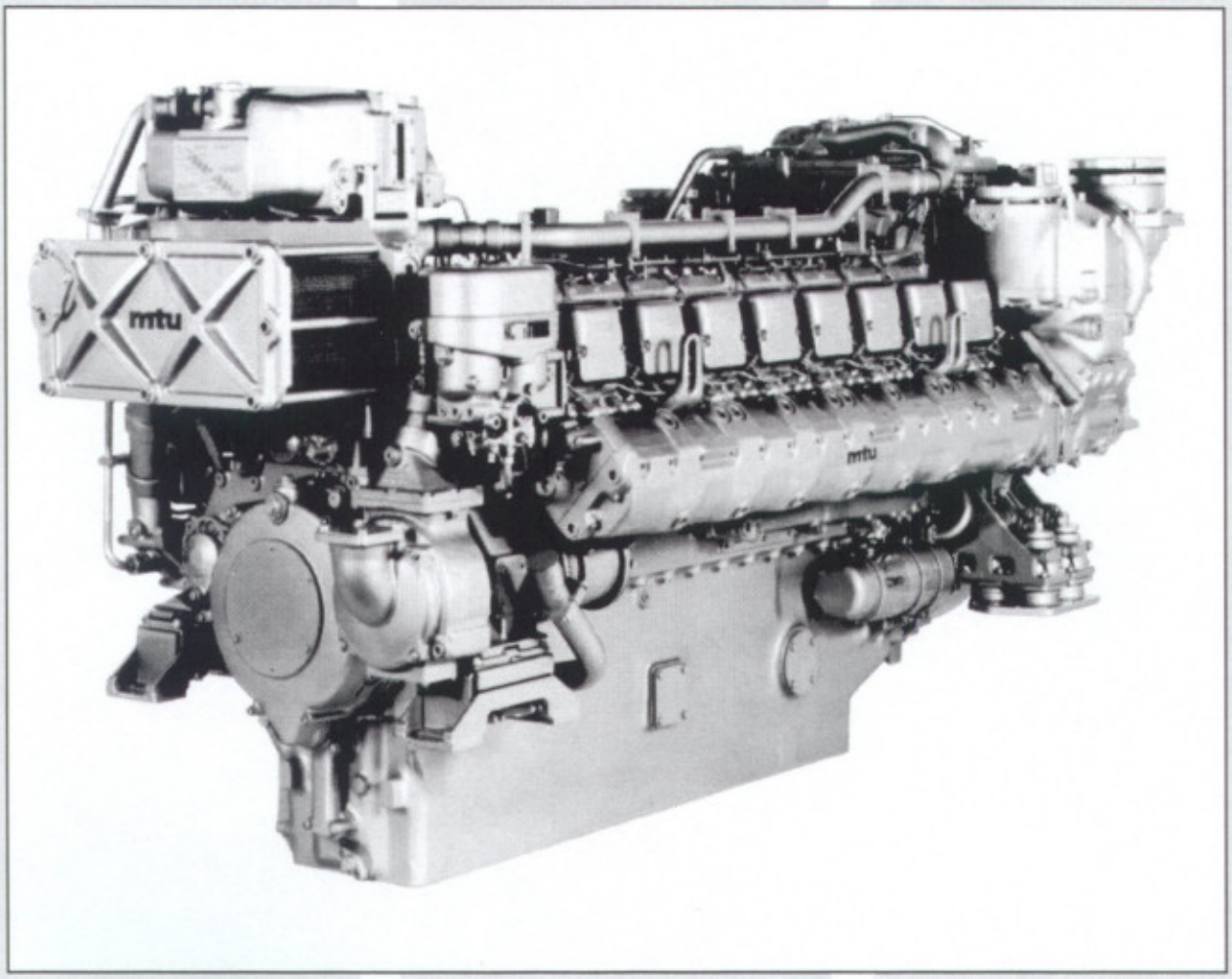
mtu

Technical Specification and Scope of Supply

16V 396 TE94

Propulsion Plant for
Non-Classified / Classified
Fast Vessels with Low Load Factors

2240 kW · 2000 rpm



Basic Data

16V 396 TE94 Application: Fast vessels with low load factors

Engine Power Rating

2240 kW *[3045 mHP]* at 2000 rpm
(Continuous Power ICFN)

The engine power represents the net brake power according to ISO 3046 at the PTO flange.

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

Application

MTU application group 1DS:

Fast vessels with low load factors

Reference Conditions

■ Intake air temperature	25 °C
■ Raw water temperature	25 °C
■ Barometric pressure	1000 mbar
■ Intake air depression	20 mbar
■ Exhaust back pressure	30 mbar

10.6 % derating at
45 °C intake air temperature and
32 °C raw water temperature:
(approx. 1.5 % fuel consumption increase)

Basic Design

- 16 cylinders
- 90° V cylinder arrangement
- Four-stroke diesel
- Liquid cooling
- Direct fuel injection
- Sequential exhaust turbocharging and charge-air cooling
- Wet, replaceable cylinder liners
- Piston cooling
- 2 inlet, 2 exhaust valves per cylinder
- Triple-walled, liquid-cooled exhaust lines
- Bosch block-type injection pump with cylinder cutout system
- Electronic engine management ECS

