

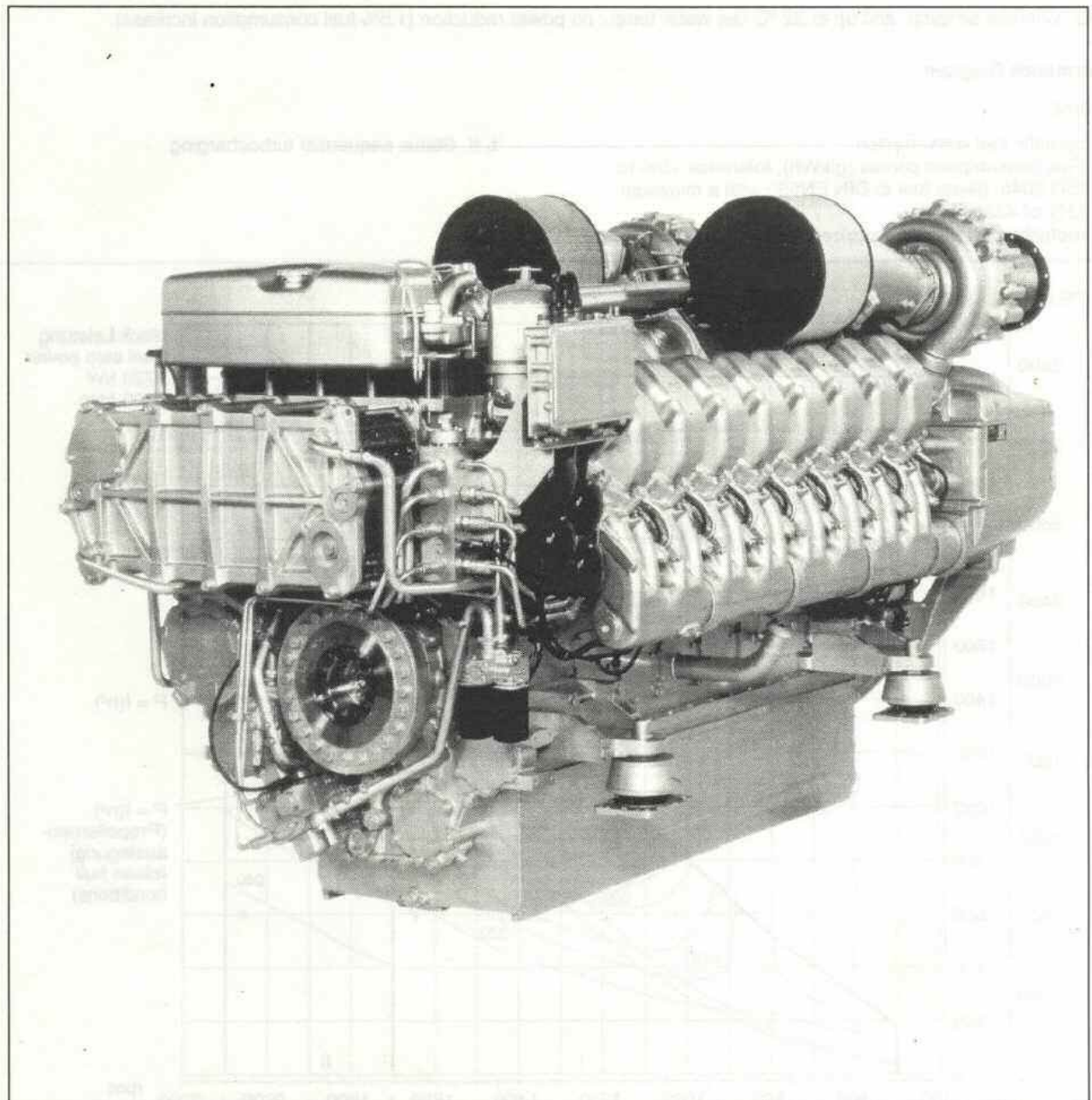
## Standard Quotation

MTU/DDC Engine Series 4000

### 16V 4000 M90

Propulsion Plant for Fast, Non-Classified Ships

2720 kW · 2100 rpm



Engine Rating

| Engine Model | Application Group | rpm  | Fuel Stop Power |             |
|--------------|-------------------|------|-----------------|-------------|
|              |                   |      | kW              | HP (metric) |
| 16V 4000 M90 | 1DS               | 2100 | 2720            | 3700        |

The rating shown represents net brake power (DIN/ISO 3046) at the PTO flange (raw water pump requirement deducted).

To calculate the power available at the gearbox output flange, a gearbox efficiency of 0.97 must be taken into account.

