into account that some figures contained in it want only to identify the described parts and therefore might not correspond to the machine in your possession.

## INFORMATION OF GENERAL TYPE

In the envelope given together with the machine and/or set you will find: the manual for Use Maintenance and Spare Parts, the manual for use of the engine and the tools (if included in the equipment), the guarantee (in the countries where it is prescribed by law).

The Manufacturer shall not be liable for ANY USE OF THE PRODUCT OTHER THAN THAT PRECISELY SPECIFIED IN THIS MANUAL and is thus not liable for any risks which may occur as a result of IMPROPER USE. The Company does not assume any liability for any damage to persons, animals or property.

Our products are made in conformity with the safety norms in force, for which it is advisable to use all these devices or information so that the use does not bring damage to persons or things.

While working it is advisable to keep to the personal safety norms in force in the countries to which the product is destined (clothing, work tools, etc.).

Do not modify for any motive parts of the machine (fastenings, holes, electric or mechanical devices, others..) if not duly authorized in writing: the responsibility coming from any potential intervention will fall on the executioner as in fact he becomes maker of the machine.

☞ **Notice:** *the manufacturer, who keeps the faculty, apart the essential characteristics of the model here described and illustrated, to bring betterments and modifications to parts and accessories, without putting this manual uptodate immediately.*





Any of our product is labelled with CE marking attesting its conformity to applicable directives and also the fulfillment of safety requirements of the product itself; the list of these directives is part of the declaration of conformity included in any machine standard equipment.

Here below the adopted symbol:



CE marking is clearly readable and unerasable and it can be either part of the data-plate.

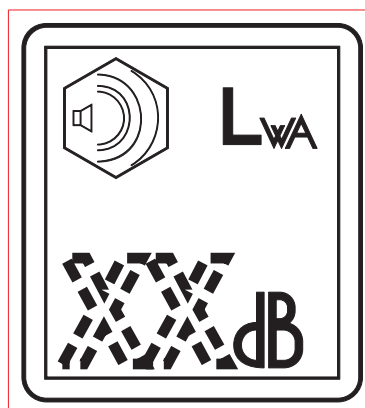
	Made in UE-ITALY	TYPE	
	SERIAL N°		
	X		
	I <sub>2</sub> (A)		
	U <sub>0</sub>	U <sub>2</sub> (V)	
	I <sub>2</sub> (A)		
	U <sub>0</sub>	U <sub>2</sub> (V)	
	Hz	kVA	
	P.F.	V (V)	
		I (A)	
	n	RPM	n <sub>1</sub>
	n <sub>0</sub>	RPM	P <sub>1max</sub>
		IP	
		KW	I. CL.

	Made in UE-ITALY	TYPE	
	Generating Set ISO 8528	SERIAL N°	
	KVA		
	V		
	I		
	Hz	P.F.	LTP POWER IN ACCORDANCE WITH ISO 8528
	RPM	I. CL.	IP
	ALTIT. 100 m	TEMP. 25 °C	MASS

	TYPE	
	SERIAL N°	Made in UE-ITALY
	TYPE/N°	
	VOLTAGE(V)	
	POWER(W)	
	Hz	KVA
	P.F.	V(V)
	I.C.L.	I(A)
	LTP POWER IN ACCORDANCE WITH ISO 8528	
	n	RPM
	P <sub>max</sub>	TEMP. °C
		ALTIT. m
		IP
		Kg

	Made in UE-ITALY	I. CL.	
	IEC 60974-1	IP	
	U <sub>0</sub>		
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	n <sub>0</sub>	RPM	P <sub>1max</sub>
		RPM	kw
	P	V	I

Furthermore, on each model it is shown the noise level value; the symbol used is the following:



The indication is shown in a clear, readable and indeleble way on a sticker.

**BCS S.p.A.**

Sede legale:  
Via Marradi 1  
20123 Milano - Italia

**Stabilimento di Cusago, 20090 (Mi) - Italia**

V.le Europa 59  
Tel.: +39 02 903521  
Fax: +39 02 90390466



ISO 9001:2008 - Cert. 0192

## DICHIARAZIONE DI CONFORMITA'



Déclaration de Conformité – Declaration of Conformity – Konformitätserklärung  
Conformiteitsverklaring – Declaración de Conformidad

BCS S.p.A. dichiara sotto la propria responsabilità che la macchina:  
BCS S.p.A. déclare, sous sa propre responsabilité, que la machine:  
BCS S.p.A. declares, under its own responsibility, that the machine:  
BCS S.p.A. erklärt, daß die Aggregate:  
BCS S.p.A. verklaard, onder haar eigen verantwoordelijkheid, dat de machine:  
BCS S.p.A. declara bajo su responsabilidad que la máquina:

GRUPPO ELETTROGENO DI SALDATURA / WELDING GENERATOR

GRUPPO ELETTROGENO / POWER GENERATOR

TORRE FARO / LIGHTING TOWER

Marchio / Brand :

Modello / Model :

Matricola / Serial number :

**FAC SIMILE**

è conforme con quanto previsto dalle Direttive Comunitarie e relative modifiche:  
est en conformité avec ce qui est prévu par les Directives Communautaires et relatives modifications:  
conforms with the Community Directives and related modifications:  
mit den Vorschriften der Gemeinschaft und deren Ergänzungen übereinstimmt:  
in overeenkomst is met de inhoud van gemeenschapsrichtlijnenen gerelateerde modificaties:  
comple con los requisitos de la Directiva Comunitaria y sus anexos:

**2006/42/CE - 2006/95/CE - 2004/108/CE**

Nome e indirizzo della persona autorizzata a costituire il fascicolo tecnico :  
Nom et adresse de la personne autorisée à composer le Dossier Technique :  
Person authorized to compile the technical file and address :  
Name und Adresse der zur Ausfüllung der technischen Akten ermächtigten Person :  
Persoon bevoegd om het technische document , en bedrijf gegevens in te vullen  
Nombre y dirección de la persona autorizada a componer el expediente técnico :

**ing. Benso Marelli - Consigliere Delegato / Managing Director ; V.le Europa 59, 20090 Cusago (MI) – Italy**

Cusago,

Ing. Benso Marelli  
Consigliere Delegato  
Managing Director

Technical data	TS 400 KS	TS 400 KSX
<b>ALTERNADOR</b>		Self-excited, self-regulated, brushless
Type		three-phase, asynchronous
Insulating class		H
<b>GENERATOR</b>		
Three-phase generation		13 kVA / 400 V / 18.7 A
Single-phase generation		7 kVA / 230 V / 30.4 A
Single-phase generation		3.5 kVA / 110 V / 31.8 A
Single-phase generation		5 kVA / 48 V / 104 A
Frequency		50 Hz
<b>ENGINE</b>		
Mark / Model		KOHLER KD625/2
Type / Cooling system		Diesel 4-stroke / air
Cylinders / Displacement		2 / 1248 cm <sup>3</sup>
*Net output		18.8 kW (25.5 HP)
Speed		3000 rpm
Fuel consumption (welding 60%)		3.2 l/h
Engine oil capacity		2.8 l
Starter		Electric
*Maximum output (not overloadable) according to ISO 3046-1		
<b>GENERAL SPECIFICATIONS</b>		
Tank capacity		26 l
Running time (welding 60%)		8 h
Protection		IP 23
*Dimensions / max. Lxwxh (mm)		1455x840x880
*Weight	450 Kg	465 Kg
Measured acoustic power LwA (pressure LpA)	-	96 dB(A) (71 dB(A) @ 7 m)
Guaranteed acoustic power LwA (pressure LpA)	-	96 dB(A) (71 dB(A) @ 7 m)
**Acoustic power LwA (pressure LpA)	98 dB(A) (73 dB(A) @ 7 m)	-
* Dimensions and weight are inclusive of all parts without wheels and towbar. ** For fixed installation only.		



### POWER

Declared power according to ISO 3046-1 (temperature 25°C, 30% relative humidity, altitude 100 m above sea level).

It's admitted overload of 10% each hour every 12 h.

In an approximative way one reduces: of 1% every 100 m altitude and of 2.5% for every 5°C above 25°C.

### ACOUSTIC POWER LEVEL

**ATTENTION:** The concrete risk due to the machine depends on the conditions in which it is used. Therefore, it is up to the end-user and under his direct responsibility to make a correct evaluation of the same risk and to adopt specific precautions (for instance, adopting a I.P.D. -Individual Protection Device)

**Acoustic Noise Level (LwA) - Measure Unit dB(A):** it stands for acoustic noise released in a certain delay of time. This is not submitted to the distance of measurement.

**Acoustic Pressure (Lp) - Measure Unit dB(A):** it measures the pressure originated by sound waves emission. Its value changes in proportion to the distance of measurement.

The here below table shows examples of acoustic pressure (Lp) at different distances from a machine with Acoustic Noise Level (LwA) of 95 dB(A)

Lp a 1 meter = 95 dB(A) - 8 dB(A) = 87 dB(A)

Lp a 7 meters = 95 dB(A) - 25 dB(A) = 70 dB(A)

Lp a 4 meters = 95 dB(A) - 20 dB(A) = 75 dB(A)

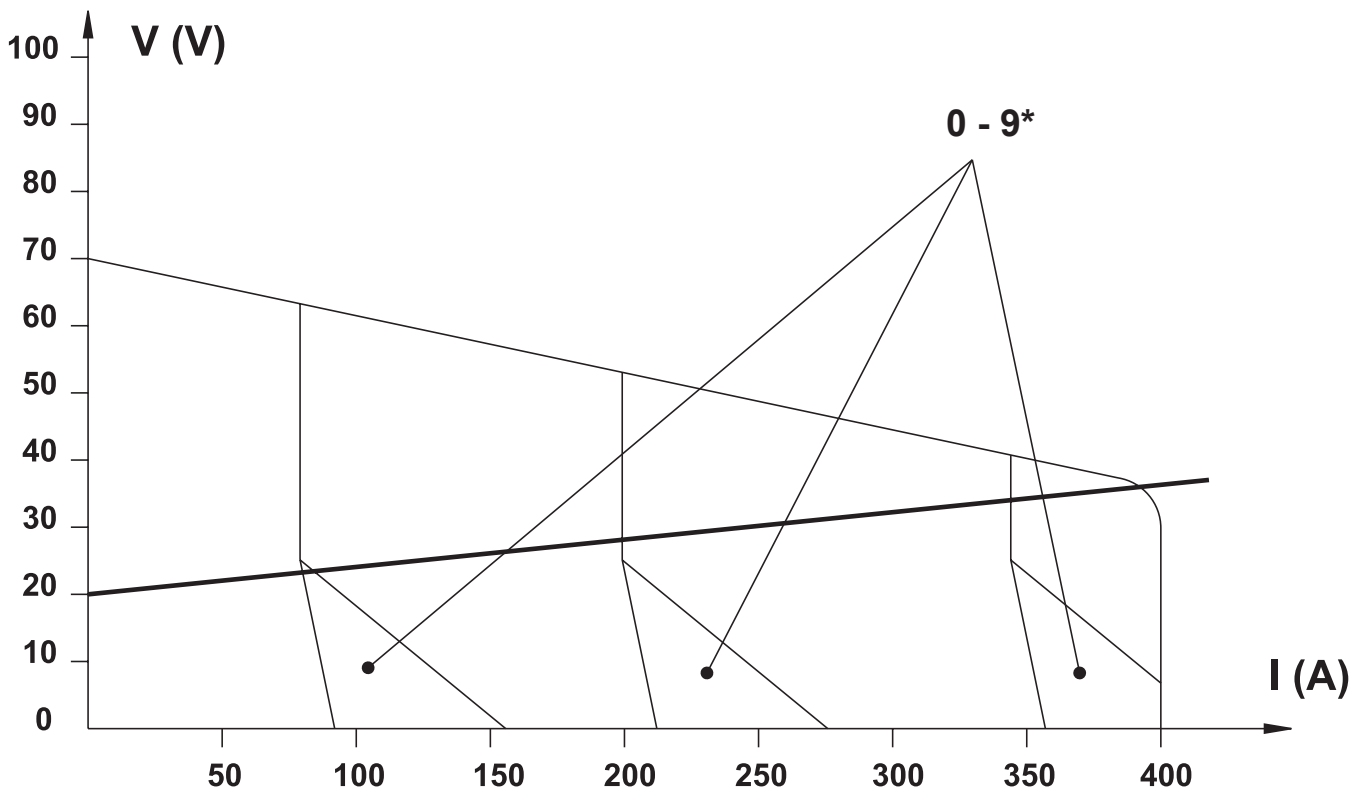
Lp a 10 meters = 95 dB(A) - 28 dB(A) = 67 dB(A)

**PLEASE NOTE:** the symbol when with acoustic noise values, indicates that the device respects noise emission limits according to 2000/14/CE directive.

D.C. WELDING C.C.

Service	400 A - 35%, 350 A - 60%, 300 A - 100%
Welding current regulation (I Scale)	20 - 400A
Arc Force regulation *	0 ÷ 9
Open circuit voltage	70 V
Welding voltage	20 - 36 V

OUTPUT CHARACTERISTIC



Welding current regulator position	%	0	25	50	75	75
	approx. current values A	20	100	200	300	300


SIMULTANEOUS UTILIZATION FACTORS

In case **Welding** and **Generation** can be used simultaneously, however, the engine **cannot** be overloaded. The table below gives the maximum limits to be respected:

WELDING CURRENT	>250 A	200 A	150 A	100 A	0
AUXILIARY POWER	0	4 kVA	7.5 kVA	10 kVA	13 kVA

The installation and general warnings regarding operations are aimed achieving correct use of the machine and/or apparatus in the place where it is used as a genset and/or motor welder.

- Advice to the User about the safety:

 NB: The information contained in the manual can be changed without notice.

Any damage caused in connection with the use of these instructions shall not be considered as they are only indicative.

Remember that the non observance of the indications reported by us might cause damage to persons or things. It is understood, that local dispositions and/or laws must be respected.

 **DANGEROUS**

This heading warns of an immediate danger for persons as well for things. Not following the advice can result in serious injury or death.

 **WARNING**

This heading warns of situations which could result in injury for persons or damage to things.

 **CAUTION**

To this advice can appear a danger for persons as well as for things, for which can appear situations bringing material damage to things.


 **IMPORTANT**

 **NOTE**

 **ATTENTION**


These headings refer to information which will assist you in the correct use of the machine and/or accessories.



 **FIRST AID.** In case the operator should be sprayed by accident, from corrosive liquids a/o hot toxic gas or whatever event which may cause serious injuries or death, predispose the first aid in accordance with the ruling labour accident standards or of local instructions.

Skin contact	Wash with water and soap
Eyes contact	Irrigate with plenty of water, if the irritation persists contact a specialist
Ingestion	Do not induce vomit as to avoid the intake of vomit into the lungs, send for a doctor
Suction of liquids from lungs	If you suppose that vomit has entered the lungs (as in case of spontaneous vomit) take the subject to the hospital with the utmost urgency
Inhalation	In case of exposure to high concentration of vapours take immediately to a non polluted zone the person involved



 **FIRE PREVENTION.** In case the working zone, for whatsoever cause goes on fire with flames liable to cause severe wounds or death, follow the first aid as described by the ruling norms or local ones.

EXTINCTION MEANS	
Appropriated	Carbonate anhydride (or carbon dioxide) powder, foam, nebulized water
Not to be used	Avoid the use of water jets
Other indications	Cover eventual shedding not on fire with foam or sand, use water jets to cool off the surfaces close to the fire
Particular protection	Wear an autorespiratory mask when heavy smoke is present
Useful warnings	Avoid, by appropriate means to have oil sprays over metallic hot surfaces or over electric contacts (switches, plugs, etc.). In case of oil sprinkling from pressure circuits, keep in mind that the inflammability point is very low.

**SYMBOLS**



**STOP** - Read absolutely and be duly attentive



Read and pay due attention



**GENERAL ADVICE** - If the advice is not respected damage can happen to persons or things.



**HIGH VOLTAGE** - Attention High Voltage. There can be parts in voltage, dangerous to touch. The non observance of the advice implies life danger.



**FIRE** - Danger of flame or fire. If the advice is not respected fires can happen.



**HEAT** - Hot surfaces. If the advice is not respected burns or damage to things can be caused.



**EXPLOSION** - Explosive material or danger of explosion. in general. If the advice is not respected there can be explosions.



**WATER** - Danger of shortcircuit. If the advice is not respected fires or damage to persons can be caused.



**SMOKING** - The cigarette can cause fire or explosion. If the advice is not respected fires or explosions can be caused.



**ACIDS** - Danger of corrosion. If the advice is not respected the acids can cause corrosions with damage to persons or things.



**WRENCH** - Use of the tools. If the advice is not respected damage can be caused to things and even to persons.



**PRESSION** - Danger of burns caused by the expulsion of hot liquids under pressure.



**ACCES FORBIDDEN** to non authorized people.

**PROHIBITIONS** No harm for persons

**Use only with safety clothing -**



It is compulsory to use the personal protection means given in equipment.