■ Bore	165 mm
■ Stroke	185 mm
■ Cylinder displacement	3.96 lit.
■ Total displacement	63.3 lit.
■ Compression ratio	12.3 : 1
■ Direction of rotation (facing driving end)	ccw
■ Flywheel housing	SAE 0
■ Cold start capability: air temperature (without start assistance, without coolant preheating)	+ 10 °C

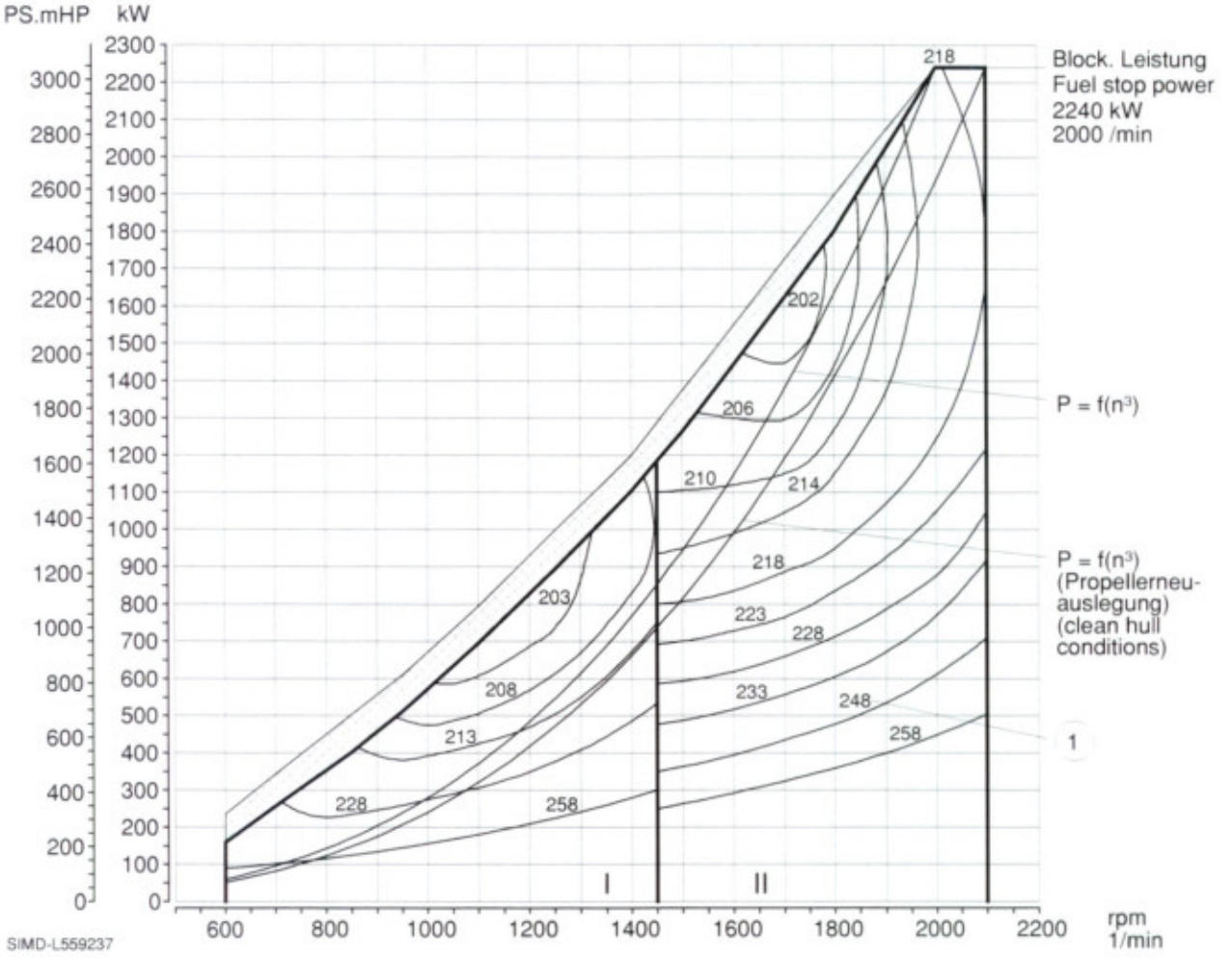
Performance Diagram

16V 396 TE94 Application: Fast vessels with low load factors

Remarks:

① Specific fuel consumption
fuel consumption curves (g/kWhr), 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 of sequential turbocharging



Engine setting and design configuration:
optimized for exhaust emission (IMO No_x specification) per ISO 8178

TBO (time between major overhauls)	6 000 hrs	
Standard load profile (P, t) [P = Load referred to fuel stop power (%)] [t = Portion of operating time (%)]	P 100 70 <10	t 10 70 20

Technical Data

16V 396 TE94 Application: Fast vessels with low load factors

Engine Rated Power (Continuous Power ICFN)	kW	**2240**
Speed	rpm	2000
Mean piston speed	m/s	12.3
M.E.P.	bar	21.2