Application Group **1DS: Fast Ships**

Reference Conditions: Intake air temperature 25°C\* Barometric pressure 1000 mbar  
 Raw water temperature 25°C\* Intake depression 25 mbar  
 Exhaust back pressure 30 mbar

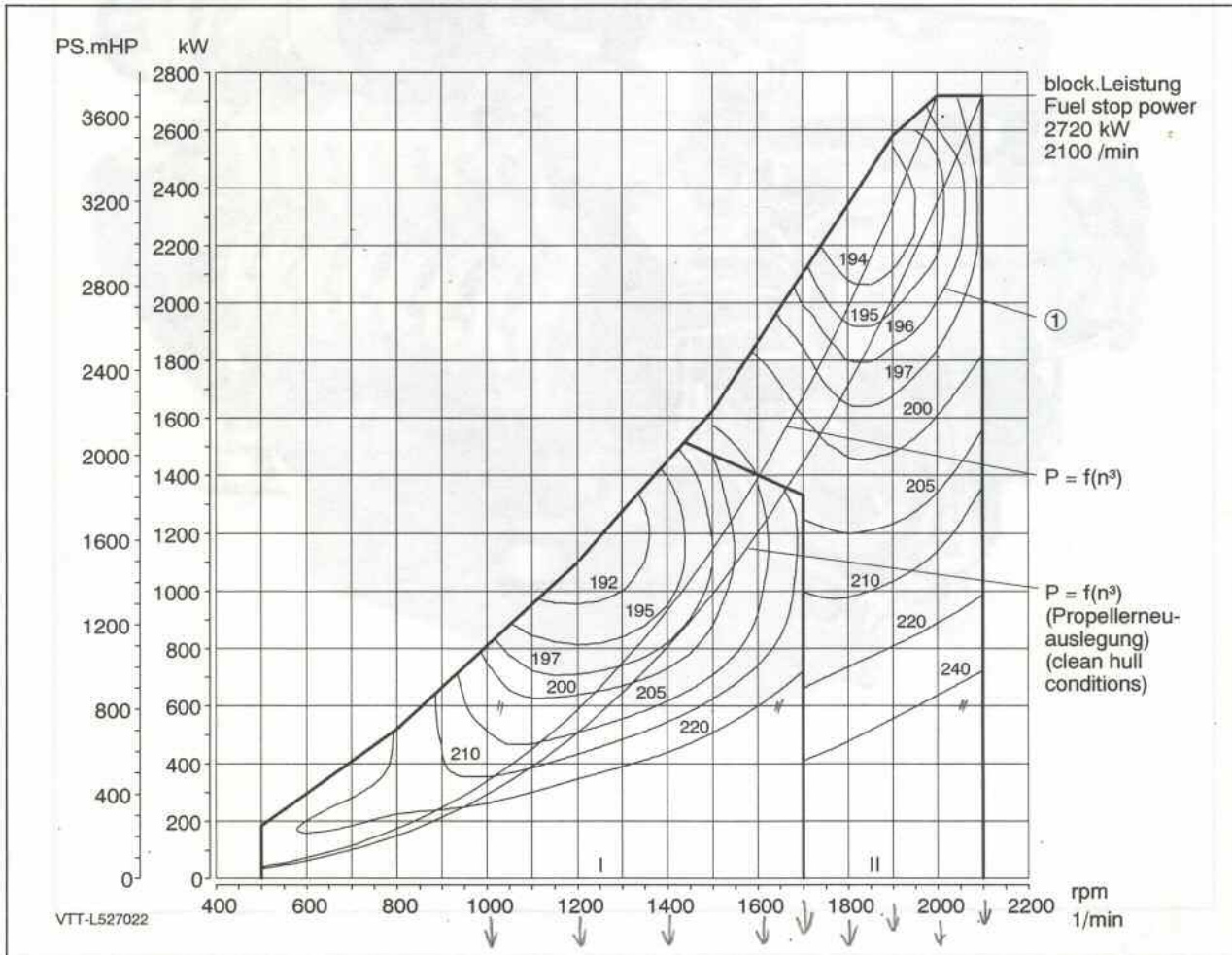
\* at 45 °C intake air temp. and up to 32 °C raw water temp.: no power reduction (1.5% fuel consumption increase)

Performance Diagram

Remarks:

- ① Specific fuel consumption  
 Fuel consumption curves (g/kWh), tolerance +5% to ISO 3046, diesel fuel to DIN EN590 with a minimum LHV of 42800 kJ/kg.  
**Including all pumps required for engine operation.**

