



**MAIN PROPULSION REVERSE REDUCTION HYDRAULIC GEARBOXES FOR 6 NOS. QUAD  
PROPULSION CATAMARAN TYPE SURVEY VESSELS FOR INDIAN NAVY, YARD NOS. 257 TO 262**

**1.1 SPECIFICATION FOR REDUCTION & REVERSING MARINE HYDRAULIC GEARBOX**

No.	Description		Requirement	To be Confirmed / Declared by Manufacturer	
1	Type and quantity		Indian Navy approved type, bell housing mounting type vertically offset multi disc marine hydraulic reverse reduction gearbox with quick shift arrangement, rated for continuous duty. Input power 895 kw MCR approx. Qty.: 4 Nos./Ship	..... ..... ..... ..... kw rating Qty.: ..... Nos./Ship	
2	Make & Model		To be declared by manufacturer	Make ..... Model .....	
3	Reduction Ratio		2.03:1 approx.	..... Ratio	
4	Rated revolution of input shaft	rpm	1800	..... RPM	
5	Rated revolution of output shaft	rpm	..... approx.	..... RPM	
6	Bell housing as per SAE standard with mounting bolts		Suitable for mounting with engine flywheel housing: 1 set/gearbox	SAE ..... ..... set/ gearbox	
7	Flexible coupling with mounting bolts		Suitable for mounting with engine flywheel and as per SAE standard specified by engine manufacturer: 1 set / gearbox	..... ..... ..... set/gearbox	
8	<b>Direction of Rotation:</b> <b>Input side</b> Looking at input coupling of the gearbox		Clockwise	.....	
	<b>Output side</b> Looking at propeller from stern		Port	Ahead: Counter clockwise Astern: clockwise	
			Stbd	Ahead: clockwise Astern: Counter clockwise	
				.....	
9	Lubricating oil type & grade		To be declared by manufacturer	.....	
10	Lubricating oil sump system		Wet sump : 1 no./gearbox	..... no./gearbox	
11	Lubricating method		Hydraulic pump integral gearbox driven and running through input side drive of the gearbox and L.O. filter arrangement: 1 set/gearbox	..... ..... ..... set/gearbox	
12	Cooling system	Oil cooler	Sea Water	.....	
		Gears	Oil	.....	
13	Dry weight	Kg.	To be declared by manufacturer	..... Kg.	
14	Capacity of oil & cooling water (l)	R/R Gear: LO [sump]	Ltrs.	To be declared by manufacturer	..... Ltrs.
		LO cooler: LO & SW	Ltrs.	To be declared by manufacturer	LO ..... Ltrs. SW ..... Ltrs.
15	Mounting		Foundation brackets considering rigid mounting: 1 set/gearbox	..... ..... set/gearbox	



No.	Description	Requirement	To be Confirmed / Declared by Manufacturer
16	Brake / interlocks	Each gearbox to be provided with output brake and interlocks for operation during different combinations [selection] of propulsion drive operation: 1 set/gearbox	..... ..... ..... ..... set/gearbox
17	Quick Shift Arrangement	Each gearbox to be provided with quick shift clutch technology, which utilizes a sequenced engagement of clutch, operating automatically by design not needing any manual adjustment. To be confirmed/complied by the manufactured and details of the same to be submitted along with technical offer.	..... ..... ..... ..... .....
18	Trolling valve	Gearbox to be equipped with trolling valve for slow speed drive [0-6 knot speed with one no. propulsion plant / shaft line in operation during hydrography survey operation mode]: 1 no./gearbox	..... ..... ..... ..... no./gearbox
19	Trailing pump / valve	For propeller trailing purpose the gearbox to be provided with approved type trailing pump / valve arrangement: 1 set/gearbox	..... ..... ..... set/gearbox
20	Turning gear arrangement	Gearbox to be provided with turning gear arrangement with suitable interlocks for the turning of gearbox / shaft line, independent of engine: 1 set/gearbox	..... ..... ..... set/gearbox
21	Submergence	The gearbox should be designed to be operable even after submergence in S.W. to a depth of five meters above the output shaft centre line for the period of 48 hours.	..... ..... .....
22	Site conditions	Gearbox to operate satisfactorily at following site conditions; a) <u>Ambient air temp.:</u> (-) 10° C to (+) 40° C b) <u>Maximum temp. in engine room:</u> (+) 55° C c) <u>Atm. air pressure:</u> 760 mm of Hg d) <u>Relative humidity / salinity:</u> Up to 90% condensation at 35° C Salinity of water up to 35 PPM	..... ..... a) ..... b) ..... c) ..... d) .....



