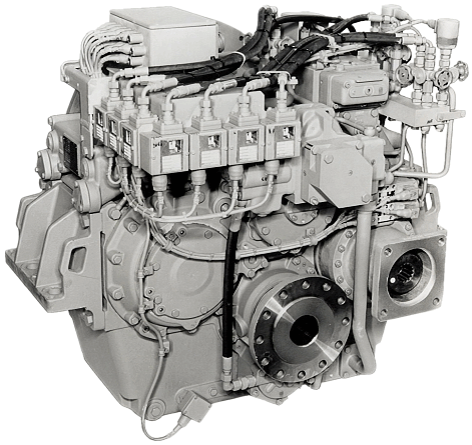


ZF 4650

Vertical offset, direct or remote mount marine transmission.

Maximum Input**

Duty	kW	hp	RPM
Pleasure	2312	3098	2500
Light	2239	3001	2500
Medium	1836	2460	2500
Continuous	1319	1768	2100

** Must not be exceeded

Description

- 3 shaft, reverse reduction transmission with hydraulic clutch mounted on the input shaft and another one mounted on the reverse shaft. Input drive on opposite side to output drive.
- Non-reversing NR version also available .
- Fully works tested, reliable and simple to install .
- Suitable for high performance applications in all types of fast craft, luxury motoryachts, patrol vessels, crew-boats etc .
- Design, manufacture and quality control standards comply with ISO 9001 and AQAP .
- Compatible with all types of engines and propulsion systems, including waterjets and surface-piercing propellers and cpp's .

Features

- Lightweight and robust aluminum alloy casing (sea water resistant) .
- Case hardened and precisely ground gear teeth for long life and smooth running .
- Output shaft thrust bearing designed to take maximum propeller thrust astern and ahead .
- Smooth and reliable hydraulic shifting with control lever for attachment of push-pull cable or other operating system .
- Compact, space-saving design, complete with oil cooler, pump and full flow filter .
- Suitable for multi engine installation (same ratio and torque capacity enginewise or counter enginewise .