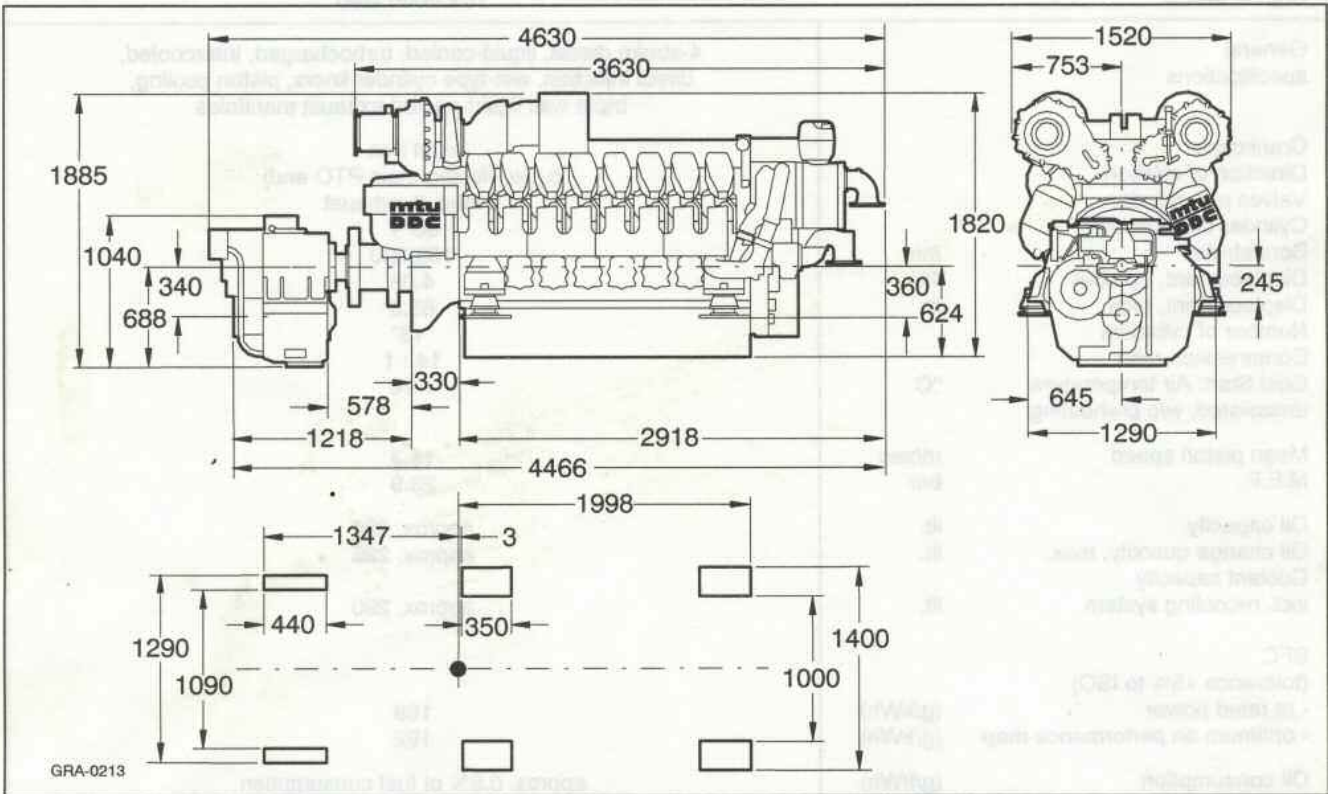
I, II Status sequential turbocharging



## Technical Data

| Engine Model   | 16V 4000 M90   |                                  |
|--|--|----------------------------------|
| General specifications                                 | 4-stroke diesel, liquid-cooled, turbocharged, intercooled, direct injection, wet-type cylinder liners, piston cooling, triple-wall liquid-cooled exhaust manifolds |                                  |
| Crankcase  | cast iron  |                                  |
| Direction of rotation                                  | c.c.w. (facing main PTO end)   |                                  |
| Valves per cylinder                                    | 2 inlet, 2 exhaust   |                                  |
| Cylinder arrangement                                   | 90°V   |                                  |
| Bore/stroke  | mm   | 165/190                          |
| Displacement, cylinder                                 | lit.   | 4.06                             |
| Displacement, total                                    | lit.   | 65.0                             |
| Number of cylinders                                    | 16   |                                  |
| Compression ratio                                      | 14 : 1   |                                  |
| Cold Start: Air temperature unassisted, w/o preheating | °C   | + 10                             |
| Mean piston speed                                      | m/sec  | 13.3                             |
| M.E.P.   | bar  | 23.9                             |
| Oil capacity   | lit.   | approx. 290                      |
| Oil change quantity, max.                              | lit.   | approx. 225                      |
| Coolant capacity incl. recooling system                | lit.   | approx. 290                      |
| SFC (tolerance +5% to ISO)                             |  |                                  |
| - at rated power                                       | (g/kWh)  | 199                              |
| - optimum on performance map                           | (g/kWh)  | 192                              |
| Oil consumption (after approx. 100 hours)              | (g/kWh)  | approx. 0.5% of fuel consumption |
| Intake depression, new/max. permissible                | mbar   | 25/35                            |
| Exhaust back pressure, new/max. permissible            | mbar   | 30/50                            |
| Radiation and convection heat                          | kW   | 55                               |
| Coolant heat dissipation                               | kW   | 2040                             |
| Raw water flow requirement, approx.                    | m <sup>3</sup> /h  | 108                              |
| Combustion air flow                                    | m <sup>3</sup> /sec  | 3.5                              |
| Exhaust flow   | m <sup>3</sup> /sec  | 8.3                              |
| Exhaust temperature after turbine                      | °C   | 410                              |
| Inclinations relative to waterline:                    |  |                                  |
| Trim, permanent (main PTO end down)                    | ∠ °  | 15                               |
| Trim, permanent (main PTO end up)                      | ∠ °  | 10                               |
| List, permanent (left)                                 | ∠ °  | 22.5                             |
| List, permanent (right)                                | ∠ °  | 22.5                             |

