www.solediesel.com

Marine diesel engines

Operator's manual

MINI-17
MINI-29
MINI-33
MINI-44
MINI-55

U_CTMT1755_EN
Revision 1

Introduction

Presentation

Dear Customer,

First of all, we would like to thank you for choosing a Solé Diesel product. We recommend that you read this manual carefully before carrying out any of the operations and keep it close at hand, near the engine, as it can be of great use in the future.

Our goal as a manufacturing company is that you enjoy our product, regardless of the use you make of it. The equipment manufactured in Solé Diesel facilities is designed to offer the highest performance in the most demanding operating conditions.

⚠NOTICE

The images, text and information contained in this manual are based on the product's features at the time of publication. Solé Diesel reserves the right to modify this document without prior notice.

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Safety precautions and instructions

Solé Diesel is concerned for your safety and your machine's condition. Safety Precautions and Instructions are one of the primary ways to call your attention to the potential hazards associated with our engine operation. Follow the precautions listed throughout the manual before and during operation and maintenance procedures for your safety, the safety of others and the performance of your engine.

Types of Safety Precautions:

⚠WARNING

Indicates the presence of a hazard that can cause severe personal injuries, death or substantial property damages.

⚠CAUTION

Indicates the presence of a hazard that will or can cause minor personal injury or property damages.

⚠NOTICE

Communicates installation, operation and maintenance information that is safety related but not hazard related.

⚠WARNING

Servicing the fuel system and combustible materials. A flash fire can cause severe injury or death

Do not smoke or permit flames or sparks near the fuel injection system, fuel line, fuel filter, fuel pump, or other potential sources of spilled fuels or fuel vapors. Never add fuel to the tank while the engine is running because spilled fuel may ignite on contact with hot parts or from sparks.

Catch fuels in an approved container when removing the fuel line or fuel system. Keep the fuel lines and connections tight and in good condition. Do not replace flexible fuel lines with rigid lines and use flexible sections to avoid fuel line breakage caused by vibrations.

Keep the compartment and the engine clean and free of debris to minimize the risk of fire.

⚠WARNING

Servicing the air cleaner. A sudden backfire can cause severe injury or death.

Do not operate the engine with the air cleaner/silencer removed.

⚠WARNING

Combustible materials. A fire can cause severe injury or death.

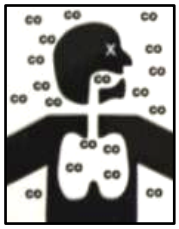
Engine fuels, fuel vapors and combustible materials are flammable and explosive. Handle these materials carefully to minimize the risk of fire or explosion. Equip the compartment or nearby area with a fully charged fire extinguisher.

In case of fire do not open sound shield compartment and follow these instructions:

- Shut down engine(s)
- Continuously discharge entire contents of a halon or CO2 portable fire extinguisher (or other provision) immediately.

⚠WARNING

Carbon monoxide (CO) can cause severe nausea, fainting or death.



Engine exhaust gases contains carbon monoxide gas. Carbon monoxide is an odourless, colourless, tasteless, no irritating gas that can cause death if inhaled for even a short time.

Get fresh air and do not sit, lie down or fall asleep if anyone shows signs of carbon monoxide poisoning:

- Light-headedness, dizziness
- Physical fatigue, weakness in joints and muscles. Sleepiness, mental fatigue, inability to concentrate or speak clearly, blurred vision. Stomachache, vomiting, nausea.

⚠WARNING

Keep the area around the battery well ventilated. While the engine is running or the battery is charging, hydrogen gas is produced which can be easily ignited.

Never allow battery fluid (battery contains sulfuric acid) to come in contact with clothing, skin or eyes. Always wear safety gloves and protective clothing when servicing the battery. If battery fluid contacts the eyes and/or skin, immediately flush the affected area with a large amount of clean water and obtain prompt medical treatment.

⚠CAUTION

Moving parts. Keep hands, feet, hair, clothing and test leads away from the belts and pulleys when the engine is running. Replace guards, screens and covers before operating the engine.

⚠CAUTION

Before working on the engine or connected equipment, disable the engine as follows:

Set the engine controller to OFF position.

(1) Disconnect the power input from battery.

(2) Disconnect the battery cables. Remove the negative (-) lead first when disconnecting the battery. Reconnect the negative (-) lead last when reconnecting the battery.

Follow these precautions to prevent the starting of the engine by engine controller, remote start/stop switch, or engine start command from a remote computer.

⚠CAUTION

Never remove the cooler cap if the engine is hot. Steam and hot engine coolant will spurt out and seriously burn you. Allow the engine to cool down before you attempt to remove the cooler cap.

⚠NOTICE

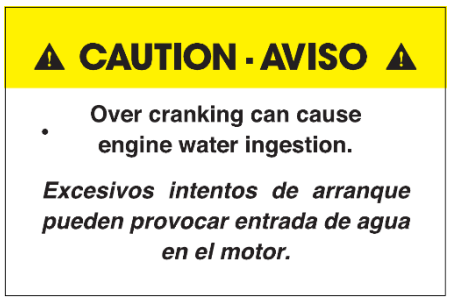
Read the engine operator's manual and understand it before operation and maintenance of the engine, to ensure that it continues operating practices and maintenance procedures.

Hearing protection. Use to avoid hearing loss when handling the motor.

⚠NOTICE

1. The installer/operator of the engine has to wear suitable CLOTHING for the workplace and the situation; in particular, avoid loose clothes, chains, bracelets, rings and all accessories that could become entangled with moving parts.
2. The installer/operator of the engine has to wear personal protective equipment such as gloves, work shoes, eye and hearing protection as required by the task.
3. The area in which the operator is working has to be kept tidy and free of oil and other liquid spillages and solid waste (metal chips, etc.).

Engine labels



If the engine does not start after several attempts to crank may cause water entering the engine. In this situation it is recommended:

1) Close the seacock.
2) Drain the water from the exhaust system in the water trap.
3) Do not try to restart the engine until the cause of the start fail is identified.

The engine and the gearbox are supplied without any fluid inside. Consult the manual to follow the installation procedure and commissioning as well as the fluid capacity - coolant, oil and oil of gearbox

Read the engine operator's manual and understand it before any operation and maintenance of the engine, to ensure that it continues operating practices and maintenance procedures insurance.

Dangerous voltage. Operate the engine only when all guards and electrical panels are ready.
Hot parts, coolant and steam. Stop the engine and let it cool down before touching or removing any engine part.
Moving parts. Keep hands, feet, hair, clothing and test leads away from the belts and pulleys when the engine is running. Replace guards, screens and covers before operating the engine.
Heavy Material. Engine is a heavy element, use the right tools for transportation and handling.
Do not use the motor as a step. Use it as a step can cause engine damage plus cause undesired operation.

Connection point of the battery cables to the engine. Red cable (positive) and black cable (negative).

⚠NOTICE

Engine exhaust line installation label, above and below the waterline. See 5.7. Intake and exhaust system.

Solé Diesel warranty

Read the manual and documents delivered with each engine before carrying out any of the operations or presenting any queries. The engine is supplied without any liquids. Ensure that the liquids used match the specifications contained in Solé Diesel manuals.

The application of the conditions described in this document shall only be effective for engines or generator sets that have been invoiced after November 4, 2011.

Solé Diesel limited warranty

Solé Diesel guarantees that at the time of shipment all its engines and generator sets comply with the provided specifications and do not have any manufacturing defects.

The limited warranty provided by Solé Diesel enters into force from the time of sale to the firs end-purchaser or user of the engine or generator ser. In the event that the product is not immediately delivered to the end-customer, the warranty shall enter into force 6 months after the date of sale. Any limited warranty period that has not elapsed can be transferred to the following purchaser (s).

Unless authorized otherwise by Solé Diesel, the warranty periods are applied according to the time elapsed in months from the date of purchase or the limit of hours of operation (whichever occurs first) listed in the following table:

Limited Warranty Coverage Periods				
Product	**Pleasure**		**Work**	
	Months	**Hours**	**Months**	**Hours**
Propulsion Engines	36	1000	12	2000
Generators sets	36	1000	12	2000

Solé Diesel extended warranty

Solé Diesel an extended period of coverage for the following components: engine block, cylinder head, crankshaft, camshaft, flywheel housing, timing gear housing, timing gear, conrod.

Extended Coverage Periods				
Product	**Pleasure**		**Work**	
	Months	**Hours**	**Months**	**Hours**
Propulsion Engines	24	1500	-	-
Generators sets	24	1500	-	-

Restrictions

Coverage:

a) To validate the warranty is necessary fill and send the inspection prior to the delivery of propulsion engines or genset to Solé Diesel through an official installer. See SECTION 12.
b) The warranty covers any failure of the product under normal opera- ting conditions caused by a defect in manufacturing.
c) The warranty covers the labour costs necessary to replace and/or repair the defective original components, according to Solé Diesel standards of excellence. The time period covered for these operatio- ns is limited to 4 hours.
d) The warranty covers reasonable costs of travel required to carry out the necessary operations. The travel distance is limited to 300 kilome- tres in conjunction to a travel time of 3 hours.

Excluded from coverage:

a) If Solé Diesel products are installed and used alongside other products not designed or manufactured by Solé Diesel that affect their operation, the warranty shall apply exclusively to the Solé Diesel products and shall not apply if the products from another manufacturer are inappropriate for use alongside Solé Diesel products or are the cause of the failure or poor operation of our products.
b) The warranty doesn't will be effective if don't filled correctly and send the inspection prior to the delivery of propulsion engines and genset to Solé through an official installer. SECTION 12.
c) The warranty shall not apply if the revisions and maintenance services indicated in the User and Maintenance Manuals have not been adhered to properly. In case of implemented warranty, supporting document of the revisions and maintenance service should be exhibited, proving the requirements outlined in the manuals have been followed.
d) Deterioration resulting from time of storage exceeding 6 months and/or storage conditions that do not comply with the procedures described in the User and Maintenance Manuals.
e) Faults due to negligence, lack of service, accidents, abnormal use and inadequate service or installation.
f) Faults due to the use of components not manufactured or sold by Solé Diesel.
g) Faults due to electrical installations that do not comply with Solé Diesel design specifications or are not expressly approved by Solé Diesel.
h) Faults due to the use of and operation with fuels, oils or lubricants that are not authorised by Solé Diesel.
i) Faults due to water entering the cylinder(s) through the exhaust system.
j) Faults in propulsion engines due to the use of a propeller that is inadequate for the load or application. We recommend contacting Solé Diesel to consult the choice of the correct propeller(s).
k) Failure for general omission of the procedures described in the User and Maintenance Manuals.
l) Components subjected to normal operating wear and tear.
m) Costs due to phone communications, loss of time or money, discomfort, launching, grounding, removal or replacement of vessel parts or materials because the design of the vessel makes it necessary to do so to access the engine, and damage and/or accidents caused as a result of a failure.

Responsibilities

Responsibilities of the manufacturer:

The obligations of Solé Diesel are restricted to repairing the defective parts or, IF DEEMED APPROPRIATE BY SOLÉ DIESEL, returning the amount of the purchase or replacing the parts to prevent poor operation resulting from defective materials or faults in the manufacture covered by the warranty.

Solé Diesel reserves the right to modify the design of any of its products without taking on any obligation to modify a product that has been manufactured previously.

This manual, as well as technical documentation, manuals or pamphlets may undergo modifications without prior notice.

Responsibilities of the purchaser:

The purchaser shall be responsible for the care, operation and maintenance of the product in compliance with the contents of the User and Maintenance Manuals. The purchaser shall provide proof of all the maintenance services performed on the product. The costs of said services and that of the components and liquids replaced during said services shall be at the expense of the purchaser.

The maintenance operations described in this manual shall be performed during the Warranty Contract Periods (Limited and Extended Coverage) by an AUTHORISED SOLÉ DIESEL DEALER. Non-compliance with this condition shall void the warranty in all its terms. In such an event, the materials (oil, filters, etc.) and labour involved shall be at the expense of the purchaser. The purchaser should keep the invoice of the work performed as proof.

If the service is not covered by the warranty, the purchaser must pay for all labour performed, the associated materials and any other expense related to the service.

All shipments of products or components sent by the purchaser for inspection and repair shall be paid in advance by the purchaser.

After-sales service contact

Claims shall be presented during the warranty period to the nearest authorized Solé Diesel dealer (see chart of Solé Diesel Dealers), who shall take care the service covered by the warranty.

The purchaser must provide a proof of purchase and date of purchase by presenting the invoice to the authorized dealer for the purchase of the product served or a copy of it. Claims under warranty shall not be dealt with by the dealer until the date of purchase has been verified.

The following information must also be provided by the purchaser:

a) Owner's name, address and contact telephone number.
b) Product model and serial number.
c) Number of service hours of the product.
d) Detailed description of the problem.
e) Information regarding any repair or installation performed by a service not included in the Solé Diesel distribution network, as well as the services performed.

For an updated list of our distribution network, visit Dealers section in our web page www.solediesel.com

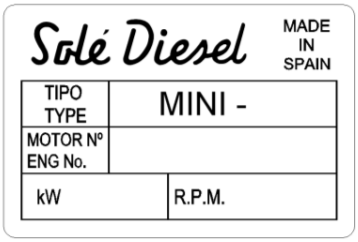
Or request this information by contacting Solé Diesel at:

e-mail: info@solediesel.com
Phone: +34 93 775 14 00

Section 1 – Engine information

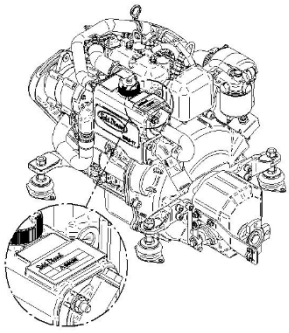
1.1. Engine Identification

Identification label:

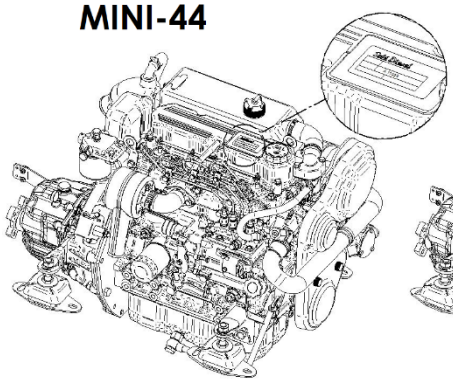


The nameplate is located above the refrigerator, for MINI-17 and MINI-29, and on top of the rocker cover for the MINI-33, MINI-44 and MINI-55.

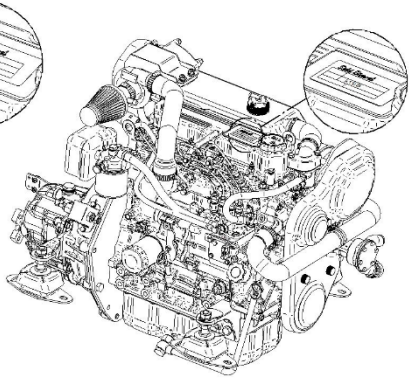
MINI-17
MINI-29



MINI-33
MINI-44

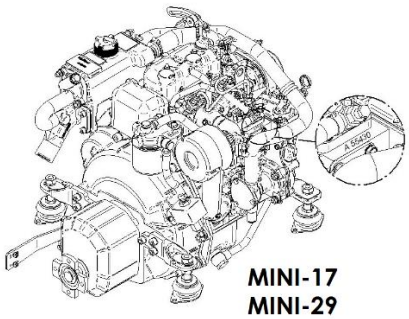


MINI-55

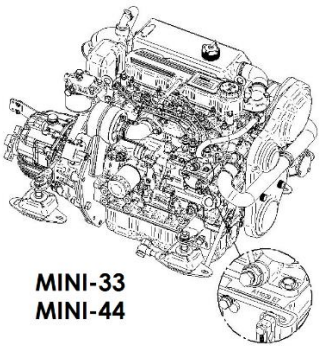


Engine serial number:

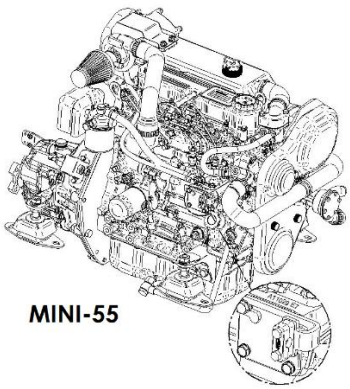
In addition, all engines are marked with the serial number on the block.



MINI-17
MINI-29



MINI-33
MINI-44



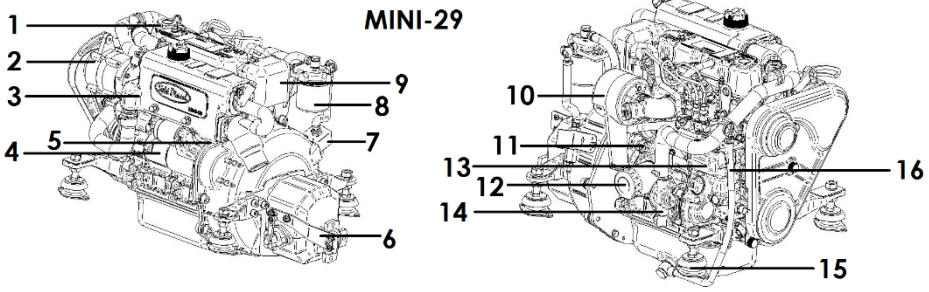
MINI-55

1.2. Engine parts identification

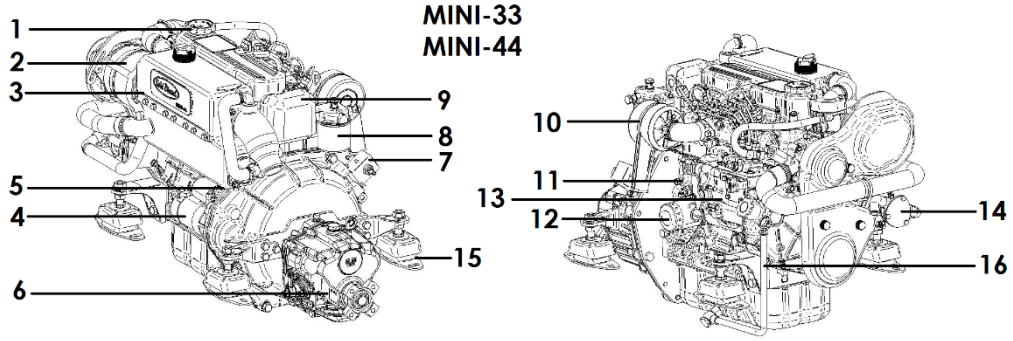
PIECE	ELEMENT
1	Oil filler cap
2	Alternator
3	Cooler assy
4	Starter assy
5	Coolant drain plug
6	Gearbox control lever
7	Fuel pump
8	Fuel filter

PIECE	ELEMENT
9	Relay set
10	Air filter
11	Stop solenoid
12	Oil filter
13	Injection pump
14	Seawater pump
15	Silentblocks
16	Oil dipstick
17	Turbocharger

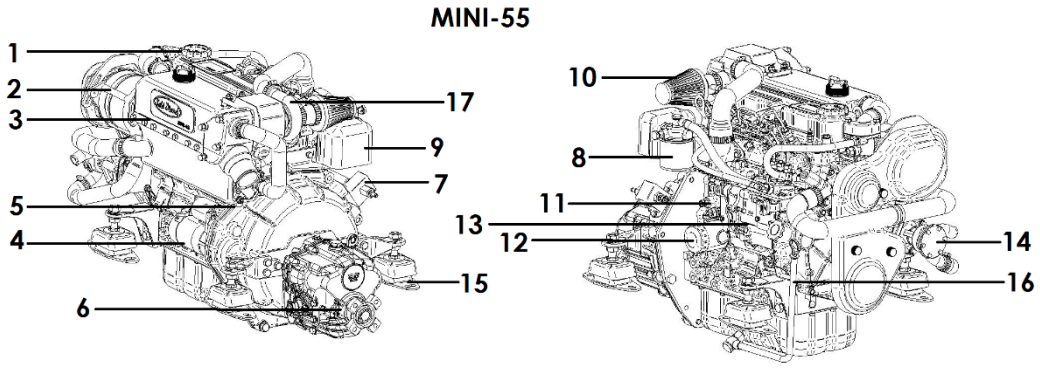
MINI-17
MINI-29



MINI-33
MINI-44



MINI-55



Section 2 – Transport, handling and storage

2.1. Reception

When the engine is delivered make sure that the packing has not been damaged during transport and that it has not been tampered with or that components inside the packing have been removed (see information marked on covers, bases and cartons).