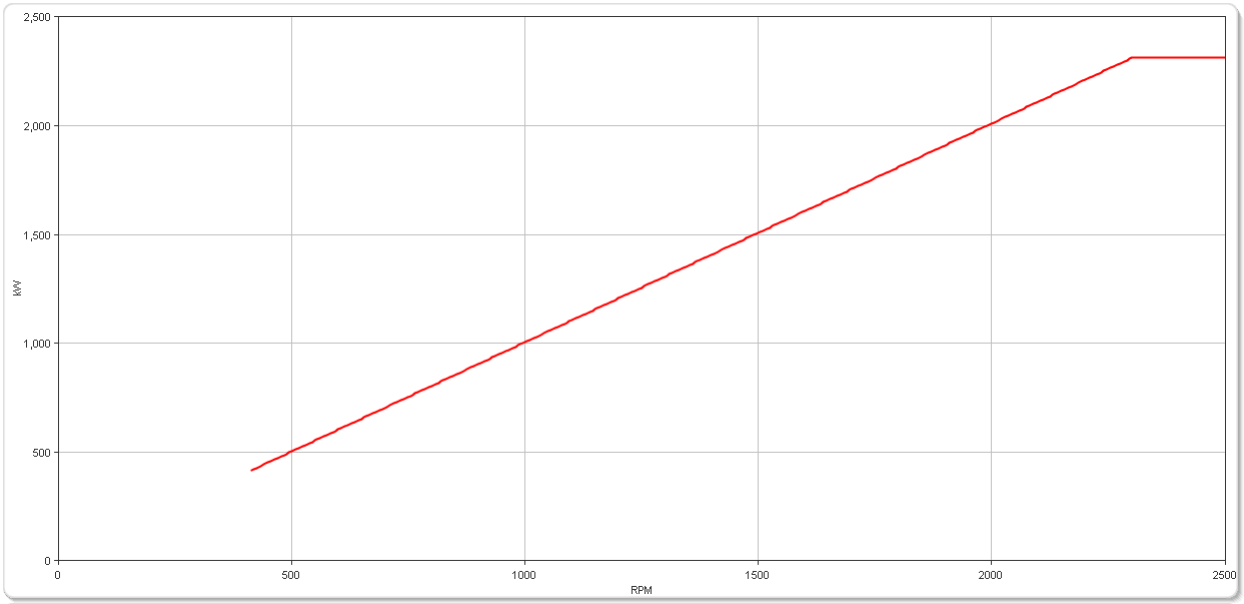
Options

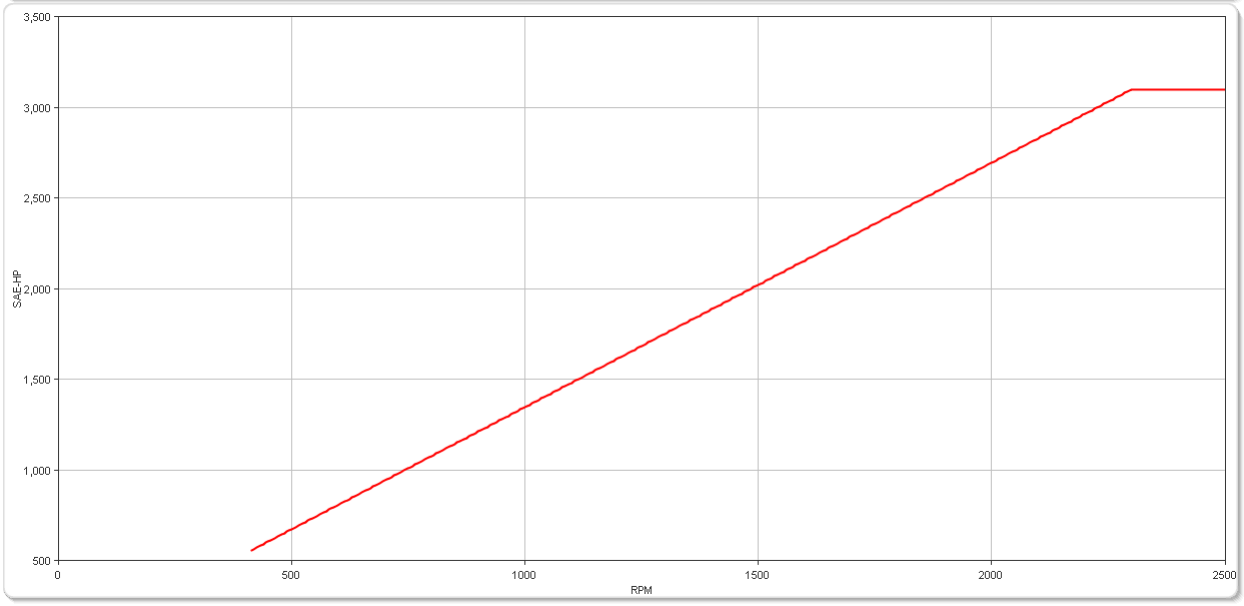
- Engine-matched torsional coupling .
- Mounting brackets for rigid connection to foundation or elastic mounting brackets .
- Trolling valve for slow-speed drive .
- Propeller shaft flange and coupling bolt sets .
- SAE 0 or SAE. 00 bell housings .
- Monitoring kit .
- Trailing pump .
- PTO (live) .
- Electric clutch control (24 VDC) .
- PTI (second input drive) .
- Optional diagonal offset -D (only suitable for water jet applications) .
- Classification by all major Classification Societies on request .
- "AUTOTROLL" .

ZF 4650
Ratings

Pleasure Duty

RATIOS	MAX. TORQUE		POWER/RPM		MAXIMUM RATED POWER						MAX. RPM
	Nm	ftlb	kW	hp	kW	hp	kW	hp	kW	hp	
					1800 rpm		2100 rpm		2300 rpm		
1.180*, 1.293*, 1.353*, 1.463*, 1.509, 1.595*, 1.659*, 1.689*, 1.757*, 1.795*, 1.857*, 1.941*, 2.030, 2.077*, 2.125*, 2.158*, 2.270*, 2.333*, 2.571, 2.633*, 2.759*, 2.893*, 3.040	9600	7081	1.0052	1.3480	1809	2426	2111	2831	2312	3100	2500



