Canaline Marine Engines

Owners Handbook

Engines Models

Canaline 38
Canaline 42
Canaline 52
Canaline 60
Canaline 70T

Failure to read this or carry out the required service programme may invalidate your warranty.

To register your new Canaline Engine for warranty, please register at www.enginesplus.co.uk/warranty

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Introduction

This Canaline Marine diesel engine is based on the Kioti diesel engine which is manufactured by Daedong Industrial Co Ltd.

Engines Plus Ltd wishes to thank you for purchasing your new Canaline Marine Diesel engine. Your new engine is the result of many years of research and development, and high quality manufacturing. This engine is designed based on strict quality standards applied to and use of Kioti genuine components. Its knowledge on the operation of the diesel engine is based on faithful service and reliability for years. This manual makes users familiar with the diesel engine and provides useful information on safety, operation, and maintenance of the diesel engine.

To get the fullest use and benefit from your marine engine, it is important that you install, operate and maintain it correctly. This manual, along with gearbox operators' handbook, is designed to help you do this.

Please read this manual carefully and follow its operating maintenance recommendations, along with the installation guidelines. This will ensure many years of trouble-free and economical engine operation.

Should you require further advice, technical assistance or an engine service, please contact your nearest marine engine outlet, he knows your engine best and is ready to meet your requirements.

You must complete your on-line warranty registration on the Engines Plus website, to validate your warranty, without doing this it may invalidate any warranty claims.

All information, illustrations, and specifications contained in this Manual are based on the latest product information available at the time of publication.

Engines Plus Ltd is a mariniser of industrial diesel engines, of which the Canaline product is part of our product portfolio. Engines Plus Ltd produces this manual for use on the Canaline marine engine based on the Kioti Diesel engine.

Engines Plus Ltd reserves the right to make changes in this manual at any time without prior notice.

The information given is subject to the company's current conditions of Tender and Sale, is for the assistance of users, and is based upon results obtained from tests carried out at the place of manufacture and in vessels used for development purposes. We do not guarantee the same results will be obtained elsewhere under different conditions.

Engine Identification

NOTE: In all communications with the Engines Plus Ltd or a local dealer the engine serial number and engine type must be quoted.

The engine serial number is on a decal affixed to the top surface of the Rocker Cover, as shown below. The Kioti Engine Number is also stamped on the Engine Block, outboard of the Injection Pump Flange.

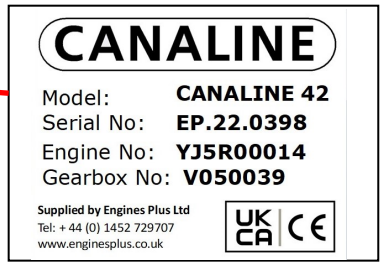
As part of your engine warranty please fill in the warranty registration on the Engines Plus website to validate your warranty.

Engine Information

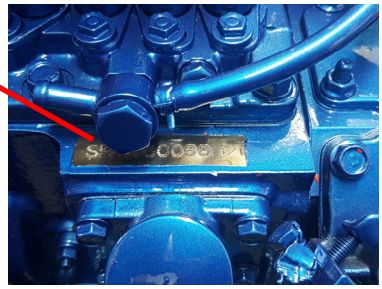
Fill in your engine information below, so you have it to hand when contacting your local dealer.

Engine Type:	
EP Serial No:	
Gearbox Type:	
Gearbox Number:	
Date of Installation:	

Engines Plus Ltd
Engine Serial Number Decal



Kioti Engine Serial Number Stamping



Symbols in the Manual and on Engines

General operational note

Prescription-Indication notices (rectangle); it is obligatory to adopt the protective measures shown in the notices to perform the operation in question in total safety.

Protect hands (Gloves)

Protect eyes (Safety Glasses)

Protect respiratory passages (Mask)

Danger! General Danger situation

Danger Warning-Attention Notices (triangular); General Attention regarding personal safety and protection of the engine

Danger! Electrical Discharges

Danger! Sources of Heat

Danger! Engine Coolant Pressure

The operation indicated in the text *is strictly prohibited*

Prohibition Notices (Circular) indicating potentially hazardous situations.

Danger! From moving Parts ~ do not perform maintenance work.

Engine Coolant Level

Identification Notices (No Border)

Engine Oil Level

Engine Lubricating Oil ~ Fill Point

Lifting Point ~ Engine & Gearbox ONLY

Engine Coolant ~ Fill Point

Read the Manual.

Safety Precautions

Keep the engine, gearbox and surrounding area clean, including the area immediately below the engine.

Drives – Power Take Off Areas 

Gearbox Output Flange

The purpose of the marine diesel propulsion engine is to provide motive power to propel a vessel. Accordingly the gearbox output shaft rotates and its flange is designed to be coupled to a propeller shaft by the installer. Steps must be taken to ensure adequate guarding.

Forward End Drive

Engines are supplied with unguarded vee and poly vee belt drives to power the fresh water pump and battery-charging alternator. The installer must ensure that it is not possible for injury to occur by allowing accessibility to this area of the engine. The drives can cause injury if personnel or clothing come in contact with the moving belts or pulleys, when the engine is running.

Exhaust  *Do not touch Hot Surfaces*

Exhaust Outlet

Diesel marine propulsion engines emit exhaust gases at high temperatures – around 400 - 500°C. Engines are supplied with either wet exhaust outlet (water injection bend) or dry outlet (dry exhaust stub) – see engine price list. At the outlet next to the heat exchange header tank, the exhaust outlet can become very hot and if touched, can injure. This must be lagged or avoided by ensuring adequate guarding. It is the responsibility of the installer to lag the exhaust system if a dry system is used. Exhaust gases are harmful if ingested, the installer must therefore ensure that exhaust lines are routed overboard and that leakage into the vessel does not occur.

Fuel  *Do not ingest liquids*

Fuel Lines

Diesel engines are equipped with high pressure fuel injection pumps, if leakage should occur, or pipes fracture, fuel at high pressure can be harmful. Skin must be thoroughly cleaned in the event of contact with diesel fuel.

Fuel Supply Connections

Engines are supplied with 8mm fittings. The installer must ensure that when connections are made, they are clean and free of leaks.

Oil  *Do not ingest liquids*

The Canaline marine propulsion package is supplied with 2 dipsticks, one for the engine and one for the gearbox. Ensure dipsticks are returned and secure after checking. If not, oil leaks can cause infection when touched. Do not remove dipsticks whilst engine is running, as this can cause oil to blow out. All oil must be removed from the skin to prevent infection.

Scalding  *Do not remove Pressure Cap when Hot*

An engine running under load will have a closed circuit fresh water temperature of 71° to 85°C. The pressure cap on the top of the header tank must not be removed when the engine is running. It should only be removed when the engine is stopped and has cooled down.

Transportation/Lifting 

Engines are supplied on transportable pallets. Lifting eyes on engines are used for lifting engine and gearbox assembly only, not the pallet and associated kit.

GENERAL DECLARATION

This machinery is not intended to be put into service until it has been incorporated into or with other machinery. It is the responsibility of the purchaser/installer/owner, to ensure that the machinery is properly guarded and that all necessary health and safety requirements, in accordance with the laws of the relevant country, are met before it is put into service.

Note: Recreational Craft

Where applicable, the purchaser/installer/owner and operator must be responsible for making sure that Directive 2013/53/EU is complied with.

Canal Boat Engines – Technical Data

Model		Canaline 38	Canaline 42	Canaline 52	Canaline 60	Canaline 70T
Cylinders		4	4	4	4	4
Bore	mm	87.0	87.0	87.0	87.0	87.0
Stroke	mm	92.4	92.4	92.4	102.4	102.4
Displacement	cc	2179	2179	2179	2430	2430
Combustion		Indirect Injection				
Cooling		Keel Cooled				
Power Output	Bhp	38	42	52	57	65
ISO 8665 Rated Power @ Speed	kW	29.2	30.4	33.7	36.4	44.0
	r/min	2600	2600	2600	2600	2600
Max Torque	Nm	133	133	145	158	192
	r/min	1600	1600	1600	1600	1800
Oil Capacity	litres	8.0	8.0	8.0	9.7	9.7
Weight	kg	235	237	248	256	256
Engine Coolant Capacity	Litres	7.5	7.5	7.5	8.3	7.3
Alternator	Amps	75 & 100	75 & 175	75 & 175	75 & 175	75 & 175
Starter Motor	kW	1.7				
Air Intake restriction	kPa	2.45 max				
Exhaust Back Pressure	kPA	10.0 max				
Ventilation required	M3/min	2.25	2.25	2.65	3.07	3.15
Gearbox		PRM 125	PRM 150	PRM 150	PRM 150	PRM 150*
Starter Battery size		Minimum recommended size - 700 CCA / 100 Ah				

Note: The specification details above are for standard configurations.
BHP* ~ to EN ISO8665
*The PRM 150 on the Canaline 70T can only be used for pleasure boat applications

Starting and Stopping

Important checks prior to use 

Your engine has been filled with new oil for both engine and gearbox when it leaves the factory. However, please check, see the section on engine maintenance.

Ensure the engine is free to turn without obstructions, and daily checks have been carried out.

Ensure battery is fully charged and connected (the isolator is in the 'ON' position).

Ensure Morse speed and gearbox cables are fitted correctly and that cable travel lengths are correct.

Ensure fuel taps from fuel tank have been turned on

CAUTION: for safety's sake conduct checks above, with engine stopped, before starting.

Engine starting

Check the engine and gearbox oil levels are correct ~ see relevant section in this manual for further information.

- Set the engine throttle to 1/3, out of gear.
- Turn the Key to the "1" Position.

The panel will go through a procedure to ensure all lights and the buzzer are working, once this has been completed you can then start the engine.

- Turn the Key to Pre-Heat, and hold ***until the Yellow light goes out***.
- Turn the Key to the Start/Crank position and release when the engine fires.

Ensure alarm buzzer is not sounding and red warning lights are off.

Note:

If the alternator warning light is still on then increase the engine speed to excite the alternator, then return to idle. The light should then go out.

Make sure the engine is running smoothly, with no smoke and sounds normal.

Repeated engagement of the starter to the flywheel ring gear without a break will result in damage to the starter pinion gear and flywheel ring gear. It will also cause excessive build-up of heat in the Starter Motor Windings.

It may also cause the Engine Stop Solenoid to burn out due to heat build-up.

Crank for no longer than 20 seconds, with at least a 20 second break between attempts.

The oil pressure gauge on the deluxe engine control panel may read high on start-up and whilst the engine is cold. This is normal, and it will then decrease to the running level.

STOPPING

Every propulsion engine is fitted with a stop solenoid. To stop engine simply turn the key to the "0" position and the engine will stop.

When leaving the boat for an extended period, turn off battery isolator.

Canaline Engine Control Panels

Canaline Engine control panels feature LED Module to indicate as listed below. An Intermediate Panel is shown for illustration only.

1. Yellow ~ Timed Preheat LED
   Illuminates when Key is switched to preheat position to indicate Preheat time.
2. Red & Buzzer ~ Engine Coolant Temperature
   LED Illuminates and Buzzer sounds if Engine Temperature is too high.
3. Red & Buzzer ~ Starter Alternator
   LED Illuminates and Buzzer sounds if no charge from Alternator or Belt breaks.
4. Green ~ Panel Power
   LED illuminates when Key is switched on.
5. Red & Buzzer ~ Engine Oil Pressure
   LED Illuminates and Buzzer sounds if Oil Pressure is too low.
6. Red & Buzzer ~ Auxiliary / Domestic Alternator
   LED Illuminates and Buzzer sounds if there is no charge from Alternator or Belt breaks.

The Blue button changes between Engine running hours, engine start battery voltage, trip hours and time.

Engine running hours - This displays Total Running Hours. Hours are logged providing the Tachometer is reading more than 400 r/min. Should the Tachometer have condensation inside, then the LED Display may disappear. Running Hours will continue to be logged. Once dried out the Display will return.
Trip Hours - This is equivalent to a Mileage Trip in a vehicle and logs the Running Hours since the engine was last started. This will be lost when the Key is switched off.
Time - The display can be set to show Time, but this is not used as the time is lost once the key switch is off
Engine start battery voltage - This displays Voltage at the Starter Battery.

Checks during operation

While operating the engine, keep checking whether all parts of the engine are operating smoothly and correctly.

COOLING SYSTEM  *Do not remove Pressure Cap when Hot*

If steam or coolant is escaping from the overflow tube; stop the engine, allow it to cool, and check the following and correct as needed.

1. Check for cooling system leaks.
2. Check for obstructions that block cooling air.
3. Check and adjust the fan belt tension.
4. Ensure that the system is filled to the correct coolant level with the proper mix of Coolant Concentrate (anti-freeze) and water.
5. Check the radiator cap for proper type and condition.

IMPORTANT

To avoid personal injury:
DO NOT remove the Manicooler cap while the engine is hot.
Pressurized steam or coolant will escape and cause serious injury to you and any bystanders.
Open the cap at least 10 minutes after the engine is stopped.

OIL PRESSURE LED

The oil pressure LED comes on when the oil pressure drops below a safe level. If the lamp comes on while the engine is operated at or above 850 rpm, immediately stop the engine and check the engine oil level.

FUEL

The fuel tank should never be allowed to become completely empty. An empty tank will allow air into the fuel system; and the engine will not operate without bleeding the fuel system.

EXHAUST SMOKE

The engine exhaust should be colorless during normal operation within the rated output of the engine. Continuous dark emissions or smoke may indicate improper usage or an engine malfunction.

STOP THE ENGINE IMMEDIATELY:

1. If the engine speed suddenly changes.
2. If there is an unusual noise.
3. If the engine exhausts suddenly darkens.
4. If the oil pressure, temperature light or alternator comes on.

Fuel and Oil Specifications

Fuel

Important

- Do not use Kerosene, which is very low in cetane rating and lubricity, and may adversely affect the engine.
- Be careful not to let the fuel tank become empty, or air can enter the fuel system, necessitating bleeding before next engine start.

Fuel selection

The following criteria is required for the diesel fuel…

1. Must be free from minute dust particles.
2. Must have adequate viscosity.
3. Must have high cetane value.
4. Must have high fluidity at low temperature.
5. Must have low sulphur content.
6. Must have little residual carbon.