Place the packed engine as close as possible to the place of installation and remove the packing material, checking that the goods supplied correspond to the order specifications.

⚠NOTICE

If you notice damage or missing parts, inform SOLÉ S.A. after-sales departments and the carrier immediately and forward photographic evidence of the damage.

After inspecting the goods if you notice damage, write a reservation on the delivery note. Have the carrier countersign the note and advise SOLÉ S.A., preferably by mail (info@solediesel.com).

2.2. Transport and handling the packed engine

When lifting and transporting the engine use EXCLUSIVELY a forklift or bridge crane of appropriate load capacity, with chains equipped with safety hooks suitable for lifting the load.

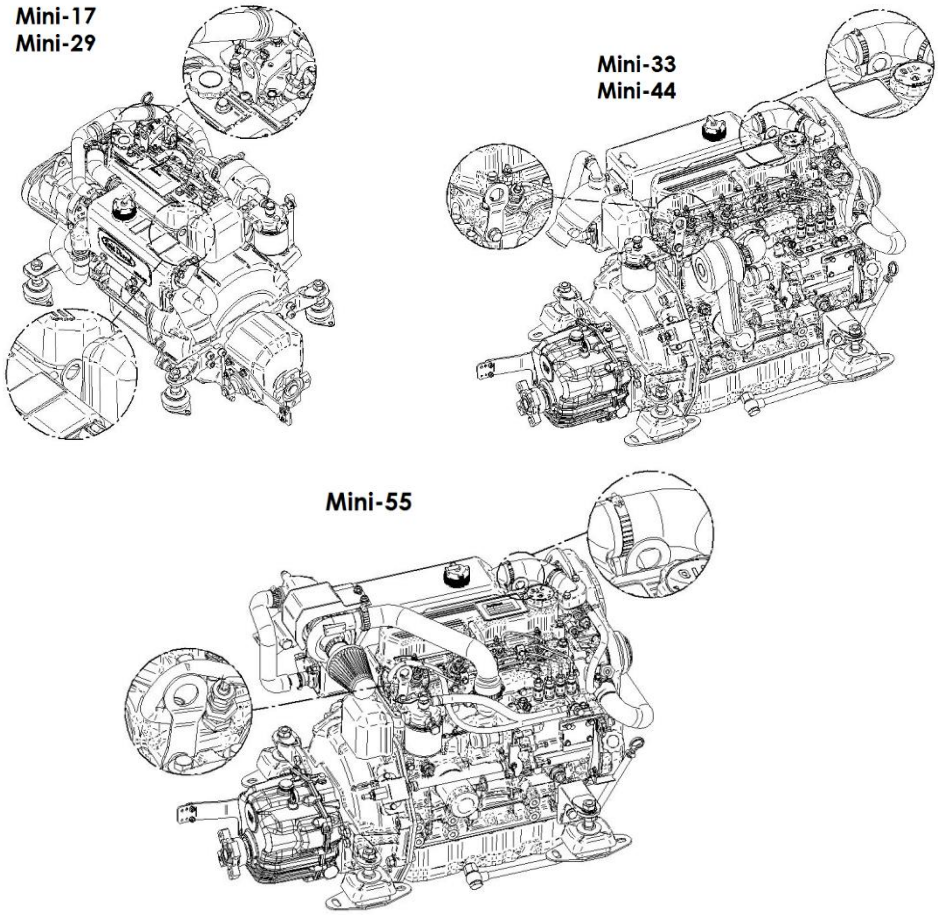
The use of any other system automatically invalidates the insurance guarantee against possible damage to the engine.

To unpack the engine, you must follow these steps:

1. Remove the cardboard create.
2. Lift the engine using a forklift and suitable chains, which hook to the engine eyebolts.
3. Transfer the engine to the intended position of installation.
4. Remove the wooden base
5. Begin installation operations.

2.3. Transporting and handling the unpacked Engine

When the engine is unpacked and ready for transport, use EXCLUSIVELY the appropriate lifting eyebolts.



2.4. Storage of packed and unpacked engine

If the engine is left idle for prolonged periods, the client must check the possible conditions of conservation in relation to the place of storage.

If the engine is unused for prolonged periods and stored, observe all the relative technical specifications.

The treatment of the engine for storage is guaranteed for 6 months after the time of delivery.

⚠NOTICE

If the user decides to start the engine after a long time period, this must be done in the presence of an authorized technician.

Section 3 - Installation

3.1. Angle of installation

Make sure the engine is installed on a level surface. Otherwise, the following angular operation maximum is permitted:

	Continuously	Temporaly
MINI-17 / MINI-29	25º	30º (Max. 30 min.)
MINI-33 / MINI-44 / MINI-55	15º	30º (Max. 30 min.)

If the engine operates in these conditions, check Section 5.4 Lubrication System.

3.2. Engine Installation

Follow these steps to install the engine:

1. Fix engine. *See Section 10 Overall Dimensions and Section 8 Tightening torques*.
2. Engine coupling. Couple the motor to the inverter, hydraulic pump, alternator or power extraction mechanism correctly.
3. Connect exhaust outlet. *See Section 10 Overall Dimensions.*
    i. Wet exhaust outlet
    ii. Dry exhaust outlet + Seawater outlet
4. Connect siphon breaker. (if installed) *See Section 10 Overall Dimensions and section 5.7 Inlet and exhaust system.*
5. Connect seawater inlet. *See Section 10 Overall Dimensions*
6. Connect fuel inlet. *See Section 10 Overall Dimensions*
7. Connect leak coolant outlet. *See Section 10 Overall Dimensions*
8. Fill the lubrication circuit with an adequate oil. See *5.4 Lubrication System*.
9. Fill the cooling circuit with an adequate coolant. See *5.6 Cooling System*.
10. Check each pipe connection for oil or coolant leaks.
11. Prime the fuel system. *See 5.5 Fuel System*
12. Connect to control panel. *See the Panel Control Operator's Manual*.
13. Connect to the battery. *Follow label battery connection into the engine*

⚠NOTICE

It is necessary to install a waterlock (supplied as accessory) in the exhaust system to avoid water ingestion (*See section 5.7 Inlet and exhaust system*).

Section 4 - Operation

4.1. Prestart checklist

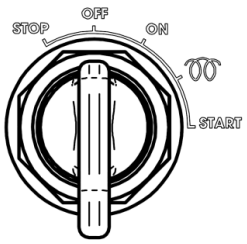
Follow these checks and inspections to ensure the correct engine operation. In addition, some checks require verification after unit starts.

AIR CLEANER: Check for a clean and installed air cleaner element to prevent unfiltered air from entering the engine.
AIR INLETS: Check for clean and unobstructed air inlets.
BATTERY: Check for tight battery connections.
COOLANT LEVEL: Check the coolant level according to coolant circuit capacity.
DRIVE BELTS: Check the belt condition and tension of the coolant pump and battery charging alternator belt.
EXHAUST SYSTEM: Check for exhaust leaks and blockages. Check the silencer and piping condition and check for tight exhaust system connections.
Check that the exhaust outlet is unobstructed.
FUEL LEVEL: Check the fuel level and keep the tank(s) full to ensure adequate fuel supply.
OIL LEVEL: Maintain the oil level below dipstick high mark and above dipstick low mark.
OPERATING AREA: Check for obstructions that could block the flow of admission air.
SEAWATER PUMP PRIMING: Prime the seawater pump before initial startup. To prime the pump:

- Close the seacock
- Remove the hose from the seawater-filter outlet
- Fill the hose and seawater pump with clean water
- Reconnect the hose to the water filter outlet
- Open the seacock

Confirm seawater pump operation on startup as indicated by water discharge from the exhaust outlet.

4.2. Cranking the engine



1. *TURN ON THE KEY POSITION. To start all instruments with fuel pump.*
2. *TURN THE KEY TO PREHEATING POSITION. To heat the engine for a few seconds before the start.*
3. *TURN THE KEY TO STARTER POSITION. To feed the starter and start the engine.*

⚠NOTICE

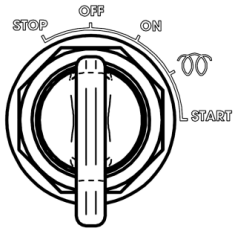
If the engine doesn't start after several attempts to start, may cause water entering in the engine. See warning label on the engine.

After starting up the engine, check the following points. If you find anything wrong, immediately stop the engine, and then investigate the cause.

1. Lubrication oil pressure should be from 0,2 to 0,4 MPa (2 to 4 kgf/cm2) (2,9 to 3,9 bar) at nominal speed.
2. Coolant temperature should be 75 to 85ºC.
3. Oil temperature should be 60 to 95ºC.
4. Check for leakage of oil, coolant and fuel.
5. Knocking should die away as coolant temperature rises. No other defective noise should be heard.
6. Check for exhaust colour and abnormal odors.

4.3. Stopping engine

1. *REMOVE ENGINE LOAD. Before turning off the engine, it must be freed of all charges (disengaged gearbox to neutral)*
2. *TURN THE KEY TO STOP POSITION. The key automatically returns to the OFF position. All instruments are off.*
3. *CLOSE THE SEACOCK.*



⚠NOTICE

If the needle of tachometer is marking counter rpm when the engine is off, turn the key back to ON and then OFF again.

4.4. Engine operation at low temperatures

Whenever the atmospheric temperature drops below zero, the following series of circumstances occur:

- The cooling liquids may freeze.
- The oil becomes thicker.
- There is a drop in the voltage at the battery terminals.
- The inlet air temperature is low and the engine has difficulty in starting.
- The fuel loses fluidity.

To prevent the damage caused by low temperature operation, the engine should be prepared:

1. Use special low temperature coolant or suitable anti-freezing agent concentration.
2. Close the seawater cock, when the engine is stopped. Open the seawater filter cover and start the engine adding a mixture of freshwater and suitable anti-freezing agent concentration (see package labels) until the seawater circuit is filled completely. Stop the engine and replace the seawater filter cover. Before starting the engine again, open the seawater cock.
   Repeat this operation whenever the engine is used at temperatures below 0ºC.
3. Use oil with suitable quality and viscosity. SAE 15W40 is recommended. Under extreme conditions contact with technical support.
4. Cover battery with an adequate material to protect it against the cold. Check that the battery is fully charged.
   It is also advisable to use a dielectric spray on the electrical connections.
5. When starting the engine, make sure that the glow plugs become hot enough.
6. If necessary, replace the diesel oil by a specified diesel oil type for low temperatures.
   The accumulation of impurities in the fuel tank could cause faulty firing.

⚠NOTICE

All engines not in use are subject to rusting and corrosion of machined surfaces that are not protected with a paint coating. The degree of corrosion depends on meteorological changes and climatic conditions. The following recommendations are therefore of a general nature but they will help prevent or reduce the risk of damage due to rusting.

4.5. Winterization and preservation

If the boat is not going to be used for a long period of time or during the winter, certain tasks must be carried out to keep it in perfect operating condition. Follow the steps indicated below carefully:

1. Clean the outer surface of the engine.
2. Bleed the seawater circuit by filling it with fresh water. Fill the seawater circuit again with a mixture of fresh water and anti-freezing agent.
3. Remove the impeller from the seawater pump, clean it with fresh water and store it in place protected from moisture and sunlight.
4. Renew and refill the heat exchanger to the maximum level with a mixture of fresh water and anti-freezing agent.
5. Renew the oil in the engine.
6. Cover the air intake.
7. If the fuel tank is small, empty it completely and clean it; fill it up again with a mixture of diesel and anti-corrosion additive. Solé S.A. recommends DIECYL PLUS. Add one measure of this additive for every 25 liters of diesel. On the other hand, if the fuel tank is large, add 1 liter of this additive for every 500 liters of diesel.
8. Clean and dry the area where the engine is installed.
9. Loosen the belts.
10. Apply dielectric spray on the electrical connection, disassemble the battery and charge it several times during the time it is not being used.
11. Apply moisture repellent spray on the motor.

4.6. Maintenance during the storage

During the long engine storage, it has to be stored inside a ventilated area and free of humidity.

When the engine stay stopped for 3 months or more, inside parts can be oxidize and lost the oil film. As a result, the engine could to size up after the storage. To avoid this, the engine must work periodically during the storage.

Realize the following steps at least once per month:

1. In case that has a battery next to the engine, check the electrolyte level and fill it.
2. Start the engine during approximately 10 seconds.
3. Stop the engine during 1 minute. Repeat this action two or three times.
4. Be sure that oil pressure of the engine increase.
5. Get the engine work during 5 or 10 minutes without load, as maintenance operation.

4.7. Restoration of operational conditions

When starting up the engine again after winter lay-up, certain operations must be performed. Follow these steps:

1. Fill the fuel tank with clean diesel. The mixture of diesel oil and anti-corrosion additive in tank for winter lay-up can be used to operate the engine.
2. Check the fuel filter. If the filter is clogged, replace the filter.
3. Renew the oil in the engine.
4. Check the condition of coolant circuit's rubber hoses.
5. Reconnect the battery and apply a layer of neutral Vaseline to the battery terminals.
6. Remove the nozzle supports and clean them. If possible, verify the setting of the nozzles at a workshop. Then install the clean nozzles.
7. Connect the cooling and exhaust system. Open the seawater cock.
8. Verify whether there are any leaks in the fuel, coolant and oil systems.

Section 5 – Systems and scheduled maintenance

5.1. Safety and prevention

Information of special tools required and basic safety precautions.

Disassembly:

- ✓ Use the correct tools and instruments. Serious injury or damage to the engine can result from using the wrong tools and instruments.
- ✓ Use an overhaul stand or work bench if necessary. Also, use assembly bins to keep the engine parts in order of removal.
- ✓ Lay down disassembled or cleaned parts in the order in which they were removed. This will save you time at reassembly.
- ✓ Pay attention to the marks on assemblies, components and parts for positions or directions. Put on your own marks, if necessary, to aid reassembly.
- ✓ Carefully check each part for faults during removal or cleaning. Signs of abnormal wear will tell if parts or assemblies are functioning improperly.
- ✓ When lifting or carrying heavy parts, get someone to help you if the part is too awkward for one person to handle. Use jacks and chain blocks when necessary.

Reassembly:

- ✓ Wash all engine parts, except oil seals, O-rings, rubber seals, etc. in cleaning solvent and dry them.
- ✓ Use only the correct tools and instruments.
- ✓ Use only good quality lubricating oils and greases. Be sure to apply a coat of oil, grease, or sealant to parts as specified.
- ✓ Use a torque wrench to tighten parts when specified tightening torques is required.
- ✓ Replace all gaskets and packing. Apply appropriate amount of adhesive or liquid gasket when required.

⚠NOTICE

- ✓ Increase the frequency of maintenance in harsh duty conditions (frequent stops and starts, dusty surrounding, prolonged winter season, no-load running).
- ✓ Risk of burns during maintenance operations carried out when the engine is hot. Wear suitable safety clothing.
- ✓ It is strictly forbidden to clean the engine with compressed air.
- ✓ It is strictly forbidden to perform maintenance/cleaning operations in the presence of moving parts.
- ✓ Use gloves, overalls, etc. to protect the body from burns.

5.2. Periodic maintenance schedule

The maintenance and fault diagnostic procedures involve risks that may cause severe injury or even death. These procedures should therefore be carried out solely by qualified electrical and mechanical specialists. Before any maintenance and cleaning work, make sure that there are no moving parts that the generator housing has cooled to ambient temperature, that the electricity generating set cannot be accidentally started up and that all procedures are strictly observed.

Systems and scheduled maintenance

	Intervals								
	Inspection Item	**Daily**	**1st 20h-50h**	**Every 200h**	**Every 400h**	**Every 800h**	**Every year**	**Every 2 years**	**Winter storage and Preservation**
General	Screw tightening, fastening.		I		I				
	Engine block.								CL
	Valve clearance.				I				
	Exhaust gas, noise and vibrations.	I							
	Compression pressure.					I			
Lubrication system*	Genset oil.	I	C	C			C		C
	Oil filter.		C	C					
Fuel System	Fuel level.	I							
	Fuel tank.							CL	E/CL/I
	Fuel filter.				C				
	Water separator filter (if applicable).		E		C				
	Injection pump.					I			
	Injector.					I			
	Purge the feed system.							I	
Cooling system	Coolant.	I						C	C
	Sea water circuit								I/CL
	Water filter	I	CL	CL					
	Sea water cock	I							
	Sea water pump impeller.			I/C	I				I/CL
	Anode			I/C					
Intake system	Air filter.		I		C			C	I
Electrical system	Instruments.	I							
	Starter and alternator.				I				
	Belt.		I		I	C			I
	Battery level		I	I		C			
	Main alternator - electrical insulation.					I			I

* Use oil with 15W40 viscosity and no less than ACEA E5 or API CH-4/SJ quality.

I: Inspect, adjust or fill. E: Empty. C: Change. CL: Clean.

5.3. General

Solé Diesel offers, for these engine models, the several Pack, consult on the web.

- Welcome pack.
- On board pack.
- Maintenance pack 50 hours.
- Maintenance pack 1600 hours.
- Maintenance pack 3000 hours.

Maintenance task. Screw tightening, fastening

For details of tightening torques see *Section 8 Torques*.

Maintenance task. Valve clearance inspection

The rocker cover must be dismounted to check the valve clearance. This operation must be carried out when the engine is cold.

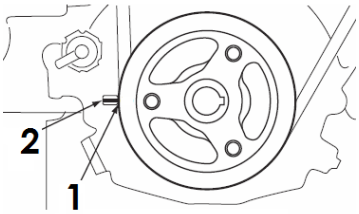
Item		Assembly standard
Valve clearance (cold setting)	Inlet	0,25 mm
	Exhaust	

Inspection

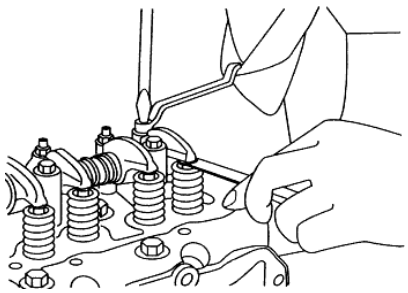
1. Inspect the valve clearance in the injection sequence. To check, turn the crankshaft by the specified crank angle in the normal direction to bring the piston to the top dead center of the compression stroke.

	Injection sequence	Crank angle
MINI-17	1 - 2	240°
MINI-29 MINI-33	1 - 3 - 2	240°
MINI-44 MINI-55	1 – 3 - 4 - 2	180°

2. The TDC of the compression stroke can be obtained by aligning the TDC mark on the crankshaft pulley (1) with the mark on the gear case (2).



3. First align the TDC mark for the No.1 cylinder. Confirm that the valves do not move up and down when the crankshaft is turned about 20° in normal direction of rotation and in reverse direction. If the rocker arms move, No. 1 piston is at TDC on the intake or exhaust stroke. In such a case, turn the crankshaft 360° in the direction of engine rotation again. No.1 piston is now at TDC on the compression stroke.