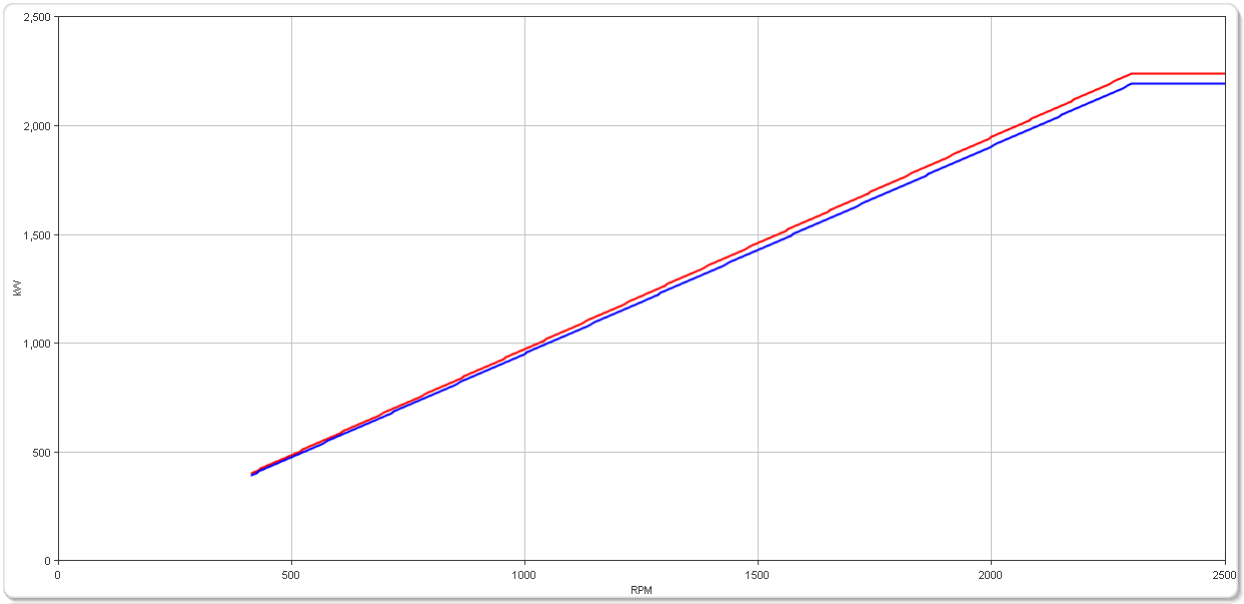


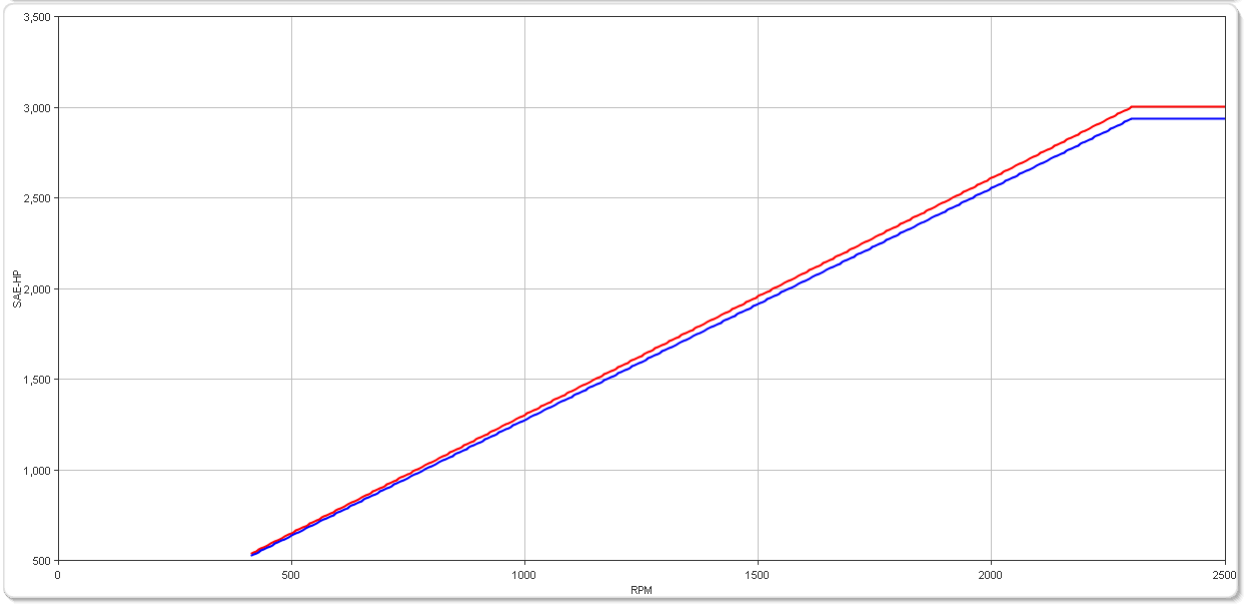
* Special Order Ratio

ZF 4650
Ratings

Light Duty

RATIOS	MAX. TORQUE		POWER/RPM		MAXIMUM RATED POWER						MAX. RPM
	Nm	ftlb	kW	hp	kW	hp	kW	hp	kW	hp	
					1800 rpm		2100 rpm		2300 rpm		
1.180*, 1.293*, 1.353*, 1.463*, 1.509, 1.595*, 1.659*, 1.689*, 1.757*, 1.795*, 1.857*, 1.941*, 2.030, 2.077*, 2.125*, 2.158*, 2.270*, 2.333*, 2.571, 2.633*, 2.759*, 2.893*	9300	6859	0.9738	1.3059	1753	2351	2045	2742	2240	3004	2500
3.040	9101	6713	0.9530	1.2780	1715	2300	2001	2684	2192	2939	2500





