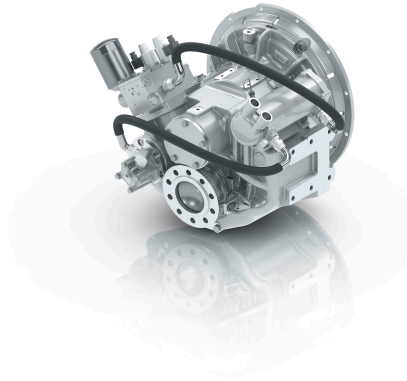


ZF 400

TECHNICAL DATA SHEET

ZF 400 SERIES PRODUCT DETAILS



Description

- Integrated Intelligent Technology
- Robust design with cast iron housing withstands continuous duty in workboat applications
- Rated up to 735 kW
- Fully works tested, reliable and simple to install
- Design, manufacture and quality control standards comply with ISO 9001
- Compatible with all types of engines and propulsion systems, including waterjets and surface-piercing propellers, as applicable
- Suitable for high performance applications in motoryachts, sport fishers, express cruisers etc
- Power factor up to 0.3195 kW/rpm (typical engine 1000HP@2300rpm)
- Gear ratios from 0,8 to 2,95

Features

- Supershift2 technology inside
- Optional embedded electronic unit to better control the proportional valves, thus granting smoother shifting/trolling
Possibility to integrate further smart alert functionalities for scheduled maintenance
- Configurable to various application in the appropriate power range, for both yachts and commercial vessels
- 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 clutch operation with hydraulically controlled clutch engagement and electrical actuation
- Replaceable oil filter cartridge



ZF 400

RATINGS

Ratios	Power Factor		Input Power Capacity						Max. kW	Max. hp	Max. RPM
	kW/RPM	hp/RPM	kW	hp	kW	hp	kW	hp			
Pleasure Duty - Diesel ^{14, 15}			2100 RPM		2300 RPM		2500 RPM				
0.854, 0.925, 1.000, 1.109, 1.233, 1.526, 1.781, 2.033, 2.214	0.3196	0.4286	671	900	735	986	799	1072	959	1286	3000
2.600	0.2917	0.3912	613	822	671	900	729	978	875	1174	3000
2.957	0.2557	0.3429	537	720	588	789	639	857	767	1029	3000
Light Duty - Diesel ^{14, 15}			2100 RPM		2300 RPM		2500 RPM				
0.854, 0.925, 1.000, 1.109, 1.233, 1.526, 1.781, 2.033, 2.214	0.2917	0.3912	613	822	671	900	729	978	875	1174	3000
2.600	0.2660	0.3567	559	749	612	820	665	892	798	1070	3000
2.957	0.2351	0.3153	494	662	541	725	588	788	705	946	3000
Medium Duty - Diesel ^{14, 15}			1800 RPM		2100 RPM		2300 RPM				
0.854, 0.925, 1.000, 1.109, 1.233, 1.526, 1.781, 2.033, 2.214	0.2130	0.2856	383	514	447	600	490	657	639	857	3000
2.600	0.2101	0.2817	378	507	441	592	483	648	630	845	3000
2.957	0.1882	0.2524	339	454	395	530	433	581	565	757	3000
Continuous Duty - Diesel ^{14, 15}			1600 RPM		1800 RPM		2100 RPM				
0.854, 0.925, 1.000, 1.109, 1.233, 1.526, 1.781, 2.033, 2.214, 2.600, 2.957	0.1802	0.2417	288	387	324	435	378	508	541	725	3000

