

Data Book VI

Lancing Marine



The Boat Builder's Guide

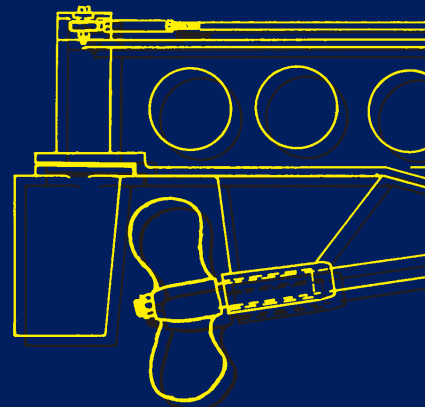
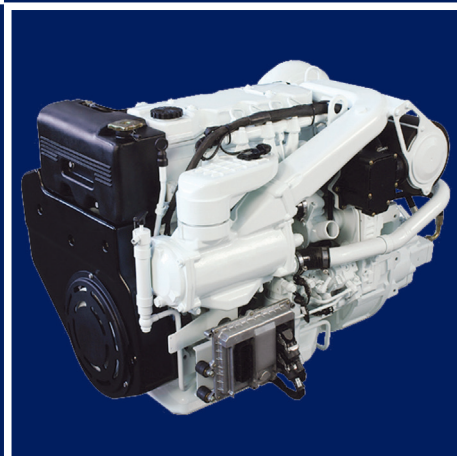
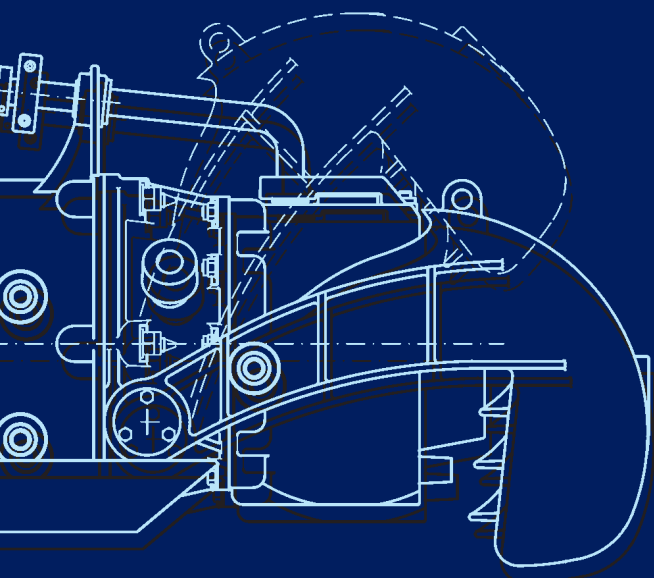
to Engines

Transmissions

and Sterngear



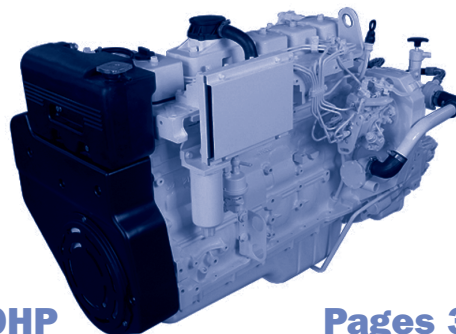
Lancing Marine



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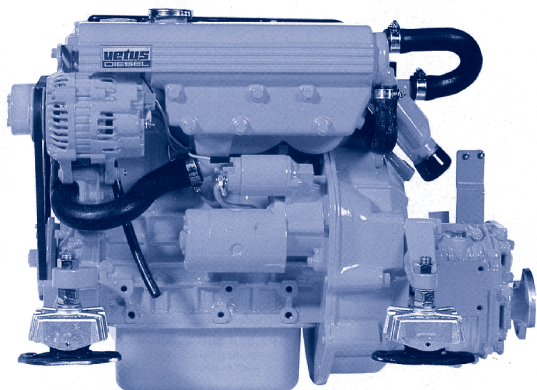
F.P.T. N-Series diesels



100 - 570HP

Pages 3 - 4

Vetus diesels



12 - 25HP

Page 5

Ford diesels



40 - 65HP

Pages 6 - 7

Standard specification for all engines

Sea water pump
Heat exchanger and water cooled manifold
Engine oil cooler in fresh water circuit, where used
Engine mount brackets with adjustable rubber mounts
Speed control cable connection
Hot test after marinisation
Owner's handbook
12V electric starter
12V alternator

Optional items

Geabox oil cooler
Gear control cable connections
Dual station control connections
Calorifier connections
Sump pump kit
Heavy flywheel
Auxilliary fuel filter
All-speed governing in lieu of power/torque
Armoured feed and return hoses
"Inland waterways" fuel pipes
On-board spares kit
Workshop manual
Parts identification manual

Instrumentation and electrical options

Start/run switch, warning lights and 4M harness
Tachometer (with hours), hour meter, temperature, oil pressure, battery voltage, fuel, rudder angle and gearbox pressure gauges, standard or custom made instrument panels
High output alternator, Sterling "smart" alternator control, load split relay, 4M harness extension, intake blockage sensor, fly-bridge alarm & re-start panel, battery cable kit

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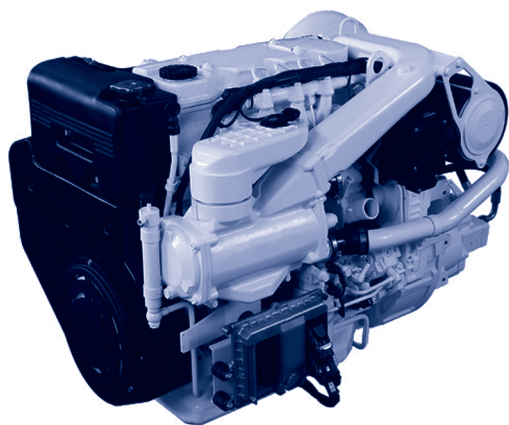
E-mail: data@lancingmarine.com

Web-site: www.lancingmarine.com

Tel: 01273 410025 Fax: 01273 430290



N-Series Diesels



N67-220 - 220 HP at 2800 RPM
N67-280 - 280 HP at 2800 RPM
N60-400E - 370 HP at 3000 RPM
N67-450E - 420 HP at 3000 RPM
'FPT by Lancing Marine', based upon a proven base engine by one of the World's leading engine manufacturers.

Engine specifications may vary as improvements are introduced
 Specifications are subject to change without notice and are not for engineering purposes
 See the Lancing Marine Price Book for Complete Installation Kit
 Lancing Marine reserve the right to alter specifications without notice

Design Features

Engine

Low noise, high strength, rugged bottom end with 7 main bearings, piston cooling, thick wall parent bore. Large diameter valves to improve volumetric efficiency. High compression ratio for faster starts and warm ups with reduced white smoke.

Fuel system

High nozzle opening pressures for high fuel efficiency and low smoke. Self air purge fuel pump, automatic excess fuel and timing retard for excellent cold starting. Full electronic control on 400E and 450E.

Reliability

The 'FPT by Lancing Marine' range is derived from a partner collaboration of major manufacturers. Inspired from a raceboat pedigree, they are worldwide proven.

Serviceability

Piston jet oil cooling for extended life. Long filter and oil change intervals (600 hours pleasure). Self adjusting poly vee drive belt for alternator and fresh water pump for low slippage with minimal power loss and longer bearing life.

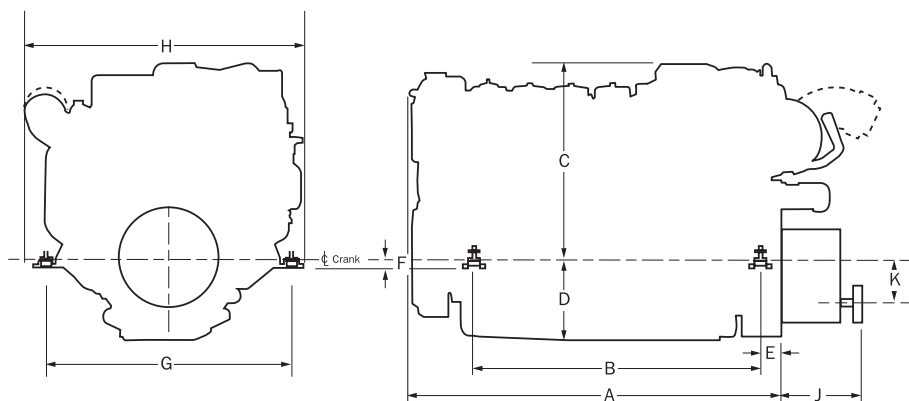
Variation to standard specification (see inside front cover) and extra optional items for this engine type

Additional standard items

Electric run/stop control
 Full power dynamometer test
 Electronic fuel injection on 'E' models
 Oil sump drain pump

Optional items

Drive belt guard
 Power take-off pulley or shaft
 Keel cooling and dry exhaust in lieu of heat exchanger system



Dimensions J & K can be found in the gearbox specification pages 9 - 13

Dimensions in mm

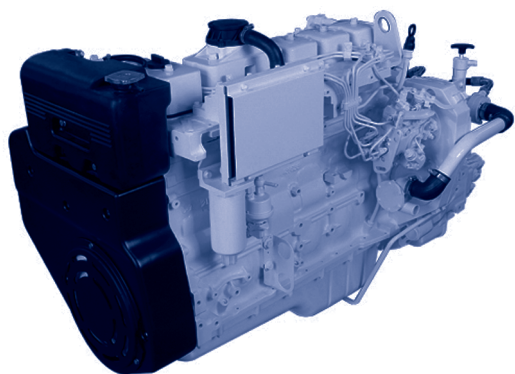
	N67-220	N67-280	N60-400E	N67-450E
A	1071	1071	1071	1089
B	888	888	889	895
C	585	585	542	552
D	236	236	236	236
E	60	60	49	55
F	115	115	115	115
G	610/710	610/710	610/710	610/710
H	710	710	739	724

Detailed specification

Engine model	N67-220	N67-280	N60-400E	N67-450E
Power Maximum H.P.	220	280	370	420
RPM Maximum	2800	2800	3000	3000
Torque Maximum Nm	700	920	1030	1270
Cubic capacity, litres	6.7	6.7	6.0	6.7
Bore, mm	104	104	102	104
Stroke, mm	132	132	120	132
Aspiration	Turbocharged		Turbocharged/Intercooled	
Engine rotation	Anti-clockwise viewed from rear			
Compression ratio	17.5:1			
Electrics 12v earth return Alt,	Amps 90			
Minimum battery size	1X180 AH 12 volt			
Minimum starter cable, length=size 0.6M = 70mm ² /1.2M = 95mm ²				
Engine operating angles				
Engine front down (degrees)	0	0	0	0
Sideways (degrees)	23	23	22	22
Engine front up (degrees)	18	18	18	18

Engine model	N67-220	N67-280	N60-400E	N67-450E
Max Fuel Flow required, lit/hour (includes return)	140	140	250	250
Fuel feed diameter, mm	9			
Fuel return diameter, mm	9			
Exhaust diameter, ins (mm)	5 (127)			
Water intake diameter, mm	45			
Coolant capacity, lit	24.5			
Oil capacity, lit	16.5			
Weight, Engine, Kg	585	605	595	600
Guide to sterngear				
Max Prop dia for gear ratio 1.5:1	22"	23"	24"	24"
Min. Shaft dia. St. St. mm	45	45	50	50
Speed range for this ratio (knots)	24+	24+	30+	30+
Max. Prop. dia. for gear ratio 2:1	28"	28"	28"	28"
Min. Shaft dia. St. St. mm	50	50	55	55
Speed range for this ratio (knots)	17-30	17-30	24-33	25-35

N-Series Diesels



N45-100 - 100 HP at 2800 RPM
N67-150 - 150 HP at 2800 RPM
'FPT by Lancing Marine', based upon a proven base engine by one of the World's leading engine manufacturers and supported by Lancing Marine giving worldwide parts availability.

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Design Features

Engine

Low noise, high strength, rugged bottom end with 7 main bearings, piston cooling, thick wall parent bore. Large diameter valves to improve volumetric efficiency. High compression ratio for faster starts and warm ups with reduced white smoke.

Fuel system

High nozzle opening pressures for high fuel efficiency and low smoke. Self air purge fuel pump, automatic excess fuel and timing retard for excellent cold starting.

Reliability

The 'FPT by Lancing Marine' range is derived from a partner collaboration of major manufacturers, extensively used in automotive, industrial and agricultural tractor applications.

Serviceability

Piston jet oil cooling for extended life. Long filter and oil change intervals (600 hours pleasure). Self adjusting poly vee drive belt for alternator and fresh water pump for low slippage with minimal power loss and longer bearing life.