No.	Description	Requirement	To be Confirmed / Declared by Manufacturer																
23	Operating criteria and other requirements	<p>(A) Gearbox and associated systems should be capable of efficient operation under the following conditions of vessel during operation:</p> <p>a) Heel: 20° C continuous either side  b) Roll: 20°  c) Trim: 5° continuous  d) Pitch: 6°</p> <p>(B) Gearbox should have reliability and maintainability for a minimum mission period of four weeks.</p> <p>(C) The gearbox offered should confirm and comply with the Indian Navy RFP requirements as applicable.</p> <p>(d) Sea Worthiness: The vessel together with it's machinery and equipments to be capable of conducting Hydro graphic survey operation up to sea-state 3. The vessel and its machinery and equipments also to be survivable at best heading upto sea stat 5.</p>	<p>(A) .....  .....  .....  .....</p> <p>a) .....  b) .....  c) .....  d) .....  (B) .....  .....</p> <p>(C) .....  .....</p>																
24	Operating mode and speed of the vessel	<p>Vessel's propulsion machinery exploitation will be assumed as to ensure vessel's operation of 4500 hours per year. Speed, range, endurance and mission duration is clearly specified as follows;</p> <table border="1" data-bbox="678 1182 1203 1720"> <thead> <tr> <th data-bbox="678 1182 810 1346">Speed range [knots] and operating mode</th> <th data-bbox="810 1182 938 1346">Installed engine power required [kw]</th> <th data-bbox="938 1182 1066 1346">% of annual hours [% of 4500 hours]</th> <th data-bbox="1066 1182 1203 1346">No. of main engine in operation</th> </tr> </thead> <tbody> <tr> <td data-bbox="678 1346 810 1480">0 to 6 knots, hydrographic survey operation</td> <td data-bbox="810 1346 938 1480">[1x895]</td> <td data-bbox="938 1346 1066 1480">10% [450 hours]</td> <td data-bbox="1066 1346 1203 1480">One</td> </tr> <tr> <td data-bbox="678 1480 810 1615">12 knots, cruising / economical speed operation</td> <td data-bbox="810 1480 938 1615">[2x895]</td> <td data-bbox="938 1480 1066 1615">80% [3600 hours]</td> <td data-bbox="1066 1480 1203 1615">Two</td> </tr> <tr> <td data-bbox="678 1615 810 1720">18 knots, sprint/full speed operation</td> <td data-bbox="810 1615 938 1720">[4x895] *</td> <td data-bbox="938 1615 1066 1720">10% [450 hours]</td> <td data-bbox="1066 1615 1203 1720">Four</td> </tr> </tbody> </table> <p><b>Note:</b> Propeller shall be designed / manufactured such a way that the sprint / maximum speed should be achieved at 85% MCR of installed and deployed main engine power.</p>	Speed range [knots] and operating mode	Installed engine power required [kw]	% of annual hours [% of 4500 hours]	No. of main engine in operation	0 to 6 knots, hydrographic survey operation	[1x895]	10% [450 hours]	One	12 knots, cruising / economical speed operation	[2x895]	80% [3600 hours]	Two	18 knots, sprint/full speed operation	[4x895] *	10% [450 hours]	Four	33
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1.2 **AUX. ACCESSORIES, INSTRUMENTATION, MANUALS, INSPECTION AND CERTIFICATION & GUARANTEE**