* Special Order Ratio

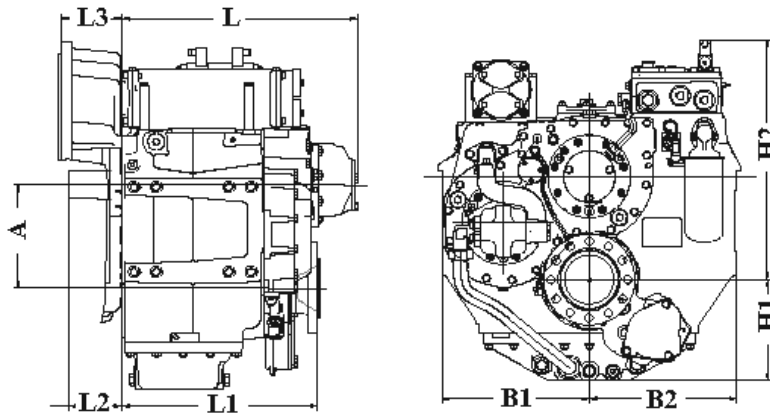
Footnotes:

¹⁴ Hybrid Ready (for more details contact ZF Padova application dept.)

¹⁵ Free Standing Installation available

ZF 400

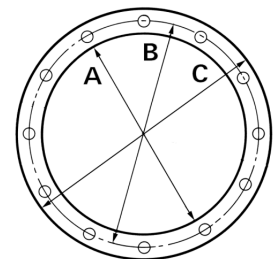
DIMENSIONS



A	B1	B2	H1	H2	L	L1	L2
Millimeter (mm)							
175.0	290.0	290.0	177.0	405.0	521.0	420.0	57.0
Inch (in)							
6.89	11.42	11.42	6.97	15.94	20.51	16.54	2.24
Weight (kg)		Weight (lb)		Amount of Oil (l)		Amount of Oil (qt)	
160		353		10.0		10.6	

BELL HOUSING DIMENSIONS

Name	A		B		C		L3		Bolt Holes		
	mm	in	mm	in	mm	in	mm	in	No.	Diameter	
										mm	in
SAE 1	511.2	20.13	530.2	20.87	554.0	21.81	45.0	1.77	12	12.0	0.47
SAE 2	447.68	17.63	466.73	18.38	488.95	19.25	46.0	1.81	12	10.32	0.41



OUTPUT FLANGE DIMENSIONS

A		B		C		D		Bolt Holes		
mm	in	mm	in	mm	in	mm	in	No.	Diameter (E)	
									mm	in
205.0	8.07	170.0	6.69	140.0	5.51	20.0	0.79	10	18.2	0.72



GENERAL INFORMATION

Duty Definitions

Pleasure Duty

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
Applications:	Private, non-commercial, non-charter leisure activities, no racing

Light Duty

Intermittent operation with large variations in engine speed and power.

Average engine operating hours limit:	2500 hours/year (for hydraulic transmissions smaller than ZF 2000 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

Intermittent operation with some variations in engine speed and power.

Average engine operating hours limit:	4000 hours/year (for hydraulic transmissions smaller than ZF 2000 series and workboat ZF W2700 series, 3500 hours/year)
Typical hull forms:	Semi-displacement and displacement
Typical applications:	Charter and commercial craft (example: crew boats), and naval and police activities

Continuous Duty

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

Technical Notes

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.
- 1 Kg = 0.454 lb

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, 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.

Survey Society Classification

In most cases, the maximum medium and continuous duty ratings permitted by ZF are accepted in full by major classification societies. If classification is required, contact ZF regarding proper procedures (also for yacht service and ice classifications service).

Dimensions and Weights

Dimensions and weights refer to transmissions with bell housing (where appropriate) but excluding options such as: trolling valves, power take-offs, propeller shaft companion flanges, torsional couplings etc.

Torsional Vibration and Torsional Couplings

The responsibility for ensuring torsional vibration compatibility rests with the overall propulsion system integration responsible party.

Compatibility check of torsional vibration must include excitations induced by engine governor. ZF cannot accept any liability for gearbox noise or for damage to the gearbox, the flexible coupling or to other parts of the drive unit caused by torsional vibrations. Contact ZF for further information and assistance.

For single engine powered boats, where loss of propulsion can result in loss of control, ZF recommends the use of a torsional limit stop. It is the buyer's responsibility to specify this option. ZF cannot accept any 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 at commonly rated engine speeds. Consult ZF for details concerning speed limits of standard offered torsional couplings, which can be below transmission limits. Special torsional couplings may be required for Survey Society requirements.