Consumption		
Specific fuel consumption (tolerance to ISO 3046)		
(IMO 2000 NOx exhaust emission certified)		
at rated power	g/kWh	218
optimum value in performance map	g/kWh	202
Lube oil consumption (after 100 hrs operation), average / max.		0.5 / 1 % of fuel consumption

Oil and Coolant Capacity		
Engine lube oil (standard oil system)*		
Total initial filling	lit.	210
Oil dipstick mark, min. / max.	lit.	120 / 160
Oil change quantity	lit.	160
Engine coolant, total	lit.	203

Heat Dissipation		
Heat dissipated by engine coolant	kW	1500
Radiation and convection heat, engine	kW	45

Cooling System		
Raw water pump flow rate, approx. min. / max.	m^3/h	90
Raw water pump inlet pressure, min. / max. permissible	bar	-0.2 /
Pressure loss in off-engine raw water system, max. permissible	bar	2.0

Fuel System		
Fuel pressure at supply connection on engine, min. / max. permissible	bar	-0.3 / +0.5
Fuel flow rate to engine, max.	lit./min	32
Fuel return flow from engine, max.	lit./min	20
Fuel pressure at return connection on engine, max. permissible	bar	1.5

Combustion-air System		
Combustion-air flow rate	m^3/s	3.0
Intake air depression, design / max. permissible	mbar	20 / 35

Exhaust System		
Exhaust gas flow rate	m^3/s	8.2
Exhaust gas temperature after turbocharger	°C	530
Exhaust back pressure, design / max. permissible	mbar	30 / 50

Starting System		
- Electric Starting		
Voltage / Power	V / kW	24 / 15
- Pneumatic Starting (air-in-cylinder starting		
Starting air pressure, min. / max. permissible	bar	16 / 40
Air consumption per starting attempt (at atmospheric press.)	m_N^3	0.6
Starting attempt duration, approx. (engine preheated)	s	2

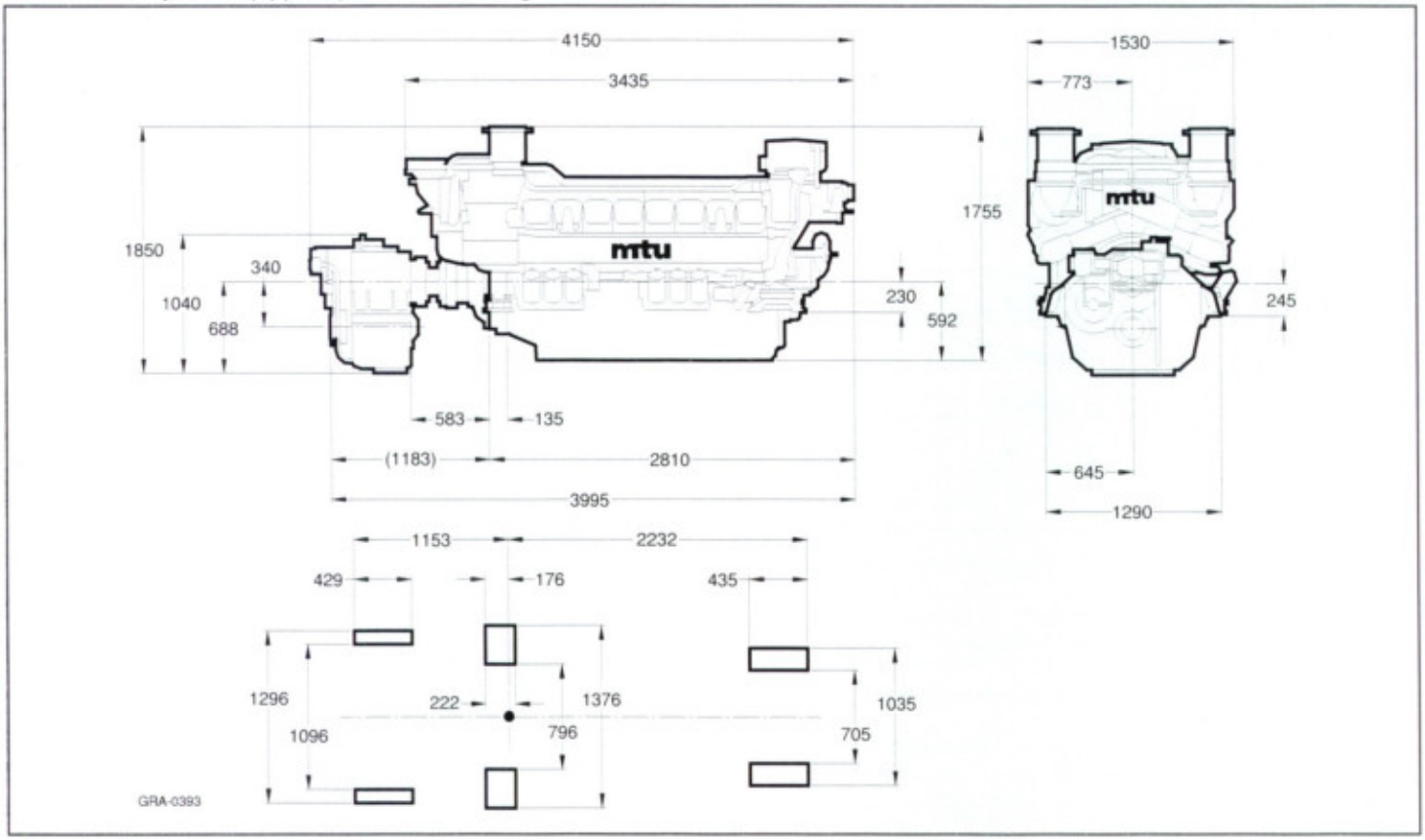
Inclinations*		
(permanent, relative to water line)		
Longitudinal (driving end down)	∠°	11
Longitudinal (driving end up)	∠°	10
Transverse right	∠°	25
Transverse left	∠°	25