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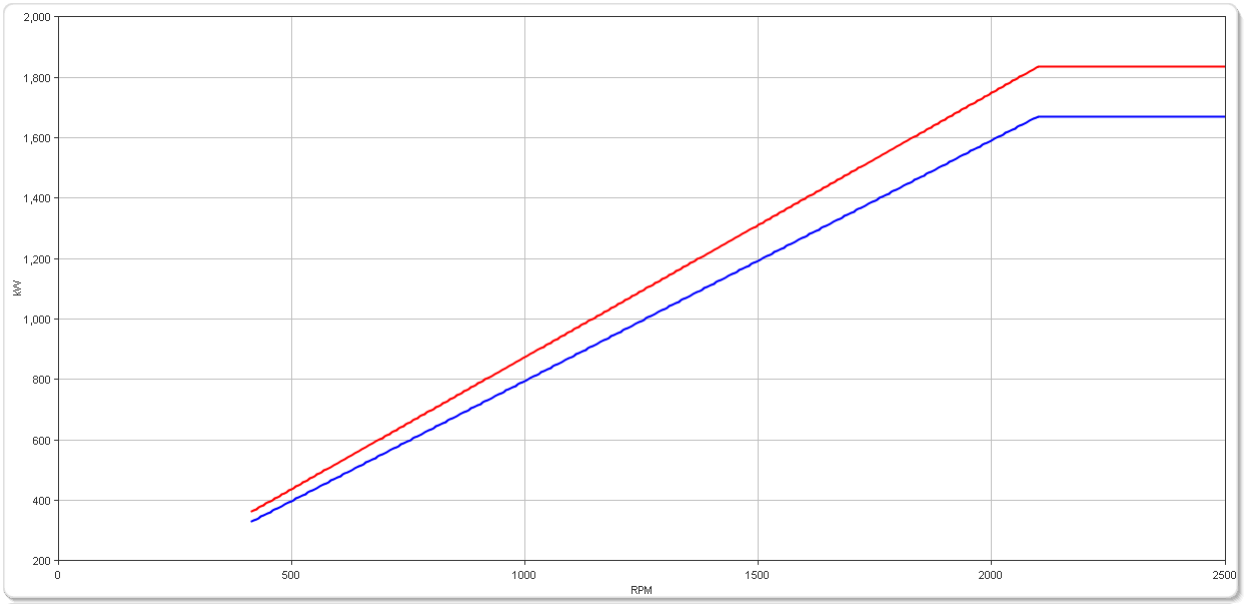
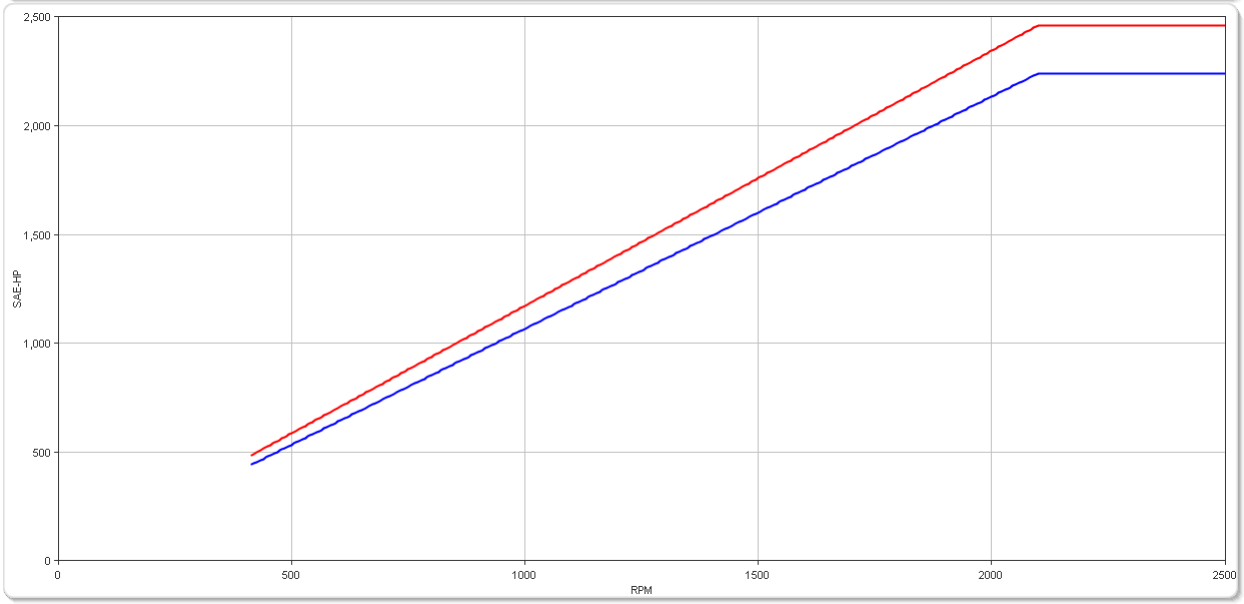
* Special Order Ratio

ZF 4650
Ratings

Medium Duty

RATIOS	MAX. TORQUE		POWER/RPM		MAXIMUM RATED POWER						MAX. RPM
	Nm	ftlb	kW	hp	kW	hp	kW	hp	kW	hp	
					1800 rpm		1900 rpm		2100 rpm		
1.180*, 1.293*, 1.353*, 1.463*, 1.509, 1.595*, 1.659*, 1.689*, 1.757*, 1.795*, 1.857*, 1.941*, 2.030, 2.077*, 2.125*, 2.158*, 2.270*, 2.333*, 2.571, 2.633*, 2.759*, 2.893*	8350	6159	0.8743	1.1725	1574	2111	1661	2228	1836	2462	2500
3.040	7600	5605	0.7958	1.0672	1432	1921	1512	2028	1671	2241	2500