**Use only with safety clothing -**



It is compulsory to use the personal protection means given in equipment.

**Use only with safety protections -**



It is a must to use protection means suitable for the different welding works.

**Use with only safety material -**



It is prohibited to use water to quench fires on the electric machines.

**Use only with non inserted voltage -**



It is prohibited to make interventions before having disinserted the voltage.

**No smoking -**



It is prohibited to smoke while filling the tank with fuel.

**No welding -**



It is forbidden to weld in rooms containing explosive gases.

**ADVICE** No harm for persons and things

**Use only with safety tools, adapted to the specific use -**

It is advisable to use tools adapted to the various maintenance works.

**Use only with safety protections, specifically suitable**



It is advisable to use protections suitable for the different welding works.

**Use only with safety protections -**



It is advisable to use protections suitable for the different daily checking works.

**Use only with safety protections -**



It is advisable to use all protections while shifting the machine.

**Use only with safety protections -**



It is advisable to use protections suitable for the different daily checking works.and/or of maintenance.

## INSTALLATION AND ADVICE BEFORE USE

The operator of the welder is responsible for the security of the people who work with the welder and for those in the vicinity.

The security measures must satisfy the rules and regulations for engine driven welders.

The information given below is in addition to the local security norms.

Estimate possible electromagnetic problems in the work area taking into account the following indications.

1. Telephonic wirings and/or of communication, check wirings and so on, in the immediate vicinity.
2. Radio and television receptors and transmitters.
3. Computer and other checking devices.
4. Critical devices for safety and/or for industrial checks.
5. Peapop who, for instance, use pace-maker, hearing-aid for deaf or something and else.
6. Devices used for rating and measuring.
7. The immunity of other devices in the operation area of the welder. Make sure that other used devices are compatible. If it is the case, provide other additional measures of protection.
8. The daily duration of the welding time.



Make sure that the area is safe before starting any welding operation.

- Do not touch any bare wires, leads or contacts as they may be live and there is danger of electric shock which can cause death or serious burns. The electrode and welding cables, etc. are live when the unit is operating.
- Do not touch any electrical parts or the electrode while standing in water or with wet hands, feet or clothes.
- Insulate yourself from the work surface while welding. Use carpets or other insulating materials to avoid physical contact with the work surface and the floor.
- Always wear dry, insulating gloves, without holes, and body protection.
- Do not wind cables around the body.
- Use ear protections if the noise level is high.
- Keep flammable material away from the welding area.
- Do not weld on containers which contain flammable material.
- Do not weld near refuelling areas.
- Do not weld on easily flammable surfaces.
- Do not use the welder to defrost (thaw) pipes.
- Remove the electrode from the electrode holder, when not welding.
- Avoid inhaling fumes by providing a ventilation system or, if not possible, use an approved air breather.
- Do not work in closed areas where there is no fresh air flow.
- Protect face and eyes (protective mask with suitable dark lens and side screens), ears and body (non-flammable protective clothers).



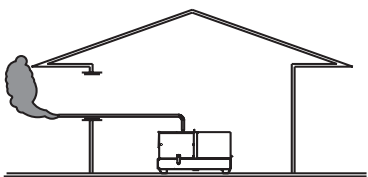
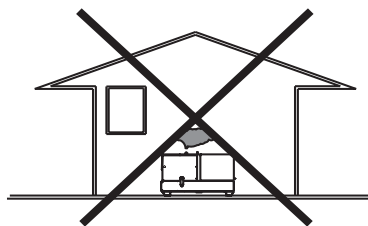
## INSTALLATION AND ADVICE BEFORE USE

### GASOLINE ENGINES

- ☞ Use in open space, air swept or vent exhaust gases, which contain the deadly carbone oxyde, far from the work area.

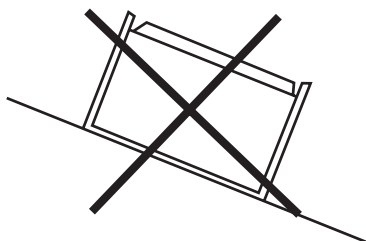
### DIESEL ENGINES

- ☞ Use in open space, air swept or vent exhaust gases far from the work area.

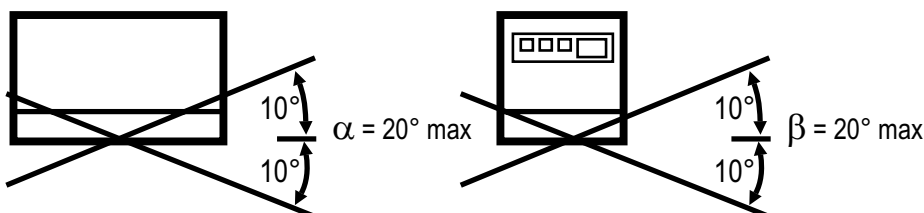


### POSITION

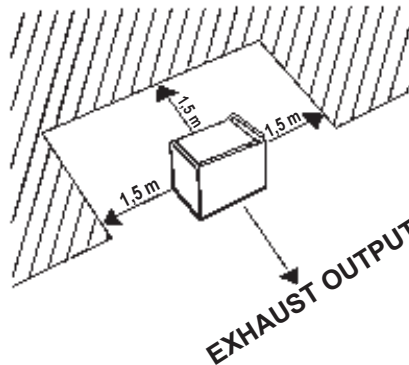
Place the machine on a level surface at a distance of at least 1,5 m from buildings or other plants.



Maximum leaning of the machine (in case of dislevel)



Check that the air gets changed completely and the hot air sent out does not come back inside the set so as to cause a dangerous increase of the temperature.



- ☞ Make sure that the machine does not move during the work: **block** it possibly with tools and/or devices made to this purpose.

### MOVES OF THE MACHINE

- ☞ At any move check that the engine is **off**, that there are no connections with cables which impede the moves.

### PLACE OF THE MACHINE



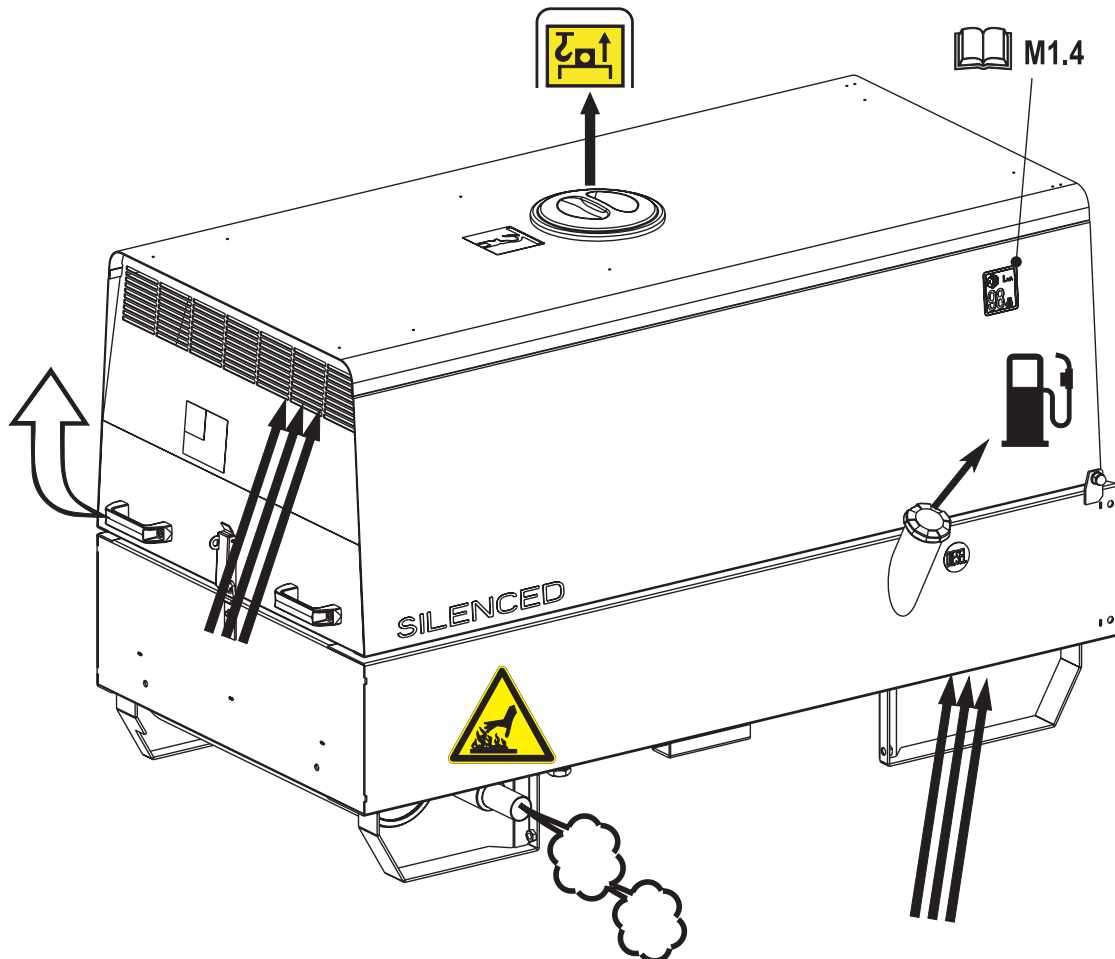
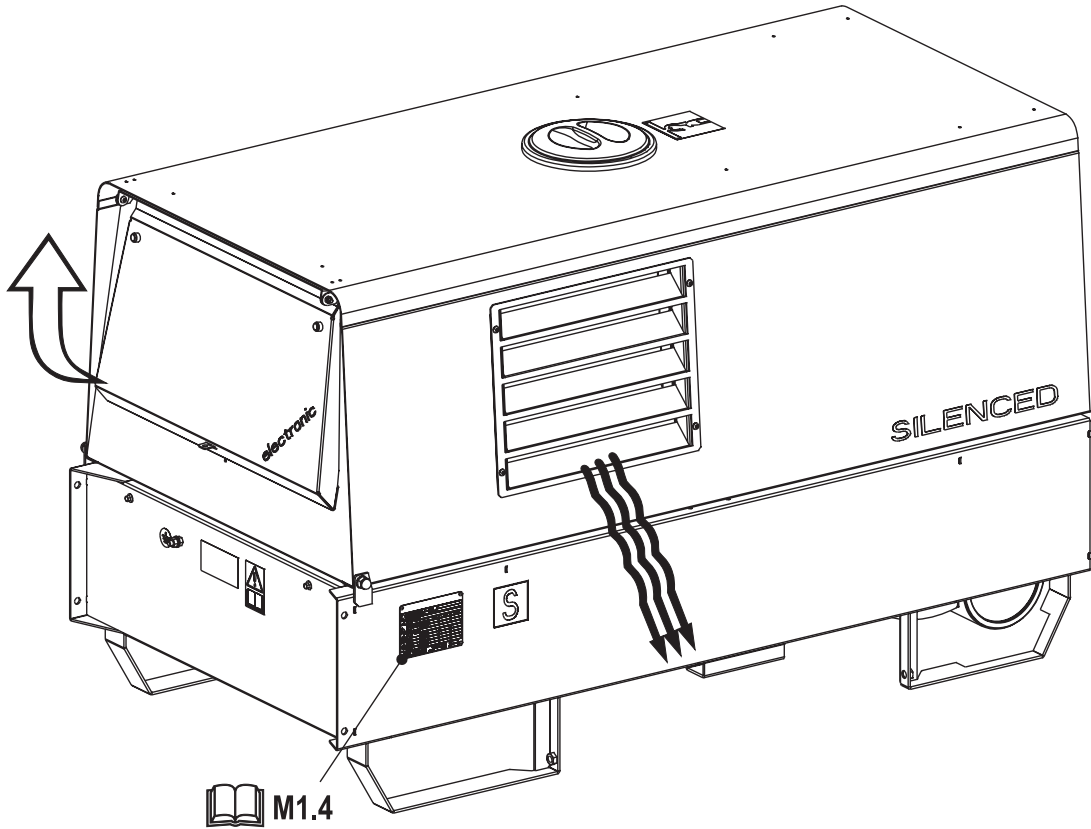
## ATTENTION



For a safer use from the operator **DO NOT** fit the machine in locations with high risk of flood.

Please do not use the machine in weather conditions which are beyond IP protection shown both in the data plate and on page named "technical data" in this same manual.



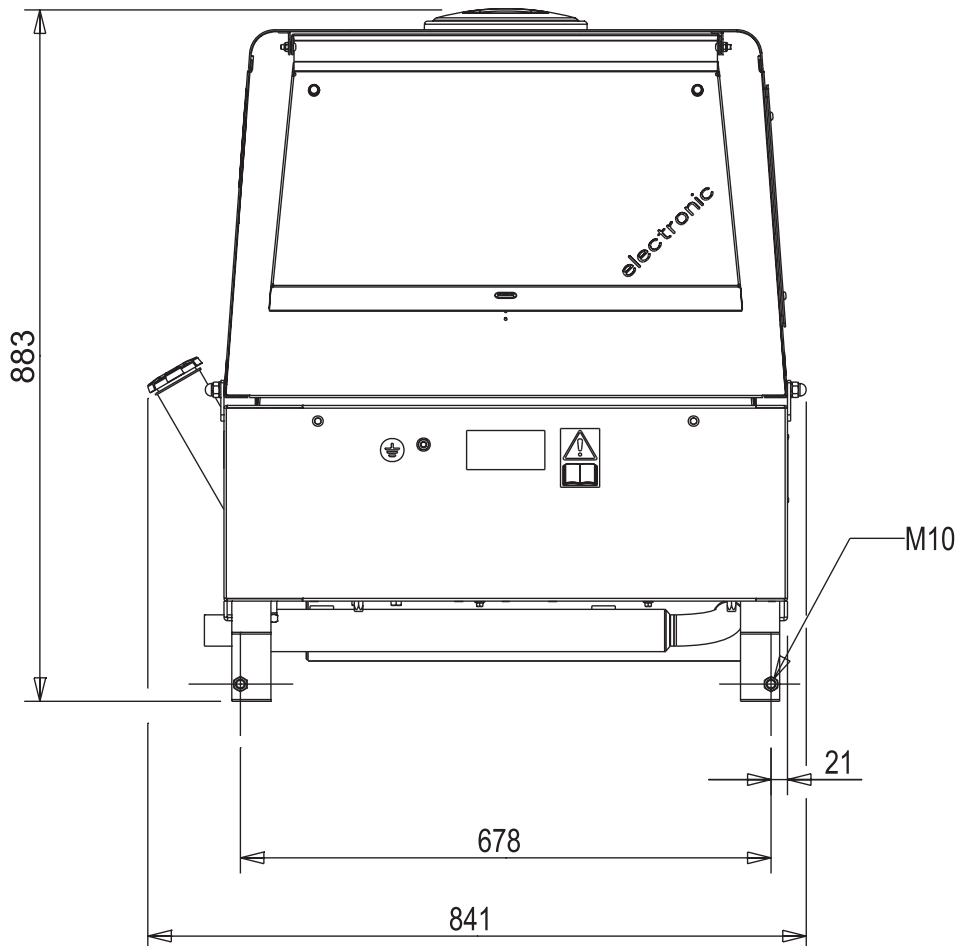
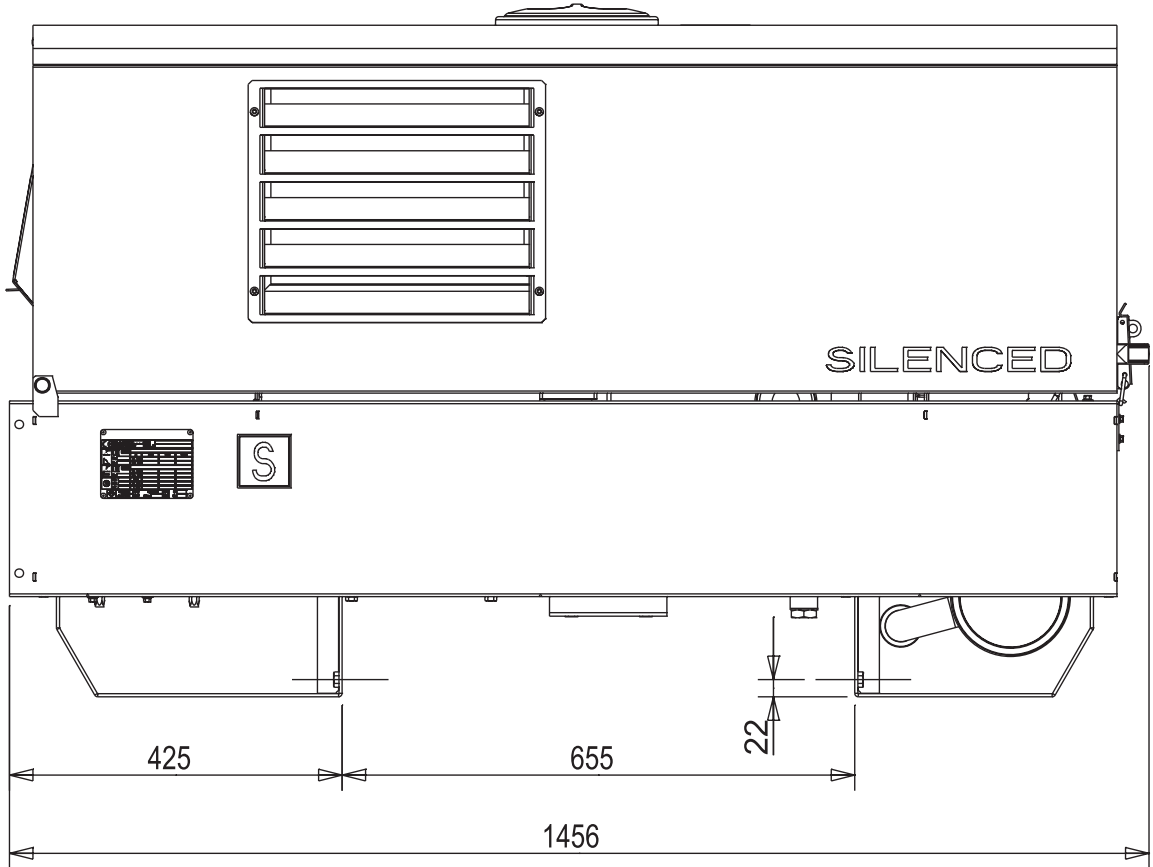