**STANDARD**

No.	Description	Requirement	To be Confirmed / Declared by Manufacturer
1	L.O. cooler (material of construction as per IN standard). Tube material to be 70/30 Cupro Nickel	1 no. / GB	..... ..... ..... no. / GB
2	L.O. pressure gauge and temperature gauge. Gauges to be self illuminated type with the provision of dimmer switch	1 no. each / GB	..... ..... ..... no. each / GB
3	L.O. low pressure switch for alarm/trip function. DME specification 405 (R2), 411, 412, 413 and 424 of Indian Navy are to be used as guidance specifications for selection, supply and installation of instrumentation / alarm / trips. Deviations if any, are to be clearly stated by the vendor in their technical offer with adequate justification.	1 set / GB	..... ..... set / GB ..... ..... ..... .....
4	Control for propulsion machinery will be microprocessor based auto control system, with distributed digital control system. Accordingly engines are to be provided with suitable interface arrangements for proper integration.	To be confirmed	..... ..... ..... .....
5	MCR instrumentation / monitoring system to be replicated for bridge, gearbox to be supplied with necessary facility for the same.	To be confirmed	..... .....
6	Gearbox to have instrumentation / gauges as per Indian Navy and class requirements. Sensor / signal required for interface with VDR as per statutory requirements are to be provided for the gearbox.	To be confirmed	..... ..... ..... .....
7	Vessel will be installed with the integrated propulsion control system / bridge and platform management system. Accordingly gearboxes are required to be equipped with all necessary accessories / sensors required for interface and integration of above said system/s.	To be confirmed	..... ..... ..... .....
8	Hoses, fittings, connections for L.O. cooler to gearbox. Hoses and end connection are to be class approved type and having pressure and temperature ratings as per classification society requirements	1 set / GB	..... ..... ..... ..... set / GB
9	Installation manuals, maintenance manuals, operation manuals, spare part catalogue and complete set of drawings to be supplied inline with D-787 of Indian Navy.	6 sets each/vessel	..... ..... ..... sets each/vessel





No.	Description	Requirement	To be Confirmed / Declared by Manufacturer
14	<b>Commissioning:</b> Installation & commissioning assistance by competent service engineer as per yard schedule at vendor's cost	To be confirmed / complied by manufacturer	..... ..... .....
15	<b>Approval of Drawings and specifications</b> Within two weeks of placement of order the manufacturer is to forward to the yard, a drawing and technical information / calculation schedule indicating list of documents / drawings and proposed dates by which these will be submitted to the yard, class, statutory authority and IHQ-MOD(N) respectively for their approval. This list should contain the drawings / documents / information / calculations etc. required as per all above agencies / authorities. All the drawings and technical informations are to be submitted by the manufacturer on magnetic media with required number of hard copies for onward submission to IHQ-MOD[N] for their approval and record. All the drawing / technical information that requires yard / class / statutory authority approval are to be first submitted by the manufacturer to all above for their approval and after obtaining their approvals same shall be submitted to IHQ-MOD(N) for their final scrutiny, comments and approval.		
16	<b>Equipment Drawings</b> Before manufacturing / supplying any equipment, fitting or material, the manufacturer is to forward final detailed drawing / specification for the prior approval of all concern. Approval of the yard, class and statutory authority as applicable shall be obtained by the manufacturer prior to submission to IHQ-MOD[N]. The approval of any proposal, specification, drawing will not exonerate the manufacturer from their responsibility in connection with the correct supply and functioning of the systems and complete installation		



No.	Description	Requirement	To be Confirmed / Declared by Manufacturer
17	<p><b><u>As made drawings and distribution of documents</u></b></p> <p>The manufacturer to furnish a list of “As made” drawings of various equipment proposed to be supplied. Same shall be subject to approval of the yard and IHQ-MOD(N). All drawings and documents are required to be supplied on magnetic media also in addition to the hard copies. The electronic documents to be in compliance with IETM/CALS format. The documents such as Ship Fit Definition [SFD], D-787, list of B&amp;D and onboard spares, OEM / Manufacturer / Vendor details etc. to be provided in Integrated Logistic Management System [ILMS] format. The manufacturer is to ensure that the tracings and prints are of the best quality and to the satisfaction of the yard and Naval Overseer. The requirements of sets of “As made” drawings, velographs, manuals and other documents are to be supplied by the contractor / vendor for distribution to various Naval authorities as per following list for “Distribution of Documents”.</p>		