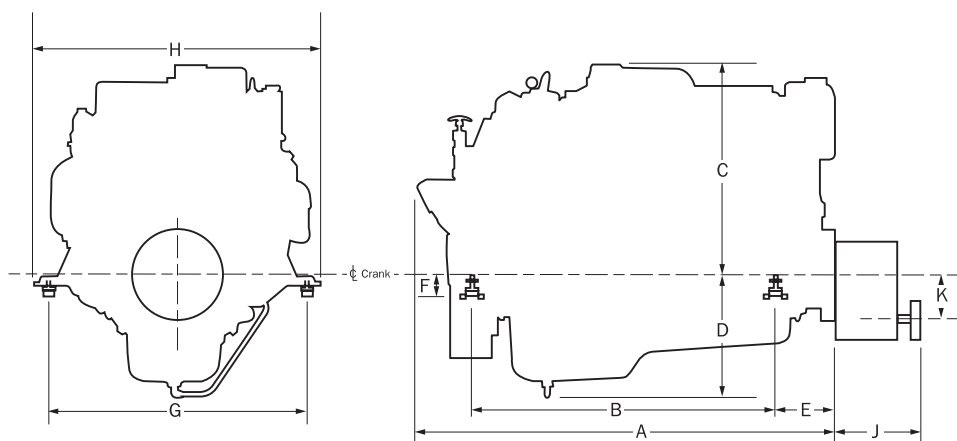
Variation to standard specification (see inside front cover) and extra optional items for this engine type

Additional standard items

Electric run/stop control
 Full power dynamometer test
 Oil sump drain pump

Optional items

Drive belt guard
 Power take-off pulley or shaft
 Keel cooling and dry exhaust in lieu of heat exchanger system



Dimensions J & K can be found in the gearbox specification pages 9 - 13

Dimensions in mm

	N45-100	N67-150
A	811	1071
B	648	888
C	585	585
D	257	335
E	60	60
F	115	115
G	610/710	610/710
H	700	705

Detailed specification

Engine model	N45-100	N67-150	Engine model	N45-100	N67-150
Power Maximum H.P. pleasure	100	150	Max Fuel Flow required, lit/hour (includes return)	140	
RPM Maximum	2800	2800	Fuel feed diameter, mm	9	
Torque Maximum Nm	310	465	Fuel return diameter, mm	9	
Cubic capacity, litres	4.5	6.7	Exhaust diameter, ins (mm)	4 (102)	
Bore, mm	104		Water intake diameter, mm	35	
Stroke, mm	132		Coolant capacity, lit	21	22.5
Aspiration	Normally aspirated		Oil capacity, lit	11.5	16.5
Engine rotation	Anti-clockwise viewed from rear		Weight, Engine, Kg	430	530
Compression ratio	17.5:1		Guide to sterngear		
Electrics 12v earth return Alt, Amps	90		Max. Prop. dia. for gear ratio 1.5:1 ins	19"	21"
Minimum battery size	1X180 AH 12 volt		Min. Shaft Dia. St. St. mm	35	35
Minimum starter cable, length=size	0.6M = 70mm ² /1.2M = 95mm ²		Speed range for this ratio (knots)	14-30	18-31
Engine operating angles			Max. Prop. dia. for gear ratio 2:1	24"	26"
Engine front down (degrees)	0		Min. Shaft Dia. St. St. mm	40	45
Sideways (degrees)	22		Speed range for this ratio (knots)	9-25	11-28
Engine front up (degrees)	20		Max. Prop. dia. for gear ratio 3:1	31"	33"
			Min. Shaft Dia. St. St. mm	50	55
			Speed range for this ratio (knots)	6-20	7-22

Vetus Marine Diesel Engines supplied by *Lancing Marine*

M2.13 - 12 HP at 3600 RPM

M2.18 - 16 HP at 3600 RPM

M3.29 - 27 HP at 3600 RPM

M4.35 - 33 HP at 3000 RPM

M4.45 - 42 HP at 3000 RPM

M4.56 - 52 HP at 3000 RPM

VH4.65 - 65 HP at 3000 RPM

VH4.80 - 80 HP at 4000 RPM

Standard design features

Normally aspirated
Lightweight
Gearbox adaptation
Indirect injection
Automatic starting aids
Fuel lift pumps
Heat exchanger cooling
Wiring harness and control panel

Spin-on oil filter
Anti-vibration mountings
Electric starting
Electric stop control
Sump pump
Water-injected exhaust
Morse control connection

Optional extras

Dieselize version for existing sterndrive
Genset or hydraulic power version
Keel cooling
Choice of extra instrumentation
"Smart" alternator control
Calorifier take-offs

Load-split charge relay
I.W. low pressure fuel hoses
Auxiliary fuel filter
Water feed for deep sea seal
Power take-off pulley
Dual station gearshift connection

Detailed specification

Engine model	M2.13	M2.18	M3.29	M4.35	M4.45	M4.56	VH4.65	VH4.80
Power, max, HP	12	16	27	33	42	52	65	80
R.P.M., max	3000	3600	3600	3000	3000	3000	3000	4000
Torque, max, N-Met	33	35	60	84	106	127	170	170
Bore, mm	76	76	76	78	78	78	91.1	91.1
Stroke, mm	70	70	70	92	92	92	100	100
Number of cylinders	2	2	3	4	4	4	4	4
Capacity, cc	635	635	952	1758	1758	1758	2607	2607
Engine rotation	anti-clockwise, viewed on flywheel							
Alternator output, standard A	75	75	75	110	110	110	115	115
Alternator output, optional A	110							
Battery capacity, A-H, min	55	55	55	55	108	108	108	108
Fuel consumption at max power, litres/hour	3.1	4.4	6.8	7.9	10.1	12.2	15	21
Specific fuel consumption, best, gms/HP/hour	195	196	199	185	185	180	188	188
Fuel feed pipe diameter, mm	8	8	8	8	8	8	8	8
Fuel return pipe diameter, mm	8	8	8	8	8	8	8	8
Sea water inlet diameter, mm	20	20	20	20	20	28	25	25
Exhaust outlet diameter, mm	40	40	40	50	50	60	75	75
Coolant capacity, liters	2.2	2.2	3.0	6.5	6.6	6.6	12	12
Oil sump capacity, liters	2.4	2.4	3.6	5.6	5.6	5.6	7	7
Weight, ready for gearbox, Kg	98	98	125	185	185	180	216	221

Engine dimensions mm

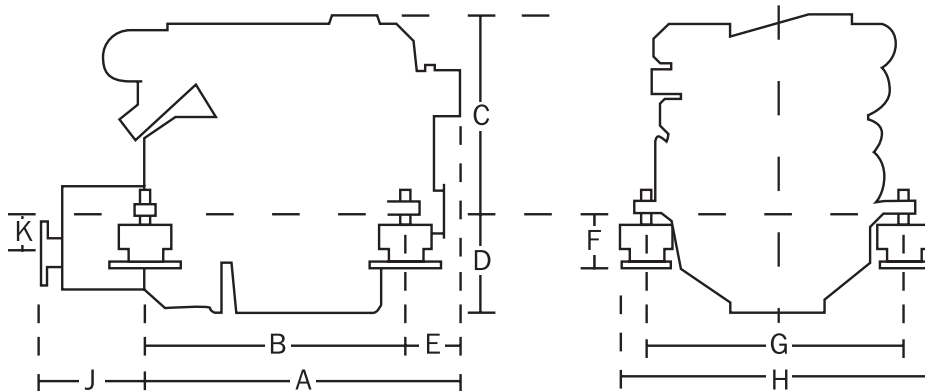
Engine model	M2.13	M2.18	M3.29	M4.35	M4.45	M4.56	VH4.65	VH4.80
A	469	469	552	660	660	659	719	719
B	350	360	443	585	585	585	585	585
C	350	350	350	399	399	399	460	460
D	178	178	178	195	195	195	179	179
E	109	109	109	75	75	74	134	134
F	58-92	70-92	87-95	60-87	60-87	60-87	79	79
G	430	430	430	430	430	430	465	465
H	495	505	516	490	490	490	643	643

J & K

see appropriate gearbox information page

All numerical data certified within $\pm 5\%$

Vetus[®]
MARINE DIESEL ENGINES
supplied by



Ford FSD 2.5 litre 4 cylinder marine diesel



FSD - 65HP at 3500 RPM
only available built on used base engine

Ford parts support throughout Europe and 170 countries worldwide

Engine specifications may vary as improvements are introduced
 Specifications are subject to change without notice and are not for engineering purposes

See the Lancing Marine Boatbuilder's Guide for Complete Installation Kit
 Lancing Marine reserve the right to alter specifications without notice

Design Features

Engine

Well proven, normally aspirated.
 Suitable for shaft, sterndrive or jetpump installations.

Fuel system

Direct injection for good starting,
 with pre-set minimum and maximum speed control.

Low fuel consumption

Precise fuel management system includes an automatic timing advance and torque control unit, to control maximum fuel delivery throughout the speed range.

Reliability

Meets high reliability and durability demands. Cast iron cylinder head with optimised gas flow.

Serviceability

Low maintenance requirements, 4 rib Poly-Vee belt for low slippage. Easy access to all serviceable components.

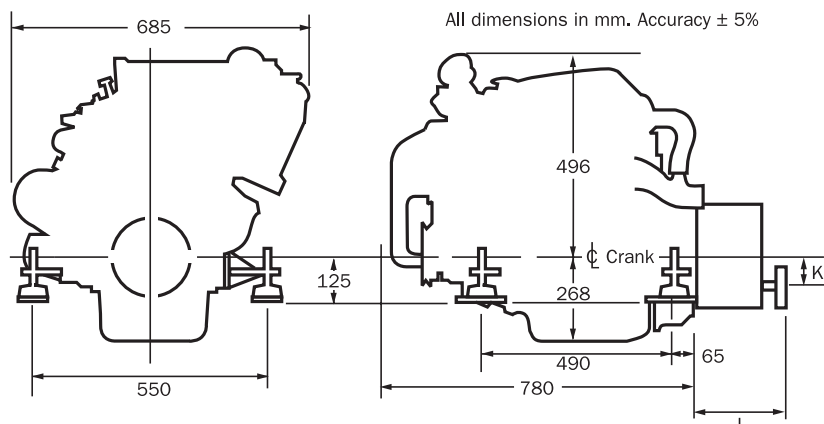
Variation to standard specification (see inside front cover) and extra optional items for this engine type

Additional standard items

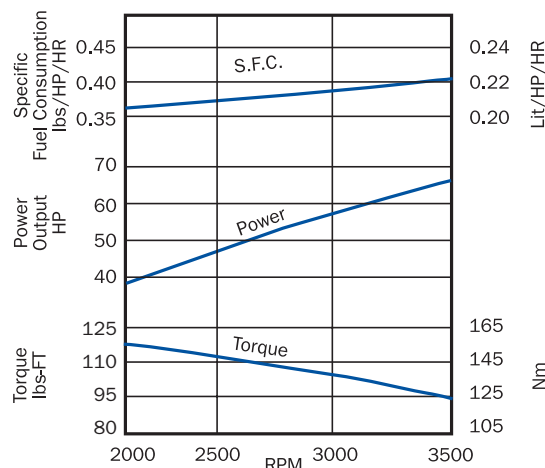
Electric run/stop control
 Single groove P.T.O. pulley
 Water injected exhaust outlet
 Transmission attachment parts
 Low oil pressure and high water temperature switches with alarm

Optional items

Keel cooling and dry exhaust in lieu of heat exchanger system
 High-rise exhaust
 "Dieselise" package for stern drive use
 Aluminium sump



Dimensions J & K can be found in the gearbox specification pages 9 - 15

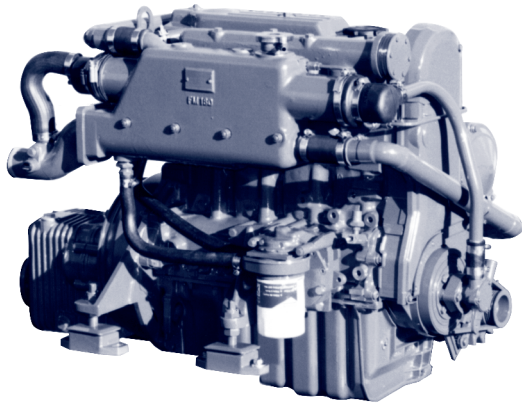


Detailed specification

Engine model	FSD
Power Maximum H.P.	65
RPM Maximum	3500
Torque Maximum Nm	170
Cubic capacity, litres	2.5
Bore, mm	93.7
Stroke, mm	90.5
Aspiration	Natural
Engine rotation	Anti-clockwise viewed from rear
Compression ratio	18.3:1
Electrics 12v earth return Alt, Amps, as available	55-90
Minimum battery size	1X85 AH 12 volt
Minimum starter cable, length=size	0.6M = 40mm ² /1.2M = 70mm ²
Engine operating angles	
Engine front down (degrees)	5
Sideways (degrees)	15
Engine front up (degrees)	15

Engine model	FSD
Max Fuel Consumption, lit/hour	15
Fuel feed diameter, ins (mm)	5/16 (8)
Fuel return diameter, ins	5/16 (8)
Exhaust diameter, ins (mm)	2 (50)
Water intake diameter, mm	28
Coolant capacity, lit	13
Oil capacity, lit	7.1
Weight, Engine, Kg	263
Guide to sterngear	
Max. Prop. dia. for gear ratio 1.5:1 ins	15"
Min. Shaft Dia. St. St. ins (mm)	1 (25)
Speed range for this ratio (knots)	11-22
Max. Prop. dia. for gear ratio 2:1	19"
Min. Shaft Dia. St. St. ins (mm)	1 1/4 (32)
Speed range for this ratio (knots)	7-16
Max. Prop. dia. for gear ratio 3:1	23"
Min. Shaft Dia. St. St. ins (mm)	1 3/8 (35)
Speed range for this ratio (knots)	5-10

Ford XLD 1.8 litre 4 cylinder diesel



XLD - 55 HP at 4000 RPM
XLD LP 40HP AT 2800RPM
only available built on used base engine

Ford parts support throughout Europe and 170 countries worldwide

Engine specifications may vary as improvements are introduced Specifications are subject to change without notice and are not for engineering purposes

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Design Features

Engine

Well proven, normally aspirated. Light weight, suitable for shaft, sterndrive or jetpump installations.

Fuel system

Indirect rotary injection pump with pre-set minimum and maximum speed control and integral lift pump. Good starting with integral thermostat/hydraulic advance and automatic high speed glow plugs.

Reliability

Meets high reliability and durability demands. Self air-purging fuel pump, longer life engine with a fully closed crankcase breathing system which greatly reduces oil sludge formation.

Serviceability

Low maintenance requirements, Easily adjustable alternator mount bracket. Low slip Poly-Vee belt.