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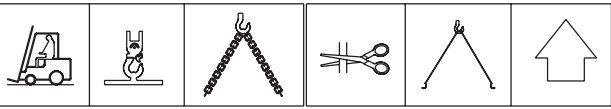
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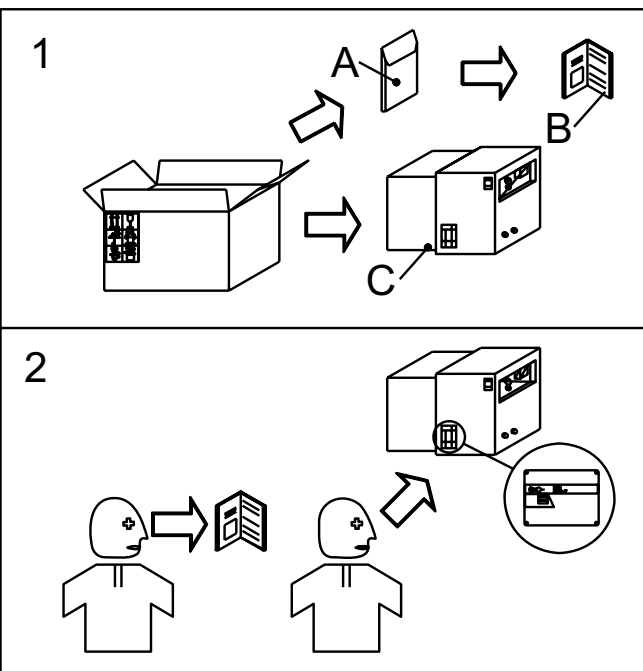
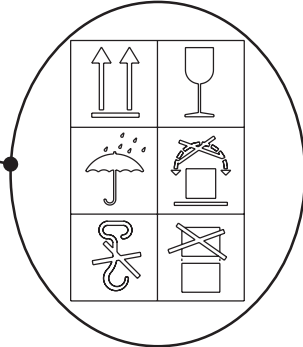
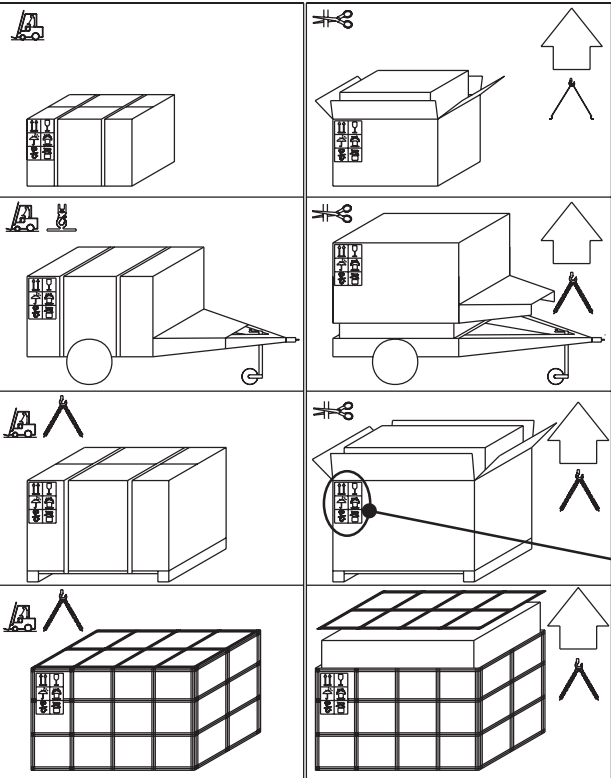


 **NOTE**



Be sure that the lifting devices are: correctly mounted, adequate for the weight of the machine with its packaging, and conforms to local rules and regulations. When receiving the goods make sure that the product has not suffered damage during the transport, that there has not been rough handling or taking away of parts contained inside the packing or in the set. In case you find damages, rough handling or absence of parts (envelopes, manuals, etc.), we advise you to inform immediately our Technical Service.

For eliminating the packing materials, the User must keep to the norms in force in his country.



- 1) Take the machine (C) out of the shipment packing. Take out of the envelope (A) the user's manual (B).
- 2) Read: the user's manual (B), the plates fixed on the machine, the data plate.





**NOTE**

Transportation must always take place with the engine off, electrical cables and starting battery disconnected and fuel tank empty.

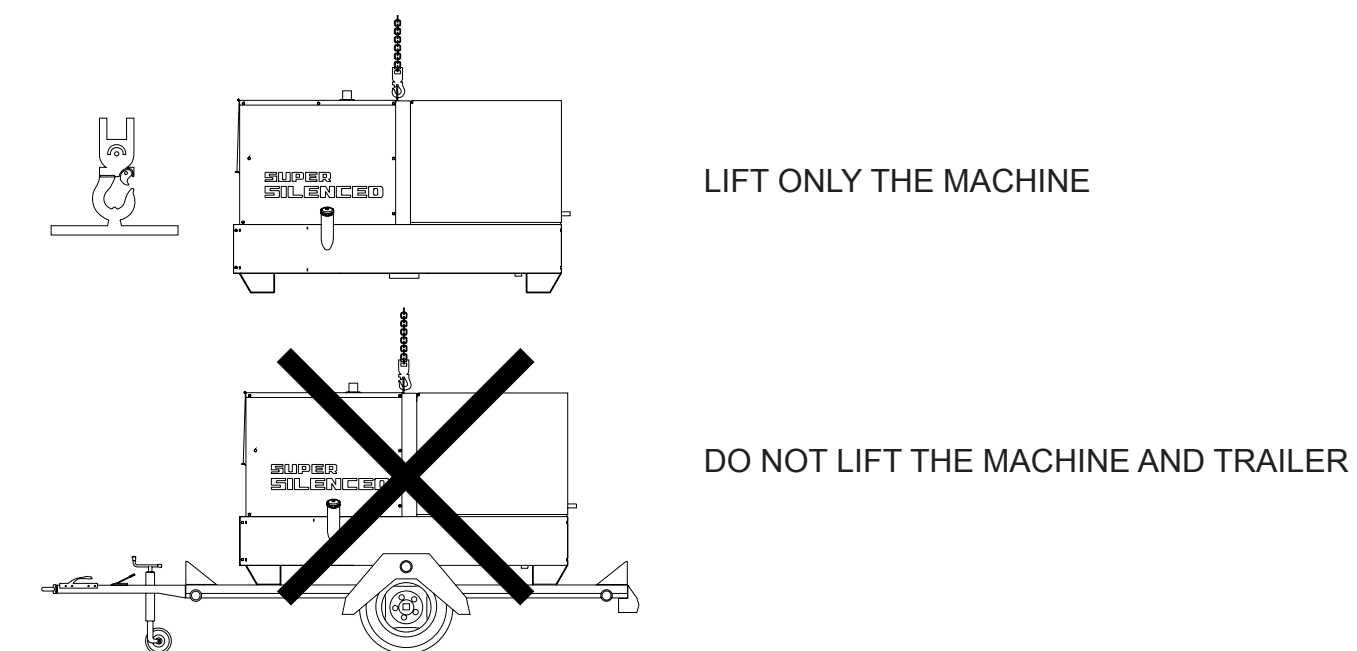
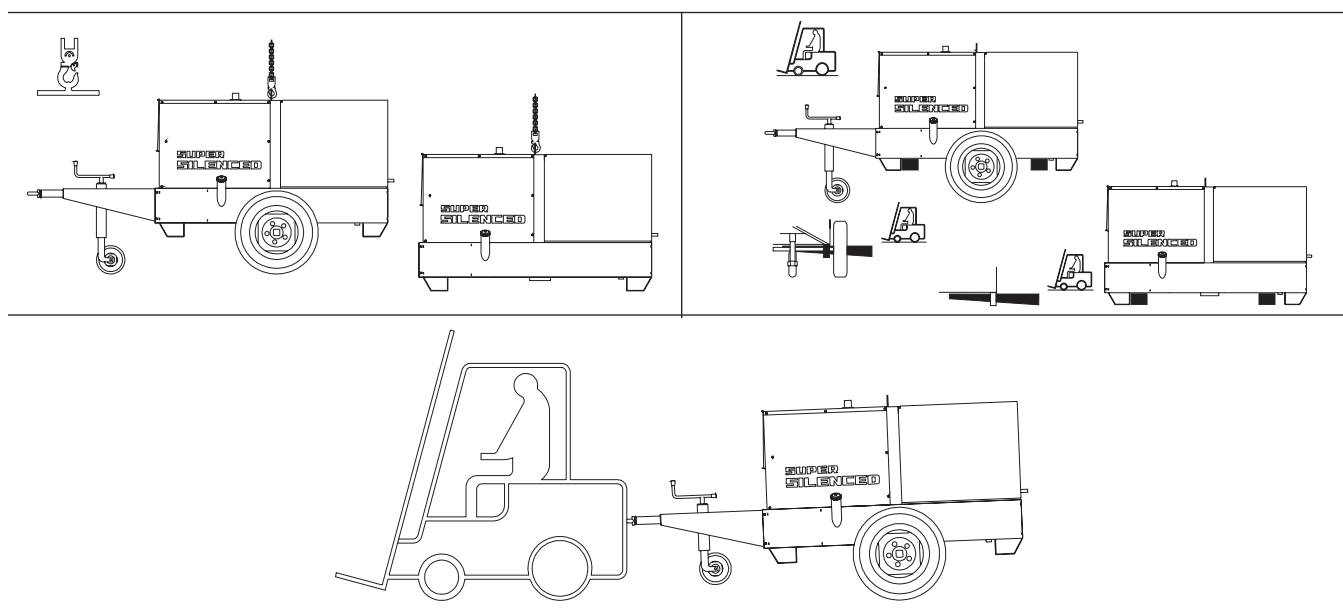
Be sure that the lifting devices are: correctly mounted, adequate for the weight of the machine with it's packaging, and conform to local rules and regulations.

Only authorized persons involved in the transport of the machine should be in the area of movement.

**DO NOT LOAD OTHER PARTS WHICH CAN MODIFY WEIGHT AND BARICENTER POSITION.**

**IT IS STRICTLY FORBIDDEN TO DRAG THE MACHINE MANUALLY OR TOW IT BY ANY VEHICLE (model with no CTL accessory).**

If you did not keep to the instructions, you could damage the structure of the machine.



**DANGER: LIFTING EYE IS NOT DESIGNED TO SUPPORT ADDED WEIGHT OF ROAD TOW TRAILER**



**⚠ ATTENTION**

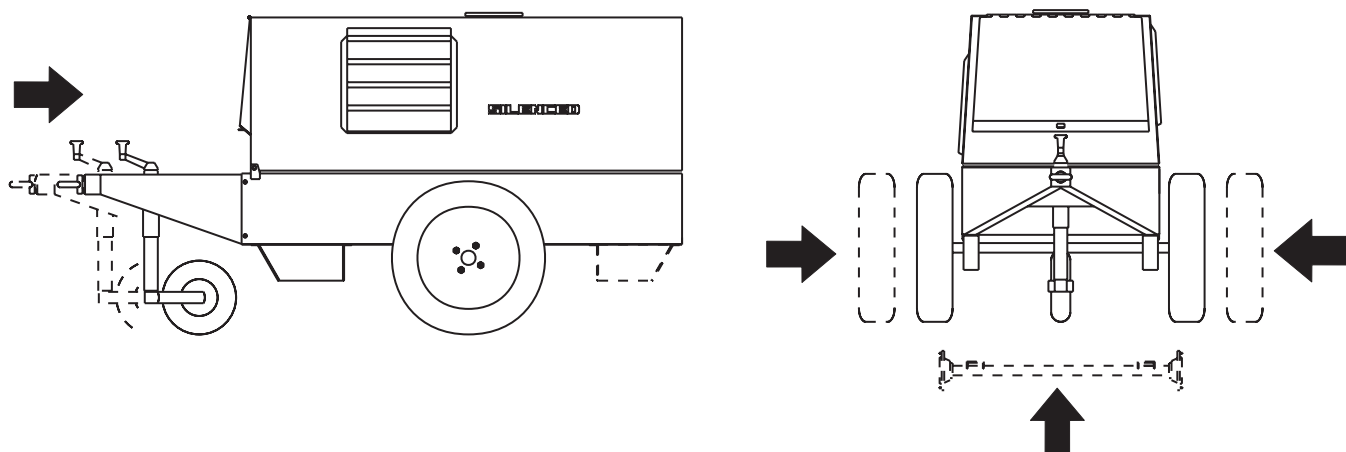
The CTL accessory cannot be removed from the machine and used separately (actioned manually or following vehicles) for the transport of loads or anyway for used different from the machine movements.

**TRAILERS**

The machines provided for assembling the CTL accessory (slow towing trolley) can be towed up to a **maximum** speed of **40 Kms/hour** on asphalted surfaces.

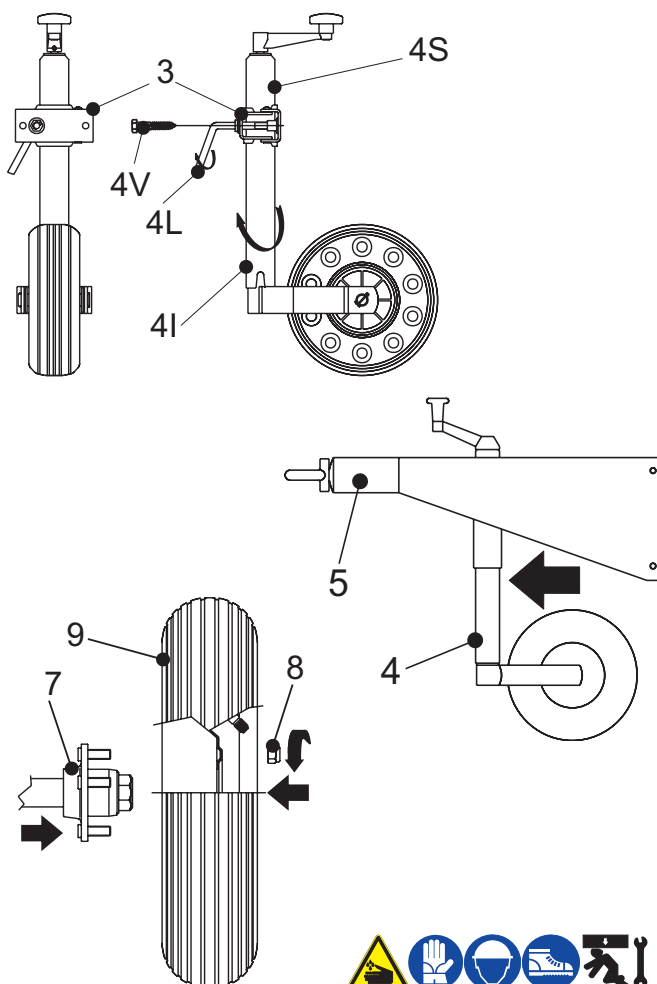
Towing on public roads or turnpikes of any type **IS EXCLUDED**, because **not** in possession of the requirements by national and foreign traffic norms.