Diesel fuels

Applicable standard	Recommendation
JIS (Japanese Industrial Standard)	NO. 2
DIN (Deutsches Institut für Normung)	DIN 51601
SAE (Society of Automotive Engineers)	NO.2-D
Based on SAE-J-313C	BS
BS (British Standard)	EN590:2013+A1: 2017

If fuel other than specified is used, engine functions will be lowered.

Fuel Requirements

NOTICE: The fuel injection pump, injector or other parts of the fuel system and engine can be damaged if you use any fuel or fuel additive other than those specifically recommended by Canaline / Kioti. Such damage is not the responsibility of Canaline / Kioti and is not covered by their Warranty.

To help avoid fuel system or engine damage, please read the following:

- Some service stations mix used engine oil with diesel fuel. Some manufacturers of large diesel engines allow this; however for your diesel engine, do not use diesel fuel, which has been contaminated with engine oil.
- Do not use any fuel additive (other than as recommended under "Biocide" in this section). At the time this manual was printed, no other fuel additive was recommended. (See your authorisation dealer to find out if this has changed).

Fuel system air bleeding 

The entry of air into the fuel system will cause difficult engine starting or engine malfunction. When servicing such as emptying the fuel tank, draining the Water Sedimenter, and the fuel filter element change, be sure to bleed air.

Air Bleeding Procedure:

1. Please refer to the Changing the Fuel Filter section.
2. Start the engine and thoroughly check the fuel system for leaks.

CAUTION: the water/diesel fuel mixture is flammable and could be hot. To help avoid personal injury and/or property damage to not touch the fuel coming from the drain valve and do not expose the fuel to open flames or sparks. Be sure you do not overfill the container. Heat (such as from the engine) can cause the fuel to expand. If the container is too full, fuel could be forced out of the container. This could lead to a fire and the risk of personal injury and/or vehicle or equipment damage.

Biocides

In warm or humid weather, fungus and/or bacteria may form in diesel fuel if there is water in the fuel.

NOTICE: fungus or bacteria can cause fuel systems damage by plugging the fuel lines, fuel filters or injector. They can also cause fuel system corrosion.

If fungus or bacteria has caused problems, you should have your authorised dealer correct these problems. Then, use a diesel fuel biocide to sterilise the fuel system (follow the biocide manufacturer's instructions). Biocides are available from your dealer, service stations, parts stores and other automotive places. See your authorised dealer for advice on using biocides in your area and for recommendations on which biocides you should use.

Smoke suppressants

Because of extensive testing of treated fuel versus untreated fuel, the use of a smoke suppressant additive is not recommended. This may enhance the possibility of stuck rings and valve failure, resulting from extensive ash deposits.

Fuels used should contain no more than 7% Biodiesel. Exceeding this amount will invalidate Warranty and may affect compliance with Emission Approval.

Lubricant

The quality of engine oil may affect engine performance, start-ability and engine life. The use of unsuitable oil may result in piston ring stick, piston and cylinder seizure, and accelerate sliding surface wear causing increased oil consumption, lowered output and possible engine failure.
To avoid this, use the specified engine oil.

Engine Oil Selection

Engines Plus Ltd recommends oil to the following specifications…
API CC or CD specification is used in Canaline 38, 42, 52 & 60 Marine engines.
API CH is used in Canaline 70T Marine engines.

Either 10W/40, 10W/30 or 15w/40 is acceptable for temperate climates.

Do NOT use Synthetic or Semi-Synthetic Oils in Canaline Marine engines.

The correct grade oil is available from your local marine dealer.

- 5 litres API CC 15W/40 – EPL Part No - EP710008 - CL38~60
- 20 litres API CC 15W/40 – EPL Part No - EP710562 – CL38~60

- 5 litres API CH-4 15W/40 – EPL Part No - EP710560 – CL70T **ONLY**
- 20 litres API CH-4 15W/40 – EPL Part No - EP710561 – CL70T **ONLY**

Gearbox Oil Selection

PRM recommends oil to the following specification

- PRM 125, Mechanical Gearbox – ATF Dextron II or III
- PRM 150/PRM 280, Hydraulic Gearbox – API CC 10W/40

Coolant

Two main types of Coolant Concentrate (Anti-freeze) are available, and either may be used…

1. Blue ~ standard Coolant Concentrate, which has a typical service life of 12months.

2. Red/Orange ~ Long Life Coolant Concentrate which has a typical service life of 2~3 years.

Both types should be mixed with clean water, up to a maximum concentration of 50%. Refer to the product container or specification sheet for frost protection vs concentration, and recommended service life.

Maintenance

Schedule

Daily or every 8 hours running.

- Check engine oil level.
- Check gearbox oil level, see gearbox manual.
- Check coolant level.
- Check drive belt tension, adjust if necessary.
- Check colour of exhaust fumes and unusual engine noise on start up.

After first 50 hours.

- Change gearbox lubricant (see separate gearbox manual).
- Change engine lubricating oil, oil filter and fuel filter.
- Check fuel contamination and drain off water trap/Agglomerator if fitted.
- Check Air Filter Element for contamination and change if necessary.
- Check all water pipes are not chaffing and for any leaks and adjust if necessary.
- Check all fuel pipes are not chaffing and for any leaks and adjust if necessary.
- Check exhaust system for any leaks, etc, and adjust if necessary.
- Check wiring looms and cables are not chaffing and adjust if necessary.
- Check coupling alignment and ensure all bolts are tight.
- Check bolts/nuts on the anti-vibration mounts are tight and secure.
- Check control cables installation to ensure gearbox is correctly being engaged and adjust if necessary.

Every 250 hours or every year.

- All checks as 50 hours and the following -
- Change engine oil and oil filter.
- Change gearbox oil.
- Change Air filter, Fuel Filter and Pre-fuel filter, if you are carrying out a once-a-year service.

Every 500 hours.

- All checks as 50 and the following –
- Change engine oil and oil filter.
- Change air cleaner element.
- Change fuel filter and pre-fuel filter.
- Change anti-freeze.
- Change gearbox oil.
- Check electrical equipment, condition of hoses and belts, replace as necessary.

Annually

The front crankshaft pulley to ensure its security, where retained by a nut. Remove the retaining nut and crank pulley, clean the nut and crankshaft threads, re-fit securing nut with Bondloc B638 on the threads. Torque back to 137.3~156.9Nm.

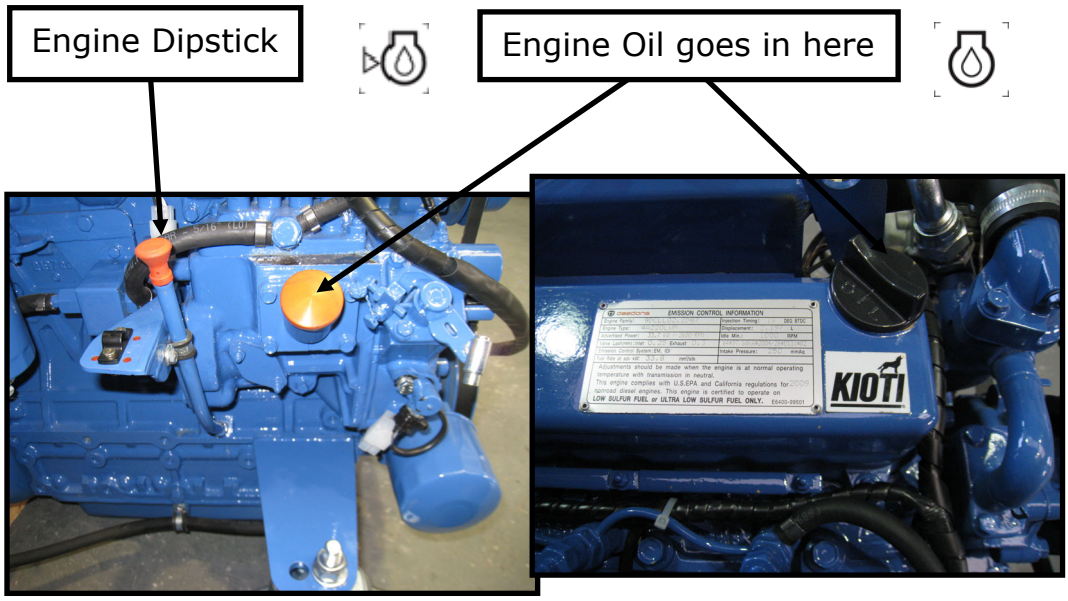
First Service

A new marine engine will require an engine service and check over ***at 50 hours***.
The LCD display in the tachometer shows the engine running hours. It is very important that this is carried out, as this includes many checks to ensure the engine has settled down correctly. **All services are chargeable and is the owner's responsibility to organise, failure to do so may invalidate warranty.**

Checking engine oil level  *Do not ingest liquids*

For quantities of oil please refer to page 9. When checking the engine oil level, do so before starting or more than five minutes after stopping.

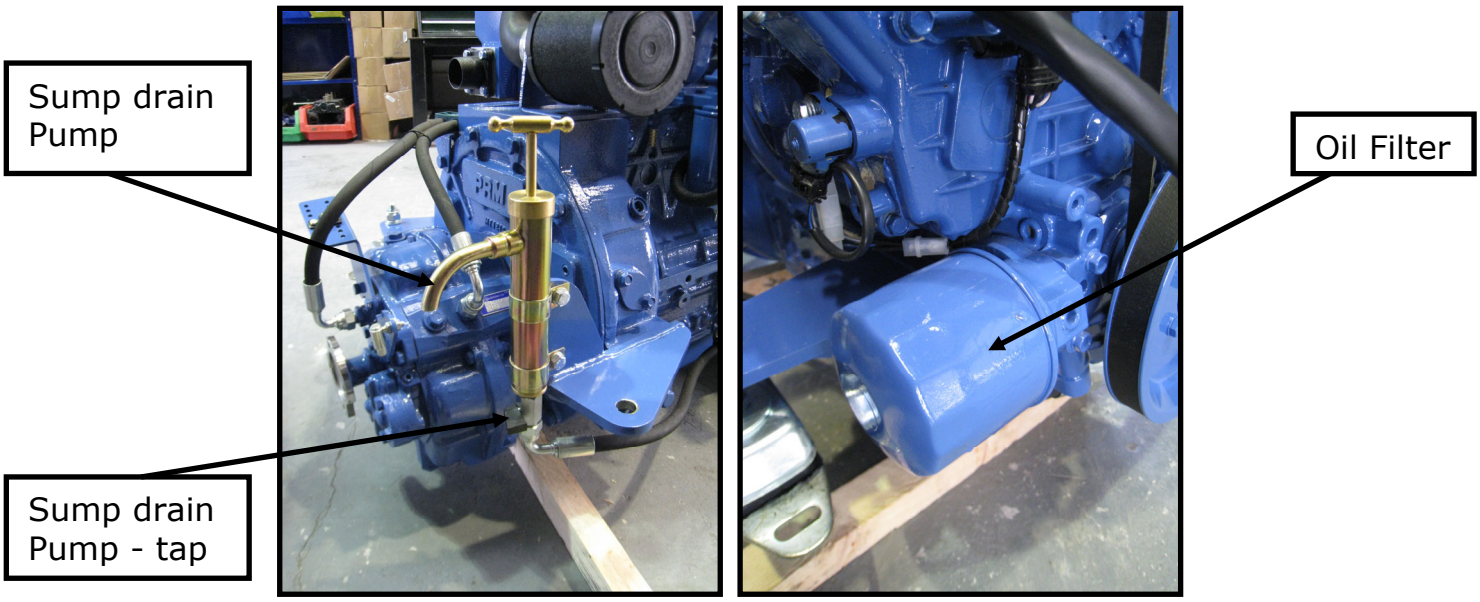
1. To check the oil level, draw out the dipstick, wipe clean, re-insert it and draw it out again. Check to see that the oil level lies between the two major marks on the dipstick.
2. If the level is too low add new oil via the oil filler port, to the specified level – do not overfill.



Important
When using oil of different make or viscosity from the previous one, drain old oil. Never mix two different types of oil. Engine oil and filter should be changed after the first 50 hours running time and then every 250 hours or every year. Oil filter is a cartridge type mounted on the side of the engine.

Changing Engine Oil  *Do not ingest liquids*

1. Run the engine for 10 minutes to warm up the oil.
2. Your engine is provided with a sump drain pump. Turn the tap to "on". Use the hand pump as shown to pump out the oil into a bucket. Turn the tap to off position and replace end cap.
3. Unscrew the oil filter and replace with a new one, E6201-32443. See diagram below



Note: it is best to wrap a plastic bag around the filter, to catch any oil left in the system. (Always keep your bilges clean!) Before screwing in the new filter spread a thin film of oil round the rubber gasket to ensure a good seal and screw in – hand tight.

4. Fill the engine with new oil, refer to page 13 for specification, as described above.

Note: once you have re-filled the engine will oil, run the engine for about 5 minutes, so the oil can be pumped around the engine and into the new filter. Stop the engine, and let it settle for about 10 minutes, and re-check the oil level, fill if required.

Changing the fuel filter

1. The fuel filter is a spin-on Cartridge.
   Remove by turning anti-clockwise when viewed from below, see picture….
2. Replace the fuel filter cartridge
3. Remove metal bung and O Ring from the old fuel filter and fit to new fuel filter, E4682-43172 (see below)
4. Apply fuel oil thinly over the filter gasket and
5. tighten into position – hand tight
6. Prime fuel system…
   Place a rag or receptacle under the Fuel Filter
   Slacken the Bleed Screw
   Pump the Fuel Primer until air free fuel comes from the Bleed Screw, then tighten the Bleed Screw
   Continue to pump until a reasonable effort is required.
7. Check for leaks

Note: Do not get fuel on the flexible engine mounts

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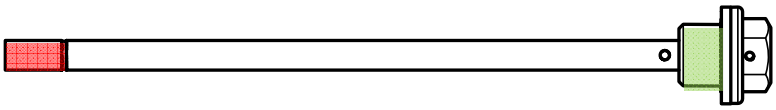
Checking Gearbox Oil Level – please refer to gearbox manual, but on the **PRM 125D** mechanical gearboxes, please ensure the following



Ensure the oil mark is below the marker on the dipstick (shaded).

Ensure thread (shaded) is fully screwed down into case with its relevant bonded seal when measuring the oil level.