Version 1: Engine with standard equipment, including coupling and free-standing ZF BW 755-1 gearbox  
 Mass dry/wet: approx. 8595/9280 kg



\* Dimensions and mass may deviate depending on the equipment installed (within standard manufacturing tolerances).  
 Binding installation data after technical clarification of order.

| Power (kW) | Power (hp) | Mass (kg) | Mass (kg) |
|------------|------------|-----------|-----------|
| 800        | 1080       | 2310      | 2310      |
| 1000       | 1360       | 2720.00   | 2720.00   |
| 1200       | 1640       | 2720.00   | 2720.00   |
| 1400       | 1920       | 2720.00   | 2720.00   |
| 1600       | 2190       | 2720.00   | 2720.00   |
| 1800       | 2470       | 2720.00   | 2720.00   |
| 1900       | 2600       | 2720.00   | 2720.00   |
| 2000.0     | 2720.00    | 2720.00   | 2720.00   |
| 2100       | 2860       | 2720.00   | 2720.00   |
| 2300       | 3120       | 2720.00   | 2720.00   |
| 2500       | 3390       | 2720.00   | 2720.00   |
| 2700       | 3660       | 2720.00   | 2720.00   |
| 2900       | 3940       | 2720.00   | 2720.00   |
| 3100       | 4210       | 2720.00   | 2720.00   |
| 3300       | 4490       | 2720.00   | 2720.00   |
| 3500       | 4760       | 2720.00   | 2720.00   |
| 3700       | 5040       | 2720.00   | 2720.00   |
| 3900       | 5310       | 2720.00   | 2720.00   |
| 4100       | 5590       | 2720.00   | 2720.00   |
| 4300       | 5860       | 2720.00   | 2720.00   |
| 4500       | 6140       | 2720.00   | 2720.00   |
| 4700       | 6410       | 2720.00   | 2720.00   |
| 4900       | 6690       | 2720.00   | 2720.00   |
| 5100       | 6960       | 2720.00   | 2720.00   |
| 5300       | 7240       | 2720.00   | 2720.00   |
| 5500       | 7510       | 2720.00   | 2720.00   |
| 5700       | 7790       | 2720.00   | 2720.00   |
| 5900       | 8060       | 2720.00   | 2720.00   |
| 6100       | 8340       | 2720.00   | 2720.00   |
| 6300       | 8610       | 2720.00   | 2720.00   |
| 6500       | 8890       | 2720.00   | 2720.00   |
| 6700       | 9160       | 2720.00   | 2720.00   |
| 6900       | 9440       | 2720.00   | 2720.00   |
| 7100       | 9710       | 2720.00   | 2720.00   |
| 7300       | 9990       | 2720.00   | 2720.00   |
| 7500       | 10260      | 2720.00   | 2720.00   |
| 7700       | 10540      | 2720.00   | 2720.00   |
| 7900       | 10810      | 2720.00   | 2720.00   |
| 8100       | 11090      | 2720.00   | 2720.00   |
| 8300       | 11360      | 2720.00   | 2720.00   |
| 8500       | 11640      | 2720.00   | 2720.00   |
| 8700       | 11910      | 2720.00   | 2720.00   |
| 8900       | 12190      | 2720.00   | 2720.00   |
| 9100       | 12460      | 2720.00   | 2720.00   |
| 9300       | 12740      | 2720.00   | 2720.00   |
| 9500       | 13010      | 2720.00   | 2720.00   |
| 9700       | 13290      | 2720.00   | 2720.00   |
| 9900       | 13560      | 2720.00   | 2720.00   |
| 10100      | 13840      | 2720.00   | 2720.00   |
| 10300      | 14110      | 2720.00   | 2720.00   |
| 10500      | 14390      | 2720.00   | 2720.00   |
| 10700      | 14660      | 2720.00   | 2720.00   |
| 10900      | 14940      | 2720.00   | 2720.00   |
| 11100      | 15210      | 2720.00   | 2720.00   |
| 11300      | 15490      | 2720.00   | 2720.00   |
| 11500      | 15760      | 2720.00   | 2720.00   |
| 11700      | 16040      | 2720.00   | 2720.00   |
| 11900      | 16310      | 2720.00   | 2720.00   |
| 12100      | 16590      | 2720.00   | 2720.00   |
| 12300      | 16860      | 2720.00   | 2720.00   |
| 12500      | 17140      | 2720.00   | 2720.00   |
| 12700      | 17410      | 2720.00   | 2720.00   |
| 12900      | 17690      | 2720.00   | 2720.00   |
| 13100      | 17960      | 2720.00   | 2720.00   |
| 13300      | 18240      | 2720.00   | 2720.00   |
| 13500      | 18510      | 2720.00   | 2720.00   |
| 13700      | 18790      | 2720.00   | 2720.00   |