**Nota:** Lift the machine and assemble the parts as shown in the drawing



For assembling the generating set on the trolley CTL400 please keep to following instructions:

- 1) - Lift the generating set (by means of suitable hook).
- 2) - Slightly fix the jaw (3) of the parking foot to the bar with the M10x20 screws, the M10 nuts and the washers (so as to let the foot sprag go through).
- 3) - Split (unscrewing them) the two parts of the foot (4S-4I) to be able later to assemble them on the jaw.
- 4) - Introduce into the jaw (3) the upper part (4S) of the foot and screw again the lower part (4I), then tighten the screws (4V) of the jaw to the towbar and block momentarily with the lever (4L) the whole foot.
- 5) - Assemble on the machine the towbar (5) complete of foot with the M10x20 screws, nuts and washers (see fig. page M6.2).
- 6) - Assemble the axle (7) to the base of the machine (see fig. page M6.2) with the M 10x20 screws and relative washers (two per part) so that their supports coincide.
- 8) - Insert the wheel (9) on the axle then screw the self blocking nuts (8).
- 9) - Pump the tyre (9) bringing the pressure to four atms.
- 10) - Lower the machine to the ground and place the parking foot definitively (regulating at the best height).



**⚠ ATTENTION**

Do not substitute the original tires with other types.





### BATTERY WITHOUT MAINTENANCE



Connect the cable + (positive) to the pole + (positive) of the battery (after having taken away the protection), by properly tightening the clamp.

Check the state of the battery from the colour of the warning light which is in the upper part.

- Green colour: battery OK
- Black colour: battery to be recharged
- White colour: battery to be replaced

**DO NOT OPEN THE BATTERY.**



### LUBRICANT

#### RECOMMENDED OIL

MOSA recommends selecting **AGIP** engine oil. Refer to the label on the motor for the recommended products.

 PRODOTTI RACCOMANDATI RECOMMENDED PRODUCTS	
<b>AGIP</b> SIGMA TURBO PLUS 15W/40 API CG4 - ACEA E3	OLIO MOTORE DIESEL DIESEL ENGINE OIL
<b>AGIP</b> SUPERMOTOROIL 20W/50 API CC-SF	OLIO MOTORE BENZINA GASOLINE ENGINE OIL
<b>AGIP</b> ANTIFREEZE EXTRA INIBITE ETHYLENE GLYCOL (50% + 50% + H <sub>2</sub> O)	CIRCUITO DI RAFFREDDAMENTO COOLING CIRCUIT (CUNA NC 956-16 ED 97)

Please refer to the motor operating manual for the recommended viscosity.

### REFUELLING AND CONTROL:

Carry out refuelling and controls with motor at level position.

1. Remove the oil-fill tap (24)
2. Pour oil and replace the tap
3. Check the oil level using the dipstick (23); the oil level must be comprised between the minimum and maximum indicators.



### ATTENTION

It is dangerous to fill the motor with too much oil, as its combustion can provoke a sudden increase in rotation speed.



### DRY AIR FILTER

Check that the dry air filter is correctly installed and that there are no leaks around the filter which could lead to infiltrations of non-filtered air to the inside of the motor.



### OIL BATH AIR FILTER

Fill the air filter using the same engine oil up to the level indicated on the filter.



### FUEL



### ATTENTION



Do not smoke or use open flames during refuelling operations, in order to avoid explosions or fire hazards.

Fuel fumes are highly toxic; carry out operations outdoors only, or in a well-ventilated environment.



Avoid accidentally spilling fuel. Clean any eventual leaks before starting up motor.

Refill the tank with good quality diesel fuel, such as automobile type diesel fuel, for example.

For further details on the type of diesel fuel to use, see the motor operating manual supplied.

Do not fill the tank completely; leave a space of approx. 10 mm between the fuel level and the wall of the tank to allow for expansion.

In rigid environmental temperature conditions, use special winterized diesel fuels or specific additives in order to avoid the formation of paraffin.



### GROUNDING CONNECTION

The grounding connection to an earthed installation **is obligatory** for all models equipped with a differential switch (circuit breaker). In these groups the generator star point is generally connected to the machine's earthing; by employing the TN or TT distribution system, the differential switch guarantees protection against indirect contacts.

In the case of powering complex installations requiring or employing additional electrical protection devices, the coordination between the protection devices must be verified.

For the grounding connection, use the terminal (12); comply to local and/or current regulations in force for electrical installations and safety.





Check daily



**NOTE**

*Do not alter the primary conditions of regulation and do not touch the sealed parts.*

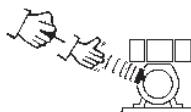
**ENGINES WITH MANUAL RECOIL**



Hold the starting handle firmly.



Pull the rope hard and fast. Pull it all the way out. Use two hands if necessary.

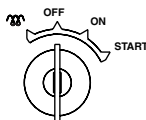


Then returning it slowly.

**ENGINES WITH ACCELERATOR LEVER**

Make sure that the accelerator lever or the switch (16) is at its minimum setting.

Insert the electric protection device (D-Z2-N2) lever towards above and, where mounted, check the isolation monitor (A3) see page M37 –



Introduce the key (Q1), turn it clockwise completely, leaving it as soon as the engine starts and/or the push button (32) (models without key) leaving it as soon as the engine starts.

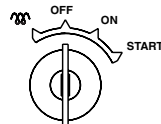
**NB.: for safety reason the key must be kept by qualified personnel.**

Once the engine has started leave it running at a reduced speed for some minutes.

Accelerate the engine at max., set lever on maximum position and then take up load.

**ENGINES WITHOUT ACCELERATOR LEVER**

Insert the electric protection device (D-Z2-N2) lever towards above and, where mounted, check the isolation monitor (A3) see page M37 –



Introduce the key (Q1), turn it clockwise completely, leaving it as soon as the engine starts.

**NB.: for safety reason the key must be kept by qualified personnel.**

Let the engine run for some minutes before drawing the load.

Open the fuel cock (where it is assembled).



**CAUTION**

**RUNNING-IN**

*During the first 50 hours of operation, do not use more than 60% of the maximum output power of the unit and check the oil level frequently, in any case please stick to the rules given in the engine use manual.*



**NOTE**


*The machines with E.P.1 engine protection device (D1), use the accelerator lever ONLY IN EMERGENCY when the engine protection does not work. In this case turn immediately to our Authorized Assistance Centers.*

## ENGINE WITH PREHEATING GLOW PLUGS

Turn the starter key (Q1) on the position "preheating glow plugs" (the glow plugs light will be on I4), when the light is off, turn the starter key completely clockwise until the engine begins to fire.  
Let the engine run for some minutes before drawing the load.

### ENGINES WITH R.P.M. ELECTRONIC ADJUSTER (ONLY FOR GENERATING SET)

Turn the starter key (Q1) completely clockwise until the engine begins to fire.

 Wait for the AUTOMATIC preheating time before drawing the load

### OCCASIONAL USE OF THE ENGINE

Using the engine in special conditions which need an immediate intervention, such as emergency plants, etc., use advise to use our Engine Assistance Centres for specific interventions or our Technical Assistance Service.



### CAUTION

If the engine fails to start, do not insist for at least 15 seconds.  
*Space the further operations waiting for at least 4 minutes.*



### CAUTION

**MACHINE WITH EMERGENCY BUTTON**  
Before starting the engine, make sure that the emergency button (32B) is off (turn the button clockwise for this operation)

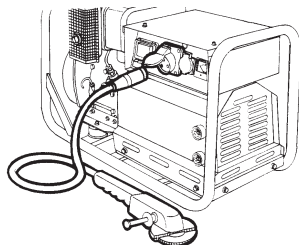


### CAUTION

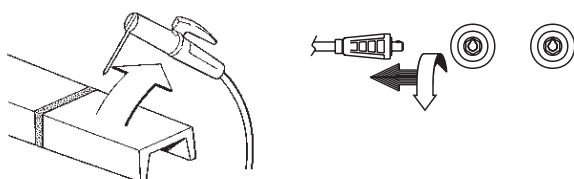
**RUNNING-IN**  
*During the first 50 hours of operation, do not use more than 60% of the maximum output power of the unit and check the oil level frequently, please follow the instructions on the engine use and maintenance manual..*



☞ Before stopping the engine **it is compulsory** to effect the following operations:  
- stop to draw three/single-phase current from the auxiliary sockets.



- stop to draw power from the welding sockets (only for TS models).



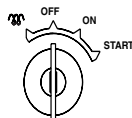
**ENGINES WITH ACCELERATOR LEVER**

☞ Make sure that the unit is not supplying any power.

Disconnect the electrical protection device (D-Z2-N2) lever downward.

Set the accelerator lever or the switch (16) to minimum position and wait for a few minutes to allow the engine to cool, anyway follow the instructions contained in the engine manual.

Pull the stop lever (28) until the engine stops (where it is assembled).



Remove the key (Q1) turning it counter clockwise, OFF position, then take it out.

☞ **NB.: for safety reason the key must be kept by qualified personnel.**

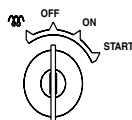
**ENGINES WITHOUT ACCELERATOR LEVER**

Make sure that the unit is not supplying any power.

Disconnect the electrical protection device (D-Z2-N2) lever downward.  
Let the engine idle for a few minutes.

Press the pushbutton (F3) until the engine stops (where it is assembled).

Shut the fuel cock (where it is assembled).



Remove the key (Q1) turning it counter clockwise, OFF position, then take it out.

☞ **NB.: for safety reason the key must be kept by qualified personnel.**

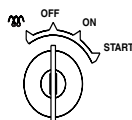
**ENGINES WITH R.P.M. ELECTRONIC ADJUSTER (ONLY FOR GENERATING SET)**

Make sure that the unit is not supplying any power.

Disconnect the electrical protection device (D-Z2-N2) lever downward.

Let the engine idle for a few minutes.

Press the pushbutton (F3) until the engine stops (where it is assembled).



Remove the key (Q1) turning it counter clockwise, OFF position, then take it out.

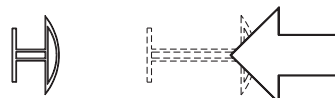
☞ **NB.: for safety reason the key must be kept by qualified personnel.**



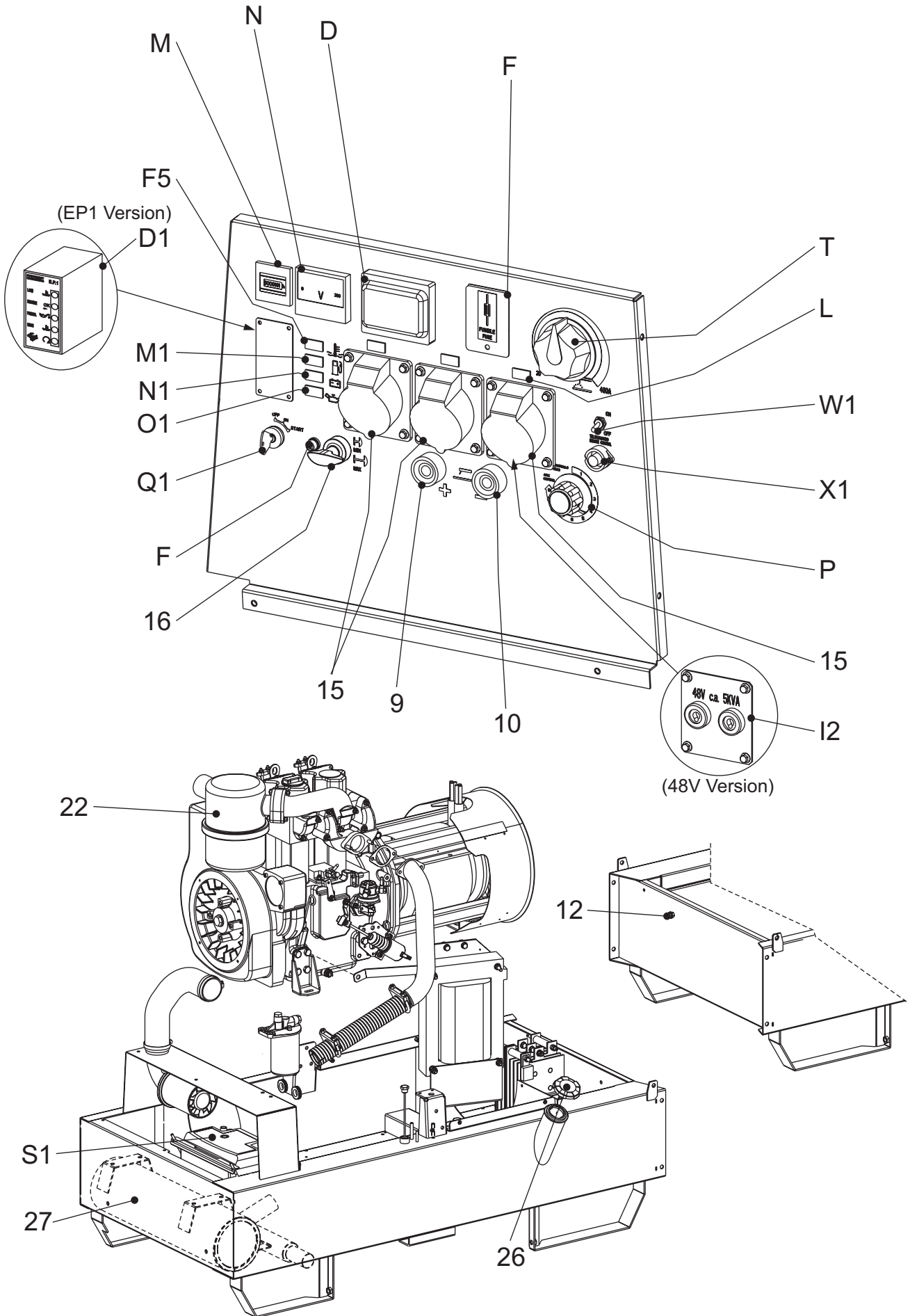
**CAUTION**

**MACHINE WITH EMERGENCY BUTTON**

Pressing it, it allows to stop the engine in any condition (32B) (when assembled).  
To re-establish it, see page M21...



4A	Hydraulic oil level light	B4	Exclusion indicating light PTO HI	W3	Selection push button 30 I/1' PTO HI
9	Welding socket ( + )	B5	Auxiliary current push button	W5	Battery voltmeter
10	Welding socket ( - )	C2	Fuel level light	X1	Remote control socket
12	Earth terminal	C3	E.A.S. PCB	Y3	Button indicating light 20 I/1' PTO HI
15	A.C. socket	C6	Control unit for generating sets QEA	Y5	Commutator/switch, serial/parallel
16	Accelerator lever	D	Ground fault interrupter ( 30 mA )	Z2	Thermal-magnetic circuit breaker
17	Feed pump	D1	Engine control unit and economiser EP1	Z3	Selection push button 20 I/1' PTO HI
19	48V D.C. socket			Z5	Water temperature indicator
22	Engine air filter	D2	Ammeter		
23	Oil level dipstick	E2	Frequency meter		
24	Engine oil reservoir cap	E6	Frequency rpm regulator		
24A	Hydraulic oil reservoir cap	E7	Voltmeter regulator		
24B	Water filling cap	F	Fuse		
25	Fuel prefilter	F3	Stop switch		
26	Fuel tank cap	F5	Warning light, high temperature		
27	Muffler	F6	Arc-Force selector		
28	Stop control	G1	Fuel level transmitter		
29	Engine protection cover	H2	Voltage commutator		
30	Engine cooling/alternator fan belt	H6	Fuel electro pump		
31	Oil drain tap	H8	Engine control unit EP7		
31A	Hydraulic oil drain tap	I2	48V A.C. socket		
31B	Water drain tap	I3	Welding scale switch		
31C	Exhaust tap for tank fuel	I4	Preheating indicator		
32	Button	I5	Y/▲ switch		
33	Start button	I6	Start Local/Remote selector		
34	Booster socket 12V	I8	AUTOIDLE switch		
34A	Booster socket 24V	L	A.C. output indicator		
35	Battery charge fuse	L5	Emergency button		
36	Space for remote control	L6	Choke button		
37	Remote control	M	Hour counter		
42	Space for E.A.S.	M1	Warning level light		
42A	Space for PAC	M2	Contactora		
47	Fuel pump	M5	Engine control unit EP5		
49	Electric start socket	M6	CC/CV switch		
54	Reset button PTO HI	N	Voltmeter		
55	Quick coupling m. PTO HI	N1	Battery charge warning light		
55A	Quick coupling f. PTO HI	N2	Thermal-magnetic circuit breaker/ Ground fault interrupter		
56	Hydraulic oil filter				
59	Battery charger thermal switch	N5	Pre-heat push-button		
59A	Engine thermal switch	N6	Connector - wire feeder		
59B	Aux current thermal switch	O1	Oil pressure warning light/Oil alert		
59C	Supply thermal switch wire feeder-42V	O8	V/A digital instruments and led VRD PCB		
59D	Pre-heater (spark plug) thermal switch	P	Welding arc regulator		
59E	Supply thermal switch oil/water heater	P8	Water in fuel		
59F	Electropump thermal switch	Q1	Starter key		
63	No load voltage control	Q3	Derivation box		
66	Choke control	Q4	Battery charge sockets		
67A	Auxiliary / welding current control	Q7	Welding selector mode		
68	Cellulosic electrodes control	R3	Siren		
69A	Voltmeter relay	S	Welding ammeter		
70	Warning lights	S1	Battery		
71	Selecting knob	S3	Engine control unit EP4		
72	Load commut. push button	S6	Wire feeder supply switch		
73	Starting push button	S7	Plug 230V singlephase		
74	Operating mode selector	T	Welding current regulator		
75	Power on warning light	T4	Dirty air filter warning light/indicator		
76	Display	T5	Earth leakage relay		
79	Wire connection unit	T7	Analogic instrument V/Hz		
86	Selector	U	Current transformer		
86A	Setting confirmation	U3	R.P.M. adjuster		
87	Fuel valve	U4	Polarity inverter remote control		
88	Oil syringe	U5	Release coil		
A3	Insulation monitoring	U7	Engine control unit EP6		
A4	Button indicating light 30 I/1' PTO HI	V	Welding voltage voltmeter		
B2	Engine control unit EP2	V4	Polarity inverter control		
B3	E.A.S. connector	V5	Oil pressure indicator		
		W1	Remote control switch		





This symbol (Norm EN 60974-1 security standards for arc welders ) signifies that the welder can be used in areas with increased risk of electrical shock.