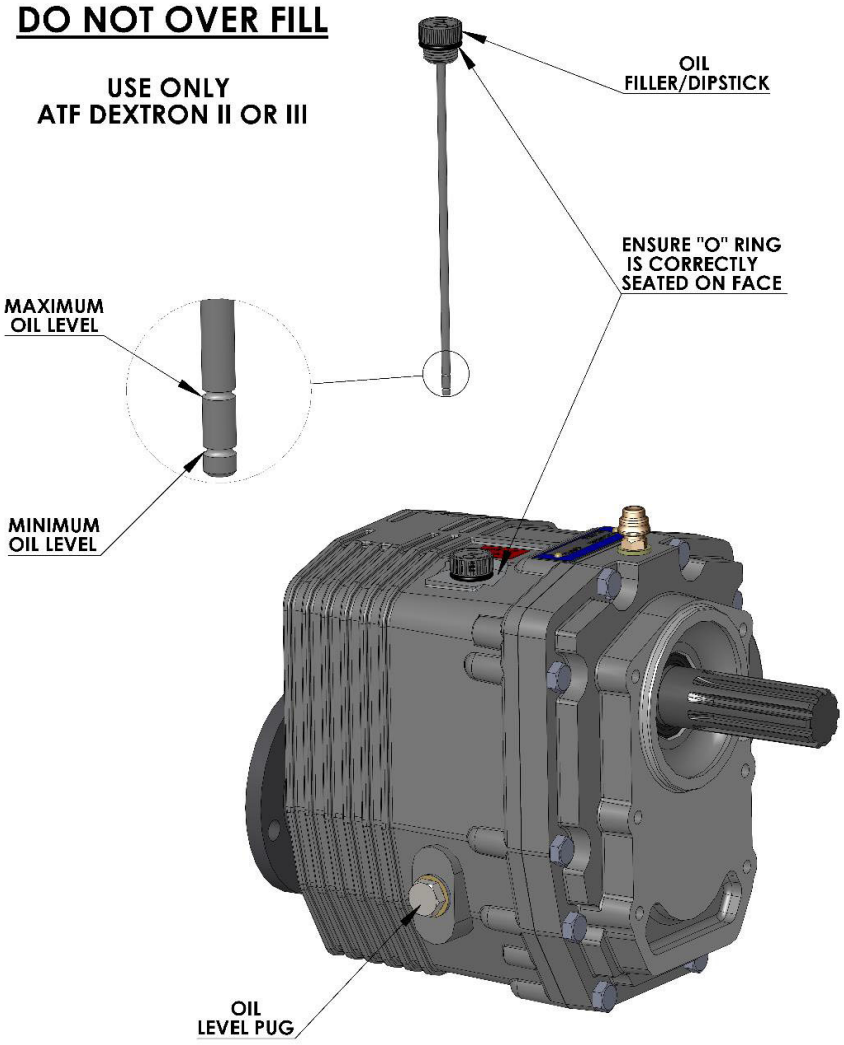
Never exceed the maximum oil level on the dipstick!

Always use ATF Dextron II or III for your gearbox

PRM125D

The PRM125D Gearbox is fitted with a Level Plug, as shown below. This should be used when re-filling the gearbox with oil after draining, to allow an easy and quick reference.

NOTE: When checking the oil level, ensure the Gearbox is in neutral, start and run the engine for a short time to circulate oil. Stop the engine and allow the oil to settle for 2 minutes. Check the oil level with the Dipstick.
NOTE: The Dipstick should be secured firmly when checking the oil level.



Freshwater Cooling System

New engines are supplied with the freshwater drained off.
The following instructions must be followed to fill the system.

(a) Mix up in a clean bucket a solution of 50% anti-freeze/water mix.
(b) Fill engine with the freshwater/anti-freeze solution through the top of the header tank with the filler/pressure cap removed.
(c) Fill the header tank to the top of the filler neck and replace cap. Press down firmly on filler cap and hand tighten in a clockwise direction.

Note: for keeled cooled engines a larger volume of freshwater/anti-freeze mix is required depending on the size of the keel cooling tank – refer to the builder.

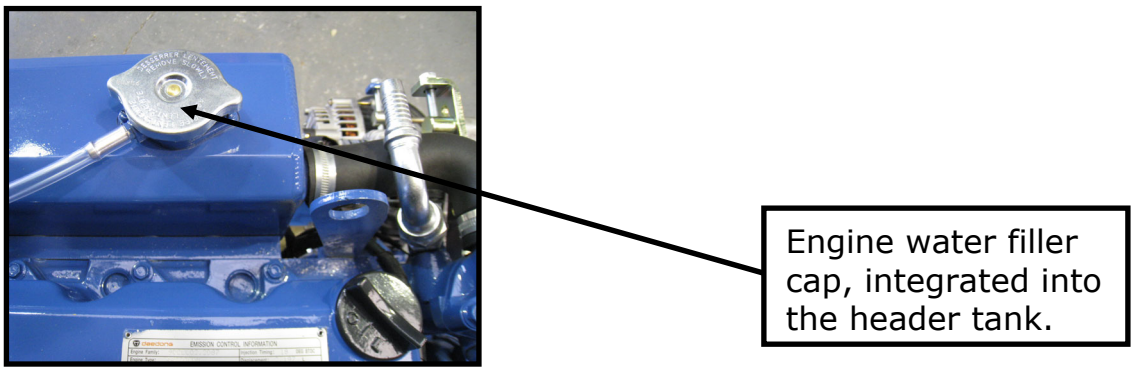
(d) Run the engine for 5 minutes on no load (out of gear) and then check the coolant level. Top up if necessary.
(e) Check the complete system for leaks, including the Calorifier circuit if fitted.

Note: for keel cooled engines it is very important to bleed all the air out of the system before the engine is run on load (check the boat builders' instructions).

(f) If a Calorifier is fitted care must be taken to see that this is also full of coolant and all air is expelled. (see Calorifier notes in installation section)
(g) Run the engine on one third speed for 15 minutes, preferably with the boat tied up. As the system warms up coolant may be expelled from the overflow pipe into the bilge. Stop the engine and allow the engine to cool down before removing the pressure cap and top up the coolant to 25mm below the filler neck.

Important
Removal of the pressure cap from a hot engine, can cause severe injury from hot coolant under pressure. Always allow the engine to cool and then use a large cloth when turning the cap anti-clockwise to the stop. This allows the pressure to be released. Press firmly down on the cap and continue to turn anticlockwise to release the cap.

(h) Repeat (g) if coolant level is more than 25mm below the base of the filler neck when the engine has cooled down.
(i) Run engine on $^{2}/_{3}$ speed for 20 minutes, check for leaks and repeat (g)
(j) Anti-freeze solutions should be drained off every 400 hours or 2 years whichever is sooner, and replaced with a new solution, dependant on the type of Antifreeze used.

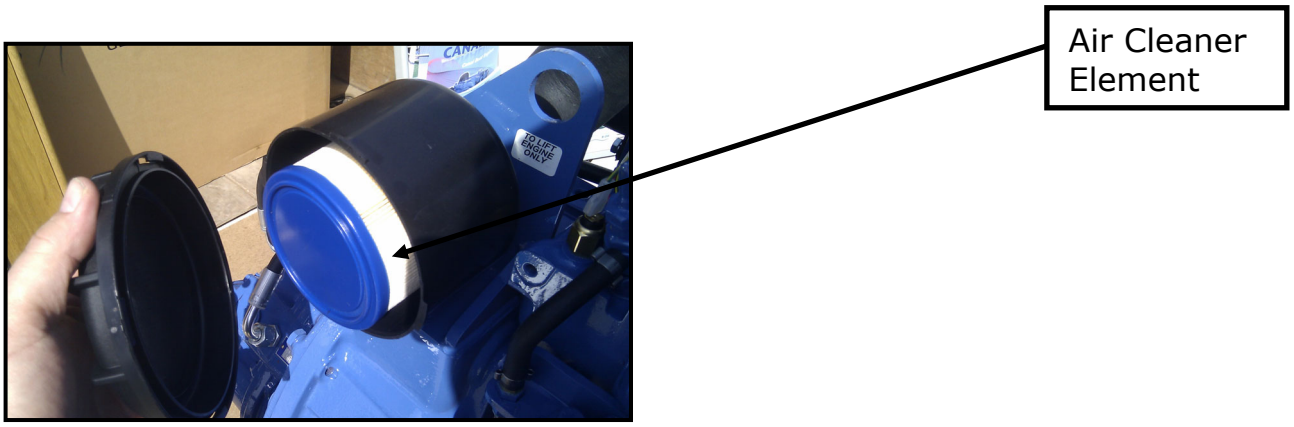


Changing the Air filter

The Air filter should be changed every 500 hours, once per year or sooner if necessary.

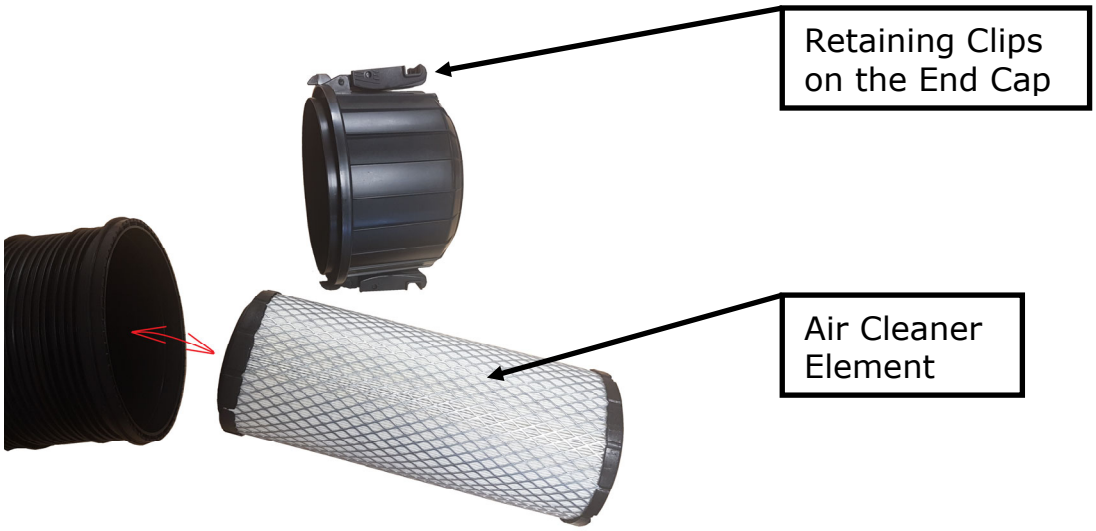
The air cleaner fitted to the Canaline 38~60 marine engines, has a replaceable element, part no EP110529.

1. Remove Air cleaner lid, by unscrewing anti-clockwise.
2. Remove the old element.
3. Wipe the inside of the Air Cleaner Body clean.
4. Replace a new element.
5. Re-locate lid, and turn clockwise until it clicks.



The air cleaner fitted to the Canaline 70T marine engine, has a replaceable element, part no EP110550.

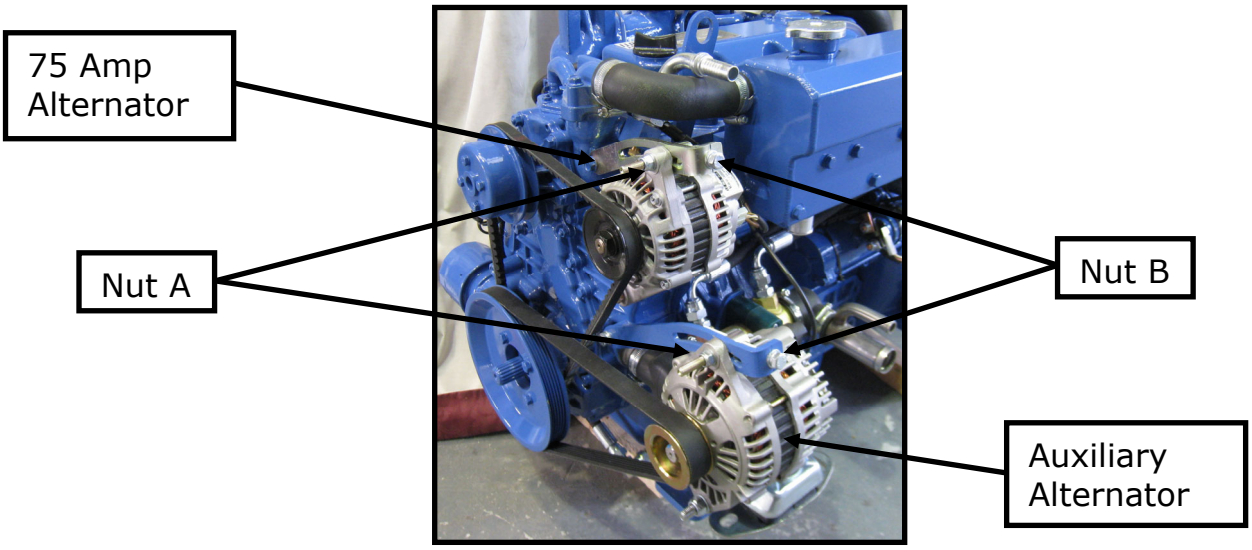
1. Remove Air cleaner lid, by unclipping the 2 retaining clips.
2. Remove the old element.
3. Wipe the inside of the Air Cleaner Body clean.
4. Replace a new element.
5. Re-locate lid, and secure with the 2 clips, ensuring the dust valve is facing downwards.



Alternator Drive Belts 

It is important to check both alternator drive belts to ensure both engine performance and that batteries are charged

The 75 Amp alternator drive belt also drives the engine water pump.



To tighten both belts, please follow these instructions

1. Loosen nuts A
2. Use bolt B to tighten belt
3. Adjust accordingly
4. Retighten nut A after finish

Note: Low belt tension can result in engine overheating and insufficient battery charging. A belt that is too tight may cause bearing failure and belt life may be shortened

Note: 75 Amp Alternator fitted to the Canaline 38 engines are not fitted with a jacking bolt style tensioner link.

Engine Wiring Diagram Index

Engine Type	Drawing Number
Canaline 38 / 42 / 52 / 60 / 70T	
Engine Wiring Loom	WD910731
Intermediate Engine Control Panel	WD910506.1
Deluxe Engine Control Panel	WD910507.1
Hirefleet Engine Control Panel	WD910559.2

Starter Battery…..