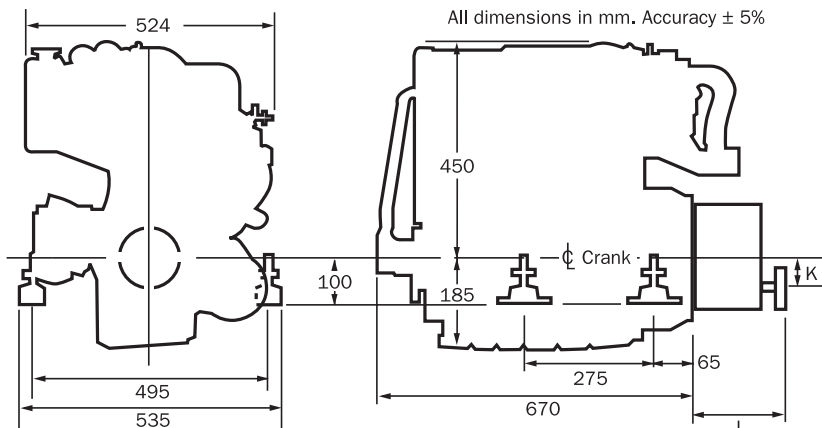
Variation to standard specification (see inside front cover) and extra optional items for this engine type

Additional standard items

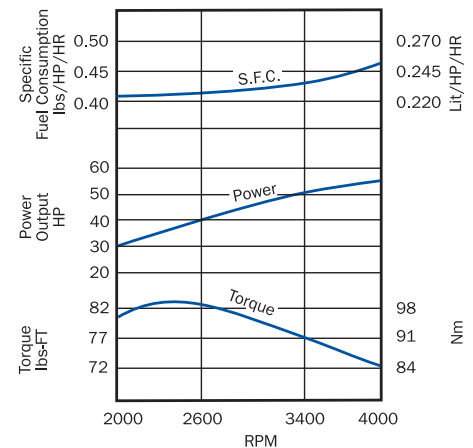
Electric run/stop control
 Water injected exhaust outlet
 Transmission attachment parts
 Low oil pressure and high water temperature switches with alarm

Optional items

Single-groove power take-off pulley
 Keel cooling and dry exhaust in lieu of heat exchanger system
 High-rise exhaust
 "Dieselise" package for stern drive use
 Charge amplifier for domestic battery charging



Dimensions J & K can be found in the gearbox specification pages 9 - 15



Detailed specification

Engine model	XLD LP	XLD	Engine model	XLD LP	XLD
Power Maximum H.P.	40	55	Max Fuel Consumption, lit/hour	9.2	12.5
RPM Maximum	2800	4000	Fuel feed diameter, ins (mm)	$\frac{5}{16}$ (8)	$\frac{5}{16}$ (8)
Torque Maximum Nm		108	Fuel return diameter, ins	$\frac{5}{16}$ (8)	$\frac{5}{16}$ (8)
Cubic capacity, litres		1.8	Exhaust diameter, ins (mm)	2 (50)	2 (50)
Bore, mm		82.5	Water intake diameter, mm	28	28
Stroke, mm		82	Coolant capacity, lit	8.5	8.5
Aspiration		Natural	Oil capacity, lit	5.7	5.7
Engine rotation		Anti-clockwise viewed from rear	Weight, Engine, Kg	184	184
Compression ratio		21.5:1	Guide to sterngear		
Electrics 12v earth return Alt, Amps, as available	55-90		Max. Prop. dia. for gear ratio 1.5:1 ins	17"	14"
Minimum battery size		1X65 AH 12 volt	Min. Shaft Dia. St. St. ins (mm)	1 (25)	1 (25)
Minimum starter cable, length=size		0.6M = 25mm ² /1.2M = 40mm ²	Speed range for this ratio (knots)	7-20	9-25
Engine operating angles			Max. Prop. dia. for gear ratio 2:1	19"	17"
Engine front down (degrees)		5	Min. Shaft Dia. St. St. ins (mm)	1 (25)	1 (25)
Sideways (degrees)		15	Speed range for this ratio (knots)	6-15	8-17
Engine front up (degrees)		15	Max. Prop. dia. for gear ratio 3:1	23"	20"
			Min. Shaft Dia. St. St. ins (mm)	$1\frac{1}{4}$ (32)	$1\frac{1}{4}$ (32)
			Speed range for this ratio (knots)	5-10	7-12

A QUICK GUIDE TO ENGINE SWAPS

Dieselize your gas-guzzling sterndrive and save the whole cost of a new engine in 300 hours full power use!

Initial considerations

1. Determine the power that you require from your new (slightly heavier) diesel engine, by reference to performance on your existing gasoline power, or from the Lancing Marine computer. Remember that gasoline engines give 30-40hp less than their model numbers might indicate.
2. If your required swap is shown on the spreadsheet on page 20 of the Price Book, you can be reasonably sure that the job is technically feasible.
3. Check that you have enough room for the new engine(s) by reference to the dimensions on pages 4 & 5, or measurement of your proposed engine. Ask Lancing Marine for final advice.

Engine removal

Volvo

Remove drive cover and disconnect control cable. Remove steering pivot screw, rubber bellows and clamps.

Support drive and remove lock screws. Drive pivot pins inwards into bellows area using a suitable drift and a 2lb. hammer.

Pull drive aft to disengage drive line. Early type 100 drives will dump their oil if laid on their sides.

Support engine with hoist. Remove 6 bolts and 3 locktabs from around the outside of the driveshaft housing. Grease the three holes now exposed and insert 3 of the bolts into these holes, and tighten to 50 lbs-ft.

This should jack the locking off of the driveshaft housing. Heating locking with gas torch may help.

If this proves difficult, consult Lancing Marine for further advice.

Mer cruiser

Remove nuts and washers from outer ends of trim rams and pull rams sideways to disengage.

Shift gearshift into forward gear and remove 6 stainless nuts on back of upper gear case.

Take the weight of the drive on lift eye with a rope from above.

Lift the leg part way and drop it down. This should cause the upper unit to kick out and disengage the drive line, allowing the whole unit to be pulled out of the transom shield.

Undo two rear engine mount bolts. Nuts should be captive in the inner transom shield.

All engines

Disconnect battery cables from engine and battery
Disconnect fuel hose and ensure that it cannot spill fuel.

Disconnect water inlet hose and exhaust outlet hose(s).

Disconnect wiring harness at multi-pin plug.

Disconnect control cable(s) fixed to engine.

Disconnect any extra items connecting engine to boat.

Disconnect front mounts from the hull. (if present)

Lift engine forwards and upwards with suitable lifting equipment.

Take care as it is quite heavy....

COMPONENT REMOVAL

Remove wiring harness from engine, together with senders.

Remove flywheel housing from engine.

Remove Mercruiser coupling from engine.

Remove exhaust connection from transom shield if a blanking plate is to be fitted.

ASSEMBLY AND INSTALLATION

Follow guidance notes supplied with engine.

General notes

D-I-Y kits contain all marinisation and modification parts and services to complete ex-vehicle engines to specifications similar to those of our completely prepared engines. The engine swaps listed are the more popular ones, but others can be quoted on a one-off basis. Whilst every attempt is made to ensure 100% compatibility, there may be variations of makers' specifications or boatbuilders installations that we have not foreseen, in which case we will try to vary the parts we supply at least possible cost. Existing installation photographs will often help us to customise the equipment we supply at minimal extra cost.

Fuel tanks that are galvanised or zinc plated inside must have their interiors protected from the effects of diesel fuel, owing to its high sulphur content. Diesel engines to be used on inland waterways require fuel system modification. See price book.

A higher standard of fuel filtration is required for diesel engines than for gasoline, so we suggest the fitment of our pre-filter with water separator. The following parts need to be sent with your order to Lancing Marine for modification or installation on the replacement engine:-

Flywheel housing Engine half wiring harness

Temperature and oil pressure senders Flywheel coupling

Power steering pump and mount

Exhaust connection from transom shield, if modification is required, or blanking plate to be made.

IF IN DOUBT, ASK LANCING MARINE FOR HELP.

Kits for D-I-Y dieselisation and marinisation for other drive systems are also available

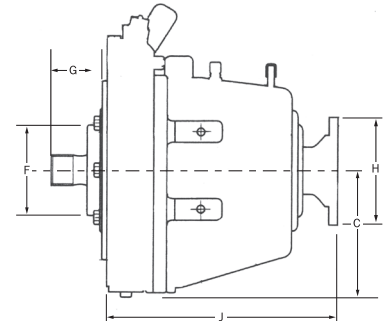
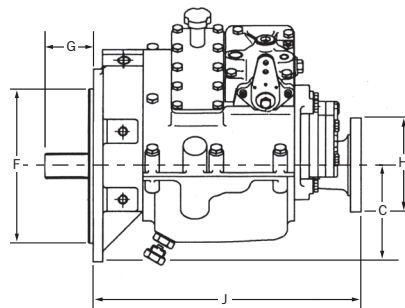
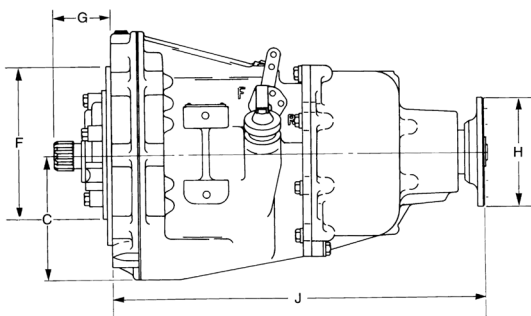
Do's and Don'ts of D-I-Y Marinisation

1. First try to establish just how much power you need in order to obtain the performance you require from the boat that you wish to power, either by asking the original boatbuilder or by using Lancing Marine's propeller and speed calculation computer program.
2. Look for engines of suitable power that also appear in the pricebook, and avoid non-listed engines, as you may find marinisation parts for them practically unobtainable.
3. Try to obtain engines that are still in good running order, either from crashed vehicles, or from M.O.T. failures. Don't buy an engine that is not in running order, as it is often more expensive to repair a worn-out motor than to buy a brand new one.
4. Always ask to see the engine run before buying it. Watch for white or blue smoke from the exhaust, fumes blowing out of the oil filler, and listen for knocks, especially on the over-run as you blip it, and at idle. These are all portents of potential disaster. Look at the oil on the dip-stick and if it is very black and sludgy, the piston rings may be badly worn.
5. Before stripping any parts, give the engine a good scrub with Jizer and hose it off. This makes the job much more pleasant. Then remove external automotive parts that will not be re-used, and drain the engine oil.
6. Lay the engine on its side, or stand it on end on its flywheel, taking care that it will not fall over, and remove the sump. Examine the residue in the sump for metal particles, and odd parts that may have fallen off. If you find anything like this, start worrying . . .
7. Remove bearing caps and examine bearings and journals, push feeler gauges up between the piston skirt and the bore to measure the wear, and examine all the lobes of the camshaft. If you find any serious damage or wear at this stage, reject the engine and ask your supplier for a better one, as it is a lot cheaper to start on another one than to try to repair serious faults.
8. Reassemble the engine, do normal service checks, and fit the marinisation parts, gearbox, mountings, etc. If you have any problems in this respect, then phone Lancing Marine for advice.
9. Prior to installation in the boat, fill up with water and lubricants, connect up a fuel supply, battery cables, and fit on your exhaust hose, and silencer if you have one, so that it dumps into a clean tank. Fill the tank with water and connect a hose from the tank to the water pump pick-up.
10. Make sure the engine cannot fall over, and fire it up. Check oil pressure as soon as it starts and run it for long enough to get well warmed up, checking for leaks and unusual noises, and re-checking the oil pressure. Take time over testing, as it is much easier to correct faults whilst the engine is out of the boat, than it is once it has been installed.
11. "Whatever happens do not panic. Instead phone Mike Bellamy on 01273 410025".



HAPPY BOATING

In-line hydraulic engagement gearboxes



Make	VELVET DRIVE			PRM		ZF MARINE		
Model	71/71L ^④	72/72L/72LX ^④	72 ^④	260C	750C	ZF45C ^④	ZF63C ^④	301-1C ^④
REDUCTION RATIOS :1	1.00	1.00	(1.52)		(1.09)	1.00	1.00	(1.00)
IN FORWARD (AS ENGINE)			(1.88) ^③	1.96	1.94			1.24
ROTATION			2.57	2.94	[2.90]			1.41
REDUCTION RATIO ^① IN REVERSE	1.00	1.10	+10%	SAME AS FORWARD		1.03	1.03	SAME AS FORWARD
Weight W Kgs	43/28	49/32	69	63	93	31	32	87
Length J mm	267	291	452	360	400	267	267	344
Depth C mm	144	144	144	117	155	145	145	200
Spigot F mm	209	209	209	209	209	209	209	SAE 1, 2, 3
Shaft G mm	65	65	65	65	65	65	65	SAE11½, 14
Flange H ins	4	5	5	5	5¾ ^⑤	4	5	5¾ TD
Max Diesel HP/100*	5.7/7.8	8.6/4.9/14.2 ^②	8.6(7.1)	3.6	(10.5)9.5[8]	7.4	9.6	19.4 (15.0)
MAX RPM	6000	6000	6000	4500	4500	5500	5500	3000
Cooler size (min)	1	2	2	2	3	1	1	2
Lubricant	ATF Dextron Made in USA			Engine Oil Made in England		ATF Dextron Made in European Community		

① Short term, low power use only, except PRM boxes which will take full power in both directions

② High power variants available, 72LH 19.0, 72LHP 26.7. Dimensions change to W=39, J=323, C=241, F+77

③ Output rotation is opposite to input

* Pleasure boat rating

④ Also available as an integral Vee-drive, request information

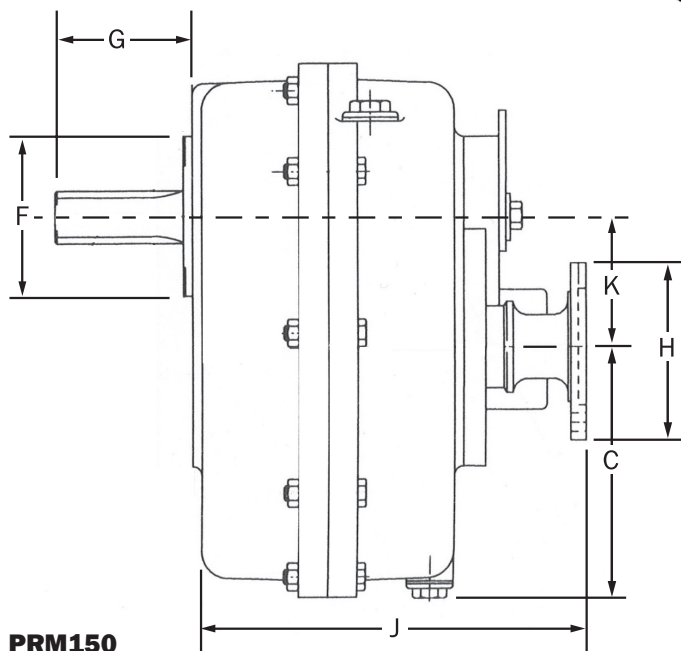
⑤ If fitted with MT0530 adaptor, H=5, J=452, W=98

Installation parts available include:- Flywheel housings and adaptors, flywheel drive plates, oil coolers, shift cable connection kits, flexible couplings, shaft half couplings, C.V shafts and thrust bearings

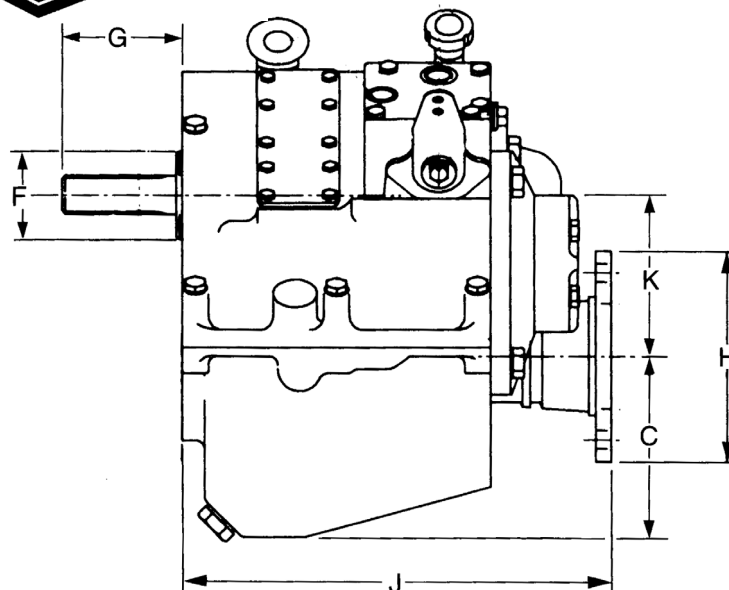
Electric shift available (aftermarket on PRM)

All gearboxes may be operated with single lever remote controls, and will accept propeller shaft thrust. Always fit a flexible coupling.