**⚠ ATTENTION**

The sockets, after the machine is started (see pages M21-26), also with no cables, are anyway under voltage.

**⚠ ATTENTION**

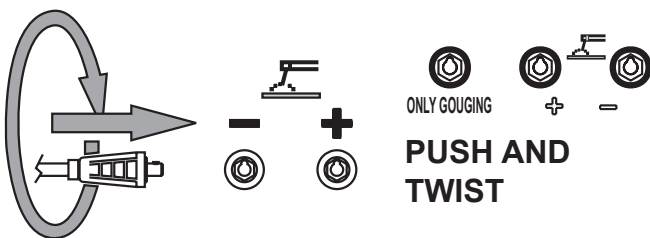
The areas, access of which is forbidden to unqualified personnel, are:

- the control switchboard (front) - the exhaust of the endothermic engine - the welding process.

Check at the beginning of any work the electric parameters and/or the control placed on the front.

Make sure that the ground connection (12) is efficient (keep to installation local rules and/or to national laws), in order to integrate or ensure the working of various electric protection devices referring to the several distribution system TT/TN/IT, operation unnecessary for machine with isometer.

Fully insert the welding cable plugs into the corresponding sockets ("only gauging", 9+/10-) turning them clockwise to lock them in position.



**TECTION (D1)**  
See page M 39.1

**REMOTE CONTROL TC...**  
See page M 38


**WELDING CURRENT REGULATOR**  
Position welding current adjusting knob (T) in correspondance of the chasen current value, so as to obtain the necessary amperage, taking into account the diameter and the type of the electrode.  
For technical data see page M1.6

Make sure that the ground clamp ,whose cable must be connected to the + or - terminal, depending on the type of electrode, makes a good connection and is near to the welding position.


Pay attention to the two polarities of the welding circuit, which must not come in electric contact between themselves.

When using the welder for air arc gouging connect the ground lead to the - socket and the gouging lead to the socket marked "only gouging" (if present).

**MACHINES WITH E.V. PROTECTION**

 Accelerate the engine at max. with the accelerator lever (16). See page M 39.

**MACHINE WITH E.P.2 PROTECTION (B2)**

 Accelerate the engine at max. with the accelerator lever (16) (when assebled).  
See page M 39

**MACHINE WITH E.P.1 PRO-**

**⚠ ATTENTION**


To reduce the risk of electromagnetic interferences, use the minimum lenght of welding cables and keep them near and down (ex. on the floor). The welding operations must take place far from any sensitive electronic device. Make sure that the unit is earthed. (see M20 and/or M25). In case the interference should last, adapt further disposition, such as: move the unit, use screened cables, line filters, screen the entire work area. In case the above mentioned operations are non sufficient, please contact our Thechnical Assistance Service.

**⚠ CAUTION**

With a welding cable length up to 20 m is suggested a section of 35 mm<sup>2</sup>; with longer cables a bigger section is required.



## MACHINE WITH REDUCTION SCALE SWITCH

100%  
  
 XXX A  
 max

For small electrodes (up to Ø 3.25-130A and 4-200A) it is recommended to use the reduction scale switch (I3) allowing a more accurate regulation of the welding current (lever position at 130 A and/or 200A).

When using electrodes of a diameter greater than 3.25 and/or 4 set the welding scale knob to 100% and/or max. position.

The arc regulator (T) functions equally between both positions (100%-130A and/or 200A).




Protection fuse (when assembled):the fuse protects the electronic welding PCB in case the remote control is short circuited.

## MACHINE WITH O.C.V.

65V  
 75V


It permits to choose, according to the work to be done and/or the electrode type used, the best O.C.V.

## MACHINE WITH POLARITY INVERTER

+  
  
 -

It permits to have at the electrode holder the positive or negative polarity of the welding diode bridge. It is used above all in the first run with cellulosic electrodes to lower the bath temperature and so doing ease up the welding on pipes of small thickness



## MACHINE WITH BASIC CURRENT "BC"

ON  
  
 OFF

Positioning the switch on „ON“, is obtained a low voltage welding current which keeps, always, the lit arc necessary for some types of cellulosic electrodes or when a high penetration is wanted.

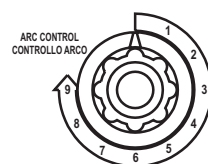
For electrodes of basic or rutile type, position the switch on "OFF", the welding current will always remain constant.

## "CC/CV" MODELS


  


These models can be used with electrodes or for TIG welding by selecting the CC (constant current) mode, and with solid wire (MIG, MAG) or flux cored wire selecting the CV (constant voltage) mode. The mode of operation is selected by a switch on the front panel.

## MACHINE WITH ARC CONTROL OR SELECTOR "ARC FORCE"




Set the welding arc using adjuster knob (P) so as to obtain, for the chosen current value, the best arc characteristic according to the electrode type and to the work to be performed.

ON  
  
 OFF

ARC FORCE

On machines with an Arc Force selector, the same result can be obtained by turning the selector "ON" or "OFF". When switched "ON" a base current is applied to the welding current output acting as a sort of "automatic" arc forcing that does not need to be regulated.

For technical data see page M1.6

 At the end of every welding process and/or work, proceed with all the use operations **in inverted sense**.

To stop the machine see pages M 22-27.

☞ **It is strictly forbidden to connect the group to the public mains a/o to another source of electric power.**

**WARNING**

Sockets are not **self-locked**: tension is available immediately after starting also with no plug.

**WARNING**

The areas, **access** of which is forbidden to unqualified personel, are:

- the control switchboard (front), the exhaust of the endothermic engine.

☞ At the beginning of every work, check the electric parameters and/or the controls placed on the front.

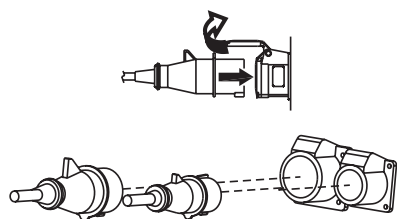
Make sure the unit is properly grounded (12) (where it is assembled).  
- See page M20, 21, 22, 25, 26, 27 -.

Move the accelerator lever (16) and reach the engine maximum speed, except for the engines with constant rpm; the voltmeter (N) (where it is assembled) shows the single-phase voltage whether three or single-phase current has to be drawn.

Nominal voltage	Indicative no-load voltage	
	asynchronous	synchronous (*)
110V	±10%	±5%
230V	±10%	±5%
230V	±10%	±5%
400V	±10%	±5%

\*N.B.: with electronic tens. regul. RVT ±1%

Connect up the machine, using proper plugs and cables in good condition to the AC socket (15) to draw single or three-phase power, or, by cables with adequate section, to the terminal board, placed inside the derivation box (Q3).



The warning light (L), located near the current socket, lights up when the unit can supply alternated current, on condition that the engine is at the maximum rpm.

☞ N.B.:if the warning light does not flash, check the accelerator which must be at its maximum, or the fuse of the relevant socket. (single-phase) or the thermoprotection.

Using several sockets at the same time, the maximum power possible is that indicated on the data plate.

To draw power simultaneously in the TS welder version see page M1.6

**CAUTION**

The replacement of the fuse must absolutely be done with the engine off (remove the mechanical protection, then shift down the small lever of the fuse holder placed on the front panel).

The max. continuous power of the generating set or the load current must not be exceeded.

**MACHINE WITH THERMOPROTECTION**

If you overload the genset the thermoprotection will automatically switch off.  
If the thermoprotection is released, disconnect all the connected loads.



CIRCUIT BREAKER

Reset the thermoprotection pressing the central pole.  
When reset, connect the loads again.  
In case the protection should act furtherly, check: the connections, the wires or others, and if necessary call the Assistance Service.



Avoid to hold the central pole of the thermoprotection pressed for a long time.

Otherwise, in case of trouble, it will not click, **dama-**  
**ging** the generating set.



**TS ... PL VERSION**

Start the machine and wait for the end of the pre-heating time imposed by the EP1, EP2, EP5 engine protection device. - See pages M39... -

Press the „generation possibility“ push button (B5) placed on the front side of machine.

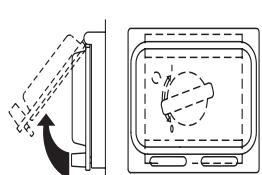
The voltmeter will show the auxiliary voltage which, for machines at 1500/1800 RPM, must be approx.  $\approx 230V \pm 10\%$  and for machines at 3000/3600 RPM (engine idling) must be approx.  $\approx 180V \pm 10\%$ .

Push upwards the lever of magnetothermic switch referring to the socket from which load is to be drawn.

**MACHINE WITHOUT PROTECTIVE DEVICE**

In case machine is not equipped with protective device of indirect contacts, by means of automatic breaking of supply, it **is necessary** to put between the load and the generation a differential switch or a similar equipment capable, in any case, to observe the regulations in force CEI 64/8 (and/or successive) Part 4 Par. 4.13.1 and harmonized by directive Nr. 72/23/EEC.

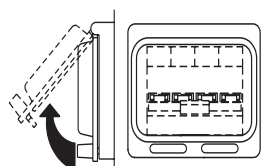
**UNIT FITTED WITH GROUND FAULT INTERRUPTER SWITCH (GFI)**



Turn on the GFI safety-switch (D) by pushing it upwards.

The GFI is a safety device which protects the circuit in the event of a malfunction. In this case the switch disconnects the three and single-phase circuit when in any part of the electric connections a current leakage of more than 30 mA occurs.

**UNIT FITTED WITH THERMAL MAGNETIC BREAKER**

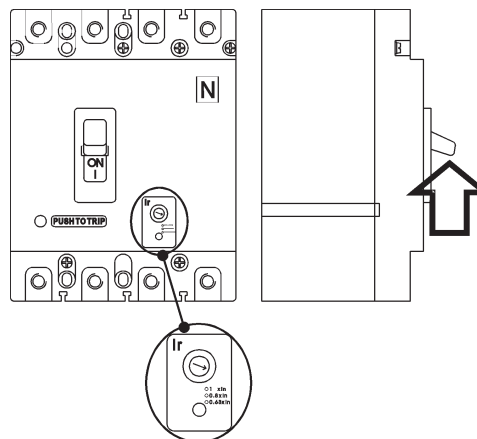


Turn on the thermal magnetic breaker (Z2) by pushing it to the ON position.

The thermal-magnetic breaker is a safety device which protects the circuit in the event of a malfunction. In this case the switch disconnects the three and single-phase circuit when in any part of the electric connections a short circuit or a current absorption occurs above the data specified on the label of the unit.

In the model with setting **DO NOT INTERVENE** on the setting itself. To modify it, please contact our Technical Assistance Service.

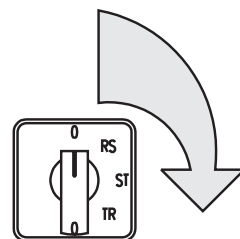
**UNIT FITTED WITH GFI SWITCH THERMAL MAGNETIC BREAKER**



This switch includes the characteristics of both types of breakers (N2).

**UNIT WITH VOLTMETRIC COMMUTATOR (ONLY FOR GENERATING SET)**

**WARNING:** the possible single-phase loads must be correctly divided in the three phases, in order to avoid any possible voltage fall on one phase that results excessively loaded.



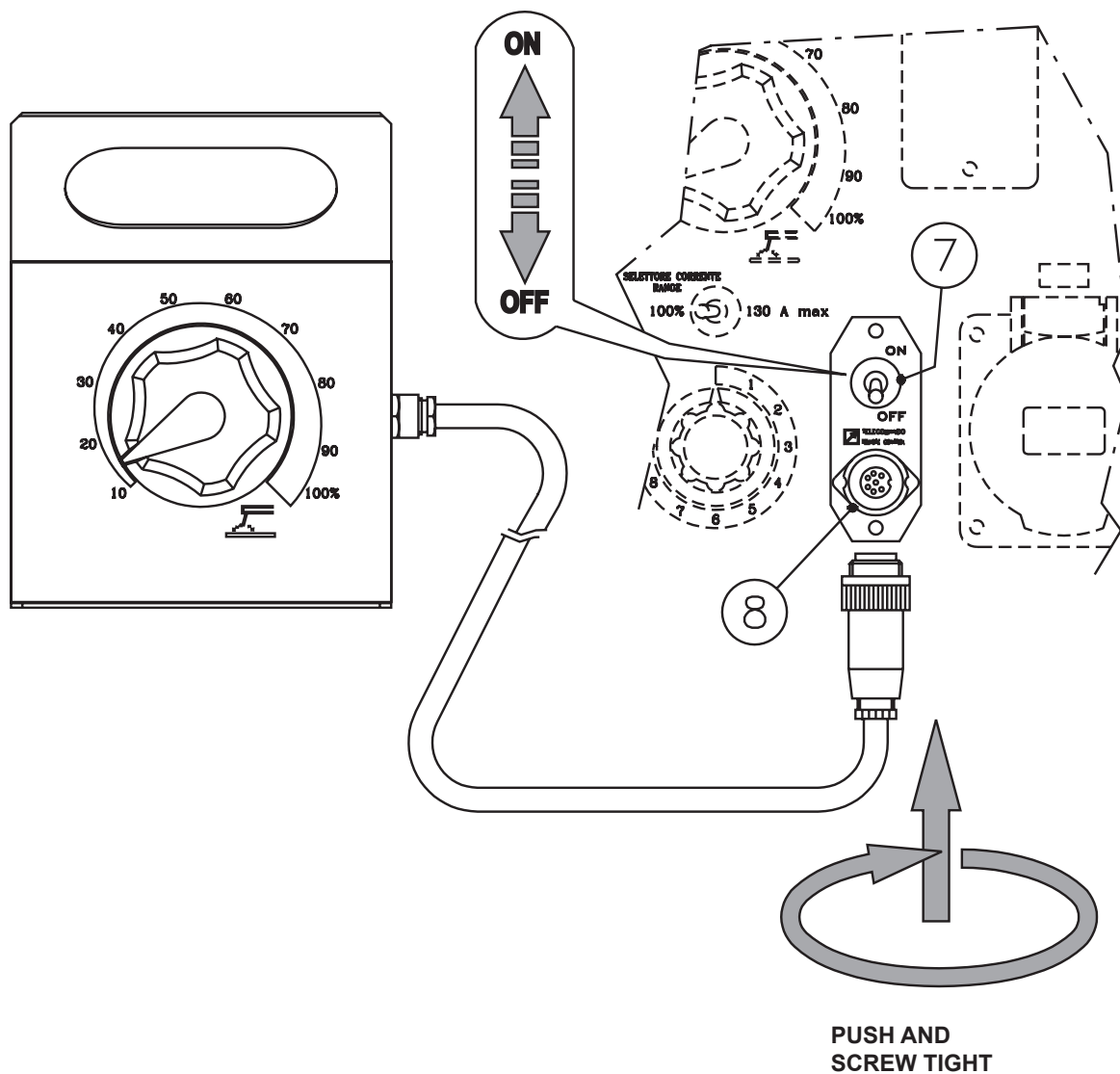
Check the voltages on the various phases with the switch located on the front (H2) and check, reading on the voltmeter (N) about the same voltage value

**N.B.:** in case of overload, it is possible that the engine lowers its speed and the voltage is reduced remarkably. In this case, it is necessary to reduce immediately the load.

**CAUTION**

For machines at 3000/3600 RPM the EP1 safety device will automatically provide to accelerate engine when load is drawn.  
- See page M39.1 -





The remote control device for regulating the welding current is connected to the front panel by means of a multipole connector.

To regulate the current from the TC2 / TC2/50, move the switch (7), located above the multipole connector (8), to "ON" position.

Position welding current adjusting (T) knob at the necessary current value for the diameter and type of electrode.



## ENGINE PROTECTION (EP1)

The electronic device EP.1 (D1) is a microprocessor with logic-circuit board that ensures the protection of the engine in case of low oil pressure or engine high temperature.