For all Canaline Engines in this manual we would recommend a minimum Starter Battery capacity of 700CCA / 100Ah

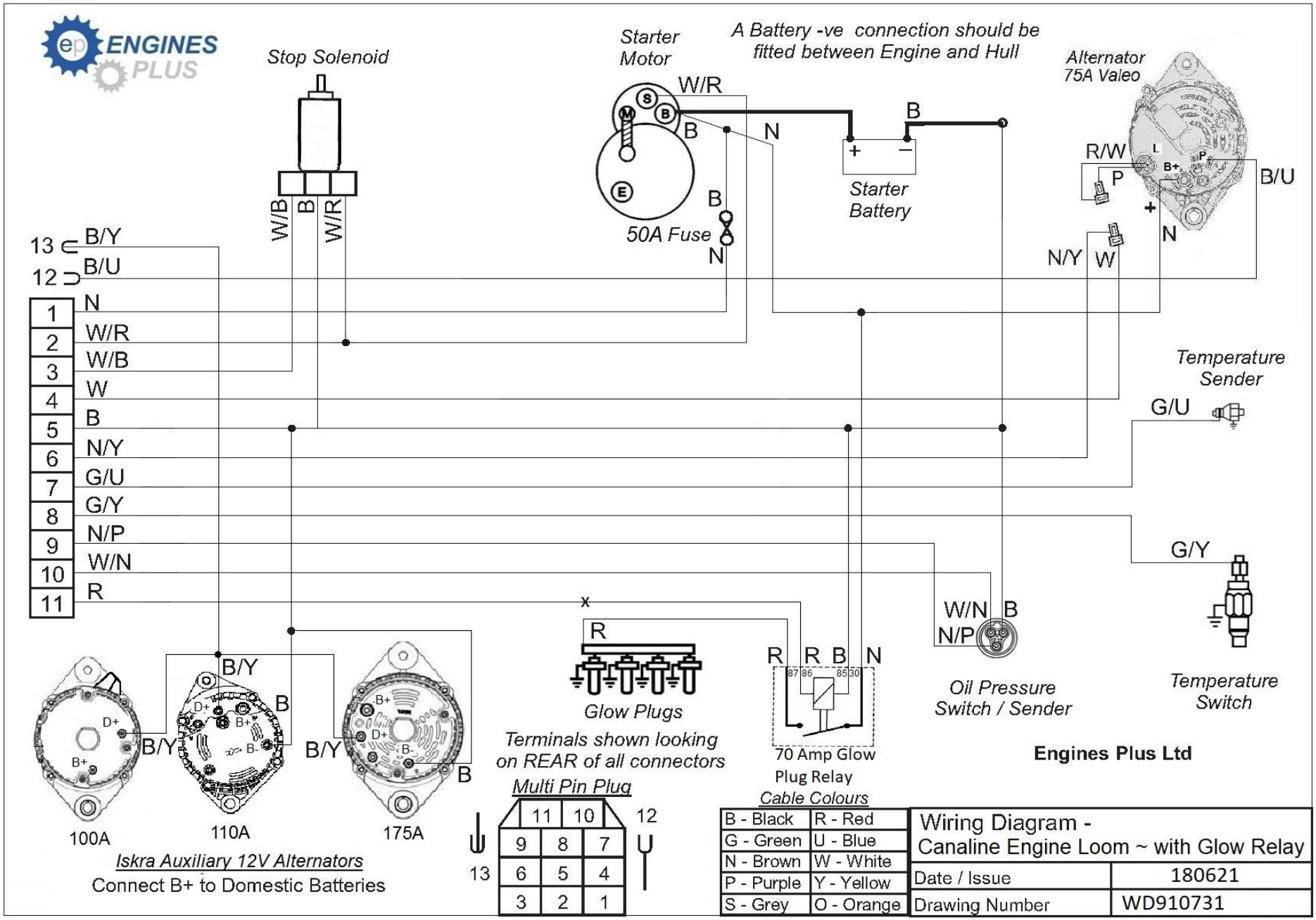
Starter Battery Cable Sizes…

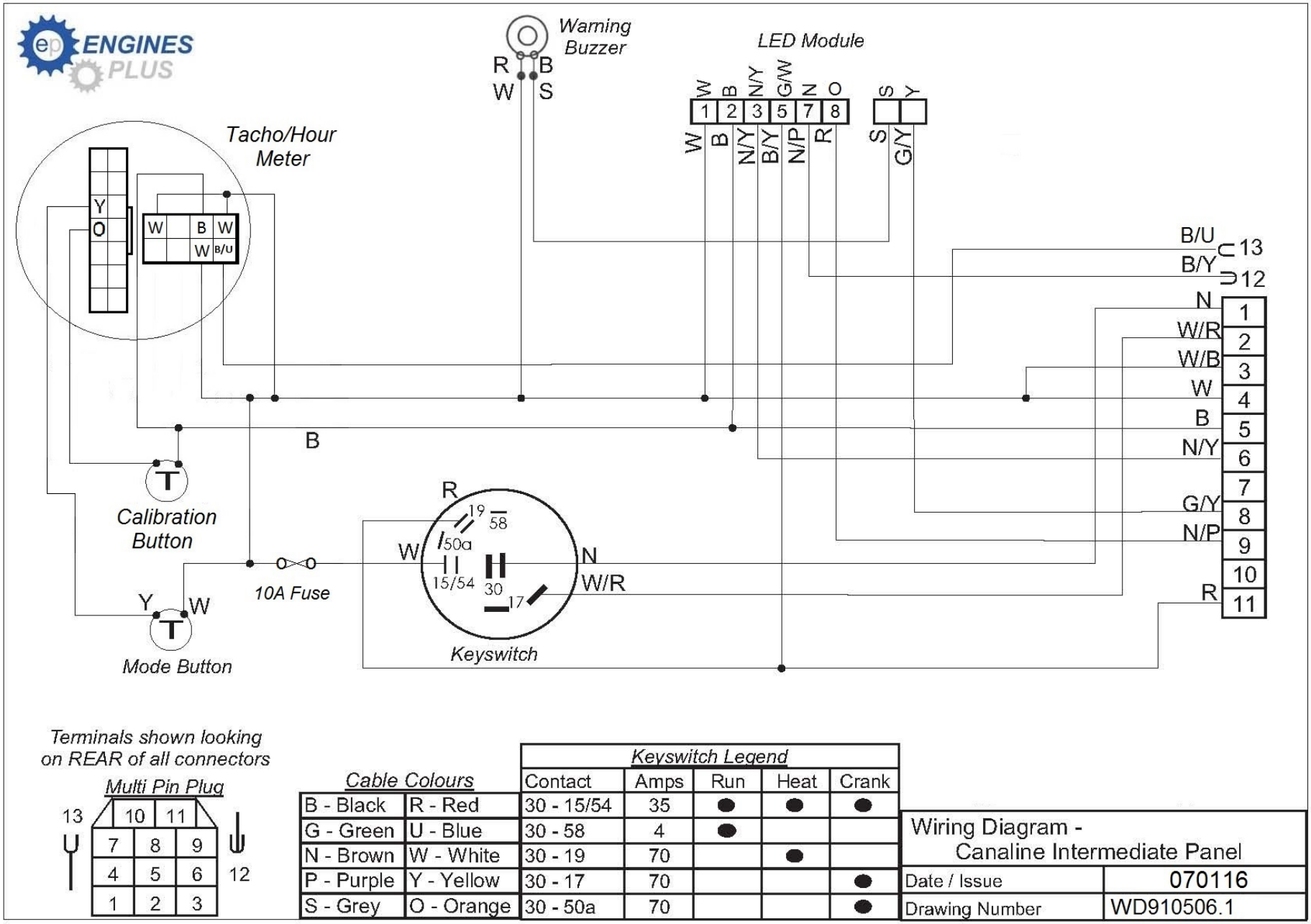
The Starter Battery, should be positioned as close to the engine as is feasible, and safe.

For all Canaline engines, where the TOTAL cable run, ie from Battery to the engine and back does not exceed …

2.5m, use 25mm^2 cable.
3.5m, use 35mm^2 cable.
7.5m, use 70mm^2 cable.

Battery Cables which are too small will create excessive voltage drop and may overheat and catch fire.

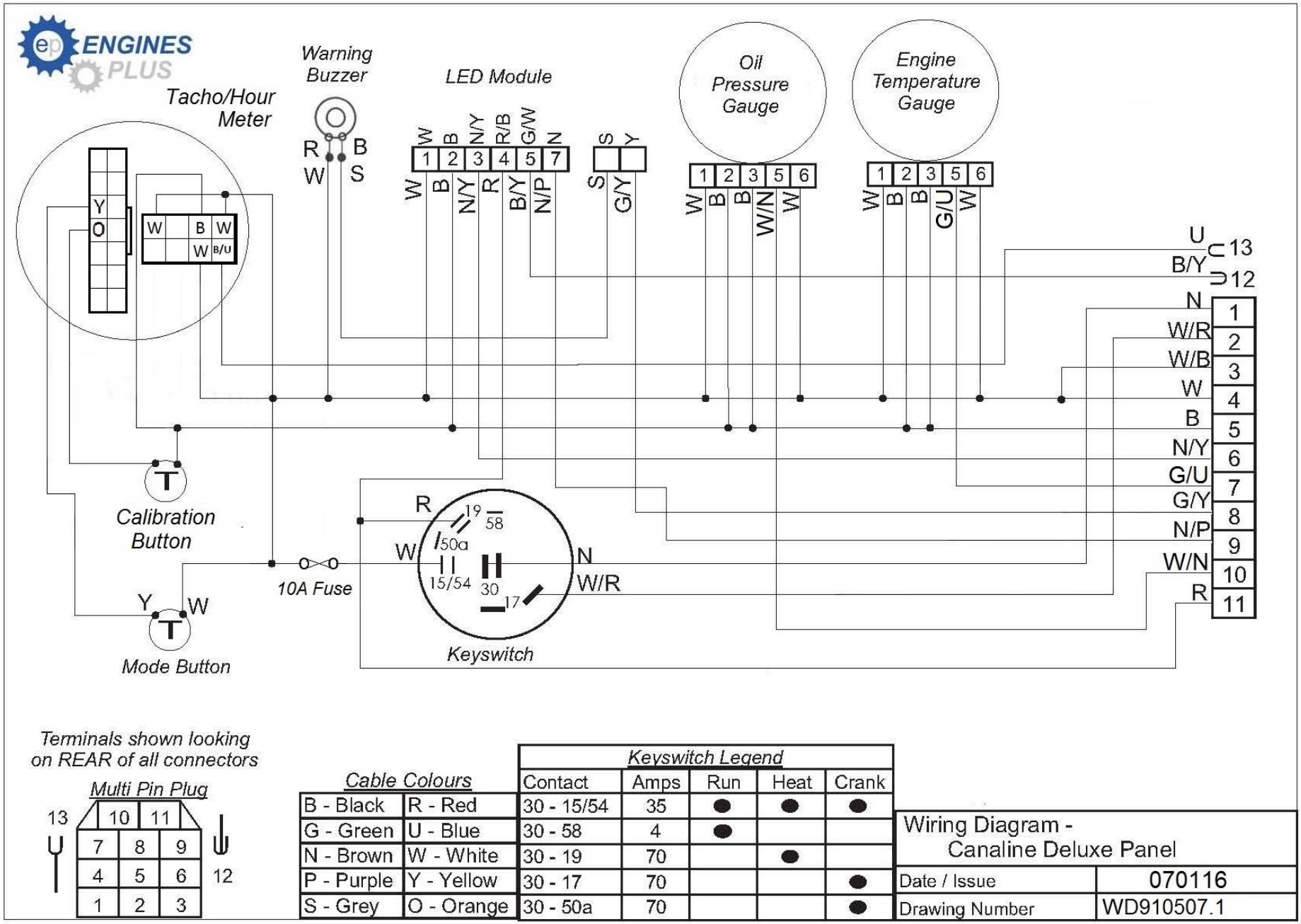

ENGINES PLUS
Stop Solenoid
W/B
B
W/R
Starter Motor
A Battery -ve connection should be fitted between Engine and Hull
W/R
B
N
B
+
−
Starter Battery
50A Fuse
B
N
Alternator 75A Valeo
R/W
L
B+
P
P
+
B/U
N
N/Y
W
13 B/Y
12 B/U
1 N
2 W/R
3 W/B
4 W
5 B
6 N/Y
7 G/U
8 G/Y
9 N/P
10 W/N
11 R
Temperature Sender
G/U
G/Y
W/N
N/P
B
R
R
R
B
N
87
86
85
30
Oil Pressure Switch / Sender
Temperature Switch
x
R
Glow Plugs
Terminals shown looking on REAR of all connectors
70 Amp Glow Plug Relay
Engines Plus Ltd
B/Y
B
B/Y
B/Y
B
D+
B+
B-
100A
110A
175A
Iskra Auxiliary 12V Alternators
Connect B+ to Domestic Batteries
Multi Pin Plug
11
10
12
13
9
8
7
6
5
4
3
2
1
Cable Colours
B - Black
R - Red
G - Green
U - Blue
N - Brown
W - White
P - Purple
Y - Yellow
S - Grey
O - Orange
Wiring Diagram -
Canaline Engine Loom ~ with Glow Relay
Date / Issue
180621
Drawing Number
WD910731