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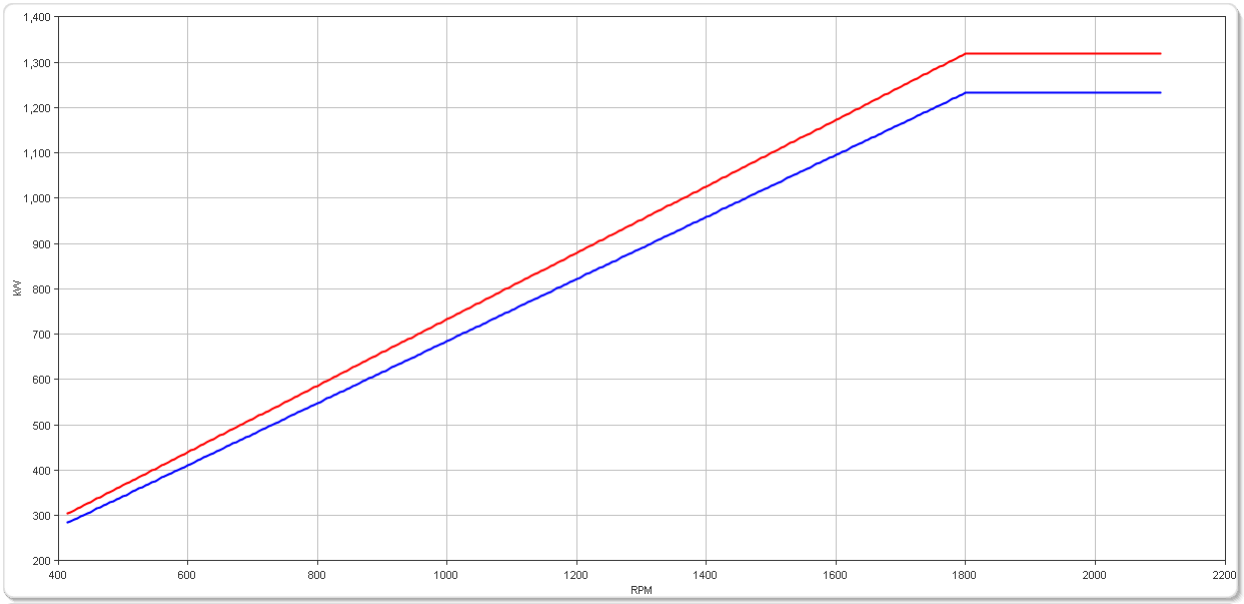
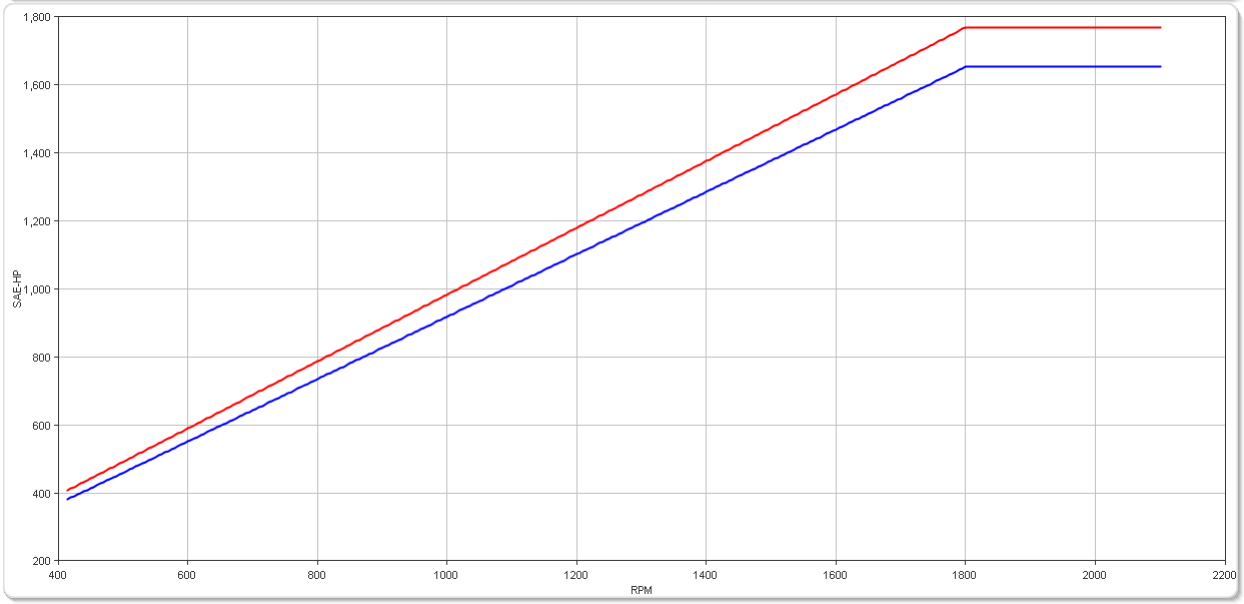
* Special Order Ratio