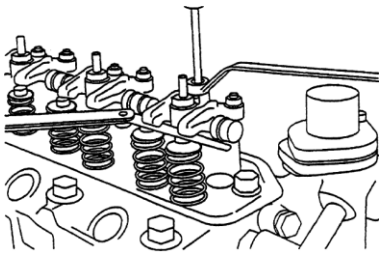


4. Loosen the lock nut for the adjusting screw. With a feeler gauge inserted between the rocker arm and valve cap, adjust the valve clearance by turning the adjusting screw.
5. After adjusting the clearance, tighten the lock nut. Inspect the clearance again and make sure that it is correct.
6. Turn the crankshaft 240° or 180° clockwise, according to your engine model (see table 8. Injection sequence), from TDC of the No.1 cylinder, to set the No.2-cylinder TDC. Repeat from step 1 to step 6. And the same procedure for No.3 and 4 cylinders.
7. After the valve clearance on the valves for all cylinders has been adjusted, turn the crankshaft two or three times and make sure the valve clearance is correct.

NOTICE

Valve clearance should be inspected and adjusted when the engine is cold.

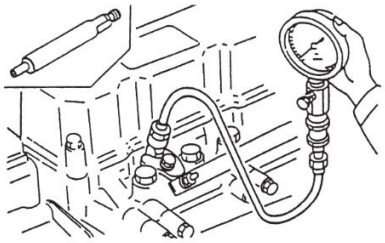
Adjusting



1. Loosen the lock nut of the adjusting screw. Adjust the clearance by turning the screw in either direction to the extent that the gauge is slightly gripped between the rocker arm and valve cap.
2. After adjusting the clearance, tighten the lock nut. Inspect the clearance again and make sure that it is correct.

Maintenance task. Compression pressure inspection

Start by:



1. Make sure the engine oil level, air cleaner, starting motor and battery are well-conditioned.
2. Start the engine and allow it to warm up thoroughly, until 50ºC or more coolant temperature.

Measure the compression pressure on all cylinders:

1. Remove the injection nozzle from the cylinder head where the compression pressure is to be measured.
2. Attach the compression pressure gauge.
3. Disconnect the stop solenoid connector (the fuel supply shut off) and crank the engine by means of the starter and read the compression pressure gauge indication when the engine is running at specified speed.
4. If the compression pressure is lower than repair limit, check the engine parts affected.

	Engine speed	Compression pressure	Repair limit	Máximum pressure difference betwen cylinders
MINI-17	280 rpm	2,7MPa (28 kgf/cm^2)	2,2 MPa (22 kgf/cm^2)	0,25 MPa (2,5 kgf/cm^2)
MINI-29	280 rpm	2,7MPa (28 kgf/cm^2)	2,2 MPa (22 kgf/cm^2)	0,25 MPa (2,5 kgf/cm^2)
MINI-33	290 rpm	2,94MPa (30 kgf/cm^2)	2,65 MPa (27 kgf/cm^2)	0,29 MPa (3 kgf/cm^2)
MINI-44	290 rpm	2,94MPa (30 kgf/cm^2)	2,65 MPa (27 kgf/cm^2)	0,29 MPa (3 kgf/cm^2)
MINI-55	290 rpm	2,94MPa (30 kgf/cm^2)	2,65 MPa (27 kgf/cm^2)	0,29 MPa (3 kgf/cm^2)

NOTICE

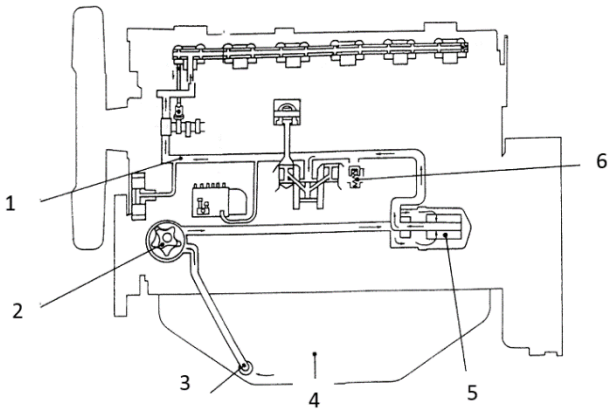
- It is not a good practice to measure the compression pressure on only few cylinders, and presume the compression on the remaining cylinders.
- Compression pressure varies with engine speed. Check engine speed when measuring the compression pressure.
- The compression pressure will be slightly higher in a new or overhauled engine due to new piston rings, valve seats, etc

5.4. Lubrication system

Circuit description

The lubrication circuit is forced by the trochoid gear pump, and it is composed of the following elements.

PIECE	ELEMENT
1	Main gallery
2	Oil pump
3	Oil strainer
4	Oil pan
5	Oil filter
6	Pressure relief valve



	Oil circuit capacity (l)*
MINI-17	2.8
MINI-29	4,0
MINI-33	4.0
MINI-44	6,0
MINI-55	6,0

*Including filter change (0,5l)

Oil specifications

Use oil with 15W40 viscosity (this is an all-season oil for temperatures ranging between -15ºC and +40ºC) or select the most suitable oil viscosity for the atmospheric temperatures on which the engine is going to be operated. On the other hand, use oil quality no less than ACEA E5/E3 or API CH-4/SJ. Other engine oils may affect warranty coverage, cause internal engine components to seize and/or shorten engine life.

Never mix different types of engine oil. This may adversely affect the lubricating properties of the engine oil.

Maintenance task. Oil filter change

The oil filter is located under inlet manifold of the engine. Remove oil filter with a belt wrench. When fitting a fresh oil filter, smear a small quantity of oil into the annular seal and firmly tighten it with the hand. When this operation is finished, start the engine and check oil is not leaking.

Maintenance task. Oil level check

Check the oil level in the crankcase daily or before each start-up to ensure that the level is between the upper (Max mark) and lower (Min mark) lines on the dipstick. To check the oil level:

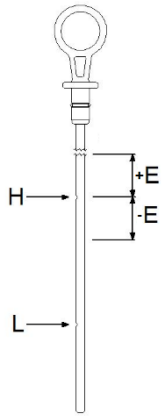
1. Remove the dipstick
2. Wipe the dipstick end
3. Reinsert it inside the guide
4. Remove it again to see the oil level

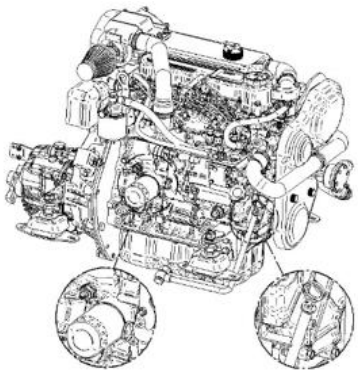
If the motor is installed with an inclination, the level of the oil rods may vary. See the attached table to check the correct level of oil in the dipstick.

H: maximum level that marks the rod
L: minimum level that marks the rod
E: Adjustment of the maximum level according to the inclination of the motor. It can be a positive or negative measure.

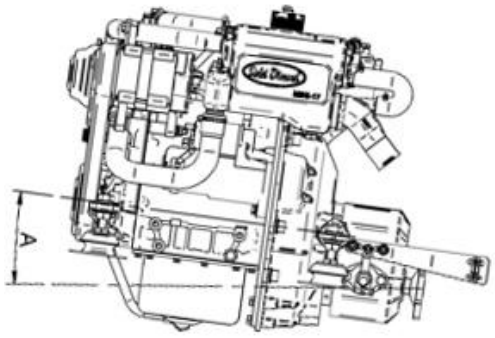
A	MINI-17		MINI-29		MINI-33		MINI-44		MINI-55	
	Front	Side	Front	Side	Front	Side	Front	Side	Front	Side
4º	3.6	-4.9	-2.8	-8.9	-9	6.8	-14	4.47	-14	4.47
8º	5	-9.7	-5.5	-22.6	-17.5	13	-16	8.81	-16	8.81
12º	4.6	-25	-5.9	-28.5	-24	22	-26	15.66	-26	15.66
15º	4.8	-38	-7.5	-40.3	-38	33	-32	16.3	-32	16.3
20º	6.6	-47	-12.7	-40.3	-	-	-	-	-	-
25º	8	-52.3	-14.2	-	-	-	-	-	-	-

Units expressed in: mm





Side dipstick



Front dipstick

NOTICE

Do not operate the engine if the oil level is below the Min mark or above the Max mark. Be careful the oil dipstick marks refer to the engine as a horizontal position. Therefore, check the engine inclination when the oil level is verified.

Maintenance task. Oil fill/Change

Oil must be changed with hot engine so as to be sure the oil is fully drained. The procedure is the following:

1. Drain the oil (follow steps below)
   a. Stop the engine.
   b. Disconnect the battery negative (-) terminal.
   c. Remove the oil dipstick.
   d. Connect the external oil pump to the end of the oil drain hose. Place the outlet of the pump into an oil collection container.
   e. Allow time for the engine oil to drain completely.
2. Replace the oil filter
3. **Remove external oil pump. Do not insert oil dipstick.**
4. Fill with oil according to oil capacity circuit.
5. Check for leaks.
6. Check oil level according to the oil level check procedure.

⚠NOTICE

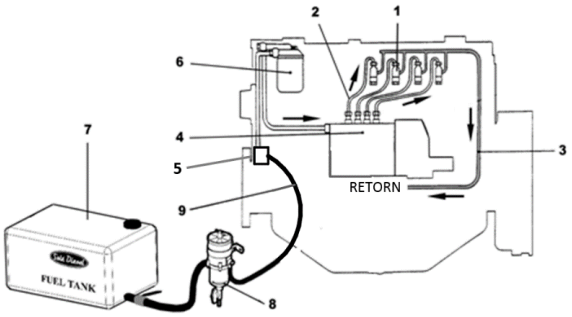
Never overfill. Overfilling may result in white exhaust smoke, engine over speed or internal damage. **It is important to remove the dipstick to let the air out of the engine while the engine is filled with oil, otherwise, bubbles can be creating that make oil overflowing outside.**

5.5. Fuel system

Circuit description

The fuel system is based on a fuel feed pump and an in-line mechanical injection pump.

PIECE	ELEMENT
1	Fuel injection Nozzle
2	Fuel injection pipe
3	Fuel return pipe
4	Injection pump
5	Feed pump
6	Fuel filter
7	Tank (Not supplied)
8	Fuel decanting filter (accessory)
9	Fuel intake pipe (accessory)



Fuel specifications

Use ASTM diesel fuel No.2-D for the best engine performance, to prevent engine damage. Never use kerosene, heavy diesel fuel or biodiesel. It is essential to use clean and filtered diesel oil.

The use of diesel oil that not complies with the technical specifications may affect warranty coverage and cause serious damage in the injection system and internal engine components.

Maintenance task. Fuel level inspection

Periodically, it is necessary to check the fuel level to assure the operation of the engine. On top of that, if fuel pump sucks air when the fuel level is lower than pump suction, it could break.

Whenever possible, keep the fuel tank full. The temperature changes may cause condensation of the damp air present in the tank and this water accumulates at the bottom. It can cause an increase of corrosion or an impossibility of starting the engine if this water is aspired by the fuel pump.

Maintenance task. Fuel tank clean

The fuel impurities could obstruct the suction pump. For this reason, drain out the content of the fuel tank to remove condensate and any foreign material. Then, wash the tank with fuel and refill it.

Maintenance task. Water separator filter purge

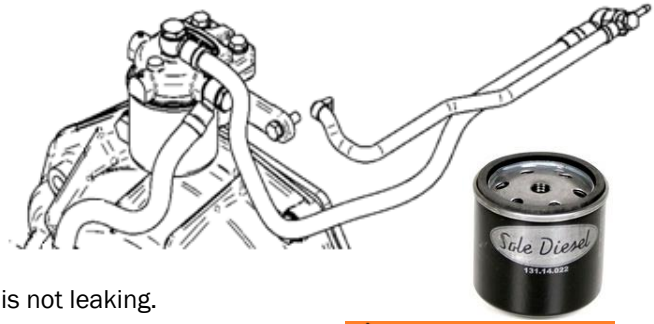
The fuel system has to have a water separator filter (supplied as accessory) to avoid the inlet of water in the fuel circuit. According to the maintenance plan it is necessary to purge the filter to eliminate water periodically. This is the procedure:

1. Loosen the bottom nut to eliminate water.
2. Shut it off again.
3. Check for any leakage.

Maintenance task. Fuel filter change

Procedure to change the fuel filter:

1. Remove fuel filter with a belt wrench.
2.
3. Place a new fuel filter and firmly tighten it with the hand.
4. Prime the system.
5. When this operation is finished, start the engine and check that it is not leaking.



⚠CAUTION

Wash hands after any contact with diesel fuel.

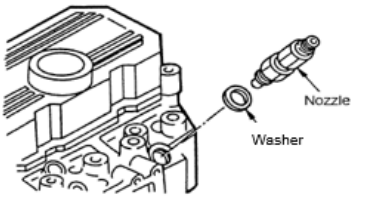
Maintenance task. Injection pump inspection

The injection pump is adjusted at factory and should never be adjusted carelessly. Such adjustment, whenever is required, shall be made by a SOLÉ DIESEL licensed service shop, since a precision pump monitor and skill knowledge are required.

You must check:

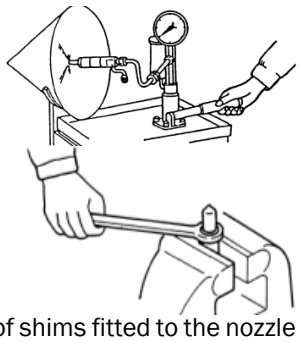
- The presence of exhaust smoke color.
  Procedure: quickly accelerate engine.
  Criteria: no remarkably black smoke exhaust, and correct function of fuel cut-off solenoid
- Any leaks at the body injection pump or fuel lines.

Maintenance task. Injector inspection



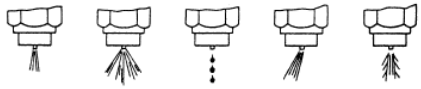
To check the injection pressure of injectors (opening pressure) you have to follow these steps:

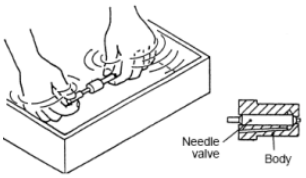
1. Remove nozzle and washer.
2. Install the injection nozzle on the tester. Slowly operate the tester handle full strokes to bleed (remove) air from the pipe and nozzle.
3. Make a slow increase in pressure by operating the tester handle at a speed of more than one stroke per second while observing the pressure gauge.
4. The pressure gauge reading will slowly increase and, when the nozzle starts discharging fuel, it will go down fast. Take the gauge reading right then as the injection pressure.



Injection pressure	13,73 MPa (140 kgf/cm²)

5. To adjust the injection pressure, increase or decrease the amount of shims fitted to the nozzle holder.
6. Look at the orifice discharge pattern (shape of discharge) when fluid begins to flow through the injection nozzle. The discharge must be finely and uniformly atomized. Any change is an indication of a bad nozzle.





7. If the nozzle is bad, remove the tip from the nozzle and wash needle valve and body in clean washing solution.
   And if the nozzle is still bad after the tip has been washed, replace the tip.
   When installing the new tip, remove synthetic resin film from the tip and slide the needle valve in the body in clean diesel fuel to wash off inhibitor completely.
8. The washer shown on point 1 must be replaced.

⚠WARNING

When testing the injection nozzle, keep its tip pointed away from the operator. Fuel from the orifices in the tip of the nozzle is under high pressure and can cause injury to the operator.

Maintenance task. Bleeding air from the fuel system

Prime the fuel system to bleed the air from the circuit. Trapped air in the fuel system can cause difficult starting and erratic engine operation. It is necessary to prime the system:

- ✓ Before starting the engine for the first time.
- ✓ After running out of fuel and adding fuel to the tank.
- ✓ After fuel system maintenance such as changing the fuel filter, draining the fuel/water separator, or replacing a fuel system component.

For this operation you have to follow these steps:

1. Loosen all the injection pipes.
2. Start the engine to drive out air in the injection pipes and nozzles automatically.
3. When fuel overflows from an injection pipe, tighten it up and wait until fuel overflows from another one. Repeat it until all injection pipes are tightened.
4. After bleeding, clean up fuel spillage.

⚠CAUTION

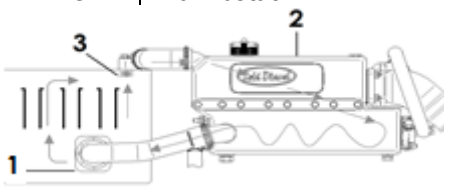
When fuel overflows from the injection pipes, wipe thoroughly with a cloth. Spilled fuel is a fire hazard.

5.6. Cooling system

The engine cooling system is based on coolant circulation controlled by centrifugal pump with thermostatic control and heat exchanger, where the coolant is refrigerated by sea water. Moreover, the exhaust manifold is cooled also by sea water.

COOLANT CIRCUIT DESCRIPTION

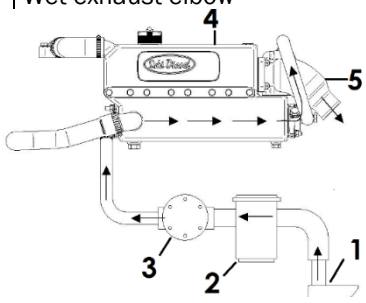
PIECE	ELEMENT
1	Coolant pump
2	Heat exchanger
3	Thermostat



	Coolant circuit capacity (l)
MINI-17	2,7
MINI-29	3,0
MINI-33	5.7
MINI-44	8,0
MINI-55	8,0

SEAWATER CIRCUIT DESCRIPTION

PIECE	ELEMENT
1	Bottom cock (supplied as accessory)
2	Sea water filter
3	Sea water pump
4	Heat exchanger
5	Wet exhaust elbow



Thermostatic valve	
Initial opening	76,5ºC
Final opening	90ºC

Coolant specifications

It is recommended use SOLÉ DIESEL 50% coolant or another coolant with similar specifications. On the other hand, distilled water with an anti-freezing agent is also suitable. The anti-freezing agent concentration according to operating conditions is specified in anti-freezing agent package labels. It is advisable select the anti-freezing agent concentration based on a temperature approx. 5ºC under the actual atmospheric temperature.

Other engine coolants may affect warranty coverage, cause an internal build-up of rust and scale and/or shorten engine life.

⚠NOTICE

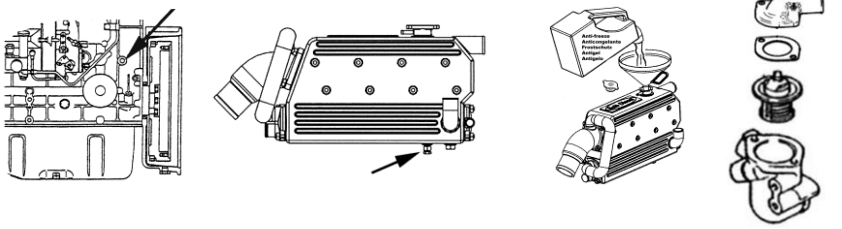
Never mix different types of coolants. This may adversely affect the properties of the engine coolant.

Maintenance task. Coolant check

Allow the engine to cool. Release pressure from the cooling system before removing the pressure cap. To release pressure, cover the pressure cap with a thick cloth and then slowly turn the cap counterclockwise. Remove the cap after pressure has been completely released and the engine has cooled. Check the coolant level at the tank, the level must be approximately 3/4 full.

Maintenance task. Coolant fill/change

1. Drain off all the coolant by opening the two drain plugs, one in the heat exchanger and the other in the cylinder block.
2. Close the drain plugs.
3. Remove bleeding bolt of thermostat holder (only Mini-17/29).
4. Refill to the hole in the tank cap with coolant.



Maintenance task. Seawater filter inspection

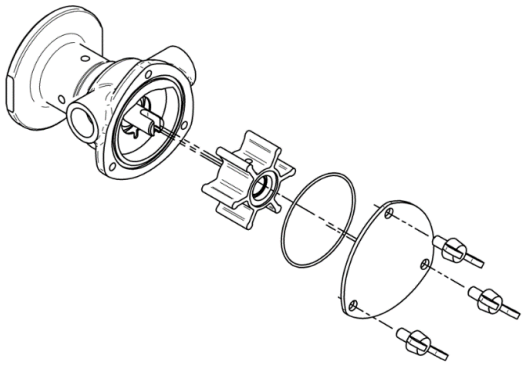
It is important to install a seawater filter (supplied as accessory) between seawater cock and the seawater pump to avoid that any impurity might clog the seawater circuit or seawater pump.