Drop centre hydraulic engagement gearboxes



PRM150

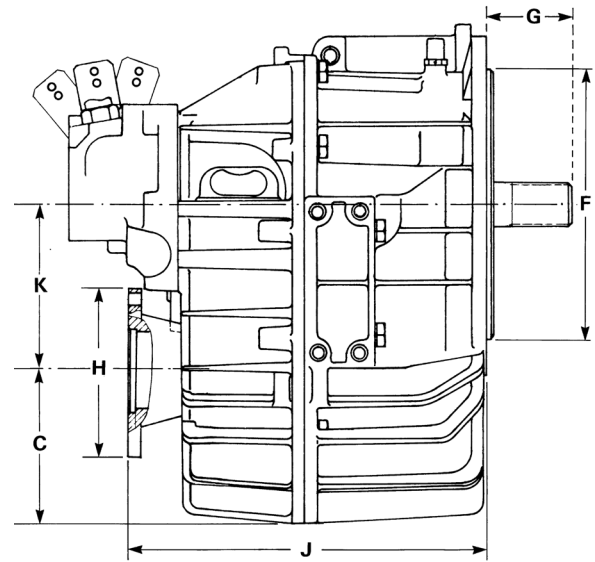
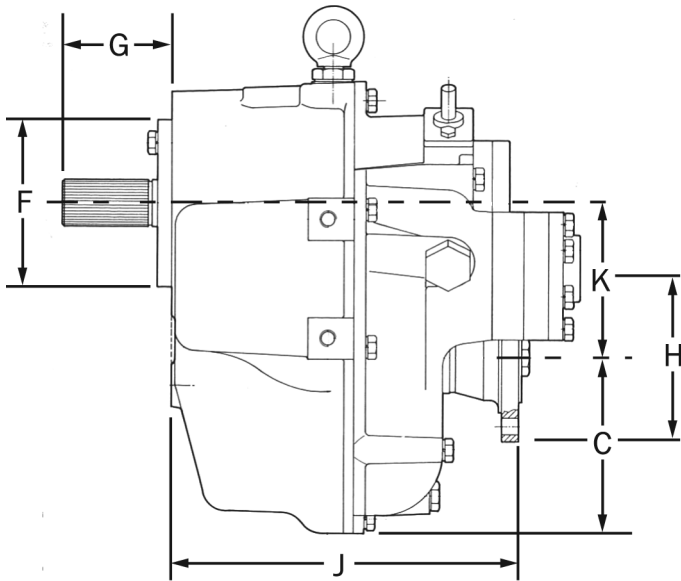


PRM280-1000

Make		PRM									
Model		150	280	500	750	750	1000	1000	1500SC**	1500DC**	
REDUCTION RATIOS :1		1.50	1.96	1.46	(1.09) (1.46)	3.95	(1.53) 2.03	4.00	1.22/1.56 1.94	3.12	
		2.10	1.96	1.94	1.94	[2.90]	[2.86]	2.25	2.45	4.50	
		2.82	2.94	[2.90]	[2.90]			(3.00)	(4.90)		
Weight	W Kgs	21	48	68	72	80	86	93	260	300	
Length	J mm	216	293	314	314	314	290	290	513	513	
Drop	K mm	74	89	121	121	153	135	174	188	248	
Depth	C mm	122	117	121	155	140	127	162	200	180	
Spigot	F mm	88	50.8	63.5	63.5	63.5	88.5	88.5	SAE3	SAE1,2	
Shaft	G mm	75	95	89	89	89	76	76	60	60	
Flange	H ins	4	5	6	6	6	6	7 ¼	7 ¼	10 ½	
Max Diesel HP/100*		2.1	3.9	6.4[6.2]	(10.5)9.5[8.0]	8.0	(14.4)12.6[11.5]	11.5	21(18.9)	21(18.3)	
Max RPM		5000	4500	4500	4500	4500	3500	3500	3000	3000	
Cooler size (min)		1	1	2	2	3	2	3	4	4	
Lubricant		Engine Oil									
*Pleasure boat rating		PT.O. available on 280 - 1750, SAE B, 13-spline Get you home device fitted After market trolling valve and electric shift available on 280 - 1750 All PRM gearboxes except 150, 1500 & 1750 may be ordered for non-standard input rotation. All gearboxes may be used with either rotation propeller. High flow oil pump available on 1000 for engines with low idle speeds					** details for 1750SC/DC identical except - power rating is 24.6, (4.9:1 - 22.5)				
		Made in England									

Installation parts available include:- Flywheel housings and adaptors, flywheel drive plates, oil coolers, shift cable connection kits, flexible couplings, shaft half couplings, C.V shafts and thrust bearings

All gearboxes may be operated with single lever remote controls, and will accept

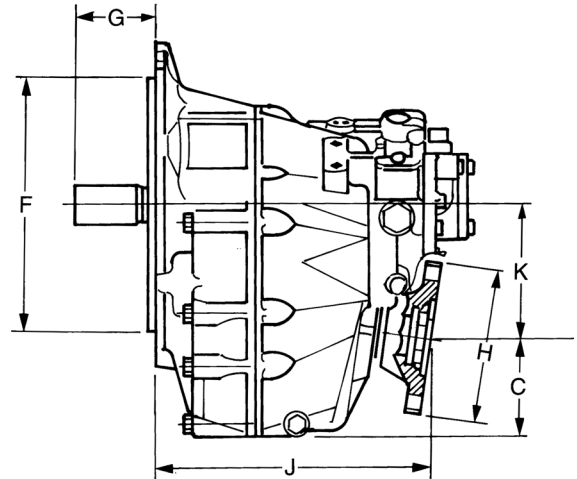
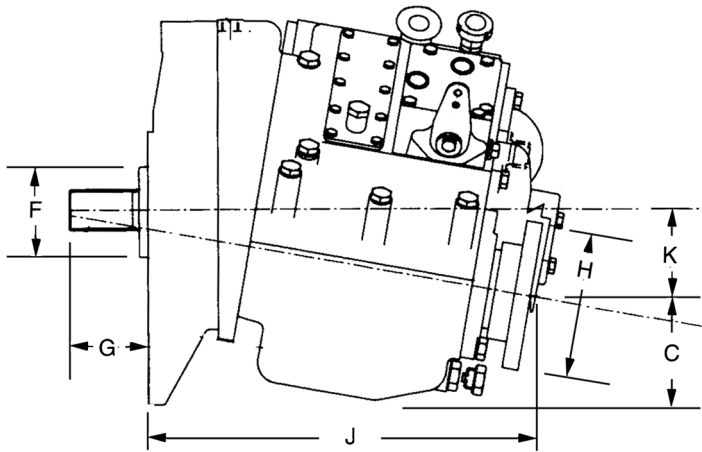


TECHNODRIVE				ZF (PREVIOUS HURTH HSW TYPES)				
345	93	170	265 ^③	25(250H)	45(450H)	63(630H)	220	280-1
(1.54)	(1.51)	(1.50)	(1.17)	1.97	2.20	1.51, 1.75	1.00	0.8, 1.00
2.00	2.09	(2.04)	1.50		2.51	1.95	1.24	1.06, 1.14
[2.47]	[2.40]	2.50	2.09		3.03	(2.48)	1.96	1.21, 1.30
[2.47]	{2.77}	[2.94]	2.82	(2.80)	3.74	(2.79)	2.48	1.51, 2.00
							(3.00)	2.48, 3.00
25	55	78	165	24	60	46	63	73
255	258	253	408	270	222	273	287	299
97	110	132	158	99	151	127	135	146
95	126	131	177	101	139	119	125	131
209	120	120	SAE 1,2,3 ^①	92	111FEM	209	111FEM	111FEM
65	78	78	SAE11½, 14 ^①	83	74	65	95	71
5	5	5	5¾T.D.	4	5¾	5	5¾T.D.	5¾T.D.
(4.8)3.8[2.9]	(7.2)6.2[5.5]{4.8}	(10.4)8.4[7,2]	15	4.4(3.4)	6.3	9.6(7.9)	13.2(11.5)	18.7
4500	4500	4000	300	5500	5500	5500	4500	3300
1HP	2HP	2HP	3HP	1	2	1	3HP	4HP
SAE 20W/40 Engine Oil				ATF Dextron			SAE30 Engine Oil	
^① Not included in basic cost of gearbox ^③ P.T.O. SAE.B available				Electric shift available		PTO flanges available		
				Trolling valves available				
All gearboxes may be used with either rotation propeller.				All gearboxes may be used with either rotation propeller.				
Made in European Community				Made in European Community, except 45 (Brazil)				

Installation parts available include:- Flywheel housings and adaptors, flywheel drive plates, oil coolers, shift cable connection kits, flexible couplings, shaft half couplings, C.V shafts and thrust bearings

propeller shaft thrust. Always fit a flexible coupling

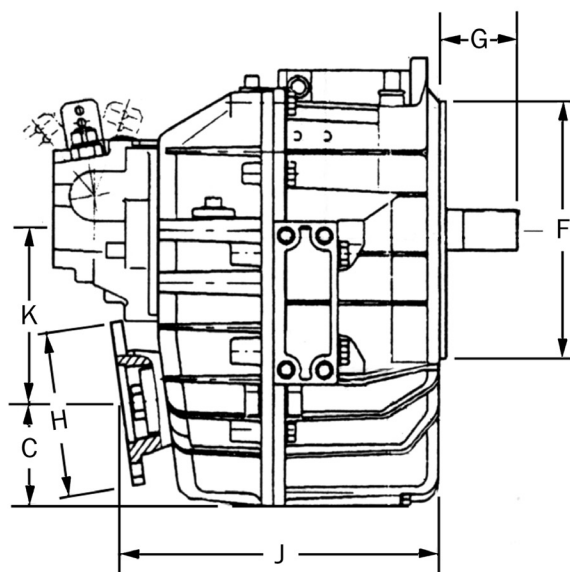
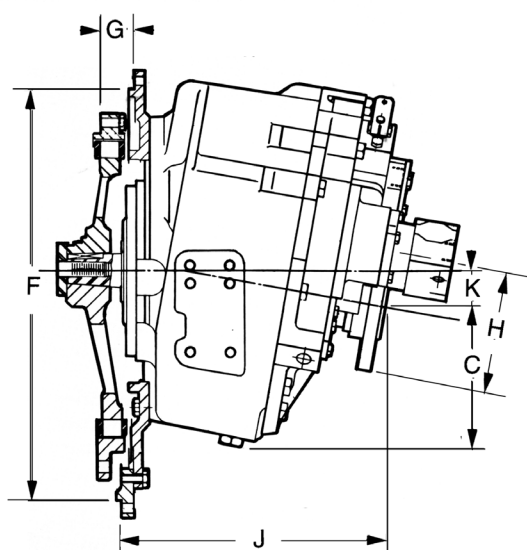
Angle-drive hydraulic engagement gearboxes



Make		PRM		TECHNODRIVE		
Model		750A	1000A	TM345A	93A	265A ①
REDUCTION RATIOS :1		1.09 1.46 (1.94) (2.57) [2.90]	1.53 (2.03) [2.86]	(1.54) 2.00 [2.47]	(1.51) 2.09 [2.40]	(1.44) 2.09 [2.30]
ANGLE		8°	10°	8°	8°	7°
Weight	W Kgs	90	118	25	51	165
Length	J mm	400	381	224	245	406
Drop	K mm	76	86	111	125	176
Depth	C mm	75	75	83	110	159
Spigot	F mm	63.5	88.5	209	120	SAE1,2,3
Shaft	G mm	89	76	66	78	SAE11½, 14
Flange	H ins	5 ¾	5 ¾	5	5	5¾TD
Max Diesel HP/100*		9.6(9.5)[8.0]	12.9(12.6)[11.5]	(4.8)3.8[2.9]	(6.6)5.5[4.8]	(14.9)13.8[12.5]
Max RPM		4500	3500	4500	4500	3000
Cooler size (min)		3	4	1HP	2HP	3HP
Lubricant		Engine Oil		SAE20/40 Engine Oil		
Notes and options * Pleasure boat rating		Aftermarket trolling valves and electric shifts, PTO Mountings, SAE,B, 13 spline Get you home device as standard All gearboxes may be ordered for non-standard input rotation Made in England			Trolling valves ① P.T.O., SAE,B	
					Made in European Community	

Installation parts available include:- Flywheel housings and adaptors, flywheel drive plates, oil coolers, shift cable connection kits, flexible couplings, shaft half couplings, C.V shafts and thrust bearings