| 13900      | 19060      | 2720.00   | 2720.00   |
| 14100      | 19340      | 2720.00   | 2720.00   |
| 14300      | 19610      | 2720.00   | 2720.00   |
| 14500      | 19890      | 2720.00   | 2720.00   |
| 14700      | 20160      | 2720.00   | 2720.00   |
| 14900      | 20440      | 2720.00   | 2720.00   |
| 15100      | 20710      | 2720.00   | 2720.00   |
| 15300      | 20990      | 2720.00   | 2720.00   |
| 15500      | 21260      | 2720.00   | 2720.00   |
| 15700      | 21540      | 2720.00   | 2720.00   |
| 15900      | 21810      | 2720.00   | 2720.00   |
| 16100      | 22090      | 2720.00   | 2720.00   |
| 16300      | 22360      | 2720.00   | 2720.00   |
| 16500      | 22640      | 2720.00   | 2720.00   |
| 16700      | 22910      | 2720.00   | 2720.00   |
| 16900      | 23190      | 2720.00   | 2720.00   |
| 17100      | 23460      | 2720.00   | 2720.00   |
| 17300      | 23740      | 2720.00   | 2720.00   |
| 17500      | 24010      | 2720.00   | 2720.00   |
| 17700      | 24290      | 2720.00   | 2720.00   |
| 17900      | 24560      | 2720.00   | 2720.00   |
| 18100      | 24840      | 2720.00   | 2720.00   |
| 18300      | 25110      | 2720.00   | 2720.00   |
| 18500      | 25390      | 2720.00   | 2720.00   |
| 18700      | 25660      | 2720.00   | 2720.00   |
| 18900      | 25940      | 2720.00   | 2720.00   |
| 19100      | 26210      | 2720.00   | 2720.00   |
| 19300      | 26490      | 2720.00   | 2720.00   |
| 19500      | 26760      | 2720.00   | 2720.00   |
| 19700      | 27040      | 2720.00   | 2720.00   |
| 19900      | 27310      | 2720.00   | 2720.00   |
| 20100      | 27590      | 2720.00   | 2720.00   |
| 20300      | 27860      | 2720.00   | 2720.00   |
| 20500      | 28140      | 2720.00   | 2720.00   |
| 20700      | 28410      | 2720.00   | 2720.00   |
| 20900      | 28690      | 2720.00   | 2720.00   |
| 21100      | 28960      | 2720.00   | 2720.00   |
| 21300      | 29240      | 2720.00   | 2720.00   |
| 21500      | 29510      | 2720.00   | 2720.00   |
| 21700      | 29790      | 2720.00   | 2720.00   |
| 21900      | 30060      | 2720.00   | 2720.00   |
| 22100      | 30340      | 2720.00   | 2720.00   |
| 22300      | 30610      | 2720.00   | 2720.00   |
| 22500      | 30890      | 2720.00   | 2720.00   |
| 22700      | 31160      | 2720.00   | 2720.00   |
| 22900      | 31440      | 2720.00   | 2720.00   |
| 23100      | 31710      | 2720.00   | 2720.00   |
| 23300      | 31990      | 2720.00   | 2720.00   |
| 23500      | 32260      | 2720.00   | 2720.00   |
| 23700      | 32540      | 2720.00   | 2720.00   |
| 23900      | 32810      | 2720.00   | 2720.00   |
| 24100      | 33090      | 2720.00   | 2720.00   |
| 24300      | 33360      | 2720.00   | 2720.00   |
| 24500      | 33640      | 2720.00   | 2720.00   |
| 24700      | 33910      | 2720.00   | 2720.00   |
| 24900      | 34190      | 2720.00   | 2720.00   |
| 25100      | 34460      | 2720.00   | 2720.00   |
| 25300      | 34740      | 2720.00   | 2720.00   |
| 25500      | 35010      | 2720.00   | 2720.00   |
| 25700      | 35290      | 2720.00   | 2720.00   |
| 25900      | 35560      | 2720.00   | 2720.00   |
| 26100      | 35840      | 2720.00   | 2720.00   |
| 26300      | 36110      | 2720.00   | 2720.00   |
| 26500      | 36390      | 2720.00   | 2720.00   |
| 26700      | 36660      | 2720.00   | 2720.00   |
| 26900      | 36940      | 2720.00   | 2720.00   |
| 27100      | 37210      | 2720.00   | 2720.00   |
| 27300      | 37490      | 2720.00   | 2720.00   |
| 27500      | 37760      | 2720.00   | 2720.00   |
| 27700      | 38040      | 2720.00   | 2720.00   |
| 27900      | 38310      | 2720.00   | 2720.00   |
| 28100      | 38590      | 2720.00   | 2720.00   |
| 28300      | 38860      | 2720.00   | 2720.00   |
| 28500      | 39140      | 2720.00   | 2720.00   |
| 28700      | 39410      | 2720.00   | 2720.00   |