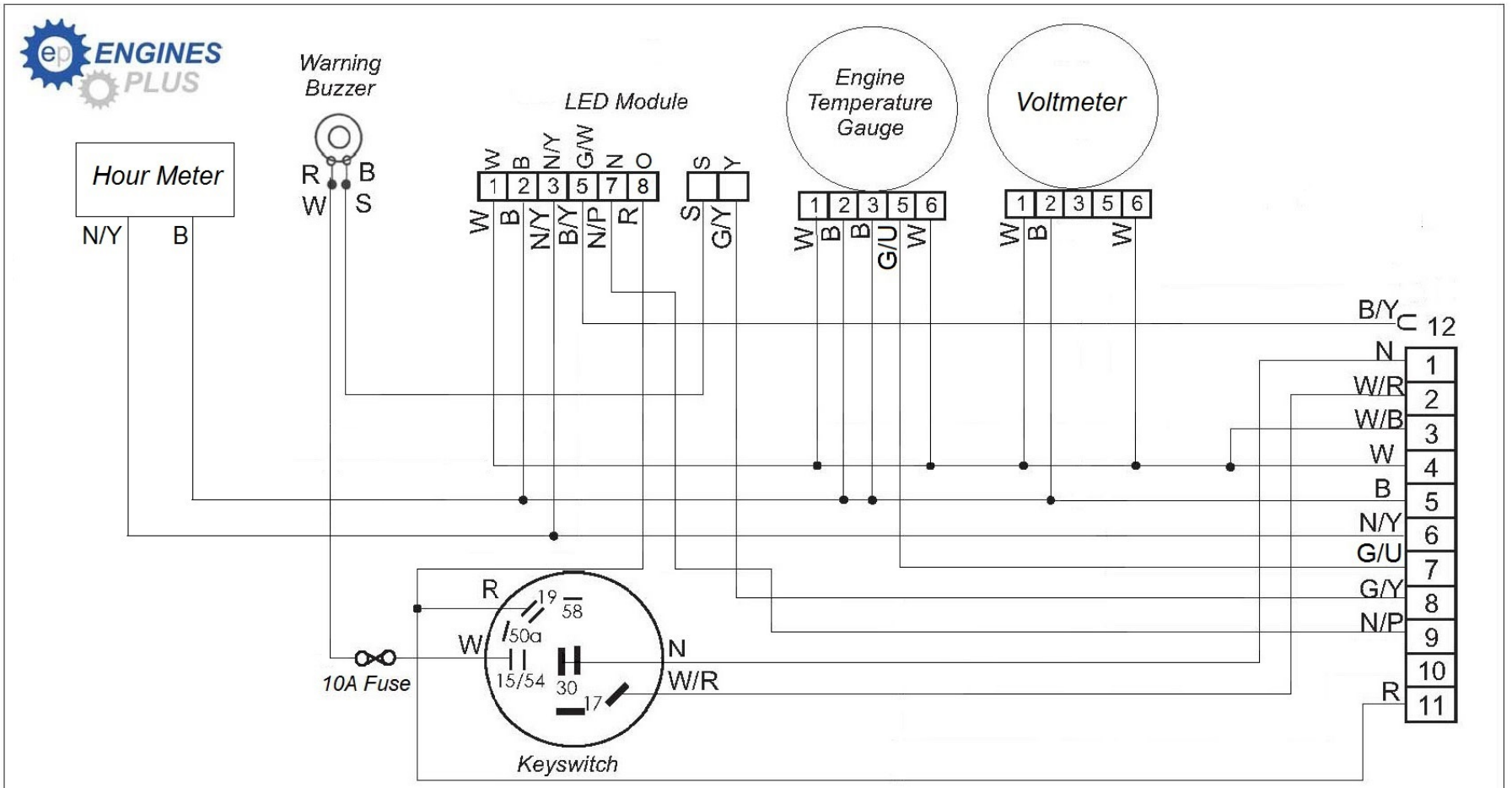


Cable Colours	
B - Black	R - Red
G - Green	U - Blue
N - Brown	W - White
P - Purple	Y - Yellow
S - Grey	O - Orange

Keyswitch Legend				
Contact	Amps	Run	Heat	Crank
30 - 15/54	35	●	●	●
30 - 58	4	●		
30 - 19	70		●	
30 - 17	70			●
30 - 50a	70			●

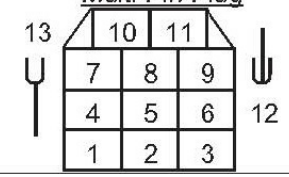
Wiring Diagram - Canaline Intermediate Panel	
Date / Issue	070116
Drawing Number	WD910506.1


ENGINES PLUS
Tacho/Hour Meter
Warning Buzzer
LED Module
Oil Pressure Gauge
Engine Temperature Gauge
Calibration Button
10A Fuse
Mode Button
Keyswitch
Terminals shown looking on REAR of all connectors
Multi Pin Plug
Cable Colours
B - Black
R - Red
G - Green
U - Blue
N - Brown
W - White
P - Purple
Y - Yellow
S - Grey
O - Orange
Keyswitch Legend
Contact
Amps
Run
Heat
Crank
30 - 15/54
35
30 - 58
4
30 - 19
70
30 - 17
70
30 - 50a
70
Wiring Diagram - Canaline Deluxe Panel
Date / Issue
070116
Drawing Number
WD910507.1



Terminals shown looking on REAR of all connectors

Multi Pin Plug



Cable Colours	
B - Black	R - Red
G - Green	U - Blue
N - Brown	W - White
P - Purple	Y - Yellow
S - Grey	O - Orange

Keyswitch Legend

Contact	Amps	Run	Heat	Crank
30 - 15/54	35	●	●	●
30 - 58	4	●		
30 - 19	70		●	
30 - 17	70			●
30 - 50a	70			●

Engines Plus Ltd

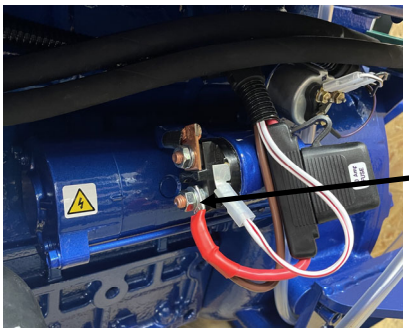
Wiring Diagram - Canaline Hire Fleet Panel

Date / Issue	030417
Drawing Number	WD910559.2

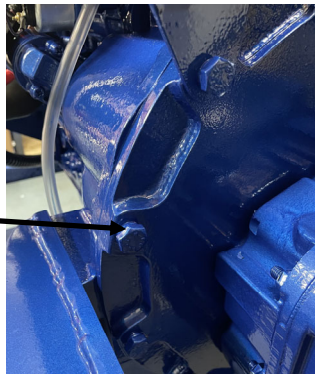
Marine Engine Installation Information

Starter Battery connections

Connection of the starter battery



Starter battery positive



Starter battery negative

Domestic Alternator Wiring

- B+ Terminal to Battery positive
- Engine Frame to Battery negative

Domestic Alternator Options

- 12V, 100 Amp Alternator, Alternator part no – EP910655
- 12V, 110 Amp Alternator, Alternator part no – EP910586
- 12V, 175 Amp Alternator, Alternator part no - EP910346
    - Connect the Black/Yellow to D+ Stud terminal.

Positive output cable – Consult Marine Electrician for recommended cable size

Only connect cable to the alternator field terminals after domestic batteries have been connected.

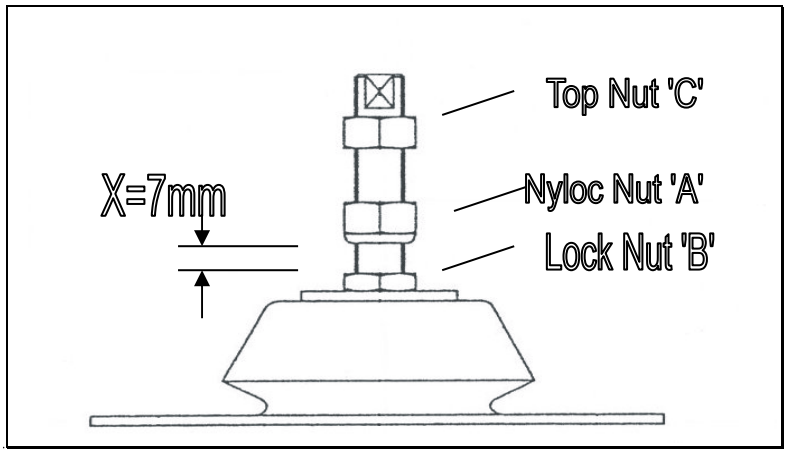
Do not use the alternators above with Lithium/Gel Batteries, please refer to Engines Plus GTB 35 information sheet.

24V alternators / Mastervolt Alternators fitted as a nonstandard option, require alternative connection diagram – consult Engines Plus for more information

Anti-vibration Mount Installation and gearbox alignment.

These mounts are supplied for use where accurate alignment is required, e.g. between the gearbox output shaft and propeller shaft on marine installations. They also provide isolation of the power unit, to minimise the transmission of vibration into the hull.

Assembly and adjustment is as below:

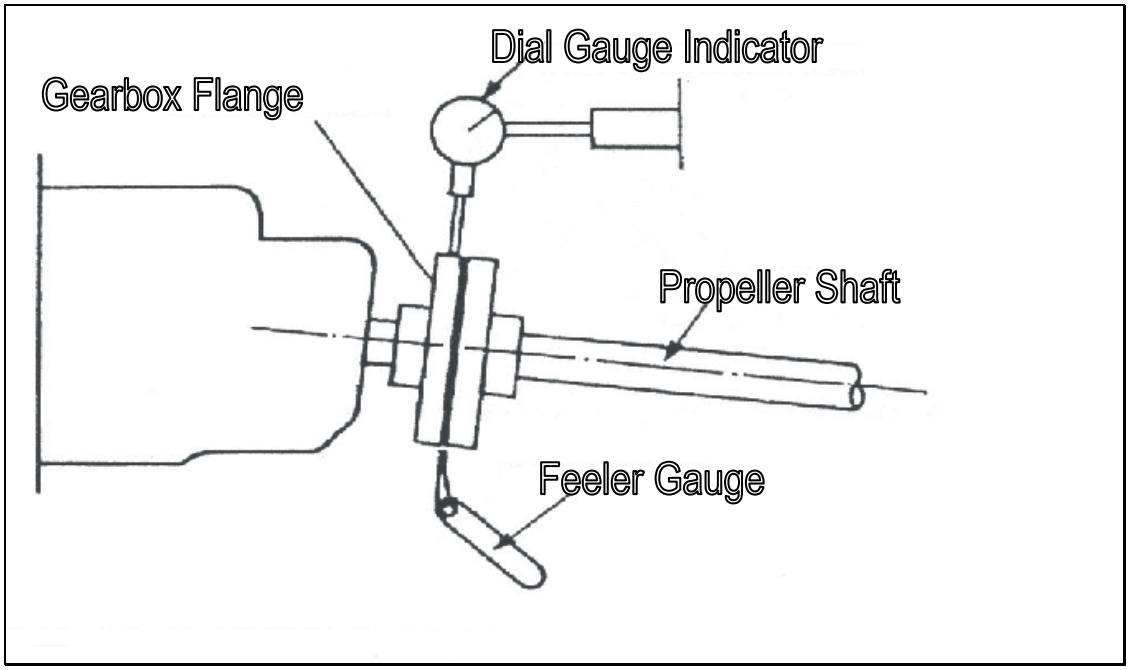


Set the gap 'X' between the lower face of the Nyloc Nut 'A' and the upper face of Locknut 'B' to 7mm.

1. Attach each mount to the engine bearers and secure by tightening Top Nut 'C'
2. Lower the propulsion unit, complete with mounts onto the beds or support structure, ensuring that the base of each mounts is fully seated. If any clearance between the underside of the mounts and beds is found, proceed as below:
3. (i) If the gap is less than 2mm, re-adjust Nyloc Nut 'A', until the base of the mount contacts the bed face.

   (ii) If the gap exceeds 2mm, a separate packing piece / shim should be fitted.
4. Fit and tighten the bolts fixing the mounts to the bed. Tighten Top Nut 'C'. Alignment between the Gearbox and Propeller Shaft Flanges should now be checked, preferably using a dial indicator for concentricity and feeler gauges for angular misalignment (see sketch).

   Adjust the alignment by raising or lowering the Nyloc Nut 'A', to achieve alignment within the limits of the Gearbox to Propeller Shaft Coupling, as specified by the manufacturer. If a rigid coupling is used, then it is suggested that eccentricity should not exceed 0.25mm (0.010") total indicator reading and, angular misalignment should be within 0.025mm (0.001") per 25mm of flange diameter.



Coupling alignment procedures should be re-checked after 10/15 hours of operation, during which time any "settling" of the system should have taken place. If this is not possible, the power unit should be raised approximately 1mm on each mount after completing the alignment procedure.

5. If the distance between the underside of Nyloc Nut 'A' and the top of Locknut 'B' exceeds 15mm, then a 5mm Packing Piece should be inserted between the base of the mount and top face of the beds. Nyloc Nut 'A' should then be adjusted to compensate.
6. Following any height adjustment on the mountings, alignment of the Coupling Flanges should be re-checked after tightening the Top Nut 'C' and Mount to Bed Bolts securely.

NOTE……Locknut 'B' should NOT be loosened or adjusted at any time.

Exhaust System

The exhaust will be very hot when the engine is running (>500°C) and could cause severe burns to personnel and heat damage/fire risk to susceptible materials in the immediate vicinity.
To prevent this the exhaust should be suitably lagged/guarded and kept clear of other items in the engine bay.

Exhaust Back Pressure must remain within the limits specified in the Technical Data section, to maintain Emissions Compliance. This figure should be checked at the Mani-cooler or Turbocharger Outlet Flange.

We recommend the use of the following Exhaust Silencer & piping size:

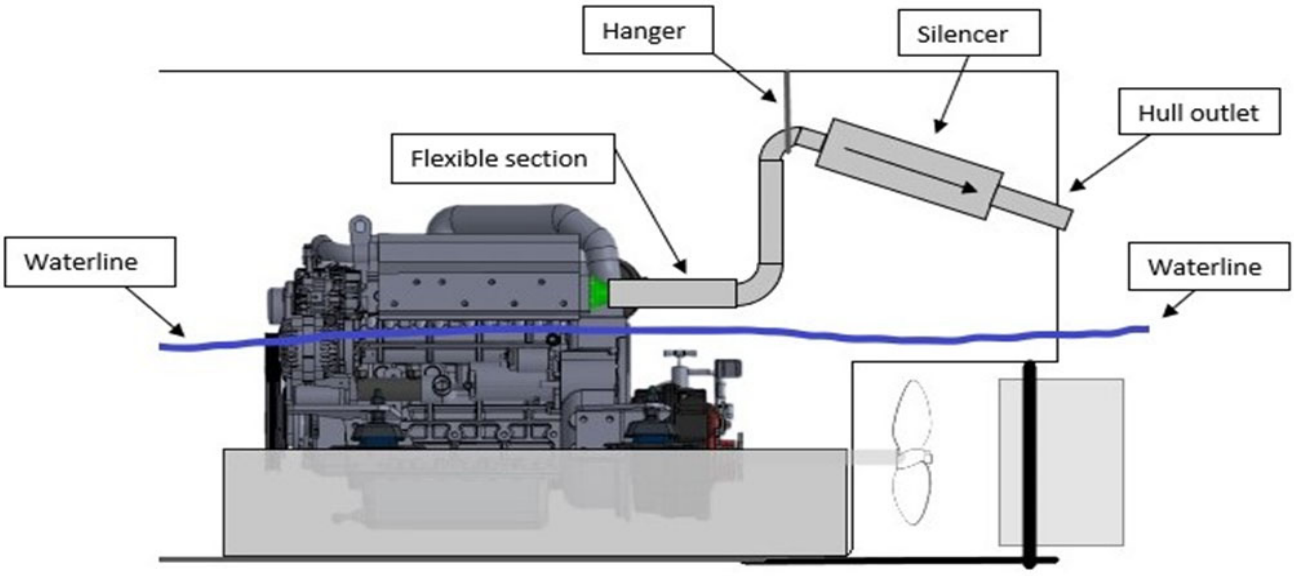
- Canaline 38, 42, 52 & 60: 1.5” BSP
- Canaline 70T: 2” BSP.