To clean this filter:

1. Loosen the wing nut.
2. Remove the filtering component and clean it.
3. Fit it again taking care that the cover is well seated on the o-ring.
4. Start the engine to check seawater leakages.

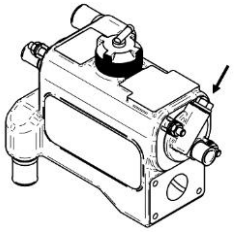
Maintenance task. Seawater pump impeller inspection

Seawater pump impeller is neoprene and cannot rotate dried. If operated without water, the impeller can be broken. It is important therefore that a spare impeller is always available. Impeller inspection and replacement procedure:



1. Close the seawater cock.
2. Remove the seawater pump cover plate.
3. Remove the impeller from the shaft.
4. Clean the housing.
5. Inspect the impeller for damaged, cranked, broken, missing or flattened vanes. The impeller vanes should be straight and flexible.
6. If it is damaged replace with a new one.
7. Lubricate the impeller with soapy water before installation.
8. Install the impeller. During installation push and rotate the impeller in the same direction as the engine rotation until it is thoroughly seated in the impeller housing.
9. Inspect the cover plate and gasket for corrosion and/or damage. Replace components as necessary.
10. Lubricate the oil ring with silicon grease and attach the gasket and cover plate to the seawater pump housing.
11. Open the seacock.
12. Start the engine and check for leaks.

Maintenance task. Zinc anode inspection



In order to avoid the corrosion produced by galvanic currents, the engine is fitted with a zinc anode located on the front lid of the coolant-seawater heat exchanger. Anticorrosion zinc anode inspection and replacement:

1. With the engine cooled, close the seacock, open the coolant drain plug and drain the coolant into a suitable container.
2. Remove the anticorrosion zinc anode (plug) from the heat exchanger.
3. Use a wire brush to remove the loose corrosion on the anticorrosion zinc anode.
4. Clean the threaded hole of the heat exchanger and coat the threads of anticorrosion zinc anode. Install the anticorrosion zinc anode into the heat exchanger.
5. Close the coolant drain plug and open the seacock. Refill the coolant circuit.
6. Start the engine and check for leaks at the anticorrosion zinc anode location. The pump is operating if the seawater flows from the exhaust outlet.

5.7. Inlet and exhaust system

Exhaust circuit description

There are two possible installations of the exhaust system. You need to check the distance between water injection point and waterline to decide which type of installation you need. This information is specified in the following drawings.

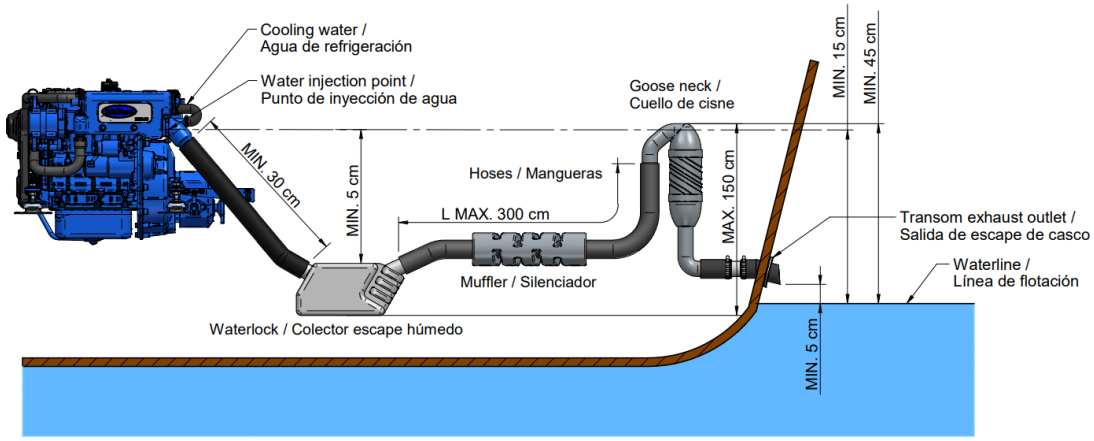
The elements included in the drawing are essential for the correct engine operation:

- Waterlock (supplied as accessory) to prevent seawater from entering inside the engine when it stops.
  To calculate the required collector capacity, we must follow the following formula:
  C = collector capacity (L)
  D = Inside diameter of the tube (mm)
  L = Tube length (mm)

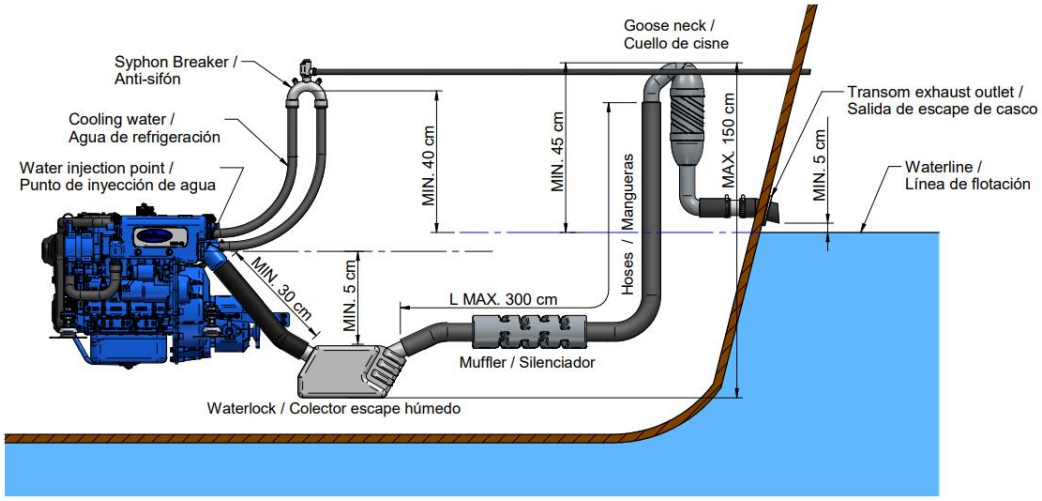
$$C = \frac{\left(\frac{\pi}{4} D^2 * L\right)}{1000000} * 0.5$$

- Goose neck (supplied as accessory)
- Siphon breaker (supplied as accessory) – needed in case there is less than 150 mm between the water injection point of wet exhaust and the waterline, or if the point of injection is below waterline.

Type 1 installation. When between water injection point of wet exhaust and waterline is minimum 150 mm.



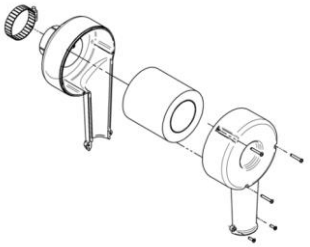
Type 2 installation. When between water injection point of wet exhaust and waterline there is less than 150 mm or the point of injection is below waterline.



NOTICE

The wet exhaust is the engine's standard equipment. If you want dry exhaust, which is an optional equipment, contact with our dealers.

Maintenance task. Air filter inspection



Engine is provided with an intake air filter. Examine the element and housing for damage. Replace the complete air filter if necessary.

NOTICE

It is important to ensure that the combustion air is freely supplied and freely expelled from the area.

Maintenance task. Exhaust gas, noise and vibrations inspection

Inspect the exhaust system components for cranks, leaks and corrosion.

Exhaust system inspection point

1. Check the hoses for softness, cranks or dents. Replace the hoses as needed.
2. Check for corroded or broken metal parts and replace them as needed.
3. Check for loose, corroded or missing clamps. Tighten or replace the hose clamps and/or hangers as needed.
4. Check that the exhaust outlet is unobstructed.
5. Visually inspect the exhaust system for exhaust leaks. Check for carbon or soot residue on exhaust components. Carbon and soot residue indicate an exhaust leak. Seal leaks as needed.

5.8. Electrical system

Control Panel

You can find the all information related to the control panel in Control Panel Operator's Manual of your engine.

Sensors and switches

Coolant temperature sensor:

- Operating voltage: 6-24V
- Operating current: <85mA, Pmax<0.25W
- Operating temperature: -40°C to +120°C
- Measuring range: -40°C to +120°C
- Absolute max. value: 130°C, max. 1 min.
- Protection: BODY IP 67
- Tightening torque: Max. 20Nm

Function table		
Temperature (ºC)	**Resistance (ohm)**	**Tolerance (ohm)**
40	287.4	±32.8
60*	134	±13.5
80	69.1	±6.5
90*	51.2	±4.3
100*	38.5	±3.0
120	22.7	±2.2

*Test point

Oil pressure sensor:

- Operating voltage: 6-24V
- Operating current: >20mA, <85mA, Pmax<0.25W
- Operating temperature: -20°C to +100°C
- Measuring range: 0 – 10 BAR
- Absolute max. value: 30 BAR, max. 2 seconds.
- Protection: BODY IP 67
- Tightening torque: Max. 20Nm
-

Function table		
Pressure (BAR)	**Resistance (ohm)**	**Tolerance (ohm)**
0	10	+3/-5
2	52	±4
4	88	±4
6	124	±5
8	155	±5
10	184	+20/-10

Coolant temperature sensor specifications (two pole)

- Operating voltage: 6-24V
- Operating current: <85mA, Pmax<0.25W
- Operating temperature: -40°C to +120°C
- Measuring range: -40°C to +120°C
- Absolute max. value: 130°C, max. 1 min.
- Protection: BODY IP 67
- Tightening torque: Max. 20Nm

Function table		
Temperature (ºC)	**Resistance (ohm)**	**Tolerance (ohm)**
40	287.4	±32.8
60*	134	±13.5
80	69.1	±6.5
90*	51.2	±4.3
100*	38.5	±3.0
120	22.7	±2.2

*Test point

Oil pressure sensor (two pole):

- Operating voltage: 6-24V
- Operating current: >20mA, <85mA, Pmax<0.25W
- Operating temperature: -20°C to +100°C
- Measuring range: 0 – 10 BAR
- Absolute max. value: 30 BAR, max. 2 seconds.
- Protection: BODY IP 67
- Tightening torque: Max. 20Nm

Function table		
Pressure (BAR)	**Resistance (ohm)**	**Tolerance (ohm)**
0	10	+3/-5
2	52	±4
4	88	±4
6	124	±5
8	155	±5
10	184	+20/-10

TEMPERATURE SWITCH:

- Operating voltage: 12-24V
- Operating power: 5W
- Operating temperature: ≤100°C ±4°C (OPEN CIRCUIT), ≥100°C±2°C (CLOSE CIRCUIT)

OIL PRESSURE SWITCH:

- Operating voltage: 12V
- Operating power: 5W
- Operating pressure: 0.98bar (CLOSE CIRCUIT)

TEMPERATURE SWITCH (TWO POLE)

- Operating voltage: 6-24V
- Operating power: Max 100W
- Operating temperature: 96°C ±3°C (CLOSE CIRCUIT)

OIL PRESSURE SWITCH (TWO POLE):

- Operating voltage: 6-24V
- Operating current: <0.5A

Operating pressure: 0.4bar±0.15bar (CLOSE CIRCUIT)

Battery

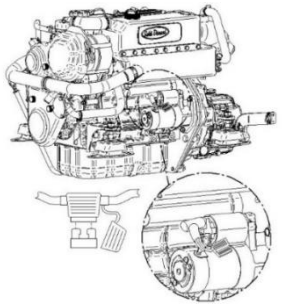
The minimum recommended battery capacity is 80 Ah. However, this is a general reference value since it is related to the maximum current that can offer for starting the engine.

The connection of the battery for a standard engine:

- Positive battery is connected to the starter.
- Negative battery is connected to the relay support.

The connection of the battery for an earth isolated engine.

- Positive battery is connected to the starter.
- Negative battery is connected to the bipolar relay.

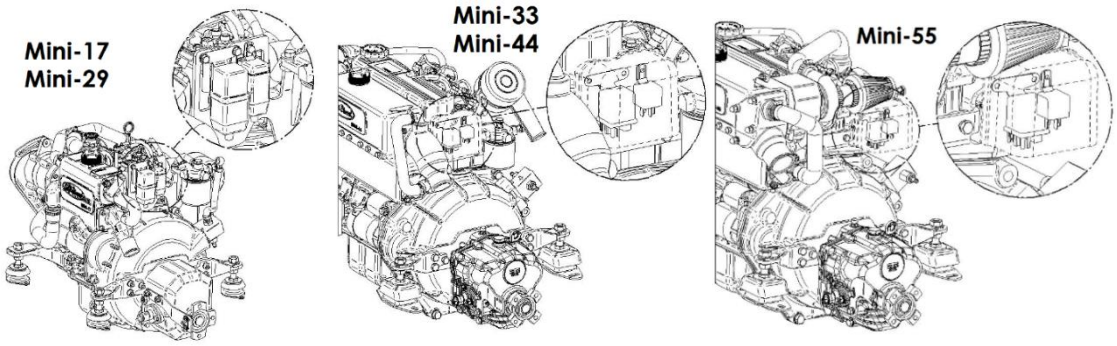


Circuit protection

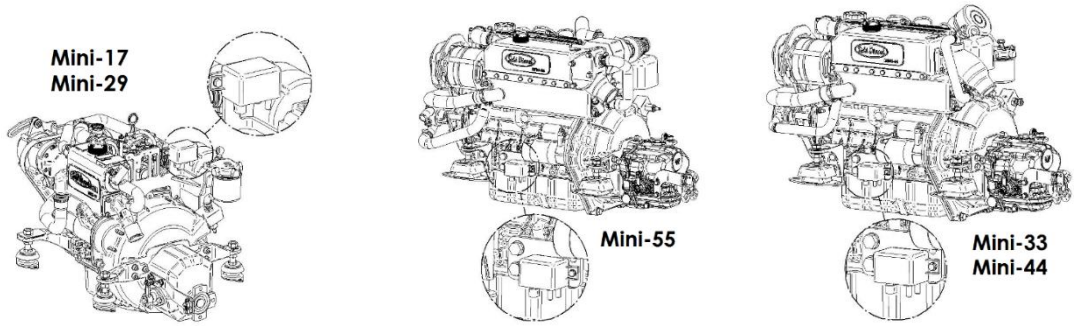
The electrical installation of the engine has a fuse that protects all the electronics in case of overload or short circuit. It is located in the wire harness next to the starter motor.

Relays

The relays of the electrical installation are located inside the electrical protective box where it is shown in the image.

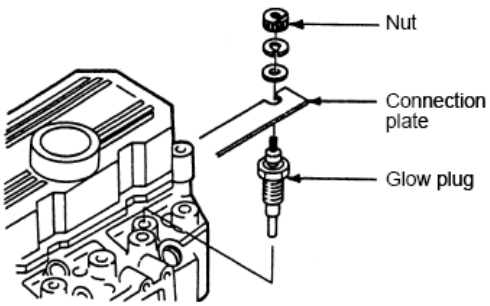


The earth isolated engines have bipolar relays, in the images can see the position.

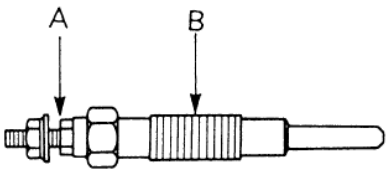


Maintenance task. Incandescent glow plug inspection

1. Loosen nuts, and then remove connection plate and glow plug.
2. If the glow plug glows red when the positive (+) wire is connected to the portion A with the portion B grounded, the plug can be used.



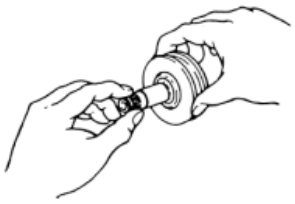
Rated Voltage - Current	12 V	9,7 – 10,5 A



Maintenance task. Starter inspection

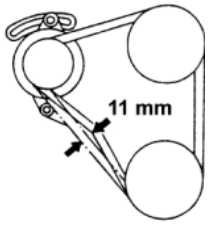
STARTER:

1. Check if there is any impurity in pinion teeth.
2. Make sure that the pinion shaft turns freely when turned in the direction of driving (clockwise) and it is locked when turned in the opposite direction. If not, replace the overrunning clutch.



Maintenance task. Alternator belt tension inspection

Push the belt inward with thumb pressure exerted midway between the pulleys, as shown, to check the belt tension (deflection). If the tension is incorrect, loosen the adjusting bracket bolt and mounting bolt, and move the alternator in or out.



Element	Assembly Standard
V-belt deflection	10-12 mm

NOTICE

An excessive tension may cause a quick wear of the belt and alternator bearings. Otherwise, if the belt is excessively loose or has oil and insufficient load, it can cause the belt to skid.

CAUTION

Never adjust the belt tension with engine running or battery connected.

Maintenance task. Battery level

Battery requires a very careful handling and frequent checking. Proceed as shown below:

1. Keep battery dry and cleaned.
2. Check terminal cleanliness regularly. If dust is settled, terminals should be loosened, cleaned and smeared with a neutral grease layer.
3. Metal objects must not be placed over the battery.
4. Add distilled water if the level is out of range

5.

Section 6 - Troubleshooting

If a fault occurs in the engine, proceed as follows:

- Within the period of warranty

  - Contact to Solé Diesel Official Service. See *SOLÉ DIESEL WARRANTY*

- Outside the period of warranty

  - Contact to Solé Diesel Official Service. *See SOLÉ DIESEL WARRANTY*.
  - Stop the engine, determine the cause and repair it before continuing driving the motor.

Troubleshooting

ENGINE FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
MANUAL START FAILURE	ELECTRICAL SYSTEM (CC)	Power cable fuse (red).	Replace the fuse in the installation. If fuse blows again, check electrical system for overloads or short circuits.
		Discharged or empty battery.	Charge the battery or replace it with a new one.
		Loose or corroded battery connections.	Check the battery connections are correct, clean and tight.
		Faulty start/preheating relay.	Check and replace the preheating/start relay if necessary.
		Faulty starter motor	Check starter motor and replace it if necessary.
		Control panel start signal	Check the start signal from the controller (pink wire).
		Faulty stop solenoid (ETR).	Check stop solenoid and replace it if necessary.
	GENERAL	Low compression pressure.	Check the compression of each cylinder.
	LUBRICATION SYSTEM	Oil viscosity too high.	Check oil viscosity (according to Technical Specifications).
	FUEL SYSTEM	Faulty or clogged fuel pump.	Check the pump by verifying the fuel inlet and outlet of the pump. Replace it with a new one if necessary.
		Clogged fuel pipes	Check fuel pipes.
		Clogged fuel filter	Replace fuel filter.
		Faulty injection pump	Contact an Official Solé Diesel Service.
		Air in fuel system	Bleed fuel system.
		Dirty or faulty fuel injectors	Clean, test and/or replace fuel injector which is not operating properly.
		Fuel injection timing malfunction	Adjust fuel injection timing
		Empty fuel tank or closed fuel valve.	Add fuel and place fuel valve in open position.
		Dirty or clogged fuel tank.	Clean tank with proper products.
	INLET AND EXHAUST SYSTEM	Dirty or clogged air filter.	Replace the air filter element.