* with 5 ° installation inclination (driving end down)
(data for other installation inclinations upon request)

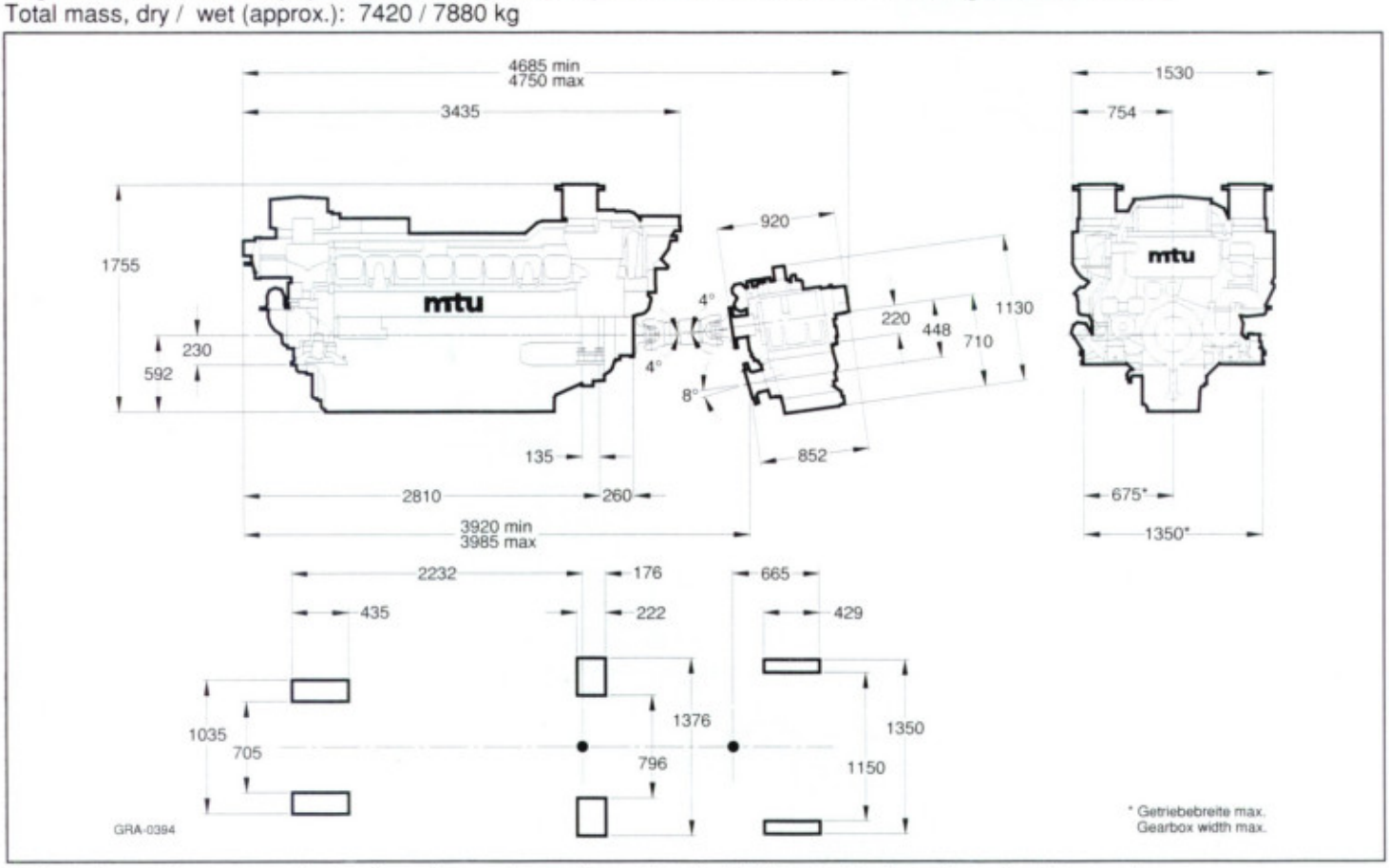
Installation Drawing *(mm, kg)

16V 396 TE94 Application: Fast vessels with low load factors

Engine with standard equipment including coupling and ZF 7549 gearbox (free-standing)
Total mass, dry / wet (approx.): 7370 / 7840 kg