ZF 4650
Ratings

Continuous Duty

RATIOS	MAX. TORQUE		POWER/RPM		MAXIMUM RATED POWER						MAX. RPM
	Nm	ftlb	kW	hp	kW	hp	kW	hp	kW	hp	
					1200 rpm		1600 rpm		1800 rpm		
1.180*, 1.293*, 1.353*, 1.463*, 1.509, 1.595*, 1.659*, 1.689*, 1.757*, 1.795*, 1.857*, 1.941*, 2.030, 2.077*, 2.125*, 2.158*, 2.270*, 2.333*, 2.571, 2.633*, 2.759*, 2.893*	7001	5164	0.7331	0.9831	880	1180	1173	1573	1320	1770	2100
3.040	6540	4824	0.6848	0.9184	822	1102	1096	1469	1233	1653	2100





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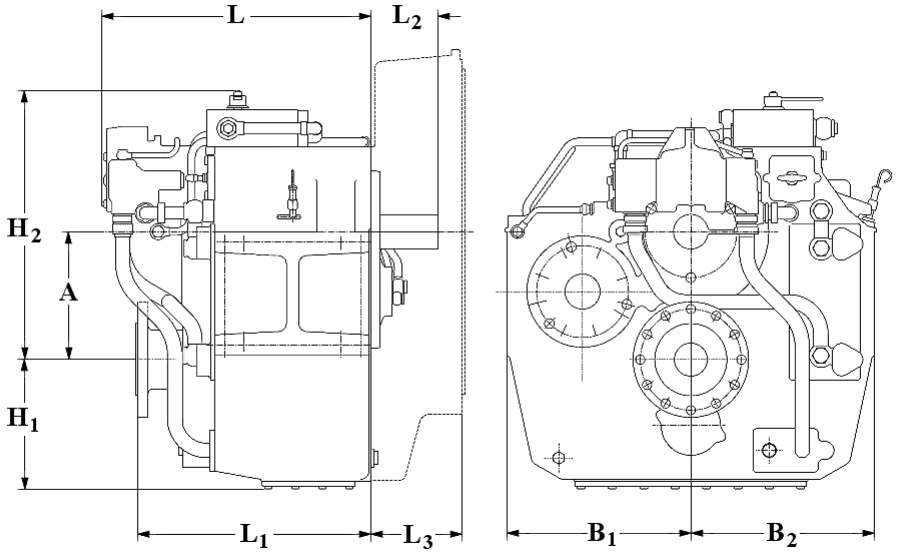
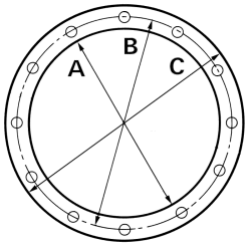
* Special Order Ratio

ZF 4650
Dimensions



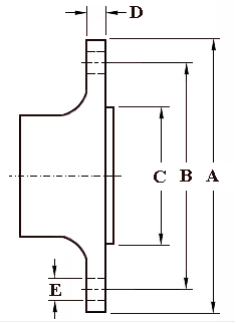
mm (inches)									
A	B_1	B_2	H_1	H_2	L	L_1	L_2	L_3	Bell Hsg.
310 (12.2)	445 (17.5)	445 (17.5)	313 (12.3)	652 (25.7)	653 (25.7)	565 (22.2)	162 (6.38)	220 (8.66)	0
Weight kg (lb)					Oil Capacity Litre (US qt)				
745 (1642)					60.0 (63.6)				

SAE Bell Housing Dimensions



SAE No.	A		B		C		Bolt Holes		
							No.	Diameter	
	mm	in	mm	in	mm	in		mm	in
00	787.4	31	850.9	33.5	882.65	34.75	16	13.49	17/32
0	647.7	25.5	679.45	26.75	711.2	28.0	16	13.49	17/32

Output Coupling Dimensions



A		B		C		D		Bolt Holes		
								No.	Diameter (E)	
mm	in	mm	in	mm	in	mm	in		mm	in
280	11.0	245	9.65	175	6.89	25.0	0.98	16	22.2	0.87

Refer to the Installation Drawing for detail.