Troubleshooting

ENGINE FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
STARTS AND THEN STOPS	GENERAL	The fuel regulator is not operational.	Contact an Official Solé Diesel Service.
	FUEL SYSTEM	Faulty or clogged fuel pump	Check fuel pump inlet.
		Clogged fuel filter	Replace fuel filter.
		Air in fuel system	Bleed fuel system.
		Incorrect injection pump setting	Contact an Official Solé Diesel Service.
		Closed fuel outlet tap	Open the fuel outlet tap.
	COOLING SYSTEM	Low cooling liquid level.	Check cooling liquid level and fill tank if necessary.
	ELECTRICAL SYSTEM (CC)	Faulty stop solenoid (ETR).	Check stop solenoid and replace it if necessary.
		Pressed emergency stop button.	Reset the emergency stop button position.
		Control panel start signal.	Check the start signal from the controller (yellow wire).
	INLET AND EXHAUST SYSTEM	Dirty or clogged air filter.	Replace the air filter element.
BLACK SMOKE	FUEL SYSTEM	Clogged fuel filter.	Replace fuel filter.
		Dirty or faulty fuel injectors.	Clean, test and/or replace fuel injector which is not operating properly.
		Incorrect injection pump setting.	Contact an Official Solé Diesel Service.
	INLET AND EXHAUST SYSTEM	Clogged air filter.	Replace the air filter element.
BLUE SMOKE	GENERAL	Incorrect valve clearance.	Perform valve adjustment.
	LUBRICATION SYSTEM	Oil level too high.	Check the lubrication oil level and reset it.
LOW OIL PRESSURE	LUBRICATION SYSTEM	Faulty oil pump.	Contact our dealer
		Strangled oil pressure-relief valve.	Clean the valve and check its operation.
		Oil pressure too low.	Check oil level.
		Oil level too low.	Reset oil level. Inspect the engine for leaks.
		Faulty oil pressure valve.	Contact an Official Solé Diesel Service.
		Faulty pressure gauge, pressure sensor and/or pressure switch.	Check and/or replace elements.
		Engine tilt above allowable values.	Check the engine installation inclination. Reinstall the engine if necessary.

Troubleshooting

ENGINE FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
OIL PRESSURE TOO	**LUBRICATION SYSTEM**	Strangled oil pressure-relief valve	Clean the valve and check its operation.
		Faulty oil pressure valve	Contact an Official Solé Diesel Service.
		Oil level too high.	Reset oil level.
		Obstruction of oil lines.	Contact an Official Solé Diesel Service.
HIGH FUEL CONSUMPTION	**GENERAL**	Low compression pressure.	Check compression.
		Electrical overload.	Reduce electrical load.
		The regulator is not working properly.	Contact an Official Solé Diesel Service.
	FUEL SYSTEM	Fuel injection timing malfunction.	Adjust fuel injection timing
	INLET AND EXHAUST SYSTEM	Clogged air filter	Replace the air filter element.
LOW POWER	**GENERAL**	Incorrect valve clearance.	Perform valve adjustment.
	FUEL SYSTEM	Clogged fuel filter.	Replace fuel filter.
		Dirty or faulty fuel injectors.	Clean, test and/or replace fuel injector which is not operating properly.
		Water in fuel system.	Clean fuel system with proper products. Inspect the source of the water inlet.
		Fuel injection timing malfunction.	Adjust fuel injection timing
	INLET AND EXHAUST SYSTEM	Clogged air filter	Replace the air filter element.
		Exhaust detonations	Inspect exhaust system. Replace exhaust system components that are not operational.
ENGINE OVERHEATING	**GENERAL**	Low compression pressure.	Check compression.
		Electrical overload.	Reduce electrical load.
	LUBRICATION SYSTEM	Faulty oil pump.	Contact an Official Solé Diesel Service.
		Oil viscosity too high.	Check oil specifications according to Technical Specifications.
		Oil level too low.	Reset oil level. Inspect the engine for leaks.

Troubleshooting

ENGINE FAILURE	SYSTEM	PROBABLE CAUSES	RECOMMENDED ACTIONS
ENGINE OVERHEATING	COOLING SYSTEM	Faulty coolant water pump.	Check coolant pump (impeller, pump sealing).
		Plugged or restricted-pitch salt water tap.	Clean the tap, check if the salt water pump impeller is damaged.
		Faulty salt water pump.	Check sea water pump (impeller, pump sealing).
		Clogged water cooler.	Clean the water cooler.
		Low coolant level.	Restore normal coolant level for operation.
		Thermostat is not operational.	Replace the thermostat.
	INLET AND EXHAUST SYSTEM	Clogged air filter	Replace the air filter element.
FAULTY BATTERY CHARGE	ELECTRICAL SYSTEM (DC)	Discharged or empty battery.	Charge the battery or replace it with a new one.
		Loose or corroded battery connections.	Check the battery connections are correct, clean and tight.
		Faulty DC alternator regulator.	Replace alternator.
		DC alternator belt tension.	Check belt tension and change if necessary.

Section 7 - Technical specifications

MINI-17

Specifications			
No. Of Strokes:	4	**Number of cylinders:**	2
Layout of cylinders:	In line	**Cylinder diameter (mm):**	76
Stroke (mm):	70	**Total displacement (cc):**	635
Compression ratio:	23:1	**Continuous power (kW):**	10,6
Intermittent Power (kW):	11,8	**Max RPM:**	3600
Rotation (viewed from flywheel side):	Counterclockwise	**Idle RPM:**	900 (±50)
Intake system:	Naturally aspirated	**Starting aid:**	Air Heater

Electrical system			
Voltage (V):	12	**Alternator (A):**	75
Minimum Battery Capacity (Ah):	45	**Engine shut off system:**	ETS
Battery Cable Length (m):	1,5 m	**Battery Cable Section (mm2):**	70 mm2

Fuel system			
Fuel type:	Diesel	**Injection system:**	Mechanical and indirect
Fuel standards:	Fueloil diesel ASTM	**Injection pump type:**	In line
Maximum suction head (m):	0,3	**Governor type:**	Mechanical
Injection Pressure (bar):	140	**Maximum static head of return pipe (bar):**	0,26
Firing order:	1-2	**Injection timing (°):**	17 Before TDC
Idle Consumption (g/kWh):	310	**Consumption at 50 % (g/kWh):**	278
Consumption At 75 % (g/kWh):	273	**Consumption at 100 % (g/kWh):**	308

Lubrication system			
Lubrication type:	Forced circulation	**Oil consumption at full load (g/kWh):**	9,2
Minimum pressure at maximum RPM (kg/cm2):	3	**Maximum pressure at maximum RPM (kg/cm2):**	4
Minimum pressure at idle (kg/cm2):	1	**Oil type:**	SAE 15W40
Maixmum oil temperature (°C):	95	**Oil pan capacity (l):**	2,3
Total circuit capacity (l):	2,8	**Oil pressure switch (kg/cm2):**	0,5

Cooling system			
Coolant type:	Organic 50%, -38°C	**Volume capacity of coolant circuit (l):**	2,7
Coolant pump flow at maximum RPM (l/min):	33	**Sea water pump flow at maximum RPM (l/min):**	38 *
Maximum suction head of sea water (m):	3	**Thermostat valve starts opening (°C):**	71
Thermostat valve completely opened (°C):	85	**Maximum sea water temperature (°C):**	32
Heat to be extracted at 100 % load (kcal/h):	13000,93	**Engine ratio/coolant pump RPM:**	0,87

Installation data / Dimensions			
Sea water hose inner diameter (mm):	20	**Fuel feeding hose inner diameter (mm):**	8
Fuel return hose inner diameter (mm):	5	**Exhaust hose inner diameter (mm):**	40**
Total length (mm):	396	**Total width (mm):**	392
Total height (mm):	500	**Down Angle (RO):**	25
Max. Intermittent inclination in operation (°):	30		

* The sea water pump flow has been obtained under zero aspiration height conditions. Besides, depending on the arrangement of the complete system (hoses, elbows, suction heads, etc.) this value can be lower.

** The diameter system will be calculated depending on each installation in case of a dry exhaust

1 kW ≅ 1,36 CV 1 kW ≅ 1,36 HP (metric) 1 kW ≅ 1,36 CH

MINI-29

Specifications			
No. Of Strokes:	4	**Number of cylinders:**	3
Layout of cylinders:	In line	**Cylinder diameter (mm):**	76
Stroke (mm):	70	**Total displacement (cc):**	952
Compression ratio:	22:1	**Continuous power (kW):**	18
Intermittent Power (kW):	20	**Max RPM:**	3600
Rotation (viewed from flywheel side):	Counterclockwise	**Idle RPM:**	900 (±50)
Intake system:	Naturally aspirated	**Starting aid:**	Glow plugs

Electrical system			
Voltage (V):	12	**Alternator (A):**	75
Minimum Battery Capacity (Ah):	60	**Engine shut off system:**	ETS
Battery Cable Length (m):	1,5 m	**Battery Cable Section (mm2):**	70 mm2

Fuel system			
Fuel type:	Diesel	**Injection system:**	Mechanical and indirect
Fuel standards:	Fueloil diesel ASTM	**Injection pump type:**	In line
Maximum suction head (m):	0,3	**Governor type:**	Mechanical
Injection Pressure (bar):	140	**Maximum static head of return pipe (bar):**	0,26
Firing order:	1-3-2	**Injection timing (°):**	19 Before TDC
Idle Consumption (g/kWh):	303	**Consumption at 50 % (g/kWh):**	264
Consumption At 75 % (g/kWh):	272	**Consumption at 100 % (g/kWh):**	292

Lubrication system			
Lubrication type:	Forced circulation	**Oil consumption at full load (g/kWh):**	8,8
Minimum pressure at maximum RPM (kg/cm2):	3	**Maximum pressure at maximum RPM (kg/cm2):**	4
Minimum pressure at idle (kg/cm2):	1	**Oil type:**	SAE 15W40
Maixmum oil temperature (°C):	98	**Oil pan capacity (l):**	3,5
Total circuit capacity (l):	4	**Oil pressure switch (kg/cm2):**	0,5

Cooling system			
Coolant type:	Organic 50%, -38°C	**Volume capacity of coolant circuit (l):**	3
Coolant pump flow at maximum RPM (l/min):	51	**Sea water pump flow at maximum RPM (l/min):**	34 *
Maximum suction head of sea water (m):	3	**Thermostat valve starts opening (°C):**	71
Thermostat valve completely opened (°C):	85	**Maximum sea water temperature (°C):**	32
Heat to be extracted at 100 % load (kcal/h):	18994,09	**Engine ratio/coolant pump RPM:**	0,79

Installation data / Dimensions			
Sea water hose inner diameter (mm):	20	**Fuel feeding hose inner diameter (mm):**	8
Fuel return hose inner diameter (mm):	5	**Exhaust hose inner diameter (mm):**	50**
Total length (mm):	504	**Total width (mm):**	388
Total height (mm):	504	**Down Angle (RO):**	25
Max. Intermittent inclination in operation (°):	30		

* The sea water pump flow has been obtained under zero aspiration height conditions. Besides, depending on the arrangement of the complete system (hoses, elbows, suction heads, etc.) this value can be lower.

** The diameter system will be calculated depending on each installation in case of a dry exhaust

MINI-33

Specifications			
No. Of Strokes:	4	**Number of cylinders:**	3
Layout of cylinders:	In line	**Cylinder diameter (mm):**	78
Stroke (mm):	92	**Total displacement (cc):**	1318
Compression ratio:	22:1	**Continuous power (kW):**	20,8
Intermittent Power (kW):	23,1	**Max RPM:**	3000
Rotation (viewed from flywheel side):	Counterclockwise	**Idle RPM:**	900 (±50)
Intake system:	Naturally aspirated	**Starting aid:**	Glow plugs

Electrical system			
Voltage (V):	12	**Alternator (A):**	120
Minimum Battery Capacity (Ah):	65	**Engine shut off system:**	ETS
Battery Cable Length (m):	1,5 m	**Battery Cable Section (mm2):**	70 mm2

Fuel system			
Fuel type:	Diesel	**Injection system:**	Mechanical and indirect
Fuel standards:	Fueloil diesel ASTM	**Injection pump type:**	In line
Maximum suction head (m):	0,3	**Governor type:**	Mechanical
Injection Pressure (bar):	140	**Maximum static head of return pipe (bar):**	0,26
Firing order:	1-3-2	**Injection timing (°):**	17 Before TDC
Idle Consumption (g/kWh):	168	**Consumption at 50 % (g/kWh):**	250
Consumption At 75 % (g/kWh):	260	**Consumption at 100 % (g/kWh):**	280

Lubrication system			
Lubrication type:	Forced circulation	**Oil consumption at full load (g/kWh):**	N/A
Minimum pressure at maximum RPM (kg/cm2):	3	**Maximum pressure at maximum RPM (kg/cm2):**	4
Minimum pressure at idle (kg/cm2):	1	**Oil type:**	SAE 15W40
Maixmum oil temperature (°C):	98	**Oil pan capacity (l):**	3,5
Total circuit capacity (l):	4	**Oil pressure switch (kg/cm2):**	0,5

Cooling system			
Coolant type:	Organic 50%, -38°C	**Volume capacity of coolant circuit (l):**	5,7
Coolant pump flow at maximum RPM (l/min):	75	**Sea water pump flow at maximum RPM (l/min):**	33 *
Maximum suction head of sea water (m):	3	**Thermostat valve starts opening (°C):**	76,5
Thermostat valve completely opened (°C):	90	**Maximum sea water temperature (°C):**	32
Heat to be extracted at 100 % load (kcal/h):	20000,11	**Engine ratio/coolant pump RPM:**	0,75

Installation data / Dimensions			
Sea water hose inner diameter (mm):	20	**Fuel feeding hose inner diameter (mm):**	8
Fuel return hose inner diameter (mm):	5	**Exhaust hose inner diameter (mm):**	50**
Total length (mm):	489	**Total width (mm):**	441
Total height (mm):	573	**Down Angle (RO):**	15
Max. Intermittent inclination in operation (°):	30		

* The sea water pump flow has been obtained under zero aspiration height conditions. Besides, depending on the arrangement of the complete system (hoses, elbows, suction heads, etc.) this value can be lower.

** The diameter system will be calculated depending on each installation in case of a dry exhaust

1 kW ≅ 1,36 CV 1 kW ≅ 1,36 HP (metric) 1 kW ≅ 1,36 CH

MINI-44

Specifications			
No. Of Strokes:	4	**Number of cylinders:**	4
Layout of cylinders:	In line	**Cylinder diameter (mm):**	78
Stroke (mm):	92	**Total displacement (cc):**	1758
Compression ratio:	22:1	**Continuous power (kW):**	27,8
Intermittent Power (kW):	30,9	**Max RPM:**	3000
Rotation (viewed from flywheel side):	Counterclockwise	**Idle RPM:**	900 (±50)
Intake system:	Naturally aspirated	**Starting aid:**	Glow plugs

Electrical system			
Voltage (V):	12	**Alternator (A):**	120
Minimum Battery Capacity (Ah):	80	**Engine shut off system:**	ETS
Battery Cable Length (m):	1,5 m	**Battery Cable Section (mm2):**	70 mm2

Fuel system			
Fuel type:	Diesel	**Injection system:**	Mechanical and indirect
Fuel standards:	Fueloil diesel ASTM	**Injection pump type:**	In line
Maximum suction head (m):	0,3	**Governor type:**	Mechanical
Injection Pressure (bar):	140	**Maximum static head of return pipe (bar):**	0,26
Firing order:	1-3-4-2	**Injection timing (°):**	17 Before TDC
Idle Consumption (g/kWh):	268	**Consumption at 50 % (g/kWh):**	252
Consumption At 75 % (g/kWh):	255	**Consumption at 100 % (g/kWh):**	276

Lubrication system			
Lubrication type:	Forced circulation	**Oil consumption at full load (g/kWh):**	N/A
Minimum pressure at maximum RPM (kg/cm2):	3	**Maximum pressure at maximum RPM (kg/cm2):**	4
Minimum pressure at idle (kg/cm2):	1	**Oil type:**	SAE 15W40
Maixmum oil temperature (°C):	100	**Oil pan capacity (l):**	5,5
Total circuit capacity (l):	6	**Oil pressure switch (kg/cm2):**	0,5

Cooling system			
Coolant type:	Organic 50%, -38°C	**Volume capacity of coolant circuit (l):**	8
Coolant pump flow at maximum RPM (l/min):	100	**Sea water pump flow at maximum RPM (l/min):**	33 *
Maximum suction head of sea water (m):	3	**Thermostat valve starts opening (°C):**	76,5
Thermostat valve completely opened (°C):	90	**Maximum sea water temperature (°C):**	32
Heat to be extracted at 100 % load (kcal/h):	26999,29	**Engine ratio/coolant pump RPM:**	0,75

Installation data / Dimensions			
Sea water hose inner diameter (mm):	20	**Fuel feeding hose inner diameter (mm):**	8
Fuel return hose inner diameter (mm):	5	**Exhaust hose inner diameter (mm):**	50**
Total length (mm):	578	**Total width (mm):**	441
Total height (mm):	573	**Down Angle (RO):**	15
Max. Intermittent inclination in operation (°):	30		

* The sea water pump flow has been obtained under zero aspiration height conditions. Besides, depending on the arrangement of the complete system (hoses, elbows, suction heads, etc.) this value can be lower.

** The diameter system will be calculated depending on each installation in case of a dry exhaust

1 kW ≅ 1,36 CV 1 kW ≅ 1,36 HP (metric) 1 kW ≅ 1,36 CH

MINI-55

Specifications			
No. Of Strokes:	4	**Number of cylinders:**	4
Layout of cylinders:	In line	**Cylinder diameter (mm):**	78
Stroke (mm):	92	**Total displacement (cc):**	1758
Compression ratio:	22:1	**Continuous power (kW):**	33,1
Intermittent Power (kW):	36,8	**Max RPM:**	3000
Rotation (viewed from flywheel side):	Counterclockwise	**Idle RPM:**	900 (±50)
Intake system:	Turbocharged	**Starting aid:**	Glow plugs

Electrical system			
Voltage (V):	12	**Alternator (A):**	120
Minimum Battery Capacity (Ah):	80	**Engine shut off system:**	ETS
Battery Cable Length (m):	1,5 m	**Battery Cable Section (mm2):**	70 mm2

Fuel system			
Fuel type:	Diesel	**Injection system:**	Mechanical and indirect
Fuel standards:	Fueloil diesel ASTM	**Injection pump type:**	Rotative
Maximum suction head (m):	0,3	**Governor type:**	Mechanical
Injection Pressure (bar):	140	**Maximum static head of return pipe (bar):**	0,5
Firing order:	1-3-4-2	**Injection timing (°):**	14 Before TDC
Idle Consumption (g/kWh):	260	**Consumption at 50 % (g/kWh):**	245
Consumption At 75 % (g/kWh):	250	**Consumption at 100 % (g/kWh):**	272

Lubrication system			
Lubrication type:	Forced circulation	**Oil consumption at full load (g/kWh):**	N/A
Minimum pressure at maximum RPM (kg/cm2):	0,8	**Maximum pressure at maximum RPM (kg/cm2):**	4
Minimum pressure at idle (kg/cm2):	1	**Oil type:**	SAE 15W40
Maixmum oil temperature (°C):	101	**Oil pan capacity (l):**	5,5
Total circuit capacity (l):	6	**Oil pressure switch (kg/cm2):**	0,3

Cooling system			
Coolant type:	Organic 50%, -38°C	**Volume capacity of coolant circuit (l):**	8
Coolant pump flow at maximum RPM (l/min):	100	**Sea water pump flow at maximum RPM (l/min):**	56 *
Maximum suction head of sea water (m):	4,5	**Thermostat valve starts opening (°C):**	76,5
Thermostat valve completely opened (°C):	90	**Maximum sea water temperature (°C):**	32
Heat to be extracted at 100 % load (kcal/h):	37996,77	**Engine ratio/coolant pump RPM:**	0,75

Installation data / Dimensions			
Sea water hose inner diameter (mm):	26	**Fuel feeding hose inner diameter (mm):**	8
Fuel return hose inner diameter (mm):	5	**Exhaust hose inner diameter (mm):**	60**
Total length (mm):	578	**Total width (mm):**	495
Total height (mm):	625	**Down Angle (RO):**	15
Max. Intermittent inclination in operation (°):	30		

* The sea water pump flow has been obtained under zero aspiration height conditions. Besides, depending on the arrangement of the complete system (hoses, elbows, suction heads, etc.) this value can be lower.