All gearboxes may be operated with single lever remote controls, and will accept

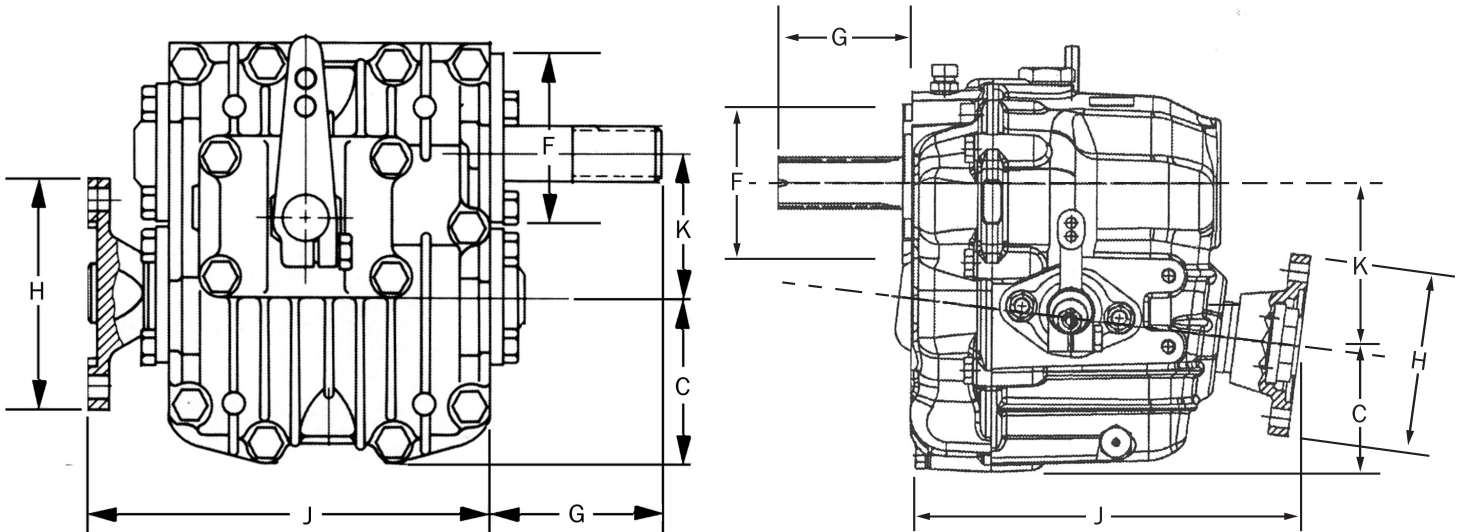


VELVET		ZF (PREVIOUS HURTH HSW TYPES)					
5000/6000	25A(250A)	45A(450A)	63A(630A)	85A(800A)	220A	280-1A	286A
1.0, 1.25	1.55	1.26	1.22	1.57	1.23	1.12	1.20, 1.48
1.50	1.93	1.51	1.56	1.75	1.53	1.48	1.75, 1.92
2.0	(2.29)	2.03	2.04	1.96	1.75	1.77	(2.20)
2.45	(2.48)	(2.43)	(2.52)	(2.50)	2.04	2.00, 2.27	(2.39)
(2.80)	(2.71)		(2.70)		(2.45)	2.45	[2.50]
8°	8°	8°	8°	8°	10°	7°	7°
49	24	28	44	69	50	73	77
228	216	228	265	291	246	280	300
151	115	126	144	160	145	147	149
97	75	79	82	112	116	114	126
209	92	209	209	209	111FEM	111FEM	111FEM
65	83	65	65	71	93	71	55
5	4	5	5	5 ¾TD	4 ¾TD	5 ¾TD	5 ¾TD
9.5/11.4(8.6)	4.4(3.4)	6.3(5.9)	9.6(8.4)	14.9	12.5(11.5)	18.8(16.2)	23.0(20.2)[18.5]
5000	5500	5500	5500	4500	4500	3600	3600
2	1	2	2	3	3HP	4HP	4HP
ATF	ATF Dextron				SAE30 Engine Oil		
V-Drive version available	Electric shift controls V-Drive versions (not 25A)		PTO mountings Trolling valves				
Made in USA	Made in European Community						

Installation parts available include:- Flywheel housings and adaptors, flywheel drive plates, oil coolers, shift cable connection kits, flexible couplings, shaft half couplings, C.V shafts and thrust bearings

propeller shaft thrust. Always fit a flexible coupling

Mechanical engagement gearboxes



Make ZF (PREVIOUS HURTH HBW TYPES)

Model	10M** (100)	12M (125)	15M (150)	15MIV (150V)	15MA (150A)	25M (250)	30M
REDUCTION	-		1.56 ^o			-	
RATIOS :1	(1.86 ^A)	(1.95 ^A)	1.88 ^o	2.13 ^o	1.88 ^o 2.14 ^o	1.88 ^o	2.15 ^o
^A As engine rotation	2.05 ^o	2.14 ^o	(1.95 ^A)	(2.22 ^A)2.72 ^o	(1.95 ^A)	(2.10 ^A) 2.27 ^o	(2.64 ^A)
^o Opposite rotation	(2.72 ^o)	(2.63 ^o)		(2.99 ^o)	2.63 ^o	(2.74 ^o)	2.70 ^o
Weight W Kgs	10	13	13	20	13	18	33
Length J mm	180	192	192	265	194	218	254
Drop K mm	62	72	72	147 at 15°	94 at 8°	85	90
Depth C mm	73	86	86	106	76	93	94
Spigot F mm	88	88	88	88	88	92	92
Shaft G mm	75	75	75	75	75	83	62
Flange H ins	4	4	4	4	4	4	4
Max Diesel HP/100*	1.4(0.9)	1.8(1.5)	2.0	2.0(1.5)	2.0(1.5)	3.6(2.4)	3.2(2.6)
Max RPM	5000	5000	5000	5000	5000	5000	5000
Cooler size	H	H	H	H	H	H	H
Lubricant	Automatic transmission fluid, Dextron ZF 12M, 15M and 25M gearboxes may be ordered for non-standard input rotation May be locked in astern or trailed while sailing Made in European Community						

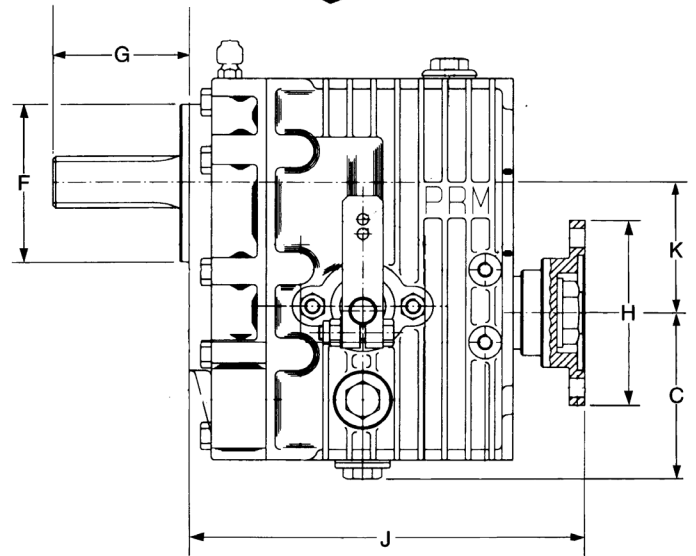
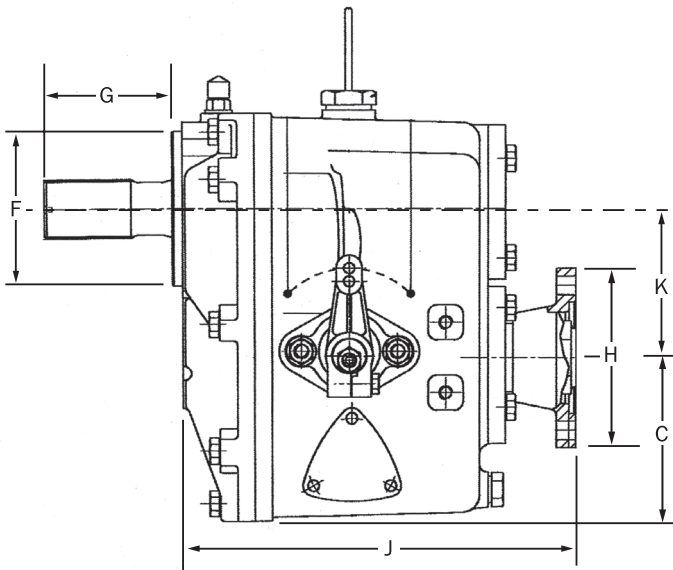
*Pleasure boat rating for 4 cylinder engines. 2 or 3 cylinder ratings are lower

**No longer available. Information given for comparison purposes

Lancing Marine are able to modify any of these boxes for horizontal offset at extra charge

Installation parts available include:- Flywheel housings and adaptors, flywheel drive plates, oil coolers, shift cable connection kits, flexible couplings, shaft half couplings, C.V shafts and thrust bearings

All gearboxes may be operated with single lever remote controls, and will accept



TECHNODRIVE				PRM		
TMC40 M TYPE	TMC60 M TYPE	TMC60A	TMC260	60	90	125
1.45 ^o	1.54 ^o	-	1.54 ^o	[1.50 ^o]	2.04 ^o	2.04 ^o
2.00 ^o	2.00 ^[o]	2.00 ^o	2.00 ^[A]	2.00 ^o	[2.47 ^o]	[2.50 ^o]
(2.13 ^A)	[2.45 ^{o(A)}]	(2.17 ^A)	2.47 ^[A]	2.05 ^A	[2.50 ^A]	(2.50 ^A)
2.60 ^o	(2.83 ^o)	2.45 ^o	(2.88 ^o)	2.50 ^o		[2.94 ^o]
9	14	16	19	9	13	16
160	225	218	225	160	196	217
67.5	79	91@7°	85	67.5	72	72
63	82	71	93	70.5	76	76
88	88	88	88	88	88	88
75	75	75	80	75	75	75
4	4	4	4	4	4	4
1.0(0.7)	2.1[1.7](1.4)	1.8(1.2)	3.0(2.5)[2.0]	[0.98]0.85	1.26[1.1]	1.75(1.39)1.15
4500	5000	4500	5000	4500	4500	4500
—	—	—	—	—	—	—
Automatic transmission fluid, Dextron May be locked in astern or trailed while sailing				Automatic transmission fluid, Dextron May be locked in astern or trailed while sailing		
Made in European Community				Made in England		

^o indicates output rotation opposite to engine

^A is as engine rotation

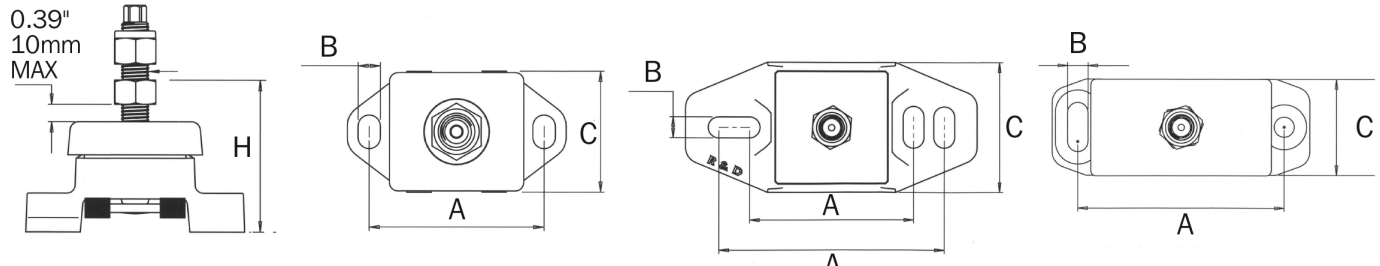
Lancing Marine are able to modify any of these boxes for horizontal offset at extra charge

Installation parts available include:- Flywheel housings and adaptors, flywheel drive plates, oil coolers, shift cable connection kits, flexible couplings, shaft half couplings, C.V shafts and thrust bearings

propeller shaft thrust. Always fit a flexible coupling

R & D Marine Engine drive plates, mountings & couplings

Engine mountings



Sheer							Double-acting							Yanmar						
Style	A	B	C	H	S	Full Load	Style	A	B	C	H	S	Full Load	Style	A	B	C	H	S	Full Load
	(mm)	(mm)	(mm)	(mm)	Thread	Rating, Kg		(mm)	(mm)	(mm)	(mm)	Thread	Rating, Kg		(mm)	(mm)	(mm)	(mm)	Thread	Rating, Kg
C-Type	102	13	72	56	5/8" UNF	86, 136	Sheer, large	102	13	92	71	3/4" UNF	345	Yanmar Y50	128	12.5	60	100	M16	60
Sheer, small	102	13	56	56	5/8" UNF	42, 78	Double-acting	102-140	13	70	78	5/8" or 3/4"	190, 305	Yanmar Y70-Y200	175	12.5	60	100	M16	60, 73, 109, 146
Sheer, medium	102	13	70	78	5/8" or 3/4"	80, 105, 156, 255, 309														
Sheer, long	127-140	13	70	78	5/8" or 3/4"	81, 106, 187, 256, 310														

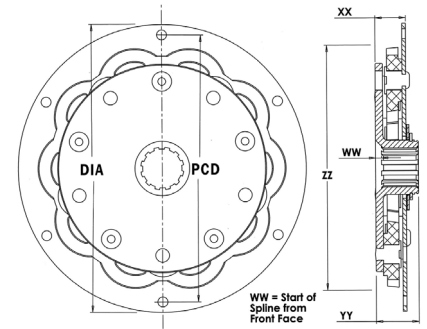
Engine and gearbox weight is often split 40/60 front/rear. Full load of selected mount should be about twice the weight of the corner of the engine it is supporting.

Flywheel drive plates

Drive Plate Selection

If replacing an existing R & D drive plate, look for its code number (something like "15M2") stamped close to the edge if the plate on the gearbox side. Otherwise, do the following:-

1. Identify the spline of your gearbox from the table below.
2. Chose element. Select High Def for 3 or 4-cyl engines and for 6-cyl with light flywheels like Cummins and Perkins, as these are best at eliminating gearbox rattle. Hammer Head can be used if there is not enough space for the High Def element though rattle absorption is not as good. Loop elements can be used on 6-cylinder engines like Ford and Gardner with heavier flywheels where rattle is not a major problem.
3. Measure your flywheel in both Imperial and Metric units, as most common flywheels are drilled in Imperial, fractional dimensions. If the flywheel is recessed to take the drive plate, order "M/C O.D.". Almost any size plate can be supplied and can be drilled on any P.C.D. that is more than about 1/2" (13mm) bigger than the ZZ dimension of the element.