Located on the front of the machine, the EP.1 enters in operation when the engine has been turned on with the ignition key.

The yellow warning light for low oil temperature (D1.1) will immediately light up; **after** 15 seconds the engine will be checked and if everything is operating normally, the "OK engine" light will switch on.



### CAUTION

IN THE FIRST FRACTION OF TIME THE DEVICE DOES NOT MAKE ANY PROTECTION.

The automatic device requires an engine warning up time of at least 45 seconds, not permitting to draw power when the engine is still cold.

**N.B.:** A longer warning up time (4-5 minutes) is advisable for temperatures below +10°C.

When the warning light (D1.1) goes off, whether the unit is used as welder or as a generator, the green light (D1.5) will light up, the engine will go to maximum speed, permitting to draw power. Should the oil pressure be insufficient, the red light (D1.3) will light up and the EP.1 device will stop the engine.

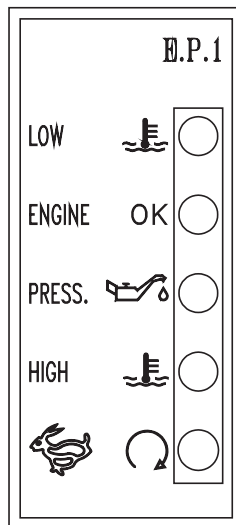
If the temperature rises to dangerous levels, the red light (D1.4) will light up and the engine will stop thus preventing to draw power.

### LIQUID COOLED ENGINE

In case of cooling liquid high temperature, the warning light (D1.4) will light up and the engine will stop thus preventing to draw power.

In this case it is **SUGGESTED** to stop the engine and control the cooling level.

In case of low pressure, check the level and if it is correct, call the service station. In case of high temperature, make sure that there are no leaves and/or pieces of material obstructing the air circuit.



- D1.1(G) Low oil temperature/ Cold engine
- D1.2(V) Engine test/ OK engine
- D1.3(R) Low oil pressure
- D1.4(R) High temperature
- D1.5(V) Engine at maximum

### COLORS

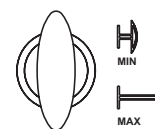
- G = yellow
- V = green
- R = red

## ENGINE EQUIPPED WITH A MANUAL ACCELERATOR

**NOTE:** This unit is equipped with a manual accelerator for use in the unlikely event that the EP.1 or the accelerator solenoid should fail. This manual accelerator can also be used in cases where the auto-idle function is not suitable for the type of welding being carried out.

**CAUTION:** for machines with EP.1 engine protection: use the accelerator lever **ONLY IN EMERGENCY** when the automatic idle does not work.

Accelerator lever



**N.B.:** if the unit is used as a generator in hot climates and with loads near to the maximum, the protection can be triggered off, please reduce the load of the engine.

Once the cause of the problem has been removed, to ensure the protection it is sufficient to set the key to zero and restart the engine.



### NOTE

THE ENGINE PROTECTIONS OF THE "EP" TYPE DO NOT WORK WHEN THE OIL IS OF LOW QUALITY BECAUSE NOT CHANGED REGULARLY AT INTERVALS AS PRESCRIBED IN THE OWNER'S ENGINE MANUAL.

**ENGINE PROTECTION (ES - EV)**

The devices ES or EV ensure the protection of the engine in case of low oil pressure or engine high temperature.

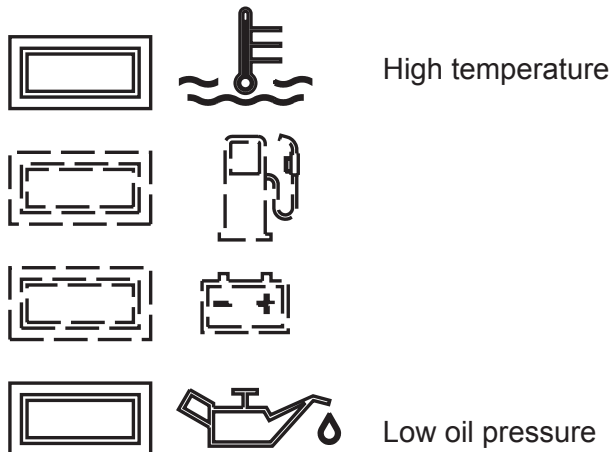
The system consist of electronic card of control and check, and of an engine stop device: solenoid (**ElettroStop**), electrovalve (**ElettroValvola**)

The device enter in operation when the engine starts and, in case of low oil pressure and high temperature, will stop the machine and show the cause of the stop with the warning light of high temperature or low oil pressure.

In case of low oil pressure, check the level and if it is correct, call the Service Station. In case of high temperature, make sure that there are no leaves and/or pieces of material obstructing the air ducts.

**N.B.:** if the unit is used as a generator in hot climates and with loads near to the maximum, the protection device can be triggered off, please reduce the load of the engine.

Once the cause of the problem is removed, to reset the protection, it is enough to report the ignition key (Q1) on "OFF" position and start the engine again.






**NOTE**

*THE ENGINE PROTECTIONS DO NOT WORK WHEN THE OIL IS OF LOW QUALITY BECAUSE NOT CHANGED REGULARLY AT INTERVALS AS PRESCRIBED IN THE OWNER'S ENGINE MANUAL.*

PROBLEM	POSSIBLE CAUSE	WHAT TO DO
No welding current but auxiliary output is OK	1) Defective diode bridge 2) Problem with welding current control (PCB)	1) Check the diodes of the bridge 2) Is the remote control switch in the internal position? 3) Check the diodes and SCR's of the bridge. 4) Check the transformer which supplies power to the welding control PCB. If it is OK replace the PCB.
Weld poorly	1) Defective diode bridge 2) Problem with welding current control (PCB)	1) Check the open circuit welding voltage. If it is OK the diode bridge is OK. If it is 1/3 or 2/3 of the nominal value check the diodes or the SCR's. 2) If the diode bridge is OK replace the PCB.
Intermittently welds poorly	1) Bad connections to welding current PCB 2) Problem with welding current control PCB	1) Check that the pins of the green connectors are clean and making good contact. Check that shunt connections are tight. 2) Replace the welding current control PCB.
No welding output and no auxiliary power output	1) Short circuit in wiring 2) Defective condenser 3) Defective stator 4) Short circuited diode bridge	1) Check the wiring inside the welder for a short circuit between cables or to ground. 2) If the wiring is OK, short circuit the condenser to be sure that it is discharged, disconnect all wires from condenser and, using an ohmmeter, check that the condenser is not short circuited. 3) If the condenser box is OK, disconnect all leads from the stator except for those going to the condenser box and check the output from the alternator. If there is no output from the welding winding and the auxiliary winding, replace the stator. 4) If there is output from all windings reconnect the diode bridge and check if there is welding current. If not the diode bridge is defective. If there is welding current connect the auxiliary power leads one at a time until there is no output; at this point, the short circuit is in that line.

 only for models with electronic control of welding current.

 <b>WARNING</b>		
	<ul style="list-style-type: none"> <li>Have <b>qualified</b> personnel do maintenance and troubleshooting work.</li> <li>Stop the engine before doing any work inside the machine. If for any reason the machine must be operated while working inside, <b>pay attention</b> moving parts, hot parts (exhaust manifold and muffler, etc.) electrical parts which may be unprotected when the machine is open.</li> <li>Remove guards only when necessary to perform maintenance, and replace them when the maintenance requiring their removal is complete.</li> <li>Please wear the appropriate clothing and make use of the PPE (Personal Protective Equipment), according to the type of intervention (protective gloves, insulated gloves, glasses).</li> <li>Do not modify the components if not authorized.</li> </ul> <p style="text-align: center;">- See pag. M1.1 -</p>	
<b>MOVING PARTS can injure</b>		<b>HOT surface can hurt you</b>

**NOTE**

By maintenance at care of the utilizer we intend all the operatios concerning the verification of mechanical parts, electrical parts and of the fluids subject to use or consumption during the normal operation of the machine.

For what concerns the fluids we must consider as maintenance even the periodical change and or the refills eventually necessary.

Maintenance operations also include machine cleaning operations when carried out on a periodic basis outside of the normal work cycle.

The repairs **cannot be considered** among the maintenance activities, i.e. the replacement of parts subject to occasional damages and the replacement of electric and mechanic components consumed in normal use, by the Assistance Authorized Center as well as by manufacturer.

The replacement of tires (for machines equipped with trolleys) must be considered as repair since it is not delivered as standard equipment any lifting system.

The periodic maintenance should be performed according to the schedule shown in the engine manual. An optional hour counter (M) is available to simplify the determination of the working hours.

maintenance intervals and specific checks for each model: it is necessary to consult the specific engine or alternator USER AND MAINTENANCE manual.

**VENTILATION**

Make certain there are no obstructions (rags, leaves or other) in the air inlet and outlet openings on the machine, alternator and motor.

**ELECTRICAL PANELS**

Check condition of cables and connections daily. Clean periodically using a vacuum cleaner, **DO NOT USE COMPRESSED AIR.**

**DECALS AND LABELS**

*All warning and decals should be checked once a year and **replaced** if missing or unreadable.*

**STRENUOUS OPERATING CONDITIONS**



Under extreme operating conditions (frequent stops and starts, dusty environment, cold weather, extended periods of no load operation, fuel with over 0.5% sulphur content) do maintenance more frequently.

**BATTERY WITHOUT MAINTENANCE  
DO NOT OPEN THE BATTERY**

The battery is charged automatically from the battery charger circuit supplied with the engine.

Check the state of the battery from the colour of the warning light which is in the upper part.

- Green colour: battery OK
- Black colour: battery to be recharged
- White colour: battery to be replaced


 <b>IMPORTANT</b>
<div style="display: flex; align-items: center;">  <p style="margin: 0;">In the maintenance operations avoid that polluting substances, liquids, exhausted oils, etc. bring damage to people or things or can cause negative effects to surroundings, health or safety respecting completely the laws and/or dispositions in force in the place.</p> </div>

**ENGINE and ALTERNATOR**

**PLEASE REFER TO THE SPECIFIC MANUALS PROVIDED.**

Every engine and alternator manufacturer has



 <b>NOTE</b>
<p>THE ENGINE PROTECTION NOT WORK WHEN THE OIL IS OF LOW QUALITY BECAUSE NOT CHARGED REGULARLY AT INTERVALS AS PRESCRIBED IN THE OWNER'S ENGINE MANUAL.</p>

In case the machine should not be used for more than 30 days, make sure that the room in which it is stored presents a suitable shelter from heat sources, weather changes or anything which can cause rust, corrosion or damages to the machine.

☞ Have **qualified** personnel prepare the machine for storage.

### GASOLINE ENGINE

Start the engine: It will run until it stops due to the lack of fuel.

Drain the oil from the engine sump and fill it with new oil (see page M25).

Pour about 10 cc of oil into the spark plug hole and screw the spark plug, after having rotated the crankshaft several times.

Rotate the crankshaft slowly until you feel a certain compression, then leave it.

In case the battery, for the electric start, is assembled, disconnect it.

Clean the covers and all the other parts of the machine carefully.

Protect the machine with a plastic hood and store it in a dry place.

### DIESEL ENGINE

For short periods of time it is advisable, about every 10 days, to make the machine work with load for 15-30 minutes, for a correct distribution of the lubricant, to recharge the battery and to prevent any possible blocking of the injection system.

For long periods of inactivity, turn to the after sales service of the engine manufacturer.

Clean the covers and all the other parts of the machine carefully.

Protect the machine with a plastic hood and store it in a dry place.

In case of necessity for first aid and of fire prevention, see page. M2.5.



## IMPORTANT



In the storage operations avoid that polluting substances, liquids, exhausted oils, etc. bring damage to people or things or can cause negative effects to surroundings, health or safety respecting completely the laws and/or dispositions in force in the place.



☛ Have **qualified** personnel disassemble the machine and dispose of the parts, including the oil, fuel, etc., in a correct manner when it is to be taken out of service.

In case of necessity for first aid and fire prevention, see page M2.5.

As cust off we intend all operations to be made, at utilizer's care, at the end of the use of the machine. This comprises the dismantling of the machine, the subdivision of the several components for a further reutilization or for getting rid of them, the eventual packing and transportation of the eliminated parts up to their delivery to the store, or to the bureau encharged to the cust off or to the storage office, etc.

The several operations concerning the cust off, involve the manipulation of fluids potentially dangerous such as: lubricating oil and battery electrolyte.

The dismantling of metallic parts liable to cause injuries or wounds, must be made wearing heavy gloves and using suitable tools.

The getting rid of the various components of the machine must be made accordingly to rules in force of law a/o local rules.

**Particular attention must be paid when getting rid of:**  
**lubricating oils, battery electrolyte, and inflammable liquids such as fuel, cooling liquid.**



The machine user is responsible for the observance of the norms concerning the environment conditions with regard to the elimination of the machine being cust off and of all its components.

In case the machine should be cust off without any previous disassembly it is however compulsory to remove:

- tank fuel
- engine lubricating oil
- cooling liquid from the engine
- battery

**NOTE:** The manufacturer is involved with custing off the machine **only** for the second hand ones, when not reparable.

This, of course, after authorization.

 <b>IMPORTANT</b>	
	In the cust-off operations avoid that polluting substances, liquids, exhausted oils, etc. bring damage to people or things or can cause negative effects to surroundings, health or safety respecting completely the laws and/or dispositions in force in the place.

The information here below are to be intended only as indicative since the above norm is much larger. For further details please see the specific norms and/or the manufacturers of the product to be used in the welding process.

**RUTILE ELECTRODES: E 6013**

Easily removable fluid slag, suitable for welding in all position. Rutile electrodes weld in d.c. with both polarities (electrode holder at + or -) and in a.c.. Suitable for soft steels R-38/45 kg/mm<sup>2</sup>. Also for soft steels of lower quality.

**BASIC ELECTRODES: E 7015**

Basic electrodes weld only in d.c. with inverse polarity (+ on the electrode holder) ; there are also types for a.c. Suitable for impure carbon steels. Weld in all position.

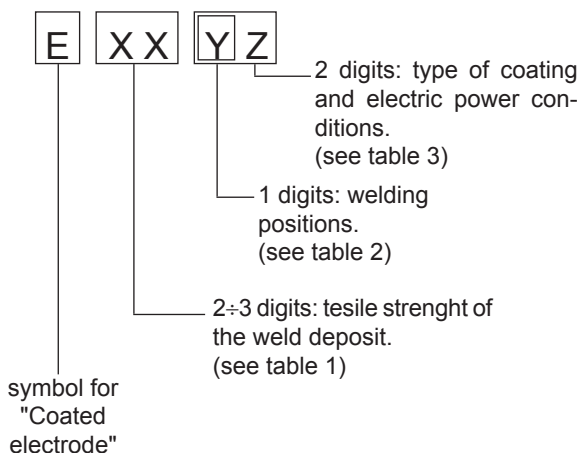
**HIGH YIELD BASIC ELECTRODES: E 7018**

The iron contained in the coating increases the quality of metal added. Good mechanical properties. Weld in all position. Electrode holder at + (inverse polarity). Weld deposit of nice aspect, also vertical. Workable; high yield. Suitable for steels with high contents of sulphur (impurities).

**CELLULOSIC ELECTRODES: E 6010**

Cellulosic electrodes weld only in d.c. with polarity + electrode holder - ground clamp. Special for steels run on pipes with R max 55 kg/mm<sup>2</sup>. Weld in all position. volatile slag.

**ELECTRODES IDENTIFICATION ACCORDING TO A.W.S. STANDARDS**



Number	Strength	
	K.s.l.	Kg/mm <sup>2</sup>
60	60.000	42
70	70.000	49
80	80.000	56
90	90.000	63
100	100.000	70
110	110.000	77
120	120.000	84

Table 1

1	for all positions
2	for plane and vertical
3	for plane position only

Table 2

N°	Descrizione
10	Cellulose electrodes for d.c.
11	Cellulose electrodes for a.c.
12	Rutile electrode for d.c.
13	Rutile electrode for a.c.
14	High yield rutile electrodes
15	Basic electrodes for d.c.
16	Basic electrodes for a.c.
18	High yield basic electrodes for d.c. (inverse polarity)
20	Acid electrodes for flat or front position welding for d.c. (- pole) and for a.c.
24	High yield rutile electrodes for flat or front plane position welding for d.c. and a.c.
27	High yield acid electrodes for flat or front plane position welding for d.c. (- pole) and a.c..
28	High yield basic electrodes for flat or front plane position welding for d.c. (inverse polarity)
30	Extra high yield acid electrodes, extra high penetration if required, for flat position welding only for d.c. (- pole) and a.c.