Engine with standard equipment including coupling, universal shaft and ZF 7550 V gearbox (V-Drive)
Total mass, dry / wet (approx.): 7420 / 7880 kg



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

A. Engine with Standard Equipment

A.1 Liquid-cooled four-stroke diesel engine, anticlockwise direction of rotation (viewed on driving end), with direct fuel injection, controlled exhaust gas turbocharging and charge-air cooling; crankcase with oil pan and bolted-on flywheel housing (SAE 0-flange); individual, four-valve cylinder heads with „Rotocap" valve rotators; fuel delivery pump; fuel duplex filter with diverter valve; Bosch block-type injection pump with emergency shutdown lever and cylinder-cutout system; lube oil pump; lube oil heat exchanger; lube oil multi-stage filter with in-line back-up filter; coolant circulation pump; coolant thermostat; gear train for valve gear and auxiliary PTO; vibration damper (subject to torsional vibration calculation); normal and safety engine shutdown via emergency air shut-off flaps; all necessary on-engine air, exhaust, coolant, fuel and oil pipework;
Electronic engine control and monitoring unit ECS (see Item A.11)

A.2 Electric starter (28 VDC; 2-pole);
Electric control unit

A.3 AC battery-charging generator
(28 VDC; 85 A; 2-pole)

A.4 Fuel prefilter with diverter valve, with water separator, pressure gauge and water level monitor; hose lines to and from engine

A.5 Fuel safety equipment (jacketed HP lines incl. leak-off fuel tank with level monitor; flameproof hose line)

A.6 Oil change equipment with semirotary hand pump

A.7 Set of combustion air filters incl. brackets and hose lines, separate from engine

A.8 Set of bellows with companion flange, to be connected to on-engine exhaust connections (vertical discharge)

A.9 Engine-mounted recooling equipment, consisting of:
coolant-to-raw water plate-core heat exchanger with expansion tank; self-priming raw water pump; set of flameproof bellows for raw water inlet/outlet; set of flameproof hose lines for venting and overflow;
raw water outlet and hose line for gearbox oil cooler connection

A.10 Resilient engine mounts at free end

A.11 Electronic engine control and monitoring system ECS with integrated load-profile recorder, in sheet metal housing with plug connectors, for separate installation in engine room, and the following functions/subassemblies:
- Engine speed control in response to speed setting signal with fuel injection and speed limitation as a function of engine status and operating conditions
- Sequential-turbocharging and cylinder-cutout control
- Automatic start / stop / emergency stop sequence system
- Data processing logic for serial data transfer (RS 422) to Local Operating Panel (LOP) and instrumentation in main control stand
- Connections for gearbox transmitters/monitors incl. data processing logic
- Data modules, programmed with engine and plant-related data
- Electric governor actuator (24 VDC)

A.12 Monitoring in engine room
(standard version acc. to customer's specification)
Monitoring system, consisting of:
- Set of on-engine sensors and wiring incl. terminal box with plug connector
- Connecting interface CCS, in sheet metal housing with plug-in connecting cable to ECS and terminals for ship's cable, for external-signal adaptation and remote-control-signal conversion and amplification
- Local operating panel LOP, in sheet metal housing, ready for installation with plug connector, and the following equipment:
  - 2 LCD display units with selector buttons for display of the measured parameters:
    Speeds
    Fuel injection
    Temperatures
    Pressures
  - Alarm unit with visual individual alarm and output for audio common alarm
  - Operational status signal unit for activated turbocharger and cylinder cutout
  - Combined control and display elements for:
    Local control
    Ready for operation
    Engine start / stop / emergency stop
    Gearbox engaged / disengaged
    Overspeed test
    Engine speed increase / decrease
    Lamp test
    Common alarm acknowledgement
- Horn for acoustic common alarm in engine room
- Set of connecting cables with plug connectors, for connection of the individual monitoring system components

A.14 Engine factory acceptance testing

A.15 Paint finish "brilliant blue",
single-component paint, single color (RAL 5007)

A.16 Standard installation, operation and maintenance documentation; torsional vibration calculation

Mass:
Engine with Standard Equipment
dry / wet (approx.): 5720 / 6110 kg

B. Additional and Alternative Equipment

ENGINE ACCESSORIES

Alternative to Item Pos. A.12

B.1 a Monitoring in engine room
(in compliance with Classification Society Regulations; with ABS, BV, DNV, GL, LRS, NK, RINA type test approval)