Gearbox Spline Sizes

Diameter No. of gearbox models

Diameter (mm)	No. of splines	gearbox models
19.7	17	PRM Delta
22.6	20	Volvo MS, Yanmar SD
25.4	10	PRM100-280, Volvo 100 Z-drive
28.6	10	PRM 175-265, 310
28.84	17	PRM 301-750
29	10	PRM 60-90, 120-150, ZF 5-15, B/W 500, TMC30-60
35.4	26	B/W 71-73, 5000, 6000, PRM C, Paragon, TMP1200, Twin Disc 5010, 502, TM 93-880, Volvo MS3-5, SD 110, 250-280 drive, ZF 25-220,
38.1	10	Parsons
40.5	18	PRM 601, 1000
41.3	10	SCG MRF350
44.8	20	PRM 1500, 1750
52.3	32	SCG MRF350HD

Element details

Torque	Code	Rotation	XX	YY	WW	ZZ
HP/100RPM			(mm)	(mm)	(mm)	(mm)
HIGH DEF						
1.9	AM	Anti-clockwise	25.4	32	0	127
3.8	AN	Anti-clockwise	25.4	35	5	182
5.7	AL	Anti-clockwise	26.4	34	12.5	194
9.5	AD	Anti-clockwise	29	36	6	235
13.3	AE	Anti-clockwise	31.8	39	0	302
HAMMER HEAD						
1.9	W	Either	25.4	32	2.3	127
3.0	D	Either	25.4	35	5	175
4.8	Y	Either	28.7	35	5	182
5.7	AJ	Either	29.5	36	8.1	150
5.9	L	Either	25.4	35	5	175
6.7	U	Either	28.7	35	5	182
10.5	R	Either	28.7	35	5	182

Element details

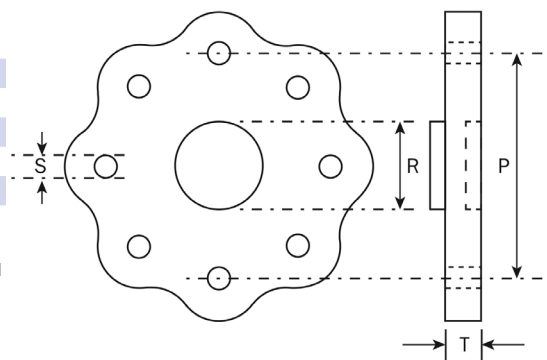
Torque	Code	Rotation	XX	YY	WW	ZZ
HP/100RPM			(mm)	(mm)	(mm)	(mm)
LOOP						
1.1	A	Either	25.4	32	0	127
1.9	B	Either	25.4	32	0	127
3.4	E	Either	25.4	35	5	207
3.8	F	Either	29.5	36	8.1	158
4.8	G	Either	25.4	35	5	207
5.1	H	Either	29.5	36	5	183
5.7	J	Either	29.5	36	8.1	158
6.3	K	Either	28.7	35	5	207
7.6	M	Either	25.4	35	5	207
8.6	H	Either	29.5	36	5	183
8.6	V	Either	28.7	35	5	207
10.5	P	Either	28.7	35	5	207
14.3	S	Either	31.8	35	5	207
22.9	Z	Anti-clockwise	44.2	57.2	0	330

Flexible shaft couplings

Gearbox Flange Type	Number of Holes	Size S	Pitch Circ P	Register R	Thicknesses T (mm)	Ratings HP/100RPM
4" standard	4	10mm	3 3/4"	2 1/2"	32.5, 32.5, 35.6	3, 5, 8
4" Volvo	4	10mm	80mm	60mm	32.5, 32.5, 35.6	3, 5, 8
5" Standard	4	7/16"	4 1/4"	2 1/2"	32.5, 32.5, 35.6	8, 13, 20
4" Yanmar	4	10mm	78mm	60mm	45, 45, 52.4	3, 5, 8
5" Yanmar	4	10mm	100mm	65mm	45	10
5 3/4" Twin Disc	6	5/8"	4 3/4"	3"	47.5, 49.8, 55.4	20, 28, 37
6" Standard	6	1/2"	4 3/4"	3"	47.5, 49.8	20, 28

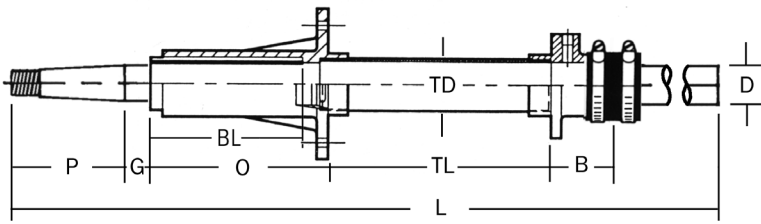
In order to select an appropriate coupling, first identify the diameter of the output flange of the gearbox. Then take the full HP rating of the engine, multiply it by the gear ratio of the gearbox and divide it by the full RPM of the engine, in hundreds.

For example, with a 120HP, 2500RPM engine and a 2.9:1 gearbox, this would be 120 times 2.9 divided by 25 which is 13.93 HP/100RPM on the propeller shaft. So a coupling should be selected that is a little more than this figure

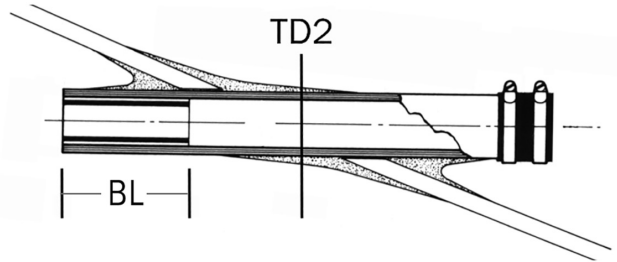


Sterngear and shaft seal dimensions

Bolt-in Sterntube



Glass-in and weld-in Sterntube



Tube dimensions

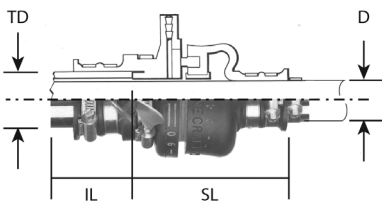
Shaft diameter	D ins	¾"	1"	1¼"	1½"	1¾"	2	2¼"	2½"
Tube diameter **	TD/TD2	1½"/1½"	1½"/1¾"	2"/2"	2¼"/2¼"	2½"/2 5/8"	2 7/8"/3"	3"	3½"
Shaft length	L	TO ORDER							
Tube length, min/max	TL cm	3/120	3/150	3/180	3/180	3/210	3/210	3/240	3/240
Unner spigot length	B mm	60	60	60	60	70	70	80	80
Overhang length	O cm	8	10	13	15	18	20	23	25
Bearing length	BL inches	3	4	5	6	7	8	9	10
Prop seat to Tip length	P m	79	95	121	140	159	184	203	216
Rope-cutter gap	G mm	38	38	41	41	51	51	57	57
Flange size *	cm	10x5	13x6	14x8	14x9	16x9	17x9	18x10	23x15
Drilling centres*	mm	79	102	111	114	133	140	149	178x57

* Bolt-in style only

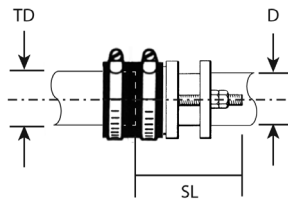
** Other diameters available in G.R.P., aluminium and steel

Tubes are shown as ready for flexible seal assemblies, but some can also be fitted with solid glands which are typically 30-40mm shorter than nut type or bolt type glands below.

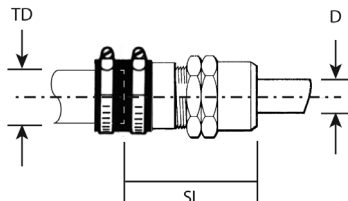
Deep sea seal



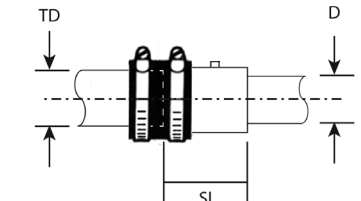
Stud type gland



Nut type gland



Canal & river seal



Deep sea seals

Shaft diameter	Tube diameter		Max RPM	Length SL mm	Set No	
	Ins	mm				
1" - 1¼"	25 - 32	1 3/8" - 1 5/8"	2950	96	2	
1" - 1¼"	25 - 32	1 5/8" - 2"	2950	96	3	
1¼" - 1 3/8"	32 - 35	1 5/8" - 2"	2850	96	4	
1¼" - 1 3/8"	32 - 35	2" - 2 3/8"	51 - 60	2850	96	5
1 3/8" - 1 5/8"	35 - 40	2" - 2 3/8"	51 - 60	2750	96	6
1 3/8" - 1 5/8"	35 - 40	2 3/8" - 2 3/4"	60 - 70	2750	96	7
1 3/4"	45	2 3/4" - 3 1/8"	70 - 80	2600	96	8
1 7/8" - 2"	45 - 51	2 3/4" - 3 1/8"	70 - 80	2600*	96	9
2 1/8"	55	2 3/4" - 3 1/8"	70 - 80	1550	106	14
2 1/4"	58	3 1/8" - 3 1/2"	80 - 90	1550	106	11
2 3/8"	60	3 1/8" - 3 1/2"	80 - 90	1500	106	15
2 1/2"	64	3 1/8" - 3 1/2"	80 - 90	1500	106	12
2 5/8"	65	3 1/2" - 4"	90 - 100	1500	106	16
2 3/4"	70	3 1/2" - 4"	90 - 100	1500	106	13

* To use set 9 for 2" shaft, bush must be removed, and so max speed is only 1560RPM.

Ideally Deep Sea seals are water fed with spent cooling water from the engine, but if well below waterline on low speed boats, they can just be ventilated.

On boats fitted with anti-siphon vents, the feed should be connected into their overboard dump hose.

Aluminium tubes must be painted where static rubber portion fits.

Stud type

Nut type

Canal & river

Shaft Dia	Tube Dia**	Seal Length	Tube		Seal	
			TD mm	SL mm	TD mm	SL mm
1"	38	143	38	124	1 3/4"	45
1¼"	51	159	51	140	2"	51
1½"	57	170	57	141	2¼"	57
1¾"	63	174	63	155	2¾"	70
2"	66	174	63	144	3"	76
2¼"	76	185	76	165	-	-
2½"	84	210	84	190	-	-

** These seals can be supplied to fit a limited range of other sterntube sizes on request.

Stud type and Nut type seals can be water or grease fed. Canal seals are grease fed with a screw-down greaser and River seals need to be water fed from the spent cooling water circuit of the engine.

On boats fitted with anti-siphon vents, the feed should be connected into the overboard dump hose.

All these seals have a short rubber connection (which can be extended if necessary) to allow flexibility, and sealing is with conventional packing in stud and nut types and with two double-lip seals on Canal and River types.

Body of Canal and River seals is made of phenolic material that runs well on stainless or bronze shaft with either water or grease for lubrication.

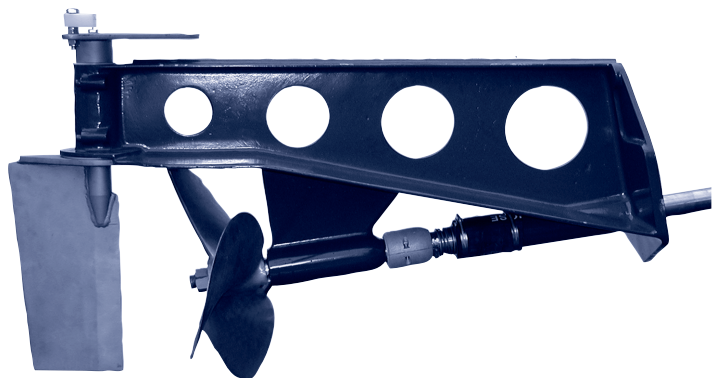
Aluminium tubes must be painted where static rubber portion fits.

LM Transom Drives

The New All-British designed and manufactured **LM TRANSOM DRIVE** that increases the operational efficiency of sportsboats and fast motor cruisers.

These rugged units are capable of being coupled to the more powerful petrol engines of which the Ford V6, Jaguar 4.2, and the American 'Small and Big Block' V8's are typical, PLUS diesel engines of up to 600 h.p. through a ZF, PRM or other suitable gearbox.

There are three models to cover the range of engine applications. Each model comes complete with hydraulic steering as standard.



LM TRANSOM DRIVE comes complete with: Shaft and rudder carrier, propeller shaft, rudder and tiller arm, Hydraulic helm head, steering cylinder and transom mount, hoses and connections, Shaft, bearing and seal assembly.

Extras:

Propeller, Shaft coupling and flexible coupling to suit engine/gearbox being installed, Set of transom bolts.

The advantages of the **LM TRANSOM DRIVE** over other forms of marine propulsion drives apply right through the designer - boatbuilder - user spectrum because:-

LM TRANSOM DRIVE allows for inboard engine installation in a position close to the transom.

LM TRANSOM DRIVE propeller shaft runs at an angle of only 8°.

LM TRANSOM DRIVE has direct-drive from gearbox eliminating the power loss experienced in sterndrives.

LM TRANSOM DRIVE requires a smaller aperture cut into the boat's transom than for a sterndrive.

LM TRANSOM DRIVE has no gears to wear or break.

LM TRANSOM DRIVE has a smaller underwater profile, causing less underwater drag.

LM TRANSOM DRIVE has a high rake surface piercing propeller, which when running partially out of the water, helps trim the bow of the boat up on high speed running AND YET when fully immersed still gives transom lift to ensure easy planing.

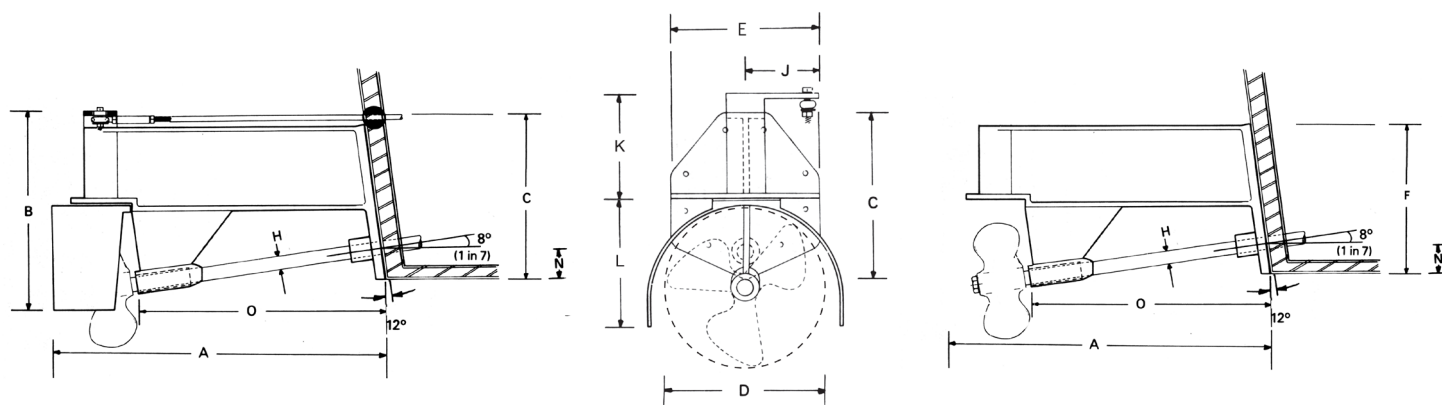
LM TRANSOM DRIVE subjects steering systems to very light steering loads due to its balanced rudder design.

LM TRANSOM DRIVE 14 rudder forms a propeller guard.