** The diameter system will be calculated depending on each installation in case of a dry exhaust

1 kW ≅ 1,36 CV 1 kW ≅ 1,36 HP (metric) 1 kW ≅ 1,36 CH

Section 8 – Tightening torques

Important nuts and screws:

Tightening torques

TIGHTENING VALUES	Dia. x pitch of the thread (M thread)	MINI-17/29			
		N·m		kgf·m	
Cylinder head	M10 x 1.25	73.5 to 83.4		7.5 to 8.5	
Rocker cover	M6 × 1.0	4.9 to 6.9		0.5 to 0.7	
Rocker arm shaft bracket	M8 x 1.25	14.7 to 21.6		1.5 to 2.2	
Main bearing cap	M10 × 1.25	49.0 to 53.9		5.0 to 5.5	
Connecting rod cap nut	M8 × 1.0	31.4 to 34.3		3.2 to 3.5	
Flywheel	M10 × 1.25	83.4 to 93.2		8.5 to 9.5	
Crankshaft pulley	M16 × 1.5	98.1 to 117.7		10 to 12	
Swing arm nut	M6 × 1.0	8.8 to 10.8		0.9 to 1.1	
Hollow screw (fuel injection pump)	M10 × 1.0	9.8 to 14.7		1.0 to 1.5	
Delivery valve holder (fuel injection pump)		34.3 to 38.2		3.5 to 3.9	
Air bleeding plug (fuel injection pump)		4.9 to 6.9		0.5 to 0.7	
Fuel injection nozzle retaining nut	M16 × 0.75	34.3 to 39.2		3.5 to 4.0	
Injection nozzle holder	M20 × 1.5	49.0 to 68.6		5.0 to 7.0	
Fuel injection pipe	M12 x 1.5	24.5 to 29.4		2.5 to 3.0	
Fuel return pipe	M12 x 1.5	20.6 to 24.5		2.1 to 2.5	
Oil relief valve	M18 × 1.5	39.2 to 49.0		4.0 to 5.0	
Oil pan drain plug	M18 × 1.5	49.0 to 58.8		5.0 to 6.0	
Oil pressure switch	PT1/8	7.85 to 11.8		0.8 to 1.2	
Oil pump	M6 × 1.0	7.8 to 9.8		0.8 to 1.0	
Oil filter shaft	M20 x 1.5	49 ± 5		5.0 ± 0.5	
Oil filter	M20 x 1.5	12 ± 1		1.2 ± 0.1	
Temperature switch	M16 × 1.5	19.6 to 29.4		2.0 to 3.0	
Thermostat cover bolt	M6 × 1.0	8 to 10		0.8 to 1.0	
Hole plug for thermoswitch	M16 × 1.5	19.6 to 24.5		2.0 to 2.5	
Intake bolt	M6 × 1.0	7.8 to 9.8		0.8 to 1.0	
Exhaust manifold	M8 x 1.25	14.7 to 21.6		1.5 to 2.2	
Starter terminal M		8.8 to 12.7		0.90 to 1.30	
Starter terminal B	M8 × 1.25	7.8 to 11.8		0.8 to 1.2	
Stop solenoid fixing nut	M30 × 1.5	39.2 to 49.0		4.0 to 5.0	
Glow plug	M10 × 1.25	14.7 to 19.6		1.5 to 2.5	
Glow plug lead wire nut	M4 × 0.7	0.98 to 1.47		0.10 to 0.15	
General tightening torque		7T		10.9T	
		N·m	kgf·m	N·m	kgf·m
	M8 x 1.25	17	1.7	30	3.1
	M10 x 1.25	33	3.4	60	6.1
	M12 x 1.25	60	6.1	108	11.0
	M14 × 1.5	97	9.9	176	17.9
	M16 × 1.5	145	14.8	262	26.7
	M18 × 1.5	210	21.4	378	38.5

Tightening torques

TIGHTENING VALUES	Dia. x pitch of the thread (M thread)	MINI-33/44/55	
		N·m	kgf·m
Cylinder head	M10x1.75	83.4 to 93.2	8.5 to 9.5
Rocker cover	M8x1.25	9.81 to 12.7	1.0 to 1.3
Rocker arm shaft bracket	M8x1.25	9.81 to 19.6	1.0 to 2.0
Rocker arm adjusting nut	M8x1.25	18.0 to 22.0	1.8 to 2.2
Thrust plate	M8x1.25	9.8 to 11.8	1.0 to 1.2
Main bearing cap bolt	M10x1.25	49.0 to 53.9	5.0 to 5.5
Connecting rod cap nut	M9x1.0	32.4 to 37.3	3.3 to 3.8
Flywheel	M12x1.25	127 to 137	13.0 to 14.0
Crankshaft pulley	M18x1.5	147 to 196	15.0 to 20.0
Rear plate mounting bolt	M12x1.25	53.9 to 73.5	5.5 to 7.5
Hollow screw (injection pump)	M12x1.25	14.7 to 19.6	1.5 to 2.0
Delivery valve holder (fuel injection pump)		39.2 to 49.0	4.0 to 5.0
Air-bleeding plug (injection pump)	M8x1.25	9.81 to 13.7	1.0 to 1.4
Nozzle retaining nut	M16x0.75	34.3 to 39.2	3.5 to 4.0
Nozzle holder	M20x1.5	49.0 to 58.8	5.0 to 6.0
Injection pipe nut	M12x1.5	24.5 to 34.3	2.5 to 3.5
Fuel leak-off pipe nut	M12x1.5	20.6 to 24.5	2.1 to 2.5
Relief valve (lubrication)	M22x1.5	44.1 to 53.9	4.5 to 5.5
Oil drain plug	M14x1.5	34.3 to 44.1	3.5 to 4.5
Oil filter	M20x1.5	10.8 to 12.7	1.1 to 1.3
Pressure switch	PT 1/8	7.85 to 11.8	0.8 to 1.2
Oil pan bolt	M8x1.25	24.5 to 30.4	2.5 to 3.1
Temperature switch	M16x1.5	18.6 to 26.5	1.9 to 2.7
Thermostat cover bolt	M8x1.25	16 to 20	1.6 to 2.0
Inlet bolt	M8x1.25	14.7 to 21.6	1.5 to 2.2
Exhaust manifold bolt	M8x1.25	14.7 to 21.6	1.5 to 2.2
Starter engine terminal B	M8x1.25	9.81 to 11.8	1.0 to 1.2
Solenoid fixing nut	M30x1.5	39.2 to 49.0	4.0 to 5.0
Glow plug	M10x1.25	14.7 to 19.6	1.5 to 2.0
Glow plug connection plate fixing nut	M4x0.7	0.98 a 1.47	0.1 to 0.15
General tightening torque		7T		10.9T	
		N·m	kgf·m	N·m	kgf·m
	M8 x 1.25	17	1,7	30	3,1
	M10 x 1.25	33	3,4	60	6,1
	M12 x 1.25	60	6,1	108	11
	M14 × 1.5	97	9,9	176	17,9
	M16 × 1.5	145	14,8	262	26,7
	M18 × 1.5	210	21,4	378	38,5

Section 9 – Wiring diagrams

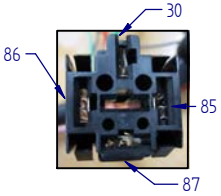
CONECTOR 1: C1 /
CONNECTOR 1: C1

6 5 4 3 2 1

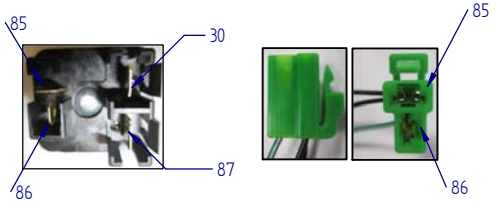
CONECTOR 2: C2 /
CONNECTOR 2: C2

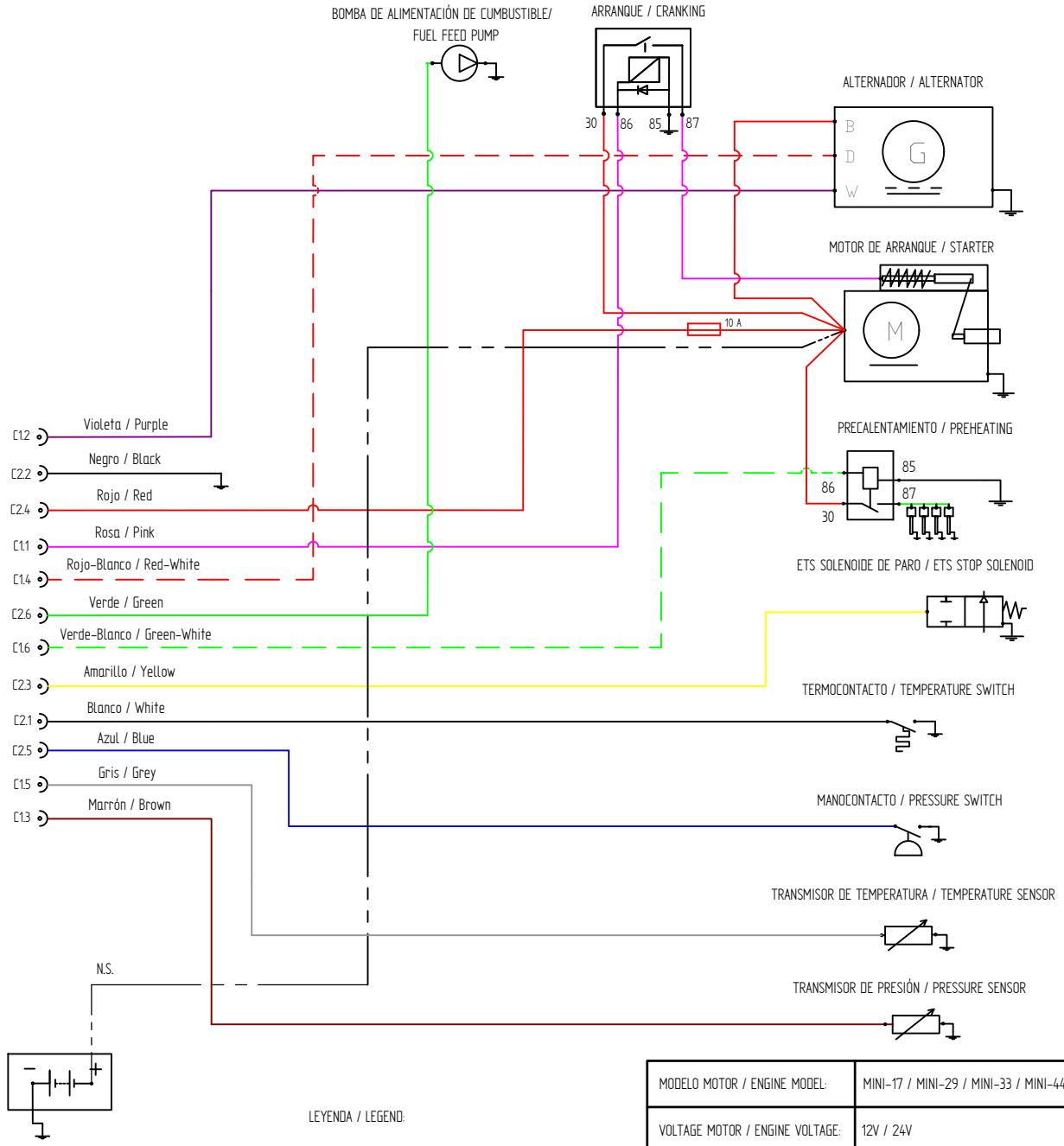
1 2 3 4 5 6

DETALLE RELE DE ARRANQUE /
STARTER RELAY



DETALLE RELE BUJIAS PRECALENTAMIENTO / PREHEATING RELAY



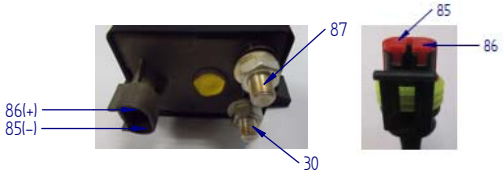


LEYENDA / LEGEND:

- N.S.: NO SUMINISTRADO / NOT SUPPLIED
- OPT.: OPCIONAL / OPTIONAL

MODELO MOTOR / ENGINE MODEL:	MINI-17 / MINI-29 / MINI-33 / MINI-44 / MINI-55			
VOLTAGE MOTOR / ENGINE VOLTAGE:	12V / 24V			
DIBUJADO D. ROMARTÍNEZ	VERIFICADO RUBEN D.	FECHA CREACIÓN 16/03/2017	ÚLTIMA REVISIÓN	PÁGINA
Solé Diesel SOLÉ, S.A.	E1380E02P_SVT			1 de 1

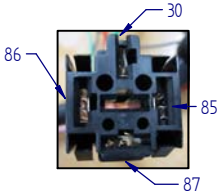
DETALLE RELÉ AISLAMIENTO / ISOLATING RELAY



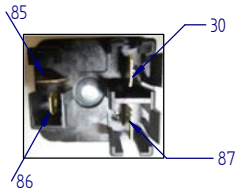
CONECTOR 1: C1 /
CONNECTOR 1: C1

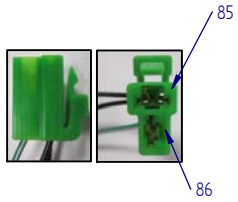
CONECTOR 2: C2 /
CONNECTOR 2: C2

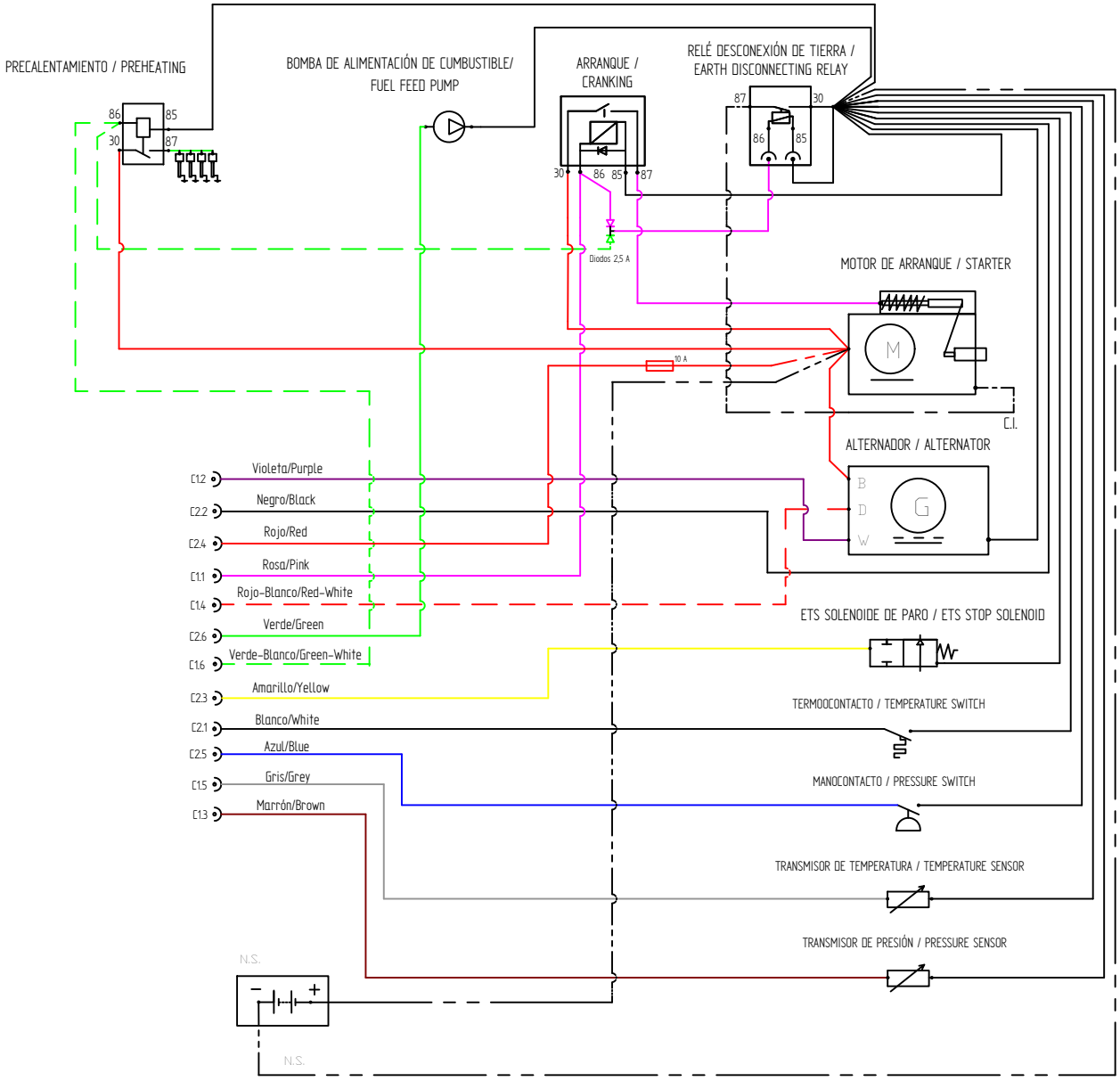
DETALLE RELÉS DE ARRANQUE /
STARTER RELAY



DETALLE RELÉ BUJIAS PRECALENTAMIENTO / PREHEATING RELAY





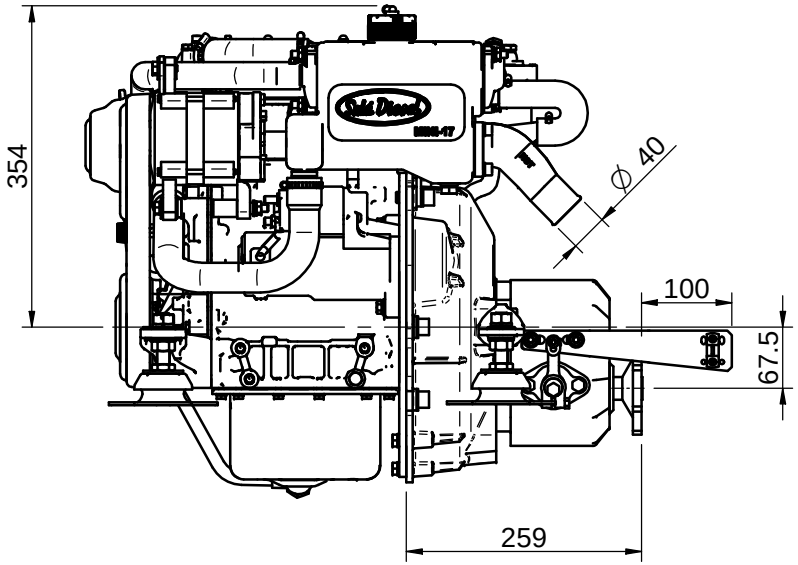


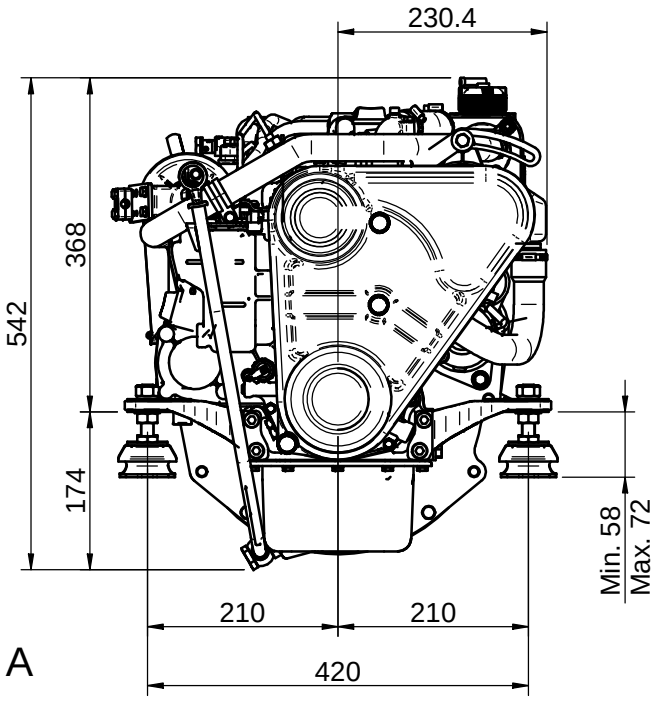
LEYENDA / LEGEND:

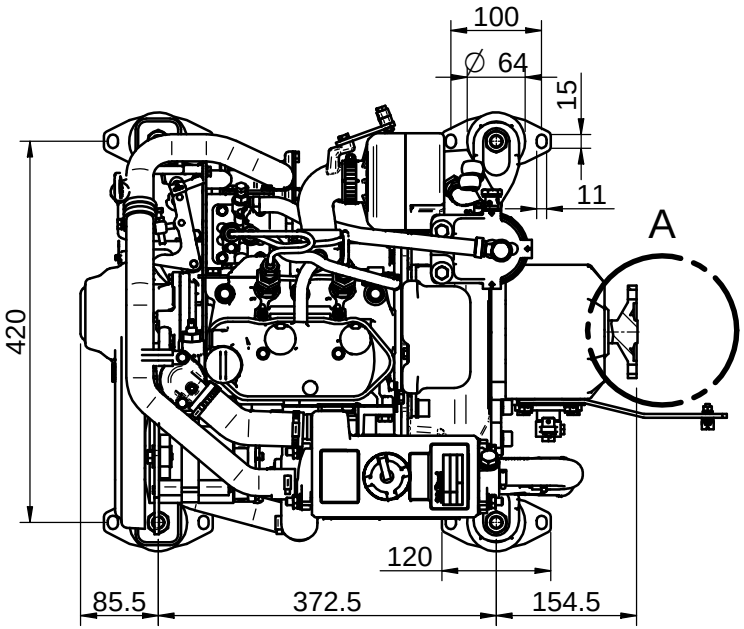
- N.S.: NO SUMINISTRADO / NOT SUPPLIED
- OPT.: OPCIONAL / OPTIONAL
- C.I.: CABLE INDEPENDIENTE / SEPARATE CABLE

MODELO MOTOR / ENGINE MODEL:	MINI-17 / MINI-29 / MINI-33 / MINI-44 / MINI-55 LIBRE MASA / ISOLATED			
VOLTAGE MOTOR / ENGINE VOLTAGE:	12V / 24V			
DIBUJADO D. ROMARTÍNEZ	VERIFICADO RUBEN D.	FECHA CREACIÓN 30/03/2017	ÚLTIMA REVISIÓN	PÁGINA
Solé Diesel SOLÉ, S.A.	E1380B02P_SVT			1 de 1

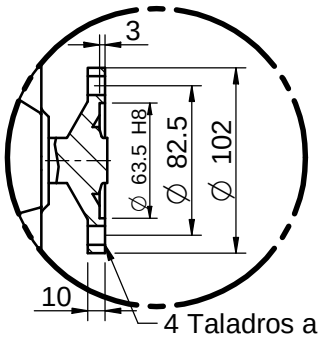
Section 10 – Overall dimensions







DETALLE A



DATOS TÉCNICOS / ***TECHNICAL DATA***

(1) Manguera entrada agua salada / *Sea water hose intake: Ø20mm*

(2) Manguera entrada combustible / *Fuel hose intake: Ø8mm*

(3) Manguera retorno combustible / *Diesel Fuel return hose: Ø5mm*

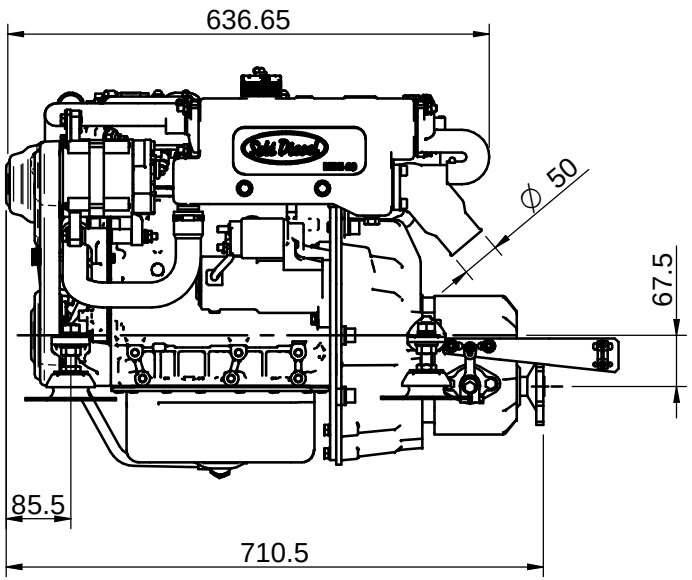
MOTOR MINI-17 v6 INV. TMC-40 2,00:1

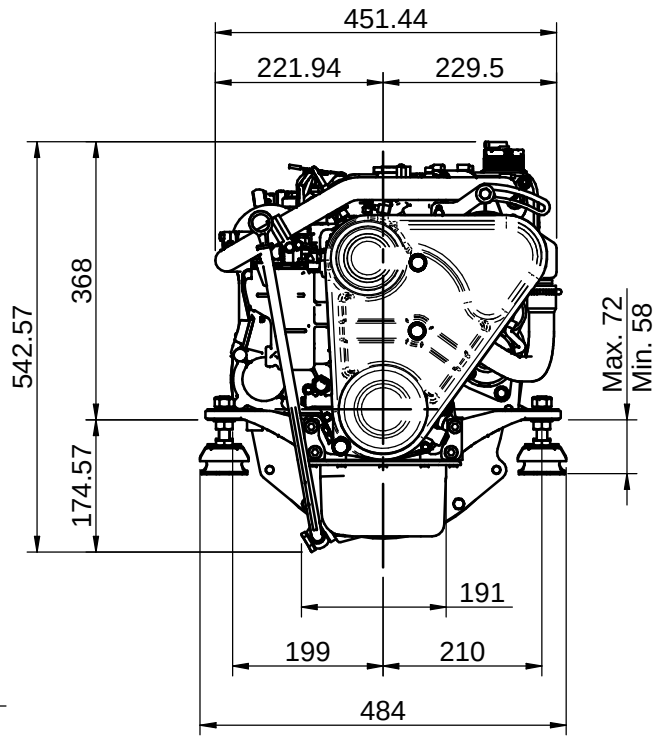
MINI-17 v6 ENGINE TMC-40 2.00:1 GBOX.

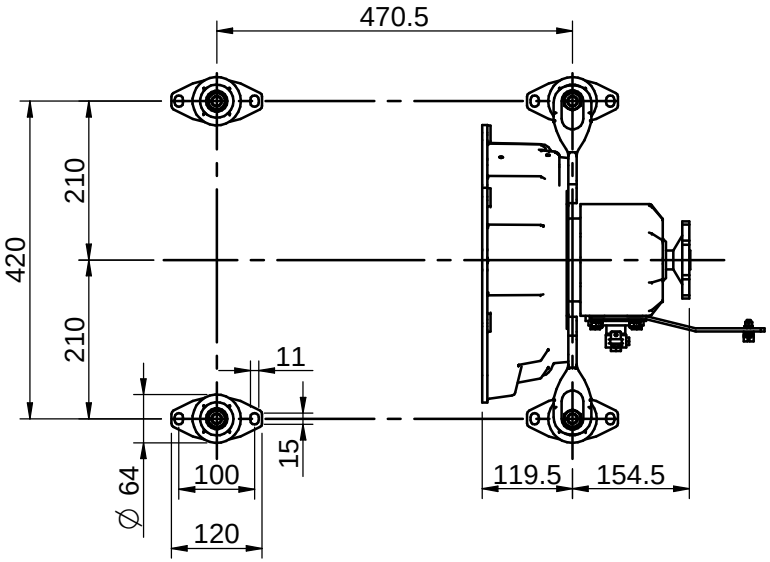
MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
			Suavizar aristas	./.

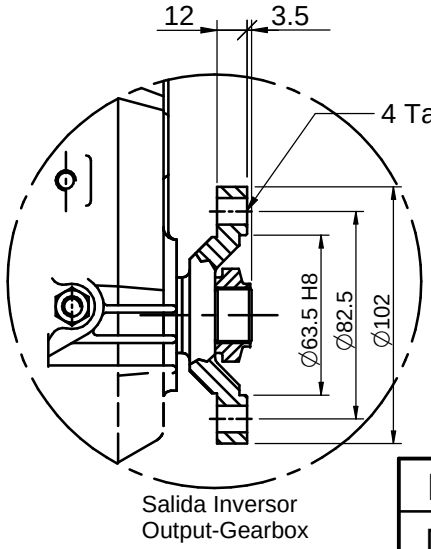
DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN
X.MARGARIT			02/03/2016	

SOLÉ, S.A.	FA0965	A









DATOS TÉCNICOS / *TECHNICAL DATA*

Manguera entrada agua salada / *Sea water hose intake:* *Ø20mm*
Manguera entrada combustible / *Fuel hose intake:* *Ø8mm*
Manguera retorno combustible / *Diesel Fuel return hose:* *Ø5mm*

Especificaciones del producto pueden ser modificadas sin previo aviso
(Product specifications are subject to change without notice)

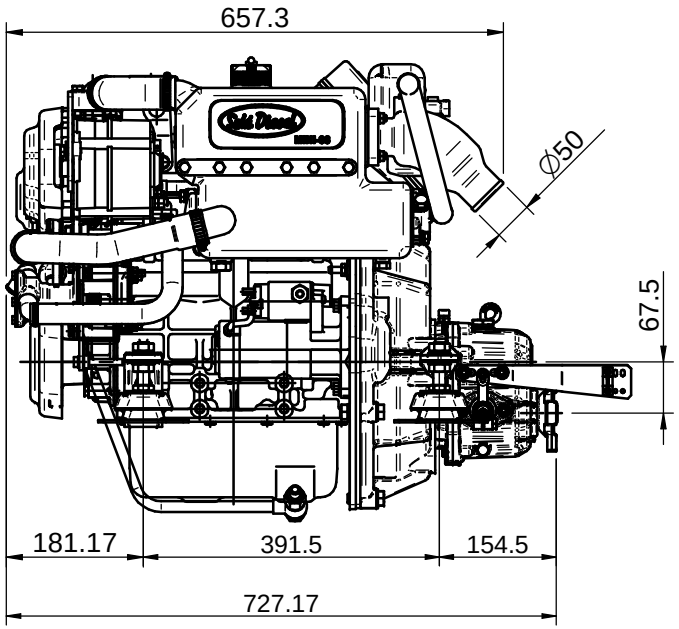
MOTOR MINI-29 v6 INV. TMC-40P 2,00:1

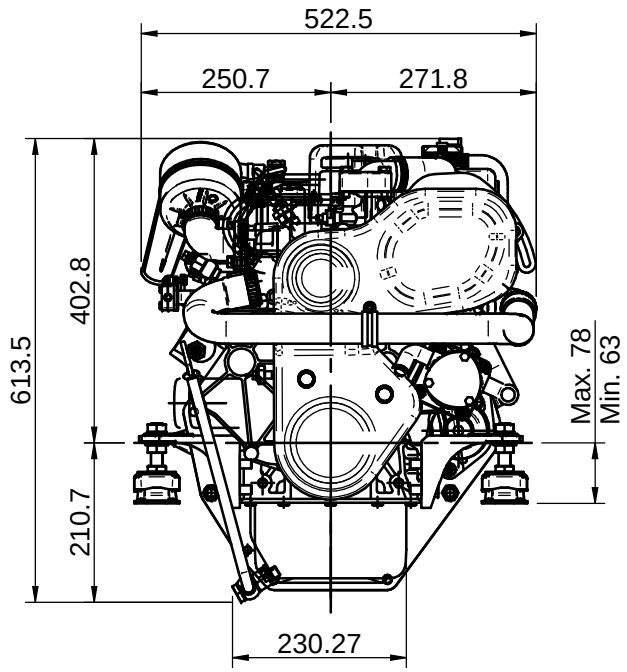
MINI-29 ENGINE WITH TMC-40P 2,00:1 GBOX

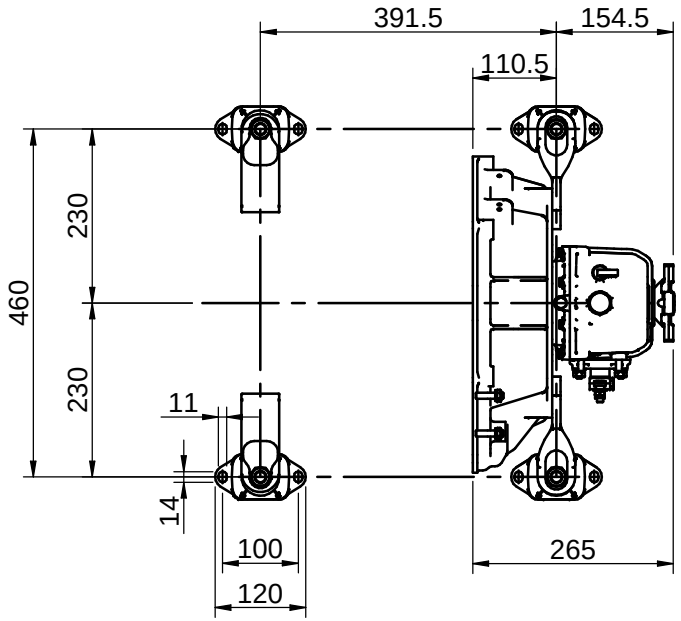
MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
				./.

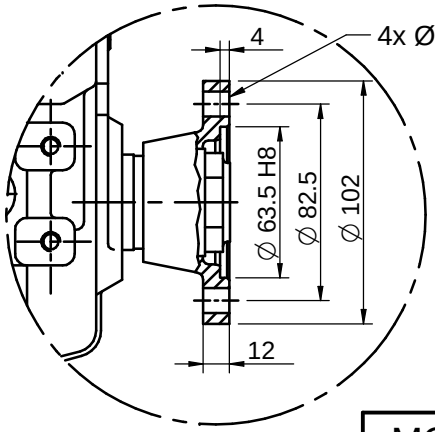
DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN
J.RODRÍGUEZ	ORIOLG		06/09/2017	03/10/2019

Solé Diesel **SOLÉ, S.A.** 17633100.6 A









Salida Inversor
Output Gearbox

DATOS TÉCNICOS (*TECHNICAL DATA)*

Manguera agua salada	*(Sea water hose)* :	Ø20mm
Manguera entrada combustible	*(Fuel hose intake)*:	Ø8mm
Manguera retorno combustible	*(Fuel hose return)*:	Ø5mm

Especificaciones del producto pueden ser modificadas sin previo aviso
(Product specifications are subject to change without notice)

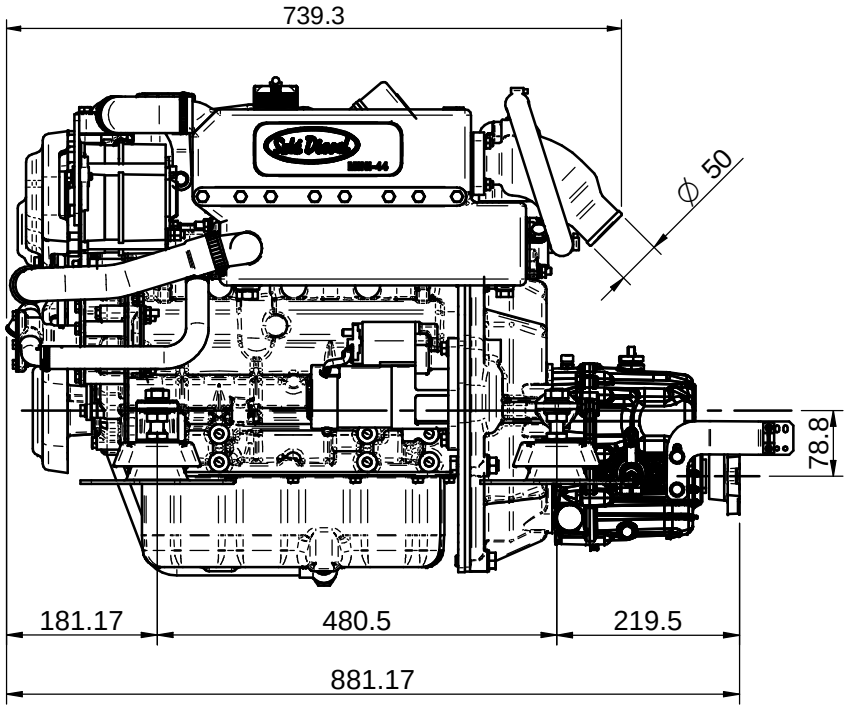
MOTOR MINI-33 v6 INV. TMC-40P 2,00:1

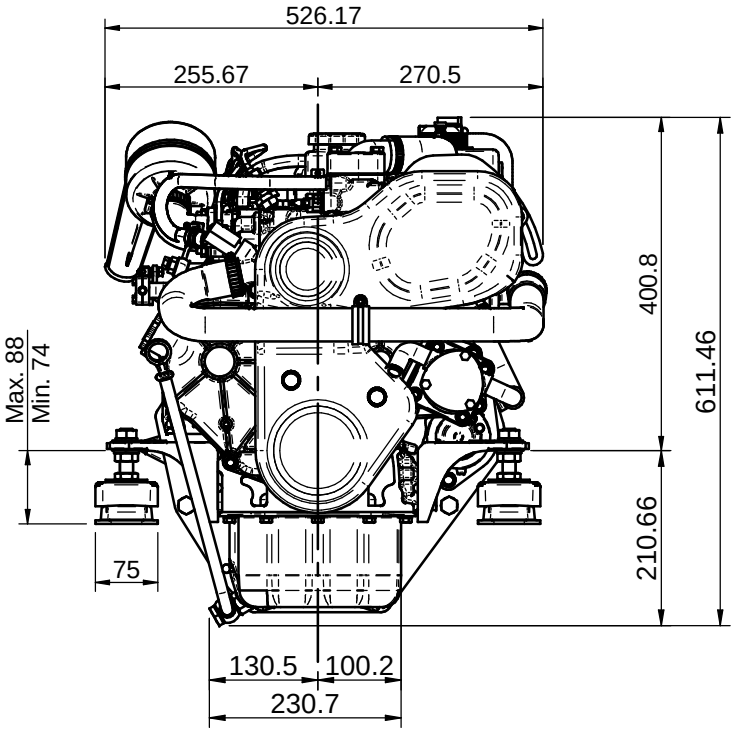
MINI-33 v6 ENGINE TMC-40P 2.00:1 GBOX.

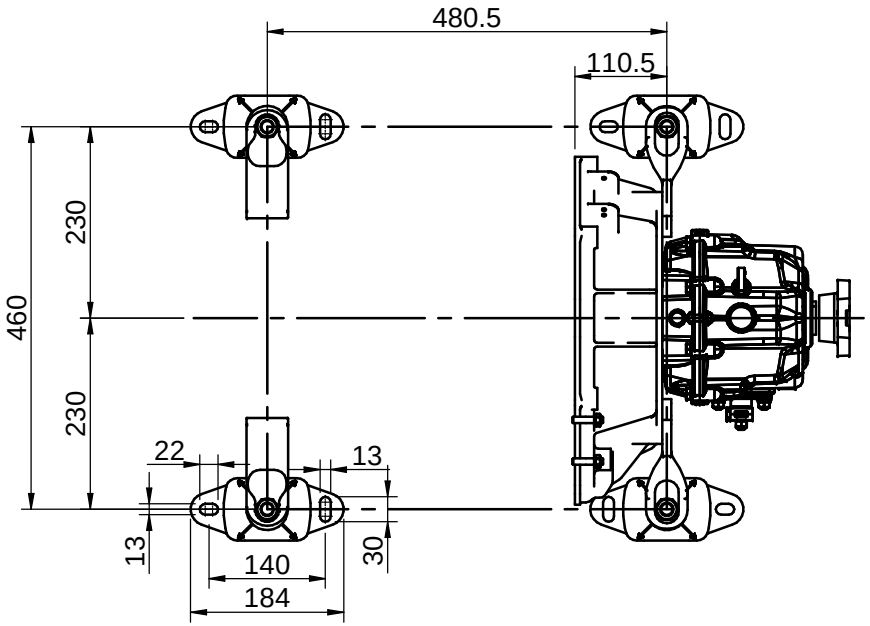
MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
				./.