Monitoring system, consisting of:
- Set of on-engine sensors (extended scope) and wiring incl. terminal box with plug connector
- Safety system DSS-01 B for installation in main control stand console, ready for connection with terminal strip for ship-side wiring, and the following equipment:
  - Visual individual display/alarm for:
    Engine in operation
    Gearbox-disengaged mode
    Sensor malfunction / broken wire
    Speed-sensor malfunction
    Low engine lube-oil / gearbox oil pressure
  - Emergency shutdown in case of:
    Engine overspeed
    Low engine lube-oil / gearbox oil pressure
  - Push buttons for:
    Lamp test, Alarm acknowledgement,
    Alarm memory reset
  - Output for:
    Common alarm for further processing in other monitoring units
    Acoustic common alarm
- Connecting interface CCS, in sheet metal housing with plug-in connecting cable to ECS and terminals for ship´s cable, for external-signal adaptation and remote-control-signal conversion and amplification
- Local operating panel LOP, in sheet metal housing, ready for installation with plug connector, and the following equipment:
  - 2 LCD display units with selector buttons of the measured parameters:
    Speeds
    Fuel injection
    Temperatures
    Pressures
  - Alarm unit with visual individual alarm and output for audio common alarm
  - Operational status signal unit for activated turbo-charger and cylinder cutout
  - Combined control and display elements for:
    Local control
    Ready for operation
    Engine start / stop / emergency stop
    Gearbox engaged / disengaged
    Overspeed test
    Engine speed increase / decrease
    Lamp test
    Common alarm acknowledgement
- Flashing light and horn for visual and acoustic common alarm in engine room
- Set of connecting cables with plug connectors for connection of the individual monitoring system components

Alternative to Item A.11, A.12, B.1a

B.1 b Control and monitoring system
(version with back up-ECS)
(in compliance with Classification Society Regulations; with ABS, BV, DNV, GL, LRS, NK, RINA type test approval)

Control and monitoring system,
complete, consisting of:
- Electronic engine control and monitoring system (ECS + BU-ECS),
  scope analog to A.11, however with additional back up ECS (BU-ECS) as redundant equipment to standard ECS
- Monitoring in engine room
  scope analog to B.1a, however without safety system DSS-01 B (functions executed by BU-ECS)

B. Additional and Alternative Equipment

ENGINE ACCESSORIES

Alternative to Item A.2

B.2 a Air-in-cylinder starting system (max. 40 bar) with solenoid starting valve (24 VDC) and hose line

Alternative to Item A.2

B.2 b Starting system with compressed air starter (max. 10 bar) with solenoid starting valve (24 VDC), hose line and pressure reduction valve (40/10 bar)

B.3 Fuel consumption measurement device, comprising 2 flow meters with temperature compensation and digital display unit

(required for ambient temperatures below + 10°C or high load application immediately after engine start)

B.5 Coolant preheating system including on-engine connecting hardware and flameproof hose lines

- a - 400 VAC; 3 ph; 50 Hz; 4,5 kW
- b - 440 VAC; 3 ph; 60 Hz; 4,5 kW

B.6 a Centrifugal oil filter (for extension of oil change intervals)

(mandatory with Classification Society BV, CCS, GL, LRS)

B.6 b Automatic lube oil level monitoring and oil replenishment system

Possible Addition only in conjunction with Item B.1a, b)
(mandatory with Classification Society BV, CCS, DNV, GL, KR, LRS, RINA)

B.7 Set of sensors for individual-cylinder exhaust temperature measurement

(mandatory with free-standing gearbox)

B.9 Resilient engine mounts at driving end

(mandatory with free-standing direct-drive gearbox)

B.12 a Torsionally resilient and off-set compensating coupling

(mandatory with free-standing V-drive gearbox)

B.12 b Torsionally resilient coupling in carrier housing

B.14 Bilge pump (1x per ship)

B.15 Free auxiliary PTO with flange (max. torque 1470 Nm)

B.18 Engine acceptance by Classification Society

- a - ABS
- b - BV
- c - CCS
- d - DNV
- e - GL
- f - KR
- g - LRS
- h - NK
- i - RINA

B. Additional and Alternative Equipment

MARINE GEARBOX (ZF)

B.20* Free-standing marine reverse-reduction gearbox; ZF 7549 (PTO axial, vertically off-set); electrically operated; with hydraulic clutches and propeller thrust bearing; rigid gearbox mount; on-gearbox sensors and wiring; connecting parts for oil extraction and oil cooler
- a - i = 1.479
- b - i = 2.028
- c - i = 2.548
- d - i = 3.074

B.22* V-Drive marine reverse-reduction gearbox; ZF 7550 V (PTO 8° inclined, vertically off-set); electrically operated; with hydraulic clutches and propeller thrust bearing; rigid gearbox mount; on-gearbox sensors and wiring; connecting parts for oil extraction and oil cooler
- a - i = 1.478 (special ratio)
- b - i = 2.027
- c - i = 2.548
- d - I = 2.964

B.22.1 Universal shaft between engine and gearbox

* Classification subject to specific project parameters upon request

B.35 Propeller shaft flange

B.36 a Trolling unit (Autotroll)

B.37 On-gearbox auxiliary PTO (pump mounted) (PTO for hydraulic pump, without pump, not clutchable)
- a - Size SAE A (max. 60 Nm)
- b - Size SAE B (max. 90 Nm)
- c - Size SAE B-B (max. 160 Nm)

B.37 On-gearbox auxiliary PTO (reverse shaft mounted) (PTO for hydraulic pump, without pump, not clutchable)
- d - Size SAE C (max. 650 Nm)
- e - Size SAE C-C (max. 650 Nm)

(only if shaft speed display is required)
(only in conjunction with Item B.1a, b)