### DISTRIBUTION OF DOCUMENTS

SL. NO	DESCRIPTION OF DOCUMENTS	SOURCE	TYPE OF DOCUMENT	IHQ-MOD(N)				ADMIN AUTH *				REPAIR AUTH *				MS *				WPS/WOT	SHIP	SMA	MTU/ETMU/WATT	DQA(WP/DQA(N)	SHIVAJI/VALSURA	TOTAL
				PROD. DTE.	PROF. DTE.	DFM	DLS	HQ WNC	HQ ENC	HQ SNC	HQ ANC	ASD (M)	ASD (V)	NSRY(C)	NSRY(PB)	FMU(B)	BMU(V)	MS(B)	MS(V)							
1	SCHEMATIC SYS. DRGS	S/B	VELO		1						1															2
			PRINT	1	1	1			1			2		1	1	1				1	1	1	1	1	1	1
2	AS MADE EQPT DRGS	S/B	VELO		1						1															2
			PRINT	1	1	1			1			2		1	1	1				1	1		1	1	1	13
3	CPL/PIL	S/B	PRINT	1	1		1			1		1	1	1					1							9
4	EQPT HAND BOOK	S/B	PRINT	1	1	1			1		1		1	1	1				1	1	1	1	1	1	1	14
5	INSTALLATION SPECS	S/B	PRINT	1	1	1			1		1								1	1						7
6	EQPT CODE	S/B	PRINT	1	1	1	1		1		1								1	1			1			9
7	MACHINERY / INFO BOOK	S/B	PRINT	1	1				1		1		1	1					1	1	1			1		10
8	TEST CERTIFICATES LLYODS / IRS ETC	S/B	PRINT	1	1						1								1	1			1			6
9	EQPT ORDER COPY	S/B	PRINT	1	1														1				1			4
10	OPERATION, MAINTENANCE MANUAL.	S/B	PRINT	1	1						1		1	1					1	1	1	1				9
11	MATERIAL SCHEDULE	S/B	PRINT	1	1						1								1	1						5
12	MAINTENANCE SCHEDULE	S/B	PRINT	1	1	1			1		1		1	1					1	1	1			1		11
13	D-787	S/B	VELO		1																					1
			PRINT	1	1	1	1		1			1				1				1	2					
14	HATS/SATS SCHEDULE	S/B	PRINT	1	1																					2

No.	Description	Requirement	To be Confirmed / Declared by Manufacturer
18	Yard / IHQ-MOD(N) reserve the right to depute their representatives to witness Factory Acceptance Test / Trials of equipment. The vendor is to intimate the dates of these trials at least six weeks in advance to the yard without fail.		



### 1.3 TECHNICAL AND OTHER INFORMATION

Following drawing / data / information to be submitted along with your technical offer

No.	Requirements / Description	To be confirmed and submitted by manufacturer
1	Dimensional G.A. Drawing with weight of the gearbox and its accessories	
2	Gearbox foundation detail and installation drawing	
3	Drawing/circuit diagram for gearbox systems like S.W. cooling, lub oil, hydraulic oil etc.	
4	Electrical drawings for control / instrumentation etc.	
5	Noise level data	
6	Heat dissipation data	
7	DME 452 is to be the guiding document for preparation and distribution of all technical / information	
8	Introduction of organization including details of turnover, sales figures and reference list	
9	Construction / performance details of equipment / machinery offered	
10	Product support strategy including minimum stock level, lead time for supply, rupee payment facility for imported items if any	
11	Details of service network	
12	Details of import content as applicable and indigenisation plans for the same	
13	Life cycle costing taking in to consideration, operating, watch keeping, maintenance, spares and other associated costs	
14	General content of standard documentation being provided [details of operation manual, technical manual, PIL, watch keeping, calendar based routines, stock calculations etc.]	
15	Letter of undertaking contractual commitment to provide product support for a minimum period of 15 years after delivery of the last vessel to Indian Navy or 20 years after delivery of the vessel whichever is later. In case the equipment / machinery is likely to become obsolete, the vendor should confirm to give a clear three years notice to the Indian Navy to assess the requirement of "life time buy" of the spares. The vendor should also confirm and ensure supply of these items prior to discontinuation of the production facilities	



1.4 **ONBOARD SPARES AS A STANDARD SCOPE OF SUPPLY FOR GEARBOX FOR 2 YEARS (OPERATION CYCLE: 4500 HOURS / ANNUM) OPERATION OF THE SHIP AS PER CLASS REQUIREMENT AND MAKER'S STANDARD (LIST OF ABOVE SPARES TO BE SUBMITTED WITH QTY. SPECIFIED)**

No.	Description	Quantity / Ship	Remark
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1.5 **TOOLS, SPECIAL TOOLS, JIGS AND FIXTURES REQUIRED FOR THE GUARANTEED OPERATION CYCLE OF TWO YEARS AS A STANDARD SCOPE FOR GEARBOX AS PER CLASS REQUIREMENT AND MAKER'S STANDARD (LIST OF ABOVE TOOLS TO BE SUBMITTED WITH QTY. SPECIFIED)**

No.	Description	Quantity / Ship	Remark
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1.6 **BASE AND DEPOT SPARES FOR GEARBOX FOR 5 YEARS OPERATION OF THE SHIP AS PER MAKER'S STANDARD (LIST OF ABOVE SPARES TO BE SUBMITTED WITH QTY. AND ITEM RATE / PRICE SPECIFIED)**

No.	Description	Quantity / Ship	Rate	Remark
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