Table 3



# ELECTRICAL SYSTEM LEGENDE

M  
60

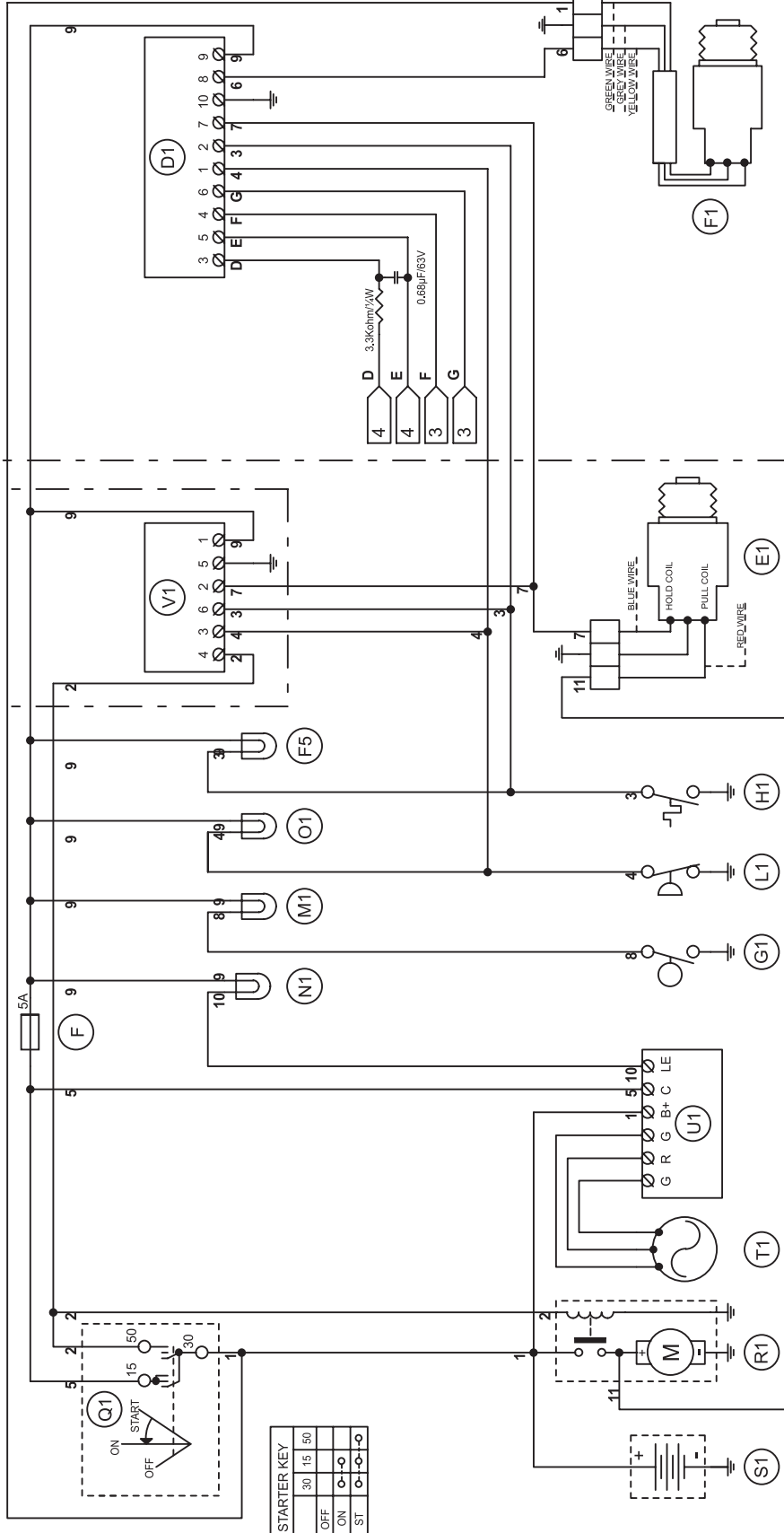
REV.10-05/13

A : Alternator	E3 : Open circuit voltage switch	I6 : Start Local/Remote selector	N9 : UP/DOWN button mast
B : Wire connection unit	F3 : Stop push-button	L6 : Choke button	O9 : Hydraulic unit solenoid valve
C : Capacitor	G3 : Ignition coil	M6 : Switch CC/CV	P9 : Hydraulic unit engine
D : G.F.I.	H3 : Spark plug	N6 : Connector – wire feeder	Q9 : Ignitor
E : Welding PCB transformer	I3 : Range switch	O6 : 420V/110V 3-phase transformer	R9 : Lamp
F : Fuse	L3 : Oil shut-down button	P6 : Switch IDLE/RUN	S9 : Power system
G : 400V 3-phase socket	M3 : Battery charge diode	Q6 : Hz/V/A analogic instrument	T9 :
H : 230V 1phase socket	N3 : Relay	R6 : EMC filter	U9 :
I : 110V 1-phase socket	O3 : Resistor	S6 : Wire feeder supply switch	V9 :
L : Socket warning light	P3 : Sparkler reactor	T6 : Wire feeder socket	Z9 :
M : Hour-counter	Q3 : Output power unit	U6 : DSP chopper PCB	W9 :
N : Voltmeter	R3 : Electric siren	V6 : Power chopper supply PCB	X9 :
P : Welding arc regulator	S3 : E.P.4 engine protection	Z6 : Switch and leds PCB	Y9 :
Q : 230V 3-phase socket	T3 : Engine control PCB	W6 : Hall sensor	
R : Welding control PCB	U3 : R.P.M. electronic regulator	X6 : Water heater indicator	
S : Welding current ammeter	V3 : PTO HI control PCB	Y6 : Battery charge indicator	
T : Welding current regulator	Z3 : PTO HI 20 l/min push-button	A7 : Transfer pump selector AUT-0-MAN	
U : Current transformer	W3 : PTO HI 30 l/min push-button	B7 : Fuel transfer pump	
V : Welding voltage voltmeter	X3 : PTO HI reset push-button	C7 : "GECO" generating set test	
Z : Welding sockets	Y3 : PTO HI 20 l/min indicator	D7 : Flooting with level switches	
X : Shunt	A4 : PTO HI 30 l/min indicator	E7 : Voltmeter regulator	
W : D.C. inductor	B4 : PTO HI reset indicator	F7 : WELD/AUX switch	
Y : Welding diode bridge	C4 : PTO HI 20 l/min solenoid valve	G7 : Reactor, 3-phase	
A1 : Arc striking resistor	D4 : PTO HI 30 l/min solenoid valve	H7 : Switch disconnecter	
B1 : Arc striking circuit	E4 : Hydraulic oil pressure switch	I7 : Solenoid stop timer	
C1 : 110V D.C./48V D.C. diode bridge	F4 : Hydraulic oil level gauge	L7 : "VODIA" connector	
D1 : E.P.1 engine protection	G4 : Preheating glow plugs	M7 : "F" EDC4 connector	
E1 : Engine stop solenoid	H4 : Preheating gearbox	N7 : OFF-ON-DIAGN. selector	
F1 : Acceleration solenoid	I4 : Preheating indicator	O7 : DIAGNOSTIC push-button	
G1 : Fuel level transmitter	L4 : R.C. filter	P7 : DIAGNOSTIC indicator	
H1 : Oil or water thermostat	M4 : Heater with thermostat	Q7 : Welding selector mode	
I1 : 48V D.C. socket	N4 : Choke solenoid	R7 : VRD load	
L1 : Oil pressure switch	O4 : Step relay	S7 : 230V 1-phase plug	
M1 : Fuel warning light	P4 : Circuit breaker	T7 : V/Hz analogic instrument	
N1 : Battery charge warning light	Q4 : Battery charge sockets	U7 : Engine protection EP6	
O1 : Oil pressure warning light	R4 : Sensor, cooling liquid temperature	V7 : G.F.I. relay supply switch	
P1 : Fuse	S4 : Sensor, air filter clogging	Z7 : Radio remote control receiver	
Q1 : Starter key	T4 : Warning light, air filter clogging	W7 : Radio remote control transmitter	
R1 : Starter motor	U4 : Polarity inverter remote control	X7 : Isometer test push-button	
S1 : Battery	V4 : Polarity inverter switch	Y7 : Remote start socket	
T1 : Battery charge alternator	Z4 : Transformer 230/48V	A8 : Transfer fuel pump control	
U1 : Battery charge voltage regulator	W4 : Diode bridge, polarity change	B8 : Ammeter selector switch	
V1 : Solenoid valve control PCB	X4 : Base current diode bridge	C8 : 400V/230V/115V commutator	
Z1 : Solenoid valve	Y4 : PCB control unit, polarity inverter	D8 : 50/60 Hz switch	
W1 : Remote control switch	A5 : Base current switch	E8 : Cold start advance with temp. switch	
X1 : Remote control and/or wire feeder socket	B5 : Auxiliary push-button ON/OFF	F8 : START/STOP switch	
Y1 : Remote control plug	C5 : Accelerator electronic control	G8 : Polarity inverter two way switch	
A2 : Remote control welding regulator	D5 : Actuator	H8 : Engine protection EP7	
B2 : E.P.2 engine protection	E5 : Pick-up	I8 : AUTOIDLE switch	
C2 : Fuel level gauge	F5 : Warning light, high temperature	L8 : AUTOIDLE PCB	
D2 : Ammeter	G5 : Commutator auxiliary power	M8 : A4E2 ECM engine PCB	
E2 : Frequency meter	H5 : 24V diode bridge	N8 : Remote emergency stop connector	
F2 : Battery charge transformer	I5 : Y/▲ commutator	O8 : V/A digital instruments and led VRD PCB	
G2 : Battery charge PCB	L5 : Emergency stop button	P8 : Water in fuel	
H2 : Voltage selector switch	M5 : Engine protection EP5	Q8 : Battery disconnect switch	
I2 : 48V a.c. socket	N5 : Pre-heat push-button	R8 : Inverter	
L2 : Thermal relay	O5 : Accelerator solenoid PCB	S8 : Overload led	
M2 : Contactor	P5 : Oil pressure switch	T8 : Main IT/TN selector	
N2 : G.F.I. and circuit breaker	Q5 : Water temperature switch	U8 : NATO socket 12V	
O2 : 42V EEC socket	R5 : Water heater	V8 : Diesel pressure switch	
P2 : G.F.I. resistor	S5 : Engine connector 24 poles	Z8 : Remote control PCB	
Q2 : T.E.P. engine protection	T5 : Electronic GFI relais	W8 : Pressure turbo protection	
R2 : Solenoid control PCB	U5 : Release coil, circuit breaker	X8 : Water in fuel sender	
S2 : Oil level transmitter	V5 : Oil pressure indicator	Y8 : EDC7-UC31 engine PCB	
T2 : Engine stop push-button T.C.1	Z5 : Water temperature indicator	A9 : Low water level sender	
U2 : Engine start push-button T.C.1	W5 : Battery voltmeter	B9 : Interface card	
V2 : 24V c.a. socket	X5 : Contactor, polarity change	C9 : Limit switch	
Z2 : Thermal magnetic circuit breaker	Y5 : Commutator/switch, series/parallel	D9 : Starter timing card	
W2 : S.C.R. protection unit	A6 : Commutator/switch	E9 : Luquid pouring level float	
X2 : Remote control socket	B6 : Key switch, on/off	F9 : Under voltage coil	
Y2 : Remote control plug	C6 : QEA control unit	G9 : Low water level warning light	
A3 : Insulation moiting	D6 : Connector, PAC	H9 : Chopper driver PCB	
B3 : E.A.S. connector	E6 : Frequency rpm regulator	I9 : Fuel filter heater	
C3 : E.A.S. PCB	F6 : Arc-Force selector	L9 : Air heater	
D3 : Booster socket	G6 : Device starting motor	M9 : ON/OFF switch lamp	
	H6 : Fuel electro pump 12V c.c.		



VERSIONE EP1  
EP1 VERSION

VERSIONE ES  
ES VERSION



STARTER KEY	
30	TS 50
OFF	ON
ON	OFF
ST	ST

D	Sostituito elettromagnete stop con modello senza elettronica (E1).	19.02.2008	N.L.	2	5
C	Sostituiti elettromagneti con modello CEI (E1) (F1).	24.07.2007	N.L.	2	5
B	Eliminato modifica "A" e aggiunto filtro RC sui morsetti 3 e 5 dell'EP1.	17.05.2007	N.L.	2	5
A	Aggiunto resistenza sul cavo collegato al morsetto 3 dell'EP1.	30.09.2005	N.L.	2	5
Esp. Eqp.					
Denominazione: Engine Lombardini 9LD625-2 (vers. ES-EP1)		Disegnatore: Leporace N.		Data: 30.07.2001	
Da Pag. From Page		Modifica Modification		Dis. n. Dwg. n.	
Alia Pag. to Page		Denominazione: 21760.prg		Dis. n. Dwg. n.	
		Project: 21760.prg		Approvato: Approver:	

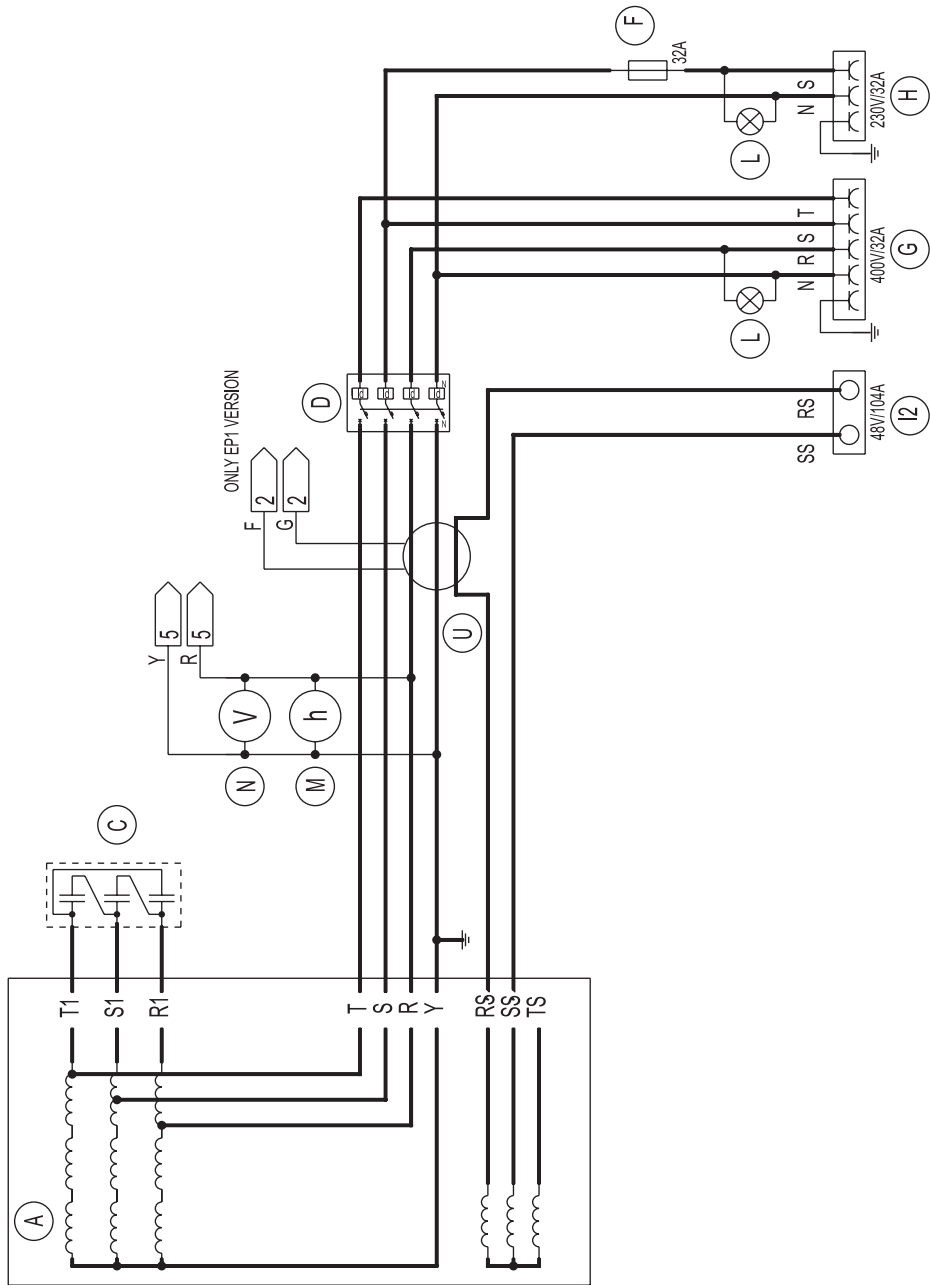
(I) Schema elettrico  
 (GB) Electric diagram  
 (F) Schemas électriques

(D) Stromlaufplan  
 (E) Esquema eléctrico  
 (NL) Schemas électriques

TS 400 KS - KSX

M  
61.2

REV.0-06/14



Esch. Exib.	Modifica Modification	Data Date	Dis. Desig.	Appr. Appr.
	Denominazione: aux. (400T/230M/48M) D	Project: 21760.ptg	Page n°: 3	di n°: 5
Da Pag. From Page	Macchina: Machine	Data: Date	Dis. n°: 21760.S.020	
Alia Pag. To Page	Designatore: Designer: Leporace N.	Date: 30.07.2001	Approvato: Approved: <i>Rosa</i>	