LM TRANSOM DRIVE 14 has a splined propeller shaft enabling the propeller to be quickly removed, especially applicable to trailable craft where propeller damage can occur during transit.

14" unit with standard rudder

14" unit with separate rudder



Dimensions

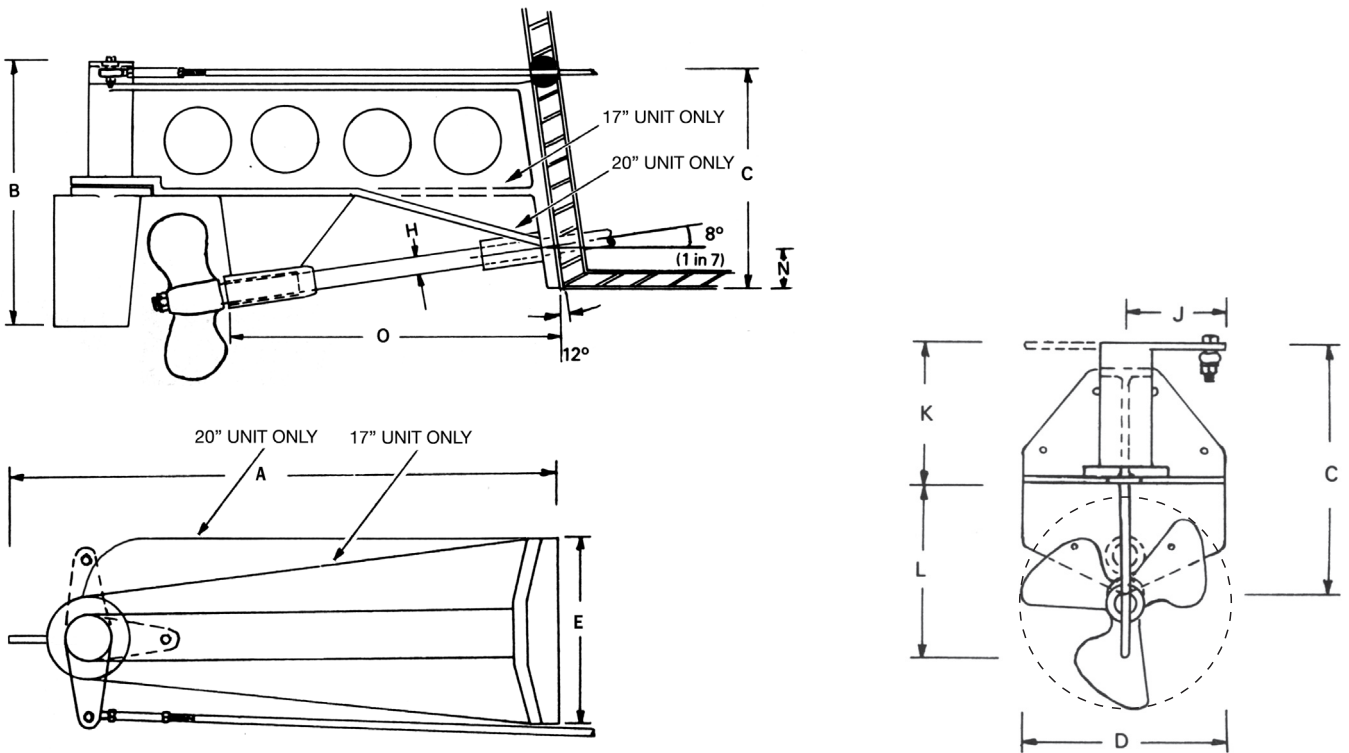
Model	A	B	C	D	E	F	H	J	K	L	M	N	O	WEIGHT excl. prop
14" STD	890	510	380	13½"	305	—	1¼"	190	215	255	—	85	610	33Kg
17" STD	1215	675	410	17"	356	—	1¾"	190	280	320	—	114	835	67Kg
20" STD	1300	725	520	20"	356	—	2"	190	280	370	—	114	835	85Kg
14" SEP	730	—	380	15"	305	380	1¼"	190	165	292	445	85	610	58Kg (pair)
17" SEP	1000	—	465	17"	356	410	1¾"	190	290	418	545	114	835	103Kg (pair)
20" SEP	1025	—	465	20"	356	520	2"	190	290	418	570	114	835	145Kg (pair)

All measurements are in mm, unless otherwise stated, and are approximate. 14"SEP uses similar rudder assembly to 17"SEP. Weights in Kg. and for separate rudder units include two drives and one rudder assembly.

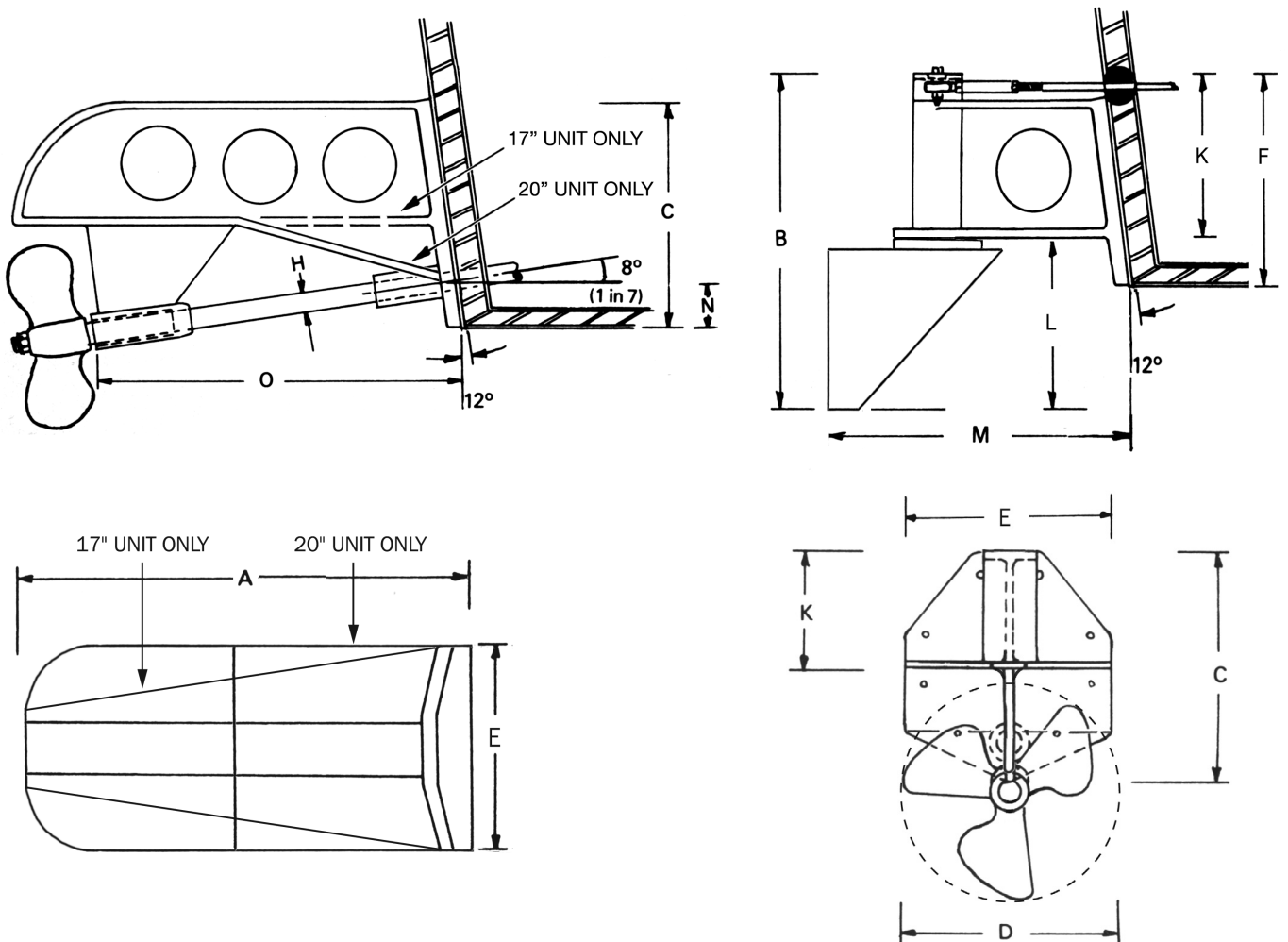
Installation drawings

Our policy is one of continual improvement and specifications may change without notice

17" & 20" units with standard rudder



17" & 20" units with separate rudder



Steering systems, rudders and stocks



Hydraulic steering

The Helm Pump

Smooth operating, high efficiency axial piston pumps provide the 'Power' to the steering cylinder when the steering wheel is turned. They are matched to cylinder size to give suitable number of wheel turns according to the rudder torque. All helm have a lockvalve which 'blocks' rudder feedback and isolates each pump in a multiple station. The system is filled simply by pouring the recommended oil into the helm pump filler - no external pressurisation is required.

Any number of steering stations may be used in a single system. Each helm pump operates independently without station transfer and each has full control of rudder. Wheels not in use do not turn.

Optional power steering and autopilot pump sets are connected in the same manner as additional stations.

The Steering Cylinder

Cylinders are double acting, fully balanced, to give an equal number of turns of the wheel in each direction. Suitable end fittings are provided, according to application, but usually a ball joint on the end of the rod, and a swivel base on the cylinder. 32mm and 40mm cylinders have aluminium bodies and larger cylinders all have brass bodies. Compression fittings and nylon or metallic piping complete the kits.

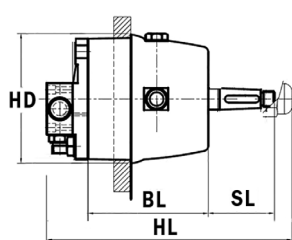


Helm head dimensions

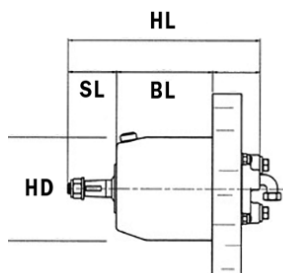
Helm, Cc/Rev	20	25 to 45	68
HL Total Length	228	215	314
BL Body Length	108.5	107	90
SL Shaft Length	62.5	55	97.5
HD Body Dia	127	115	142

Cylinder dimensions (mm) and Torque (Kg-Met)

Cylinder, Bore X Stroke	32 X 178	40 X 178	40 X 222	50 X 230	50 X 300
Cc for Full Stroke	132	168	215	339	442
Max Torque Kg/Met	58	87	111	217	281
A Overall length	568	620	720	901	981
B Max sideways Projection	151	175	225	265	335
C Cylinder and mount length	348	366	416	500	570
D Base Width	60	60	60	90	90



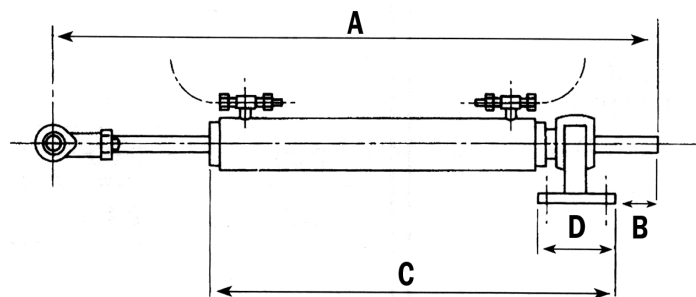
HD Helm



LD Helm

Lock valve at each steering station
All components repairable
No pressurisation required
Special attachments available for Sternpower 80, Mercruiser, Autopilot and through tube outboards

High overall efficiency
Ideal for multi stations and autopilot
Suitable for most boats 4m to 20m



Lancing Marine standard rudder dimensions (cms)

A cm	B cm	C cm	SD ins	SL cm	MAX kts @ 30°
8	20	30	1	20	25
10	25	38	1	25	18
10	25	38	1¼	23	25
12	30	46	1¼	23	18
12	30	46	1½	25	25
15	38	56	1½	25	18
15	38	56	1¾	28	27
15	38	56	2	30	28

Rudder torque must be carefully calculated as follows:-

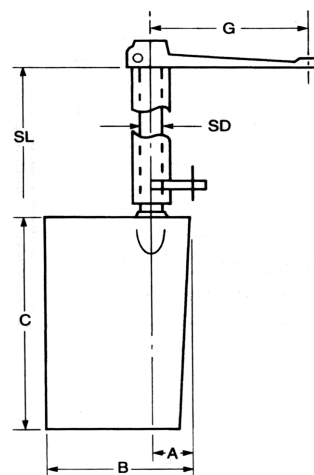
$$\text{Torque forward (Kg-Met)} = \frac{(0.37B-A) \text{ C.B. } V_f^2}{71460}$$

$$\text{Torque astern (Kg-Met)} = \frac{(0.63B-A) \text{ C.B. } V_r^2}{71460}$$

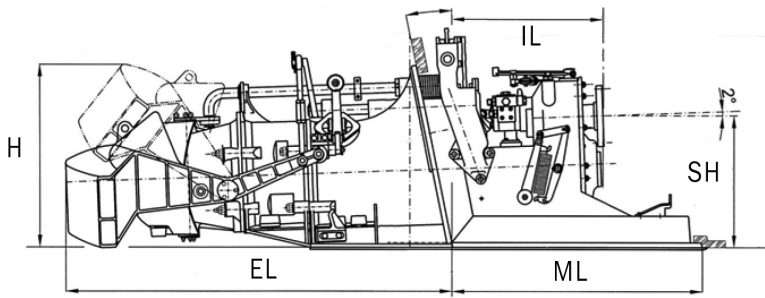
A = Balance length, cms
B = Total length, cms
C = Rudder height, cms
V_f = Max. forward speed, knots
V_r = Max. astern speed, knots

Detailed calculations can be done using the Lancing Marine Boatspeed and Propeller Program, available for PC operating systems.

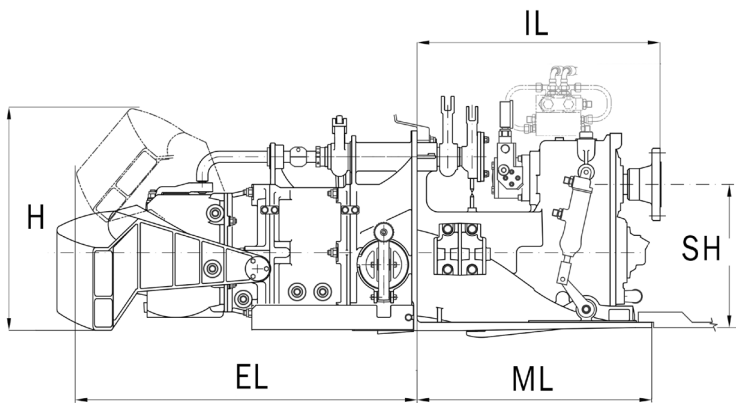
Rudder and tube assembly



Castoldijet drive systems



Type 282



Types 240HC - 490HC

CASTOLDI water jet drive systems are manufactured in Italy by a large family-run company in a modern factory equipped with the latest computer- controlled machinery that also produces advanced agricultural equipment, welding and generating sets, and garden and agricultural tractors of modern design.