| 28900      | 39690      | 2720.00   | 2720.00   |
| 29100      | 39960      | 2720.00   | 2720.00   |
| 29300      | 40240      | 2720.00   | 2720.00   |
| 29500      | 40510      | 2720.00   | 2720.00   |
| 29700      | 40790      | 2720.00   | 2720.00   |
| 29900      | 41060      | 2720.00   | 2720.00   |
| 30100      | 41340      | 2720.00   | 2720.00   |
| 30300      | 41610      | 2720.00   | 2720.00   |
| 30500      | 41890      | 2720.00   | 2720.00   |
| 30700      | 42160      | 2720.00   | 2720.00   |
| 30900      | 42440      | 2720.00   | 2720.00   |
| 31100      | 42710      | 2720.00   | 2720.00   |
| 31300      | 42990      | 2720.00   | 2720.00   |
| 31500      | 43260      | 2720.00   | 2720.00   |
| 31700      | 43540      | 2720.00   | 2720.00   |
| 31900      | 43810      | 2720.00   | 2720.00   |
| 32100      | 44090      | 2720.00   | 2720.00   |
| 32300      | 44360      | 2720.00   | 2720.00   |
| 32500      | 44640      | 2720.00   | 2720.00   |
| 32700      | 44910      | 2720.00   | 2720.00   |
| 32900      | 45190      | 2720.00   | 2720.00   |
| 33100      | 45460      | 2720.00   | 2720.00   |
| 33300      | 45740      | 2720.00   | 2720.00   |
| 33500      | 46010      | 2720.00   | 2720.00   |
| 33700      | 46290      | 2720.00   | 2720.00   |
| 33900      | 46560      | 2720.00   | 2720.00   |
| 34100      | 46840      | 2720.00   | 2720.00   |
| 34300      | 47110      | 2720.00   | 2720.00   |
| 34500      | 47390      | 2720.00   | 2720.00   |
| 34700      | 47660      | 2720.00   | 2720.00   |
| 34900      | 47940      | 2720.00   | 2720.00   |
| 35100      | 48210      | 2720.00   | 2720.00   |
| 35300      | 48490      | 2720.00   | 2720.00   |
| 35500      | 48760      | 2720.00   | 2720.00   |
| 35700      | 49040      | 2720.00   | 2720.00   |
| 35900      | 49310      | 2720.00   | 2720.00   |
| 36100      | 49590      | 2720.00   | 2720.00   |
| 36300      | 49860      | 2720.00   | 2720.00   |
| 36500      | 50140      | 2720.00   | 2720.00   |
| 36700      | 50410      | 2720.00   | 2720.00   |
| 36900      | 50690      | 2720.00   | 2720.00   |
| 37100      | 50960      | 2720.00   | 2720.00   |
| 37300      | 51240      | 2720.00   | 2720.00   |
| 37500      | 51510      | 2720.00   | 2720.00   |
| 37700      | 51790      | 2720.00   | 2720.00   |
| 37900      | 52060      | 2720.00   | 2720.00   |
| 38100      | 52340      | 2720.00   | 2720.00   |
| 38300      | 52610      | 2720.00   | 2720.00   |
| 38500      | 52890      | 2720.00   | 2720.00   |
| 38700      | 53160      | 2720.00   | 2720.00   |
| 38900      | 53440      | 2720.00   | 2720.00   |
| 39100      | 53710      | 2720.00   | 2720.00   |
| 39300      | 53990      | 2720.00   | 2720.00   |
| 39500      | 54260      | 2720.00   | 2720.00   |
| 39700      | 54540      | 2720.00   | 2720.00   |
| 39900      | 54810      | 2720.00   | 2720.00   |
| 40100      | 55090      | 2720.00   | 2720.00   |
| 40300      | 55360      | 2720.00   | 2720.00   |
| 40500      | 55640      | 2720.00   | 2720.00   |
| 40700      | 55910      | 2720.00   | 2720.00   |
| 40900      | 56190      | 2720.00   | 2720.00   |
| 41100      | 56460      | 2720.00   | 2720.00   |
| 41300      | 56740      | 2720.00   | 2720.00   |
| 41500      | 57010      | 2720.00   | 2720.00   |
| 41700      | 57290      | 2720.00   | 2720.00   |
| 41900      | 57560      | 2720.00   | 2720.00   |
| 42100      | 57840      | 2720.00   | 2720.00   |
| 42300      | 58110      | 2720.00   | 2720.00   |
| 42500      | 58390      | 2720.00   | 2720.00   |
| 42700      | 58660      | 2720.00   | 2720.00   |
| 42900      | 58940      | 2720.00   | 2720.00   |
| 43100      | 59210      | 2720.00   | 2720.00   |
| 43300      | 59490      | 2720.00   | 2720.00   |
| 43500      | 59760      | 2720.00   | 2720.00   |
| 43700      | 60         |           |           |