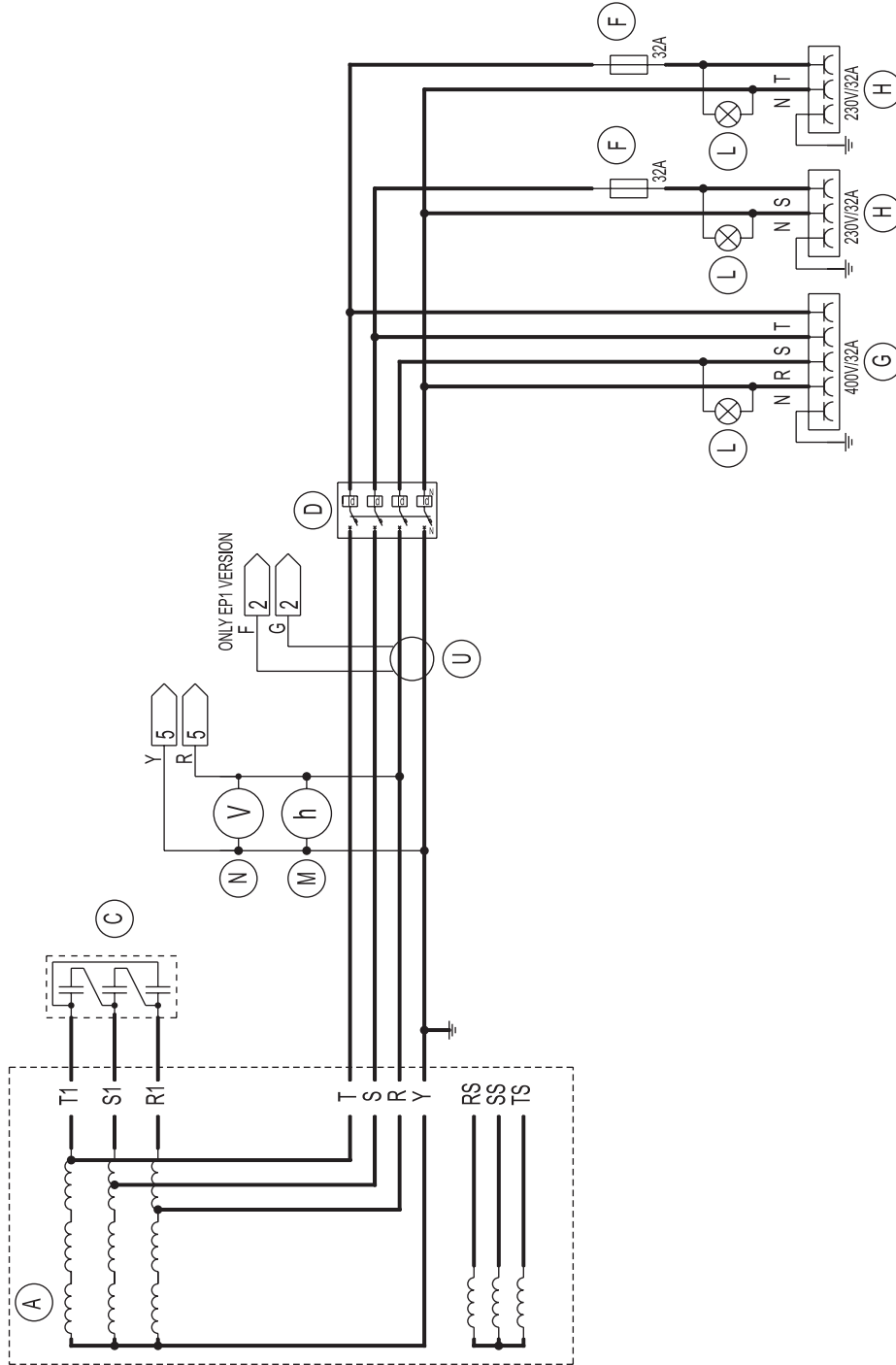
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 (F) Schemas électriques

(D) Stromlaufplan  
 (E) Esquema eléctrico  
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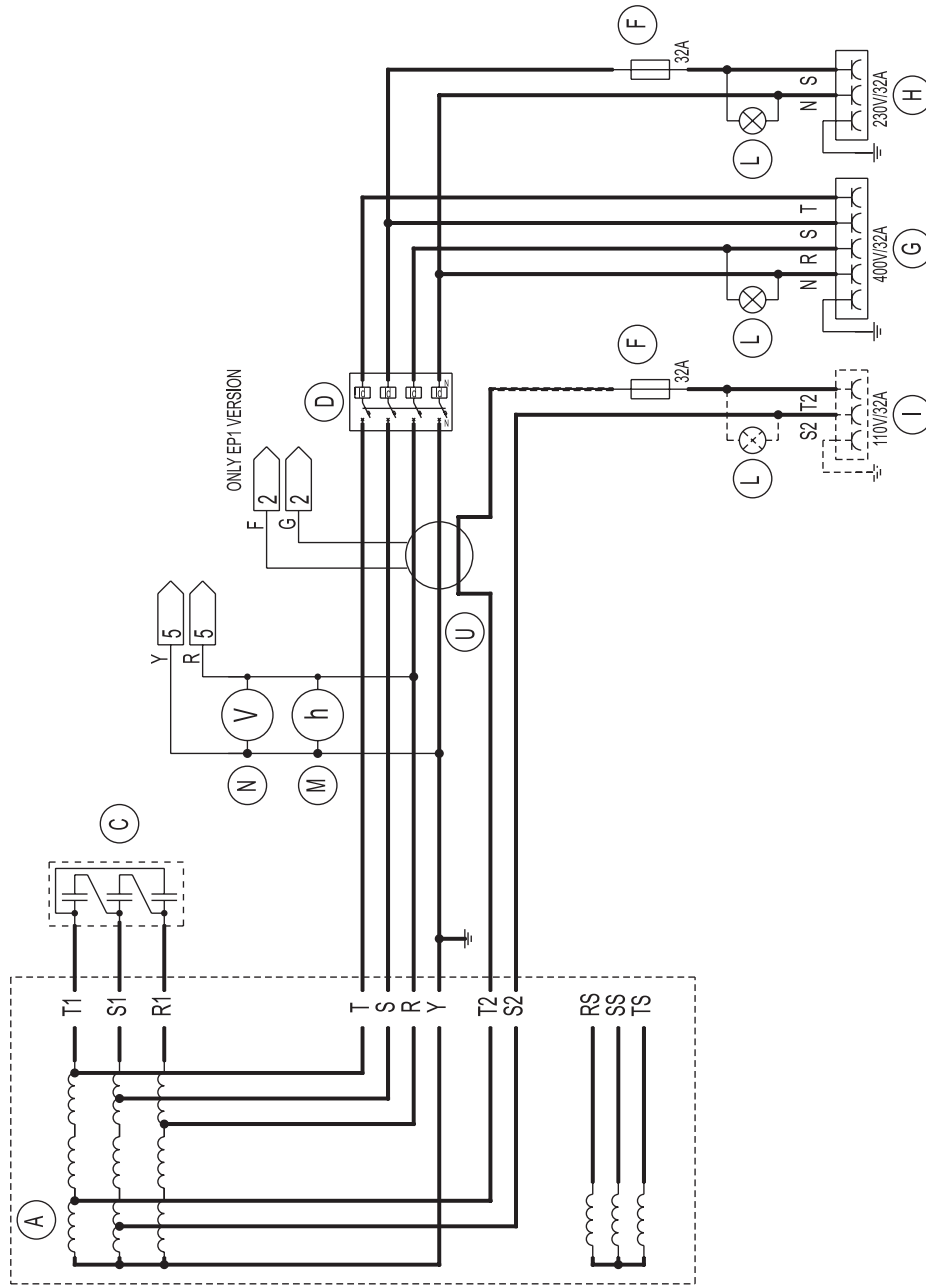
TS 400 KS - KSX


M  
61.3

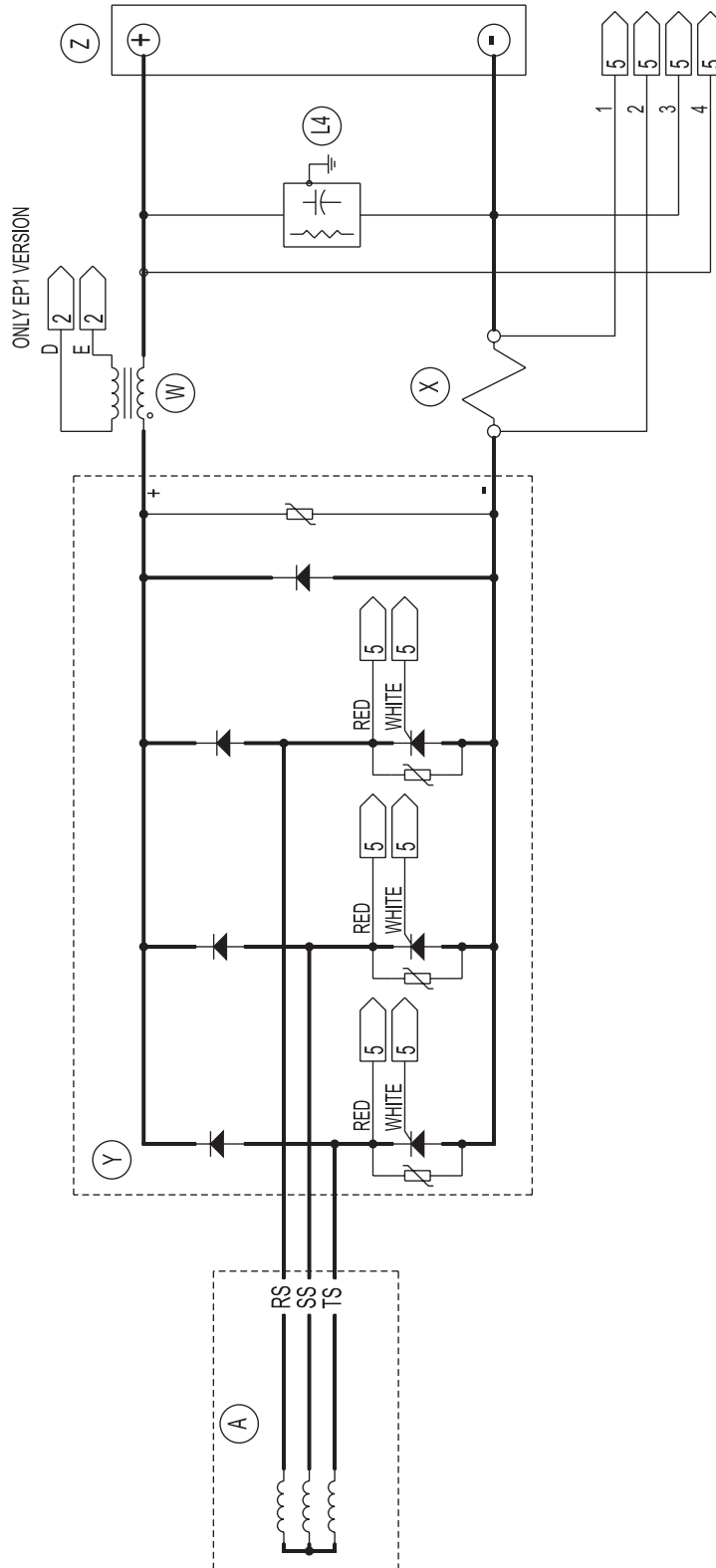
REV.0-06/14



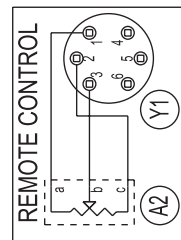
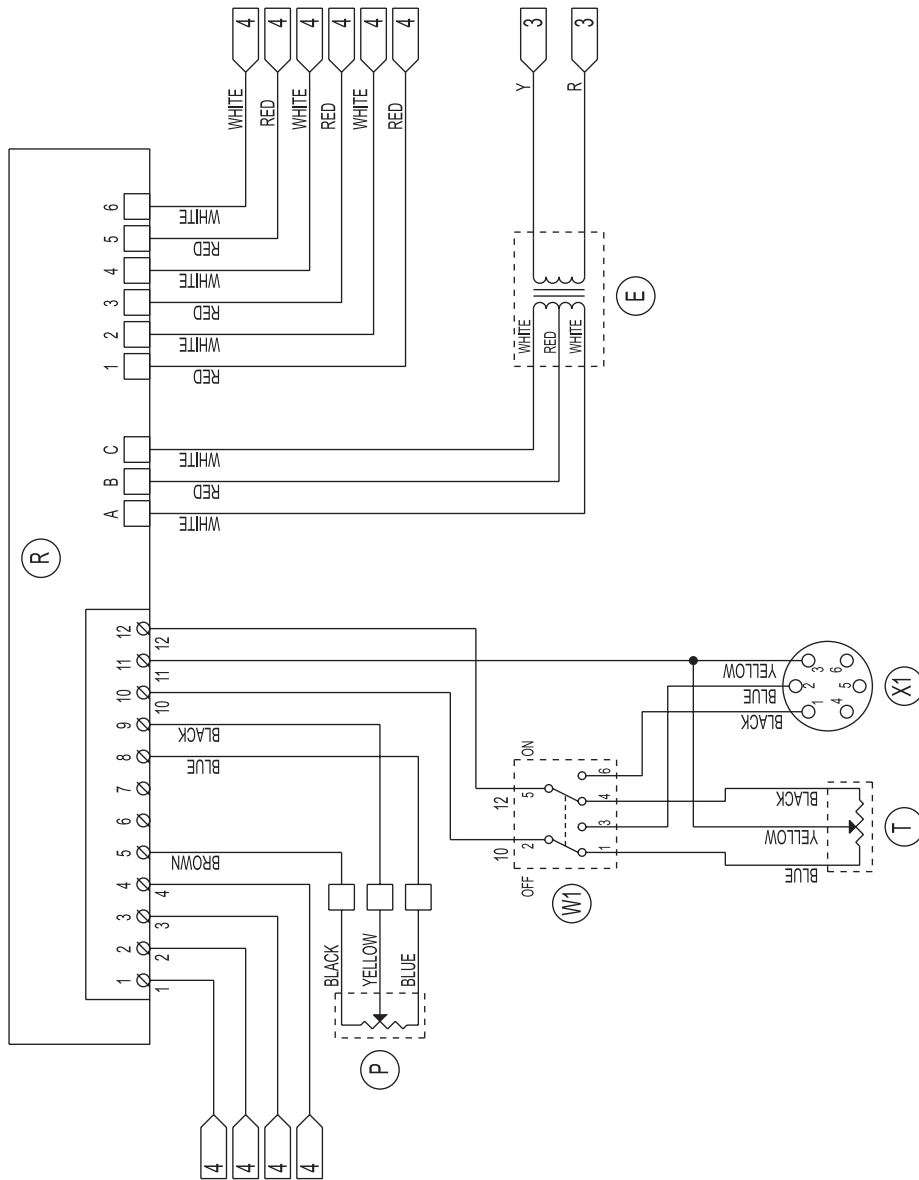
Esp. Exp.	Modifica Modification		Data Date	Dis. Dess.	Appr. Appr.
	Denominazione: Denomination:	AUX. (400T/230Mx2) D	Progetto: Project:	21762.prg	di n° of n°
	Da Pag. From Page			3	5
	Alta Pag. To Page		Disegnatore: Designer:	Leporace N.	Disegn. n°: 21762.S.020
			Data: Date:	10.09.2001	Approved: <i>[Signature]</i>



Esp. Exp.	Modifica Modification	Data Date	Dis. Desi.	Appr. Appr.
	Denominazione: Denomination:	Projecto: Project:	Page n° Page n°	di n° of n°
	Aux. (400T/230M/110CTE) D	21768.prg	3	5
	Macchina: Machine:	Dis. n°: Draw. n°:	Approvato: Approved:	
	Leporace N.	10.09.2001		



Esp. Exp.		Modifica Modification	Data Date	Dis. Dess.	Appr. Appr.
		Denominazione: Denomination:	Project:	Page n°	di n° of n°
		Da Page From Page	21760.prg	4	5
		Alto Page To Page			
		Disegnatore: Designer:	Data Date:	Dis. n°: Dwg. n°:	Approvato: Approved:
		Leporace N.	30.07.2001	21760.S.030	Roseff



Esp. Exco.	Modifica Modification	Data Date	Dis. Desl.	Appr. Appr.
	Denominazione: Denomination: Welding Control	Progetto: Project: 21982.prg	Page n° Page n°	di n° of n°
Da Pag. From Page	Macchina: Machine:	Data: Date: 09/05/2000	5	5
Alla Pag. To Page	Disegnato: Designer: Leporace N.	Dis. n°: Dwg. n°: 21982.S.040	5	5
		Approvato: Approved: <i>[Signature]</i>		



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