The **CASTOLDI** design of water-jet propulsion unit is unique in having the drive taken through a pair of gears that can be changed to match the units to a wide variety of gasoline and diesel engines from 30 to 1500 h.p. running at speeds from 1000 to 6000 r.p.m. This gear train also incorporates a dog-clutch that can be used to disconnect the engine from the jet to allow it to be run on no load, and without producing any disturbance of the water.

Table of dimensions

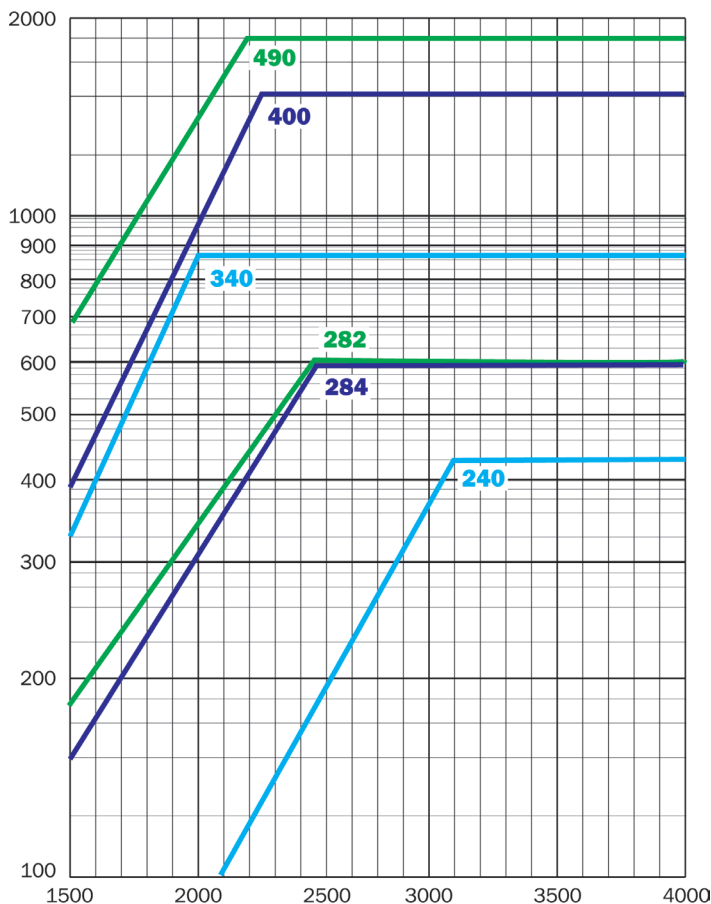
MODEL	DISP	EL	H	IL	ML	SH	TA	Weight Kg
240HC	2.5	893	433	358	358	296	12	130
282	4	1104	526	433	716	378	11.5	182
284HC	4	887	550	599	578	353	0	193
284LV	4	887	550	599	578	353	0	183
340HC	5	1034	645	736	810	406	0	307
400HC	10	1200	767	870	874	491	0	480
490HC	17	1524	903	1012	960	583	0	890

DISP is the suggested maximum boat weight in tons per jet unit. All dimensions are in mm.

General characteristics

- Twin steering deflectors
- Hydrodynamic reverse deflector allows infinite control of thrust from full ahead to full astern
- Remotely controlled moveable intake screen allows easy removal of debris
- Specially designed steering, forward/reverse and speed controls are available for all models
- Special controls are available for twin and triple engine configurations
- High quality corrosion protection is provided by anodising aluminium components, the use of a baked-on paint finish and extensive use of zinc anodes for cathodic protection
- No gearbox or clutch required on the engine
- Built-in water supply for engine cooling on 05, 238 and 240
- Simple installation with U/J or C.V. driveline
- No underwater appendages
- Highly efficient at speeds from 20 to 50 knots
- All jets can be matched by selection of appropriate gears from the Castoldi gear selection charts to a wide range of engine powers and speeds as shown on the HP/RPM operating zone chart and from there up to a maximum engine speed of 6000 RPM though 490HC is limited to 4800 RPM.
- HC models incorporate multi-disc hydraulic clutches, hydraulic intake grid clearing system and power steering.
- Control systems can be mechanical on 05 and 238, Hydromech or electric/hydraulic on all models and also full electronic with joy-stick manoeuvring on any of the HC models. Detailed choice varies with model.

HP/RPM operating zones



Trim tabs



When performance is the key to your boating safety and enjoyment, BENNETT tabs offer you unsurpassed quality and value.

Extra-value features include-

- higher maximum speed
- lower fuel consumption
- improved acceleration
- increased ride comfort
- eliminate 'upwind lean' under windy conditions
- major components are adaptable to upgrade manufacturers' products
- all components carry 'life-time' guarantee against defects



The complete Bennett tab kit comprises

Electric/hydraulic 12 volt power pack (24v available)

Two hydraulic rams (4 or 6 rams on widest kits)

Two stainless steel trim planes

Wiring kit

Control switches in panel

D.I.Y. instruction sheet

Fixing kit

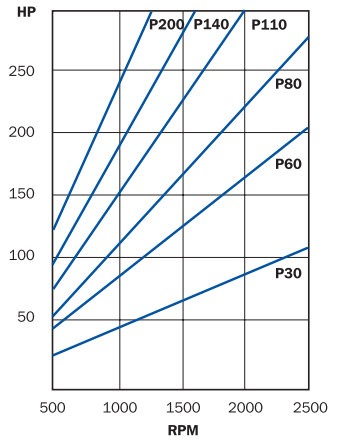
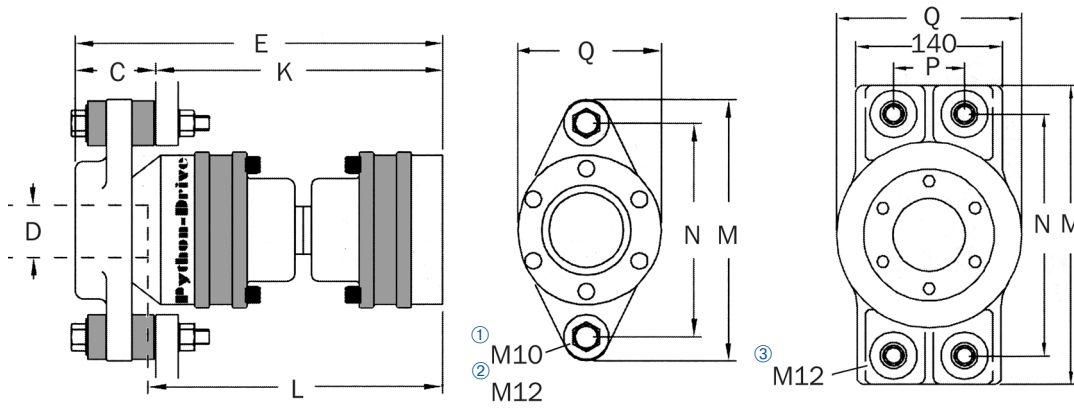
Trim Tab size selection chart (cms)

LENGTH	Boat speed Knots			
	12-20	18-30	24-40	35-50
Up to 7m	45 x 30	30 x 30	30 x 30	30 x 30
6 - 8.5m	60 x 30	45 x 30	45 x 30 (2)	30 x 30 (2)
7.5 - 10m	75 x 30	60 x 30	60 x 30 (2)	45 x 30 (2)
9 - 13m	90 x 30 (2)	75 x 30 (2)	60 x 30 (2)	60 x 30 (3)
11 - 17m	120 x 30 (2)	90 x 30 (2)	75 x 30 (3)	75 x 30(3)

Figures in brackets () indicate the number of hydraulic cylinders to be used on each trim plane, if more than one. The above sizes are for general guidance only. Boats requiring more or less effort to control roll or fore-and-aft attitude will require larger or smaller tabs. Care should be taken with deep-vee hulls and boats with very fine entry forward, not to use excessive tab effort. For speeds above 50 knots, consult Lancing Marine.

Optional extras

Position indicator kit - Hatch lifter kit - Second station kits - Automatic 'power-off' retraction system - Extra operating cylinders Custom made and extra strong trim planes. Automatic tab control. Second station controls and indicator. Relay modules to allow long control cables. N.M.E.A.2000 output signal. Choice of control panels.



Dimensions in millimetres (mm) Thrust (T) in Kg

	Bolting	D*	C	E	K	L**	M	N	P	Q	T
P30-R	①	19-30	54	246	192	186	175	143	—	100	430
P60-K	②	30-40	59	296	237	206	189	157	—	116	570
P80-S	②	30-45	57	351	294	236	224	170	—	148	1200
P110-S	②	35-45	57	340	283	215	224	170	—	148	1200
P110-T	③	35-51	65	350	285	227	284	230	68	117	1800
P140-T	③	40-55	65	350	285	227	284	230	68	117	1800
P200-T	③	40-60	65	435	400	321	284	230	68	117	1800

** Longer lengths available at extra charge

Made in Europe

* Imperial shaft sizes also available

Series Maximum shaft R.P.M.

Series	8°	7°	6°	5°	4°	3°	2.5°	2°	1.5°	0°	
Joint angle, each	8°	7°	6°	5°	4°	3°	2.5°	2°	1.5°	0°	
P30-P140	30-40	1000	150	2000	2500	3500	4500	4500	4500	4500	0
P200					1200	1500	1750	2250	3000	0	

Maintenance-free thrust assembly

Gearbox flange for choice of commonly available gearbox included

Detailed selection advice available free-of-charge

1:10 taper coupling available in lieu of clamp coupling

No thrust is transmitted to engine

About Lancing Marine

Lancing Marine are a company with many years experience of engine marinising, right back to the BMC 1.5 in the early '70s, through the Ford range of petrol and diesel engines, the New Holland tractor engines, and over 60 other engine types, together with the application of those engines to a wide variety of marine transmissions. Their engine marinisation and aftermarket marinising kits make use of the popularly available Jabsco and Bowman products and a variety of Lancing Marine specialised castings, together with many components from commercially available sources in the automotive and industrial worlds.

The Lancing Marine team is headed by **Mike Bellamy** who founded the business in 1970, and has extensive experience in circuit and offshore powerboat racing both as a competitor, as a team manager, and as an organiser. For many years he has run a succession of cruising powerboats that have gained him valuable experience in the development of new Lancing Marine product lines.

His interest in performance powercraft led him to develop the Lancing Marine propeller computer programme, now one of the most widely used boat speed and propeller calculation systems in the world.

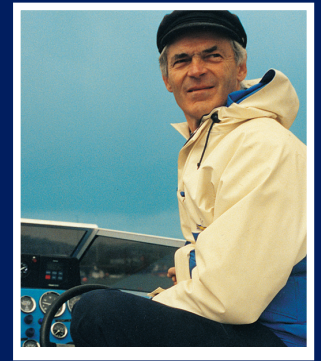
Sales director is **Mark Dooley** who trained with Watercraft Ltd., originally as a boatbuilder and later as a drawing office technician, before joining Lancing Marine in 1985. His keen interest in many forms of watersports, including water-skiing, diving and offshore sailing enable him to give valuable advice and prompt service to clients with many different types of craft.

In-house expertise extends to a fully equipped machine shop, capable of undertaking most conventional turning, milling, drilling and grinding operations at tolerances right up to toolroom standards.

Lancing Marine's extensive chain of expert sub-contractors cover several diverse fields, including heavy steel fabrication, gear-cutting, diesel injection equipment repair, heat treatment, grinding and metal finishing, to name but a few.

This large field of experience means that Lancing Marine can undertake a wide range of supplies ranging from supply of minor components, to the shipping of what eventually turns out to be a complete D-I-Y kit for a boatyard to mechanically fit out a yacht or motor cruiser.

How to find us at Lancing Marine



Mike Bellamy
winner of the
world's longest powerboat race



By Road

From London and the M25

Take the M23 for Brighton. This becomes the A23 after Gatwick Airport. About 3 miles outside Brighton follow the signs for the A27 westwards towards Worthing. Proceed to the second exit and follow the signs to Portslade. Turn left at T-junction and then right at the traffic lights. Follow the road down to Portslade railway station, where you turn right just in front of the railway crossing into Victoria Road.

From the West

After crossing the river Adur at Shoreham flyover on the A27, proceed towards Brighton through tunnel. Then take the next exit, signed Portslade and West Hove, and follow the Portslade signs. Turn left at T-junction and then right at the lights. Follow the road down to Portslade railway station, where you turn right just in front of the railway crossing into Victoria Road.

By Rail

Train from London, Victoria, destination either Littlehampton or Worthing, to Portslade station. Some trains do not stop at Portslade, in which case change onto the local service 'Coastway West' at Hove and travel one or two stations to 'Portslade and West Hove' station. On leaving the station cross the level crossing and turn left into Victoria Road. From Portsmouth, all Brighton trains stop at Portslade.

By Sea

Car Ferries - Via Portsmouth

Leave the docks and follow the signs to the Motorway. Follow 'M27 Brighton' signs onto the A27. Then proceed as 'From West'.

Via Sheerness, Dover, Ramsgate or Folkestone.

Follow the signs to London until you reach the M25. Follow the route signposted 'Gatwick airport' until you reach the M23. Then proceed as 'From London'.

Via Newhaven

Leave ferry terminal following 'Lewes' signs and join A27 going West. Then proceed as 'From London'.

By private yacht

Moor in Brighton Marina, approximately 4 miles East of town centre (They listen on channel 80). Take a rental car from close to the Eastern pier and follow the signs to Brighton or phone 01273 204060 for a taxi.

By Air

Via London Heathrow

Take underground tube train (London Transport) to Victoria, transfer to main line railway station and proceed as 'By Rail'.

Via Gatwick

Take the Littlehampton or Worthing train and proceed as 'By Rail'.

By Private Plane

Go to Shoreham Airport, where taxis are readily available by telephone at exit from main terminal.

Lancing Marine

51 Victoria Road, Portslade, Sussex, BN41 1XY, England

Telephone: Brighton +44 (01273) 410025

Fax: +44 (01273) 430290

e-mail: data@lancingmarine.com

Website: www.lancingmarine.com

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