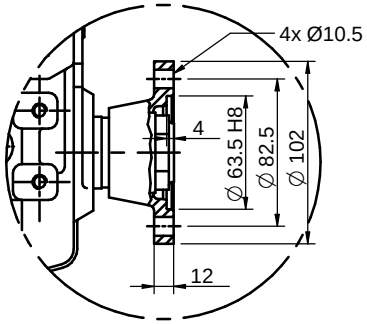
DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN
J.RODRÍGUEZ			04/06/2018	---

Solé Diesel **SOLÉ, S.A.** 17230263V6









Salida Inversor
Output Gearbox

DATOS TÉCNICOS (*TECHNICAL DATA)*

Manguera agua salada *(Sea water hose)* : Ø20mm
Manguera entrada combustible *(Fuel hose, inlet)*: Ø8mm
Manguera retorno combustible *(Fuel Hose, outlet)*: Ø5mm

Especificaciones del producto pueden ser modificadas sin previo aviso
(Product specifications are subject to change without notice)

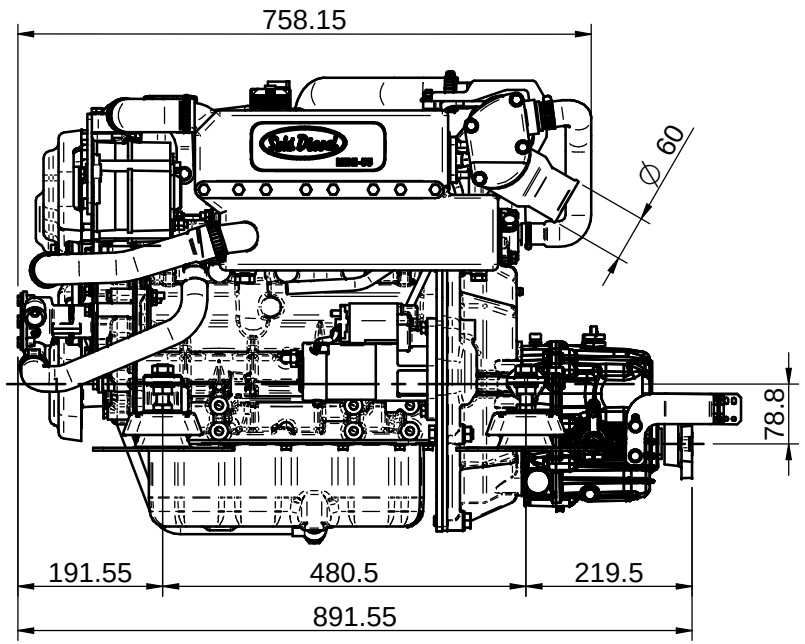
MOTOR MINI-44 v6 INV. TMC-60P 2,00:1

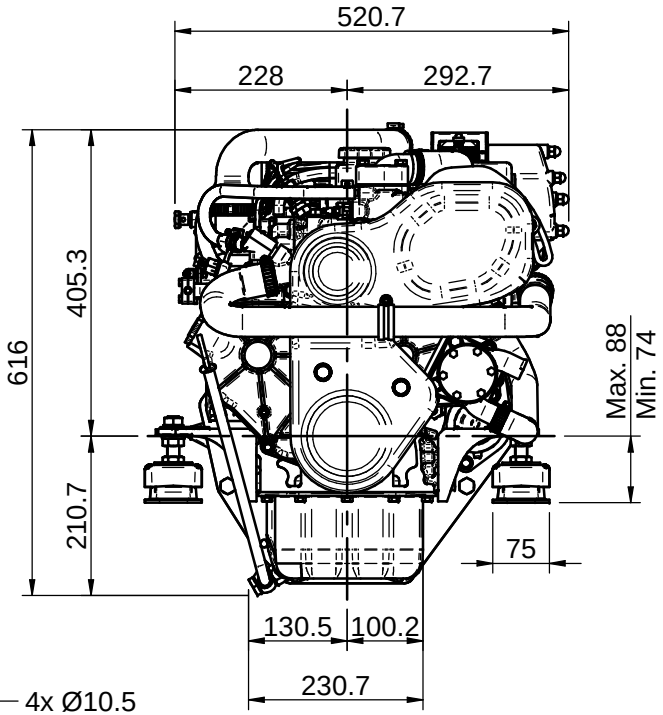
MINI-44 v6 ENGINE TMC-60P 2.00:1 GBOX.

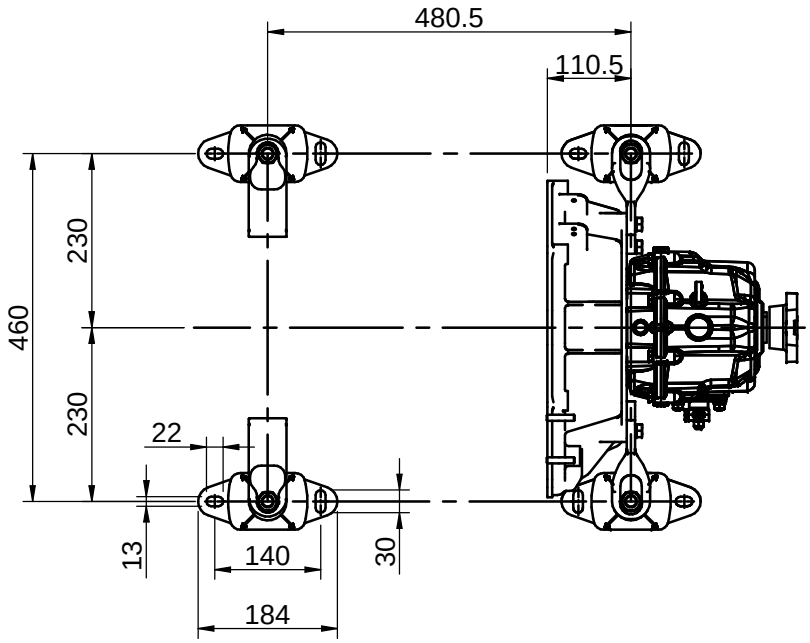
MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
				./.

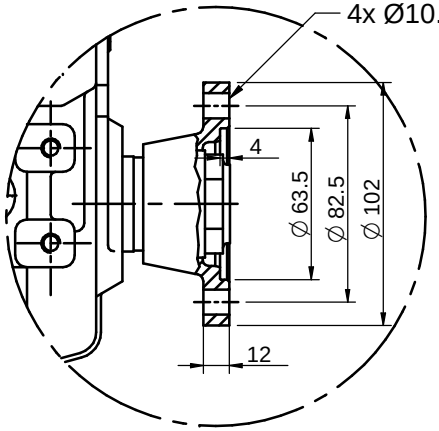
DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN
J.RODRÍGUEZ			01/06/2018	---

Solé Diesel **SOLÉ, S.A.** 17333483V6 ---









Salida Inversor/
Output GBox.

DATOS TÉCNICOS (*TECHNICAL DATA)*

Manguera agua salada	*(Sea water hose)* :	Ø26mm
Manguera entrada combustible	*(Fuel hose intake)*:	Ø8mm
Manguer retorno combustible	*(Fuel hose return)*:	Ø5mm

Especificaciones del producto pueden ser modificadas sin previo aviso
(Product specifications are subject to change without notice)

MOTOR MINI-55 v6 INV. TMC-60P 2.00:1

MINI-55 v6 ENGINE & TMC-60P GBOX 2.00:1

MATERIAL	ACABADO	TRATAMIENTO	PRESENTACIÓN	ESCALA
				./.

DIBUJADO	VERIFICADO	GRADO PRECISIÓN	FECHA CREACIÓN	ÚLTIMA REVISIÓN
J.RODRÍGUEZ		MEDIO	01/06/2018	---

Solé Diesel **SOLÉ, S.A.** 17733483V6

Section 11 – Instructions to Replace and Remove

When you decide to replace the engine, please contact SOLÉ S.A.; will provide relevant instructions regarding the laws in force at the time. When disposing of the whole or parts of this engine, meets LAWS IN FORCE IN THE COUNTRY OF INSTALLATION.

For more information about the materials they are made of the individual components of the engine, contact SOLÉ S.A.

Section 12 - Inspection prior to the delivery of propulsion engines

INSPECTION PRIOR TO THE DELIVERY OF PROPULSION ENGINES					
Installer / Marina information					
Installer Company:			Installation Date:		
Contact Tel. no.:			E-mail:		
Owner's Information					
Name and surnames:					
Contact Tel. no.:			Email:		
Ingine Information					
Engine model:					
Engine serial number:			Gearbox / Saildrive serial nº.:		
Installation Information					
Machine chamber operating temperature:					ºC
Angle of the engine (boat moored):					º
Maximum angle of the engine (navigation conditions):					º
Is the wet exhaust ebow above or below the floating line?			above		below
Propulsion Line Information					
Boat model:			Gearbox / Saildrive transmission ratio:		
Shaft diameter:	mm		Shaft length:		mm
Propeller diameter:	mm/inches	Propeller pitch:		mm/inches	Nº. Of propeller blades:
Exhaus, Cooling and Fuel Line Information					
Int. Diameter of exhaust hose:	mm	Int. Diameter of sea water intake to the pump:		mm	
Int. Diameter of diesel intake:	mm				
Int. Diameter of diesel return intake:	mm				
Has an exhaust collector been installed?	YES / NO	Has an air trap been installed?		YES / NO	

Verifications Prior to Start-Up	V/x	Notes
Correct engine alignment.		
Electrical installation connections.		
Engine oil level.		
Gearbox oil level.		
Coolant level and concentration.		
Control lever operation.		
Transmissions belts and belt tension.		
Airtight sea water cock.		

Verification of Engine No-Load Operations	V/x	Notes
Unusual noises from the transmission.		
Oil pressure		
Bleed the fresh water cooling system		
Verify the instrument panel: normal indications and alarm operation.		
Water, oil and fuel leaks in the engine or transmission.		

Inspection prior to the delivery of propulsion engines

INSPECTION PRIOR TO THE DELIVERY OF PROPULSION ENGINES

Verification of Motor Operating with Propeller Load	V/x	Notes
Verify maximum engine rpm at full load and with forward gear clutched. This test should be performed with the engine heated up. (If top rpm is not achieved contact Solé to inspect propeller dimensions).	rpm	
Engine rpm with engine idling and clutch out	rpm	
Engine output and inverter operation. Verify operation of the Trolling valve, if applicable.		
Engine temperature and oil pressure.		

Information for the Owner	V/x	Notes
Delivery of the instrucions manual and engine-related documents.		
Review of the engine instrucions manual.		
Study the instruments panel functions and the engine control functions.		
Report the first revision date.		
Report the maintenance schedule indicated in the manuals.		

Section 13 – Declaration of conformity for recreational Craft Propulsion Engines

SOLÉ, S.A.
CIF ES-A08191223
C-243b, km. 2, P.O. BOX 15
08760 - Martorell (Barcelona)
SPAIN

www.solediesel.com

Marine engines - Gensets - Accesories

Declaration of Conformity for Recreational Craft Propulsion Engines (inboard engines and stern drive engines without integral exhaust) with the requirements of Directive 2013/53/EU

Name of engine manufacturer: SOLÉ, S.A.

Address: Ctra. C-243b, Km. 2

Town: Martorell Post Code: 08760 Country: Spain

Name of Authorised Representative:

Address:

Town: Post Code: Country:

Name of Notified Body for exhaust emission assessment: EUROCONTROL

Address: Santa Engracia, 56

Town: Madrid Post Code: 28010 Country: Spain

ID Number: 0057

Conformity assessment module used for exhaust emissions: ☑ B+C/C1 ☐ B+D ☐ B+E ☐ B+F ☐ G ☐ H

or engine type-approved according to: ☐ Directive 97/68/EC ☐ EC Regulation No 595/2009

Other Community Directives applied:

DESCRIPTION OF PROPULSION ENGINE TYPE(S)

Main Propulsion ExhaustType:

- ☐ With integral exhaust
- ☑ Without integral exhaust

Combustion Type:

- ☑ Internal combustion, Diesel (CI)
- ☐ Internal combustion, Petrol (SI)
- ☐ Other

Combustion cycle:

- ☐ 2 stroke
- ☑ 4 stroke

IDENTIFICATION OF ENGINE(S) COVERED BY THIS DECLARATION OF CONFORMITY

Name of engine model or engine family:	Unique engine identification number(s) or engine family code(s)	EC Type–examination certificate or type-approval certificate number
MINI-17		16-09-RCD-SSA-G00255/C-1
MINI-29		16-09-RCD-SSA-G00259/C-Rev. 2
MINI-33		16-09-RCD-SSA-G00261/C-Rev. 2
MINI-44		16-09-RCD-SSA-G00263/C-Rev. 2

This declaration of conformity is issued under the sole responsibility of the manufacturer. I declare on behalf of the manufacturer that the recreational craft propulsion engine(s) mentioned above fulfil(s) the requirements specified in Article 4 (1) and Annex I of Directive 2013/53/EU.

Name / function: **Sr. Enrique Solé Matas**

(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative) of the engine manufacturer or his authorised representative)

Signature and title: Chief Executive Officer

(or an equivalent marking)

Date and place of issue: (dd/mm/yyyy), 17/01/2022

ISO 9001 BUREAU VERITAS Certification

SOLÉ, S.A.
CIF ES-A08191223
C-243b, km. 2, P.O. BOX 15
08760 - Martorell (Barcelona)
SPAIN

Essential requirements reference to relevant articles in Annex IB & IC of the Directive)	Harmonised standards Full Application	Harmonised standards Partial application, see tech. File	Other reference documents 1 Full Application	Other reference documents Partial Application , see tech. File	Other proof of conformity See technical. File	Specify the harmonised 2 standards or other reference documents used (with year of publication like "EN ISO 8666:2002")
	Tick only one box per line					All lines right of ticked boxes must be filled in
Annex I.A - Design and Construction of Products						
Design and Construction of Products (Annex I A.)	☐	☐	☐	☑	☐	Chapter 1.1 (Owner's Manual)
Annex I.B – Exhaust Emissions						
Propulsion Engine Identification (Annex I B.1)	☐	☐	☐	☑	☐	Chapter 1
Exhaust Emission Requirements (Annex I B. 2)	☑	☐	☐	☐	☐	EN ISO 8178-1:1996
Durability (Annex I B.3)	☐	☐	☐	☑	☐	Chapter 7.1 (Owner's Manual)
Owner's manual (Annex I B.4)	☐	☐	☑	☐	☐	
Annex I.C – Noise Emissions	See Declaration of Conformity of the recreational craft in which the engine(s) has (have) been installed					

1. Annex I.C – Noise Emissions

2.Standards published in EU Official Journal

ISO 9001
BUREAU VERITAS
Certification

SOLÉ, S.A.
CIF ES-A08191223
C-243b, km. 2, P.O. BOX 15
08760 - Martorell (Barcelona)
SPAIN

www.solediesel.com

Marine engines - Gensets - Accesories

Declaration of Conformity for Recreational Craft Propulsion Engines (inboard engines and stern drive engines without integral exhaust) with the requirements of Directive 2013/53/EU

Name of engine manufacturer: SOLÉ, S.A.

Address: Ctra. C-243b, Km. 2

Town: Martorell Post Code: 08760 Country: Spain

Name of Authorised Representative:

Address:

Town: Post Code: Country:

Name of Notified Body for exhaust emission assessment: THE VEHICLE CERTIFICATION AGENCY

Address: 1 The Eastgate Office Centre

Town: Bristol Post Code: BS5 6XX Country: United Kindom

ID Number: 1580

Conformity assessment module used for exhaust emissions: ☑ B+C/C1 ☐ B+D ☐ B+E ☐ B+F ☐ G ☐ H

or engine type-approved according to: ☐ Directive 97/68/EC ☐ EC Regulation No 595/2009

Other Community Directives applied:

DESCRIPTION OF PROPULSION ENGINE TYPE(S)

Main Propulsion ExhaustType:

- ☐ With integral exhaust
- ☑ Without integral exhaust

Combustion Type:

- ☑ Internal combustion, Diesel (CI)
- ☐ Internal combustion, Petrol (SI)
- ☐ Other

Combustion cycle:

- ☐ 2 stroke
- ☑ 4 stroke

IDENTIFICATION OF ENGINE(S) COVERED BY THIS DECLARATION OF CONFORMITY

Name of engine model or engine family:	Unique engine identification number(s) or engine family code(s)	EC Type–examination certificate or type-approval certificate number
MINI-55 (S4L2-T)		e11*97/68KA*2004/26*0142*02

This declaration of conformity is issued under the sole responsibility of the manufacturer. I declare on behalf of the manufacturer that the recreational craft propulsion engine(s) mentioned above fulfil(s) the requirements specified in Article 4 (1) and Annex I of Directive 2013/53/EU.

Name / function: **Sr. Enrique Solé Matas**

(identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative) of the engine manufacturer or his authorised representative)

Signature and title: Chief Executive Officer

(or an equivalent marking)

Date and place of issue: (dd/mm/yyyy), 08/05/2019

ISO 9001 BUREAU VERITAS Certification
N° ES065498-1

SOLÉ, S.A.
CIF ES-A08191223
C-243b, km. 2, P.O. BOX 15
08760 - Martorell (Barcelona)
SPAIN

Essential requirements reference to relevant articles in Annex IB & IC of the Directive)	Harmonised standards Full Application	Harmonised standards Partial application, see tech. File	Other reference documents 1 Full Application	Other reference documents Partial Application , see tech. File	Other proof of conformity See technical. File	Specify the harmonised 2 standards or other reference documents used (with year of publication like "EN ISO 8666:2002")
	Tick only one box per line					All lines right of ticked boxes must be filled in
Annex I.A - Design and Construction of Products						
Design and Construction of Products (Annex I A.)	☐	☐	☐	☑	☐	Chapter 1.1 (Owner's Manual)
Annex I.B – Exhaust Emissions						
Propulsion Engine Identification (Annex I B.1)	☐	☐	☐	☑	☐	Chapter 1
Exhaust Emission Requirements (Annex I B. 2)	☑	☐	☐	☐	☐	EN ISO 8178-1:1996
Durability (Annex I B.3)	☐	☐	☐	☑	☐	Chapter 7.1 (Owner's Manual)
Owner's manual (Annex I B.4)	☐	☐	☑	☐	☐	
Annex I.C – Noise Emissions	See Declaration of Conformity of the recreational craft in which the engine(s) has (have) been installed					

1. Annex I.C – Noise Emissions

2.Standards published in EU Official Journal

ISO 9001
BUREAU VERITAS
Certification
Nº ES065498-1

Section 14 - Maintenance log

DATE	HOURS	DESCRIPTION	SERVICE NAME

Maintenance log

DATE	HOURS	DESCRIPTION	SERVICE NAME

MARINE DIESEL ENGINES · GENSETS · PROPELLERS · ACCESSORIES

C-243 b, km 2 · 08760 Martorell (Barcelona)
Tel. +34 93 775 14 00 · Fax +34 93 775 30 13
www.solediesel.com · info@solediesel.com

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BUREAU VERITAS Certification
Nº ES065498-1

U_CTMT1755_EN
Revision 1
07/2022