Where Exhaust Systems incorporate turns, it is preferable to use swept bends or swept elbows, to minimise back pressure.

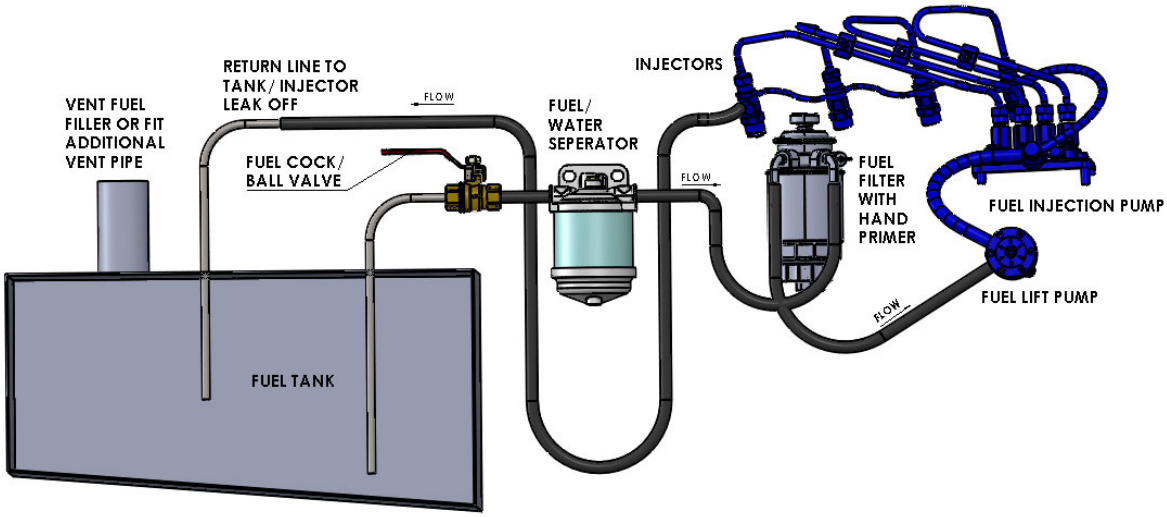
A flexible bellows section should be fitted immediately after the engine exhaust outlet. The weight of the exhaust should be supported by hangers (Minimum 1 hanger). Flexibly mounting the hangers and the connection to the hull outlet will help lessen any sound attenuation through the vessel structure.

The exhaust should be installed in such a way that canal (river, sea, lake etc.) water cannot enter the exhaust via wave action and drain into the engine. Water entering the engine via the exhaust can cause serious engine damage. The exhaust system should slope downward to the hull outlet, the hull outlet should be at least 100mm / 4” above the waterline. In most canal boat installations, it is likely that due to the relative positions of the engine, the waterline and the exhaust outlet the exhaust will need to rise up toward the deckhead before sloping down to the hull outlet to achieve this.

Example of a simple exhaust system with flexible section, rise toward deckhead, 1 hanger & silencer:



Fuel System



Schematic for visual guidance only, when installing fuel/water separator always ensure the flow arrows on the casing are correct in relation to the fuel flow to the engine.

- A fuel/water separator must be installed in the fuel supply system, water in the fuel can damage the injection system.
- If a fuel supply shutoff valve is fitted, do not use a taper tap, only use a ball valve. Ball valves are more reliable and less likely to allow air into the fuel system.
- The mechanical fuel lift pump is fitted to all engines as standard, but if a suction head of 0.25m or more is required, then an electric fuel lift pump must be fitted.
- It is very important that the excess fuel from the injectors is fed back to the fuel tank and not back to any point in the supply line. This will help prevent air getting into the system.
- The fuel return (leak off) pipe must loop down to be level with the bottom of the tank before it enters the top of the tank, this prevents fuel 'draining down'.
- Fuel lines and hoses connecting the fuel tank to the engine must be secured, separated, and protected from any source of significant heat. The filling, storage, venting, fuel supply arrangements and installation must be designed and installed to minimise the risk of fire. When connecting the engine to the fuel supply and return lines, marine grade flexible fuel hoses are highly recommended.
- Any fuel leaks in the system when static, are likely to cause poor starting and/ or erratic running. They must be corrected immediately. These leaks will allow air to be sucked in when the engine is running.
- Be careful not to let the fuel tank become empty, or air can enter the fuel system, necessitating bleeding before the next engine start.

Cooling Systems – Keel Cooling Tanks

Due to the nature of narrow boats and the conditions that they operate in, by far the most popular way of cooling the diesel engine is through a keel cooling tank. These are usually just a double skin of steel boxed welded onto the side of a narrow boat.

The most important factors to consider when designing a keel cooling tank for a canal boat are:

- The surface area of the tank in contact with the cold water outside the boat.
- The ability of the tank design to ensure that all the water passing through the tank is forced to make contact with the cold surface and cannot take a "short cut" - a baffle is normally needed.
- The total volume of the system and the effect on expansion.

We recommend the tank is fitted vertically to the swim, or to the side of the boat, and not the bottom, as the base plate is often thicker, and the hotter water remains at the top of the tank, so very in efficient.

Calculations
The surface area of the outer skin which forms one side of the tank should be sized as follows:

- Steel Hull : Engine bhp ÷ 4 = area in square feet

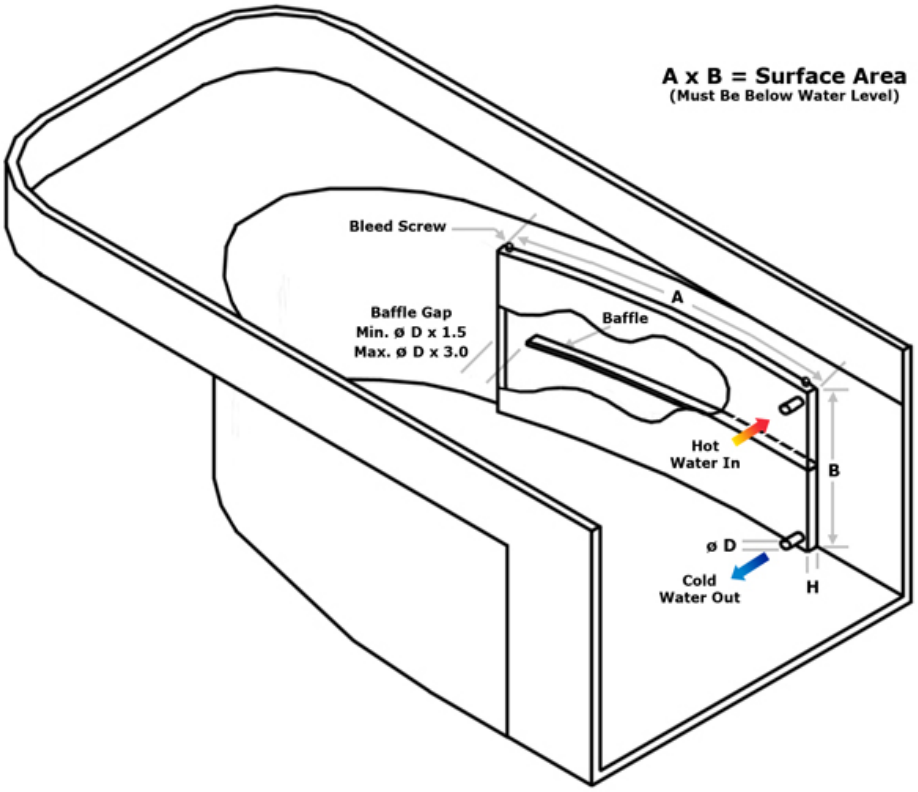
- Aluminium Hull: - Engine bhp ÷ 5 = area in square feet
    - Aluminium has a higher thermal conductivity; the cooler size may be smaller:

This gives us the following areas for the Canaline range of engines:

Engine type	**Power Output**	Steel ft2	Aluminium ft2
Canaline 38	38bhp @ 2600 r/min	9.5	7.6
Canaline 42	42bhp @ 3000 r/min	10.5	8.4
Canaline 52	52bhp @ 3000 r/min	13.0	10.4
Canaline 60	60bhp @ 3000 r/min	15.0	12.0
Canaline 70	65bhp @ 2500 r/min	16.25	13.0

This area assumes that the engine is developing its maximum continuous power at full engine rpm and it is therefore what we recommend. In practice many boaters do not cruise at maximum rpm and many are over propped, so we much smaller areas have been used, but we have calculated on the maximum.

Typical Installation of Keel cooler in Canal Boat



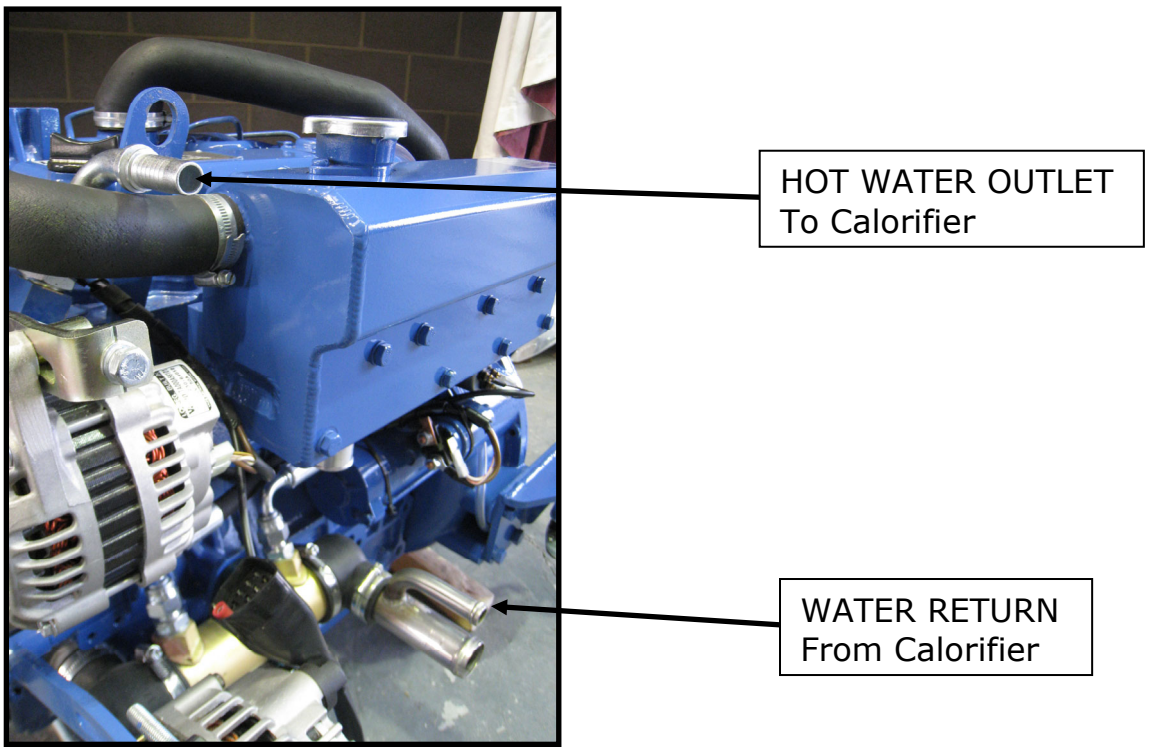
We would recommend at least two baffles, rather than the one shown to allow for a better working keel cooling tank.

Expansion

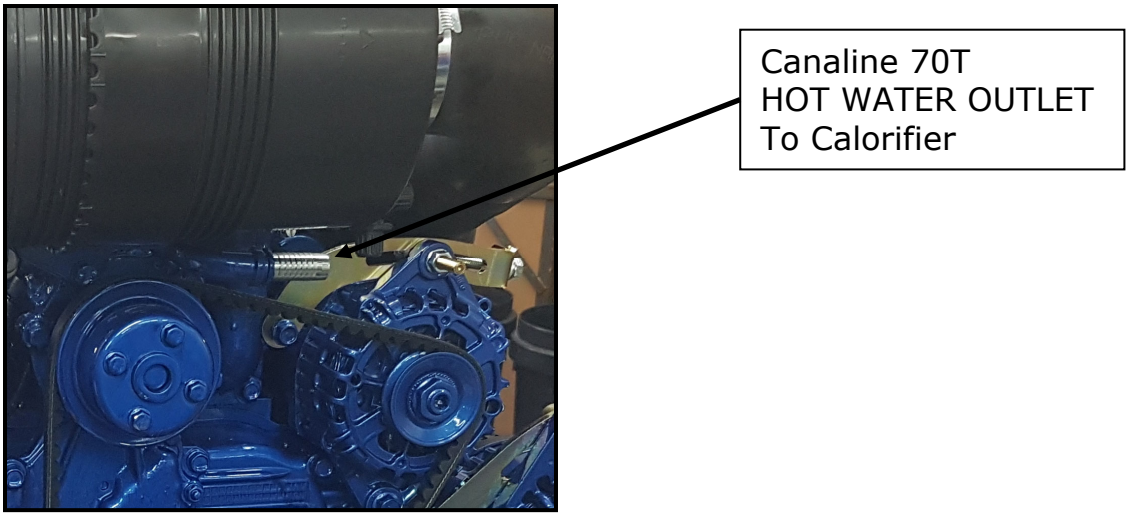
We favour slim tanks, as they give much better performance but just as important, less expansion. When water heats up its density drops thus increasing its volume, and potentially the loss of water through the overflow. So the larger the cooling system the larger the expansion. The objective must be to keep the volume of the total system as low as possible using a slim line tank.

Cooling Systems Calorifier Connection Points

Calorifier connection points are as shown below. Connection stubs are provided and are suitable to accept 15mm (5/8”) dia bore flexible hose. The hose must be secured with suitable hose clips to give a watertight connection capable of withstanding a water pressure of 15 psi. Hoses are not supplied by Engines Plus.