## A. Engine with Standard Equipment

- A.1 Marine diesel engine with MTU sequential turbo-charging and charge air cooling; fully encapsulated and cooled exhaust manifolds and turbochargers; four-valve individual cylinder heads with "Rotocap" valve rotators; fuel delivery pump; fuel duplex filter with diverter valve; "Common Rail" high-pressure fuel system with jacketed lines, electron. controlled fuel injection and load-dependent cylinder cutout system; lube oil pump; lube oil heat exchanger, multistage lube oil filter with centrifugal oil filter; coolant pump; coolant thermostat; coolant distribution housing with expansion tank and breather valve; gear drive for auxiliary equipment; vibration damper; Electronic engine governor and control unit (ECU-MDEC; see item A.12)
- A.2 2 electric starters (each 24 VDC; 7.5 kW; 2-pole)
- A.3 Generator (28 VDC; 120 A; 2-pole)
- A.4 Flame-proof hose lines for fuel connection
- A.5 Fuel prefilter with water separator
- A.6 Oil dipstick (on left or right side)
- A.7 Oil change equipment with semirotary hand pump
- A.8 2 combustion air filters, engine-mounted (sea water-resistant, plastic filter element)
- A.9 2 bellows with companion flange to be connected to two on-engine exhaust connections
- A.10 Coolant-to-raw water/fuel-to-raw water plate-core heat exchanger; self-priming raw water centrifugal pump; set of flameproof rubber bellows for raw water inlet/outlet; set of flameproof hose lines for venting and overflow
- A.11 Resilient engine mount at aux. PTO end
- A.12 Propulsion plant management system (standard version according to customer's specification)  
Electronic propulsion plant management system PCS-5/MS I with CAN data bus/Interface technology, with the following components/functions:
- Electronic engine governor and control unit ECU-MDEC with integrated load profile recorder and data modules, programmed with engine and plant-related data, for engine speed control in response to speed setting with fuel injection and speed limitation as a function of engine status and operating conditions as well as MTU sequential-turbocharging control
  - Set of on-engine sensors
  - if gearbox is not supplied by MTU: electron. gearbox control system GCU for data processing, in sheet-metal housing for separate installation in engine room; system cable (10 m, plug connectors at both ends) for GCU and LOP connection
  - Local Operating Panel LOP in sheet metal housing for installation in engine room, featuring the following functions/components:
    - Interface to ECU, EMU, gearbox GCU, Ship's-Side Monitoring System, and Remote Control
    - Automatic start/stop and emergency stop sequencing control
    - LCD-display with selector keyboard for sensor data, and status display of sequential turbocharging and cylinder cutout
    - Alarm unit for individual visual alarm with output for acoustic common alarm
    - Combined control and display elements for engine and gearbox
      - Ready for Operation/Local Control/
      - Engine Start/Stop/Emergency Stop/
      - Gearbox Clutch Control/Engine Speed/
      - Lamp Test/Alarm Acknowledgment/
      - Illum. Dim Control
    - Set of connecting cables (10 m, plug connectors at both ends) for electronic components
    - Flashing light and horn for engine room alarm
- A.13 Factory acceptance testing
- A.14 Paint finish "white aluminium", single-component varnish, single color (RAL 9006)
- A.15 Installation, operation and maintenance instructions

Mass dry/wet: 7545/8160 kg

**B. Additional and Alternative Equipment****ENGINE ACCESSORIES**

- B.1 Coolant preheating system, incl. on-engine connecting hardware and flameproof hose lines (required for ambient temperatures of below +5 °C or high load application immediately after engine start)
- a - 400 VAC; 3 ph; 50 Hz; 4.5 kW
  - b - 440 VAC; 3 ph; 60 Hz; 4.5 kW
- B.3 Bilge pump  
(1x per ship)
- B.4 Free auxiliary PTO  
(flange on crankshaft extension at aux. PTO end, without coupling) for drive of ships-side auxiliary equipment (max. 3700 Nm)
- B.5 Torsionally resilient, offset-compensating coupling  
(for free-standing gearbox)
- B.8 Resilient engine mount at main PTO end  
(for free-standing gearbox)
- B.10 Engine/gearbox standard interface  
(only if "Remote Control" and/or "Ship's-Side Monitoring System" is not supplied by MTU)  
(Electronic data processing unit in terminal box for connection of customer-side systems to PCS-5/MS I, incl. interface definition and documentation)

**MARINE GEARBOX**

- B.20 Free-standing marine reverse-reduction gearbox ZF, model BW 755-1 (PTO axial, vertically off-set) electrically operated; hydraulic clutches and propeller thrust bearing; rigid gearbox mount; on-gearbox sensors; electron. gearbox control unit GCU for data processing, in sheet-metal housing for separate installation in engine room; system cable (10 m, plug connectors at both ends) for GCU and LOP connection
- a - i = 1,164 (special ratio)
  - b - i = 1,479
  - c - i = 2,028
  - d - i = 2,548
- B.26 Trolling valve for ZF gearbox
- B.27 Propeller shaft flange for ZF gearbox
- B.28 PTO on ZF gearbox  
(not clutchable, max. 90 Nm, with drive components for a Rexroth A10VO71 hydraulic pump, without pump)
- B.29 PTO on ZF gearbox  
(cylindrical shaft with key; not clutchable, max. 650 Nm, for drive of ship's-side auxiliary equipment via coupling or gear)