B.38 Shaft speed transmitter

B.39* Gearbox classification by Classification Society
- a - ABS
- b - BV
- c - CCS
- d - DNV
- e - GL
- f - KR
- g - LRS
- h - NK
- i - RINA

B. Additional and Alternative Equipment

MARINE GEARBOX (Reintjes)

B.30 Free-standing marine reverse-reduction gearbox; WVS 930 (PTO axial, vertically off-set); electrically operated; with hydraulic clutches and propeller thrust bearing; rigid gearbox mount; on-gearbox sensors and wiring; connecting parts for oil extraction and oil cooler
- a - i = 1.348
- b - i = 1.525
- c - i = 2.032
- d - i = 2.481
- e - i = 3.043

B.32 V-Drive marine reverse-reduction gearbox; WVS 930 U (PTO axial, vertically off-set); electrically operated; with hydraulic clutches and propeller thrust bearing; rigid gearbox mount; on-gearbox sensors and wiring; connecting parts for oil extraction and oil cooler
- a - i = 1.348
- b - i = 1.525
- c - i = 2.032
- d - i = 2.481
- e - i = 3.043

B.32.1 Universal shaft between engine and gearbox

B.35 Propeller shaft flange

B.36 b Trolling unit

B.37 k On-gearbox auxiliary PTO (PTO for hydraulic pump, without pump, not clutchable)

(only if shaft speed display is required)
(only in conjunction with Item B.1a, b)

B.38 Shaft speed transmitter

B.39 Gearbox classification by Classification Society
- a - ABS
- b - BV
- c - CCS
- d - DNV
- e - GL
- f - KR
- g - LRS
- h - NK
- i - RINA

B. Additional and Alternative Equipment

REMOTE CONTROL (for FPP plants)

(in compliance with Classification Society Regulations)

B.40a Electronic Remote Control System (RCS-5 FPP) for the main control stand (enclosed); Remote control system with illumination control and CAN bus interface, with the following functions/ components: . Engine speed and gearbox clutch control via control lever incl. control buttons for command transfer selection, single lever control for multiple shaft systems and alphanumeric monochrome LCD display for operation status, alarms and program information; built-in buzzer for acoustic fault signal

Alternative to Item B.40a

B.40b Electronic Remote Control System (RCS-5 FPP) for the main control stand (open) (scope analog to Item B.40a)

Possible Addition to Item B.40a,b (mandatory, if Item B.40a,b is specified)

B.41 CAN interface coupler, in terminal box for engine room installation

Possible Addition to Item B.40a,b (required if Monitoring in Control Stand, Item B.50a,b is not specified)

B.42 Key switch for remote control on/off

Possible Addition to Item B.40a,b

B.43a* Remote control for slave control stands (enclosed) (scope analog to Item B.40a)

Possible Addition to Item B.40a,b

B.43b* Remote control for slave control stands (open) (scope analog to Item B.40b)

Possible Addition to Item B.40a,b

B.44a Manual control unit for docking manoeuvres Portable manual control unit for engine speed and gearbox clutch control, incl. interface module for connection to CAN bus, connecting box and cable (8 m) (for control of 2 propulsion plants)

Possible Addition to Item B.44a (max. 2 additional connecting boxes)

B.44b Additional connecting box for manual control unit

Possible Addition to Item B.40a,b (only in conjunction with on-gearbox trolling unit Item B.26)

B.46 Trolling mode for dead-slow propulsion

Possible Addition to Chapter "Remote Control"/ "Monitoring in Control Stand"

B.58 Acceptance of Remote Control and/or Monitoring in Control Stand components by Classification Society

Alternative to Item B.40-B.58

(for twin-engine plant) (in compliance with manufacturer´s specification)

B.47 Electronic Remote Control System (RCS-5 DUO) for the main control stand (enclosed or open); Remote control system with CAN bus interface, with the following functions/ components: .
- 1 remote control unit for engine speed and gearbox clutch control (twin control lever, protection class front/rear IP66/65 for installation in control console) incl. control buttons and operation status indication for command transfer selection and single lever control, built-in buzzer for acoustic fault signal
- 2 remote interface modules (RIM, 1x per propulsion unit; protection class IP23) for connection of the remote control unit to CAN bus
- 2 connecting cables (1x per propulsion unit) with plug connectors at both ends for connection of the remote control unit to remote interface modules

a Cable length 5 m
b Cable length 10 m

Possible Addition to Item B.47 (mandatory, if Item B.47 is specified)

B.48 CAN interface coupler, in terminal box for engine room installation

Possible Addition to Item B.47

B.49** Remote control for slave control stands (enclosed or open) (scope analog to Item B.47)

a Cable length 5 m
b Cable length 10 m

Possible Addition to Item B.47

B.44a Manual control unit for docking manoeuvres Portable manual control unit for engine speed and gearbox clutch control, incl. interface module for connection to CAN bus, connecting box and cable (8 m) (for control of 2 propulsion plants)

Possible Addition to Item B.44a (max. 2 additional connecting boxes)

B.44b Additional connecting box for manual control unit

Possible Addition to Item B.47 (only in conjunction with on-gearbox trolling unit Item B.26)