If no Calorifier is fitted, the connections must be blanked off, They MUST NOT BE CONNECTED DIRECTLY TOGETHER, Blanking plugs are available on request.



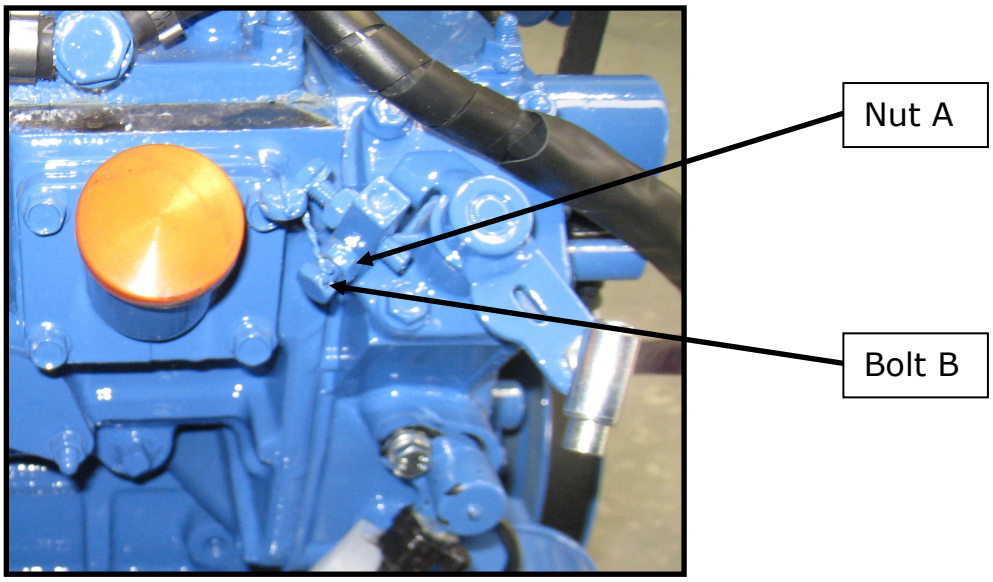
Calorifier Position

The Canaline Marine range has been developed to operate with approximately 3m of piping between the engine and Calorifier, with a minimum number of bends and restrictions in this pipework. We recommend the Calorifier Inlet and Outlet connections be no more than 400mm above the top of the engine nor below the bottom of the engine sump.
Provided these criteria are applied and the system is fully bled of air, then satisfactory performance should result.
Both Feed and Return connections are situated on the engine side of the Thermostat, and water is therefore allowed to circulate around the Calorifier Circuit at all times. It should be noted that during long periods of engine operation, when no hot water is drawn from the Calorifier, that the hot water temperature within could approach 80 degC. Under these circumstances, extreme care should be taken when using the hot water circuit.

Engine Idle Speed

The Canaline Marine engines idle speed should be set between 850 – 900 r/min, however this can be adjusted by the installer if the engine idle speed is incorrect without affecting the engines warranty.

To change idle speed, please adjust accordingly



Loosen nut A, and adjust idle speed with bolt B, then re-tighten nut A to lock the idle speed, please ensure the cable is then re-adjusted accordingly

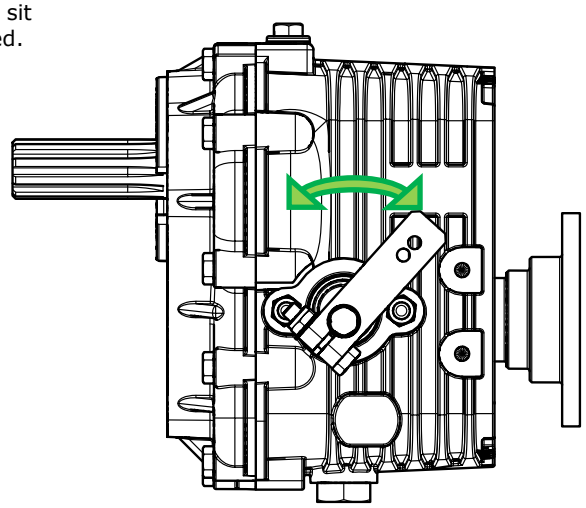
NOTE… where a Hydraulic Gearbox is fitted, the idle speed should be 850 r/min minimum, to maintain sufficient hydraulic oil pressure in the Gearbox.

PRM 125 Morse control cable installation

It is highly important the Morse control cable and lever installation is performed correctly, otherwise this may well lead to the early failure of your gearbox, which would not be covered by warranty.

Ensure the cable that operates the selector lever allows the lever to travel fully to the stops in the forward and reverse positions at all times, we would recommend that you use the inside hole on the lever to ensure the lever fully engages and keep the gearbox firmly in gear.

The lever has a section of over throw that the lever should sit in when the gear is selected.



The adjustment should be regularly checked as cables can stretch.

Laying-up procedure for Canal Boat Marine Engines

Where an engine is to be standing idle for periods of over 6 months consideration should be taken to minimise the deterioration of components.

The engine should be stored in a clean, dry environment, which is free from frost and damp. It is best stored in its delivered state from Engines Plus Ltd.
If the engine is to be installed and not used, it is best that the engine is not run prior to its lay-up. The vessel containing the engine should be stored in a dry, frost free environment.

When storage for above 6 months is necessary, then the engine should be inhibited. Failure to do so could promote corrosion internally. Contact Engines Plus Ltd for more details.

Parts Bulletin for Canal Boat Marine Engines

Engine Type :	**Canaline 38**	**Canaline 42**	**Canaline 52**	**Canaline 60**	**Canaline 70T**
Kioti Engine designation	*4A220LWS-R-41*	*4A220LWS-R-41*	*4A220LWS-R-45*	*4B243LWS-R-49*	*4B243TLWS-R-59*
Oil Filter Element	E6201-32443				
Fuel Filter Element	T4682-43172				
Air Filter Element	EP110529				EP110550
Thermostat	E5800-73011				
Fan Belt - A section	E6300-72532			E5800-72531	E6305-72533
Starter Motor	E5500-63016				
75 Amp Alternator	E7251-64012				
100 Amp Auxiliary Alternator	EP910655	N/A			
110 Amp Auxiliary Alternator	N/A	EP910586			
175 Amp Auxiliary Alternator	N/A	EP910346			
Glow Plugs	E6301-65512				
Oil Pressure Switch	E5500-39013				
Oil Pressure Switch / Sender	EP910039				
Engine Temperature Switch	EP910512				
Engine Temperature Sender	EP910041				
Top Hose	EP410511				EP410693
Aux Alt Drive Belt (80 / 100 A) - A Sec	EP810975	N/A			
Aux Alt Drive Belt (110/175 Amp)	N/A	EP811065			
Engine Oil - 5 Litre	EP710008				EP710560
Engine Oil - 20 Litre	EP710562				EP710561

Genuine Parts

In order to protect your engine warranty, only Genuine Canaline parts must be used.

Engines Parts – Availability

All engine parts are available through your local dealer or direct from Engines Plus Ltd.

Our latest dealer network is available on our website –
www.canaline-engines.co.uk .

Alternatively, all our fastmoving consumable spares are available to order on line at

www.enginesplus.co.uk/product-category/canaline-engine-spares/

Servicing of the engine

We would always recommend that the engine is serviced by a qualified engineer. We have Dealers and Mobile Service Engineers, see website -
www.canaline-engines.co.uk for the latest information.

Trouble Shooting Guide

Canaline diesels are very reliable if installed and serviced correctly, but problems can occur and the following list gives the most common ones and their solution.

Problem: Engine does not start but starter motor turns over OK	
No fuel:	Turn fuel cock on and fill tank.
Air in fuel system:	Vent air.
Water in fuel:	Change fuel filter, check fuel/water separator and bleed system.
Blocked fuel pipe:	Clean out and bleed system.
Fuel filter clogged:	Change filter and bleed system.
Fuel lift pump blocked:	Remove and replace.
Blocked injector:	Remove and clean.
Fuel return not fed back to the tank:	Re-route fuel return pipe.
Heater plugs not working:	Check wiring to the plugs, test and replace plugs if they are burnt out.
Stop solenoid stuck in off position:	Check solenoid is free to return to run position.

Problem: Starter motor will not turn or turns over very slowly	
Battery discharged:	Check Battery Voltage, charge or replace. Check alternator belt tension.
Starter motor flooded with water:	Remove and clean or replace.
Wiring disconnected or loose:	Check circuit for loose connections.
Water in cylinders:	Check engine oil for signs of water (creamy-colored oil). If found do not attempt to start the engine, contact your dealer.
Engine harness fuse blown:	Replace fuse located by starter motor and check for wiring faults.

Problem: Low power output	
Propeller is too big:	Change or de-pitch.
Check gearbox reduction ratio relative to propeller size:	Change the most appropriate item.
Blocked fuel filter:	Replace.
Blocked air filter:	Replace.
Air in fuel system:	Check system and bleed.
Governor spring incorrectly mounted:	Dealer to adjust.
Single lever control not operating correctly:	Disconnect the speed control cable and move the lever by hand. Adjust cable.
The electrical load is too large on startup:	Disconnect or reduce the load.

Problem: Erratic running / hunting	
Air in fuel supply:	Check supply system for leaks and fix.
Fuel lift pump faulty:	Replace.
Clogged fuel filter:	Replace.
Fuel return not fed back to the fuel tank, or blocked pipe:	Re-route pipe or clean.
Air filter blocked:	Replace.
Worn or blocked injector:	Service injectors.
Engine rpm in gear is too low, this must be 850 min:	Increase engine tick over speed.
Faulty stop solenoid:	Disconnect wiring to solenoid. If running improves check for a wiring fault.
Broken fuel injection pump spring:	Replace, this is usually caused by water in the engine oil/fuel.
Fuel suction head is too great:	Fit electric fuel lift pump.

Problem: Hunting at idle	
Idle adjustment screw may need adjusting:	Always contact Canaline for advice with idle adjustment

Problem: Hunting at higher speeds	
Fuel supply problem:	Change fuel filter and check fuel supply.

Problem: White or blue exhaust gas	
Engine oil level too high:	Reduce the level.
Blocked injector:	Service injectors.
Piston ring and bore worn or con rod bent due to water ingression, giving a low compression:	Get the compression checked by your dealer or service agent. They will advise action to be taken.
Check that the breather pipe is clear and not obstructed:	Remove and clean out.

Problem: Black exhaust gas	
Blocked air filter element:	Inspect and replace.
Accumulated debris on hull:	Inspect and clean if required.
Over pitched propeller - engine will not reach its full rpm:	Get the propeller re-pitched if necessary.

Problem: Low oil pressure warning light on when underway	
Oil diluted with fuel:	Check for raised oil level and fuel smell in oil
Wiring fault to ground - oil pressure circuit	Check wiring continuity to ground
Incorrect oil used at refill	Drain and refill with correct specification oil

Problem: Low oil pressure warning light when engine speed reduced to tick over	
Faulty switch sender:	Replace.
Engine running too hot:	Check cooling water flow (please refer to 'Cooling').
Oil relief valve stuck partially open with dirt:	Remove and clean.
Blocked oil filter:	Change.
Wiring fault:	Check circuit.
Insufficient oil:	Top up and check for leaks.

Problem: High oil consumption	
Oil leaks:	Check for leaks.
Piston rings worn:	Overhaul required.
Valve stem and guide worn:	Overhaul required.
Piston rings gap facing the same direction:	Shift ring gap position. Dealer or service agent to check.

Problem: Water in lubricating oil - general	
Head Gasket leak	Contact Canaline for diagnostic service/ repair
Oil goes "milky" due to water entering exhaust manifold and then into the sump:	Check installation - has dry exhaust system been fitted correctly, ensuring rain water cannot enter the exhaust port and run back? Change engine oil and run engine for 10 minutes each time to eliminate any water. Get injection pump checked by dealer or service agent.

Problem: Engine overheats - general	
Check coolant level:	Top up.
Pressure cap loose:	Tighten correctly or replace.
Water temperature switch sender faulty:	Replace.
Insufficient restrictions in pipe to calorifier:	Clamp off pipe to confirm.
High exhaust back pressure:	Must not exceed the information given in 'exhaust back pressure' in the technical data section
Keel cooler insufficient size:	Contact boat builder.

Problem: Engine overheats - keel cooled, commonly overheating is caused by:
(a) Not fully venting the engine cooling system of air. It is necessary to remove all air from the cooling system - including the "skin" tanks and (if fitted) the Calorifier and associated piping.
(b) Incorrectly sized "skin" tanks that have been sized for 'usual' canal use (rather than maximum engine output that can sometimes be required) on fast flowing rivers.

Problem: Vibrations	
Poor alignment to shaft:	The alignment must be accurate even if a flexible coupling is used (please refer to 'Alignment' on page 31).
Flexible mounts not adjusted correctly to take even weight: Check relative compression of each mount.	
Flexible mount rubber perished:	Replace. (Diesel or oil will eventually perish rubbers).
Loose securing nut on flexible mount:	Check alignment and then tighten the nuts.
Insufficient clearance between the propeller tip and the bottom of the boat:	There must be at least 10% of the propeller diameter as tip clearance between the propeller and the bottom of the boat. Reduce propeller diameter/increase pitch.
Weak engine support/bearers:	Check for cracked or broken feet.

Problem: Knocking Noise	
Propshaft touching gearbox output coupling through split boss or Type 16 coupling:	Adjust, giving correct clearance give 5mm - 10mm between gearbox and propeller shaft.
Flexible mount stud touching engine bed:	Adjust stud to clear.
Drive plate broken:	Replace/repair.
Engine touching engine bed:	Re-align engine/modify bed.
Injectors blocked through excess carbon caused by water in the fuel:	Remove and check injector nozzles, replace if required.

Problem: Transmission Noise	
Check gearbox oil level:	Top up.
"Singing" propeller:	Check with propeller supplier about 'harmonics'.
Drive plate rattle at tickover:	Check engine rpm (must be 900rpm min. in gear).
Worn drive plate:	Change.
Propeller shaft hitting the Gearbox half coupling:	Move shaft back to give 5mm - 10mm clearance (Type 12/16 couplings only).
Propeller torsionals causing gears to rattle at low rpm:	Fit a torsional flexible coupling such as Centaflex type 16 or equivalent.