**B. Additional and Alternative Equipment****REMOTE CONTROL**

- B.40 Electronic engine and gearbox remote control RCS-5 FPP (for fixed pitch propeller plant), for the first control stand (closed) consisting of:  
microprocessor-controlled remote control system with CAN data bus/interface technology. Engine speed and gearbox coupling control via control lever. Operating panel with command transfer selection, option "single lever control" for multiple shaft systems and LCD-display for operation status and program information
- b - for twin-engine plant
  - c - for three-engine plant
  - d - for four-engine plant
- Possible Addition to Item B.40
- B.41\* Electronic engine and gearbox remote control for each additional control stand (closed or open) (scope analogous to B.40)
- b - for twin-engine plant
  - c - for three-engine plant
  - d - for four-engine plant
- Possible Addition to Item B.40
- B.42\* Electronic engine and gearbox remote control for 2 wing control stands (closed or open) (scope 2x analogous to B.41)
- b - for twin-engine plant
  - c - for three-engine plant
  - d - for four-engine plant
- Possible Addition to Item B.40
- B.43 Portable remote control unit for auxiliary control stand  
Portable manual control unit for docking maneuvers from an open control stand incl. connection box and cable (for twin-engine plant)
- Possible Addition to Item B.43
- B.44 Additional connection box for manual control unit (max. 2 additional connections)
- Possible Addition to Item B.40
- B.45 Trolling mode for dead-slow propulsion (only in conjunction with B.26)
- b - for twin-engine plant
  - c - for three-engine plant
  - d - for four-engine plant

\* only in conjunction with B.40  
B.41 + B.42 max. 5 slave control stands possible

**SHIP'S-SIDE MONITORING SYSTEM**

- B.50 Engine and gearbox instrumentation for the first control stand (closed), consisting of:  
microprocessor-controlled panel-type monitoring system MCS-5, type 1, with integrated CAN bus interface for propulsion plant management system PCS-5/MS 1, incl. dimmer control, ready for connection in console-fitting enclosure, with the following components:
- LCD display unit with selector key-board for quasi-analog and digital display of sensor data from CAN bus, such as:  
Speed / Fuel injection / Temperatures / Pressures / Gearbox Clutch Position
  - Alarm unit with visual individual alarms for various engine and gearbox measuring points, incl. reset keys, lamp test and alarm buzzer
  - Control panel with Engine Start, Stop, Emergency Stop and Override buttons, displays for Ready for Operation and Local Control
  - Illuminated analog engine speed display
- b - for twin-engine plant
  - c - for three-engine plant
  - d - for four-engine plant
- Possible Addition to Item B.50
- B.52\* Engine and gearbox instrumentation for the first slave control stand (closed or open), consisting of:
- Control panel with integrated CAN bus interface, incl. dimmer control, ready for connection in console-fitting enclosure, with control units for Engine Start, Stop, Emergency Stop and Override, displays for Ready for Operation, Local Control as well as visual common alarm incl. reset keys and lamp test
  - Horn for acoustic alarm
  - Illuminated analog engine speed display
- b - for twin-engine plant
  - c - for three-engine plant
  - d - for four-engine plant

\* only in conjunction with B.50  
B.52 + B.54 + B.56 max. 5 slave control stands possible

**B. Additional and Alternative Equipment**

cont'd: **SHIP'S-SIDE MONITORING SYSTEM**

Possible Addition to Item B.52

- B.54\* Engine and gearbox instrumentation for each additional slave control stand (closed or open), consisting of:
- Control panel with integrated CAN bus interface, incl. dimmer control, ready for connection in console-fitting enclosure, with control units for Engine Start, Stop, Emergency Stop and Override, displays for Ready for Operation, Local Control as well as visual common alarm incl. reset keys and lamp test
  - Horn for acoustic alarm
  - Illuminated analog engine speed display
- b - for twin-engine plant  
c - for three-engine plant  
d - for four-engine plant

Possible Addition to Item B.50

- B.56\* Engine and gearbox instrumentation for 2 wing control stands (closed or open), each wing stand consisting of:
- Control panel with integrated CAN bus interface, incl. dimmer control, ready for connection in console-fitting enclosure, with control units for Engine Start, Stop, Emergency Stop and Override, displays for Ready for Operation, Local Control
  - Horn for acoustic alarm
  - Illuminated analog engine speed display
- b - for twin-engine plant  
c - for three-engine plant  
d - for four-engine plant

\* only in conjunction with B.50  
B.52 + B.54 + B.56 max. 5 slave control stands possible

Note:  
**SHIP'S-SIDE MONITORING SYSTEM**

Monitoring System (MCS-5, type 2) with graphic control stations (active process visualization via color monitors) for monitoring of propulsion plants and additional measuring points and control functions in general ship's area  
- upon request

**PAINTWORK**

- B.70 Alternative to Item A.14  
Paint finish "grey silver",  
single-component varnish, single color  
(RAL 7001)
- B.71 Paint finish "signal white",  
single-component varnish, single color  
(RAL 9003)
- B.72 Paint finish "gold metallic",  
single-component varnish, metallic-effect paint,  
single color (RAL 462)

**SPARE PARTS**

- B.80 Shipboard spare parts kit  
To manufacturer's recommendation, for engine,  
gearbox, monitoring system and remote control  
- small kit -  
(1 x per ship)

**TOOLS**

- B.90 Shipboard tool kit  
To manufacturer's recommendation, for engine,  
gearbox, monitoring system and remote control  
- small kit -  
(1x per ship)

**mtu**  
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