Duty Definitions

PLEASURE DUTY DEFINITION	Highly intermittent operation with very large variations in engine speed and power
Average engine operating hours limit:	500 hours/year 300 hours/year for mechanical gearboxes
Typical hull forms:	Planing.
Typical applications:	Private, non-commercial, non-charter sport/leisure activities.
LIGHT DUTY DEFINITION	Intermittent operation with large variations in engine speed and power
Average engine operating hours limit:	2500 hours/year (for hydraulic gearboxes smaller than the ZF 650 series, 2000 hours/year).
Typical hull forms:	Planing and semi-displacement.
Typical applications:	Private and charter, sport/leisure activities, naval and police activities.
MEDIUM DUTY DEFINITION	Intermittent operation with some variations in engine speed and power
Average engine operating hours limit:	4000 hours/year. 3500 hours/year for gearboxes smaller than ZF 2000 series and workboat ZF W2700 series.
Typical hull forms:	Semi-displacement and displacement
Typical applications:	Charter and commercial craft (example: crew boats and fast ferries), and naval and police activities.
CONTINUOUS DUTY DEFINITION	Continuous operation with little or no variations in engine speed and power
Average engine operating hours limit:	Unlimited
Typical hull forms:	Displacement.
Typical applications:	Heavy duty commercial vessels, tugs, fishing boats.

Duty Ratings

Ratings apply to marine diesel engines at the indicated speeds. At other engine speeds, the respective power capacity (kW) of the transmission can be obtained by multiplying the Power/Speed ratio by the speed.
Approximate conversion factors:

1 kW = 1.36 metric hp

1 kW = 1.34 U.S. hp (SAE)

1 U.S. hp = 1.014 metric hp

1 Nm = 0.74 lb.ft.

Ratings apply to right hand turning engines, i.e. engines having counterclockwise rotating flywheels when viewing the flywheel end of the engine. These ratings allow full power through forward and reverse gear trains, unless otherwise stated.
Contact your nearest ZF Sales and Service office for ratings applicable to gas turbines, gasoline (petrol) engines, as well as left hand turning engines, and marine transmissions for large horsepower capacity engines.
Ratings apply to marine transmissions currently in production or in development and are subject to change without prior notice.
NOTE: THE MAXIMUM RATED INPUT POWER MUST NOT BE EXCEEDED (SEE RESPECTIVE RATINGS IN THE TECHNICAL DATA SHEETS)

Safe Operating Notice

The safe operation of ZF products depends upon adherence to technical data presented in our brochures. Safe operation also depends upon proper installation, operation and routine maintenance and inspection under prevailing conditions and recommendations set forth by ZF. Damage to transmission caused by repeated or continuous emergency manoeuvres or abnormal operation is not covered under warranty. It is the responsibility of users and not ZF to provide and install guards and safety devices, which may be required by recognized safety standards of the respective country (e.g. for U.S.A. the Occupational Safety Act of 1970 and its subsequent provisions).

Monitoring Notice

The safe operation of ZF products depends upon adherence to ZF monitoring recommendations presented in our operating manuals, etc. It is the responsibility of users and not ZF to provide and install monitoring devices and safety interlock systems as may be deemed prudent by ZF. Consult ZF for details and recommendations.

Torsional Responsibility and Torsional Couplings

The responsibility for ensuring torsional compatibility rests with the assembler of the drive and driven equipment. ZF can accept no liability for gearbox noise caused by vibrations or for damage to the gearbox, the flexible coupling or to other parts of the drive unit caused by this kind of vibration. Contact ZF for further information and assistance. ZF recommends the use of a torsional limit stop for single engine powered boats, wherein loss of propulsion power can result in loss of control. It is the buyer's responsibility to specify this option, which can result in additional cost and a possible increase in installation length.

ZF can accept no liability for personal injury, loss of life, or damage or loss of property due to the failure of the buyer to specify a torsional limit stop. ZF selects torsional couplings on the basis of nominal input torque ratings and commonly accepted rated engine governed speeds. Consult ZF for details concerning speed limits of standard offering torsional couplings, which can be less than the transmission limit. Special torsional couplings may be required for Survey Society Ice Classification requirements.