Problem: Battery quickly discharges	
High load and insufficient running:	Reduce load or increase charging time. Large domestic battery banks subject to high electrical loads will take a considerable time to recharge from a single alternator.
Low electrolyte level:	Top up.
Fan belt slipping - black dust in engine compartment, engine compartment temperature too high:	Adjust tension/replace belt with a high temperature type and/or improve engine compartment ventilation.
Alternator defective:	Check with dealer or service agent.
Battery defective:	Check and replace.
Poor wiring connection:	Check wiring system.

Problem: Morse control cable will not fit	
Incorrect fitting:	Cables are being fitted the wrong way around, switch over and fit the opposite way

Problem: Panel rev counter not working (when fitted)	
No W connection to alternator:	Check output from 'W' connection. Should be about 9V AC.

EU Declaration of Conformity for Recreational Craft Propulsion Engines
Exhaust Emission Certification to the requirements of Directive 2013/53/EU.

Name of Engine Manufacturer:	Daedong Industrial Co Ltd.
Name of Authorised Representative:	Engines Plus Ltd
Address of above:	Unit F, The Aquarius Centre, Edison Road, Waterwells Business Park, Quedgeley GL2 2FN. UK
Name of the Notified Body for Exhaust Emission assessment:	TUV SUD Product Service Gmbh
Address of above:	Ridlerstrabe 65, 80339 Munich, Germany

This declaration of conformity is issued under the sole responsibility of the manufacturer, the private importer or the person referred to in Article 19(3) or (4) of Directive 2013/53/EU.

Engine Model	Engine Family	EC-Type examination Certificate
Canaline 38	4A220 3118-2613	SBSA 103241 0001 Rev. 00
Canaline 42	4A220 3118-2613	SBSA 103241 0001 Rev. 00
Canaline 52	4A220 3415-2613	SBSA 103241 0001 Rev. 00
Canaline 60	4B243 3617-2613	SBSA 103241 0002 Rev. 00
Canaline 70T	4B243T 4421-2623	SBSA 103241 0003 Rev. 00

The object of the declaration described in point 4 is in conformity with the relevant Union Harmonisation Legislation: 2013/53/EU.

References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared: Conformity of the engines above is declared in accordance with Exhaust Emissions Type Approval to RCD2.

This declaration of conformity is issued under the sole responsibility of the manufacturer. I declare on behalf of the engine manufacturer that the engine(s) [is (are) in conformity with the type(s) for which above mentioned EC type-examination or type approval certificate(s) has (have) been issued and]1 will meet the exhaust emission requirements of Directive 2013/53/EU when installed in a recreational craft, in accordance with the engine manufacturer's supplied instructions and that this (these) engine(s) must not be put into service until the recreational craft which it is (they are) to be installed has been declared in conformity with the relevant provisions of the above mentioned Directives.

Signed for on behalf of Engines Plus Ltd

Name: Mr H Beavis, Managing Director
(Identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative)

Date: 26/05/2020
Ref: RCD DofC 2013/53/EU Iss 3

Declaration of Conformity for Recreational Craft Propulsion Engines
Exhaust Emission Certification to the requirements of Recreational Craft Directive 2017.

Name of Engine Manufacturer:	Daedong Industrial Co Ltd.
Name of Authorised Representative:	Engines Plus Ltd
Address of above:	Unit F, The Aquarius Centre, Edison Road, Waterwells Business Park, Quedgeley GL2 2FN. UK
Name of the Notified Body for Exhaust Emission assessment:	HPi-CEproof Ltd
Address of above:	The Manor House, Howberry Park, Wallingford, OX10 8BA

This declaration of conformity is issued under the sole responsibility of the manufacturer, the private importer or the person referred to in Article 19(3) or (4) of Recreational Craft Directive 2017.

Engine Model	Engine Family	Type examination Certificate
Canaline 38	4A220 3118-2613	HPiUK-R1295-004-I-01-00
Canaline 42	4A220 3118-2613	HPiUK-R1295-004-I-01-00
Canaline 52	4A220 3415-2613	HPiUK-R1295-004-I-01-00
Canaline 60	4B243 3617-2613	HPiUK-R1295-005-I-01-00
Canaline 70T	4B243T 4421-2623	HPiUK-R1295-006-I-01-00

The object of the declaration described in point 4 is in conformity with the relevant Union Harmonisation Legislation: Recreational Craft Directive 2017.

References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared: Conformity of the engines above is declared in accordance with Exhaust Emissions Type Approval to RCD2.

This declaration of conformity is issued under the sole responsibility of the manufacturer. I declare on behalf of the engine manufacturer that the engine(s) [is (are) in conformity with the type(s) for which above mentioned EC type-examination or type approval certificate(s) has (have) been issued and]1 will meet the exhaust emission requirements of the Recreational Craft Directive 2017 when installed in a recreational craft, in accordance with the engine manufacturer's supplied instructions and that this (these) engine(s) must not be put into service until the recreational craft which it is (they are) to be installed has been declared in conformity with the relevant provisions of the above mentioned Directives.

Signed for on behalf of Engines Plus Ltd

Name: Mr H Beavis, Managing Director
(Identification of the person empowered to sign on behalf of the engine manufacturer or his authorised representative)

Date: 10/2/2022
Ref: RCD UKCA Iss 1

Emission Durability Statement for Recreational Craft Propulsion Engines
As referred to in Directive 2013/53/EU Annex 1/B/3

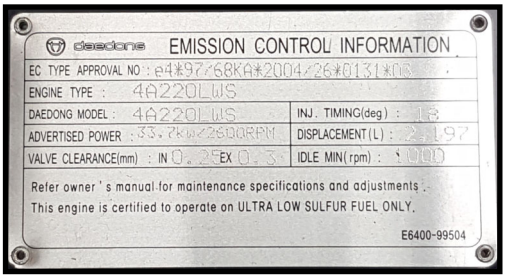
Provided engines are installed in accordance with the installation and maintenance instructions contained in the Owner's Manual, then engines will continue to comply with the Emission Certification as specified in Directive 2013/53/EU Annex 1/B/2.2 throughout the normal life of the engine and under normal conditions of use.

Normal life of the engine for CI engines in Directive 2013/53/EU Annex 1/B/3 is defined as 480 hours or 10 years, whichever occurs first.

Compliance will depend on many factors, such as Installation, Ventilation, Fuel and Lubricants, Maintenance and the mode of operation and storage.
Fuels and Lubricants should conform to the specifications contained in the Owners Handbook.
Fuel settings on the engines are protected with Tamperproof Caps. Should any adjustment be made to these settings, then Emissions Compliance, and compliance to the Directive will be invalidated, as will any Warranty or Guarantee on the engine.
Exhaust systems are not generally supplied by Engines Plus Ltd, but must meet the specifications in the Owners Handbook. Particular attention should be paid where multiple bends, and especially elbows, are fitted. Allowance must be made for these. Back Pressures stated should be measured at the Engine Exhaust Outlet Flange. This is at the Manicooler or, where applicable, the Turbocharger Outlet.
To maintain the manufacturer's Warranty, and Emission Compliance only Genuine Replacement Parts should be used. It is the responsibility of the owner to ensure regular maintenance is carried out competently, in accordance with the guidelines in the Owners Handbook
Where engines are to be unused for a period of more than 6 months, they should be "laid up" according to the guidelines contained in the Owners Handbook. Failure to do so may lead to deterioration of components, resulting in reduced performance, and possible non-compliance of the Directive.

From experience of engines operating under the RCD over many years, with correct maintenance and operation, we have found that performance is maintained, and durability will far exceed that specified in the Directive.

Emissions Compliance Plate ~ attached to Rocker Cover.



Date: 2016/11/01
Ref: RCD Emission Durability 2013/53/EU Iss 1

Emission Durability Statement for Recreational Craft Propulsion Engines
As referred to in Recreational Craft Directive 2017 Annex 1/B/3

Provided engines are installed in accordance with the installation and maintenance instructions contained in the Owner's Manual, then engines will continue to comply with the Emission Certification as specified in Recreational Craft Directive 2017_Annex 1/B/2.2 throughout the normal life of the engine and under normal conditions of use.

Normal life of the engine for CI engines in Recreational Craft Directive 2017_Annex 1/B/3 is defined as 480 hours or 10 years, whichever occurs first.

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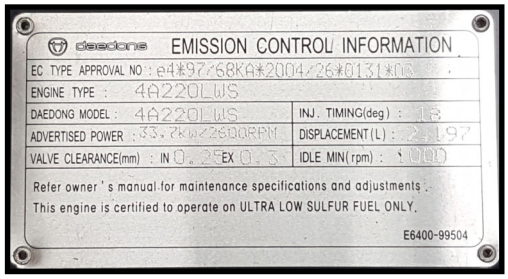

Date: 10/2/22
Ref: RCD Emission Durability UKCA Iss 1

Warranty Terms and Conditions

INTRODUCTION

Your new Canaline Marine Engine is covered by the Engines Plus Ltd warranty according to the conditions and instructions contained within this document.

Engines Plus Ltd warranty covers only the engine and its ancillary parts. /
The gearbox is covered by the gearbox manufacturer's warranty.

OWNER'S OBLIGATIONS

The operation, maintenance and care of your Canaline Marine engine, in accordance with the instructions and requirements listed in your Operators Manual, is your responsibility. Records should be kept of all maintenance services performed, including engine oil and filter changes. This record of correct maintenance is required for the purpose of determining warranty coverage on repairs and should be transferred to each subsequent owner.

It is your responsibility to ensure that the warranty registration is completed (self-certification) and returned to Engines Plus Ltd, as this information forms part of the validation of your engine warranty.

The warranty registration must be returned completed to ensure the warranty on your engine is valid, this is the responsibility of the owner.

REPORT OF A DEFECT

It is the responsibility of the owner of any Canaline product referred to herein to report any defect to Engines Plus Ltd, Distributor, Dealer, Workshop or Boat builder. Such a report must be made as soon as possible and no later than fourteen (14) days from the date when the user first observed the defect.

WARRANTY TERMS AND CONDITIONS

1.0 In the event that Goods supplied are defective in that they have a defect that existed at the time of delivery, Engines Plus Ltd shall (at its option) meet the cost of replacing or repairing such defective Goods or part thereof subject to the following:-

1.1 Labour costs will be paid in accordance with Engines Plus Ltd's standard repair times and standard rates, which are agreed upon before work is carried out.

1.2 Engines Plus Ltd has the sole discretion to determine whether the Goods shall be returned to Engines Plus Ltd's premises or repaired at any other location, which Engines Plus Ltd may nominate.

1.3 Engines Plus Ltd will pay for lubricating oil, coolant concentrate, filter elements, belts, hoses, gaskets and other maintenance items that are not reusable due to such defect. (at its discretion)

1.4 Only distributors, dealers or workshops authorized by Engines Plus Ltd may carry out warranty repairs.

1.5 No incidental, consequential or related costs such as costs for travelling, transport, extra costs due to the installation in making the products accessible, docking or cranes, loss of use, loss of income, loss of time, loss of profits or damages of any other parts or goods shall be payable under this condition 1.0 by Engines Plus Ltd.

2.0 The warranty in condition 1.0 above does not cover Goods which in Engines Plus Ltd's opinion have been damaged during transportation, installation or repair or through abnormal use, overload, carelessness, insufficient lubrication, normal wear, use of spare parts other than genuine parts approved by Engines Plus Ltd or through any type of incorrect installation, abuse, misuse, accident or through neglect or failure to follow instructions in the applicable owner's manual, maintenance instructions or installation instructions.

3.0 The warranty in condition 1.0 above will be void if You or your representative, employees or contractors have taken abnormal risks or if modifications have been performed, which in the judgement of Engines Plus Ltd have caused or enhanced the damage, or if the security seals have been broken, or settings altered, or if the Goods or any part thereof have been used in violation of the law, or for an unintended purpose.

4.0 The warranty does not cover expendable parts, such as all kinds of filters, belts, gaskets, rubber hoses, fuses, brushes, etc and lubricants.

5.0 The operation, maintenance and care of the Goods in accordance with the instructions and requirements listed in the owner's manual and the warranty and service booklet provided by Engines Plus Ltd is your responsibility. Records must be kept of all maintenance services performed, including engine oil and filter changes. This record of proper maintenance is required for the purpose of determining warranty coverage on repairs and should be transferred to each subsequent owner of the Goods.

6.0 All warranty claims must be advised to Engines Plus Ltd prior to work being carried out, and an authorisation number being allocated, to the distributors, dealer or authorized by Engines Plus Ltd workshop. No claims for warranty will be accepted unless previously authorised by Engines Plus Ltd.

7.0 The period of cover relating to the warranty in condition 1.0 above is as follows:.

	MULTIUSER or HIRE USE	PRIVATE USE
Pleasure boats	The earlier of either 18 months from the date of despatch from Engines Plus Ltd's factory or 12 months or 2,000 hours from engine installation	The earlier of either 42 months from the date of despatch from Engines Plus Ltd's factory or 36 months or 1,500 hours from engine installation
Pleasure boats Electrical equipment and turbocharger	As above	12 months or 1,500 hours
Work boat engines and associated products	The earlier of either 18 months from the date of despatch from Engines Plus Ltd's factory or 12 months or 2,000 hours	The earlier of either 18 months from the date of despatch from Engines Plus Ltd's factory or 12 months or 2,000 hours
Gearbox	This is covered by the gearbox manufacturer, please consult the gearbox operators handbook	

8.0 Save where the Goods are sold to a person dealing as a consumer (within the meaning of the Unfair Contract Terms Act 1977) all warranties conditions or other terms implied by law or custom are excluded to the fullest extent permitted by law.

9.0 Engines Plus Ltd shall under no circumstances be liable for any indirect or consequential loss, loss of profits, loss of savings, loss of business or loss of contract. Engines Plus Ltd's liability whether in contract, tort (including negligence), breach of statutory duty or otherwise shall not exceed the price of the Goods in respect of which any claim arises PROVIDED THAT nothing in these Conditions shall restrict or exclude Engines Plus Ltd's liability for death or personal injury caused by its negligence.

Service Record

Proof of Service – 50 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 250 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 500 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 750 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 1000 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 1250 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 1500 Hour	Actual Engine Hours:
Date:	Dealer:

Proof of Service – 1750 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 2000 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 2250 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 2500 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 2750 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 3000 Hour	Actual Engine Hours:
Date:	Dealer:
Proof of Service – 3250 Hour	Actual Engine Hours:
Date:	Dealer:

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