B.46 Trolling mode for dead-slow propulsion

* only in conjunction with Item B40a,b; B.43a,b altogether max. 5 slave control stands possible (1 wing control stand = 1 slave control stand)

** only in conjunction with Item B.47; B.49 altogether max. 5 slave control stands possible (1 wing control stand = 1 slave control stand)

B. Additional and Alternative Equipment

MONITORING IN CONTROL STAND
(Monitoring system MCS-5 type 1)
(in compliance with manufacturer´s specification and Classification Society Regulations)

B.50a Monitoring unit for engine and gearbox for the main control stand (enclosed), (square display units), consisting of:
Monitoring equipment and instrumentation with illumination control and CAN bus interface with the following equipment:
- Alphanumeric, monochrome LCD display for display of measured data and alarms in case of exceeding limit values, incl. control buttons for menu and illumination
- Operating panel with indicator lamps for Ready For Operation, engine and gearbox control Remote, buttons for engine Start/Stop/Emergency Stop
- Operating panel with buttons for Alarm Acknowledgement, Lamp Test, Safety System Override and Illumination Control
- Buzzer for common alarm
- Key switch for Monitoring System On/Off (also used for Remote Control On/Off, if Item B.40 is specified)
- Electric display unit for engine speed (96x96 mm, analog, illuminated)

Alternative to Item B.50a

B.50b Monitoring unit for engine and gearbox for the main control stand (open), (square display units)
(scope analog to Item B.50a)

Possible Addition to Item B.50a,b
(mandatory, if Item B.40a,b, B.47 is not specified)

B.51 CAN interface coupler, in terminal box for engine room installation

Possible Addition to Item B.50a,b

B.52a* Monitoring unit for engine and gearbox for slave control stands (enclosed), (full scope of instrumentation, square display units) consisting of:
Monitoring equipment and instrumentation with illumination control and CAN bus interface with the following equipment:
- Operating panel with indicator lamps for Ready For Operation, engine and gearbox control Remote, buttons for engine Start/Stop/Emergency Stop
- Operating panel with display unit for Common Alarm and buttons for Alarm Acknowledgement, Lamp Test, Safety System Override and Illumination Control
- Buzzer for common alarm
- Electric display unit for engine speed (96x96 mm, analog, illuminated)

Possible Addition to Item B.50a,b

B.52b* Monitoring unit for engine and gearbox for slave control stands (open), (full scope of instrumentation, square display units)
(scope analog to Item B.51a)

Possible Addition to Item B.50

B.53* Monitoring unit for engine and gearbox for slave control stands (enclosed or open), (reduced scope of instrumentation, square display units)
consisting of:
Monitoring equipment and instrumentation with illumination control and CAN bus interface with the following equipment:
- Operating panel with indicator lamps for Ready For Operation, engine and gearbox control Remote, buttons for engine Start/Stop/Emergency Stop (lamp test and illumination control via monitoring equipment in main control stand)
- Electric display unit for engine speed (96x96 mm, analog, illuminated)

Possible Addition to Item B.50a,b , B.52a,b , B.53

B.54 Set of display units (72x72 mm, analog, illuminated) for:
engine lube oil pressure, engine coolant temperature,
gearbox control oil pressure, gearbox oil temperature

Possible Addition to Item B.50a,b , B.52a,b , B.53
(only in conjunction with shaft speed transmitter Item B.28/B.38)

B.56 Display unit for shaft speed (96x96 mm, analog, illuminated)

Possible Addition to Chapter "Remote Control"/ "Monitoring in Control Stand"

B.58 Acceptance of Remote Control and/or Monitoring in Control Stand components by Classification Society

* only in conjunction with Item B50a,b; B.52a,b+B.53 altogether max. 5 slave control stands possible
(1 wing control stand = 1 slave control stand)

B. Additional and Alternative Equipment

Note:
SHIP'S-SIDE-MONITORING SYSTEM
(in compliance with Classification Society Regulations)
Monitoring System (MCS-5. type 2) with graphic control stations (active process visualisation via color monitors) for monitoring of propulsion plants and additional measuring points and control functions in general ship's area - upon request

PAINTWORK

Alternative to Item A.15

B.70 Paint finish "aluminium white"
single-component paint, single color (RAL 9006)

B.71 Paint finish "cement grey"
single-component paint, single color (RAL7023)

B.72 Paint finish "signal white"
single-component paint, single color (RAL 9003)

B.73 Paint finish "metallic beige" (metallic gold)
single-component paint, single color (RAL 462)

SPARE PARTS

B.80 Shipboard spare parts kit
to manufacturer's recommendation
- small kit - (1x per ship)
a - for engine
b - for ZF gearbox
c - for Reintjes gearbox
e - for monitoring system and remote control

B.81 Shipboard spare parts kit
in compliance with Classification Society Regulations
- for restricted operation - (1x per ship)
a - for engine
e - for monitoring system and remote control

TOOLS

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

B.91 Shipboard tool kit
in compliance with Classification Society Regulations
- for restricted operation - (1x per ship)
a - for engine
e - for monitoring system and remote control

Note:
The numbering and layout of this scope of supply refers only to this document and is different from other MTU documentation.

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